March 30, 2020

City of Sherwood
Attention: Joy Chang
22560 SW Pine Street
Sherwood, OR 97140

Re: **Tualatin-Sherwood Industrial Park - Land Use**
LU 2020-001 Incompleteness Response
Project Number 2180459.04

Dear Joy:

Thank you for your incompleteness letter dated February 16, 2020, and the guidance it provided for the proposed five-building Tualatin-Sherwood Industrial Park development. We have responded as noted in the items below; our replies follow staff's comments and additional material is listed in the exhibits below.

INFORMATION NECESSARY TO COMPLETE APPLICATION

1. *Clean Water Service Provider Letter.*

Response: The applicant continues to coordinate with Clean Water Services staff in pursuit of a Service Provider Letter and will forward a copy of the Letter upon receipt.

2. *Parking will not be allowed on SW Cipole Place per Engineering Comments. Narrative response tied to parking standards must be modified.*

Response: The narrative has been updated to reflect the Engineering comments related to the proposed parking along SW Cipole Place. Parking will be located solely within the proposed parking lots for the five industrial buildings.

3. *Ultimately 15-copies of the complete application. Please generate once the application is deemed complete.*

Response: An electronic copy of the application is being provided for staff's use. The applicant can also provide as many paper copies as are requested by staff.

While not specifically a completeness issue, the following must be addressed to comply with City requirements:

4. *Engineering Comments dated January 28, 2020.*

Response: Many of the Engineering comments have been incorporated into the revised civil plans. See further information below.

ENGINEERING COMPLETENESS REVIEW COMMENTS

The following responses have been provided by Jeff Shoemaker, PE, civil engineer at DOWL:

Comments to Be Addressed prior to Packet Submittal to Planning Commission for Land Use Decision

1. *Provide CWS service provider letter (SPL).*

Response: The applicant continues to coordinate with Clean Water Services staff in pursuit of a Service Provider Letter and will forward a copy of the Letter upon receipt.

2. *Need to get City Engineer approved Design Modification Request for the block length on future SW Blake Road in order to not extend SW Cipole Road to SW Blake Road (210.6E Intersection Spacing). Form on city website.*

Response: A Design Modification Request has been submitted as a part of the updated package.

3. *Need to get City Engineer approved Design Modification Request for cul-de-sac length in excess of standard (210.7 Cul-de-sacs, Eyebrows, Turnouts). Form on city website.*

Response: A Design Modification Request has been submitted as a part of the updated package.

4. *Need to get City Engineer approved Design Modification Request for cul-de-sac radius in excess of standard (Standard Drawing RD-10). Form on city website.*

Response: A Design Modification Request has been submitted as a part of the updated package.

5. *Need to get City Engineer approved Design Modification Request for no sidewalk on east side of SW Cipole Road (Standard Drawing RD-1). Form on city website.*

Response: A Design Modification Request to eliminate the sidewalk and public utility easement on the east side of Cipole has been submitted as a part of the updated package.

6. *No parking to be allowed on new street. Confirm not using on-street parking in parking calculations.*

Response: This comment has been confirmed. No parking will be proposed on Cipole as requested by the City.

7. *Need to show how subject development is getting phased and public improvements to be constructed with each phase.*

Response: A preliminary construction sequencing plan has been attached.

8. *Need to address how the new south leg of the SW Tualatin-Sherwood Road/SW Cipole Road intersection will function in relation to traffic signalization in the interim to SW Tualatin-Sherwood Road being widened.*

Response: As agreed in our meeting with staff on February 18, 2020, the City will craft a condition as a part of the land use to satisfy Washington County requirements. Suggested language as follows: "Applicant shall coordinate access at the intersection of Cipole and Tualatin-Sherwood Road with Washington County."

9. *Need to show how water quality treatment and hydro-modification is being provided for the street widening improvements along the west side of SW 124th Avenue.*

Response: The drainage report dated March 4, 2020 has been updated to include the widening on 124th Avenue.

10. Label elevations on existing contours.
Response: Additional contour labels have been added to all grading sheets for additional clarity.

11. Need to provide information on how Cipole Road/T-S Road intersection is to work if construction entrance to site is located at the proposed Cipole Road extension. Addition of signalization on north side of intersection required? Possible alternative construction site entrance identified/coordinated with WACO?
Response: As agreed in our meeting with staff on February 18, 2020, the City will craft a condition as a part of the land use to satisfy Washington County requirements. Suggested language as follows: "Applicant shall coordinate construction access to the site with Washington County. Washington County approval shall be required for the issuance of site construction permits."

Technical Review Comments from Engineering

1. Provide design information for reconfiguration of stormwater underground detention/treatment system for SW 124th Avenue.
Response: The drainage report dated March 4, 2020 has been updated to include the widening on 124th Avenue.

2. Providing detention for the 25-year event on top of the hydro-modification will make the project eligible for SDC detention credits.
Response: This comment has been noted.

3. Please note that meeting hydro-modification standards does not qualify the project for SDC credits for detention. You'll need to provide calculations for meeting the detention standards in the CWS design standards in order to quality for detention SDC credits.
Response: This comment has been noted.

4. The existing sanitary sewer shown at the southwest corner of the SW Tualatin-Sherwood Road/SW Oregon Street intersection is not accurate. Project will need to tie into the manhole at the southwest corner of the SW Tualatin-Sherwood Road/SW Oregon Street intersection where the out pipe has a 12-inch diameter.
Response: The plans have been updated to show the sanitary line tying into the manhole at the SW corner of Tualatin-Sherwood Road.

5. Extension of the public sanitary sewer shall be located behind the future south curb line of SW Tualatin-Sherwood Road with WACO concurrence.
Response: As discussed at the February 18, 2020 meeting, the County's planned location for the new storm line widening is behind the future southern curb line of Tualatin-Sherwood Road. We will need to work with Washington County and the City of Sherwood to locate the sanitary line alignment on Tualatin-Sherwood Road.

6. No public sanitary sewer mains are to be installed within private property, except within public utility easement dedicated to the City as approved by City Engineer.
Response: The sanitary configuration has been revised to eliminate proposed public utility easements for sanitary sewer outside of future ROW with the exception of the utility extension from the end of the Cipole cul-de-sac to future Blake Road.

7. *The 16-inch diameter public water line within SW Cipole Road north of SW Tualatin-Sherwood Road shall be extended southward along the proposed SW Cipole Road extension and/or public utility easement, being capped at the site developments southern property line. Another 16-inch diameter line will also be run east along SW Tualatin Sherwood Road to SW 124th Avenue, then south along SW 124th Avenue to the future intersection with SW Blake Road, then westward and being capped at the west right-of-way line of SW 124th Avenue. These extensions will allow for future extension and completion of the looped public waterline within SW Blake Road by the future WWSP project. Blow off assemblies will be installed at the capped end of each water mainline stub.*

Response: The alignment described above is reflected in the updated plans.

8. *No public water line are to be installed within private property outside of the proposed SW Cipole Road extension right-of-way or public utility easement dedicated to the City as approved by the City Engineer. Easements for installation of public water service to fire vaults will be as close to the public right-of-way as possible.*

Response: The water configuration has been updated to eliminate proposed public utility easements for water outside of future ROW with the exception of the utility extension from the end of the Cipole cul-de-sac to future Blake Road. Private to private water easements may still be required and have been reflected on the plans.

9. *The existing storm basins in the preliminary storm report don’t correlate with the existing contours.*

Response: The drainage report dated March 4, 2020 has been updated to reflect the proper existing stormwater catchment basins.

10. *Verify ground water depth at each pond and ensure that pond bottom is not below ground water level.*

Response: The GeoDesign geotechnical report dated February 6, 2018 and supplementary memo dated December 23, 2019 reflect groundwater as follows:

- A groundwater elevation at approximately 176.5' at the closest boring location to the Tract E (TP-11). The tract E pond elevation is designed at 186.60.
- Groundwater not encountered at approximately 176.5' at the closest boring location to the Tract C (B-2). The tract C pond elevation is designed at 184.85.
- A ground water elevation at approximately 185' at the closest boring location to the Tract B (B-6). The tract B pond elevation is designed at 188.60.

11. *Extend sanitary sewer, water and stormwater systems through the Cipole Road extension to the south property line in a straight alignment (no bends at south end). End sanitary and stormwater line extensions with cleanout. End waterline extension with a blow-off assembly.*

Response: Plans have been updated to reflect a straight run from the end of the Cipole cul-de-sac to the termination in future Blake Road.

12. *The invert information for SDMH-P4 is listed backwards for the pipelines. The treatment line invert should be the lower of the two, with the high flow bypass invert having the higher invert. Currently the high flow bypass invert is the lower of the two inverts, hence during normal rainfall event conditions no treatment is being performed.*

Response: As discussed in the meeting with staff held March 4, 2020, DOWL has updated the plans to separate the storm line for Cipole Place collection from the line extending from future Blake Road, resolving any question on manhole SDMH-P4.

13. *Separate storm pipes outlets that are discharging into water quality ponds as far away from outlet structures as possible. Check to make sure that no short circuiting effects occur and that retention/treatment time is maintained.*

Response: DOWL has updated the plans to maximize the distance from inlet to outlet of the ponds as much as feasible.

14. *Need to install public storm sewer to serve Lot 3 and Lot 4.*

Response: Plans have been updated to reflect a public storm line and easements through Lots 1, 2, and 5 to serve Lots 1, 3, and 4.

15. *Regional storm facilities require a sedimentation manhole prior to storm discharge to facility.*

Response: Updated plans reflect sedimentation manholes on storm lines prior to discharge into the storm ponds.

Thank you for your consideration in beginning full review of the land use application. We understand that questions, comments, and suggestions from staff may come up within the review process. We welcome such dialogue and intend to respond promptly to inquiries and suggestions as they may arise. Please contact me at 971.346.3742 or bvarricchione@mcknze.com if you have any questions.

Sincerely,

Brian Varricchione

Brian Varricchione

Enclosure(s): City of Sherwood Incompleteness Letter Dated February 16, 2020
Updated Application Package

c: Kirk Olsen – Trammell Crow Company
Jeff Shoemaker – DOWL

City of Sherwood
Oregon
Home of the Tualatin River National Wildlife Refuge

City of Sherwood
22560 SW Pine St.
Sherwood, OR 97140
Tel 503-625-5522
Fax 503-625-5524
www.sherwoodoregon.gov

City Manager
Joseph Gall, ICMA-CM

February 16, 2020

Trammell Crow Company
Kirk Olsen
1300 SW 5th Avenue Suite 3050
Portland OR 97201

RE: T-S Corporate Park, LU 2020-001 SP SUB CUP VAR
Completeness Review

This letter is to confirm that the City received your application for a project type on January 17, 2020. A review by staff has determined that your application is incomplete at this time. Please provide the following for staff to deem the application complete and schedule this matter for a hearing.

1. Clean Water Services Service Provider Letter

2. Parking will not be allowed on SW Cipole Place per Engineering Comments. Narrative response tied to parking standards must be modified.

3. Ultimately 15-copies of the complete application. Please generate once the application is deemed complete.

While not specifically a completeness issue, the following must be addressed to comply with City requirements:

4. Engineering Comments dated January 28, 2020

Once your application is complete, we will schedule this matter for hearing. If you have any questions, please contact me at 503-625-4214 or changj@sherwoodoregon.gov.

In accordance with ORS 227.178(2) your application will be deemed complete once we have received:

1. All of the missing information noted; or
2. Some of the missing information and written notice that no additional information will be provided; or
3. Written notice that no additional information will be provided.

Please note that you have 180-days from the date of this letter to bring your application into completeness or the application becomes void per ORS 227.178(4).

Sincerely,

Joy L. Chang, Senior Planner
City of Sherwood

Attachment: COS Engineering Comments dated January 28, 2020

CC: David Kraska, WWSSC, via email
Corianne Burnett, WWSSC, via email
Bran Varricchione, Mackenzie, via email
Jeff Shoemaker, DOWL, via email

Engineering Completeness Review Comments

City of Sherwood Oregon

To:	Joy Chang, Senior Planner
From:	Craig Christensen, P.E., Civil Engineer
Project:	Sherwood Industrial Park (LU 2020-001)
Date:	January 28, 2020

Engineering staff has reviewed the information provided for the above referenced project and has the following completeness comment(s):

<u>Comments that need to be addressed prior to packet submittal to Planning Commission for Land Use Decision</u>

1. Provide CWS service provider letter (SPL).
2. Need to get City Engineer approved Design Modification Request for the block length on future SW Blake Road in order to not extend SW Cipole Road to SW Blake Road (210.6E Intersection Spacing). Form on city website.
3. Need to get City Engineer approved Design Modification Request for cul-de-sac length in excess of standard (210.7 Cul-de-sacs, Eyebrows, Turnouts). Form on city website.
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5. Need to get City Engineer approved Design Modification Request for no sidewalk on east side of SW Cipole Road (Standard Drawing RD-1). Form on city website.
6. No parking to be allowed on new street. Confirm not using on-street parking in parking calculations.
7. Need to show how subject development is getting phased and public improvements to be constructed with each phase.
8. Need to address how the new south leg of the SW Tualatin-Sherwood Road/SW Cipole Road intersection will function in relation to traffic signalization in the interim to SW Tualatin-Sherwood Road being widened.
9. Need to show how water quality treatment and hydro-modification is being provided for the street widening improvements along the west side of SW 124th Avenue.
10. Label elevations on existing contours.
11. Need to provide information on how Cipole Road/T-S Road intersection is to work if construction entrance to site is located at the proposed Cipole Road extension. Addition of signalization on north side of intersection required? Possible alternative construction site entrance identified/coordinated with WACO?

Technical Review Comments from Engineering

1. Provide design information for reconfiguration of stormwater underground detention/treatment system for SW 124th Avenue.
2. Providing detention for the 25-year event on top of the hydro-modification will make the project eligible for SDC detention credits.
3. Please note that meeting hydro-modification standards does not qualify the project for SDC credits for detention. You'll need to provide calculations for meeting the detention standards in the CWS design standards in order to quality for detention SDC credits.
4. The existing sanitary sewer shown at the southwest corner of the SW Tualatin-Sherwood Road/SW Oregon Street intersection is not accurate. Project will need to tie into the manhole at the southwest corner of the SW Tualatin-Sherwood Road/SW Oregon Street intersection where the out pipe has a 12-inch diameter.
5. Extension of the public sanitary sewer shall be located behind the future south curb line of SW Tualatin-Sherwood Road with WACO concurrence.
6. No public sanitary sewer mains are to be installed within private property, except within public utility easement dedicated to the City as approved by City Engineer.
7. The 16-inch diameter public water line within SW Cipole Road north of SW Tualatin-Sherwood Road shall be extended southward along the proposed SW Cipole Road extension and/or public utility easement, being capped at the site developments southern property line. Another 16-inch diameter line will also be run east along SW Tualatin-Sherwood Road to SW 124th Avenue, then south along SW 124th Avenue to the future intersection with SW Blake Road, then westward and being capped at the west right-of-way line of SW 124th Avenue. These extensions will allow for future extension and completion of the looped public waterline within SW Blake Road by the future WWSP project. Blow off assemblies will be installed at the capped end of each water mainline stub.
8. No public water line are to be installed within private property outside of the proposed SW Cipole Road extension right-of-way or public utility easement dedicated to the City as approved by the City Engineer. Easements for installation of public water service to fire vaults will be as close to the public right-of-way as possible.
9. The existing storm basins in the preliminary storm report don't correlate with the existing contours.
10. Verify ground water depth at each pond and ensure that pond bottom is not below ground water level.
11. Extend sanitary sewer, water and stormwater systems through the Cipole Road extension to the south property line in a straight alignment (no bends at south end). End sanitary and stormwater line extensions with cleanout. End waterline extension with a blow-off assembly.
12. The invert information for SDMH-P4 is listed backwards for the pipelines. The treatment line invert should be the lower of the two, with the high flow bypass invert having the higher invert. Currently the high flow bypass invert is the lower of the two inverts, hence during normal rainfall event conditions no treatment is being performed.
13. Separate storm pipes outlets that are discharging into water quality ponds as far away from outlet structures as possible. Check to make sure that no short circuiting effects occur and that retention/treatment time is maintained.
14. Need to install public storm sewer to serve Lot 3 and Lot 4.

15. Regional storm facilities require a sedimentation manhole prior to storm discharge to facility.

END OF COMMENTS

MACKENZIE.

DESIGN DRIVEN | CLIENT FOCUSED

PRELIMINARY SUBDIVISION, SITE PLAN REVIEW, CONDITIONAL USE, AND VARIANCE

To
City of Sherwood

For
T-S Corporate Park

Dated
January 17, 2020
Revised March 30, 2020

Project Number
2180459.04

MACKENZIE
Since 1960

RiverEast Center | 1515 SE Water Ave, Suite 100, Portland, OR 97214
PO Box 14310, Portland, OR 97293 | T 503.224.9560 | www.mcknze.com

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MATERIALS PROVIDED SEPARATELY

1. Application fee
2. Mailing labels for properties within 1,000 feet of site
3. Land Use Submittal Checklists
4. Electronic copy of all submittal materials

I. PROJECT SUMMARY

Applicant:	Trammell Crow Company, Attn: Kirk Olsen 1300 SW 5th Avenue, Suite 3050 Portland, OR 97201 KOlsen@trammellcrow.com
Owner:	Willamette Water Supply System Commission, Attn: David Kraska 1500 NW Bethany Boulevard, Suite 305 Beaverton, OR 97006 david.kraska@tvwd.org
Site Address:	12822 SW Tualatin-Sherwood Road Sherwood, OR 97140
Washington County Tax Lot:	Tax Lot 2S128D001100
Site Area:	46.5 acres
Zoning:	Employment Industrial (EI)
Comprehensive Plan:	Industrial
Adjacent Zoning:	North: City of Sherwood General Industrial (GI) and City of Tualatin General Manufacturing (MG) East: City of Tualatin Manufacturing Business Park (MBP) South: City of Sherwood Employment Industrial (EI) and Washington County Future Development, 20-acre (FD-20) West: Washington County Future Development, 20-acre (FD-20)
Existing Structures:	None (Vacant Lot)
Request:	Preliminary Subdivision, Site Plan Review, Conditional Use, and Variance application for a five-building industrial park, totaling 535,194 square feet within the Tonquin Employment Area (TEA)
Project Contact:	Mackenzie, Attn: Brian Varricchione 1515 SE Water Avenue, Suite 100 Portland, OR 97214 (503) 224-9560 bvarricchione@mcknze.com

II. INTRODUCTION

Description of Request

The applicant, Trammell Crow Company, requests Type III Preliminary Subdivision, Site Plan Review, Conditional Use, and Variance approval for five industrial buildings totaling approximately 535,194 square feet (SF) with associated parking and site improvements on an approximately 46.5-acre Employment Industrial (EI) zoned site in the City of Sherwood, Oregon (Washington County Tax Lot 2S128D001100). Two pre-application conferences regarding the proposed development were conducted on August 16, 2018 and July 18, 2019, with the City of Sherwood.

As the EI zone has restrictions which limit the size of standalone warehousing and distribution uses to 150,000 square feet unless a Conditional Use Permit is obtained, this application requests a Conditional Use Permit to authorize Building C to have an area of 183,292 SF. The application also requests variance relief from the cul-de-sac standards of Section 16.106.040.E.

Existing Site and Surrounding Land Use

The 46.53-acre site, located at the southwest corner of SW Tualatin-Sherwood Road and SW 124th Avenue, slopes downhill from south to north with steeper grades near the south property line. Blackberries and trees exist on the southern and western portions of the site. A wetland delineation by Pacific Habitat Services (PHS) has identified three wetlands on the site (Attachments 14 and 24), the southernmost of which is contiguous with similar features in the undeveloped property south of the site. Per the Department of State Lands Statewide Wetland Inventory Map, a 4.20-acre freshwater emergent wetland exists approximately a quarter of an acre away from the property. Due to area topography, stormwater runoff flows into the site from the southwesterly neighboring undeveloped land, making portions of the project area susceptible to wetlands and water dependent plant species. The PHS Natural Resource Assessment report (Attachment 15) provides recommendations for on-site wetlands preservation to maintain the ecological integrity of these resource features.

Several structures associated with the site's previous farming activities have been removed from the eastern portion of the site. The rest of the property remains undeveloped. Properties north of the site are within the city limits of Sherwood and Tualatin. These developments are industrial in nature and include Conrad Lumber Company, Columbia Corrugated Box Co., Inc., and Packaging Resources. To the west of the property is the City of Tualatin municipal water storage tank in unincorporated Washington County. The undeveloped properties to the east are in the City of Tualatin, and the undeveloped properties to the south are in the City of Sherwood or unincorporated Washington County.

The site was recently annexed into the City of Sherwood (application AN 19-002) and is identified as Parcel 1 of Partition Plat 2019-029, recorded at Washington County on September 19, 2019. The two parcels created by the partition are now separated by the future alignment of Blake Road extending westward from 124th Avenue south of the site. The site is located within the EI zone, which was created specifically for the Tonquin Employment Area.

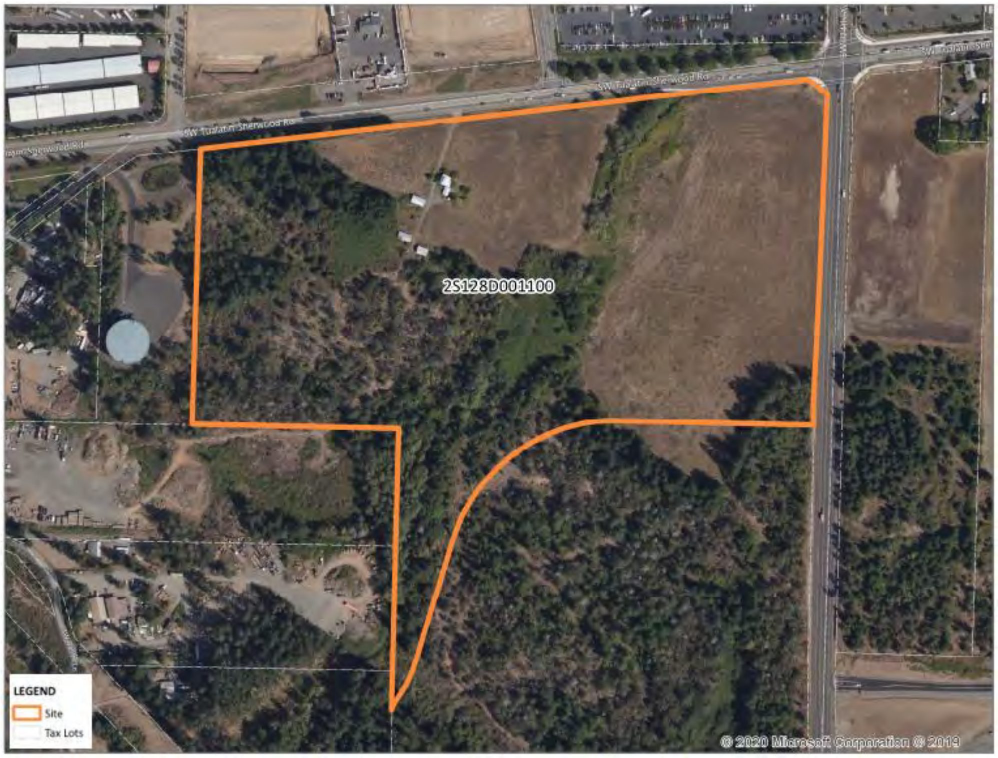

Figure 1: Site Aerial Photo

Proposed Development

The project proposes the construction of five speculative warehouse buildings for manufacturing and warehouse use, totaling approximately 535,194 square feet. The overall site will provide 671 on-site parking spaces.

Building Square Footage and Parking		
Building	**Building Square Footage**	**Parking Count**
A	87,490 SF	152
B	56,576 SF	124
C	183,292 SF	181
D	145,624 SF	127
E	62,212 SF	87
Total	**535,194 SF**	**671**

Site access will be achieved from SW Tualatin-Sherwood Road at an existing signalized intersection where SW Cipole Road forms the north leg. Washington County Land Use and Transportation staff has previously indicated that the site would not be permitted to have direct driveway access to SW 124th Avenue. SW Cipole Place is proposed as a cul-de-sac extending into the site to allow for ample vehicular access and circulation throughout the proposed industrial campus. Public utilities will be extended to the site to accommodate industrial development.

The applicant has constructed similar buildings in the Tualatin-Sherwood Road corridor (in the City of Tualatin) and has utilized this familiarity to inform the design of the project. The speculative buildings, which will be similar to that illustrated in the plans (Attachment 6), are designed to accommodate a range of industrial tenants, whether manufacturing, light industrial, or warehouse/distribution. The buildings will utilize concrete tilt-up construction with ample glass at office locations to emphasize customer- and public-facing entrances. The buildings can accommodate a range of tenant space demands and may have single or multiple users. Each building will provide numerous loading docks for users and appropriate parking consistent with the applicant's experience with market demand in the Tualatin-Sherwood Road corridor.

Subdivision Request

To provide maximum flexibility for end users, many of whom wish to purchase their own sites rather than leasing, the applicant is proposing a five-lot subdivision with varying lot sizes, which in turn accommodate varying building sizes. The subdivision also proposes the creation of five tracts, three of which are for public stormwater management facilities and two of which will contain wetlands and tree areas. No development is proposed within the wetland areas.

There is a chance that the applicant will later choose not to subdivide the property, in which case the final plat would never be filed. As a result, the applicant requests that conditions of approval be specific to each land use approval so it is clear which conditions would not apply in the event that the property remains a single parcel.

Conditional Use Permit Request

In the EI zone, standalone warehousing and distribution uses exceeding 150,000 SF require Conditional Use Permit (CUP) approval. This application requests a CUP to allow Building C, containing 183,292 SF, to accommodate a future warehousing/distribution tenant exceeding 150,000 SF without requiring a separate land use review and approval, if such a user were to propose utilizing Building C.

Public Improvements and Transportation

Right-of-Way Dedication and Public Improvements

The site abuts SW Tualatin-Sherwood Road and SW 124th Avenue, both of which are classified as five-lane arterial roadways under Washington County jurisdiction. This street standard requires a minimum 102-foot right-of-way (51 feet from centerline) for SW Tualatin-Sherwood Road and a minimum 98-foot right-of-way (49 feet from centerline) for SW 124th Avenue. As required the conditions of approval when the property was divided into two parcels (when the site was in unincorporated Washington County), the property owner dedicated this required right-of-way on the recently recorded partition plat. Based on direction from County staff, the applicant anticipates that the County will require additional right-of-way dedication to accommodate turn lanes.

The applicant proposes to dedicate additional right-of-way along both SW Tualatin-Sherwood Road and SW 124th Avenue to allow for street improvements to arterial standards. SW 124th Avenue, which was recently constructed by Washington County, restricts access to abutting properties. Washington County's Tualatin-Sherwood Road (Teton Avenue to Langer Farms Parkway) project will widen Tualatin-Sherwood Road to five lanes (including the frontage along the subject parcel), with construction beginning in the summer of 2021, so the applicant does not propose to improve SW Tualatin-Sherwood Road. The applicant proposes to widen SW 124th Avenue and add sidewalk.

The applicant proposes a new public cul-de-sac, Cipole Place, opposite the existing Cipole Road where it intersects SW Tualatin-Sherwood Road.

The site does not have City or County public utilities adjacent to the site except for storm lines in abutting streets. As illustrated on Sheets C6.0-C6.6 in Attachment 6, the applicant proposes to extend water and sanitary sewer infrastructure from their nearest locations in and near SW Tualatin-Sherwood Road. Stormwater from the proposed development will be managed by multiple shared facilities (extended dry basins) as illustrated on Sheets C5.0-C5.2.

The applicant proposes to dedicate a public utility easement (PUE) from the terminus of the proposed Cipole Place cul-de-sac to the southern site boundary, to provide a public utilities corridor to serve additional industrial development to the south in the future.

Transportation Impact Analysis

Kittelson & Associates transportation engineers projected site trip generation (Attachment 11) based on Land Use Code 130 – Industrial Park within the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 10th edition*. The Transportation Impact Analysis (TIA) indicates that the proposed development will generate 1,844 weekday trips, 219 of which will occur in the AM peak hour and 219 of which will occur within the PM peak hour.[1] The report analyzed traffic operations in the vicinity in the years 2021 and 2025, both with and without the proposed development:

- In 2021, the SW Oregon Street/SW Tualatin-Sherwood Road intersection is expected to exceed mobility standards (i.e., experience unsatisfactory performance, with intersection delay that exceeds target parameters) in the PM peak hour, with or without the proposed development.
- In 2021, the proposed development would cause the SW Oregon Street/SW Tonquin Road intersection to exceed mobility standards in the PM peak hour.
- In 2021, all other intersections in the study area are anticipated to meet mobility standards in both the AM and PM peak hours.
- In 2025 (following Washington County's planned improvements to SW Tualatin-Sherwood Road), the SW Oregon Street/SW Tonquin Road intersection is expected to exceed mobility standards in the PM peak hour, with or without the proposed development.
- In 2025, all other intersections in the study area are anticipated to meet mobility standards in both the AM and PM peak hours.

The TIA provides a recommended proportionate cost share allocation towards the future conversion of the SW Oregon Street/SW Tonquin Road intersection, either to a roundabout or a signalized intersection.

The TIA also notes that the site is currently served by TriMet bus route 97 on SW Tualatin-Sherwood Road, with service every half hour from 6:20 to 9:30 AM and from 3:10 to 7:00 PM on weekdays and no service on weekends.

[1] Actual traffic volumes will likely be lower since the TIA was based on 547,220 SF of building area while the current proposal is for 535,194 SF.

Site Access and Cul-de-Sac Variance

The applicant seeks to construct a public cul-de-sac, not an internal drive as noted in the transportation planning documents, which will allow the property to be subdivided. By creating multiple parcels accessible from a public roadway, the applicant will be able to offer each building for sale (and/or for lease). A north-south connecting roadway, instead of a cul-de-sac, was studied and remains impractical. The length of the proposed cul-de-sac is longer than code in order to serve the eastern section of the property, so a variance is requested.

The applicant has verified the following related to roadway infrastructure at the property:

1) Prior transportation planning documents call for one access point to the property.
   - Located at existing signalized intersection on Tualatin-Sherwood Road
   - Assumed to be an "internal drive"
   - No other access points to adjacent roads are permitted
2) Transportation planning documents do not recommend a through-road or connecting roadway that bisects the property.
3) There is no significant system-wide traffic benefit with a connecting roadway; a cul-de-sac does not negatively impact the regional system in the short or long term.
4) A connecting road is not feasible, since its design would result in grades between 6% and 15%.
   - Road grades over 5% are impractical, especially for a road serving an industrial park
   - Dangerous conditions would be created at intersections (driveways and Blake Road)
5) A connecting road would have negative impacts, including:
   - 64 to 220 jobs lost (due to reduced building area)
   - $5.4 million to $18.6 million lost property tax revenue (due to reduced building area) over a 50-year period
   - $610,000 to $1.2 million additional cost for roadway extension from cul-de-sac

The City of Sherwood and Washington County transportation planning documents call for a single access point to the property at the signalized intersection of SW Cipole Road and SW Tualatin-Sherwood Road; no other access point to the property is proposed. This anticipated access point at Cipole Road was assumed to be "an internal drive." However, instead of a private drive serving the five-building industrial park, the applicant proposes to construct a public street. A public street extending into the property will enable the applicant to subdivide the property, thereby allowing each building to be sold, as opposed to leased, to an occupying company.

The "internal drive" access point recommended in the transportation planning documents conflicted with Washington County code which requires access to an arterial road (i.e., SW Tualatin-Sherwood Road) to be from another arterial or collector. Thus, the applicant sought and was granted a Design Exception from Washington County (Attachment 12). The County is allowing access to the property at the SW Cipole Road intersection that is a lower class of roadway or driveway; an arterial or collector street is not a requirement at the access point.

None of the City or County transportation planning documents call for a roadway of any classification through the property. Rather, the documents propose a north-south arterial along the property's eastern boundary (i.e., SW 124th Avenue) and an east-west collector to the south of the property (i.e., Blake Road). The planners concluded any north-south roadway through the property would be impractical due to topographical conditions, among other considerations/constraints. The topographical challenges have been exacerbated since the proposed Blake Road alignment has shifted 600 feet to the north as part of the recent property partition approved by Washington County.

To achieve a relatively flat site for efficient industrial use, the site is designed as a multi-building industrial campus oriented to SW Tualatin-Sherwood Road. If not for market demand from users that seek to own their buildings, it would be possible to keep the site as a single parcel and utilize a central, shared private drive. However, the applicant wants to have the option to divide the property into a one-building-per-lot configuration, which requires public street frontage and public utility connections for each of the proposed lots. The purpose of the proposed public cul-de-sac is to allow all five lots to meet public street frontage and utility connection requirements – and ultimately for users to be able to purchase buildings.

Based on City staff requests, the applicant analyzed a connecting roadway compared to a cul-de-sac. Data from the TIA shows there is no significant system-wide benefit of a north-south road that bisects the property compared to a roadway that terminates as a cul-de-sac. Traffic engineers' analysis recommends that the proposed five-building development can be constructed as planned with the cul-de-sac while meeting the traffic mobility and safety standards established for the surrounding transportation system.

In addition to traffic operational analyses, the applicant studied the construction feasibility of a connecting roadway southward to the future alignment of Blake Road in multiple scenarios. Since the street would need to overcome a significant elevation difference of 45 feet, the resulting road grades would be between 6% and 15%. These grades are simply non-conforming to a roadway serving an industrial park with trucks making turns into driveways. The grades would be dangerous and unattractive to users that prefer grades less than 5%. Further, it would add between $610,000 to $1.2 million in project cost.

Side slopes from the roadway would decrease the building area of the project. Reduced building area—between 38,000 SF and 132,100 SF—would result in up to 220 fewer jobs and $18.6 million in lost property tax revenue over the life of the buildings (assumed to be 50 years). For all the reasons stated above, the cul-de-sac design solution was selected as the most appropriate roadway design.

The proposed cul-de-sac (SW Cipole Place) has a length of approximately 550 feet. Its length is due to

- the fact that there is no access permitted from SW 124th Avenue,
- the location and shape of the 2.4-acre wetland in the central part of the site,
- the applicant's desire to avoid impacting the natural resource, and
- the need for the eastern portion of the property to be served by the road and utilities.

The applicant is requesting a variance to exceed Sherwood's 200-foot length standard for cul-de-sacs and to utilize a cul-de-sac rather than construct a through street connection to SW Blake Road. This standard seems to be geared toward residential development, rather than large-lot industrial park development, and there appear to be situations where this length variance has been granted (e.g., SW Greengate Place which is 1,500 feet long and constructed relatively recently). The Tualatin Valley Fire & Rescue fire marshal has approved the cul-de-sac and its length, which is not an unusual condition (e.g., the recently-constructed 975-foot cul-de-sac and 915-foot cul-de-sac in Tualatin, near SW 115th Avenue in the Koch Business Park). The applicant has also submitted an associated Engineering Design Modification request (Attachment 20).

Detailed justification for the variance and an explanation of the alternatives analysis (Attachment 13) is found in the responses to Chapter 16.84 below.

III. NARRATIVE AND COMPLIANCE

The following narrative addresses the specific Sherwood Zoning and Community Development Code (Sherwood Municipal Code Title 16) approval criteria and development standards that apply to the proposed project.

Division II. - Land Use and Development

Chapter 16.31 - Industrial Land Use Districts

16.31.010 - Purpose

A. *Employment Industrial (EI) - The EI zoning district provides employment areas that are suitable for, and attractive to, key industries and industry clusters that have been identified by the State of Oregon and the City's economic development strategy as important to the state and local economy. The following are preferred industry sectors for areas zoned EI: Clean Technology; Technology and Advanced Manufacturing; and Outdoor Gear and Active Wear.*

Land zoned EI shall provide for large and medium-sized parcels for industrial campuses and other industrial sites that can accommodate a variety of industrial companies and related businesses. Areas zoned EI are also intended to provide the opportunity for flex building space within small- and medium-sized industrial campuses and business parks to accommodate research and development companies, incubator/emerging technology businesses, related materials and equipment suppliers, and/or spin-off companies and other businesses that derive from, or are extensions of, larger campus users and developments. Retail and commercial uses are allowed only when directly supporting area employers and employees.

Industrial establishments and support services shall not have objectionable external features and shall feature well-landscaped sites and attractive architectural design, as determined by the Hearing Authority.

Response: The proposed development is speculative, so specific users are not known at this time. The applicant will seek users consistent with the City's economic development objectives and zoning regulations. Depending on market demand, users may include manufacturing, warehouse/distribution, or other permitted uses.

16.31.020 - Uses

A. *The table below identifies the land uses that are permitted outright (P), permitted conditionally (C) and not permitted (N) in the industrial zoning districts. The specific land use categories are described and defined in Chapter 16.88.*

B. *Uses listed in other sections of this Code, but not within this specific table are prohibited.*

C. *Any use not otherwise listed that can be shown to be consistent or associated with the uses permitted outright or conditionally in the industrial zones or contribute to the achievement of the objectives of the industrial zones may be permitted outright or conditionally, utilizing the provisions of Chapter 16.88.*

D. *Additional limitations for specific uses are identified in the footnotes of this table.*

16.31.020 – Permitted Uses within the EI Zone (Excerpt)	
Office and Professional Support Services	***EI[1]***
Business and Professional Offices[3]	*P*
Business Support such as duplicating, photocopying, mailing services, fax, and computer facilities[3]	*P*
Any incidental business, service, processing storage or display, not otherwise permitted, that is essential to and customarily associated with a use permitted outright, provided said incidental use is conducted entirely within an enclosed building.	*P*
Industrial	
Manufacture, compounding, processing, assembling, packaging, treatment, fabrication of products contained wholly within an enclosed building provided exterior odor and noise is consistent with municipal code standards and there is no unscreened storage and not otherwise regulated elsewhere in the code	*P*
Manufacture, compounding, processing, assembling, packaging, treatment, fabrication of products not otherwise prohibited elsewhere in the code provided other off-site impacts are compliant with local, state and federal regulations	*C*
Manufacture, compounding, processing, assembling, packaging, treatment, or fabrication of acids, paints, dyes, soaps, ammonia, chlorine, sodium compounds, fertilizer, herbicides, insecticides and similar chemicals	*N*
Distribution, warehousing and storage associated with a permitted use operating on the same site	*P*
Distribution and warehousing up to 150,000 square feet, provided product(s) are stored within an enclosed building[9]	*P*
Distribution and warehousing greater than 150,000 square feet provided product(s) are stored within an enclosed building[9]	*C*
Medical or dental laboratories, including biomedical compounding	*P*
Laboratories (not medical or dental)	*P*
Research and development and associated manufacturing	*P*
Notes: *[1] See special criteria for the EI zone, 16.31.030 and the Tonquin Employment Area (TEA), 16.31.040.* *[3] Limited in size to five thousand (5,000) square feet in a single outlet and no more than twenty thousand (20,000) square feet in multiple outlets in the same development project.* *[9] For standalone warehousing and distribution only. Warehousing and distribution associated with another approved use is ancillary and permitted without size limitations.*	

Response: The proposed development is speculative in nature, with no specific users at this time. Future uses of the development may include manufacturing, warehouse/distribution, or other allowed uses of the Employment Industrial Zone. This application includes a request for a conditional use permit to allow a potential standalone warehouse/distribution use in Building C to be over 150,000 SF. This standard is met.

16.31.030 - Development Standards
A. *Generally*

No lot area, setback, yard, landscaped area, open space, off-street parking or loading area, or other site dimension or requirement, existing on, or after, the effective date of this Code shall be reduced below the minimum required by this Code. Nor shall the conveyance of any portion of a lot, for other than a public use or right-of-way, leave a lot or structure on the remainder of said lot with less than minimum Code dimensions, area, setbacks or other requirements, except as permitted by Chapter 16.84 (Variances and Adjustments).

B. Development Standards

Except as otherwise provided, required minimum lot areas and dimensions and setbacks shall be:

16.31.030 – Development Standards by Zone			
Development Standards	***LI***	***GI***	***EI***
Lot area – Industrial Uses:	*10,000 SF*	*20,000 SF*	*3 acres*[9]
Lot area – Commercial Uses (subject to Section 16.31.050)	*10,000 SF*	*20,000 SF*	*10,000 SF*
Lot width at front property line:	*100 feet*		
Lot width at building line:	*100 feet*		
Front yard setback[11]	*20 feet*	*None*	*20 feet*
Side yard setback[10]	*None*	*None*	*None*
Rear yard setback[11]	*None*	*None*	*None*
Corner lot street side[11]	*20 feet*	*None*	*20 feet*
Height[11]	*50 feet*		

Notes:

[9] *Lots within the EI zone that were legal lots of record prior to October 5, 2010 and smaller than the minimum lot size required in the table below may be developed if found consistent with other applicable requirements of Chapter 16.31 and this Code. Further subdivision of lots smaller than three (3) acres shall be prohibited unless Section 16.31.050 applies.*

[10] *When a yard is abutting a residential zone or public park, there shall be a minimum setback of forty (40) feet provided for properties zoned Employment Industrial and Light Industrial Zones, and a minimum setback of fifty (50) feet provided for properties zoned General Industrial.*

[11] *Structures located within one-hundred (100) feet of a residential zone shall be limited to the height requirements of that residential zone.*

Response: The proposed T-S Corporate Park is located wholly in the EI zone, which requires a minimum lot width of 100 feet, including 100 feet of frontage at the front property line. Lot 1 will have over 100 feet of street frontage along SW Tualatin-Sherwood Road; Lots 2 and 3 will have sufficient frontage on SW Cipole Court, and Lots 4 and 5 will have sufficient frontage on SW 124th Avenue. The proposed subdivision will divide the property into five lots and five tracts with no corner lots proposed. As shown in the preliminary subdivision plan (see Sheet C8.00, Attachment 6), all lots will be greater than 3 acres in size and maintain lot widths in excess of 100 feet. The site does not abut a residential zone on any side and thus requires a minimum front setback of 20 feet (20 feet for a street side setback), and 0-foot setback for all non-street side and rear setbacks. As reflected in Attachment 6 Sheets A0.10-A0.12, all five proposed industrial buildings are sited over 60 feet from adjacent lot lines on all sides. The height of the buildings ranges from 40.5 feet to 48 feet, complying with the 50 foot height limit within the EI zone. The industrial zone development standards for nonresidential development in the EI zone are met.

16.31.040 - Employment Industrial (EI) Restrictions

A. Use Restrictions

1. Retail and professional services that cater to daily customers, such as restaurants and financial, insurance, real estate, legal, medical and dental offices, shall be limited in the EI zone.

a. *New buildings for stores, branches, agencies or other retail uses and services shall not occupy more than five thousand (5,000) square feet of sales or service area in a single outlet and no more than twenty thousand (20,000) square feet of sales or service area in multiple outlets in the same development project, and*

b. *New buildings for stores, branches, agencies or other retail uses and services shall not be located on lots or parcels smaller than five (5) acres in size. A "development project" includes all improvements proposed through a site plan application.*

Response: No retail or professional services that cater to daily customers are proposed. The nature of the site will be wholly industrial for speculative warehousing, manufacturing and light industrial uses. This standard does not apply.

2. *Notwithstanding the provisions of Section 16.31.050 "Commercial Nodes Use Restrictions," commercial development permitted under 16.31.050(1)(a) may only be proposed concurrent with or after industrial development on the same parcel. Commercial development may not occur prior to industrial development on the same parcel.*

Response: The proposed development is industrial in nature. No commercial uses are proposed at this time; however, this standard will apply to tenanting and operation of the property following development.

B. *Land Division Restrictions*

1. *Lots of record prior to October 5, 2010 that are smaller than the minimum lot size required in the El zone may be developed if found consistent with other applicable requirements of Chapter 16.31 and this code. Further subdivision of lots smaller than three (3) acres shall be prohibited unless Section 16.31.050 applies.*
2. *Lots or parcels larger than fifty (50) acres may be divided into smaller lots and parcels pursuant to a Planned Unit Development approved by the city so long as the resulting division yields at least one (1) lot or parcel of at least 50 acres in size.*
3. *Lots or parcels fifty (50) acres or larger, including those created pursuant to subsection (2) above, may be divided into any number of smaller lots or parcels pursuant to a Planned Unit Development approved by the city so long as at least forty (40) percent of the area of the lot or parcel has been developed with industrial uses or uses accessory to industrial use.*

Response: The proposed project includes the subdivision of the 46.5-acre parcel into five lots, all of which are greater than three acres, see table below and Sheet A0.10 in Attachment 6. Subsections 1, 2 and 3 are not applicable because the subject property contains a total area of 46.5 acres – larger than the minimum 3-acre lot area in the EI zone, but smaller than 50 acres.

Proposed Lot Areas		
Lot	**Area (SF)**	**Area (ac)**
1	231,767 SF	5.32 ac
2	162,691 SF	3.73 ac
3	392,410 SF	9.00 ac
4	348,540 SF	8.00 ac
5	196,251 SF	4.51 ac

16.31.050 - Tonquin Employment Area (TEA) Commercial Nodes Use Restrictions

A. Within the Tonquin Employment Area (TEA), only commercial uses that directly support industrial uses located within the TEA are permitted as conditional uses.

B. Commercial development, not to exceed a total of five (5) contiguous acres in size, may be permitted.

C. Commercial development may not be located within three hundred (300) feet of SW 124th Avenue or SW Oregon Street, and must be adjacent to the proposed east-west collector street.

Response: Commercial development or uses are not proposed at this time. The nature of the T-S Corporate Park is proposed to be wholly industrial; however, a future tenant could seek Conditional Use Permit approval to locate within the T-S Corporate Park. This standard is met.

16.31.060 - Community Design

For standards relating to off-street parking and loading, energy conservation, historic resources, environmental resources, landscaping, access and egress, signs, parks and open space, on-site storage, and site design, the applicable provisions of Divisions V, VIII and IX will apply.

Response: The proposed development has been designed to meet the provisions of the Sherwood Development Code Divisions V and VIII as presented herein. Division IX does not apply as there are no historic resources on site. These standards are addressed elsewhere in the narrative.

16.31.070 - Floodplain

Except as otherwise provided, Section 16.134.020 shall apply.

Response: According to Flood Insurance Rate Map 41067C0606F, dated October 19, 2018, the site is not within a regulated floodplain. This standard does not apply.

Chapter 16.58 - Clear Vision and Fence Standards

16.58.010 - Clear Vision Areas

A. A clear vision area shall be maintained on the corners of all property at the intersection of two (2) streets, intersection of a street with a railroad, or intersection of a street with an alley or private driveway.

B. A clear vision area shall consist of a triangular area, two (2) sides of which are lot lines measured from the corner intersection of the street lot lines for a distance specified in this regulation; or, where the lot lines have rounded corners, the lot lines extended in a straight line to a point of intersection, and so measured, and the third side of which is a line across the corner of the lot joining the non-intersecting ends of the other two (2) sides.

C. A clear vision area shall contain no planting, sight obscuring fence, wall, structure, or temporary or permanent obstruction exceeding two and one-half (2½) feet in height, measured from the top of the curb, or where no curb exists, from the established street center line grade, except that trees exceeding this height may be located in this area, provided all branches and foliage are removed to the height of seven (7) feet above the ground on the sidewalk side and ten (10) feet on the street side.

The following requirements shall govern clear vision areas:

1. In all zones, the minimum distance shall be twenty (20) feet.

2. In all zones, the minimum distance from corner curb to any driveway shall be twenty-five (25) feet.

3. Where no setbacks are required, buildings may be constructed within the clear vision area.

Response: Clear vision areas are illustrated on the plan sheets at street intersections and driveway locations. No buildings and no sight-obscuring obstructions are proposed within the clear vision areas. This standard is met.

16.58.020 - Fences, Walls and Hedges.

C. Applicability: The following standards apply to walls, fences, hedges, lattice, mounds, and decorative toppers. The standards do not apply to vegetation, sound walls and landscape features up to four (4) feet wide and at least twenty (20) feet apart.

D. Location—Residential Zone:

1. *Fences up to forty-two (42) inches high are allowed in required front building setbacks.*
2. *Fences up to six (6) feet high are allowed in required side or rear building setbacks, except fences adjacent to public pedestrian access ways and alleys shall not exceed forty-two (42) inches in height unless there is a landscaped buffer at least three (3) feet wide between the fence and the access way or alley.*
3. *Fences on corner lots may not be placed closer than eight (8) feet back from the sidewalk along the corner-side yard.*
4. *All fences shall be subject to the clear vision provisions of Section 16.58.010.*
5. *A sound wall is permitted when required as a part of a development review or concurrent with a road improvement project. A sound wall may not be taller than twenty (20) feet.*
6. *Hedges are allowed up to eight (8) feet tall in the required side and rear setbacks.*

Response: The subject parcel is zoned Employment Industrial (EI) and is not in a residential zone. These standards do not apply.

E. Location—Non-Residential Zone:

1. *Fences up to eight (8) feet high are allowed along front, rear and side property lines, subject to Section 16.58.010. (Clear Vision) and building department requirements.*
2. *A sound wall is permitted when required as a part of a development review or concurrent with a road improvement project. A sound wall may not be taller than twenty (20) feet.*
3. *Hedges up to twelve (12) feet tall are allowed, however, when the non-residential zone abuts a residential zone the requirements of section 16.58.030.d.6. shall apply.*

Response: Four-foot-tall black chain link fencing is proposed around the stormwater management facilities, which is below the eight-foot maximum. Black chain link fencing would also be the likely material for fall protection at the tops of tall retaining walls. This standard is met.

F. General Conditions—All Fences:

1. *Fences must be structurally sound and maintained in good repair. A fence may not be propped up in any way from the exterior side.*
2. *Chain link fencing is not allowed in any required residential front yard setback.*
3. *The finished side of the fence must face the street or the neighboring property. This does not preclude finished sides on both sides.*
4. *Buffering: If a proposed development is adjacent to a dissimilar use such as a commercial use adjacent to a residential use, or development adjacent to an existing farming operation, a buffer plan that includes, but is not limited to, setbacks, fencing, landscaping, and maintenance via a homeowner's association or managing company must be submitted and approved as part of the preliminary plat or site plan review process per Section 16.90.020 and Chapter 16.122.*
5. *In the event of a conflict between this Section and the clear vision standards of Section 16.58.010, the standards in Section 16.58.010 prevail.*
6. *Fences and walls cannot be located within or over a public utility easement without an approved right-of-way permit.*
7. *The height of a fence or wall is measured from the actual adjoining level of finished grade measured six (6) inches from the fence. In the event the ground is sloped, the lowest grade within six (6) inches of the fence is used to measure the height.*

Response: Four-foot-tall black chain link fencing is proposed around the stormwater management facilities. Since the site is industrial rather than residential, chain link fencing is acceptable. Black chain link fencing would also be the likely material for fall protection at the tops of tall retaining walls. The fencing is not proposed to violate the conditions outlined above. This standard is met.

Chapter 16.60 - Yard Requirements

16.60.010 - Through Lots

On a through lot the front yard requirements of the zone in which such a lot is located shall apply to the street frontage where the lot receives vehicle access; except where access is from an alley, the front yard requirements shall apply to the street opposite the alley.

Response: The proposed development includes through lots that will receive vehicle access from the proposed cul-de-sac (Lots 4 and 5). Development on these lots meet the front yard requirements of the EI zone, 20 feet, as measured from Cipole Place rather than 124th Avenue. This standard is met.

16.60.020 - Corner Lots

On a corner lot, or a reversed corner lot of a block oblong in shape, the short street side may be used as the front of the lot provided:

A. The front yard setback shall not be less than twenty-five (25) feet; except where otherwise allowed by the applicable zoning district and subject to vision clearance requirements.

B. The side yard requirements on the long street side shall conform to the front yard requirement of the zone in which the building is located.

Response: No corner lots are proposed as all property abutting street intersections are occupied by proposed stormwater tracts. This standard does not apply.

16.60.030 - Yards

A. Except for landscaping, every part of a required yard (also referred to as minimum setback) shall be open and unobstructed from its lowest point to the sky, except that architectural features such as awnings, fire escapes, open stairways, chimneys, or accessory structures permitted in accordance with Chapter 16.50 (Accessory Structures) may be permitted when so placed as not to obstruct light and ventilation.

B. Where a side or rear yard is not required, and a primary structure is not erected directly on the property line, a primary structure must be set back at least three (3) feet.

Response: Minimum setbacks at this location are 20 feet abutting streets and zero feet elsewhere. As illustrated on Attachment 6 Sheets A0.10-A0.12, no buildings are proposed within minimum setbacks, and no buildings are proposed within three feet of a property line. This standard is met.

16.60.040 - Lot Sizes and Dimensions

A. If a lot or parcel, or the aggregate of contiguous lots or parcels, recorded or platted prior to the effective date of this Code, has an area or dimension which does not meet the requirements of this Code, the lot or aggregate lots may be put to a use permitted outright, subject to the other requirements of the zone in which the property is located.

Response: The development is proposed to be fully compliant with area and dimension standards for the EI zone. This standard does not apply.

B. Exceptions

1. Residential uses are limited to a single-family dwelling, or to the number of dwelling units consistent with the density requirements of the zone. However, a dwelling cannot be built on a lot with less area than thirty-two hundred (3,200) square feet, except as provided in Chapter 16.68.

2. *Yard requirements of the underlying zone may be modified for infill developments as provided in Chapter 16.68 (Infill Development).*

Response: No residential uses are proposed, and no setback/yard modifications are requested for infill development. This standard does not apply.

16.70.020 - Neighborhood Meeting

A. *The purpose of the neighborhood meeting is to solicit input and exchange information about the proposed development.*

B. *Applicants of Type III, IV and V applications are required to hold a meeting, at a public location for adjacent property owners and recognized neighborhood organizations that are within 1,000 feet of the subject application, prior to submitting their application to the City. Affidavits of mailing, sign-in sheets and a summary of the meeting notes must be included with the application when submitted. Applicants for Type II land use action are encouraged, but not required to hold a neighborhood meeting.*

   1. *Projects requiring a neighborhood meeting in which the City or Urban Renewal District is the property owner or applicant shall also provide published and posted notice of the neighborhood meeting consistent with the notice requirements in 16.72.020.*

Response: A neighborhood meeting was conducted on December 4, 2019 to discuss the proposed development, as documented in Attachment 9. This standard has been met.

Division III. - Administrative Procedures

Chapter 16.72 - Procedures for Processing Development Permits

16.72.010 - Generally

A. *Classifications*

Except for Final Development Plans for Planned Unit Developments, which are reviewed per Section 16.40.030, all quasi-judicial development permit applications and legislative land use actions shall be classified as one of the following:

   2. *Type II*

   The following quasi-judicial actions shall be subject to a Type II review process:

      a. *Land Partitions*

      b. *Expedited Land Divisions - The Planning Director shall make a decision based on the information presented, and shall issue a development permit if the applicant has complied with all of the relevant requirements of the Zoning and Community Development Code. Conditions may be imposed by the Planning Director if necessary to fulfill the requirements of the adopted Comprehensive Plan, Transportation System Plan or the Zoning and Community Development Code.*

      c. *"Fast-track" Site Plan review, defined as those site plan applications which propose less than 15,000 square feet of floor area, parking or seating capacity of public, institutional, commercial or industrial use permitted by the underlying zone, or up to a total of 20% increase in floor area, parking or seating capacity for a land use or structure subject to a Conditional Use Permit, except as follows: auditoriums, theaters, stadiums, and those applications subject to Section 16.72.010.A.4.*

      d. *"Design Upgraded" Site Plan review, defined as those site plan applications which propose between 15,001 and 40,000 square feet of floor area, parking or seating capacity and which propose a minimum of eighty percent (80%) of the total* *possible points of design criteria in the "Commercial Design Review Matrix" found in Section 16.90.020.D.6.d.*

e. Industrial "Design Upgraded" projects, defined as those site plan applications which propose between 15,001 and 60,000 square feet of floor area, parking or seating capacity and which meet all of the criteria in Section 16.90.020.D.7.b.

f. Homeowner's association street tree removal and replacement program extension.

g. Class B Variance

h. Street Design Modification

i. Subdivisions between 4—10 lots

j. Medical marijuana dispensary permit

Response: The applicant proposes to subdivide the property into five lots so a Type II land use review will be triggered as part of this development request. However, due to the extent of development requiring site plan review, a CUP, and Class A variance, the applicant is seeking consolidated subdivision review with those Type III and IV applications.

3. Type III

The following quasi-judicial actions shall be subject to a Type III review process:

a. Conditional Uses

b. Site Plan Review — between 15,001 and 40,000 square feet of floor area, parking or seating capacity except those within the Old Town Overlay District, per Section 16.72.010.A.

c. Subdivisions between 11—50 lots.

Response: The proposed development includes five speculative buildings, one of which (Building C) exceeds 150,000 SF. To allow for the possibility that the building will be used for warehouse/distribution, the applicant is requesting a Conditional Use Permit, which requires Type III review.

4. Type IV

The following quasi-judicial actions shall be subject to a Type IV review process:

a. Site Plan review and/or "Fast Track" Site Plan review of new or existing structures in the Old Town Overlay District.

b. All quasi-judicial actions not otherwise assigned to a Hearing Authority under this section.

c. Site Plans — Greater than 40,000 square feet of floor area, parking or seating capacity.

d. Site Plans subject to Section 16.90.020.D.6.f.

e. Industrial Site Plans subject to Section 16.90.020.D.7.b.

f. Subdivisions — over 50 lots.

g. Class A Variance

Response: The proposed development consists of five industrial buildings, each of which has greater than 40,000 SF of floor area and parking so Type IV site plan review is required. The extent of development will include a Class A Variance triggering a Type IV review process. The industrial site plan, however, will not be subject to section 16.90.020.D.7.b as the development project will meet the provisions of section 16.90.020.D.7.a.

5. Type V

The following legislative actions shall be subject to a Type V review process:

a. Plan Map Amendments

b. Plan Text Amendments

c. Planned Unit Development — Preliminary Development Plan and Overlay District.

Response: The proposal does not include Plan Map Amendments, Plan Text Amendments, or a Planned Unit Development Preliminary Development Plan and Overlay District. This standard does not apply.

C. Approval Criteria

1. The approval criteria for each development permit application shall be the approval standards and requirements for such applications as contained in this Code. Each decision made by a Hearing Authority or Appeal Authority shall list the approval criteria and indicate whether the criteria are met. It is the applicant's burden to demonstrate to the Hearing Authority and Appeal Authority how each of the approval criteria are met. An application may be approved with conditions of approval imposed by the Hearing Authority or Appeal Authority. On appeal, the Appeal Authority may affirm, reverse, amend, refer, or remand the decision of the Hearing Authority.

2. In addition to Section 1 above, all Type IV quasi-judicial applications shall also demonstrate compliance with the Conditional use criteria of Section 16.82.020.

Response: The applicant presents this narrative/findings document, drawings and other evidence for the proposed development to meet requirements for submitted applications as contained in this Code, and to demonstrate compliance with applicable standards and approval criteria. A Conditional Use permit will be requested in conjunction with this development, subject to the provisions of Section 16.82.020.

Division IV. - Planning Procedures

Chapter 16.82 - Conditional Uses

16.82.010 - Generally

A. Authorization

Uses permitted in zoning districts as conditional uses may be established, enlarged, or altered by authorization of the Commission in accordance with the standards and procedures established in this Chapter. If the site or other conditions are found to be inappropriate for the use requested, the Commission or Hearings Officer (cited below as Hearing Authority) may deny the conditional use.

B. Changes in Conditional Uses

Changes in use or expansion of a legal non-conforming use, structure or site, or alteration of structures or uses classified as conditional uses, that either existed prior to the effective date of this Code or were established pursuant to this Chapter shall require the filing of a new application for review conforming to the requirements of this Chapter if the proposed changes would increase the size, square footage, seating capacity or parking of existing permitted improvements by twenty percent (20%) or more.

C. Application and Fee

An application for a Conditional Use Permit (CUP) shall be filed with the City and accompanied by the appropriate fee pursuant to Section 16.74.010. The applicant is responsible for submitting a complete application which addresses all criteria of this Chapter and other applicable sections of this Code.

Response: Based on the table in Section 16.31.020, in the EI Zone, standalone distribution and warehousing up to 150,000 SF is a permitted use, provided product(s) are stored within an enclosed building. Such operations exceeding 150,000 SF require Conditional Use Permit approval.

This application includes a new CUP request to allow Building C, containing 183,292 SF, to accommodate a future warehousing/distribution tenant without further land use review, as authorized by subparagraph A. Subparagraph B is not applicable because the proposal is a new CUP request rather than a change in an existing one. The applicant has submitted a complete application and fee payment consistent with Subparagraph C. This standard is met.

16.82.020 - Permit Approval

A. Hearing Authority Action

1. *The Hearings Authority shall conduct a public hearing pursuant to Chapter 16.72 and take action to approve, approve with conditions, or deny the application. Conditions may be imposed by the Hearings Authority if necessary to fulfill the requirements of the adopted Comprehensive Plan, Transportation System Plan, or the Code. The decision shall include appropriate findings of fact as required by this Section, and an effective date.*

Response: These provisions establish the authority of the Hearings Authority and provide procedural guidance; they require no evidence from the applicant.

2. *Conditional uses may be approved at the hearing for a larger development (i.e. business campus or industrial park), to include future tenants of such development, if the range of uses allowed as conditional uses are considered, and specifically approved, at the time of original application.*

Response: The intended development is to be generally industrial in nature, including warehousing, distribution, and light industrial uses. Although this development proposal does not include any known future conditional use tenants, it is reasonable to anticipate that a warehousing/distribution tenant may find the 183,292 SF Building C suitable. The applicant requests conditional use approval to allow Building C to be occupied by future warehouse and distribution facilities greater than 150,000 SF, up to its total area of 183,292 SF, without a further land use procedure. This will enable Building C to compete effectively for such tenants against other prospective sites where no discretionary land use review would be required. This request is consistent with the authority provided in Subsection 2.

B. Final Site Plan

Upon approval of a conditional use by the Hearing Authority, the applicant shall prepare a final site plan for review and approval pursuant to Section 16.90. The final site plan shall include any revisions or other features or conditions required by the Hearing Authority at the time of the approval of the conditional use.

Response: The applicant will provide construction plans following CUP approval, including a final site plan consistent with these requirements. Compliance can be assured through a condition of approval.

C. Use Criteria

No conditional use shall be granted unless each of the following is found:

1. *All public facilities and services to the proposed use, including but not limited to sanitary sewers, water, transportation facilities, and services, storm drains, electrical distribution, park and open space and public safety are adequate; or that the construction of improvements needed to provide adequate services and facilities is guaranteed by binding agreement between the applicant and the City.*

Response: As discussed in the Division VI and Division VII compliance findings, existing utility services and streets in the vicinity of the subject property have sufficient capacity to serve the site, with extensions to be provided by the applicant to extend utilities to the site and within the proposed cul-de-sac street to serve the proposed lots and buildings. This standard is met.

2. *Proposed use conforms to other standards of the applicable zone and is compatible with abutting land uses in regard to noise generation and public safety.*

Response: The subject property, located in the City's Employment Industrial zone, is suitable for a wide variety of industrial uses. All five of the proposed buildings are designed to accommodate a range of light industrial, manufacturing, or warehousing/distribution tenants, similar to the many that exist in the vicinity of the subject property, i.e., within the Tualatin-Sherwood Road corridor between commercial centers to the east (in Tualatin) and west (near Oregon Highway 99W in Sherwood). The proposed development is therefore consistent and compatible with nearby land uses. Abutting land uses include municipal water storage to the west and a planned water treatment facility to the south, neither of which would be negatively impacted by noise from a warehouse/distribution center (there are no abutting land uses to the north or east based on the Development Code's definition of "abut"). Conditional Use Permit approval is required only for Building C because it alone exceeds 150,000 SF. This standard is met.

3. *The granting of the proposal will provide for a facility or use that meets the overall needs of the community and achievement of the goals and/or policies of the Comprehensive Plan, the adopted City of Sherwood Transportation System Plan and this Code.*

Response: As noted above, all of the buildings are proposed for a range of light industrial, manufacturing, or warehousing/distribution use, which is consistent with the purpose of the EI zone and comprehensive planning for the Tonquin Employment Area in which the subject property is located. Building C is in alignment with the overall proposal for development and use of the property consistent with its comprehensive plan designation and zoning; however, a standalone warehouse/distribution user that exceeds 150,000 SF would require CUP approval to locate there. The applicant has provided a traffic impact analysis for the development as a whole, demonstrating the capacity of the transportation system to accommodate resulting traffic, assuming full occupancy of all proposed buildings, including Building C. This standard is met.

4. *Surrounding property will not be adversely affected by the use, or that the adverse effects of the use on the surrounding uses, the neighborhood, or the City as a whole are sufficiently mitigated by the conditions proposed.*

Response: As noted above, the proposed Warehouse/Distribution use and development are consistent with and compatible with the uses surrounding the subject property in the Tualatin-Sherwood Road industrial corridor as well as the planning for development of the Tonquin Employment Area. No impacts requiring mitigation actions are anticipated. This criterion is met.

5. *The impacts of the proposed use of the site can be accommodated considering size, shape, location, topography and natural features.*

Response: As noted above, the proposed Warehouse/Distribution use and development are consistent with and compatible with the uses surrounding the subject property in the Tualatin-Sherwood Road industrial corridor as well as the planning for development of the Tonquin Employment Area. This criterion is met.

6. *The use as proposed does not pose likely significant adverse impacts to sensitive wildlife species or the natural environment.*

Response: The subject property contains wetlands that have not been designated as a significant habitat resource area. The applicant has retained Pacific Habitat Services (PHS) to prepare an expert inventory of wetland resource values within the subject property and make recommendations for resource conservation. As a result, development as proposed in the upland areas of the subject property will not adversely affect sensitive wildlife species or significant wetland natural resource features. While the southern portion of the site has been designated by

Metro as upland habitat, the proposed tree removal in some of this habitat area will be performed in full compliance with the City's tree preservation standards to maintain the ecological functions of the tree areas. This criterion is met.

7. *For wireless communication facilities, no Conditional Use Permit will be granted unless the following additional criteria is found:*
   a. *The applicant demonstrates to the satisfaction of the City that the wireless communication facility cannot be located in an IP zone due to the coverage needs of the applicant.*
   b. *The proposed wireless communication facility is designed to accommodate co-location or it can be shown that the facility cannot feasibly accommodate co-location.*
   c. *The applicant demonstrates a justification for the proposed height of the tower or antenna and an evaluation of alternative designs which might result in lower heights.*
   d. *The proposed wireless communication facility is not located within one-thousand (1,000) feet of an existing wireless facility or that the proposed wireless communication facility cannot feasibly be located on an existing wireless communication facility.*
   e. *The proposed wireless communication facility is located a minimum of three-hundred (300) feet from residentially zoned properties.*

Response: These provisions are not applicable because the proposal does not include wireless communication facilities.

8. *The following additional criteria apply to transportation facilities and improvements subject to Conditional Use approval per Chapter 16.66. These are improvements and facilities that are (1) not designated in the adopted City of Sherwood Transportation System Plan (TSP), and are (2) not designed and constructed as part of an approved land use application.*
   a. *The project preserves or improves the safety and function of the facility through access management, traffic calming, or other design features.*
   b. *The project includes provisions for bicycle and pedestrian access and circulation consistent with the Comprehensive Plan, the requirements of this Code, and the TSP.*
   c. *Proposal inconsistent with TSP: If the City determines that the proposed use or activity or its design is inconsistent with the TSP, then the applicant is required to apply for and obtain a plan and/or zoning amendment prior to or in conjunction with Conditional Use Permit approval.*
   d. *State transportation system facility or improvement projects: The Oregon Department of Transportation (ODOT) must provide a narrative statement with the application demonstrating compliance with all of the criteria and standards in Sections 16.82.020.C.1—6 and 8.a—8.d. Where applicable, an Environmental Impact Statement or Environmental Assessment may be used to address one or more of these criteria.*

Response: These provisions are not applicable because the proposal does not include transportation facilities and improvements subject to Conditional Use approval per Chapter 16.66.

D. *Additional Conditions*

In permitting a conditional use or modification of an existing conditional use, additional conditions may be applied to protect the best interests of the surrounding properties and neighborhoods, the City as a whole, and the intent of this Chapter. These conditions may include but are not limited to the following:

1. *Mitigation of air, land, or water degradation, noise, glare, heat, vibration, or other conditions which may be injurious to public health, safety or welfare in accordance with environmental performance standards.*
2. *Provisions for improvement of public facilities including sanitary sewers, storm drainage, water lines, fire hydrants, street improvements, including curb and sidewalks, and other above and underground utilities.*
3. *Increased required lot sizes, yard dimensions, street widths, and off-street parking and loading facilities.*
4. *Requirements for the location, number, type, size or area of vehicular access points, signs, lighting, landscaping, fencing or screening, building height and coverage, and building security.*
5. *Submittal of final site plans, land dedications or money-in-lieu of parks or other improvements, and suitable security guaranteeing conditional use requirements.*
6. *Limiting the number, size, location, height and lighting of signs.*
7. *Requirements for the protection and preservation of existing trees, soils, vegetation, watercourses, habitat areas and drainage areas.*
8. *Requirements for design features which minimize potentially harmful environmental impacts such as noise, vibration, air pollution, glare, odor and dust.*

Response: The proposed CUP is to allow a potential future warehousing/distribution user larger than 150,000 SF in Building C, the only one of five proposed industrial buildings with floor area exceeding 150,000 SF. As discussed in other sections of this narrative, the project will include construction of utility system extensions and street improvements to satisfy all applicable City of Sherwood standards for the project as a whole, including the 183,292 SF Building C. The proposed use and development are consistent with the subject property's EI zoning, and compatible with the industrial zoning and development surrounding it. For these reasons, no imposition of additional conditions is necessary or warranted to protect the best interests of the surrounding properties and neighborhoods, the City as a whole, and the intent of this Chapter. This criterion is met without additional conditions.

E. Time Limits

Unless approved under Section 16.82.020.A.2 for a larger development to include future tenants of such development, authorization of a conditional use shall be void after two (2) years or such lesser time as the approval may specify unless substantial construction, in the City's determination, has taken place. The Hearing Authority may extend authorization for an additional period, not to exceed one (1) year, upon a written request from the applicant showing adequate cause for such extension, and payment of an extension application fee as per Section 16.74.010.

Response: This provision provides procedural guidance for implementation following approval and requires no evidence from the applicant.

F. Revocation

Any departure from approved plans not authorized by the Hearing Authority shall be cause for revocation of applicable building and occupancy permits. Furthermore, if, in the City's determination, a condition or conditions of CUP approval are not or cannot be satisfied, the CUP approval, or building and occupancy permits, shall be revoked.

Response: This provision provides procedural guidance for implementation following approval and requires no evidence from the applicant.

Chapter 16.84 - Variances

16.84.010 - Purpose
This Chapter provides standards and procedures for variances, which are modifications to land use or development standards that are not otherwise permitted elsewhere in this Code as exceptions to Code standards. This Chapter provides flexibility, while maintaining the purposes and intent of the Code. No variances shall be granted to allow the use of property for a purpose not authorized within the zone in which the proposed use is located. In granting a variance, conditions may be imposed when necessary to protect the best interests of surrounding properties and neighborhoods, and otherwise achieve the purposes of the adopted Comprehensive Plan, the Transportation System Plan, and other Code provisions.
Response: The applicant has provided evidence below responding to applicable approval criteria for the requested variance to exceed the 200-foot length standard in Section 16.106.040.E and to utilize a cul-de-sac rather than construct a through street connection to SW Blake Road.

16.84.020 - Applicability
A. Exceptions and Modifications versus Variances
A code standard or approval criterion may be modified without approval of a variance if the applicable code section expressly allows exceptions or modifications. If the code provision does not expressly provide for exceptions or modifications then a variance is required to modify that code section and the provisions of Chapter 16.84 apply.
Response: Deviations from the cul-de-sac standard in Section 16.106.040.E are not expressly listed as allowable exceptions or modifications, so the applicant is requesting variance approval. This standard is met.

B. Combining Variances with Other Approvals; Permit Approvals by Other Agencies.
Variance requests may be combined with and reviewed concurrently by the City approval body with other land use and development applications (e.g., development review, site plan review, subdivision, conditional use, etc.); however, some variances may be subject to approval by other permitting agencies, such as ODOT in the case of State Highway access.
Response: The applicant requests that the City review the variance application concurrently with the site plan review, conditional use, and subdivision application. This standard is met.

C. Adjustments and variances cannot be applied to change any existing Planned Unit Development (PUD).
Response: This site is not within an existing PUD. This standard does not apply.

16.84.030 - Types of Variances
As provided in this Section, there are three types of variances: Adjustments, Class A variance and Class B variance; the type of variance required depends on the extent of the variance request and the discretion involved in the decision making process.

C. Class A Variances
1. Generally
a. The Class A variance procedure may be used to modify a standard for three (3) or fewer lots, including lots yet to be created through a partition process.
b. An applicant who proposes to vary a standard for lots yet to be created through a subdivision process may not utilize the Class A variance procedure. Approval of a Planned Unit Development shall be required to vary a standard for lots yet to be created through a subdivision process, where a specific code section does not otherwise permit exceptions.

c. *A Class A Variance shall not be approved that would vary the "permitted, conditional or prohibited uses" of a land use district.*

Response: The applicant is requesting a Class A Variance to vary cul-de-sac length from the 200-foot maximum limit to allow the proposed 550-foot length for SW Cipole Place and to waive the standard for a paved bicycle and pedestrian path south of the cul-de-sac. This section is not applicable because the proposed variance would not vary the standards for lots (subparagraphs a and b) or uses (subparagraph c).

2. *Approval Process:*

a. *Class A Variances shall be processed using a Type IV procedure, as governed by Chapter 16.84, using the approval criteria in subsection 3, below.*

Response: The applicant requests a Class A Variance and the request has been prepared and submitted consistent with the requirements stipulated for a Type IV procedure. The information required for a Type IV application has been submitted to the City of Sherwood along with the corresponding application fee. Review of and issuance of a decision on the request shall occur consistent with the relevant provisions from Chapter 16.72 and Section 16.84.030. Findings in response to the applicable review criteria are presented below. This standard is met.

b. *In addition to the application requirements contained in Chapter 16.72.010, the applicant shall provide a written narrative describing the reason for the variance, why it is required, alternatives considered, and compliance with the criteria in subsection 3.*

Response: This section provides the rationale for the SW Cipole Place cul-de-sac variance request and a description of the multiple alternative designs for the site and the roadway examined by the applicant. Compliance with subsection 3 is provided in the responses to that section below.

Background

As discussed in the narrative introduction, the applicant is proposing a subdivision for the sole reason of being able to offer buildings for sale or lease to potential users in a one-building-per-lot final configuration. Trammell Crow Company's experience with industrial development in the Tualatin-Sherwood Road corridor reveals that many users prefer to own their own sites, and that by doing so, they make greater investment in the community and increase the likelihood of manufacturing jobs. If market demand did not call for the flexibility for users to purchase their own lots, then all five proposed buildings could be constructed on a single lot, with no associated subdivision. In this scenario, a public street would not be needed to provide access, and the development could be constructed with a single private internal drive from SW Tualatin-Sherwood Road and no vehicle or pedestrian/bicycle connection to SW Blake Road.

Since neither the City of Sherwood 2014 Transportation Plan (TSP) nor applicable industrial development standards require a vehicular or pedestrian connection through the property, the applicant proposes a single point of access across from Cipole Road, the only location that is feasible and approved by Washington County. Washington County has approved a Design Exception (Attachment 12) for non-arterial/non-collector access to SW Tualatin-Sherwood Road at the existing signalized Cipole Road intersection, as this provides a safe protected location for large trucks, employees, and customers of the site and does not create a new intersection on an existing arterial. The County is not permitting driveway connections to 124th Avenue since this is an access-controlled roadway with grades that would not accommodate connections at locations other than Blake Road. Access cannot be obtained from the west due to the location of the existing municipal water reservoir, the unimproved/substandard condition of existing roadways (e.g., Dahlke Lane and the access to the reservoir), and the close proximity of the Dahlke Lane/Oregon Street intersection to the signal at the Oregon Street/Tualatin-Sherwood Road intersection.

Assessment of Cul-de-Sac vs. Through Street

Prior transportation planning efforts for the City in general and the Tonquin Employment Area have not identified the need for a public street extending southward from the SW Cipole Road/SW Tualatin-Sherwood Road intersection. As detailed in the supporting materials in Attachment 12, Figure 18 in the TSP depicts the south approach of this intersection with an arrow, indicating it is a conceptual street connection, not a proposed roadway. Significantly, the 2015 Tonquin Employment Area Market Analysis, Business Recruitment Strategy, and Implementation Plan[2] (the *TEA Implementation Plan*) notes that "…we are assuming an internal drive will be located here instead" of an extension of Cipole Road south of Tualatin-Sherwood Road.

As further detailed in the supporting materials in Attachment 12, neither the City TSP, the TEA Implementation Plan, nor the Washington County TSP Functional Classification Urban Area Map 6 illustrate an existing or proposed street at this location, or anywhere south of Tualatin-Sherwood Road between Oregon Street and SW 124th Avenue.

The Traffic Impact Analysis (Attachment 11) compared the resulting roadway operations for a cul-de-sac and a through street to Blake Road, concluding the following:

> *Traffic Operations: Regardless of whether or not SW Cipole Road is extended through the site, the adjacent study intersections are all anticipated to meet the jurisdictional mobility standard. While the extension of SW Cipole Road results in slightly improved operations at the SW Cipole Road / SW Tualatin-Sherwood Road intersection, operations remain the same or slightly deteriorate at the SW 124th Avenue / SW Tualatin-Sherwood Road, SW Cipole Road/Blake Road and SW 124th Avenue / Blake Road intersections. Therefore, there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road.*
>
> *Traffic Safety: A connection to Blake Road would add an access point to the roadway network, introducing conflict. Limiting SW Cipole Road to a cul-de-sac ending would result in fewer unprotected left-turn conflict points on the surrounding roadway network, especially those involving large trucks.*

[2] The TEA Implementation Plan built on the work in earlier planning documents including transportation and utility master plans, the Tonquin Employment Area concept plans, and the City's economic development strategy.

In addition to not being necessary or advantageous for traffic operations, the potential extension of Cipole Place to Blake Road would also increase street maintenance costs for the City and increase the potential for conflicts between trucks and passenger vehicles that may opt to cut through Cipole Place rather than use SW 124th Avenue for north-south travel. An extension of Cipole Road to Blake Road would connect to Blake on a horizontal roadway curve which presents several concerns since curves can pose sight distance problems; if a perpendicular intersection were instead created then it may result in steeper road grades and would increase site impacts due to additional right-of-way and fill slope requirements.

Importantly, the Fire Marshal from Tualatin Valley Fire & Rescue has indicated that, from the perspective of emergency service, “The proposed cul de sac is allowed and a secondary access would not be required if all buildings are fully sprinklered.” The applicant does plan to construct buildings with sprinkler systems for fire suppression. As illustrated on Sheet C3.3 in Attachment 6, the proposed cul-de-sac terminates in a bulb with a paved radius of 54 feet to allow for fire truck turnarounds.

Roadway grades over 3% (which would be required if the road extended south to Blake Road) affect intersection sight distance needs. If a relatively flat grade is not provided at the Cipole/Blake intersection, additional intersection sight distance will be needed, which exacerbates the intersection design.

Assessment of Cul-de-Sac Length

The City’s 200-foot standard is primarily geared toward residential development rather than large-lot industrial development. The site size, configuration, dimensions, and locations of wetlands make a 200-foot cul-de-sac infeasible for an industrial park. At 200 feet, the cul-de-sac would be too far north to provide access to Building E without impacting wetlands. Additionally, a length of 200 feet or less may provide inadequate space for trucks to queue during peak operations, potentially leading to conflicts if southbound vehicles spill back onto SW Tualatin-Sherwood Road. Accordingly, the applicant is requesting a longer cul-de-sac to provide for safe operations by alleviating queuing concerns, and to reduce resource impacts by allowing driveways to be routed around wetlands. The proposed site layout extends the cul-de-sac south and west away from the wetlands, with the resulting access point to Building E being situated on the cul-de-sac bulb 550 feet south of Tualatin-Sherwood Road. This is the shortest length possible without causing wetland impacts. The applicant has also submitted an associated Engineering Design Modification request (Attachment 20).

Economic Development Opportunity

The site is a designated Industrial area in Metro’s Urban Growth Management Functional Plan (UGMFP) Title 4 *Industrial and Other Employment Areas* map (October 2014). Section 3.07.410 of the UGMFP stipulates in part that “To improve the economy, Title 4 seeks to provide and protect a supply of sites for employment…” Accordingly, after the Tonquin Employment Area (TEA) was brought into the urban growth boundary, the City of Sherwood designated the TEA for industrial development and established the EI zone with limits on the size and scope of non-industrial uses. Now that the property has been annexed into the City and zoned EI, the applicant seeks to maximize opportunities for industrial development and employment.

Alternatives Analysis

The proposal to construct a cul-de-sac itself was not a design decision that was approached casually, but rather reflected extensive alternatives analysis that examined the feasibility of the street southward to connect to the future alignment of Blake Road. The steep slope and configuration of the site poses development constraints for the large-footprint industrial buildings envisioned for the TEA and allowed in the EI zone. To address the requirement for large, flat sites, there are two basic approach options for designing the site and the roadway. The first focuses on the site with the primary objective of accommodating the property's industrial Comprehensive Plan designation, with roadway design subordinate to site planning. The second approach's objective is to create a street design that falls within engineering standards and best practices, subordinating site design. To advance the City's and Metro's economic development goals for the TEA, the applicant is implementing the first approach.

The site slopes downward steeply from south to north, with an elevation drop of approximately 45 feet[3] from the future Blake Road location to SW Tualatin-Sherwood Road. The majority of the site has slopes over 7%, which is generally the upper limit for accommodating large-footprint industrial structures, as steeper slopes do not accommodate large, rectangular buildings, truck courts, and associated parking areas without significant grading efforts and associated development costs. The localized areas of lesser slopes contain existing wetlands that the applicant proposes to preserve. Without significant site grading, the site would provide space for only one large industrial building with much less capacity than the proposed plan.

In keeping with the first approach outlined above, the applicant proposes to maximize building area and achieve efficient cross-lot circulation by grading the site as depicted in Attachment 6, Sheets C4.0-C4.2. This layout establishes the buildings' finished floor elevations at approximately the same level, with only a three-foot difference among buildings. Much of the existing hillside will be excavated to accommodate the building footprints and parking areas, with site walls present around most of the site perimeter (some of these would be engineered retaining walls, while others would be cut faces in rock areas). In general, Lots 3 and 4 and the western portion of Lot 1 will be lower than off-site abutting land, while Lots 2 and 5 and the northern portion of Lot 1 will be higher than off-site abutting land. The resulting SW Cipole Place roadway design utilizes a 3% slope (Attachment 6, Sheet C3.3), which is appropriate for a street with significant truck traffic.[4] The elevation of the cul-de-sac bulb would remain approximately 30 feet lower than Blake Road.

As part of the alternatives analysis, for Option 1 the design team examined the implications of utilizing the same Cipole Place profile as shown in Attachment 6, Sheet

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[3] On the proposed grading plan, the SW Cipole Road/Tualatin-Sherwood Road intersection would be at elevation 189'; future Blake Road intersects SW 124th Avenue at elevation 233' and the existing topography slopes uphill as the corridor proceeds to the west.

[4] *Designing for Truck Movements and other Large Vehicles in Portland*, October 8, 2008, City of Portland, recommends a slope of no more than 5% for local streets in industrial areas. Recent communication with Bob Hillier, the current City of Portland Freight Coordinator, indicates that this best practice continues to be observed by City of Portland staff.

C3.3, but then extending the roadway southward to connect to the future Blake Road (Attachment 13, pages 1-3). Key points about the Option 1 design are:

- The road was designed with a design speed of 25 miles per hour, per standards for local streets.
- The road grade from SW Tualatin-Sherwood Road to the main vehicle entries in the cul-de-sac bulb was set at 3% to facilitate truck operations and allow reasonable access to the northeast portion of the site without crossing the wetlands.
- This option minimizes wall height for Cipole Place (north of the cul-de-sac bulb) and minimizes impact to vegetated corridor.
- The roadway vertical curves were designed to minimum K values as specified in the Engineering Design Manual, requiring street lighting to meet American Association of State Highway and Transportation Officials (AASHTO) and City of Sherwood standards.
- The resulting roadway profile (Attachment 13, page 2) illustrates that a portion of the street would need to be constructed at a 14.9% slope, thus necessitating City Engineer approval (City engineering standards dictate that road slopes may not exceed 15%, and any slopes over 12% require special approval by the City Engineer).
- Any vehicle turning onto Cipole Place from Blake Road will not be able to see the driveway entries until after they have crested the vertical curve and are descending down the 14.9% slope, creating a hazardous traffic condition.
- The resulting cross-section fill slopes extend into the site by up to 100 feet (Attachment 13, page 1), impacting additional vegetated corridor and reducing developable area.

Option 1 reduces the size of Building D by more than 38,600 SF compared to the applicant's proposal (Attachment 13, page 3), and requiring placement of a significant volume of fill that would impact existing wetland features. Based on the reduction in building area, the applicant would expect an associated reduction of 64 jobs, using an average rate of 600 SF per employee based on Appendix 6 of Metro's 2014 Urban Growth Report. Furthermore, assuming a property tax rate of $1.25 per SF per year, growing at 3% per year, this reduction in building area would result in lost property tax revenue of over $5.4 million over the expected life of a building (50 years). Finally, the associated cost of extending the roadway using this road profile would be $610,000 greater than the applicant's proposal.

In keeping with the second approach outlined above, the design team examined a second alternative (Option 2) which would extend Cipole Place to Blake Road using a constant slope, and then adjusting site grades to fit the roadway (Attachment 13, pages 4-6). Key points about the Option 2 design are:

- The road was designed with a design speed of 25 miles per hour, per standards for local streets.
- The roadway profile (Attachment 13, Sheet 5) utilizes a 6% slope from SW Tualatin-Sherwood Road to Blake Road. While this slope requires no special approval from the City Engineer, it is steeper than comfortable for trucks (3% would be preferable for trucks, and a maximum of 5% is recommended).

- The roadway vertical curves were designed to minimum K values as specified in the Engineering Design Manual, requiring street lighting to meet AASHTO and City of Sherwood standards.
- Wall heights along the east side of Cipole Place north of the cul-de-sac bulb are the same as in Option A, but due to the higher roadway slope this results in additional grading at 3:1 side slopes, impacting the vegetated corridor and wetlands.
- Due to the higher roadway profile, the resulting cross-section fill slopes extend into the site by over 400 feet in some locations (Attachment 13, page 4), requiring fill in Wetland A and imposing additional vegetated corridor impacts while also reducing developable area.
- Due to increased vegetated corridor and wetland impacts, a dedicated area for on-site mitigation is illustrated west of Cipole Place, using up valuable land.
- The wetland impacts would require state and Federal permitting, a time-consuming and unpredictable process.
- To provide tenant and truck access to buildings both east and west of Cipole Place, sloped drive aisles would need to be constructed at slopes of approximately 4-4.5%, which pushes buildings farther away from the street and results in smaller building footprints.
- These site slopes are higher than some industrial users are willing to accept due to impacts on truck operations, which then reduces the attractiveness of the site for potential tenants/purchasers. For instance, Amazon's standards stipulate a maximum slope of 3.5% in truck areas at their facilities.
- The longer truck aisles needed to access the site result in the complete elimination of an entire building since trucks can no longer access it and a shared truck court is no longer feasible.

The Option 2 alternative reduces the total building area by over 132,000 SF (Attachment 13, page 6) compared to the applicant's proposal. Based on the reduction in building area, the applicant would expect an associated reduction of 220 jobs, using an average rate of 600 SF per employee based on Appendix 6 of Metro's 2014 Urban Growth Report. Furthermore, assuming a property tax rate of $1.25 per SF per year, growing at 3% per year, this reduction in building area would result in lost property tax revenue of over $18.6 million over the expected life of a building (50 years). Finally, the associated cost of extending the roadway using this road profile would be $1.2 million greater than the applicant's proposal.

Compared to the applicant's proposal, both alternatives decrease building area, which yields a corresponding reduction in job opportunity for the community. Taken together, the resulting increased costs of extending the street farther south, the constrained circulation, and the reduced square footage yields would make industrial development infeasible. Furthermore, the TIA points out potential roadway conflicts that would occur if Cipole Road were extended south to Blake Road.

The analysis above provides evidence that the applicant has thoroughly evaluated multiple alternatives before arriving at the proposed site and roadway design, and that the proposed design is superior to the alternatives. This standard is met.

3. *Approval Criteria: The City shall approve, approve with conditions, or deny an application for a Class A Variance based on the following criteria:*

a. *The proposed variance will not be materially detrimental to the purposes of this Code, to any other applicable policies and standards, and to other properties in the same land use district or vicinity;*

Response: A Variance is requested to elements of Section 16.106.040.E, which would restrict cul-de-sac length to 200 feet and would require pedestrian/bicycle connections from the cul-de-sac bulb to other streets. As illustrated on Sheet C3.3, the applicant proposes a cul-de-sac length of approximately 550 feet for SW Cipole Place and proposes not to provide an impractically steep pedestrian/bike path to SW Blake Road.

The purposes of the Code are outlined in Section 16.02.020, which states that:

This Code is enacted to:

- *A. Encourage the most appropriate use of land.*
- *B. Conserve and stabilize the value of property.*
- *C. Preserve natural resources.*
- *D. Facilitate fire and police protection.*
- *E. Provide adequate open space for light and air.*
- *F. Minimize congestion on streets.*
- *G. Promote orderly growth of the City.*
- *H. Prevent undue concentrations of population.*
- *I. Facilitate adequate provision of community facilities.*
- *J. Promote in other ways the public health, safety, convenience, and general welfare.*
- *K. Enable implementation of the Sherwood Comprehensive Plan in compliance with State Land Use Goals.*

Lengthening the cul-de-sac from 200 feet to approximately 550 feet would not be detrimental to these purposes as it would result in orderly and efficient use of industrial land, lead to increased employment within city limits, and maintain acceptable traffic operations as detailed in Attachment 11.

As the cul-de-sac will be entirely self-contained within the limits of the Corporate Park, the additional roadway length does not negatively impact abutting properties or those in the vicinity. Extending the length of the cul-de-sac will provide adequate space for southbound trucks to queue in the cul-de-sac without spilling back into SW Tualatin-Sherwood Road, thereby decreasing the potential for unsafe traffic conditions at the intersection, which could occur if the roadway were limited to 200 feet. Furthermore, abutting properties do not need access to SW Cipole Place in order to develop, as properties to the north have access to SW Tualatin-Sherwood Road; properties to the east have access to SW 124th Avenue; properties to the south can take access to Blake Road when it gets constructed; and properties to the west can take access from Dahlke Lane. As demonstrated in Attachment 11, traffic operations are not negatively affected by utilizing a cul-de-sac rather than a through street.

The proposed variance will have a greater positive impact on the surrounding area than the alternatives, by allowing for increased building sizes as compared to constructing a through street to Blake Road. Because usable square footage will be higher, employment opportunities and tax base growth will also increase.

Based on the factors described above, a 550-foot industrial cul-de-sac rather than a through street or a 200-foot cul-de-sac will not result in a materially detrimental impact on surroundings properties or roadways, or on employees, customers, and guests who will be working at and visiting the site.

Allowing the 550-foot cul-de-sac, as proposed, will also enable development of the site in an efficient manner that is compatible with surrounding land uses. Construction of the street as proposed allows the balance of the site to be designed with an efficient building placement and vehicle circulation pattern that respects the location and value of the on-site wetlands; by contrast, driveway alignments necessary with a 200-foot cul-de-sac length would cause significantly greater impacts. These characteristics are consistent with Industrial Land Use Policies 1 and 2 of Chapter 4 of the Sherwood Comprehensive Plan II, which state the following.

> *Policy 1 – Industrial uses will be located in areas where they will be compatible with adjoining uses, and where necessary services and natural amenities are favorable.*
>
> *Policy 2 – The City will encourage sound industrial development by all suitable means to provide employment and economic stability to the community.*

The degree of flexibility sought by the proposed Variance also aligns with Community Design Policy 4, as referenced below, through applying a flexible site design approach that effectively maintains transportation operational standards while allowing for a financially viable industrial development that does not allocate valuable land to roadway cross-section fill slopes which diminish the usability of the site.

> *Policy 4 – Promote creativity, innovation and flexibility in structural and site design.*

Approving the proposed variance would provide economic benefit to the City as it would accommodate larger buildings, leading to a corresponding increase in the number of jobs available for area residents, improving the City's jobs-housing balance.

Finally, with respect to providing a pedestrian/bicycle connection to a neighboring street, due to the elevation difference between the proposed SW Cipole Place cul-de-sac and SW Blake Road, a path between the two would need to be steeply sloped and traverse a steep cut/fill bank with high retaining walls. Even with safety railings, a path through this location could pose safety risks, especially in wet or icy/snowy conditions. Situated within an industrially zoned area, there is little reason to anticipate significant pedestrian or bike traffic. Routing by way of SW 124th Avenue, with sidewalks and bike lanes when fully improved, will be much safer, so the applicant is proposing pedestrian connections from Buildings D and E to 124th Avenue.

Given these findings, the proposed Variance is consistent with the criterion cited above.

b. A hardship to development exists which is peculiar to the lot size or shape, topography, or other similar circumstances related to the property over which the applicant has no control, and which are not applicable to other properties in the vicinity (e.g., the same land use district);

Response: The site's developable area is constrained both by the locations of the wetlands (which the applicant wishes to preserve in their natural state), by the site size and shape (which differs from other sites in the TEA), and by the site topography. From south to north, the site has an elevation drop of approximately 45 feet from the future Blake Road location to SW Tualatin-Sherwood Road, which has the effect of making a through connection to Blake Road impracticable for the reasons discussed above. Since Washington County has indicated that no connections will be permitted to SW 124th Avenue, then the only remaining option for a street is a cul-de-sac extending southward from SW Tualatin-Sherwood Road. Limiting this cul-de-sac to 200 feet is not viable since it could cause truck queuing spillbacks onto Tualatin-Sherwood Road and would require the driveway for Lot 5 to pass through the wetlands, negatively impacting their condition. The north-south dimension of the site necessitates a longer roadway to provide access to all the proposed Lots and buildings.

The site's topography, particularly the elevation difference between the proposed cul-de-sac and (future) SW Blake Road also makes construction of a safe pedestrian/bike facility impractical at this location.

Based on the evidence provided, this standard is met.

c. *The use proposed will be the same as permitted under this title and City standards will be maintained to the greatest extent that is reasonably possible while permitting reasonable economic use of the land;*

Response: Approval of the proposed Class A Variance will have no effect on the types of uses occurring at the site; the applicant proposes speculative industrial buildings which are consistent with allowed uses in the EI zone. Other than the cul-de-sac length, applicable development standards are proposed to be met with this development. Allowing a 550-foot cul-de-sac allows development of 535,000 SF of industrial space, which constitutes a significant boost to the local economy as intended by the Tonquin Employment Area plan. Allowing the variance and not requiring a through street to Blake Road results in a roadway that complies with engineering design standards for road grade, suitable for semi tractor-trailer trucks and fire trucks while remaining financially viable for the applicant. By contrast, due to the elevation difference from north to south, extending SW Cipole Place to Blake Road would have required side slopes that decreased developable area and resulted in less building area, at which point the project may no longer be viable. This standard is met.

d. *Existing physical and natural systems, such as but not limited to traffic, drainage, natural resources, and parks will not be adversely affected any more than would occur if the development occurred as specified by the subject Code standard;*

Response: It will remain possible to construct all necessary transportation facilities along the SW Tualatin-Sherwood Road and SW 124th Avenue frontages, consistent with the applicable design standards for arterial roadways, as specified in the Sherwood Transportation System Plan and proposed through the corresponding Site Plan Review and Preliminary Subdivision application. In effect, as discussed above, the proposed cul-de-sac will be functionally equivalent to a single, central private drive serving all tenants within the industrial park, while allowing subdivision of the property to locate each building on its own lot.

The transportation impact study (Attachment 11) evaluates the effect of the proposed development on the transportation system and provides evidence in support of the requested variance. Specifically, this analysis compares both network concepts and demonstrates no net benefit to the transportation system if SW Cipole Place were a through street. The TIA demonstrates that the development will have a negligible impact on the operations of nearby streets, and that the proposed cul-de-sac is appropriate given the trip generation and capacity of nearby roadways. Therefore, approving the variance is consistent with the general purpose of promoting safety and maintaining an efficient transportation network.

The preliminary storm report (Attachment 16) demonstrates that stormwater management will be performed in accordance with drainage best practices and Clean Water Services standards; the variance does not affect the ability to provide appropriate stormwater management.

Wetland Delineation Reports and Natural Resource Assessment Report (Attachments 14 and 15) provide evidence that the development avoids wetlands, which is achieved by curving the cul-de-sac alignment southwesterly from the SW Cipole Road/SW Tualatin-Sherwood Road intersection to minimize habitat and water quality impacts on the existing wetlands.

Allowing a cul-de-sac longer than 200 feet at this location will have no impact on parks since no parks are located on or near the site.

Based on the above factors and considerations, this standard is met.

e. The hardship is not self-imposed; and

Response: The presence of natural resources (wetlands) on site, the significant elevation gain from north to south precluding a through street or pedestrian/bike path to Blake Road, and the lot depth, are all conditions beyond the control of the applicant. These conditions are existing and not "self-imposed," so the need for the variance was not created by the applicant. The elevation changes alone pose a significant design constraint for industrial development, as the grading required to achieve the large, flat sites needed for large industrial buildings results in a road profile that does not allow for safe or convenient access to Blake Road. This condition was exacerbated when the alignment of Blake Road was shifted northward approximately 550 feet (see supporting materials in Attachment 12) to accommodate the needs of the planned Willamette Water Supply Program water treatment facility; the northward shift shortened the horizontal distance between SW Tualatin-Sherwood Road and Blake Road without decreasing the elevation change. As a result, attempting to construct a through street to Blake Road results in a steeper roadway that is not conducive to industrial development. This standard is met.

f. The variance requested is the minimum variance that would alleviate the hardship.

Response: The proposed use of a 550-foot cul-de-sac rather than a 200-foot cul-de-sac or a through street to Blake Road represents the minimum reduction necessary to alleviate the site design constraints discussed above. If the property were flatter, then a roadway profile could be established that would accommodate large, flat industrial sites and still maintained traffic safety. Alternately, if the site was planned for non-industrial uses, the need for large, flat sites would be reduced, the roadway could be established with a continuous slope, and the site could be designed with smaller multi-family residential or commercial buildings built into the hillside. However, planning for the Tonquin

Employment Area as well as current zoning do not support residential or commercial uses, and the applicant is not seeking authorization for them.

As noted, approving the Variance will enable efficient use of the site by accommodating large industrial buildings while still maintaining site access. At the scale of a 46.5-acre development site, authorizing a 550-foot cul-de-sac rather than a 200-foot cul-de-sac or a through street to Blake Road is a relatively small variance. Granting the variance allows for a financially viable development that will result in 535,000 SF of industrial building square footage, which will benefit the City as well as the region, consistent with the long-term vision for the Tonquin Employment Area. This standard is met.

In order to provide a through connection to Blake Road or limit the cul-de-sac to 200 feet as specified in the code, the resulting building areas would have to be considerably smaller, thereby constraining the spectrum of potential industrial businesses that would otherwise be likely to occupy the site, while also decreasing the financial viability of the project for the developer. The proposed Variance is a reasonable and measured modification that serves to offset the hardship imposed by strict application of the code standards.

Division V. - Community Design

Chapter 16.90 - Site Planning

16.90.020 - Site Plan Review

A. Site Plan Review Required

Site Plan review is required prior to any substantial change to a site or use that does not meet the criteria of a minor or major modification, issuance of building permits for a new building or structure, or for the substantial alteration of an existing structure or use.

For the purposes of Section 16.90.020, the terms "substantial change" and "substantial alteration" mean any development activity as defined by this Code that generally requires a building permit and may exhibit one or more of the following characteristics:

1. *The activity alters the exterior appearance of a structure, building or property and is not considered a modification.*
2. *The activity involves changes in the use of a structure, building, or property from residential to commercial or industrial and is not considered a modification.*
3. *The activity involves non-conforming uses as defined in Chapter 16.48.*
4. *The activity constitutes a change in a City approved plan, per Section 16.90.020 and is not considered a modification.*
5. *The activity is subject to site plan review by other requirements of this Code.6.The activity increases the size of the building by more than 100% (i.e. the building more than doubles in size), regardless of whether it would be considered a major or minor modification.*

Response: The applicant is requesting Site Plan Review for the five proposed buildings. Since the site is currently undeveloped, the proposal does not qualify as a major or minor modification or a substantial alteration. This standard is met.

B. Exemption to Site Plan Requirement

1. *Single and two family uses*

*2.	Manufactured homes located on individual residential lots per Section 16.46.010, but including manufactured home parks.*

Response: No single and two family uses, or manufactured homes are proposed as part of this development. This standard does not apply.

*C.	Reserved*

*D.	Required Findings*
No site plan approval will be granted unless each of the following is found:

*1.	The proposed development meets applicable zoning district standards and design standards in Division II, and all provisions of Divisions V, VI, VIII and IX.*
*2.	The proposed development can be adequately served by services conforming to the Community Development Plan, including but not limited to water, sanitary facilities, storm water, solid waste, parks and open space, public safety, electric power, and communications.*
*3.	Covenants, agreements, and other specific documents are adequate, in the City's determination, to assure an acceptable method of ownership, management, and maintenance of structures, landscaping, and other on-site features.*

Response: Findings that demonstrate compliance with the applicable development standards from Divisions II, IV, V, VI, and VIII are presented herein. Division IX does not apply as there are no historic resources on site. As substantiated by relevant portions of those findings, the subject development has been designed in a manner that will ensure adequate service can be provided by existing public and private utilities. Following construction, ongoing maintenance of the site and related improvements will be provided by the property owner(s) and building tenants. This standard is met.

*4.	The proposed development preserves significant natural features to the maximum extent feasible, including but not limited to natural drainage ways, wetlands, trees, vegetation (including but not limited to environmentally sensitive lands), scenic views, and topographical features, and conforms to the applicable provisions of Division VIII of this Code and Chapter 5 of the Community Development Code.*

Response: The natural features that have been documented at the site are existing trees and wetlands (Attachments 14, 15, and 18). Findings below address tree preservation and wetland vegetated corridor mitigation; in particular, standards from Division VIII. This standard is met.

*5.	For developments that are likely to generate more than 400 average daily trips (ADTs), or at the discretion of the City Engineer, the applicant must provide adequate information, such as a traffic impact analysis (TIA) or traffic counts, to demonstrate the level of impact to the surrounding transportation system. The developer is required to mitigate for impacts attributable to the project, pursuant to TIA requirements in Section 16.106.080 and rough proportionality requirements in Section 16.106.090. The determination of impact or effect and the scope of the impact study must be coordinated with the provider of the affected transportation facility.*

Response: The applicant has submitted a Traffic Impact Analysis that demonstrates the anticipated effect of the proposed development on the surrounding transportation system (Attachment 11). The analysis has been prepared consistent with provisions contained in Section 16.106.080. This standard is met.

6. *The proposed commercial, multi-family, institutional or mixed-use development is oriented to the pedestrian and bicycle, and to existing and planned transit facilities. Urban design standards include the following:*
   a. *Primary, front entrances are located and oriented to the street, and have significant articulation and treatment, via facades, porticos, arcades, porches, portal, forecourt, or stoop to identify the entrance for pedestrians. Additional entrance/exit points for buildings, such as a postern, are allowed from secondary streets or parking areas.*
   b. *Buildings are located adjacent to and flush to the street, subject to landscape corridor and setback standards of the underlying zone.*
   c. *The architecture of buildings are oriented to the pedestrian and designed for the long term and be adaptable to other uses. Aluminum, vinyl, and T-111 siding are prohibited. Street facing elevations have windows, transparent fenestration, and divisions to break up the mass of any window. Roll up and sliding doors are acceptable. Awnings that provide a minimum 3 feet of shelter from rain are required unless other architectural elements are provided for similar protection, such as an arcade.*
   d. *As an alternative to the standards in Section 16.90.020.D.6.a—c, the following Commercial Design Review Matrix may be applied to any commercial, multi-family, institutional or mixed use development (this matrix may not be utilized for developments within the Old Town Overlay). A development must propose a minimum of 60 percent of the total possible points to be eligible for exemption from the standards in Section 16.90.020.D.6.a—c. In addition, a development proposing between 15,001 and 40,000 square feet of floor area, parking or seating capacity and proposing a minimum of 80 percent of the total possible points from the matrix below may be reviewed as a Type II administrative review, per the standards of Section 16.72.010.A.2.*
   e. *As an alternative to the standards in Sections 16.90.020.D.6.a—c, the Old Town Design Standards (Chapter 16.162) may be applied to achieve this performance measure.*
   f. *As an alternative to the standards in Sections 16.90.020.D.6.a.—e, an applicant may opt to have a design review hearing before the Planning Commission to demonstrate how the proposed development meets or exceeds the objectives in Section 16.90.010.B of this Code. This design review hearing will be processed as a Type IV review with public notice and a public hearing.*

Response: The project site is located within the Employment Industrial zone and the proposed uses are industrial rather than commercial, multi-family, institutional or mixed-use. This standard does not apply.

7. *Industrial developments provide employment opportunities for citizens of Sherwood and the region as a whole. The proposed industrial development is designed to enhance areas visible from arterial and collector streets by reducing the "bulk" appearance of large buildings. Industrial design standards include the following:*
   a. *Portions of the proposed industrial development within 200 feet of an arterial or collector street and visible to the arterial or collector (i.e. not behind another building) must meet any four of the following six design criteria:*
      (1) *A minimum 15% window glazing for all frontages facing an arterial or collector.*

(2) *A minimum of two (2) building materials used to break up vertical facade street facing frontages (no T-111 or aluminum siding).*

(3) *Maximum thirty-five (35) foot setback for all parts of the building from the property line separating the site from all arterial or collector streets (required visual corridor falls within this maximum setback area).*

(4) *Parking is located to the side or rear of the building when viewed from the arterial or collector.*

(5) *Loading areas are located to the side or rear of the building when viewed from the arterial or collector. If a loading area is visible from an arterial or collector, it must be screened with vegetation or a screen made of materials matching the building materials.*

(6) *All roof-mounted equipment is screened with materials complimentary to the building design materials.*

Response: The project will meet design criteria 1, 2, 5, and 6. The proposed buildings will utilize a minimum of 15% window glazing on all frontages facing an arterial (SW Tualatin-Sherwood Road and SW 124th Avenue) and a minimum of two building materials used to break up vertical façade street facing frontages, see Sheets AA2.10, BA2.10, CA2.10-CA2.11, DA2.10-DA2.11, and EA2.10 (Attachment 6). Loading areas are located to the side or rear of the building when viewed from the public right-of-way (Sheet A0.10), and all roof-mounted equipment is screened with parapets constructed of the same materials as the adjoining portions of the buildings. These design elements enhance the overall building façade visible from the public right-of-way and reduce the “bulk” appearance of the large buildings. This standard is met.

b. *As an alternative to Section 16.90.020.D.7.a, an applicant may opt to have a design review hearing before the Planning Commission to demonstrate how the proposed development meets or exceeds the applicable industrial design objectives below (this design review hearing will be processed as a Type IV review):*

(1) *Provide high-value industrial projects that result in benefits to the community, consumers and developers.*

(2) *Provide diversified and innovative working environments that take into consideration community needs and activity patterns.*

(3) *Support the City's goals of economic development.*

(4) *Complement and enhance projects previously developed under the industrial design standards identified in Section 16.90.020.D.7.*

(5) *Enhance the appearance of industrial developments visible from arterials and collectors, particularly those considered "entrances" to Sherwood, including but not limited to: Highway 99W, Tualatin-Sherwood Road and Oregon Street.*

(6) *Reduce the "bulk" appearance of large industrial buildings as viewed from the public street by applying exterior features such as architectural articulation, windows and landscaping.*

(7) *Protect natural resources and encourage integration of natural resources into site design (including access to natural resources and open space amenities by the employees of the site and the community as a whole).*

Response: The project will meet the provisions of section 16.90.020.D.7.a, so the applicant is not seeking approval under the provisions of subsection b. This section does not apply.

8. *Driveways that are more than twenty-four (24) feet in width shall align with existing streets or planned streets as shown in the Local Street Connectivity Map in the adopted Transportation System Plan (Figure 17), except where prevented by topography, rail lines, freeways, pre-existing development, or leases, easements, or covenants.*

Response: Access to the site is proposed by the construction of SW Cipole Place, with no additional driveways proposed on SW Tualatin-Sherwood Road or SW 124th Place. There are no existing or planned streets along SW Cipole Place so there is no opportunity for driveways to align with these streets. This standard does not apply.

E. Approvals

The application is reviewed pursuant to Chapter 16.72 and action taken to approve, approve with conditions, or deny the application for site plan review. Conditions may be imposed by the Review Authority if necessary to fulfill the requirements of the adopted Comprehensive Plan, Transportation System Plan or the Zoning and Community Development Code. The action must include appropriate findings of fact as required by Section 16.90.020. The action may be appealed to the Council in accordance with Chapter 16.76.

F. Time Limits

Site plan approvals are void after two (2) years unless construction on the site has begun, as determined by the City. The City may extend site plan approvals for an additional period not to exceed one (1) year, upon written request from the applicant showing adequate cause for such extension, and payment of an extension application fee as per Section 16.74.010. A site plan approval granted on or after January 1, 2007 through December 31, 2009, is extended until December 31, 2013.

Response: The submittal will meet the provisions of the section above. This standard is met.

Chapter 16.92 - Landscaping

16.92.010 - Landscaping Plan Required

All proposed developments for which a site plan is required pursuant to Section 16.90.020 shall submit a landscaping plan that meets the standards of this Chapter. All areas not occupied by structures, paved roadways, walkways, or patios shall be landscaped or maintained according to an approved site plan.

Response: The proposed development has been designed to meet the provisions of Chapter 16.92 – Landscaping, of the Sherwood Municipal Code, please refer to the landscape sheets in Attachment 6. This standard is met.

16.92.020 - Landscaping Materials

A. Type of Landscaping

Required landscaped areas shall include an appropriate combination of native evergreen or deciduous trees and shrubs, evergreen ground cover, and perennial plantings. Trees to be planted in or adjacent to public rights-of-way shall meet the requirements of this Chapter. Plants may be selected from the City's "Suggested Plant Lists for Required Landscaping Manual" or suitable for the Pacific Northwest climate and verified by a landscape architect or certified landscape professional.

1. *Ground Cover Plants*
    - a. *All of the landscape that is not planted with trees and shrubs must be planted in ground cover plants, which may include grasses. Mulch is not a substitute for ground cover, but is allowed in addition to the ground cover plants.*
    - b. *Ground cover plants other than grasses must be at least the four-inch pot size and spaced at distances appropriate for the plant species. Ground cover plants must*

be planted at a density that will cover the entire area within three (3) years from the time of planting.

2. *Shrubs*
    a. *All shrubs must be of sufficient size and number to be at full growth within three (3) years of planting.*
    b. *Shrubs must be at least the one-gallon container size at the time of planting.*
3. *Trees*
    a. *Trees at the time of planting must be fully branched and must be a minimum of two (2) caliper inches and at least six (6) feet in height.*
    b. *Existing trees may be used to meet the standards of this chapter, as described in Section 16.92.020.C.2.*

Response: Attachment 6 presents the proposed landscaping plans for the subject site. As required by the standards cited above, trees will have a minimum caliper of two inches at time of installation, shrubs will have a minimum container size of one gallon, and groundcovers will have a minimum pot size of four inches. Final landscaping plans will be submitted as part of materials provided to the City of Sherwood for review and approval of site and building permits. The review of these plans will confirm installation of trees, shrubs, and groundcovers at or above the minimum specifications notes above. This standard is met.

B. Plant Material Selection and Preparation

1. *Required landscaping materials shall be established and maintained in a healthy condition and of a size sufficient to meet the intent of the approved landscaping plan. Specifications shall be submitted showing that adequate preparation of the topsoil and subsoil will be undertaken.*
2. *Landscape materials should be selected and sited to produce a hardy and drought-resistant landscape area. Selection of the plants should include consideration of soil type, and depth, the amount of maintenance required, spacing, exposure to sun and wind, the slope and contours of the site, and compatibility with existing native vegetation preserved on the site.*

Response: The preliminary landscaping plans have been prepared consistent with criteria 1 and 2. Final landscaping plans will be submitted as part of materials provided to the City of Sherwood for review and approval of site and building permits. The review of these plans will confirm installation of trees, shrubs, and groundcovers at or above the minimum specifications notes above. This standard is met.

C. Existing Vegetation

1. *All developments subject to site plan review per Section 16.90.020 and required to submit landscaping plans per this section shall preserve existing trees, woodlands and vegetation on the site to the maximum extent possible, as determined by the Review Authority, in addition to complying with the provisions of Section 16.142.(Parks, Trees and Open Space) and Chapter 16.144 (Wetland, Habitat, and Natural Resources).*

Response: As noted above, the site is currently fully vegetated (Attachment 18). A total of 505 of the existing trees are proposed for retention, the majority of which are located along SW Tualatin-Sherwood Road or within the wetland areas, Tracts A and D. Retention of additional trees is not possible due to the footprint and locations of the proposed buildings, as well as the need to provide adequate vehicular parking and circulation areas for the propose uses. Approximately 98.8 percent of the trees proposed for removal will be replanted on site through installation of 502 deciduous and evergreen trees that will be distributed along the perimeter of the site, around the edges of buildings, and within the vehicle parking areas (Attachment 6, Sheets L0.01-L1.21).

As discussed in response to criteria from Section 16.142.070, the proposed tree removal does not violate a minimum 30% remaining canopy requirement.

Based on these findings, the proposed development preserves existing trees to the maximum extent possible, while allowing the intensity of new Industrial development expected in the EI zone. The number of trees retained within the site and the number of trees planted within the development, upon maturity, will provide a comparable canopy. Please see below for additional findings in response to Section 16.142. This standard is met.

2. *Existing vegetation, except those plants on the Nuisance Plants list as identified in the "Suggested Plant Lists for Required Landscaping Manual" may be used to meet the landscape standards, if protected and maintained during the construction phase of the development.*
   a. *If existing trees are used, each tree six (6) inches or less in diameter counts as one (1) medium tree.*
   b. *Each tree that is more than six (6) inches and up to nine (9) inches in diameter counts as two (2) medium trees.*
   c. *Each additional three (3) inch diameter increment above nine (9) inches counts as an additional medium tree.*

Response: The applicant proposes to retain 505 existing trees within the boundaries of the site, as shown on Sheets C7.0-C7.6 (Attachment 6) and detailed in the arborist report (Attachment 18). While existing trees will be utilized to satisfy the tree canopy standards of Chapter 16.142, existing trees are not proposed to be used to satisfy any landscape standards. This standard does not apply.

D. Non-Vegetative Features

1. *Landscaped areas as required by this Chapter may include architectural features interspersed with planted areas, such as sculptures, benches, masonry or stone walls, fences, rock groupings, bark dust, semi-pervious decorative paving, and graveled areas.*

Response: Landscaping coverage calculations presented by the applicant are exclusive of any of the features listed above. The total landscaping coverage exceeds the minimum requirements despite not counting these areas. This standard does not apply.

2. *Impervious paving shall not be counted toward the minimum landscaping requirements unless adjacent to at least one (1) landscape strip and serves as a pedestrian pathway.*

Response: Due to the amount of trees retained, pedestrian pathways are not proposed to be counted towards the minimum landscaping standards. This standard does not apply.

3. *Artificial plants are prohibited in any required landscaped area.*

Response: Artificial plants are not proposed as part of required landscaping to satisfy applicable development standards. This standard is met.

16.92.030 - Site Area Landscaping and Perimeter Screening Standards

A. Perimeter Screening and Buffering

1. *Perimeter Screening Separating Residential Zones:*
   A minimum six-foot high sight-obscuring wooden fence, decorative masonry wall, or evergreen screen, shall be required along property lines separating single and two-family uses from multi- family uses, and along property lines separating residential zones from

commercial, institutional/public or industrial zones subject to the provisions of Chapter 16.48.020 (Fences, Walls and Hedges).

a. For new uses adjacent to inventoried environmentally sensitive areas, screening requirements shall be limited to vegetation only to preserve wildlife mobility. In addition, the Review Authority may require plants and other landscaping features in locations and sizes necessary to protect the privacy of residences and buffer any adverse effects of adjoining uses.

b. The required screening shall have breaks, where necessary, to allow pedestrian access to the site. The design of the wall or screening shall also provide breaks or openings for visual surveillance of the site and security.

c. Evergreen hedges used to comply with this standard shall be a minimum of thirty-six (36) inches in height at maturity, and shall be of such species, number and spacing to provide the required screening within one (1) year after planting.

Response: As detailed in the introduction, the site does not abut residential zoning or residential uses. This standard does not apply.

2. Perimeter Landscaping Buffer

a. A minimum ten (10) foot wide landscaped strip comprised of trees, shrubs and ground cover shall be provided between off-street parking, loading, or vehicular use areas on separate, abutting, or adjacent properties.

Response: As shown on Attachment 6 (Sheets L2.1, L2.2, and L1.0), a perimeter landscape buffer is provided along SW Tualatin-Sherwood Road, SW 124th Avenue, and along shared property lines along the west and south boundaries of the site. This buffer is at least 10 feet wide and increases to 15 feet in width along SW Tualatin-Sherwood Road and SW 124th Avenue to comply with the applicable Visual Corridor standards. This standard is met.

b. The access drives to a rear lots in the residential zone (i.e. flag lot) shall be separated from abutting property(ies) by a minimum of forty-two-inch sight-obscuring fence or a forty-two-inch to an eight (8) feet high landscape hedge within a four-foot wide landscape buffer. Alternatively, where existing mature trees and vegetation are suitable, Review Authority may waive the fence/buffer in order to preserve the mature vegetation.

Response: This site is zoned EI; thus, this standard is not applicable.

3. Perimeter Landscape Buffer Reduction

If the separate, abutting property to the proposed development contains an existing perimeter landscape buffer of at least five (5) feet in width, the applicant may reduce the proposed site's required perimeter landscaping up to five (5) feet maximum, if the development is not adjacent to a residential zone. For example, if the separate abutting perimeter landscaping is five (5) feet, then applicant may reduce the perimeter landscaping to five (5) feet in width on their site so there is at least five (5) feet of landscaping on each lot.

Response: No reductions to the perimeter landscape buffer width of 10 feet are proposed through this application. This standard does not apply.

B. Parking Area Landscaping

1. Purpose

The standard is a landscape treatment that uses a combination of trees, shrubs, and ground cover to provide shade, storm water management, aesthetic benefits, and *screening to soften the impacts of large expanses of pavement and vehicle movement. It is applied to landscaped areas within and around the parking lot and loading areas.*

2. *Definitions*

   a. *Parking Area Landscaping: Any landscaped area on the site that is not required as perimeter landscaping § 16.92.030 (Site Landscaping and Screening).*

   b. *Canopy Factor*

      (1) *Landscape trees are assigned a canopy factor to determine the specific number of required trees to be planted. The canopy factor is calculated based on the following formula:*
      Canopy Factor = Mature Height (in feet) × Canopy Spread (in feet) × Growth Rate Factor × .01

      (2) *Growth Rate Factor: The growth rate factor is three (3) for fast-growing trees, two (2) for medium growing trees, and one (1) for slow growing trees. The growth rate of a tree is identified in the "Suggested Plant Lists for Required Landscaping Manual."*

Response: The submitted landscaping plans provide detailed information and calculations on the classification of proposed landscaping trees as either "small," "medium," or "large" canopy trees, which are based on the methods described above. This standard is met.

3. *Required Landscaping*
   There shall be at least forty-five (45) square feet parking area landscaping for each parking space located on the site. The amount of required plant materials are based on the number of spaces as identified below.

Response: For the 671 parking spaces that are proposed, a total of 30,195 SF (0.69 acres) of parking area landscaping is required. After excluding the required parking lot perimeter screening (0.7 acres), the site (excluding tracts) has over 4.5 acres of parking area landscaping, using the definition in subsection 2.a, above. This standard is met.

4. *Amount and Type of Required Parking Area Landscaping*

   a. *Number of Trees required based on Canopy Factor*
   Small trees have a canopy factor of less than forty (40), medium trees have a canopy factor from forty (40) to ninety (90), and large trees have a canopy factor greater than ninety (90);

      (1) *Any combination of the following is required:*
         (i) *One (1) large tree is required per four (4) parking spaces;*
         (ii) *One (1) medium tree is required per three (3) parking spaces; or*
         (iii) *One (1) small tree is required per two (2) parking spaces.*
         (iv) *At least five (5) percent of the required trees must be evergreen.*

      (2) *Street trees may be included in the calculation for the number of required trees in the parking area.*

   Response: As shown on Attachment 6 (Sheet L0.02), 0 "large" trees, 170 "medium" trees, and 332 "small" trees are proposed for installation. The ratios cited above would permit a maximum of 1,174 parking spaces based on the number of "large," "medium," and "small" trees proposed for installation. As only 671 parking spaces are provided on site, this standard is met.

   b. *Shrubs:*

      (1) *Two (2) shrubs are required per each space.*

Response: Given 671 proposed parking spaces, the landscaping plans are required to include at least 1,342 shrubs. The landscape plans in Attachment 6 illustrate the areas where shrubs are proposed to satisfy this provision, as will be verified at the time of construction permits. This standard is met.

(2) For spaces where the front two (2) feet of parking spaces have been landscaped instead of paved, the standard requires one (1) shrub per space. Shrubs may be evergreen or deciduous.

Response: The front two feet of parking spaces are proposed to be paved. This standard does not apply.

c. Ground cover plants:

(1) Any remainder in the parking area must be planted with ground cover plants.

(2) The plants selected must be spaced to cover the area within three (3) years. Mulch does not count as ground cover.

Response: Groundcover plants and turf are proposed as the balance of landscaping not otherwise accounted for by shrubs and trees (Attachment 6). The proposed density and spacing is anticipated to achieve full coverage within three years of installation. This standard is met.

5. Individual Landscape Islands Requirements

a. Individual landscaped areas (islands) shall be at least ninety (90) square feet in area and a minimum width of five (5) feet and shall be curbed to protect the landscaping.

b. Each landscape island shall be planted with at least one (1) tree.

c. Landscape islands shall be evenly spaced throughout the parking area.

Response: Each of the landscaping islands proposed within the parking area is at least eight feet wide and at least 140 SF in area. All islands are sufficiently dimensioned to support at least one tree, and are relatively evenly distributed throughout the parking area. These standards are met.

d. Landscape islands shall be distributed according to the following:

(1) Residential uses in a residential zone: one (1) island for every eight (8) contiguous parking spaces.

Response: The site is zoned EI, which is not a residential zone. This standard is not applicable.

(2) Multi or mixed-uses, institutional and commercial uses: one (1) island for every ten (10) contiguous parking spaces.

Response: The proposed industrial use is not multi or mixed-use, institutional, or commercial. This standard is not applicable.

(3) Industrial uses: one (1) island for every twelve (12) contiguous parking spaces.

Response: As discussed in section 16.94.020 - Off-Street Parking Standards and illustrated in the site plan C3.0 (Attachment 6), the new parking rows will generally have an island once every 8 - 9 cars. This standard is met.

e. *Storm water bio-swales may be used in lieu of the parking landscape areas and may be included in the calculation of the required landscaping amount.*

Response: Three stormwater bio-swales (extended dry basins) are proposed as part of the project. The accumulated area of all three bioswales has not been included within the parking landscape area calculations as sufficient parking area landscaping is provided without counting the stormwater facilities. This standard does not apply.

f. *Exception to Landscape Requirement*

Linear raised or marked sidewalks and walkways within the parking areas connecting the parking spaces to the on-site buildings may be included in the calculation of required site landscaping provide that it:

(1) Trees are spaced a maximum of thirty (30) feet on at least one (1) side of the sidewalk.

(2) The minimum unobstructed sidewalk width is at least six (6) feet wide.

(3) The sidewalk is separated from the parking areas by curbs, bollards, or other means on both sides.

Response: The landscaping exception described in the criterion cited above is not proposed as part of the subject project. This standard is not applicable.

6. *Landscaping at Points of Access*

When a private access-way intersects a public right-of-way or when a property abuts the intersection of two (2) or more public rights-of-way, landscaping shall be planted and maintained so that minimum sight distances shall be preserved pursuant to Section 16.58.010.

Response: Landscaping at the proposed cul-de-sac, SW Cipole Place, and corner of SW Tualatin-Sherwood Road and SW 124th Avenue have been selected to maintain minimum sight distances, as required by Section 16.58.010. This standard is met.

7. *Exceptions*

a. *For properties with an environmentally sensitive area and/or trees or woodlands that merit protection per Chapters 16.142 (Parks, Trees and Open Space) and 16.144 (Wetland, Habitat and Natural Areas) the landscaping standards may be reduced, modified or "shifted" on-site where necessary in order to retain existing vegetation that would otherwise be removed to meet the above referenced landscaping requirements.*

b. *The maximum reduction in required landscaping buffer permitted through this exception process shall be no more than fifty (50) percent. The resulting landscaping buffer after reduction may not be less than five (5) feet in width unless otherwise permitted by the underlying zone. Exceptions to the required landscaping may only be permitted when reviewed as part of a land use action application and do not require a separate variance permit.*

Response: As shown on Sheets C7.0-C7.6 in Attachment 6, many of the existing trees within the site cannot be retained due to the proposed placement of building footprints and vehicle parking and circulation areas. The available point of access will solely be from SW Cipole Place. The proposed cul-de-sac will dictate the location of these improvements and leave little to no flexibility for tree retention. As such, the applicant is not seeking the option of relief from the landscaping standards cited above. This standard does not apply.

C. *Screening of Mechanical Equipment, Outdoor Storage, Service and Delivery Areas*

All mechanical equipment, outdoor storage and manufacturing, and service and delivery areas, shall be screened from view from all public streets and any adjacent residential zones. If unfeasible to fully screen due to policies and standards, the applicant shall make efforts to minimize the visual impact of the mechanical equipment.

Response: All new service and delivery areas will be screened from view from all public streets, and there are no adjacent residential zones. Trash enclosures are proposed in five areas of the site to satisfy refuse disposal needs of the future warehousing and light industrial needs. These enclosures will be screened by enclosures constructed with concrete walls and operable gates. Except for rooftop mechanical units, which will be screened by building parapets, no other mechanical equipment or outdoor storage is proposed at this time. However, the site use is speculative in nature and future tenants may require these features for their operations. The applicable approval process will be pursued if required to meet tenant needs. This standard is met.

D. *Visual Corridors*

Except as allowed by subsection 6. above, new developments shall be required to establish landscaped visual corridors along Highway 99W and other arterial and collector streets, consistent with the Natural Resources and Recreation Plan Map, Appendix C of the Community Development Plan, Part II, and the provisions of Chapter 16.142 (Parks, Trees, and Open Space). Properties within the Old Town Overlay are exempt from this standard.

Response: The proposed landscaping plans have been designed to provide approximately 15-foot-wide Visual Corridors along SW Tualatin-Sherwood Road and SW 124th Avenue. The responses to Chapter 16.142 address the approval standards within that chapter. This standard is met.

16.92.040 - Installation and Maintenance Standards

A. *Installation*

All required landscaping must be in-ground, except when in raised planters that are used to meet minimum Clean Water Services storm water management requirements. Plant materials must be installed to current nursery industry standards. Plant materials must be properly supported to ensure survival. Support devices such as guy wires or stakes must not interfere with vehicular or pedestrian movement.

B. *Maintenance and Mitigation of Landscaped Areas*

1. *Maintenance of existing non-invasive native vegetation is encouraged within a development and required for portions of the property not being developed.*
2. *All landscaping shall be maintained in a manner consistent with the intent of the approved landscaping plan.*
3. *Any required landscaping trees removed must be replanted consistent with the approved landscaping plan and comply with § 16.142, (Parks, Trees and Open Space).*

Response: The proposed landscaping plans have been designed to ensure compliance with the standards cited above. Ongoing maintenance of installed landscaping will be the responsibility of the property owner(s), as required by these standards.

C. *Irrigation*

The intent of this standard is to ensure that plants will survive the critical establishment period when they are most vulnerable due to lack of watering. All landscaped areas must provide an irrigation system, as stated in Option 1, 2, or 3.

1. *Option 1: A permanent built-in irrigation system with an automatic controller installed.*
2. *Option 2: An irrigation system designed and certified by a licensed landscape architect or other qualified professional as part of the landscape plan, which provides sufficient water*

to ensure that the plants become established. The system does not have to be permanent if the plants chosen can survive independently once established.

3. *Option 3: Irrigation by hand. If the applicant chooses this option, an inspection will be required one (1) year after final inspection to ensure that the landscaping has become established.*

Response: As noted on Attachment 6 Sheet L0.01, permanent irrigation is proposed for this project. This standard is met.

D. Deferral of Improvements
Landscaping shall be installed prior to issuance of occupancy permits, unless security equal to one hundred twenty-five (125) percent of the cost of the landscaping is filed with the City. "Security" may consist of a performance bond payable to the City, cash, certified check, or other assurance of completion approved by the City. If the installation of the landscaping is not completed within one (1) year, the security may be used by the City to complete the installation.

Response: If landscaping is not installed prior to occupancy permits, the applicant will provide the appropriate guarantees as required by the City. This standard is met.

Chapter 16.94 - Off-Street Parking and Loading

16.94.010 - General Requirements

A. Off-Street Parking Required
No site shall be used for the parking of vehicles until plans are approved providing for off-street parking and loading space as required by this Code. Any change in uses or structures that reduces the current off-street parking and loading spaces provided on site, or that increases the need for off-street parking or loading requirements shall be unlawful and a violation of this Code, unless additional off-street parking or loading areas are provided in accordance with Section 16.94.020, or unless a variance from the minimum or maximum parking standards is approved in accordance with Chapter 16.84 Variances.

Response: The project site is presently undeveloped except for unimproved off-street parking associated with the former single-family dwelling and associated agricultural outbuildings which have now been demolished. As discussed in the findings below and attached site and parking plans in Attachment 6, the proposed project will provide off-street parking as required to meet market demand for industrial parks in the Tualatin-Sherwood Road corridor.

B. Deferral of Improvements
Off-street parking and loading spaces shall be completed prior to the issuance of occupancy permits, unless the City determines that weather conditions, lack of available surfacing materials, or other circumstances beyond the control of the applicant make completion impossible. In such circumstances, security equal to one hundred twenty five (125) percent of the cost of the parking and loading area is provided the City. "Security" may consist of a performance bond payable to the City, cash, certified check, or other assurance of completion approved by the City. If the installation of the parking or loading area is not completed within one (1) year, the security may be used by the City to complete the installation.

Response: No deferral of improvements is anticipated at this time. Off-street parking and loading spaces are proposed for completion prior to issuance of occupancy permits. Should future circumstances necessitate a deferral, the required security will be provided. This standard is met.

C. Options for Reducing the Required Parking Spaces

1. Two (2) or more uses or, structures on multiple parcels of land may utilize jointly the same parking and loading spaces when the peak hours of operation do not substantially overlap, provided that satisfactory evidence is presented to the City, in the form of deeds, leases, or contracts, clearly establishing the joint use.

a. Within commercial, institutional and public, or industrial zones, shared parking may be provided on lots that are within five hundred (500) feet of the property line of the use to be served.

b. Shared parking is allowed if the application can show that the combined peak use is available by a parking study that demonstrates:

(1) There is a sufficient number of parking spaces to accommodate the requirements of the individual businesses; or

(2) That the peak hours of operation of such establishments do not overlap, and

(3) That an exclusive permanent easement over a delineated area has been granted for parking space use.

Response: Joint use of the same parking spaces is not proposed as the development as a whole has sufficient parking. This standard does not apply.

2. Mixed use projects are developments where a variety of uses occupies a development project or complex. For example, an eating establishment, professional office building and movie theater are all components of a mixed use site. It does not include a secondary use within a primary use such as an administrative office associated with a retail establishment. In mixed-use projects, the required minimum vehicle parking shall be determined using the following formula:

a. Primary use: i.e. that with the largest proportion of total floor area within the development at one hundred (100) percent of the minimum vehicle parking required for that use.

b. Secondary Use: i.e. that with the second largest percentage of total floor area within the development, at ninety (90) percent of the vehicle parking required for that use.

c. Subsequent use or uses, at eighty (80) percent of the vehicle parking required for that use.

Response: To be conservative, all parking calculations have been performed using 100% of the minimum vehicle parking standard. As the proposed project is speculative, the exact mixture of warehousing to industrial users is unknown. However, this standard will be applied at the time tenant improvements are submitted for building permit review. This standard will be met.

D. Prohibited Uses

Required parking, loading and maneuvering areas shall not be used for long-term storage or sale of vehicles or other materials, and shall not be rented, leased or assigned to any person or organization not using or occupying the building or use served.

Response: The proposed project does not include parking areas intended for long term storage or sale of vehicles or other materials. Parking shall be restricted to use by employees, visitors, deliveries, and others who are occupying or serving an allowed user. This standard is met.

E. Location

1. Residential off-street parking spaces:

a. Shall be located on the same lot or development as the residential use.

b. *Shall not include garages or enclosed buildings with the exception of a parking structure in multifamily developments where three (3) or more spaces are not individually enclosed. (Example: Underground or multi-level parking structures).*

Response: Residential uses are not proposed with this application. This standard is not applicable.

2. *For other uses, required off-street parking spaces may include adjacent on-street parking spaces, nearby public parking and shared parking located within five hundred (500) feet of the use. The distance from the parking, area to the use shall be measured from the nearest parking space to a building entrance, following a sidewalk or other pedestrian route. The right to use private off-site parking must be evidenced by a recorded deed, lease, easement, or similar written notarized letter or instrument.*

Response: City Engineering staff has informed the applicant that on-street parking will not be permitted on SW Cipole Place. Similarly, on-street parking will not be available on SW Tualatin-Sherwood Road or SW 124th Avenue. As a result, there is no opportunity to count on-street parking spaces. This standard does not apply.

3. *Vehicle parking is allowed only on improved parking shoulders that meet City standards for public streets, within garages, carports and other structures, or on driveways or parking lots that have been developed in conformance with this code. Specific locations and types of spaces (car pool, compact, etc.) for parking shall be indicated on submitted plans and located to the side or rear of buildings where feasible.*
   a. *All new development with forty (40) employees or more shall include preferential spaces for carpool/vanpool designation. Carpool and vanpool parking spaces shall be located closer to the main employee entrance than all other parking spaces with the exception of ADA parking spaces. Carpool/vanpool spaces shall be clearly marked as reserved for carpool/vanpool only.*
   b. *Existing development may redevelop portions of designated parking areas for multi-modal facilities (transit shelters, park and ride, and bicycle parking), subject to meeting all other applicable standards, including minimum space standards.*

Response: As demonstrated on Sheet C3.0 in Attachment 6, vehicle parking will occur in parking lots improved to City standards. As future employee counts are unknown, carpool and vanpool spaces are proposed to be addressed at the time of tenant improvement permits in accordance with these requirements. This standard will be met.

F. *Marking*

All parking, loading or maneuvering areas shall be clearly marked and painted. All interior drives and access aisles shall be clearly marked and signed to show the direction of flow and maintain vehicular and pedestrian safety.

Response: As demonstrated on Sheet C3.0 in Attachment 6, all on-site parking, loading and maneuvering areas will be clearly marked, painted, and signed to City standards. This standard is met.

G. *Surface and Drainage*

1. *All parking and loading areas shall be improved with a permanent hard surface such as asphalt, concrete or a durable pervious surface. Use of pervious paving material is encouraged and preferred where appropriate considering soils, location, anticipated vehicle usage and other pertinent factors.*
2. *Parking and loading areas shall include storm water drainage facilities approved by the City Engineer or Building Official.*

Response: All parking and loading areas will be improved with a permanent hard surface in compliance with stormwater requirements. This standard is met.

H. *Repairs*

Parking and loading areas shall be kept clean and in good repair. Breaks in paved surfaces shall be repaired. Broken or splintered wheel stops shall be replaced. Painted parking space boundaries and directional symbols shall be maintained in a readable condition.

Response: The proposed project site will include all new parking and loading areas that will be constructed for durability and compliance with City standards and will be maintained over the course of future occupancy. Since the parking areas are new, no maintenance of existing facilities is required. This standard is met.

I. Parking and Loading Plan

An off-street parking and loading plan, drawn to scale, shall accompany requests for building permits or site plan approvals, except for single and two-family dwellings, and manufactured homes on residential lots. The plan shall show but not be limited to:

1. *Delineation of individual parking and loading spaces and dimensions.*
2. *Circulation areas necessary to serve parking and loading spaces.*
3. *Location of accesses to streets, alleys and properties to be served, and any curb cuts.*
4. *Landscaping as required by Chapter 16.92.*
5. *Grading and drainage facilities.*
6. *Signing and bumper guard specifications.*
7. *Bicycle parking facilities as specified in Section 16.94.020.C.*
8. *Parking lots more than one (1) acre in size shall provide street-like features including curbs, sidewalks, and street trees or planting strips.*

Response: Off-street parking and loading is included on Sheet C3.0 of Attachment 6, with associated landscaping illustrated on Sheets L1.10 – L1.21. This standard is met.

J. Parking Districts

The City may establish a parking district (i.e., permits or signage) in residential areas in order to protect residential areas from spillover parking generated by adjacent commercial, employment or mixed-use areas, or other uses that generate a high demand for parking. The district request shall be made to the City Manager, who will forward a recommendation to the City Council for a decision.

Response: The project site is not located in, adjacent, or near a residential area. This standard does not apply.

K. Structured parking and on-street parking are exempt from the parking space maximums in Section 16.94.020.A.

Response: The proposed project does not include structured parking or on-street parking This standard does not apply.

16.94.020 - Off-Street Parking Standards

A. Generally

Where square feet are specified, the area measured shall be the gross building floor area primary to the functioning of the proposed use. Where employees are specified, persons counted shall be those working on the premises, including proprietors, during the largest shift at peak season. Fractional space requirements shall be counted as a whole space. The Review Authority may determine alternate off - street parking and loading requirements for a use not specifically listed in this Section based upon the requirements of comparable uses.

M.

Table 1: Minimum and Maximum Parking Standards (Excerpts)			
Land Use	**Minimum Parking Standard**	**Maximum Permitted Parking Zone A[1]**	**Maximum Permitted Parking Zone B[2]**
Industrial	1.6	None	None
Warehouse (gross sf; parking ratios apply to warehouses 150,000 gsf or greater)	0.3	0.4	0.5

Note:
[1] Parking Zone A reflects the maximum number of permitted vehicle parking spaces allowed for each listed land use. Parking Zone A areas include those parcels that are located within one-quarter (¼) mile walking distance of bus transit stops, one-half (½) mile walking distance of light rail station platforms, or both, or that have a greater than twenty-minute peak hour transit service.
[2] Parking Zone B reflects the maximum number of permitted vehicle parking spaces allowed for each listed land use. Parking Zone B areas include those parcels that are located at a distance greater than one-quarter (¼) mile walking distance of bus transit stops, one-half (½) mile walking distance of light rail station platforms, or both.

Response: The site is in Parking Zone B because it is not located within 0.25 miles walking distance for bus transit where regular 20-minute peak hour transit service is available, or within 0.5 miles walking distance for high capacity transit where 20-minute peak hour transit service is available (Attachment 10).

Per Table 1 of Section 16.94.020(A), industrial users must provide a minimum of 1.6 stalls per 1,000 SF of gross floor area, with no maximum number of spaces. This parking ratio applies to all industrial users including standalone warehouses of 149,999 SF or smaller. Table 1 also indicates that standalone warehouse uses in excess of 150,000 SF and within Parking Zone B are subject to minimum and maximum parking ratios of 0.3 and 0.5 per 1,000 SF respectively. It appears that these lower warehouse parking ratios would most appropriately be applied to the increment of floor area that exceeds 150,000 SF, given that the rate for warehouses up to 149,000 SF is 1.6 spaces per 1,000 SF.

All minimum parking ratios have been reduced by 20% per the sensitive lands reduction factor in Section 16.94.020.B.6 (Reduction in Required Parking Spaces). As discussed in findings elsewhere in this report, to preserve Wetlands A, B, and C and the CWS vegetated corridor, the applicant proposes the creation of tracts that reduce the developable area by approximately 10.9 acres or 24% of the site area. This land area is sufficient to account for the additional parking spaces that would otherwise have been required for the development.

The buildings do not have specific users at this time but are anticipated to contain a mix of light industrial, manufacturing, and warehouse/distribution tenants. To examine whether sufficient parking is available to accommodate a range of uses, parking calculations have been performed under two scenarios. To be consistent with the Conditional Use Permit request to allow Building C to be a standalone warehouse over 150,000 SF, Scenario 1 analyzes parking demand for Building C as 100% warehouse and the remaining buildings as 100% industrial. By contrast, Scenario 2analyzes parking demand assuming 100% industrial in all buildings, with no standalone warehouse 150,000 SF or larger.

SCENARIO 1 (BUILDING C AS STANDALONE WAREHOUSE) MINIMUM AND MAXIMUM PARKING REQUIREMENTS					
Use	**Building Area**	**Minimum Required Parking Stalls before sensitive lands reduction**	**Minimum Required Parking Stalls after 20% sensitive lands reduction**	**Maximum Permitted Parking Stalls (Zone B)**	**Proposed Parking Stalls**
Industrial (no standalone warehouse over 150,000 SF)	351,902 SF	563	451	N/A	490
Building C as standalone warehouse over 150,000 SF	183,292 SF	250 (240 for first 150,000 SF plus 10 for next 33,292 SF)	200 (192 for first 150,000 SF plus 8 for next 33,292 SF)	N/A (N/A for first 150,000 SF plus 16 for next 33,292 SF)	181
Total	***535,194 SF***	***814***	***651***	***N/A***	***671***

SCENARIO 2 (ALL BUILDINGS AS LIGHT INDUSTRIAL) MINIMUM AND MAXIMUM PARKING REQUIREMENTS					
Use	**Building Area**	**Minimum Required Parking Stalls before sensitive lands reduction**	**Minimum Required Parking Stalls after 20% sensitive lands reduction**	**Maximum Permitted Parking Stalls (Zone B)**	**Proposed Parking Stalls**
Industrial (no standalone warehouse over 150,000 SF)	535,194 SF	858	687	N/A	671

Under Scenario 1, a minimum of 651 parking spaces is required, while under Scenario 2, a minimum of 687 parking spaces is required. As illustrated on Sheets C3.0 and A0.10 in Attachment 6, the development will provide a total of 671 on-site parking spaces, and no on-street parking is available to serve the development. In Scenario 1, sufficient parking is available to serve a mix of industrial uses that includes a standalone warehouse and distribution use in Building C, if such a user should rent or purchase that building. In Scenario 2, the number of proposed parking spaces is approximately 2% below the nominal parking requirement for 100% industrial buildings, which certainly meets the intent of the Development Code to encourage appropriate use of land and promote orderly growth as outlined in Section 16.02.020 (particularly since gross building areas will be refined as the project moves closer to building permits). Moreover, the proposed number of parking spaces equates to a parking ratio of 1.25 spaces per 1,000 SF, which is on par with market demand for industrial properties in the area. If needed, additional parking could be added during final design.

Under both scenarios, there is no applicable maximum number of parking spaces since industrial uses have no maximum ratio per Table 1, and under Scenario 1, the maximum of 16 spaces for the increment of Building C that exceeds 150,000 SF does not in itself subject the use to a maximum. This standard is met.

B. Dimensional and General Configuration Standards

1. Dimensions For the purpose of this Chapter, a "parking space" means a stall nine (9) feet in width and twenty (20) feet in length. Up to twenty five (25) percent of required parking spaces may have a minimum dimension of eight (8) feet in width and eighteen (18) feet in length so long as they are signed as compact car stalls.

Response: As demonstrated on Sheet(s) C3.0 and A0.10 of Attachment 6, all proposed parking spaces meet minimum stall dimensions for standard parking; no compact parking is proposed. This standard is met.

2. Layout

Parking space configuration, stall and access aisle size shall be of sufficient width for all vehicle turning and maneuvering. Groups of more than four (4) parking spaces shall be served by a driveway so as to minimize backing movements or other maneuvering within a street, other than an alley. All parking areas shall meet the minimum standards shown in the following table and diagram.

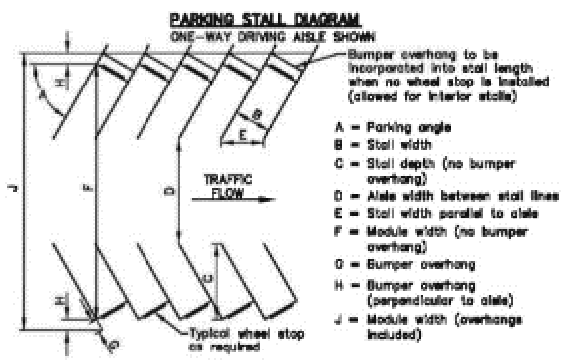


Table 3 – Two-way Driving Aisle (Dimensions in Feet)								
A	***B***	***C***	***D***	***E***	***F***	***G***	***H***	***I***
45˚	*8.0*	*16.5*	*24.0*	*11.3*	*57.0*	*3.0*	*2.5*	*62.0*
	9.0	*18.5*	*24.0*	*12.7*	*61.0*	*3.0*	*2.5*	*66.0*
60˚	*8.0*	*17.0*	*24.0*	*9.2*	*58.0*	*3.0*	*2.5*	*63.0*
	9.0	*19.5*	*24.0*	*10.4*	*63.0*	*3.0*	*2.5*	*68.0*
75˚	*8.0*	*16.5*	*26.0*	*8.3*	*59.0*	*3.0*	*3.0*	*65.0*
	9.0	*19.0*	*24.0*	*9.3*	*62.0*	*3.0*	*3.0*	*68.0*
90˚	*8.0*	*18.0*	*26.0*	*8.0*	*56.0*	*3.0*	*3.0*	*62.0*
	9.0	*20.0*	*24.0*	*9.0*	*58.0*	*3.0*	*3.0*	*64.0*

Response: As demonstrated on Sheet(s) C3.0 and A0.10-A0.12 of Attachment 6, all stall and access aisles will be of sufficient width for all vehicle turning and maneuvering in compliance with the standards for two-way drive aisles. No parking spaces will require backing or other maneuvering within a public street. This standard is met.

3. Wheel Stops

a. Parking spaces along the boundaries of a parking lot or adjacent to interior landscaped areas or sidewalks shall be provided with a wheel stop at least four (4) inches high, located three (3) feet back from the front of the parking stall as shown in the above diagram.

b. Wheel stops adjacent to landscaping, bio-swales or water quality facilities shall be designed to allow storm water runoff.

c. The paved portion of the parking stall length may be reduced by three (3) feet if replaced with three (3) feet of low lying landscape or hardscape in lieu of a wheel stop; however, a curb is still required. In other words, the traditional three-foot vehicle overhang from a wheel stop may be low-lying landscaping rather than an impervious surface.

Response: The applicant proposes to provide vertical curb at each parking stall to prevent vehicles from traveling beyond the boundary of the parking areas. All stormwater from the development will be collected and directed to engineered extended dry basins for stormwater quality treatment. This standard is met.

4. Service Drives

Service drives shall be clearly and permanently marked and defined through use of rails, fences, walls, or other barriers or markers, and shall have minimum vision clearance area formed by the intersection of the driveway center line, the street right-of-way line, and a straight line joining said lines through points fifteen (15) feet from their intersection.

Response: No service drives are proposed for this project. This standard does not apply.

5. Credit for On-Street Parking

a. On-Street Parking Credit. The amount of off-street parking required shall be reduced by one (1) off-street parking space for every on-street parking space adjacent to the development. On-street parking shall follow the established configuration of existing on-street parking, except that angled parking may be allowed for some streets, where permitted by City standards.

b. The following constitutes an on-street parking space:

(1) Parallel parking, each twenty-four (24) feet of uninterrupted curb;
(2) Forty-five (45)/sixty (60) degree diagonal, each with ten (10) feet of curb;
(3) Ninety (90) degree (perpendicular) parking, each with eight (8) feet of curb;
(4) Curb space must be connected to the lot which contains the use;
(5) Parking spaces that would not obstruct a required clear vision area, nor any other parking that violates any law or street standard; and;
(6) On-street parking spaces credited for a specific use may not be used exclusively by that use, but shall be available for general public use at all times. No signs or actions limiting general public use of on-street spaces is permitted.

Response: City Engineering staff has informed the applicant that on-street parking will not be permitted on SW Cipole Place. Similarly, on-street parking will not be available on SW Tualatin-Sherwood Road or SW 124th Avenue. This standard does not apply.

6. Reduction in Required Parking Spaces
Developments utilizing Engineered storm water bio-swales or those adjacent to environmentally constrained or sensitive areas may reduce the amount of required parking spaces by ten (10) percent when twenty-five (25) through forty-nine (49) parking spaces are required, fifteen (15) percent when fifty (50) and seventy-four (74) parking spaces are required and twenty (20) percent when more than seventy-five (75) parking spaces are required, provided the area that would have been used for parking is maintained as a habitat area or is generally adjacent to an environmentally sensitive or constrained area.

Response: As demonstrated on Sheets C5.0 in Attachment 6, the project site contains five tracts to mitigate environmental impacts on site. Two tracts are for wetland preservation and three tracts are for stormwater management facilities (bioswales or extended dry basins). The site and location of these wetlands constrains the site layout and removes a significant amount of land that could otherwise be used for parking. As all five buildings would be required to provide at least 75 parking stalls, all five buildings qualify for the 20% reduction. This standard is met.

7. Parking Location and Shared Parking
Owners of off-street parking facilities may post a sign indicating that all parking on the site is available only for residents, customers and/or employees, as applicable.

Response: This standard is optional, provides permissive direction, and is noted as a future option by the owner and/or tenants of the project site.

C. Bicycle Parking Facilities
1. General Provisions
a. Applicability. Bicycle parking spaces shall be provided for new development, changes of use, and major renovations, defined as construction valued at twenty-five (25) percent or more of the assessed value of the existing structure.
b. Types of Spaces. Bicycle parking facilities shall be provided in terms of short-term bicycle parking and long-term bicycle parking. Short-term bicycle parking is intended to encourage customers and other visitors to use bicycles by providing a convenient and readily accessible place to park bicycles. Long-term bicycle parking provides employees, students, residents, commuters, and others who generally stay at a site for at least several hours a weather-protected place to park bicycles.

c. *Minimum Number of Spaces. The required total minimum number of bicycle parking spaces for each use category is shown in Table 4, Minimum Required Bicycle Parking Spaces.*

d. *Minimum Number of Long-term Spaces. If a development is required to provide eight (8) or more required bicycle parking spaces in Table 4, at least twenty-five (25) percent shall be provided as long-term bicycle with a minimum of one (1) long-term bicycle parking space.*

e. *Multiple Uses. When there are two or more primary uses on a site, the required bicycle parking for the site is the sum of the required bicycle parking for the individual primary uses.*

Response: Per Table 4 of 16.94.020(C), industrial users are required to provide a minimum of 2 bicycle parking spaces, or 1 per 40 parking spaces, whichever is greater. The following table summarizes the required and provided bicycle parking.

Minimum Bicycle Parking Requirements				
Lot & Building	**Proposed Vehicle Parking Stalls**	**Minimum Required Bicycle Spaces**	**Minimum Required Long-term Bicycle Spaces**	**Proposed Bicycle Parking Spaces**
Lot 1 / Building A	152	4	0	4
Lot 2 / Building B	124	4	0	4
Lot 3 / Building C	181	5	0	6
Lot 4 / Building D	127	4	0	4
Lot 5 / Building E	87	3	0	4
Total	**671**	**20**	**0**	**22**

As summarized in the table, the project will provide sufficient bicycle parking as required per Table 4. This standard is met.

2. *Location and Design.*

a. *General Provisions*

(1) *Each space must be at least two (2) feet by six (6) feet in area, be accessible without moving another bicycle, and provide enough space between the rack and any obstructions to use the space properly.*

(2) *There must be an aisle at least five (5) feet wide behind all required bicycle parking to allow room for bicycle maneuvering. Where the bicycle parking is adjacent to a sidewalk, the maneuvering area may extend into the right-of-way.*

(3) *Lighting. Bicycle parking shall be at least as well lit as vehicle parking for security.*

(4) *Reserved Areas. Areas set aside for bicycle parking shall be clearly marked and reserved for bicycle parking only.*

(5) *Bicycle parking in the Old Town Overlay District can be located on the sidewalk within the right-of-way. A standard inverted "U shaped" or staple design is appropriate. Alternative, creative designs are strongly encouraged.*

(6) *Hazards. Bicycle parking shall not impede or create a hazard to pedestrians. Parking areas shall be located so as to not conflict with vision clearance standards.*

Response: As illustrated on Sheets A0.11-A0.12 in Attachment 6, all required bicycle parking will be provided as interior spaces within each building to comply with the design standards above. This standard will be met.

b. Short-term Bicycle Parking

(1) *Provide lockers or racks that meet the standards of this section.*

(2) *Locate inside or outside the building within thirty (30) feet of the main entrance to the building or at least as close as the nearest vehicle parking space, whichever is closer.*

Response: As illustrated on Sheets A0.11-A0.12 in Attachment 6, all required short term bicycle parking will be provided as interior spaces within each building. This standard will be met.

c. Long-term Bicycle Parking

(1) *Provide racks, storage rooms, or lockers in areas that are secure or monitored (e.g., visible to employees or customers or monitored by security guards).*

(2) *Locate the outside bicycle parking spaces within one hundred (100) feet of the entrance that will be accessed by the intended users.*

(3) *All of the spaces shall be covered.*

Response: As summarized in the table responding to Criterion 1 above, no long-term bicycle parking spaces are required as no building requires more than 8 bicycle spaces. This standard does not apply.

d. Covered Parking (Weather Protection)

(1) *When required, covered bicycle parking shall be provided in one (1) of the following ways: inside buildings, under roof overhangs or awnings, in bicycle lockers, or within or under other structures.*

(2) *Where required covered bicycle parking is not within a building or locker, the cover must be permanent and designed to protect the bicycle from rainfall and provide seven-foot minimum overhead clearance.*

(3) *Where required bicycle parking is provided in lockers, the lockers shall be securely anchored.*

Table 4 – Minimum Required Bicycle Parking Space (Excerpt)	
Industrial Categories	***Minimum Required Spaces***
Industrial	*2 or 1 per 40 spaces, whichever is greater*

Response: As summarized in the table responding to Criterion 1 above, no long-term bicycle parking spaces are required as no building requires more than 8 bicycle spaces. Since no long-term parking is required, no covered parking is required. However, the applicant proposes to voluntarily provide bicycle parking within the buildings rather than outdoors. This standard does not apply.

16.94.030 - Off-Street Loading Standards

A. Minimum Standards

1. *A driveway designed for continuous forward flow of passenger vehicles for the purpose of loading and unloading passengers shall be located on the site of any school, or other public meeting place, which is designed to accommodate more than twenty five (25) persons at one time.*
2. *The minimum loading area for non-residential uses shall not be less than ten (10) feet in width by twenty-five (25) feet in length and shall have an unobstructed height of fourteen (14) feet.*
3. *Multiple uses on the same parcel or adjacent parcels may utilize the same loading area if it is shown in the development application that the uses will not have substantially overlapping delivery times.*
4. *The following additional minimum loading space is required for buildings in excess of twenty thousand (20,000) square feet of gross floor area:*
    a. *Twenty thousand (20,000) to fifty (50,000) sq. ft. - five hundred (500) sq. ft.*
    b. *Fifty (50,000) sq. ft. or more - seven hundred fifty (750) sq. ft.*

Response: As demonstrated on the site plan and building elevations contained in Attachment 6, the proposed project does not include a school or other public meeting place. Each proposed building contains multiple loading areas well in excess of the 10-foot-wide, 25-foot-length, and 1,000 SF minimum for buildings larger than 50,000 SF. This standard is met.

B. Separation of Areas

Any area to be used for the maneuvering of delivery vehicles and the unloading or loading of materials shall be separated from designated off-street parking areas and designed to prevent the encroachment of delivery vehicles onto off-street parking areas or public streets. Off-street parking areas used to fulfill the requirements of this Chapter shall not be used for loading and unloading operations.

Response: As demonstrated on Sheets C3.0 and A0.11-A0.12 in Attachment 6, the proposed project separates off-street parking and off-street loading areas, and no encroachment will occur on public streets. This standard is met.

C. Exceptions and Adjustments.

The review authority, through Site Plan Review, may approve loading areas within a street right-of-way in the Old Town Overlay District when all of the following conditions are met:

1. *Short in duration (i.e., less than one (1) hour);*

2. *Infrequent (less than three (3) operations occur daily between 5:00 a.m. and 12:00 a.m. or all operations occur between 12:00 a.m. and 5:00 a.m. at a location that is not adjacent to a residential zone);*
3. *Does not unreasonably obstruct traffic; [or] Does not obstruct traffic during peak traffic hours;*
4. *Does not obstruct a primary emergency response route; and5.Is acceptable to the applicable roadway authority.*

Response: The project is not within the Old Town Overlay District. This adjustment does not apply.

Chapter 16.96 - On-Site Circulation

16.96.010 - On-Site Pedestrian and Bicycle Circulation

B. Maintenance

No building permit or other City permit shall be issued until plans for ingress, egress and circulation have been approved by the City. Any change increasing any ingress, egress or circulation requirements, shall be a violation of this Code unless additional facilities are provided in accordance with this Chapter.

Response: The City of Sherwood will review, as part of issuance of site development and building permits, plans that must demonstrate compliance with standards addressing ingress, egress, and circulation. This standard is met.

C. Joint Access

Two (2) or more uses, structures, or parcels of land may utilize the same ingress and egress when the combined ingress and egress of all uses, structures, or parcels of land satisfied the other requirements of this Code, provided that satisfactory legal evidence is presented to the City in the form of deeds, easements, leases, or contracts to clearly establish the joint use.

Response: The applicant proposes to record reciprocal access and maintenance agreements for the site that will allow unrestricted use of the parking circulation areas. Compliance with this standard can be ensured through review of materials submitted for issuance of site development and building permits. This standard is met.

D. Connection to Streets

1. *Except for joint access per this Section, all ingress and egress to a use or parcel shall connect directly to a public street, excepting alleyways with paved sidewalk.*
2. *Required private sidewalks shall extend from the ground floor entrances or the ground floor landing of stairs, ramps or elevators to the public sidewalk or curb of the public street which provides required ingress and egress.*

Response: Shared access from SW Cipole Place will enable employees, guests, and customers the ability to efficiently travel to and from the site. A network of private walkways is proposed throughout the site to enable safe and convenient pedestrian travel to each of the buildings from public sidewalks along SW Cipole Place and SW 124th Avenue. The entrance of each building is connected to a public sidewalk by an internal private walkway. This standard is met.

E. Maintenance of Required Improvements

Required ingress, egress and circulation improvements shall be kept clean and in good repair.

Response: Ongoing maintenance of ingress, egress, and circulation will be the responsibility of the property owner(s), as required by these standards.

F. Access to Major Roadways

Points of ingress or egress to and from Highway 99W and arterials designated on the Transportation Plan Map, attached as Appendix C of the Community Development Plan, Part II, shall be limited as follows:

1. *Single and two-family uses and manufactured homes on individual residential lots developed after the effective date of this Code shall not be granted permanent driveway ingress or egress from Highway 99W and arterial roadways. If alternative public access is not available at the time of development, provisions shall be made for temporary access which shall be discontinued upon the availability of alternative access.*
2. *Other private ingress or egress from Highway 99W and arterial roadways shall be minimized. Where alternatives to Highway 99W or arterials exist or are proposed, any new or altered uses developed after the effective date of this Code shall be required to use the alternative ingress and egress.*
3. *All site plans for new development submitted to the City for approval after the effective date of this Code shall show ingress and egress from existing or planned local or collector streets, consistent with the Transportation Plan Map and Section VI of the Community Development Plan.*

Response: The proposed site plan includes one point of access to SW Tualatin-Sherwood Road, forming a new south leg at the existing signalized intersection of SW Tualatin-Sherwood Road and SW Cipole Road that will enable full turn movements. An analysis of the proposed public cul-de-sac, SW Cipole Place, is presented in the Traffic Impact Analysis submitted with the application (Attachment 11). The applicant has obtained a Design Exception from Washington County to access SW Tualatin-Sherwood Road with a roadway that is not an arterial or a collector (Attachment 12). This standard is met.

G. Service Drives

Service drives shall be provided pursuant to Section 16.94.030.

Response: Service drives are discussed in the response to Section 16.94.020.B.4 (Section 16.94.030 does not have standards for service drives).

16.96.030 - Minimum Non-Residential Standards

Minimum standards for private, on-site circulation improvements in non-residential developments:

A. Driveways

2. *Industrial: Improved hard surfaced driveways are required as follows:*

Improved Hard Surface Driveway Requirements			
Parking Spaces	Required # Driveways	Minimum Width	
		One-Way Pair	Two -Way
1-249	1	15 feet	24 feet
250 and above	2	15 feet	24 feet

Response: As illustrated on Sheets C3.0 and A0.10, all five proposed buildings will have fewer than 250 parking spaces so each building is required to have at least one driveway. The proposed site layout provides access to two driveways for Buildings A through D and one driveway for Building E. This standard is met.

3. *Surface materials are encouraged to be pervious when appropriate considering soils, anticipated vehicle usage and other pertinent factors.*

Response: All proposed driveways will be hard-surfaced with concrete and asphalt but pervious paving is neither proposed nor required. This standard does not apply.

M.

B. Sidewalks and Curbs

1. A private pathway/sidewalk system extending throughout the development site shall be required to connect to existing development, to public rights-of-way with or without improvements, to parking and storage areas, and to connect all building entrances to one another. The system shall also connect to transit facilities within five hundred (500) feet of the site, future phases of development, and whenever possible to parks and open spaces.

Response: As shown on Attachment 6, a network of internal walkways is proposed to connect each of the buildings with public sidewalks fronting the site, as well as to provide connectivity between buildings within the site. A transit stop, serving TriMet bus route 97, exists adjacent to the intersection of SW Tualatin-Sherwood Road and SW Cipole Road. The development will provide a pedestrian pathway along the proposed cul-de-sac, SW Cipole Place. An additional connection from the private sidewalks to the public sidewalk network is provided to SW 124th Avenue. This standard is met.

2. Curbs shall also be required at a standard approved by the Hearing Authority. Private pathways/sidewalks shall be connected to public rights-of-way along driveways but may be allowed other than along driveways if approved by the Hearing Authority.

Response: Each of the proposed internal walkways will be vertically separated from abutting vehicular parking and circulation areas by a six-inch-tall curb, except where walkways cross through a parking area. This standard is met.

3. Private Pathway/Sidewalk Design. Private pathway surfaces shall be concrete, asphalt, brick/masonry pavers, or other pervious durable surface. Primary pathways connecting front entrances to the right of way shall be at least 6 feet wide and conform to ADA standards. Secondary pathways between buildings and within parking areas shall be a minimum of four (4) feet wide and/or conform to ADA standards. Where the system crosses a parking area, driveway or street, it shall be clearly marked with contrasting paving materials or raised crosswalk (hump). At a minimum all crosswalks shall include painted striping.

Response: Each of the proposed internal walkways will be constructed of concrete. Each of the proposed walkways, regardless of whether they provide a connection to a public sidewalk, is at least six feet wide, as shown on Attachment 6, Sheet C3.0. This standard is met.

4. Exceptions. Private pathways/sidewalks shall not be required where physical or topographic conditions make a connection impracticable, where buildings or other existing development on adjacent lands physically preclude a connection now or in the future considering the potential for redevelopment; or pathways would violate provisions of leases, restrictions or other agreements.

Response: No pathways/sidewalks are proposed southward from the cul-de-sac bulb to the future Blake Road due to the steep difference in elevation between the roadways and the fact that Blake Road has not yet been dedicated as right-of-way or constructed.

16.96.040 - On-Site Vehicle Circulation

A. Maintenance

No building permit or other City permit shall be issued until plans for ingress, egress and circulation have been approved by the City. Any change increasing any ingress, egress or circulation requirements, shall be a violation of this Code unless additional facilities are provided in accordance with this Chapter.

Response: The applicant will be required to include plans as part of materials submitted to the City of Sherwood for issuance of site development and building permits that demonstrate compliance with the standard cited above. This standard is met.

B. Joint Access [See also Chapter 16.108]
Two (2) or more uses, structures, or parcels of land are strongly encouraged to utilize jointly the same ingress and egress when the combined ingress and egress of all uses, structures, or parcels of land satisfy the other requirements of this Code, provided that satisfactory legal evidence is presented to the City in the form of deeds, easements, leases, or contracts to clearly establish the joint use. In some cases, the City may require a joint access to improve safety, vision clearance, site distance, and comply with access spacing standards for the applicable street classification.

Response: As noted above, the applicant proposes to utilize joint access for the site. Reciprocal access and maintenance agreements will be recorded for relevant portions of the site in order to ensure ongoing shared use. This standard is met.

C. Connection to Streets
1. *Except for joint access per this Section, all ingress and egress to a use or parcel shall connect directly to a public street, excepting alleyways.*
2. *Required private sidewalks shall extend from the ground floor entrances or the ground floor landing of stairs, ramps or elevators to the public sidewalk or curb of the public street which provides required ingress and egress.*

Response: As noted above, the applicant proposes to record a reciprocal access and maintenance agreement to allow unrestricted use of the shared vehicular circulation areas. Shared access from the future SW Cipole Place cul-de-sac will enable employees, guests, and customers the ability to efficiently travel to and from the site. A network of private pathways is proposed to connect the entrance of each building to a public sidewalk. This standard is met.

D. Maintenance of Required Improvements
Required ingress, egress and circulation improvements shall be kept clean and in good repair.

Response: Ongoing maintenance of ingress, egress, and circulation will be the responsibility of the property owner(s), as required by these standards.

E. Service Drives
Service drives shall be provided pursuant to Section 16.94.030.

Response: Service drives are discussed in the response to Section 16.94.020.B.4 (Section 16.94.030 does not have standards for service drives).

Chapter 16.98 - On-Site Storage

16.98.010 - Recreational Vehicles and Equipment
Recreational vehicles and equipment may be stored only within designated and improved off-street parking areas. Such areas shall meet the screening and landscaping requirements of Section 16.92.030.
Response: No recreational vehicles or equipment is anticipated within the proposed development. This standard does not apply.

16.98.020 - Solid Waste and Recycling Storage
All uses shall provide solid waste and recycling storage receptacles which are adequately sized to accommodate all solid waste generated on site. All solid waste and recycling storage areas and receptacles shall be located out of public view. Solid waste and recycling receptacles for multi-family, commercial,

industrial and institutional uses shall be screened by six (6) foot high sight-obscuring fence or masonry wall and shall be easily accessible to collection vehicles.

Response: As shown in Attachment 6 Sheets C3.0 and A0.20, the proposed waste and recycling containers will be located in separate enclosures for each building. The waste and recycling service area are located out of public view and will be screened by concrete enclosures with operable gates. No other service areas, such as outdoor storage or mechanical equipment are proposed. This standard is met.

16.98.030 - Material Storage

A. *Generally. Except as otherwise provided herein, external material storage is prohibited, except in commercial and industrial zones where storage areas are approved by the Review Authority as part of a site plan or per Section 16.98.040.*

B. *Standards. Except as per Section 16.98.040, all service, repair, storage, and merchandise display activities carried on in connection with any commercial or industrial activity, and not conducted within an enclosed building, shall be screened from the view of all adjacent properties and adjacent streets by a six (6) foot to eight (8) foot high, sight obscuring fence subject to chapter 16.58.020. In addition, unless adjacent parcels to the side and rear of the storage area have existing solid evergreen screening or sight-obscuring fencing in place, new evergreen screening no less than three (3) feet in height shall be planted along side and rear property lines. Where other provisions of this Code require evergreen screening, fencing, or a landscaped berm along side and rear property lines, the additional screening stipulated by this Section shall not be required.*

C. *Hazardous Materials. Storage of hazardous, corrosive, flammable, or explosive materials, if such storage is otherwise permitted by this Code, shall comply with all local fire codes, and Federal and State regulations.*

Response: While specific users are not known at this time, no material storage areas are proposed in conjunction with the T-S Corporate Park development. In the event future corporate park tenants or users require material storage, the necessary approval will be requested, and the provisions of this section will be met. Any hazardous materials storage will be permitted with the City and Fire District as required. This standard is met.

16.98.040 - Outdoor Sales and Merchandise Display

A. *Sales Permitted*

Outdoor sales and merchandise display activities, including sales and merchandise display that is located inside when the business is closed but otherwise located outside, shall be permitted when such activities are deemed by the Commission to be a customary and integral part of a permitted commercial or industrial use.

1. *Permanent outdoor sales and merchandise display are in use year round or in excess of four (4) months per year and require the location to be reviewed through a site plan review. They will be reviewed as conditional uses in accordance with Chapter 16.82. Permanent outdoor and merchandise display are subject to the standards outlined in subsection B, below.*
2. *Temporary outdoor sales and merchandise display are seasonal and are not displayed year round and must meet the requirements of Chapter 16.86 (temporary uses). When the temporary use is not occurring the site shall return to its original state.*
3. *Food vendors including food carts, ice cream trucks, hotdog stands or similar uses are only permitted as a permanent outdoor sale use as described in A.1 above.*

Response: No outdoor sales areas or activities are proposed as part of this development. Sales and display activities by future tenants will be subject to compliance with these requirements. This standard does not apply.

B. Standards

1. Outdoor sales and merchandise display areas shall be kept free of debris. Merchandise shall be stacked or arranged, or within a display structure. Display structures shall be secured and stable.

2. Outdoor sales and merchandise display shall not be located within required yard, building, or landscape setbacks, except where there is intervening right-of-way of a width equal to or greater than the required setback; and shall not interfere with on-site or off-site pedestrian or vehicular circulation.

3. Outdoor retail sales and merchandise display areas for vehicles, boats, manufactured homes, farm equipment, and other similar uses shall be improved with asphalt surfacing, crushed rock, or other dust-free materials.

4. Additional standards may apply to outdoor sales and merchandise display dependent on specific restrictions in the zone.

Response: No outdoor sales and merchandise display is proposed with this development. Sales and display activities by future tenants will be subject to compliance with these requirements. This standard does not apply at this time.

Chapter 16.100 - Permanent Signs

16.100.010 - Common Regulations

A. Sign Permits

1. Except as otherwise provided in this Section and in Chapter 16.102, a person may not construct, install, structurally alter or relocate any sign without first obtaining an administrative sign permit from the City as required by Chapter 16.72, including payment of the fee required by Section 16.74.010. In addition, all permitted illuminated signs are subject to the provisions of the State Electrical Code and any applicable permit fees.

Response: No signage is proposed as part of this application; all signage will be reviewed under a separate permit. This standard is met.

Division VI. - Public Infrastructure

Chapter 16.104 - General Provisions

16.104.020 - Future Improvements

The location of future public improvements including water, sanitary sewer, storm water, streets, bicycle and pedestrian paths, and other public facilities and rights-of-way, as depicted in the Transportation System Plan (TSP) Chapters 4, 5, 6 and 7 of the Community Development Plan are intended as general locations only. The precise alignment and location of a public improvement shall be established during the land use process and shall be depicted on public improvement plans submitted and approved pursuant to § 16.108 and other applicable sections of this Code.

Response: The civil plans submitted with this application (Attachment 6) depict the proposed alignment and location of public utilities and streets. This standard is met.

16.104.030 - Improvement Procedures

Except as otherwise provided, all public improvements shall conform to City standards and specifications found in the Engineering Design Manual and installed in accordance with Chapter 16.108. The Council may establish additional specifications to supplement the standards of this Code and other applicable ordinances. Except for public projects constructed consistent with an existing facility plan, a public improvements shall not be undertaken until land use approval has been granted, a public improvement

plan review fee has been paid, all improvement plans have been approved by the City, and an improvement permit has been issued.
Response: The civil plans submitted with this application (Attachment 6) depict the preliminary layout of the proposed public utilities and streets, which have been designed to be compliant with City standards. Subsequent review by the City's Engineering staff during the permit phase of the project will ensure compliance with applicable standards. This standard is met.

Chapter 16.106 - Transportation Facilities

16.106.010 - Generally
A. Creation
Public streets shall be created in accordance with provisions of this Chapter. Except as otherwise provided, all street improvements and rights-of-way shall conform to standards for the City's functional street classification, as shown on the Transportation System Plan (TSP) Map (Figure 17) and other applicable City standards. The following table depicts the guidelines for the street characteristics.

City Street Characteristic Guidelines (Excerpts)								
Type of Street	***Right of Way Width***	***Number of Lanes***	***Minimum Lane Width***	***On Street Parking Width***	***Bike Lane Width***	***Sidewalk Width***	***Landscape Strip (Exclusive of Curb)***	***Median Width***
Arterial	*60-120'*	*2-5*	*12'*	*Limited*	*6'*	*6-8'*	*5'*	*14' if required*
40' Commercial/ Industrial Not Exceeding 3000 vehicles per day	*64'*	*2*	*20'*	*8'*	*none*	*6'*	*5'*	*none*

Response: The site abuts SW Tualatin-Sherwood Road and SW 124th Avenue, both of which are classified as five-lane arterial roadways under Washington County jurisdiction. As illustrated on Sheets C3.1-C3.6, the applicant proposes to dedicate additional right-of-way along the south side of Tualatin-Sherwood Road as Washington County has a funded project to improve this section of SW Tualatin-Sherwood Road beginning in 2021, the applicant does not propose to improve the project frontage. The applicant proposes to dedicate right-of-way and improve the west side of SW 124th Avenue to arterial standards (Attachment 6, Sheet C3.2) per Washington County standards. As discussed in the Traffic Impact Analysis (Attachment 11), the project is anticipated to generate approximately 1,844 vehicle trips per day. As a result, the proposed cul-de-sac (SW Cipole Place) is proposed to have a 64-foot right of way with a 40-foot paved section with two paved lanes (see Attachment 6, Sheet C3.3). These improvements have been designed consistent with the functional classification of each street that is stipulated in the City of Sherwood Transportation System Plan. This standard is met.

B. Street Naming
1. All streets created by subdivision or partition will be named prior to submission of the final plat.
2. Any street created by a public dedication shall be named prior to or upon acceptance of the deed of dedication.

3. *An action to name an unnamed street in the City may be initiated by the Council or by a person filing a petition as described in this Section.*
4. *All streets named shall conform to the general requirements as outlined in this Section.*
5. *At the request of the owner(s), the City may approve a private street name and address. Private streets are subject to the same street name standards as are public streets. All private street signs will be provided at the owner(s) expense.*

Response: The applicant proposes the name Cipole Place for the new cul-de-sac aligned with Cipole Road, consistent with the naming convention identified in criterion C below. This name will be specified on the final plat following review and approval by the City. This standard is met.

C. Street Name Standards

1. *All streets named or renamed shall comply with the following criteria:*
   - a. *Major streets and highways shall maintain a common name or number for the entire alignment.*
   - b. *Whenever practicable, names as specified in this Section shall be utilized or retained.*
   - c. *Hyphenated or exceptionally long names shall be avoided.*
   - d. *Similar names such as Farview and Fairview or Salzman and Saltzman shall be avoided.*
   - e. *Consideration shall be given to the continuation of the name of a street in another jurisdiction when it is extended into the City.*
2. *The following classifications (suffixes) shall be utilized in the assignment of all street names:*
   - a. *Boulevards: North/south arterials providing through traffic movement across the community.*
   - b. *Roads: East/west arterials providing through traffic movement across the community.*
   - c. *Avenues: Continuous, north/south collectors or extensions thereof.*
   - d. *Streets: Continuous, east-west collectors or extensions thereof.*
   - e. *Drives: Curvilinear collectors (less than 180 degrees) at least 1,000 feet in length or more.*
   - f. *Lanes: Short east/west local streets under 1,000 feet in length.*
   - g. *Terraces: short north/south local streets under 1,000 feet in length.*
   - h. *Court: All east/west cul-de-sacs.*
   - i. *Place: All north/south cul-de-sacs.*
   - j. *Ways: All looped local streets (exceeding 180 degrees).*
   - k. *Parkway: A broad landscaped collector or arterial.*
3. *Except as provided for by this section, no street shall be given a name that is the same as, similar to, or pronounced the same as any other street in the City unless that street is an extension of an already-named street.*
4. *All proposed street names shall be approved, prior to use, by the City.*

Response: Per the preliminary subdivision plan and site plan (Attachment 6 Sheet C8.0) the proposed cul-de-sac will be named SW Cipole Place as it extends southward from existing SW Cipole Road to the north of the site. This standard is met.

D. Preferred Street Names

Whenever practicable, historical names will be considered in the naming or renaming of public roads. Historical factors to be considered shall include, but not be limited to the following:

1. *Original holders of Donation Land Claims in Sherwood.*

2. *Early homesteaders or settlers of Sherwood.*
3. *Heirs of original settlers or long-time (50 or more years) residents of Sherwood.*
4. *Explorers of or having to do with Sherwood.*
5. *Indian tribes of Washington County.*
6. *Early leaders and pioneers of eminence.*
7. *Names related to Sherwood's flora and fauna.*
8. *Names associated with the Robin Hood legend.*

Response: The proposed cul-de-sac will be named SW Cipole Place as the southward extension of existing SW Cipole Road to the north of the site. No new names are proposed. This standard does not apply.

16.106.020 - Required Improvements

A. Generally

Except as otherwise provided, all developments containing or abutting an existing or proposed street, that is either unimproved or substandard in right-of-way width or improvement, shall dedicate the necessary right-of-way prior to the issuance of building permits and/or complete acceptable improvements prior to issuance of occupancy permits. Right-of-way requirements are based on functional classification of the street network as established in the Transportation System Plan, Figure 17.

Response: As illustrated on Sheet C3.1-C3.6, the applicant proposes to dedicate additional right-of-way along the south side of Tualatin-Sherwood Road to meet the required arterial standard of a minimum 102-foot right-of-way (51 feet from centerline) for SW Tualatin-Sherwood Road. As Washington County has a funded project to improve Tualatin-Sherwood Road beginning in 2021, the applicant does not propose to improve the project frontage. The applicant proposes to dedicate right-of-way along the west side of 124th Avenue to meet the required arterial standard of a minimum 98-foot right-of-way (49 feet from centerline) for SW 124th Avenue, and to widen the street and add public sidewalk. The applicant proposes to dedicate 64 feet of right-of-way and improve Cipole Place to local street standards for industrial development. These widths fully comply with the street standards identified in the Transportation System Plan. No dedication or improvements are proposed along Blake Road south of the site since the alignment of Blake Road is entirely within the parcel to the south (Parcel 2 of Partition Plat 2019-029). This standard is met.

B. Existing Streets

Except as otherwise provided, when a development abuts an existing street, the improvements requirement shall apply to that portion of the street right-of-way located between the centerline of the right-of-way and the property line of the lot proposed for development. In no event shall a required street improvement for an existing street exceed a pavement width of thirty (30) feet.

Response: The applicant proposes to dedicate but not improve the south side of Tualatin-Sherwood Road since Washington County has a funded project to improve this section of Tualatin-Sherwood Road beginning in 2021. The applicant proposes to widen 124th Avenue and add public sidewalk. This standard is met.

C. Proposed Streets

1. *Except as otherwise provided, when a development includes or abuts a proposed street, in no event shall the required street improvement exceed a pavement width of forty (40) feet.*
2. *Half Streets: When a half street is created, a minimum of 22 feet of driving surface shall be provided by the developer.*

Response: As illustrated on Sheet C3.3, the applicant proposes to dedicate and improve the full width of the Cipole Place roadway, including the cul-de-sac bulb. This standard is met.

D. *Extent of Improvements*

1. *Streets required pursuant to this Chapter shall be dedicated and improved consistent with Chapter 6 of the Community Development Plan, the TSP and applicable City specifications included in the City of Sherwood Construction Standards. Streets shall include curbs, sidewalks, catch basins, street lights, and street trees. Improvements shall also include any bikeways designated on the Transportation System Plan map. Applicant may be required to dedicate land for required public improvements only when the exaction is directly related to and roughly proportional to the impact of the development, pursuant to Section 16.106.090.*

Response: As described above, the applicant proposes to dedicate right-of-way along SW Tualatin-Sherwood Road and SW 124th Avenue to arterial standards per the Transportation System Plan Figure 11 (Motor Vehicle Projects). The applicant does not propose to improve Tualatin-Sherwood Road since Washington County is scheduled to improve the road beginning in 2021. The applicant proposes to improve SW 124th Avenue by widening the roadway to accommodate a bike lane (per TSP Figure 13) and adding a public sidewalk to the west side. These improvements have been designed in accordance with the standards referenced above and will be eligible for System Development Charge credits consistent with City of Sherwood provisions and eligible for Washington County Transportation Development Tax credit consistent with County provisions. This standard is met.

2. *If the applicant is required to provide street improvements, the City Engineer may accept a future improvements guarantee in lieu of street improvements if one or more of the following conditions exist, as determined by the City:*
    a. *A partial improvement is not feasible due to the inability to achieve proper design standards;*
    b. *A partial improvement may create a potential safety hazard to motorists or pedestrians.*
    c. *Due to the nature of existing development on adjacent properties it is unlikely that street improvements would be extended in the foreseeable future and the improvement associated with the project under review does not, by itself, provide a significant improvement to street safety or capacity;*
    d. *The improvement would be in conflict with an adopted capital improvement plan;*
    e. *The improvement is associated with an approved land partition on property zoned residential use and the proposed land partition does not create any new streets; or*
    f. *Additional planning work is required to define the appropriate design standards for the street and the application is for a project that would contribute only a minor portion of the anticipated future traffic on the street.*

Response: Washington County is scheduled to improve SW Tualatin-Sherwood Road. The applicant has not requested to defer required improvements along SW 124th Avenue or SW Cipole Place. This standard does not apply.

E. *Transportation Facilities Modifications*

1. *A modification to a standard contained within this Chapter and Section 16.58.010 and the standard cross sections contained in Chapter 8 of the adopted TSP may be granted in accordance with the procedures and criteria set out in this section.*
2. *A modification request concerns a deviation from the general design standards for public facilities, in this Chapter, Section 16.58.010, or Chapter 8 in the adopted Transportation System Plan. The standards that may be modified include but are not limited to:*

a. Reduced sight distances.
b. Vertical alignment.
c. Horizontal alignment.
d. Geometric design (length, width, bulb radius, etc.).
e. Design speed.
f. Crossroads.
g. Access policy.
h. A proposed alternative design which provides a plan superior to these standards.
i. Low impact development.
j. Access Management Plans

3. Modification Procedure

a. A modification shall be proposed with the application for land use approval.

b. A modification is processed as a Type II application. Modification requests shall be processed in conjunction with the underlying development proposal.

c. When a modification is requested to provide a green street element that is not included in the Engineering Design Manual, the modification process will apply, but the modification fee will be waived.

4. Criteria for Modification: Modifications may be granted when criterion 4a and any one of criteria 4b through 4e are met:

a. Consideration shall be given to public safety, durability, cost of maintenance, function, appearance, and other appropriate factors to advance the goals of the adopted Sherwood Comprehensive Plan and Transportation System Plan as a whole. Any modification shall be the minimum necessary to alleviate the hardship or disproportional impact.

b. Topography, right-of-way, existing construction or physical conditions, or other geographic conditions impose an unusual hardship on the applicant, and an equivalent alternative which can accomplish the same design purpose is available.

c. A minor change to a specification or standard is required to address a specific design or construction problem which, if not enacted, will result in an unusual hardship. Self- imposed hardships shall not be used as a reason to grant a modification request.

d. An alternative design is proposed which will provide a plan equal to or superior to the existing street standards.

e. Application of the standards of this chapter to the development would be grossly disproportional to the impacts created.

Response: The applicant has not requested a transportation facility modification (see separate variance request for Cipole Place). This standard does not apply.

16.106.030 - Location

A. Generally

The location, width and grade of streets shall be considered in their relation to existing and planned streets, topographical conditions, and proposed land uses. The proposed street system shall provide adequate, convenient and safe traffic and pedestrian circulation, and intersection angles, grades, tangents, and curves shall be adequate for expected traffic volumes. Street alignments shall be consistent with solar access requirements as per Chapter 16.156, and topographical considerations.

Response: Proposed street improvements along the site boundaries will supplement existing streets in order to conform to the corresponding arterial functional classification, as specified in the City of Sherwood Transportation System Plan. Washington County's design of the Tualatin-Sherwood Road improvements and the applicant's design of the SW 124th Avenue improvements will comply with the criterion cited above to the extent that the corresponding standards achieve the stated characteristics listed above. The proposed site access (SW Cipole Place) has been proposed at a location with an existing traffic signal to minimize access points on Tualatin-Sherwood Road, and the cul-de-sac width has been designed to local commercial/industrial street standards. This standard is met.

B. Street Connectivity and Future Street Systems

1. Future Street Systems. The arrangement of public streets shall provide for the continuation and establishment of future street systems as shown on the Local Street Connectivity Map contained in the adopted Transportation System Plan (Figure 16).

Response: The Local Street Connectivity Map (Figure 18 of the Transportation System Plan) does not show the extension of any new local streets through the site. Rather, this diagram depicts an arrow for a conceptual street connection, which the *TEA Implementation Plan* describes by noting that "…we are assuming an internal drive will be located here instead" of an extension of Cipole Road south of Tualatin-Sherwood Road. This standard is met.

2. Connectivity Map Required. New residential, commercial, and mixed-use development involving the construction of new streets shall be submitted with a site plan that implements, responds to and expands on the Local Street Connectivity map contained in the TSP.

a. A project is deemed to be consistent with the Local Street Connectivity map when it provides a street connection in the general vicinity of the connection(s) shown on the map, or where such connection is not practicable due to topography or other physical constraints; it shall provide an alternate connection approved by the decision-maker.

b. Where a developer does not control all of the land that is necessary to complete a planned street connection, the development shall provide for as much of the designated connection as practicable and not prevent the street from continuing in the future.

c. Where a development is disproportionately impacted by a required street connection, or it provides more than its proportionate share of street improvements along property line (i.e., by building more than 3/4 width street), the developer shall be entitled to System Development charge credits, as determined by the City Engineer.

d. Driveways that are more than 24 feet in width shall align with existing streets or planned streets as shown in the Local Street Connectivity Map in the adopted Transportation System Plan (Figure 17), except where prevented by topography, rail lines, freeways, pre-existing development, or leases, easements, or covenants.

Response: No residential, commercial, or mixed uses development is proposed at this time. If these uses are proposed in the future, such a request would be subject to this requirement. This standard does not apply at this time.

3. Block Length. For new streets except arterials, block length shall not exceed 530 feet. The length of blocks adjacent to arterials shall not exceed 1,800 feet.

Response: The block lengths along the site's street frontage have previously been established by the existing street network and by the future Blake Road alignment approved by Partition Plat 2019-029. The block length from SW Tualatin-Sherwood Road to SW 124th Avenue is approximately 1,100 feet; the block length from SW 124th Avenue to SW Cipole Road is approximately 825 feet; and the block length from SW Cipole Road to SW Oregon Street is approximately 1,800 feet. Since both SW Tualatin-Sherwood Road and SW 124th Avenue are arterials, these lengths are acceptable. The applicant has also submitted an associated Engineering Design Modification request for block length on the future Blake Road (Attachment 22). This standard is met.

4. *Where streets must cross water features identified in Title 3 of the Urban Growth Management Functional Plan (UGMFP), provide crossings at an average spacing of 800 to 1,200 feet, unless habitat quality or length of crossing prevents a full street connection.*

Response: No Title 3-designated water features are contained within the subject site. This standard does not apply.

5. *Where full street connections over water features identified in Title 3 of the UGMFP cannot be constructed in centers, main streets and station communities (including direct connections from adjacent neighborhoods), or spacing of full street crossings exceeds 1,200 feet, provide bicycle and pedestrian crossings at an average spacing of 530 feet, unless exceptional habitat quality or length of crossing prevents a connection.*

Response: No Title 3-designated water features are contained within the subject site. This standard does not apply.

6. *Pedestrian and Bicycle Connectivity. Paved bike and pedestrian accessways consistent with cross section standards in Figure 8-6 of the TSP shall be provided on public easements or right- of-way when full street connections are not possible, with spacing between connections of no more than 300 feet. Multi-use paths shall be built according to the Pedestrian and Bike Master Plans in the adopted TSP.*

Response: The extension of a new street through the site is not required for consistency with the City of Sherwood Transportation System Plan Figure 17 (Street Functional Classification) or Figure 18 (Local Street Connectivity). Figures 12 (Pedestrian Projects) and 13 (Biking Projects) of the Transportation System Plan do not identify any pedestrian or bicycle connectivity projects that affect the site. As discussed in the response to the variance approval criteria in Chapter 16.84, the applicant is requesting a variance to waive the standard for a paved bicycle and pedestrian path south of the cul-de-sac. With the approval of the variance request, this standard is met.

7. *Exceptions. Streets, bike, and pedestrian connections need not be constructed when any of the following conditions exists:*
    a. *Physical or topographic conditions make a street or accessway connection impracticable. Such conditions include but are not limited to freeways, railroads, steep slopes, wetlands or other bodies of water where a connection could not reasonably be provided.*
    b. *Buildings or other existing development on adjacent lands physically preclude a connection now or in the future considering the potential for redevelopment; or*
    c. *Where streets or accessways would violate provisions of leases, easements, covenants, restrictions or other agreements existing as of May 1, 1995, which preclude a required street or accessway connection.*

Response: As discussed in the response to Chapter 16.84, the applicant is requesting variance approval to construct a cul-de-sac approximately 550 feet long to serve the site. The variance findings detail the reasoning behind the request and identify the physical and topographic conditions (steep slopes) that make it impracticable to extend the roadway further south to the future Blake Road alignment. The site's topography would require steeply sloped pedestrian/bike connections that would be impractical, costly, and potentially dangerous due to the combination of steep slopes and retaining walls needed to configure the site for vehicular access and circulation for industrial use. With the approval of the variance request, this standard is met.

C. *Underground Utilities*

All public and private underground utilities, including sanitary sewers and storm water drains, shall be constructed prior to the surfacing of streets. Stubs for service connections shall be long enough to avoid disturbing the street improvements when service connections are made.

Response: The applicant understands the need to construct underground utilities in the proper sequence. City Engineering staff will verify this sequence during the permitting phase. This standard is met.

D. *Additional Setbacks*

Generally additional setbacks apply when the width of a street right-of-way abutting a development is less than the standard width under the functional classifications in Section VI of the Community Development Plan. Additional setbacks are intended to provide unobstructed area for future street right-of-way dedication and improvements, in conformance with Section VI. Additional setbacks shall be measured at right angles from the centerline of the street.

Response: The applicant proposes to dedicate right-of-way along abutting streets in accordance with arterial standards and has measured setbacks based on the resulting lot lines. This standard is met.

16.106.040 - Design

Standard cross sections showing street design and pavement dimensions are located in the City of Sherwood's Engineering Design Manual.

A. *Reserve Strips*

Reserve strips or street plugs controlling access or extensions to streets are not allowed unless necessary for the protection of the public welfare or of substantial property rights. All reserve strips shall be dedicated to the appropriate jurisdiction that maintains the street.

Response: Reserve strips or street plugs controlling access or extensions to streets are not proposed as part of this development. This standard does not apply.

B. *Alignment*

All proposed streets shall, as far as practicable, be in alignment with existing streets. In no case shall the staggering of streets create a "T" intersection or a dangerous condition. Street offsets of less than one hundred (100) feet are not allowed.

Response: The development proposes the 550-foot cul-de-sac SW Cipole Place as the primary access into the development. Cipole Place will be an extension of the existing street SW Cipole Road north of the proposed development and no staggering of streets is proposed. This standard is met.

C. *Future Extension*

Where necessary to access or permit future subdivision or development of adjoining land, streets must extend to the boundary of the proposed development and provide the required roadway width. Dead-end streets less than 100' in length must comply with the Engineering Design Manual. A durable sign must be installed at the applicant's expense. The sign is required to notify the public of the intent to construct future streets. The sign must read as follows: "This road will be extended with future development. For more information contact the City of Sherwood Engineering Department."

Response: A new cul-de-sac is proposed as part of the T-S Corporate Park as the primary access to the development. The proposed street will extend approximately 550 feet into the property serving as access for all five buildings. No further extension is necessary to provide access to parcels to the south as they can take access from the future Blake Road. As a result, no signage regarding road extension is needed. This standard does not apply.

D. *Intersection Angles*

Streets shall intersect as near to ninety (90) degree angles as practical, except where topography requires a lesser angle. In all cases, the applicant shall comply with the Engineering Design Manual.

Response: The new cul-de-sac proposed extends southward from the existing SW Cipole Road at a 90-degree angle from SW Tualatin-Sherwood Road. This standard is met.

E. Cul-de-sacs

1. *All cul-de-sacs shall be used only when exceptional topographical constraints, existing development patterns, or compliance with other standards in this code preclude a street extension and circulation. A cul-de-sac shall not be more than two hundred (200) feet in length and shall not provide access to more than 25 dwelling units.*
2. *All cul-de-sacs shall terminate with a turnaround in accordance with the specifications in the Engineering Design Manual. The radius of circular turnarounds may be larger when they contain a landscaped island, parking bay in their center, Tualatin Valley Fire and Rescue submits a written request, or an industrial use requires a larger turnaround for truck access.*
3. *Public easements, tracts, or right-of-way shall provide paved pedestrian and bicycle access ways at least 6 feet wide where a cul-de-sac or dead-end street is planned, to connect the ends of the streets together, connect to other streets, or connect to other existing or planned developments in accordance with the standards of this Chapter, the TSP, the Engineering Design Manual or other provisions identified in this Code for the preservation of trees.*

Response: Cipole Place is proposed as a public cul-de-sac street solely to allow the division of the proposed industrial campus into five lots in a one-building-per-lot configuration. Making a public through street connection to (future) SW Blake Road is impractical primarily due to the site topography. If the applicant chooses not to proceed with the final plat (i.e., to keep the site as one parcel), then the cul-de-sac would be a private roadway with public utility easements. The applicant is requesting a variance to the standard in Subparagraph 1 to allow the proposed cul-de-sac length (approximately 550 feet) to exceed the 200-foot standard (Attachment 6, Sheet C3.3). The proposed cul-de-sac terminates in a bulb with a paved radius of 54 feet to allow for fire truck turnarounds, consistent with Subparagraph 2. The applicant has also submitted an associated Engineering Design Modification request for cul-de-sac radius (Attachment 21).The applicant is providing private access and is also requesting a variance to the standard in Subparagraph 3 because the site's topography would require steeply sloped pedestrian/bike connections that would be impractical, costly, and potentially dangerous (though pedestrian access is provided from Buildings D and E to 124th Avenue). Justification for the variance request is found in the response to Chapter 16.84. With the approval of the variance request, this standard is met.

F. Grades and Curves

Grades shall be evaluated by the City Engineer and comply with the Engineering Design Manual.

Response: The applicant proposes to match existing grades on abutting portions of SW Tualatin-Sherwood Road and SW 124th Avenue. The proposed 3% grade for Cipole Place is depicted on Sheet C3.3 and falls within the ranges specified in the Engineering Design Manual (which limits grades to no more than 15%). This standard is met.

G. Streets Adjacent to Railroads

Streets adjacent to railroads shall run approximately parallel to the railroad and be separated by a distance suitable to allow landscaping and buffering between the street and railroad. Due *consideration shall be given at cross streets for the minimum distance required for future grade separations and to provide sufficient depth to allow screening of the railroad.*

Response: This site is not adjacent to a railroad right-of-way. This standard does not apply.

H. Buffering of Major Streets

Where a development abuts Highway 99W, or an existing or proposed principal arterial, arterial or collector street, or neighborhood route, adequate protection for residential properties must be provided, through and local traffic be separated, and traffic conflicts minimized. In addition, visual corridors pursuant to Section 16.142.040, and all applicable access provisions of Chapter 16.96, are to be met. Buffering may be achieved by: parallel access streets, lots of extra depth abutting the major street with frontage along another street, or other treatment suitable to meet the objectives of this Code.

Response: The site abuts two arterial roadways (SW Tualatin-Sherwood Road and SW 124th Avenue) and a proposed collector (the future Blake Road). However, the proposed development is industrial, not residential, so no residential protection measures are required within the site. Compliance with Section 16.142.040 and Chapter 16.96 is addressed elsewhere in this narrative. This standard does not apply.

I. Median Islands

As illustrated in the adopted Transportation System Plan, Chapter 8, median islands may be required on arterial or collector streets for the purpose of controlling access, providing pedestrian safety or for aesthetic purposes.

Response: The site abuts two arterial roadways (SW Tualatin-Sherwood Road and SW 124th Avenue) under Washington County jurisdiction. County staff has not identified the need for median islands in either roadway (medians depicted in the TSP Figure 16A only apply in certain locations). The site also abuts a proposed collector, the future Blake Road that will be under City of Sherwood jurisdiction. Since this will be a two-lane section, no median is required per TSP Figure 16C. This standard does not apply.

J. Transit Facilities

Development along an existing or proposed transit route, as illustrated in Figure 7-2 in the TSP, is required to provide areas and facilities for bus turnouts, shelters, and other transit-related facilities to Tri-Met specifications. Transit facilities shall also meet the following requirements:

1. *Locate buildings within 20 feet of or provide a pedestrian plaza at major transit stops.*
2. *Provide reasonably direct pedestrian connections between the transit stop and building entrances on the site.*
3. *Provide a transit passenger landing pad accessible to disabled persons (if not already existing to transit agency standards).*
4. *Provide an easement or dedication for a passenger shelter and underground utility connection from the new development to the transit amenity if requested by the public transit provider.*
5. *Provide lighting at a transit stop (if not already existing to transit agency standards).*

Response: A transit stop, serving TriMet bus route 97 exists adjacent to the intersection of SW Tualatin-Sherwood Road and SW Cipole Road. Washington County is scheduled to improve SW Tualatin-Sherwood Road beginning in 2021, which will include any transit facilities as needed to satisfy TriMet standards. This standard is met.

K. Traffic Controls

1. *Pursuant to Section 16.106.080, or as otherwise required by the City Engineer, an application must include a traffic impact analysis to determine the number and types of traffic controls necessary to accommodate anticipated traffic flow.*

2. *For all other proposed developments including commercial, industrial or institutional uses with over an estimated 400 ADT, or as otherwise required by the City Engineer, the application must include a traffic impact analysis to determine the number and types of traffic controls necessary to accommodate anticipated traffic flow.*

Response: The required traffic impact analysis (TIA) is included as Attachment 11. The TIA identified the need to modify the existing signal at the intersection of SW Tualatin-Sherwood Road and Cipole Road to accommodate the addition of the proposed south leg, and the County is requiring further coordination with County staff regarding signal design (Attachment 12). This standard is met.

L. Traffic Calming

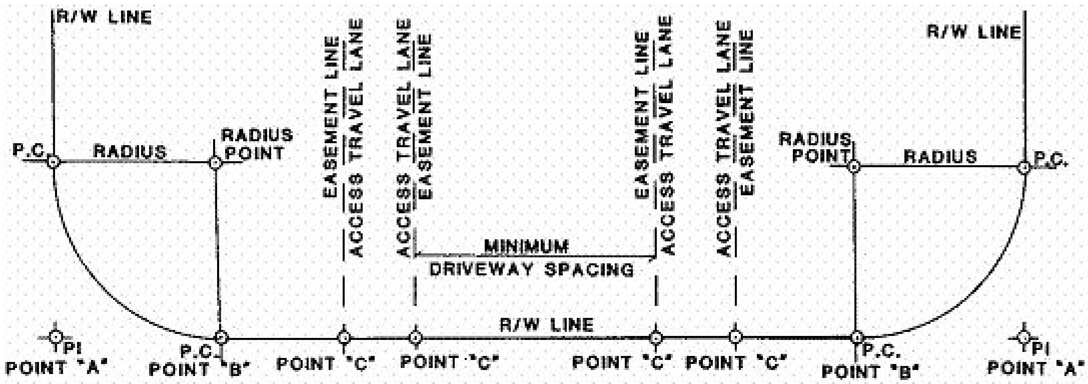
1. *The following roadway design features, including internal circulation drives, may be required by the City in new construction in areas where traffic calming needs are anticipated:*
    a. *Curb extensions (bulb-outs).*
    b. *Traffic diverters/circles.*
    c. *Alternative paving and painting patterns.*
    d. *Raised crosswalks, speed humps, and pedestrian refuges.*
    e. *Other methods demonstrated as effective through peer reviewed Engineering studies.*
2. *With approval of the City Engineer, traffic calming measures such as speed humps and additional stop signs can be applied to mitigate traffic operations and/or safety problems on existing streets. They should not be applied with new street construction unless approved by the City Engineer and Tualatin Valley Fire & Rescue.*

Response: As the site is not in a residential neighborhood and the cul-de-sac will preclude opportunities for cut-through traffic, no traffic calming measures are necessary.

M. Vehicular Access Management

All developments shall have legal access to a public road. Access onto public streets shall be permitted upon demonstration of compliance with the provisions of adopted street standards in the Engineering Design Manual.

1. *Measurement: See the following access diagram where R/W = Right-of-Way; and P.I. = Point-of-Intersection where P.I. shall be located based upon a 90 degree angle of intersection between ultimate right-of-way lines.*
    a. *Minimum right-of-way radius at intersections shall conform to City standards.*
    b. *All minimum distances stated in the following sections shall be governed by sight distance requirements according to the Engineering Design Manual.*
    c. *All minimum distances stated in the following sections shall be measured to the nearest easement line of the access or edge of travel lane of the access on both sides of the road.*
    d. *All minimum distances between accesses shall be measured from existing or approved accesses on both sides of the road.*
    e. *Minimum spacing between driveways shall be measured from Point "C" to Point "C" as shown below:*



Response: SW Cipole Place is proposed as the single connection to SW Tualatin-Sherwood Road, as reviewed and approved by Washington County pursuant to the Design Exception in Attachment 12. All building sites are proposed to have frontage along abutting streets, with all driveways providing access to SW Cipole Place. Measurements have been performed as illustrated in the diagram. This standard is met.

2. Roadway Access

No use will be permitted to have direct access to a street or road except as specified below. Access spacing shall be measured from existing or approved accesses on either side of a street or road. The lowest functional classification street available to the legal lot, including alleys within a public easement, shall take precedence for new access points.

a. Local Streets:

Minimum right-of-way radius is fifteen (15) feet. Access will not be permitted within ten (10) feet of Point "B," if no radius exists, access will not be permitted within twenty-five (25) feet of Point "A." Access points near an intersection with a Neighborhood Route, Collector or Arterial shall be located beyond the influence of standing queues of the intersection in accordance with AASHTO standards. This requirement may result in access spacing greater than ten (10) feet.

Response: SW Cipole Place is proposed as a local street. No driveway access points are proposed within 10 feet of intersection radii (Attachment 6, Sheet C3.3) or within the queuing areas identified in the TIA (Attachment 11). This standard is met.

b. Neighborhood Routes:

Minimum spacing between driveways (Point "C" to Point "C") shall be fifty (50) feet with the exception of single family residential lots in a recorded subdivision. Such lots shall not be subject to a minimum spacing requirement between driveways (Point "C" to Point "C"). In all instances, access points near an intersection with a Neighborhood Route, Collector or Arterial shall be located beyond the influence of standing queues of the intersection in accordance with AASHTO standards. This requirement may result in access spacing greater than fifty (50) feet.

Response: No access is proposed to a neighborhood route. This standard does not apply.

c. Collectors:

All commercial, industrial and institutional uses with one-hundred-fifty (150) feet or more of frontage will be permitted direct access to a Collector. Uses with less than one-hundred-fifty (150) feet of frontage shall not be permitted direct access to Collectors unless no other alternative exists.

Where joint access is available it shall be used, provided that such use is consistent with Section 16.96.040, Joint Access. No use will be permitted direct access to a Collector within one- hundred (100) feet of any present Point "A." Minimum spacing between driveways (Point "C" to Point "C") shall be one-hundred (100) feet. In all instances, access points near an intersection with a Collector or Arterial shall be located beyond the influence of standing queues of the intersection in accordance with AASHTO standards. This requirement may result in access spacing greater than one hundred (100) feet.

Response: No access is proposed to a collector. This standard does not apply.

d. Arterials and Highway 99W - Points of ingress or egress to and from Highway 99W and arterials designated on the Transportation Plan Map, attached as Figure 1 of the Community Development Plan, Part II, shall be limited as follows:

(1) Single and two-family uses and manufactured homes on individual residential lots developed after the effective date of this Code shall not be granted permanent driveway ingress or egress from Highway 99W or arterials. If alternative public access is not available at the time of development, provisions shall be made for temporary access which shall be discontinued upon the availability of alternative access.

(2) Other private ingress or egress from Highway 99W and arterial roadways shall be minimized. Where alternatives to Highway 99W or arterials exist or are proposed, any new or altered uses developed after the effective date of this Code shall be required to use the alternative ingress and egress. Alternatives include shared or crossover access agreement between properties, consolidated access points, or frontage or backage roads. When alternatives do not exist, access shall comply with the following standards:

(a) Access to Highway 99W shall be consistent with ODOT standards and policies per OAR 734, Division 51, as follows: Direct access to an arterial or principal arterial will be permitted provided that Point 'A' of such access is more than six hundred (600) feet from any intersection Point 'A' or other access to that arterial (Point 'C').

(b) The access to Highway 99W will be considered temporary until an alternative access to public right-of-ways is created. When the alternative access is available the temporary access to Highway 99W shall be closed.

(3) All site plans for new development submitted to the City for approval after the effective date of this Code shall show ingress and egress from existing or planned local, neighborhood route or collector streets, including frontage or backage roads, consistent with the Transportation Plan Map and Chapter 6 of the Community Development Plan.

Response: No access is proposed to SW 124th Avenue, and access to SW Tualatin-Sherwood Road has been coordinated with Washington County, the roadway jurisdiction. A single access is proposed at an existing signalized intersection (SW Cipole Road). Washington County has approved a Design Exception to allow a local street (SW Cipole Place) to access an arterial (SW Tualatin-Sherwood Road). This standard is met.

3. Exceptions to Access Criteria for City-Owned Streets

a. *Alternate points of access may be allowed if an access management plan which maintains the classified function and integrity of the applicable facility is submitted to and approved by the City Engineer as the access management plan must be included as part of the land use submittal or an application for modification as described in § 16.106.020 E. (Transportation Facilities Modifications).*

b. *Access in the Old Town (OT) Overlay Zone*
Access points in the OT Overlay Zone shown in an adopted plan such as the Transportation System Plan, are not subject to the access spacing standards and do not need a variance. However, the applicant shall submit a partial access management plan for approval by the City Engineer. The approved plan shall be implemented as a condition of development approval.

Response: The applicant is not proposing an access management plan and the site is not in the Old Town Overlay Zone. This standard does not apply.

N. *Private Streets*

1. *The construction of a private street serving a single-family residential development is prohibited unless it provides principal access to two or fewer residential lots or parcels (i.e. flag lots).*
2. *Provisions shall be made to assure private responsibility for future access and maintenance through recorded easements. Unless otherwise specifically authorized, a private street shall comply with the same standards as a public street identified in the Community Development Code and the Transportation System Plan.*
3. *A private street shall be distinguished from public streets and reservations or restrictions relating to the private street shall be described in land division documents and deed records.*
4. *A private street shall also be signed differently from public streets and include the words "Private Street".*

Response: No private streets are anticipated as part of the T-S Corporate Park, as SW Cipole Place is proposed to be a public roadway. If the applicant opts to lease all the buildings rather than subdividing and selling individual lots, then the applicant may not record the final subdivision plat. In that case, a private driveway would be proposed in lieu of a public street but no maintenance agreement would be needed since the driveway would be on a single lot. This standard does not apply.

16.106.060 - Sidewalks

A. *Required Improvements*

1. *Except as otherwise provided, sidewalks shall be installed on both sides of a public street and in any special pedestrian way within new development.*
2. *For Highway 99W, arterials, or in special industrial districts, the City Manager or designee may approve a development without sidewalks if alternative pedestrian routes are available.*
3. *In the case of approved cul-de-sacs serving less than fifteen (15) dwelling units, sidewalks on one side only may be approved by the City Manager or designee.*

Response: The site currently has approximately 500 feet of developed frontage along the SW Tualatin-Sherwood Road. Sidewalks appear to be five feet wide. As Washington County has a funded project to improve this section of Tualatin-Sherwood Road beginning in 2021, the applicant does not propose to improve the project frontage. The proposed development will be responsible for sidewalk improvements along the remaining frontage of SW 124th Avenue. The applicant proposes sidewalks on SW Cipole Place . This standard is met.

B. Design Standards

1. Arterial and Collector Streets

Arterial and collector streets shall have minimum six (6) or eight (8) foot wide sidewalks/multi-use paths, located as required by this Code. Residential areas shall have a minimum of a six (6) foot wide sidewalk and commercial industrial areas shall have a minimum of an eight (8) foot wide sidewalk.

2. Local Streets

Local streets shall have minimum five (5) foot wide sidewalks, located as required by this Code.

3. Handicapped Ramps

Sidewalk handicapped ramps shall be provided at all intersections.

Response: Washington County is designing the proposed improvements to SW Tualatin-Sherwood Road. As illustrated on Attachment 6 Sheet C3.6, a six-foot sidewalk is proposed on SW 124th Avenue (an arterial) and a six-foot sidewalk is proposed on SW Cipole Place (a local street). To minimize impacts on wetlands east of the cul-de-sac, the applicant proposes a sidewalk on the west side of SW Cipole Place but not on the east side north of the cul-de-sac bulb. Handicapped ramps are proposed at the intersection of SW Tualatin-Sherwood Road and SW Cipole Place (Attachment 6 Sheet C3.3). This standard is met.

C. Pedestrian and Bicycle Paths

Provide bike and pedestrian connections on public easements or right-of-way when full street connections are not possible, with spacing between connections of no more than 330 feet except where prevented by topography, barriers such as railroads or highways, or environmental constraints such as rivers and streams.

Response: The applicant has requested a variance to the corresponding standard in 16.106.040.E.3 because the site's topography would require steeply sloped pedestrian/bike connections that would be impractical, costly, and potentially dangerous due to the combination of steep slopes and retaining walls needed to configure the site for vehicular access and circulation for industrial use. Justification for the variance request is found in the response to Chapter 16.84. With the approval of the variance request, this standard is met.

16.106.070 - Bike Lanes

If shown in Figure 13 of the Transportation System Plan, bicycle lanes shall be installed in public rights-of-way, in accordance with City specifications. Bike lanes shall be installed on both sides of designated roads, should be separated from the road by a twelve-inch stripe or other means approved by Engineering Staff, and should be a minimum of five (5) feet wide.

Response: Figure 13 (Biking Projects) of the TSP illustrates the existing bike lane on SW Tualatin-Sherwood Road and the proposed bike lane on SW 124th Avenue. Washington County will install the bike lane in SW Tualatin-Sherwood Road as part of their construction project beginning in 2021, and the applicant proposes a bike lane on SW 124th Avenue (Attachment 6 Sheets C3.2 and C3.6). This standard is met.

16.106.080 - Traffic Impact Analysis (TIA)

B. Applicability

A traffic impact analysis (TIA) shall be required to be submitted to the City with a land use application at the request of the City Engineer or if the proposal is expected to involve one (1) or more of the following:

1. An amendment to the Sherwood Comprehensive Plan or zoning map.

2. A new direct property approach road to Highway 99W is proposed.

3. The proposed development generates fifty (50) or more PM peak-hour trips on Highway 99W, or one hundred (100) PM peak-hour trips on the local transportation system.

4. *An increase in use of any adjacent street or direct property approach road to Highway 99W by ten (10) vehicles or more per day that exceed the twenty thousand-pound gross vehicle weight.*
5. *The location of an existing or proposed access driveway does not meet minimum spacing or sight distance requirements, or is located where vehicles entering or leaving the property are restricted, or such vehicles are likely to queue or hesitate at an approach or access connection, thereby creating a safety hazard.6.A change in internal traffic patterns that may cause safety problems, such as back up onto the highway or traffic crashes in the approach area.*

Response: The project is anticipated to generate on the order of 1,844 vehicle trips per day. A Traffic Impact Analysis has been provided as Attachment 11. This standard is met.

C. Requirements

The following are typical requirements that may be modified in coordination with Engineering Staff based on the specific application.

1. *Pre-application Conference. The applicant shall meet with the City Engineer prior to submitting an application that requires a TIA. This meeting will be coordinated with Washington County and ODOT when an approach road to a County road or Highway 99W serves the property, so that the TIA will meet the requirements of all relevant agencies.*
2. *Preparation. The TIA shall be prepared by an Oregon Registered Professional Engineer qualified to perform traffic Engineering analysis and will be paid for by the applicant.*
3. *Typical Average Daily Trips and Peak Hour Trips. The latest edition of the Trip Generation Manual, published by the Institute of Transportation Engineers (ITE), shall be used to gauge PM peak hour vehicle trips, unless a specific trip generation study that is approved by the City Engineer indicates an alternative trip generation rate is appropriate.*
4. *Intersection-level Analysis. Intersection-level analysis shall occur at every intersection where the analysis shows that fifty (50) or more peak hour vehicle trips can be expected to result from the development.*
5. *Transportation Planning Rule Compliance. The requirements of OAR 660-012-0060 shall apply to those land use actions that significantly affect the transportation system, as defined by the Transportation Planning Rule.*

Response: The applicant's transportation consultant has coordinated with both City Engineering staff and Washington County staff to identify the applicable requirements for the TIA and has provided the appropriate data and analysis in the TIA. The TIA scoping memo is Appendix A in Attachment 11. This standard is met.

D. Study Area

The following facilities shall be included in the study area for all TIAs:

1. *All site-access points and intersections (signalized and unsignalized) adjacent to the proposed development site. If the site fronts an arterial or collector street, the analysis shall address all intersections and driveways along the site frontage and within the access spacing distances extending out from the boundary of the site frontage.*
2. *Roads and streets through and adjacent to the site.*
3. *All intersections needed for signal progression analysis.*
4. *In addition to these requirements, the City Engineer may require analysis of any additional intersections or roadway links that may be adversely affected as a result of the proposed development.*

Response: The applicant's transportation consultant has coordinated with both City Engineering staff and Washington County staff to identify the appropriate study area and has evaluated the operations of the affected intersections in the TIA (Attachment 11). This standard is met.

E. Analysis Periods

To adequately assess the impacts of a proposed land use action, the following study periods, or horizon years, should be addressed in the transportation impact analysis where applicable:

1. *Existing Year.*
2. *Background Conditions in Project Completion Year. The conditions in the year in which the proposed land use action will be completed and occupied, but without the expected traffic from the proposed land use action. This analysis should account for all City-approved developments that are expected to be fully built out in the proposed land use action horizon year, as well as all planned transportation system improvements.*
3. *Full Buildout Conditions in Project Completion Year. The background condition plus traffic from the proposed land use action assuming full build-out and occupancy.*
4. *Phased Years of Completion. If the project involves construction or occupancy in phases, the applicant shall assess the expected roadway and intersection conditions resulting from major development phases. Phased years of analysis will be determined in coordination with City staff.*
5. *Twenty-Year or TSP Horizon Year. For planned unit developments, comprehensive plan amendments or zoning map amendments, the applicant shall assess the expected future roadway, intersection, and land use conditions as compared to approved comprehensive planning documents.*

Response: The TIA analyzes existing traffic operations and forecasts operations in 2021 (prior to the County's improvements to SW Tualatin-Sherwood Road) and in 2025 (following the County's improvements to SW Tualatin-Sherwood Road). No phasing is proposed as part of the development, and no planned unit development, comprehensive plan amendment, or zoning map amendment is proposed. This standard is met.

F. Approval Criteria

When a TIA is required, a proposal is subject to the following criteria, in addition to all criteria otherwise applicable to the underlying land use proposal:

1. *The analysis complies with the requirements of 16.106.080.C;*
2. *The analysis demonstrates that adequate transportation facilities exist to serve the proposed development or identifies mitigation measures that resolve identified traffic safety problems in a manner that is satisfactory to the City Engineer and, when County or State highway facilities are affected, to Washington County and ODOT;*
3. *For affected non-highway facilities, the TIA demonstrates that mobility and other applicable performance standards established in the adopted City TSP have been met; and*
4. *Proposed public improvements are designed and will be constructed to the street standards specified in Section 16.106.010 and the Engineering Design Manual, and to the access standards in Section 16.106.040.*
5. *Proposed public improvements and mitigation measures will provide safe connections across adjacent right-of-way (e.g., protected crossings) when pedestrian or bicycle facilities are present or planned on the far side of the right-of-way.*

Response: Kittelson & Associates transportation engineers projected site trip generation (Attachment 11) based on Land Use Code 130 – Industrial Park within the Institute of Transportation Engineers' (ITE) *Trip Generation Manual, 10th edition*. The report analyzed traffic operations in the vicinity in the years 2021 and 2025, both with and without the proposed development:

- In 2021, the SW Oregon Street/SW Tualatin-Sherwood Road intersection is expected to exceed mobility standards in the PM peak hour with or without the proposed development.
- In 2021, the proposed development would cause the SW Oregon Street/SW Tonquin Road intersection to exceed mobility standards in the PM peak hour.
- In 2021, all other intersections in the study area are anticipated to meet mobility standards in both the AM and PM peak hours.
- In 2025 (following Washington County's planned improvements to SW Tualatin-Sherwood Road), the SW Oregon Street/SW Tonquin Road intersection is expected to exceed mobility standards in the PM peak hour with or without the proposed development.
- In 2025, all other intersections in the study area are anticipated to meet mobility standards in both the AM and PM peak hours.

The TIA also analyzed traffic operations depending on whether Cipole Road is extended to Blake Road or not, concluding that "there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road" and points out potential roadway conflicts if Cipole Road were extended south to Blake Road.

G. Conditions of Approval
The City may deny, approve, or approve a development proposal with conditions needed to meet operations and safety standards and provide the necessary right-of-way and improvements to ensure consistency with the future planned transportation system. Improvements required as a condition of development approval, when not voluntarily provided by the applicant, shall be roughly proportional to the impact of the development on transportation facilities, pursuant to Section 16.106.090. Findings in the development approval shall indicate how the required improvements are directly related to and are roughly proportional to the impact of development.

Response: The TIA recommends providing a proportionate cost share allocation towards the future conversion of the SW Oregon Street/SW Tonquin Road intersection either to a roundabout or signalized intersection. A condition of approval to that effect would be appropriate to mitigate for the traffic impacts of the proposed development.

16.106.090 - Rough Proportionality

A. Purpose
The purpose of this section is to ensure that required transportation facility improvements are roughly proportional to the potential impacts of the proposed development. The rough proportionality requirements of this section apply to both frontage and non-frontage improvements. A proportionality analysis will be conducted by the City Engineer for any proposed development that triggers transportation facility improvements pursuant to this chapter. The City Engineer will take into consideration any benefits that are estimated to accrue to the development property as a result of any required transportation facility improvements. A proportionality determination can be appealed pursuant to Chapter 16.76. The following general provisions apply whenever a proportionality analysis is conducted.

B. Mitigation of impacts due to increased demand for transportation facilities associated with the proposed development shall be provided in rough proportion to the transportation impacts of the proposed development. When applicable, anticipated impacts will be determined by the TIA in accordance with Section 16.106.080. When no TIA is required, anticipated impacts will be determined by the City Engineer.

C. The following shall be considered when determining proportional improvements:

1. *Condition and capacity of existing facilities within the impact area in relation to City standards. The impact area is generally defined as the area within a one-half-mile radius of the proposed development. If a TIA is required, the impact area is the TIA study area.*
2. *Existing vehicle, bicycle, pedestrian, and transit use within the impact area.*
3. *The effect of increased demand on transportation facilities and other approved, but not yet constructed, development projects within the impact area that is associated with the proposed development.*
4. *Applicable TSP goals, policies, and plans.*
5. *Whether any route affected by increased transportation demand within the impact area is listed in any City program including school trip safety; neighborhood traffic management; capital improvement; system development improvement, or others.*
6. *Accident history within the impact area.*
7. *Potential increased safety risks to transportation facility users, including pedestrians and cyclists.*
8. *Potential benefit the development property will receive as a result of the construction of any required transportation facility improvements.*
9. *Other considerations as may be identified in the review process pursuant to Chapter 16.72.*

Response: To ensure rough proportionality, the TIA recommends providing a proportionate cost share allocation towards the future conversion of the SW Oregon Street/SW Tonquin Road intersection either to a roundabout or signalized intersection and includes the proportionate share percentage computations based on traffic volumes. This standard is met.

Chapter 16.110 - Sanitary Sewers

16.110.010 - Required Improvements
Sanitary sewers shall be installed to serve all new developments and shall connect to existing sanitary sewer mains. Provided, however, that when impractical to immediately connect to a trunk sewer system, the use of septic tanks may be approved, if sealed sewer laterals are installed for future connection and the temporary system meets all other applicable City, Clean Water Services, Washington County and State sewage disposal standards.

Response: As depicted in Attachment 6 Sheets C6.3-C6.6, the proposed development will construct a public sanitary sewer line in Tualatin-Sherwood Road from Oregon Street eastward to the Cipole Road intersection, and then southward in Cipole Place to serve the development. Private sanitary sewer laterals will be constructed from the buildings to the new public line in Cipole Place. Sheets C6.0-C6.2 show all proposed connections. South of Cipole Place, sewer service will be extended southward to the future location of Blake Road to provide sewer service to the future water treatment plant south of Blake Road; this line would be in a public utility easement. This standard is met.

16.110.020 - Design Standards

A. Capacity
Sanitary sewers shall be constructed, located, sized, and installed at standards consistent with this Code, the Sanitary Sewer Service Plan Map in the Sanitary Sewer Master Plan, and other applicable Clean Water Services and City standards, in order to adequately serve the proposed development and allow for future extensions.

Response: Compliance with the standards of this code is demonstrated in this narrative and in sheets C6.0-C6.3 of Attachment 6. The sanitary sewer plan was designed in accordance with the Sanitary Sewer Service Plan Map in the Sanitary Sewer Master Plan and has been reviewed at a conceptual level with the City Engineer. Further demonstration of compliance with applicable standards will take place during the permitting phase of the project. This standard is met.

B. Over-Sizing

1. *When sewer facilities will, without further construction, directly serve property outside a proposed development, gradual reimbursement may be used to equitably distribute the cost of that over-sized system.*
2. *Reimbursement shall be in an amount estimated by the City to be a proportionate share of the cost for each connection made to the sewer by property owners outside of the development, for a period of ten (10) years from the time of installation of the sewers. The boundary of the reimbursement area and the method of determining proportionate shares shall be determined by the City. Reimbursement shall only be made as additional connections are made and shall be collected as a surcharge in addition to normal connection charges.*

Response: As illustrated in Attachment 6 Sheets C6.0-C6.6, the proposed development will construct a public sanitary sewer line in Tualatin-Sherwood Road from Oregon Street eastward to the Cipole Road intersection, and then southward in Cipole Place to serve the development. South of Cipole Place, sewer service will be extended southward to the future location of Blake Road. This line has been over-sized to accommodate anticipated discharge from the future water treatment plant south of Blake Road. If the applicant chooses to seek reimbursement for oversizing the lines, a formal request will be filed with the City. This standard is met.

16.110.030 - Service Availability

Approval of construction plans for new facilities pursuant to Chapter 16.106, and the issuance of building permits for new development to be served by existing sewer systems shall include certification by the City that existing or proposed sewer facilities are adequate to serve the development.

Response: Issuance of a service availability certification by the City shall occur through review and approval of plans for public improvements, which will be submitted to the City for issuance of the required permits subsequent to receiving necessary land use approvals. This standard is met.

Chapter 16.112 - Water Supply

16.112.010 - Required Improvements

Water lines and fire hydrants conforming to City and Fire District standards shall be installed to serve all building sites in a proposed development. All waterlines shall be connected to existing water mains or shall construct new mains appropriately sized and located in accordance with the Water System Master Plan.

Response: As shown in the sanitary and water utilities plans (Sheets C6.0-C6.2 in Attachment 6), a new 16-inch diameter public water line will be extended into the site from an existing 12-inch line located in SW Cipole Road (to be constructed by the Willamette Water Supply Program). The applicant also proposes private water loops through the west and east sides of the site for fire-fighting. The water line loops through the site will be in 10-foot-wide public utility easements. There will be separate water line taps to each of the buildings for a fire water vault and a domestic water service.

All the proposed buildings will be provided with separate water meters and private service lines. Fire hydrants and water lines were designed in conformance with City and Fire District standards. This standard is met.

16.112.020 - Design Standards

A. Capacity

Water lines providing potable water supply shall be sized, constructed, located and installed at standards consistent with this Code, the Water System Master Plan, the City's Design and Construction Manual, and with other applicable City standards and specifications, in order to adequately serve the proposed development and allow for future extensions.

Response: The sanitary and water utilities plans (Sheets C6.0-C6.2 in Attachment 6) were designed to be consistent with the City of Sherwood Code, the Water System Master Plan, the City's Design and Construction Manual, and with other applicable City standards. Further demonstration of compliance with applicable standards will take place during the permitting phase of the project. This standard is met.

B. Fire Protection

All new development shall comply with the fire protection requirements of Chapter 16.116, the applicable portions of Chapter 7 of the Community Development Plan, and the Fire District.

Response: The proposed development has been designed to comply with requirements of Chapter 16.116, the applicable portions of Chapter 7 of the Community Development Plan, and Fire District standards. New fire hydrants are proposed internal to the site and spaced to provide necessary coverage for fire apparatus response. All new buildings constructed at the site will include automatic fire suppression systems. This standard is met.

C. Over-Sizing

1. *When water mains will, without further construction, directly serve property outside a proposed development, gradual reimbursement may be used to equitably distribute the cost of that over-sized system.*
2. *Reimbursement shall be in an amount estimated by the City to be the proportionate share of the cost of each connection made to the water mains by property owners outside the development, for a period of ten (10) years from the time of installation of the mains. The boundary of the reimbursement area and the method of determining proportionate shares shall be determined by the City. Reimbursement shall only be made as additional connections are made and shall be collected as a surcharge in addition to normal connection charges.*
3. *When over-sizing is required in accordance with the Water System Master Plan, it shall be installed per the Water System Master Plan. Compensation for over-sizing may be provided through direct reimbursement, from the City, after mainlines have been accepted. Reimbursement of this nature would be utilized when the cost of over-sizing is for system wide improvements.*

Response: As illustrated in Attachment 6 Sheets C6.0-C6.2, the Willamette Water Supply Program will construct two public water mains extending southward from Tualatin-Sherwood Road to the future location of Blake Road. These lines have been over-sized to accommodate anticipated water usage for the future water treatment plant south of Blake Road. If the Willamette Water Supply Program chooses to seek reimbursement for oversizing the lines, a formal request will be filed with the City. This standard is met.

16.112.030 - Service Availability

Approval of construction plans for new water facilities pursuant to Chapter 16.106, and the issuance of building permits for new development to be served by existing water systems shall include certification by the City that existing or proposed water systems are adequate to serve the development.

Response: Issuance of a service availability certification by the City shall occur through review and approval of plans for public improvements, which will be submitted to the City for issuance of the required permits subsequent to receiving necessary land use approvals. This standard is met.

Chapter 16.114 - Storm Water

Storm water facilities, including appropriate source control and conveyance facilities, shall be installed in new developments and shall connect to the existing downstream drainage systems consistent with the Comprehensive Plan and the requirements of the Clean Water Services water quality regulations contained in their Design and Construction Standards R&O 04-9, or its replacement.

Response: The stormwater plans (Sheets C5.0-C5.2 in Attachment 6) show how the proposed development will manage stormwater from the site. New water quality and detention facilities in stormwater tracts are proposed to manage run-off in a manner consistent with applicable Clean Water Services design standards. This criterion is met.

16.114.020 - Design Standards

A. Capacity

Storm water drainage systems shall be sized, constructed, located, and installed at standards consistent with this Code, the Storm Drainage Master Plan Map, attached as Exhibit E, Chapter 7 of the Community Development Plan, other applicable City standards, the Clean Water Services Design and Construction standards R&O 04-9 or its replacement, and hydrologic data and improvement plans submitted by the developer.

B. On-Site Source Control

Storm water detention and groundwater recharge improvements, including but not limited to such facilities as dry wells, detention ponds, and roof top ponds shall be constructed according to Clean Water Services Design and Construction Standards.

C. Conveyance System

The size, capacity and location of storm water sewers and other storm water conveyance improvements shall be adequate to serve the development and accommodate upstream and downstream flow. If an upstream area discharges through the property proposed for development, the drainage system shall provide capacity to the receive storm water discharge from the upstream area. If downstream drainage systems are not sufficient to receive an increase in storm water caused by new development, provisions shall be made by the developer to increase the downstream capacity or to provide detention such that the new development will not increase the storm water caused by the new development.

Response: New water quality and detention facilities are proposed to manage run-off from the site in a manner consistent with applicable Clean Water Services standards. No upstream discharges flow through the site, and no off-site downstream facilities are proposed to be used to manage runoff from the site. The preliminary storm report (Attachment 16) demonstrates feasibility for the proposed stormwater management system. This standard is met.

16.114.030 - Service Availability

Approval of construction plans for new storm water drainage facilities pursuant to Chapter 16.106, and the issuance of building permits for new development to be served by existing storm water drainage systems shall include certification by the City that existing or proposed drainage facilities are adequate to serve the development.

Response: Issuance of a service availability certification by the City shall occur through review and approval of plans for public improvements, which will be submitted to the City for issuance of the required permits subsequent to receiving necessary land use approvals. This standard is met.

Chapter 16.116 - Fire Protection

16.116.010 - Required Improvements

When land is developed so that any commercial or industrial structure is further than two hundred and fifty (250) feet or any residential structure is further than five hundred (500) feet from an adequate water supply for fire protection, as determined by the Fire District, the developer shall provide fire protection facilities necessary to provide adequate water supply and fire safety.

Response: The Willamette Water Supply Program proposes to construct a 16-inch public water main in Cipole Place and additional private water line loops through the site will provide an adequate supply for the proposed fire protection hydrants (Sheets C6.0-C6.2 in Attachment 6). Each water line is within 250 feet of the proposed buildings. This standard is met.

16.116.020 - Standards

A. Capacity

All fire protection facilities shall be approved by and meet the specifications of the Fire District, and shall be sized, constructed, located, and installed consistent with this Code, Chapter 7 of the Community Development Plan, and other applicable City standards, in order to adequately protect life and property in the proposed development.

Response: Multiple new fire hydrants are proposed to serve the development. All fire protection facilities were designed in compliance with the City of Sherwood Development Code, Chapter 7 of the Community Development Plan, and other applicable City standards. Compliance with these standards is demonstrated on Sheets C6.0-C6.2 of Attachment 6. Further demonstration of compliance with applicable standards will take place during the permitting phase of the project. This standard is met.

B. Fire Flow

Standards published by the Insurance Services Office, entitled "Guide for Determination of Required Fire Flows" shall determine the capacity of facilities required to furnish an adequate fire flow. Fire protection facilities shall be adequate to convey quantities of water, as determined by ISO standards, to any outlet in the system, at no less than twenty (20) pounds per square inch residual pressure. Water supply for fire protection purposes shall be restricted to that available from the City water system. The location of hydrants shall be taken into account in determining whether an adequate water supply exists.

Response: Fire flow tests and hydraulic modeling will be performed during the permitting phase of the project to demonstrate compliance with this standard. The future water mains illustrated on Sheets 6.0-C6.2 of Attachment 6 are anticipated to provide more than adequate fire flow. This standard is met.

C. Access to Facilities

Whenever any hydrant or other appurtenance for use by the Fire District is required by this Chapter, adequate ingress and egress shall be provided. Access shall be in the form of an improved, permanently maintained roadway or open paved area, or any combination thereof, designed, constructed, and at all times maintained, to be clear and unobstructed. Widths, height clearances, ingress and egress shall be adequate for District firefighting equipment. The Fire District, may further prohibit vehicular parking along private accessways in order to keep them clear and unobstructed, and cause notice to that effect to be posted.

Response: All new fire hydrants on site will be easily accessible by District firefighting equipment. The sanitary and water utilities plans (Sheets C6.0-C6.2 in Attachment 6) show the location of and access routes for all new fire hydrants. As shown in the plans, all hydrants will be located adjacent to paved roads or drive aisles, which will remain unobstructed to provide adequate width, height clearance, and ingress and egress to allow for the maneuvering of District firefighting equipment. Vehicle parking areas on site will not obstruct the movement of firefighting equipment. This standard is met.

D. Hydrants

Hydrants located along private, accessways shall either have curbs painted yellow or otherwise marked prohibiting parking for a distance of at least fifteen (15) feet in either direction, or where curbs do not exist, markings shall be painted on the pavement, or signs erected, or both, given notice that parking is prohibited for at least fifteen (15) feet in either direction.

Response: There are multiple proposed hydrants internal to the site in and around buildings and parking areas. However, as the hydrants are not located on private drive aisles no curb markings or signage is merited. This standard does not apply.

16.116.030 - Miscellaneous Requirements

A. Timing of Installation

When fire protection facilities are required, such facilities shall be installed and made serviceable prior to or at the time any combustible construction begins on the land unless, in the opinion of the Fire District, the nature or circumstances of said construction makes immediate installation impractical.

B. Maintenance of Facilities

All on-site fire protection facilities, shall be maintained in good working order. The Fire District may conduct periodic tests and inspection of fire protection and may order the necessary repairs or changes be made within ten (10) days.

C. Modification of Facilities

On-site fire protection facilities, may be altered or repaired with the consent of the Fire District; provided that such alteration or repairs shall be carried out in conformity with the provisions of this Chapter.

Response: These standards are understood and will be the responsibility of the applicant to uphold. These standards are met.

Chapter 16.118 - Public and Private Utilities

16.118.020 - Standard

A. Installation of utilities shall be provided in public utility easements and shall be sized, constructed, located and installed consistent with this Code, and applicable utility company and City standards.

Response: This proposed development requires public utility easements for the public storm lines and for the utilities extending southward from Cipole Place to the future Blake Road. These easements are shown in the utility plans (Sheets C6.0-C6.2 in Attachment 6) and the preliminary plat Sheet C8.0 in Attachment 6. The easements were designed in compliance with the City of Sherwood Development Code, Chapter 7 of the Community Development Code, and applicable utility company and City standards. Further demonstration of compliance with applicable standards will take place during the permitting phase of the project. This standard is met.

B. Public utility easements shall be a minimum of eight (8) feet in width unless a reduced width is specifically exempted by the City Engineer. An eight-foot wide public utility easement (PUE) shall be provided on private property along all public street frontages. This standard does not apply to developments within the Old Town Overlay.

Response: This proposed development requires public utility easements for the public storm lines and for the utilities extending southward from Cipole Place to the future Blake Road. These easements are shown in the utility plans (Sheets C6.0-C6.2 in Attachment 6) and the preliminary plat Sheet C8.0 in Attachment 6. Additionally, an eight-foot public utility easement will be provided along the west side of Cipole Place. The easements were designed in compliance with the City of Sherwood Development Code, Chapter 7 of the Community Development Code, and applicable utility company and City standards. Further demonstration of compliance with applicable standards will take place during the permitting phase of the project. This standard is met.

C. Where necessary, in the judgment of the City Manager or his designee, to provide for orderly development of adjacent properties, public and franchise utilities shall be extended through the site to the edge of adjacent property(ies).

Response: The applicant proposes to provide a utility corridor south from Cipole Place to the future Blake Road to accommodate development to the south. This standard is met.

D. Franchise utility conduits shall be installed per the utility design and specification standards of the utility agency.

Response: The applicant will provide any needed conduits for franchise utilities during construction, as will be further verified during the permitting phase of the project. This standard is met.

E. Public Telecommunication conduits and appurtenances shall be installed per the City of Sherwood telecommunication design standards.

Response: The applicant will provide any needed conduits for franchise utilities during construction, as will be further verified during the permitting phase of the project. This standard is met.

F. Exceptions: Installation shall not be required if the development does not require any other street improvements. In those instances, the developer shall pay a fee in lieu that will finance installation when street or utility improvements in that location occur.

Response: All applicable public and private utilities requirements will be met through this proposal. No exceptions to this section are requested. This standard does not apply.

16.118.030 - Underground Facilities

Except as otherwise provided, all utility facilities, including but not limited to, electric power, telephone, natural gas, lighting, cable television, and telecommunication cable, shall be placed underground, unless specifically authorized for above ground installation, because the points of connection to existing utilities make underground installation impractical, or for other reasons deemed acceptable by the City.

Response: All proposed utilities will be constructed underground as required. Further demonstration of compliance with applicable standards will take place during the permitting phase of the project. This standard is met.

16.118.040 - Exceptions

Surface-mounted transformers, surface-mounted connection boxes and meter cabinets, temporary utility service facilities during construction, high capacity electric and communication feeder lines, and utility transmission lines operating at fifty thousand (50,000) volts or more may be located above ground. The City reserves the right to approve location of all surface-mounted transformers.

Response: It is anticipated that the development will require some or all of these above-ground utility facilities, as will be further coordinated with Engineering staff during the permitting phase of the project. This standard is met.

16.118.050 - Private Streets

The construction of new private streets, serving single-family residential developments shall be prohibited unless it provides principal access to two or fewer residential lots or parcels i.e. flag lots. Provisions shall be made to assure private responsibility for future access and maintenance through recorded easements. Unless otherwise specifically authorized, a private street shall comply with the same standards as a public street identified in the Community Development Code and the Transportation System Plan. A private street shall be distinguished from public streets and reservations or restrictions relating to the private street shall be described in land division documents and deed records. A private street shall also be signed differently from public streets and include the words "Private Street".

Response: No private streets are anticipated as part of the T-S Corporate Park, as SW Cipole Place is proposed to be a public roadway. If the applicant opts to lease all the buildings rather than subdividing and selling individual lots, then the applicant may not record the final subdivision plat. In that case, a private driveway would be proposed in lieu of a public street. This standard does not apply.

Division VII. - Land Divisions, Subdivisions, Partitions, Lot Line Adjustments and Modifications

Chapter 16.120 - Subdivisions

16.120.020 - General Subdivision Provisions

A. Approval of a subdivision occurs through a two-step process: the preliminary plat and the final plat.

1. The preliminary plat shall be approved by the Approval Authority before the final plat can be submitted for approval consideration; and

2. The final plat shall reflect all conditions of approval of the preliminary plat.

Response: The applicant is requesting approval of the preliminary plat (Sheet C8.0) as part of this application. Following approval of the preliminary plat and construction of required infrastructure, the applicant will submit a separate application for the final plat. This standard is met.

B. All subdivision proposals shall conform to all state regulations set forth in ORS Chapter 92, Subdivisions and Partitions.

Response: The preliminary subdivision plat is included as Sheet C8.0, and the final plat will be prepared by a licensed Oregon surveyor in accordance with the requirements of ORS 92 and Washington County Surveyor standards. This standard is met.

C. Future re-division

When subdividing tracts into large lots, the Approval Authority shall require that the lots be of such size and shape as to facilitate future re-division in accordance with the requirements of the zoning district and this Division.

Response: This provision is more applicable to residential subdivisions than to large-lot industrial developments. The proposed lot sizes range from 3.71 to 9.0 acres and have not been over-sized in anticipation of future re-division. This standard does not apply.

D. Future Partitioning

When subdividing tracts into large lots which may be resubdivided, the City shall require that the lots be of a size and shape, and apply additional building site restrictions, to allow for the subsequent division of any parcel into lots of smaller size and the creation and extension of future streets.

Response: This provision is more applicable to residential subdivisions than to large-lot industrial developments. The proposed lot sizes range from 3.71 to 9.0 acres and have not been over-sized in anticipation of future re-division. This standard does not apply.

E. Lot averaging

Lot size may be averaged to allow lots less than the minimum lot size allowed in the underlying zoning district subject to the following regulations:

1. The average lot area for all lots is not less than allowed by the underlying zoning district.

2. No lot created under this provision shall be less than 90 % of the minimum lot size allowed in the underlying zoning district.

3. The maximum lot size cannot be greater than 10 % of the minimum lot size.

Response: No lot averaging is proposed. This standard does not apply.

F. Required Setbacks

All required building setback lines as established by this Code, shall be shown in the preliminary subdivision plat.

Response: Proposed building setbacks are illustrated on Sheets A0.11 and A0.12. This standard is met.

G. Property Sales

No property shall be disposed of, transferred, or sold until required subdivision approvals are obtained, pursuant to this Code.

Response: The development is speculative and there are no specific users to whom the proposed lots would be sold prior to recording of the final plat. This standard is met.

16.120.030 - Approval Procedure-Preliminary Plat

A. Approval Authority

1. The approving authority for preliminary and final plats of subdivisions shall be in accordance with Section 16.72.010 of this Code.

A. A subdivision application for 4-10 lots will follow a Type II review process.

b. A subdivision application for 11-50 lots will follow a Type III review process.

c. A subdivision application for over 50 lots will follow a Type IV review process.

2. Approval of subdivisions is required in accordance with this Code before a plat for any such subdivision may be filed or recorded with County. Appeals to a decision may be filed pursuant to Chapter 16.76.

Response: The applicant is requesting subdivision approval for five lots. Therefore, the request is subject to the Type II review process. This standard is met.

B. Phased Development

1. The Approval Authority may approve a time schedule for developing a subdivision in phases, but in no case shall the actual construction time period for any phase be greater than two years without reapplying for a preliminary plat.

2. The criteria for approving a phased subdivision review proposal are:

a. The public facilities shall be scheduled to be constructed in conjunction with or prior to each phase to ensure provision of public facilities prior to building occupancy;

b. The development and occupancy of any phase shall not be dependent on the use of temporary public facilities:

(1) For purposes of this subsection, a temporary public facility is an interim facility not constructed to the applicable City or district standard; and

(2) The phased development shall not result in requiring the City or other property owners to construct public facilities that were required as a part of the approval of the preliminary plat.

3. The application for phased development approval shall be reviewed concurrently with the preliminary plat application and the decision may be appealed in the same manner as the preliminary plat.

Response: No phased subdivision is proposed, all lots will be created on a single final plat. This standard does not apply.

16.120.040 - Approval Criteria: Preliminary Plat

No preliminary plat shall be approved unless:

A. Streets and roads conform to plats approved for adjoining properties as to widths, alignments, grades, and other standards, unless the City determines that the public interest is served by modifying streets or road patterns.

Response: Additional right-of-way dedication along the north and east site boundaries will be provided as part of this development to accommodate turn lanes on SW Tualatin-Sherwood Road and SW 124th Avenue. The creation of the Cipole Place cul-de-sac utilizes the intersection location and alignment where Cipole Road currently intersects Tualatin-Sherwood Road. The partition plat which created this parcel

(Partition Plat 2019-029) established the location and alignment for the future Blake Road, which will be dedicated and constructed when the property to the south develops. This standard is met.

B. Streets and roads held for private use are clearly indicated on the plat and all reservations or restrictions relating to such private roads and streets are set forth thereon.

Response: No private roads are proposed as part of the subdivision (though if the applicant does not proceed with the final plat, Cipole Place would be a shared private driveway). This standard does not apply.

C. The plat complies with applicable zoning district standards and design standards in Division II, and all provisions of Divisions IV, VI, VIII and IX. The subdivision complies with Chapter 16.128 (Land Division Design Standards).

Response: Findings that demonstrate compliance with the applicable development standards from Divisions IV, VI, and VIII are presented herein and Division IX does not apply as there are no historic resources on site. This standard is met.

D. Adequate water, sanitary sewer, and other public facilities exist to support the use of land proposed in the plat.

Response: As illustrated in Attachment 6 Sheets C5.0-C6.6, public water and sanitary sewer lines will be available to serve the site and the applicant will construct stormwater management facilities to serve the site. Further detail is provided in the responses to Division VI. This standard is met.

E. Development of additional, contiguous property under the same ownership can be accomplished in accordance with this Code.

Response: The Willamette Water Supply System Commission owns both parcels within Partition Plat 2019-029, including the subject site (Parcel 1 of the plat) and the property to the south (Parcel 2 of the plat) which is planned for a water treatment facility. Parcel 2 can develop independently in the future, taking access from the future Blake Road and connecting to utilities to be constructed through this proposed development. A public utility easement is proposed from the southern terminus of Cipole Place to the future alignment of Blake Road. This standard is met.

F. Adjoining land can either be developed independently or is provided access that will allow development in accordance with this Code.

Response: The Willamette Water Supply System Commission owns both parcels within Partition Plat 2019-029, including the subject site (Parcel 1 of the plat) and the property to the south (Parcel 2 of the plat) which is planned for a water treatment facility. Parcel 2 can develop independently in the future, taking access from the future Blake Road and connecting to utilities to be constructed through this proposed development. Properties to the west, north, and east have access to existing roadways (Dahlke Lane to the west, Tualatin-Sherwood Road to the north, and 124th Avenue to the east). This standard is met.

G. Tree and woodland inventories have been submitted and approved as per Section 16.142.060.

Response: Existing conditions (including trees and woodlands) are depicted on Attachment 6 Sheet C2.0, with further tree detail provided on Sheets C2.1 and C2.2. The tree canopy limits illustrated in the civil plans show the location of woodlands. The arborist report (Attachment 18) provides a tree inventory in areas where trees are proposed to be preserved and along the site boundaries. This standard is met.

H. The plat clearly shows the proposed lot numbers, setbacks, dedications and easements.

Response: Attachment 6 Sheet C8.0 is the preliminary plat which includes the proposed lot numbers, dedications, and easements, while setbacks are depicted on Sheet A0.11-A0.12. This standard is met.

I. *A minimum of five percent (5%) open space has been provided per Section 16.44.010.B.8 (Townhome-Standards) or Section 16.142.030 (Parks, Open Spaces and Trees-Single-Family Residential Subdivisions), if applicable.*

Response: The proposed development is wholly industrial and not a residential development. This standard does not apply.

16.120.050 - Final Subdivision Plat

A. *Procedure*

1. *Unless otherwise noted below, final subdivision approval includes meeting all conditions from the land use approval, review and approval by County, and the signature of the City's designee on the mylar.*
2. *The subdivider shall submit the final plat, and all supplementary information required by the Planning Department or pursuant to this Code.*
3. *Upon approval of the final plat drawing, the applicant may submit the mylar for final signature.*
4. *All requirements for signature of the mylar shall be completed within two (2) years of approval of the final plat.*

B. *Extensions*

If the final plat is not approved within two (2) years, the preliminary plat approval shall expire and a new plat must be submitted. However, the City may, upon written request by the applicant, grant a single extension up to one (1) year upon a written finding that the facts upon which approval was based have not changed to an extent sufficient to warrant refiling of the preliminary plat and that no other development approval would be affected. For preliminary plat approvals granted between January 1, 2007 and December 31, 2009, the approval shall be extended until December 31, 2013.

C. *Approval Criteria: Final Plat*

By means of a Type I procedure, the City shall review the final plat based on findings regarding compliance with the following criteria:

1. *The final plat is consistent in design (e.g., number and dimensions of lots, easements, tracts, right-of-way) with the approved preliminary plat, and all conditions of approval have been satisfied;*
2. *All public improvements required by the preliminary plat have been installed and approved by the City Engineer or appropriate service provider (e.g., road authority). Alternatively, the developer has provided a performance guarantee in accordance with § 16.120.070.*
3. *The streets and roads for public use are dedicated without reservation or restriction other than reversionary rights upon vacation of any such street or road and easements for public utilities;*
4. *The plat and deed contain a dedication to the public of all public improvements, including but not limited to streets, public pathways and trails, access reserve strips, parks, sewage disposal, storm drainage and water supply systems;*
5. *The applicant has provided copies of all recorded homeowners association Covenants, Conditions and Restrictions (CC&R's); deed restrictions; private easements and agreements (e.g., for access, common areas, parking, etc.); and other recorded documents pertaining to common improvements recorded and referenced on the plat;*
6. *The plat complies with the applicable Sections of this code (i.e., there have been no changes in land use or development resulting in a code violation since preliminary plat approval);*
7. *Certification by the City or service district, as applicable, that water and sanitary sewer service is available to every lot depicted on the plat; or bond, contract or other assurance*

has been provided by the subdivider/partitioner to the City that such services will be installed in accordance Division VI of this Code, and the bond requirements of 16.120.070. The amount of the bond, contract or other assurance by the subdivider/partitioner shall be determined by a registered professional engineer, subject to review and approval by the City;

8. *The plat contains an affidavit by the surveyor who surveyed the land, represented on the plat to the effect the land was correctly surveyed and marked with proper monuments as provided by ORS Chapter 92, indicating the initial point of the survey, and giving the dimensions and kind of such monument and its reference to some corner established by the U.S. Geological Survey, or giving two or more permanent objects for identifying its location.*

Response: The current application is for preliminary subdivision approval. The final plat submittal will occur via separate application. This standard does not apply at this stage in the development process.

16.120.060 - Improvement Agreement

A. *Subdivision Agreement*

The subdivider shall either install required improvements and repair existing streets and other public facilities damaged in the development of the subdivision pursuant to the Division VI, or execute and file with the City an agreement specifying the period within which all required improvements and repairs shall be completed, and providing that if such work is not completed within the period specified, the City may complete the same and recover the full cost and expense thereof from the subdivider. Such agreement may also provide for the construction of the improvements in stages.

B. *Performance Security*

The subdivider is required to provide monetary assurance of full and faithful performance in the form of a bond, cash, or other security acceptable to the City in an amount equal to one hundred twenty-five percent (125%) of the estimated cost of the improvements.

Response: The applicant will either complete all required public improvements and repairs prior to recording the final plat or will sign an agreement with the City outlining the proposed construction schedule. The applicant will provide financial security as required. This standard is met.

16.120.070 - Bond

A. *Performance guarantee required. As required by Section 16.120.060, the subdivider shall file with the agreement an assurance of performance supported by one of the following:*

1. *A surety bond executed by a surety company authorized to transact business in the state of Oregon which remains in force until the surety company is notified by the City in writing that it may be terminated or cash.*
2. *Determination of sum. The assurance of performance shall be for a sum determined by the City Engineer as required to cover the cost of the improvements and repairs, including related engineering and incidental expenses.*
3. *Itemized improvement estimate. The subdivider shall furnish to the City Engineer an itemized improvement estimate, certified by a registered civil engineer, to assist the City Engineer in calculating the amount of the performance assurance.*
4. *When subdivider fails to perform. In the event the subdivider fails to carry out all provisions of the agreement and the City has un-reimbursed costs or expenses resulting from such failure, the City shall call on the bond, cash deposit for reimbursement.*
5. *Termination of performance guarantee. The subdivider shall not cause termination of nor allow expiration of said guarantee without having first secured written authorization from the City.*

Response: The applicant will provide the required performance bond in a form acceptable to the City, with the amount to be determined based on the cost associated with constructing public improvements. This standard is met.

16.120.080 - Filing and Recording of Final Subdivision Plat

A. County Review

When the City determines that the plat conforms to all requirements, the plat shall be authorized for review by the County.

B. Recording the Plat

After approval, the City shall authorize the transmittal of the final map, tracing, and other data to the County, to determine that there has been compliance with all provisions of State and local statutes. Approval of the final plat shall be null and void if the plat is not recorded within sixty (60) days after the date of the last required approving signatures have been obtained.

C. Effective Date

Subdivision approval shall become final upon the recording with the County of the approved subdivision plat or partition map together with any required documents. Development permits may be issued only after final approval, except for activities at the preliminary plat phase, specifically authorized by this Code.

Response: The current application is only for preliminary subdivision approval. The filing and recording of the final subdivision plat will occur via separate application. This standard does not apply at this time.

Chapter 16.128 - Land Division Design Standards

16.128.010 - Blocks

A. Connectivity

1. Block Size

The length, width, and shape of blocks shall be designed to provide adequate building sites for the uses proposed, and for convenient access, circulation, traffic control and safety.

2. Block Length

Block length standards shall be in accordance with Section 16.108.040. Generally, blocks shall not exceed five-hundred thirty (530) feet in length, except blocks adjacent to principal arterial, which shall not exceed one thousand eight hundred (1,800) feet. The extension of streets and the formation of blocks shall conform to the Local Street Network map contained in the Transportation System Plan.

3. Pedestrian and Bicycle Connectivity. Paved bike and pedestrian accessways shall be provided on public easements or right-of-way consistent with Figure 7.401.

B. Utilities Easements for sewers, drainage, water mains, electric lines, or other utilities shall be dedicated or provided for by deed. Easements shall be a minimum of ten (10) feet in width and centered on rear or side lot lines; except for tie-back easements, which shall be six (6) feet wide by twenty (20) feet long on side lot lines at the change of direction.

C. Drainages

Where a subdivision is traversed by a watercourse, drainage way, channel or street, drainage easements or rights-of-way shall be provided conforming substantially to the alignment and size of the drainage.

Response: The enclosed site plans illustrate that the site is of satisfactory dimensions to allow development of industrial uses. The block lengths along the site's street frontage have previously been established by the existing street network and by the future Blake Road alignment approved by Partition Plat 2019-029. The block length from SW Tualatin-Sherwood Road to SW 124th Avenue is approximately 1,100 feet; the block length from SW 124th Avenue to SW Cipole Road is approximately 825 feet; and the block length from SW Cipole Road to SW Oregon Street is approximately 1,800 feet. Since both SW

Tualatin-Sherwood Road and SW 124th Avenue are arterials, these lengths are acceptable. The applicant has also submitted an associated Engineering Design Modification request for block length on the future Blake Road (Attachment 22). Proposed public utility easements are depicted on Attachment 6 Sheet C8.0. There are no watercourses that need to be accommodated on site. This standard is met.

16.128.020 - Pedestrian and Bicycle Ways
Pedestrian or bicycle ways may be required to connect cul-de-sacs, divide through an unusually long or oddly shaped block, or to otherwise provide adequate circulation.
Response: The applicant proposes on-site private pedestrian connections between building entrances and the public right-of-way. The extension of a new street through the site is not required for consistency with the City of Sherwood Transportation System Plan Figure 17 (Street Functional Classification) or Figure 18 (Local Street Connectivity). Figures 12 (Pedestrian Projects) and 13 (Biking Projects) of the Transportation System Plan do not identify any pedestrian or bicycle connectivity projects that affect the site. As discussed in the response to the variance approval criteria in Chapter 16.84, the applicant is requesting a variance to waive the standard for a paved bicycle and pedestrian path south of the cul-de-sac. With the approval of the variance request, this standard is met.

16.128.030 - Lots
A. Size and Shape
Lot size, width, shape, and orientation shall be appropriate for the location and topography of the subdivision or partition, and shall comply with applicable zoning district requirements, with the following exception:
1. Lots in areas not served by public sewer or water supply shall conform to any special County Health Department standards.

Response: As previously outlined, the proposed subdivision will meet the dimensional standards of section 16.31.030 - Development Standards within the Employment Industrial zone. Public sewer and water supply currently exist and will be extended at the applicant's expense. Utility connections from the proposed industrial buildings will be developed throughout the property and connect to the City's utility infrastructure. This standard is met.

B. Access
All lots in a subdivision shall abut a public street, except as allowed for infill development under Chapter 16.68.
Response: The industrial development includes the subdivision of the property into five lots. With the development of SW Cipole Place, all lots except Lot 1 will have frontage along the proposed cul-de-sac. Lot 1 is positioned along SW Tualatin-Sherwood Road while Lots 4 and 5 will have additional frontage along SW 124th Avenue. This standard is met.

C. Double Frontage
Double frontage and reversed frontage lots are prohibited except where essential to provide separation of residential development from railroads, traffic arteries, adjacent nonresidential uses, or to overcome specific topographical or orientation problems. A five (5) foot wide or greater easement for planting and screening may be required.
Response: No double frontage lots are proposed. While Lots 4 and 5 each have frontage on SW 124th Avenue and SW Cipole Place, the frontage on Cipole Place is limited (short) due to its location on the cul-de-sac bulb. This standard is met.

D. Side Lot Lines
Side lot lines shall, as far as practicable, run at right angles to the street upon which the lots face, except that on curved streets side lot lines shall be radial to the curve of the street.

Response: As illustrated on Attachment 6 Sheet C8.0, the proposed side lot lines are as perpendicular to the street as can be accommodated by the site geometry. This standard is met.

E. Grading

Grading of building sites shall conform to the following standards, except when topography of physical conditions warrants special exceptions:

1. Cut slopes shall not exceed one (1) and one-half (1 1/2) feet horizontally to one (1) foot vertically.

2. Fill slopes shall not exceed two (2) feet horizontally to one (1) foot vertically.

Response: As detailed in the geotechnical reports (part of Attachment 16), portions of the site are underlain by bedrock, some of which will be exposed as part of the site grading process. Cut slopes in rock will be approximately 0.5:1, as depicted on Attachment 6 Sheet C4.0. In areas with no rock cuts, cut slopes will be at 3:1 and fill slopes are proposed at 3:1 (Sheets C4.1-C4.2). This standard is met.

Division VIII. - Environmental Resources

Chapter 16.136 - Procedures

16.136.010 - Applicability

The standards of this Chapter, and applicable portions of Chapter 5 of the Community Development Plan, shall apply to any new uses or changes to existing uses in commercial, industrial and institutional zones, except as per Section 16.136.050.

Response: The applicant requests that the City Manager waive the standards of this chapter per the Exceptions in Section 16.136.050. As the buildings are speculative, determination of compliance would be more appropriately deferred to the time of tenant improvements when specific users are known.

16.136.020 - Conformance

Conformance with the standards of this Chapter shall, at a minimum, be certified in writing by a professional engineer and submitted with the application for site plan review required by Chapter 16.90, except as per Section 16.136.050. The written certification shall include:

A. Statement certifying that the proposed commercial, industrial or institutional use, if properly managed and operated, will comply with City environmental performance standards, and citing evidence supporting the certification.

B. Copies of any applicable State permits or recent test results, if available, which would indicate compliance with City environmental performance standards.

Response: The applicant requests that the City Manager waive the standards of this chapter per the Exceptions in Section 16.136.050. As the buildings are speculative, determination of compliance would be more appropriately deferred to the time of tenant improvements when specific users are known.

16.136.030 - Additional Information

A. Prior to accepting any land use application to which this Chapter applies, the City Manager or his or her designee, may determine that additional expertise in evaluating the application, due to the complexity of its impact on environmental resources, is warranted. Under such circumstances, the City may contract with a professional engineer or other qualified consultant to evaluate and make recommendations on specific application elements relative to City environmental resource standards.

B. Upon the City's determination that additional expertise is needed, the applicant shall deposit a sum equal to the estimated cost, as determined by the City, of such professional services. If the actual cost of such services is more than estimated, the applicant shall be responsible for the *difference, provided however, that the applicant's financial responsibilities will not exceed ten percent (10%) of the estimate without prior written authorization. If the cost of such services is less than the estimate, the balance of the deposit shall be returned to the applicant upon final action on their land use application.*

Response: The applicant requests that the City Manager waive the standards of this chapter per the Exceptions in Section 16.136.050. As the buildings are speculative, determination of compliance would be more appropriately deferred to the time of tenant improvements when specific users are known.

16.136.040 - Referenced Statutes and Rules

The Federal, State or regional statutes and rules cited in this Chapter are made part of this Code by reference. The statutes and rules cited are as current at the time of adoption of this Code. If a referenced statute or rule is amended by Federal, State or regional agencies, this Code must be amended for the new statute or rule to take precedence.

Response: The applicant acknowledges the requirement with applicable environmental standards promulgated by agencies other than the City. The applicant requests that the City Manager waive the standards of this chapter per the Exceptions in Section 16.136.050. As the buildings are speculative, determination of compliance would be more appropriately deferred to the time of tenant improvements when specific users are known.

16.136.050 - Exceptions

The City shall make an initial determination whether a proposed development is subject to any of the standards of this Chapter, or whether the development is exempt. The City Manager or his or her designee is authorized to waive all or some of these standards when a proposed development clearly does not represent a substantial impact on the City's environmental resource standards as per this Chapter. The findings of the City Manager or his or her designee shall be made in writing, and copies shall be forwarded to the applicant and the Commission. The action of the City Manager or his or her designee may be appealed as per Chapter 16.76.

Response: The applicant requests that the City Manager waive the standards of this chapter per the Exceptions in Section 16.136.050. As the buildings are speculative, determination of compliance would be more appropriately deferred to the time of tenant improvements when specific users are known.

Chapter 16.142 - Parks, Trees and Open Spaces

16.142.040 - Visual Corridors

A. Corridors Required

New developments located outside of the Old Town Overlay with frontage on Highway 99W, or arterial or collector streets designated on Figure 8-1 of the Transportation System Plan shall be required to establish a landscaped visual corridor according to the following standards:

Landscape Visual Corridor Standards		
	Category	*Width*
1.	*Highway 99W*	*25 Feet*
2.	*Arterial*	*15 Feet*
3.	*Collector*	*10 Feet*

In residential developments where fences are typically desired adjoining the above described major street the corridor may be placed in the road right-of-way between the property line and *the sidewalk. In all other developments, the visual corridor shall be on private property adjacent to the right-of-way.*

Response: The proposed landscape design will provide a 15-foot-wide landscaped Visual Corridor along SW Tualatin-Sherwood Road and SW 124th Avenue (Attachment 6 Sheets L1.11 and L1.15). Both buffers are entirely located within the boundaries of the site. This criterion is met.

B. Landscape Materials

The required visual corridor areas shall be planted as specified by the review authority to provide a continuous visual and/or acoustical buffer between major streets and developed uses. Except as provided for above, fences and walls shall not be substituted for landscaping within the visual corridor. Uniformly planted, drought resistant street trees and ground cover, as specified in Section 16.142.060, shall be planted in the corridor by the developer. The improvements shall be included in the compliance agreement. In no case shall trees be removed from the required visual corridor.

Response: Tree, shrub, and groundcover species proposed within the Visual Corridor buffers have been selected and placed to comply with the standard cited above, as shown on Attachment 6, Sheets L1.11 and L1.15. No fences are proposed within the visual corridors, and the only proposed walls are retaining walls stemming from the site topography. This standard is met.

C. Establishment and Maintenance

Designated visual corridors shall be established as a portion of landscaping requirements pursuant to Chapter 16.92. To assure continuous maintenance of the visual corridors, the review authority may require that the development rights to the corridor areas be dedicated to the City or that restrictive covenants be recorded prior to the issuance of a building permit.

Response: The applicant acknowledges this standard. As of the date of this application, the City has not requested dedication of the Visual Corridors as public property. Ongoing maintenance of the Visual Corridors will be the responsibility of the property owners and building tenants. This standard is met.

D. Required Yard

Visual corridors may be established in required yards, except that where the required visual corridor width exceeds the required yard width, the visual corridor requirement shall take precedence. In no case shall buildings be sited within the required visual corridor, with the exception of front porches on townhomes, as permitted in Section 16.44.010(E)(4)(c).

Response: The required Visual Corridor widths along SW Tualatin-Sherwood Road and SW 124th Avenue (15 feet) are smaller than the corresponding minimum setbacks of the EI zone (20 feet). No proposed buildings are located within either Visual Corridor. This standard is met.

E. Pacific Highway 99W Visual Corridor

1. *Provide a landscape plan for the highway median paralleling the subject frontage. In order to assure continuity, appropriate plant materials and spacing, the plan shall be coordinated with the City Planning Department and ODOT.*
2. *Provide a visual corridor landscape plan with a variety of trees and shrubs. Fifty percent (50%) of the visual corridor plant materials shall consist of groupings of at least five (5) native evergreen trees a minimum of ten (10) feet in height each, spaced no less than fifty (50) feet apart, if feasible. Deciduous trees shall be a minimum of four (4) inches DBH and twelve (12) feet high, spaced no less than twenty-five (25) feet apart, if feasible.*

Response: The proposed development is not located along Pacific Highway 99W. This standard does not apply.

16.142.050 - Park Reservation

Areas designated on the Natural Resources and Recreation Plan Map, in Chapter 5 of the Community Development Plan, which have not been dedicated pursuant to Section 16.142.030 or 16.134.020, may be required to be reserved upon the recommendation of the City Parks Board, for purchase by the City within a period of time not to exceed three (3) years.

Response: The Comprehensive Plan's Natural Resources and Recreation Map does not include the subject site as the map pre-dates inclusion of the site within the urban growth boundary or city limits. More recent Metro data illustrates limited upland habitat along the southern portion of the property. However, as this site has previously been identified for industrial development, it would be inconsistent with the Comprehensive Plan for the City to purchase that portion of the site for park or recreation purposes. This standard is not applicable.

16.142.060 - Street Trees

A. Installation of Street Trees on New or Redeveloped Property.

Trees are required to be planted to the following specifications along public streets abutting or within any new development or re-development. Planting of such trees shall be a condition of development approval. The City shall be subject to the same standards for any developments involving City-owned property, or when constructing or reconstructing City streets. After installing street trees, the property owner shall be responsible for maintaining the street trees on the owner's property or within the right-of-way adjacent to the owner's property.

1. Location: Trees shall be planted within the planter strip along a newly created or improved streets. In the event that a planter strip is not required or available, the trees shall be planted on private property within the front yard setback area or within public street right-of-way between front property lines and street curb lines or as required by the City.

Response: As shown on Attachment 6, new street trees are proposed along the SW Tualatin-Sherwood Road and SW 124th Avenue frontages of the subject site, and along Cipole Place. Installation will occur either within new planter strips or behind the public sidewalk and within the front setback area. This standard is met.

2. Size: Trees shall have a minimum trunk diameter of two (2) caliper inches, which is measured six inches above the soil line, and a minimum height of six (6) feet when planted.

3. Types: Developments shall include a variety of street trees. The trees planted shall be chosen from those listed in 16.142.080 of this Code.

Response: Selected species of street trees are consistent with the adopted listed contained in Section 16.142.090, as shown on Attachment 6. Two-inch caliper street trees will be installed in conjunction with site development. These standards are met.

4. Required Street Trees and Spacing:

a. The minimum spacing is based on the maximum canopy spread identified in the recommended street tree list in section 16.142.080 with the intent of providing a continuous canopy without openings between the trees. For example, if a tree has a canopy of forty (40) feet, the spacing between trees is forty (40) feet. If the tree is not on the list, the mature canopy width must be provided to the planning department by a certified arborist.

Response: Selected street tree species have been spaced consistent with the specifications contained in Section 16.142.090, as shown on Attachment 6. This standard is met.

b. *All new developments shall provide adequate tree planting along all public streets. The number and spacing of trees shall be determined based on the type of tree and the spacing standards described in a. above and considering driveways, street light locations and utility connections. Unless exempt per c. below, trees shall not be spaced more than forty (40) feet apart in any development.*

c. *A new development may exceed the forty-foot spacing requirement under section b. above, under the following circumstances:*

(1) *Installing the tree would interfere with existing utility lines and no substitute tree is appropriate for the site; or*

(2) *There is not adequate space in which to plant a street tree due to driveway or street light locations, vision clearance or utility connections, provided the driveways, street light or utilities could not be reasonably located elsewhere so as to accommodate adequate room for street trees; and*

(3) *The street trees are spaced as close as possible given the site limitations in (1) and (2) above.*

(4) *The location of street trees in an ODOT or Washington County right-of-way may require approval, respectively, by ODOT or Washington County and are subject to the relevant state or county standards.*

(5) *For arterial and collector streets, the City may require planted medians in lieu of paved twelve-foot wide center turning lanes, planted with trees to the specifications of this subsection.*

Response: Proposed tree spacing along SW Tualatin-Sherwood Road, SW 124th Avenue, and future cul-de-sac SW Cipole Place is shown on Attachment 6 Sheets L1.10 and L1.13 at less than 40 feet on center. The applicant does not request any exceptions from that maximum spacing distance. Coordination with Washington County will determine the ultimate location and spacing of trees to be installed along SW Tualatin-Sherwood Road. Communications to date with City of Sherwood and Washington County staff have not indicated that planted medians are necessary or required along the site's SW Tualatin-Sherwood Road and SW 124th Avenue frontages. These standards are met.

B. *Removal and Replacement of Street Trees.*

Response: While some existing trees in areas to be dedicated as Tualatin-Sherwood Road right-of-way will be removed, there are no existing street trees proposed for removal with this application. Based on direction from City staff, the applicant understands that a separate street tree removal permit is not required because the removal of existing trees is being reviewed as part of the overall development. This standard does not apply.

C. *Homeowner's Association Authorization.*

The Planning Commission may approve a program for the adoption, administration and enforcement by a homeowners' association (HOA) of regulations for the removal and replacement of street trees within the geographic boundaries of the association.

1. *An HOA that seeks to adopt and administer a street tree program must submit an application to the City. The application must contain substantially the following information:*

a. *The HOA must be current and active. The HOA should meet at least quarterly and the application should include the minutes from official HOA Board meetings for* *a period not less than eighteen (18) months (six (6) quarters) prior to the date of the application.*

b. *The application must include proposed spacing standards for street trees that are substantially similar to the spacing standards set forth in 16.142.060.A above.*

c. *The application must include proposed street tree removal and replacement standards that are substantially similar to the standards set forth in 16.142.060.B above.*

d. *The application should include a copy of the HOA bylaws as amended to allow the HOA to exercise authority over street tree removal and replacement, or demonstrate that such an amendment is likely within ninety (90) days of a decision to approve the application.*

e. *The application should include the signatures of not less than seventy-five (75) percent of the homeowners in the HOA in support of the application.*

2. *An application for approval of a tree removal and replacement program under this section shall be reviewed by the City through the Type IV land use process. In order to approve the program, the City must determine:*

   a. *The HOA is current and active.*

   b. *The proposed street tree removal and replacement standards are substantially similar to the standards set forth in 16.142.060.B above.*

   c. *The proposed street tree spacing standards are substantially similar to the standards set forth in 16.142.060.A above.*

   d. *The HOA has authority under its bylaws to adopt, administer and enforce the program.*

   e. *The signatures of not less than seventy-five (75) percent of the homeowners in the HOA in support of the application.*

3. *A decision to approve an application under this section shall include at least the following conditions:*

   a. *Beginning on the first January 1 following approval and on January 1 every two (2) years thereafter, the HOA shall make a report to the city planning department that provides a summary and description of action taken by the HOA under the approved program. Failure to timely submit the report that is not cured within sixty (60) days shall result in the immediate termination of the program.*

   b. *The HOA shall comply with the requirements of Section 12.20 of the Sherwood Municipal Code.*

4. *The City retains the right to cancel the approved program at any time for failure to substantially comply with the approved standards or otherwise comply with the conditions of approval.*

   a. *If an HOA tree removal program is canceled, future tree removals shall be subject to the provisions of section 16.142.060.*

   b. *A decision by the City to terminate an approved street tree program shall not affect the validity of any decisions made by the HOA under the approved program that become final prior to the date the program is terminated.*

   c. *If the city amends the spacing standards or the removal and replacement standards in this section (SZCDC 16.142.060) the City may require that the HOA amend the corresponding standards in the approved street tree program.*

5. *An approved HOA tree removal and replacement program shall be valid for five (5) years; however the authorization may be extended as approved by the City, through a Type II Land Use Review.*

Response: The applicant is not seeking to implement a Homeowners Association for the proposed corporate park. This standard does not apply.

D. Exemption from Replacing Street Trees.

A street tree that was planted in compliance with the Code in effect on the date planted and no longer required by spacing standards of section A.4. above may be removed without replacement provided:

1. *Exemption is granted at the time of street tree removal permit or authorized homeowner's association removal per Section 16.142.060.C. above.*
2. *The property owner provides a letter from a certified arborist stating that the tree must be removed due to a reason identified in the tree removal criteria listed in Section 16.142.060.B.1. above, and*
3. *The letter describes why the tree cannot be replaced without causing continued or additional damage to public or private utilities that could not be prevented through reasonable maintenance.*

Response: While the applicant is proposing to remove some trees from the abutting road rights-of-way, these trees are not intentionally-planted street trees . Therefore, the applicant is not proposing to remove street trees, so no replacement is required. These standards are not applicable.

E. Notwithstanding any other provision in this section, the city manager or the manager's designee may authorize the removal of a street tree in an emergency situation without a tree removal permit when the tree poses an immediate threat to life, property or utilities. A decision to remove a street tree under this section is subject to review only as provided in ORS 34.100.

Response: No intentionally-planted street trees currently exist within the public right-of-way, therefore the application will not seek the removal of street trees. . This standard does not apply.

F. Trees on Private Property Causing Damage.

Any tree, woodland or any other vegetation located on private property, regardless of species or size, that interferes with or damages public streets or utilities, or causes an unwarranted increase in the maintenance costs of same, may be ordered removed or cut by the City Manager or his or her designee. Any order for the removal or cutting of such trees, woodlands or other vegetation, shall be made and reviewed under the applicable City nuisance abatement ordinances.

Response: The proposed development will not seek the authorization for tree removal under this provision. This standard does not apply.

G. Penalties.

The abuse, destruction, defacing, cutting, removal, mutilation or other misuse of any tree planted on public property or along a public street as per this Section, shall be subject to the penalties defined by Section 16.02.040, and other penalties defined by applicable ordinances and statutes, provided that each tree so abused shall be deemed a separate offense.

Response: Per the arborist report (Attachment 18) and Sensitivity Plans (Attachment 6 Sheets C7.0-C7.5), several trees have been documented within the public right-of-way. However, these trees were not intentionally planted to be street trees. As the applicant is seeking City authorization prior to removal, no penalties are appropriate. This standard does not apply.

16.142.070 - Trees on Property Subject to Certain Land Use Applications

A. Generally

The purpose of this Section is to establish processes and standards which will minimize cutting or destruction of trees and woodlands within the City. This Section is intended to help protect the scenic beauty of the City; to retain a livable environment through the beneficial effect of trees on *air pollution, heat and glare, sound, water quality, and surface water and erosion control; to encourage the retention and planting of tree species native to the Willamette Valley and Western Oregon; to provide an attractive visual contrast to the urban environment, and to sustain a wide variety and distribution of viable trees and woodlands in the community over time.*

B. Applicability

All applications including a Type II - IV land use review, shall be required to preserve trees or woodlands, as defined by this Section to the maximum extent feasible within the context of the proposed land use plan and relative to other codes, policies, and standards of the City Comprehensive Plan.

Response: The Site Plan Review and Conditional Use requests presented through this application are subject to the standards addressed below.

C. Inventory

1. To assist the City in making its determinations on the retention of trees and woodlands, land use applications including Type II - IV development shall include a tree and woodland inventory and report. The report shall be prepared by a qualified professional and must contain the following information:

a. Tree size (in DBH and canopy area)

b. Tree species

c. The condition of the tree with notes as applicable explaining the assessment

d. The location of the tree on the site

e. The location of the tree relative to the planned improvements

f. Assessment of whether the tree must be removed to accommodate the development

g. Recommendations on measures that must be taken to preserve trees during the construction that are not proposed to be removed.

2. In addition to the general requirements of this Section, the tree and woodland inventory's mapping and report shall also include, but is not limited to, the specific information outlined in the appropriate land use application materials packet.

3. Definitions for the inventory purposes of this Section

a. A tree is a living woody plant having a trunk diameter as specified below at Diameter at Breast Height (DBH). Trees planted for commercial agricultural purposes, and/or those subject to farm forest deferral, such as nut and fruit orchards and Christmas tree farms, are excluded from this definition and from regulation under this Section, as are any living woody plants under six (6) inches at DBH. All trees six (6) inches or greater shall be inventoried.

b. A woodland is a biological community dominated by trees covering a land area of 20,000 square feet or greater at a density of at least fifty (50) trees per every 20,000 square feet with at least fifty percent (50%) of those trees of any species having a six (6) inches or greater at DBH. Woodlands planted for commercial agricultural purposes and/or subject to farm forest deferral, such as nut and fruit orchards and Christmas tree farms, are excluded from this definition, and from regulation under this Section.

c. A large stature tree is over 20 feet tall and wide with a minimum trunk diameter of 30 inches at DBH.

Response: The site has considerable tree coverage, as illustrated on Sheets C2.0 and C7.0-C7.6 in Attachment 6. The project surveyor and arborist identified the extents of the tree canopy and inventoried the majority of the trees. The submitted tree inventory and arborist report (Attachment 18) provide information on the location, species, size, canopy, and condition of existing trees located within the boundaries of the site, as well as trees located along the site's SW Tualatin-Sherwood Road and SW 124th Avenue frontages (Attachment 6). Some of the trees within the interior of the site were not individually inventoried, as they are located in areas where the buildings, parking areas, and truck courts are proposed so the trees will be removed to accommodate the proposed industrial development. The intent of this standard is met.

D. Retention requirements

1. Trees may be considered for removal to accommodate the development including buildings, parking, walkways, grading etc., provided the development satisfies of D.2 or D.3, below.

Response: The applicant proposes to remove those trees in areas where the buildings, parking areas, and truck courts are proposed and trees where grading along the site perimeter is proposed. However, as shown on Attachment 6, 502 new trees are proposed for installation throughout the site, and 505 trees are proposed to be preserved. Findings in response to items "D.2" and "D.3" are presented below. This standard is met.

2. Required Tree Canopy - Residential Developments (Single Family Attached, Single Family Detached and Two - Family)

Each net development site shall provide a variety of trees to achieve a minimum total tree canopy of 40 percent. The canopy percentage is based on the expected mature canopy of each tree by using the equation πr 2 to calculate the expected square footage of canopy for each tree. The expected mature canopy is counted for each tree regardless of an overlap of multiple tree canopies.

The canopy requirement can be achieved by retaining existing trees or planting new trees. Required street trees can be used toward the total on site canopy required to meet this standard. The expected mature canopy spread of the new trees will be counted toward the needed canopy cover. A certified arborist or other qualified professional shall provide the estimated tree canopy of the proposed trees to the planning department for review.

Response: The subject proposal does not include residential development. This standard is not applicable.

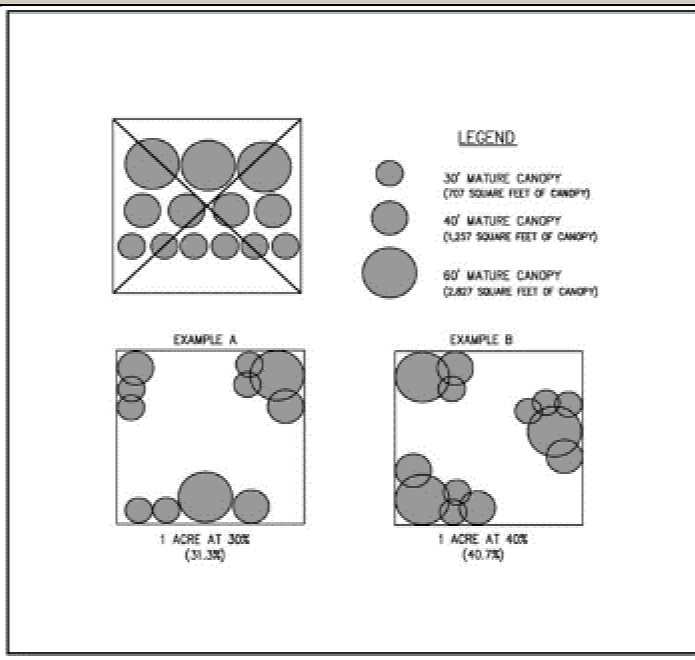
3. Required Tree Canopy - Non-Residential and Multi-family Developments

Each net development site shall provide a variety of trees to achieve a minimum total tree canopy of 30 percent. The canopy percentage is based on the expected mature canopy of each tree by using the equation πr 2 to calculate the expected square footage of each tree. The expected mature canopy is counted for each tree even if there is an overlap of multiple tree canopies.

The canopy requirement can be achieved by retaining existing trees or planting new trees. Required landscaping trees can be used toward the total on site canopy required to meet this standard. The expected mature canopy spread of the new trees will be counted toward the required canopy cover. A certified arborist or other qualified professional shall provide an estimated tree canopy for all proposed trees to the planning department for review as a part of the land use review process.

16.142.070 - Required Tree Canopy			
	Residential (single family & two-family developments)	***Old Town & Infill developments***	***Commercial, Industrial, Institutional Public and Multi-family***

Canopy Requirement	*40%*	*N/A*	*30%*
Counted Toward the Canopy Requirement			
Street trees included in canopy requirement	*Yes*	*N/A*	*No*
Landscaping requirements included in canopy requirement	*N/A*	*N/A*	*Yes*
Existing trees onsite	*Yes* *x2*	*N/A*	*Yes* *x2*
Planting new trees onsite	*Yes*	*N/A*	*Yes*
Mature Canopy in Square Feet Equation πr^2 or ($3.14159 * radius^2$) (This is the calculation to measure the square footage of a circle.) The Mature Canopy is given in diameter. In gardening and horticulture reference books, therefore to get the radius you must divide the diameter in half.			
Canopy Calculation Example: Pin Oak *Mature canopy = 35'* *($3.14159 * 17.5^2$) = 962 square feet*			



Response: As shown on Attachment 6, landscaping plans proposed for the T-S Corporate Park and portions of the site to be developed with warehouse, distribution, and light industrial uses will achieve a tree canopy coverage of 23 percent of the net site area through installation of 502 new deciduous and evergreen trees. These percentages are based on the calculated mature canopy of each selected tree species, as determined through use of the equation stipulated above. These coverages comply with Section 16.142.070.D.3 and, by rule, will effectively mitigate the site's existing tree canopy. Furthermore, as evidenced in the arborist report (Attachment 18), the 505 existing trees being retained will provide mature canopy of approximately 60.8 percent of the net site area. Combined, the existing and proposed trees will provide a canopy of 83.8 percent, which far exceeds the 30% requirement. This standard is met.

4. *The City may determine that, regardless of D.1 through D.3, that certain trees or woodlands may be required to be retained. The basis for such a decision shall include; specific findings that retention of said trees or woodlands furthers the purposes and goals of this Section, is feasible and practical both within the context of the proposed land use plan and relative to other policies and standards of the City Comprehensive Plan, and are:*
   a. *Within a Significant Natural Area, 100-year floodplain, City greenway, jurisdictional wetland or other existing or future public park or natural area designated by the City Comprehensive Plan, or*
   b. *A landscape or natural feature as per applicable policies of the City Comprehensive Plan, or are necessary to keep other identified trees or woodlands on or near the site from being damaged or destroyed due to windfall, erosion, disease or other natural processes, or*
   c. *Necessary for soil stability and the control of erosion, for managing and preserving surface or groundwater quantities or quality, or for the maintenance of a natural drainageway, as per Clean Water Services stormwater management plans and standards of the City Comprehensive Plan, or*
   d. *Necessary in required buffers between otherwise incompatible land uses, or from natural areas, wetlands and greenways, or*
   e. *Otherwise merit retention because of unusual size, size of the tree stand, historic association or species type, habitat or wildlife preservation considerations, or some combination thereof, as determined by the City.*

Response: Additional tree preservation standards beyond D.1 through D.3 are not merited as they would hinder the development of the site in contravention with the City's economic development objectives. Furthermore, since the proposed mature canopy of 60.8% far exceeds the 30% minimum standard for industrial development, the applicant is already performing significant tree retention and planting for an industrial development. The trees proposed for removal from the site are not located within a 100-year floodplain, City greenway, jurisdictional wetland, or existing or planned public park.[5] The arborist report (Attachment 18) provides specific recommendations on how to best maintain the quality and prevent damage to the 505 existing trees that will remain on site. New deciduous and evergreen trees will provide buffering and screening of the site from nearby areas. The applicant is not aware of any unique species, historic, or habitat considerations that would merit preservation of trees proposed for removal. This standard does not apply.

5. *Tree retention requirements for properties located within the Old Town Overlay or projects subject to the infill standards of Chapter 16.68 are only subject to retention requirements identified in D.4. above.*

Response: The subject site is not located within the Old Town Overlay. This standard is not applicable.

6. *The Notice of Decision issued for the land use applications subject to this Section shall indicate which trees and woodlands will be retained as per subsection D of this Section,*

[5] The term *Significant Natural Area*, as used in this section, is not defined.

which may be removed or shall be retained as per subsection D of this Section and any limitations or conditions attached thereto.

Response: The applicant requests that the Notice of Decision enumerate tree preservation and removal as proposed in the attached drawings and arborist report. This standard is met.

7. *All trees, woodlands, and vegetation located on any private property accepted for dedication to the City for public parks and open space, greenways, Significant Natural Areas, wetlands, floodplains, or for storm water management or for other purposes, as a condition of a land use approval, shall be retained outright, irrespective of size, species, condition or other factors. Removal of any such trees, woodlands, and vegetation prior to actual dedication of the property to the City shall be cause for reconsideration of the land use plan approval.*

Response: The applicant proposes to retain some of the trees in the proposed tracts depicted in Attachment 6, Sheet C8.0. If any of these tracts are dedicated to the City, then trees will be retained to the extent that they do not interfere with utility installation. This standard is met.

E. *Tree Preservation Incentive*

Retention of existing native trees on site which are in good health can be used to achieve the required mature canopy requirement of the development. The expected mature canopy can be calculated twice for existing trees. For example, if one existing tree with an expected mature canopy of 10 feet (78.5 square feet) is retained it will count as twice the existing canopy (157 square feet).

Response: As detailed in the arborist report (Attachment 18), the expected mature canopy has been calculated for existing trees proposed to remain on site. This standard is met.

F. *Additional Preservation Incentives*

1. *General Provisions. To assist in the preservation of trees, the City may apply one or more of the following flexible standards as part of the land use review approval. To the extent that the standards in this section conflict with the standards in other sections of this Title, the standards in this section shall apply except in cases where the City determines there would be an unreasonable risk to public health, safety, or welfare. Flexibility shall be requested by the applicant with justification provided within the tree preservation and protection report as part of the land use review process and is only applicable to trees that are eligible for credit towards the effective tree canopy cover of the site. A separate adjustment application as outlined in Section 16.84.030.A is not required.*
2. *Flexible Development Standards. The following flexible standards are available to applicants in order to preserve trees on a development site. These standards cannot be combined with any other reductions authorized by this code.*
   a. *Lot size averaging. To preserve existing trees in the development plan for any Land Division under Division VII, lot size may be averaged to allow lots less than the minimum lot size required in the underlying zone as long as the average lot area is not less than that allowed by the underlying zone. No lot area shall be less than 80 percent of the minimum lot size allowed in the zone;*
   b. *Setbacks. The following setback reductions will be allowed for lots preserving existing trees using the criteria in subsection (1) below. The following reductions shall be limited to the minimum reduction necessary to protect the tree.*
      (1) *Reductions allowed:*
         (a.) *Front yard - up to a 25 percent reduction of the dimensional standard for a front yard setback required in the base zone. Setback of garages may not be reduced by this provision.*

(b.) Interior setbacks - up to a 40 percent reduction of the dimensional standards for an interior side and/or rear yard setback required in the base zone.

(c.) Perimeter side and rear yard setbacks shall not be reduced through this provision.

c. Approval criteria:

(1.) A demonstration that the reduction requested is the least required to preserve trees; and

(2.) The reduction will result in the preservation of tree canopy on the lot with the modified setbacks; and

(3.) The reduction will not impede adequate emergency access to the site and structure.

Response: The applicant is not requesting to rely on any of the incentives described above. These standards are not applicable.

3. Sidewalks. Location of a public sidewalk may be flexible in order to preserve existing trees or to plant new large stature street trees. This flexibility may be accomplished through a curb-tight sidewalk or a meandering public sidewalk easement recorded over private property and shall be reviewed on a case by case basis in accordance with the provisions of the Engineering Design Manual, Street and Utility Improvement Standards. For preservation, this flexibility shall be the minimum required to achieve the desired effect. For planting, preference shall be given to retaining the planter strip and separation between the curb and sidewalk wherever practicable. If a preserved tree is to be utilized as a street tree, it must meet the criteria found in the Street Tree section, 16.142.060.

Response: The applicant is not seeking flexibility from tree preservation and planting requirements in order to construct new sidewalks. This standard is not applicable.

4. Adjustments to Commercial and Industrial development Standards. Adjustments to Commercial or Industrial Development standards of up to 20 feet additional building height are permitted provided;

a. At least 50% of a Significant Tree stand's of canopy within a development site (and not also within the sensitive lands or areas that areas dedicated to the City) is preserved;

b. The project arborist or qualified professional certifies the preservation is such that the connectivity and viability of the remaining significant tree stand is maximized;

c. Applicable buffering and screening requirements are met;

d. Any height adjustments comply with state building codes;

e. Significant tree stands are protected through an instrument or action subject to approval by the City Manager or the City manager's designee that demonstrates it will be permanently preserved and managed as such;

(1.) A conservation easement;

(2.) An open space tract;

(3.) A deed restriction; or

(4.) Through dedication and acceptance by the City.

Response: The applicant will not be requesting any adjustments to the EI zone development standards in order to preserve additional existing trees. These standards are not applicable.

G. Tree Protection During Development

The applicant shall prepare and submit a final Tree and Woodland Plan prior to issuance of any construction permits, illustrating how identified trees and woodlands will be retained, removed or *protected as per the Notice of Decision. Such plan shall specify how trees and woodlands will be protected from damage or destruction by construction activities, including protective fencing, selective pruning and root treatments, excavation techniques, temporary drainage systems, and like methods. At a minimum, trees to be protected shall have the area within the drip line of the tree protected from grading, stockpiling, and all other construction related activity unless specifically reviewed and recommended by a certified arborist or other qualified professional. Any work within the dripline of the tree shall be supervised by the project arborist or other qualified professional onsite during construction.*

Response: The trees to be retained on site are located within the wetland mitigation areas, tract A and D and along the west and south site perimeter. Tree protection within this area is shown on Sheets C7.0-C7.2 in Attachment 6. This standard is met.

H. Penalties

Violations of this Section shall be subject to the penalties defined by Section 16.02.040, provided that each designated tree or woodland unlawfully removed or cut shall be deemed a separate offense.

Response: The applicant is proposing tree removal and retention in accordance with the approval criteria in this section. This standard does not apply.

16.142.090 - Recommended Street Trees

A. Recommended Street Trees:

16.142.090 – Recommended Street Trees		
Common Name	***Botanical Name***	***Canopy Spread (feet)***
Acer - Maple		
Cavalier Norway Maple	*Acer platanoides cavalier*	
Cleveland Norway Maple	*p. Cleveland*	*30*
Cleveland II Norway Maple	*p. Cleveland*	*25*
Columnar Norway Maple	*p. columnare*	*15*
Fairway Sugar Maple (sugar maple)	*p. fairway*	*40*
Olmsted Norway Maple	*p. olmsted*	*20-25*
Roughbark Maple	*Acer triflorum*	*20*
Trident Maple	*Acer buergeranum*	*20*
Rocky Mountain Glow Maple	*Acer grandidentatum 'Schmidt'*	*15*
David's Maple	*Acer davidii*	*20*
Metro Gold Hedge Maple	*Acer campestre 'Panacek'*	*25*
Red Sunset Maple (Old Town)	*Acer rubrum red sunset - Red Sunset Maple (Old Town) (Provided that a root barrier is installed)*	*25-40*
Royal Red Maple	*r. royal red*	*20-25*
Gerling Red Maple	*r. gerling*	*25-35*
Tilford Red Maple	*r. tilford*	*30*

16.142.090 – Recommended Street Trees		
Common Name	**Botanical Name**	**Canopy Spread (feet)**
Carpinus - Hornbeam		
Pyramidal European Hornbeam	Carpinus betulus pyramidalis	30-40
Pyramidal European Hornbeam	b. columnaris	15
Pyramidal European Hornbeam	b. fastigiata	15-20
Pyramidal European Hornbeam	b. fastigiata	15-20
Eastern Redbud	Cercic, canadenis - Canadian Red Bud	10-20
Fraxinus - Ash		
Dr. Pirone Ash	augustifolia dr. pirone	35-50
Raywood Ash	raywoodi	20
Oregon Ash	latifolia	25-40
Ginkgo		
Autumn Gold	biloba	25-35
Fairmount	biloba	15-25
Gleditsia		
Honey Locust	triacanthos sunburst	20-30
Liquidamber		
American Sweetgum	styraciflua	40
Liriodenrod		30-50
Magnolia		
Evergreen Magnolia	grandiflora vars	
Southern Magnolia	grandiflora	40
Dr. Merrill Magnolia	kobus dr. merrill	15-20
Edith Bogue Magnolia	Magnolia grandiflora 'Edith Bogue'	15
Purnus - Cherry - Plum		
Double Flowering Cherry	avium plena	30-40
Scanlon Globe Cherry	avium scanlon	30-40
Japanese Cherry	serrulata vars (nonweeping)	15-30
Okame Cherry	okame	20-30
Blireana Plum	blireana	20
Pissardi Plum	pissardi	10
Krauter's Vesuvius Plum	Vesuvius	15
Amur Chokecherry	maacki	25-30
Redbark Cherry	serrula	20-30
European Birdcherry	padus	35
Bigflowered Birdcherry	grandiflora	10-20
Rancho Birdcherry	berg	15-20
Purpleleaf Birdcherry	purpurea	10-20
Prairifire Crabapple	Malus 'Prairifire'	20
Quercus		
Crimson Spire Oak	Quercus alba x Q. robur 'Crimschmidt'	15

16.142.090 – Recommended Street Trees		
Common Name	**Botanical Name**	**Canopy Spread (feet)**
Pin Oak	*palustris*	*35-40*
Tilia - Linden		
American Linden	*americana*	*35-40*
Little Leaf Linden	*cordata*	*40*
Crimean Linden	*euchlora*	*20-30*
Silver Linden	*tomentosa*	*40*
Bicentennial Linden	*bicentennial*	*30*
Greenspire Linden	*greenspire*	*20*
Salem Linden	*salem*	*20-30*
Chancellor Linden	*Tiliacordata 'Chancole'*	*20*

B. Recommended Street Trees under Power Lines:
Acer ginnala — Amur Maple 20' spread
Acer campestre — Hedge Maple 30' spread
Acer palmatum — Japanese Maple 25' spread
Acer griseum — Paperbark Maple 20' spread
Acer circinatum — Vine Maple 25' spread
Amelanchier x grandiflora — Apple Serviceberry 20' spread
Amelanchier Canadensis — Shadblow Serviceberry 20' spread
Cercis Canadensis — Eastern Redbud 25-30' spread
Clerodendrum trichotomum — Glorybower Tree 20' spread
Cornus florida — Flowering Dogwood 20-25' spread
Cornus kousa — Japanese Dogwood 25' spread
Crataegus phaenopyrum — Washington Hawthorn 25' spread
Crataegus x lavellei — Lavelle Hawthorn 20' spread
Fraxinus excelsior globosum — Globe-Headed European Ash 12-15' spread
Fraxinus ornus — Flowering Ash 20-30' spread
Fraxinus oxycarpa aureopolia — Golden Desert Ash 18' spread
Koelreuteria paniculata — Goldenrain Tree 10-20' spread
Laburnum x waterii — Golden Chain Tree 15' spread
Malus — Flowering Crabapple 20-25' spread
Prunus — Flowering Cherry 20-25' spread
Pyrus calleryana — Flowering Pear "Cleveland Select" 20' spread
Styrax japonica — Japanese Snowbell 25' spread
Syringa reticulata — Japanese Tree Lilac 20-25' spread

C. Prohibited Street Trees:
Acer, Silver Maple
Acer, Boxelder
Ailanthus, gladulosa - Tree-of-heaven
Betula; common varieties of Birch
Ulmus; common varieties of Elm
Morus; common varieties of Mulberry
Salix; common varieties of willow
Coniferous Evergreen (Fir, Pine, Cedar, etc.)
Populus; common varieties of poplar, cottonwood and aspen
Female Ginkgo

D. *Alternative Street Trees: Trees that are similar to those on the recommended street tree list can be proposed provided that they are non-fruit bearing, non-invasive and not listed on the prohibited street tree list. A letter from a certified arborist must be submitted, explaining why the tree is an equivalent or better street tree than the recommended street trees that are identified in this section.*

Response: The landscape plans (Attachment 6, Sheets L0.02 and L1.10 -L1.13) propose street trees in compliance with the recommended trees noted above. This standard is met.

Chapter 16.144 - Wetland, Habitat and Natural Areas

16.144.010 - Generally

Unless otherwise permitted, residential, commercial, industrial, and institutional uses in the City shall comply with the following wetland, habitat and natural area standards if applicable to the site as identified on the City's Wetland Inventory, the Comprehensive Plan Natural Resource Inventory, the Regionally Significant Fish and Wildlife Habitat Area map adopted by Metro, and by reference into this Code and the Comprehensive Plan. Where the applicability of a standard overlaps, the more stringent regulation shall apply.

Response: The Comprehensive Plan's Natural Resources and Recreation Map does not include the subject site as the map pre-dates inclusion of the site within the urban growth boundary or city limits. Three wetland areas, totaling approximately 3.66 acres, have been identified within the boundaries of the site and documented in the Wetland Delineation Report (Attachment 14) and the Natural Resource Assessment Report (Attachment 15). Per Metro's Regionally Significant Fish and Wildlife Habitat Area GIS data, Upland Class B habitat has been identified on the southern portion of the site (see Figure 2). However, based on Metro's *Habitat Conservation Areas Map*, the site property does not contain any land areas designated by Metro as Habitat Conservation Areas. See Figure 3.

Figure 2: Metro Regionally Significant Fish and Wildlife Habitat Area

Figure 3: Metro Habitat Conservation Areas

The proposed development has been designed to reduce the impact of the delineated wetlands and protect a significant portion of the upland habitat, preserving the ecological integrity of the area, as illustrated in the code responses hereafter.

16.144.020 - Standards

A. *The applicant shall identify and describe the significance and functional value of wetlands on the site and protect those wetlands from adverse effects of the development. A facility complies with this standard if it complies with the criteria of subsections A.1.a and A.1.b, below:*

1. *The facility will not reduce the area of wetlands on the site, and development will be separated from such wetlands by an area determined by the Clean Water Services Design and Construction Standards R&O 00-7 or its replacement provided Section 16.140.090 does not require more than the requested setback.*
   a. *A natural condition such as topography, soil, vegetation or other feature isolates the area of development from the wetland.*
   b. *Impact mitigation measures will be designed, implemented, and monitored to provide effective protection against harm to the wetland from sedimentation, erosion, loss of surface or ground water supply, or physical trespass.*
   c. *A lesser setback complies with federal and state permits, or standards that will apply to state and federal permits, if required.*
2. *If existing wetlands are proposed to be eliminated by the facility, the applicant shall demonstrate that the project can, and will develop or enhance an area of wetland on the site or in the same drainage basin that is at least equal to the area and functional value of wetlands eliminated.*

Response: Three wetlands have been identified within the boundaries of the site. Per the Pacific Habitat Services Natural Resource Assessment Report (Attachment 15), Wetland A, approximately 2.34 acres, is a broad seasonal swale that extends the northward to SW Tualatin-Sherwood Road in the northeastern portion of the site, while Wetland B is a small concave wetland on a gentle slope in the now fallow field of Wetland A. Slopes are generally quite gentle across the north end of the site but increase to the south. Wetland C is an approximate 1.29-acre depressional feature at the south end of the site that extends outside property boundaries with relatively steep slopes on the west and east sides. The northern edge is comparatively low in elevation, but topography rises several feet just to the north. In compliance with Clean Water Services Design and Construction Standards R&0 00-7 provisions, Pacific Habitat Services identified vegetated corridors (VCs) based on wetland size and the slopes adjacent to the sensitive areas, as summarized in the following table.

Summary of Vegetated Corridor Widths		
Sensitive Area	**VC Width**	**Justification**
Wetland A	50 feet	▪ >0.5 acres ▪ Slopes
Wetland B	25 feet	▪ ≤0.5 acres and isolated ▪ Slopes <25%
Wetland C	50 feet or greater	▪ >0.5 acres ▪ Slopes variable; > and 25%

No impacts or alterations are proposed to the wetlands on site. Approximately 10,699 SF of permanent VC encroachment will result from site development (Attachment 15, Figures 4-4C); to facilitate site development (e.g., roadway construction and grading). Individual encroachments are associated with Cipole Place, the site driveway to Building E, steep bank slopes southwest of Building D, and a driveway behind (south of) Building C.

The total area of permanent encroachment also includes 100 SF associated with each of three separate rip rap stilling basins related to the site's stormwater outfalls. As each is a minor encroachment associated with utility infrastructure, and not more than 100 SF in size, replacement mitigation is not necessary (per current CWS D&C Standards, Chapter 3, Section 3.05.5c and d).

Temporary encroachments will be limited to a trio of stormwater outfall lines that lead to riprap stilling basins; one each to the west and east sides of Wetland A, just south of Tualatin-Sherwood Road, and one at the south end of Wetland A. The alignments of associated pipelines have been sited to facilitate proper drainage. The installation of these pipelines will require a combined area of temporary encroachment of 4,917 SF. The footprint of temporary encroachment is defined by a 20-foot wide construction corridor centered roughly along the proposed pipe alignments. Each of the three rip rap pads for the storm outfalls will require permanent encroachment of 100 SF, as described above.

VC encroachment of 10,699 SF for site development will be mitigated through the expansion of an equivalent area of VC east of Wetland A, north of Wetland B, and north of Wetland C (Attachment 15, Figures 4-4C). Though mitigation is not required for the 300 SF of rip rap stilling basins, mitigation will nonetheless be provided. In total, 35,654 SF of VC mitigation will be provided outside of the wetland and required VC. This includes a 1 to 1 replacement for proposed encroachments, as well as an additional 24,955 SF of mitigation; proposed as a water quality benefit to the project. VC expansion will occur within five individual areas. The largest is located east of Wetland A, with smaller areas west of Wetland A, north and south of stormwater Tract C. Two additional areas will expand existing VC north of Wetland C closer to the south end of the development footprint. Proposed expansions will widen existing VC by up to 85 feet. As enhancements will be required throughout the first 50 feet of existing VC, strengthening of the proposed mitigation and water quality benefit expansion areas will occur concurrently with other invasive species control and plant installation improvements. Pacific Habitat Services has submitted the Natural Resource Assessment report (Attachment 15) to Clean Water Services for its review. The applicant has revised the site design per Clean Water Services request before CWS would issue its service provider letter, enclosed as Attachment 19. With the concurrence of Clean Water Services, this standard is met.

B. The applicant shall provide appropriate plans and text that identify and describe the significance and functional value of natural features on the site (if identified in the Community Development Plan, Part 2) and protect those features from impacts of the development or mitigate adverse effects that will occur. A facility complies with this standard if:

1. The site does not contain an endangered or threatened plant or animal species or a critical habitat for such species identified by Federal or State government (and does not contain significant natural features identified in the Community Development Plan, Part 2, Natural Resources and Recreation Plan).

2. The facility will comply with applicable requirements of the zone.

3. The applicant will excavate and store topsoil separate from subsurface soil, and shall replace the topsoil over disturbed areas of the site not covered by buildings or pavement or provide other appropriate medium for re-vegetation of those areas, such as yard debris compost.

4. The applicant will retain significant vegetation in areas that will not be covered by buildings or pavement or disturbed by excavation for the facility; will replant areas disturbed by the development and not covered by buildings or pavement with native species vegetation unless other vegetation is needed to buffer the facility; will protect disturbed areas and adjoining habitat from potential erosion until replanted vegetation is established; and will provide a plan or plans identifying each area and its proposed use.

5. Development associated with the facility will be set back from the edge of a significant natural area by an area determined by the Clean Water Services Design and Construction standards R&O 00-7 or its replacement, provided Section 16.140.090A does not require more than the requested setback. Lack of adverse effect can be demonstrated by showing the same sort of evidence as in subsection A.1 above.

Response: The applicant is unaware of any endangered or threatened plant or animal species or critical habitat within the development site, and the site does not contain notable natural features as illustrated in the Community Development Plan, Part 2, Natural Resource and Recreation Plan. The site was recently annexed into the City of Sherwood from Washington County and was not accounted for within the Community Development Plan Natural Resource and Recreation Map (see Figure 2, above). Due to the existing conditions of the site a Wetland Delineation Report (Attachment 14) and Natural Resource Assessment (Attachment 15) were prepared as part of this application. The proposed five-building facility has been designed to comply with applicable zoning standards and erosion and sedimentation control measures promulgated by the City, Clean Water Services, and the Oregon Department of Environmental Quality. The applicant proposes to minimize impact to the delineated wetlands by completely avoiding encroachments into the wetlands and by utilizing vegetated corridor and replanting mitigation as described in section 16.144.020.A and approved by Clean Water Services (Attachment 19). This standard is met.

C. *When the Regionally Significant Fish and Wildlife Habitat map indicates there are resources on the site or within 50 feet of the site, the applicant shall provide plans that show the location of resources on the property. If resources are determined to be located on the property, the plans shall show the value of environmentally sensitive areas using the methodologies described in Sections 1 and 2 below.*

The Metro Regionally Significant Fish and Wildlife Habitat map shall be the basis for determining the location and value of environmentally sensitive habitat areas. In order to specify the exact locations on site, the following methodology shall be used to determine the appropriate boundaries and habitat values:

1. *Verifying boundaries of inventoried riparian habitat. Locating habitat and determining its riparian habitat class is a four-step process:*
   a. *Located the Water Feature that is the basis for identifying riparian habitat.*
      1. *Locate the top of bank of all streams, rivers, and open water within 200 feet of the property.*
      2. *Locate all flood areas within 100 feet of the property.*
      3. *Locate all wetlands within 150 feet of the property based on the Local Wetland Inventory map and on the Metro 2002 Wetland Inventory map (available from the Metro Data Resource Center, 600 NE Grand Ave., Portland, OR 97232). Identified wetlands shall be further delineated consistent with methods currently accepted by the Oregon Division of State Lands and the US Army Corps of Engineers.*

   Response: Riparian habitat or wetlands are not identified on-site per Metro's Regional Land Information GIS Map, the current documentation of *Regionally Significant Fish and Wildlife Habitat* information (see Figure 2, above). Riparian habitat exists approximately 750 feet south of the site, well beyond the identification thresholds listed above. However, identified wetlands were further delineated by Pacific Habitat Services in accordance with the methods currently accepted by the Oregon Division of State Lands and the US Army Corps of Engineers (Attachment 14). Based on Metro's *Habitat Conservation Areas Map* (Figure 3, above), the site property does not contain any land areas designated by Metro as Habitat Conservation Areas. This standard is met.

   b. *Identify the vegetative cover status of all areas on the property that are within 200 feet of the top of bank of streams, rivers, and open water, are wetlands or are within 150 feet of wetlands, and are flood areas or are within 100 feet of flood areas. Vegetative cover status shall be as identified on the Metro Vegetative Cover map. In the event of a discrepancy between the Metro Vegetative Cover map and the existing site conditions, document the actual vegetative cover based on the following definitions along with a 2002 aerial photograph of the property;*
      1. *Low structure vegetation or open soils — Areas that are part of a contiguous area one acre or larger of grass, meadow, crop-lands, or areas of open soils located within 300 feet of a surface stream (low structure vegetation areas may include areas of shrub vegetation less than one acre in size if they are contiguous with areas of grass, meadow, crop-lands, orchards, Christmas tree farms, holly farms, or areas of open soils located within 300 feet of a surface stream and together form an area of one acre in size or larger).*
      2. *Woody vegetation — Areas that are part of a contiguous area one acre or larger of shrub or open or scattered forest canopy (less than 60% crown-closure) located within 300 feet of a surface stream.*

3. *Forest canopy — Areas that are part of a contiguous grove of trees of one acre or larger in area with approximately 60% or greater crown closure, irrespective of whether the entire grove is within 200 feet of the relevant water feature.*

Response: Figure 4below illustrates the documented vegetation types throughout the development area, per Metro's GIS Vegetation data. Per the Pacific Habitat Services Natural Resource Assessment (Attachment 15), a summary of plant communities adjacent to the associated delineated wetlands has been prepared.

Figure 4: Metro Vegetative Cover

Summary of Plant Communities				
Corridor Conditions		Plant Communities		
		A	B	C
Good	>80% cover of native plants, and >50% tree canopy		82% native plants 83% tree canopy	52% tree canopy
Marginal	50% - 80% cover of native plants, and 26-50% tree canopy			

Degraded	<50% cover of native plants, and ≤ 25% tree canopy	3% native plants 6% tree canopy		27% native plants

The condition of VC is defined by the percentages of native species and canopy cover. Plant Community A is in degraded corridor condition, as the community lacks adequate tree canopy and is overwhelmingly dominated by non-native herbaceous species. Plant Community B has both a good native tree canopy and a high overall coverage of native species. As such, this community is in good corridor condition. Plant Community C is comprised of only 27 percent native species but has a variable tree canopy. As a result of this variability, the tree canopy is 53 percent, just enough to fall within the lower range of good condition. The variability of tree canopy relative to the lower percent cover of plants justifies a corridor condition of marginal for Community C. This standard has been met.

c. Determine whether the degree that the land slopes upward from all streams, rivers, and open water within 200 feet of the property is greater than or less than 25% (using the Clean Water Services Vegetated Corridor methodology); and

Response: Per Table One of the Pacific Habitat Natural Resource Assessment (Attachment 15) and the applicant's response to Section 16.144.020, slopes upward from the delineated wetlands have been documented. Slopes adjoining Wetland C are steeper, but generally still less than 25 percent. There is one narrow point where slopes exceed 25 percent over the first 50 feet but are less than over the next 25 feet. At this location, a break in slope has been identified and the full setback of 35 feet from the break has been identified in accordance with Clean Water Services Vegetated Corridor methodology. This standard is met.

d. Identify the riparian habitat classes applicable to all areas on the property using Table 8-1 below:

Table 8-1 – Riparian Habitat Classes				
Distance in Feet from Water Feature	Development/Vegetation Status			
	Developed areas not providing vegetative cover	Low structure vegetation or open soils	Woody vegetation (shrub and scattered forest canopy)	Forest Canopy (closed to open forest canopy)
Surface Streams				
0-50	Class II	Class I	Class I	Class I
50-100		Class II	Class I	Class I
100-150		Class II if slope >25%	Class II if slope >25%	Class II
150-200		Class II if slope >25%	Class II if slope >25%	Class II if slope >25%
Wetlands (Wetland Feature itself is a Class I Riparian area)				
0-100			Class I	Class I
100-150				Class II
Flood Areas (Undeveloped portion of a flood area is a Class I Riparian area)				
0-100			Class II	Class II

Response: The site does not contain and is not adjacent to surface streams or flood areas, but does contain wetlands as identified in Attachments 14 and 15. Per the table, the wetlands themselves are Class I Riparian Areas. Based on the wetland locations and the vegetated Metro Vegetative Cover data above, the scrub and forested areas within the first 100 feet of all three wetland boundaries would be classified as Class I Riparian Habitat. Areas within 100-150 feet of Wetlands A and B would not qualify as Riparian Habitat, and the forested areas (but not scrub areas) within 100-150 feet of Wetland C would qualify as Class II Riparian Habitat. However, based on Metro's *Habitat Conservation Areas Map* (Figure 3, above), the site property does not contain any land areas designated by Metro as Habitat Conservation Areas.

2. *Verifying boundaries of inventoried upland habitat. Upland habitat was identified based on the existence of contiguous patches of forest canopy, with limited canopy openings. The "forest canopy" designation is made based on analysis of aerial photographs, as part of determining the vegetative cover status of land within the region. Upland habitat shall be as identified on the HCA map. The perimeter of an area delineated as "forest canopy" on the Metro Vegetative Cover map may be adjusted to more precisely indicate the drip line of the trees within the canopied area.*

Response: As identified on Metro's Regional Land Information System data, Class B upland habitat exists on the southern portion of the site, upslope of the former agricultural fields. As described in the Pacific Habitat Services Wetland Delineation Report (Attachment 14) and Natural Resource Assessment (Attachment 15) the inventoried upland habitat encompasses a relatively young to mature overstory of Douglas fir, bigleaf maple, and Oregon White Oak. The existing conditions plan (Attachment 6, Sheet C2.0) illustrate the location of the tree canopy on site and identify individual trees which have been assessed by the project arborist (Attachment 18). This standard is met.

16.144.030 - Exceptions to Standards

In order to protect environmentally sensitive areas that are not also governed by floodplain, wetland and Clean Water Services vegetated corridor regulations, the City allows flexibility of the specific standards in exchange for the specified amount of protection inventoried environmentally sensitive areas as defined in this code.

A. *Process*

The flexibility of standards is only applicable when reviewed and approved as part of a land use application and shall require no additional fee or permit provided criteria is addressed. In the absence of a land use application, review may be processed as a Type 1 administrative interpretation.

Response: The on-site wetlands are regulated by the Oregon Department of State Lands and the U.S. Army Corps of Engineers, and the vegetated corridor is regulated by Clean Water Services. The applicant proposes to comply with applicable standards and is seeking flexibility on the parking standard per standard B. 4 below. This standard is met.

B. *Standards modified*

1. *Lot size — Not withstanding density transfers permitted through Chapter 16.40, when a development contains inventoried regionally significant fish and wildlife habitats as defined in Section 16.144.020 above, lot sizes may be reduced up to ten percent (10%) below the minimum lot size of the zone when an equal amount of inventoried resource above and beyond that already required to be protected is held in a public or private open space tract or otherwise protected from further development.*

Response: No lot size reduction is requested by the applicant. This standard does not apply.

2. *Setbacks — For residential zones, the setback may be reduced up to thirty percent (30%) for all setbacks except the garage setback provided the following criteria are satisfied:*

a. *The setback reduction must result in an equal or greater amount of significant fish and/or wildlife habitat protection. Protection shall be guaranteed with deed restrictions or public or private tracts.*

b. *In no case shall the setback reduction supersede building code and/or Tualatin Valley Fire and Rescue separation requirements.*

c. *In no case shall the setback be reduced to less than five feet unless otherwise provided for by the underlying zone.*

Response: The site is not located within a residential zone; therefore, this standard does not apply.

3. *Density — per Section 16.10.020 (Net Buildable Acre definition), properties with environmentally sensitive areas on site may opt to exclude the environmentally sensitive areas from the minimum density requirements provided the sensitive areas are protected via tract or restrictive easement. A proposal to remove said area from the density calculation must include: a delineation of the resource in accordance with Section 16.144.020C, the acreage being protected, and the net reduction below the normally required minimum for accurate reporting to Metro.*

Response: The site is not located within a residential zone; this standard does not apply.

4. *Parking — Per Section 16.94.020.B.6, 10-25% of the required parking spaces may be reduced in order to protect inventoried regionally significant fish and wildlife habitat areas, provided these resources are protected via deed restrictions or held in public or private tracts.*

Response: While the applicant is seeking a 20% reduction to required minimum parking due to the presence of wetlands (per Section 16.94.020.B.6), these wetlands have not been designated as regionally significant fish and wildlife habitat areas. This standard does not apply.

5. *Landscaping — Per Section 16.92.030.B.6, exceptions may be granted to the landscaping standards in certain circumstances as outlined in that section.*

Response: The applicant is not seeking the option of relief from the landscaping standards per the provisions of Section 16.92.030.B.7. This standard does not apply.

Chapter 16.146 - Noise

16.146.010 - Generally

All otherwise permitted commercial, industrial, and institutional uses in the City shall comply with the noise standards contained in OAR 340-35-035. The City may require proof of compliance with OAR 340-35-035 in the form of copies of all applicable State permits or certification by a professional acoustical engineer that the proposed uses will not cause noise in excess of State standards.

Response: The applicant is aware of the statewide noise standards in OAR 340-35-035 and fully intends to comply as required by law. While specific users are not known at this time, the proposed buildings are likely to emit sounds at similar levels to other light industrial users in the area. The concrete construction type will assist in attenuation of indoor sounds, and no outdoor work activities other than vehicle circulation are proposed. This standard is met.

16.146.020 - Noise Sensitive Uses

When proposed commercial and industrial uses do not adjoin land exclusively in commercial or industrial zones, or when said uses adjoin special care, institutional, or parks and recreational facilities, or other uses that are, in the City's determination, sensitive to noise impacts, then:

A. The applicant shall submit to the City a noise level study prepared by a professional acoustical engineer. Said study shall define noise levels at the boundaries of the site in all directions.

B. The applicant shall show that the use will not exceed the noise standards contained in OAR 340-35-035, based on accepted noise modeling procedures and worst case assumptions when all noise sources on the site are operating simultaneously.

C. If the use exceeds applicable noise standards as per subsection B of this Section, then the applicant shall submit a noise mitigation program prepared by a professional acoustical engineer that shows how and when the use will come into compliance with said standards.

Response: Adjoining zones are industrial to the north, east, and south, and Washington County Future Development, 20-acre (FD-20) to the south and west (which will be zoned Employment Industrial upon annexation to City of Sherwood). The site does not abut special care, institutional, parks and recreational facilities, or other sensitive users. Furthermore, while specific users are not known at this time, the proposed buildings are likely to emit sounds at similar levels to other light industrial users in the area. This standard does not apply.

16.146.030 - Exceptions

This Chapter does not apply to noise making devices which are maintained and utilized solely as warning or emergency signals, or to noise caused by automobiles, trucks, trains, aircraft, and other similar vehicles when said vehicles are properly maintained and operated and are using properly designated rights-of-way, travel ways, flight paths or other routes. This Chapter also does not apply to noise produced by humans or

animals. Nothing in this Chapter shall preclude the City from abating any noise problem as per applicable City nuisance and public safety ordinances.
Response: The applicant is aware that the development is subject to the City's nuisance ordinance. This standard is met.

Chapter 16.148 - Vibrations

16.148.010 - Generally
All otherwise permitted commercial, industrial, and institutional uses shall not cause discernible vibrations that exceed a peak of 0.002 gravity at the property line of the originating use, except for vibrations that last five (5) minutes or less per day, based on a certification by a professional engineer.
Response: While specific users are not known at this time, the proposed industrial uses are not anticipated to generate detectable vibration at the property line based on light industrial, manufacturing, and warehouse/distribution uses typical of the Tualatin-Sherwood Road corridor. This standard is met.

16.148.020 - Exceptions
This Chapter does not apply to vibration caused by construction activities including vehicles accessing construction sites, or to vibrations caused by automobiles, trucks, trains, aircraft, and other similar vehicles when said vehicles are properly maintained and operated and are using properly designated rights-of-way, travelways, flight paths or other routes. Nothing in this Chapter shall preclude the City from abating any vibration problem as per applicable City nuisance and public safety ordinances.
Response: Construction activities are anticipated to cause vibration due to blasting of existing rock to create building industrial sites. The applicant's contractor will seek appropriate permits from the City and Fire District prior to commencing blasting operations. As construction activities are exempt from this chapter, this standard does not apply.

Chapter 16.150 - Air Quality

16.150.010 - Generally
All otherwise permitted commercial, industrial, and institutional uses shall comply with applicable State air quality rules and statutes:
A. All such uses shall comply with standards for dust emissions as per OAR 340-21-060.
B. Incinerators, if otherwise permitted by Section 16.140.020, shall comply with the standards set forth in OAR 340-25-850 through 340-25-905.
C. Uses for which a State Air Contaminant Discharge Permit is required as per OAR 340-20-140 through 340-20-160 shall comply with the standards of OAR 340-220 through 340-20-276.
Response: While specific users are not known at this time, the applicant intends to comply with applicable air quality standards as required by law. No incinerators are proposed. This standard is met.

16.150.020 - Proof of Compliance
Proof of compliance with air quality standards as per Section 16.150.010 shall be in the form of copies of all applicable State permits, or if permits have not been issued, submission by the applicant, and acceptance by the City, of a report certified by a professional engineer indicating that the proposed use will comply with State air quality standards. Depending on the nature and size of the use proposed, the applicant may, in the City's determination, be required to submit to the City a report or reports substantially identical to that required for issuance of State Air Contaminant Discharge Permits.
Response: Since specific users are not known at this time, it would be more appropriate for the City to request documentation at the time of reviewing and inspecting building permit applications for tenant improvements, rather than at the time of site plan review. This standard does not apply.

16.150.030 - Exceptions
Nothing in this Chapter shall preclude the City from abating any air quality problem as per applicable City nuisance and public safety ordinances.
Response: The applicant is aware that the development is subject to the City's nuisance and public safety ordinances. This standard is met.

Chapter 16.152 - Odors

16.152.010 - Generally
All otherwise permitted commercial, industrial, and institutional uses shall incorporate the best practicable design and operating measures so that odors produced by the use are not discernible at any point beyond the boundaries of the development site.
Response: While specific users are not known at this time, it is not anticipated that the proposed light industrial operations will produce noxious odors discernable at the property line since all operations would occur indoors and any odor-producing activities would be mitigated by appropriate air quality measures. Each facility will have a trash enclosure to contain any odors from waste. This standard is met.

16.152.020 - Standards
The applicant shall submit a narrative explanation of the source, type and frequency of the odorous emissions produced by the proposed commercial, industrial, or institutional use. In evaluating the potential for adverse impacts from odors, the City shall consider the density and characteristics of surrounding populations and uses, the duration of any odorous emissions, and other relevant factors.
Response: Since specific users are not known at this time, it would be more appropriate for the City to request documentation at the time of reviewing and inspecting building permit applications for tenant improvements, rather than at the time of site plan review. This standard does not apply.

16.152.030 - Exceptions
Nothing in this Chapter shall preclude the City from abating any odor problem as per applicable City nuisance and public safety ordinances.
Response: The applicant is aware that the development is subject to the City's nuisance and public safety ordinances. This standard is met.

Chapter 16.154 - Heat and Glare

16.154.010 - Generally
Except for exterior lighting, all otherwise permitted commercial, industrial, and institutional uses shall conduct any operations producing excessive heat or glare entirely within enclosed buildings. Exterior lighting shall be directed away from adjoining properties, and the use shall not cause such glare or lights to shine off site in excess of one-half (0.5) foot candle when adjoining properties are zoned for residential uses.
Response: All operations will be completed indoors and thus will not create heat or visible glare from high temperature processes. No abutting properties are zoned for residential use. This standard is met.

16.154.020 - Exceptions
Nothing in this Chapter shall preclude the City from abating any heat and glare problem as per applicable City nuisance and public safety ordinances.
Response: The applicant is aware that the development is subject to the City's nuisance and public safety ordinances. This standard is met.

Chapter 16.156 - Energy Conservation

16.156.020 - Standards

A. Building Orientation - The maximum number of buildings feasible shall receive sunlight sufficient for using solar energy systems for space, water or industrial process heating or cooling. Buildings and vegetation shall be sited with respect to each other and the topography of the site so that unobstructed sunlight reaches the south wall of the greatest possible number of buildings between the hours of 9:00 AM and 3:00 PM, Pacific Standard Time on December 21st.

Response: All buildings are of suitable size to accommodate solar energy systems, should the owner or tenant choose to implement such as system. Adequate clearance is provided among buildings so that buildings will not cast shade on adjoining structures. Buildings A through D are oriented on an east-west axis which would allow for south-facing solar panels, while Building E is oriented on a north-south axis which would allow for either south- or west-facing solar panels. This standard is met.

B. Wind - The cooling effects of prevailing summer breezes and shading vegetation shall be accounted for in site design. The extent solar access to adjacent sites is not impaired vegetation shall be used to moderate prevailing winter wind on the site.

Response: Based on available weather data from the National Oceanic and Atmospheric Administration (NOAA), the prevailing wind patterns in southwest portion of metropolitan Portland during summer are from the northwest. In winter, they're predominantly from the south.

Passive cooling is possible from the placement of shade trees along the building's north elevation and within the planter strip along SW Tualatin- Sherwood Road. Internal to the site, building placement within the portion of the site proposed for warehousing and light industrial uses will allow prevailing summer breezes to evenly flow through the site. Trees placed along the perimeter of the site and within the parking area will provide ample shading at maturity. In the winter, trees planted along the south and west boundaries of the site and within the proposed parking areas will buffer winds from the south. The site has a considerable amount of protected wetlands on site that will further magnify the effects of shading on site. This standard is met.

16.156.030 - Variance to Permit Solar Access

Variances from zoning district standards relating to height, setback and yard requirements approved as per Chapter 16.84 may be granted by the Commission where necessary for the proper functioning of solar energy systems, or to otherwise preserve solar access on a site or to an adjacent site.

Response: The applicant is not seeking any variances to height, setbacks, or yards to accommodate solar energy. This standard does not apply.

IV. CONCLUSION

Based on the information presented and discussed in this narrative and the attached supporting plans and documentation, this application meets applicable standards necessary for land use approval. The proposed development complies with all applicable standards of the Sherwood Zoning and Community Development Code. The applicant respectfully requests approval by the City.

As the applicant may or may not proceed with the final plat to subdivide the property, the applicant also requests that conditions of approval be specific to each land use approval so it is clear which conditions would not apply in the event that the property remains a single parcel.

City of Sherwood Oregon
Home of the Tualatin River National Wildlife Refuge

Case No. ____
Fee ____
Receipt # ____
Date ____
TYPE ____

City of Sherwood
Application for Land Use Action

Type of Land Use Action Requested: (check all that apply)

- [ ] Annexation
- [ ] Plan Amendment (Proposed Zone ____)
- [ ] Planned Unit Development
- [x] Site Plan (square footage of building and parking area)
- [x] Variance (list standards to be varied in description)
- [x] Conditional Use
- [ ] Partition (# of lots ____)
- [x] Subdivision (# of lots 5)
- [ ] Other: ____

By submitting this form the Owner, or Owner's authorized agent/ representative, acknowledges and agrees that City of Sherwood employees, and appointed or elected City Officials, have authority to enter the project site at all reasonable times for the purpose of inspecting project site conditions and gathering information related specifically to the project site.

Note: See City of Sherwood current Fee Schedule, which includes the "Publication/Distribution of Notice" fee, at **www.sherwoodoregon.gov.** Click on Government/Finance/Fee Schedule.

Owner/Applicant Information:

Applicant: Trammell Crow Company (Att: Kirk Olsen) Phone: (503) 644-9400
Applicant Address: 1300 SW 5th Ave, Suite 3050 Portland, OR 97201 Email: KOlsen@trammellcrow.com
Owner: Willamette Water Supply System Commission (Att: David Kraska) Phone: (503) 941-4561
Owner Address: 1850 SW 170th Ave. Beaverton, OR 97003 Email: david.kraska@tvwd.org
Contact for Additional Information: Mackenzie (Att: Brian Varricchione, bvarricchione@mcknze.com)

Property Information:

Street Location: Southwest corner of Tualatin-Sherwood Road and 124th Avenue.
Tax Lot and Map No: 2S128D001100
Existing Structures/Use: Vacant Lot
Existing Plan/Zone Designation: Employment Industrial (EI)
Size of Property(ies) 46.5 acres

Proposed Action:

Purpose and Description of Proposed Action:

The applicant proposes to construct five industrial buildings, approximately 535,000 square feet, for future warehousing and industrial uses . The property will be subdivided into five lots and five tracts and includes the construction of SW Cipole Place. The project requests a variance to 16.106.040.E.1 to allow a cul-de-sac over 200 feet long.

Proposed Use: Warehousing and Light Manufacturing Uses

Proposed No. of Phases (one year each): 1

Continued on Reverse

Authorizing Signatures:

I am the owner/authorized agent of the owner empowered to submit this application and affirm that the information submitted with this application is correct to the best of my knowledge.

I further acknowledge that I have read the applicable standards for review of the land use action I am requesting and understand that I must demonstrate to the City review authorities compliance with these standards prior to approval of my request.

Applicant's Signature | 1/14/20 Date

Owner's Signature | Date

The following materials must be submitted with your application or it will not be accepted at the counter. Once taken at the counter, the City has up to 30 days to review the materials submitted to determine if we have everything we need to complete the review. Applicant can verify submittal includes specific materials necessary for the application per checklist.

■ **3 Copies of Application Form*** completely filled out and signed by the property owner (or person with authority to make decisions on the property.

■ **Copy of Deed** to verify ownership, easements, etc.

■ **At least 3 folded** sets of plans*

■ **At least 3 copies** of narrative addressing application criteria*

■ **Fee** (along with calculations utilized to determine fee if applicable)

■ **Neighborhood Meeting Verification** including affidavit, sign-in sheet and meeting summary (required for Type III, IV and V projects)

* **Note** that the required numbers of copies identified on the checklist are required for completeness; however, upon initial submittal applicants are encouraged to submit only 3 copies for completeness review. Prior to completeness, the required number of copies identified on the checklist and one full electronic copy will be required to be submitted.

January 14, 2020

City of Sherwood
Attention: Joy Chang
22560 SW Pine Street
Sherwood, OR 97140

Re: T-S Corporate Park
Property Owner Authorization for Land Use Applications

Dear Ms. Chang:

The Willamette Water Supply System Commission ("WWSS Commission") is the owner of the real property described below. Although the WWSS Commission will not be the Applicant, this letter provides written authorization from the property owner for Trammell Crow Company to apply for land use applications for the property, associated with the development of the T-S Corporate Park at the southwest corner of Tualatin-Sherwood Road and 124th Avenue.

Project Details
Property Owner: Willamette Water Supply System Commission
Tax lot: 2S128D001100
Address: 12822 SW Tualatin-Sherwood Road

If you have any questions about this authorization, please contact me at (503) 941-4561 or feel free to reach out to the WWSS Commission's attorney, Tommy Brooks. Mr. Brooks can be reached at (503) 224-3092.

Sincerely,

David Kraska
General Manager
Willamette Water Supply System Commission

T-S CORPORATE PARK

12822 SOUTHWEST TUALATIN-SHERWOOD ROAD, SHERWOOD, OR 97062

SITE PLAN REVIEW SET - JANUARY 17, 2020

PROJECT DESCRIPTION

CONSTRUCTION OF FIVE NEW TILT UP CONCRETE WAREHOUSES ON AN APPROXIMATELY 20 AC LOT WITH RELATED EARTHWORK, SITE IMPROVEMENTS AND R.O.W. IMPROVEMENTS

SITE INFORMATION

TAX LOT: 2S128D000100
ZONING: EMPLOYEMENT INDUSTRIAL (EI)

APPLICANT

TRAMMELL CROW COMPANY
1300 SW 5TH AVE, SUITE 3050
PORTLAND, OR 97201
TELEPHONE: (503) 664-9400
CONTACT: KIRK OLSEN
EMAIL: KOLSEN@TRAMMELCROW.COM

ARCHITECT

MACKENZIE
1515 SE WATER AVE, SUITE 100
PORTLAND, OR 97214
TELEPHONE: (503) 224-9560
ARCHITECT: SCOTT MOORE
CONTACT: CONNOR LEINES
EMAIL: CLEINES@MCKNZE.COM

LANDSCAPE ARCHITECT

MACKENZIE
1515 SE WATER AVE, SUITE 100
PORTLAND, OR 97214
TELEPHONE: (503) 224-9560
LANDSCAPE ARCHITECT: STEVEN TUTTLE
CONTACT: ANDREW JEPSON-SULLIVAN
EMAIL: AJEPSON-SULLIVAN@MCKNZE.COM

PLANNER

MACKENZIE
1515 SE WATER AVE, SUITE 100
PORTLAND, OR 97214
TELEPHONE: (503) 224-9560
CONTACT: BRIAN VARRICCHIONE
EMAIL: BVARRICCHIONE@MCKNZE.COM

STRUCTURAL ENGINEER

MACKENZIE
1515 SE WATER AVE, SUITE 100
PORTLAND, OR 97214
TELEPHONE: (503) 224-9560
ENGINEER: RYAN BAKER
CONTACT: TBD
EMAIL: TBD

CIVIL ENGINEER

DOWL
720 SW WASHINGTON ST. SUITE 750
PORTLAND, OR 97205
TELEPHONE: (503) 280-8641
ENGINEER: JEFF SHOEMAKER
CONTACT: RYAN HALVORSON
EMAIL: RHALVORSON@DOWL.COM

GEOTECHNICAL CONSULTANT

GEODESIGN, INC.
9450 SW COMMERCE CIRCLE, SUITE 300
WILSONVILLE, OR 97070
TELEPHONE: (503) 968-8787
CONTACT: GEORGE SAUNDERS
EMAIL: GSAUNDERS@GEODESIGNINC.COM

SURVEYOR

NORTHWEST SURVEYING, INC.
1815 NW 169TH PLACE, SUITE 2090
BEAVERTON, OR 97006
TELEPHONE: (503) 848-2127
CONTACT: CLINT STUBBS
EMAIL: CLINT@NWSRVY.COM

NATURAL RESOURCE CONSULTANT

PACIFIC HABITAT SERVICES
9450 SW COMMERCE CIRCLE, SUITE 180
WILSONVILLE, OR 97070
TELEPHONE: (503) 570-0800
CONTACT: JOHN VAN STAVEREN
SHAWN EISNER
EMAIL: SE@PACIFICHABITAT.COM

TRANSPORTATION ENGINEER

KITTELSON & ASSOCIATES
851 SW 6TH AVE, SUITE 600
PORTLAND, OR 97204
TELEPHONE:(503) 228-5230
CONTACT: KRISTINE CONNOLLY
EMAIL: KCONNOLLY@KITTELSON.COM

OWNER

WILLAMETTE WATER SUPLY SYSTEM COMMISSION
1850 SW 170TH AVE.
BEAVERTON, OR 97203
CONTACT: CORIANNA BURNETT
EMAIL: CORIANNA.BURNETT@TVWD.ORG

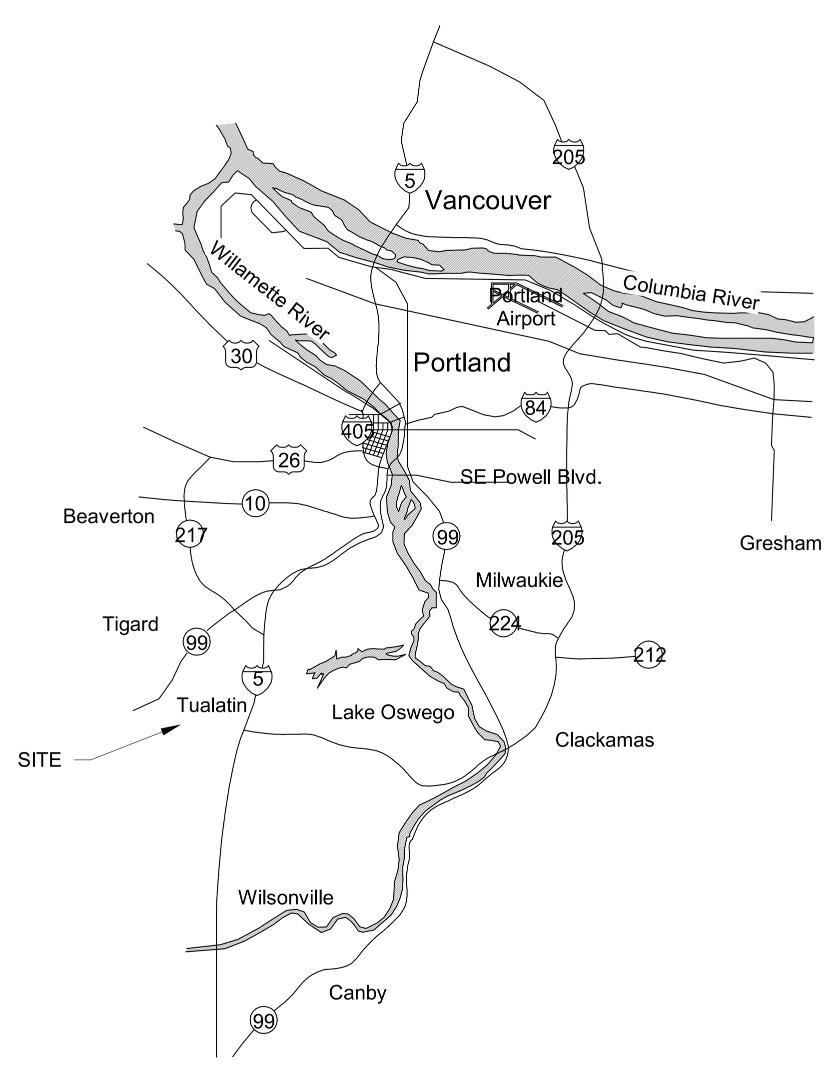
ARBORIST

TERAGAN & ASSOCIATES
3145 WESTVIEW CIRCLE
LAKE OSWEGO, OR 970347
TELEPHONE:(503) 697-1975
CONTACT: TODD PRAGER
EMAIL: TODD@TERAGAN.COM

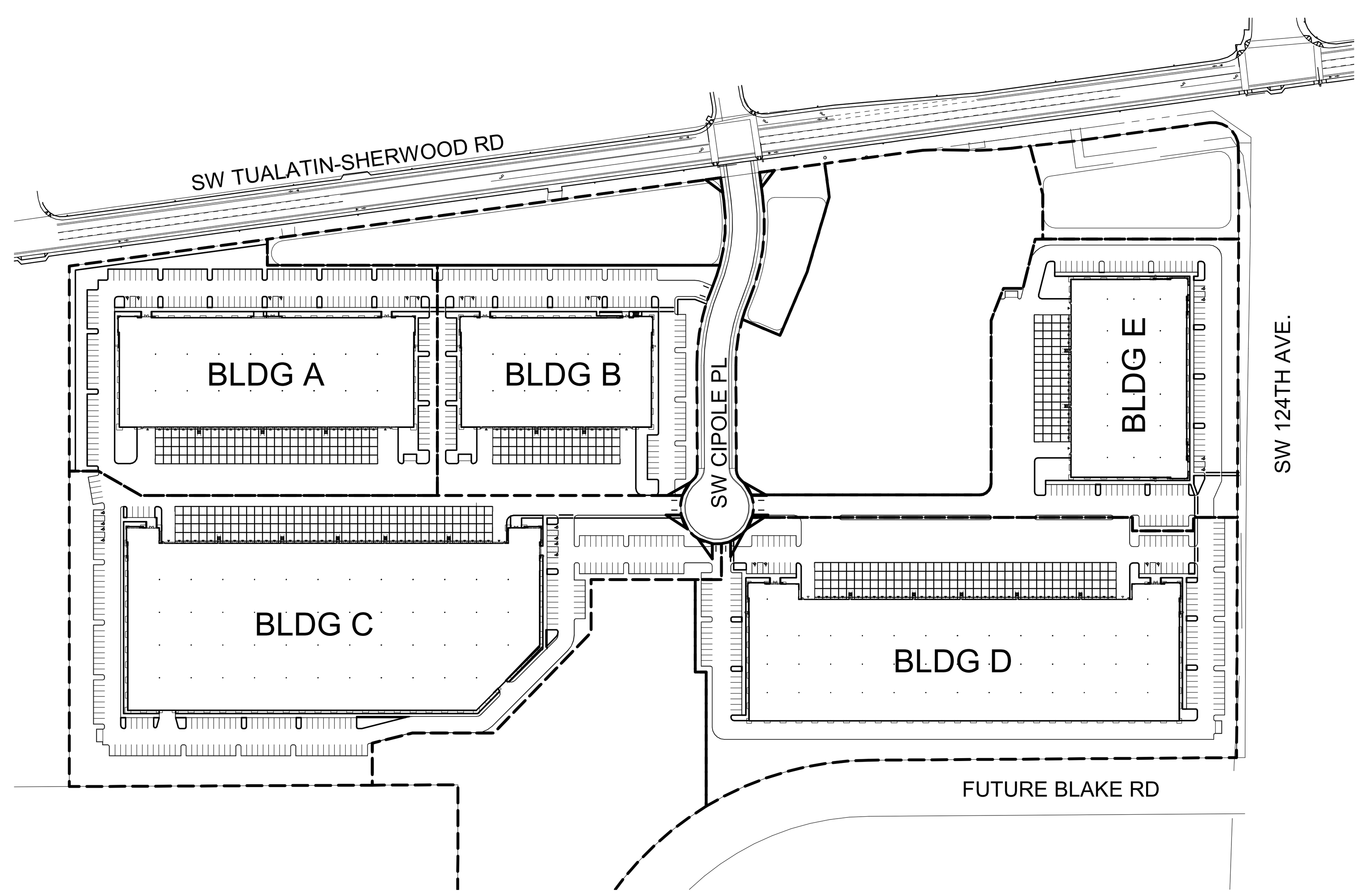
CONTRACTOR

TBD

DRAWING INDEX



1 G0.01 VICINITY MAP
NTS



2 G0.01 SITE PLAN
1" = 200'-0"

Architecture ▪ Interiors
Planning ▪ Engineering

Portland, OR
503.224.9560
Vancouver, WA
360.695.7879
Seattle, WA
206.749.9993
www.mcknze.com

MACKENZIE.
DESIGN DRIVEN | CLIENT FOCUSED

Client
TRAMMELL CROW COMPANY

1300 SW 5TH AVE., STE 3050 PORTLAND, OR 97201

Project
T-S CORPORATE PARK

12822 SW TUALATIN-SHERWOOD RD, SHERWOOD, OR 97140

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
TITLE SHEET AND DRAWING INDEX

DRAWN BY: CJL

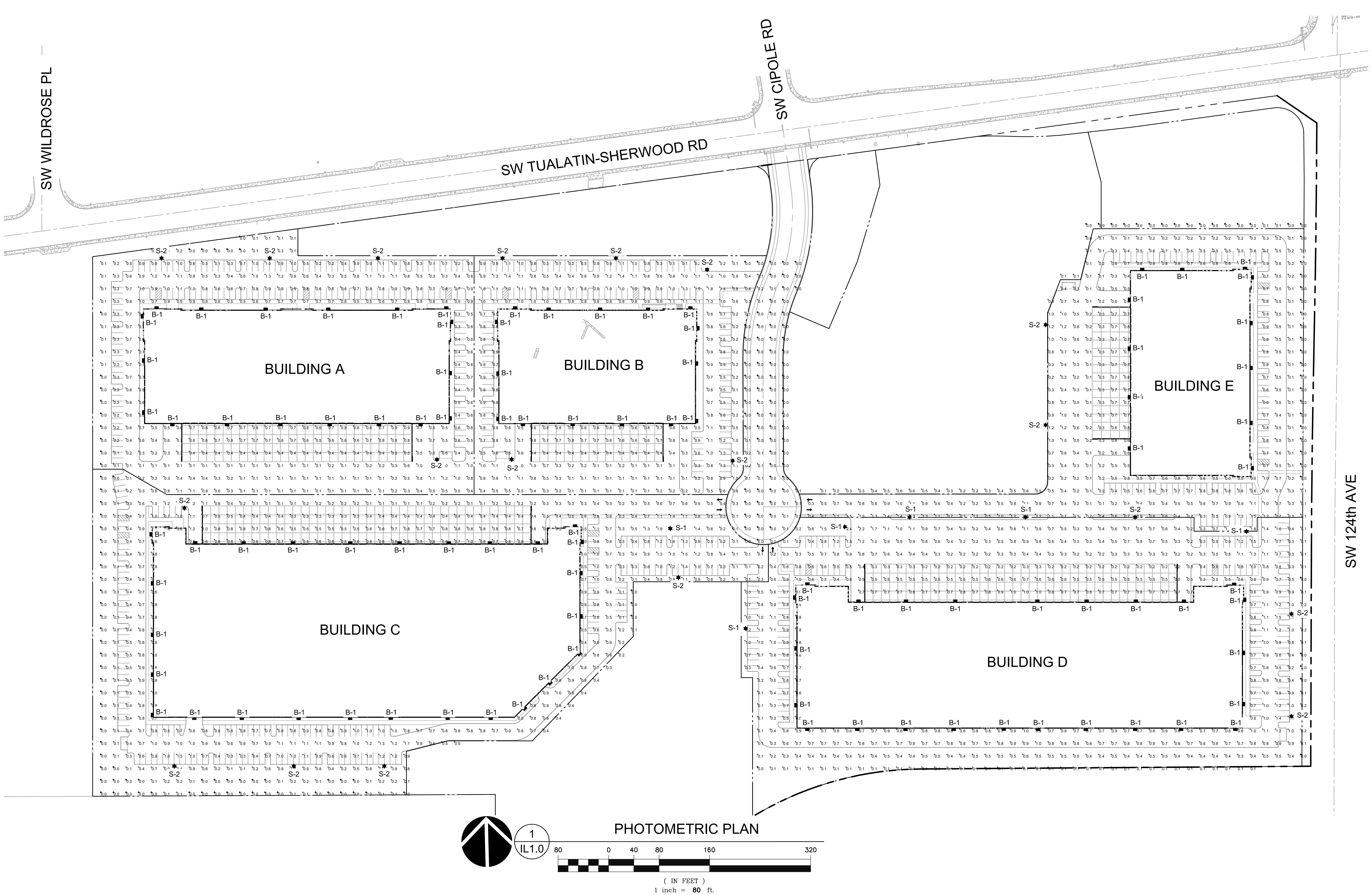
CHECKED BY: SJM

SHEET
G0.01

REVISED 03/30/20
SITE PLAN REVIEW SET - 01/17/20

JOB NO. **2180459.00**

C:\Users\cjl\Documents\Revit Projects\2180459.00 TS Corporate Park\459-TSCP_Document-v20-L.rvt 1/15/2020 4:36:05 PM As indicated



1
IL1.0
PHOTOMETRIC PLAN

PHOTOMETRICS

AVERAGE	0.3 FC
MAX	2.4 FC
MIN	0.0 FC
MAX/MIN	N/A
AVG/MIN	N/A

LIGHTING SCHEDULE

LABEL	SYMBOL	QTY	CATALOG NUMBER	NUMBER OF LAMPS	WATTAGE	MOUNTING HEIGHT (FT)	MOUNTING CONFIGURATION
B-1	▬	102	GWC-AF-01-LED-E1-T3-8030-600	16	34	26	N/A
S-1	✱	5	GLEON-AF-02-LED-E1-T3-8030-600	32	132	26	DOUBLE
S-2	✱	20	GLEON-AF-02-LED-E1-T3-8030-600	32	66	26	SINGLE

M.

Architecture ▪ Interiors
Planning ▪ Engineering

Portland, OR
503.224.9560
Vancouver, WA
360.695.7879
Seattle, WA
206.749.9993
www.mcknze.com

MACKENZIE.
DESIGN DRIVEN | CLIENT FOCUSED

Client
TRAMMELL CROW COMPANY

1300 SW 5TH AVE.
STE 3050
PORTLAND, OR 97201

Project
T-S CORPORATE PARK

REGISTERED PROFESSIONAL ENGINEER
91697
OREGON
JAN. 10, 2017
GREGORY I. MINO
EXPIRES: 12/31/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
PHOTOMETRIC PLAN

DRAWN BY: BTC
CHECKED BY:
SHEET:
IL1.0

JOB NO. 2180459.00

SITE PLAN REVIEW APPLICATION: 1/17/20

DESCRIPTION

The Galleon™ Wall LED luminaire's appearance is complementary with the Galleon area and site luminaire bringing a modern architectural style to lighting applications. Flexible mounting options accommodate wall surfaces in both an upward and downward configuration. The Galleon family of LED products deliver exceptional performance with patented, high-efficiency AccuLED Optics™, providing uniform and energy conscious lighting for parking lots, building and security lighting applications.

McGraw-Edison

Catalog #		Type
Project		
Comments		Date
Prepared by		

SPECIFICATION FEATURES

Construction
Driver enclosure thermally isolated from optics for optimal thermal performance. Heavy wall aluminum housing die-cast with integral external heat sinks to provide superior structural rigidity and an IP66 rated housing. Overall construction passes a 1.5G vibration test to ensure mechanical integrity. UPLIGHTING: Specify with the UPL option for inverted mount uplight housing with additional protections to maintain IP rating.

Optics
Choice of thirteen patented, high-efficiency AccuLED Optics. The optics are precisely designed to shape the distribution maximizing efficiency and application spacing. AccuLED Optics create consistent distributions with the scalability to meet customized application requirements. Offered standard in 4000K (+/- 275K) CCT and minimum 70 CRI. Optional 3000K, 5000K and 6000K CCT. Greater than 90% lumen maintenance expected at 60,000 hours. Available in standard 1A drive current and optional 1200mA, 800mA, and 600mA drive currents.

Electrical
LED drivers are mounted for ease of maintenance. 120-277V 50/60Hz, 347V or 480V 60Hz operation. 480V is compatible for use with 480V Wye systems only. Drivers are provided standard with 0-10V dimming. An optional Eaton proprietary surge protection module is available and designed to withstand 10kV of transient line surge. The Galleon Wall LED luminaire is suitable for operation in -40°C to 40°C ambient environments. For applications with ambient temperatures exceeding 40°C, specify the HA (High Ambient) option. Emergency egress options for -20°C ambient environments and occupancy sensor available.

Mounting
Gasketed and zinc plated rigid steel mounting attachment fits directly to 4" j-box or wall with the Galleon Wall "Hook-N-Lock" mechanism for quick installation. Secured with two captive corrosion resistant black oxide coated allen head set screws which are concealed but accessible from bottom of fixture.

Finish
Housing finished in super durable TGIC polyester powder coat paint, 2.5 mil nominal thickness for superior protection against fade and wear. Standard colors include black, bronze, grey, white, dark platinum and graphite metallic. RAL and custom color matches available. Consult the McGraw-Edison Architectural Colors brochure for the complete selection.

Warranty
Five-year warranty.

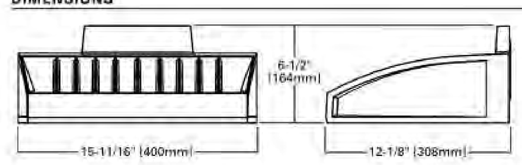
GWC GALLEON WALL

1-2 Light Squares
Solid State LED

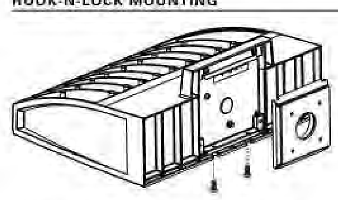
WALL MOUNT LUMINAIRE

WaveLinx

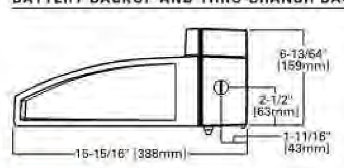
DIMENSIONS



HOOK-N-LOCK MOUNTING



BATTERY BACKUP AND THRU-BRANCH BACK BOX



CERTIFICATION DATA
UL/cUL Listed
LM79 / LM80 Compliant
IP66 Housing
ISO 9001
DesignLights Consortium® Qualified*

ENERGY DATA
Electronic LED Driver
>0.9 Power Factor
<20% Total Harmonic Distortion
120-277V 50/60Hz
347V, 480V 60Hz
-40°C Min. Temperature
40°C Max. Temperature
50°C Max. Temperature (HA Option)

SHIPPING DATA
Approximate Net Weight:
27 lbs. (12.2 kgs.)

ORDERING INFORMATION

Sample Number: GWC-AF-02-LED-E1-T3-GM

Product Family [1]	Light Engine	Number of Light Squares [2]	Lamp Type	Voltage	Distribution	Color	Mounting Options
GWC=Galleon Wall	**AF**=1A Drive Current	**01**=1 **02**=2 [3]	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [4] **480**=480V [4, 5]	**T2**=Type II **T3**=Type III **T4FT**=Type IV Forward Throw **T4W**=Type IV Wide **SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **5NQ**=Type V Square Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White **CC**=Custom Color [6]	**[BLANK]**=Surface Mount

Options (Add as Suffix)	Accessories (Order Separately)
7027=70 CRI / 2700K [7] **7030**=70 CRI / 3000K [7] **8030**=80 CRI / 3000K [7] **7050**=70 CRI / 5000K [7] **7060**=70 CRI / 6000K [7] **AMBR**=590 nm wavelength amber **600**=Drive Current Factory Set to 600mA **800**=Drive Current Factory Set to 800mA **1200**=Drive Current Factory Set to 1200mA [8] **F**=Single Fused (120, 277 or 347V. Must Specify Voltage) **FF**=Double Fused (208, 240 or 480V. Must Specify Voltage) **10K**=10kV Surge Module **DIM**=0-10V Dimming Leads [9, 10] **DALI**=DALI Driver [11] **HA**=50°C High Ambient [12] **UPL**=Uplight Housing [13] **BBB**=Battery Pack with Back Box [3, 8, 14, 27] **CWB**=Cold Weather Battery Pack with Back Box [3, 8, 14, 27] **P**=Button Type Photocontrol (120, 208, 240 or 277V. Must Specify Voltage) **R**=NEMA Twistlock Photocontrol Receptacle **PER7**=NEMA 7-PIN Twistlock Photocontrol Receptacle [15] **AHD145**=After Hours Dim, 5 Hours [16] **AHD245**=After Hours Dim, 6 Hours [16] **AHD255**=After Hours Dim, 7 Hours [16] **AHD355**=After Hours Dim, 8 Hours [16] **MS-LXX**=Motion Sensor for On/Off Operation [17, 18, 19] **MS/DIM-LXX**=Motion Sensor for Dimming Operation [17, 18, 19] **LWR-LW**=LumaWatt Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [18, 20, 21] **LWR-LN**=LumaWatt Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [18, 20, 21] **L90**=Optics Rotated 90° Left **R90**=Optics Rotated 90° Right **MT**=Factory Installed Mesh Top **LCF**=Light Square Trim Plate Painted to Match Housing [22] **HSS**=Factory Installed House Side Shield [23] **CE**=CE Marking and Small Terminal Block [24] **ZW**=WaveLinx-enabled 4-PIN Twistlock Receptacle [29, 30] **ZW-SWPD4XX**=Wavelinx Wireless Sensor, 7' – 15' Mounting Height [29, 30, 32] **ZW-SWPD5XX**=Wavelinx Wireless Sensor, 15' – 40' Mounting Height [29, 30, 32]	**OA/RA1013**=Photocontrol Shorting Cap **OA/RA1016**=NEMA Photocontrol - Multi-Tap 105-285V **OA/RA1201**=NEMA Photocontrol - 347V **OA/RA1027**=NEMA Photocontrol - 480V **MA1252**=10kV Circuit Module Replacement **MA1059XX**=Thru-branch Back Box (Must Specify Color) **FSIR-100**=Wireless Configuration Tool for Occupancy Sensor [17] **LS/HSS**=Field Installed House Side Shield [23, 25] **WOLC-7P-10A**=WaveLinx Outdoor Control Module (7-pin) [26, 29] **SWPD4-XX**=Wavelinx Wireless Sensor, 7' – 15' Mounting Height [29, 30, 31, 32] **SWPD5-XX**=Wavelinx Wireless Sensor, 15' – 40' Mounting Height [29, 30, 31, 32]

NOTES:
1. DesignLight Consortium® Qualified. Refer to www.designlights.org Qualified Products List under Family Models for details.
2. Standard 4000K CCT and minimum 70 CRI.
3. Two light squares with BBB or CWB options limited to 25°C, 120-277V only.
4. Requires the use of a step down transformer. Not available in combination with sensor options at 1200mA.
5. Only for use with 480V Wye systems. Per NEC, not for use with ungrounded systems, impedance grounded systems or corner grounded systems (commonly known as Three Phase Three Wire Delta, Three Phase High Leg Delta and Three Phase Corner Grounded Delta systems).
6. Custom colors are available. Setup charges apply. Paint chip samples required. Extended Lead times apply.
7. Extended lead times apply. Use dedicated IES files when performing layouts.
8. Not available with HA option.
9. Cannot be used with other control options.
10. Low voltage control lead brought out 18" outside fixture.
11. Only available with BBB or CWB in single light square. HA option available for single light square only. Limited to 1A and below.
12. Not available with 1200, UPL, BBB and CWB options. Available for single light square only.
13. Not available with SL2, SL3, SL4, HA, BBB, CWB, R, or PER7 options.
14. Operates a single light square only. Cold weather option operates -20°C to +40°C, standard 0°C to +40°C. Backbox is non-IP rated.
15. Compatible with standard 3-PIN photocontrols, 5-PIN or 7-PIN ANSI controls.
16. Requires the use of P photocontrol or the PER7 or R photocontrol receptacle with photocontrol accessory. See After Hours Dim supplemental guide for additional information.
17. The FSIR-100 configuration tool is required to adjust parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your lighting representative at Eaton for more information.
18. Replace LXX with the available mounting height options. L08, L20, L40 or L40W are the only choices.
19. Includes integral photosensor.
20. LumaWatt wireless sensors are factory installed requiring network components in appropriate quantities. See www.eaton.com/lighting for LumaWatt application information.
21. Bronze sensor is shipped with Bronze fixtures. White sensor shipped on all other housing color options.
22. Not available with HSS option.
23. Only for use with SL2, SL3 and SL4 distributions. The light square trim plate is painted black when the HSS option is selected.
24. CE is not available with the 1200, DALI, LWR, MS, MS/DIM, P, R or PER7 options. Available in 120-277V only.
25. One required for each light square.
26. Requires PER7.
27. Control option limited to P=Button Type Photocontrol (must specify voltage).
28. Reserved.
29. Cannot be used in conjunction with photocontrol or other controls systems (P, R, MS, LWR).
30. WAC Gateway required to enable field-configurability: Order WAC-PoE and WPOE-120 (10V to PoE injector) power supply if needed.
31. Requires ZW.
32. Replace XX with sensor color (WH, BZ, or BK).

1 / IL2.0 LIGHT B-1
N.T.S.
1:1

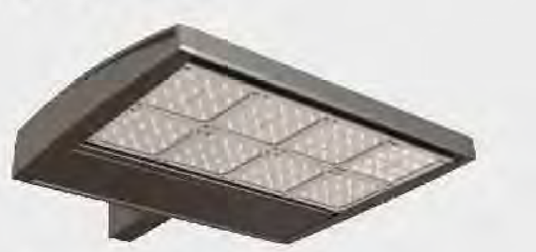
Configuration Flexibility

A New Level of Scalable Solutions

The Galleon LED luminaire is available in one to 10 Light Squares. As the number of Light Squares increases, the luminaire width increases proportionally.

1 - 4 Light Squares

5 - 6 Light Squares



7 - 8 Light Squares

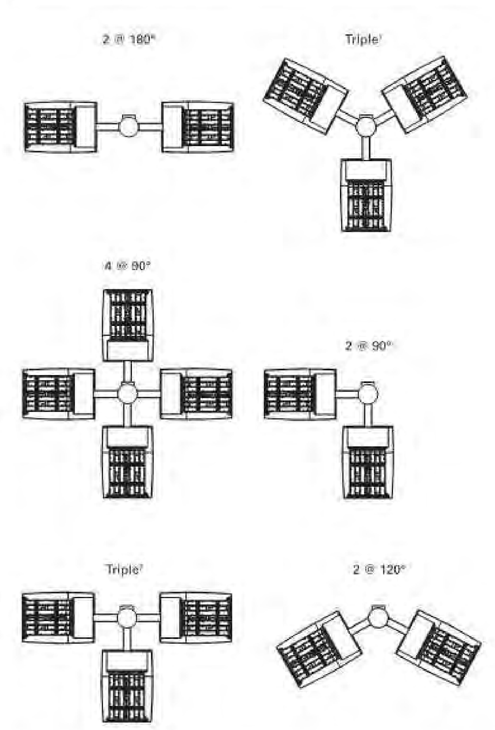
9 - 10 Light Squares

Pole Mounting Configurations

The standard Galleon LED luminaire configuration is designed to mount to a round or square pole. When mounting two or more fixtures at 90° or 120° apart, a longer Extended Arm (EA) may be required. Please reference the table below to determine when the Extended Arm is required and designate "EA" in the catalog logic.

Arm Mounting Requirements

Configuration	90° Apart	120° Apart
GLEON-AE-01	7" Arm (Standard)	7" Arm (Standard)
GLEON-AE-02	7" Arm (Standard)	7" Arm (Standard)
GLEON-AE-03	7" Arm (Standard)	7" Arm (Standard)
GLEON-AE-04	7" Arm (Standard)	7" Arm (Standard)
GLEON-AE-05	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AE-06	10" Extended Arm (Required)	7" Arm (Standard)
GLEON-AE-07	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AE-08	13" Extended Arm (Required)	13" Extended Arm (Required)
GLEON-AE-09	16" Extended Arm (Required)	16" Extended Arm (Required)
GLEON-AE-10	16" Extended Arm (Required)	16" Extended Arm (Required)



NOTES: 1. Round poles are 3 @ 120°. Square poles are 3 @ 90°. 2. Round poles are 3 @ 90°.

Ordering Information

Sample Number: GLEON-AE-04-LED-E1-T3-GM-700

Product Family	Light Engine	Number of Light Squares	Lamp Type	Voltage	Distribution		Color	Mounting
GLEON=Galleon	**AE**=1A Drive Current	**01**=1 **02**=2 **03**=3 **04**=4 **05**=5 **06**=6 **07**=7 **08**=8 **09**=9 **10**=10	**LED**=Solid State Light Emitting Diodes	**E1**=120-277V **347**=347V [1] **480**=480V [1]	**T2**=Type II **T2R**=Type II Roadway **T3**=Type III **T3R**=Type III Roadway **T4FT**=Type IV Forward Throw **T4W**=Type IV Wide **5NQ**=Type V Square Narrow **5MQ**=Type V Square Medium **5WQ**=Type V Square Wide	**SL2**=Type II w/Spill Control **SL3**=Type III w/Spill Control **SL4**=Type IV w/Spill Control **SLL**=90° Spill Light Eliminator Left **SLR**=90° Spill Light Eliminator Right **RW**=Rectangular Wide Type I **AFL**=Automotive Frontline	**AP**=Grey **BZ**=Bronze **BK**=Black **DP**=Dark Platinum **GM**=Graphite Metallic **WH**=White	**[Blank]**=Arm for Round or Square Pole **EA**=Extended Arm [3] **MA**=Mast Arm Adapter [4] **WM**=Wall Mount

Options (Add as Suffix)

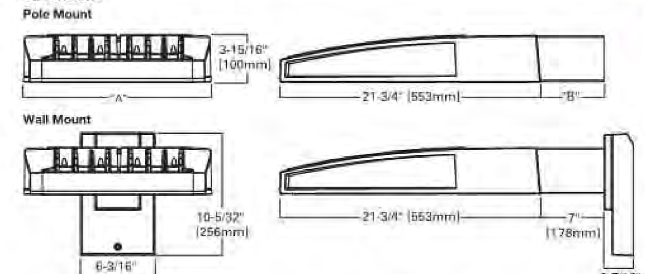
2L=Two Circuits [5, 6] **7030**=70 CRI 3000K [7] **7060**=70 CRI 6000K [7] **530**=Drive Current Factory Set to 530mA [8] **700**=Drive Current Factory Set to 700mA [8] **P**=Button Type Photocontrol (120, 208, 240 or 277V) **R**=NEMA Twistlock Photocontrol Receptacle **HA**=50°C High Ambient [9]	**MS/DIM-L08**=Motion Sensor for Dimming Operation, Maximum 8' Mounting Height [9, 10, 11, 12] **MS/DIM-L20**=Motion Sensor for Dimming Operation, 9' - 20' Mounting Height [9, 10, 11, 12] **MS/DIM-L40**=Motion Sensor for Dimming Operation, 21' - 40' Mounting Height [9, 10, 11, 12] **MS/X-L08**=Bi-Level Motion Sensor, Maximum 8' Mounting Height [11, 12, 13, 14] **MS/X-L20**=Bi-Level Motion Sensor, 9' - 20' Mounting Height [10, 11, 14] **MS/X-L40**=Bi-Level Motion Sensor, 21' - 40' Mounting Height [10, 11, 14] **DIMRF-LW**=LumaWatt Wireless Sensor, Wide Lens for 8' - 16' Mounting Height [13] **DIMRF-LN**=LumaWatt Wireless Sensor, Narrow Lens for 16' - 40' Mounting Height [13]	**L90**=Optics Rotated 90° Left **R90**=Optics Rotated 90° Right **MT**=Factory Installed Mesh Top **TH**=Tool-less Door Hardware **LCF**=Light Square Trim Plate Painted to Match Housing **HSS**=Factory Installed House Side Shield [15]

Accessories (Order Separately)

OA/RA1016=NEMA Photocontrol Multi-Tap - 105-285V **OA/RA1027**=NEMA Photocontrol - 480V **OA/RA1201**=NEMA Photocontrol - 347V **OA/RA1013**=Photocontrol Shorting Cap **OA/RA1014**=120V Photocontrol **MA1252**=10kV Surge Module Replacement **MA1036-XX**=Single Tenon Adapter for 2-3/8" O.D. Tenon **MA1037-XX**=2 @ 180° Tenon Adapter for 2-3/8" O.D. Tenon **MA1197-XX**=3 @ 120° Tenon Adapter for 2-3/8" O.D. Tenon	**MA1197-XX**=3 @ 120° Tenon Adapter for 2-3/8" O.D. Tenon **MA1188-XX**=4 @ 90° Tenon Adapter for 2-3/8" O.D. Tenon **MA1189-XX**=2 @ 90° Tenon Adapter for 2-3/8" O.D. Tenon **MA1190-XX**=3 @ 90° Tenon Adapter for 2-3/8" O.D. Tenon **MA1191-XX**=2 @ 120° Tenon Adapter for 2-3/8" O.D. Tenon **MA1038-XX**=Single Tenon Adapter for 3-1/2" O.D. Tenon **MA1039-XX**=2 @ 180° Tenon Adapter for 3-1/2" O.D. Tenon **MA1192-XX**=3 @ 120° Tenon Adapter for 3-1/2" O.D. Tenon **MA1193-XX**=4 @ 90° Tenon Adapter for 3-1/2" O.D. Tenon	**MA1194-XX**=2 @ 90° Tenon Adapter for 3-1/2" O.D. Tenon **MA1195-XX**=3 @ 90° Tenon Adapter for 3-1/2" O.D. Tenon **FSIR-100**=Wireless Configuration Tool for Occupancy Sensor [16] **GLEON-MT1**=Field Installed Mesh Top for 1-4 Light Squares **GLEON-MT2**=Field Installed Mesh Top for 5-6 Light Squares **GLEON-MT3**=Field Installed Mesh Top for 7-8 Light Squares **GLEON-MT4**=Field Installed Mesh Top for 9-10 Light Squares **LS/HSS**=Field Installed House Side Shield [15, 17]

NOTES: **1** Standard 4000K CCT and minimum 70 CRI. **2** LumaWatt Wireless Sensors not currently available for 347V or 480V applications. **3** May be required when two or more luminaires are oriented on a 90° or 120° drilling pattern. Refer to arm mounting requirement table. **4** Factory installed. **5** Only available in 5-10 Light Squares. **6** Not available with LumaWatt wireless sensors. **7** Use dedicated IES files for 3000K and 6000K when performing layouts. These files are published on the Galleon luminaire product page on the website. **8** 1 Amp standard. Use dedicated IES files when performing layouts. These files are published on the Galleon luminaire product page on the website. **9** Must specify dimming driver. Consult factory for more information. **10** 120V or 277V 60Hz and 230V 50Hz only. Replace E1 with specific voltage. Consult factory for availability in 347V and 480V. **11** The FSIR-100 accessory is required to adjust parameters. **12** Not available with HA option. **13** LumaWatt wireless sensors are factory installed only requiring network components RF-EM1, RF-GW1 and RF-ROUT1 in appropriate quantities. See www.cooperlighting.com for LumaWatt application information. **14** Sensor mounted externally. Available in 2, 3, 4, or 6 Light Square configurations. Replace "X" with number of Light Squares in low output mode. For ON/OFF operation, replace "X" with "0". Maximum two Light Squares in low output mode. Not available with dimming driver. No terminal block with bi-level operation. **15** Only for use with SL2, SL3, SL4 and AFL distributions. The Light Square trim plate is painted black when the HSS option is selected. **16** This tool enables adjustment of parameters including high and low modes, sensitivity, time delay, cutoff and more. Consult your Eaton's Cooper Lighting business representative for additional details. **17** One required for each Light Square.

Dimensions

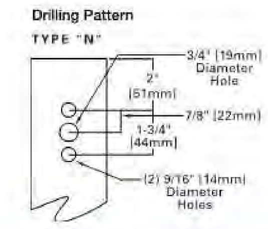


Dimensional Data

Number of Light Squares	"A" Width	"B" Standard Arm Length	"B" Extended Arm Length
1-4	15-1/2" (394mm)	7" (178mm)	10" (254mm)
5-6	21-5/8" (549mm)	7" (178mm)	10" (254mm)
7-8	27-5/8" (702mm)	7" (178mm)	13" (330mm)
9-10	33-3/4" (857mm)	7" (178mm)	16" (406mm)

NOTES: **1** Optional arm length to be used when mounting two fixtures at 90° on a single pole. **2** EPA calculated with optional arm length.

Drilling Pattern



Lumen Multiplier

Ambient Temperature	Lumen Multiplier
0°C	1.02
10°C	1.01
25°C	1.00
40°C	0.99
50°C	0.97

Lumen Maintenance

Ambient Temperature	TM-21 Lumen Maintenance (60,000 Hours)	Theoretical L70 (Hours)
25°C	> 94%	> 350,000
40°C	> 93%	> 250,000
50°C	> 90%	> 170,000

Additional Information

Compliance	Electrical Data (Electronic LED Driver)	Approximate Weight	EPA (Effective Projected Area) Square Feet
UL and cUL Wet Location Listed IP66 Light Squares 3G Vibration Rated ARRA Compliant ISO 9001	+40°C (104°F) Ambient Temperature Rating -40°C (-40°F) Ambient Temperature Rating Optional 50°F (HA) Ambient Temperature Rating >0.9 Power Factor <20% Total Harmonic Distortion 120V-277V/50 and 60 Hz 347V/60 Hz, 480V/60 Hz	1-4 Light Squares 33 lbs. (15.0 kgs.) 5-6 Light Squares 44 lbs. (20.0 kgs.) 7-8 Light Squares 54 lbs. (24.5 kgs.) 9-10 Light Squares 63 lbs. (28.6 kgs.)	1-4 Light Squares 0.96 5-6 Light Squares 1.00 7-8 Light Squares 1.07 9-10 Light Squares 1.12

NOTE: Specifications and dimensions subject to change without notice.

c UL us LISTED
RoHS
IP66 Rated

2 / IL2.0 LIGHT S-1/S-2
N.T.S.
1:1

M.
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Planning • Engineering

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Vancouver, WA
360.695.7879
Seattle, WA
206.749.9993
www.mcknze.com

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Client
TRAMMELL CROW COMPANY

1300 SW 5TH AVE.
STE 3050
PORTLAND, OR 97201

Project
T-S CORPORATE PARK

REGISTERED PROFESSIONAL ENGINEER
91897
OREGON
JAN. 10, 2017
GREGORY I. MINO
EXPIRES: 12/31/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

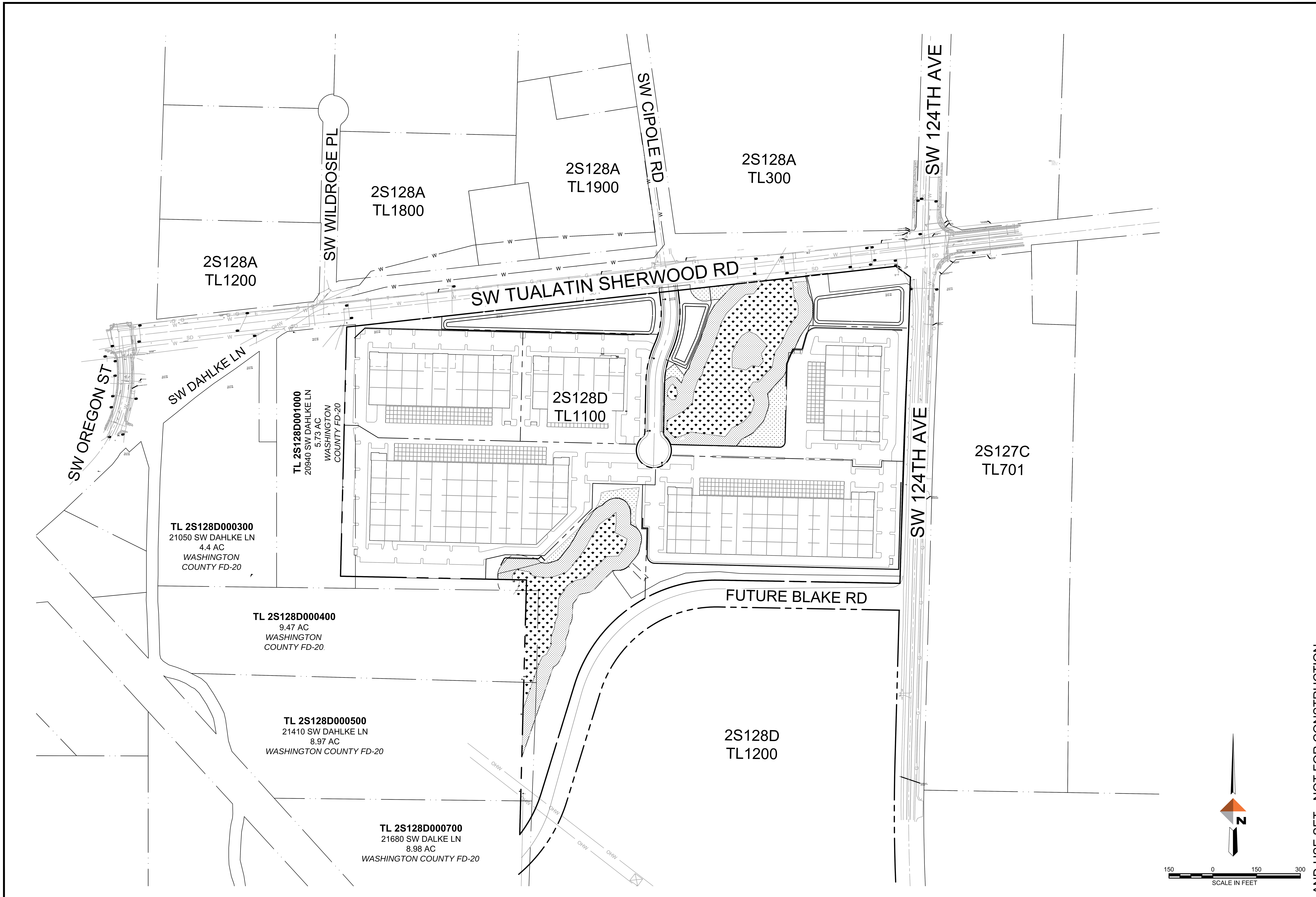
SHEET TITLE:
PHOTOMETRIC DETAILS

DRAWN BY: BTC
CHECKED BY:
SHEET:

IL2.0

JOB NO. **2180459.00**

SITE PLAN REVIEW APPLICATION: 1/17/20



REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

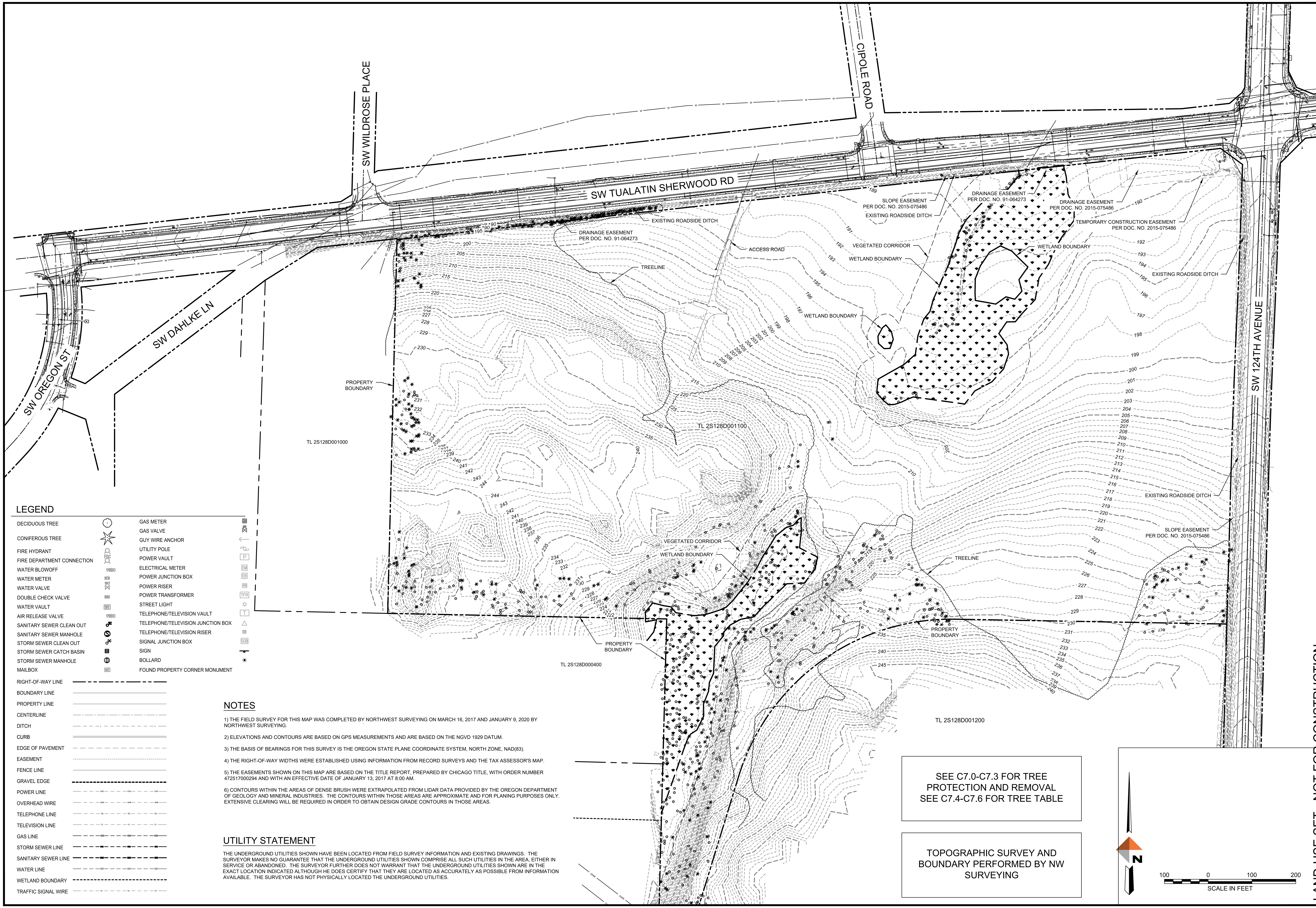
PROJECT VICINITY MAP

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C1.0

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CS-CV-TCC.DWG SAVED: 1/15/2020 4:04 PM PLOTTED: 3/30/2020 4:19 PM BY: RHALVORSON



LEGEND

DECIDUOUS TREE
CONIFEROUS TREE
FIRE HYDRANT
FIRE DEPARTMENT CONNECTION
WATER BLOWOFF
WATER METER
WATER VALVE
DOUBLE CHECK VALVE
WATER VAULT
AIR RELEASE VALVE
SANITARY SEWER CLEAN OUT
SANITARY SEWER MANHOLE
STORM SEWER CLEAN OUT
STORM SEWER CATCH BASIN
STORM SEWER MANHOLE
MAILBOX
GAS METER
GAS VALVE
GUY WIRE ANCHOR
UTILITY POLE
POWER VAULT
ELECTRICAL METER
POWER JUNCTION BOX
POWER RISER
POWER TRANSFORMER
STREET LIGHT
TELEPHONE/TELEVISION VAULT
TELEPHONE/TELEVISION JUNCTION BOX
TELEPHONE/TELEVISION RISER
SIGNAL JUNCTION BOX
SIGN
BOLLARD
FOUND PROPERTY CORNER MONUMENT
RIGHT-OF-WAY LINE
BOUNDARY LINE
PROPERTY LINE
CENTERLINE
DITCH
CURB
EDGE OF PAVEMENT
EASEMENT
FENCE LINE
GRAVEL EDGE
POWER LINE
OVERHEAD WIRE
TELEPHONE LINE
TELEVISION LINE
GAS LINE
STORM SEWER LINE
SANITARY SEWER LINE
WATER LINE
WETLAND BOUNDARY
TRAFFIC SIGNAL WIRE

NOTES

1) THE FIELD SURVEY FOR THIS MAP WAS COMPLETED BY NORTHWEST SURVEYING ON MARCH 16, 2017 AND JANUARY 9, 2020 BY NORTHWEST SURVEYING.

2) ELEVATIONS AND CONTOURS ARE BASED ON GPS MEASUREMENTS AND ARE BASED ON THE NGVD 1929 DATUM.

3) THE BASIS OF BEARINGS FOR THIS SURVEY IS THE OREGON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NAD(83).

4) THE RIGHT-OF-WAY WIDTHS WERE ESTABLISHED USING INFORMATION FROM RECORD SURVEYS AND THE TAX ASSESSOR'S MAP.

5) THE EASEMENTS SHOWN ON THIS MAP ARE BASED ON THE TITLE REPORT, PREPARED BY CHICAGO TITLE, WITH ORDER NUMBER 472517000294 AND WITH AN EFFECTIVE DATE OF JANUARY 13, 2017 AT 8:00 AM.

6) CONTOURS WITHIN THE AREAS OF DENSE BRUSH WERE EXTRAPOLATED FROM LIDAR DATA PROVIDED BY THE OREGON DEPARTMENT OF GEOLOGY AND MINERAL INDUSTRIES. THE CONTOURS WITHIN THOSE AREAS ARE APPROXIMATE AND FOR PLANING PURPOSES ONLY. EXTENSIVE CLEARING WILL BE REQUIRED IN ORDER TO OBTAIN DESIGN GRADE CONTOURS IN THOSE AREAS.

UTILITY STATEMENT

THE UNDERGROUND UTILITIES SHOWN HAVE BEEN LOCATED FROM FIELD SURVEY INFORMATION AND EXISTING DRAWINGS. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED ALTHOUGH HE DOES CERTIFY THAT THEY ARE LOCATED AS ACCURATELY AS POSSIBLE FROM INFORMATION AVAILABLE. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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T-S CORPORATE PARK

EXISTING CONDITIONS MAP (OVERALL)

SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
C2.0

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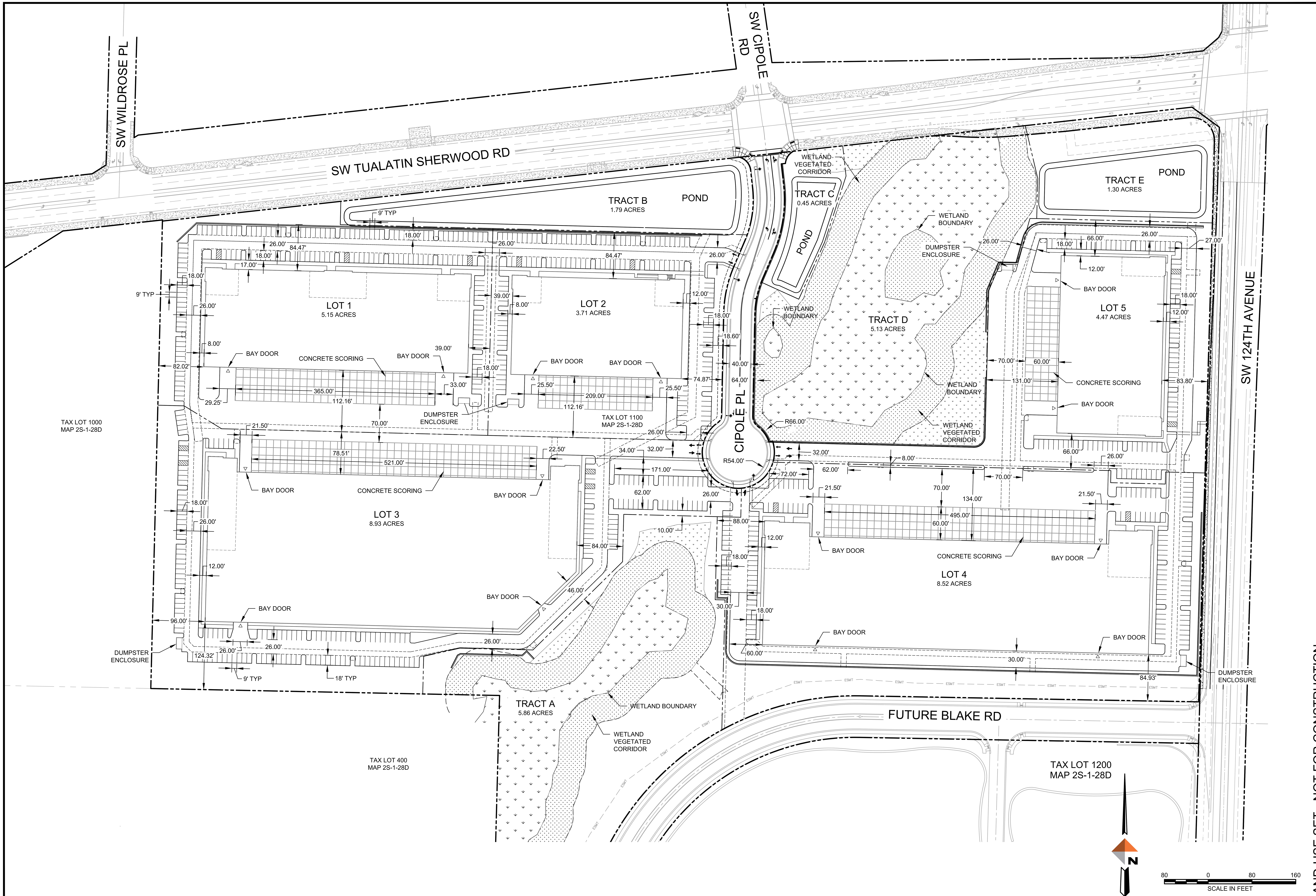

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REV	DATE	REVISIONS DESCRIPTION	BY

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OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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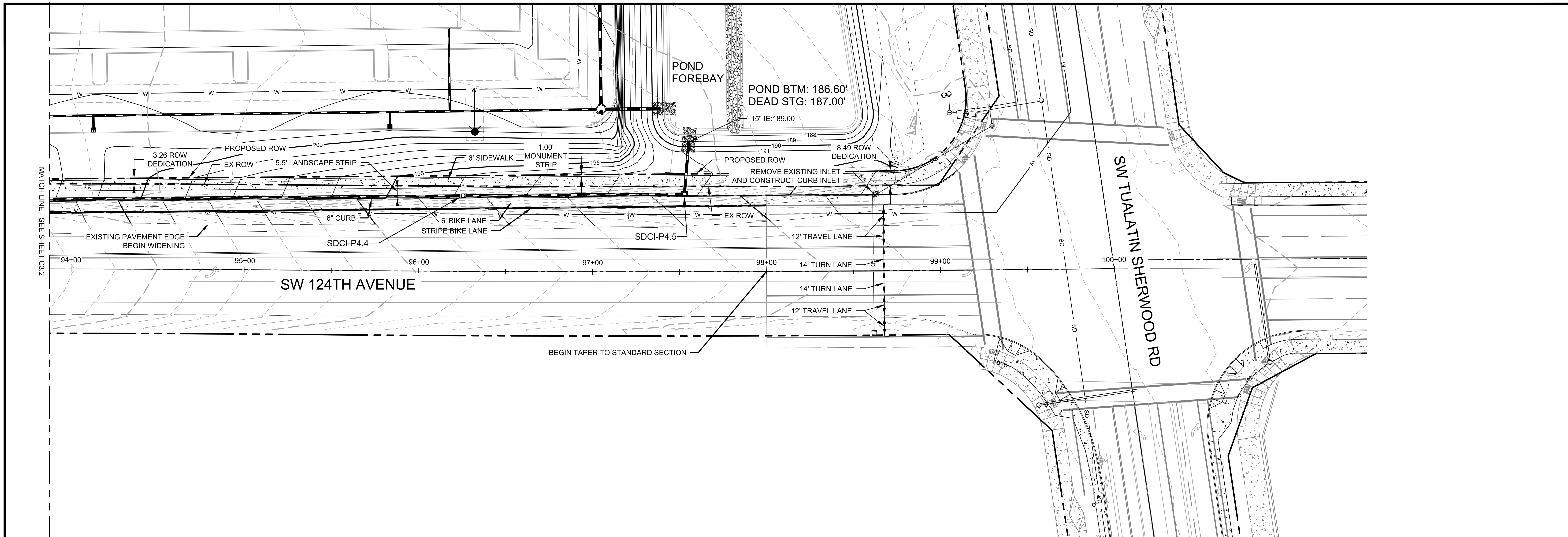
T-S CORPORATE PARK
TRANSPORTATION SHEET
SHERWOOD, OREGON

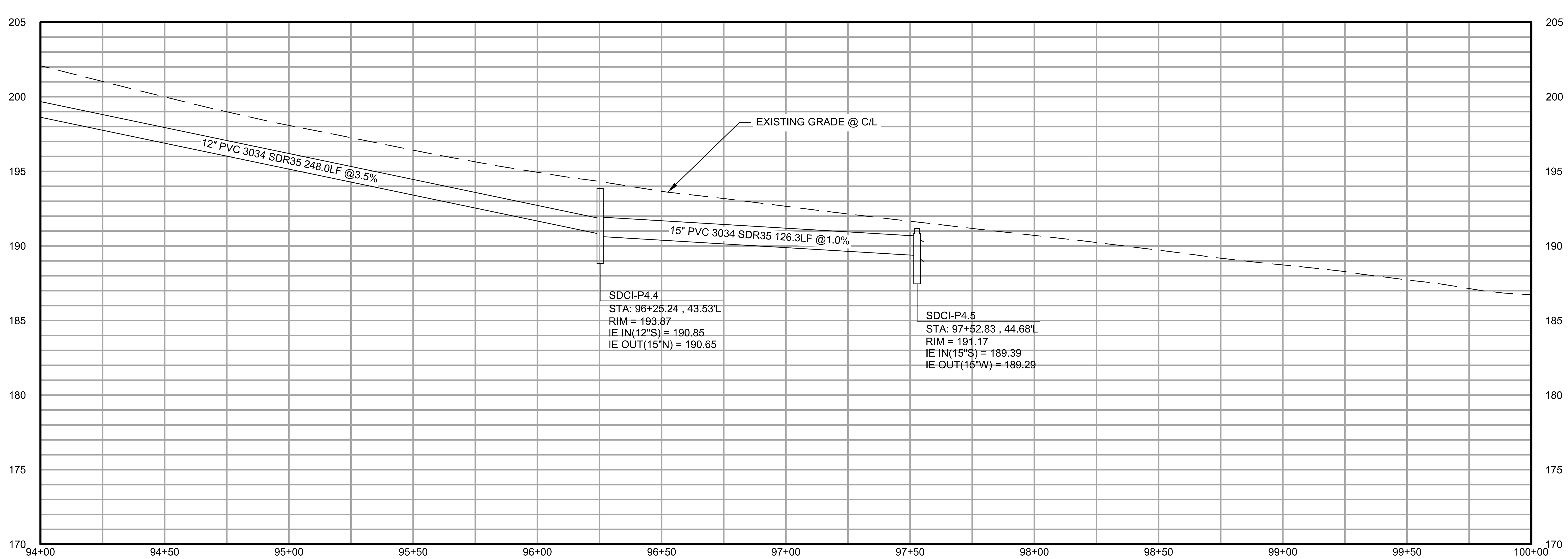
PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C3.0



SW 124TH AVE NORTH PLAN

SCALE: 1" = 30'



SW 124TH AVE NORTH PROFILE

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

30 0 30 60
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REVISIONS

REV	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
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EXPIRES: 6/30/21

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T-S CORPORATE PARK

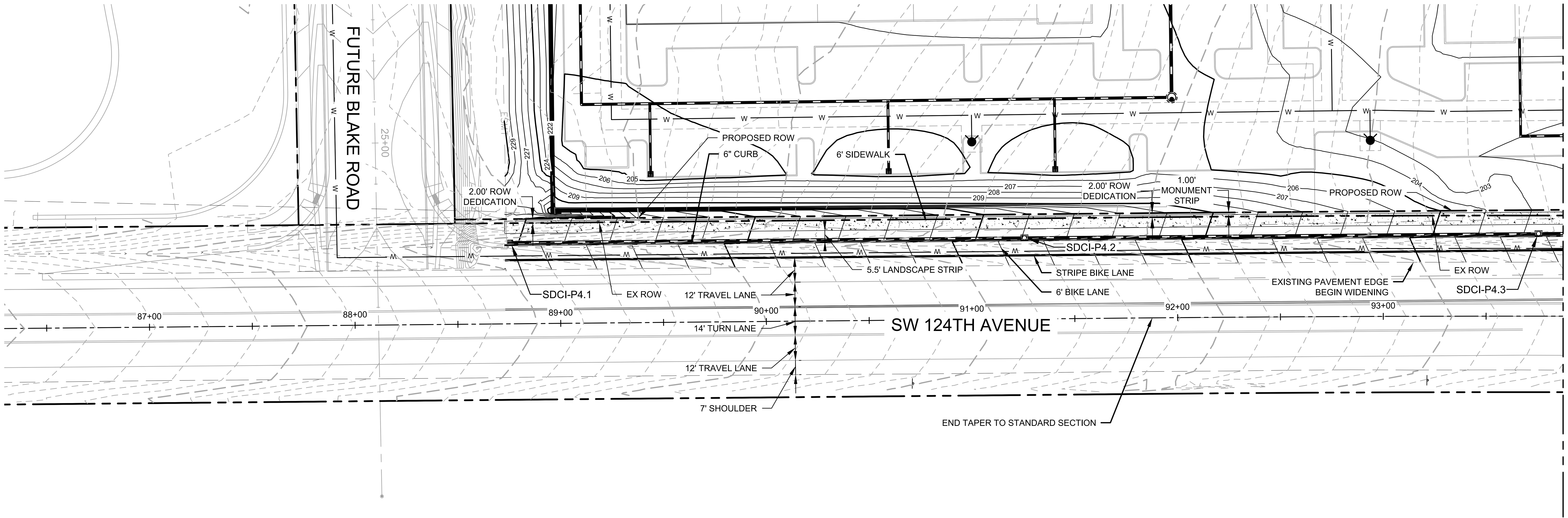
124TH AVENUE IMPROVEMENTS - NORTH

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

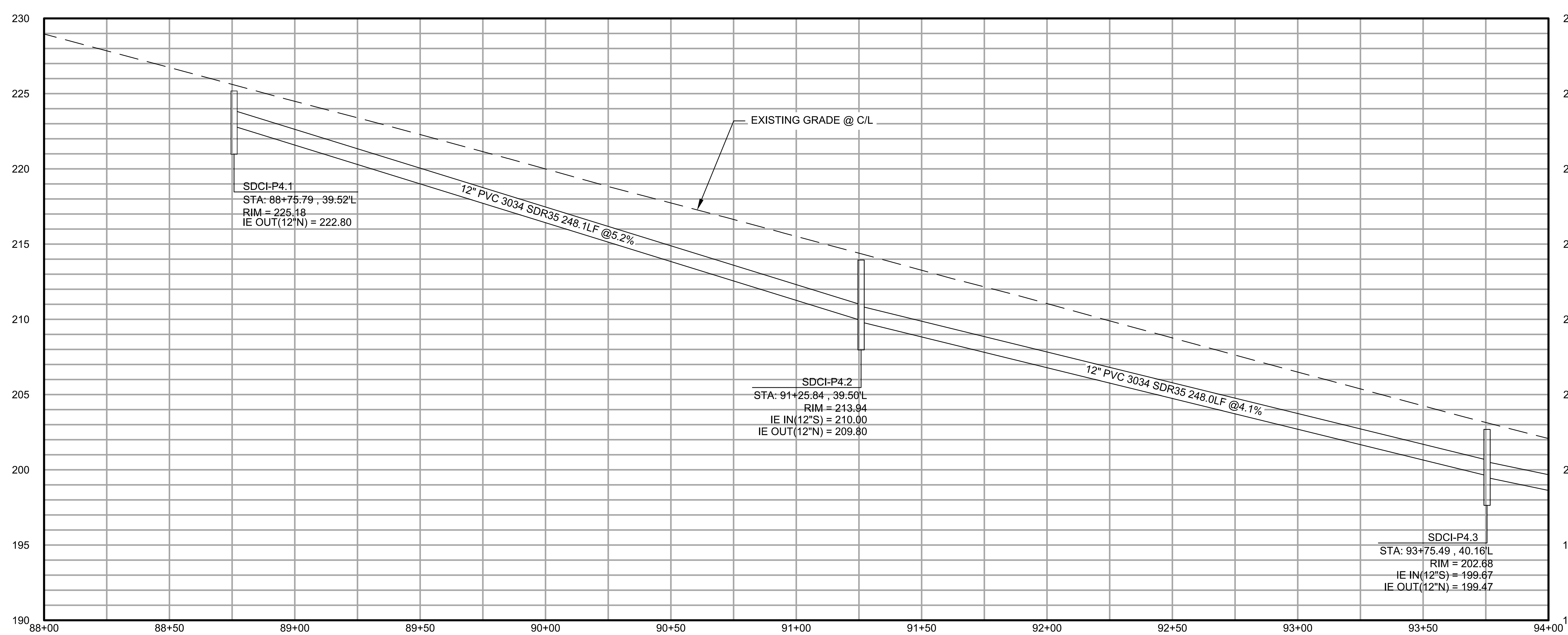
SHEET
C3.1

\\BIL-FS\BIL-PROJECTS\22\14347-01\65CAD\CIVIL_DD\SC-CT-RD-PF-TCC.DWG SAVED: 3/30/2020 3:42 PM PLOTTED: 3/30/2020 4:24 PM BY: RHALVORSON



SW 124TH AVE SOUTH PLAN

SCALE: 1" = 30'



SW 124TH AVE SOUTH PROFILE

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

N

30 0 30 60
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY
		REVISIONS	

REGISTERED PROFESSIONAL ENGINEER
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124TH AVENUE IMPROVEMENTS - SOUTH

SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
C3.2

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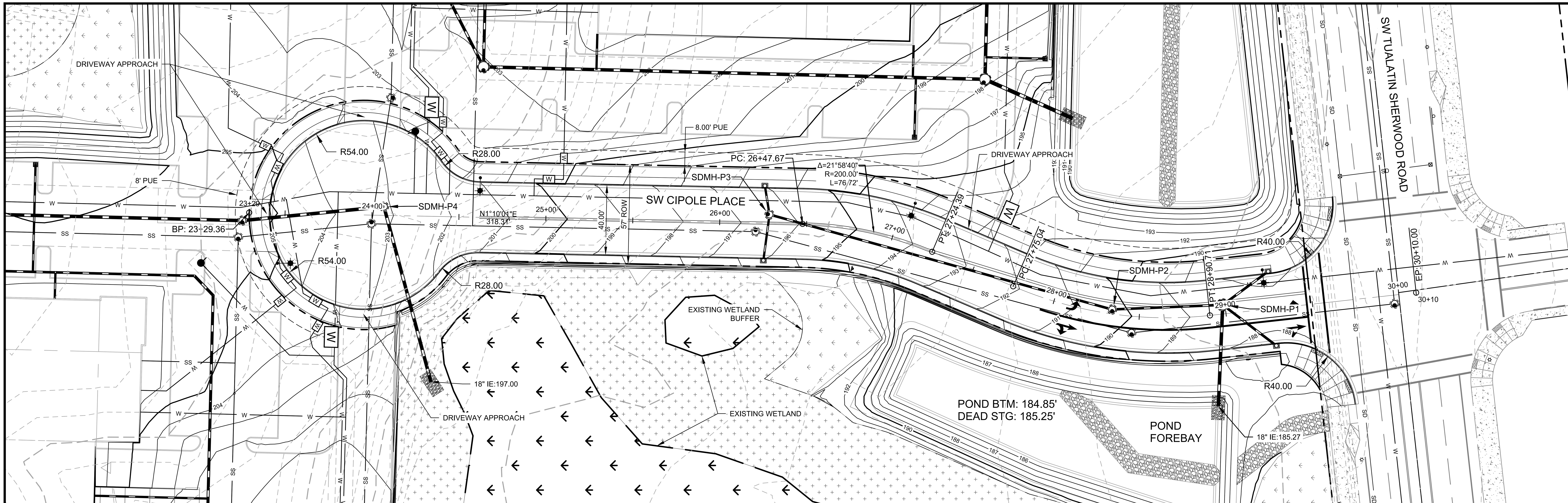
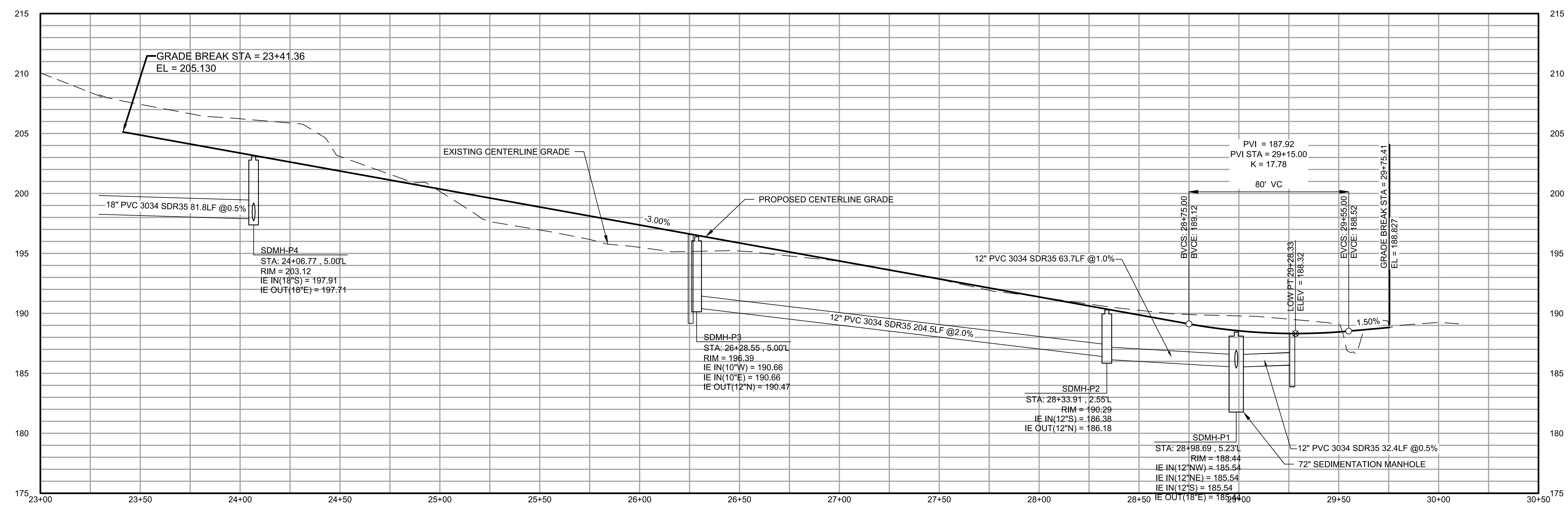


SW CIPOLE PLACE EXTENSION - PLAN

HORIZONTAL SCALE: 1" = 30'



SW CIPOLE PLACE EXTENSION - PROFILE

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 6'

30 0 30 60
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REVISIONS

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T-S CORPORATE PARK

CIPOLE PLACE PLAN AND PROFILE

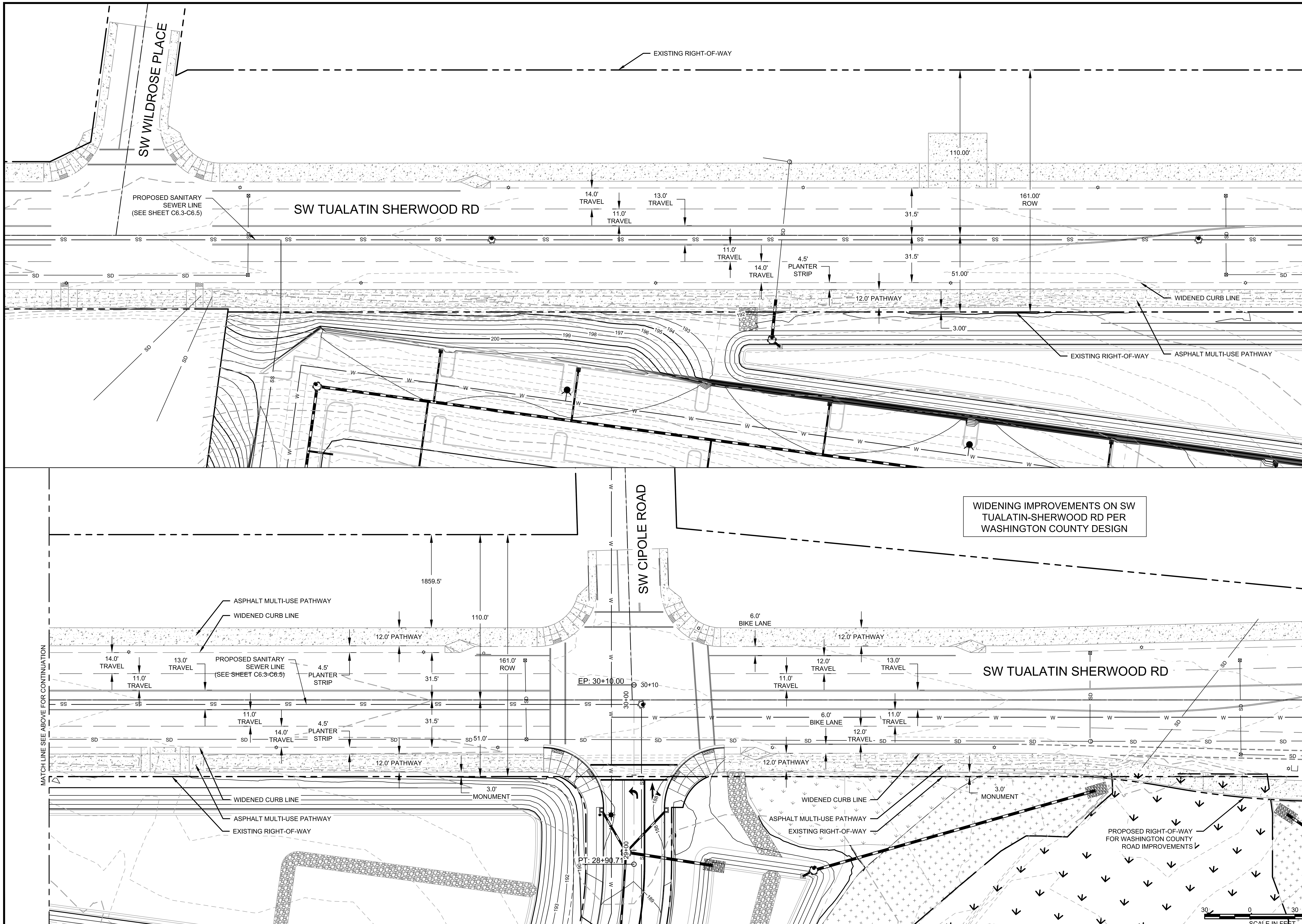
SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET

C3.3

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CT-RD-PF-TCC.DWG SAVED: 3/30/2020 3:42 PM PLOTTED: 3/30/2020 4:27 PM BY: RHALVORSON



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REV	DATE	REVISIONS DESCRIPTION	BY

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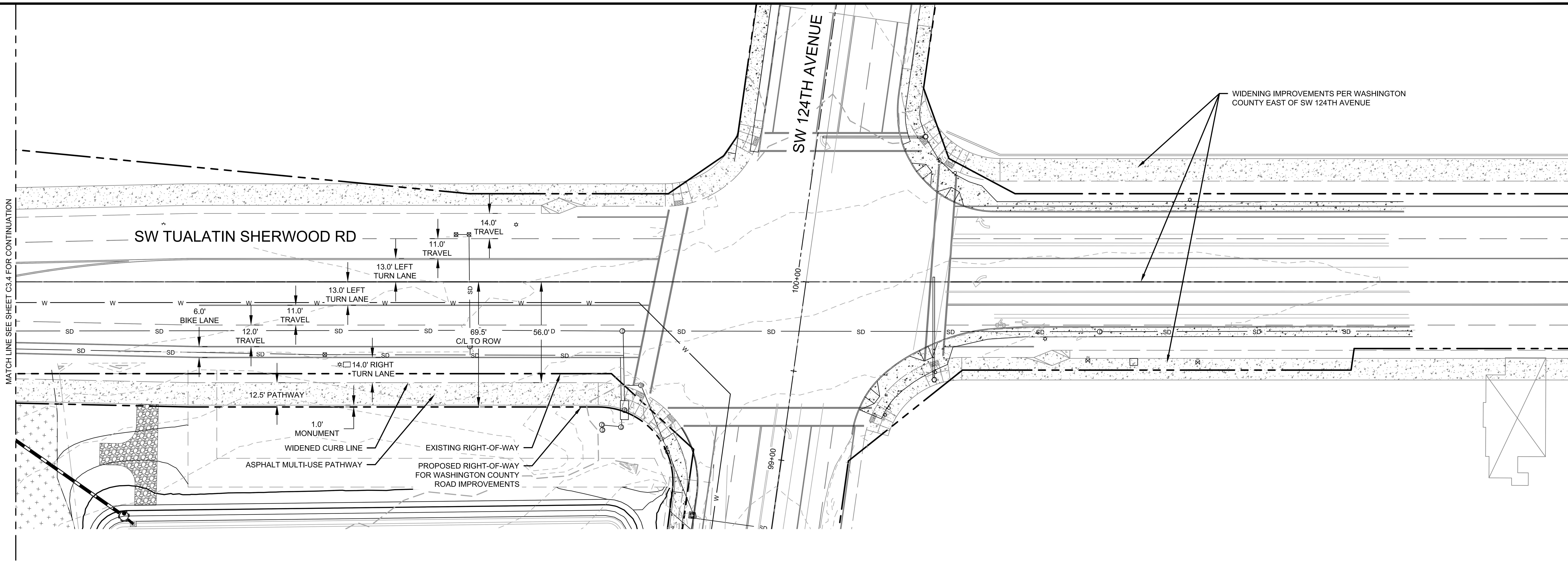
T-S CORPORATE PARK
TUALATIN-SHERWOOD ROAD IMPROVEMENTS - WEST
SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C3.4

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CT-RD-PF-TCC.DWG SAVED: 3/30/2020 3:42 PM PLOTTED: 3/30/2020 4:28 PM BY: RHALVORSON



WIDENING IMPROVEMENTS ON SW TUALATIN-SHERWOOD RD PER WASHINGTON COUNTY DESIGN

30 0 30 60
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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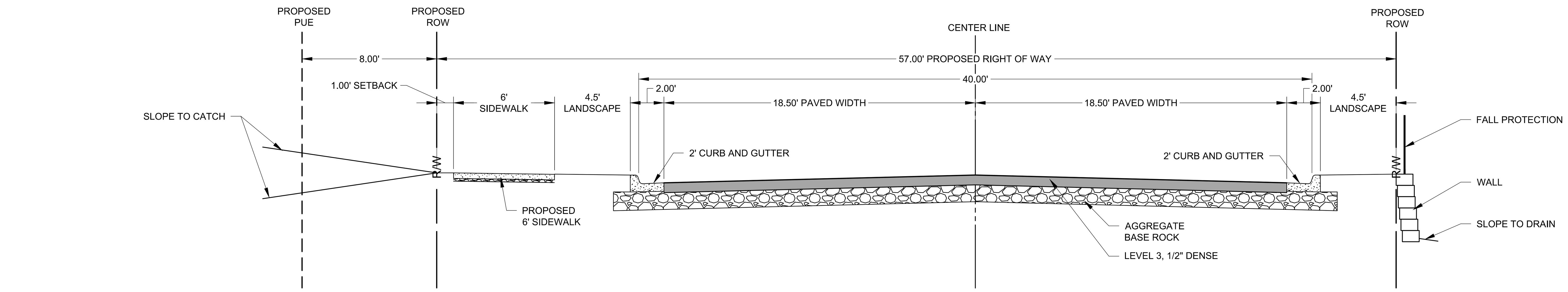
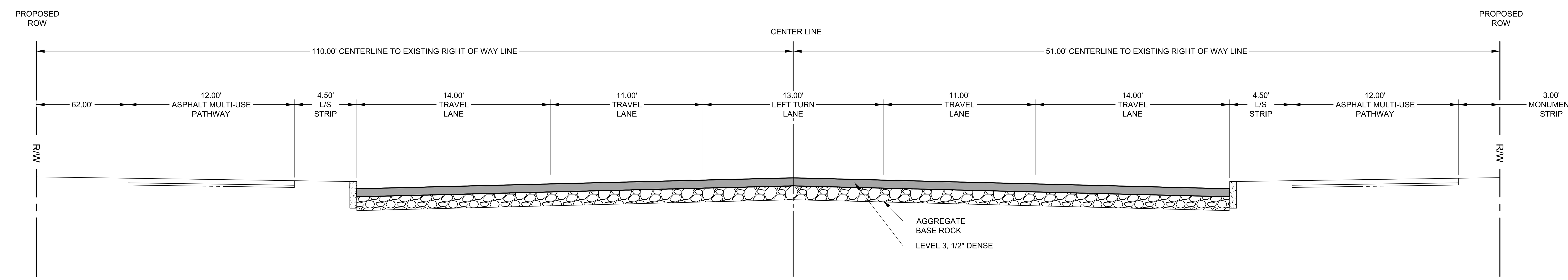
T-S CORPORATE PARK
TUALATIN-SHERWOOD ROAD IMPROVEMENTS - EAST
SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

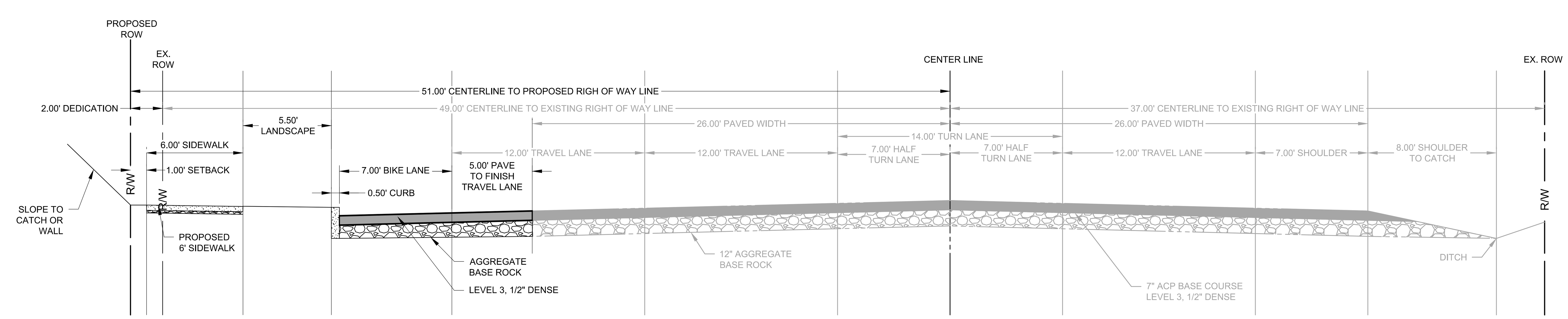
SHEET
C3.5



PROPOSED CIPOLE STREET CROSS SECTION



PROPOSED TUALATIN-SHERWOOD ROAD CROSS SECTION



PROPOSED SW 124TH AVE CROSS SECTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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Portland, Oregon 97205
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LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

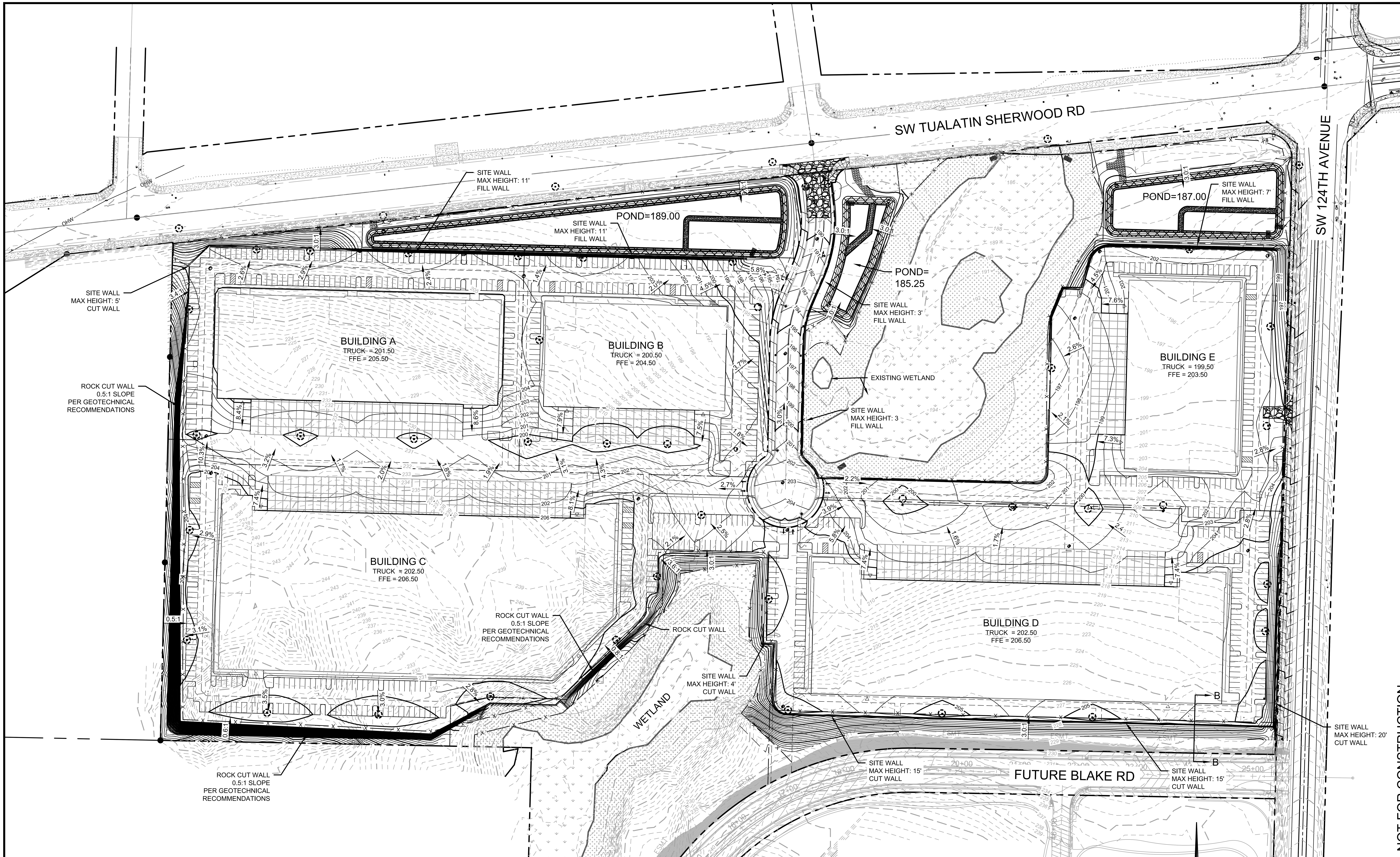
ROAD CROSS SECTIONS

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C3.6

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CT-RD-SEC-TCC.DWG SAVED: 3/30/2020 3:59 PM PLOTTED: 3/30/2020 4:29 PM BY: RHALVORSON



NOTE-
ASSUMED SOIL CUT SLOPE AT 3:1
ASSUMED ROCK CUT SLOPE IS AT 0.5:1

CUT/FILL ANALYSIS-
CUT = 775,510 CY
FILL = 38,400 CY

LEGEND

XXX.X	SPOT GRADE	340	PROPOSED 5' CONTOUR
	EXISTING CURB	341	PROPOSED 1' CONTOUR
	PROPOSED CURB	340	EXISTING 5' CONTOUR
		341	EXISTING 1' CONTOUR

LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK
GRADING AND EROSION CONTROL PLAN
SHERWOOD, OREGON

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www.DOWL.com
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

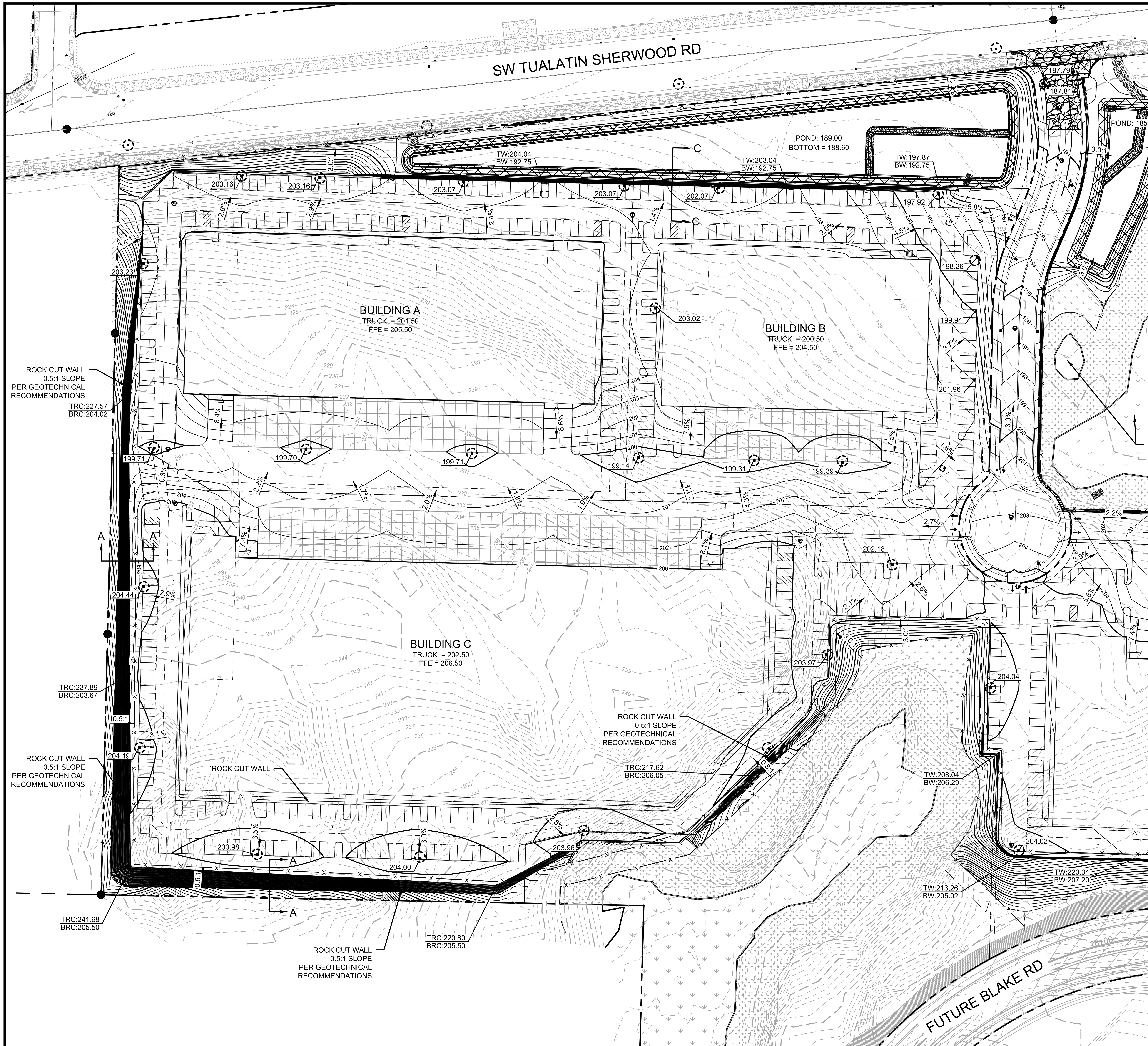
REVISIONS

REV	DATE	DESCRIPTION	BY

EXPIRES: 6/30/21

PROJECT	2322.14347.01
DATE	01/17/2020

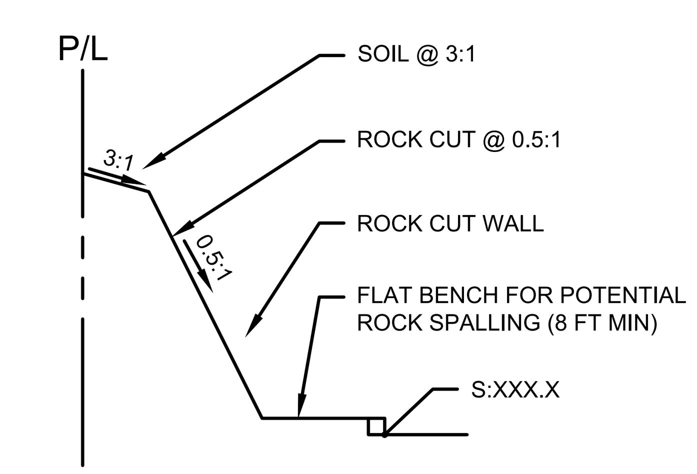
SHEET
C4.0



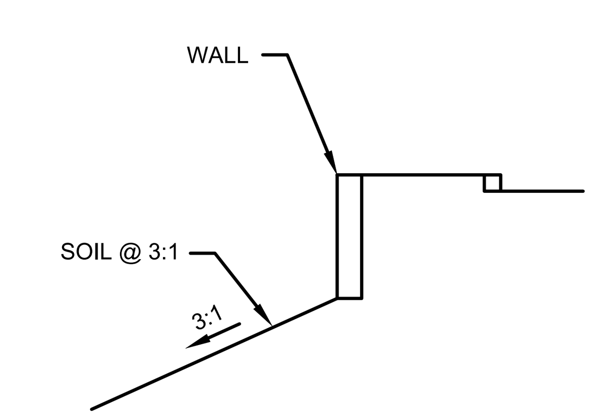
LEGEND

340	PROPOSED 5' CONTOUR
341	PROPOSED 1' CONTOUR
340	EXISTING 5' CONTOUR
341	EXISTING 1' CONTOUR
	EXISTING CURB PROPOSED CURB
XXX.X	SPOT GRADE
TW:XXX.X	FINISH GRADE AT TOP OF WALL
BW:XXX.X	FINISH GRADE AT BOTTOM OF WALL
TRC:XXX.X	TOP OF ROCK CUT
BRC:XXX.X	BOTTOM OF ROCK CUT
—x—x—	SEDIMENT FENCE
	INLET PROTECTION
	CONCRETE WASH OUT
	STRAW WATTLES
	STAGING / STOCKPILE AREA
	JUTE MATTING ON SLOPES
	CONSTRUCTION ENTRANCE

NOTE-
ASSUMED SOIL CUT SLOPE AT 3:1
ASSUMED ROCK CUT SLOPE IS AT 0.5:1



SECTION A-A - ROCK CUT



SECTION C-C - FILL WALL

SCALE IN FEET (0, 60, 120)

LAND-USE SET - NOT FOR CONSTRUCTION

REVISIONS: REV | DATE | DESCRIPTION | BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON RYAN HAJIME HALVORSON EXPIRES: 6/30/21

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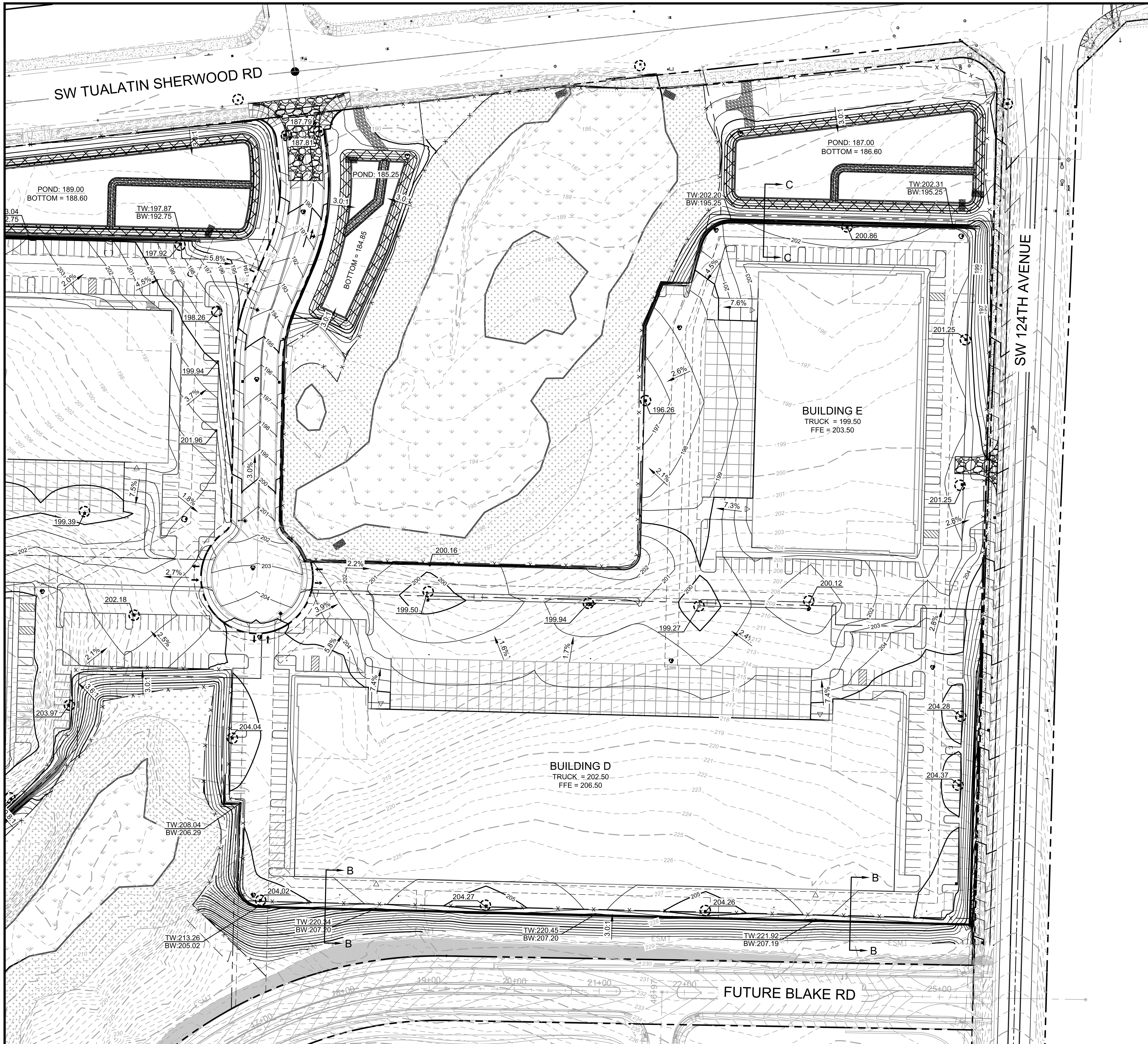
T-S CORPORATE PARK
GRADING PLAN - WEST
SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020
©DOWL 2019
SHEET
C4.1

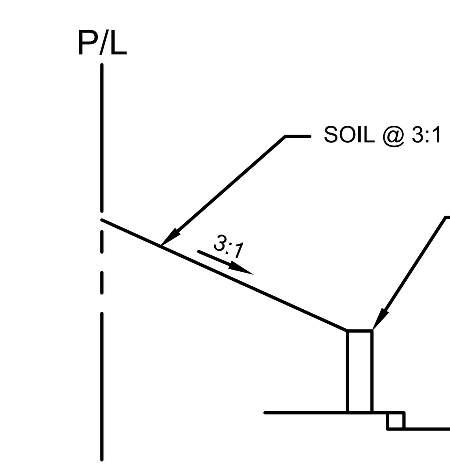
Q:\22\14347-01\65CAD\CIVIL_DD\SC-CS-FG-TCC.DWG SAVED: 3/30/2020 3:49 PM PLOTTED: 3/30/2020 4:31 PM BY: RHALVORSON



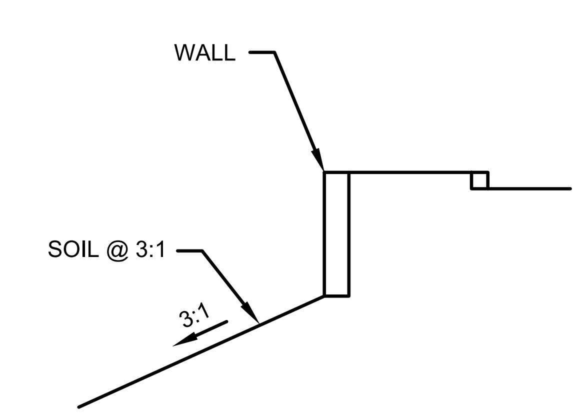
LEGEND

340	PROPOSED 5' CONTOUR
341	PROPOSED 1' CONTOUR
340	EXISTING 5' CONTOUR
341	EXISTING 1' CONTOUR
	EXISTING CURB PROPOSED CURB
XXX.X	SPOT GRADE
TW:XXX.X	FINISH GRADE AT TOP OF WALL
BW:XXX.X	FINISH GRADE AT BOTTOM OF WALL
TRC:XXX.X	TOP OF ROCK CUT
BRC:XXX.X	BOTTOM OF ROCK CUT
	SEDIMENT FENCE
	INLET PROTECTION
	CONCRETE WASH OUT
	STRAW WATTLES
	STAGING / STOCKPILE AREA
	JUTE MATTING ON SLOPES
	CONSTRUCTION ENTRANCE

NOTE-
ASSUMED SOIL CUT SLOPE AT 3:1
ASSUMED ROCK CUT SLOPE IS AT 0.5:1



SECTION B-B - NON-ROCK CUT



SECTION C-C - FILL WALL

60 0 60 120
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

GRADING PLAN - EAST

SHERWOOD, OREGON

REV | DATE | REVISIONS DESCRIPTION | BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON EXPIRES: 6/30/21

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PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
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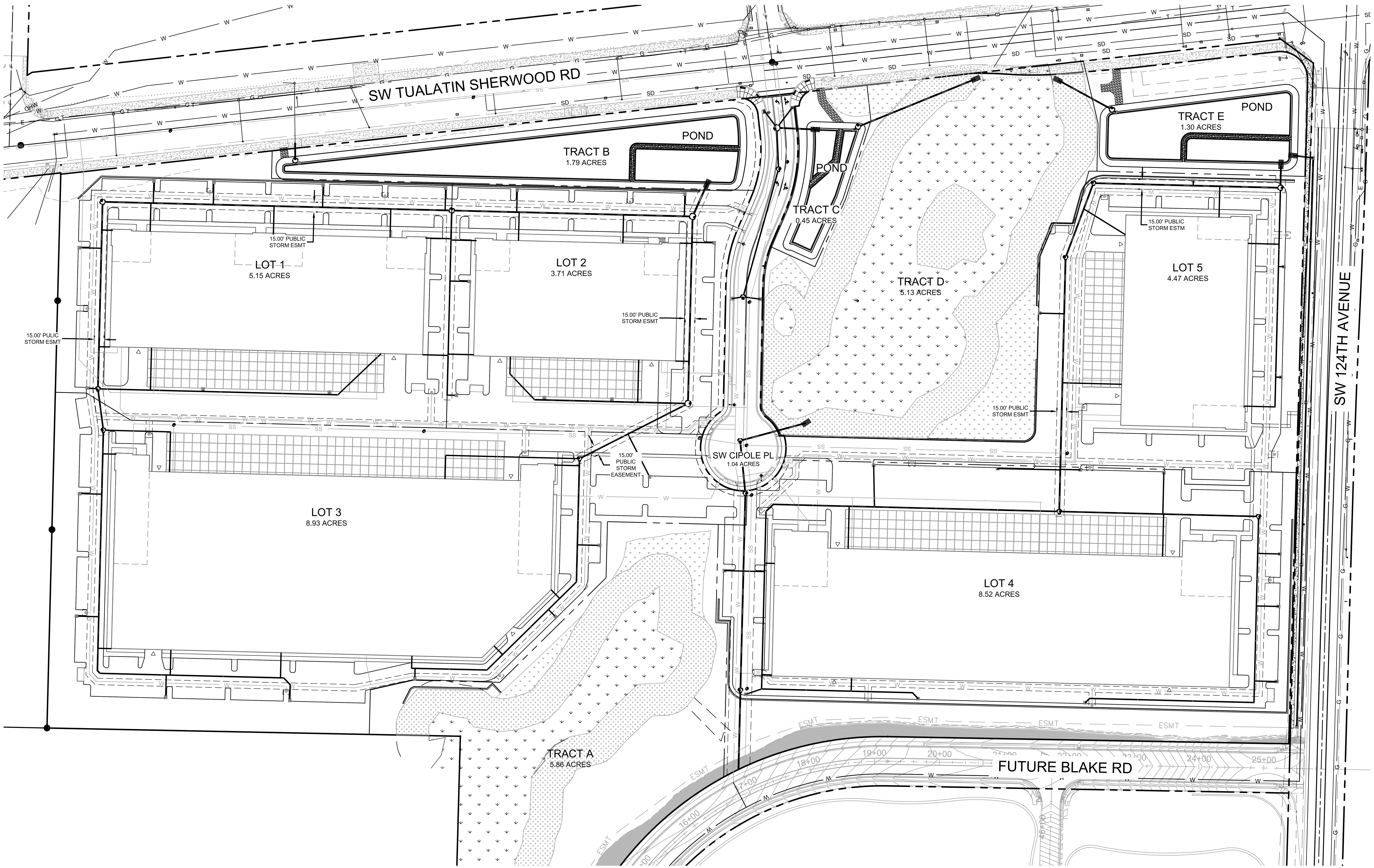
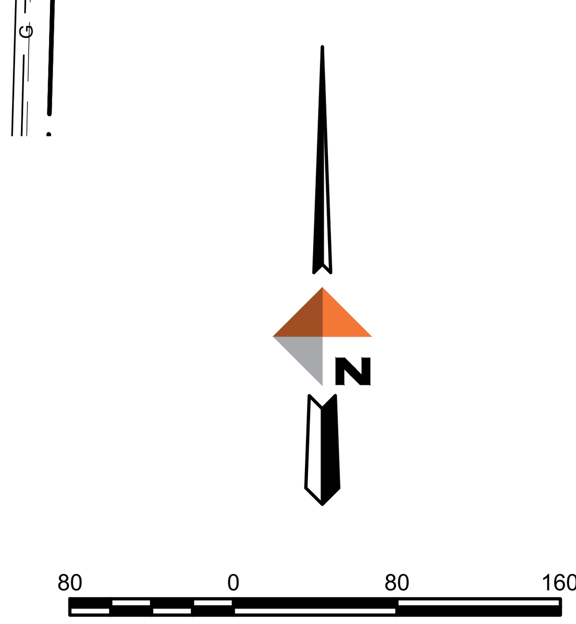


LOT 1:		
IMPERVIOUS AREA:	4.51 AC	
PERVIOUS AREA:	0.80 AC	
TOTAL AREA:	5.31 AC	
LOT 2:		
IMPERVIOUS AREA:	3.16 AC	
PERVIOUS AREA:	0.55 AC	
TOTAL AREA:	3.71 AC	
LOT 3:		
IMPERVIOUS AREA:	7.40 AC	
PERVIOUS AREA:	1.53 AC	
TOTAL AREA:	8.93 AC	
LOT 4:		
IMPERVIOUS AREA:	6.71 AC	
PERVIOUS AREA:	1.81 AC	
TOTAL AREA:	8.52 AC	
LOT 5:		
IMPERVIOUS AREA:	3.85 AC	
PERVIOUS AREA:	0.66 AC	
TOTAL AREA:	4.51 AC	
CIPOLE ROAD:		
IMPERVIOUS AREA:	0.91 AC	
PERVIOUS AREA:	0.13 AC	
TOTAL AREA:	1.04 AC	
TOTAL BASIN AREA:		
IMPERVIOUS AREA:	26.54 AC	(82.9%)
PERVIOUS AREA:	5.48 AC	(17.1%)
TOTAL AREA:	32.02 AC	



LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

STORMWATER PLAN - OVERALL

SHERWOOD, OREGON

REV	DATE	DESCRIPTION	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON EXPIRES: 6/30/21

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PROJECT 2322.14347.01
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SHEET
C5.0

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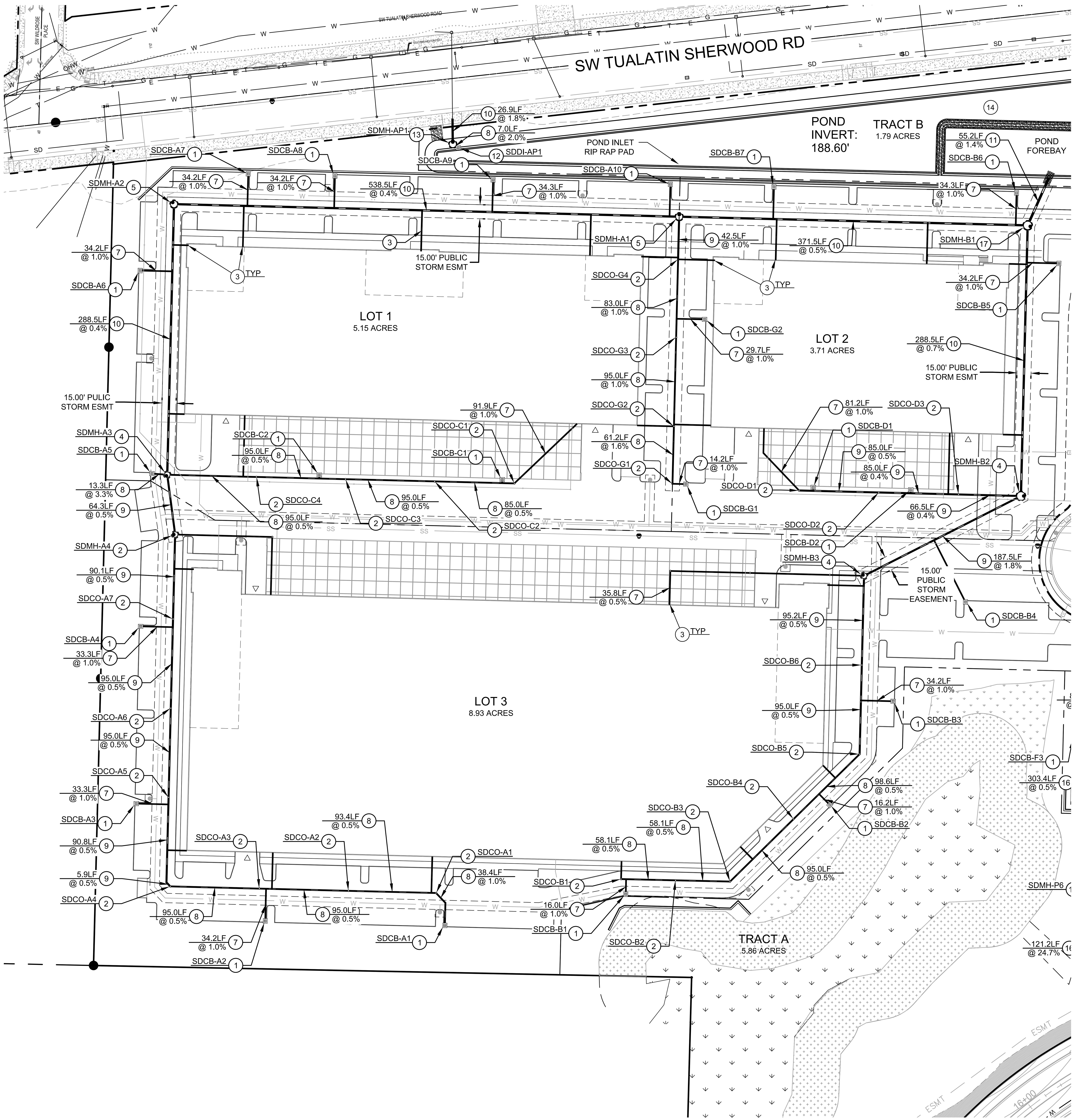


STORMWATER CONSTRUCTION NOTES

1. PROPOSED TRAPPED STEEL CATCH BASIN. SEE STORMWATER STRUCTURE TABLE FOR DATA.
2. PROPOSED STORMWATER CLEANOUT. SEE CLEANOUT TABLE FOR INVERT AND RIM ELEVATIONS.
3. PROPOSED 10" ROOF DRAIN. STUB 5' FROM FACE OF BUILDING. SLOPE @ 1.0% MIN. SEE PLAN FOR LENGTH AND SLOPE.
4. PROPOSED 48" STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
5. PROPOSED 60" STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
6. PROPOSED 72" STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
7. PROPOSED 10" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
8. PROPOSED 12" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
9. PROPOSED 15" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
10. PROPOSED 18" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
11. PROPOSED 21" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
12. PROPOSED DITCH INLET STORM STRUCTURE.
13. PROPOSED 60" FLOW CONTROL STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
14. PROPOSED STORMWATER POND. SEE SECTION THIS SHEET.
17. PROPOSED 72" WATER QUALITY SEDIMENTATION MANHOLE WITH 3' SUMP. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.

LEGEND

- EXISTING CURB
- PROPOSED CURB
- PROPOSED STORM DRAIN LINE
- EXISTING STORM MANHOLE
- EXISTING STORM SEWER CLEANOUT
- EXISTING SIGN
- EXISTING/PROPOSED CONCRETE SIDEWALK
- EXISTING STORM CATCH BASIN
- PROPOSED STORM CATCH BASIN
- PROPOSED STORM MANHOLE
- PROPOSED STORM SEWER CLEANOUT

MANHOLE DATA

SDDI-AP1
RIM: 190.32
IE OUT (12"NW) = 188.80

SDMH-A1
RIM: 203.80
IE IN (18"W) = 193.01
IE IN (15"S) = 192.37
IE OUT (18"E) = 192.81

SDMH-A2
RIM: 204.54
IE IN (18"S) = 195.36
IE OUT (18"E) = 195.16

SDMH-A3
RIM: 199.95
IE IN (15"S) = 196.71
IE IN (12"E) = 196.71
IE IN (12"W) = 195.65
IE OUT (18"N) = 196.51

SDMH-AP1
RIM: 192.25
IE IN (12"SE) = 188.66
IE OUT (18"N) = 188.56

SDMH-B1
RIM: 198.19
IE IN (18"S) = 191.15
IE IN (18"W) = 190.95
IE OUT (21"NE) = 190.75

SDMH-B2
RIM: 202.92
IE IN (15"SW) = 193.61
IE IN (15"W) = 196.03
IE OUT (18"N) = 193.31

SDMH-B3
RIM: 204.53
IE IN (15"S) = 197.15
IE IN (10"W) = 198.12
IE OUT (15"NE) = 196.95

CATCH BASIN DATA

SDCB-A1
RIM: 203.99
IE OUT (12"N) = 200.96

SDCB-A2
RIM: 204.03
IE OUT (10"N) = 200.67

SDCB-A3
RIM: 204.25
IE OUT (10"E) = 200.93

SDCB-A4
RIM: 204.48
IE OUT (10"E) = 201.11

SDCB-A5
RIM: 199.61
IE OUT (12"E) = 196.08

SDCB-A6
RIM: 203.29
IE OUT (10"E) = 199.94

SDCB-A7
RIM: 203.20
IE OUT (10"S) = 199.84

SDCB-A8
RIM: 203.20
IE OUT (10"S) = 199.85

CATCH BASIN DATA

SDCB-A9
RIM: 203.11
IE OUT (10"S) = 199.75

SDCB-A10
RIM: 203.12
IE OUT (10"S) = 200.00

SDCB-B1
RIM: 203.98
IE OUT (10"N) = 200.58

SDCB-B2
RIM: 203.93
IE OUT (10"NW) = 200.56

SDCB-B3
RIM: 204.00
IE OUT (10"W) = 200.64

SDCB-B4
RIM: 202.22
IE OUT (10"NW) = 198.86

SDCB-B5
RIM: 198.27
IE OUT (10"W) = 194.92

SDCB-B6
RIM: 197.94
IE OUT (10"S) = 194.59

CATCH BASIN DATA

SDCB-B7
RIM: 202.12
IE OUT (10"S) = 198.76

SDCB-C1
RIM: 199.74
IE OUT (12"S) = 196.20

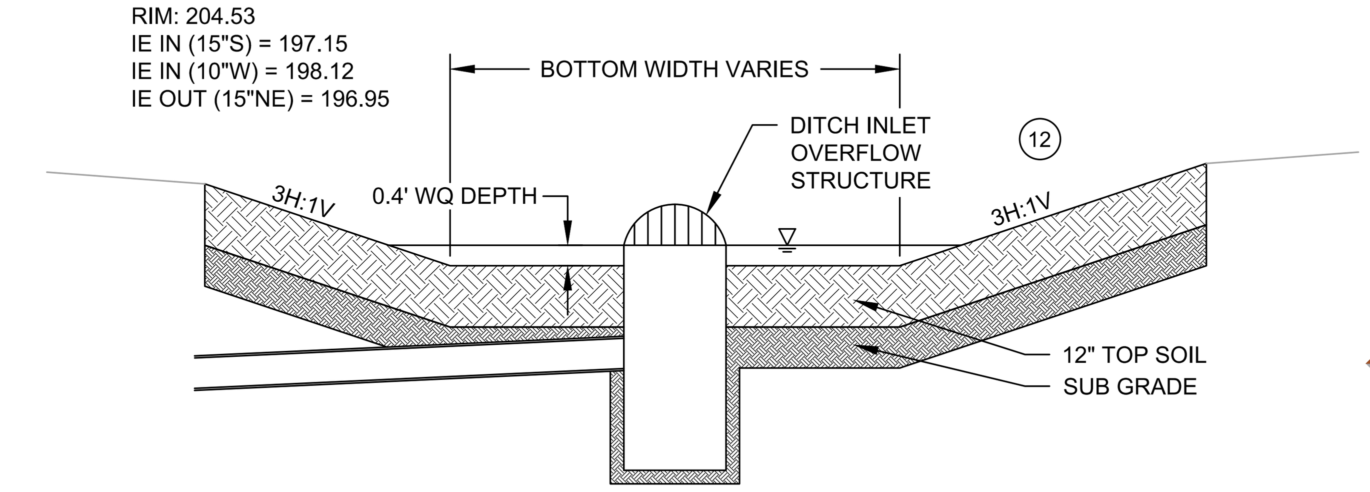
SDCB-C2
RIM: 199.72
IE OUT (12"S) = 196.20

SDCB-D1
RIM: 199.37
IE OUT (10"S) = 196.01

SDCB-D2
RIM: 199.43
IE OUT (10"S) = 196.08

SDCB-G1
RIM: 199.18
IE OUT (10"W) = 196.00

SDCB-G2
RIM: 203.07
IE OUT (10"W) = 199.72



TYPICAL POND SECTION (A-A) (14)
SCALE: NTS

60 0 60 120
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV | DATE | REVISIONS DESCRIPTION | BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON EXPIRES: 6/30/21

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T-S CORPORATE PARK
STORMWATER PLAN - WEST
SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
C5.1

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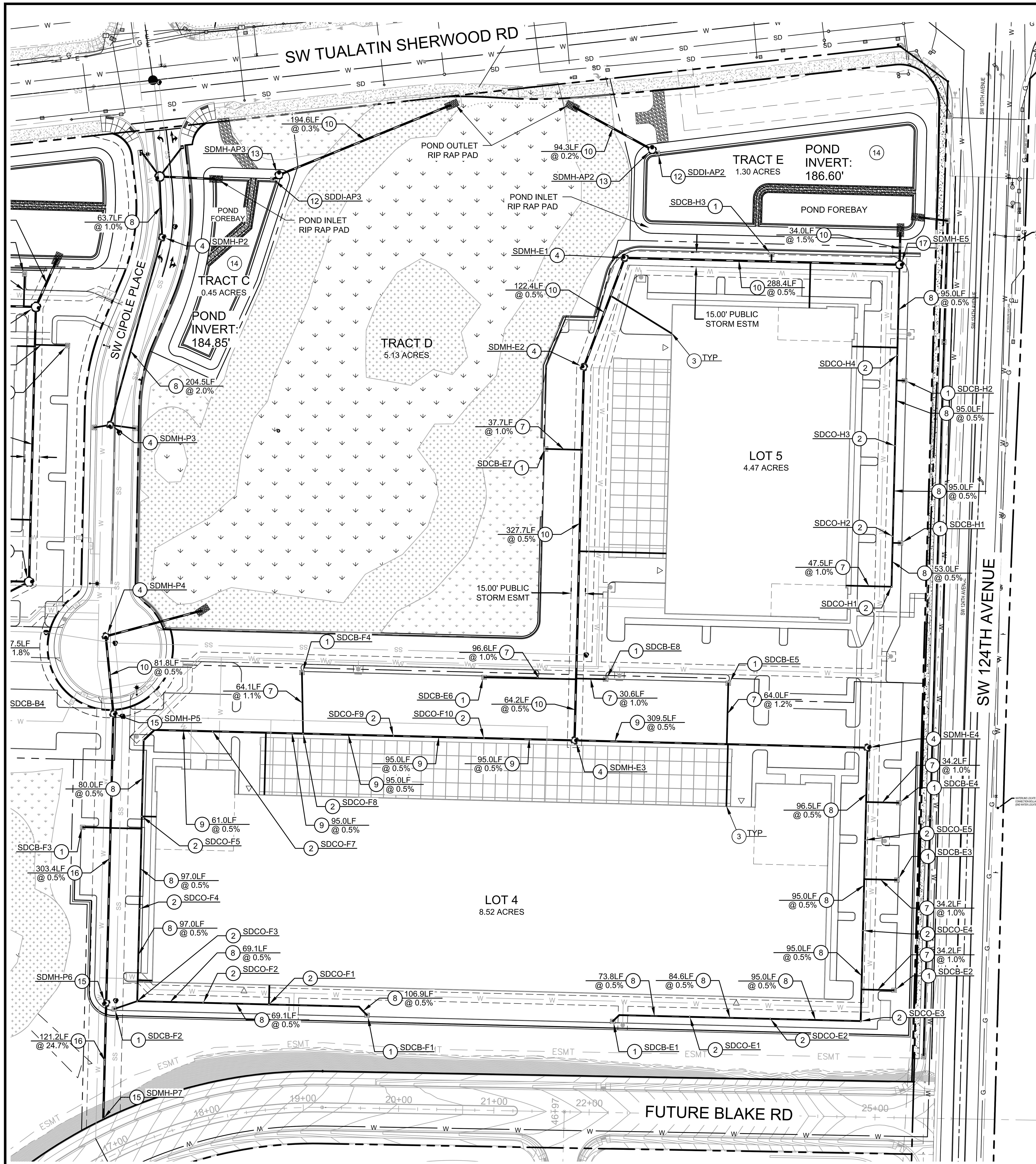


LEGEND

	EXISTING CURB
	PROPOSED CURB
	PROPOSED STORM DRAIN LINE
	EXISTING STORM MANHOLE
	EXISTING STORM SEWER CLEANOUT
	EXISTING SIGN
	EXISTING/PROPOSED CONCRETE SIDEWALK
	EXISTING STORM CATCH BASIN
	PROPOSED STORM CATCH BASIN
	PROPOSED STORM MANHOLE
	PROPOSED STORM SEWER CLEANOUT

STORMWATER CONSTRUCTION NOTES

1. PROPOSED TRAPPED STEEL CATCH BASIN. SEE STORMWATER STRUCTURE TABLE FOR DATA.
2. PROPOSED STORMWATER CLEANOUT. SEE CLEANOUT TABLE FOR INVERT AND RIM ELEVATIONS.
3. PROPOSED 10" ROOF DRAIN. STUB 5' FROM FACE OF BUILDING. SLOPE @ 1.0% MIN. SEE PLAN FOR LENGTH AND SLOPE.
4. PROPOSED 48" STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
5. PROPOSED 60" STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
6. PROPOSED 72" STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
7. PROPOSED 10" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
8. PROPOSED 12" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
9. PROPOSED 15" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
10. PROPOSED 18" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
11. PROPOSED 21" STORMWATER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
12. PROPOSED DITCH INLET STORM STRUCTURE.
13. PROPOSED 60" FLOW CONTROL STORMWATER MANHOLE. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
14. PROPOSED STORMWATER POND. SEE SECTION THIS SHEET.
15. PROPOSED 48" STORMWATER MANHOLE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.
16. PROPOSED 18" STORMWATER PIPE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM. SEE PLAN FOR LENGTH AND SLOPE.
17. PROPOSED 72" WATER QUALITY SEDIMENTATION MANHOLE WITH 3' SUMP. SEE MANHOLE TABLE FOR INVERT AND RIM ELEVATIONS.

MANHOLE DATA

SDDI-AP2
RIM: 188.32
IE OUT (12"NW) = 186.80

SDDI-AP3
RIM: 186.67
IE OUT (12"NE) = 185.15

SDMH-AP2
RIM: 190.29
IE IN (12"SE) = 186.73
IE OUT (18"NW) = 186.63

SDMH-AP3
RIM: 188.78
IE IN (12"SW) = 185.07
IE OUT (18"E) = 185.07

SDMH-E1
RIM: 200.42
IE IN (18"S) = 190.85
IE OUT (18"E) = 190.65

SDMH-E2
RIM: 194.04
IE IN (18"S) = 191.67
IE OUT (18"N) = 191.47

SDMH-E3
RIM: 199.16
IE IN (15"W) = 196.14
IE IN (15"E) = 196.49
IE OUT (18"N) = 193.72

SDMH-E4
RIM: 200.15
IE IN (12"S) = 198.04
IE OUT (15"W) = 198.04

MANHOLE DATA

SDMH-E5
RIM: 202.59
IE IN (12"S) = 198.16
IE IN (18"W) = 189.21
IE OUT (18"N) = 189.01

SDMH-P1
RIM: 188.44
IE IN (12"NW) = 185.54
IE IN (12"NE) = 185.54
IE IN (12"S) = 185.54
IE OUT (18"E) = 185.44

SDMH-P2
RIM: 190.29
IE IN (12"S) = 186.38
IE OUT (12"N) = 186.18

SDMH-P3
RIM: 196.39
IE IN (10"W) = 190.66
IE IN (10"E) = 190.66
IE OUT (12"N) = 190.47

SDMH-P4
RIM: 203.12
IE IN (18"S) = 197.91
IE OUT (18"E) = 197.71

SDMH-P5
RIM: 205.72
IE IN (18"S) = 198.42
IE OUT (18"N) = 198.32

SDMH-P7
RIM: 237.13
IE OUT (18"N) = 230.00

CATCH BASIN DATA

SDCB-E1
RIM: 204.30
IE OUT (12"NE) = 200.78

SDCB-E2
RIM: 204.03
IE OUT (10"W) = 200.67

SDCB-E3
RIM: 204.41
IE OUT (10"W) = 201.05

SDCB-E4
RIM: 204.33
IE OUT (10"W) = 200.97

SDCB-E5
RIM: 200.02
IE OUT (10"S) = 196.80

SDCB-E6
RIM: 199.94
IE OUT (10"E) = 195.11

SDCB-E7
RIM: 196.28
IE OUT (10"E) = 193.25

SDCB-E8
RIM: 199.28
IE OUT (10"W) = 195.93

CATCH BASIN DATA

SDCB-F1
RIM: 204.31
IE OUT (12"NW) = 201.27

SDCB-F2
RIM: 205.12
IE OUT (10"E) = 203.76

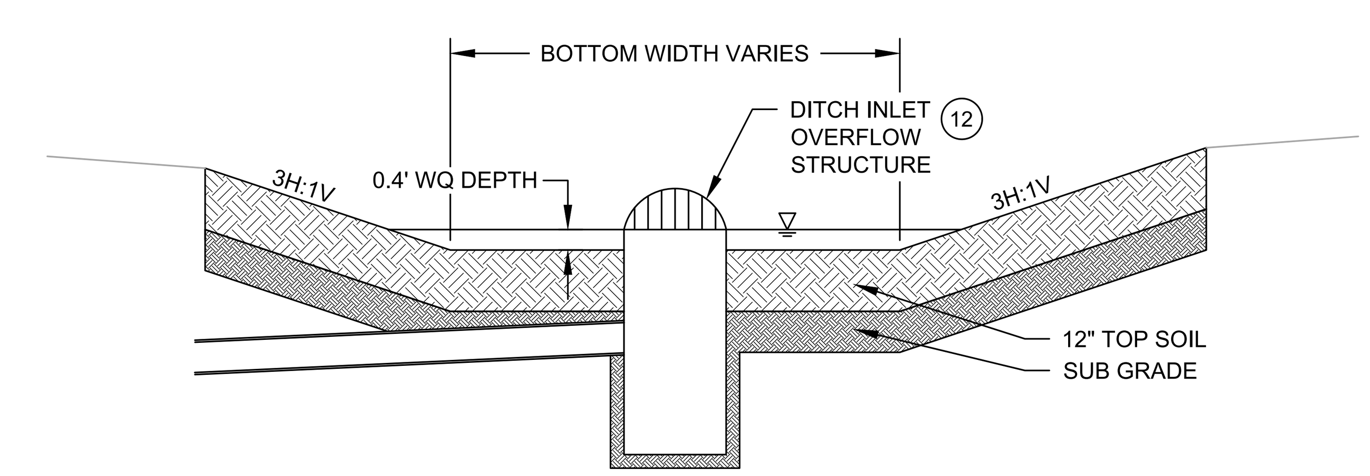
SDCB-F3
RIM: 204.09
IE OUT (10"E) = 200.50

SDCB-F4
RIM: 199.39
IE OUT (10"S) = 196.07

SDCB-H1
RIM: 201.29
IE OUT (10"W) = 197.93

SDCB-H2
RIM: 201.29
IE OUT (10"W) = 198.30

SDCB-H3
RIM: 200.89
IE OUT (10"S) = 197.54



TYPICAL POND SECTION (A-A)
SCALE: NTS

60 0 60 120
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY
		REVISIONS	

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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T-S CORPORATE PARK
STORMWATER PLAN - EAST
SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
C5.2

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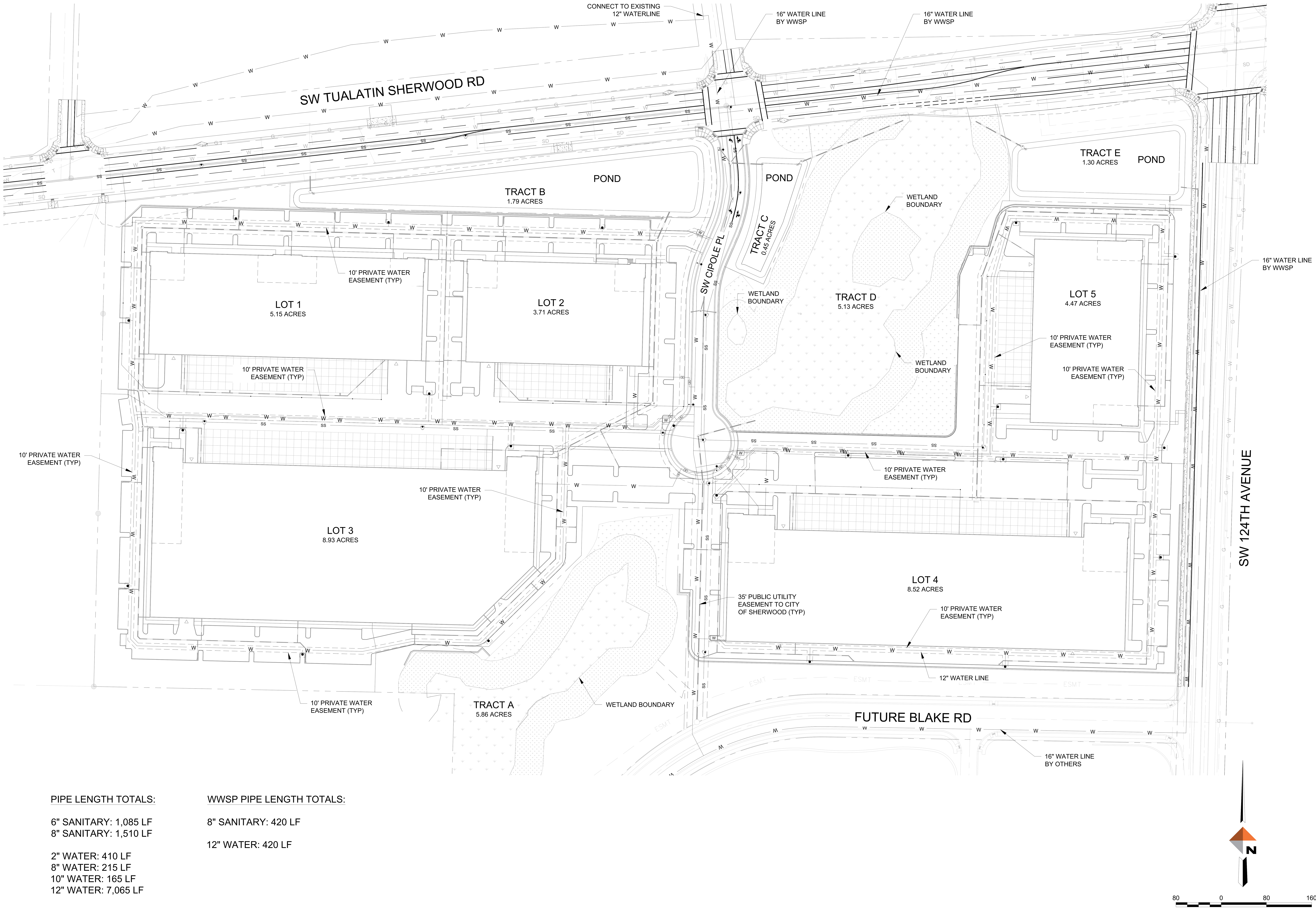

PIPE LENGTH TOTALS:

6" SANITARY: 1,085 LF
8" SANITARY: 1,510 LF

2" WATER: 410 LF
8" WATER: 215 LF
10" WATER: 165 LF
12" WATER: 7,065 LF

WWSP PIPE LENGTH TOTALS:

8" SANITARY: 420 LF

12" WATER: 420 LF

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY

REVISIONS

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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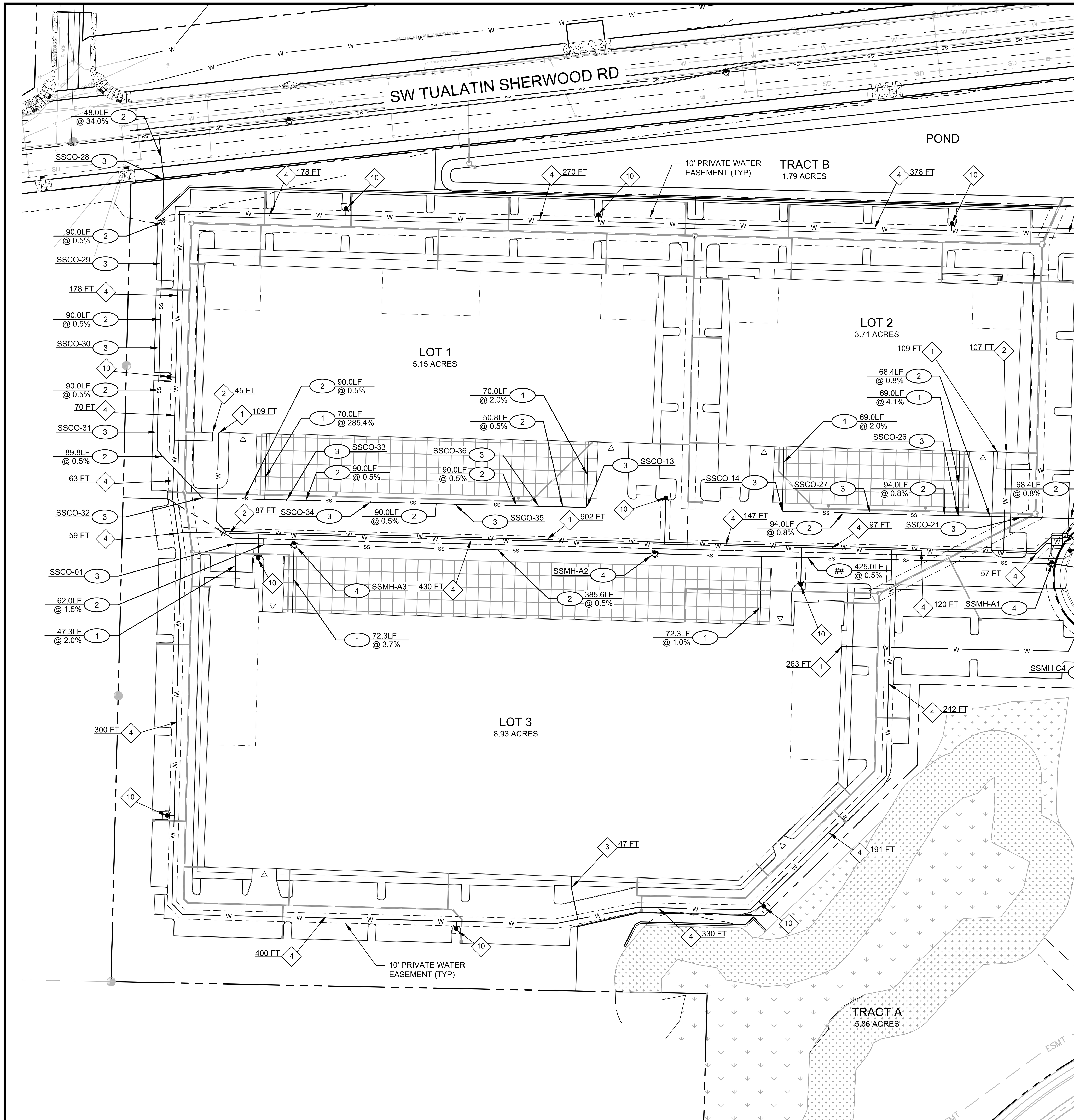
T-S CORPORATE PARK

UTILITY PLAN - OVERALL

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C6.0



LEGEND

- PROPERTY LINE
- CENTERLINE
- RIGHT OF WAY
- SETBACK LINE
- EASEMENT LINE
- WATER LINE
- SANITARY SEWER
- STORM SEWER
- ELECTRIC
- TELEPHONE LINE
- FIBER OPTIC LINE
- COMMUNICATIONS LINE
- GAS LINE
- EDGE OF LANDSCAPE AREA
- STORMWATER PIPE
- SANITARY SEWER PIPE
- WATER LINE
- STORMWATER MANHOLE
- STORMWATER CLEANOUT
- STORMWATER CATCH BASIN
- SANITARY SEWER CLEANOUT
- IRRIGATION METER
- DOMESTIC WATER METER
- WATER VALVE
- WATER DOUBLE CHECK

SANITARY SEWER CONSTRUCTION NOTES

1. PROPOSED 6" PVC PRIVATE SANITARY SEWER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
2. PROPOSED 8" PVC PRIVATE SANITARY SEWER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
3. PROPOSED SANITARY SEWER CLEANOUT. SEE SANITARY STRUCTURE TABLE FOR INVERT AND RIM ELEVATIONS.
4. PROPOSED SANITARY SEWER MANHOLE. SEE SANITARY STRUCTURE TABLE FOR INVERT AND RIM ELEVATIONS.
5. PROPOSED 8" PVC SANITARY SEWER PIPE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM. SEE PLAN FOR LENGTH AND SLOPE.
6. PROPOSED SANITARY SEWER MANHOLE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM. SEE SANITARY STRUCTURE TABLE FOR INVERT AND RIM ELEVATIONS.

WATER CONSTRUCTION NOTES

1. PROPOSED 3" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
2. PROPOSED 8" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
3. PROPOSED 10" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
4. PROPOSED 12" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
5. NOTE NOT USED.
6. PROPOSED 10" FIRE WATER DOUBLE CHECK.
7. PROPOSED 3" DOMESTIC WATER METER.
8. PROPOSED 3" DOMESTIC WATER DOUBLE CHECK.
9. PROPOSED 16" PUBLIC WATER LINE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM
10. PROPOSED FIRE HYDRANT

MANHOLE DATA

SSMH-01
RIM: 200.34
IE IN (8"N) = 193.83
IE OUT (8"W) = 193.63

SSMH-A1
RIM: 203.33
IE IN (8"W) = 192.53
IE OUT (8"E) = 192.33

SSMH-A2
RIM: 200.98
IE IN (8"W) = 194.86
IE OUT (8"E) = 194.66

SSMH-A3
RIM: 201.41
IE IN (6"W) = 197.19
IE IN (6"S) = 196.99
IE OUT (8"E) = 196.79

SSMH-C3
RIM: 203.34
IE IN (8"S) = 190.72
IE IN (8"E) = 191.16
IE IN (8"W) = 190.92
IE OUT (10"N) = 190.52

SSMH-C4
RIM: 205.60
IE IN (10"S) = 192.47
IE IN (8"E) = 192.47
IE OUT (8"N) = 192.27

SSMH-C5
RIM: 204.41
IE IN (10"S) = 195.56
IE OUT (10"N) = 195.36

CLEANOUT DATA

SSCO-01
RIM: 201.39
IE (6") = 198.14

SSCO-13
RIM: 199.66
IE (8") = 196.93

SSCO-14
RIM: 200.06
IE (8") = 195.95

SSCO-15
RIM: 200.52
IE (8") = 194.02

SSCO-16
RIM: 198.31
IE (8") = 194.46

SSCO-17
RIM: 197.56
IE (8") = 194.93

SSCO-18
RIM: 198.39
IE (8") = 195.32

SSCO-19
RIM: 202.08
IE (8") = 193.51

SSCO-20
RIM: 203.99
IE (8") = 193.14

SSCO-21
RIM: 203.08
IE (8") = 194.02

CLEANOUT DATA

SSCO-22
RIM: 201.03
IE (8") = 193.81

SSCO-23
RIM: 201.33
IE (6") = 194.48

SSCO-24
RIM: 201.23
IE (6") = 195.15

SSCO-25
RIM: 201.31
IE (6") = 195.79

SSCO-26
RIM: 200.04
IE (8") = 194.53

SSCO-27
RIM: 200.28
IE (8") = 195.24

SSCO-28
RIM: 195.86
IE (6") = 193.08

SSCO-29
RIM: 203.77
IE (8") = 193.53

SSCO-30
RIM: 204.14
IE (8") = 193.98

SSCO-31
RIM: 202.40
IE (8") = 194.43

CLEANOUT DATA

SSCO-32
RIM: 200.26
IE (8") = 194.88

SSCO-33
RIM: 200.40
IE (8") = 195.33

SSCO-34
RIM: 200.23
IE (8") = 195.78

SSCO-35
RIM: 200.53
IE (8") = 196.23

SSCO-36
RIM: 200.08
IE (8") = 196.68

60 0 60 120
SCALE IN FEET

REV | DATE | REVISIONS DESCRIPTION | BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

UTILITY PLAN - WEST

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C6.1

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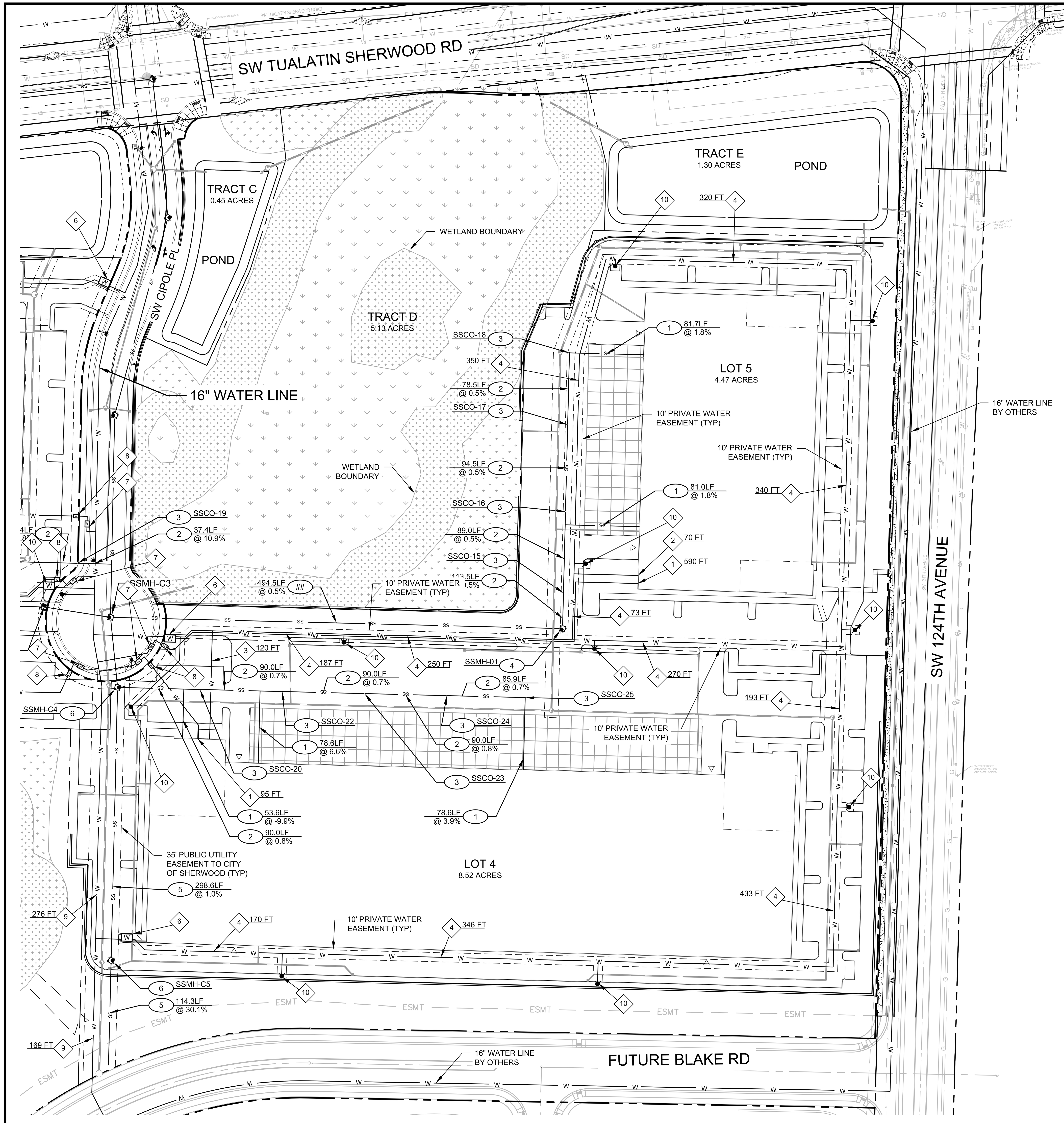


LEGEND

- PROPERTY LINE
- CENTERLINE
- RIGHT OF WAY
- SETBACK LINE
- EASEMENT LINE
- WATER LINE
- SANITARY SEWER
- STORM SEWER
- ELECTRIC
- TELEPHONE LINE
- FIBER OPTIC LINE
- COMMUNICATIONS LINE
- GAS LINE
- EDGE OF LANDSCAPE AREA
- STORMWATER PIPE
- SANITARY SEWER PIPE
- WATER LINE
- STORMWATER MANHOLE
- STORMWATER CLEANOUT
- STORMWATER CATCH BASIN
- SANITARY SEWER CLEANOUT
- IRRIGATION METER
- DOMESTIC WATER METER
- WATER VALVE
- WATER DOUBLE CHECK

SANITARY SEWER CONSTRUCTION NOTES

1. PROPOSED 6" PVC SANITARY SEWER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
2. PROPOSED 8" PVC SANITARY SEWER PIPE. SEE PLAN FOR LENGTH AND SLOPE.
3. PROPOSED SANITARY SEWER CLEANOUT. SEE SANITARY STRUCTURE TABLE FOR INVERT AND RIM ELEVATIONS.
4. PROPOSED SANITARY SEWER MANHOLE. SEE SANITARY STRUCTURE TABLE FOR INVERT AND RIM ELEVATIONS.
5. PROPOSED 8" PVC SANITARY SEWER PIPE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM. SEE PLAN FOR LENGTH AND SLOPE.
6. PROPOSED SANITARY SEWER MANHOLE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM. SEE SANITARY STRUCTURE TABLE FOR INVERT AND RIM ELEVATIONS.

WATER CONSTRUCTION NOTES

1. PROPOSED 3" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
2. PROPOSED 8" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
3. PROPOSED 10" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
4. PROPOSED 12" DUCTILE IRON WATER LINE. SEE PLAN FOR LENGTH.
5. NOTE NOT USED.
6. PROPOSED 10" FIRE WATER DOUBLE CHECK.
7. PROPOSED 3" DOMESTIC WATER METER.
8. PROPOSED 3" DOMESTIC WATER DOUBLE CHECK.
9. PROPOSED 16" PUBLIC WATER LINE TO BE INSTALLED BY WILLAMETTE WATER SUPPLY PROGRAM
10. PROPOSED FIRE HYDRANT

MANHOLE DATA

SSMH-01
RIM: 200.34
IE IN (8"N) = 193.83
IE OUT (8"W) = 193.63

SSMH-A1
RIM: 203.33
IE IN (8"W) = 192.53
IE OUT (8"E) = 192.33

SSMH-A2
RIM: 200.98
IE IN (8"W) = 194.86
IE OUT (8"E) = 194.66

SSMH-A3
RIM: 201.41
IE IN (6"W) = 197.19
IE IN (6"S) = 196.99
IE OUT (8"E) = 196.79

SSMH-C3
RIM: 203.34
IE IN (8"S) = 190.72
IE IN (8"E) = 191.16
IE IN (8"W) = 190.92
IE OUT (10"N) = 190.52

SSMH-C4
RIM: 205.60
IE IN (10"S) = 192.47
IE IN (8"E) = 192.47
IE OUT (8"N) = 192.27

SSMH-C5
RIM: 204.41
IE IN (10"S) = 195.56
IE OUT (10"N) = 195.36

CLEANOUT DATA

SSCO-01
RIM: 201.39
IE (6") = 198.14

SSCO-13
RIM: 199.66
IE (8") = 196.93

SSCO-14
RIM: 200.06
IE (8") = 195.95

SSCO-15
RIM: 200.52
IE (8") = 194.02

SSCO-16
RIM: 198.31
IE (8") = 194.46

SSCO-17
RIM: 197.56
IE (8") = 194.93

SSCO-18
RIM: 198.39
IE (8") = 195.32

SSCO-19
RIM: 202.08
IE (8") = 193.51

SSCO-20
RIM: 203.99
IE (8") = 193.14

SSCO-21
RIM: 203.08
IE (8") = 194.02

CLEANOUT DATA

SSCO-22
RIM: 201.03
IE (8") = 193.81

SSCO-23
RIM: 201.33
IE (6") = 194.48

SSCO-24
RIM: 201.23
IE (6") = 195.15

SSCO-25
RIM: 201.31
IE (6") = 195.79

SSCO-26
RIM: 200.04
IE (8") = 194.53

SSCO-27
RIM: 200.28
IE (8") = 195.24

SSCO-28
RIM: 195.86
IE (6") = 193.08

SSCO-29
RIM: 203.77
IE (8") = 193.53

SSCO-30
RIM: 204.14
IE (8") = 193.98

SSCO-31
RIM: 202.40
IE (8") = 194.43

CLEANOUT DATA

SSCO-32
RIM: 200.26
IE (8") = 194.88

SSCO-33
RIM: 200.40
IE (8") = 195.33

SSCO-34
RIM: 200.23
IE (8") = 195.78

SSCO-35
RIM: 200.53
IE (8") = 196.23

SSCO-36
RIM: 200.08
IE (8") = 196.68

60 0 60 120
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

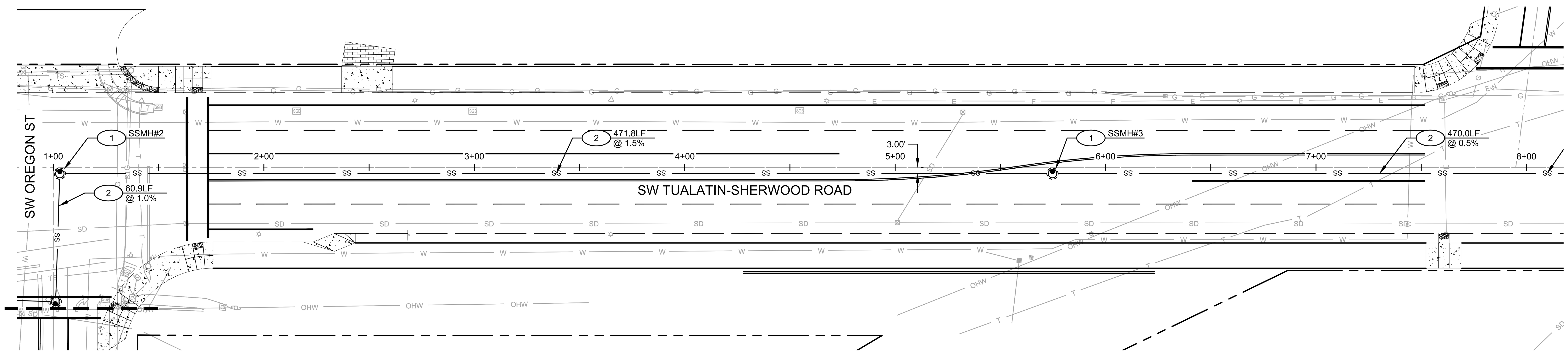
REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK
UTILITY PLAN - EAST
SHERWOOD, OREGON

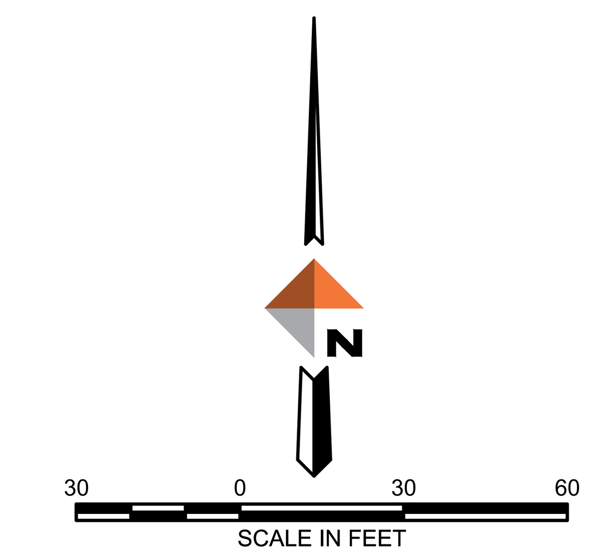
PROJECT 2322.14347.01
DATE 01/17/2020

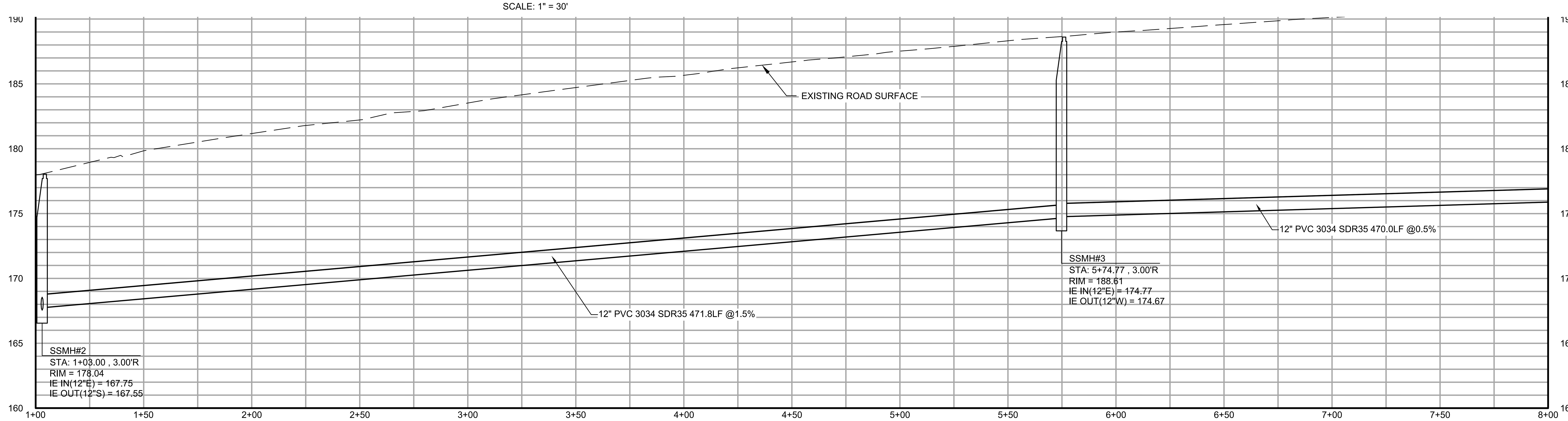
SHEET
C6.2



SW TUALATIN-SHERWOOD ROAD PUBLIC SANITARY SEWER PLAN STA: 1+00 TO 8+00

SCALE: 1" = 30'

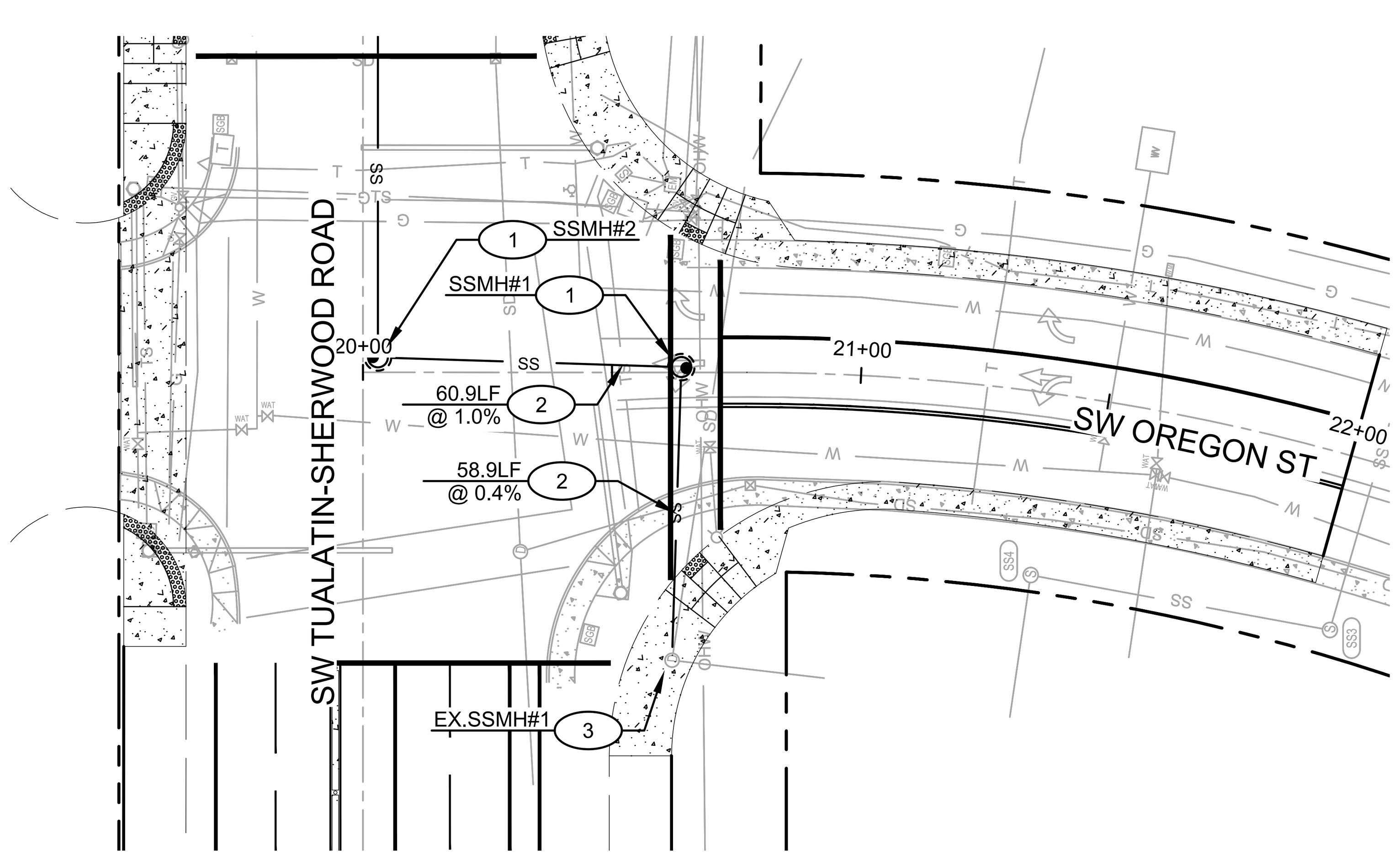




SW TUALATIN-SHERWOOD ROAD PUBLIC SANITARY SEWER PROFILE STA: 1+00 TO 8+00

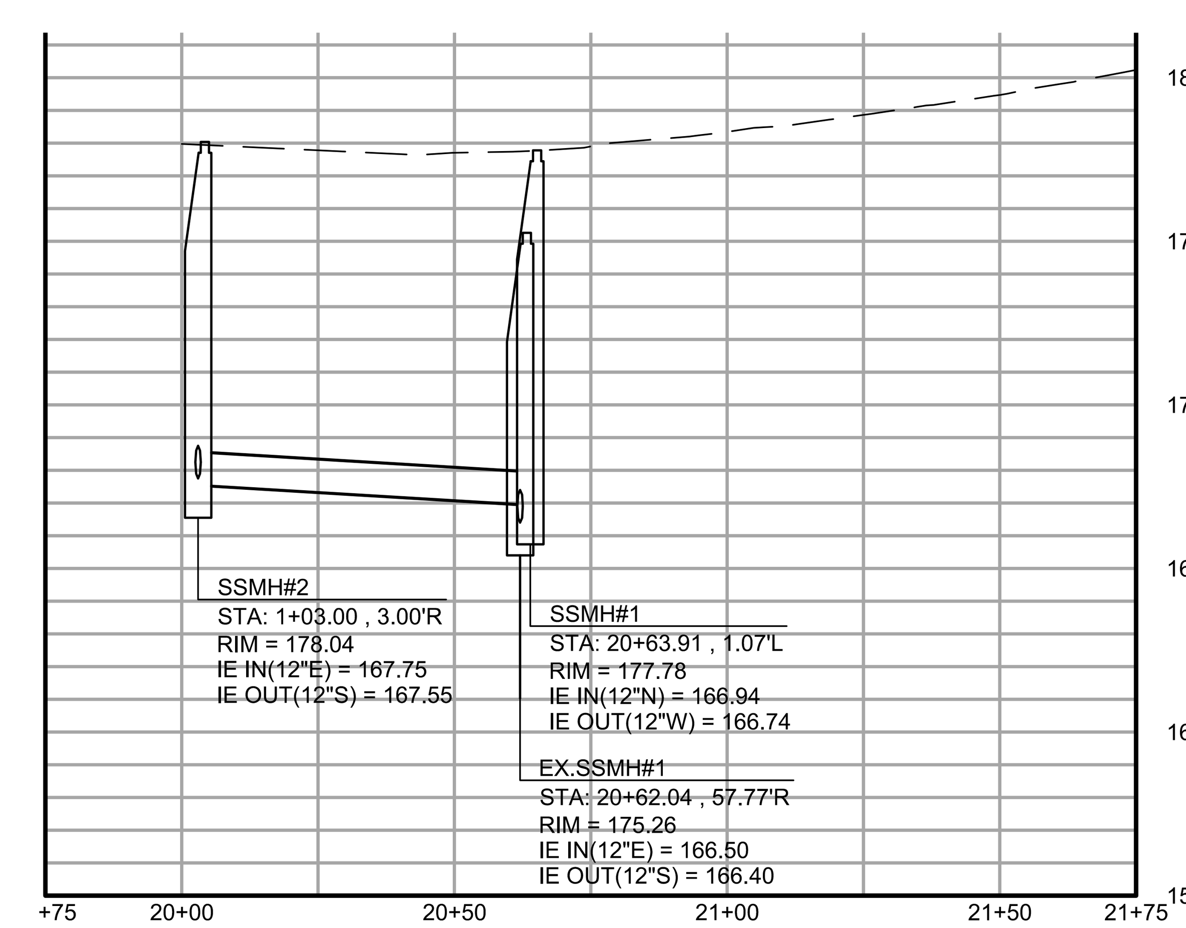
HORIZONTAL SCALE: 1" = 30'

VERTICAL SCALE: 1" = 5'



SW OREGON ST PLAN VIEW

VERTICAL SCALE: 1" = 30'



SW OREGON ST PROFILE

HORIZONTAL SCALE: 1" = 30'

VERTICAL SCALE: 1" = 5'

CONSTRUCTION NOTES

1. INSTALL 48" PUBLIC SANITARY SEWER MANHOLE. SEE PLAN AND PROFILE FOR STRUCTURE INFORMATION.
2. INSTALL 12" PVC 3034 SDR35 PUBLIC SANITARY LINE. SEE PLAN AND PROFILE FOR PIPE LENGTH AND SLOPE.
3. CONNECT TO EXISTING SANITARY SEWER MANHOLE. CONTRACTOR TO FIELD VERIFY ELEVATIONS PRIOR TO CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES.

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON RYAN HAJIME HALVORSON EXPIRES: 6/30/21

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T-S CORPORATE PARK
TUALATIN-SHERWOOD ROAD SANITARY SEWER - WEST

SHERWOOD, OREGON

PROJECT 2322.14347.01

DATE 01/17/2020

SHEET C6.3

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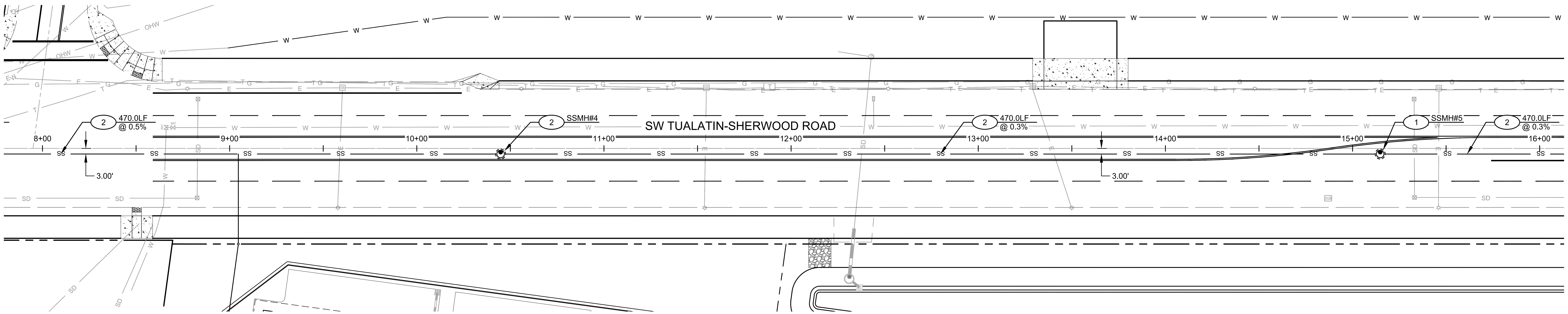
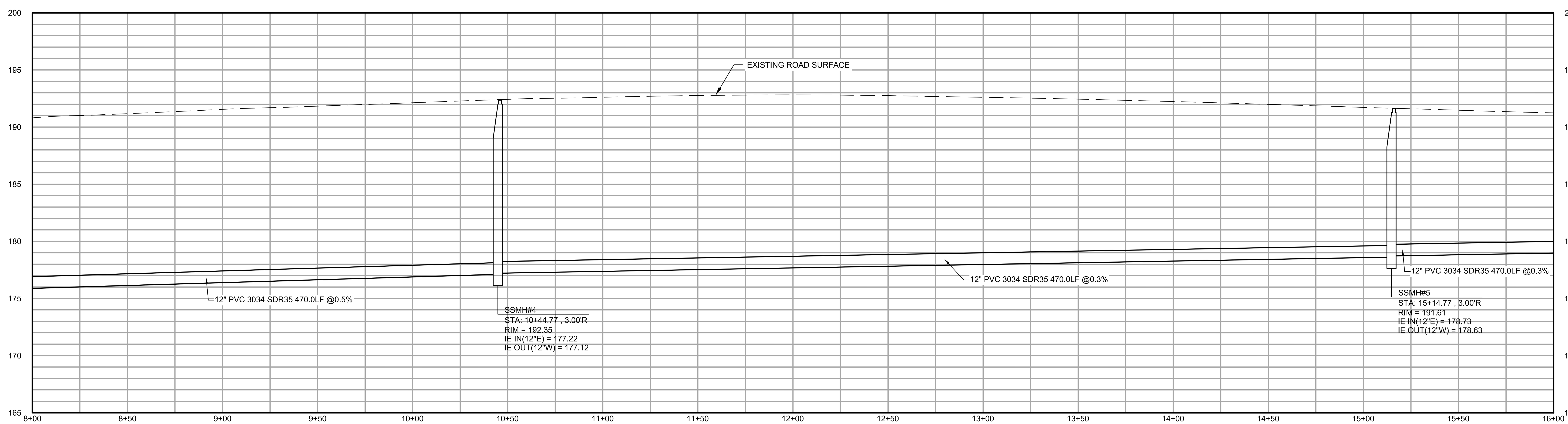


SW TUALATIN-SHERWOOD ROAD PUBLIC SANITARY SEWER PLAN STA: 8+00 TO 16+00
SCALE: 1" = 30'



SW TUALATIN-SHERWOOD ROAD PUBLIC SANITARY SEWER PROFILE STA: 8+00 TO 16+00
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

CONSTRUCTION NOTES

1. INSTALL 48" PUBLIC SANITARY SEWER MANHOLE. SEE PLAN AND PROFILE FOR STRUCTURE INFORMATION.
2. INSTALL 12" PVC 3034 SDR35 PUBLIC SANITARY LINE. SEE PLAN AND PROFILE FOR PIPE LENGTH AND SLOPE.

OREGON UTILITY NOTIFICATION CENTER
1-800-332-2344

CALL BEFORE YOU DIG

30 0 30 60
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
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720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK

TUALATIN-SHERWOOD ROAD SANITARY SEWER - MIDDLE

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C6.4

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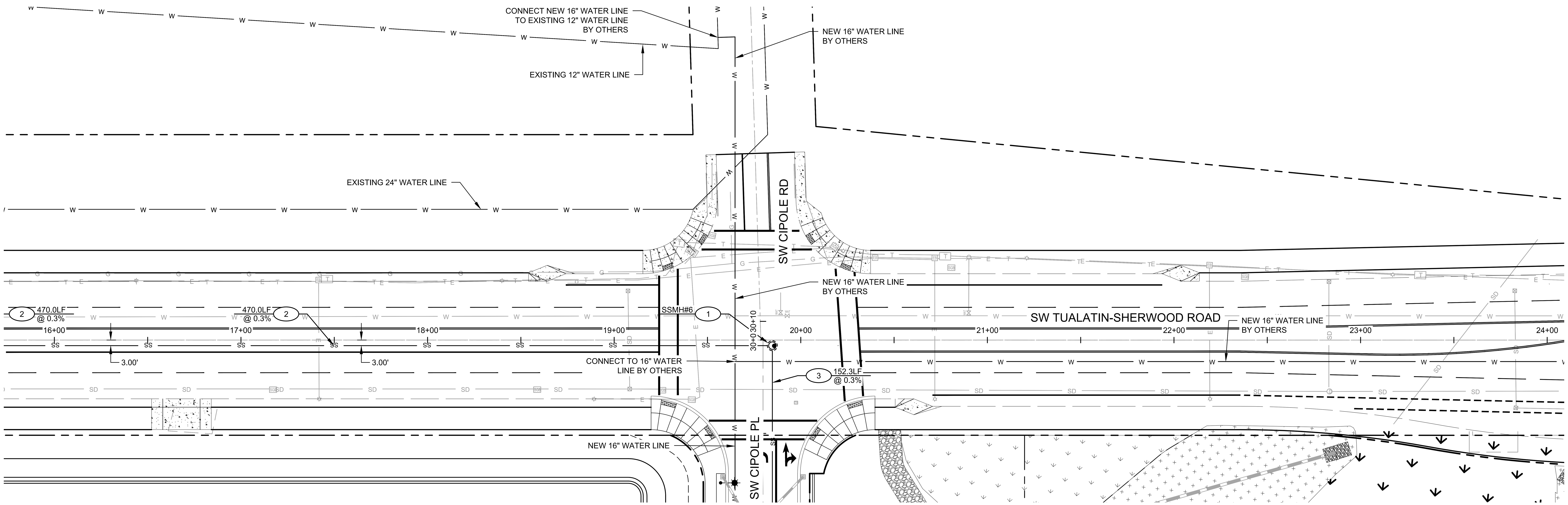
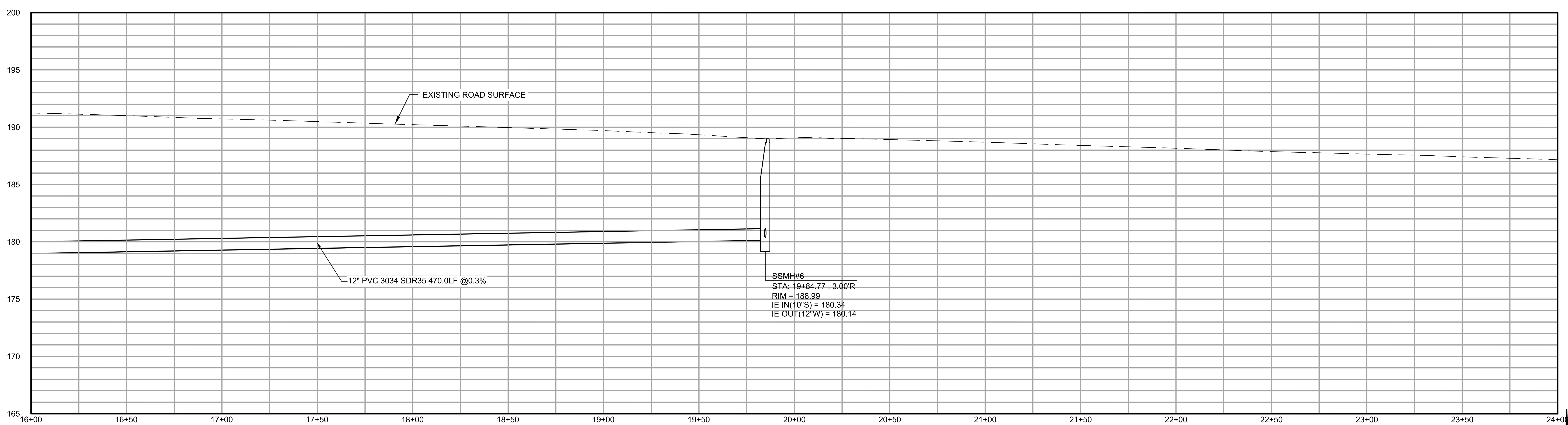


SW TUALATIN-SHERWOOD ROAD PUBLIC SANITARY SEWER PLAN STA: 16+00 TO 24+00
SCALE: 1" = 30'



SW TUALATIN-SHERWOOD ROAD PUBLIC SANITARY SEWER PROFILE STA: 16+00 TO 24+00
HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

OREGON UTILITY NOTIFICATION CENTER
1-800-332-2344

CALL BEFORE YOU DIG

CONSTRUCTION NOTES

1. INSTALL 48" PUBLIC SANITARY SEWER MANHOLE. SEE PLAN AND PROFILE FOR STRUCTURE INFORMATION.
2. INSTALL 12" PVC 3034 SDR35 PUBLIC SANITARY LINE. SEE PLAN AND PROFILE FOR PIPE LENGTH AND SLOPE.
3. INSTALL 10" PVC 3034 SDR35 PUBLIC SANITARY LINE. SEE PLAN AND PROFILE FOR PIPE LENGTH AND SLOPE.

30 0 30 60
SCALE IN FEET

N

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
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T-S CORPORATE PARK
TUALATIN-SHERWOOD ROAD SANITARY SEWER - EAST
SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C6.5

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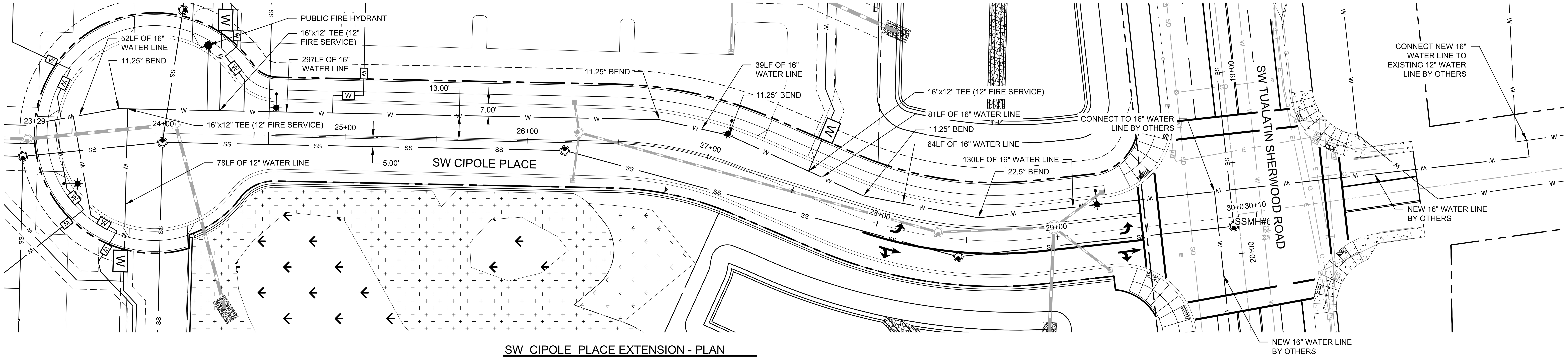
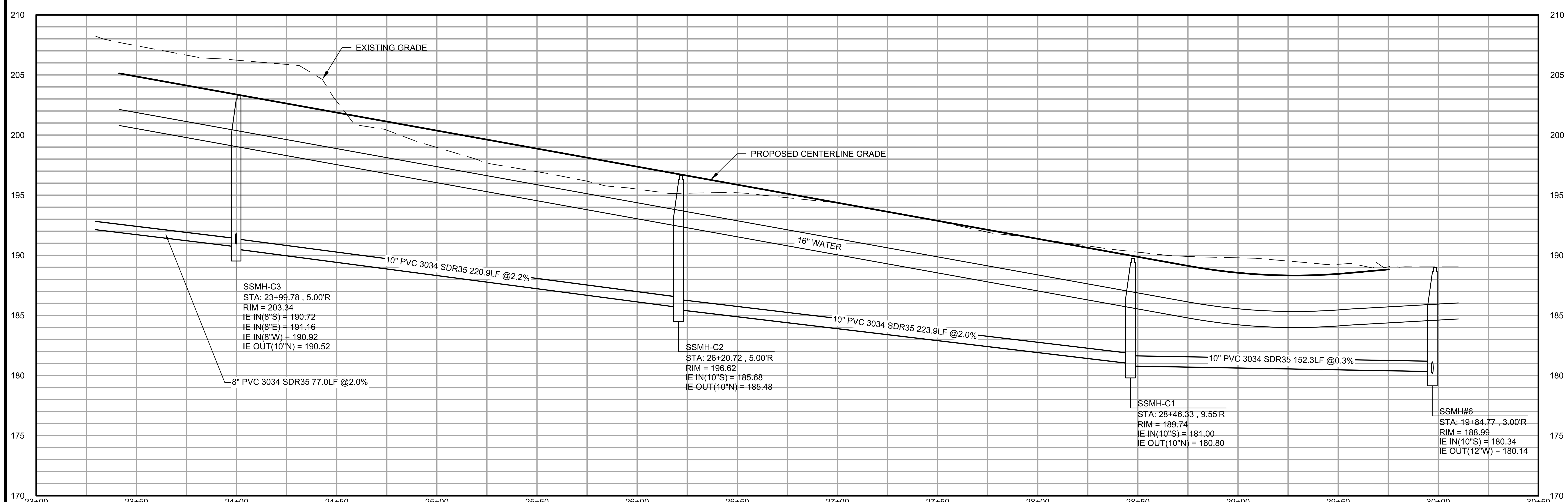


SW CIPOLE PLACE EXTENSION - PLAN

HORIZONTAL SCALE: 1" = 30'



SW CIPOLE PLACE EXTENSION - PROFILE

HORIZONTAL SCALE: 1" = 30'
VERTICAL SCALE: 1" = 5'

30 0 30 60
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON EXPIRES: 6/30/21

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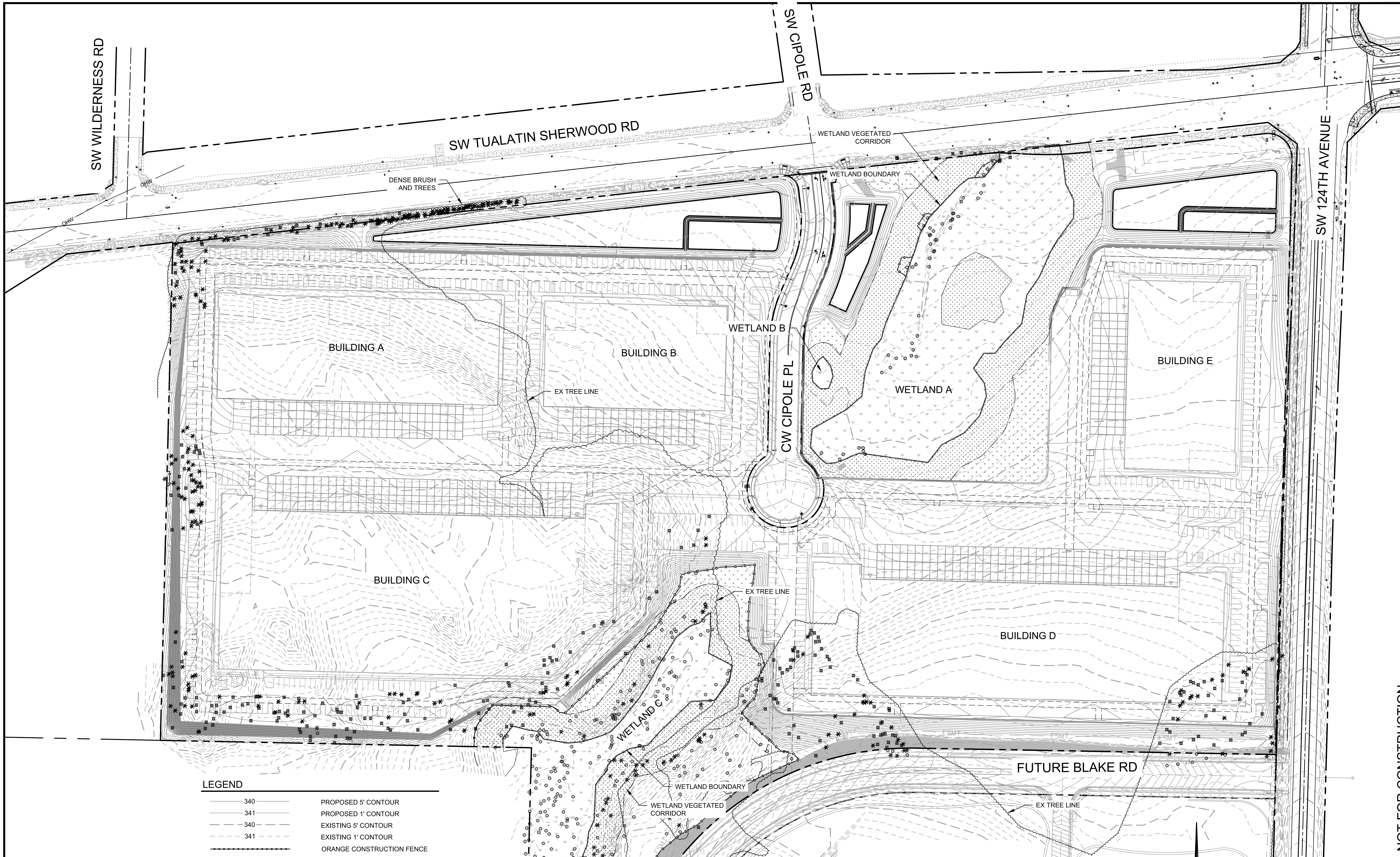
T-S CORPORATE PARK

CIPOLE PLACE SANITARY SEWER

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C6.6



LEGEND

340	PROPOSED 5' CONTOUR
341	PROPOSED 1' CONTOUR
340	EXISTING 5' CONTOUR
341	EXISTING 1' CONTOUR
	ORANGE CONSTRUCTION FENCE
	TREE PROTECTION FENCE
	EXISTING WETLAND
	VEGETATED CORRIDOR ENHANCEMENT
	MITIGATION AREA (SEE NATURAL RESOURCE ASSESSMENT REPORT
X	TREE TO BE REMOVED

SEE C7.1-C7.3 FOR TREE PROTECTION AND REMOVAL
SEE C7.4-C7.6 FOR TREE TABLE

N

80 0 80 160
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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971-280-8641

T-S CORPORATE PARK

SENSITIVITY AREA PLAN OVERALL

SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
C7.0

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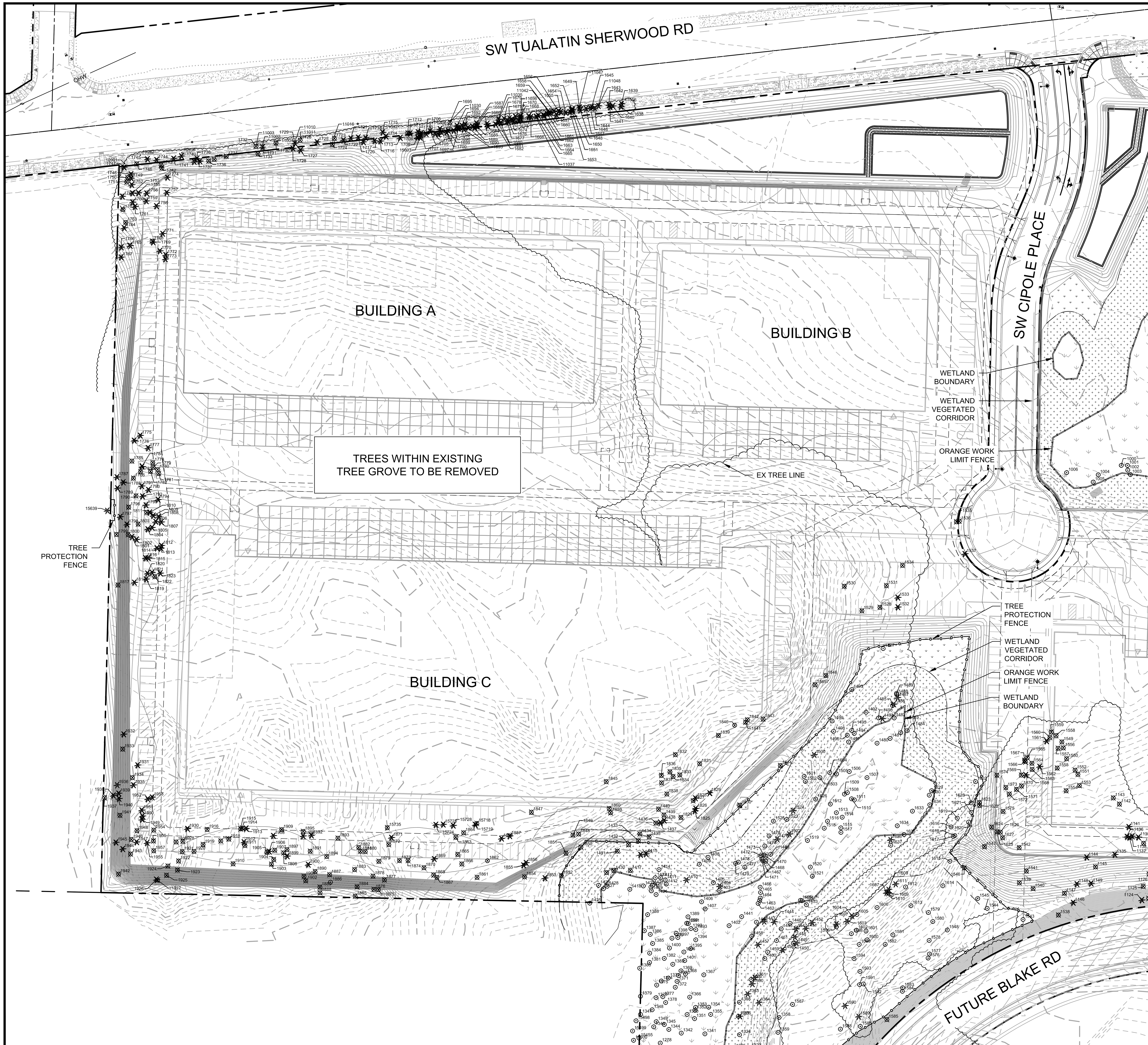

LEGEND

340	PROPOSED 5' CONTOUR
341	PROPOSED 1' CONTOUR
340	EXISTING 5' CONTOUR
341	EXISTING 1' CONTOUR
	ORANGE CONSTRUCTION FENCE
	TREE PROTECTION FENCE
	EXISTING WETLAND
	VEGETATED CORRIDOR ENHANCEMENT
	MITIGATION AREA (SEE NATURAL RESOURCE ASSESSMENT REPORT
X	TREE TO BE REMOVED

SEE SHEETS C7.4-C7.6 FOR TREE TABLE INFORMATION

60 0 60 120
SCALE IN FEET

N

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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720 SW Washington Street, #750
Portland, Oregon 97205
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T-S CORPORATE PARK
SENSITIVITY PLAN WEST HALF
SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

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SHEET
C7.1

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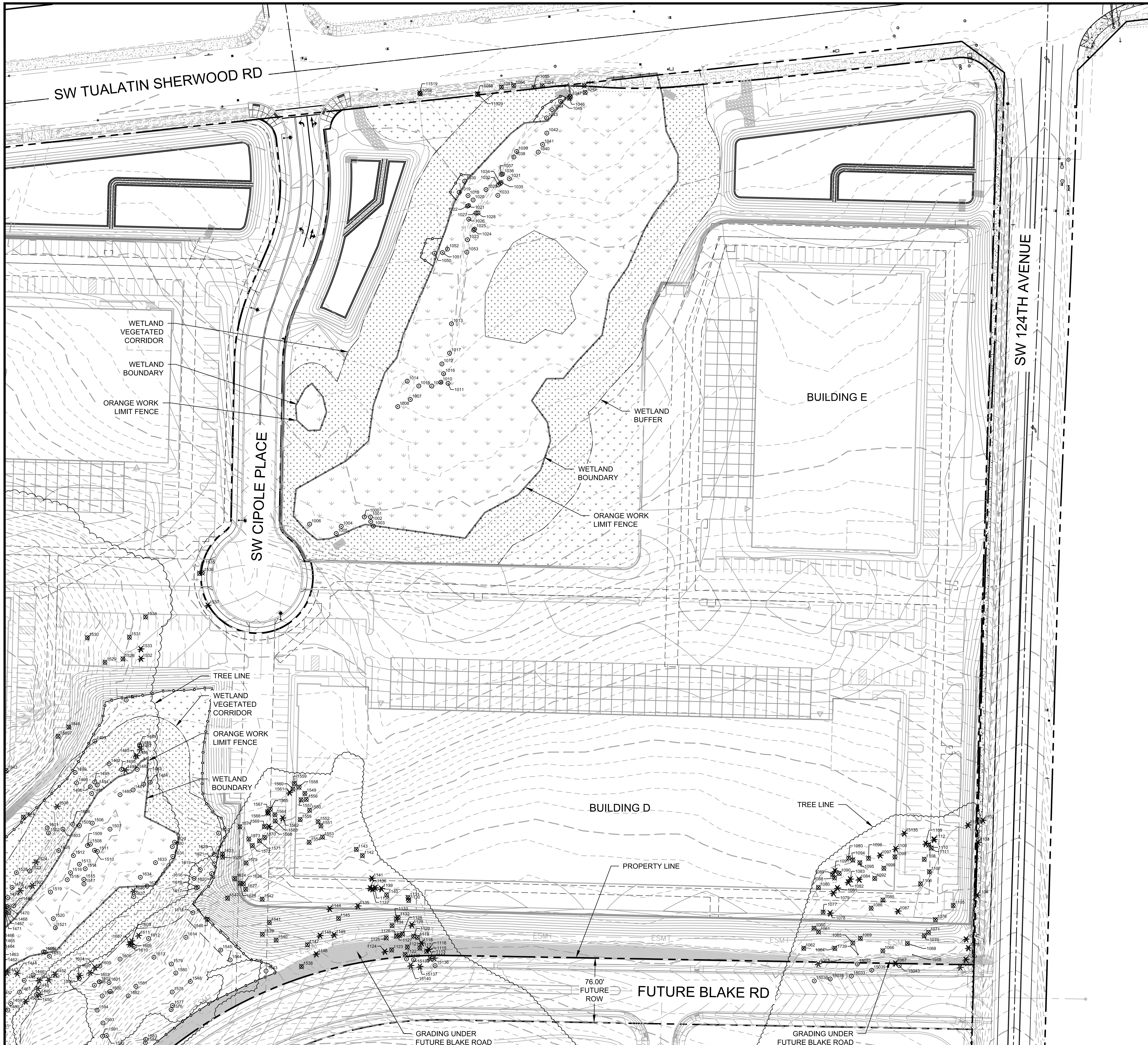

LEGEND

340	PROPOSED 5' CONTOUR
341	PROPOSED 1' CONTOUR
340	EXISTING 5' CONTOUR
341	EXISTING 1' CONTOUR
	ORANGE CONSTRUCTION FENCE
	TREE PROTECTION FENCE
	EXISTING WETLAND
	VEGETATED CORRIDOR ENHANCEMENT
	MITIGATION AREA (SEE NATURAL RESOURCE ASSESSMENT REPORT
X	TREE TO BE REMOVED

SEE SHEETS C7.4-C7.6 FOR TREE TABLE INFORMATION

N

60 0 60 120
SCALE IN FEET

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CS-SAP-TCC.DWG SAVED: 3/30/2020 4:11 PM PLOTTED: 3/30/2020 4:45 PM BY: RHALVORSON

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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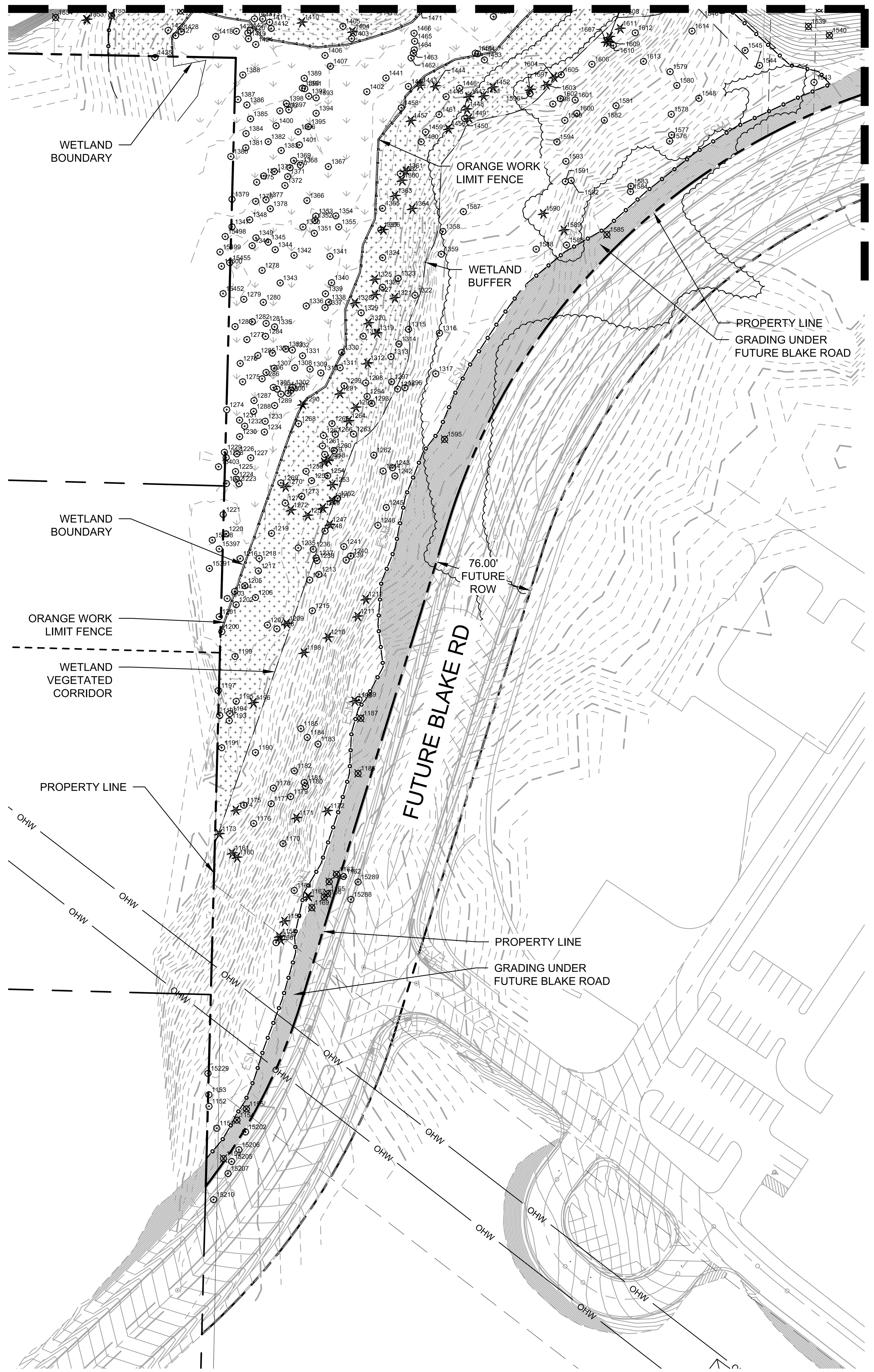
T-S CORPORATE PARK

SENSITIVITY PLAN EAST HALF

SHERWOOD, OREGON

PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
C7.2



LEGEND

340	PROPOSED 5' CONTOUR
341	PROPOSED 1' CONTOUR
340	EXISTING 5' CONTOUR
341	EXISTING 1' CONTOUR
	ORANGE CONSTRUCTION FENCE
	TREE PROTECTION FENCE
	EXISTING WETLAND
	VEGETATED CORRIDOR ENHANCEMENT
	MITIGATION AREA (SEE NATURAL RESOURCE ASSESSMENT REPORT
X	TREE TO BE REMOVED

SEE SHEETS C7.4-C7.6 FOR TREE TABLE INFORMATION

N

60 0 60 120
SCALE IN FEET

LAND-USE SET - NOT FOR CONSTRUCTION

REVISIONS

REV	DATE	DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

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Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK

SENSITIVITY PLAN SOUTH

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C7.3

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Tree No.	Common Name	DBH	Condition	Protect/ Remove
1000	Willow	19	Good	Protect
1001	Willow	13	Good	Protect
1002	Willow	6	Poor	Protect
1003	Willow	20	Fair	Protect
1004	Willow	20	Good	Protect
1005	Willow	18	Good	Protect
1006	Willow	7	Good	Protect
1007	Oregon Ash	10	Good	Protect
1008	Common Hawthorn	6	Good	Protect
1009	Common Hawthorn	10	Poor	Protect
1010	Common Hawthorn	14	Good	Protect
1011	Common Hawthorn	12	Good	Protect
1012	Common Hawthorn	6	Good	Protect
1013	Common Apple	16	Poor	Protect
1014	Sweet Cherry	9	Poor	Protect
1015	Common Hawthorn	6	Good	Protect
1016	Common Hawthorn	6	Good	Protect
1017	Common Apple	6	Poor	Protect
1018	Oregon Ash	12	Good	Protect
1019	Sweet Cherry	6	Good	Protect
1020	Common Hawthorn	7	Poor	Protect
1021	Sweet Cherry	7	Good	Protect
1022	Common Hawthorn	9	Good	Protect
1023	Willow	9	Poor	Protect
1024	Sweet Cherry	7	Good	Protect
1025	Common Hawthorn	6	Good	Protect
1026	Sweet Cherry	7	Good	Protect
1027	Common Hawthorn	14	Poor	Protect
1028	Sweet Cherry	13	Poor	Protect
1029	Common Hawthorn		Dead	Protect
1030	Oregon Ash	7	Good	Protect
1031	Common Hawthorn	10	Poor	Protect
1032	Common Hawthorn	8	Poor	Protect
1033	Common Hawthorn	9	Poor	Protect
1034	Common Hawthorn	7	Poor	Protect
1035	Common Hawthorn	9	Poor	Protect
1036	Common Hawthorn	6	Poor	Protect
1037	Common Hawthorn	6	Poor	Protect
1038	Oregon Ash	20	Good	Protect
1039	Oregon Ash	19	Good	Protect
1040	Common Hawthorn	6	Fair	Protect
1041	Common Hawthorn	6	Fair	Protect
1042	Oregon Ash	35	Fair	Protect
1043	Sweet Cherry	6	Poor	Protect
1044	Sweet Cherry	9	Good	Protect
1045	Sweet Cherry	6	Fair	Protect
1046	Oregon Ash	35	Good	Remove
1047	Sweet Cherry	11	Good	Remove
1048	Oregon Ash	8	Good	Remove
1049	Oregon Ash	10	Good	Remove
1050	Sweet Cherry	8	Good	Protect
1051	Sweet Cherry	8	Good	Protect
1052	Sweet Cherry	6	Good	Protect
1053	Cascara	8	Good	Protect
1054	Oregon Ash	7	Good	Remove
1055	Oregon Ash	6	Good	Remove
1056	Oregon Ash	7	Good	Remove
1057	Oregon Ash	6	Good	Remove
1058	European White Birch	11	Good	Remove
1059	European White Birch	20	Good	Remove
1060	Common Hawthorn	8	Good	Remove
1061	Pacific Madrone	21	Good	Remove
1062	Pacific Madrone	8	Good	Remove
1063	Douglas Fir	32	Good	Remove
1064	Pacific Madrone	11	Good	Remove
1065	Pacific Madrone	14	Good	Remove
1066	Pacific Madrone	18	Good	Remove
1067	Douglas Fir	18	Good	Remove
1068	Pacific Madrone	7	Good	Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1069	Sweet Cherry	6	Good	Remove
1070	Oregon White Oak	19	Good	Remove
1071	Pacific Madrone	14	Good	Remove
1072	Douglas Fir	11	Good	Remove
1073	Douglas Fir	8	Good	Remove
1074	Douglas Fir	10	Good	Remove
1075	Douglas Fir	12	Dead	Remove
1076	Pacific Madrone	11	Good	Remove
1077	Cascara	6	Good	Remove
1078	Douglas Fir	21	Good	Remove
1079	Douglas Fir	38	Good	Remove
1080	Sweet Cherry	6	Good	Remove
1081	Douglas Fir	24	Good	Remove
1082	Douglas Fir	11	Good	Remove
1083	Douglas Fir	32	Good	Remove
1084	Douglas Fir	31	Good	Remove
1085	Sweet Cherry	6	Poor	Remove
1086	Oregon White Oak	15	Good	Remove
1087	Douglas Fir	28	Good	Remove
1088	Sweet Cherry	6	Good	Remove
1089	Sweet Cherry	10	Good	Remove
1090	Sweet Cherry	13	Good	Remove
1091	Douglas Fir	15	Good	Remove
1092	Pacific Madrone	11	Good	Remove
1093	Sweet Cherry	11	Good	Remove
1094	Sweet Cherry	22	Poor	Remove
1095	Sweet Cherry	13	Good	Remove
1096	Sweet Cherry	7	Poor	Remove
1097	Douglas Fir	37	Good	Remove
1098	Pacific Madrone	13	Good	Remove
1099	Pacific Madrone	8	Good	Remove
1100	Douglas Fir	24	Good	Remove
1101	Douglas Fir	20	Good	Remove
1101.1	Sweet Cherry	7	Good	Remove
1102	Douglas Fir	17	Poor	Remove
1103	Douglas Fir	24	Good	Remove
1104	Douglas Fir	9	Fair	Remove
1105	Elderberry	12	Good	Remove
1106	Sweet Cherry	8	Good	Remove
1107	Sweet Cherry	8	Good	Remove
1108	Oregon White Oak	14	Good	Remove
1109	Douglas Fir	28	Good	Remove
1110	Pacific Madrone	13	Good	Remove
1111	Pacific Madrone	9	Good	Remove
1112	Douglas Fir	28	Good	Remove
1113	Douglas Fir	28	Good	Remove
1114	Douglas Fir	11	Poor	Remove
1115	Pacific Madrone	8	Good	Remove
1116	Douglas Fir	20	Good	Remove
1117	Pacific Madrone	6	Good	Remove
1118	Douglas Fir	20	Good	Remove
1119	Pacific Madrone	15	Good	Remove
1120	Sweet Cherry	9	Poor	Remove
1121	Sweet Cherry	12	Fair	Remove
1122	Sweet Cherry	6	Poor	Remove
1123	Sweet Cherry	9	Good	Remove
1124	Douglas Fir	26	Good	Remove
1125	Pacific Madrone	6	Poor	Remove
1126	Sweet Cherry	6	Good	Remove
1127	Sweet Cherry	7	Good	Remove
1128	Sweet Cherry	7	Good	Remove
1129	Douglas Fir	26	Good	Remove
1130	Sweet Cherry	6	Good	Remove
1131	Pacific Madrone	11	Good	Remove
1132	Pacific Madrone	12	Good	Remove
1133	Pacific Madrone	10	Good	Remove
1134	Pacific Madrone	7	Good	Remove
1135	Douglas Fir	25	Good	Remove
1136	Douglas Fir	15	Good	Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1137	Douglas Fir	13	Good	Remove
1138	Douglas Fir	9	Poor	Remove
1139	Douglas Fir	28	Good	Remove
1140	Pacific Madrone	9	Good	Remove
1141	Douglas Fir	23	Good	Remove
1142	Sweet Cherry	10	Good	Remove
1143	Common Hawthorn	10	Good	Remove
1144	Douglas Fir	15	Dead	Remove
1145	Oregon White Oak	11	Good	Remove
1146	Douglas Fir	16	Dead	Remove
1147	Pacific Madrone	14	Good	Remove
1148	Douglas Fir		Dead	Remove
1149	Douglas Fir	29	Good	Remove
1150	Pacific Madrone	10	Good	Remove
1151	Pacific Madrone	7	Good	Protect
1152	Pacific Madrone	11	Good	Protect
1153	Pacific Madrone	7	Good	Protect
1154	Pacific Madrone	13	Good	Remove
1155	Pacific Madrone	6	Good	Remove
1156	Oregon White Oak	7	Good	Protect
1157	Douglas Fir	8	Good	Protect
1158	Douglas Fir	11	Good	Protect
1159	Douglas Fir	14	Good	Protect
1160	Douglas Fir	18	Good	Protect
1161	Douglas Fir	18	Good	Protect
1162	Pacific Madrone	7	Good	Remove
1163	Pacific Madrone	6	Good	Remove
1164	Pacific Madrone	6	Good	Remove
1165	Pacific Madrone	10	Good	Remove
1166	Pacific Madrone	6	Good	Remove
1167	Douglas Fir	12	Poor	Remove
1168	Pacific Madrone	10	Good	Protect
1169	Oregon White Oak	7	Good	Remove
1170	Oregon White Oak	22	Good	Protect
1171	Douglas Fir	21	Poor	Protect
1172	Douglas Fir	16	Very Poor	Protect
1173	Douglas Fir	23	Dead	Protect
1174	Douglas Fir	23	Dead	Protect
1175	Sweet Cherry	6	Good	Protect
1176	Sweet Cherry	14	Good	Protect
1177	Sweet Cherry	7	Good	Protect
1178	Sweet Cherry	6	Good	Protect
1179	Sweet Cherry	6	Good	Protect
1180	Pacific Madrone	7	Good	Protect
1181	Sweet Cherry	7	Good	Protect
1182	Sweet Cherry	8	Good	Protect
1183	Oregon White Oak	8	Good	Protect
1184	Sweet Cherry	8	Good	Protect
1185	Pacific Madrone	14	Good	Protect
1186	Pacific Madrone	13	Good	Remove
1187	Pacific Madrone	11	Good	Remove
1188	Douglas Fir	21	Good	Protect
1189	Pacific Madrone	9	Good	Protect
1190	Cascara	7	Good	Protect
1191	Oregon Ash	9	Good	Protect
1192	Oregon Ash	25	Good	Protect
1193	Oregon Ash	18	Good	Protect
1194	Oregon Ash	24	Good	Protect
1195	Oregon Ash	15	Good	Protect
1196	Douglas Fir	21	Dead	Protect
1197	Oregon Ash	9	Good	Protect
1198	Douglas Fir	25	Good	Protect
1199	Oregon Ash	23	Good	Protect
1200	Cascara	6	Poor	Protect
1201	Cascara	6	Poor	Protect
1202	Oregon Ash	12	Good	Protect
1203	Oregon Ash	16	Good	Protect
1204	Oregon Ash	12	Fair	Protect
1205	Oregon Ash	15	Good	Protect

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1206	Oregon Ash	25	Good	Protect
1207	Oregon Ash	12	Good	Protect
1208	Bigleaf Maple	7	Good	Protect
1209	Douglas Fir	13	Dead	Protect
1210	Douglas Fir	19	Good	Protect
1211	Douglas Fir	27	Good	Protect
1212	Douglas Fir	17	Good	Protect
1213	Sweet Cherry	6	Poor	Protect
1214	Sweet Cherry	6	Good	Protect
1215	Bigleaf Maple	12	Good	Protect
1216	Oregon Ash	10	Good	Protect
1217	Oregon Ash	6	Good	Protect
1218	Oregon Ash	9	Good	Protect
1219	Oregon Ash	9	Good	Protect
1220	Oregon Ash	25	Poor	Protect
1221	Oregon Ash	48	Poor	Protect
1222	Oregon Ash	29	Good	Protect
1223	Oregon Ash	19	Good	Protect
1224	Oregon Ash	12	Dead	Protect
1225	Oregon Ash	10	Good	Protect
1226	Oregon Ash	8	Good	Protect
1227	Oregon Ash	14	Fair	Protect
1228	Oregon Ash	12	Good	Protect
1229	Oregon Ash	23	Good	Protect
1230	Oregon Ash	25	Poor	Protect
1231	Oregon Ash	17	Good	Protect
1232	Oregon Ash	11	Poor	Protect
1233	Oregon Ash	9	Dead	Protect
1234	Oregon Ash	11	Good	Protect
1235	Willow	8	Poor	Protect
1236	Sweet Cherry	6	Good	Protect
1237	Willow	6	Poor	Protect
1238	Sweet Cherry	10	Good	Protect
1239	Cascara	6	Good	Protect
1240	Willow	7	Good	Protect
1241	Sweet Cherry	13	Good	Protect
1242	Bigleaf Maple	17	Good	Protect
1243	Bigleaf Maple	17	Good	Protect
1244	Bigleaf Maple	16	Good	Protect
1245	Sweet Cherry	10	Good	Protect
1246	Sweet Cherry	15	Good	Protect
1247	Douglas Fir	13	Good	Protect
1248	Willow	12	Good	Protect
1249	Douglas Fir	10	Good	Protect
1250	Douglas Fir	19	Good	Protect
1251	Douglas Fir	7	Good	Protect
1252	Willow	7	Poor	Protect
1253	Douglas Fir	6	Good	Protect
1254	Willow	6	Poor	Protect
1255	Willow	10	Poor	Protect
1256	Willow	7	Poor	Protect
1257	Douglas Fir	10	Dead	Protect
1258	Douglas Fir	17	Dead	Protect
1259	Willow	8	Good	Protect
1260	Willow	7	Good	Protect
1261	Willow	6	Good	Protect
1262	Sweet Cherry	7	Good	Protect
1263	Willow	7	Good	Protect
1264	Douglas Fir	8	Good	Protect
1265	Willow	6	Fair	Protect
1266	Willow	6	Good	Protect
1267	Willow	6	Good	Protect
1268	Sweet Cherry	6	Good	Protect
1269	Willow	8	Poor	Protect
1270	Douglas Fir	15	Dead	Protect
1271	Sweet Cherry	6	Poor	Protect
1272	Douglas Fir	15	Dead	Protect
1273	Sweet Cherry		Good	Protect
1274	Oregon Ash	16	Poor	Protect

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1275	Oregon Ash		Poor	Protect
1276	Oregon Ash	8	Good	Protect
1277	Oregon Ash	8	Good	Protect
1278	Oregon Ash	13	Poor	Protect
1279	Oregon Ash	8	Good	Protect
1280	Oregon Ash	6	Very Poor	Protect
1281	Oregon Ash	10	Dead	Protect
1282	Oregon Ash	12	Good	Protect
1283	Oregon Ash	9	Good	Protect
1284	Oregon Ash	6	Poor	Protect
1285	Oregon Ash	13	Fair	Protect
1286	Oregon Ash	10	Poor	Protect
1287	Oregon Ash	11	Good	Protect
1288	Oregon Ash	7	Poor	Protect
1289	Oregon Ash	22	Good	Protect
1290	Douglas Fir	10	Dead	Protect
1291	Douglas Fir	15	Fair	Protect
1292	Douglas Fir	8	Fair	Protect
1293	Bigleaf Maple	6	Good	Protect
1294	Willow	6	Poor	Protect
1295	Bigleaf Maple		Good	Protect
1296	Bigleaf Maple	6	Good	Protect
1297	Bigleaf Maple	7	Good	Protect
1298	Willow	8	Good	Protect
1299	Willow	9	Good	Protect
1300	Oregon Ash	7	Poor	Protect
1301	Oregon Ash	10	Good	Protect
1302	Oregon Ash	11	Good	Protect
1303	Oregon Ash	13	Fair	Protect
1304	Oregon Ash	6	Poor	Protect
1305	Oregon Ash	8	Dead	Protect
1306	Oregon Ash	11	Poor	Protect
1307	Oregon Ash	14	Good	Protect
1308	Oregon Ash	8	Fair	Protect
1309	Oregon Ash	18	Good	Protect
1310	Oregon Ash	9	Good	Protect
1311	Bigleaf Maple	9	Good	Protect
1311.1	Oregon Ash	10	Good	Protect
1312	Douglas Fir	8	Good	Protect
1313	Bigleaf Maple	7	Poor	Protect
1314	Bigleaf Maple	7	Good	Protect
1315	Bigleaf Maple	6	Good	Protect
1316	Bigleaf Maple	8	Good	Protect
1317	Bigleaf Maple	12	Good	Protect
1318	Bigleaf Maple	7	Good	Protect
1319	Douglas Fir	10	Good	Protect
1320	Douglas Fir	9	Good	Protect
1321	Douglas Fir	20	Good	Protect
1322	Bigleaf Maple	7	Good	Protect
1323	Willow	8	Dead	Protect
1324	Willow	7	Poor	Protect
1325	Douglas Fir	6	Good	Protect
1326	Oregon Ash	10	Good	Protect
1327	Douglas Fir	6	Poor	Protect
1328	Douglas Fir	6	Poor	Protect
1329	Willow	8	Poor	Protect
1330	Willow	6	Good	Protect
1331	Oregon Ash	9	Good	Protect
1332	Oregon Ash	18	Good	Protect
1333	Oregon Ash	8	Good	Protect
1334	Oregon Ash	12	Good	Protect
1335	Oregon Ash	18	Good	Protect
1336	Oregon Ash	26	Good	Protect
1337	Oregon Ash	7	Good	Protect
1338	Oregon Ash	7	Good	Protect
1339	Oregon Ash	12	Good	Protect
1340	Oregon Ash	8	Good	Protect
1341	Oregon Ash	30	Good	Protect
1342	Oregon Ash	14	Poor	Protect

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Sept. 11, 2012 RYAN HAJIME HALVORSON

EXPIRES: 6/30/21

DOWL

www.DOWL.com

720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK

TREE TABLE

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C7.4

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CS-SAP-TREE-TCC.DWG SAVED: 3/4/2020 7:54 PM PLOTTED: 3/30/2020 4:45 PM BY: RHALVORSON

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1343	Oregon Ash	27	Poor	Protect
1344	Oregon Ash	8	Good	Protect
1345	Oregon Ash	9	Dead	Protect
1346	Oregon Ash	13	Good	Protect
1347	Oregon Ash	12	Good	Protect
1348	Oregon Ash	17	Fair	Protect
1349	Oregon Ash	13	Poor	Protect
1350	Oregon Ash	10	Poor	Protect
1351	Oregon Ash	22	Good	Protect
1352	Oregon Ash	11	Good	Protect
1353	Oregon Ash	10	Good	Protect
1354	Willow	6	Good	Protect
1355	Oregon Ash	10	Good	Protect
1356	Douglas Fir	8	Good	Protect
1357	Willow	6	Good	Protect
1358	Bigleaf Maple	17	Good	Protect
1359	Pacific Madrone	12	Good	Protect
1360	Douglas Fir	9	Good	Protect
1361	Douglas Fir	6	Good	Protect
1362	Willow	8	Fair	Protect
1363	Douglas Fir	6	Good	Protect
1364	Douglas Fir	17	Good	Protect
1365	Willow	8	Good	Protect
1366	Oregon Ash	13	Dead	Protect
1367	Oregon Ash	26	Poor	Protect
1368	Oregon Ash	10	Poor	Protect
1369	Oregon Ash	12	Poor	Protect
1370	Oregon Ash	12	Poor	Protect
1371	Oregon Ash	12	Poor	Protect
1372	Oregon Ash	13	Good	Protect
1373	Oregon Ash	16	Good	Protect
1374	Oregon Ash	8	Poor	Protect
1375	Oregon Ash	17	Good	Protect
1376	Oregon Ash	17	Good	Protect
1377	Oregon Ash	6	Poor	Protect
1378	Oregon Ash	12	Dead	Protect
1379	Oregon Ash	6	Dead	Protect
1380	Oregon Ash	17	Good	Protect
1381	Oregon Ash	9	Poor	Protect
1382	Oregon Ash	6	Good	Protect
1383	Oregon Ash	8	Good	Protect
1384	Oregon Ash	15	Fair	Protect
1385	Oregon Ash	8	Good	Protect
1386	Oregon Ash	8	Poor	Protect
1387	Oregon Ash	17	Good	Protect
1387.1	Oregon Ash	7	Good	Protect
1388	Oregon Ash	17	Good	Protect
1389	Oregon Ash	14	Good	Protect
1390	Oregon Ash	10	Good	Protect
1391	Oregon Ash	15	Good	Protect
1392	Oregon Ash	7	Good	Protect
1393	Oregon Ash	13	Dead	Protect
1394	Oregon Ash	10	Good	Protect
1395	Oregon Ash	14	Poor	Protect
1396	Oregon Ash	15	Good	Protect
1397	Oregon Ash	10	Poor	Protect
1398	Oregon Ash	14	Good	Protect
1399	Oregon Ash	9	Good	Protect
1400	Oregon Ash	9	Good	Protect
1401	Oregon Ash	7	Good	Protect
1402	Oregon Ash	10	Good	Protect
1403	Oregon White Oak	29	Good	Protect
1404	Douglas Fir	17	Good	Protect
1405	Bigleaf Maple	6	Good	Protect
1406	Oregon Ash	8	Good	Protect
1407	Bigleaf Maple	15	Fair	Protect
1408	Oregon White Oak	9	Good	Protect
1409	Oregon Ash	6	Good	Protect
1410	Douglas Fir	20	Good	Protect

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1411	Sweet Cherry	7	Good	Protect
1412	Oregon White Oak	10	Good	Protect
1413	Sweet Cherry	6	Good	Protect
1414	Willow	8	Good	Protect
1415	Douglas Fir	10	Poor	Remove
1416	Douglas Fir	10	Poor	Remove
1417	Willow	9	Good	Remove
1418	Oregon Ash	23	Good	Protect
1419	Oregon Ash	13	Good	Protect
1420	Sweet Cherry	8	Good	Protect
1421	Sweet Cherry	7	Good	Protect
1422	Sweet Cherry	6	Poor	Protect
1423	Sweet Cherry	7	Poor	Protect
1424	Sweet Cherry	6	Poor	Protect
1425	Willow	18	Good	Protect
1426	Willow	12	Good	Protect
1427	Willow	6	Poor	Protect
1428	Willow	9	Good	Protect
1429	Willow	8	Good	Protect
1430	Willow	7	Good	Protect
1431	Willow	6	Poor	Remove
1432	Willow	7	Poor	Remove
1433	Willow	6	Poor	Remove
1434	Willow	6	Good	Remove
1435	Willow	8	Good	Remove
1436	Willow	6	Dead	Remove
1437	Douglas Fir	13	Good	Remove
1438	Douglas Fir	9	Good	Remove
1439	Sweet Cherry	7	Good	Remove
1440	Sweet Cherry	10	Good	Remove
1441	Willow	16	Poor	Protect
1442	Bigleaf Maple	14	Poor	Protect
1443	Douglas Fir	14	Poor	Protect
1444	Douglas Fir	20	Good	Protect
1445	Willow	6	Fair	Protect
1446	Bigleaf Maple	6	Good	Protect
1447	Douglas Fir	8	Good	Protect
1448	Douglas Fir	13	Good	Protect
1449	Douglas Fir	7	Good	Protect
1450	Willow	6	Poor	Protect
1451	Douglas Fir	11	Good	Protect
1452	Douglas Fir	11	Good	Protect
1453	Willow	6	Poor	Protect
1454	Sweet Cherry	7	Poor	Protect
1455	Sweet Cherry	6	Good	Protect
1456	Douglas Fir	12	Good	Protect
1457	Douglas Fir	17	Good	Protect
1458	Willow	6	Good	Protect
1459	Willow	6	Good	Protect
1460	Willow	6	Good	Protect
1461	Willow	6	Good	Protect
1462	Oregon Ash	11	Good	Protect
1463	Oregon Ash	7	Good	Protect
1464	Oregon Ash	8	Good	Protect
1465	Willow	6	Poor	Protect
1466	Willow	6	Good	Protect
1467	Bigleaf Maple	7	Poor	Protect
1468	Bigleaf Maple	6	Poor	Protect
1469	Bigleaf Maple	8	Poor	Protect
1470	Bigleaf Maple	13	Poor	Protect
1471	Bigleaf Maple	10	Dead	Protect
1472	Bigleaf Maple	15	Poor	Protect
1473	Bigleaf Maple	7	Poor	Protect
1474	Bigleaf Maple	7	Poor	Protect
1475	Oregon White Oak	12	Good	Protect
1476	Douglas Fir	16	Poor	Protect
1477	Pacific Madrone	8	Good	Protect
1478	Pacific Madrone	9	Good	Protect
1479	Bigleaf Maple	9	Good	Protect

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1480	Oregon Ash	12	Good	Protect
1481	Sweet Cherry	8	Dead	Protect
1481.1	Sweet Cherry	10	Good	Protect
1482	Sweet Cherry	11	Good	Protect
1483	Sweet Cherry	9	Good	Protect
1484	Sweet Cherry	6	Good	Protect
1485	Sweet Cherry	6	Poor	Protect
1486	Douglas Fir	9		Protect
1487	Douglas Fir	11	Poor	Protect
1488	Oregon White Oak	22	Good	Protect
1489	Sweet Cherry	16	Good	Protect
1490	Oregon White Oak	10	Good	Protect
1491	Douglas Fir	8	Dead	Protect
1492	Willow	6	Poor	Protect
1493	Oregon White Oak	14	Good	Protect
1494	Oregon White Oak	26	Good	Protect
1495	Oregon White Oak	13	Poor	Protect
1496	Sweet Cherry	6	Good	Protect
1497	Oregon White Oak	14	Fair	Protect
1498	Sweet Cherry	11	Good	Protect
1499	Sweet Cherry	11	Good	Protect
1500	Douglas Fir	12	Good	Protect
1501	Oregon White Oak	13	Good	Protect
1502	Oregon White Oak	8	Good	Protect
1503	Sweet Cherry	6	Good	Protect
1504	Sweet Cherry	7	Good	Protect
1505	Oregon White Oak	32	Good	Protect
1506	Oregon Ash	18	Good	Protect
1507	Oregon Ash	18	Poor	Protect
1508	Oregon Ash	7	Dead	Protect
1509	Oregon Ash	12	Good	Protect
1510	Oregon Ash	17	Poor	Protect
1511	Oregon Ash	19	Good	Protect
1512	Oregon Ash	13	Good	Protect
1513	Oregon Ash	15	Fair	Protect
1514	Oregon Ash	18	Good	Protect
1515	Oregon Ash	16	Fair	Protect
1516	Oregon Ash	16	Good	Protect
1517	Oregon Ash	17	Good	Protect
1518	Oregon Ash	16	Poor	Protect
1519	Oregon Ash	9	Good	Protect
1520	Oregon Ash	28	Poor	Protect
1521	Oregon Ash	22	Poor	Protect
1522	Douglas Fir	22	Poor	Protect
1523	Oregon White Oak	25	Good	Protect
1524	Douglas Fir	15	Fair	Protect
1525	Pacific Madrone	7	Good	Protect
1526	Pacific Madrone	10	Fair	Protect
1527	Oregon Ash	7	Good	Protect
1528	Oregon Ash	8	Good	Remove
1529	Oregon Ash	8	Good	Remove
1530	Oregon White Oak	11	Good	Remove
1531	Sweet Cherry	6	Good	Remove
1532	Douglas Fir	12	Fair	Remove
1533	Douglas Fir	6	Dead	Remove
1534	Willow	10	Good	Remove
1535	Pacific Madrone	10	Good	Remove
1536	Pacific Madrone	13	Good	Remove
1537	Douglas Fir	18	Good	Remove
1538	Oregon White Oak	8	Good	Remove
1539	Oregon White Oak	8	Good	Remove
1540	Pacific Madrone	13	Good	Remove
1541	Oregon White Oak	7	Good	Remove
1542	Willow	7	Poor	Protect
1543	Oregon White Oak	8	Good	Protect
1544	Pacific Madrone	15	Good	Protect
1545	Pacific Madrone	17	Good	Protect
1546	Pacific Madrone	11	Good	Remove
1547	Pacific Madrone	14	Good	Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1548	Pacific Madrone	10	Good	Protect
1549	Sweet Cherry	14	Good	Remove
1550	Willow	7	Dead	Remove
1551	Pacific Madrone	10	Good	Remove
1552	Pacific Madrone	6	Poor	Remove
1553	Pacific Madrone	7	Good	Remove
1554	Pacific Madrone	13	Good	Remove
1555	Willow	8	Poor	Remove
1556	Willow	6	Good	Remove
1557	Willow	11	Good	Remove
1558	Sweet Cherry	11	Good	Protect
1559	Sweet Cherry	7	Poor	Protect
1560	Sweet Cherry	7	Good	Protect
1561	Douglas Fir	17	Good	Protect
1562	Douglas Fir	16	Good	Protect
1563	Willow	6	Poor	Protect
1564	Willow	8	Good	Protect
1565	Willow	8	Poor	Protect
1566	Willow	6	Poor	Protect
1567	Willow	17	Good	Protect
1568	Douglas Fir	13	Good	Protect
1569	Willow	11	Good	Protect
1570	Sweet Cherry	9	Good	Protect
1571	Willow	8	Dead	Protect
1572	Willow	10	Poor	Protect
1573	Willow	12	Good	Protect
1574	Willow	8	Good	Protect
1575	Bigleaf Maple	18	Good	Protect
1576	Oregon White Oak	6	Good	Protect
1577	Oregon White Oak	6	Good	Protect
1578	Pacific Madrone	15	Good	Protect
1579	Pacific Madrone	12	Good	Protect
1580	Oregon White Oak	8	Good	Protect
1581	Pacific Madrone	7	Good	Protect
1582	Willow	13	Poor	Protect
1583	Oregon White Oak	6	Good	Protect
1584	Oregon White Oak	10	Good	Protect
1585	Pacific Madrone	14	Good	Remove
1586	Oregon White Oak	13	Good	Protect
1587	Pacific Madrone	7	Good	Protect
1588	Pacific Madrone	7	Good	Protect
1589	Douglas Fir	13	Good	Protect
1590	Douglas Fir	15	Good	Protect
1591	Sweet Cherry	7	Good	Protect
1592	Sweet Cherry	7	Good	Protect
1593	Willow	11	Good	Protect
1594	Willow	10	Good	Protect
1595	Bigleaf Maple	8	Good	Protect
1596	Willow	6	Poor	Protect
1597	Douglas Fir	13	Good	Protect
1598	Willow	11	Poor	Protect
1599	Willow	6	Poor	Protect
1600	Sweet Cherry	6	Good	Protect
1601	Sweet Cherry	8	Good	Protect
1602	Willow	6	Fair	Protect
1603	Douglas Fir	11	Good	Protect
1604	Douglas Fir	6	Good	Protect
1605	Sweet Cherry	9	Good	Protect
1606	Willow	6	Good	Protect
1606.1	Willow	9	Good	Protect
1607	Douglas Fir	10	Good	Protect
1608	Douglas Fir	9	Good	Protect
1609	Douglas Fir	11	Good	Protect
1610	Willow	7	Poor	Protect
1611	Douglas Fir	14	Good	Protect
1612	Willow	6	Poor	Protect
1613	Pacific Madrone	13	Good	Protect
1614	Oregon White Oak	12	Good	Protect
1615	Pacific Madrone	18	Good	Protect

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1616	Sweet Cherry	6	Good	Protect
1617	Sweet Cherry	7	Good	Protect
1618	Sweet Cherry	8	Good	Protect
1619	Willow	7	Good	Protect
1620	Sweet Cherry	13	Good	Protect
1621	Willow	11	Good	Protect
1622	Willow	6	Dead	Protect
1623	Willow	8	Good	Protect
1624	Oregon Ash	6	Good	Protect
1625	Sweet Cherry	6	Good	Protect
1626	Sweet Cherry	6	Good	Protect
1627	Willow	6	Poor	Protect
1628	Willow	8	Good	Protect
1629	Willow	12	Good	Protect
1630	Willow	9	Good	Protect
1631	Sweet Cherry	8	Good	Protect
1632	Willow	8	Good	Protect
1633	Willow	12	Good	Protect
1634	Willow	9	Good	Protect
1635	Willow	8	Good	Protect
1636	Douglas Fir	12	Poor	Protect
1637	Willow	6	Fair	Protect
1638	Douglas Fir	10	Good	Remove
1639	Douglas Fir	6	Good	Remove
1640	Douglas Fir	12	Good	Remove
1641	Douglas Fir	12	Good	Remove
1642	Douglas Fir	10	Good	Remove
1643	Douglas Fir	14	Good	Remove
1644	Douglas Fir	7	Poor	Remove
1645	Douglas Fir	13	Good	Remove
1646	Douglas Fir	9	Good	Remove
1647	Douglas Fir	18	Good	Remove
1648	Douglas Fir	13	Good	Remove
1649	Douglas Fir	11	Good	Remove
1650	Douglas Fir	9	Good	Remove
1651	Douglas Fir	10	Good	Remove
1652	Douglas Fir	7	Good	Remove
1653	Douglas Fir	8	Poor	Remove
1654	Douglas Fir	11	Good	Remove
1655	Douglas Fir	15	Good	Remove
1656	Douglas Fir	9	Fair	Remove
1657	Douglas Fir	11	Good	Remove
1658	Douglas Fir	6	Poor	Remove
1659	Douglas Fir	11	Good	Remove
1660	Douglas Fir	9	Good	Remove
1661	Douglas Fir	6	Poor	Remove
1662	Douglas Fir	12	Good	Remove
1663	Douglas Fir	10	Good	Remove
1664	Douglas Fir	8	Good	Remove
1665	Douglas Fir	8	Good	Remove
1666	Douglas Fir	14	Good	Remove
1667	Douglas Fir	8	Fair	Remove
1668	Douglas Fir	8	Good	Remove
1669	Douglas Fir	8	Poor	Remove
1670	Douglas Fir	8	Fair	Remove
1671	Douglas Fir	9	Good	Remove
1672	Douglas Fir	7	Good	Remove
1673	Douglas Fir	6	Poor	Remove
1674	Douglas Fir	11	Good	Remove
1675	Douglas Fir	9	Good	Remove
1676	Douglas Fir	10	Good	Remove
1677	Douglas Fir	7	Poor	Remove
1678	Douglas Fir	9	Good	Remove
1679	Douglas Fir	12	Good	Remove
1680	Douglas Fir	12	Good	Remove
1681	Douglas Fir	8	Good	Remove
1682	Douglas Fir	9	Good	Remove
1683	Douglas Fir	16	Good	Remove
1684	Douglas Fir	13	Good	Remove

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	REVISIONS DESCRIPTION	BY

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
www.DOWL.com
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK

TREE TABLE

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C7.5

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CS-SAP-TREE-TCC.DWG SAVED: 3/4/2020 7:54 PM PLOTTED: 3/30/2020 4:45 PM BY: RHALVORSON

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1685	Douglas Fir	6	Poor	Remove
1686	Douglas Fir	12	Good	Remove
1687	Douglas Fir	7	Poor	Remove
1688	Douglas Fir	11	Good	Remove
1689	Douglas Fir	9	Good	Remove
1690	Douglas Fir	7	Fair	Remove
1691	Douglas Fir	8	Good	Remove
1692	Douglas Fir	6	Poor	Remove
1693	Douglas Fir	14	Good	Remove
1694	Douglas Fir	6	Poor	Remove
1695	Black Cottonwood	23	good	Remove
1696	Douglas Fir	6	Poor	Remove
1697	Douglas Fir	6	Poor	Remove
1698	Douglas Fir	12	Good	Remove
1712	Sweet Cherry	8	Dead	Remove
1713	Douglas Fir	6	Poor	Remove
1714	Douglas Fir	11	Good	Remove
1715	Douglas Fir	11	Good	Remove
1716	Douglas Fir	10	Fair	Remove
1717	Douglas Fir	6	Dead	Remove
1718	Douglas Fir	8	Good	Remove
1719	Douglas Fir	16	Good	Remove
1720	Douglas Fir	10	Good	Remove
1721	Douglas Fir	7	Good	Remove
1722	Douglas Fir	6	Poor	Remove
1723	Black Cottonwood	21	Good	Remove
1724	Pacific Madrone	6	Good	Remove
1725	Douglas Fir	12	Good	Remove
1726	Black Cottonwood	16	Good	Remove
1727	Douglas Fir	11	Good	Remove
1728	Douglas Fir	6	Good	Remove
1729	Douglas Fir	6	Good	Remove
1730	Black Cottonwood	14	Good	Remove
1731	Douglas Fir	6	Poor	Remove
1732	Black Cottonwood	13	Good	Remove
1733	Pacific Madrone	6	Good	Remove
1733.1	Pacific Madrone	7	Good	Remove
1734	Pacific Madrone	8	Good	Remove
1735	Pacific Madrone	7	Good	Remove
1736	Pacific Madrone	6	Good	Remove
1737	Douglas Fir	6	Poor	Remove
1738	Sweet Cherry	9	Good	Remove
1739	Douglas Fir	6	Poor	Remove
1740	Douglas Fir	7	Good	Remove
1741	Douglas Fir	7	Good	Remove
1742	Black Cottonwood	8	Good	Remove
1743	Pacific Madrone	6	Good	Remove
1744	Douglas Fir	6	Poor	Remove
1745	Douglas Fir	7	Poor	Remove
1746	Black Cottonwood	6	Good	Remove
1747	Douglas Fir	9	Good	Remove
1748	Black Cottonwood	6	Poor	Remove
1749	Douglas Fir	11	Good	Remove
1750	Black Cottonwood	9	Good	Remove
1751	Black Cottonwood	8	Good	Remove
1752	Douglas Fir	8	Poor	Remove
1753	Douglas Fir	13	Good	Remove
1754	Douglas Fir	7	Poor	Remove
1755	Douglas Fir	9	Good	Remove
1756	Douglas Fir	11	Good	Remove
1757	Douglas Fir	12	Good	Remove
1758	Douglas Fir	11	Good	Remove
1759	Douglas Fir	10	Good	Remove
1760	Douglas Fir	14	Good	Remove
1761	Douglas Fir	11	Good	Remove
1762	Black Cottonwood	10	Good	Remove
1762	Black Cottonwood	10	Good	Remove
1763	Sweet Cherry	6	Good	Remove
1763	Sweet Cherry	6	Good	Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1764	Douglas Fir	13	Good	Remove
1764	Douglas Fir	13	Good	Remove
1765	Douglas Fir	12	Good	Remove
1765	Douglas Fir	12	Good	Remove
1766	Douglas Fir	12	Good	Remove
1766	Douglas Fir	12	Good	Remove
1767	Douglas Fir	14	Good	Remove
1767	Douglas Fir	14	Good	Remove
1768	Pacific Madrone	6	Good	Remove
1768	Pacific Madrone	6	Good	Remove
1769	Douglas Fir	14	Good	Remove
1769	Douglas Fir	14	Good	Remove
1770	Douglas Fir	7	Good	Remove
1770	Douglas Fir	7	Good	Remove
1771	Douglas Fir	11	Good	Remove
1771	Douglas Fir	11	Good	Remove
1772	Douglas Fir	11	Good	Remove
1772	Douglas Fir	11	Good	Remove
1773	Douglas Fir	10	Good	Remove
1773	Douglas Fir	10	Good	Remove
1774	Douglas Fir	12	Good	Remove
1774	Douglas Fir	12	Good	Remove
1775	Douglas Fir	21	Poor	Remove
1776	Western Red Cedar	22	Dead	Remove
1777	Douglas Fir	12	Dead	Remove
1778	Sweet Cherry	6	Good	Remove
1779	Sweet Cherry	8	Good	Remove
1780	Sweet Cherry	7	Good	Remove
1781	Sweet Cherry	6	Good	Remove
1782	Sweet Cherry	6	Good	Remove
1783	Douglas Fir	7	Good	Remove
1784	Douglas Fir	10	Poor	Remove
1785	Sweet Cherry	6	Good	Remove
1786	Willow	6	Good	Remove
1787	Douglas Fir	16	Good	Remove
1788	Douglas Fir	22	Good	Remove
1789	Douglas Fir	22	Good	Remove
1790	Sweet Cherry	6	Good	Remove
1791	Douglas Fir	6	Good	Remove
1792	Douglas Fir	9	Good	Remove
1793	Douglas Fir	10	Good	Remove
1794	Douglas Fir	12	Good	Remove
1795	Douglas Fir	9	Good	Remove
1796	Sweet Cherry	9	Good	Remove
1797	Douglas Fir	15	Good	Remove
1798	Douglas Fir	9	Good	Remove
1799	Willow	11	Good	Remove
1800	Sweet Cherry	6	Good	Remove
1801	Douglas Fir	10	Good	Remove
1802	Douglas Fir	6	Dead	Remove
1803	Willow	10	Poor	Remove
1804	Douglas Fir	8	Good	Remove
1805	Douglas Fir	9	Good	Remove
1806	Douglas Fir	6	Poor	Remove
1807	Douglas Fir	11	Good	Remove
1808	Douglas Fir	11	Good	Remove
1809	Douglas Fir	7	Dead	Remove
1810	Douglas Fir	7	Good	Remove
1811	Sweet Cherry	8	Good	Remove
1812	Douglas Fir	8	Dead	Remove
1813	Douglas Fir	18	Good	Remove
1814	Douglas Fir	11	Good	Remove
1815	Douglas Fir	15	Good	Remove
1816	Douglas Fir	21	Good	Remove
1817	Sweet Cherry	7	Good	Remove
1818	Douglas Fir	14	Good	Remove
1819	Douglas Fir	21	Good	Remove
1820	Douglas Fir	21	Good	Remove
1821	Douglas Fir	7	Poor	Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1822	Willow	11	Poor	Remove
1823	Douglas Fir	24	Good	Remove
1824	Pacific Madrone	8	Good	Remove
1825	Douglas Fir	17	Poor	Remove
1826	Douglas Fir	15	Poor	Remove
1827	Bigleaf Maple	7	Good	Remove
1828	Douglas Fir	19	Poor	Remove
1829	Douglas Fir	17	Poor	Remove
1830	Oregon White Oak	11	Good	Remove
1831	Pacific Madrone	11	Good	Remove
1832	Oregon White Oak	18	Good	Remove
1833	Pacific Madrone	8	Good	Remove
1834	Pacific Madrone	7	Good	Remove
1835	Pacific Madrone	7	Good	Remove
1836	Pacific Madrone	6	Good	Remove
1837	Pacific Madrone	16	Poor	Remove
1838	Pacific Madrone	13	Good	Remove
1839	Pacific Madrone	6	Good	Remove
1840	Pacific Madrone	6	Good	Remove
1841	Oregon White Oak	6	Good	Remove
1842	Oregon White Oak	11	Good	Remove
1843	Oregon White Oak	21	Good	Remove
1844	Pacific Madrone	11	Good	Remove
1845	Oregon White Oak	14	Good	Remove
1846	Oregon White Oak	8	Good	Remove
1847	Oregon White Oak	20	Good	Remove
1848	Pacific Madrone	13	Poor	Remove
1849	Oregon White Oak	10	Good	Remove
1850	Sweet Cherry	7	Good	Remove
1851	Willow	6	Good	Remove
1852	Willow	11	Good	Remove
1853	Douglas Fir	14	Good	Remove
1854	Oregon White Oak	10	Good	Remove
1855	Douglas Fir	19	Good	Remove
1856	Douglas Fir	30	Good	Remove
1857	Douglas Fir	21	Dead	Remove
1858	Douglas Fir	21	Dead	Remove
1859	Oregon White Oak	10	Good	Remove
1860	Oregon White Oak	8	Good	Remove
1861	Pacific Madrone	8	Good	Remove
1862	Pacific Madrone	12	Poor	Remove
1863	Pacific Madrone	10	Good	Remove
1864	Pacific Madrone	15	Poor	Remove
1865	Pacific Madrone	13	Dead	Remove
1866	Oregon White Oak	9	Good	Remove
1867	Oregon White Oak		Good	Remove
1868	Oregon White Oak	17	Good	Remove
1869	Douglas Fir	13	Dead	Remove
1870	Oregon White Oak	13	Poor	Remove
1871	Douglas Fir	23	Dead	Remove
1872	Pacific Madrone	21	Poor	Remove
1873	Pacific Madrone		Dead	Remove
1874	Oregon White Oak	14	Good	Remove
1875	Pacific Madrone	6	Good	Remove
1876	Pacific Madrone	11	Dead	Remove
1877	Oregon White Oak	23	Good	Remove
1878	Pacific Madrone	6	Poor	Remove
1879	Pacific Madrone	7	Good	Remove
1880	Pacific Madrone	11	Poor	Remove
1881	Pacific Madrone	8	Poor	Remove
1882	Pacific Madrone	8	Dead	Remove
1883	Pacific Madrone	8	Poor	Remove
1884	Pacific Madrone	9	Poor	Remove
1885	Oregon White Oak	13	Good	Remove
1886	Pacific Madrone	8	Dead	Remove
1887	Pacific Madrone	9	Poor	Remove
1888	Pacific Madrone	7	Poor	Remove
1889	Pacific Madrone	7	Good	Remove
1890	Pacific Madrone	7	Poor	Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
1891	Pacific Madrone	17	Dead	Remove
1892	Douglas Fir	13	Dead	Remove
1893	Oregon White Oak	14	Good	Remove
1894	Pacific Madrone	7	Poor	Remove
1895	Pacific Madrone	8	Poor	Remove
1896	Douglas Fir	16	Dead	Remove
1897	Pacific Madrone	6	Dead	Remove
1898	Pacific Madrone	6	Dead	Remove
1899	Douglas Fir	11	Dead	Remove
1900	Douglas Fir	17	Dead	Remove
1901	Pacific Madrone	8	Poor	Remove
1902	Pacific Madrone	6	Poor	Remove
1903	Pacific Madrone	12	Poor	Remove
1904	Pacific Madrone	9	Poor	Remove
1905	Pacific Madrone	10	Dead	Remove
1906	Douglas Fir	18	Fair	Remove
1907	Pacific Madrone	7	Dead	Remove
1908	Douglas Fir	19	Poor	Remove
1909	Pacific Madrone	8	Dead	Remove
1910	Pacific Madrone	7	Good	Remove
1911	Pacific Madrone	8	Poor	Remove
1912	Douglas Fir	21	Dead	Remove
1913	Douglas Fir	12	Dead	Remove
1914	Pacific Madrone	9	Poor	Remove
1915	Pacific Madrone	6	Good	Remove
1916	Oregon White Oak	9	Poor	Remove
1917	Pacific Madrone	6	Good	Remove
1918	Pacific Madrone	10	Good	Remove
1919	Pacific Madrone	9	Poor	Remove
1920	Oregon White Oak	15	Good	Remove
1921	Pacific Madrone	8	Poor	Remove
1922	Pacific Madrone	8	Good	Remove
1923	Pacific Madrone	8	Poor	Remove
1924	Pacific Madrone	10	Poor	Remove
1925	Pacific Madrone	10	Poor	Remove
1926	Douglas Fir	14	Dead	Remove
1927	Pacific Madrone	7	Poor	Remove
1928	Oregon White Oak	9	Good	Remove
1929	Pacific Madrone	6	Poor	Remove
1930	Douglas Fir	13	Poor	Remove
1931	Douglas Fir	23	Poor	Remove
1932	Douglas Fir	7	Poor	Remove
1933	Pacific Madrone	6	Good	Remove
1934	Pacific Madrone	6	Good	Remove
1935	Douglas Fir	17	Poor	Remove
1936	Douglas Fir	18	Poor	Remove
1937	Douglas Fir	11	Good	Remove
1938	Douglas Fir	20	Dead	Remove
1939	Douglas Fir	15	Dead	Remove
1940	Douglas Fir	20	Dead	Remove
1941	Oregon White Oak	19	Good	Remove
1942	Oregon White Oak	23	Good	Remove
1943	Pacific Madrone	13	Good	Remove
1944	Douglas Fir	13	Dead	Remove
1945	Douglas Fir	22	Poor	Remove
1946	Pacific Madrone	10	Good	Remove
1947	Douglas Fir	24	Poor	Remove
1948	Pacific Madrone	10	Good	Remove
1949	Douglas Fir	13	Poor	Remove
1950	Douglas Fir	14	Poor	Remove
1951	Douglas Fir	24	Good	Remove
1952	Douglas Fir	20	Good	Remove
1953	Douglas Fir	16	Poor	Remove
1954	Pacific Madrone	8	Poor	Remove
1955	Douglas Fir	10	Poor	Remove
1956	Pacific Madrone	6	Dead	Remove
1957	Pacific Madrone	13	Dead	Remove
11003				Remove
11004				Remove

Tree No.	Common Name	DBH	Condition	Protect/ Remove
11011				Remove
11016				Remove
11030				Remove
11519				Remove
11529				Remove
15032	Pacific Madrone	9	Good	Remove
15033	Oregon White Oak	16	Good	Remove
15035	Pacific Madrone	7	Good	Remove
15036	Pacific Madrone	13	Good	Remove
15039	Pacific Madrone	8	Good	Remove
15043	Pacific Madrone	10	Good	Remove
15135	Douglas Fir	25	Good	Remove
15135.1	Douglas Fir	23	Good	Remove
15135.2	Douglas Fir	19	Good	Remove
15135.3	Pacific Madrone	9	Good	Remove
15136	Pacific Madrone	10	Good	Remove
15137	Douglas Fir	6	Fair	Remove
15138	Pacific Madrone	5	Good	remove
15139	Sweet Cherry	5	Poor	Remove
15140	Douglas Fir	17	Good	Remove
15202	Pacific Madrone	6	Good	Remove
15205	Pacific Madrone	9	Good	Remove
15206	Pacific Madrone	9	Good	Remove
15207	Pacific Madrone	13	Good	Remove
15210	Oregon White Oak	9	Good	Remove
15229	Pacific Madrone	6	Good	Protect
15288	Pacific Madrone	8	Good	Remove
15289	Oregon White Oak	13	Good	Remove
15391	Oregon Ash	21	Good	Protect
15397	Oregon Ash	22	Good	Protect
15398	Oregon Ash	21	Good	Protect
15403	Oregon Ash	14	Poor	Protect
15452	Oregon Ash	18	Good	Protect
15455	Oregon Ash	7	Poor	Protect
15498	Oregon Ash	12	Dead	Protect
15499	Oregon Ash	20	Good	Protect
15500	Oregon Ash	16	Fair	Protect
15603	Douglas Fir	7	Good	Protect
15603	Douglas Fir	7	Good	Protect
15639	Douglas Fir	17	Good	Protect
15697	Pacific Madrone	7	Good	Protect
15718	Oregon White Oak	18	Good	Remove
15719	Douglas Fir	27	Poor	Remove
15723	Douglas Fir	16	Good	Remove
15724	Douglas Fir	18	Fair	Remove
15728	Douglas Fir	21	Dead	Remove
15735	Pacific Madrone	18	Poor	Remove

REV | DATE | REVISIONS DESCRIPTION | BY

REGISTERED PROFESSIONAL ENGINEER 78906PE OREGON Oct. 11, 2012 RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641
WWW.DOWL.COM

LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

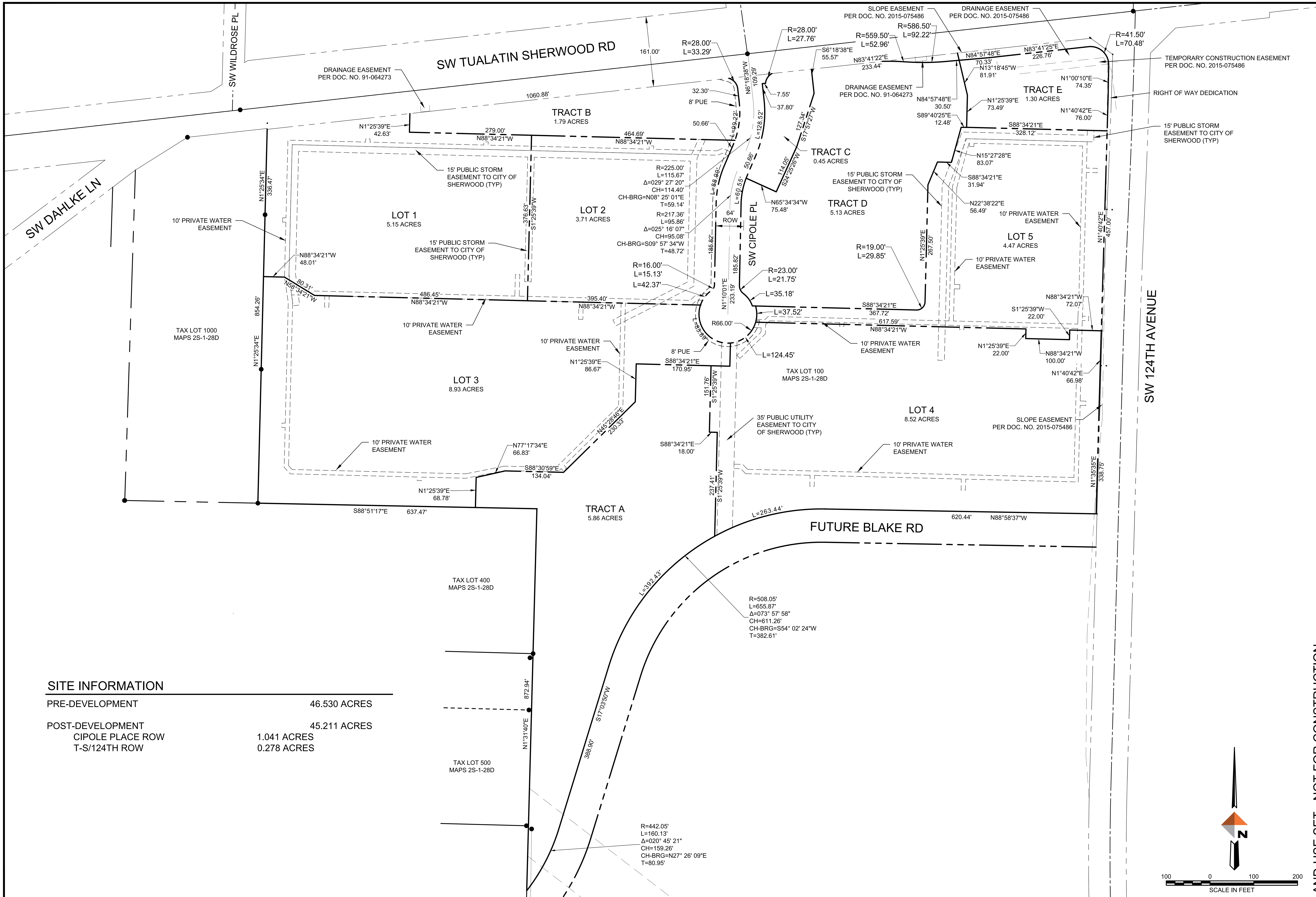
TREE TABLE

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C7.6

Q:\22\14347-01\65CAD\CIVIL_DD\SC-CS-SAP-TREE-TCC.DWG SAVED: 3/4/2020 7:54 PM PLOTTED: 3/30/2020 4:45 PM BY: RHALVORSON



SITE INFORMATION

PRE-DEVELOPMENT	46.530 ACRES
POST-DEVELOPMENT	45.211 ACRES
CIPOLE PLACE ROW	1.041 ACRES
T-S/124TH ROW	0.278 ACRES

Q:\22\14347-01\65CAD\CIVIL_DD\SC-PREL-PLAT-TCC.DWG SAVED: 3/6/2020 1:28 PM PLOTTED: 3/30/2020 4:56 PM BY: RHALVORSON

REV | DATE | DESCRIPTION | BY
REVISIONS

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

DOWL
www.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK
PRELIMINARY PLAT
SHERWOOD, OREGON

LAND-USE SET - NOT FOR CONSTRUCTION

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
C8.0

GENERAL NOTES

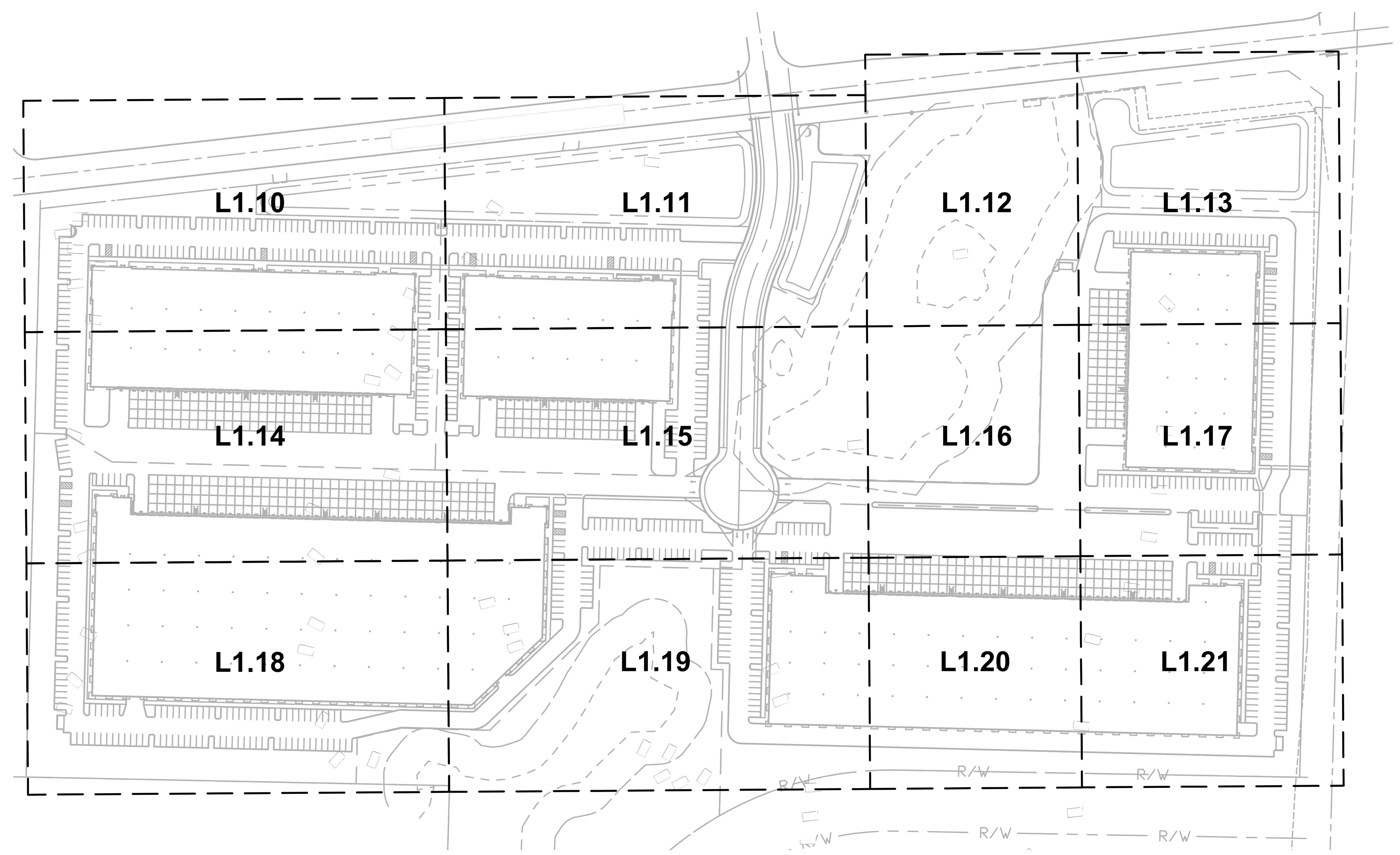
1. CONTRACTOR SHALL CONFIRM ALL EXISTING CONDITIONS PRIOR TO COMMENCING WORK AND NOTIFY THE OWNER OF ANY DISCREPANCIES OR CONFLICTS.
2. CONTRACTOR SHALL VERIFY EXISTING TREES IN THE FIELD PRIOR TO COMMENCEMENT OF WORK.
3. CONTRACTOR SHALL LOCATE AND VERIFY ALL UNDERGROUND UTILITIES PRIOR TO COMMENCEMENT OF WORK. NOTIFY LANDSCAPE ARCHITECT OF ANY DISCREPANCIES.
4. COORDINATE ALL LANDSCAPE WORK WITH OTHER TRADES AND SCHEDULES.
5. COORDINATE STAGING AREA WITH GENERAL CONTRACTOR AND OWNER.
6. CONTRACTOR SHALL COORDINATE WITH THE OWNER ANY DISRUPTION TO VEHICULAR CIRCULATION PRIOR TO COMMENCEMENT OF ANY WORK.
7. DURING THE CONSTRUCTION PROCESS, THE OWNER'S AGENTS SHALL PROVIDE ABOVE AND BELOW GROUND PROTECTION FOR EXISTING TREES AND PLANT MATERIAL TO REMAIN.
8. TREES AND PLANT MATERIALS IDENTIFIED FOR PRESERVATION SHALL BE PROTECTED BY CHAIN LINK OR OTHER STURDY FENCING PLACED AROUND THE TREE AT THE DRIP LINE.
9. NEITHER TOP SOIL STORAGE NOR CONSTRUCTION MATERIAL STORAGE SHALL BE LOCATED WITHIN THE DRIP LINE OF TREES DESIGNATED TO BE PRESERVED.

PLANTING NOTES

1. GROWING MEDIUM FOR PLANTING AREAS SHALL BE A SANDY LOAM SOIL ACCORDING TO USDA SOIL TEXTURE TRIANGLE. TOPSOIL TO BE LOOSE, FRIABLE, WELL BLENDED AND FREE OF DEBRIS, WOOD, WEEDS OR OTHER FOREIGN MATTER.
2. TOPSOIL TO BE TESTED BY AN INDEPENDENT LABORATORY, RECOGNIZED BY THE STATE DEPARTMENT OF AGRICULTURE, WITH THE CAPABILITY TO CONDUCT THE TESTING INDICATED. FOLLOW TEXTURAL AND pH RECOMMENDATIONS FROM SOIL TEST.
3. ALL PLANT MATERIAL SHALL BE HEALTHY NURSERY STOCK, WELL BRANCHED AND ROOTED, FULL FOLIAGE, FREE FROM INSECTS, DISEASES, WEEDS, WEED ROT, INJURIES AND DEFECTS WITH NO LESS THAN MINIMUMS SPECIFIED IN AMERICAN STANDARDS FOR NURSERY STOCK, ANSI Z60.1-2014.
4. GROUNDCOVER PLANTS MUST BE 4" POT SIZE OR GREATER AT THE TIME OF PLANTING, AND PLANTED AT A DENSITY THAT WILL COVER THE ENTIRE AREA WITHIN THREE (3) YEARS FROM THE TIME OF PLANTING. REFERENCE PLANTING SCHEDULE ON L0.02.
5. SHRUBS MUST BE 1 GALLON SIZE OR GREATER AT THE TIME OF PLANTING, AND MUST BE OF SUFFICIENT SIZE AND NUMBER TO BE AT FULL GROWTH WITHIN THREE (3) YEARS FROM THE TIME OF PLANTING. REFERENCE PLANTING SCHEDULE ON L0.02.
6. TREES MUST BE FULLY BRANCHED, AND BE A MINIMUM OF TWO (2) CALIPER INCHES AND AT LEAST SIX (6) FEET IN HEIGHT AT TIME OF PLANTING. REFERENCE TREE SCHEDULE ON L0.02.
4. PLACE 2" DEPTH MEDIUM GRIND HEMLOCK BARK MULCH AT ALL PLANTING AREAS. REFERENCE SOIL AND MULCH PREPARATION DETAILS.
5. DO NOT PLANT IN WEATHER ABOVE 90deg. OR BELOW 32deg.
6. PLANT MATERIAL STORED ON-SITE TO BE PROTECTED FROM EXTREME HEAT, CHILL OR WIND.
7. REMOVE POTS, TWINE AND BURLAP FROM ALL PLANT MATERIAL PRIOR TO PLANTING.
8. SCARIFY ALL ROOTBALLS AND LOOSEN ROOTS PRIOR TO PLANTING.
9. AT CLOSE OF PROJECT, REMOVE ALL EXTRA MATERIALS, SUPPLIES AND EQUIPMENT FROM SITE.

IRRIGATION NOTES

1. ALL NEW LANDSCAPE AREAS TO BE IRRIGATED WITH A HIGH EFFICIENCY PERMANENT FULLY AUTOMATIC UNDERGROUND IRRIGATION SYSTEM.
2. VALVES SHALL BE WIRED AND INSTALLED PER MANUFACTURER'S RECOMMENDED INSTALLATION PROCEDURES AND CONNECTED TO THE IRRIGATION CONTROLLER.
3. PROVIDE SLEEVING AT ALL AREAS WHERE PIPE TRAVELS UNDER CONCRETE OR HARD SURFACING.
4. IRRIGATION SYSTEM AS DESIGNED AND INSTALLED SHALL PERFORM WITHIN THE TOLERANCES AND SPECIFICATIONS OF THE SPECIFIED MANUFACTURERS.
5. ALL IRRIGATION PIPE MATERIAL AND INSTALLATION SHALL CONFORM TO APPLICABLE CODE FOR PIPING AND COMPONENT REQUIREMENTS.
6. SYSTEM SHALL SUPPLY MANUFACTURER'S SPECIFIED MINIMUM OPERATING PRESSURE TO FARTHEST EMITTER FROM WATER METER.
7. REF. CIVIL PLANS AND DETAILS FOR POINT OF CONNECTION AND BACKFLOW PREVENTION INFORMATION.
8. IRRIGATION SHALL BE WINTERIZED THROUGH LOW PRESSURE, HIGH VOLUME AIR BLOWOUT CONNECTION THROUGH QUICK COUPLER.
9. QUICK COUPLERS TO BE PLACED EVERY 300 LINEAR FT. MIN.
10. CONTRACTOR TO PROVIDE SHOP DRAWINGS FOR REVIEW BY LANDSCAPE ARCHITECT PRIOR TO PURCHASE OR INSTALLATION OF SYSTEM. DRAWINGS TO INDICATE HEAD TYPE, GALLONS PER MINUTE, LATERAL LINES, AND BE AT MINIMUM SCALE OF 1"=20'.



2 L0.01 KEY MAP

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1300 SW 5TH AVE.
STE 3050
PORTLAND, OR 97201

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T-S CORPORATE PARK

REGISTERED 906 Brad E. Theurer OREGON 09/19/2016 LANDSCAPE ARCHITECT
EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
LANDSCAPE NOTES AND KEY MAP

DRAWN BY: AJ

CHECKED BY: BET

SHEET:

L0.01

JOB NO. **2180459.00**

SITE PLAN REVIEW APPLICATION: 1/17/20

TREE SCHEDULE

PLANT SCHEDULE

TREES	BOTANICAL / COMMON NAME	SIZE	REMARKS	SIZE AT MATURITY
	ACER GRISEUM PAPERBARK MAPLE	2" CAL., B&B		20' H x 20' W'
	ACER RUBRUM 'FRANKSRED' RED SUNSET MAPLE	2" CAL., B&B		40' H x 40' W'
	ALNUS RUBRA RED ALDER	2" CAL., B&B		20' H x 20' W'
	CARPINUS BETULUS EUROPEAN HORNBEAM	2" CAL., B&B	STREET TREE	40' H x 40' W'
	CARPINUS BETULUS 'FRANZ FONTAINE' FRANZ FONTAINE HORNBEAM	2" CAL., B&B		30' H x 15' W'
	CERCIS CANADENSIS EASTERN REDBUD	2" CAL., B&B		20' H x 20' W'
	CLADRASTIS KENTUKEA AMERICAN YELLOWWOOD	2" CAL., B&B		40' H x 40' W'
	FRAXINUS AMERICANA 'AUTUMN PURPLE' AUTUMN PURPLE ASH	2" CAL., B&B		50' H x 50' W'
	FRAXINUS LATIFOLIA OREGON ASH	2" CAL., B&B	STREET TREE	40' H x 40' W'
	FRAXINUS OXYCARPA 'RAYWOOD' RAYWOOD ASH	2" CAL., B&B		35' H x 35' W'
	GINKGO BILOBA 'AUTUMN GOLD' MAIDENHAIR TREE	2" CAL., B&B	STREET TREE	35' H x 35' W'
	GLEDITSIA TRIACANTHOS VAR. INERMIS 'SUNCOLE' SUNBURST HONEYLOCUST	2" CAL., B&B		35' H x 35' W'
	JUNIPERUS SCOPULORUM 'SKYROCKET' SKYROCKET JUNIPER	6'-8' HT. MIN. B&B		20' H x 3' W'
	LIQUIDAMBAR STYRACIFLUA AMERICAN SWEET GUM	2" CAL., B&B	STREET TREE	40' H x 40' W'
	QUERCUS ROBUR X BICOLOR 'LONG' REGAL PRINCE OAK	2" CAL., B&B		30' H x 15' W'
	RHAMNUS PURSHIANA CASCARA	2" CAL., B&B		20' H x 20' W'
	STEWARTIA PSEUDOCAMELLIA JAPANESE STEWARTIA	2" CAL., B&B		20' H x 20' W'
	TILIA CORDATA LITTLE LEAF LINDEN	2" CAL., B&B		40' H x 40' W'
	ZELKOVA SERRATA 'GREEN VASE' GREEN VASE SAWLEAF ZELKOVA	2" CAL., B&B		50' H x 50' W'

ON-SITE TREE CANOPY COVERAGE

30% SITE CANOPY COVERAGE REQUIRED, DOES NOT INCLUDE RIGHT-OF-WAY TREES

TREE SPECIES	QTY.	H X W	SIZE CLASSIFICATION	MATURE CANOPY AREA (SF)	TOTAL MATURE CANOPY COVERAGE (SF)
ACER GRISEUM	22	20' x 20'	SMALL	314	6,908
ACER RUBRUM 'FRANKSRED'	56	40' X 40'	MEDIUM	1256	70,336
ALNUS RUBRA	69	20' X 20'	SMALL	314	21,666
CARPINUS BETULUS 'FRANZ FONTAINE'	23	30' X 15'	SMALL	178	4,094
CERCIS CANADENSIS	21	20' X 20'	SMALL	314	6,594
CLADASTRIS KENTUCKEA	21	40' X 40'	MEDIUM	1256	26,376
FRAXINUS AMERICANA 'AUTUMN PURPLE'	17	50' X 50'	MEDIUM	1964	33,388
FRAXINUS OXYCARPA 'RAYWOOD'	18	35' X 35'	SMALL	962	17,316
GLEDITSIA TRIACANTHOS CAR INERMIS 'SUNCOLE'	44	35' X 35'	SMALL	962	42,328
JUNIPERUS SCOPULORIUM 'SKYROCKET'	31	20' X 3'	SMALL	7	217
QUERCUS ROBUR X BICOLOR 'LONG'	18	30' X 15'	SMALL	178	3,204
RHAMNUS PURSHIANA	75	20' x 20'	SMALL	314	23,550
STEWARTIA PSEUDOCAMELLIA	11	20' x 20'	SMALL	314	3,454
TILIA CORDATA	50	40' X 40'	MEDIUM	1256	62,800
ZELKOVA SERRATA 'GREEN VASE'	26	50' X 50'	MEDIUM	1964	51,064

NOTES:

1. HEIGHT AND WIDTH (SPREAD) AT MATURITY.

TOTAL QUALIFYING TREES*	502
TOTAL CANOPY COVERAGE AREA (SF)	373,295

*ONLY PROPOSED TREES / DOES NOT INCLUDE EXISTING TREES ON SITE, OR R.O.W. TREES

PLANTING SCHEDULE

SITE LANDSCAPE PLANTING

BOTANICAL NAME	COMMON NAME	SPACING	SIZE AT MATURITY
SHRUBS			
CISTUS X HYBRIDUS	WHITE ROCKROSE	48" O.C.	4'X4'
CORNUS SERICEA 'FARROW'	ARCTIC FIRE RED TWIG DOGWOOD	48" O.C.	4'X4
FOTHERGILLA GARDENII	DWARF FOTHERGILLA	36" O.C.	3'X3'
HYDRANGEA QUERCIFOLIA	OAKLEAF HYDRANGEA	48" O.C.	4'X4
ILEX GLABRA 'SHAMROCK'	INKBERRY	36" O.C.	3'X4'
MAHONIA AQUAFOLIUM	OREGON GRAPE	36" O.C.	4'X4
NANDINA DOMESTICA ' GULF STREAM'	GULF STREAM HEAVENLY BAMBOO	36" O.C.	4'X4
PINUS MUGO VAR. PUMILO	DWARF MUGO PINE	48" O.C.	4'X4
POLYSTICHUM MUNITUM	WESTERN SWORD FERN	24" O.C.	2'X2'
PRUNUS LAUROCERASUS 'OTTO LUYKEN'	OTTO LUYKEN LAUREL	48" O.C.	4'X4
ROSMARINUS OFFICINALIS 'TUSCAN BLUE'	TUSCAN BLUE ROSEMARY	48" O.C.	4'X4
SARCOCOCCA RUSCIFOLIA	FRAGRANT SARCOCOCCA	36" O.C.	3'X3'
SPIRAEA BETULIFOLIA 'TOR GOLD'	GLOW GIRL BIRCHLEAF SPIREA	36" O.C.	3'X3'
SPIRAEA JAPONICA 'GOLDMOUND'	GOLDMOUND SPIREA	36" O.C.	3'X3'
VIBURNUM DAVIDII	DAVID VIBURNUM	48" O.C.	4'X3
GROUNDCOVER			
ARCTOSTAPHYLOS UVA-URSI	KINNIKINNICK	12" O.C.	---
MAHONIA REPENS	CREEPING OREGON GRAPE	18" O.C.	---
RUBUS PENTALOBUS 'EMERALD CARPET'	CREEPING BRAMBLE	24" O.C.	---
SEED MIXES			
TURF MIX	TURFWORX BY SUNMARK SEEDS	N/A	---

VISUAL CORRIDOR PLANTINGS

BOTANICAL NAME	COMMON NAME	SPACING	SIZE AT MATURITY
SHRUBS			
ILEX GLABRA 'SHAMROCK'	INKBERRY	36" O.C.	3'X4'
MAHONIA AQUAFOLIUM	OREGON GRAPE	36" O.C.	4'X4
NANDINA DOMESTICA ' GULF STREAM'	GULF STREAM HEAVENLY BAMBOO	36" O.C.	4'X4
PRUNUS LAUROCERASUS 'OTTO LUYKEN'	OTTO LUYKEN LAUREL	48" O.C.	4'X4
VIBURNUM DAVIDII	DAVID VIBURNUM	48" O.C.	4'X3
GROUNDCOVER			
ARCTOSTAPHYLOS UVA-URSI	KINNIKINNICK	12" O.C.	---
MAHONIA REPENS	CREEPING OREGON GRAPE	18" O.C.	---

PERIMETER SCREENING PLANTINGS

BOTANICAL NAME	COMMON NAME	SPACING	SIZE AT MATURITY
SHRUBS			
ILEX CRENATA 'COMPACTA'	COMPACT JAPANESE HOLLY	48" O.C.	6'X6'
MAHONIA NERVOSA	LONGLEAF OREGON GRAPE	24" O.C.	2'X2'
PRUNUS LAUROCERASUS 'OTTO LUYKEN'	OTTO LUYKEN LAUREL	48" O.C.	4'X4
VIBURNUM DAVIDII	DAVID VIBURNUM	48" O.C.	4'X3
GROUNDCOVER			
FRAGARIA CHILOENSIS	COAST STRAWBERRY	12" O.C.	---
MAHONIA REPENS	CREEPING OREGON GRAPE	18" O.C.	---

STORMWATER PLANTINGS

BOTANICAL NAME	COMMON NAME	SPACING	SIZE AT MATURITY
SMALL SHRUBS			
CORNUS SERICEA 'KELSEYI'	KELSEY DOGWOOD	24" O.C.	2'X2'
MAHONIA NERVOSA	LONGLEAF OREGON GRAPE	24" O.C.	2'X2'
ROSA NUTKANA	NOOTKA ROSE	36" O.C.	3'X8'
SPIRAEA BETULIFOLIA	BIRCHLEAF SPIREA	36" O.C.	3'X3'
VACCINIUM OVATUM	EVERGREEN HUCKLEBERRY	36" O.C.	6'X6'
LARGE SHRUBS			
ACER CIRCINATUM	VINE MAPLE	10' O.C.	15'X15'
CORNUS SERICEA	RED TWIG DOGWOOD	48" O.C.	8'X8'
HOLODISCUS DISCOLOR	OCEANSPRAY	48" O.C.	8'X8'
PHYSICARPUS CAPITATUS	PACIFIC NINEBARK	48" O.C.	10'X10'
RIBES SANGUINEUM	RED-FLOWERING CURRANT	48" O.C.	8'X8'
GROUNDCOVER			
ARCTOSTAPHYLOS UVA-URSI	KINNIKINNICK	12" O.C.	---
FRAGARIA CHILOENSIS	COAST STRAWBERRY	12" O.C.	---
MAHONIA REPENS	CREEPING OREGON GRAPE	18" O.C.	---
HERBACEOUS PLANTS			
CAREX OBNUPTA	SLOUGH SEDGE	12" O.C.	---
CAREX TESTACEA	NEW ZEALAND ORANGE SEDGE	12" O.C.	---
IRIS DOUGLASIANA	DOUGLAS IRIS	12" O.C.	---
JUNCUS EFFUSUS	SOFT RUSH	12" O.C.	---
JUNCUS PATENS 'ELK BLUE'	ELK BLUE SPREADING RUSH	12" O.C.	---

RIGHT OF WAY PLANTINGS

BOTANICAL NAME	COMMON NAME	SPACING	SIZE AT MATURITY
SHRUBS			
NANDINA DOMESTICA ' GULF STREAM'	GULF STREAM HEAVENLY BAMBOO	36" O.C.	4'X4
PRUNUS LAUROCERASUS 'OTTO LUYKEN'	OTTO LUYKEN LAUREL	48" O.C.	4'X4
VIBURNUM DAVIDII	DAVID VIBURNUM	48" O.C.	4'X3
GROUNDCOVER			
MAHONIA REPENS	CREEPING OREGON GRAPE	18" O.C.	---
RUBUS PENTALOBUS 'EMERALD CARPET'	CREEPING BRAMBLE	24" O.C.	---
SEED MIXES			
TURF MIX	TURFWORX BY SUNMARK SEEDS	N/A	---

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REGISTERED 906 LANDSCAPE ARCHITECT
Brad E. Theurer
OREGON
09/19/2016
EXPIRES: 9/30/20

REVISION SCHEDULE

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SHEET TITLE:

PLANTING SCHEDULES

DRAWN BY: AJ

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L0.02

JOB NO. 2180459.00

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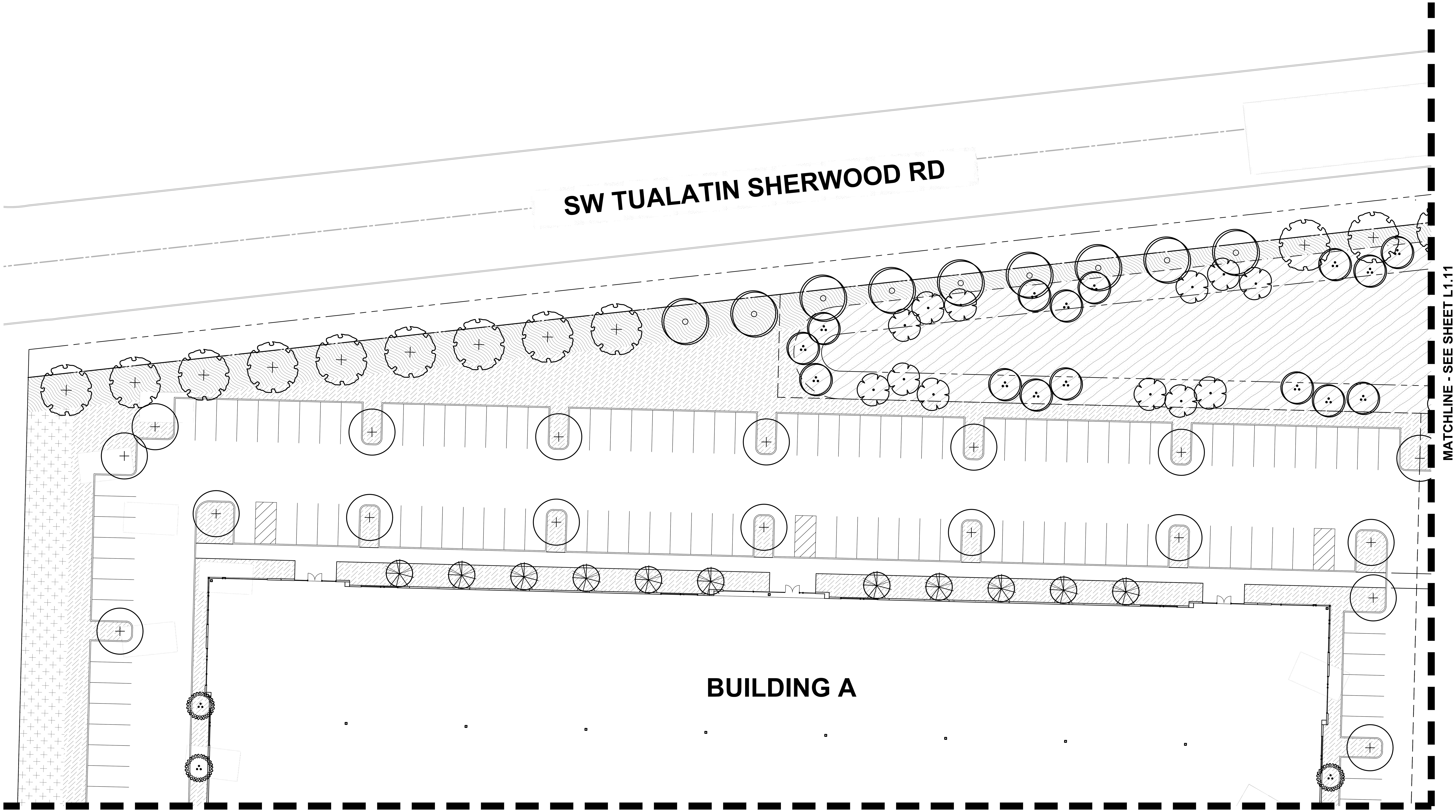
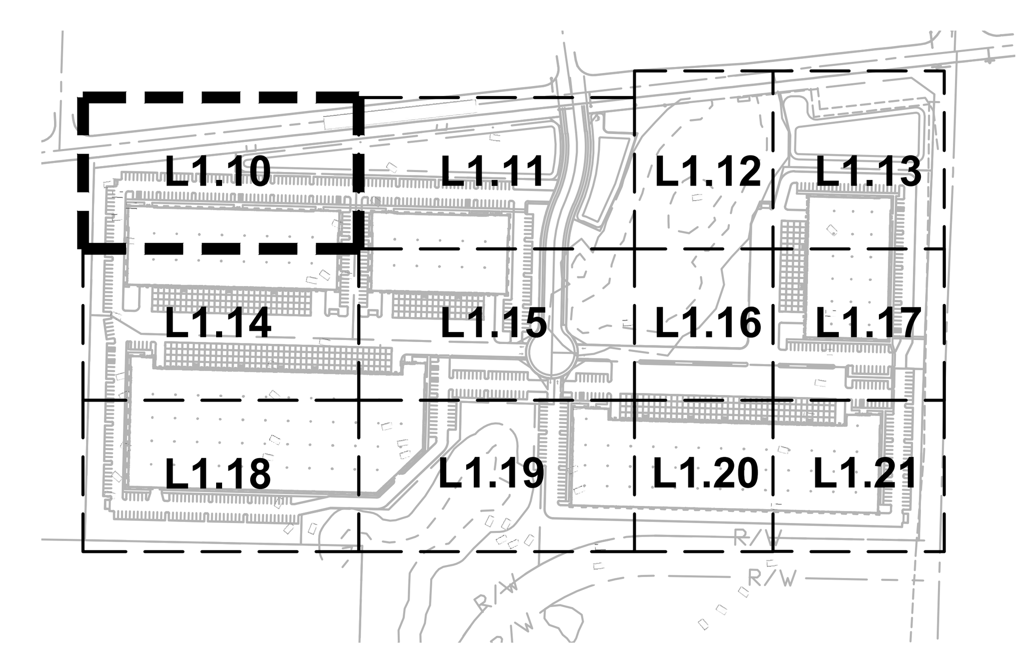


MATCHLINE - SEE SHEET L1.14

1 L1.10 LANDSCAPE PLAN



2 L1.10 KEY MAP

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LANDSCAPE PLAN

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SHEET:
L1.10

JOB NO. 2180459.00

1 L1.11 LANDSCAPE PLAN

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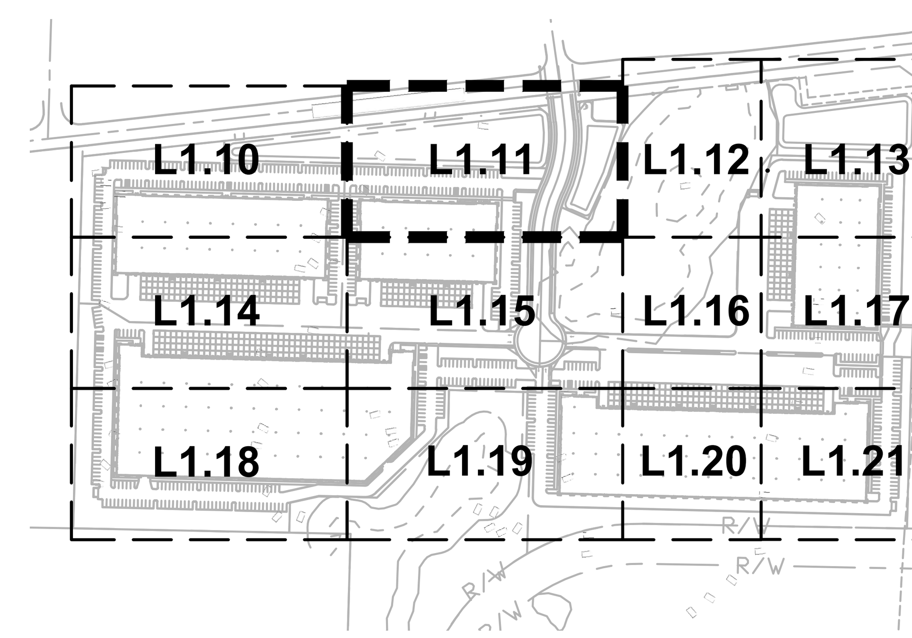
(IN FEET)
1 inch = 20 ft.



2 L1.11 KEY MAP

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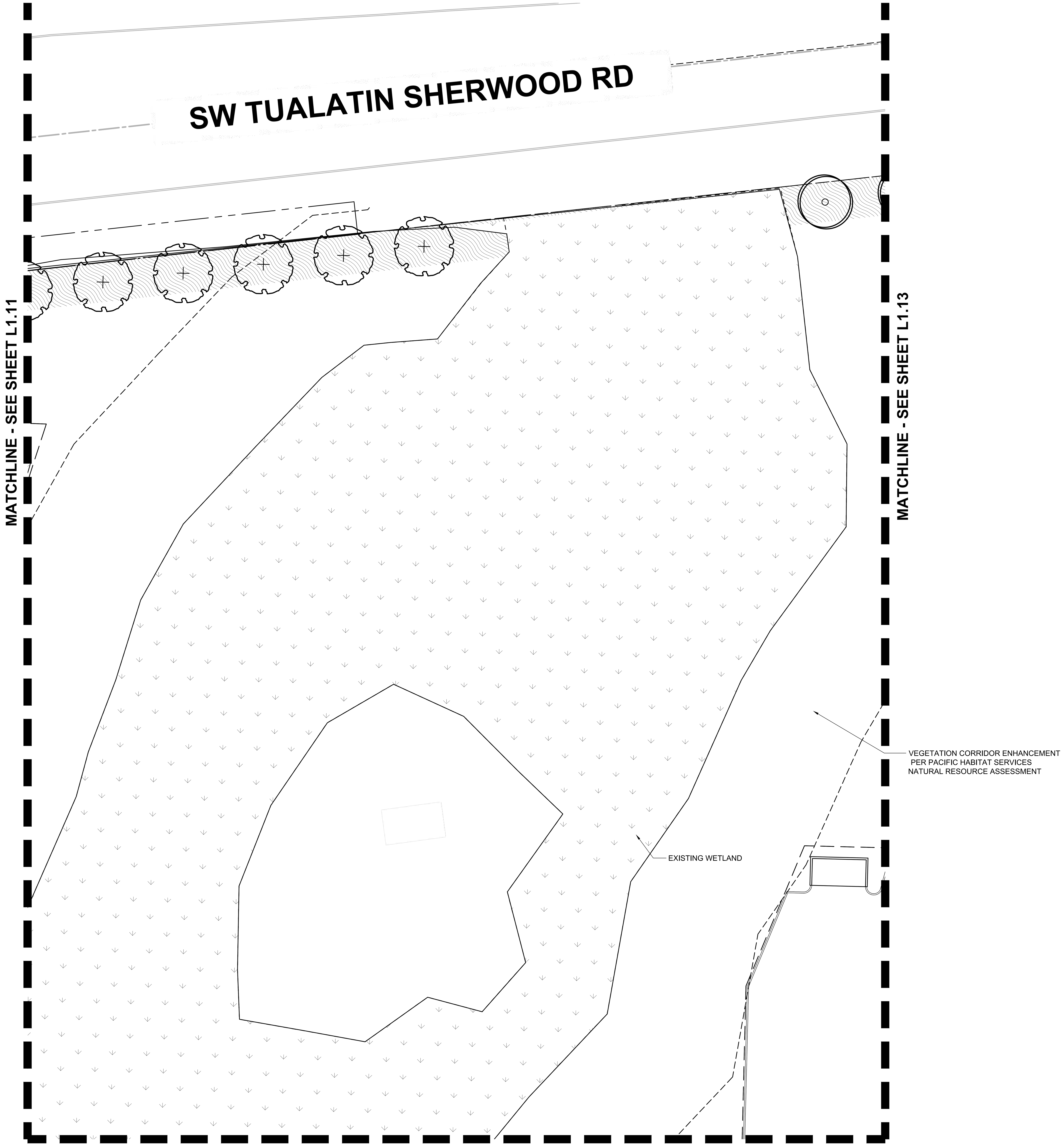

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L1.12

LANDSCAPE PLAN

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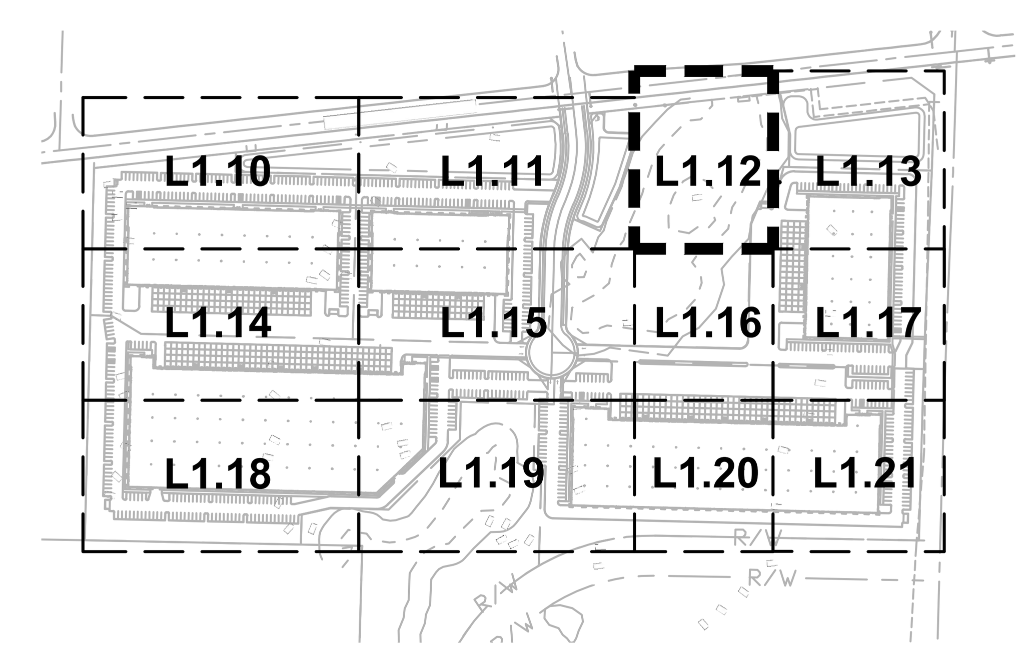
1 inch = 20 ft.



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L1.12

KEY MAP

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L1.12

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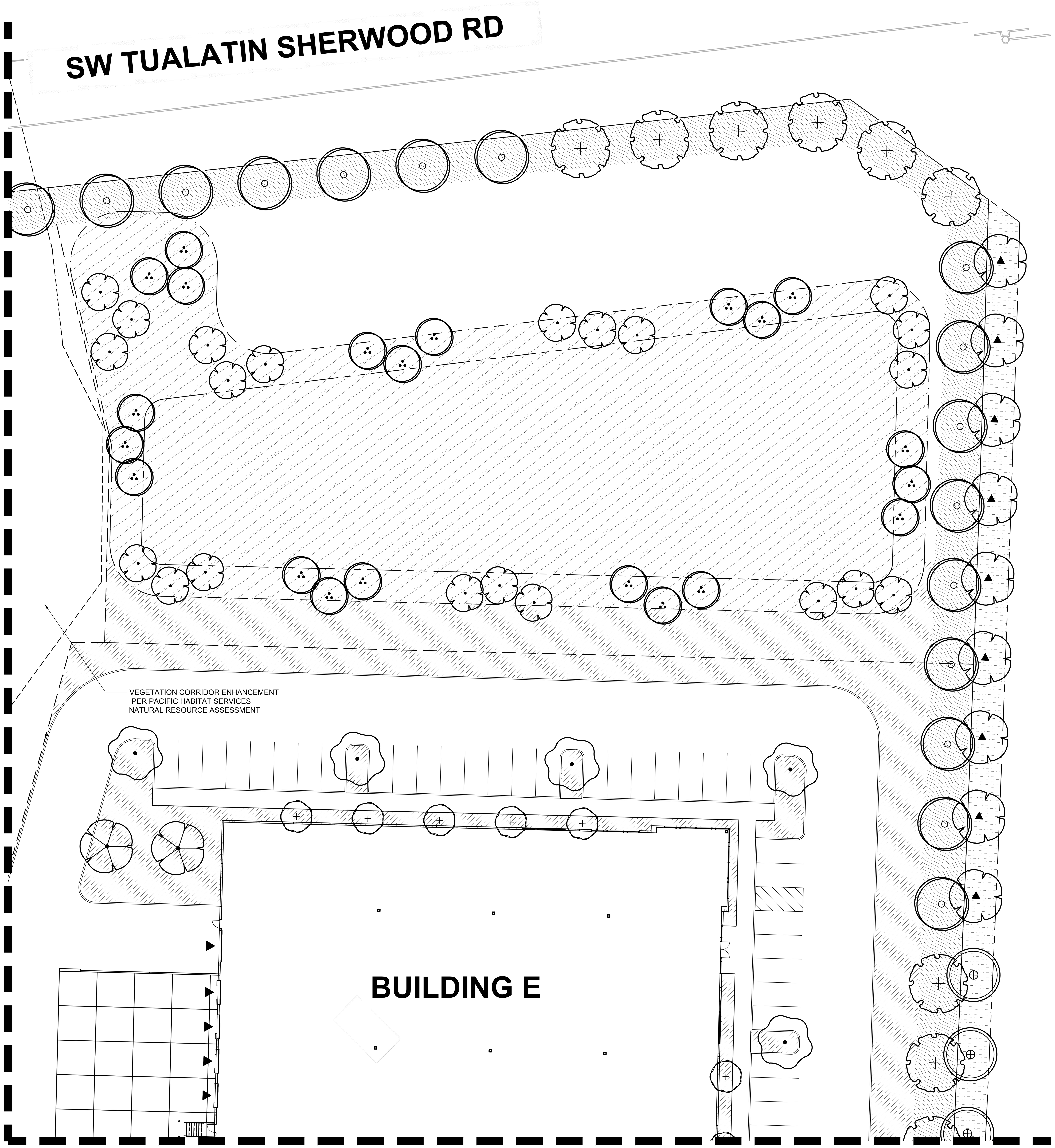

1 L1.13 LANDSCAPE PLAN

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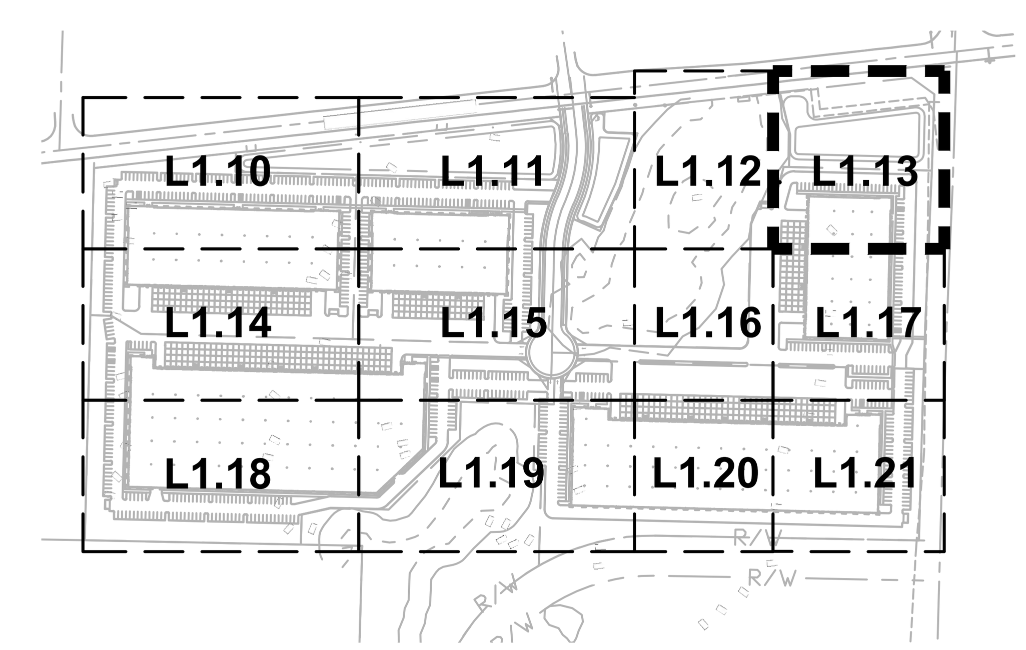

2 L1.13 KEY MAP

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STE 3050
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EXPIRES: 9/30/20

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LANDSCAPE PLAN

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CHECKED BY: BET
SHEET:
L1.13

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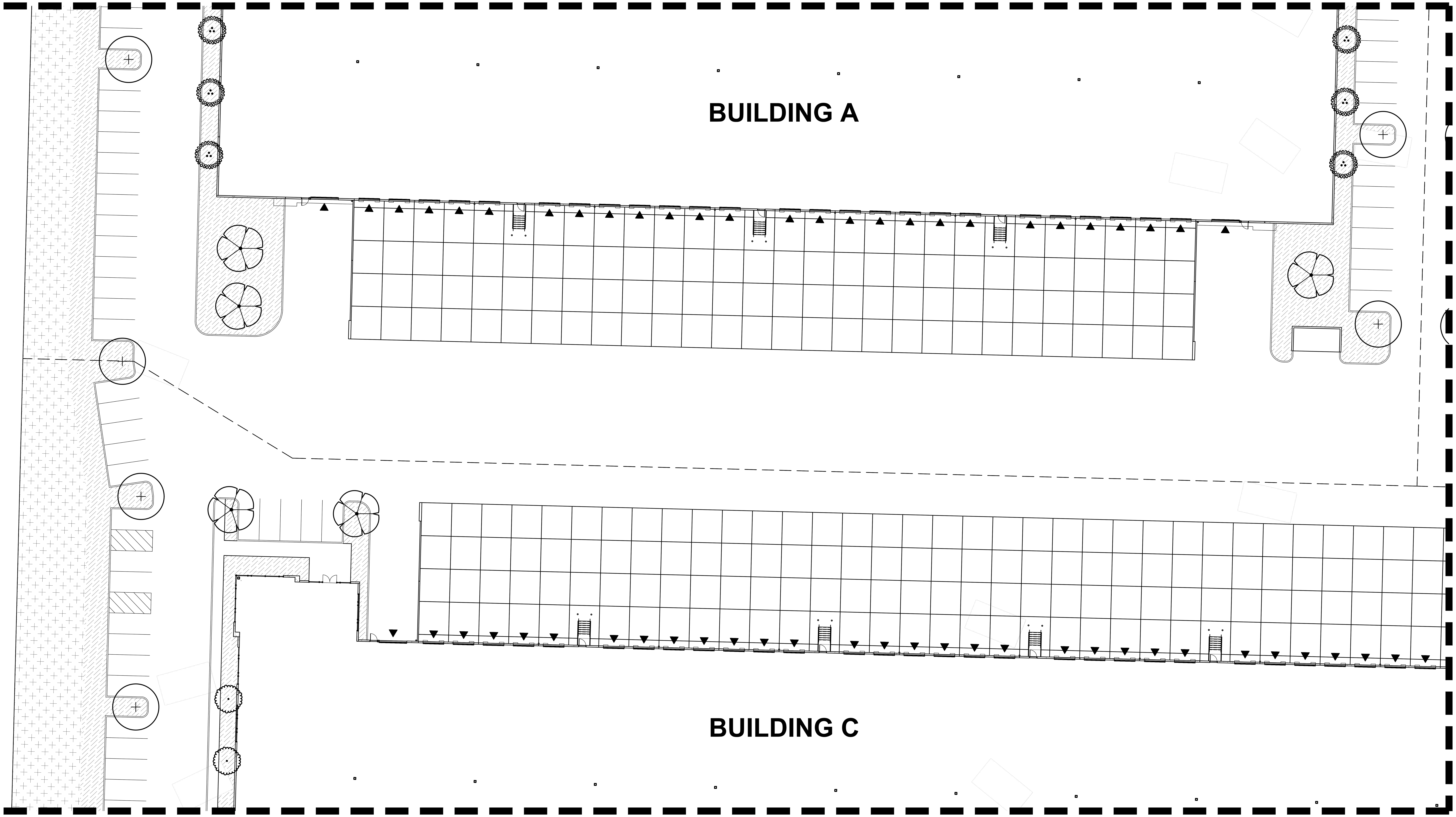

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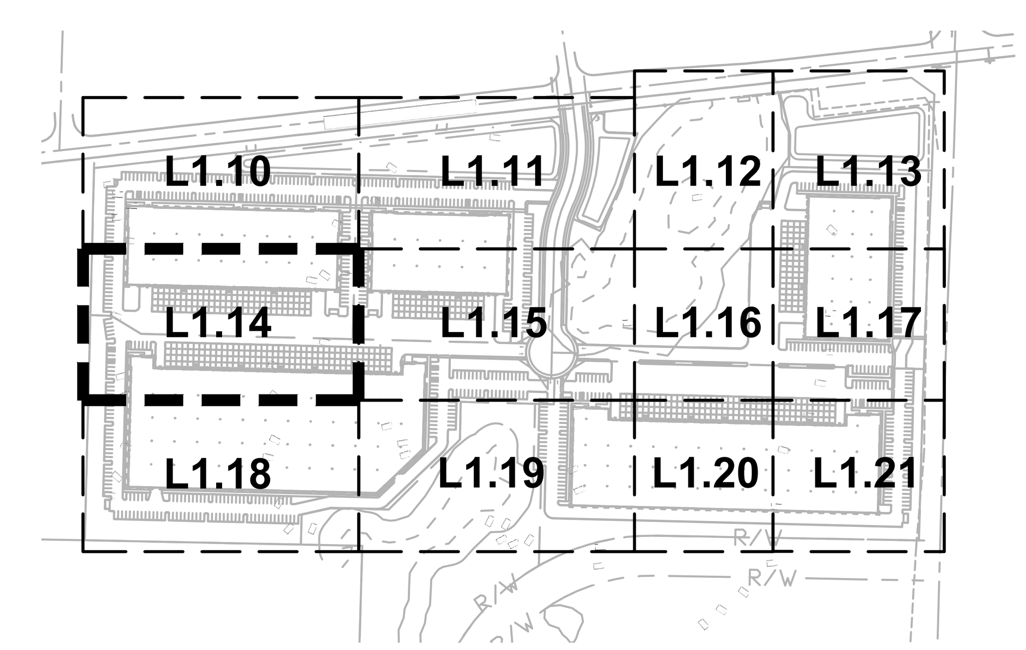
1 L1.14 LANDSCAPE PLAN



2 L1.14 KEY MAP

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LANDSCAPE PLAN

DRAWN BY: AJ

CHECKED BY: BET

SHEET:
L1.14

JOB NO. 2180459.00

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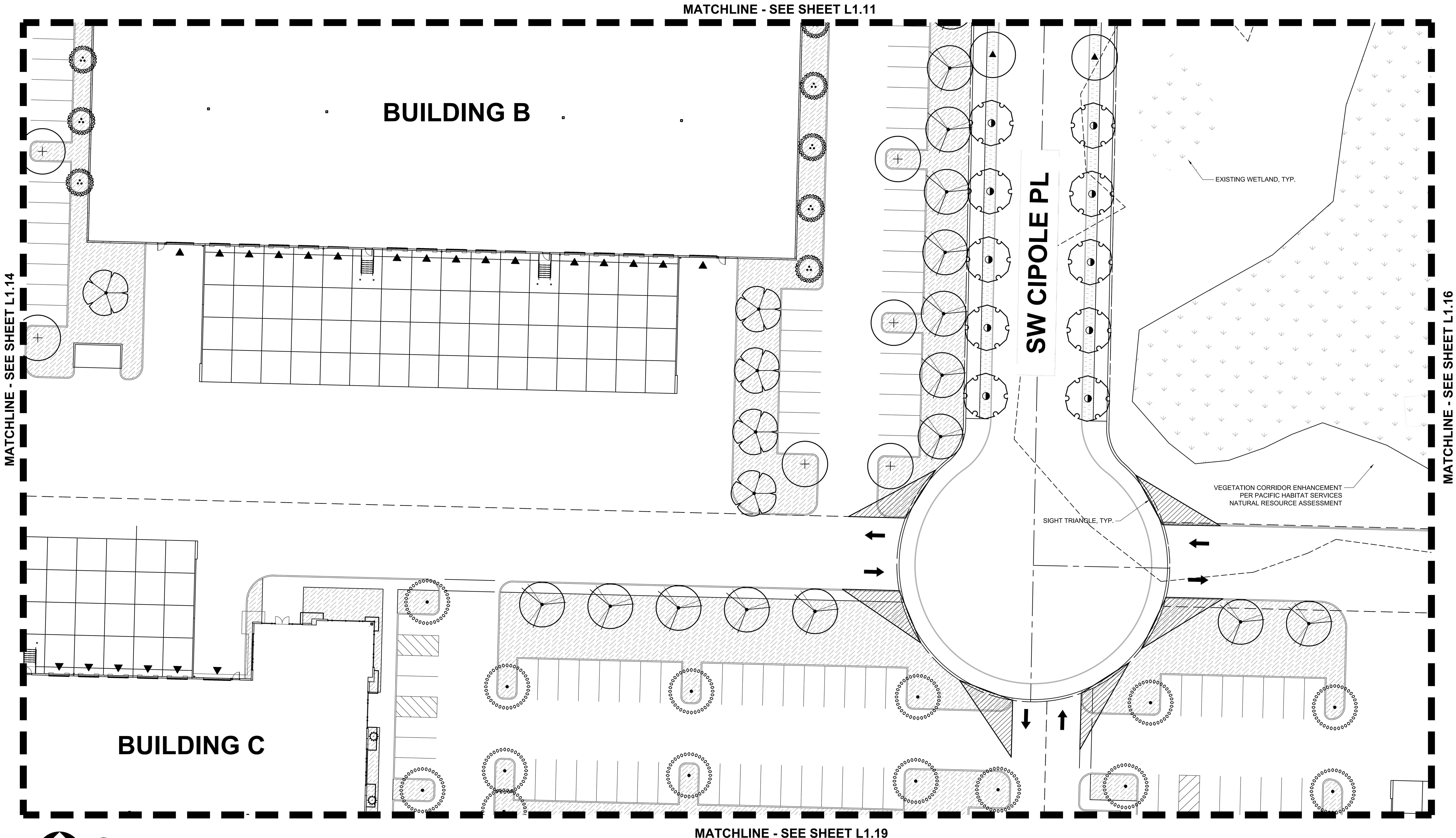
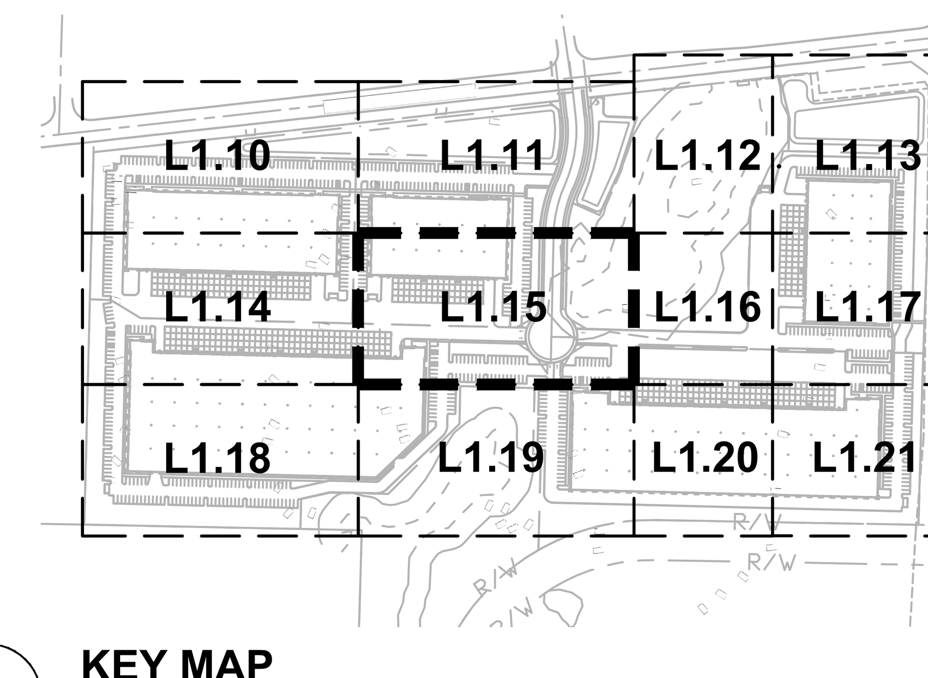


1 L1.15 **LANDSCAPE PLAN**

20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.



2 L1.15 **KEY MAP**

M.

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Planning ▪ Engineering

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Vancouver, WA
360.695.7879
Seattle, WA
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DESIGN DRIVEN | CLIENT FOCUSED

Client
TRAMMELL CROW COMPANY

1300 SW 5TH AVE.
STE 3050
PORTLAND, OR 97201

Project
T-S CORPORATE PARK

REGISTERED
906
Brad E. Theurer
OREGON
09/19/2016
LANDSCAPE ARCHITECT
EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
LANDSCAPE PLAN

DRAWN BY: AJ

CHECKED BY: BET

SHEET:
L1.15

JOB NO. **2180459.00**

SITE PLAN REVIEW APPLICATION: 1/17/20

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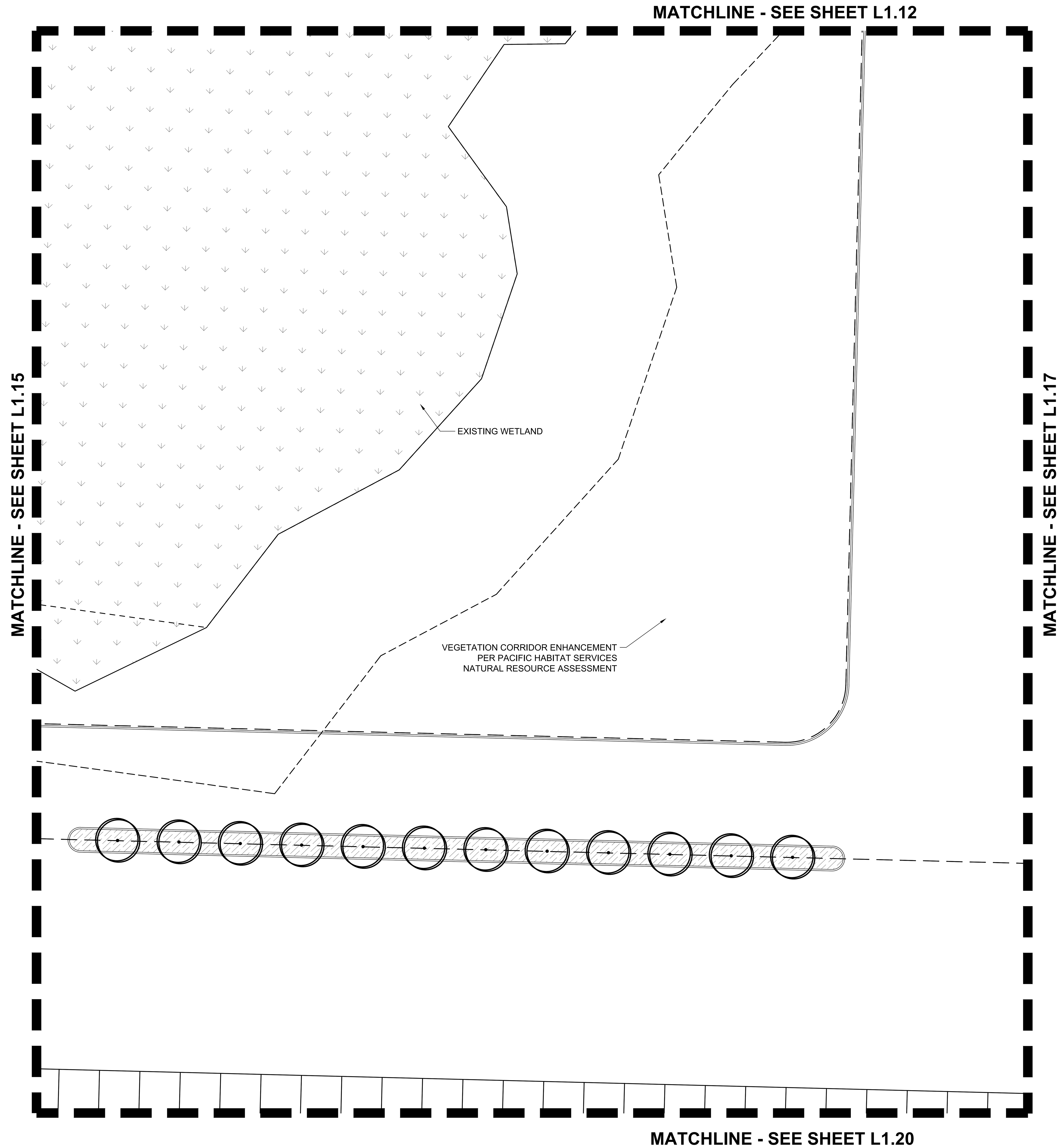

1 L1.16 LANDSCAPE PLAN

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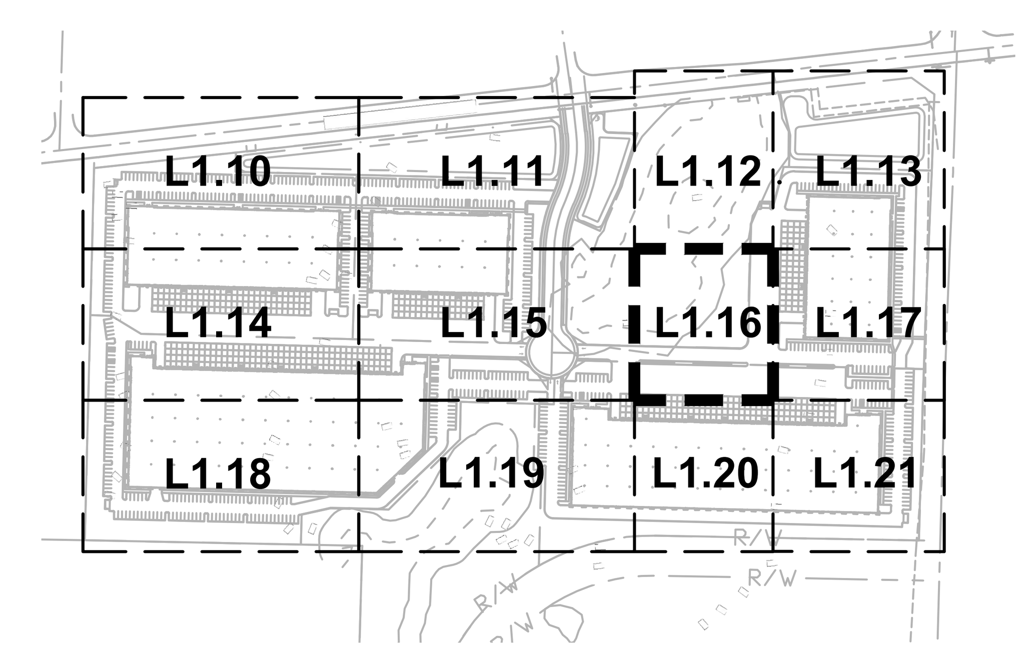
(IN FEET)
1 inch = 20 ft.



2 L1.12 KEY MAP

SITE PLAN REVIEW APPLICATION: 1/17/20

2180459001\4_DRAWINGS\LANDSCAPE\459-L1.10-L1.13.DWG:L1.12 AJ 01/09/20 16:14 1:1.00

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09/19/2016
LANDSCAPE ARCHITECT
EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
LANDSCAPE PLAN

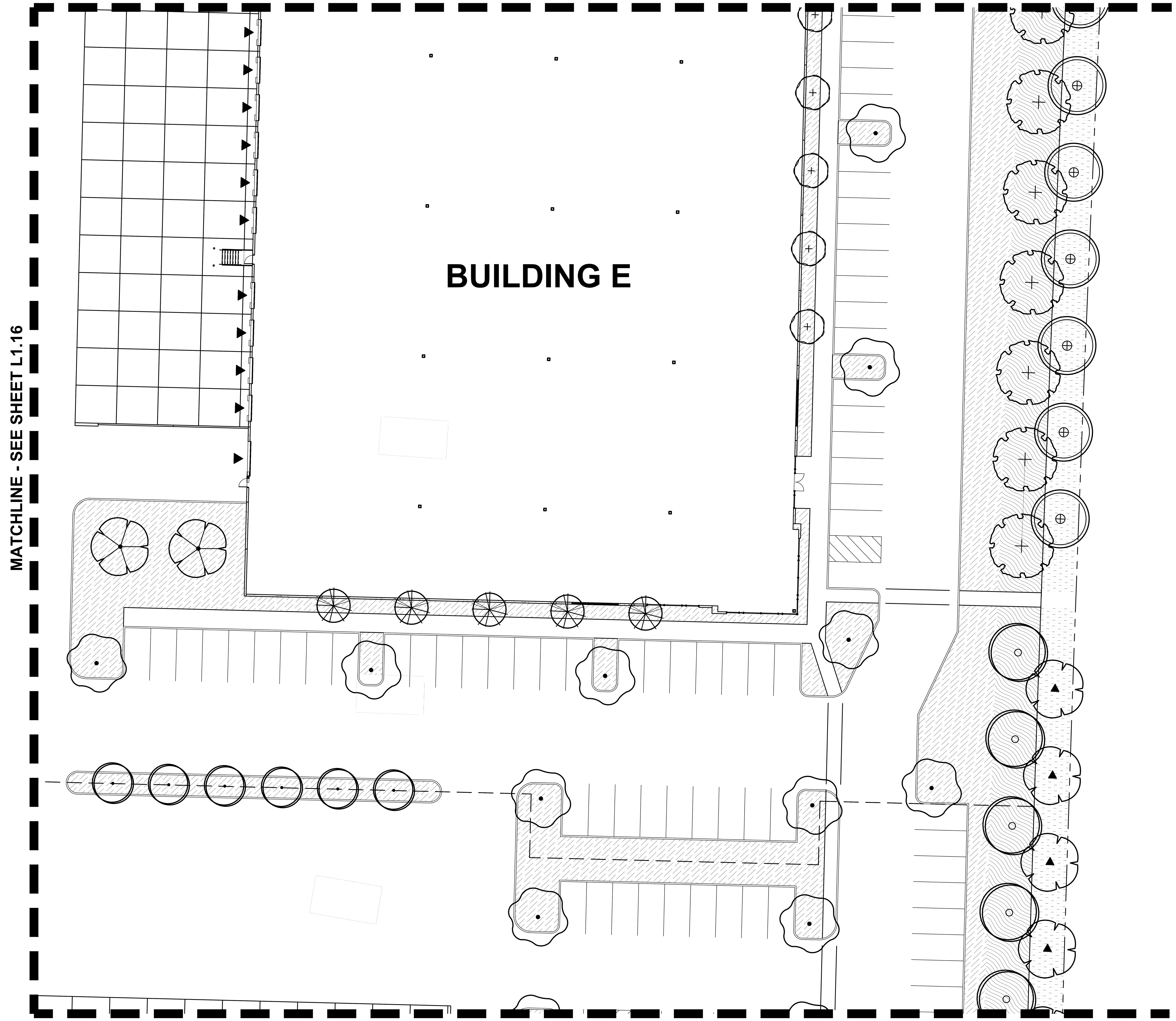
DRAWN BY: AJ

CHECKED BY: BET

SHEET:
L1.16

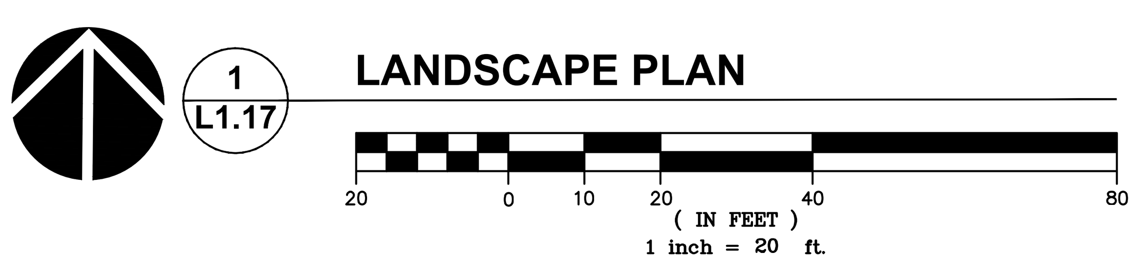
JOB NO. **2180459.00**

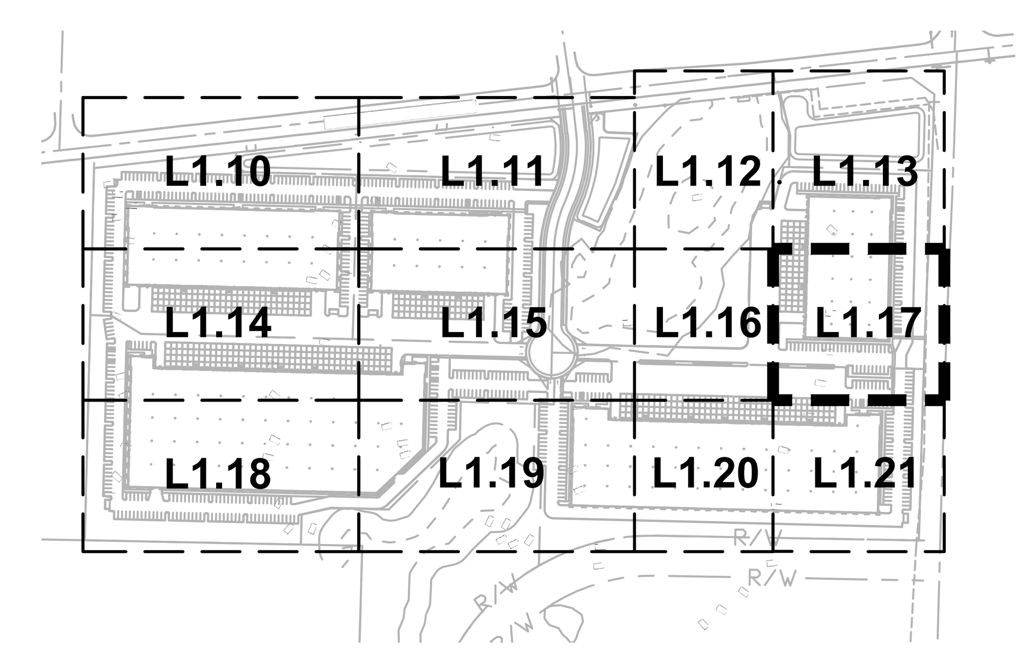
MATCHLINE - SEE SHEET L1.13



MATCHLINE - SEE SHEET L1.21

1 / L1.17 LANDSCAPE PLAN





2 / L1.17 KEY MAP

SITE PLAN REVIEW APPLICATION: 1/17/20

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OREGON
09/19/2016
EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:

LANDSCAPE PLAN

DRAWN BY: AJ

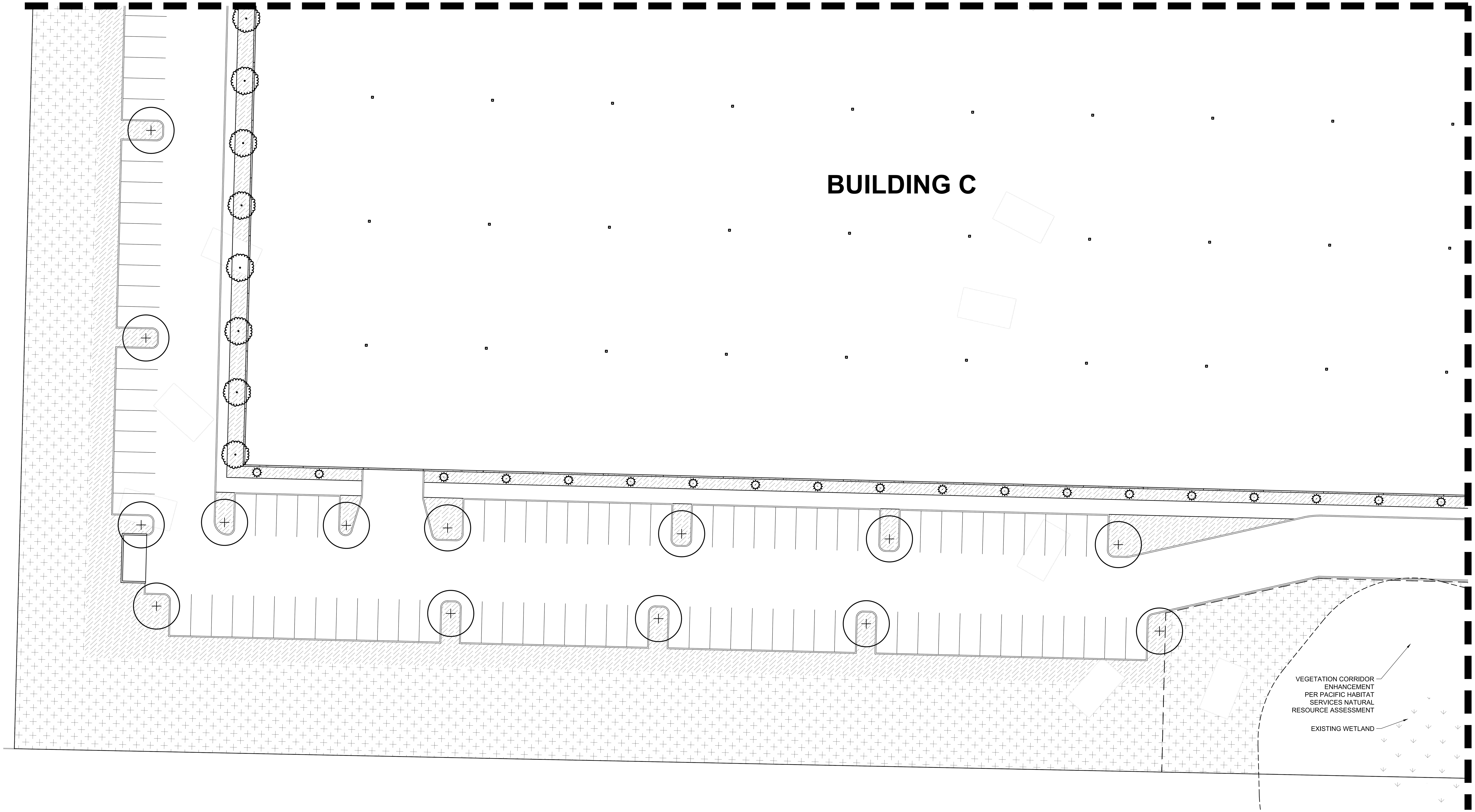
CHECKED BY: BET

SHEET:

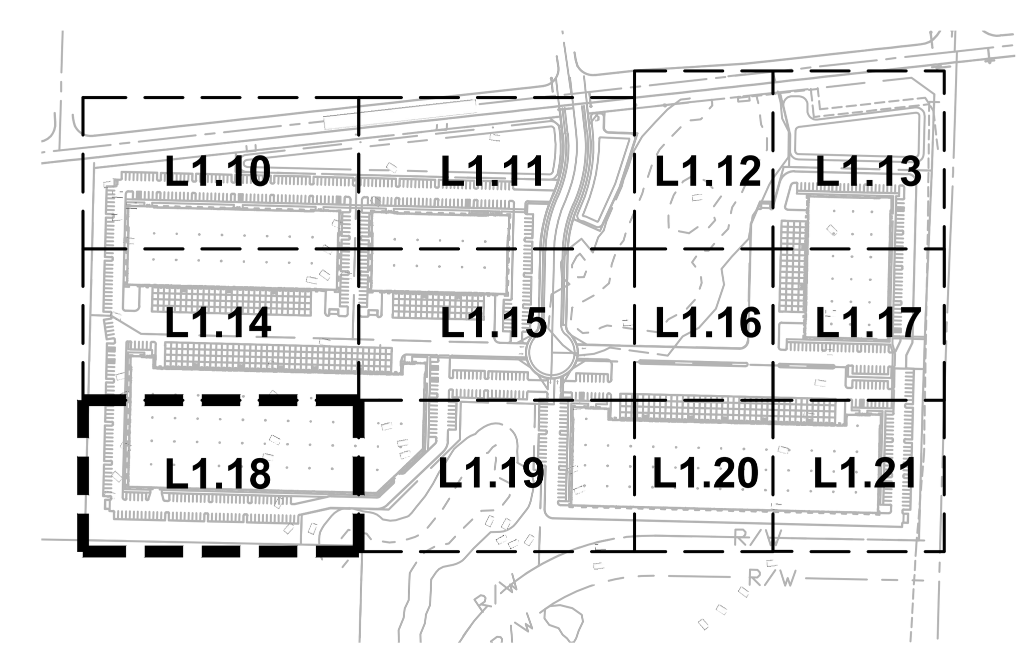
L1.17

JOB NO. 2180459.00

MATCHLINE - SEE SHEET L1.14



1 L1.18 LANDSCAPE PLAN



2 L1.18 KEY MAP

SITE PLAN REVIEW APPLICATION: 1/17/20

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OREGON
09/19/2016
LANDSCAPE ARCHITECT
EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

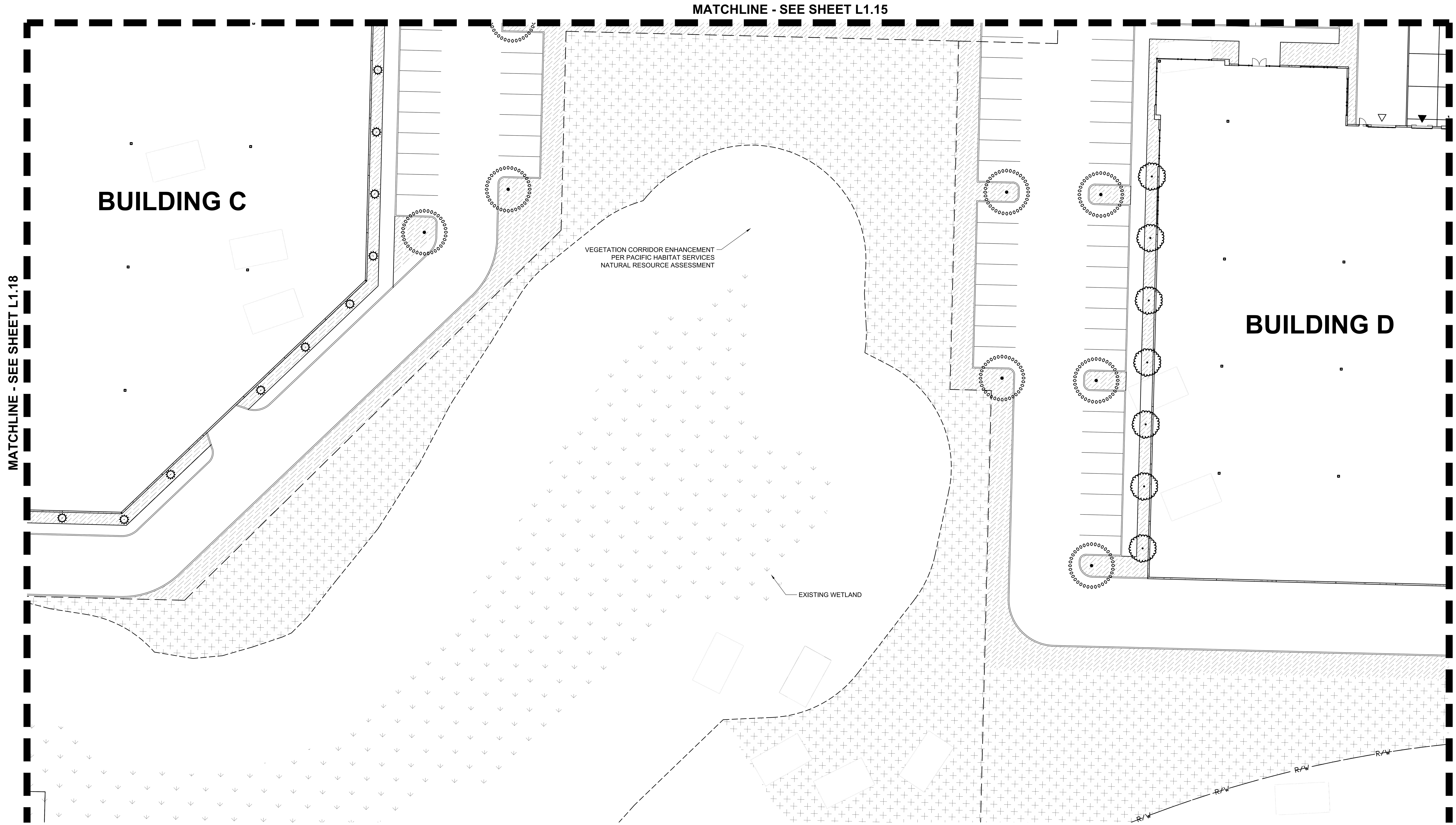
SHEET TITLE:
LANDSCAPE PLAN

DRAWN BY: AJ

CHECKED BY: BET

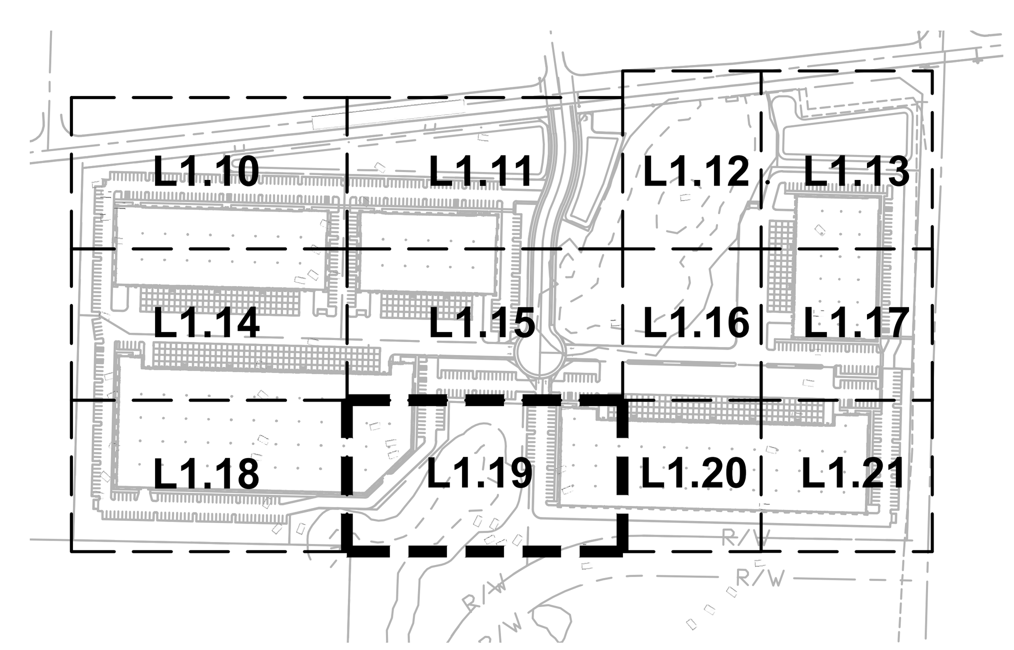
SHEET:
L1.18

JOB NO. 2180459.00



1
L1.19
LANDSCAPE PLAN

20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.



2
L1.19
KEY MAP

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REVISION SCHEDULE

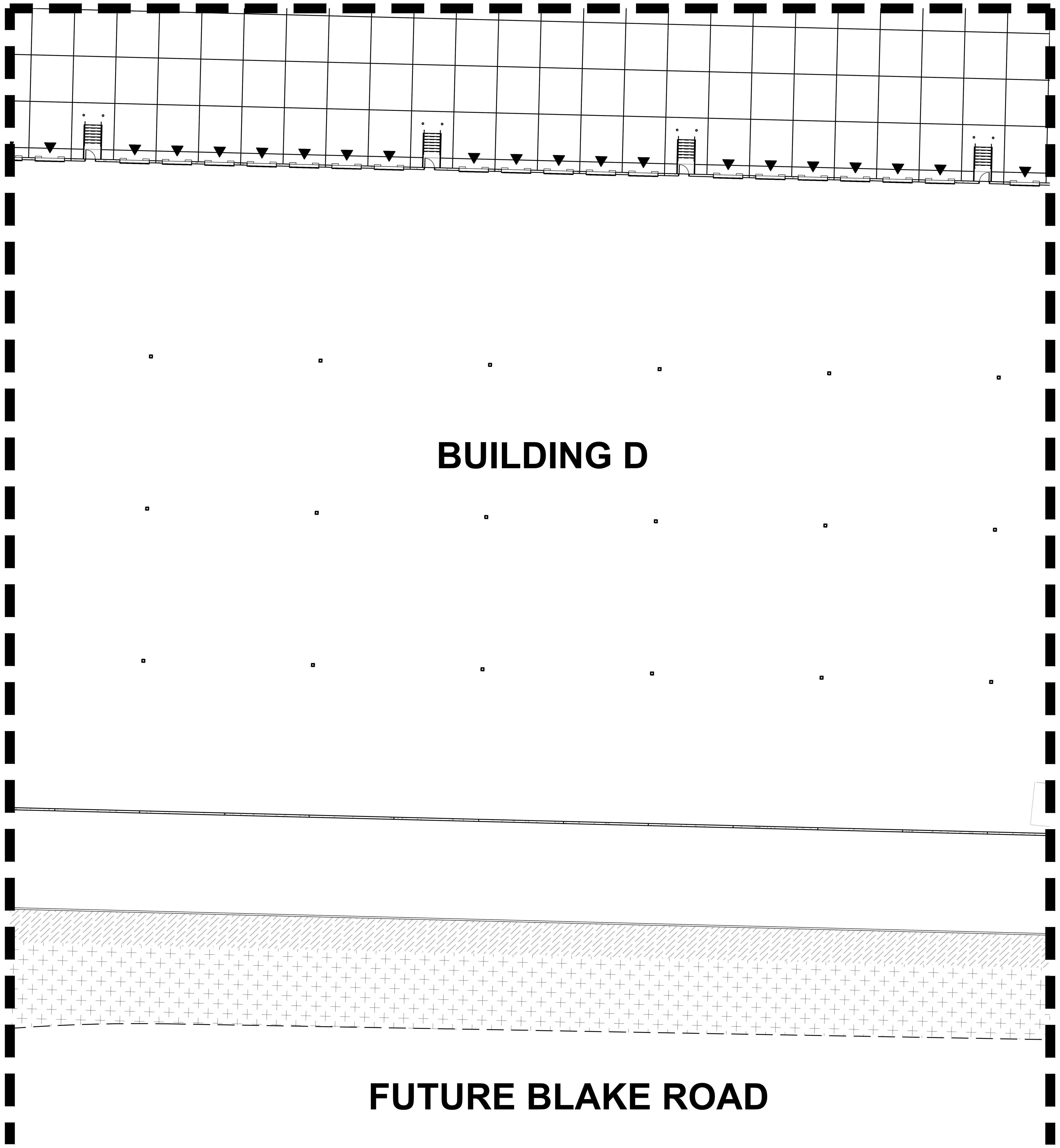
Delta	Issued As	Issue Date

SHEET TITLE:
LANDSCAPE PLAN

DRAWN BY: AJ
CHECKED BY: BET
SHEET:
L1.19

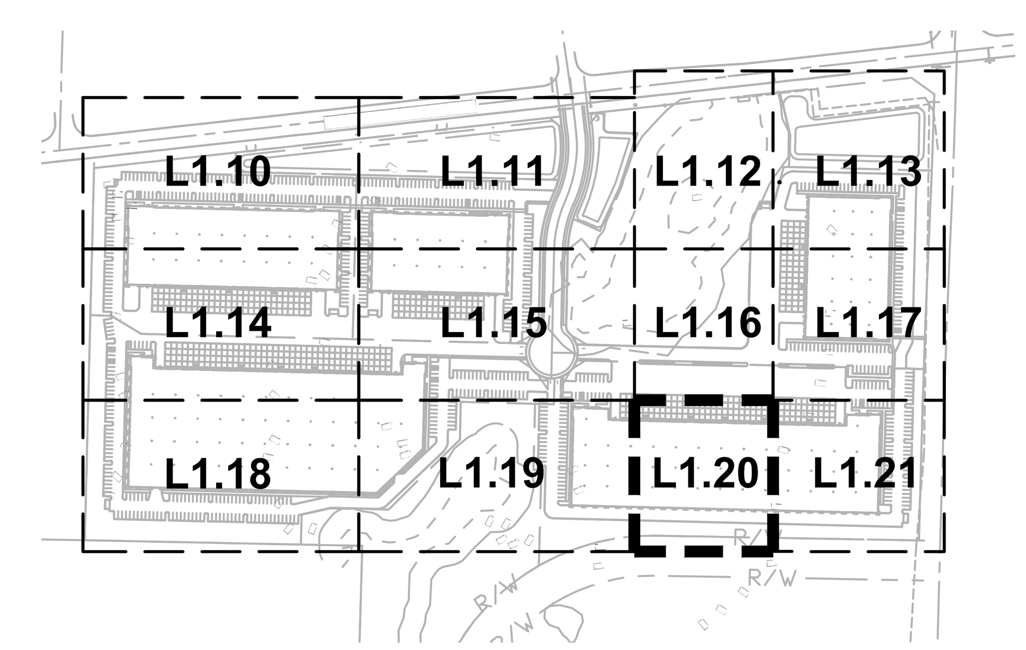
JOB NO. 2180459.00

SITE PLAN REVIEW APPLICATION: 1/17/20



1
L1.20
LANDSCAPE PLAN

20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.



2
L1.20
KEY MAP

SITE PLAN REVIEW APPLICATION: 1/17/20

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LANDSCAPE ARCHITECT
EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

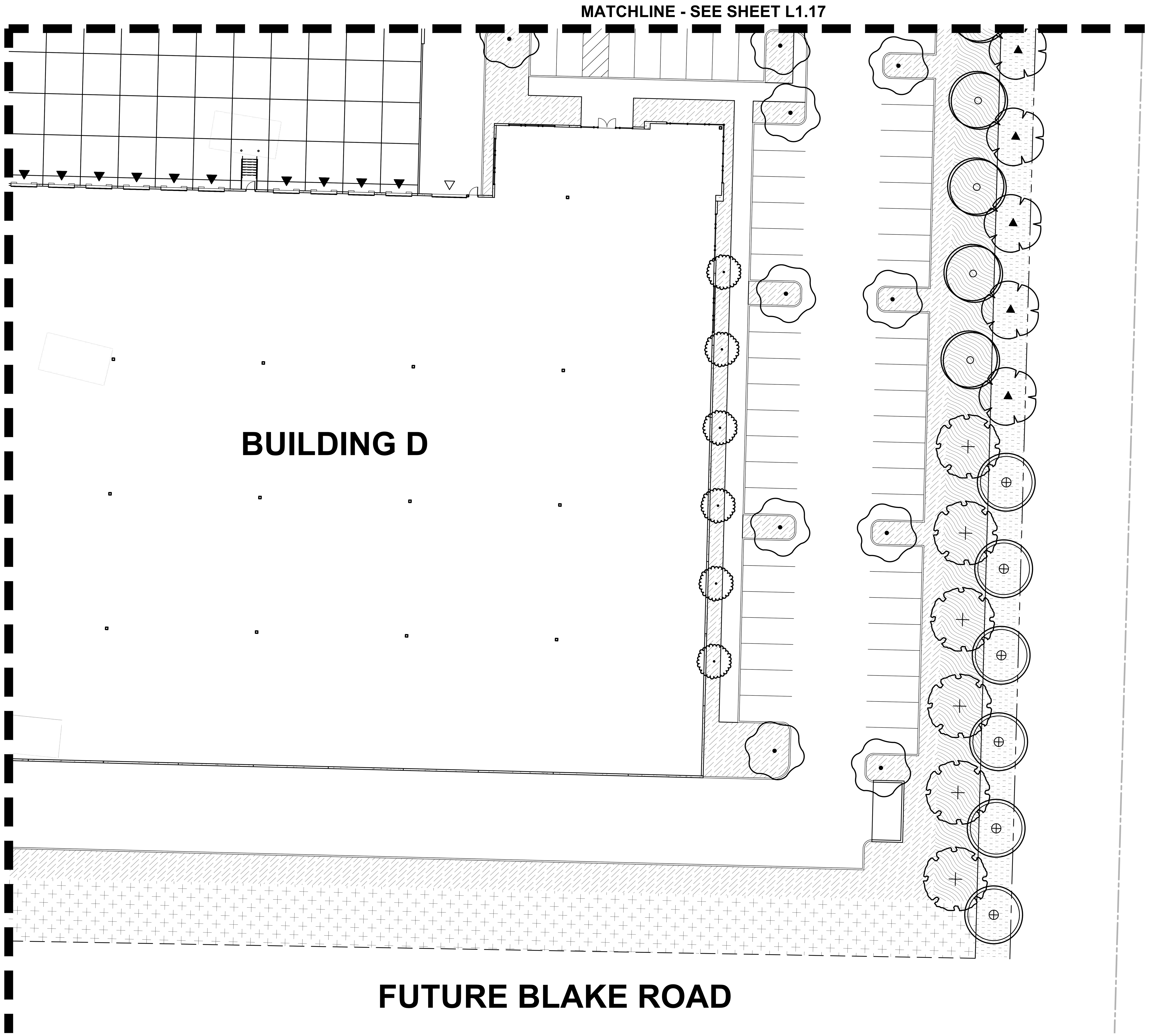
SHEET TITLE:
LANDSCAPE PLAN

DRAWN BY: AJ

CHECKED BY: BET

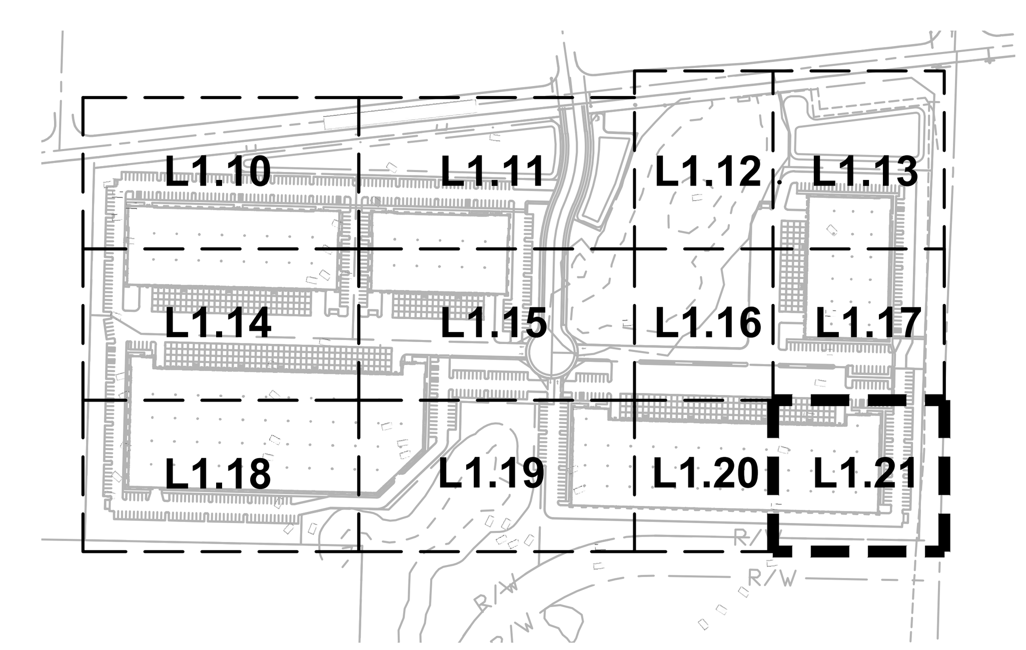
SHEET:
L1.20

JOB NO. 2180459.00



1
L1.21
LANDSCAPE PLAN

20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.



2
L1.21
KEY MAP

SITE PLAN REVIEW APPLICATION: 1/17/20

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EXPIRES: 9/30/20

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
LANDSCAPE PLAN

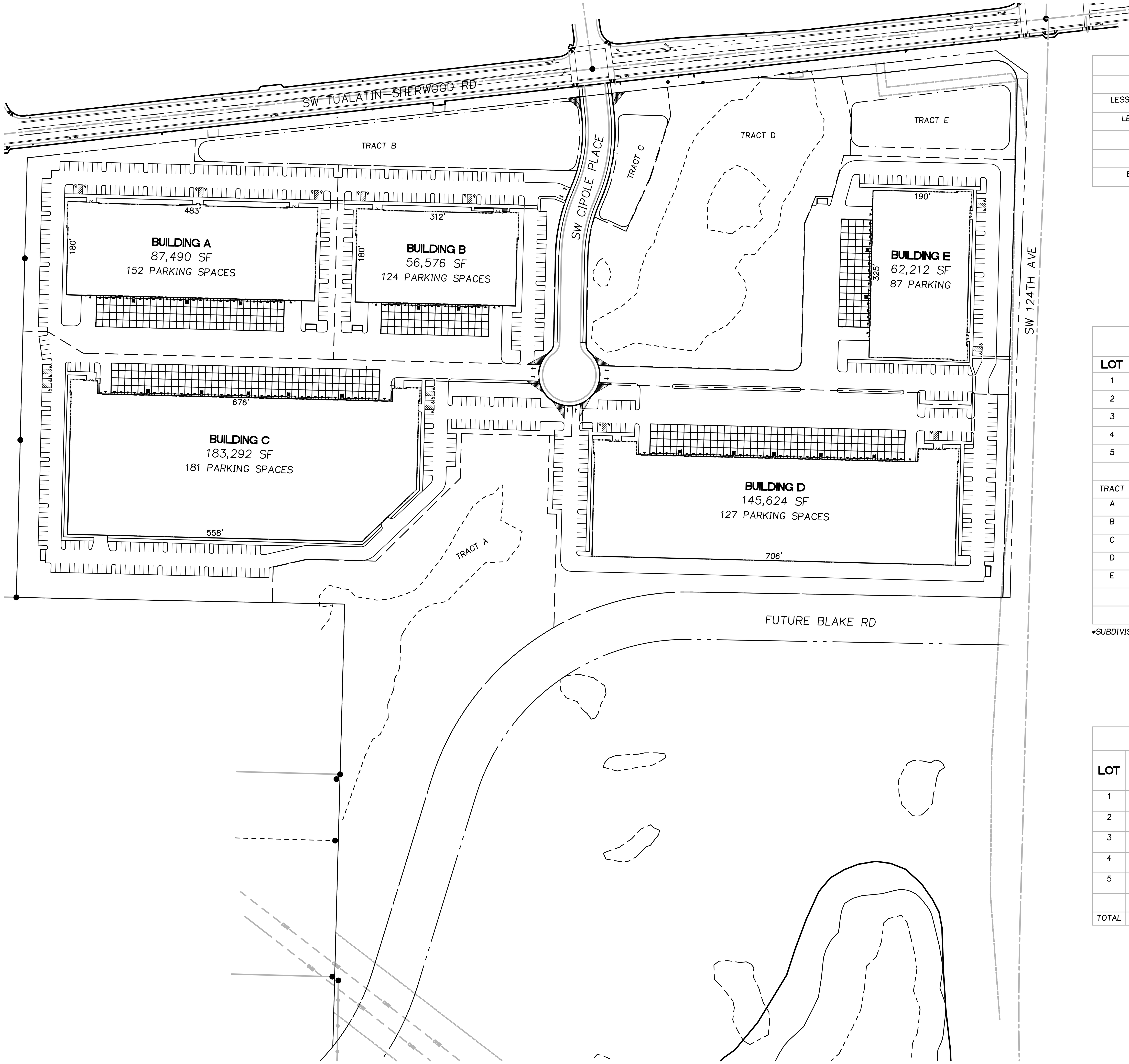
DRAWN BY: AJ

CHECKED BY: BET

SHEET:
L1.21

JOB NO. 2180459.00

2180459\00\4_DRAWINGS\LANDSCAPE\459-L1.18-L1.21.DWG:L1.21 AJ 01/14/20 15:57 1:1.00



TOTAL SITE DATA

GROSS SITE AREA	2,014,513 SF
LESS WETLAND AND BUFFER	327,958 SF
LESS ROW DEDICATION	67,663 SF
NET SITE AREA	1,618,892 SF
BUILDING AREA	535,194 SF
BUILDING COVERAGE	33.1%

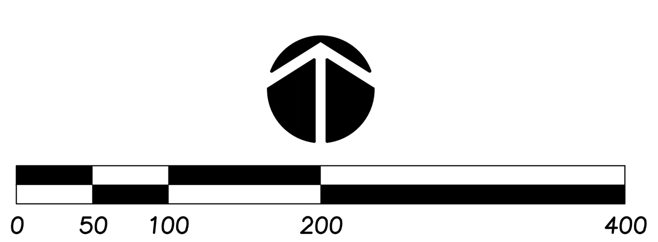
SUBDIVISION AREAS

LOT	AREA (SF)	AREA (AC)
1	231,767 SF	5.32 AC
2	162,691 SF	3.73 AC
3	392,410 SF	9.01 AC
4	348,540 SF	8.00 AC
5	196,251 SF	4.51 AC
	1,331,659 SF	30.57 AC
TRACT		
A	250,718 SF	5.76 AC
B	69,937 SF	1.61 AC
C	23,239 SF	0.53 AC
D	214,941 SF	4.93 AC
E	56,818 SF	1.30 AC
	615,653 SF	14.13 AC
	1,947,312 SF	44.70 AC

*SUBDIVISION AREAS EXCLUDE RIGHT OF WAY DEDICATIONS

LOT AND BUILDING DATA

LOT	LOT AREA	BUILDING	BUILDING AREA	LOT COVERAGE	PARKING PROVIDED	IMPERIVOUS AREA	LANDSCAPE AREA
1	231,767 SF	BUILDING A	87,490 SF	37.75%	152	4.51 AC	0.80 AC
2	162,691 SF	BUILDING B	56,576 SF	34.78%	124	3.16 AC	0.55 AC
3	392,410 SF	BUILDING C	183,292 SF	46.71%	181	7.40 AC	1.53 AC
4	348,540 SF	BUILDING D	145,624 SF	41.78%	127	6.71 AC	1.81 AC
5	196,251 SF	BUILDING E	62,212 SF	31.70%	87	3.85 AC	0.66 AC
TOTAL	1,331,659 SF		535,194 SF	40.19%	671	25.63 AC	5.35 AC



1
A0.10

OVERALL ARCHITECTURAL SITE PLAN

1"=100'

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Project
T-S CORPORATE PARK

REVISION SCHEDULE		
Delta	Issued As	Issue Date

SHEET TITLE:
OVERALL ARCHITECTURAL SITE PLAN

DRAWN BY: CJL

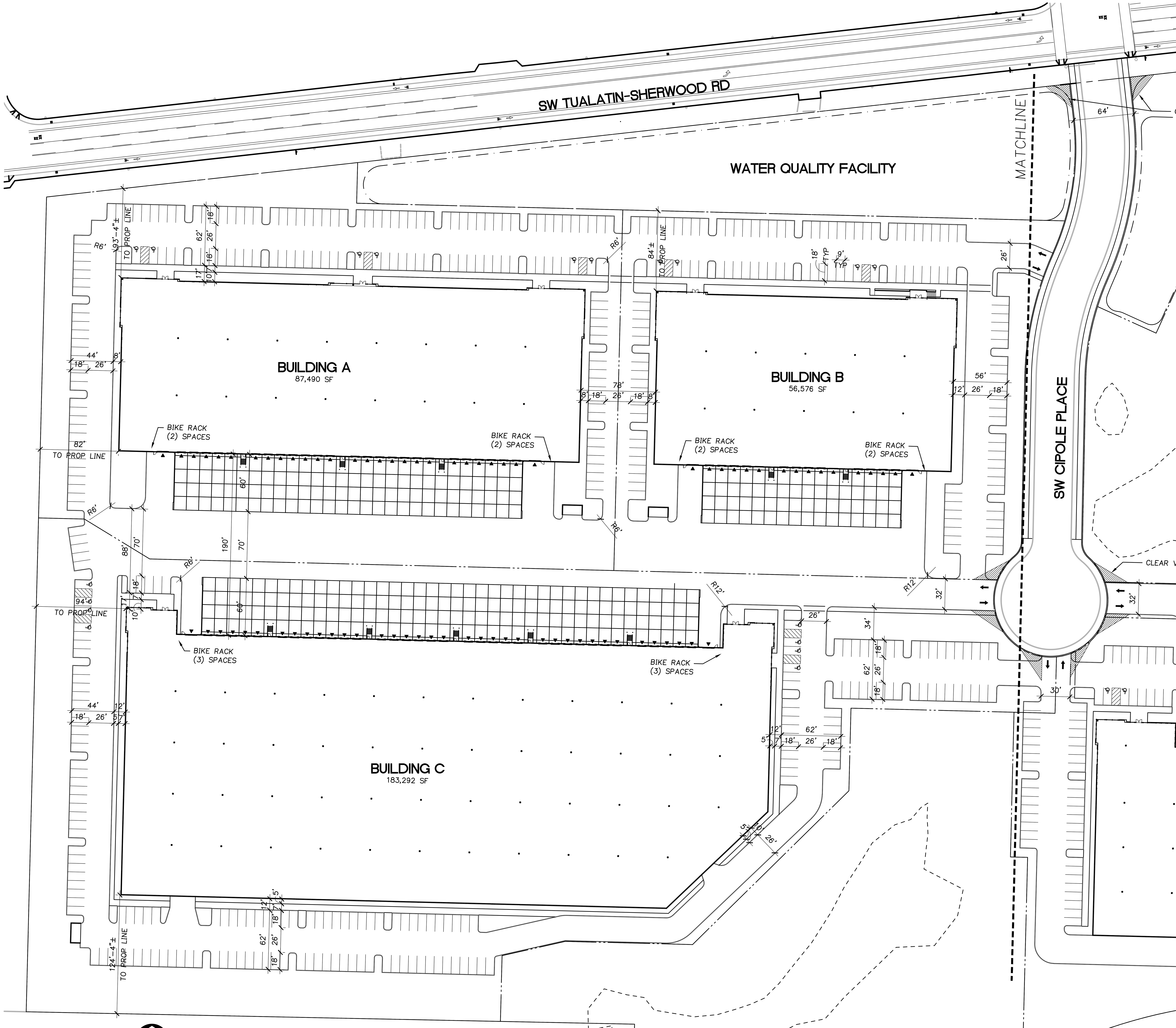
CHECKED BY:SJM

SHEET:
A0.10

JOB NO. **2180459.00**

SITE PLAN REVIEW APPLICATION: 1/17/20

2180459\00\4_DRAWINGS\ARCHITECTURAL\459-A0.10.DWG CJL 01/16/20 14:02 1:100.00



0 25 50 100 200

1
A0.11
ARCHITECTURAL SITE PLAN - WEST
1"=50'

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REGISTERED ARCHITECT
SCOTT J. MOORE
PORTLAND, OREGON
#5795
STATE OF OREGON

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
ARCHITECTURAL SITE PLAN - WEST

DRAWN BY: CJL

CHECKED BY:SJM

SHEET:

A0.11

JOB NO. 2180459.00

SITE PLAN REVIEW APPLICATION: 1/17/20

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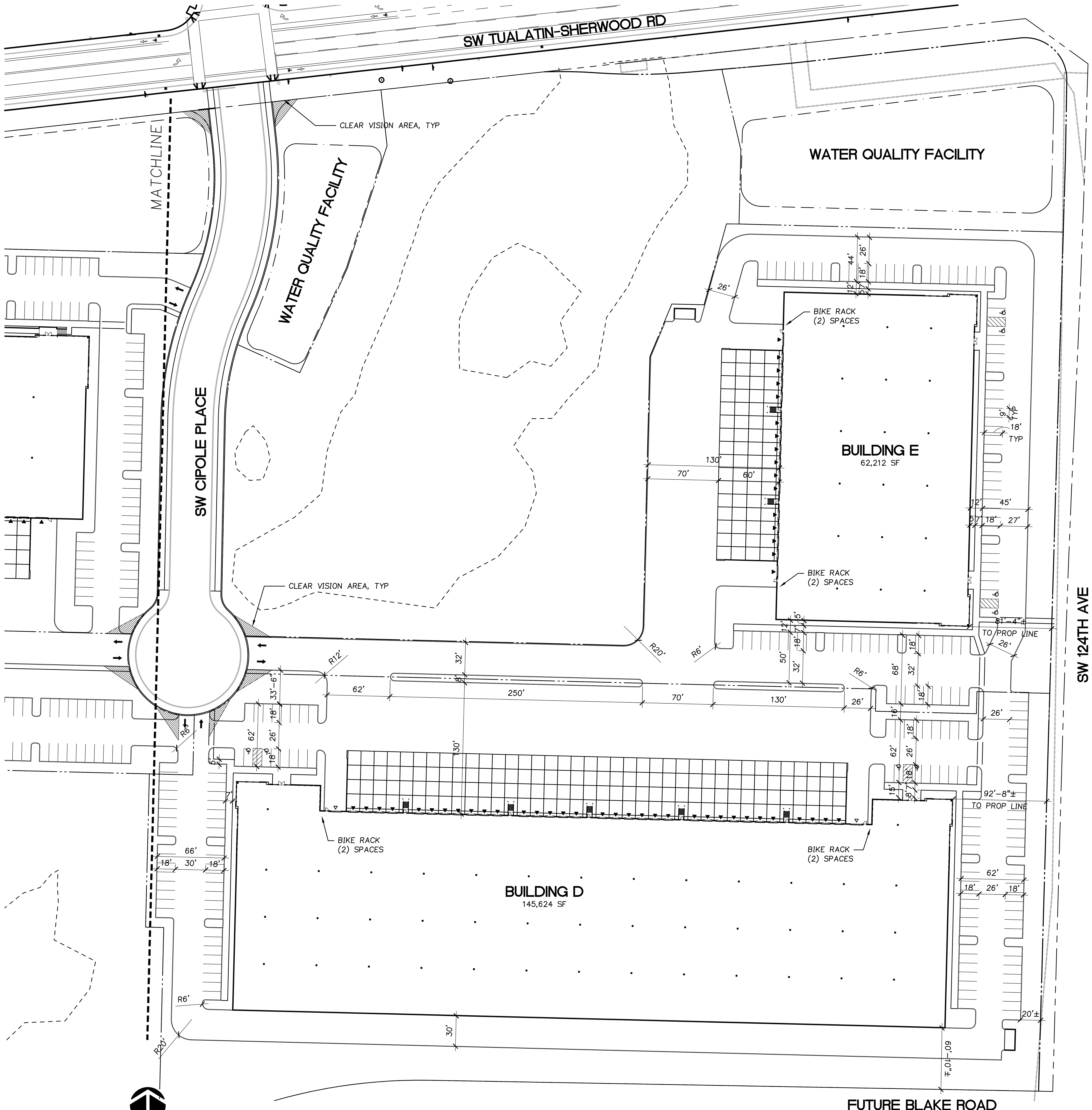

0 25 50 100 200

1 A0.12 ARCHITECTURAL SITE PLAN - EAST
1"=50'

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REGISTERED ARCHITECT
SCOTT J. MOORE
PORTLAND, OREGON
#5795
STATE OF OREGON

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
ARCHITECTURAL SITE PLAN - EAST

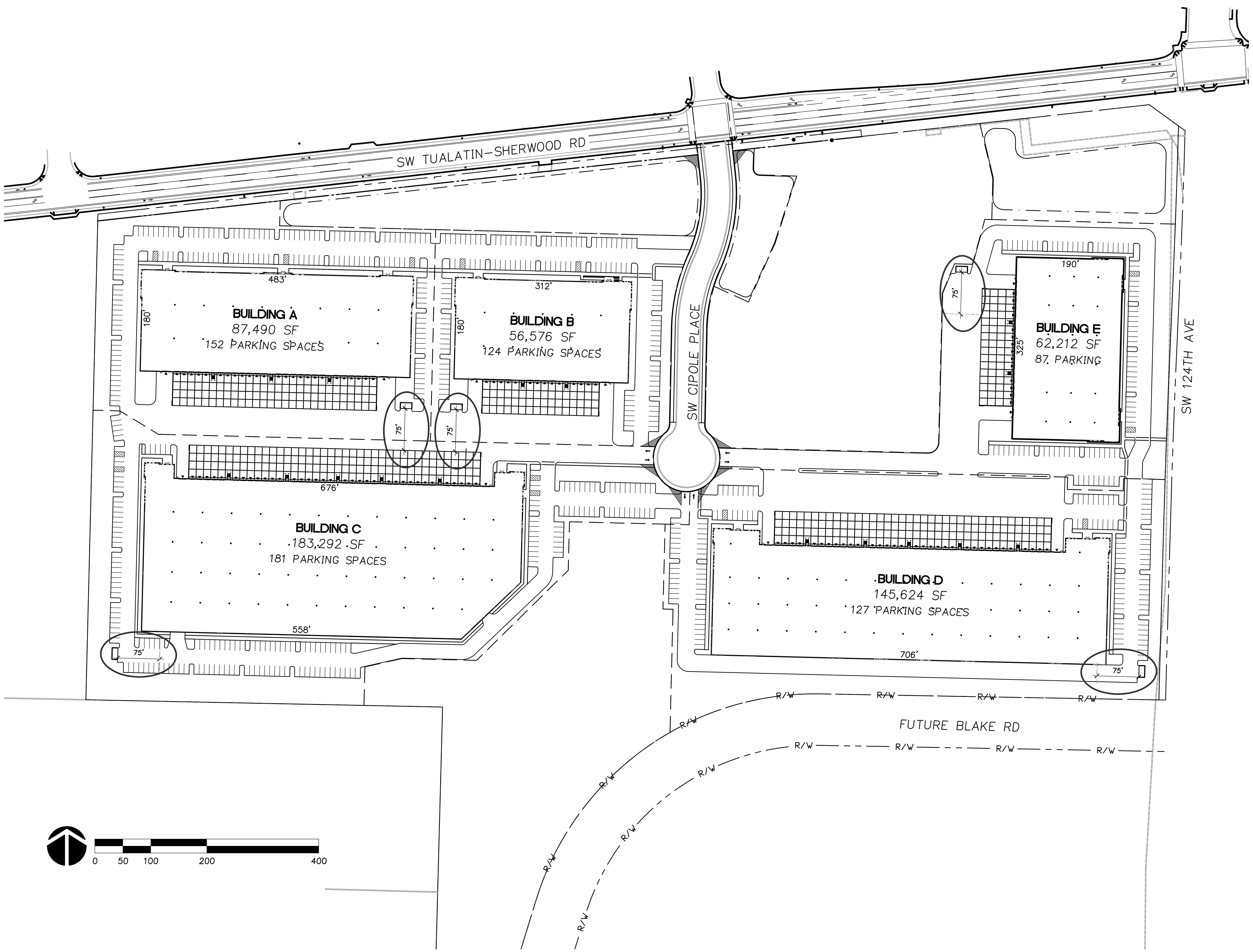
DRAWN BY: CJL

CHECKED BY:SJM

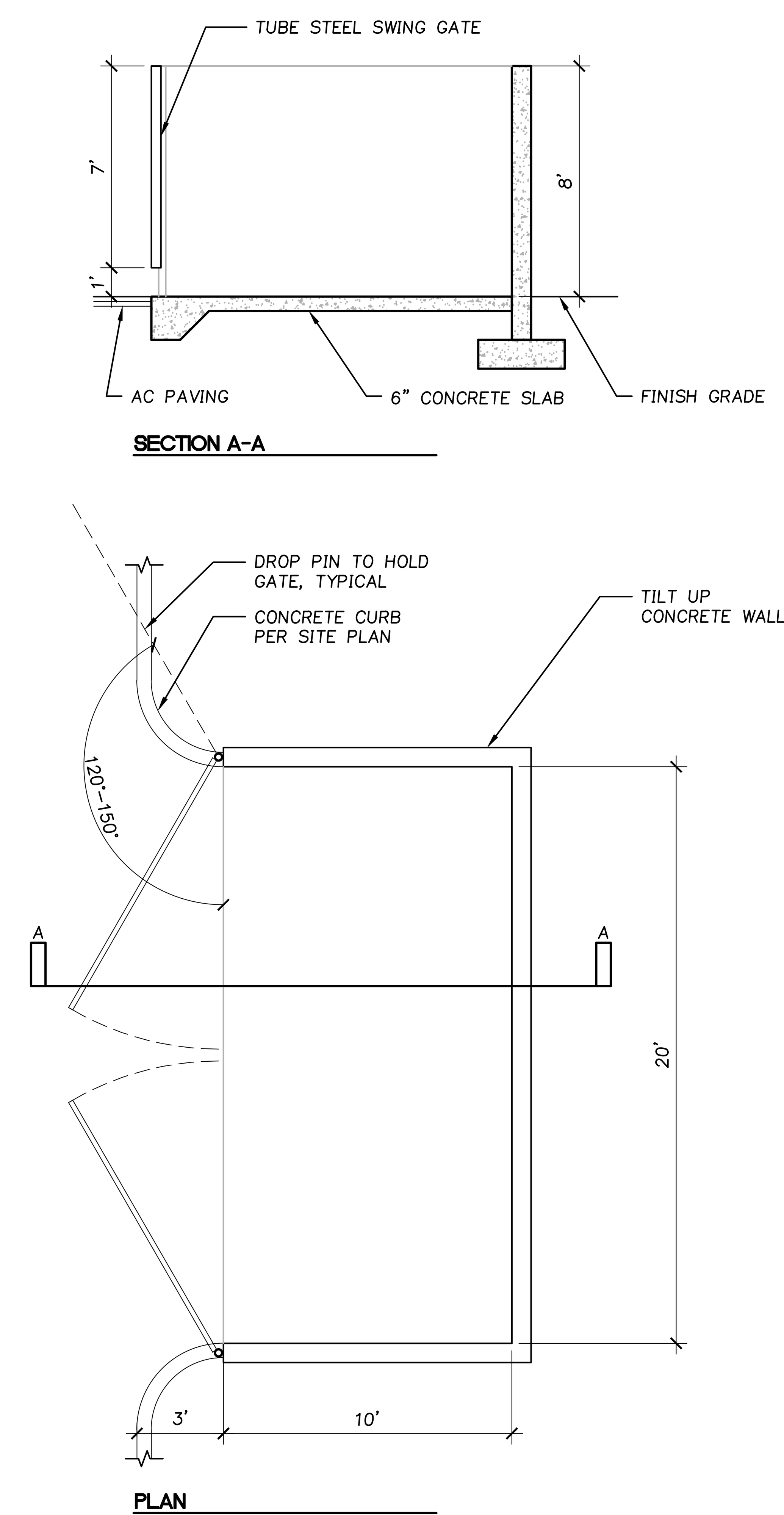
SHEET:
A0.12

JOB NO. 2180459.00

SITE PLAN REVIEW APPLICATION: 1/17/20



1 A0.20 TRASH ENCLOSURE EXHIBIT
1"=100'



2 A0.20 TYPICAL TRASH ENCLOSURE
1/4"=1'-0"

TRASH ENCLOSURE

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#5795
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REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
TRASH ENCLOSURE EXHIBIT

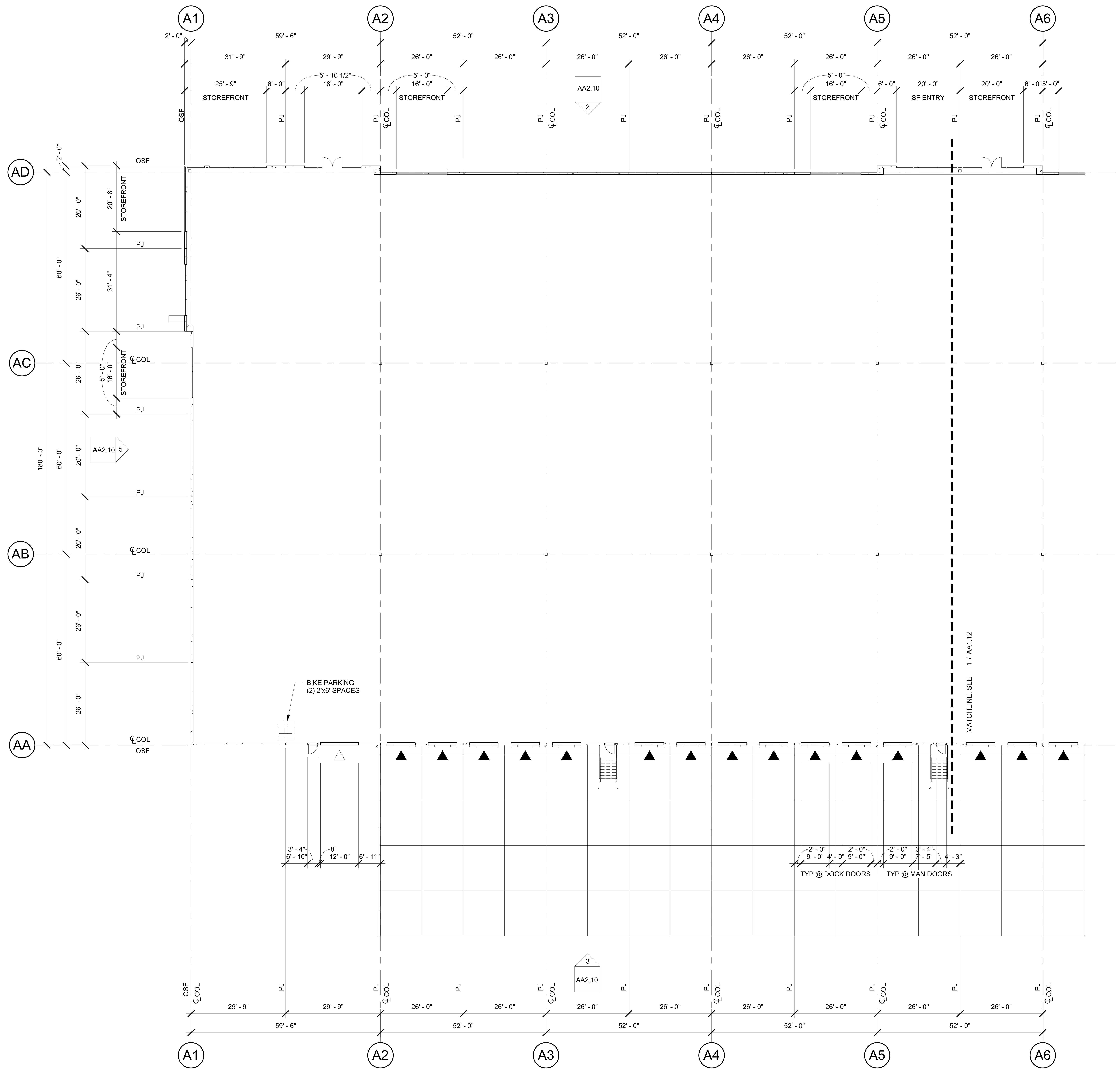
DRAWN BY: CJL
CHECKED BY:SJM
SHEET:

A0.20

JOB NO. **2180459.00**

SITE PLAN REVIEW SET - 1/17/20

2180459004_DRAWINGS\ARCHITECTURAL\TRASH ENCLOSURE EXHIBIT.DWG:FULL CJL 01/14/20 16:36 1:100.00



1 AA1.11 FLOOR PLAN - WEST - BUILDING A
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 87,490 SF
CLEAR HEIGHT: 28'

KEYPLAN

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OR 97201

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12822 SW TUALATIN-SHERWOOD RD,
SHERWOOD, OR 97140

REGISTERED ARCHITECT
SCOTT J. MOORE
PORTLAND, OREGON
#5795
STATE OF OREGON

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN - BLDG A - WEST

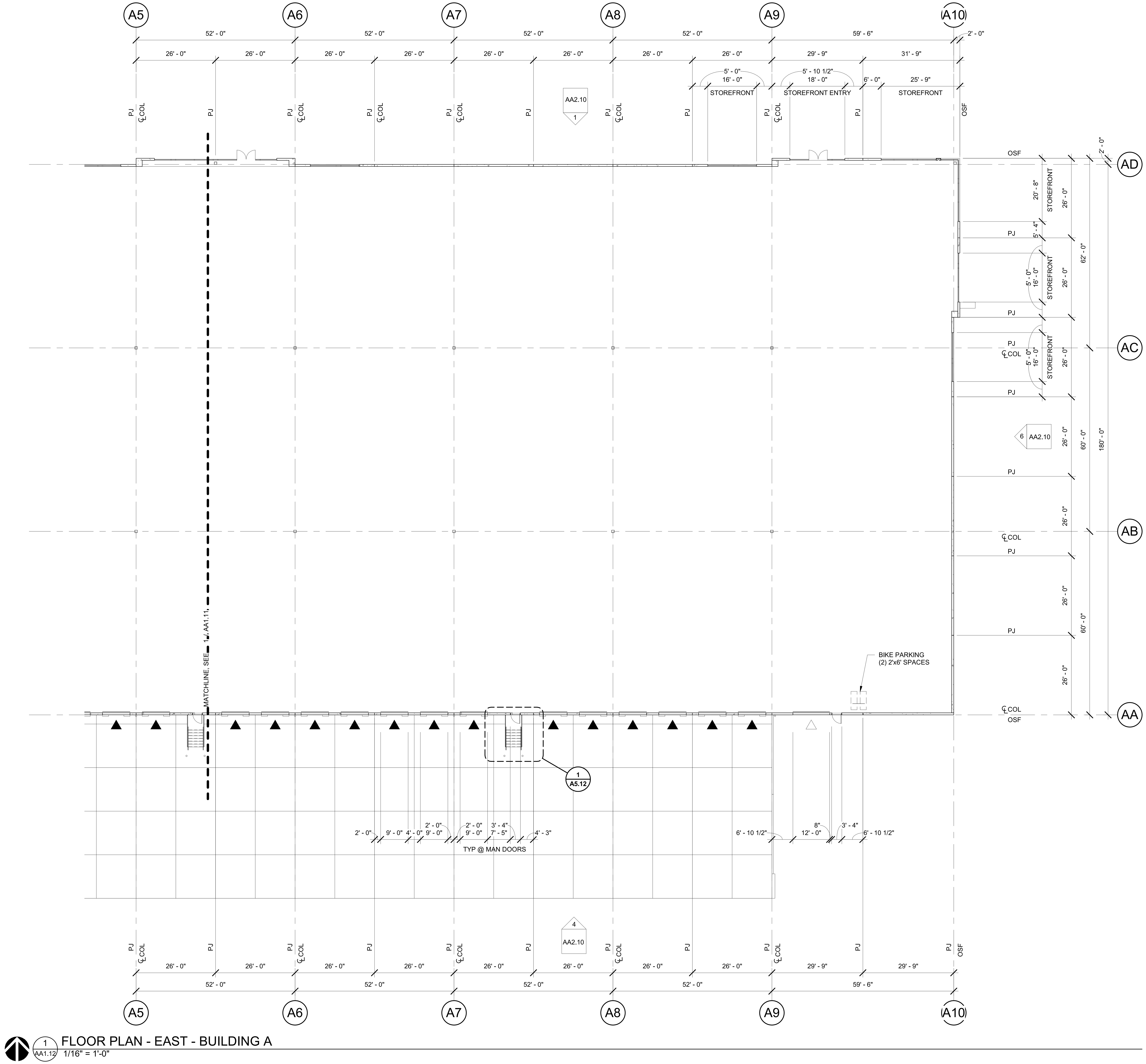
DRAWN BY: AGC, CJL

CHECKED BY: SJM

SHEET
AA1.11

JOB NO. 2180459.00

SITE PLAN REVIEW SET - 01/17/20



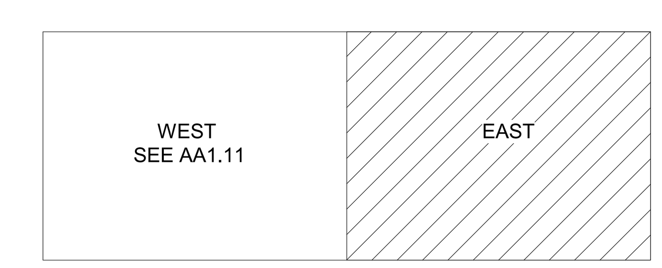
1 AA1.12 FLOOR PLAN - EAST - BUILDING A
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 87,490 SF
CLEAR HEIGHT: 28'



KEYPLAN

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REVISION SCHEDULE

Delta	Issued As	Issue Date

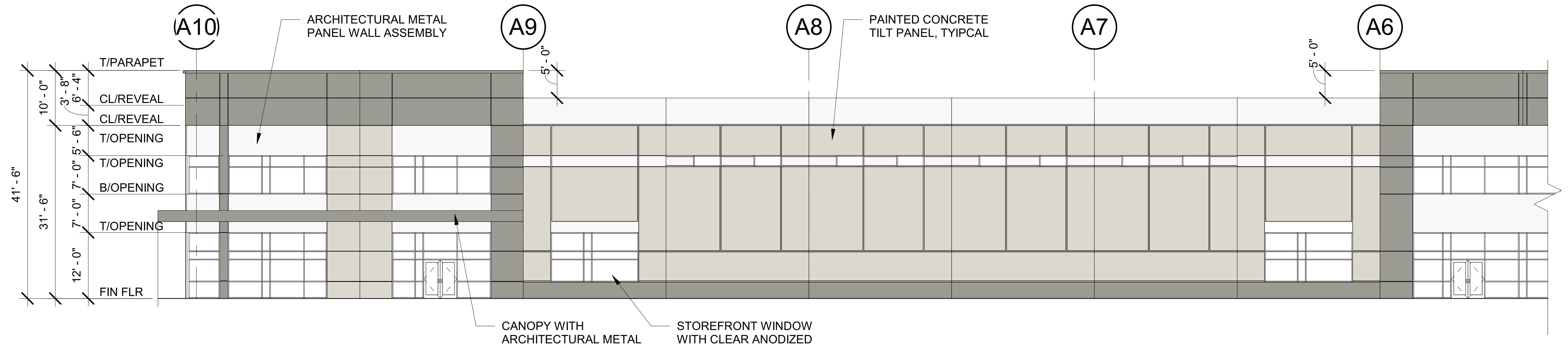
SHEET TITLE:
FLOOR PLAN - BLDG A - EAST

DRAWN BY: CJL
CHECKED BY: SJM
SHEET
AA1.12

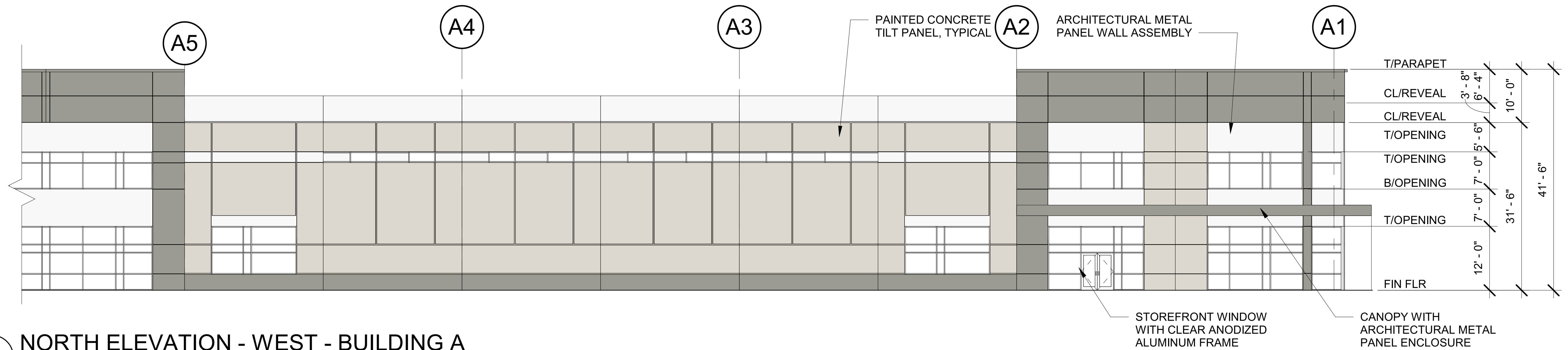
JOB NO. **2180459.00**

SITE PLAN REVIEW SET - 01/17/20

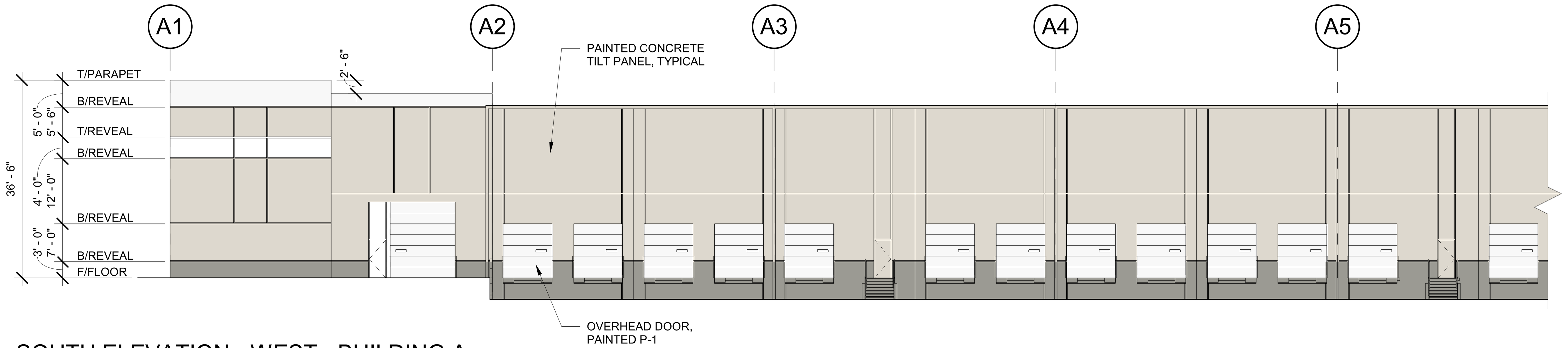
C:\Users\cjl\Documents\Revit Projects\2180459.00 TS Corporate Park\459-TSCP_Document-v20-L.rvt 1/15/2020 4:35:14 PM As indicated



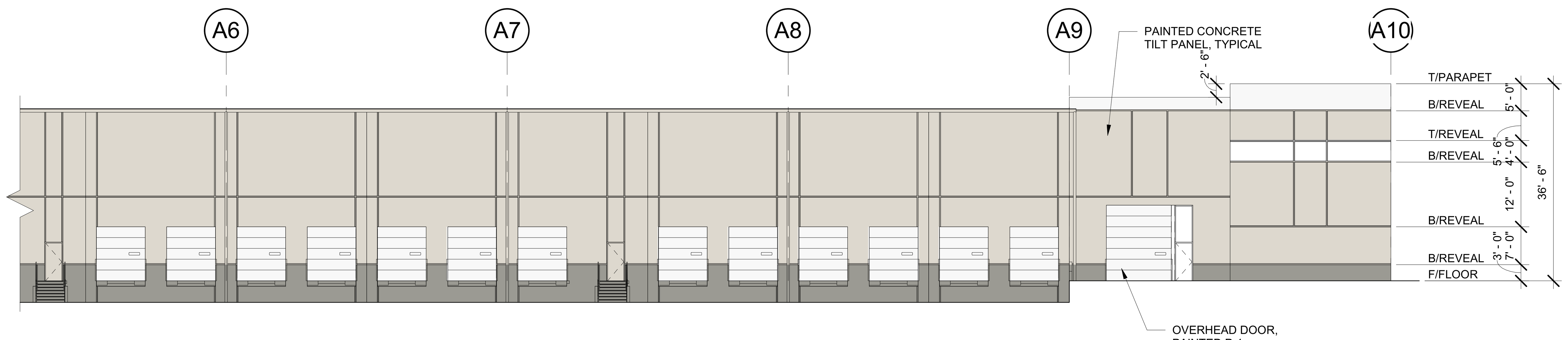
1 NORTH ELEVATION - EAST - BUILDING A
AA2.10 1/16" = 1'-0"



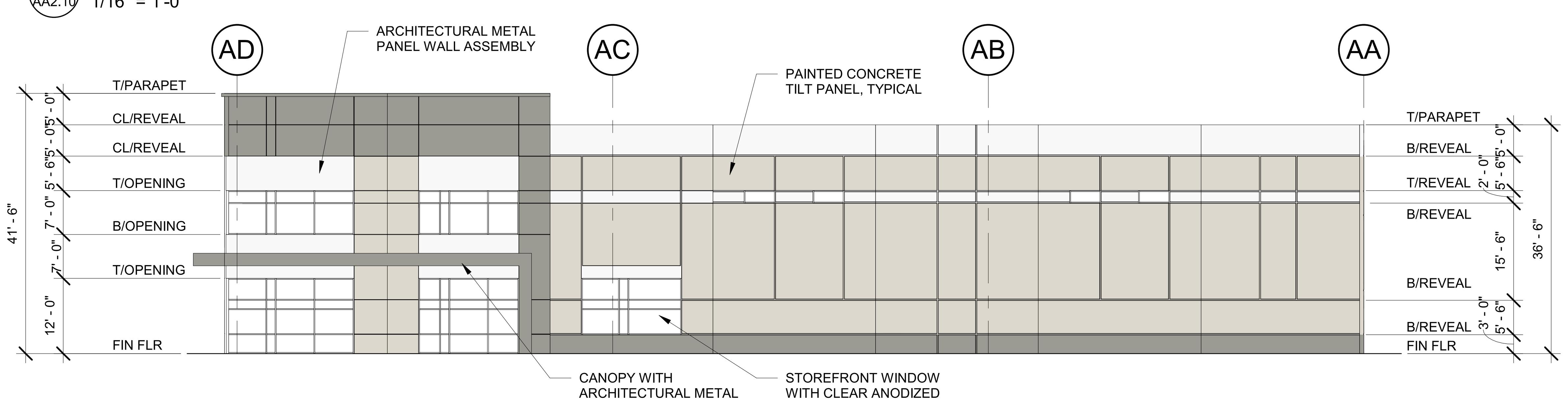
2 NORTH ELEVATION - WEST - BUILDING A
AA2.10 1/16" = 1'-0"



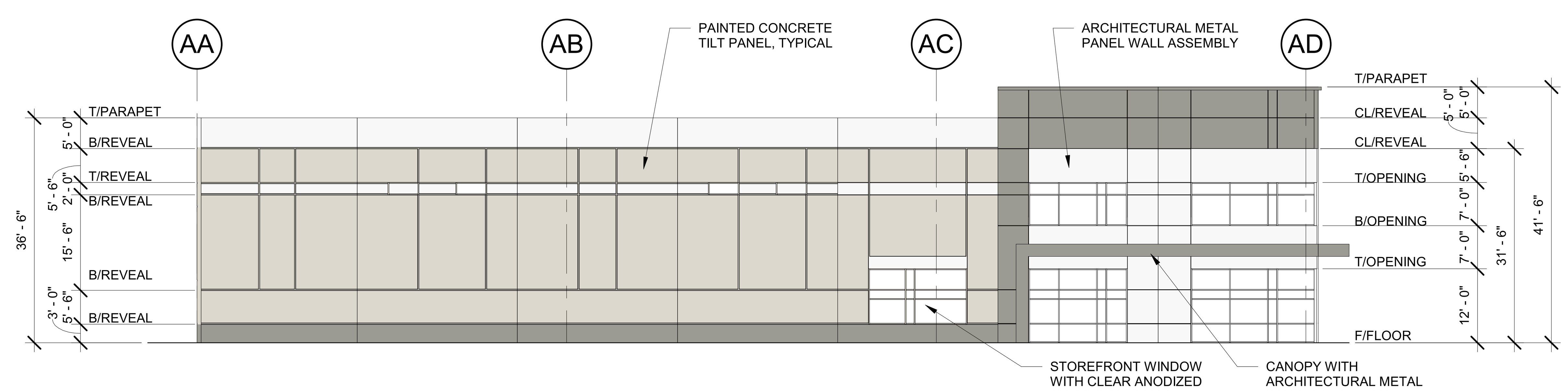
3 SOUTH ELEVATION - WEST - BUILDING A
AA2.10 1/16" = 1'-0"



4 SOUTH ELEVATION - EAST - BUILDING A
AA2.10 1/16" = 1'-0"



5 WEST ELEVATION - BUILDING A
AA2.10 1/16" = 1'-0"



6 EAST ELEVATION - BUILDING A
AA2.10 1/16" = 1'-0"

PAINT LEGEND

- P-1 : ELASTOMERIC WALL PAINT, COLOR TBD
- P-2 : ELASTOMERIC WALL PAINT, COLOR TBD
- P-3 : ELASTOMERIC WALL PAINT, COLOR TBD

GLAZING CALCULATIONS

NORTH ELEVATION	
TOTAL AREA:	18,650 SF
GLAZING AREA:	2,910 SF
PERCENT:	15.6%
WEST ELEVATION	
TOTAL AREA:	6,904 SF
GLAZING AREA:	917 SF
PERCENT:	13.3%
SOUTH ELEVATION	
TOTAL AREA:	15,805 SF
GLAZING AREA:	71 SF
PERCENT:	0.4%
EAST ELEVATION	
TOTAL AREA:	6,904 SF
GLAZING AREA:	917 SF
PERCENT:	13.3%

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REGISTERED ARCHITECT
SCOTT J. MOORE
PORTLAND, OREGON
#5795
STATE OF OREGON

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
BUILDING ELEVATIONS - BLDG A

DRAWN BY: AGC

CHECKED BY: CJL

SHEET
AA2.10

JOB NO. 2180459.00

SITE PLAN REVIEW SET - 01/17/20

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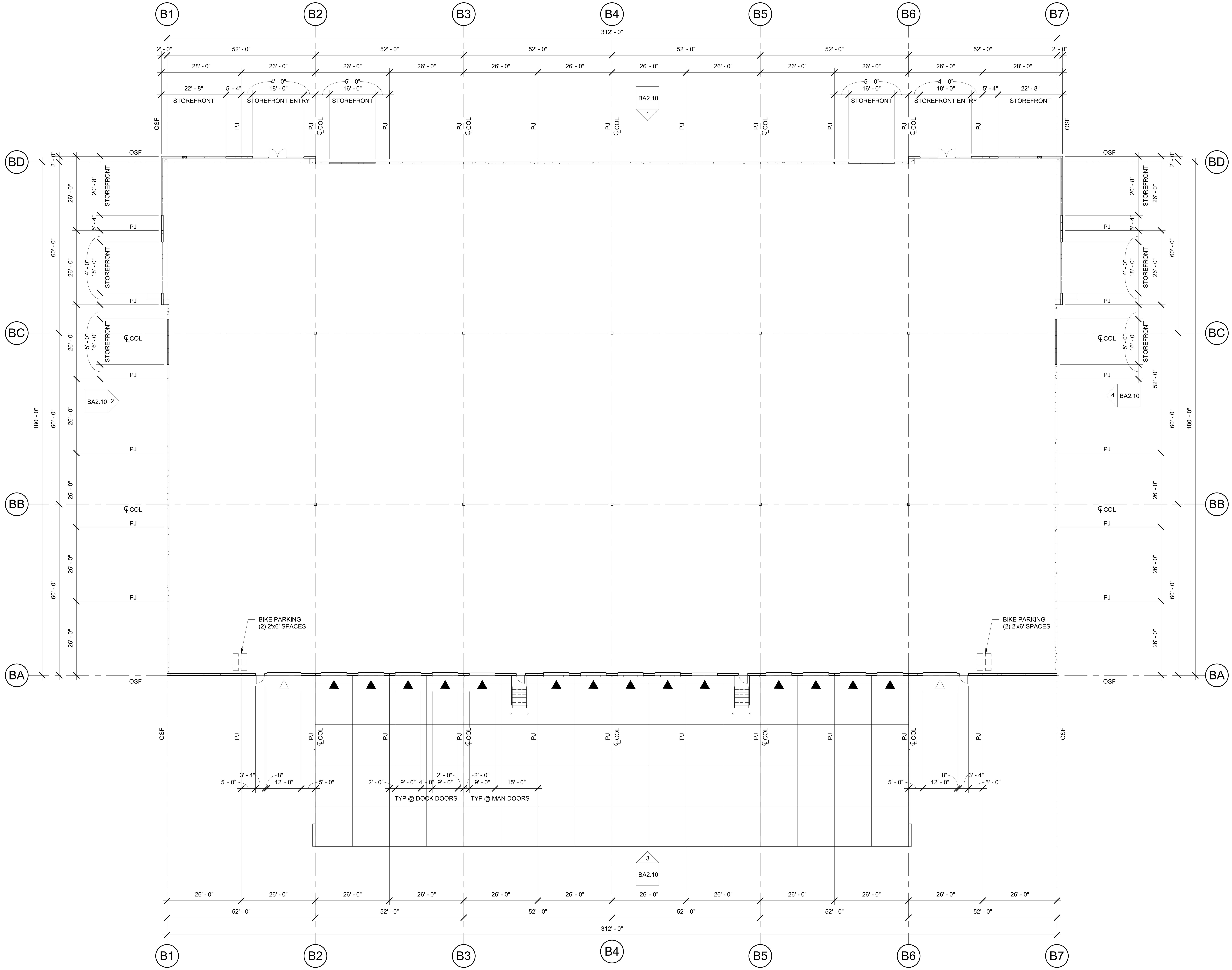

1 / BA1.10 FIRST FLOOR PLAN - BUILDING B
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA:	56,576 SF
CLEAR HEIGHT:	28'

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Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN - BLDG B

DRAWN BY: AGC

CHECKED BY: CJL

SHEET
BA1.10

JOB NO. **2180459.00**

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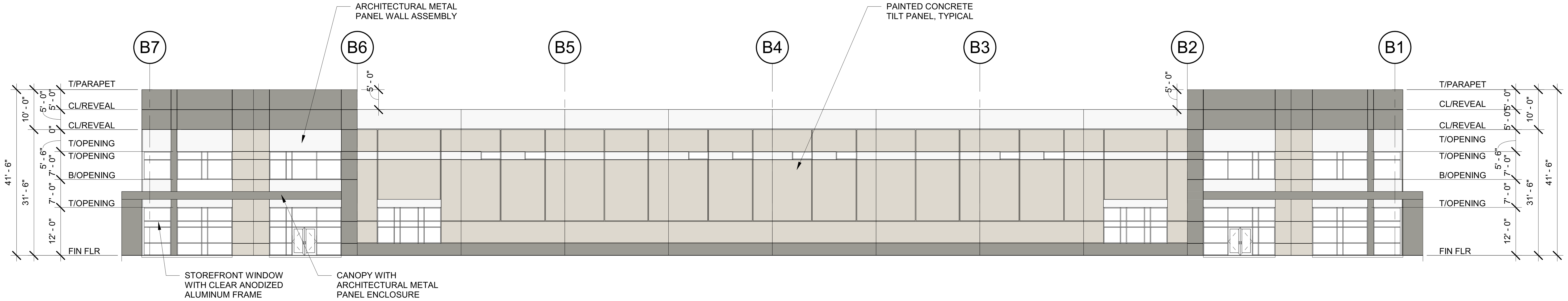
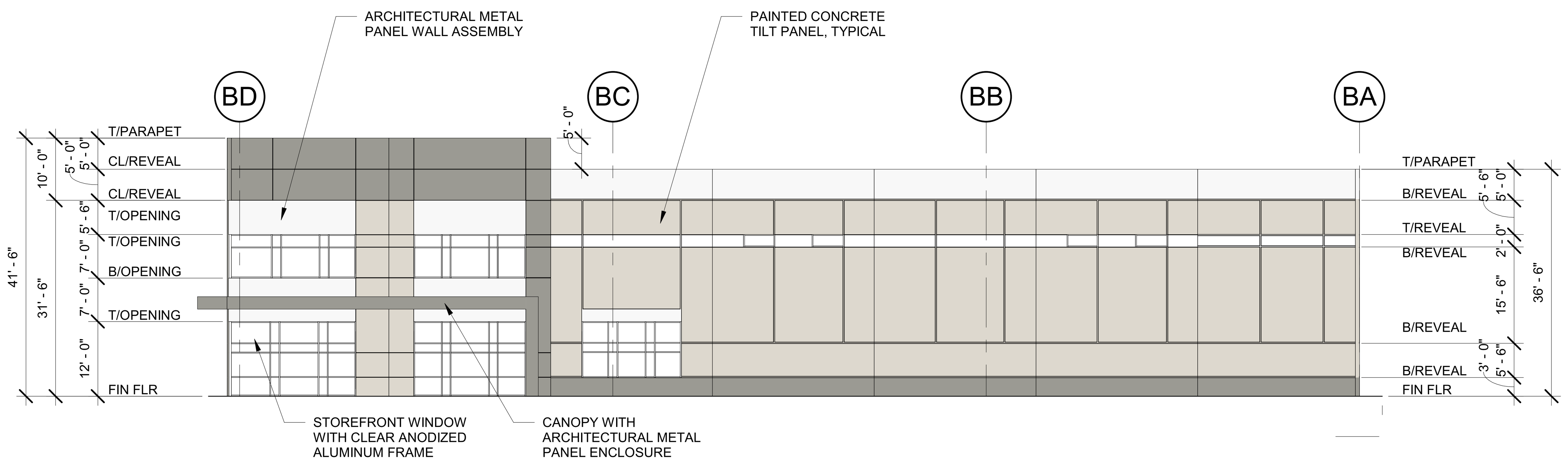
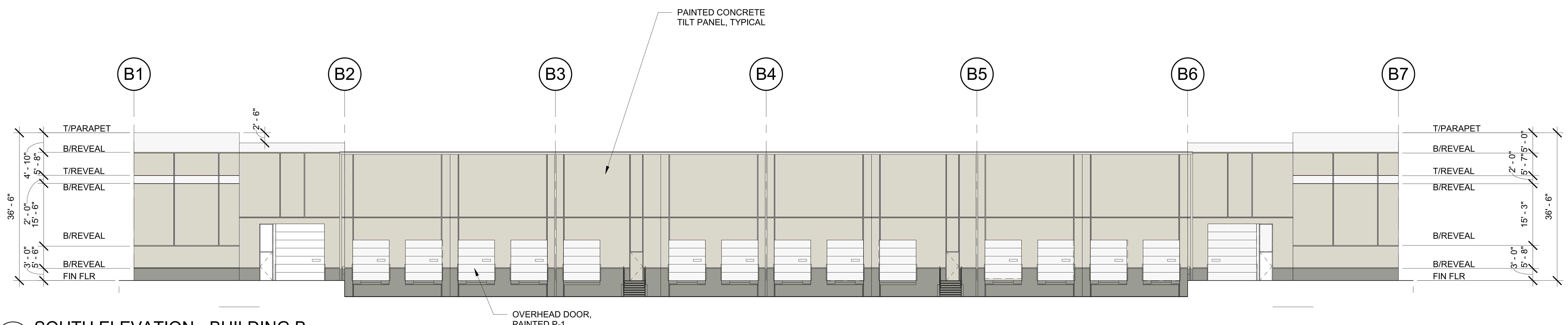


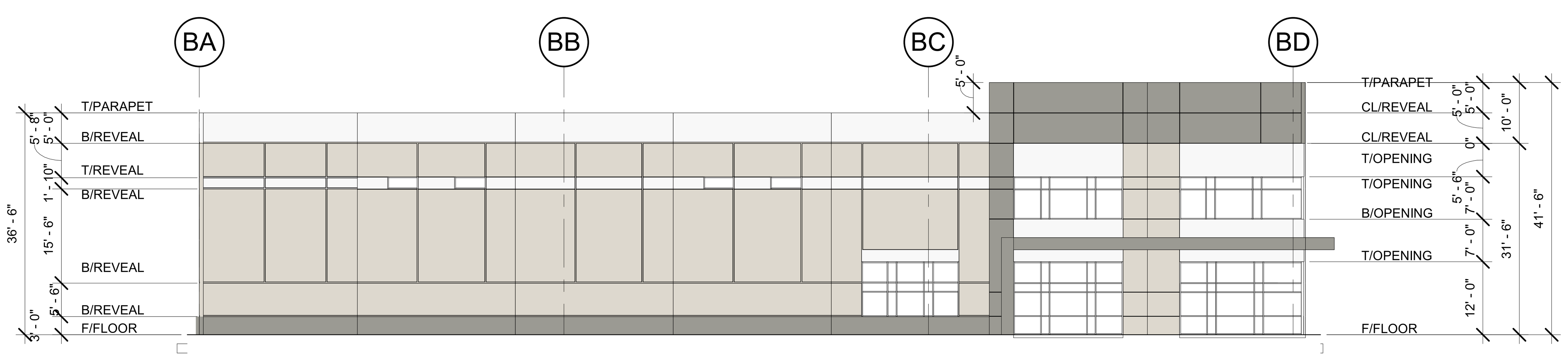
1 BA2.10 NORTH ELEVATION - BUILDING B
1/16" = 1'-0"



2 BA2.10 WEST ELEVATION - BUILDING B
1/16" = 1'-0"



3 BA2.10 SOUTH ELEVATION - BUILDING B
1/16" = 1'-0"



4 BA2.10 EAST ELEVATION - BUILDING B
1/16" = 1'-0"

PAINT LEGEND

P-1 : ELASTOMERIC WALL PAINT, COLOR TBD

P-2 : ELASTOMERIC WALL PAINT, COLOR TBD

P-3 : ELASTOMERIC WALL PAINT, COLOR TBD

GLAZING CALCULATIONS

NORTH ELEVATION	
TOTAL AREA:	12,087 SF
GLAZING AREA:	2,000 SF
PERCENT:	16.2%
WEST ELEVATION	
TOTAL AREA:	6,904 SF
GLAZING AREA:	917 SF
PERCENT:	13.3%
SOUTH ELEVATION	
TOTAL AREA:	10,274 SF
GLAZING AREA:	62 SF
PERCENT:	0.6%
EAST ELEVATION	
TOTAL AREA:	6,904 SF
GLAZING AREA:	917 SF
PERCENT:	13.3%

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Delta	Issued As	Issue Date

SHEET TITLE:
BUILDING ELEVATIONS - BLDG B

DRAWN BY: SJE, CJL

CHECKED BY: SJM

SHEET
BA2.10

JOB NO. **2180459.00**

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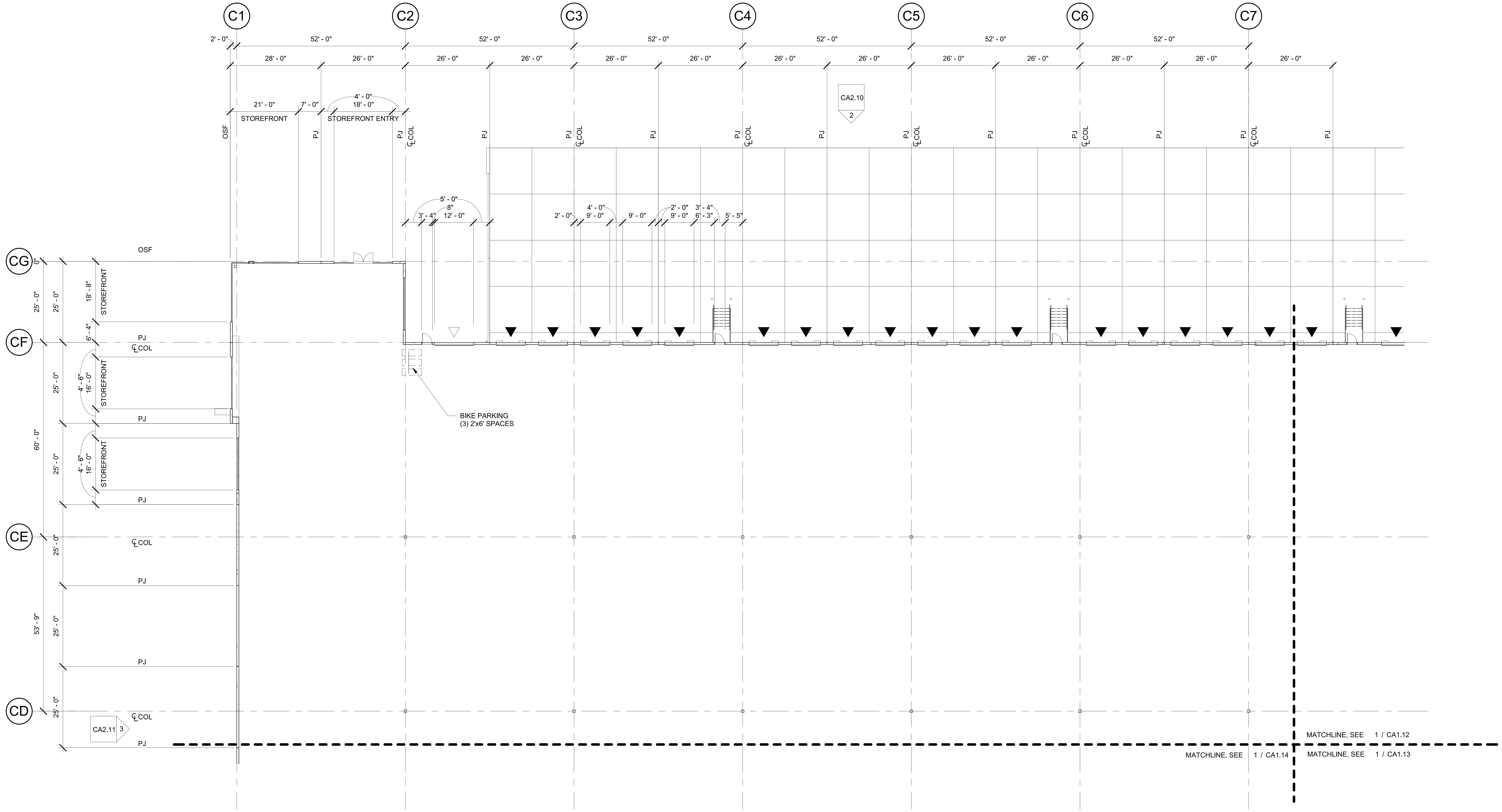

1 CA1.11 FLOOR PLAN - NORTHWEST - BUILDING C
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 183,292 SF
CLEAR HEIGHT: 32'

KEYPLAN

NORTHWEST | NORTHEAST SEE CA1.12
SOUTHWEST SEE CA1.14 | SOUTHEAST SEE CA1.13

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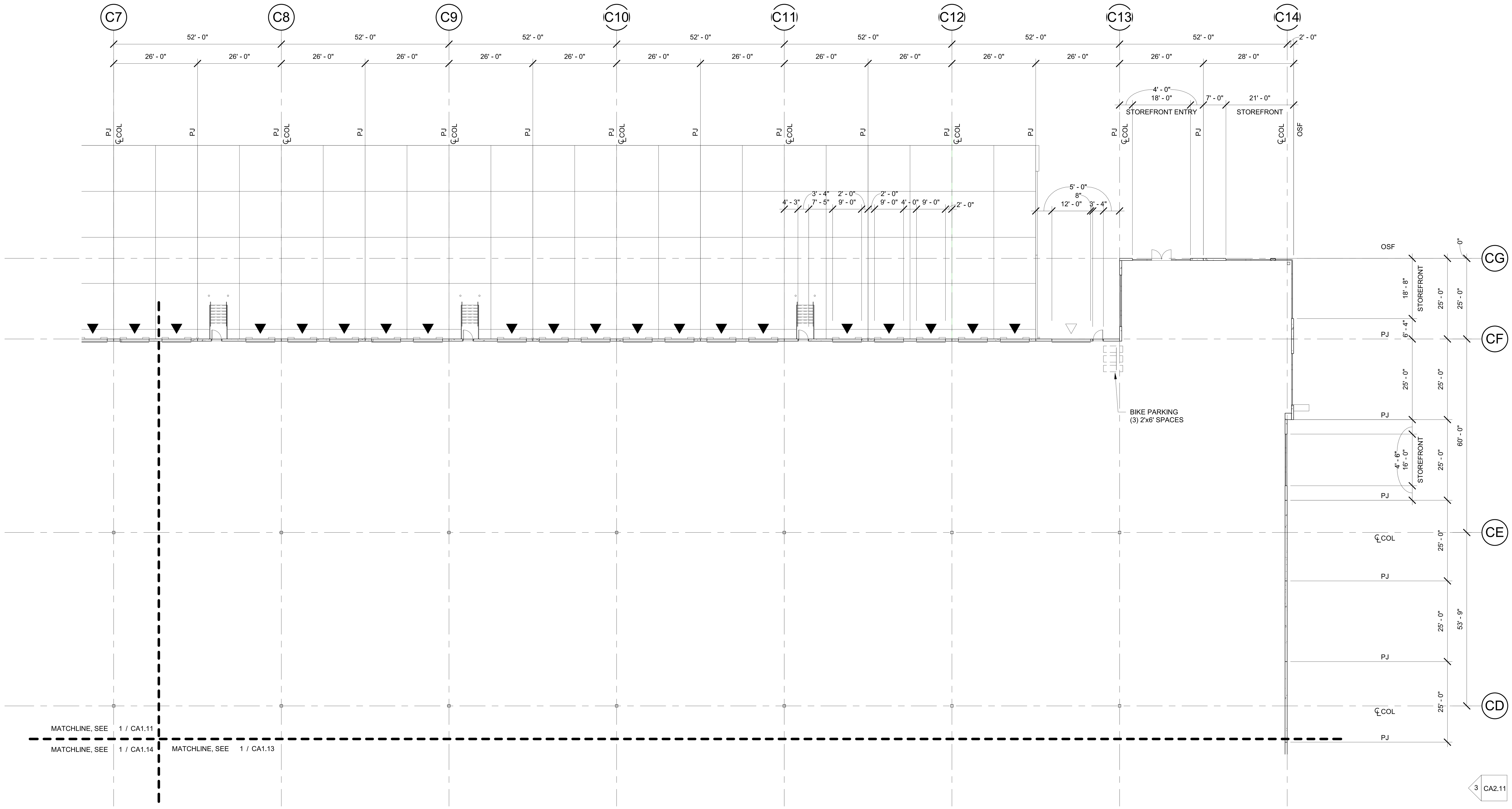
Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN - BLDG C - NORTHWEST

DRAWN BY: SJE CJL
CHECKED BY: SJM

SHEET
CA1.11

JOB NO. 2180459.00



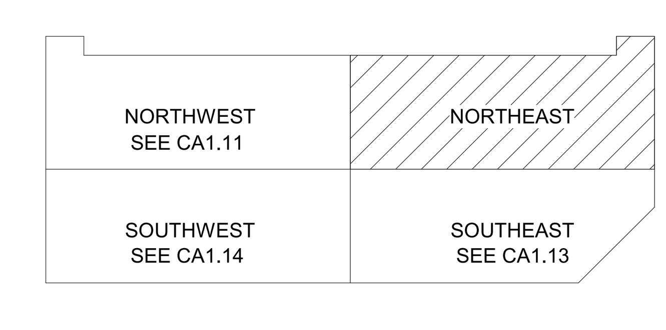
1 CA1.12 FLOOR PLAN - NORTHEAST - BUILDING C
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 183,292 SF
CLEAR HEIGHT: 32'



KEYPLAN

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Delta	Issued As	Issue Date

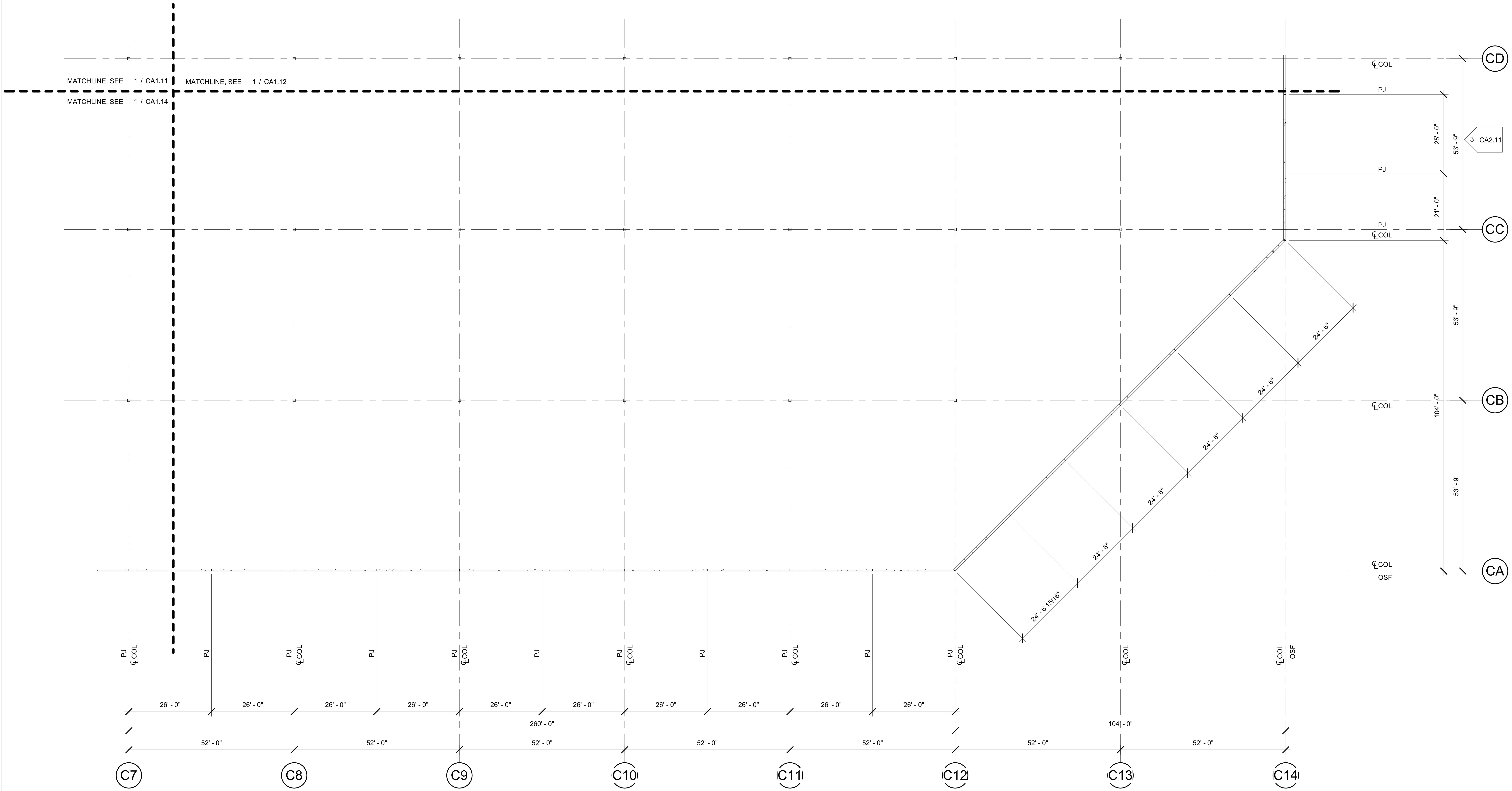
SHEET TITLE:
FLOOR PLAN - BLDG C - NORTHEAST

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET
CA1.12

JOB NO. **2180459.00**



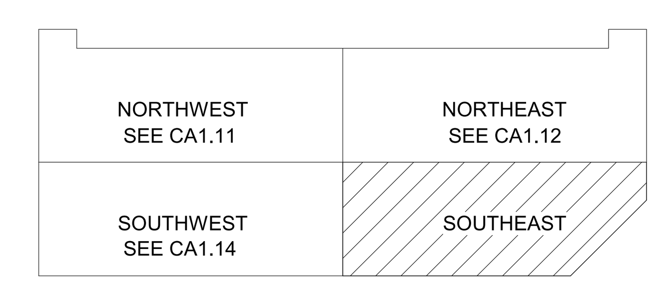
1 CA1.13 FLOOR PLAN - SOUTHEAST - BUILDING C
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 183,292 SF
CLEAR HEIGHT: 32'



KEYPLAN

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REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN -BLDG C - SOUTHEAST

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET
CA1.13

JOB NO. 2180459.00

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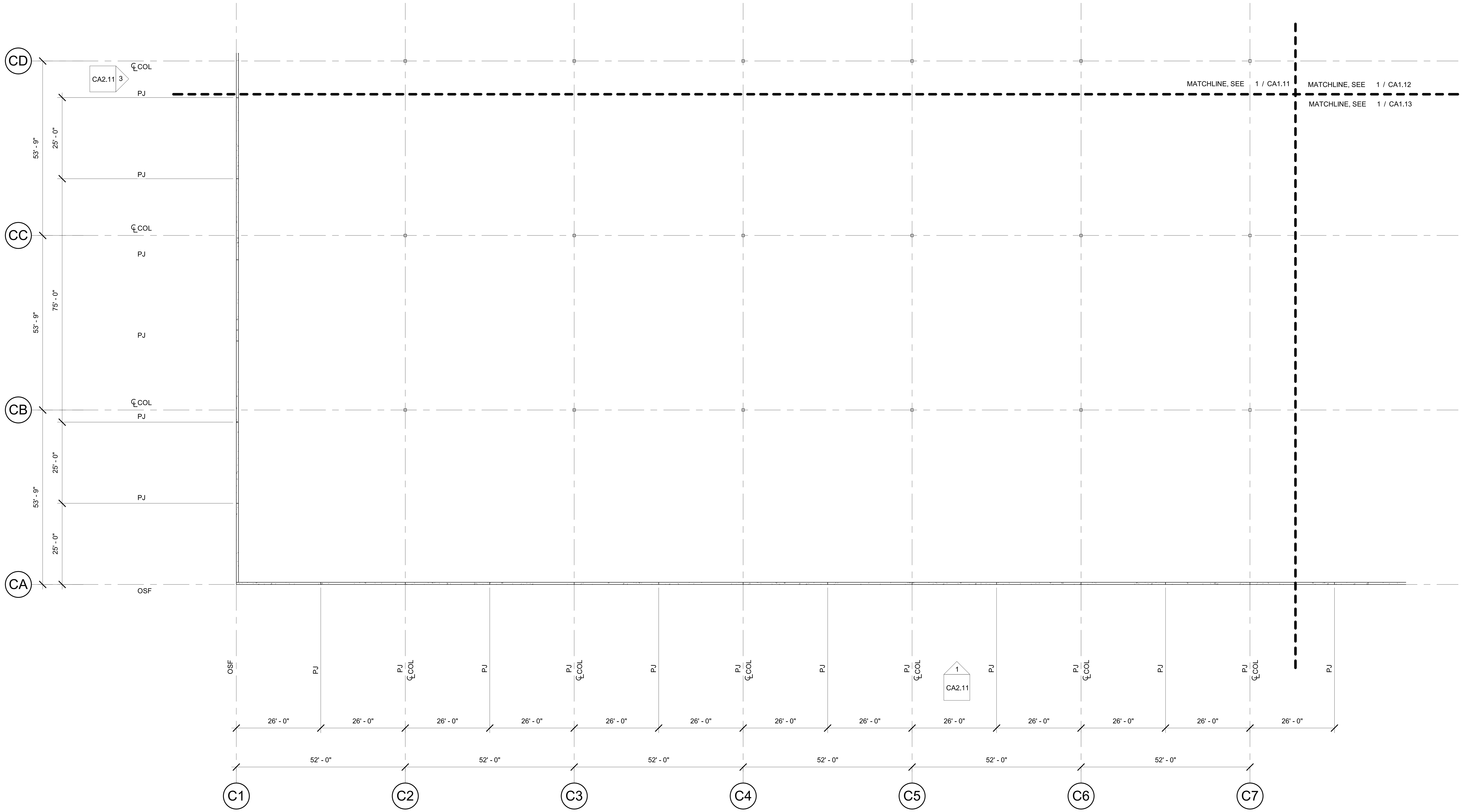


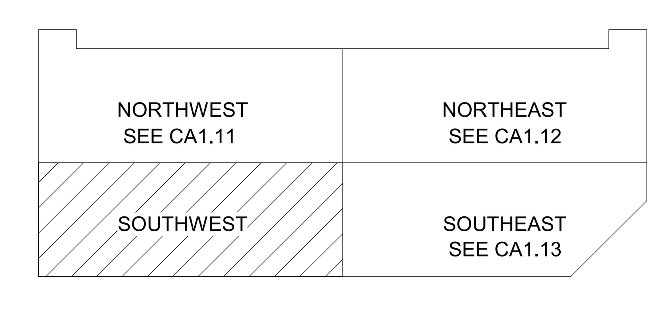
1 / CA1.14 FLOOR PLAN - SOUTHWEST - BUILDING C
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 183,292 SF
CLEAR HEIGHT: 32'



KEYPLAN

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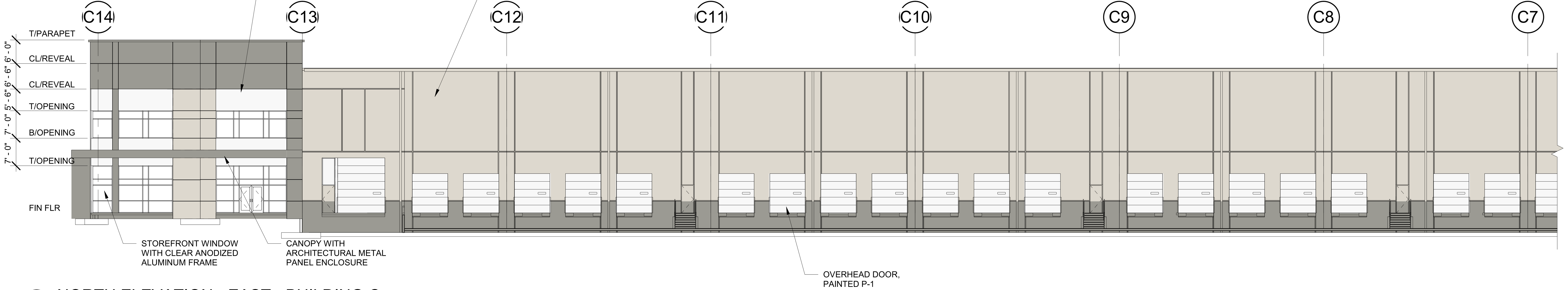
SHEET TITLE:
FLOOR PLAN - BLDG C - SOUTHWEST

DRAWN BY: SJE CJL

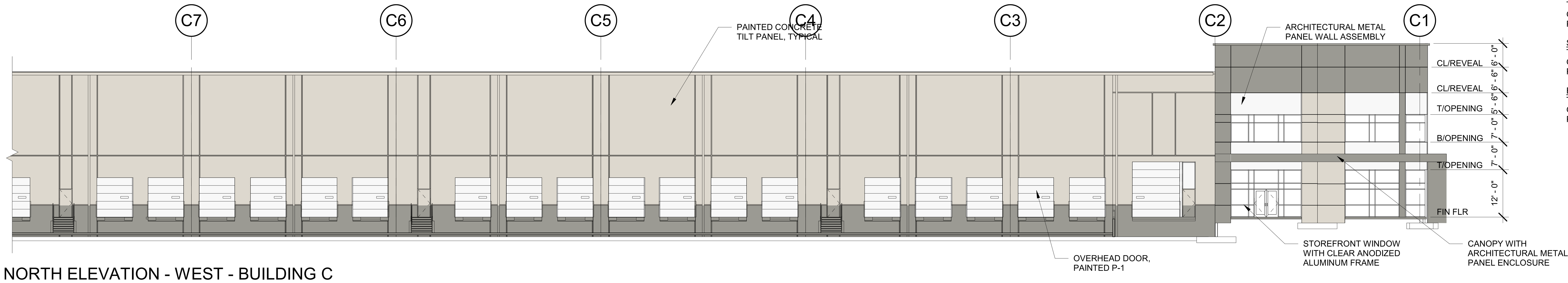
CHECKED BY: SJM

SHEET
CA1.14

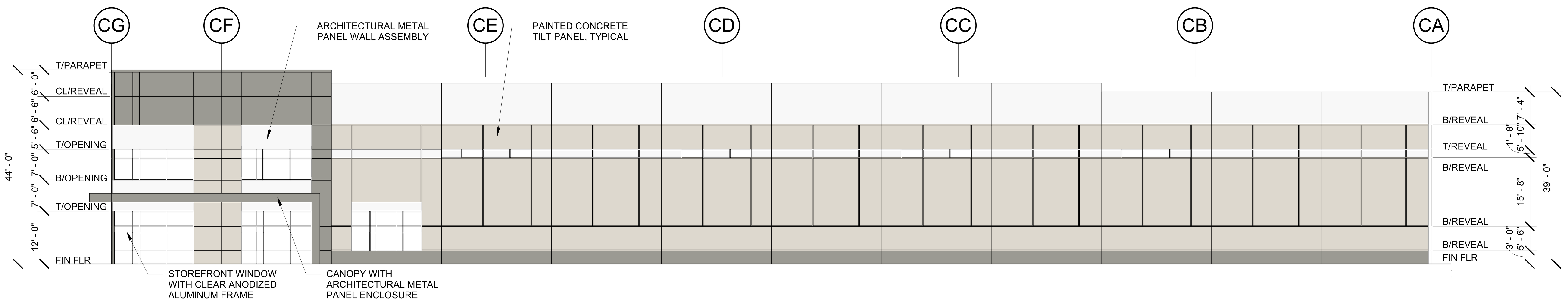
JOB NO. 2180459.00



1 CA2.10 NORTH ELEVATION - EAST - BUILDING C
1/16" = 1'-0"



2 CA2.10 NORTH ELEVATION - WEST - BUILDING C
1/16" = 1'-0"



3 CA2.10 WEST ELEVATION - BUILDING C
1/16" = 1'-0"

PAINT LEGEND

P-1 : ELASTOMERIC WALL PAINT, COLOR TBD

P-2 : ELASTOMERIC WALL PAINT, COLOR TBD

P-3 : ELASTOMERIC WALL PAINT, COLOR TBD

GLAZING CALCULATIONS

NORTH ELEVATION
TOTAL AREA: 25,805 SF
GLAZING AREA: 1,821 SF
PERCENT: 7.1%

WEST ELEVATION
TOTAL AREA: 12,300 SF
GLAZING AREA: 883 SF
PERCENT: 7.2%

SOUTH ELEVATION
TOTAL AREA: 20,937 SF
GLAZING AREA: 0 SF
PERCENT: 0%

EAST ELEVATION
TOTAL AREA: 12,300 SF
GLAZING AREA: 883 SF
PERCENT: 7.2%

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Delta	Issued As	Issue Date

SHEET TITLE:
BUILDING ELEVATIONS - BLDG C

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET

CA2.10

JOB NO. 2180459.00

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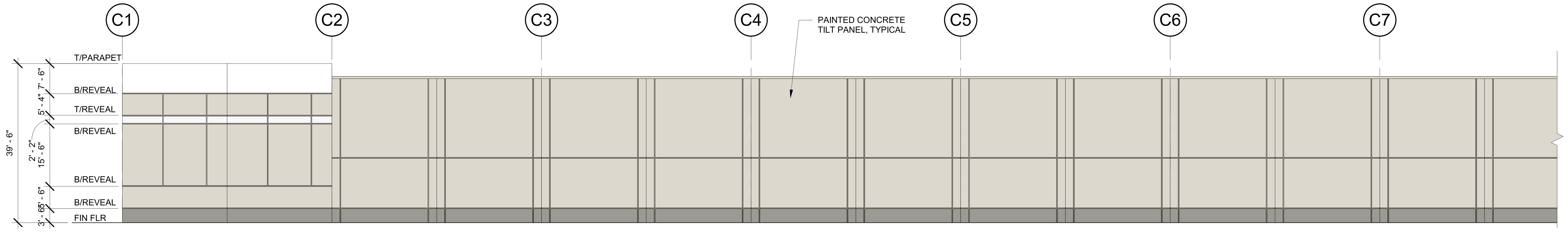
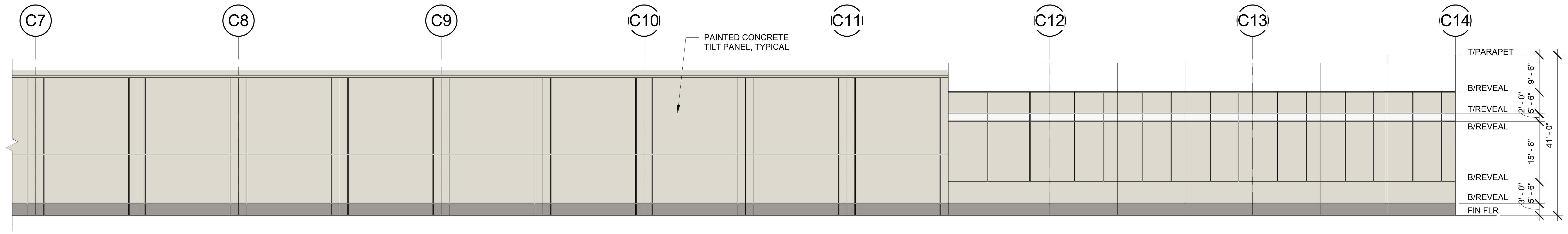
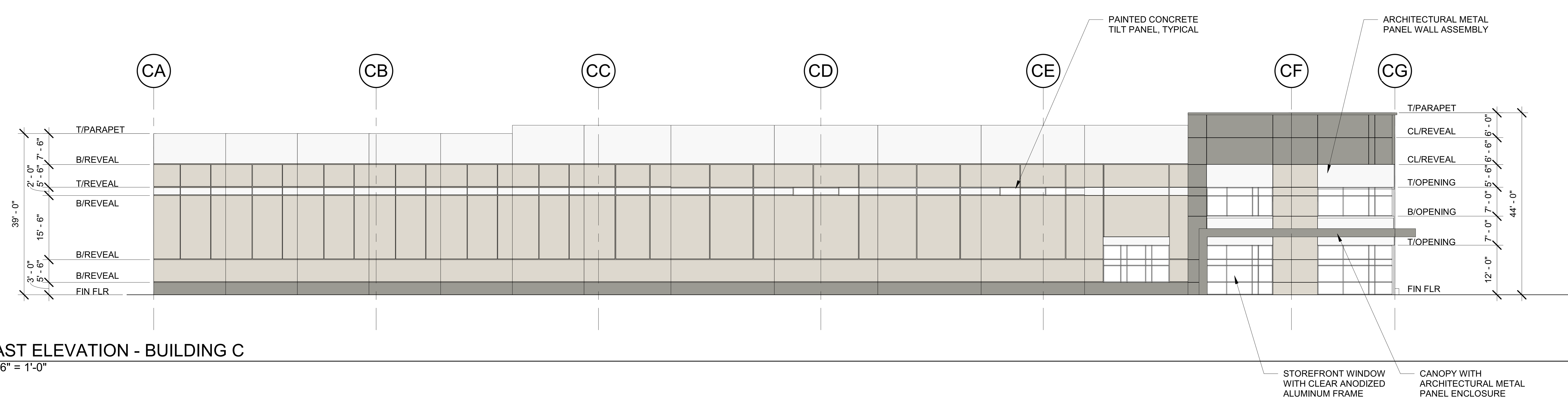


1 CA2.11 SOUTH ELEVATION - WEST - BUILDING C
1/16" = 1'-0"



2 CA2.11 SOUTH ELEVATION - EAST - BUILDING C
1/16" = 1'-0"



3 CA2.11 EAST ELEVATION - BUILDING C
1/16" = 1'-0"

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REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
BUILDING ELEVATIONS - BLDG C

DRAWN BY: SJE CJL

CHECKED BY: SJM

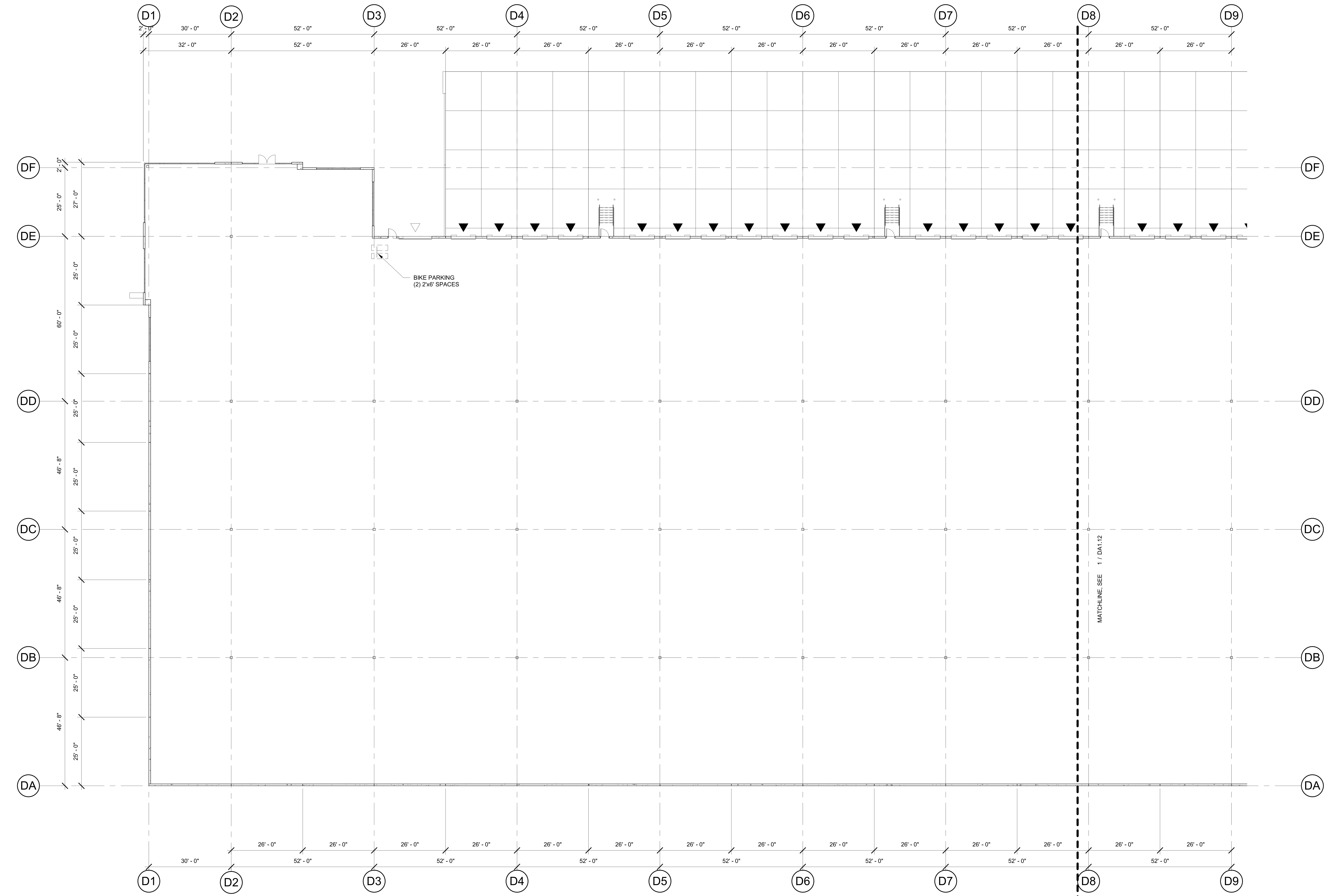
SHEET

CA2.11

JOB NO. 2180459.00

SITE PLAN REVIEW SET - 01/17/20

C:\Users\cjl\Documents\Revit Projects\2180459.00 TS Corporate Park\459-TSCP_Document-v20-L.rvt 1/15/2020 4:35:42 PM 1/16" = 1'-0"



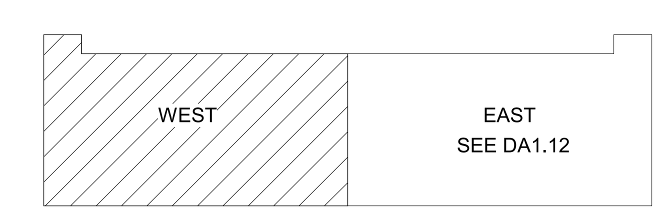
1 DA1.11 FLOOR PLAN - WEST - BUILDING D
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA: 145,824 SF
CLEAR HEIGHT: 32'



KEYPLAN

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REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN - BLDG D - WEST

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET

DA1.11

JOB NO. 2180459.00

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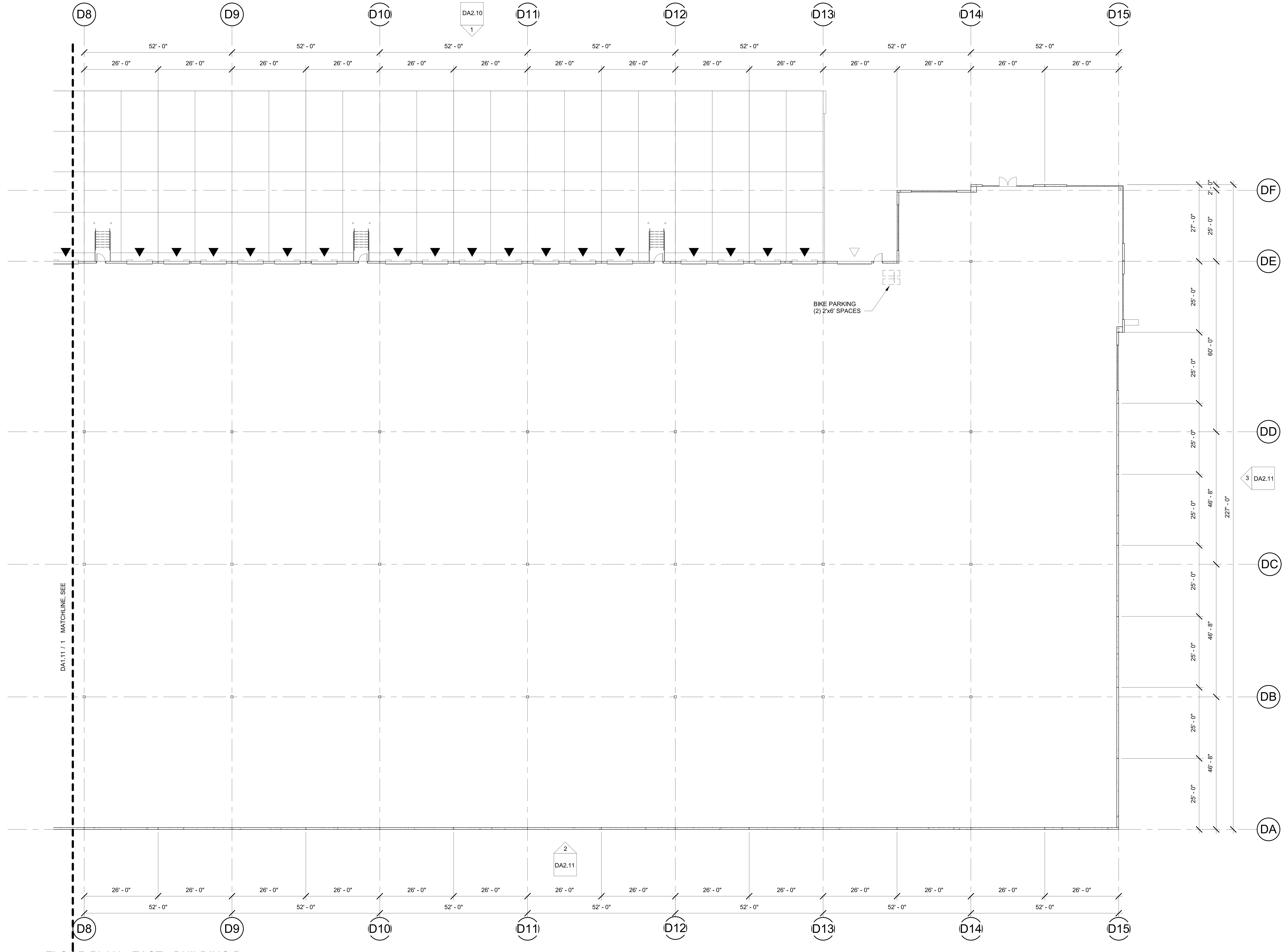


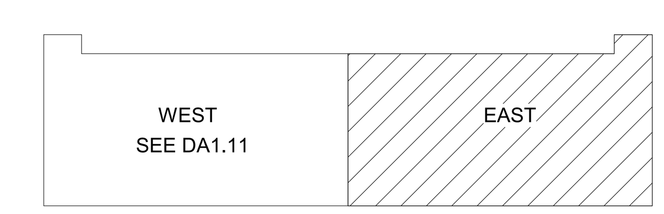
1 DA1.12 FLOOR PLAN - EAST - BUILDING D
1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA:	145,824 SF
CLEAR HEIGHT:	32'



KEYPLAN

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Client
TRAMMELL CROW COMPANY

1300 SW 5TH AVE.,
STE 3050 PORTLAND,
OR 97201

Project
T-S CORPORATE PARK

12822 SW TUALATIN-SHERWOOD RD,
SHERWOOD, OR 97140

REGISTERED ARCHITECT
SCOTT J. MOORE
PORTLAND, OREGON
#5795
STATE OF OREGON

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN - BLDG D - EAST

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET
DA1.12

JOB NO. **2180459.00**

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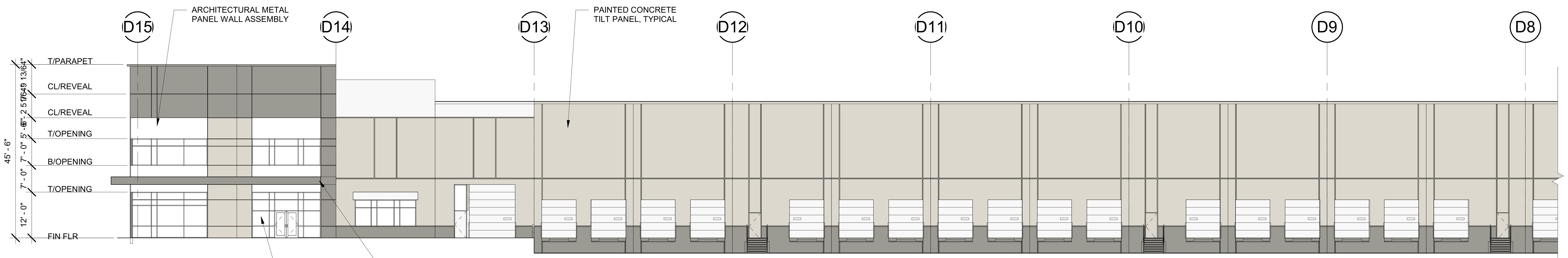
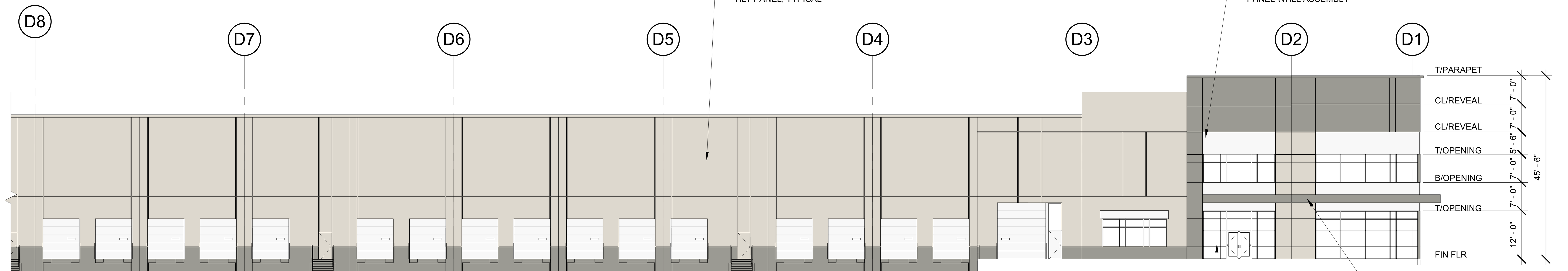
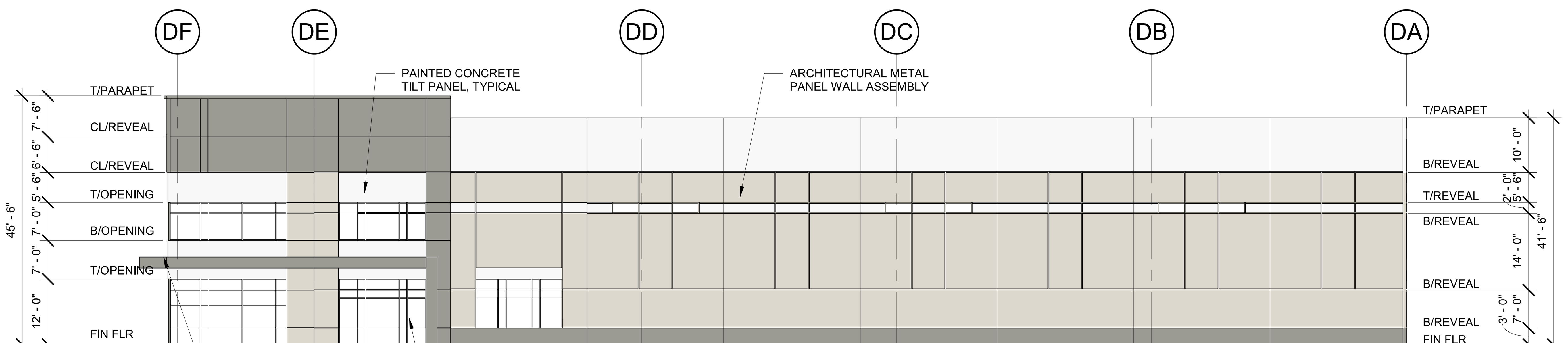


1 DA2.10 NORTH ELEVATION - EAST - BUILDING D
1/16" = 1'-0"



2 DA2.10 NORTH ELEVATION - WEST - BUILDING D
1/16" = 1'-0"



3 DA2.10 WEST ELEVATION - BUILDING D
1/16" = 1'-0"

CANOPY WITH ARCHITECTURAL METAL PANEL ENCLOSURE

STOREFRONT WINDOW WITH CLEAR ANODIZED ALUMINUM FRAME

PAINT LEGEND

P-1 : ELASTOMERIC WALL PAINT, COLOR TBD

P-2 : ELASTOMERIC WALL PAINT, COLOR TBD

P-3 : ELASTOMERIC WALL PAINT, COLOR TBD

GLAZING CALCULATIONS

NORTH ELEVATION	
TOTAL AREA:	27,559 SF
GLAZING AREA:	1,758 SF
PERCENT:	6.4%
WEST ELEVATION	
TOTAL AREA:	9,629 SF
GLAZING AREA:	969 SF
PERCENT:	10.1%
SOUTH ELEVATION	
TOTAL AREA:	28,386 SF
GLAZING AREA:	180 SF
PERCENT:	.6%
EAST ELEVATION	
TOTAL AREA:	9,629 SF
GLAZING AREA:	969 SF
PERCENT:	10.1%

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Delta	Issued As	Issue Date

SHEET TITLE:
BUILDING ELEVATIONS - BLDG D

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET

DA2.10

JOB NO. 2180459.00

SITE PLAN REVIEW SET - 01/17/20

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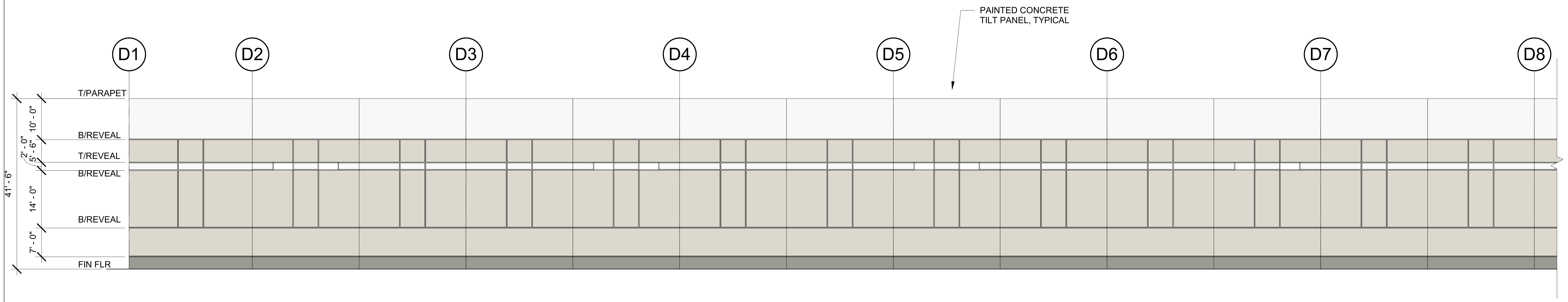

1 SOUTH ELEVATION - WEST - BUILDING D
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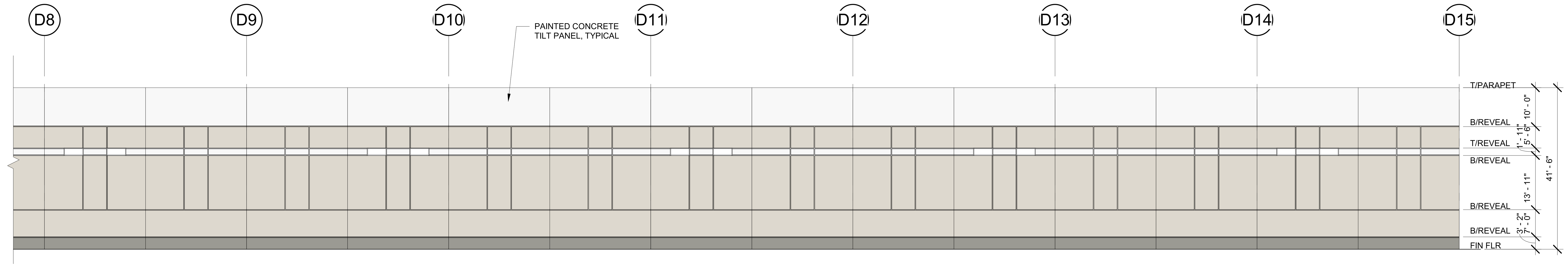

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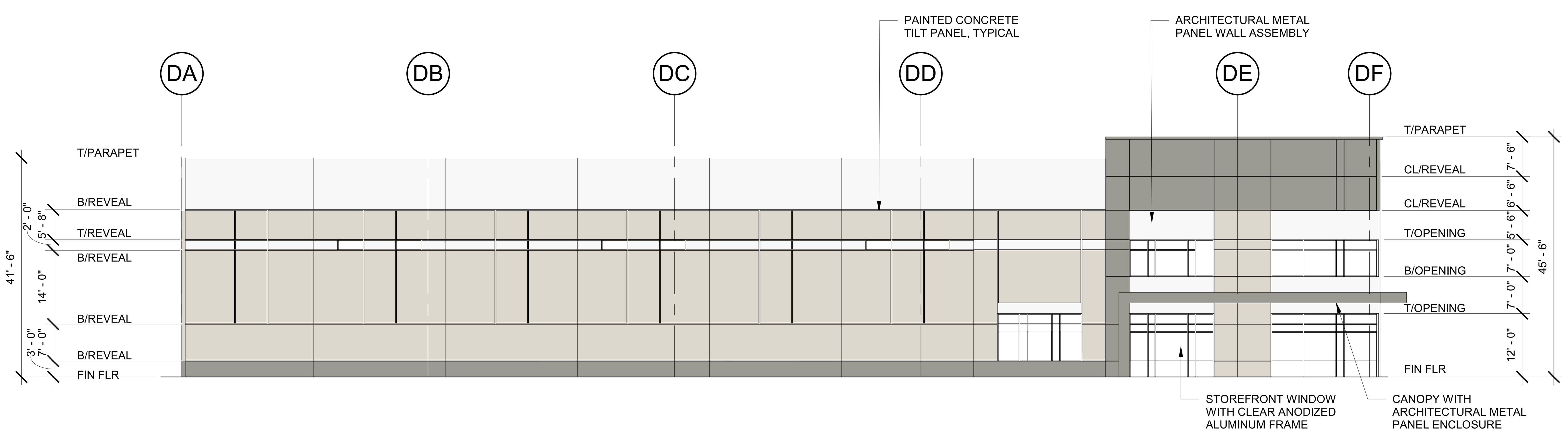
DA2.11 1/16" = 1'-0"



3 EAST ELEVATION - BUILDING D
DA2.11 1/16" = 1'-0"

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SHEET TITLE:
BUILDING ELEVATIONS - BLDG D

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET

DA2.11

JOB NO. 2180459.00

SITE PLAN REVIEW SET - 01/17/20

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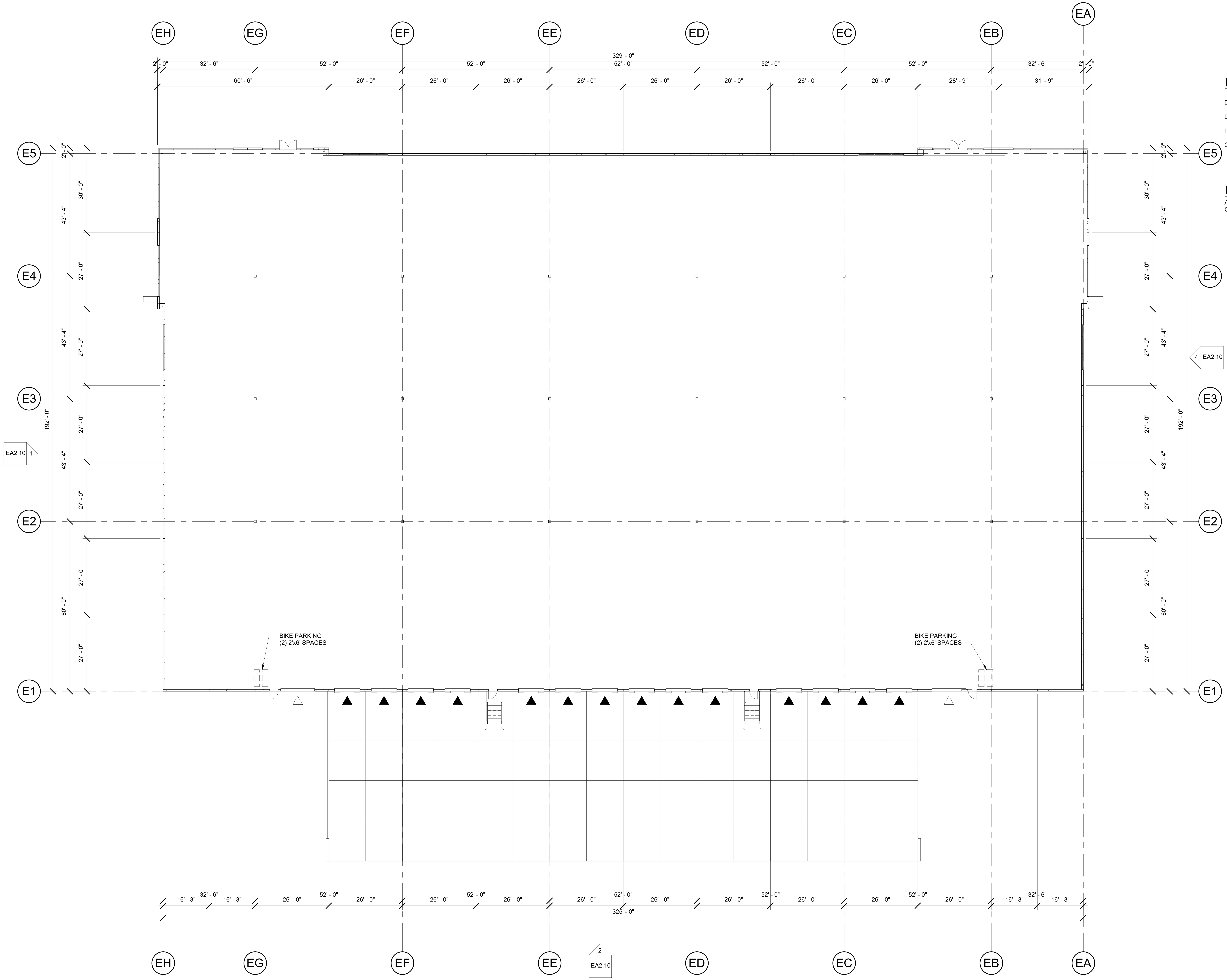

1
EA1.10

OVERALL FLOOR PLAN

1/16" = 1'-0"

LEGEND

DOCK HIGH OVERHEAD DOOR	▲
DRIVE IN OVERHEAD DOOR	△
PANEL JOINT	PJ
OUTSIDE FACE	OSF

BUILDING INFORMATION

AREA:	62,212 SF
CLEAR HEIGHT:	28'

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REGISTERED ARCHITECT
SCOTT J. MOORE
PORTLAND, OREGON
#5795
STATE OF OREGON

REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
FLOOR PLAN - BLDG E

DRAWN BY: SJE CJL

CHECKED BY: SJM

SHEET
EA1.10

JOB NO. **2180459.00**

SITE PLAN REVIEW SET - 01/17/20

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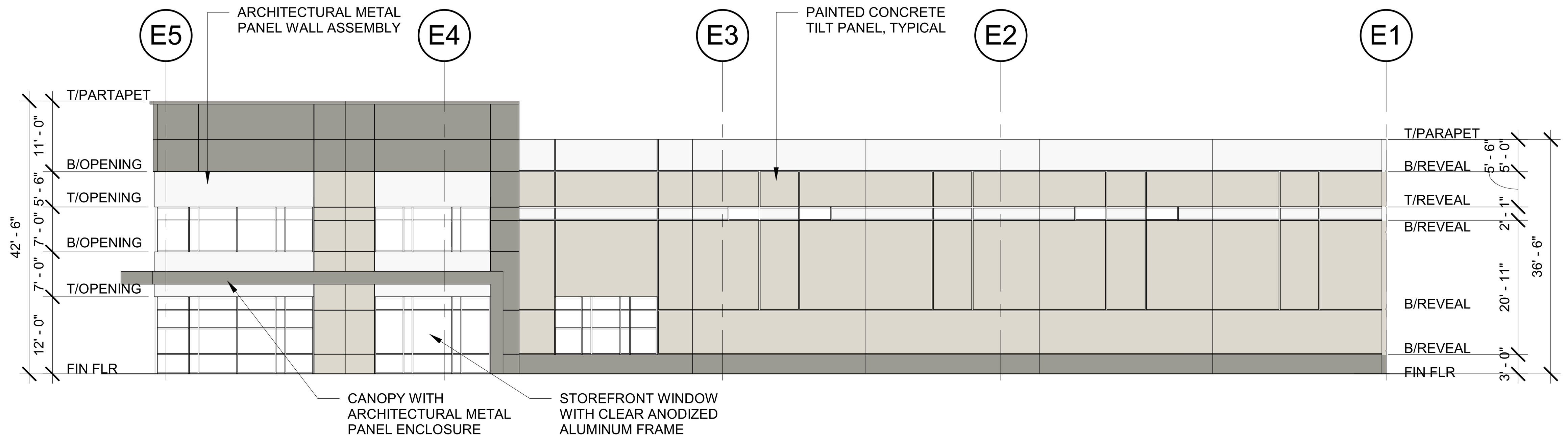
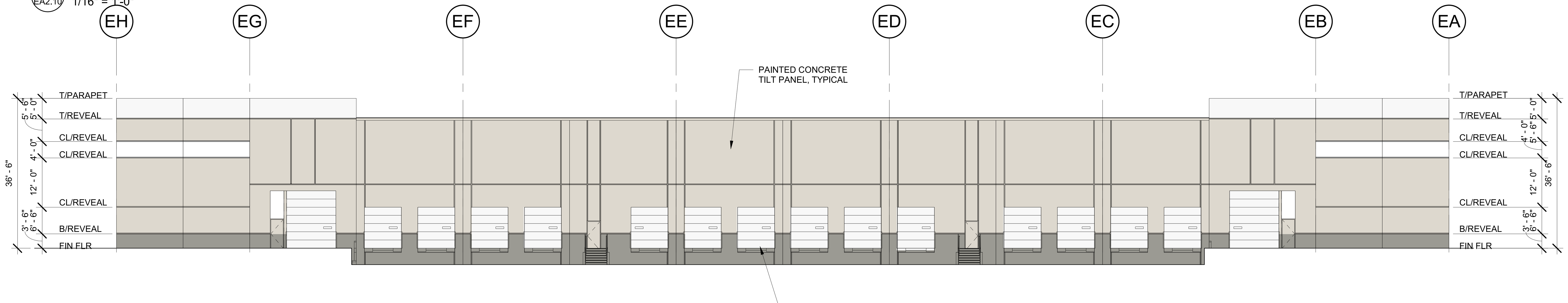


1 EA2.10 NORTH ELEVATION - BUILDING E
1/16" = 1'-0"



2 EA2.10 WEST ELEVATION - BUILDING E
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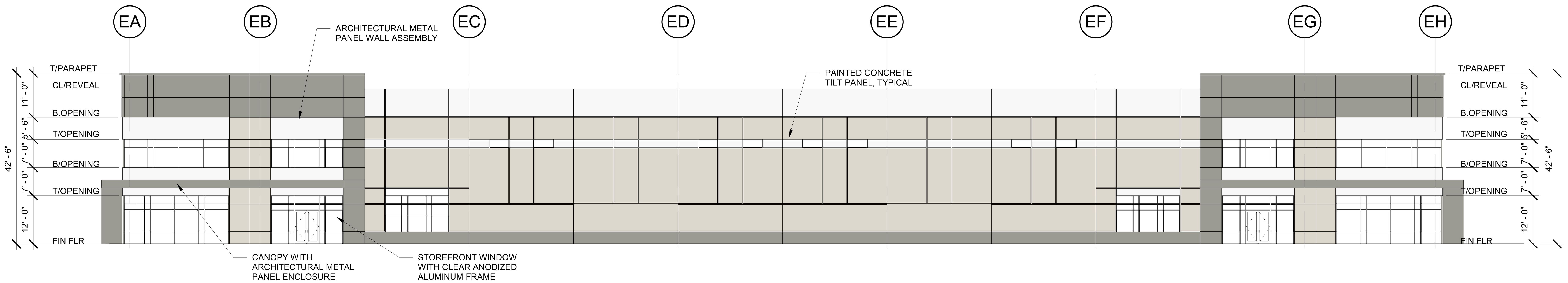
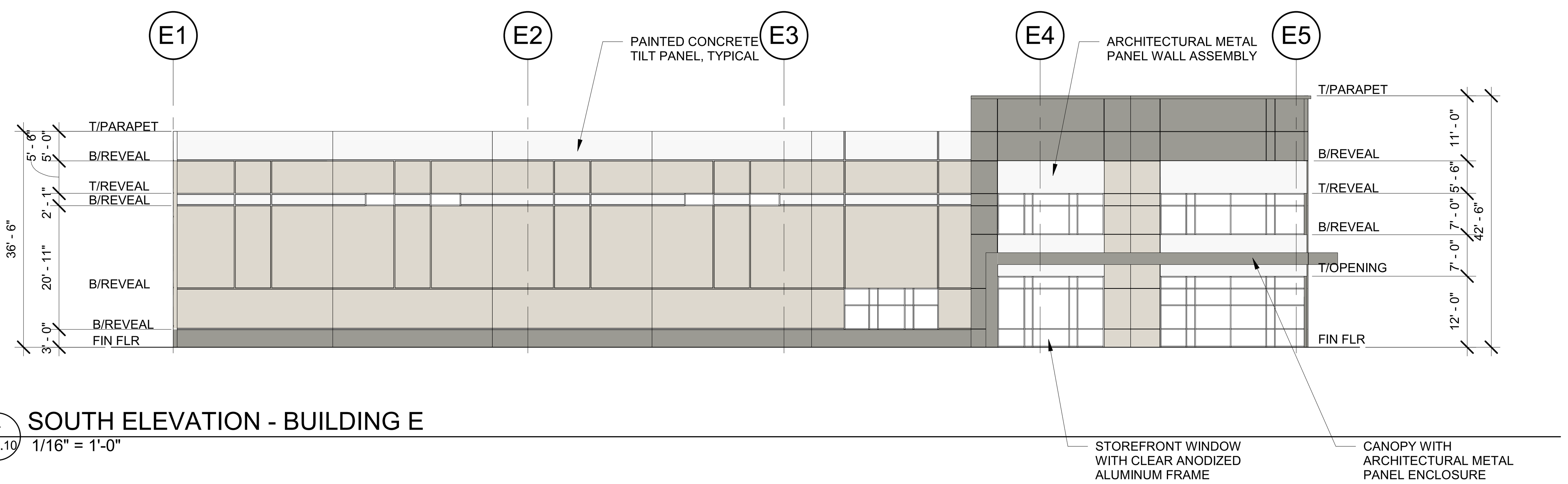


3 EA2.10 EAST ELEVATION - BUILDING E
1/16" = 1'-0"



4 EA2.10 SOUTH ELEVATION - BUILDING E
1/16" = 1'-0"

PAINT LEGEND

P-1 : ELASTOMERIC WALL PAINT, COLOR TBD

P-2 : ELASTOMERIC WALL PAINT, COLOR TBD

P-3 : ELASTOMERIC WALL PAINT, COLOR TBD

GLAZING CALCULATIONS

EAST ELEVATION	
TOTAL AREA:	13,151 SF
GLAZING AREA:	2,068 SF
PERCENT:	15.7%
NORTH ELEVATION	
TOTAL AREA:	7,350 SF
GLAZING AREA:	1,002 SF
PERCENT:	13.6%
WEST ELEVATION	
TOTAL AREA:	10,888 SF
GLAZING AREA:	62 SF
PERCENT:	0.6%
SOUTH ELEVATION	
TOTAL AREA:	7,350 SF
GLAZING AREA:	1,002 SF
PERCENT:	13.6%

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REVISION SCHEDULE

Delta	Issued As	Issue Date

SHEET TITLE:
BUILDING ELEVATION - BLDG E

DRAWN BY: CJL, ACR

CHECKED BY: SOS

SHEET
EA2.10

JOB NO. 2180459.00

SITE PLAN REVIEW SET - 01/17/20

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KITTELSON & ASSOCIATES
851 SW 6th AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

T-S Corporate Park – Traffic Impact Analysis

Date:	January 15, 2020
To:	Bob Galati, PE, City of Sherwood Jinde Zhu, PE, Washington County
From:	Brian J. Dunn, PE, Kristine Connolly, PE & Claire Dougherty
CC:	Garth Appanaitis, PE – DKS Associates
Project:	T-S Corporate Park – Sherwood, Oregon
Subject:	Traffic Impact Analysis

REGISTERED PROFESSIONAL ENGINEER
60027PE
OREGON
July 13, 1999
BRIAN JOSEPH DUNN
EXPIRES: 12-31-21

This report presents the comprehensive traffic impact analysis (TIA) completed for the proposed T-S Corporate Park development, to be located the southwest quadrant of the SW Tualatin-Sherwood Road and SW 124th Avenue intersection in Sherwood, Oregon. Based on the results of this TIA, the proposed T-S Corporate Park can be developed while maintaining acceptable levels of mobility and safety at the study intersections, assuming provision of the recommended mitigation measures. The primary findings and recommendations of this study are summarized below and in the following sections of this report.

FINDINGS AND RECOMMENDATIONS

Based on the analysis herein, the following findings and recommendations are associated with the proposed development of the T-S Corporate Park project:

Year 2019 Existing Conditions

- Crash History:
  - The observed crash rates exceed the ODOT published 90th percentile crash rate at three study intersections:
    - SW Oregon Street/SW Tualatin-Sherwood Road
    - SW 124th Avenue/SW Tualatin-Sherwood Road
    - SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road
  - The ODOT published 2017 Washington County Safety Priority Index System (SPIS) List identifies the study intersection of SW 115th Avenue/ W Tualatin-Sherwood Road, with an SPIS score of 80.23 out of 100.

- Five study intersections are identified on the Washington County maintained SPIS 2014-2016 list, with ranking and SPIS scores as follows:
  - SW 124th Avenue and SW Tualatin-Sherwood Road is ranked 20th on the list, with an SPIS score of 78.3 out of 100; and
  - SW 112th Avenue-SW Avery Street and SW Tualatin-Sherwood Road is ranked 22nd on the list, with an SPIS score of 78.3 out of 100; and
  - SW Cipole Road and SW Tualatin-Sherwood Road is ranked 29th on the list, with an SPIS score of 75.7 out of 100; and
  - SW Oregon Street and SW Tualatin-Sherwood Road is ranked 30th on the list, with an SPIS score of 75.7 out of 100; and
  - SW Langer Farms Parkway and SW Tualatin-Sherwood Road is ranked 146th on the list, with an SPIS score of 42.0 out of 100.

- All study intersections currently operate at levels which meet the jurisdictional mobility standards.
  - However, as observed in the field, and reported within the queuing analysis, vehicle queueing is prevalent east-west along the SW Tualatin-Sherwood Road corridor during both AM and PM peak hours, which is indicative of over-saturated conditions.

Year 2021 Background Traffic Conditions

- This analysis assumed that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place, with limited re-distributed trips from SW Tualatin-Sherwood Road.
- All study intersections are forecast to operate acceptably and meet jurisdictional mobility standards during the weekday AM and PM peak hours, except:
  - The SW Oregon Street / SW Tualatin-Sherwood Road intersection is forecast to operate with a volume to capacity ratio greater than 1.0 during the PM peak hour.

Proposed Development Plan

- The proposed development of up to 547,220 square-feet of industrial buildings is estimated to generate 1,844 net new weekday daily trips; including 219 net new trips (177 inbound, 42 outbound) during the weekday AM peak hour and 219 net new trips (46 inbound, 173 outbound) during the weekday PM peak hour.
- Site access is proposed via an extension of SW Cipole Road into the site, terminating as a local access cul-de-sac.

Year 2021 Total Traffic Conditions

- This analysis assumed that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place, with limited re-distributed trips from SW Tualatin-Sherwood Road.
- All study intersections are forecast to operate acceptably and meet the jurisdictional mobility standards during the weekday AM and PM peak hours, except:
  - Similar to existing and background traffic conditions, the SW Oregon Street / SW Tualatin-Sherwood Road intersection is forecast to operate with a volume to capacity ratio greater than 1.0 during the PM peak hour.
  - Under total traffic conditions only, the SW Oregon Street / SW Tonquin Road intersection is forecast to operate with a volume to capacity ratio greater than 1.0 during the PM peak hour.
- A *SimTraffic* queuing analysis showed that under year 2021 total traffic conditions, most 95th percentile queues can generally be accommodated by the existing or assumed lane storage capacities. However, east-west queues on SW Tualatin-Sherwood Road may extend to adjacent intersections during peak hours.

Year 2025 Background Traffic Conditions

- In addition to the Blake Road connection from SW Oregon Street to SW 124th Avenue, the year 2025 background analysis also assumes Washington County's planned and funded widening of SW Tualatin-Sherwood Road to five lanes has been completed.
- All study intersections are forecast to operate acceptably and meet the jurisdictional mobility standards during the weekday AM and PM peak hours, except:
  - The SW Oregon Street / SW Tonquin Road intersection is forecast to operate with a volume to capacity ratio greater than 1.0 during the PM peak hour.

Year 2025 Total Traffic Conditions

- In addition to the Blake Road connection from SW Oregon Street to SW 124th Avenue, the year 2025 total analysis also assumed that SW Tualatin-Sherwood Road has been widened to five lanes.
- All study intersections are forecast to operate acceptably and meet the jurisdictional mobility standards during the weekday AM and PM peak hours, except:
  - The SW Oregon Street / SW Tonquin Road intersection is forecast to continue operating with a volume to capacity ratio greater than 1.0 during the PM peak hour. The proposed site traffic contributes 2.36% of the projected future total traffic through the intersection during the critical PM peak hour.

- A *SimTraffic* queuing analysis showed that under year 2025 total traffic conditions, most 95th percentile queues can generally be accommodated by the existing or assumed lane storage capacities.

Supplemental Access Analysis

- Per City of Sherwood request, a supplemental analysis was performed for a potential scenario in which SW Cipole Road would bisect the site and connect to the future Blake Road, rather than terminating as a cul-de-sac.
- A comparison of this scenario to the proposed site access led to the following findings which support limiting SW Cipole Road to a cul-de-sac ending, as proposed, rather than extending it through the site to Blake Road:
  - Traffic Operations: Regardless of whether or not SW Cipole Road is extended through the site, the adjacent study intersections are all anticipated to meet the jurisdictional mobility standard. While the extension of SW Cipole Road results in slightly improved operations at the SW Cipole Road / SW Tualatin-Sherwood Road intersection, operations remain the same or slightly deteriorate at the SW 124th Avenue / SW Tualatin-Sherwood Road, SW Cipole Road/Blake Road and SW 124th Avenue / Blake Road intersections. Therefore, there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road.
  - Traffic Safety: A connection to Blake Road would add an access point to the roadway network, introducing conflict. Limiting SW Cipole Road to a cul-de-sac ending would result in fewer unprotected left-turn conflict points on the surrounding roadway network, especially those involving large trucks.

Recommendations

Based on the analysis provided and documented herein, the proposed development can be constructed while meeting the traffic mobility and safety standards established for the surrounding transportation system, assuming Washington County completes the planned and funded widening of SW Tualatin-Sherwood Road to five lanes by 2025 and the following site traffic impact mitigation measures are made:

- Provide a proportionate cost share allocation towards the future conversion of the SW Tonquin / SW Oregon Street intersection either to a roundabout or signalized intersection.
- Modify the existing traffic signal at the SW Cipole Road / SW Tualatin-Sherwood Road intersection to accommodate the addition of the proposed south leg.
- Provide a northbound left-turn lane with 150 feet of storage exiting the site.

The SW Oregon Street / SW Tualatin-Sherwood Road intersection is anticipated to exceed jurisdictional mobility standards by 2021, with or without the T-S Corporate Park development. However, when SW

Tualatin-Sherwood Road is widening to five lanes by year 2025, the SW Oregon Street / SW Tualatin-Sherwood Road intersection will meet jurisdictional mobility standards. The planned widening will also aid in reducing existing crashes and queuing along SW Tualatin-Sherwood Road. Based on this finding, we are not recommending any mitigation associated with site development at this location.

Additionally, shrubbery and landscaping, as well as above ground utilities and signage should be appropriately located and maintained on-site and at the proposed site access to provide adequate intersection sight distance per City of Sherwood standards.

INTRODUCTION

The Applicant, Trammell Crow Company, is proposing to develop up to 547,220 square-feet of industrial park on the subject property. The site is currently vacant and is bordered by the recent extension of SW 124th Avenue to the east, SW Tualatin-Sherwood Road to the north, future industrial land uses to the west and a future east-west collector, Blake Road, to the south. The site was recently annexed into the City of Sherwood from unincorporated Washington County.

Figure 1 displays a site vicinity map and Figure 2 displays the proposed site plan. As shown in the site plan figure, SW Cipole Road will be extended into the site from SW Tualatin-Sherwood Road and terminate as a local access cul-de-sac. No site access driveways are planned on SW 124th Avenue.

Scope of Report

This study evaluates transportation conditions for the following scenarios:

- Year 2019 existing traffic conditions within the study area during the weekday AM and PM peak hours;
- Year 2021 background traffic conditions (without the proposed development) during the weekday AM and PM peak hours, assuming that the future Blake Road connection from SW Oregon Street to SW 124th Avenue is in place;
- Year 2021 total traffic conditions (with full build-out of the proposed development) during the weekday AM and PM peak hours;
- Year 2025 background traffic conditions (without the proposed development) during the weekday AM and PM peak hours, assuming that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place and that SW Tualatin-Sherwood Road has been widened to five lanes;
- Year 2025 total traffic conditions (with full build-out of the proposed development) during the weekday AM and PM peak hours;
- Supplemental analysis of total traffic conditions for a scenario in which SW Cipole Road bisects the site to connect to Blake Road, per City of Sherwood request.

Site Vicinity Map
Sherwood, Oregon

Figure
1

H:\23\23278 - Orr Property Corporate Park\dwgs\23278_TIA.dwg Jan 02, 2020 - 11:26am - cdougherty Layout Tab: Site Vicinity Map_Fig 1

KITTELSON & ASSOCIATES

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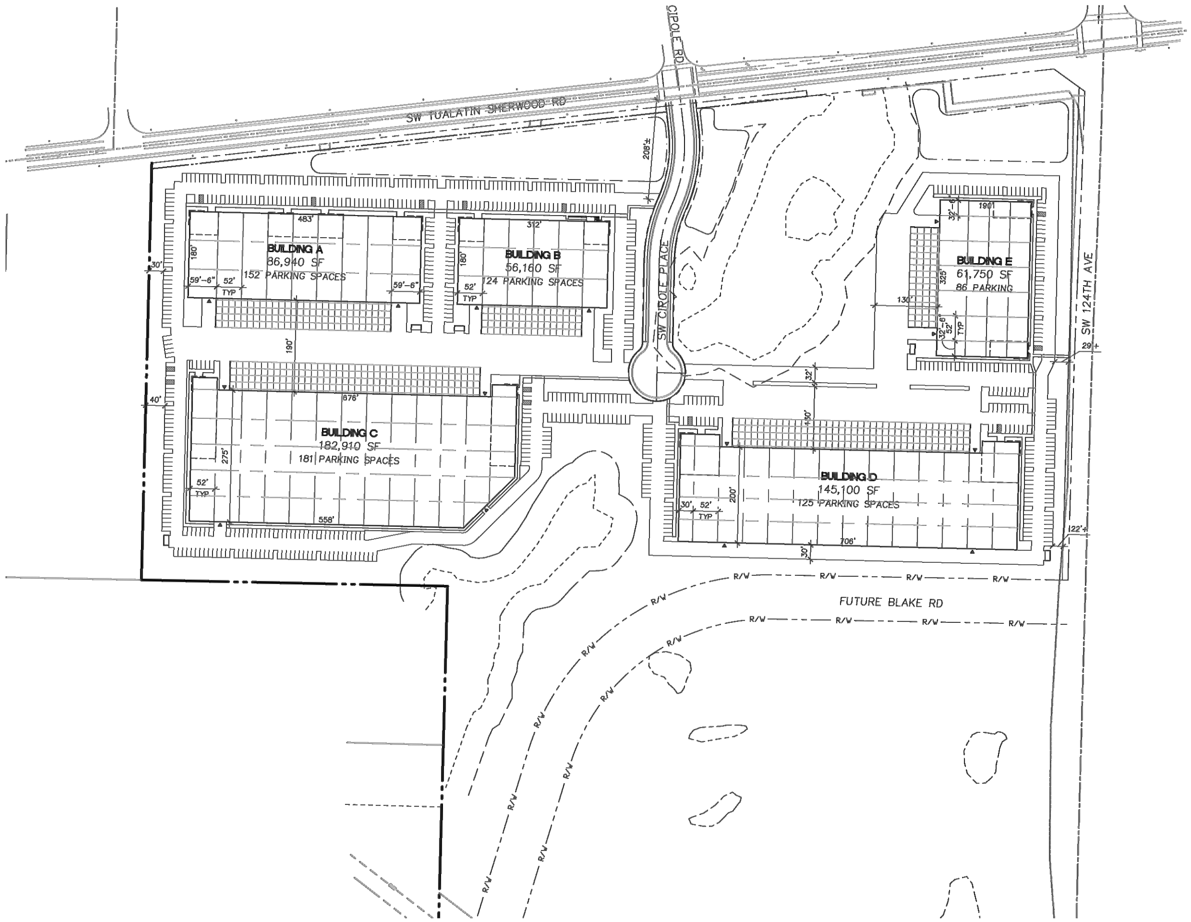

SITE DATA			
BUILDING	BLDG AREA	PARKING COUNT	PARKING PER 1000 SF
BUILDING A	86,940 SF	152	1.75
BUILDING B	56,160 SF	124	2.21
BUILDING C	182,910 SF	181	0.99
BUILDING D	145,100 SF	125	0.86
BUILDING E	61,750 SF	86	1.39
TOTAL	532,860 SF	668	1.25

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Proposed Site Plan
SW Cipole Road Cul-de-sac
Sherwood, OR

Figure 2

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KITTELSON & ASSOCIATES

The following study intersections were identified in a scoping memorandum submitted to the City of Sherwood and Washington County DLUT for review:

- SW Tualatin-Sherwood Road/SW Oregon Street;
- SW Tualatin-Sherwood Road/SW Wildrose Place;
- SW Tualatin-Sherwood Road/SW Cipole Road;
- SW Tualatin-Sherwood Road/SW 124th Avenue;
- SW Tualatin-Sherwood Road/SW 120th Avenue;
- SW Tualatin-Sherwood Road/SW 115th Avenue; and,
- SW Tualatin-Sherwood Road/SW 112th Avenue-SW Avery Street.

After further scoping discussions with the City of Sherwood, the following study intersections were added for analysis:

- SW Tualatin-Sherwood Road/SW Langer Farms Parkway;
- SW Oregon Street/SW Tonquin Road;
- SW Oregon Street/SW Murdock Road;
- Blake Road / SW 124th Avenue (future year only); and,
- Blake Road / SW Cipole Road (supplemental analysis of future year only).

Appendix "A" contains the transportation scoping memorandum prepared for this analysis.

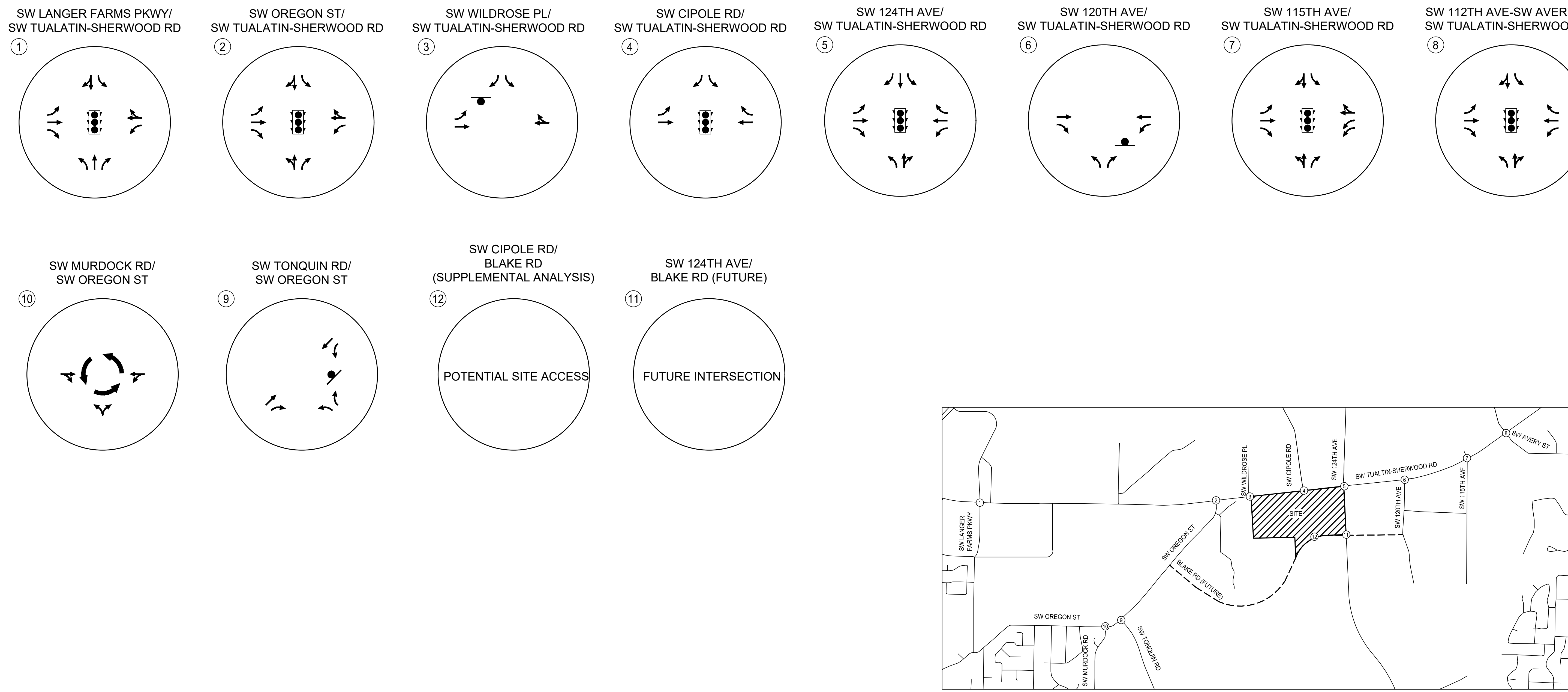
EXISTING CONDITIONS

This section summarizes the existing characteristics of the transportation system and adjacent land uses in the vicinity of the proposed development, including an inventory of the existing multi-modal transportation facilities, an evaluation of existing intersection operations for motor vehicles at the study intersections, and a summary of recent crash history.

The site vicinity was visited and inventoried in February 2019. At that time, site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area were collected. Figure 3 illustrates the existing lane configurations and traffic control devices at each of the study intersections. It should be emphasized that all observations and traffic counts were completed after the SW 124th Avenue extension became operational.

Site Conditions and Adjacent Land Uses

The proposed site was recently annexed and is now located in the City of Sherwood. The site is currently vacant and is specified as an Employment Industrial (EI) area on the City of Sherwood Zoning Map (Reference 1). The site is bordered by SW Tualatin-Sherwood Road to the north, industrial land uses to the west, SW 124th Avenue to the east, and undeveloped land to the south.



- ROUNDABOUT
- STOP SIGN
- TRAFFIC SIGNAL

Existing Lane Configuration &
Traffic Control Devices
Sherwood, Oregon

Figure
3

Transportation Facilities

Table 1 summarizes the existing attributes of the key transportation facilities in the study area.

Table 1. Existing Transportation Facilities and Roadway Designations

Roadway	Functional Classification	Number of Lanes	Posted Speed (mph)	Sidewalks?	Bicycle Lanes?	On-Street Parking?
SW Tualatin-Sherwood Road	Arterial[1]	3	45	Yes	Yes	No
SW Langer Farms Parkway	Collector[1]	3	25-30[4]	Yes	No	No
SW Oregon Street	Arterial[1]	3	35	Yes	Partial[5]	No
SW Wildrose Place	Local[1]	2	-	Yes	No	No
SW Cipole Road	Collector[1]	2	45	Partial[6]	No	No
SW 124th Avenue	Arterial[1]	2 - 5	45	Partial[7]	Partial[8]	No
SW 120th Avenue	Commercial/ Industrial Connector[2]	2	-	Partial[9]	No	No
SW 115th Avenue	Major Collector[2]	3	-	Yes	Yes	No
SW 112th Avenue / SW Avery Street	Major Collector[3]	2 - 3	35	Yes	Yes	No
SW Tonquin Road	Arterial[1]	2	45	No	No	No
SW Murdock Road	Arterial[1]		35	Partial[10]	No	Partial[11]

[1] Per City of Sherwood Transportation System Plan (Reference 2);
[2] Per 2035 Washington County Transportation System Plan (Reference 3);
[3] Per City of Tualatin Transportation System Plan (Reference 4);
[4] Posted speed limit on SW Langer Farms Parkway is 30 mph north of SW Tualatin-Sherwood Road and 25 mph south of SW Tualatin-Sherwood Road;
[5] A bike lane exists on SW Oregon Street from SW Murdock Road to approximately 800 feet south of SW Tualatin-Sherwood Road;
[6] There is existing sidewalk on the east side of SW Cipole Road, and intermittent sidewalk on the west side;
[7] Sidewalk exists on both sides of SW 124th Avenue, north of SW Tualatin-Sherwood Road. No sidewalk is provided south of SW Tualatin-Sherwood Road;
[8] Striped bicycle lanes are provided along SW 124th Avenue, north of SW Tualatin-Sherwood Road. South of SW Tualatin-Sherwood Road, 7-foot wide paved shoulders are available to cyclists;
[9] Sidewalk only exists on the east side of SW 120th, south of SW Tualatin-Sherwood Road to the first driveway, approximately 275 feet total;
[10] Sidewalk exists only on the west side of SW Murdock Road;
[11] On-street parking is provided on the west side of SW Murdock Road.

Non-Motorized Facilities

As shown in Table 1, SW Tualatin-Sherwood Road, SW Cipole Road, and SW 124th Avenue, north of SW Tualatin-Sherwood Road, have sidewalks in the immediate site vicinity. Sidewalks are not provided on SW 124th Avenue, south of SW Tualatin-Sherwood Road. Bicycle access within the study area is primarily provided with on-street bicycle lanes. SW Tualatin-Sherwood Road has buffered bicycle lanes. All signalized and roundabout study intersections have marked crosswalks.

Transit Facilities

Local transit service is currently provided within the site vicinity by TriMet (Reference 5). TriMet Line 97 provides service between Sherwood and the Tualatin WES Station via SW Tualatin-Sherwood Road, Monday through Friday from 6:20 AM to 9:30 AM and 3:10 PM to 7:00 PM on 30-minute headways. Line 97 does not have scheduled service on Saturday or Sunday. Line 97 transit stops are located within 200 feet of the SW Tualatin-Sherwood Road / SW Cipole Road intersection, close to the study site.

TriMet Line 93 provides service between Sherwood and the Tigard Transit Center via SW Sherwood Boulevard, SW Langer Drive, SW Baler Way, and SW Tualatin-Sherwood Road (west of SW Baler Way) Monday through Sunday from 4:30 AM to 1:00 AM on approximately 45-minute headways. The closest Line 93 transit stop is located approximately 1.5 miles west of the study site. Trimet Line 94 follows a similar route, with additional weekday express service from Sherwood and Tigard to Portland City Center.

Traffic Safety

The reported crash history at the existing study intersections was reviewed to identify potential safety issues. Oregon Department of Transportation (ODOT) provided crash records for the study intersections for the most recently available five-year period, from January 1, 2013 through December 31, 2017. Table 2 summarizes the reported crash data at the study intersections over the five-year period and shows the calculated crash rates per million entering vehicles for each study intersection. Note that the summarized ODOT intersection crash data may not encompass all intersection-related crashes occurring further from the intersection due to corridor congestion. *Appendix "B" contains the crash data obtained from ODOT.*

Table 2: Intersection Crash History (January 1, 2013 – December 31, 2017)

#	Intersection	Collision Type				Severity			Total Crashes	Crash Rate (per MEV[2])
		Rear-End	Turning	Angle	Other	PDO[1]	Injury	Fatal		
1	SW Langer Farms Parkway/ SW Tualatin-Sherwood Road	13	9	1	-	11	12	0	23	0.52
2	SW Oregon Street/ SW Tualatin-Sherwood Road	16	23	1	1	23	18	0	41	0.96
3	SW Wildrose Place/ SW Tualatin-Sherwood Road	1	3	-	1	2	3	0	5	0.13
4	SW Cipole Road/SW Tualatin-Sherwood Road	14	2	-	1	5	12	0	17	0.43
5	SW 124th Avenue/SW Tualatin-Sherwood Road	28	3	-	1	12	20	0	32	0.82[3]
6	SW 120th Avenue/SW Tualatin-Sherwood Road	2	1	-	1	1	3	0	4	0.12
7	SW 115th Avenue/SW Tualatin-Sherwood Road	7	4	-	-	1	10	0	11	0.30
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	23	9	1	-	16	17	0	33	0.93
9	SW Oregon Street/ SW Tonquin Road	1	3	-	-	3	1	0	4	0.18
10	SW Oregon Street/ SW Murdock Road	1	-	-	-	1	0	0	1	0.05

[1] PDO = Property Damage Only
[2] MEV = Million Entering Vehicles, calculated using 2019 PM peak hour volumes
[3] MEV calculation for SW 124th Avenue / SW Tualatin-Sherwood road intersection does not include counted vehicles to/from the south leg, as that approach opened to traffic in late 2018, and is therefore not represented in crash data.

Table 3 provides a comparison between the calculated crash rates for each intersection and the published 90th percentile crash rates from the *Assessment of Statewide Intersection Safety Performance* (Reference 6) per ODOT methodology as described in the *Analysis Procedure Manual* (Reference 7).

Table 3: Intersection Crash Rate Assessment

#	Intersection	Total Crashes	90th Percentile Crash Rate	Observed Crash Rate at Intersection	Observed Crash Rate > 90th Percentile Crash Rate?
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	23	0.86	0.52	No
2	SW Oregon Street/SW Tualatin-Sherwood Road	41	0.86	0.96	***Yes***
3	SW Wildrose Place/SW Tualatin-Sherwood Road	5	0.293	0.13	No
4	SW Cipole Road/SW Tualatin-Sherwood Road	17	0.509	0.43	No
5	SW 124th Avenue/SW Tualatin-Sherwood Road[1]	32	0.509[1]	0.82	***Yes***
6	SW 120th Avenue/SW Tualatin-Sherwood Road	4	0.290	0.12	No
7	SW 115th Avenue/SW Tualatin-Sherwood Road	11	0.86	0.30	No
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	33	0.86	0.93	***Yes***
9	SW Oregon Street/ SW Tonquin Road	4	0.293	0.18	No
10	SW Oregon Street/ SW Murdock Road	1	0.509[2]	0.05	No

[1]Compared to 3-leg signalized intersection rate.
[2]3-leg roundabout rates not published, therefore comparing to 3-leg signalized intersection rate.

As highlighted in Table 3, the observed crash rate exceeds the applicable 90th percentile crash rate at the following study intersections:

- SW Oregon Street/SW Tualatin-Sherwood Road
- SW 124th Avenue/SW Tualatin-Sherwood Road
- SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road

SW Oregon Street/SW Tualatin-Sherwood Road

The SW Oregon Street/SW Tualatin-Sherwood Road intersection currently operates permitted-only northbound and southbound left-turn movements. The eastbound/westbound left-turn movements are permitted-protected and incorporate Flashing Yellow Arrow (FYA) operations on the mainline street of SW Tualatin-Sherwood Road.

Of the 41 reported crashes at this intersection, a large component (16) were rear-end related. This type of crash pattern is typical for signalized intersections experiencing heavy traffic demand along arterial corridors, where the stop-and-go effect created by the signal cycles creates vehicle queues that result in rear-end crashes. The frequency of this crash pattern may reduce once SW Tualatin-Sherwood Road is widened from three to five lanes.

Turning type crashes were the most prevalent type of crash reported for this intersection (23), involving left-turns on the mainline and turn movements from the minor street approach. To help reduce this frequency of this crash patterns, it is recommended that Washington County review the signal timing plans and identify possible lengthening of the red clearance times between phases. Also, because SW Tualatin-Sherwood Road only has a single through lane in each direction, left-turn drivers may not be finding acceptable gaps in oncoming traffic due to heavy demand during the peak travel periods. Once Tualatin-Sherwood Road is widened to five lanes, drivers may find more acceptable gaps to make these left turns without conflict.

SW 124th Avenue/SW Tualatin-Sherwood Road

Though not reflected in the historic crash data, a fourth (northbound) approach was added to the SW 124th Avenue/SW Tualatin-Sherwood Road intersection in late 2018. At that time, additional intersection modifications were made, including permitted-protected left-turn movements with FYA left-turn for all approaches. These improvements, while adding capacity to the overall intersection, may not affect the most prevalent crash pattern, where 28 of the 32 reported crashes were rear-end. However, the frequency of this type of crash may reduce once SW Tualatin Road is widened from three lanes to five lanes and vehicle queues created by the stop-and-go effect of the signal cycles is reduced.

SW 112th Avenue- SW Avery Street/SW Tualatin-Sherwood Road

The SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road intersection currently operates protected left-turn phasing northbound and southbound, whereas the eastbound/westbound left-turn movements from Tualatin-Sherwood Road are operated under permitted-protected phasing and incorporate Flashing Yellow Arrow (FYA) operations.

Of the 33 reported crashes at this intersection, the largest component (23) were rear-end related. Like other signalized intersections in the Tualatin-Sherwood Road corridor, this type of crash pattern is common and due to heavy traffic demand along the arterial corridor, where the stop-and-go effect created by the signal cycles creates vehicle queues that result in rear-end crashes. The frequency of this crash pattern may reduce once SW Tualatin-Sherwood Road is widened from three to five lanes.

ODOT and Washington County SPIS Review

ODOT and Washington County maintain Safety Priority Index System (SPIS) lists to identify existing hazardous intersections for potential safety improvements. The SPIS lists consider the crash data for the 3 prior years. The ODOT-published 2017 Washington County SPIS list (Reference 8) and the Washington County maintained 2014-2016 SPIS list (Reference 9) were reviewed to determine if any study intersections were identified as having an SPIS score in the top 10 percent and ranking amongst other projects. The SPIS score is calculated based on three factors:

- Frequency of crashes (25% of the SPIS score)
- Rate of crashes (25% of the SPIS score)
- Severity of crashes (50% of the SPIS score)

ODOT Published 2017 Washington County SPIS List

The study intersection of SW 115th Avenue and SW Tualatin-Sherwood Road is identified with an SPIS score of 80.23 out of 100 on the ODOT published Washington County SPIS list. No other study intersections were identified on the ODOT published SPIS list.

Washington County SPIS List 2014-2016

Five study intersections are identified on the Washington County maintained SPIS 2014-2016 list, with ranking and SPIS scores as follows:

- SW 124th Avenue and SW Tualatin-Sherwood Road is ranked 20th on the list, with an SPIS score of 78.3 out of 100; and
- SW 112th Avenue-SW Avery Street and SW Tualatin-Sherwood Road is ranked 22nd on the list, with an SPIS score of 78.3 out of 100; and
- SW Cipole Road and SW Tualatin-Sherwood Road is ranked 29th on the list, with an SPIS score of 75.7 out of 100; and
- SW Oregon Street and SW Tualatin-Sherwood Road is ranked 30th on the list, with an SPIS score of 75.7 out of 100; and
- SW Langer Farms Parkway and SW Tualatin-Sherwood Road is ranked 146th on the list, with an SPIS score of 42.0 out of 100.

As stated previously, the three intersections identified with observed crash rates greater than the ODOT 90th percentile crash rates and the six intersections identified on the ODOT or Washington County SPIS lists will be impacted by Washington County's planned widening of SW Tualatin-Sherwood Road from three lanes to five lanes, which will add capacity to the corridor and provide Washington County with an opportunity for incorporating design elements to improve safety.

Traffic Operations Analysis Methodology

All level-of-service analyses described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (HCM) (Reference 10). The peak 15-minute flow rates were used in the evaluation of all intersection level-of-service (LOS) and volume-to-capacity (V/C) ratios. For this reason, the analyses reflect conditions that are only likely to occur for the peak 15 minutes out of each average peak hour. Traffic conditions during non-peak weekday hours are expected to operate with lower levels of delay than those described in this report. The signalized and stop-controlled intersection operations analyses presented in this report were completed using Synchro 10 software. The roundabout intersection operations analyses were completed using SIDRA 7 software, based on the procedures stated in the *Highway Capacity Manual, 6th Edition* (HCM 6th Ed., Reference 11).

Traffic Operating Standards

Per Section 8 of Sherwood's 2014 Transportation System Plan, "The City target for signalized, all way stop (AWSC), or roundabout intersections is level of service D or volume to capacity ratio equal to or less than 0.85. The target for unsignalized two way stop control (TWSC) intersections is level of service E or a volume to capacity ratio equal to or less than 0.90."

For those streets owned by Washington County or city-owned streets that are labeled on the Arterial and Throughway Network Map of Metro's 2014 Regional Transportation Plan (Reference 12), a Regional 0.99 volume to capacity (V/C) operating standard applies. The Arterial and Throughway Network Map identifies SW Tualatin-Sherwood Road as a Major Arterial and SW Oregon Street as a Minor Arterial. As all existing study intersections are along SW Tualatin-Sherwood Road or SW Oregon Street, the 0.99 V/C operating standard will be used. Additionally, as SW 124th Avenue extension is also identified as a Minor Arterial on the Arterial and Throughway Network, the 0.99 V/C standard will also be used for the assumed future TWSC intersection of Blake Road and SW 124th Avenue.

Existing Traffic Operations

Intersection turning-movement counts were conducted at the study intersections when local area schools were in session in February 2019, and after the new extension of SW 124th Avenue was operational. All the weekday counts were conducted on a typical mid-week day during the morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak time periods. From the counts, the weekday AM peak hour was found to occur from 7:20 to 8:20 AM and the PM peak hour occurs from 4:45 to 5:45 PM. *Appendix "C" contains the February 2019 traffic count worksheets.*

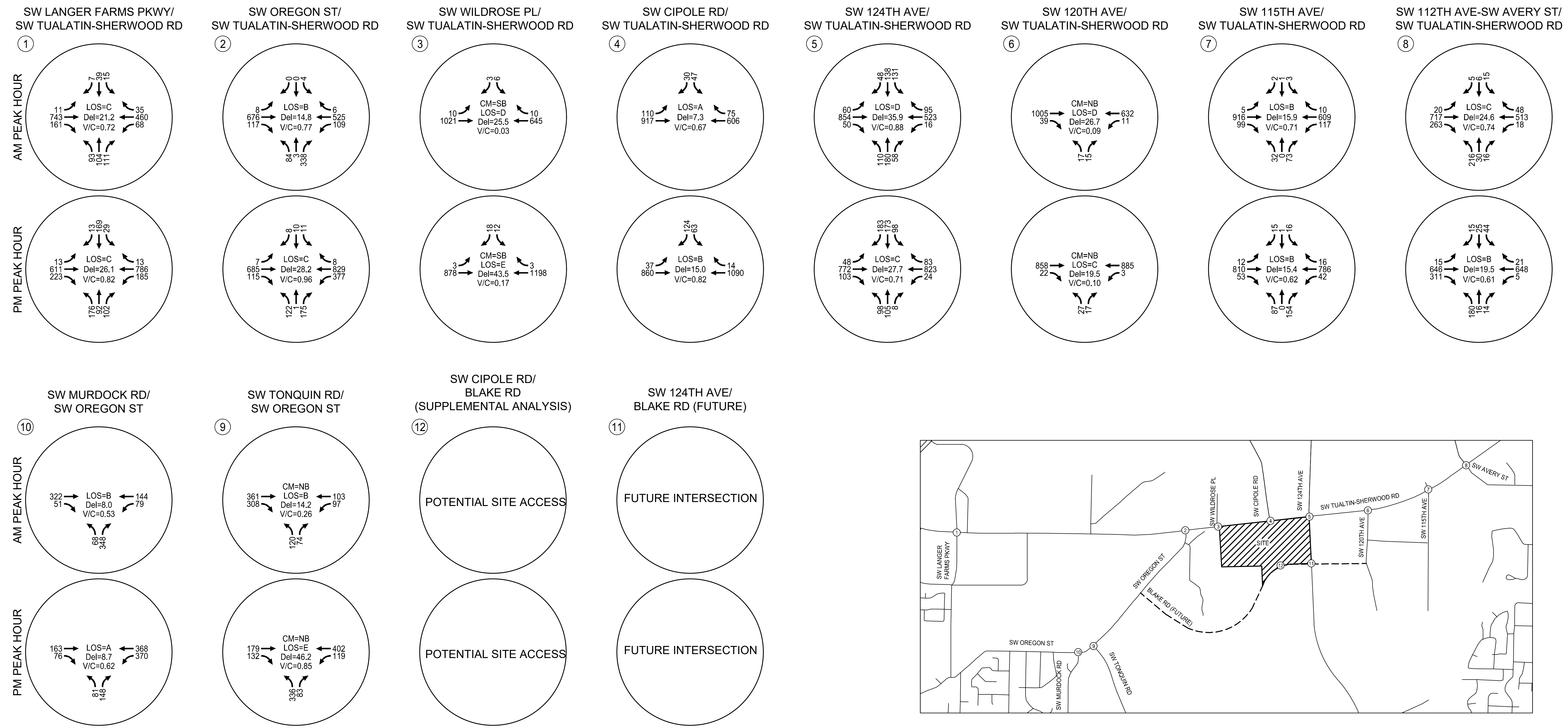
Table 4 and Figure 4 summarize the operational analysis for the study intersections under existing traffic conditions for the weekday AM and PM peak hours. As shown, all study intersections currently operate at levels that meet the jurisdictional mobility standards. However, as observed in the field, and reported within the queuing outputs in the Synchro worksheets, vehicle queueing is prevalent in the east-west directions along the SW Tualatin-Sherwood Road corridor during both AM and PM peak hours indicating oversaturated conditions.

Appendix "D" contains the year 2019 existing traffic level-of-service and queuing worksheets.

Table 4: Existing Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Standard	Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (21.2)	C (26.1)	0.72	0.82	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (14.8)	C (28.2)	0.77	0.96	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	D (25.5)	E (43.5)	0.03 (SB)	0.17 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (7.3)	B (15.0)	0.67	0.82	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road[1]	D (35.9)	C (27.7)	0.88	0.71	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (26.7)	C (19.5)	0.09 (NB)	0.10 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (15.9)	B (15.4)	0.71	0.62	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	C (24.6)	B (19.5)	0.74	0.61	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	B (14.2)	E (46.2)	0.26	0.85 (NB)	Regional	V/C of 0.99	Yes
10	SW Oregon Street/ SW Murdock Road	A (8.0)	A (8.7)	0.53	0.62	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	N/A	N/A	N/A	N/A	Regional	V/C of 0.99	N/A

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP);
N/A = Not applicable. Intersection does not yet exist.



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Existing Year 2019 Traffic Conditions Weekday AM and PM Peak Hours Sherwood, Oregon

Figure 4

KITTELSON & ASSOCIATES

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TRAFFIC IMPACT ANALYSIS

The future conditions analysis identifies how the transportation facilities within the study area will operate in the proposed project completion year of 2021 and in year 2025, which is the anticipated completion year for the planned widening of SW Tualatin-Sherwood Road. The following elements were analyzed to account for the impacts of the proposed development:

- Year 2021 background traffic conditions (without the proposed development) during the weekday AM and PM peak hours, assuming that the future Blake Road connection from SW Oregon Street to SW 124th Avenue is in place;
- Trips generated by the proposed development and assigned to the street network, with SW Cipole Road terminating as a local access cul-de-sac within the site.
- Year 2021 total traffic conditions (with full build-out of the proposed development) during the weekday AM and PM peak hours;
- Year 2025 background traffic conditions (without the proposed development) during the weekday AM and PM peak hours, assuming that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place and that SW Tualatin-Sherwood Road has been widened to five lanes;
- Year 2025 total traffic conditions (with full build-out of the proposed development) during the weekday AM and PM peak hours;
- Supplemental analysis of total traffic conditions for a scenario in which SW Cipole Road bisects the site to connect to Blake Road, per City of Sherwood request.

Year 2021 Background Traffic Conditions

The year 2021 background traffic conditions analysis identifies how the study area's transportation system will operate without the proposed development. This analysis includes trips from traffic attributed to general growth in the region (application of a 1.5 percent annual growth rate), but does not include traffic from the proposed development.

In-process trips from the following developments were also included in the background traffic volumes:

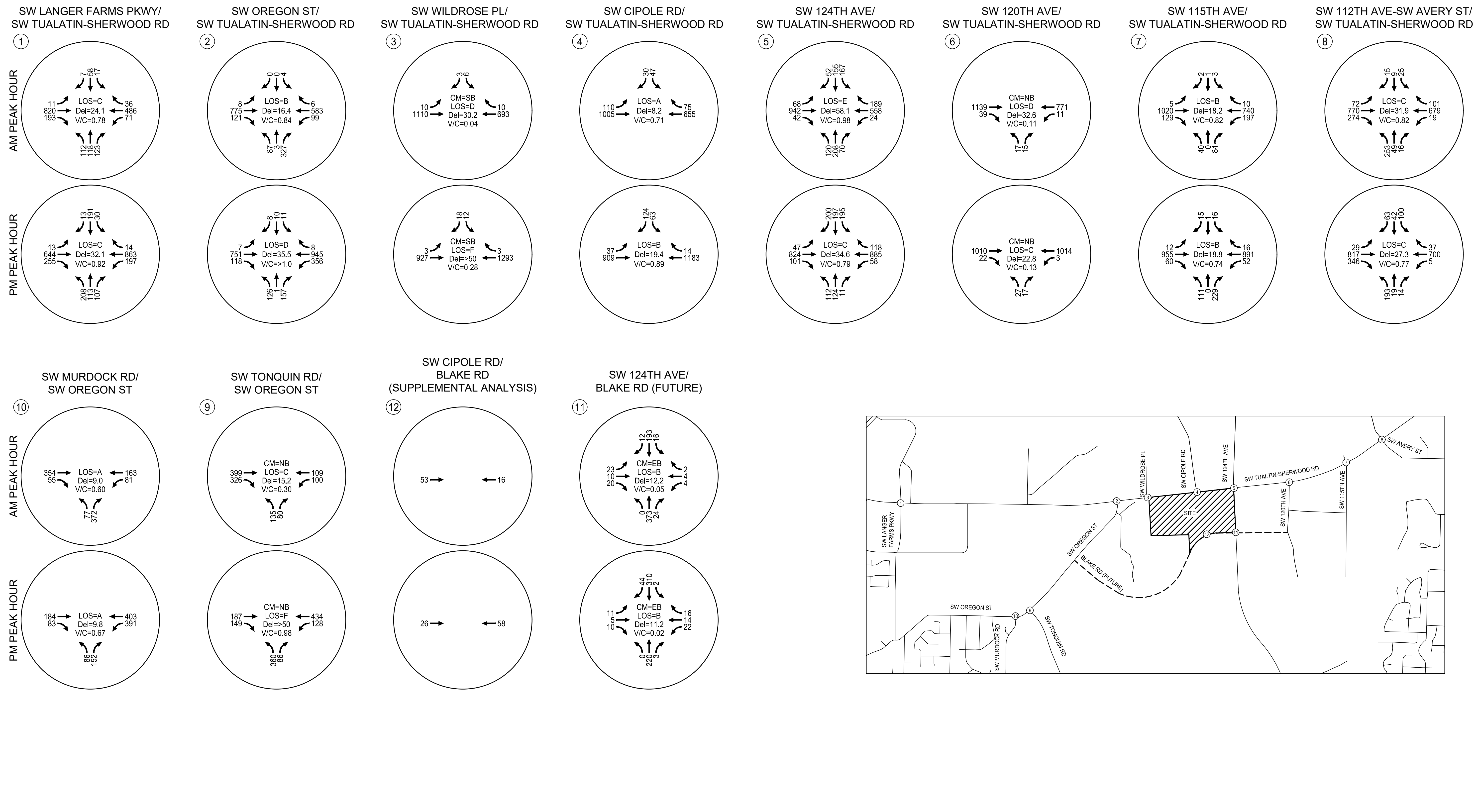
- Parkway Village South (SW Langer Farms Parkway)
- Spring Creek Industrial
- Four-S Corporate Warehouse
- IPT Tualatin
- Majestic SW 115th Avenue Industrial Park
- Hedges C Building
- Tualatin Business Park

Additionally, it was assumed that Blake Road would be in place from SW Oregon Street to SW 124^{th} Avenue, with minor re-distribution of trips from the SW Oregon Street / SW Tualatin-Sherwood Road and SW 124^{th} Avenue / SW Tualatin-Sherwood Road intersections.

The future year analyses assume the re-coordination of the traffic signals in the SW Tualatin-Sherwood Road corridor at the SW Cipole Road, SW 124^{th} Avenue, SW 115^{th} Avenue and SW 112^{th} Avenue /SW Avery Street intersections. While existing signal timing parameters provided by Washington County show that during the AM peak hour, the SW Cipole Road and SW 124^{th} Avenue signals operate with a coordinated 120 second cycle length and the SW 115^{th} and SW 112^{th}/SW Avery Street signals operate with a coordinated 140 second cycle, the future years analysis assumed that all four signals would be coordinated with 150 second cycle length during the AM peak, accounting for the addition of the northbound approach at the SW 124^{th} Avenue intersection and regional growth. No cycle length changes were assumed in the future year PM peak hour analysis, as Washington County recently implemented changes at the SW Tualatin-Sherwood Road/SW Cipole Road and SW Tualatin-Sherwood Road/SW 124^{th} Avenue intersections, such that both intersections now operate as fully-actuated, uncoordinated signals, with AutoMax enabled during the PM peak hour. The coordination offset for the other coordinated signals was optimized to account for future traffic patterns.

Figure 5 and Table 5 summarize the operational analysis for the study intersections under the weekday AM and PM peak hour background 2021 traffic conditions. As indicated in Table 5, all study intersections are forecast to operate at levels which meet the jurisdictional mobility standards during both weekday AM and PM peak hours, except for the SW Oregon Street / SW Tualatin-Sherwood Road intersection. However, as noted later in this report, when SW Tualatin-Sherwood Road is widening to five lanes by year 2025, the SW Oregon Street / SW Tualatin-Sherwood Road intersection will meet jurisdictional operating standards.

Appendix "E" contains the year 2021 background traffic level-of-service worksheets, including Figures E-1 detailing the in-process trips and E-2 showing the re-distributed Blake Road trips included in the background traffic volumes.



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Year 2021 Background Traffic Conditions Weekday AM and PM Peak Hours Sherwood, Oregon

Figure 5

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Table 5: Year 2021 Background Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	A (24.1)	C (32.1)	0.78	0.92	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (16.4)	D (35.5)	0.84	***1.01***	Regional	V/C of 0.99	***No***
3	SW Wildrose Place/SW Tualatin-Sherwood Road	D (30.2)	F (76.7)	0.04 (SB)	0.28 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (8.2)	B (19.4)	0.71	0.89	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (58.1)	C (34.6)	0.98	0.79	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (32.6)	C (22.8)	0.11 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (18.2)	B (18.8)	0.82	0.74	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	C (31.9)	C (27.3)	0.82	0.77	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.2)	F (72.1)	0.30	0.98	Regional	V/C of 0.99	Yes
10	SW Oregon Street/ SW Murdock Road	A (9.0)	A (9.8)	0.60	0.67	Regional	V/C of 0.99	Yes
11	SW 124th Avenue / Blake Road	B (12.2)	B (11.2)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

Proposed Development Plan

The proposed development consists of up to 547,220 square-feet of industrial park. Site access is proposed via an extension of SW Cipole Road into the site, terminating as a local access cul-de-sac. Development is expected to be complete by year 2021.

Trip Generation

A trip generation estimate for the proposed development was prepared based on the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 10th Edition (Reference 13). Table 6 displays the estimated trip generation for the proposed site, assuming the site is fully developed to a maximum of 547,200 square-feet of industrial park use.

Table 6. Estimated Site Trip Generation

Land Use Category	ITE Code	Size (SF)	Total Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Industrial Park	130	547,220	1,844	219	177	42	219	46	173

Per comments received from the City of Sherwood on the scoping memorandum, weekday peak hour driveway counts were conducted at a similar industrial park development nearby, to confirm that the ITE land use code for *Industrial Park* would not underestimate trips for the planned development. Counts were collected during peak periods for three consecutive weekdays and analysis showed a trip generation rate of approximately half that of ITE *Industrial Park* land use code. Therefore, for a conservative analysis, the ITE trip generation as presented in Table 6 was carried forward for the traffic analysis.

Trip Distribution

Based on a review of general traffic patterns in the region, the proposed land use and external site access patterns, and prior history of our firm's involvement on other development projects in the City of Sherwood, the following site trip distribution was utilized:

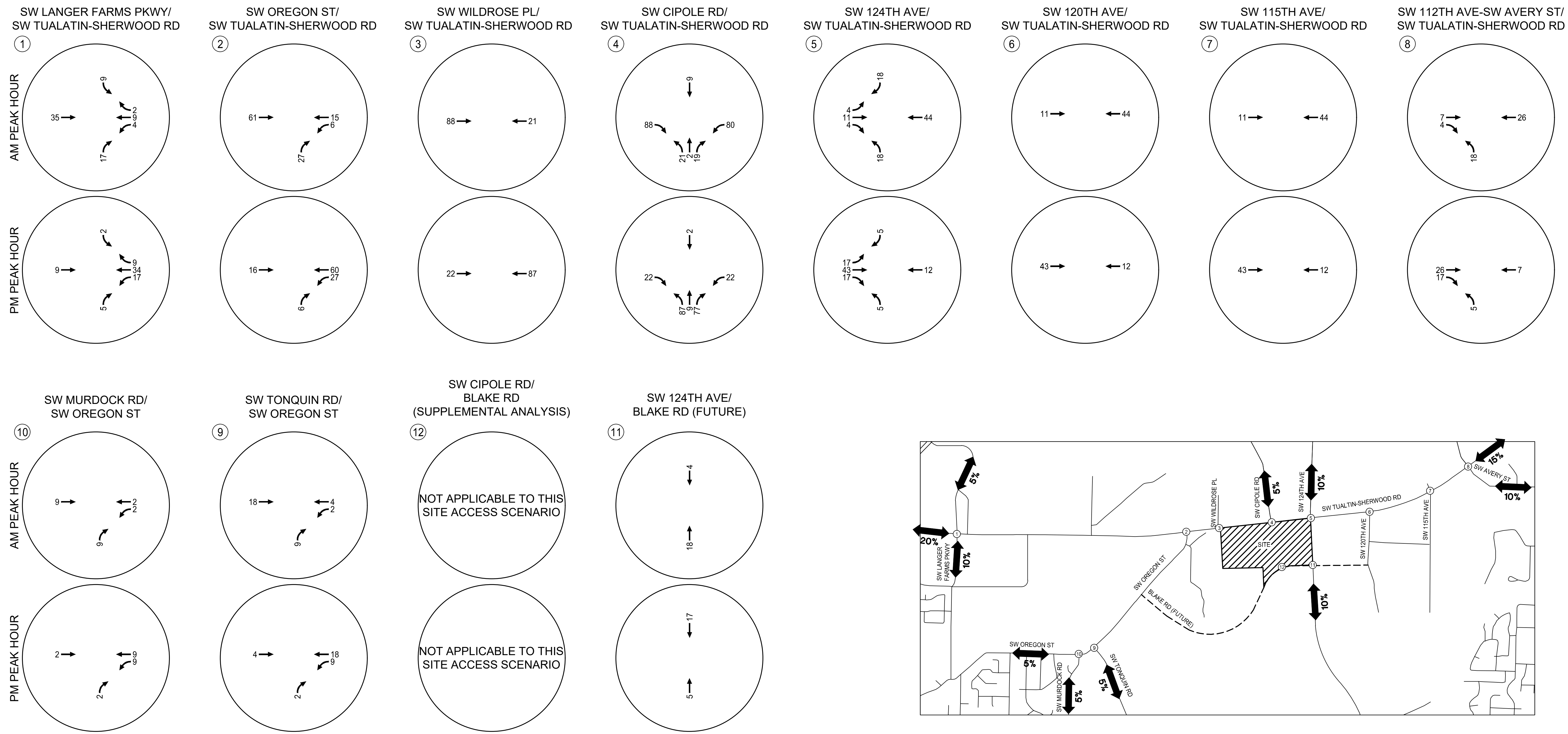
- 35 percent to/from the west via SW Tualatin-Sherwood Road,
- 15 percent to/from the southwest via SW Oregon Street,
- 10 percent to/from the southeast via SW 124th Avenue,
- 5 percent to/from the north via Cipole Road,
- 10 percent to/from the north via SW 124th Avenue,
- 10 percent to/from the east via SW 112th Avenue – SW Avery Street, and
- 15 percent to/from the east via SW Tualatin-Sherwood Road.

The trip distribution percentages and trip assignment patterns are shown in Figure 6.

Site truck traffic percentage and distribution was estimated by review of the nearby industrial development driveway counts heavy vehicle percentage and turning movement counts collected at the NE 115th Avenue / SW Tualatin-Sherwood Road intersection. It was estimated that 13 percent of the proposed development traffic would be heavy vehicles during the AM peak hour and 8 percent would be heavy vehicles during the PM peak hour. The east/west directional distribution of heavy vehicles at the NE 115th Avenue / SW Tualatin-Sherwood Road intersection was generally even, therefore the heavy percentages listed above were applied evenly to each movement to and from the study site.

Year 2021 Total Traffic Conditions

The total traffic conditions analysis identifies how the study area's transportation system will operate with the proposed development trips added to the background traffic volumes. Similar to the background year 2021 analysis, this analysis assumed that Blake Road would be in place from SW Oregon Street to SW 124th Avenue, with limited re-distribution of trips from the SW Oregon Street / SW Tualatin-Sherwood Road and SW 124th Avenue/SW Tualatin-Sherwood Road intersections.



Site Trip Distribution
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure
6

Addition of the site generated trips shown in Figure 6 to the background 2021 volumes in Figure 5 results in the operational characteristics presented in Table 7 and shown in Figure 7. *Appendix "F" contains the year 2021 total traffic level-of-service worksheets.*

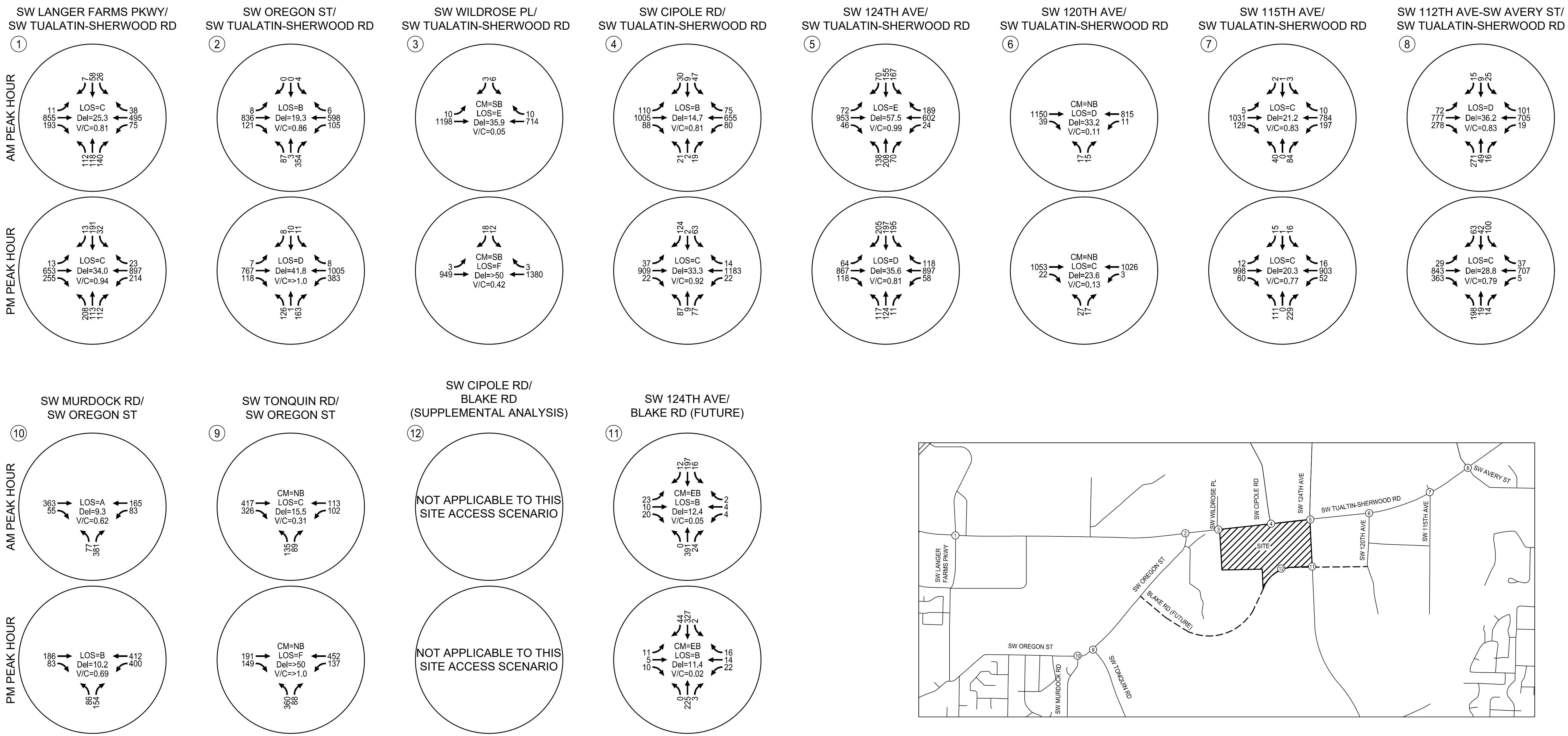
Table 7: Year 2021 Total Traffic Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (25.3)	C (34.0)	0.81	0.94	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (19.3)	D (41.8)	0.86	***1.09***	Regional	V/C of 0.99	***No***
3	SW Wildrose Place/SW Tualatin-Sherwood Road	E (35.9)	F (134.6)	0.05 (SB)	0.42 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	B (14.7)	C (33.3)	0.81	0.92	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (57.5)	D (35.6)	0.99	0.81	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (33.2)	C (23.6)	0.11 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	C (21.2)	C (20.3)	0.83	0.77	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (36.2)	C (28.8)	0.83	0.79	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.5)	F (87.2)	0.31 (NB)	***1.03 (NB)***	Regional	V/C of 0.99	***No***
10	SW Oregon Street/ SW Murdock Road	A (9.3)	B (10.2)	0.62	0.69	Regional	V/C of 0.99	yes
11	Blake Road / SW 124th Avenue	B (12.4)	B (11.4)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

As indicated in Tables 5 and 7, the SW Oregon Street / SW Tualatin-Sherwood Road intersection v/c ratio is anticipated to exceed the jurisdictional operating standard during the PM peak hour, in year 2021 background conditions and with site development. However, as noted later in this report, when SW Tualatin-Sherwood Road is widened to five lanes by year 2025, the SW Oregon Street / SW Tualatin-Sherwood Road intersection will meet jurisdictional operating standards.

Additionally, as highlighted in Table 7, the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the jurisdictional operating standard during the PM peak hour with site development.



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Year 2021 - Traffic Traffic Conditions
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure 7

Year 2021 Total Traffic - Mitigation

The City of Sherwood Transportation System Plan and Five Year Capital Improvement Plan (CIP, Reference 14) identify the reconstruction of the SW Oregon Street / SW Tonquin Road intersection as a roundabout as a “short-term” improvement. Additionally, Washington County’s Transportation Development Tax (TDT) Road Project List (Reference 15) identifies the reconstruction of the SW Oregon Street / SW Tonquin Road intersection as a roundabout in the 2014 - 2024 timeframe.

However, as the timeframe and funding of the project is unclear, mitigation of the SW Oregon Street / SW Tonquin Road intersection with either the installation of a traffic signal or roundabout was investigated. As summarized in Table 8, the SW Oregon Street / SW Tonquin Road intersection can meet the jurisdictional operating standards as a signalized or roundabout intersection. *Appendix “G” contains the year 2021 total traffic conditions mitigation service worksheets for the Oregon/Tonquin intersection.*

Table 8: Year 2021 Total Traffic Conditions – Mitigation Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
9	SW Oregon Street/ SW Tonquin Road (signal)	A (7.9)	B (10.4)	0.55	0.70	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road (roundabout)	A (2.7)	B (12.0)	0.59	0.81	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout);
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

Year 2025 Background Traffic Conditions

The year 2025 background traffic conditions analysis identifies how the study area’s transportation system will operate without the proposed development. Similar to the year 2021 background analysis, the year 2025 analysis includes trips from traffic attributed to general growth in the region (application of a 1.5 percent annual growth rate), trips from the in-process developments and some re-distribution of trips, assuming the connection of Blake Road from SW Oregon Street to SW 124th Avenue.

Additionally, the 2025 background analysis accounts for the planned and funded widening of SW Tualatin-Sherwood Road to five lanes, as identified as Project #318 in the Washington County Major Streets Transportation Improvement Program (MSTIP) 3e (Reference 16). Volumes on SW Tualatin-Sherwood Road and SW 124th Avenue were increased an additional 5 percent on top of regional growth, to account for increased future demand.

Assumed lane configurations are shown in Figure 8 and match the planned widening of SW Tualatin-Sherwood Road, as determined from preliminary design layouts posted on the Washington County project website in August 2019 (Reference 17). Beyond the addition of eastbound and westbound through lanes on SW Tualatin-Sherwood Road, additional improvements anticipated in the year 2025 analyses included:

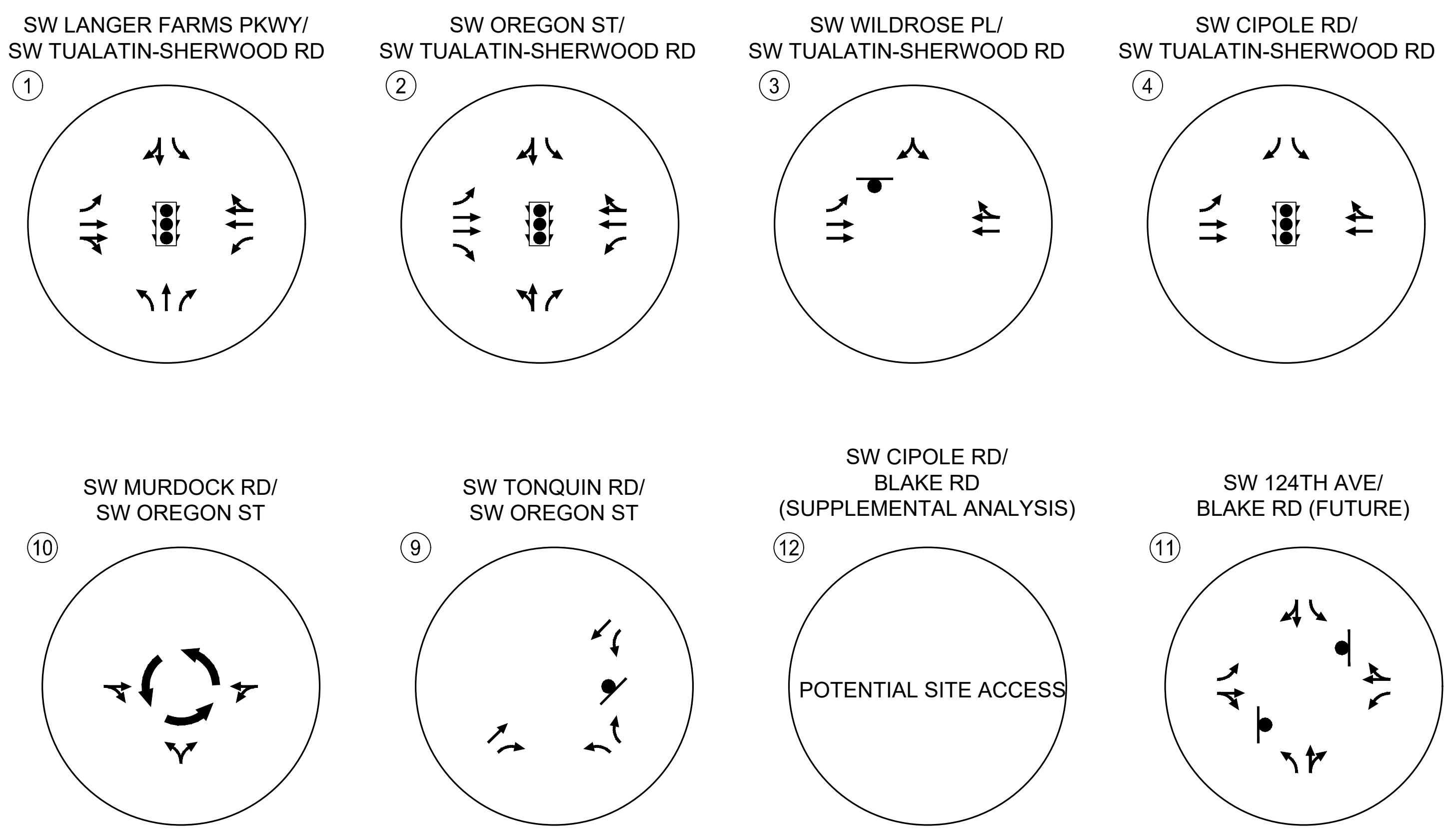
- An eastbound right-turn lane with 200 feet of storage capacity at the SW Oregon Street / SW Tualatin-Sherwood Road intersection;
- Dual left-turn lanes for the eastbound, westbound and northbound approaches to the SW 124th Avenue / SW Tualatin-Sherwood Road intersection;
    - o With the lane re-configuration, it was assumed that these movements would become protected-only left turns.
- An eastbound right-turn lane with 130 feet of storage capacity at the SW 115th Avenue / SW Tualatin-Sherwood Road intersection; and
- An eastbound right-turn lane with 300 feet of storage capacity at the SW 112th Avenue - SW Avery St / SW Tualatin-Sherwood Road.

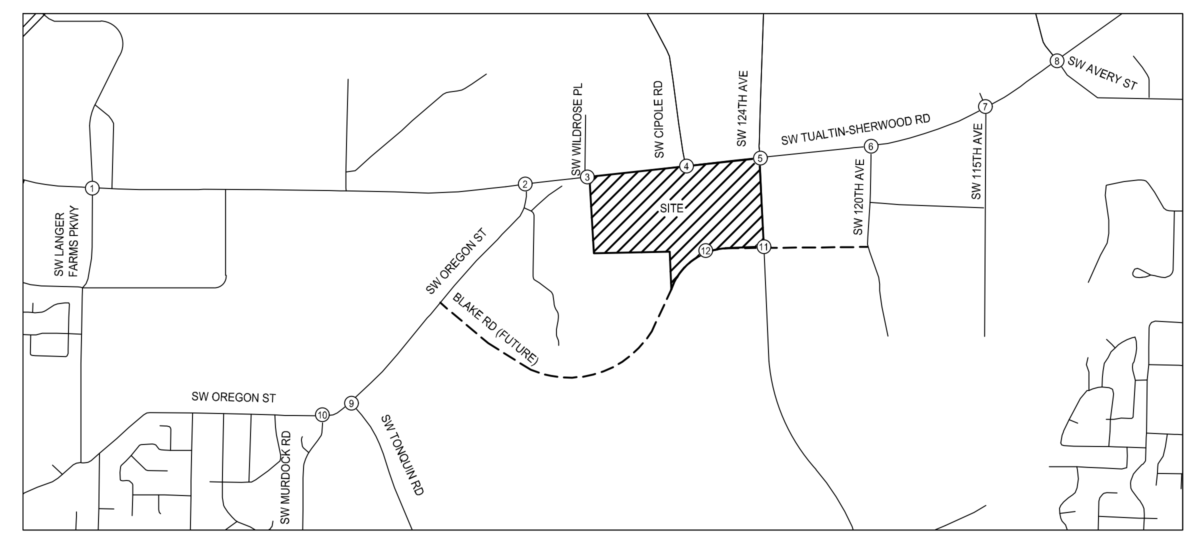
Table 9 and Figure 9 summarize the operational analysis for the study intersections under background 2025 traffic conditions during weekday AM and PM peak hours. As indicated in Table 9, all study intersections except for the SW Oregon Street / SW Tonquin Road intersection are forecast to operate at levels which meet the jurisdictional mobility standards during both weekday AM and PM peak hours. *Appendix "H" contains the year 2025 background traffic level-of-service worksheets.*

Table 9: Year 2025 Background Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	B (18.0)	C (24.9)	0.64	0.80	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (10.6)	B (16.4)	0.70	0.86	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	C (16.1)	C (21.2)	0.03 (SB)	0.06 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (5.6)	A (9.5)	0.43	0.62	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (32.0)	C (23.6)	0.64	0.60	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	F (59.5)	C (23.0)	0.22	0.13	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (15.8)	B (14.1)	0.53	0.48	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (39.2)	B (19.6)	0.62	0.53	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (16.0)	F (107.5)	0.33 (NB)	***1.09 (NB)***	Regional	V/C of 0.99	***No***
10	SW Oregon Street/ SW Murdock Road	A (9.9)	B (10.9)	0.65	0.72	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (12.7)	B (11.6)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

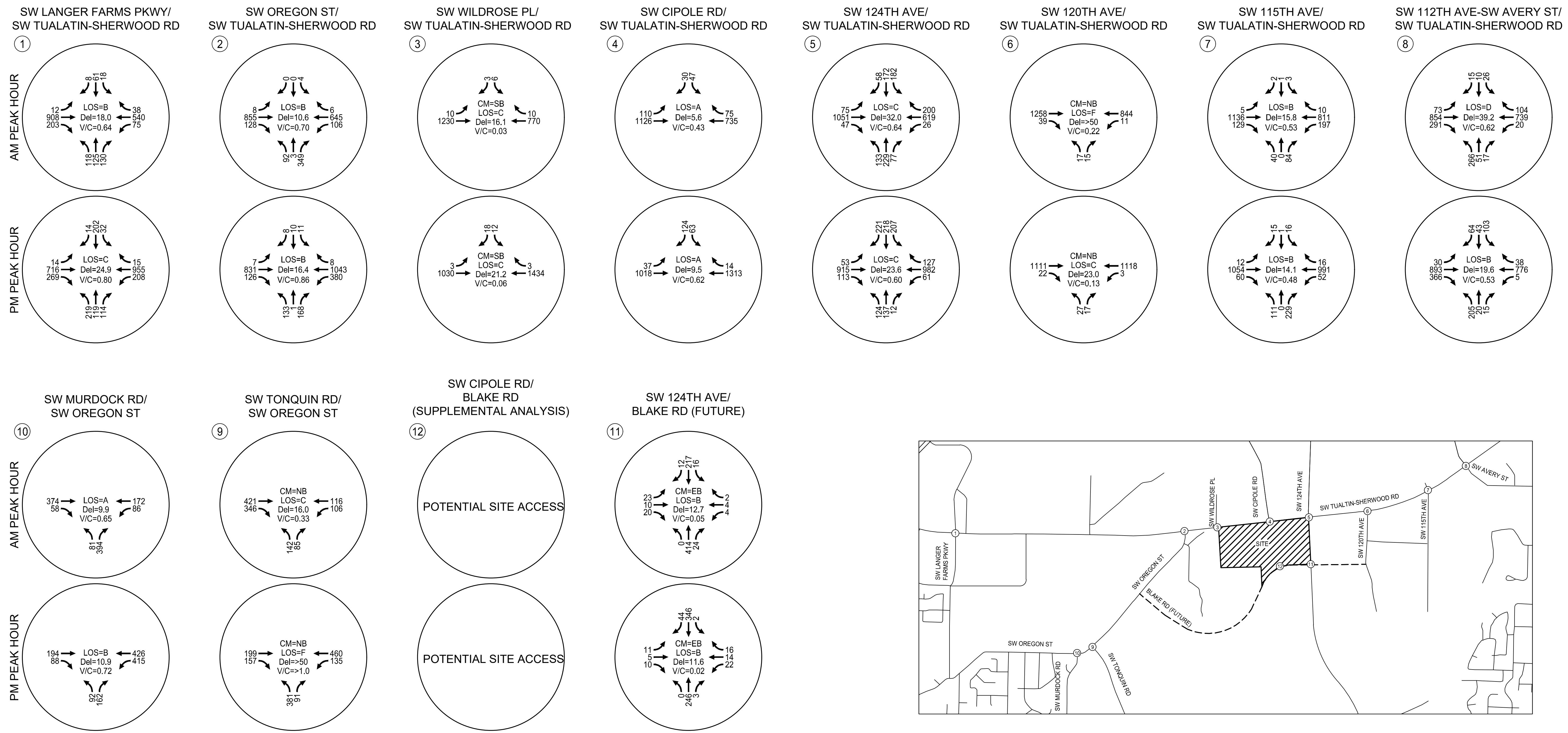




- ROUNDABOUT
- STOP SIGN
- TRAFFIC SIGNAL

Year 2025 - Assumed Lane Configuration & Traffic Control Devices
Sherwood, Oregon

Figure
8



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Year 2025 Background Traffic Conditions
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure
9

KITTELSON & ASSOCIATES

Year 2025 Total Traffic Conditions

The total traffic conditions analysis identifies how the study area's transportation system will operate with the proposed development trips added to the background traffic volumes. Similar to the background year 2025 analysis, this analysis assumed that Blake Road would be in place from SW Oregon Street to SW 124th Avenue, and assumed the 5-lane widening of SW Tualatin-Sherwood Road and associated intersection modifications.

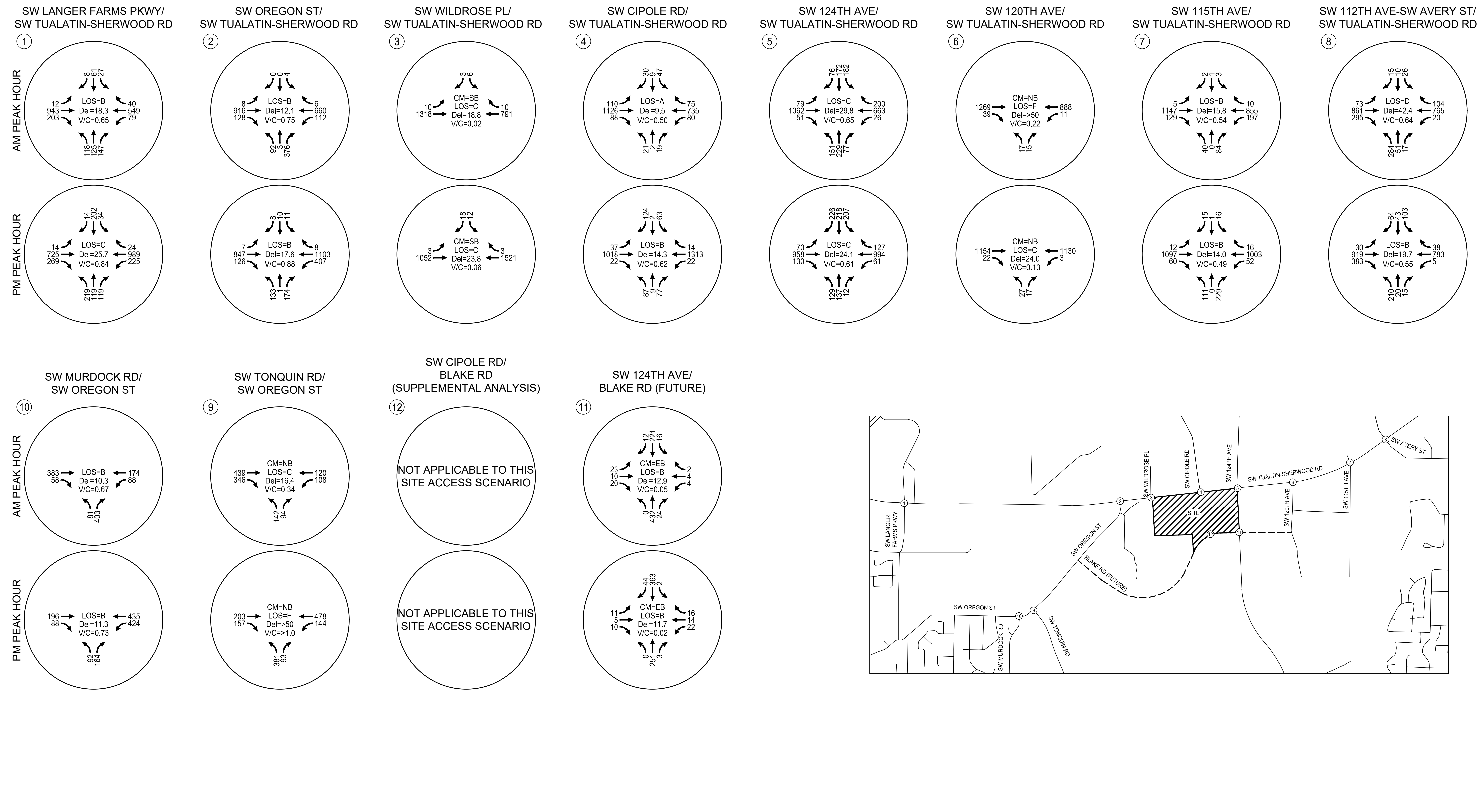
Addition of the site trips shown in Figure 7 to the background 2025 volumes in Figure 9 results in the operational results presented in Table 10 and shown in Figure 10. *Appendix "I" contains the year 2025 total traffic level-of-service worksheets.*

Table 10: Year 2025 Total Traffic Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	B (18.3)	C (25.7)	0.65	0.84	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (12.1)	B (17.6)	0.75	0.88	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	C (18.8)	C (23.8)	0.02 (SB)	0.06 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (9.5)	B (14.3)	0.50	0.62	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (29.8)	C (24.1)	0.65	0.61	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	F (61.1)	C (24.0)	0.22 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (15.8)	B (14.0)	0.54	0.49	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (42.4)	B (19.7)	0.64	0.55	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (16.4)	F (129.1)	0.34 (NB)	***1.15 (NB)***	Regional	V/C of 0.99	***No***
10	SW Oregon Street/ SW Murdock Road	B (10.3)	B (11.3)	0.67	0.73	Regional	V/C of 0.99	yes
11	Blake Road / SW 124th Avenue	B (12.9)	B (11.7)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

As highlighted in Table 10, the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the jurisdictional operating standard during the PM peak hour with site development.



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Year 2025 - Total Traffic Conditions
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure 10

H:\23\23278 - Orr Property Corporate Park\dwgs\23278_TIA.dwg Jan 15, 2020 - 1:43pm - cdougherty Layout Tab: Total culdesac 2025 Ops_Fig 10

KITTELSON & ASSOCIATES

Year 2025 Total Traffic - Mitigation

As shown in Tables 9 and 10, the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the jurisdictional operating standard during the PM peak hour in year 2025 background conditions and with site development.

As previously discussed, the timeframe and funding for intersection improvements at the SW Oregon Street / SW Tonquin Road intersection are unclear, therefore mitigation with either the installation of a temporary traffic signal or permanent roundabout was investigated. As summarized in Table 11, the SW Oregon Street / SW Tonquin Road intersection can meet the jurisdictional operating standards as a signalized or roundabout intersection. *Appendix "J" contains the year 2025 total traffic mitigation worksheets for the Oregon/Tonquin intersection.*

Table 11: Year 2025 Total Traffic Conditions – Mitigation Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
9	SW Oregon Street/ SW Tonquin Road (signal)	A (8.2)	B (10.9)	0.58	0.73	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road (roundabout)	A (2.9)	C (15.4)	0.63	0.89	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout);
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

Site Traffic Impact at SW Oregon Street/SW Tonquin Road Intersection

As the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the jurisdictional operating standard during the PM peak hour in year 2021 with site development and by year 2025, with or without site development, this section summarizes the proposed development's relative impact and influence at the intersection, to inform mitigation proportionality discussions.

The percentage of site traffic impact was calculated to show how much of the projected future total traffic at the intersection is attributable to the proposed site development. Table 12 summarizes the estimated number of site trips added, as compared to the future volumes entering at the intersection, and provides an estimate of resulting percentage traffic impact.

Table 12: Estimated Percentage of Site Traffic Impact - SW Oregon Street / SW Tonquin Road Intersection

#	Intersection	Site Trips Added to Intersection		Intersection Total Entering Trips[1]		Percentage Site Traffic Impact	
		AM	PM	AM	PM	AM	PM
9	SW Oregon Street/ SW Tonquin Road	33	33	1187	1399	2.78%	2.36%

[1]Year 2025 Total Traffic intersection peak hour volumes;

As shown in the table above, the estimated site traffic impact at the intersection ranges from 2.36% during the PM peak hour to 2.78% during the AM peak hour.

Vehicle Queuing Analysis

A 95th-percentile vehicle queuing analysis was completed under future build-out years 2021 and 2025. For the SimTraffic analysis, four 15-minute periods were recorded, with the second period representative of the peak 15-minute period, with the report results averaging five runs. *Appendix "K" contains the updated year 2021 total traffic SimTraffic worksheets and Appendix "L" contains the year 2025 total traffic SimTraffic worksheets.*

2021 Traffic Conditions Vehicle Queuing

As shown in Table 13, under year 2021 total traffic conditions, most 95th percentile queues can generally be accommodated by the existing or assumed lane storage capacities. Eastbound SW Tualatin-Sherwood Road through lane queues may extend to adjacent intersections during the AM peak hour and westbound through lane queues may extend to adjacent intersections during the PM peak hour. In the instances where demand in the striped turn bay storage is exceeded, as measured by the length of the white gore stripe, additional queue storage is available in the adjacent striped median or two-way left-turn lane (TWLTL) area, with the exception of:

- The eastbound right-turn lane at the SW Oregon Street / SW Tualatin-Sherwood Road intersection during the PM peak hour.
    - The eastbound right-turn lane 95th percentile queue is estimated at 175 feet during the PM peak, whereas the striped turn bay storage, as measured by the length of the white gore stripe, is 95 feet. Inclusive of the taper length, there is adequate storage to accommodate up to a 175-foot-long queue before potentially impacting the adjacent bike lane or eastbound through lane.
- The southbound left-turn lane during the AM and PM peak hours and the westbound right-turn lane during the PM peak hour at the SW 124th Avenue / SW Tualatin-Sherwood Road intersection.
    - The southbound left-turn lane 95th percentile queues are estimated at 275 – 325 feet, whereas the striped turn bay storage, as measured by the length of the white gore stripe, is 240 feet. Inclusive of the taper length, there is adequate storage to accommodate a 300-foot-long queue before a raised median limits additional storage. There is additional queue storage available in left-most southbound through lane, as only the right-most southbound through lane continues through the intersection.
    - The westbound right-turn lane 95th percentile queue is estimated at 425 feet, whereas the striped turn bay storage, as measured by the length of the white gore stripe, is 375 feet. Inclusive of the taper length, there is adequate storage to accommodate a 425-foot-long queue before potentially impacting the adjacent bike lane or westbound through lane.

Table 13: Year 2021 Total Traffic Conditions – 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Oregon Street / SW Tualatin-Sherwood Road		Storage (feet)	250[1]	2000	95	350[1]	1075	-	-	200[1]	200[2]	75	-	-
	Total Traffic Conditions	AM Queue	50	525	150	250	525	-	-	***225***	***400***	25	-	-
		PM Queue	50	550	***175***	***425***	650	-	-	***225***	150	50	-	-
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	1100	-	250	790	125	200	200	-	300	725	-
	Total Traffic Conditions	AM Queue	300	1025	-	150	225	50	75	75	-	175	75	-
		PM Queue	*75*	*425*	-	*125*	***825***	*50*	*150*	*125*	-	*125*	*150*	
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	790	350	375	1180	375	460	1000	-	240[3]	730	250
	Total Traffic Conditions	AM Queue	300	***975***	300	125	550	250	275	400	-	***325***	350	75
		PM Queue	125	725	350	300	***1200***	***425***	175	200	-	***275***	275	225
SW 124th Avenue / Blake Road		Storage (feet)[4]	150	800	-	150	-	-	150	1000	-	150	-	-
	Total Traffic Conditions	AM Queue	50	75	-	25	-	-	0	0	-	50	-	-
		PM Queue	50	50	-	50	-	-	0	25	-	25	-	-

Notes:

95th percentile queue lengths are reported in feet and have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;

Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;

[1]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in striped median;

[2]Northbound right turn storage measured to first intersection to the south (SW Dahlke Lane), additional storage available to the south of the intersection;

[3]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in left-most southbound through lane, as only the right southbound through lane continues through the intersection;

[4]Storage for future intersection eastbound left-turn lanes assumed to be 150 feet;

2025 Traffic Conditions Vehicle Queuing

As detailed in Table 14, under year 2025 total traffic conditions, including the planned widening of SW Tualatin-Sherwood Road, 95th percentile queues can be accommodated by the planned lane configuration storage capacity, with the exception of:

- The southbound left-turn movement at the SW Tualatin-Sherwood Road/SW 124th Avenue intersection during the AM peak hour.
  - The southbound left-turn lane 95th percentile queues are estimated at 300 feet, whereas the striped turn bay storage, as measured by the length of the white gore stripe, is 240 feet. Inclusive of the taper length, there is adequate storage to accommodate a 300-foot-long queue before a raised median limits additional storage. Additional queue storage may be available depending upon ultimate Washington County SW Tualatin-Sherwood Road Widening project intersection lane modifications. No site-generated trips are added to this movement.

Table 14: Year 2025 Total Traffic Conditions – 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Oregon Street / SW Tualatin-Sherwood Road		Storage (feet)	250[1]	2000	200[2]	350[1]	1075	1075	-	200[1]	200[5]	75	-	-
	Total Traffic Conditions	AM Queue	25	175	75	125	225	250	-	150	200	50	-	-
		PM Queue	25	200	125	275	300	300	-	150	125	50	-	-
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	1100	1100	250	790	790	200	200	-	300	725	-
	Total Traffic Conditions	AM Queue	75	150	200	125	150	175	75	50	-	150	75	-
		PM Queue	75	150	200	50	200	200	100	100	-	100	100	-
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)[3]	250	790	375	375	1180	375	300	1000	1000	240[4]	730	730
	Total Traffic Conditions	AM Queue	200	425	125	100	250	175	175	200	250	***300***	225	225
		PM Queue	150	325	125	75	275	100	100	100	100	225	175	250
SW 124th Avenue / Blake Road		Storage (feet)[6]	150	800	-	150	-	-	150	1000	-	150	-	-
	Total Traffic Conditions	AM Queue	50	75	-	25	-	-	0	25	-	50	-	-
		PM Queue	50	50	-	50	-	-	0	0	-	25	-	-

Notes:
95th percentile queue lengths are reported in feet and have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;
Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;
[1]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in striped median;
[2]Eastbound right-turn lane storage assumed to provide 200 feet of storage per intersection design as posted on Washington County SW Tualatin-Sherwood Road Widening project website.
[3]Dual left-turn lanes for the eastbound, westbound and northbound approaches to the SW 124th Avenue / SW Tualatin-Sherwood Road intersection and revisions to right-turn lane lengths assumed per intersection design as posted on Washington County SW Tualatin-Sherwood Road Widening project website.
[4]Storage measured as the length of existing white gore stripe for turn lane, additional queue storage may be available depending upon ultimate Washington County SW Tualatin-Sherwood Road Widening project intersection modifications.
[5]Storage capacity listed to first industrial driveway, additional storage available south of driveway.
[6]Storage for future intersection eastbound left-turn lanes assumed to be 150 feet.

Sight Distance

Sight distance was not evaluated for the proposed site access, since it has not yet been completely designed or constructed. The following are recommended to ensure adequate safety and operation at the site internal intersections, roadways and site access intersections:

- All intersections should be designed to ensure adequate sight distance; and
- Shrubbery, weeds, and landscaping near intersections should be designed and maintained to provide adequate sight distance.

Supplemental Access Analysis

The City of Sherwood requested that a supplemental analysis be performed for a potential scenario in which SW Cipole Road would bisect the site and connect to the future Blake Road, rather than terminating as a cul-de-sac. The same trip distribution was used for this scenario, though routing to and from the site varied. The trip assignment for this alternative access scenario is shown in Figure 11.

The assumed future TWSC intersection of SW Cipole Road and Blake Road for this supplemental analysis was compared to the City of Sherwood unsignalized TWSC intersection standards, under the assumption that properties west of SW 124th Avenue are brought into the City limits of Sherwood as planned.

2021 Level-of-Service Analysis – Alternative Access Scenario

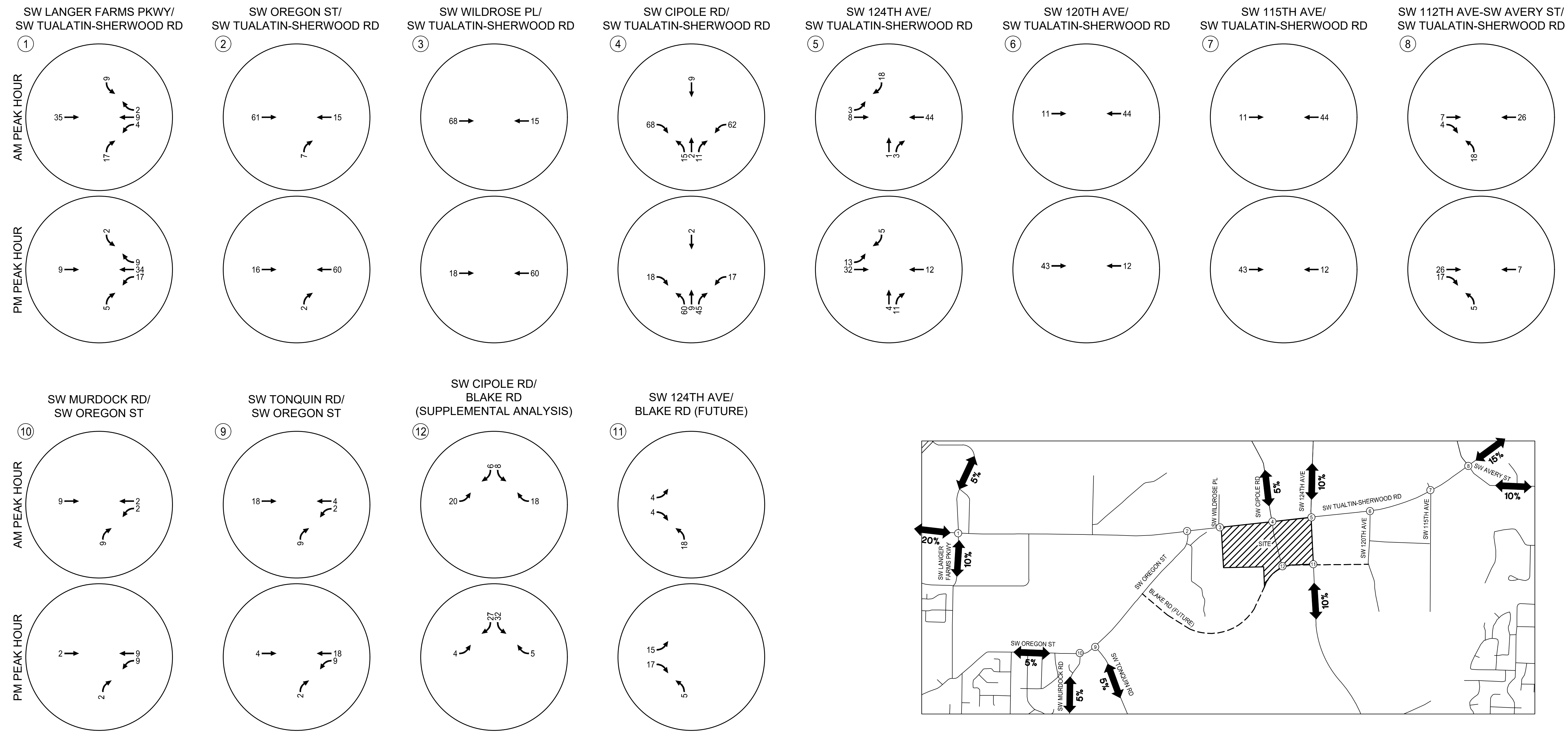
Addition of the site trips shown in Figure 11 to the background 2021 volumes in Figure 5 results in the operational characteristics presented in Table 15 and shown in Figure 12. Refer to Table 7 and Figure 7 for a comparison to the proposed site access plan. A*ppendix "M" contains the year 2021 total traffic alternative access scenario level-of-service worksheets.*

Table 15: Year 2021 Total Traffic Conditions – Alternative Access Scenario Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (25.3)	C (34.0)	0.81	0.94	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (18.3)	D (40.0)	0.85	***1.08***	Regional	V/C of 0.99	***No***
3	SW Wildrose Place/SW Tualatin-Sherwood Road	D (34.6)	F (110.8)	0.05 (SB)	0.37 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	B (13.2)	C (26.0)	0.78	0.90	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (58.3)	D (36.2)	0.99	0.81	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (33.2)	C (23.6)	0.11	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	C (21.0)	C (20.3)	0.83	0.77	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (36.3)	C (28.8)	0.83	0.79	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.5)	F (87.2)	0.31 (NB)	***1.03 (NB)***	Regional	V/C of 0.99	***No***
10	SW Oregon Street/ SW Murdock Road	A (9.3)	B (10.2)	0.62	0.69	Regional	V/C of 0.99	Yes
11	SW 124th Avenue / Blake Road	B (12.7)	B (11.5)	0.06 (EB)	0.05 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	A (9.1)	A (9.2)	0.02 (SB)	0.07 (SB)	City of Sherwood	LOS "E" or V/C of 0.90	Yes

1 HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized, roundabout) or critical movement delay (TWSC);
2 HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
3 Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

As indicated in Table 15, under year 2021 total traffic conditions, projected study intersection operations do not differ significantly from the performance expected with the proposed access.



Site Trip Distribution - Alternative Access Scenario
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure
11

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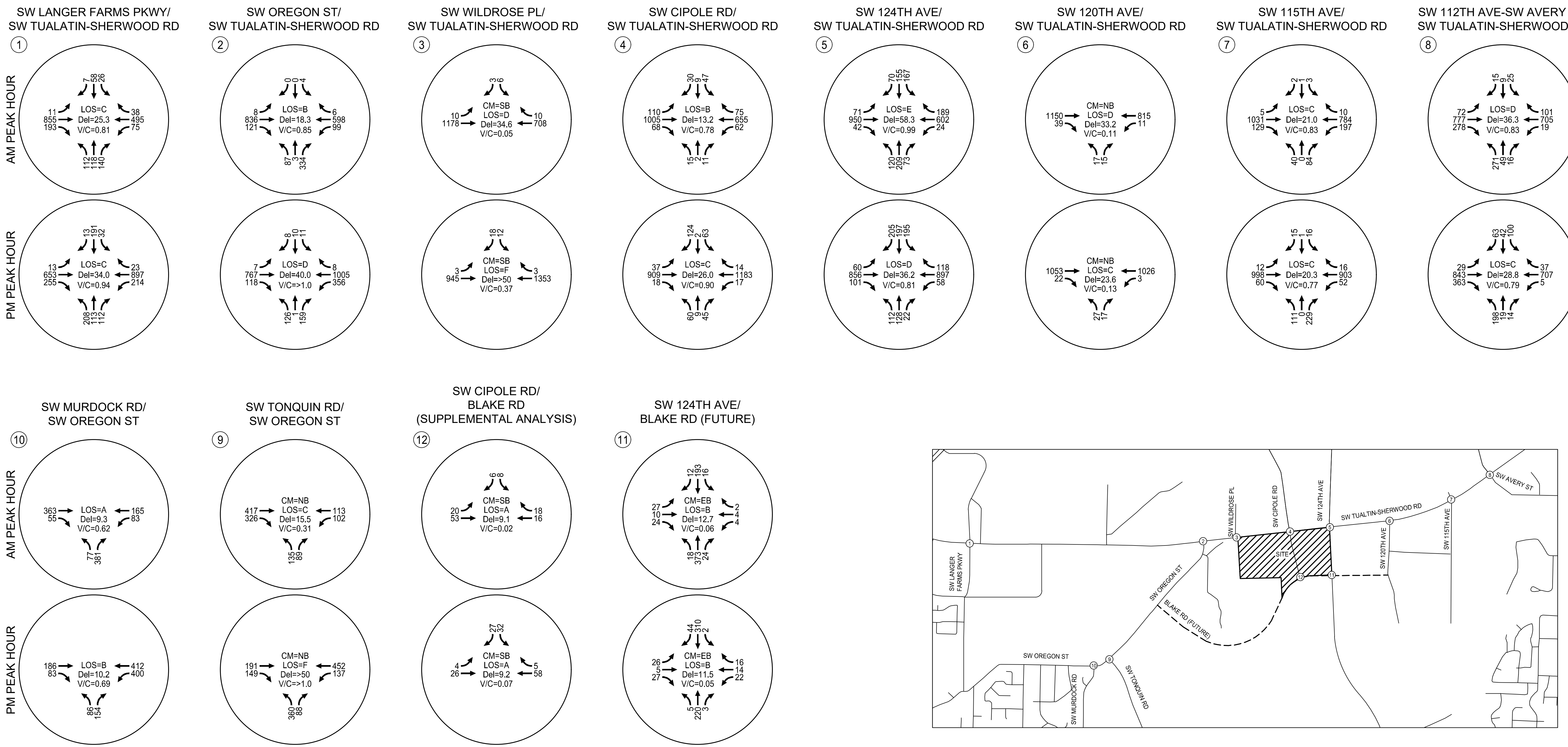
KITTELSON & ASSOCIATES



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Year 2021 - Traffic Traffic Conditions - Alternative Access Scenario
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure 12

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2025 Level-of-Service Analysis – Alternative Access Scenario

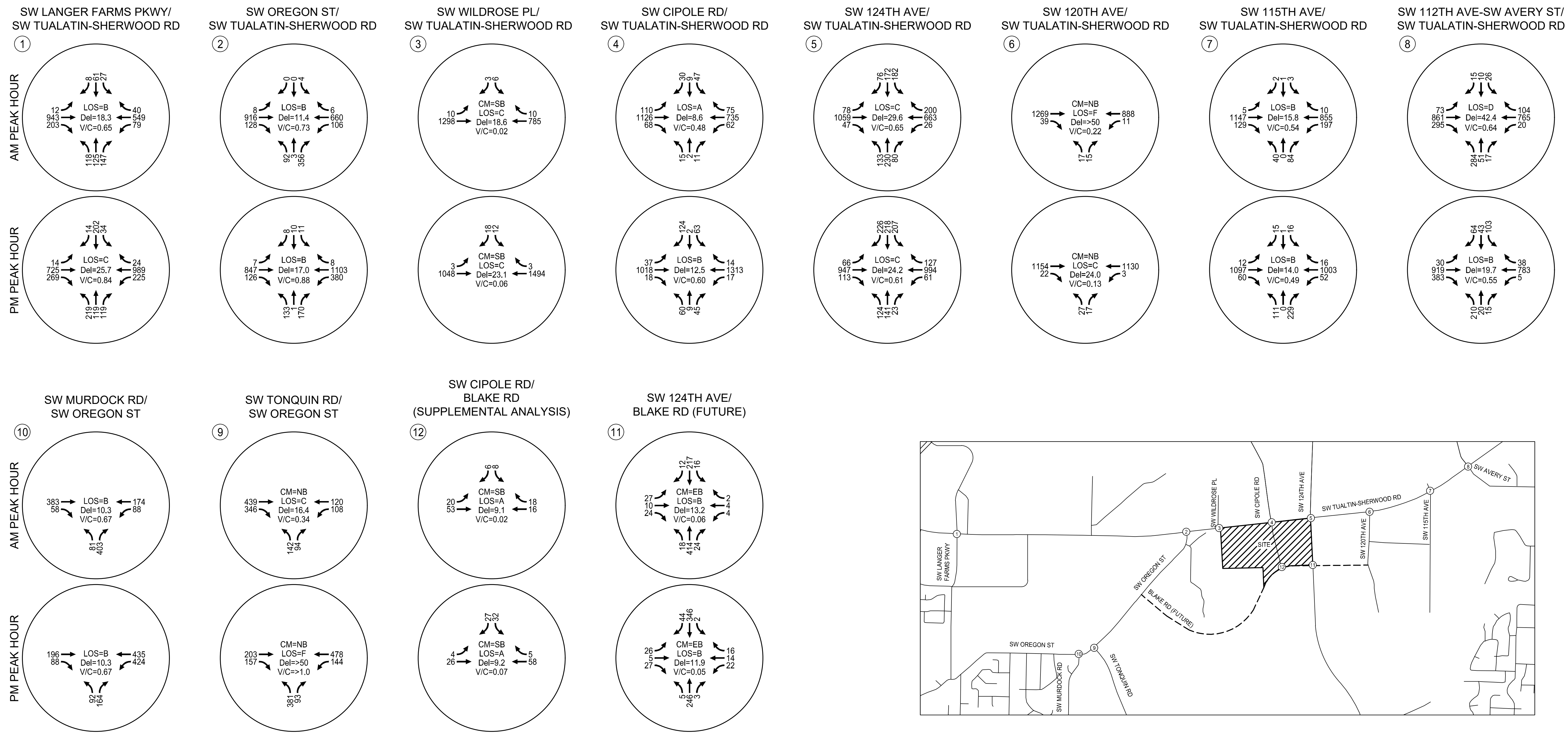
Addition of the site trips shown in Figure 11 to the background 2025 volumes in Figure 9 results in the operational results presented in Table 16 and shown in Figure 13. *Appendix "N" contains the year 2025 total traffic alternative access scenario level-of-service worksheets.*

Table 16: Year 2025 Total Traffic Conditions – Alternative Access Scenario Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	B (18.3)	C (25.7)	0.65	0.84	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin-Sherwood Road	B (11.4)	B (17.0)	0.73	0.88	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	C (18.6)	C (23.1)	0.02 (SB)	0.06 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (8.6)	B (12.5)	0.48	0.60	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (29.6)	C (24.2)	0.65	0.61	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	F (61.1)	C (24.0)	0.22 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (15.8)	B (14.0)	0.54	0.49	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (42.4)	B (19.7)	0.64	0.55	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (16.4)	F (129.1)	0.34 (NB)	***1.15 (NB)***	Regional	V/C of 0.99	***No***
10	SW Oregon Street/ SW Murdock Road	B (10.3)	B (11.3)	0.67	0.73	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (13.2)	B (11.9)	0.06 (EB)	0.05 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	A (9.1)	A (9.2)	0.02 (SB)	0.07 (SB)	City of Sherwood	LOS "E" or V/C of 0.90	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio. For TWSC intersections, the critical movement is shown in parenthesis;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

As indicated in Table 16, under year 2025 total traffic conditions, projected study intersection operations do not differ significantly from the performance expected with the proposed access.



CM = Critical Movement (Unsignalized)
LOS = Intersection Level of Service (Signalized) / Critical Movement Level of Service (Unsignalized)
Del = Intersection Average Control Delay (Signalized) / Critical Movement Control Delay (Unsignalized)
V/C = Volume-to-Capacity Ratio

Year 2025 Total Traffic Conditions - Alternative Access Scenario
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure 13

2021 Traffic Conditions Vehicle Queuing – Alternative Access Scenario

As shown in Table 17, under year 2021 total traffic conditions in the alternative access scenario, projected 95th percentile queues do not differ significantly from the queues expected with the proposed access. *Appendix "K" also contains the SimTraffic worksheets for this alternative access scenario.*

Table 17: Year 2021 Total Traffic Conditions – Alternative Access Scenario 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Oregon Street / SW Tualatin-Sherwood Road		Storage (feet)	250[1]	2000	95	350[1]	1075	-	-	200[1]	200[2]	75	-	-
	Total Traffic Conditions	AM Queue	50	450	150	225	500	-	-	200	***225***	50	-	-
		PM Queue	75	600	***175***	***400***	600	-	-	200	125	50	-	-
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	1100	-	250	790	125	200	200	-	300	725	-
	Total Traffic Conditions	AM Queue	300	925	-	150	225	75	75	75	-	***325***	425	-
		PM Queue	125	400	-	125	725	75	100	100	-	125	150	-
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	790	350	375	1180	375	460	1000	-	240[3]	730	250
	Total Traffic Conditions	AM Queue	350	***1000***	275	100	550	325	250	450	-	***375***	650	100
		PM Queue	175	600	250	250	900	325	150	200	-	***300***	400	225
SW 124th Avenue / Blake Road		Storage (feet)[4]	150	800	-	150	-	-	150	1000	-	150	-	-
	Total Traffic Conditions	AM Queue	50	75	-	25	-	-	25	25	-	50	-	-
		PM Queue	50	50	-	50	-	-	25	0	-	25	-	-
SW Cipole Road / Blake Road		Storage (feet)[6]	150	-	-	-	-	-	-	-	-	300[6]	-	
	Total Traffic Conditions	AM Queue	25	-	-	-	-	-	-	-	-	50	-	-
		PM Queue	25	-	-	-	-	-	-	-	-	75	-	-

Notes:
95th percentile queue lengths are reported in feet and have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;
Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;
[1]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in striped median;
[2]Northbound right turn storage measured to first intersection to the south (SW Dahlke Lane), additional storage available to the south of the intersection;
[3]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in left-most southbound through lane, as only the right southbound through lane continues through the intersection;
[4]Storage for future intersection eastbound left-turn lanes assumed to be 150 feet;

2025 Traffic Conditions Vehicle Queuing – Alternative Access Scenario

As detailed in Table 18, under year 2025 total traffic conditions in the alternative access scenario, projected 95th percentile queues do not differ significantly from the queues expected with the proposed access. *Appendix "L" also contains the SimTraffic worksheets for this alternative access scenario.*

Table 18: Year 2025 Total Traffic Conditions – Alternative Access Scenario 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Oregon Street / SW Tualatin-Sherwood Road		Storage (feet)	250[1]	2000	200[2]	350[1]	1075	1075	-	200[1]	200[5]	75	-	-
	Total Traffic Conditions	AM Queue	25	150	75	125	225	250	-	150	175	25	-	-
		PM Queue	50	225	150	275	250	250	-	175	125	50	-	-
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	1100	1100	250	790	790	200	200	-	300	725	-
	Total Traffic Conditions	AM Queue	75	150	175	100	175	175	50	50	-	125	75	-
		PM Queue	75	150	175	50	200	225	100	75	-	100	100	-
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)[3]	250	790	375	375	1180	375	300	1000	1000	240[4]	730	730
	Total Traffic Conditions	AM Queue	175	350	75	100	275	175	150	225	250	**350**	375	300
		PM Queue	150	325	100	75	275	100	100	100	125	225	200	275
SW 124th Avenue / Blake Road		Storage (feet)[6]	150	800	-	150	-	-	150	1000	-	150	-	-
	Total Traffic Conditions	AM Queue	50	75	-	25	-	-	25	25	-	50	-	-
		PM Queue	50	50	-	50	-	-	25	25	-	25	-	-
SW Cipole Road / Blake Road		Storage (feet)	150[8]	-	-	-	-	-	-	-	-	300[9]	-	-
	Total Traffic Conditions	AM Queue	25	-	-	-	-	-	-	-	-	50	-	-
		PM Queue	25	-	-	-	-	-	-	-	-	75	-	-

Notes:
95th percentile queue lengths are reported in feet and have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;
Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;
[1]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in striped median;
[2]Eastbound right-turn lane storage assumed to provide 200 feet of storage per intersection design as posted on Washington County SW Tualatin-Sherwood Road Widening project website.
[3]Dual left-turn lanes for the eastbound, westbound and northbound approaches to the SW 124th Avenue / SW Tualatin-Sherwood Road intersection and revisions to right-turn lane lengths assumed per intersection design as posted on Washington County SW Tualatin-Sherwood Road Widening project website.
[4]Storage measured as the length of existing white gore stripe for turn lane, additional queue storage may be available depending upon ultimate Washington County SW Tualatin-Sherwood Road Widening project intersection modifications.
[5]Storage capacity listed to first industrial driveway, additional storage available south of driveway.
[6]Storage for future intersection eastbound left-turn lanes assumed to be 150 feet.

Whether or not SW Cipole Road is extended through the site, the adjacent study intersections are all anticipated to meet the regional mobility standard of v/c of 0.99 or less. Nevertheless, while the extension of SW Cipole Road results in slightly improved operations at the SW Cipole Road / SW Tualatin-Sherwood Road intersection, operations remain the same or slightly deteriorate at the SW 124th Avenue / SW Tualatin-Sherwood Road, SW Cipole Road/Blake Road and SW 124th Avenue / Blake Road intersections. Therefore, there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road.

In addition to the operational impacts of the SW Cipole Road extension, the impacts on traffic safety should also be considered. A connection to Blake Road would add an access point to the roadway network, introducing conflict. Were the connection to be made, vehicles (including large trucks) associated with the T-S Corporate Park would enter or leave the site by making unprotected left turns across a collector street (Blake Road) and arterial roadway (124th Avenue), whereas, without the connection to Blake Road, left-turning vehicles would have the added protection of traffic signal phasing at both the SW Cipole Road / SW Tualatin-Sherwood Road and SW 124th Avenue/SW Tualatin-Sherwood Road intersections. In our opinion, limiting Cipole Road to a cul-de-sac ending would result in fewer unprotected left-turn conflict points on the surrounding roadway network, especially those involving large trucks.

Recommendations

Based on the analysis provided and documented herein, the proposed development can be constructed while meeting the traffic mobility and safety standards established for the surrounding transportation system, assuming Washington County completes the planned and funded widening of SW Tualatin-Sherwood Road to five lanes by 2025 and the following site traffic impact mitigation measures are made:

- Provide a proportionate cost share allocation towards the future conversion of the SW Tonquin / SW Oregon Street intersection either to a roundabout or signalized intersection.
- Modify the existing traffic signal at the SW Cipole Road / SW Tualatin-Sherwood Road intersection to accommodate the addition of the proposed south leg.
- Provide a northbound left-turn lane with 150 feet of storage exiting the site.

The SW Oregon Street / SW Tualatin-Sherwood Road intersection is anticipated to exceed jurisdictional mobility standards by 2021, with or without the T-S Corporate Park development. However, when SW Tualatin-Sherwood Road is widening to five lanes by year 2025, the SW Oregon Street / SW Tualatin-Sherwood Road intersection will meet jurisdictional mobility standards. The planned widening will also aid in reducing existing crashes and queuing along SW Tualatin-Sherwood Road. Based on this finding, we are not recommending any mitigation associated with site development at this location.

Additionally, shrubbery and landscaping, as well as above ground utilities and signage should be appropriately located and maintained on-site and at the proposed site access to provide adequate intersection sight distance per City of Sherwood standards.

REFERENCES

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APPENDICES

A. Scoping Memorandum
B. Crash Data
C. Traffic Counts
D. Year 2019 Existing Conditions Worksheets
E. Year 2021 Background Conditions Worksheets
F. Year 2021 Total Traffic Conditions Worksheets
G. Year 2021 Total Traffic Conditions – Mitigation Worksheets
H. Year 2025 Background Conditions Worksheets
I. Year 2025 Total Traffic Conditions Worksheets
J. Year 2025 Total Traffic Conditions – Mitigation Worksheets
K. Year 2021 SimTraffic Queuing Worksheets
L. Year 2025 SimTraffic Queuing Worksheets
M. Year 2021 Total Traffic Conditions – Alternative Access Scenario
N. Year 2025 Total Traffic Conditions – Alternative Access Scenario

Appendix A Scoping Memorandum

Claire Dougherty

From: Garth Appanaitis <gaa@dksassociates.com>
Sent: Friday, February 01, 2019 4:44 PM
To: Kristine Connolly
Cc: Joy Chang; Bob Galati; Brian Dunn; Clarissa Dougherty
Subject: Re: FW: Sherwood Industrial Park Traffic Study Scope

Hi Kristine,

Here are some initial comments on the scoping memo. It would be good to have a call next week to run through these since some require additional discussion. Let me know your general availability.

1. Page 1 - TIA Scope - In addition to the other items noted in the Development Code, be sure to include a review of site circulation and an assessment of safe ped crossings for adjacent roads. These items are often overlooked and I wanted to flag them now.
2. Page 5 - Trip Generation - Additional description of the site uses and potential tenant spectrum should be provided to verify that the ITE trip gen category is appropriate.
3. Page 5 - Trip Distribution - No major issues with the initial assumptions, but it would be good to understand how these values may change with the collection of traffic counts.
4. Page 8 - Study intersections - This will be dependent on trip generation and trip distribution (see related comments), but will likely need to add a few intersections, including TS/LFP, Oregon/Tonquin, and Oregon/Murdock
5. Page 8 - Queuing - SimTraffic or similar stochastic analysis tools should be used rather than the base queuing estimation within Synchro 10. This may have been intended, but was not clear from the narrative.
6. Page 8 - In process developments - To be provided.
7. Page 9 - Future roadway network. We'll need to discuss and clarify the assumed future roadway network. It appears that the Blake Road extension is being proposed to be assumed for the traffic analysis, yet it is an unfunded improvement.
8. Page 9 - Traffic counts - There will likely be some initial normalization and balancing of traffic flows as drivers adjust to the new 124th extension. How will this be addressed in the traffic analysis if the counts are collected soon after the road is opened?

Thanks,
Garth

Garth Appanaitis, PE | Project Manager | Portland Planning Group Manager
Phone: (503.243.3500) | Cell: (971.570.4709) | gaa@dksassociates.com

720 SW Washington St., Suite 500 | Portland, OR 97205 | 503.243.3500
dksassociates.com

DKS Associates is an employee-owned company.

From: Kristine Connolly <kconnolly@kittelson.com>
Sent: Tuesday, December 18, 2018 2:39 PM
To: Bob Galati <GalatiB@SherwoodOregon.gov>; Jinde Zhu <Jinde_Zhu@co.washington.or.us>
Cc: Brian Dunn <bdunn@kittelson.com>; Olsen, Kirk @ Portland <KOlsen@trammellcrow.com>; Clarissa Dougherty <cdougherty@kittelson.com>
Subject: Sherwood Industrial Park Traffic Study Scope

Bob/Jinde,

Attached is our proposed scope of work for the Sherwood Industrial Park project on the southwest corner of Tualatin-Sherwood Road and 124th. Please review and let us know if you have any comments or questions on the proposed scope.

Please also advise regarding in-process trips.

Thank you,

Kristine Connolly, PE
Senior Engineer

Kittelson & Associates, Inc.
Transportation Engineering / Planning
851 SW 6th Avenue, Suite 600
Portland OR 97204
503.228.5230 (Portland)
503.535.7448 (direct)

503.329.0199 (cell)

Streetwise Twitter Facebook

KITTELSON & ASSOCIATES
851 SW 6th AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

SCOPING MEMORANDUM

Date:	December 18, 2018	Project #: 23278
To:	Bob Galati, City of Sherwood Jinde Zhu, PE, Washington County	
From:	Brian Dunn, PE, Kristine Connolly, PE, & Claire Dougherty	
Project:	Sherwood Industrial Park	
Subject:	Traffic Impact Study Scoping Memorandum	

This memorandum represents a scoping needs assessment for preparing the Traffic Impact Study (TIS) associated with the proposed Sherwood Industrial Park development located on the southwest corner of the SW Tualatin Sherwood Road/SW 124th Avenue intersection in Washington County, OR (soon to be Sherwood). The assumptions for scoping the TIS are based on discussions between the City of Sherwood and the Applicant, our review of the conceptual site plans, and our working knowledge of the transportation policies of the City of Sherwood.

TRAFFIC IMPACT ANALYSIS

Kittelson and Associates, Inc. (KAI) will prepare a TIS per the requirements enumerated in Sherwood's Development Code Section 16.106.080, Washington County's Resolution & Order 86-95, and scoping direction received from the City and County staff. Key assumptions are outlined in the remainder of this document.

Proposed Development

The Applicant, Trammell Crow Company, is in the process of preparing an application to develop 547,220 square feet of industrial buildings on the subject property. The site is currently vacant and is bordered by the SW 124th Avenue future extension to the east, and shopping centers to the north, industrial land uses to the west and a future east-west collector, Blake Road, to the south.

Figure 1 displays a site vicinity map and Figures 2 and 3 display two proposed site plan alternatives. The site plan as shown in Figure 2 details a possible extension of Cipole Road into the site terminating as a private cul-de-sac within the subject site, whereas Figure 3 shows Cipole Road bisecting the site as a public street, extending to intersect with the future Blake Road. As shown in both site plans, no site access driveways are planned on NE 124th Avenue.

Site Vicinity Map
Sherwood, Oregon

Figure
1

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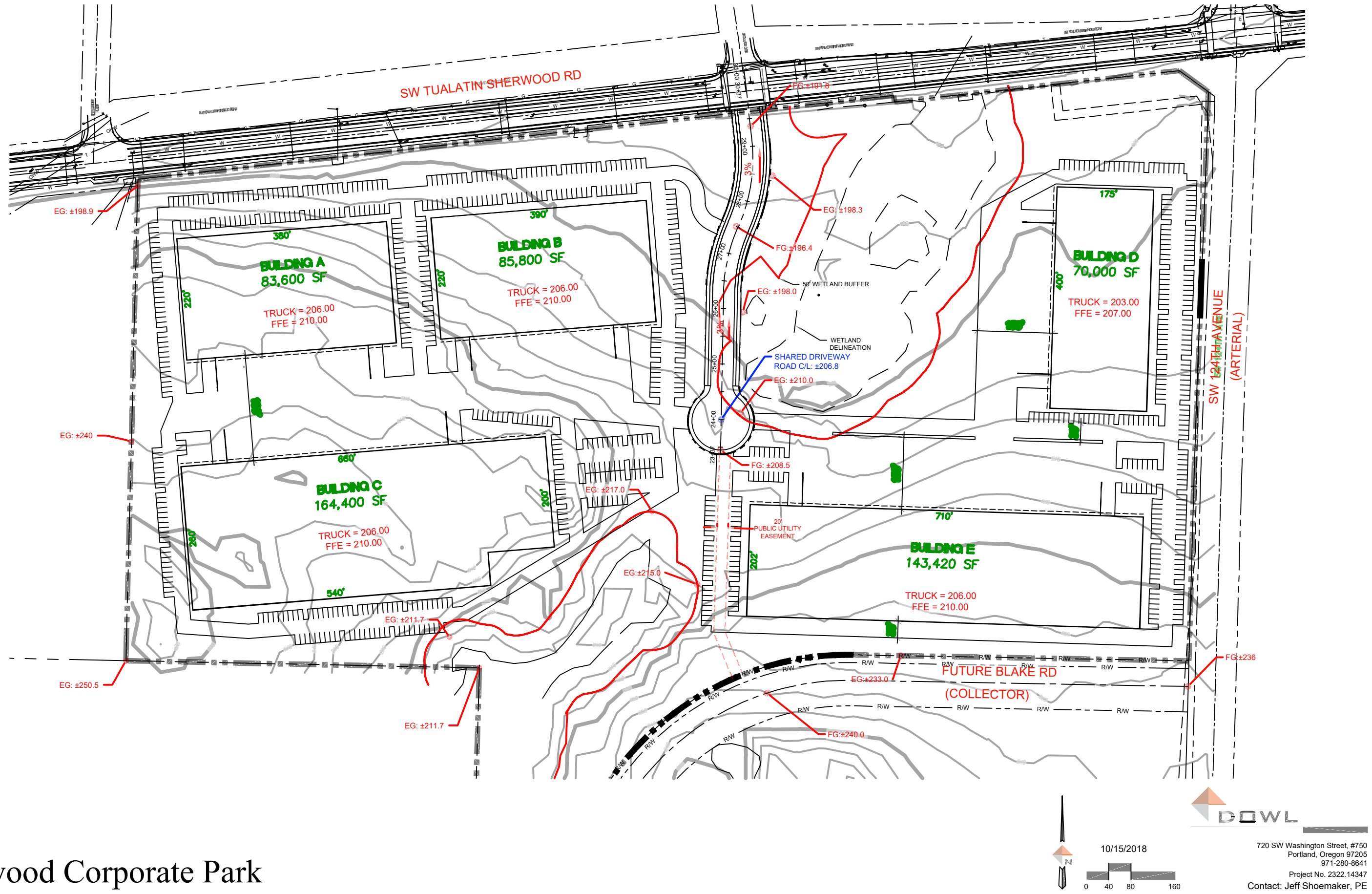


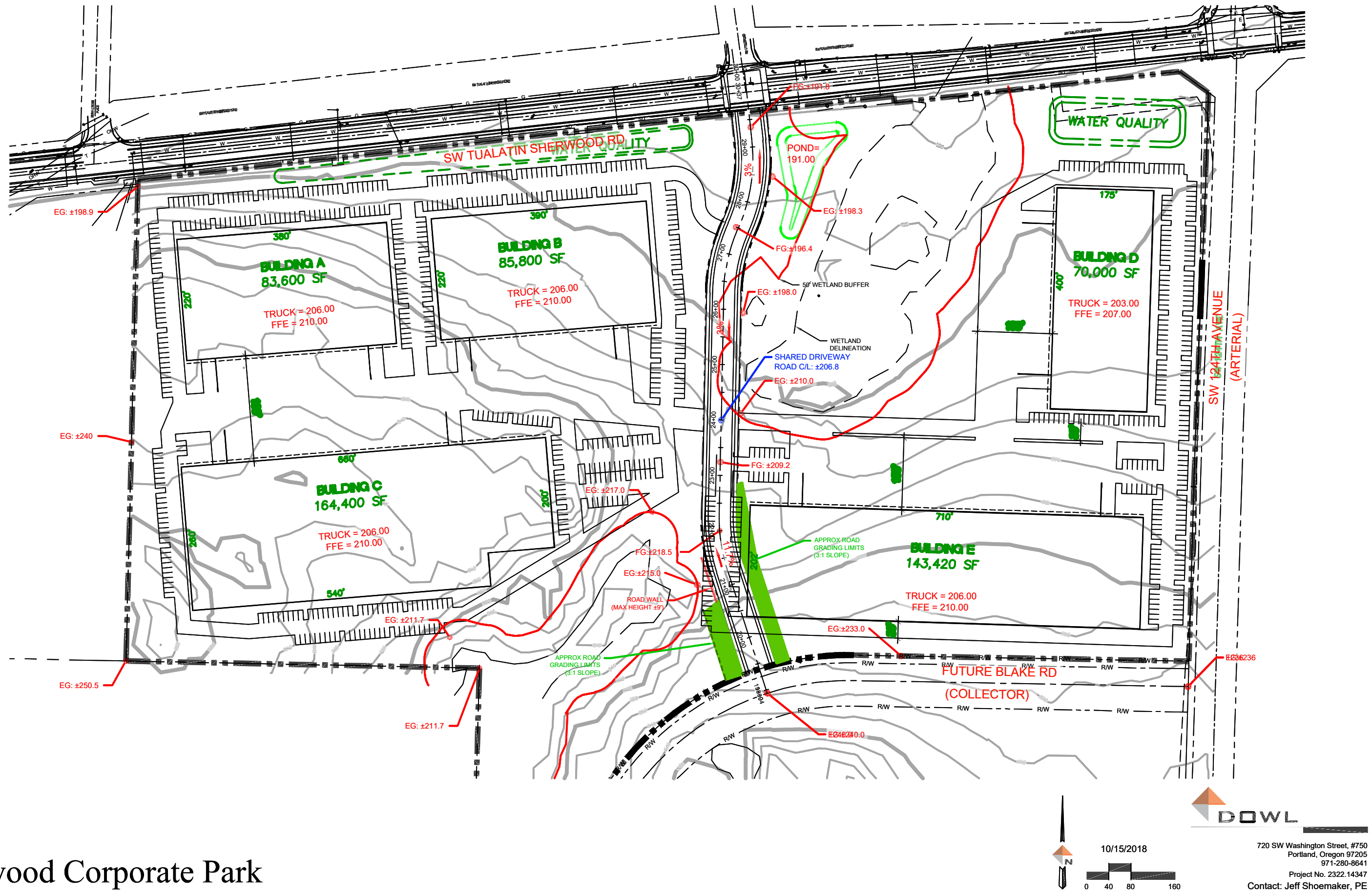
Sherwood Corporate Park

CIPOLE RD CUL-DE-SAC (1 OF 2)

RECEIVED FROM TCC : October 23, 2018

Proposed Site Plan
Cipole Road Cul-de-sac
Sherwood, OR

Figure
2



Sherwood Corporate Park

CIPOLE RD CONNECTION TO BLAKE RD TEST FIT (1 OF 2)

RECEIVED FROM TCC : October 23, 2018

Proposed Site Plan
Cipole Road Connection
Sherwood, OR

Figure
3

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Trip Generation

A preliminary trip generation estimate for the proposed development was prepared based on the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 10^{th} Edition. Table 1 displays the preliminary trip generation for the proposed site.

Table 1. Preliminary Trip Generation Estimate

Land Use Category	ITE Code	Size (SF)	Total Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Industrial Park	130	547,200	1844	219	177	42	219	46	173

Trip Distribution

Based on a review of general traffic patterns in the region, the proposed land use and external site access patterns, and prior history of our firm's involvement on other development projects in the City of Sherwood, the following site trip distributions are proposed for each site plan scenario:

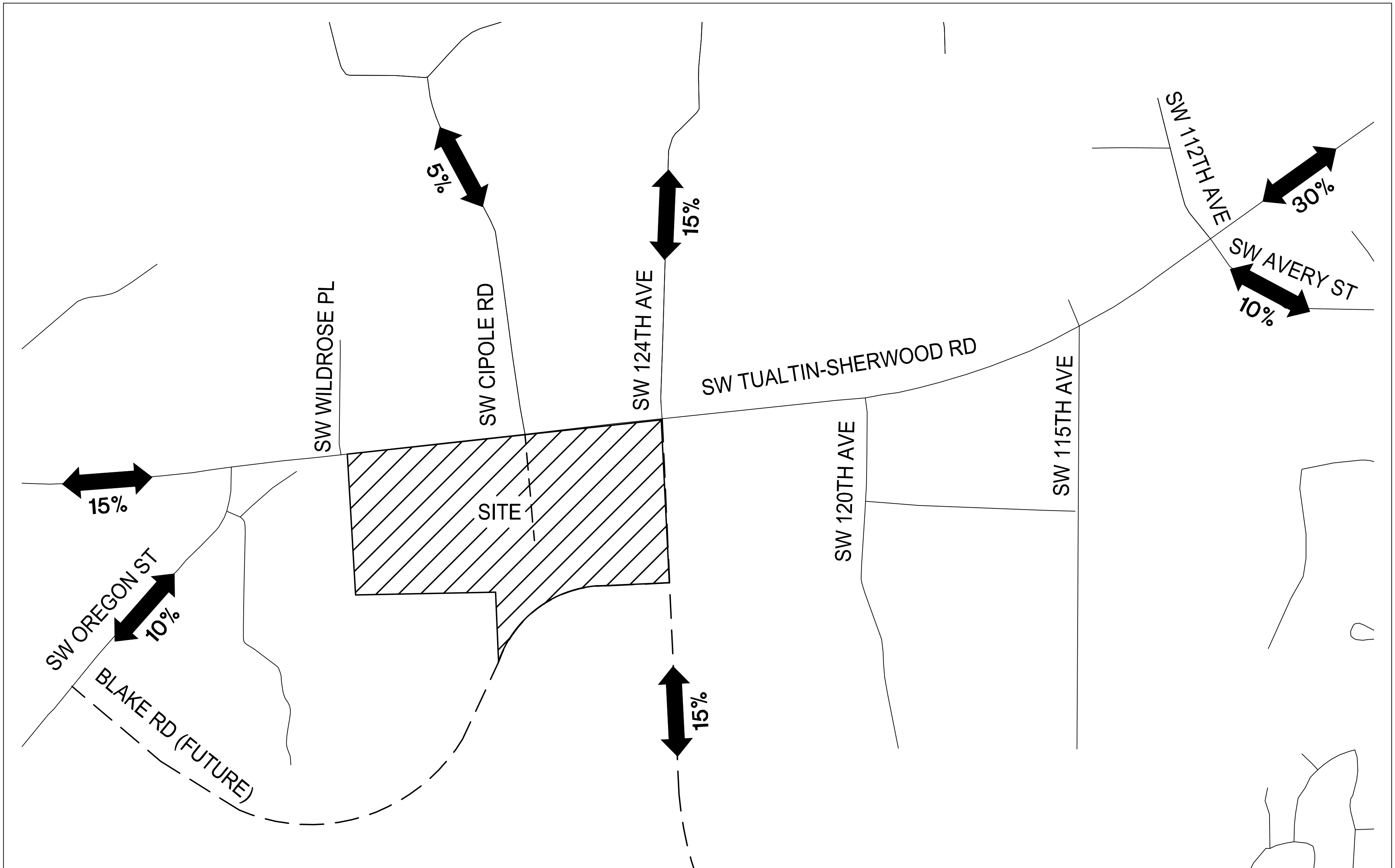
Cipole Road Cul-de-sac Site Plan

- 15 percent to/from the west via SW Tualatin-Sherwood Road,
- 10 percent to/from the southwest via SW Oregon Street,
- 5 percent to/from the north via Cipole Road,
- 15 percent to/from the north via SW 124^{th} Avenue,
- 15 percent to/from the south via the SW 124^{th} Avenue extension,
- 10 percent to/from the east via SW 112^{th} Avenue – SW Avery Street,
- 30 percent to/from the east via SW Tualatin-Sherwood Road.

Cipole Road Connection to Blake Road Site Plan

- 10 percent to/from the west via SW Tualatin-Sherwood Road,
- 5 percent to/from the southwest via SW Oregon Street,
- 10 percent to/from the southwest via the future Blake Road,
- 20 percent to/from the southeast via the future Blake Road and SW 124^{th} Avenue extension,
- 5 percent to/from the north via Cipole Road,
- 15 percent to/from the north via SW 124^{th} Avenue,
- 10 percent to/from the east via SW 112^{th} Avenue – SW Avery Street,
- 25 percent to/from the east via SW Tualatin-Sherwood Road.

The preliminary trip distribution patterns for each site plan concept are displayed in Figures 4 and 5 for informational purposes. The estimated patterns shown in these figures represent our best guess and are subject to change pending collection of new traffic counts and technical analysis needed to prepare the TIS.



Estimated Trip Distribution Pattern
Cipole Road Cul-de-sac Site Plan
Sherwood, OR

Figure 4

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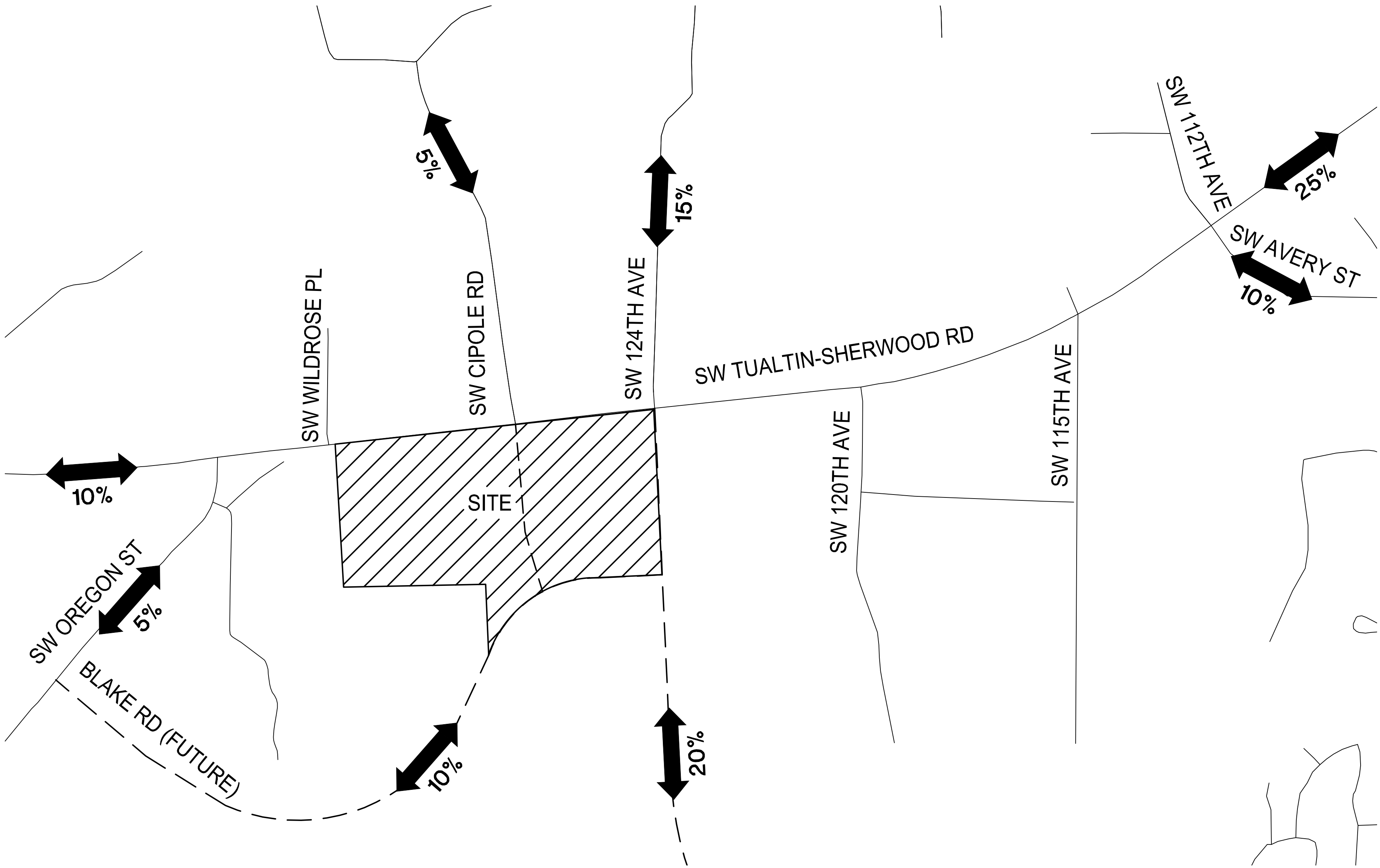
KITTELSON & ASSOCIATES



Estimated Trip Distribution Pattern
Cipole Road Connection Site Plan
Sherwood, OR

Figure 5

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Study Area and Intersections

Based on the estimated trip generation and assignment patterns, the following intersections and accesses are proposed for analysis:

1. SW Tualatin-Sherwood Road/SW Oregon Street
2. SW Tualatin-Sherwood Road/SW Wildrose Place
3. SW Tualatin-Sherwood Road/SW Cipole Road – Proposed Site Access
4. SW Tualatin-Sherwood Road/SW 124th Avenue
5. SW Tualatin-Sherwood Road/ SW 120th Avenue
6. SW Tualatin-Sherwood Road/SW 115th Avenue
7. SW Tualatin-Sherwood Road/SW 112th Avenue – SW Avery Street

Time Periods for Analysis

Existing and estimated build-out year 2021 and future year 2023 operating conditions and 95th-percentile queuing conditions at the identified study intersections will be analyzed using Synchro Version 10 software only. The weekday AM (7:00 AM to 9:00 AM) and weekday PM (4:00 PM to 6:00 PM) peak hours will be assessed.

Operating Standards

Per Section 8 of *The City of Sherwood Transportation System Plan* (adopted 2014), "The City target for signalized, all way stop (AWSC), or roundabout intersections is level of service D or volume to capacity ratio equal to or less than 0.85. The target for unsignalized two way stop control (TWSC) intersections is level of service E or a volume to capacity ration equal to or less than 0.90."

As SW Tualatin-Sherwood Road is designated on the Arterial and Throughway Network, and all proposed study intersections are along SW Tualatin-Sherwood Road, the 0.99 volume to capacity operating standard will be used. This is consistent with the Washington County operating targets.

In-Process Developments and Planned Transportation Improvements

We anticipate a 1.5 percent annual growth rate can be applied to existing traffic to generate future background traffic volumes on the surrounding street network before any trips associated with approved in-process developments are added to the background traffic volumes. This growth rate is consistent with other previous traffic impact studies in the area.

In-process developments that KAI is aware of include the IPT Tualatin development north of the SW Tualatin-Sherwood/124th Avenue Intersection and Majestic Properties development at the south end of SW 115th Avenue. We request that the City of Sherwood provide the trip estimates and assignments for any additional developments in the site vicinity to be included as in-process.

The City of Sherwood Transportation System Plan (TSP) and Capital Improvement Plan (CIP) identify the following projects in the study area vicinity:

- Extension of SW 124th Avenue, from SW Tualatin Sherwood Road to SW Grahams Ferry Road, which is currently under construction and expected to open to traffic by January 1, 2019;
- Tonquin Employment Area East/West Collector (Blake Road) –A future collector street connecting SW Oregon Street to the SW 124th Avenue Extension. The project is listed as unfunded through FY23 in the CIP and as a low priority.
- Widening of SW Tualatin-Sherwood Road – Design is underway to widen the existing three lane arterial road to five lanes, with bicycle facilities. The estimated completion date is end of 2023.

For the TIS build-out year 2021 analysis, only the SW 124th Avenue Extension and future Blake Road will be considered in the roadway network.

For the TIS future year 2023 analysis, the SW 124th Avenue Extension, future Blake Road and widening of SW Tualatin-Sherwood Road will be considered in the roadway network.

No other funded transportation improvements have been identified or are anticipated in the study within the development timeline of this project.

Crash Analysis

The most recent five years of reported crash data at the study intersections will be requested from ODOT and reviewed in detail. The ODOT Statewide Priority Index System (SPIS) will also be reviewed to identify any sites where safety issues may encourage further investigation.

Signal Timing

We have downloaded the latest signal timing and phasing information for the five signalized intersections from the Washington County GIS Traffic Plans portal. We request that Washington County provide the signal phasing and timing plan that will be implemented at with the SW Tualatin-Sherwood Road/SW 124th Avenue intersection upon opening of the 124th Avenue extension, if available.

Analysis Scenarios

The following analysis scenarios will be included in the TIS analysis:

Existing Conditions – Year 2019

Traffic counts will be collected in mid-January 2019, once the 124th Ave Extension is open and schools are back in session.

Background Conditions – Year 2021

In this analysis, it will be assumed that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place, with limited re-distributed trips from SW 124th Avenue.

Total Traffic Conditions – Year 2021 Cipole Cul-de-sac

In this analysis, it will be assumed that Blake Road connection to SW 124th Avenue is in place, but that SW Cipole Road terminates as a cul-de-sac within the project site.

Total Traffic Conditions – Year 2021 Cipole Road Extension to Blake Road

In this analysis, it will be assumed that the Blake Road connection to SW 124th Avenue is in place, and that SW Cipole Road bisects the project site, connecting to Blake Road as a TWSC intersection.

Background Conditions – Year 2023

In this analysis, it will be assumed that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place, with limited re-distributed trips from SW 124th Avenue. It will also be assumed that SW Tualatin-Sherwood Road has been widened to 5 lanes.

Total Traffic Conditions – Year 2023 Cipole Cul-de-sac

In this analysis, it will be assumed that Blake Road connection to SW 124th Avenue is in place and SW Tualatin-Sherwood Road has been widened, but that SW Cipole Road terminates as a cul-de-sac within the project site.

Total Traffic Conditions – Year 2023 Cipole Road Extension to Blake Road

In this analysis, it will be assumed that the Blake Road connection to SW 124th Avenue is in place, SW Tualatin-Sherwood Road has been widened, and that SW Cipole Road bisects the project site, connecting to Blake Road as a TWSC intersection.

Next Steps

We trust this memorandum provides adequate documentation of the proposed land use action, estimated site trip generation and distribution patterns, and specific study intersections and analysis periods to address in the TIS. We formally request that the City of Sherwood and Washington County provide written confirmation and/or questions regarding the proposed methodology and project TIS assumptions as soon as possible so that we may proceed with our analysis. If you have any questions, please give us a call at (503) 228-5230.

Appendix B Crash Data

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SWTualatin-Sherwood Rd & SW Oregon St
January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
REAR-END	0	3	2	5	0	4	0	2	3	5	0	5	0	0
TURNING MOVEMENTS	0	3	6	9	0	7	4	8	1	6	3	9	0	0
2017 TOTAL	0	6	8	14	0	11	4	10	4	11	3	14	0	0
YEAR: 2016														
HEAD-ON	0	1	0	1	0	2	0	1	0	0	1	1	0	0
REAR-END	0	2	1	3	0	2	0	2	1	3	0	3	0	0
TURNING MOVEMENTS	0	3	3	6	0	4	2	3	3	5	1	6	0	0
2016 TOTAL	0	6	4	10	0	8	2	6	4	8	2	10	0	0
YEAR: 2015														
REAR-END	0	1	2	3	0	1	0	3	0	3	0	3	0	0
TURNING MOVEMENTS	0	2	0	2	0	5	0	2	0	1	1	2	0	0
2015 TOTAL	0	3	2	5	0	6	0	5	0	4	1	5	0	0
YEAR: 2014														
REAR-END	0	0	2	2	0	0	0	2	0	2	0	2	0	0
TURNING MOVEMENTS	0	1	0	1	0	4	0	1	0	0	1	1	0	0
2014 TOTAL	0	1	2	3	0	4	0	3	0	2	1	3	0	0
YEAR: 2013														
ANGLE	0	1	0	1	0	2	0	1	0	1	0	1	0	0
REAR-END	0	1	2	3	0	2	0	2	1	3	0	3	0	0
TURNING MOVEMENTS	0	0	5	5	0	0	1	5	0	4	1	5	0	0
2013 TOTAL	0	2	7	9	0	4	1	8	1	8	1	9	0	0
FINAL TOTAL	0	18	23	41	0	33	7	32	9	33	8	41	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Oregon St & SW Murdock Rd
January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2014														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2014 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Oregon St & SW Tonquin Rd

January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
TURNING MOVEMENTS	0	1	1	2	0	2	0	2	0	2	0	2	0	0
2017 TOTAL	0	1	1	2	0	2	0	2	0	2	0	2	0	0
YEAR: 2015														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2015 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
YEAR: 2013														
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2013 TOTAL	0	0	1	1	0	0	0	1	0	1	0	1	0	0
FINAL TOTAL	0	1	3	4	0	2	0	4	0	4	0	4	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW 112th Ave / SW Avery St
January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
REAR-END	0	2	1	3	0	3	0	2	1	2	1	3	0	0
TURNING MOVEMENTS	0	1	5	6	0	1	0	2	4	5	1	6	0	0
2017 TOTAL	0	3	6	9	0	4	0	4	5	7	2	9	0	0
YEAR: 2016														
REAR-END	0	2	3	5	0	2	0	3	2	4	1	5	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	0	1	0	1	1	0	0
2016 TOTAL	0	2	4	6	0	2	0	3	3	4	2	6	0	0
YEAR: 2015														
REAR-END	0	1	1	2	0	2	0	1	0	2	0	2	0	0
2015 TOTAL	0	1	1	2	0	2	0	1	0	2	0	2	0	0
YEAR: 2014														
ANGLE	0	1	0	1	0	5	0	1	0	0	1	1	0	0
REAR-END	0	9	3	12	0	20	0	6	5	11	1	12	0	0
2014 TOTAL	0	10	3	13	0	25	0	7	5	11	2	13	0	0
YEAR: 2013														
REAR-END	0	1	0	1	0	3	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	0	2	2	0	0	0	2	0	2	0	2	0	0
2013 TOTAL	0	1	2	3	0	3	0	3	0	3	0	3	0	0
FINAL TOTAL	0	17	16	33	0	36	0	18	13	27	6	33	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW 115th Ave

January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
REAR-END	0	2	0	2	0	3	0	1	1	2	0	2	0	0
2017 TOTAL	0	2	0	2	0	3	0	1	1	2	0	2	0	0
YEAR: 2016														
REAR-END	0	1	0	1	0	1	0	1	0	0	1	1	0	0
TURNING MOVEMENTS	0	0	1	1	0	0	0	1	0	1	0	1	0	0
2016 TOTAL	0	1	1	2	0	1	0	2	0	1	1	2	0	0
YEAR: 2015														
REAR-END	0	2	0	2	0	3	1	2	0	2	0	2	0	0
2015 TOTAL	0	2	0	2	0	3	1	2	0	2	0	2	0	0
YEAR: 2014														
TURNING MOVEMENTS	0	2	0	2	0	3	0	2	0	1	1	2	0	0
2014 TOTAL	0	2	0	2	0	3	0	2	0	1	1	2	0	0
YEAR: 2013														
REAR-END	0	2	0	2	0	3	0	2	0	2	0	2	0	0
TURNING MOVEMENTS	0	1	0	1	0	2	0	0	1	1	0	1	0	0
2013 TOTAL	0	3	0	3	0	5	0	2	1	3	0	3	0	0
FINAL TOTAL	0	10	1	11	0	15	1	9	2	9	2	11	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

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TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW 124th Ave

January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
REAR-END	0	6	2	8	0	9	1	6	2	5	3	8	0	0
TURNING MOVEMENTS	0	2	0	2	0	2	0	1	1	2	0	2	0	0
2017 TOTAL	0	8	2	10	0	11	1	7	3	7	3	10	0	0
YEAR: 2016														
FIXED / OTHER OBJECT	0	0	1	1	0	0	0	1	0	1	0	1	0	1
REAR-END	0	2	4	6	0	2	1	6	0	6	0	6	0	0
TURNING MOVEMENTS	0	1	0	1	0	1	0	1	0	1	0	1	0	0
2016 TOTAL	0	3	5	8	0	3	1	8	0	8	0	8	0	1
YEAR: 2015														
REAR-END	0	2	2	4	0	3	0	4	0	4	0	4	0	0
2015 TOTAL	0	2	2	4	0	3	0	4	0	4	0	4	0	0
YEAR: 2014														
REAR-END	0	6	3	9	0	13	0	7	2	8	1	9	0	0
2014 TOTAL	0	6	3	9	0	13	0	7	2	8	1	9	0	0
YEAR: 2013														
REAR-END	0	1	0	1	0	2	0	0	1	1	0	1	0	0
2013 TOTAL	0	1	0	1	0	2	0	0	1	1	0	1	0	0
FINAL TOTAL	0	20	12	32	0	32	2	26	6	28	4	32	0	1

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW 120th Ave

January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
BACKING	0	1	0	1	0	3	1	0	1	1	0	1	0	0
REAR-END	0	1	0	1	0	1	0	1	0	1	0	1	0	0
TURNING MOVEMENTS	0	1	0	1	0	1	0	1	0	1	0	1	0	0
2017 TOTAL	0	3	0	3	0	5	1	2	1	3	0	3	0	0
YEAR: 2014														
REAR-END	0	0	1	1	0	0	0	0	1	1	0	1	0	0
2014 TOTAL	0	0	1	1	0	0	0	0	1	1	0	1	0	0
FINAL TOTAL	0	3	1	4	0	5	1	2	2	4	0	4	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW Cipole Rd
January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2016														
REAR-END	0	1	1	2	0	1	0	2	0	2	0	2	0	0
TURNING MOVEMENTS	0	1	0	1	0	1	1	1	0	1	0	1	0	0
2016 TOTAL	0	2	1	3	0	2	1	3	0	3	0	3	0	0
YEAR: 2015														
BACKING	0	0	1	1	0	0	1	1	0	1	0	1	0	0
REAR-END	0	1	3	4	0	1	0	3	1	3	1	4	0	0
2015 TOTAL	0	1	4	5	0	1	1	4	1	4	1	5	0	0
YEAR: 2014														
REAR-END	0	4	0	4	0	8	0	2	2	3	1	4	0	0
2014 TOTAL	0	4	0	4	0	8	0	2	2	3	1	4	0	0
YEAR: 2013														
REAR-END	0	4	0	4	0	5	0	3	1	3	1	4	0	0
TURNING MOVEMENTS	0	1	0	1	0	1	0	1	0	0	1	1	0	0
2013 TOTAL	0	5	0	5	0	6	0	4	1	3	2	5	0	0
FINAL TOTAL	0	12	5	17	0	17	2	13	4	13	4	17	0	0

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW Langer Farms Pkwy

January 1, 2013 through December 31, 2017

COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
REAR-END	0	2	1	3	0	4	1	2	1	3	0	3	0	0
TURNING MOVEMENTS	0	2	1	3	0	2	0	3	0	2	1	3	0	0
2017 TOTAL	0	4	2	6	0	6	1	5	1	5	1	6	0	0
YEAR: 2016														
ANGLE	0	1	0	1	0	1	0	1	0	1	0	1	0	0
REAR-END	0	4	0	4	0	4	0	2	2	3	1	4	0	0
TURNING MOVEMENTS	0	1	3	4	0	1	0	1	3	3	1	4	0	0
2016 TOTAL	0	6	3	9	0	6	0	4	5	7	2	9	0	0
YEAR: 2015														
REAR-END	0	0	3	3	0	0	0	2	1	2	1	3	0	0
2015 TOTAL	0	0	3	3	0	0	0	2	1	2	1	3	0	0
YEAR: 2014														
REAR-END	0	0	2	2	0	0	0	1	1	2	0	2	0	0
TURNING MOVEMENTS	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2014 TOTAL	0	1	2	3	0	2	0	2	1	3	0	3	0	0
YEAR: 2013														
REAR-END	0	0	1	1	0	0	0	1	0	1	0	1	0	1
TURNING MOVEMENTS	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2013 TOTAL	0	1	1	2	0	2	0	2	0	2	0	2	0	1
FINAL TOTAL	0	12	11	23	0	16	1	15	8	19	4	23	0	1

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT
CRASH SUMMARIES BY YEAR BY COLLISION TYPE

Intersectional Crashes at SW Tualatin-Sherwood Rd & SW Wildrose Pl
January 1, 2013 through December 31, 2017

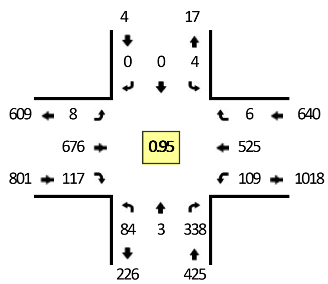
COLLISION TYPE	FATAL CRASHES	NON-FATAL CRASHES	PROPERTY DAMAGE ONLY	TOTAL CRASHES	PEOPLE KILLED	PEOPLE INJURED	TRUCKS	DRY SURF	WET SURF	DAY	DARK	INTER-SECTION	INTER-SECTION RELATED	OFF-ROAD
YEAR: 2017														
FIXED / OTHER OBJECT	0	0	1	1	0	0	0	0	0	1	0	1	0	1
TURNING MOVEMENTS	0	1	0	1	0	2	0	1	0	1	0	1	0	0
2017 TOTAL	0	1	1	2	0	2	0	1	0	2	0	2	0	1
YEAR: 2014														
REAR-END	0	1	0	1	0	1	0	1	0	1	0	1	0	0
2014 TOTAL	0	1	0	1	0	1	0	1	0	1	0	1	0	0
YEAR: 2013														
TURNING MOVEMENTS	0	1	1	2	0	1	0	0	2	0	2	2	0	0
2013 TOTAL	0	1	1	2	0	1	0	0	2	0	2	2	0	0
FINAL TOTAL	0	3	2	5	0	4	0	2	2	3	2	5	0	1

Disclaimers: *Effective 2016,* ***collection of "Property Damage Only" (PDO) crash data elements was reduced for vehicles and participants.*** *Age, Gender, License, Error and other elements are no longer available for PDO crash reporting. Please keep this in mind when comparing 2016 PDO crash data to prior years.*

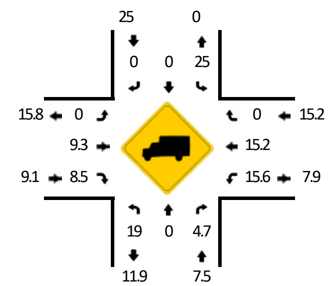
A higher number of crashes may be reported as of 2011 compared to prior years. This does not necessarily reflect an increase in annual crashes. The higher numbers may result from a change to an internal departmental process that allows the Crash Analysis and Reporting Unit to add previously unavailable, non-fatal crash reports to the annual data file. Please be aware of this change when comparing pre-2011 crash statistics. For all disclaimers, see https://www.oregon.gov/ODOT/Data/documents/Crash_Data_Disclaimers.pdf.

Appendix C Traffic Counts

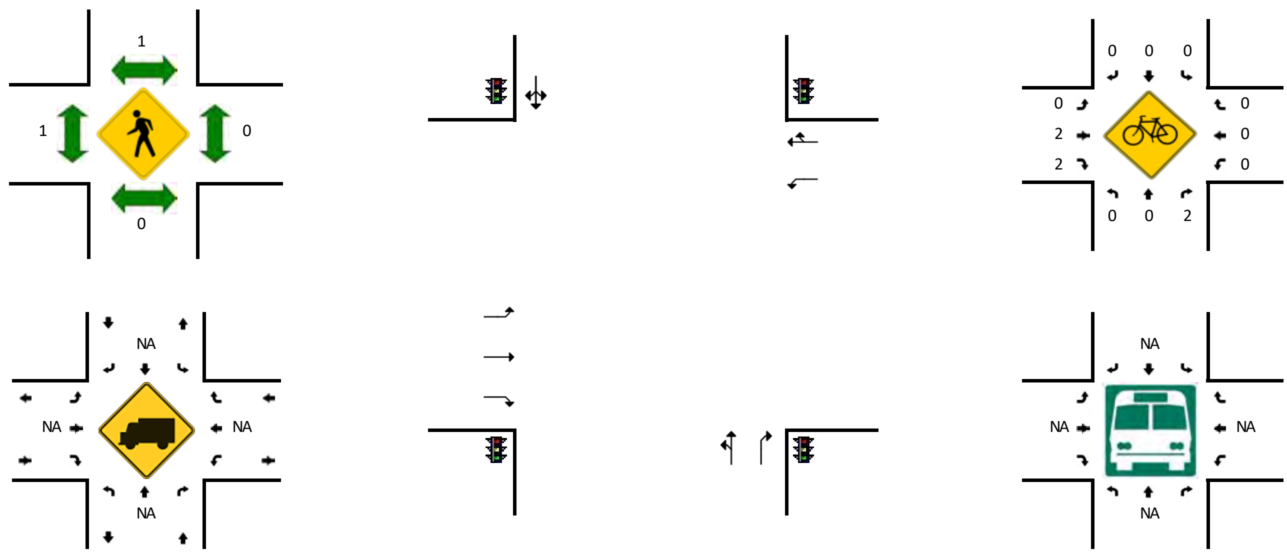
LOCATION: Oregon St -- Tualatin-Sherwood Rd | **QC JOB #:** 14898001
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019



Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:20 AM -- 7:35 AM



Quality Counts
DATA THAT DRIVES COMMUNITIES



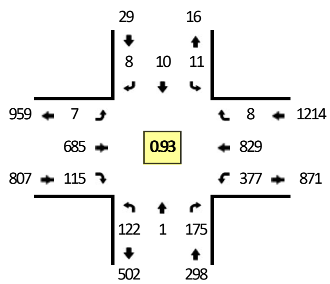
5-Min Count Period Beginning At	Oregon St (Northbound) Left	Thru	Right	U	Oregon St (Southbound) Left	Thru	Right	U	Tualatin-Sherwood Rd (Eastbound) Left	Thru	Right	U	Tualatin-Sherwood Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
7:00 AM	4	0	35	0	0	0	0	0	0	73	9	0	9	37	0	0	167	
7:05 AM	9	0	37	0	0	0	1	0	0	45	5	0	8	37	0	0	142	
7:10 AM	2	0	24	0	1	0	0	0	1	69	9	0	1	42	0	0	149	
7:15 AM	7	1	45	0	0	0	0	0	0	47	10	0	10	29	0	0	149	
7:20 AM	5	0	34	0	0	0	0	0	2	60	7	0	12	35	0	0	155	
7:25 AM	9	1	17	0	0	0	0	0	0	61	13	0	10	60	0	0	171	
7:30 AM	5	0	25	0	1	0	0	0	0	63	18	0	8	45	0	0	165	
7:35 AM	9	0	29	0	0	0	0	0	0	43	11	0	9	32	0	0	133	
7:40 AM	6	0	29	0	0	0	0	0	0	64	4	0	5	41	2	0	151	
7:45 AM	7	0	27	0	0	0	0	0	2	44	13	0	13	50	0	0	156	
7:50 AM	8	0	33	0	0	0	0	0	2	61	5	0	11	44	1	0	165	
7:55 AM	8	1	33	0	0	0	0	0	1	62	7	0	10	39	0	0	161	1864
8:00 AM	11	1	28	0	0	0	0	0	0	58	12	0	6	42	3	0	161	1858
8:05 AM	5	0	34	0	2	0	0	0	1	54	8	0	10	49	0	0	163	1879
8:10 AM	8	0	22	0	0	0	0	0	0	62	6	0	3	40	0	0	141	1871
8:15 AM	3	0	27	0	1	0	0	0	0	44	13	0	12	48	0	0	148	1870
8:20 AM	7	0	16	0	0	0	0	0	0	62	12	0	3	39	1	0	140	1855
8:25 AM	8	0	19	0	1	0	0	0	0	60	10	0	16	34	4	0	152	1836
8:30 AM	5	0	24	0	0	1	0	0	0	54	8	0	15	44	1	0	152	1823
8:35 AM	7	1	21	0	0	0	0	0	0	62	7	0	8	41	0	0	147	1837
8:40 AM	12	0	18	0	0	0	0	0	0	56	5	0	7	54	2	0	154	1840
8:45 AM	6	0	39	0	0	0	0	0	1	53	8	0	8	43	0	0	158	1842
8:50 AM	6	0	24	0	0	0	0	0	0	45	4	0	11	42	1	0	133	1810
8:55 AM	8	1	8	0	0	0	0	0	1	58	1	0	7	43	1	0	128	1777

Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	76	4	304	0	4	0	0	0	8	736	152	0	120	560	0	0	1964
Heavy Trucks	12	0	8		4	0	0		0	72	20		16	88	0		220
Pedestrians		0				4				4				0			8
Bicycles	0	0	1		0	0	0		0	1	0		0	0	0		2
Railroad																	
Stopped Buses																	

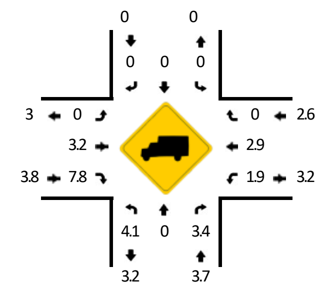
Comments:

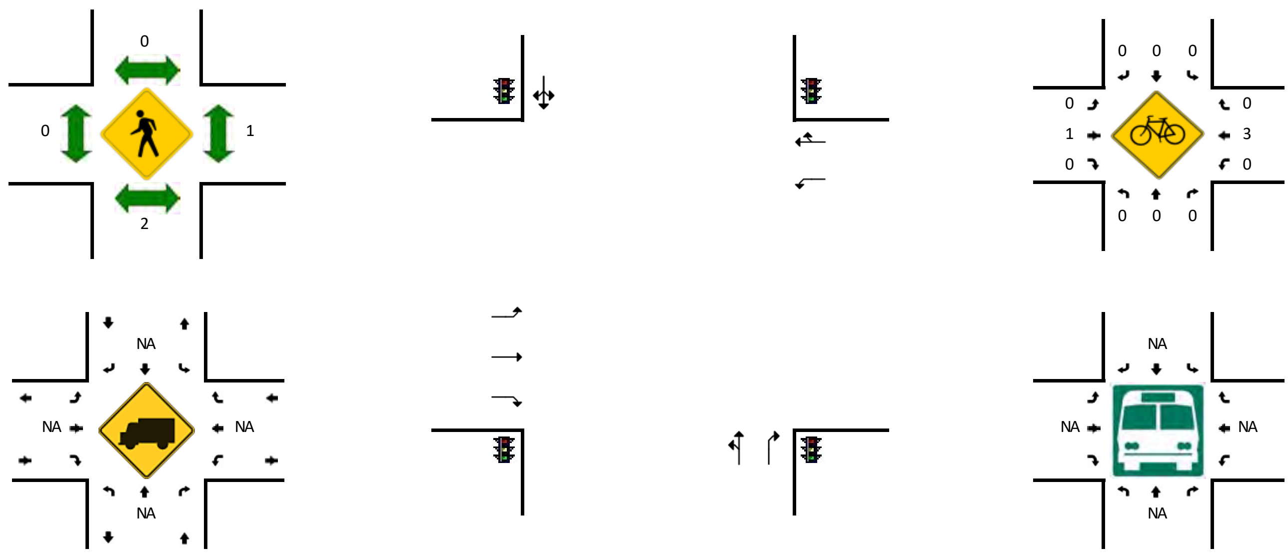
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

LOCATION: Oregon St -- Tualatin-Sherwood Rd | **QC JOB #:** 14898002
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019



Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:00 PM -- 5:15 PM





5-Min Count Period Beginning At	Oregon St (Northbound) Left	Thru	Right	U	Oregon St (Southbound) Left	Thru	Right	U	Tualatin-Sherwood Rd (Eastbound) Left	Thru	Right	U	Tualatin-Sherwood Rd (Westbound) Left	Thru	Right	U	Total	Hourly Totals
4:00 PM	5	0	11	0	0	0	1	0	0	62	11	0	25	70	0	0	185	
4:05 PM	12	0	15	0	0	1	0	0	0	58	11	0	20	55	0	0	172	
4:10 PM	12	0	22	0	3	1	0	0	0	49	8	0	29	65	0	0	189	
4:15 PM	6	0	7	0	2	0	0	0	1	64	7	0	24	63	0	0	174	
4:20 PM	9	0	14	0	1	0	0	0	0	42	13	0	29	68	0	0	176	
4:25 PM	6	1	9	0	0	1	2	0	0	43	11	0	26	62	2	0	163	
4:30 PM	6	0	7	0	1	0	0	0	0	57	9	0	33	78	0	0	191	
4:35 PM	11	0	12	0	0	0	0	0	0	62	13	0	22	55	0	0	175	
4:40 PM	6	1	13	0	1	0	1	0	1	46	9	0	36	77	0	0	191	
4:45 PM	12	0	20	0	1	0	0	0	0	46	11	0	25	64	1	0	180	
4:50 PM	13	0	8	0	1	0	0	0	0	54	12	0	31	70	0	0	189	
4:55 PM	13	0	14	0	1	1	0	0	0	58	7	0	29	61	0	0	184	2169
5:00 PM	5	0	12	0	4	2	0	0	0	64	12	0	28	67	0	0	194	2178
5:05 PM	10	0	23	0	0	1	1	0	0	74	17	0	27	62	2	0	217	2223
5:10 PM	10	0	22	0	3	4	2	0	1	68	9	0	28	74	1	0	222	2256
5:15 PM	10	0	19	0	0	0	1	0	1	58	7	0	32	59	0	0	187	2269
5:20 PM	8	0	11	0	0	0	1	0	0	52	9	0	37	79	1	0	198	2291
5:25 PM	9	0	8	0	0	0	0	0	1	50	9	0	31	76	0	0	184	2312
5:30 PM	10	1	15	0	1	2	1	0	1	50	12	0	35	66	3	0	197	2318
5:35 PM	16	0	11	0	0	0	1	0	1	54	7	0	34	69	0	0	193	2336
5:40 PM	6	0	12	0	0	0	1	0	2	57	3	0	40	82	0	0	203	2348
5:45 PM	5	0	13	0	0	0	0	0	0	46	6	0	32	66	1	0	169	2337
5:50 PM	11	0	13	0	1	0	0	0	0	45	4	0	27	64	1	0	166	2314
5:55 PM	7	0	14	0	1	0	0	0	1	52	6	0	17	74	1	0	173	2303

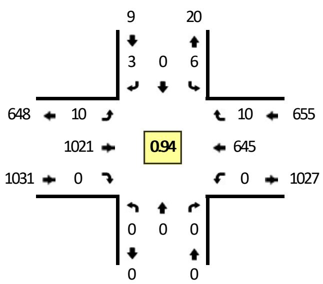
Peak 15-Min Flowrates	Northbound Left	Thru	Right	U	Southbound Left	Thru	Right	U	Eastbound Left	Thru	Right	U	Westbound Left	Thru	Right	U	Total
All Vehicles	100	0	228	0	28	28	12	0	4	824	152	0	332	812	12	0	2532
Heavy Trucks	4	0	8		0	0	0		0	40	20		4	8	0		84
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

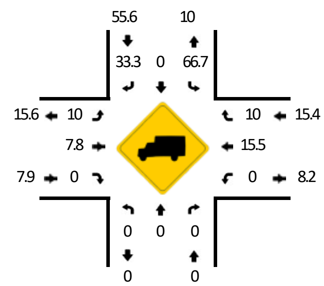
Report generated on 2/26/2019 10:13 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

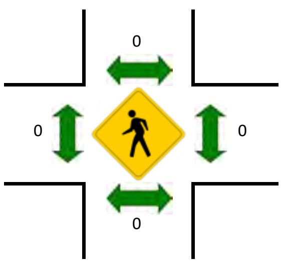
LOCATION: Wildrose Pl -- Tualatin-Sherwood Rd
CITY/STATE: Washington, OR

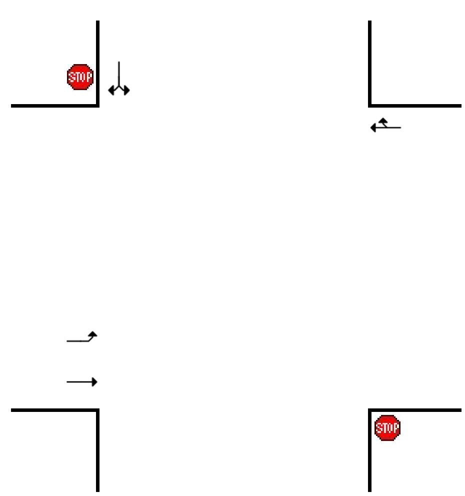
QC JOB #: 14898003
DATE: Wed, Feb 13 2019

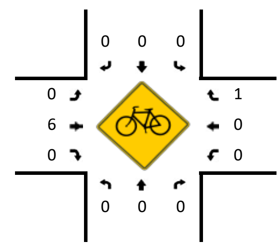


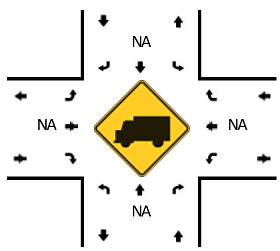
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:50 AM -- 8:05 AM

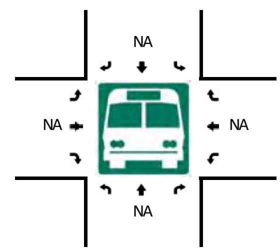












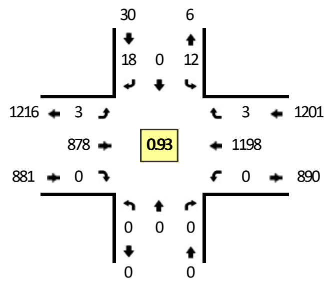
5-Min Count Period Beginning At	Wildrose Pl (Northbound)				Wildrose Pl (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	0	0	0	0	2	96	0	0	0	43	1	0	142	
7:05 AM	0	0	0	0	0	0	2	0	0	83	0	0	0	47	1	0	133	
7:10 AM	0	0	0	0	0	0	1	0	2	87	0	0	0	40	3	0	133	
7:15 AM	0	0	0	0	1	0	2	0	0	95	0	0	0	46	0	0	144	
7:20 AM	0	0	0	0	1	0	0	0	0	93	0	0	0	47	0	0	141	
7:25 AM	0	0	0	0	0	0	0	0	0	80	0	0	0	64	0	0	144	
7:30 AM	0	0	0	0	1	0	1	0	0	81	0	0	0	53	0	0	136	
7:35 AM	0	0	0	0	1	0	0	0	1	79	0	0	0	40	0	0	121	
7:40 AM	0	0	0	0	1	0	0	0	1	94	0	0	0	52	1	0	149	
7:45 AM	0	0	0	0	0	0	0	0	0	74	0	0	0	62	1	0	137	
7:50 AM	0	0	0	0	0	0	0	0	2	89	0	0	0	63	1	0	155	
7:55 AM	0	0	0	0	1	0	0	0	3	89	0	0	0	51	3	0	147	1682
8:00 AM	0	0	0	0	0	0	1	0	0	88	0	0	0	59	1	0	149	1689
8:05 AM	0	0	0	0	1	0	0	0	1	87	0	0	0	51	0	0	140	1696
8:10 AM	0	0	0	0	0	0	0	0	1	81	0	0	0	48	1	0	131	1694
8:15 AM	0	0	0	0	0	0	1	0	1	86	0	0	0	55	2	0	145	1695
8:20 AM	0	0	0	0	0	0	0	0	1	78	0	0	0	46	1	0	126	1680
8:25 AM	0	0	0	0	3	0	1	0	0	78	0	0	0	55	0	0	137	1673
8:30 AM	0	0	0	0	1	0	0	0	1	78	0	0	0	59	0	0	139	1676
8:35 AM	0	0	0	0	0	0	0	0	0	79	0	0	0	57	1	0	137	1692
8:40 AM	0	0	0	0	0	0	0	0	1	76	0	0	0	59	1	0	137	1680
8:45 AM	0	0	0	0	1	0	1	0	1	88	0	0	0	51	3	0	145	1688
8:50 AM	0	0	0	0	0	0	0	0	0	73	0	0	0	51	0	0	124	1657
8:55 AM	0	0	0	0	1	0	0	0	1	66	0	0	0	53	1	0	122	1632

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	4	0	4	0	20	1064	0	0	0	692	20	0	1804
Heavy Trucks	0	0	0		4	0	0		0	60	0		0	124	4		192
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

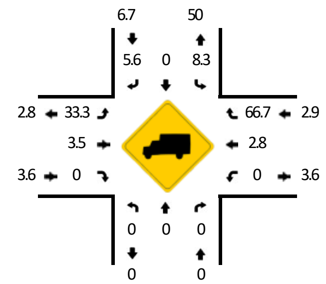
Comments:

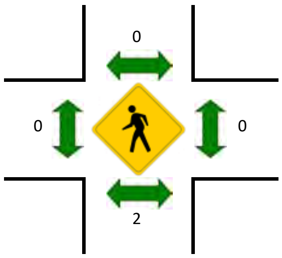
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

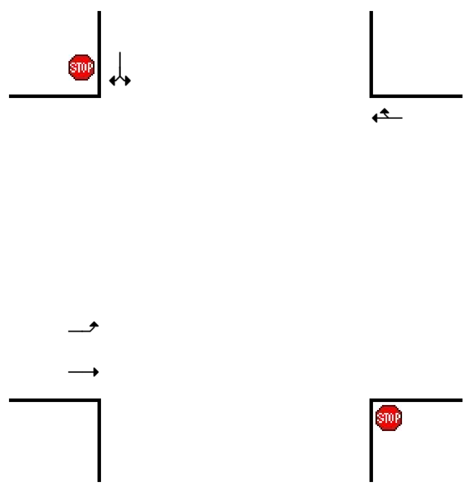
LOCATION: Wildrose Pl -- Tualatin-Sherwood Rd | **QC JOB #:** 14898004
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019

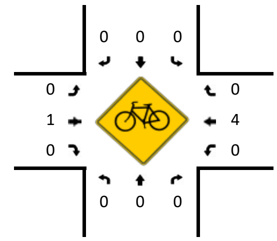


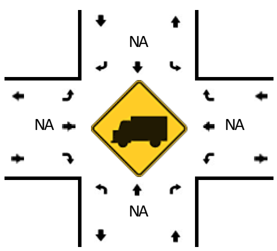
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

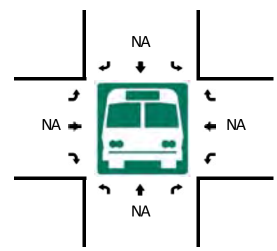












5-Min Count Period Beginning At	Wildrose Pl (Northbound)				Wildrose Pl (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	1	0	1	0	0	75	0	0	0	90	0	0	167	
4:05 PM	0	0	0	0	1	0	1	0	1	69	0	0	0	79	0	0	151	
4:10 PM	0	0	0	0	1	0	2	0	0	76	0	0	0	91	1	0	171	
4:15 PM	0	0	0	0	1	0	2	0	1	77	0	0	0	84	0	0	165	
4:20 PM	0	0	0	0	0	0	1	0	0	60	0	0	0	95	1	0	157	
4:25 PM	0	0	0	0	2	0	1	0	0	54	0	0	0	90	0	0	147	
4:30 PM	0	0	0	0	1	0	0	0	1	66	0	0	0	109	1	0	178	
4:35 PM	0	0	0	0	1	0	1	0	0	67	0	0	0	86	0	0	155	
4:40 PM	0	0	0	0	0	0	0	0	0	67	0	0	0	104	1	0	172	
4:45 PM	0	0	0	0	0	0	2	0	1	65	0	0	0	92	0	0	160	
4:50 PM	0	0	0	0	0	0	1	0	0	67	0	0	0	98	0	0	166	
4:55 PM	0	0	0	0	3	0	2	0	1	70	0	0	0	95	0	0	171	1960
5:00 PM	0	0	0	0	2	0	3	0	0	76	0	0	0	84	0	0	165	1958
5:05 PM	0	0	0	0	2	0	1	0	0	96	0	0	0	97	0	0	196	2003
5:10 PM	0	0	0	0	2	0	0	0	0	94	0	0	0	99	0	0	195	2027
5:15 PM	0	0	0	0	0	0	1	0	0	80	0	0	0	94	0	0	175	2037
5:20 PM	0	0	0	0	1	0	2	0	0	66	0	0	0	109	1	0	179	2059
5:25 PM	0	0	0	0	1	0	0	0	1	60	0	0	0	105	0	0	167	2079
5:30 PM	0	0	0	0	1	0	3	0	0	67	0	0	0	103	1	0	175	2076
5:35 PM	0	0	0	0	0	0	1	0	0	67	0	0	0	110	1	0	179	2100
5:40 PM	0	0	0	0	0	0	2	0	0	70	0	0	0	112	0	0	184	2112
5:45 PM	0	0	0	0	0	0	1	0	1	57	0	0	0	94	0	0	153	2105
5:50 PM	0	0	0	0	0	0	1	0	0	60	0	0	0	95	0	0	156	2095
5:55 PM	0	0	0	0	0	0	3	0	2	70	0	0	0	92	0	0	167	2091

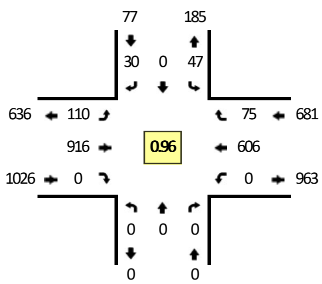
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	16	0	8	0	0	1080	0	0	0	1160	0	0	2264
Heavy Trucks	0	0	0		0	0	0		0	52	0		0	28	0		80
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	0		0	1	0		0	1	0		2
Railroad																	
Stopped Buses																	

Comments:

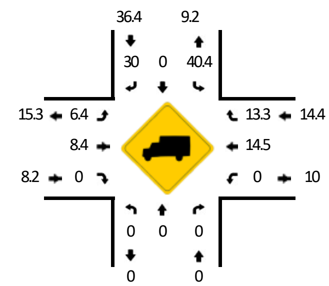
Report generated on 2/26/2019 10:13 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

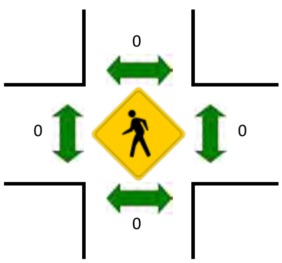
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

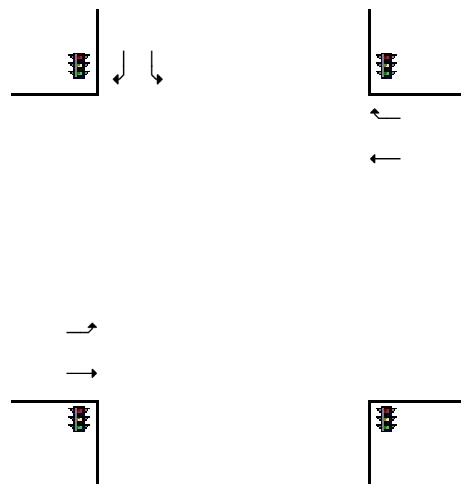
LOCATION: Cipole Rd -- Tualatin-Sherwood Rd | **QC JOB #:** 14898005
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019

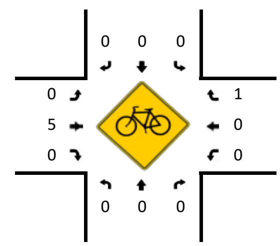


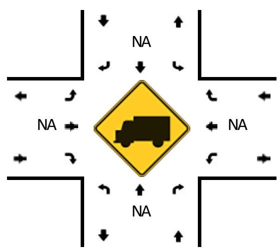
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

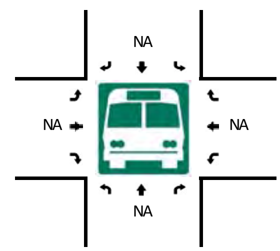












5-Min Count Period Beginning At	Cipole Rd (Northbound)				Cipole Rd (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	0	0	0	0	3	0	2	0	8	91	0	0	0	39	13	0	156	
7:05 AM	0	0	0	0	7	0	4	0	8	73	0	0	0	45	4	0	141	
7:10 AM	0	0	0	0	3	0	1	0	2	85	0	0	0	44	10	0	145	
7:15 AM	0	0	0	0	3	0	3	0	9	83	0	0	0	43	9	0	150	
7:20 AM	0	0	0	0	6	0	5	0	8	86	0	0	0	47	5	0	157	
7:25 AM	0	0	0	0	5	0	0	0	5	75	0	0	0	59	5	0	149	
7:30 AM	0	0	0	0	4	0	2	0	10	79	0	0	0	45	6	0	146	
7:35 AM	0	0	0	0	7	0	1	0	10	67	0	0	0	36	10	0	131	
7:40 AM	0	0	0	0	2	0	2	0	11	82	0	0	0	50	11	0	158	
7:45 AM	0	0	0	0	4	0	4	0	10	68	0	0	0	59	4	0	149	
7:50 AM	0	0	0	0	4	0	2	0	7	79	0	0	0	56	9	0	157	
7:55 AM	0	0	0	0	5	0	3	0	11	65	0	0	0	53	5	0	142	1781
8:00 AM	0	0	0	0	2	0	1	0	12	84	0	0	0	59	7	0	165	1790
8:05 AM	0	0	0	0	3	0	5	0	7	78	0	0	0	41	3	0	137	1786
8:10 AM	0	0	0	0	1	0	3	0	8	79	0	0	0	49	5	0	145	1786
8:15 AM	0	0	0	0	4	0	2	0	11	74	0	0	0	52	5	0	148	1784
8:20 AM	0	0	0	0	1	0	3	0	7	88	0	0	0	43	7	0	149	1776
8:25 AM	0	0	0	0	1	0	9	0	6	73	0	0	0	49	1	0	139	1766
8:30 AM	0	0	0	0	3	0	4	0	8	69	0	0	0	47	9	0	140	1760
8:35 AM	0	0	0	0	3	0	1	0	4	72	0	0	0	62	3	0	145	1774
8:40 AM	0	0	0	0	4	0	3	0	4	71	0	0	0	54	8	0	144	1760
8:45 AM	0	0	0	0	4	0	5	0	6	84	0	0	0	45	11	0	155	1766
8:50 AM	0	0	0	0	3	0	1	0	4	77	0	0	0	56	0	0	141	1750
8:55 AM	0	0	0	0	3	0	2	0	4	63	0	0	0	43	2	0	117	1725

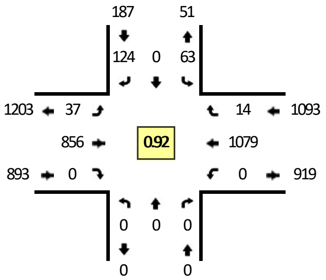
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	40	0	32	0	112	916	0	0	0	660	96	0	1856
Heavy Trucks	0	0	0		16	0	8		12	60	0		0	44	12		152
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

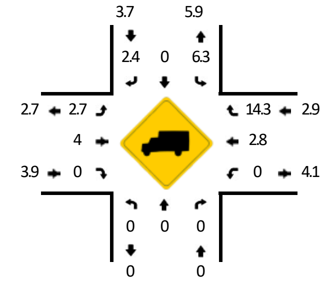
Report generated on 2/26/2019 10:13 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

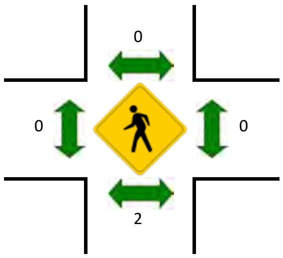
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

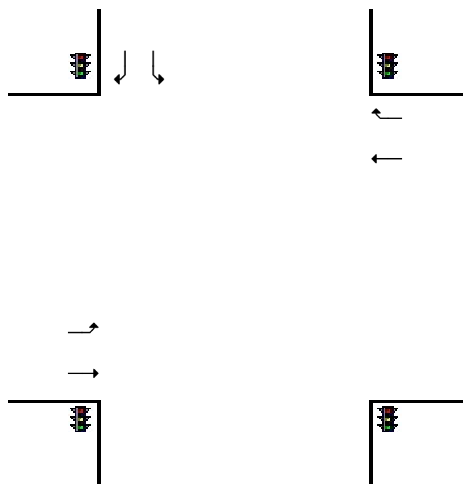
LOCATION: Cipole Rd -- Tualatin-Sherwood Rd | **QC JOB #:** 14898006
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019

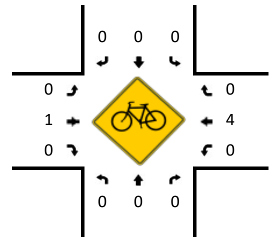


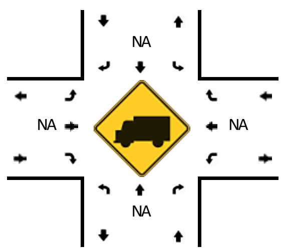
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

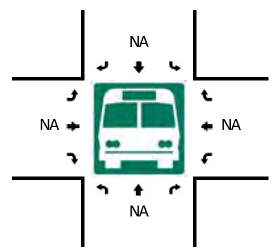












5-Min Count Period Beginning At	Cipole Rd (Northbound)				Cipole Rd (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	22	0	14	0	4	66	0	0	0	75	3	0	184	
4:05 PM	0	0	0	0	18	0	12	0	5	62	0	0	0	73	2	0	172	
4:10 PM	0	0	0	0	10	0	16	0	2	78	0	0	0	71	7	0	184	
4:15 PM	0	0	0	0	11	0	14	0	6	72	0	0	0	77	2	0	182	
4:20 PM	0	0	0	0	9	0	6	0	3	50	0	0	0	81	4	0	153	
4:25 PM	0	0	0	0	5	0	8	0	3	68	0	0	0	92	2	0	178	
4:30 PM	0	0	0	0	6	0	12	0	1	62	0	0	0	90	1	0	172	
4:35 PM	0	0	0	0	3	0	8	0	2	67	0	0	0	86	3	0	169	
4:40 PM	0	0	0	0	7	0	12	0	4	58	0	0	0	87	4	0	172	
4:45 PM	0	0	0	0	10	0	9	0	3	64	0	0	0	85	1	0	172	
4:50 PM	0	0	0	0	5	0	7	0	1	70	0	0	0	85	4	0	172	
4:55 PM	0	0	0	0	6	0	11	0	5	71	0	0	0	89	1	0	183	2093
5:00 PM	0	0	0	0	8	0	12	0	2	65	0	0	0	77	0	0	164	2073
5:05 PM	0	0	0	0	9	0	15	0	8	81	0	0	0	82	1	0	196	2097
5:10 PM	0	0	0	0	3	0	11	0	7	92	0	0	0	86	2	0	201	2114
5:15 PM	0	0	0	0	7	0	11	0	4	86	0	0	0	87	0	0	195	2127
5:20 PM	0	0	0	0	2	0	12	0	3	63	0	0	0	94	1	0	175	2149
5:25 PM	0	0	0	0	3	0	8	0	1	69	0	0	0	95	1	0	177	2148
5:30 PM	0	0	0	0	3	0	11	0	1	53	0	0	0	102	0	0	170	2146
5:35 PM	0	0	0	0	4	0	8	0	1	78	0	0	0	100	1	0	192	2169
5:40 PM	0	0	0	0	3	0	9	0	1	64	0	0	0	97	2	0	176	2173
5:45 PM	0	0	0	0	1	0	8	0	0	63	0	0	0	90	3	0	165	2166
5:50 PM	0	0	0	0	5	0	7	0	3	58	0	0	0	89	1	0	163	2157
5:55 PM	0	0	0	0	1	0	4	0	1	67	0	0	0	91	0	0	164	2138

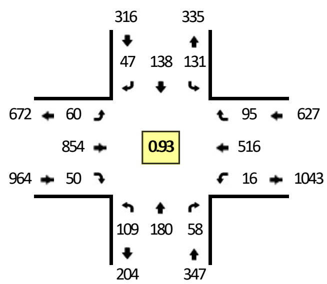
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	76	0	148	0	76	1036	0	0	0	1020	12	0	2368
Heavy Trucks	0	0	0		8	0	0		4	52	0		0	24	8		96
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	0		0	1	0		0	1	0		2
Railroad																	
Stopped Buses																	

Comments:

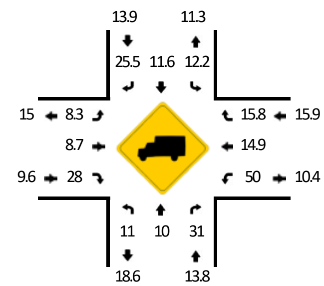
Report generated on 2/26/2019 10:14 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

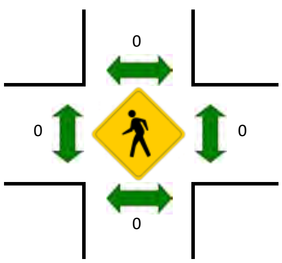
LOCATION: 124th Ave -- Tualatin-Sherwood Rd **QC JOB #:** 14898007
CITY/STATE: Washington, OR **DATE:** Wed, Feb 13 2019

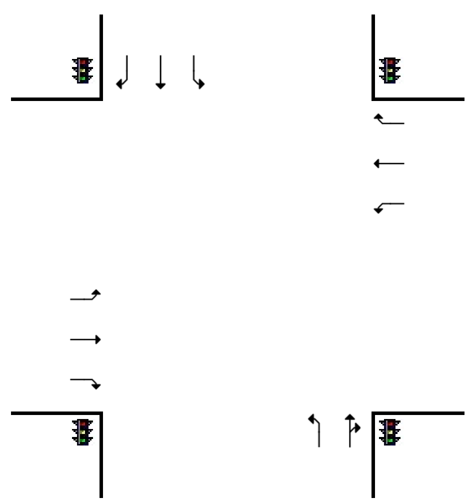
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

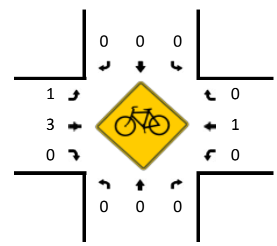


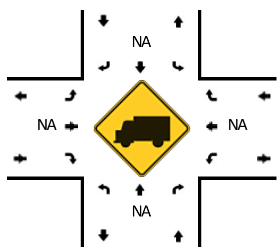
Quality Counts
DATA THAT DRIVES COMMUNITIES

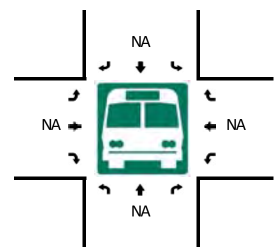












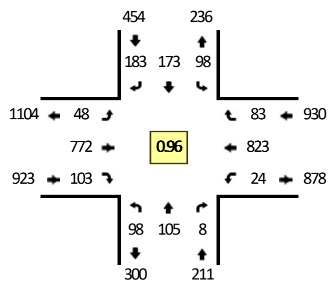
5-Min Count Period Beginning At	124th Ave (Northbound)				124th Ave (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	8	15	8	0	10	8	3	0	6	81	6	0	0	42	5	0	192	
7:05 AM	10	21	3	0	8	3	0	0	9	60	4	0	1	39	8	0	166	
7:10 AM	5	10	4	0	6	8	1	0	16	81	1	0	0	51	9	0	192	
7:15 AM	10	5	4	0	9	9	2	0	7	80	4	0	1	42	8	0	181	
7:20 AM	11	9	5	0	8	15	2	0	7	80	4	0	0	41	6	0	188	
7:25 AM	9	15	7	0	11	16	4	0	7	71	3	0	2	50	6	0	201	
7:30 AM	5	17	5	0	11	9	2	0	3	65	5	0	0	39	6	0	167	
7:35 AM	10	13	3	0	20	20	3	0	5	67	5	0	1	31	5	0	183	
7:40 AM	11	24	6	0	11	12	3	0	2	66	7	0	0	47	13	0	202	
7:45 AM	15	14	7	0	13	14	4	0	8	74	1	0	2	53	10	0	215	
7:50 AM	10	15	7	0	8	10	7	0	7	68	5	0	1	43	6	0	187	
7:55 AM	8	17	5	0	13	15	9	0	5	69	2	0	3	42	14	0	202	2276
8:00 AM	11	16	3	0	6	8	5	0	3	79	8	0	1	45	7	0	192	2276
8:05 AM	5	13	3	0	9	7	4	0	7	68	4	0	1	33	11	0	165	2275
8:10 AM	7	15	2	0	9	8	2	0	4	73	2	0	1	48	6	0	177	2260
8:15 AM	7	12	5	0	12	4	2	0	2	74	4	0	4	44	5	0	175	2254
8:20 AM	7	9	1	0	8	6	2	0	9	75	5	0	0	41	8	0	171	2237
8:25 AM	9	16	0	0	11	11	4	0	4	65	2	0	0	40	8	0	170	2206
8:30 AM	4	14	3	0	3	3	4	0	7	68	7	0	1	44	9	0	167	2206
8:35 AM	5	8	4	0	8	7	5	1	5	61	7	0	0	61	4	0	176	2199
8:40 AM	14	9	2	0	4	6	5	0	12	55	3	0	2	38	5	0	155	2152
8:45 AM	8	11	0	0	6	6	5	0	14	70	4	0	0	46	7	0	177	2114
8:50 AM	5	13	2	0	11	8	5	0	9	67	4	0	0	45	6	0	175	2102
8:55 AM	4	15	1	0	10	3	4	0	4	63	3	0	1	35	8	0	151	2051

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	144	212	80	0	128	144	56	0	68	832	52	0	12	572	116	0	2416
Heavy Trucks	8	16	12		12	8	12		0	56	12		4	48	4		192
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

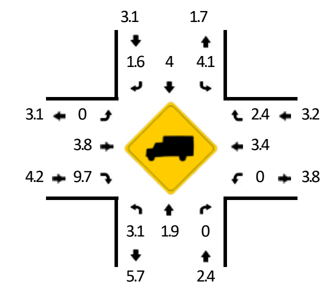
Comments:

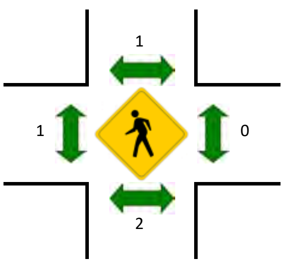
Type of peak hour being reported: User-Defined　　Method for determining peak hour: Total Entering Volume

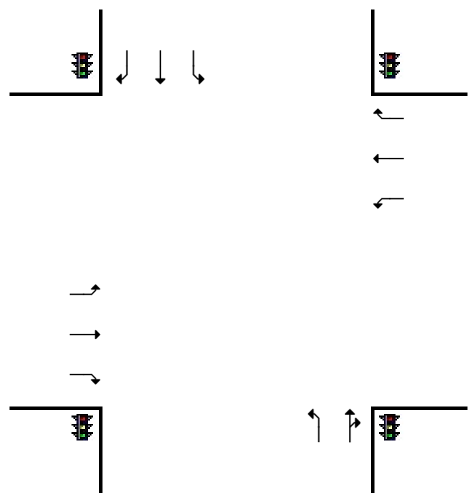
LOCATION: 124th Ave -- Tualatin-Sherwood Rd　　**QC JOB #:** 14898008
CITY/STATE: Washington, OR　　**DATE:** Wed, Feb 13 2019

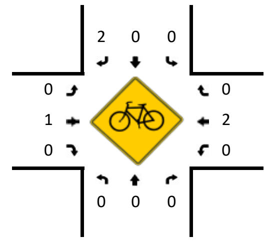


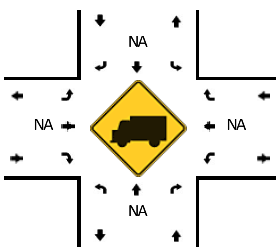
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:10 PM -- 5:25 PM

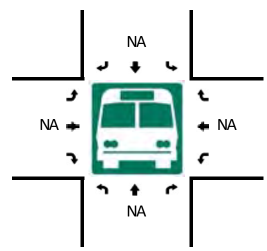












5-Min Count Period Beginning At	124th Ave (Northbound)				124th Ave (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	7	7	1	0	5	12	11	0	4	66	9	0	3	62	3	0	190	
4:05 PM	9	4	1	0	10	13	15	0	5	68	15	0	2	58	5	0	205	
4:10 PM	9	11	0	0	8	12	11	0	8	63	13	0	4	63	10	0	212	
4:15 PM	8	6	1	0	5	13	8	0	4	73	12	0	2	61	10	0	203	
4:20 PM	9	16	0	0	13	11	15	1	3	50	8	0	3	57	6	0	192	
4:25 PM	4	9	2	0	5	7	8	0	3	58	13	0	8	83	7	0	207	
4:30 PM	4	5	1	0	9	12	16	0	1	58	10	0	2	81	4	0	203	
4:35 PM	8	6	1	0	9	22	18	0	6	58	3	0	1	61	11	0	204	
4:40 PM	11	8	3	0	12	18	20	0	10	46	9	0	4	57	12	0	210	
4:45 PM	7	2	1	0	9	20	17	0	7	63	12	0	3	63	6	0	210	
4:50 PM	12	17	0	0	16	15	11	0	1	48	9	0	1	70	6	0	206	
4:55 PM	8	9	0	0	9	14	16	0	5	80	7	0	1	69	7	0	225	2467
5:00 PM	6	4	1	0	10	16	11	0	6	53	10	0	1	65	8	0	191	2468
5:05 PM	5	5	2	0	10	14	12	0	4	81	9	0	1	64	8	0	215	2478
5:10 PM	8	11	0	0	8	17	16	0	5	80	14	0	1	69	13	0	242	2508
5:15 PM	4	11	1	0	2	13	17	0	8	63	9	0	4	53	9	0	194	2499
5:20 PM	10	9	0	0	7	11	22	0	3	73	6	0	2	75	2	0	220	2527
5:25 PM	8	10	1	0	5	11	13	0	2	56	9	0	4	69	4	0	192	2512
5:30 PM	20	10	0	0	10	14	16	0	2	56	4	0	3	70	4	0	209	2518
5:35 PM	5	6	1	0	8	9	10	0	0	62	8	0	2	84	11	0	206	2520
5:40 PM	5	11	1	0	4	19	22	0	5	57	6	0	1	72	5	0	208	2518
5:45 PM	9	11	3	0	6	14	12	0	2	53	7	0	2	68	6	0	193	2501
5:50 PM	8	4	0	0	3	6	3	0	3	57	10	0	0	85	7	0	186	2481
5:55 PM	4	6	0	0	2	10	9	0	0	62	3	0	0	92	4	0	192	2448

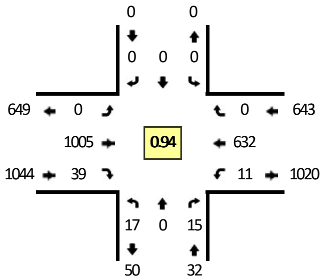
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	88	124	4	0	68	164	220	0	64	864	116	0	28	788	96	0	2624
Heavy Trucks	0	4	0		0	4	4		0	40	16		0	48	0		116
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	1		0	1	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

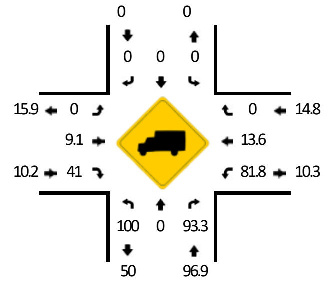
Report generated on 2/26/2019 10:20 AM　　SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

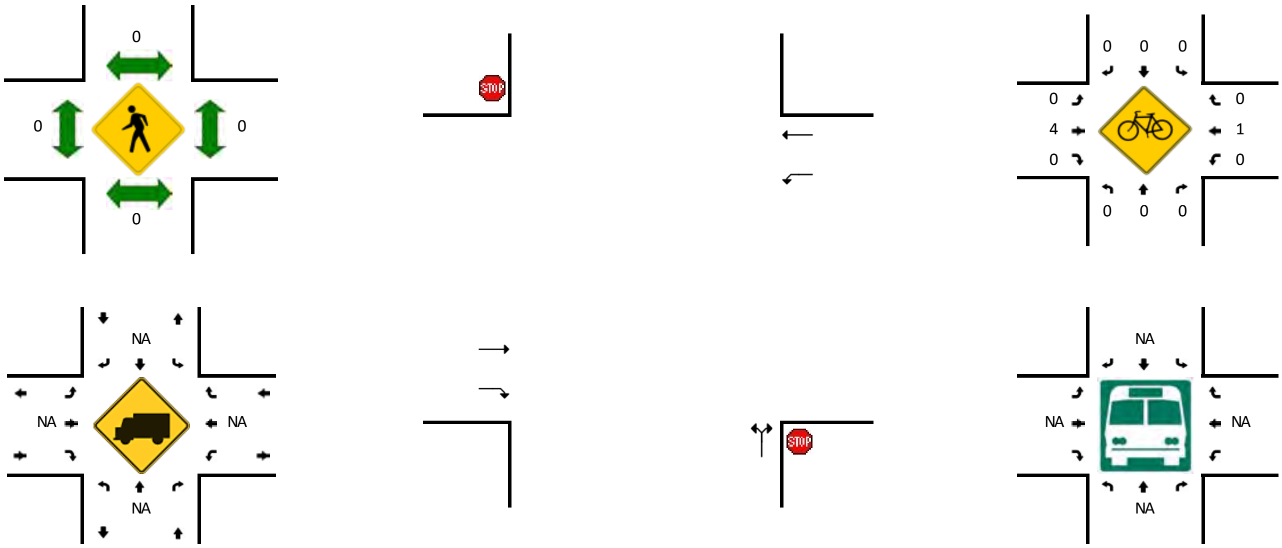
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

LOCATION: 120th Ave -- Tualatin-Sherwood Rd | **QC JOB #:** 14898009
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019



Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:40 AM -- 7:55 AM





5-Min Count Period Beginning At	120th Ave (Northbound)				120th Ave (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	1	0	0	0	0	0	0	0	0	86	6	0	2	42	0	0	137	
7:05 AM	0	0	0	0	0	0	0	0	0	79	3	0	1	54	0	0	137	
7:10 AM	2	0	1	0	0	0	0	0	0	74	6	0	0	49	0	0	132	
7:15 AM	1	0	1	0	0	0	0	0	0	97	1	0	0	52	0	0	152	
7:20 AM	3	0	2	0	0	0	0	0	0	74	4	0	1	47	0	0	131	
7:25 AM	3	0	0	0	0	0	0	0	0	93	3	0	0	61	0	0	160	
7:30 AM	2	0	0	0	0	0	0	0	0	87	1	0	1	38	0	0	129	
7:35 AM	1	0	1	0	0	0	0	0	0	87	1	0	0	42	0	0	132	
7:40 AM	0	0	3	0	0	0	0	0	0	85	2	0	1	63	0	0	154	
7:45 AM	1	0	0	0	0	0	0	0	0	84	4	0	2	60	0	0	151	
7:50 AM	0	0	0	0	0	0	0	0	0	80	6	0	4	61	0	0	151	
7:55 AM	1	0	1	0	0	0	0	0	0	75	8	0	0	56	0	0	141	1707
8:00 AM	1	0	1	0	0	0	0	0	0	91	2	0	0	46	0	0	141	1711
8:05 AM	1	0	4	0	0	0	0	0	0	76	1	0	0	48	0	0	130	1704
8:10 AM	2	0	2	0	0	0	0	0	0	76	4	0	2	55	0	0	141	1713
8:15 AM	2	0	1	0	0	0	0	0	0	97	3	0	0	55	0	0	158	1719
8:20 AM	1	0	2	0	0	0	0	0	0	86	2	0	1	39	0	0	131	1719
8:25 AM	1	0	0	0	0	0	0	0	0	76	0	0	1	55	0	0	133	1692
8:30 AM	1	0	4	0	0	0	0	0	0	71	4	0	1	51	0	0	132	1695
8:35 AM	0	0	1	0	0	0	0	0	0	72	3	0	1	60	0	0	137	1700
8:40 AM	2	0	3	0	0	0	0	0	0	61	1	0	3	52	0	0	122	1668
8:45 AM	2	0	0	0	0	0	0	0	0	65	3	0	1	46	0	0	117	1634
8:50 AM	2	0	1	0	0	0	0	0	0	76	0	0	2	46	0	0	127	1610
8:55 AM	1	0	1	0	0	0	0	0	0	74	4	0	1	52	0	0	133	1602

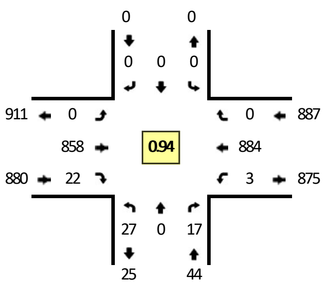
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	0	12	0	0	0	0	0	0	996	48	0	28	736	0	0	1824
Heavy Trucks	4	0	12		0	0	0		0	68	12		24	64	0		184
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

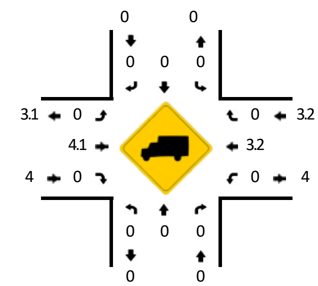
Report generated on 2/26/2019 10:20 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

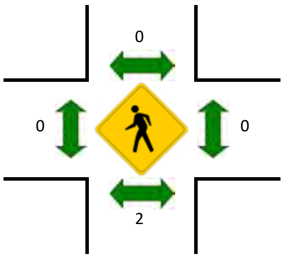
Type of peak hour being reported: User-Defined Method for determining peak hour: Total Entering Volume

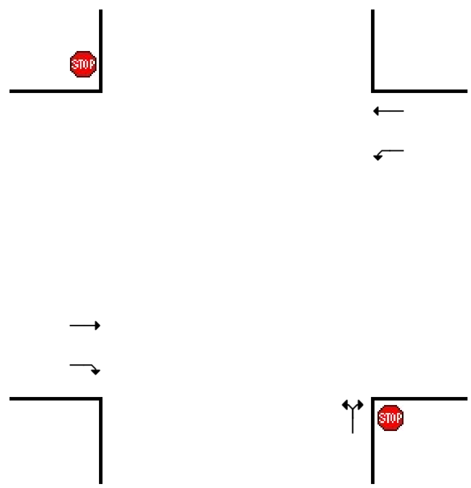
LOCATION: 120th Ave -- Tualatin-Sherwood Rd **QC JOB #:** 14898010
CITY/STATE: Washington, OR **DATE:** Wed, Feb 13 2019

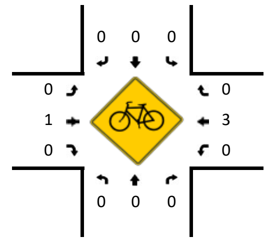


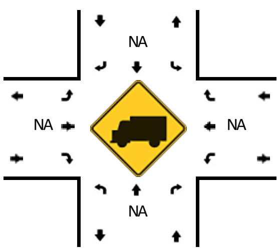
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

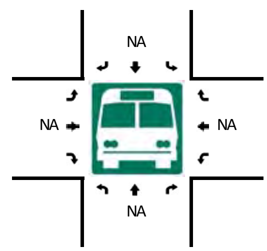












5-Min Count Period Beginning At	120th Ave (Northbound)				120th Ave (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	0	4	0	0	0	0	0	0	62	1	0	0	67	0	0	142	
4:05 PM	0	0	3	0	0	0	0	0	0	78	2	0	1	61	0	0	145	
4:10 PM	3	0	2	0	0	0	0	0	0	70	0	0	0	61	0	0	136	
4:15 PM	1	0	0	0	0	0	0	0	0	83	4	0	0	73	0	0	161	
4:20 PM	3	0	0	0	0	0	0	0	0	65	0	0	0	65	0	0	133	
4:25 PM	1	0	0	0	0	0	0	0	0	55	2	0	0	92	0	0	150	
4:30 PM	1	0	1	0	0	0	0	0	0	63	3	0	1	81	0	0	150	
4:35 PM	4	0	2	0	0	0	0	0	0	65	2	0	1	73	0	0	147	
4:40 PM	2	0	1	0	0	0	0	0	0	64	1	0	0	75	0	0	143	
4:45 PM	2	0	2	0	0	0	0	0	0	70	2	0	0	69	0	0	145	
4:50 PM	4	0	0	0	0	0	0	0	0	57	0	0	1	62	0	0	124	
4:55 PM	1	0	1	0	0	0	0	0	0	89	0	0	0	83	0	0	174	1750
5:00 PM	2	0	1	0	0	0	0	0	0	58	3	0	0	72	0	0	136	1744
5:05 PM	1	0	3	0	0	0	0	0	0	92	4	0	0	64	0	0	164	1763
5:10 PM	2	0	2	0	0	0	0	0	0	87	4	0	0	71	0	0	166	1793
5:15 PM	4	0	2	0	0	0	0	0	0	71	4	0	1	68	0	0	150	1782
5:20 PM	3	0	0	0	0	0	0	0	0	72	2	0	1	76	0	0	154	1803
5:25 PM	1	0	0	0	0	0	0	0	0	55	2	0	0	80	0	0	138	1791
5:30 PM	3	0	4	0	0	0	0	0	0	67	0	0	0	79	0	0	153	1794
5:35 PM	4	0	2	0	0	0	0	0	0	70	1	0	0	80	0	0	157	1804
5:40 PM	0	0	0	0	0	0	0	0	0	70	0	0	0	80	0	0	150	1811
5:45 PM	3	0	0	0	0	0	0	0	0	62	1	0	1	78	0	0	145	1811
5:50 PM	0	0	0	0	0	0	0	0	0	53	3	0	1	82	0	0	139	1826
5:55 PM	1	0	1	0	0	0	0	0	0	54	3	0	0	78	0	0	137	1789

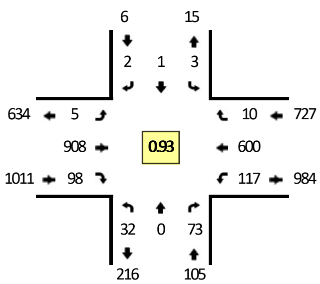
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	28	0	28	0	0	0	0	0	0	1000	48	0	4	812	0	0	1920
Heavy Trucks	0	0	0		0	0	0		0	48	0		0	36	0		84
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

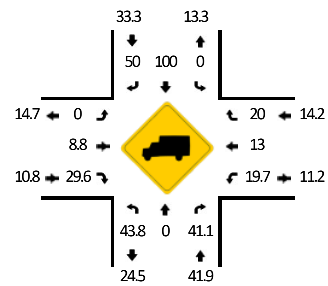
Report generated on 2/26/2019 10:20 AM SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: User-Defined
Method for determining peak hour: Total Entering Volume

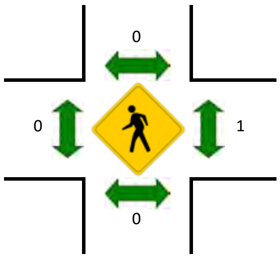
LOCATION: 115th Ave -- Tualatin-Sherwood Rd
QC JOB #: 14898011
CITY/STATE: Washington, OR
DATE: Wed, Feb 13 2019

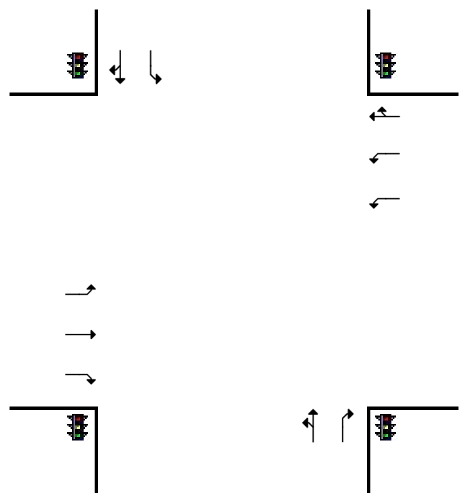


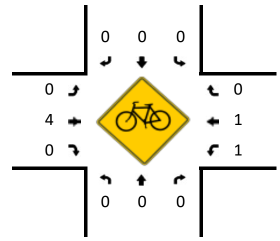
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

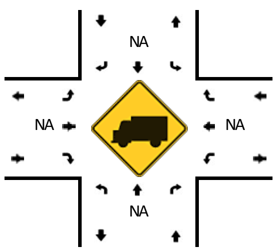


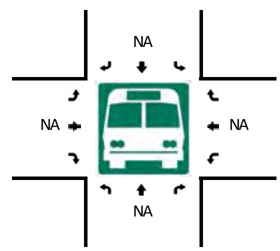
Quality Counts
DATA THAT DRIVES COMMUNITIES











5-Min Count Period Beginning At	115th Ave (Northbound)				115th Ave (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	2	0	5	0	1	0	0	0	0	75	10	0	10	42	1	0	146	
7:05 AM	1	0	5	0	0	0	1	0	0	75	11	0	7	54	0	0	154	
7:10 AM	3	0	8	0	3	0	1	0	0	61	6	0	5	37	0	0	124	
7:15 AM	3	0	5	0	1	0	0	0	0	86	11	0	7	49	0	0	162	
7:20 AM	4	0	10	0	0	0	0	0	0	63	10	0	9	49	0	0	145	
7:25 AM	2	0	4	0	2	0	0	0	0	70	14	0	19	59	1	0	171	
7:30 AM	2	0	6	0	0	0	0	0	0	88	12	0	5	35	1	0	149	
7:35 AM	2	0	8	0	0	0	0	0	0	68	12	0	10	40	0	0	140	
7:40 AM	5	0	7	0	0	0	0	0	1	86	4	0	14	58	0	0	175	
7:45 AM	4	0	4	0	0	0	0	0	1	90	5	0	10	59	1	0	174	
7:50 AM	3	0	4	0	0	0	0	0	2	61	7	0	11	56	2	0	146	
7:55 AM	3	0	7	0	0	0	1	0	0	69	8	0	5	46	1	0	140	1826
8:00 AM	1	0	5	0	1	0	0	0	1	65	8	0	15	53	2	0	151	1831
8:05 AM	2	0	8	0	0	1	0	0	0	89	2	0	4	40	0	0	146	1823
8:10 AM	2	0	4	0	0	0	1	0	0	72	6	0	14	50	1	0	150	1849
8:15 AM	2	0	6	0	0	0	0	0	0	87	10	0	1	55	1	0	162	1849
8:20 AM	4	0	5	0	2	0	1	0	4	78	5	0	3	36	2	0	140	1844
8:25 AM	0	0	4	0	0	0	0	0	0	70	7	0	3	55	0	0	139	1812
8:30 AM	5	0	6	0	0	0	0	0	0	63	6	0	5	49	0	0	134	1797
8:35 AM	2	0	9	0	0	0	1	0	4	70	7	0	6	55	1	0	155	1812
8:40 AM	6	0	8	0	0	0	0	0	0	65	3	0	5	51	0	0	138	1775
8:45 AM	1	0	7	0	1	0	0	0	1	55	4	0	6	42	0	0	117	1718
8:50 AM	3	0	8	0	0	0	0	0	1	83	3	0	4	45	2	0	149	1721
8:55 AM	4	0	3	0	4	0	0	0	0	66	2	0	2	52	3	0	136	1717

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	48	0	60	0	0	0	0	0	16	948	64	0	140	692	12	0	1980
Heavy Trucks	16	0	16		0	0	0		0	64	12		20	76	4		208
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		1	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 2/26/2019 10:20 AM
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: User-Defined

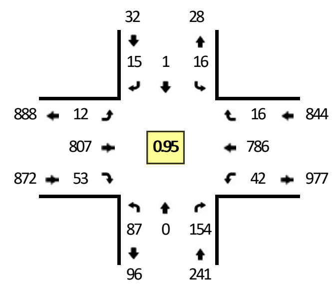
Method for determining peak hour: Total Entering Volume

LOCATION: 115th Ave -- Tualatin-Sherwood Rd

CITY/STATE: Washington, OR

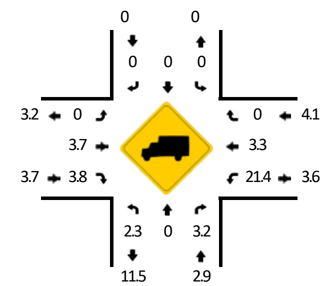
QC JOB #: 14898012

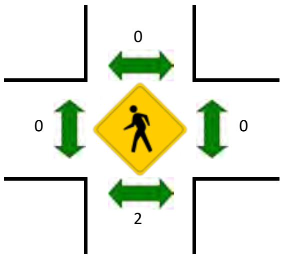
DATE: Wed, Feb 13 2019

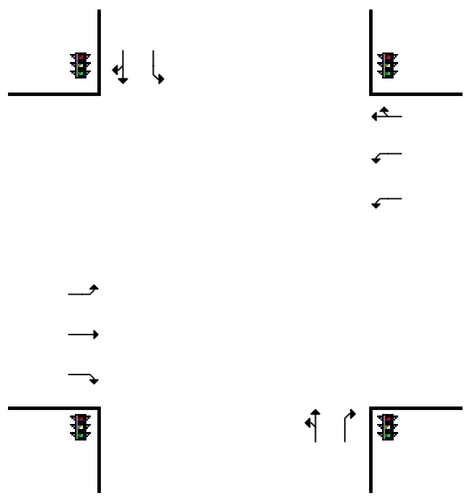


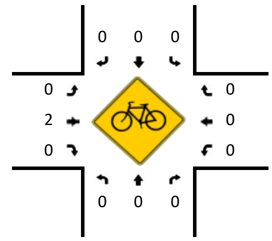
Peak-Hour: 4:45 PM -- 5:45 PM

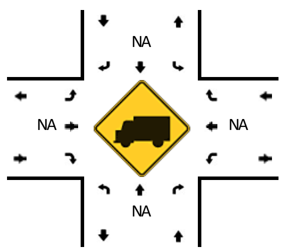
Peak 15-Min: 5:05 PM -- 5:20 PM

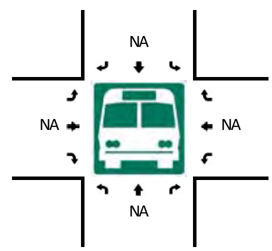












5-Min Count Period Beginning At	115th Ave (Northbound)				115th Ave (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	4	0	13	0	1	0	1	0	0	65	2	0	2	66	2	0	156	
4:05 PM	15	0	31	0	3	0	2	0	1	63	4	0	0	47	1	0	167	
4:10 PM	7	0	9	0	0	0	0	0	0	76	1	0	0	51	1	0	145	
4:15 PM	5	0	12	0	2	0	1	0	2	79	3	0	8	72	1	0	185	
4:20 PM	2	1	6	0	0	0	0	0	1	67	5	0	2	61	0	0	145	
4:25 PM	10	0	14	0	2	0	1	0	0	56	2	0	4	75	2	0	166	
4:30 PM	6	0	13	0	2	0	1	0	0	56	2	0	3	80	0	0	163	
4:35 PM	17	0	12	0	0	0	0	0	1	59	4	0	4	63	1	0	161	
4:40 PM	8	0	10	0	1	0	1	0	3	68	2	0	4	61	1	0	159	
4:45 PM	9	0	7	0	0	0	1	0	2	60	7	0	5	64	1	0	156	
4:50 PM	3	0	11	0	2	0	1	0	0	56	6	0	1	58	3	0	141	
4:55 PM	3	0	12	0	1	0	3	0	2	82	5	0	4	75	2	0	189	1933
5:00 PM	4	0	13	0	1	0	1	0	0	57	1	0	3	70	1	0	151	1928
5:05 PM	14	0	17	0	2	0	2	0	0	68	8	0	6	50	1	0	168	1929
5:10 PM	7	0	20	0	1	0	2	0	2	89	6	0	2	52	1	0	182	1966
5:15 PM	10	0	12	0	0	0	0	0	1	72	3	0	3	72	0	0	173	1954
5:20 PM	2	0	11	0	0	1	1	0	1	70	3	0	1	70	3	0	163	1972
5:25 PM	7	0	13	0	3	0	1	0	0	59	1	0	2	71	2	0	159	1965
5:30 PM	3	0	9	0	1	0	1	0	1	60	5	0	4	72	1	0	157	1959
5:35 PM	18	0	14	0	2	0	2	0	2	53	4	0	7	53	0	0	155	1953
5:40 PM	7	0	15	0	3	0	0	0	1	81	4	0	4	79	1	0	195	1989
5:45 PM	8	0	12	0	0	0	1	0	0	62	2	0	0	74	1	0	160	1993
5:50 PM	2	0	7	0	0	0	1	0	1	44	3	0	3	80	2	0	143	1995
5:55 PM	2	0	6	0	1	0	0	0	3	59	0	0	4	60	1	0	136	1942

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	124	0	196	0	12	0	16	0	12	916	68	0	44	696	8	0	2092
Heavy Trucks	8	0	4		0	0	0		0	40	4		4	32	0		92
Pedestrians		8				0				0				0			8
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

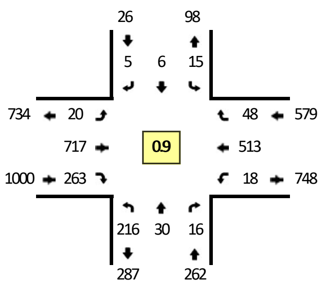
Comments:

Report generated on 2/26/2019 10:23 AM

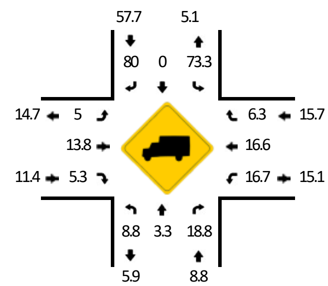
SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

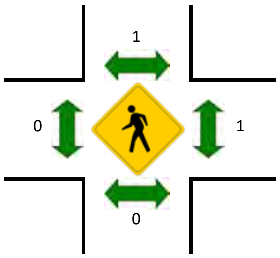
LOCATION: 112th Ave/Avery St -- Tualatin-Sherwood Rd
CITY/STATE: Washington, OR

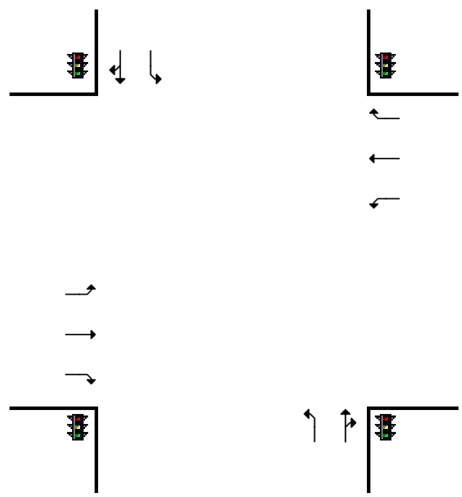
QC JOB #: 14898013
DATE: Wed, Feb 13 2019

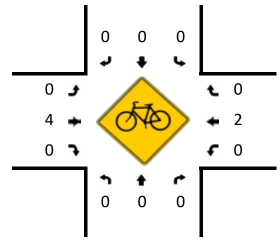


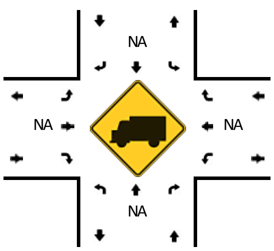
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:40 AM -- 7:55 AM

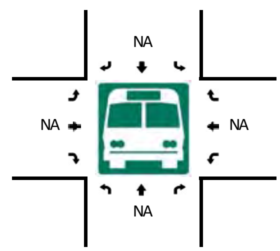












5-Min Count Period Beginning At	112th Ave/Avery St (Northbound)				112th Ave/Avery St (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	15	4	1	0	0	1	0	0	4	61	19	0	0	45	1	0	151	
7:05 AM	13	3	1	0	0	0	0	0	1	49	23	0	0	49	4	0	143	
7:10 AM	18	4	0	0	0	0	0	0	1	63	13	0	0	21	3	0	123	
7:15 AM	16	3	0	0	0	0	1	0	3	63	22	0	0	39	4	0	151	
7:20 AM	16	2	1	0	0	0	0	0	2	61	18	0	0	47	3	0	150	
7:25 AM	28	0	0	0	2	0	0	0	1	50	22	0	2	48	5	0	158	
7:30 AM	9	5	1	0	1	2	0	0	0	68	22	0	0	30	2	0	140	
7:35 AM	11	3	0	0	1	1	1	0	3	58	21	0	1	42	4	0	146	
7:40 AM	21	2	2	0	2	0	0	0	2	53	38	0	2	56	3	0	181	
7:45 AM	16	2	1	0	1	1	0	0	3	57	34	0	1	45	8	0	169	
7:50 AM	24	2	3	0	3	1	2	0	1	52	17	0	2	53	11	0	171	
7:55 AM	26	3	2	0	0	0	0	0	1	53	25	0	2	31	1	0	144	1827
8:00 AM	19	3	3	0	2	0	0	0	1	58	13	0	1	47	4	0	151	1827
8:05 AM	16	6	2	0	0	0	0	0	1	79	21	0	2	28	2	0	157	1841
8:10 AM	19	1	1	0	2	0	2	0	3	54	8	0	4	39	2	0	135	1853
8:15 AM	11	1	0	0	1	1	0	0	2	74	24	0	1	47	3	0	165	1867
8:20 AM	15	2	0	0	1	0	0	0	1	72	13	0	0	30	0	0	134	1851
8:25 AM	9	0	1	0	2	1	1	0	0	51	15	0	1	44	7	0	132	1825
8:30 AM	15	0	0	0	0	1	1	0	1	63	8	0	0	46	2	0	137	1822
8:35 AM	9	1	0	0	1	0	0	0	2	56	18	0	1	50	0	0	138	1814
8:40 AM	11	0	2	0	1	1	2	0	0	71	9	0	0	43	4	0	144	1777
8:45 AM	8	0	0	0	1	0	1	0	1	46	17	0	3	39	5	0	121	1729
8:50 AM	10	3	1	0	2	0	3	0	0	69	20	0	0	39	4	0	151	1709
8:55 AM	11	2	1	0	2	2	2	0	0	56	13	0	1	44	5	0	139	1704

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	244	24	24	0	24	8	8	0	24	648	356	0	20	616	88	0	2084
Heavy Trucks	8	0	4		16	0	8		0	76	16		8	88	0		224
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	1	0		1
Railroad																	
Stopped Buses																	

Comments:

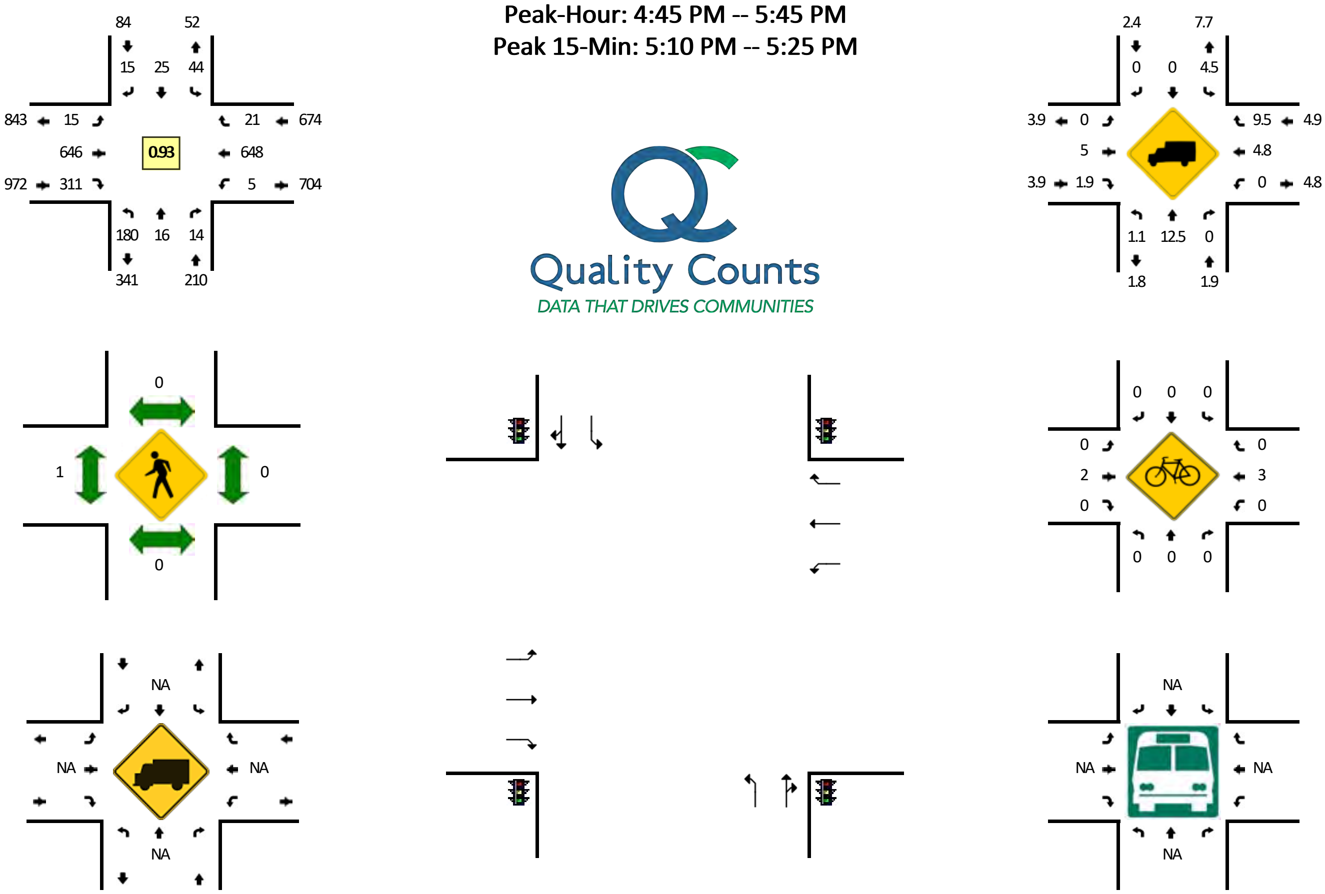
Type of peak hour being reported: User-Defined — Method for determining peak hour: Total Entering Volume

LOCATION: 112th Ave/Avery St -- Tualatin-Sherwood Rd — **QC JOB #:** 14898014

CITY/STATE: Washington, OR — **DATE:** Wed, Feb 13 2019

Peak-Hour: 4:45 PM -- 5:45 PM

Peak 15-Min: 5:10 PM -- 5:25 PM



5-Min Count Period Beginning At	112th Ave/Avery St (Northbound)				112th Ave/Avery St (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	11	0	0	0	7	2	0	0	1	46	23	0	0	54	1	0	145	
4:05 PM	24	1	0	0	5	4	3	0	2	55	34	0	0	37	0	0	165	
4:10 PM	15	1	2	0	1	1	1	0	1	63	23	0	1	31	2	0	142	
4:15 PM	15	3	1	0	0	3	2	0	2	72	26	0	1	53	3	0	181	
4:20 PM	11	2	0	0	2	2	1	0	3	48	22	0	0	58	5	0	154	
4:25 PM	20	0	1	0	5	3	0	0	1	45	28	0	0	55	5	0	163	
4:30 PM	13	0	0	0	4	3	4	0	0	56	19	0	1	64	2	0	166	
4:35 PM	38	4	6	0	8	6	1	0	0	44	23	0	0	37	1	0	168	
4:40 PM	19	1	1	0	3	4	1	0	1	61	25	0	0	41	3	0	160	
4:45 PM	25	1	0	0	1	2	1	0	0	37	25	0	0	43	0	0	135	
4:50 PM	10	4	1	0	4	2	0	0	0	44	27	0	0	52	3	0	147	
4:55 PM	12	0	1	0	5	2	1	0	0	55	30	0	1	61	0	0	168	1894
5:00 PM	13	2	0	0	4	0	1	0	1	50	25	0	2	67	5	0	170	1919
5:05 PM	28	1	2	0	6	4	4	0	3	57	23	0	0	36	1	0	165	1919
5:10 PM	12	0	2	0	6	2	1	0	1	76	32	0	0	32	1	0	165	1942
5:15 PM	22	4	1	0	6	2	0	0	2	53	25	0	1	56	3	0	175	1936
5:20 PM	11	2	2	0	4	2	5	0	0	58	34	0	0	58	5	0	181	1963
5:25 PM	13	1	2	0	2	0	1	0	1	55	24	0	0	61	1	0	161	1961
5:30 PM	8	0	2	0	2	2	0	0	3	47	18	0	0	62	0	0	144	1939
5:35 PM	11	1	0	0	3	6	0	0	2	43	21	0	1	53	1	0	142	1913
5:40 PM	15	0	1	0	1	1	1	0	2	71	27	0	0	67	1	0	187	1940
5:45 PM	22	1	1	0	1	3	1	0	1	41	31	0	0	48	2	0	152	1957
5:50 PM	19	1	0	0	3	0	0	0	0	44	13	0	1	58	1	0	140	1950
5:55 PM	15	2	1	0	3	0	4	0	0	47	14	0	0	45	4	0	135	1917

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	180	24	20	0	64	24	24	0	12	748	364	0	4	584	36	0	2084
Heavy Trucks	4	4	0		8	0	0		0	48	8		0	44	4		120
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

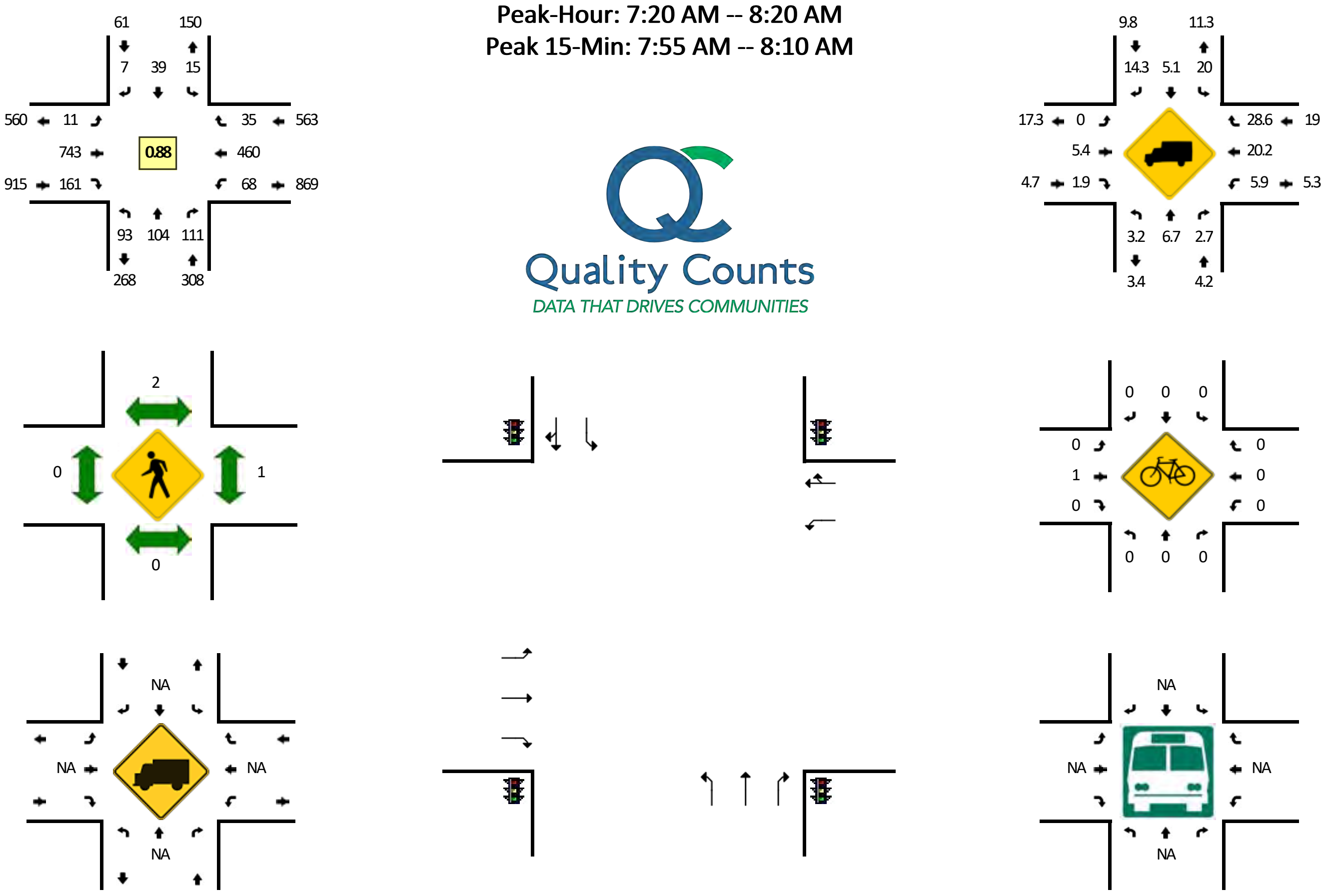
Comments:

Report generated on 2/26/2019 10:20 AM — SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

LOCATION: Langer Farms Pkwy -- Tualatin-Sherwood Rd | **QC JOB #:** 14898021
CITY/STATE: Not found, No | **DATE:** Wed, Feb 13 2019

Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:55 AM -- 8:10 AM



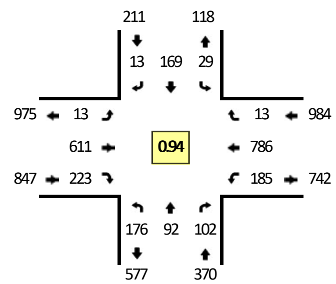
5-Min Count Period Beginning At	Langer Farms Pkwy (Northbound)				Langer Farms Pkwy (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	9	2	7	0	3	1	0	0	1	95	12	0	4	27	6	0	167	
7:05 AM	8	9	5	0	3	2	0	0	0	82	12	0	1	32	4	0	158	
7:10 AM	3	7	9	0	1	0	0	0	1	62	15	0	1	40	3	0	142	
7:15 AM	7	7	11	0	4	3	0	0	0	49	10	0	4	31	2	0	128	
7:20 AM	5	8	14	0	0	2	1	0	0	73	11	0	5	30	4	0	153	
7:25 AM	8	11	8	0	0	1	2	0	0	61	9	0	5	40	2	0	147	
7:30 AM	7	8	7	0	1	6	0	0	0	55	20	0	6	41	3	0	154	
7:35 AM	6	7	11	0	0	4	0	0	0	60	10	0	9	34	3	0	144	
7:40 AM	3	7	9	0	1	4	2	0	2	61	16	0	0	24	5	0	134	
7:45 AM	11	11	15	0	3	5	0	0	1	63	11	0	6	42	2	0	170	
7:50 AM	10	9	9	0	0	5	0	0	1	56	21	0	3	42	2	0	158	
7:55 AM	9	8	9	0	0	4	2	0	1	67	14	0	6	42	3	0	165	1820
8:00 AM	10	12	10	0	3	3	0	0	0	77	13	0	8	42	3	0	181	1834
8:05 AM	9	11	10	0	2	0	0	0	2	76	12	0	9	42	3	0	176	1852
8:10 AM	10	8	3	0	3	4	0	0	1	50	14	0	3	39	3	0	138	1848
8:15 AM	5	4	6	0	2	1	0	0	3	44	10	0	8	42	2	0	127	1847
8:20 AM	5	8	7	0	3	2	0	0	0	71	15	0	7	35	2	0	155	1849
8:25 AM	3	7	9	0	4	4	0	0	2	56	10	0	5	45	4	0	149	1851
8:30 AM	11	5	8	0	6	2	0	0	0	55	12	0	3	24	0	0	126	1823
8:35 AM	8	5	6	0	3	4	0	0	0	62	10	0	11	44	2	0	155	1834
8:40 AM	10	8	9	0	2	4	0	0	2	52	6	0	9	34	4	0	140	1840
8:45 AM	3	4	5	0	2	2	0	0	0	52	6	0	8	40	2	0	124	1794
8:50 AM	5	5	7	0	2	7	0	0	0	61	11	0	5	31	1	0	135	1771
8:55 AM	4	6	7	0	2	2	0	0	0	50	7	0	9	43	1	0	131	1737

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	112	124	116	0	20	28	8	0	12	880	156	0	92	504	36	0	2088
Heavy Trucks	8	8	0		0	4	0		0	60	4		4	108	16		212
Pedestrians		0				8				0				4			12
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

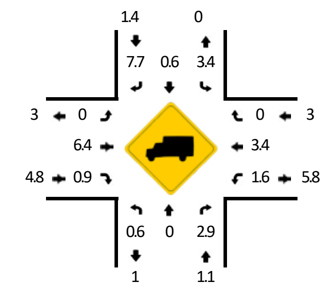
Report generated on 2/26/2019 10:21 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

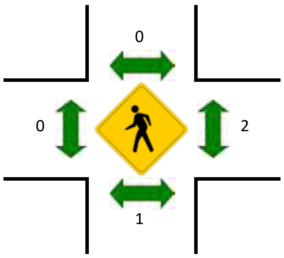
LOCATION: Langer Farms Pkwy -- Tualatin-Sherwood Rd **QC JOB #:** 14898022
CITY/STATE: Not found, No **DATE:** Wed, Feb 13 2019

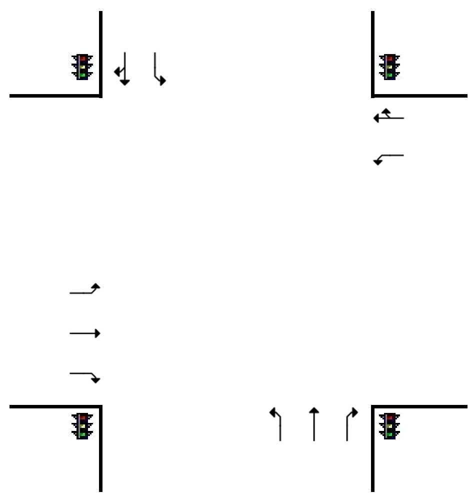


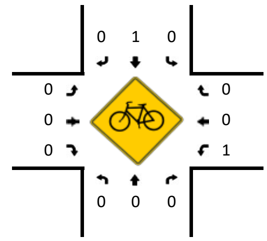
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

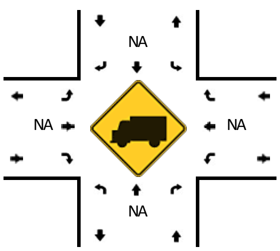
Quality Counts
DATA THAT DRIVES COMMUNITIES

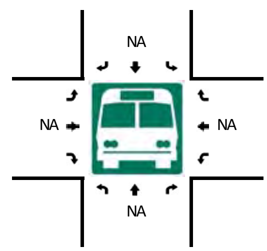












5-Min Count Period Beginning At	Langer Farms Pkwy (Northbound)				Langer Farms Pkwy (Southbound)				Tualatin-Sherwood Rd (Eastbound)				Tualatin-Sherwood Rd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	5	6	0	6	17	0	0	0	59	23	0	13	74	5	0	216	
4:05 PM	15	9	8	0	3	8	1	0	1	43	12	0	10	58	3	0	171	
4:10 PM	11	3	10	0	3	4	1	0	2	51	16	0	8	73	1	0	183	
4:15 PM	14	9	6	0	5	13	2	0	1	40	11	0	6	58	3	0	168	
4:20 PM	10	7	5	0	3	16	0	0	0	51	20	0	10	57	1	0	180	
4:25 PM	8	11	14	0	2	11	3	0	1	47	16	0	18	67	5	0	203	
4:30 PM	12	6	5	0	1	9	1	0	0	47	12	0	18	66	2	0	179	
4:35 PM	12	9	5	0	1	18	1	0	0	49	16	0	16	60	3	0	190	
4:40 PM	8	7	6	0	3	13	2	0	0	47	16	0	13	54	5	0	174	
4:45 PM	10	14	8	0	3	12	0	0	0	57	19	0	16	70	3	0	212	
4:50 PM	13	8	11	0	4	14	0	0	0	62	26	0	15	71	1	0	225	
4:55 PM	13	2	9	0	4	21	0	0	1	62	11	0	14	69	0	0	206	2307
5:00 PM	18	8	16	0	4	12	1	0	0	48	11	0	15	68	1	0	202	2293
5:05 PM	19	8	7	0	3	18	1	0	3	54	18	0	18	57	2	0	208	2330
5:10 PM	18	7	5	0	1	11	1	0	0	62	20	0	13	77	2	0	217	2364
5:15 PM	17	6	10	0	2	11	1	0	2	53	19	0	17	68	0	0	206	2402
5:20 PM	14	11	9	0	2	17	3	0	0	40	18	0	12	61	0	0	187	2409
5:25 PM	13	7	8	0	0	9	3	0	3	45	19	0	24	67	0	0	198	2404
5:30 PM	16	7	9	0	4	14	1	0	3	39	21	0	19	57	1	0	191	2416
5:35 PM	11	8	5	0	1	14	1	0	0	46	19	0	13	48	1	0	167	2393
5:40 PM	14	6	5	0	1	16	1	0	1	43	22	0	9	73	2	0	193	2412
5:45 PM	13	10	10	0	2	11	3	0	2	39	15	0	23	66	1	0	195	2395
5:50 PM	10	8	9	0	3	14	1	0	0	44	18	0	19	54	3	0	183	2353
5:55 PM	13	8	11	0	1	13	1	0	1	49	17	0	9	67	1	0	191	2338

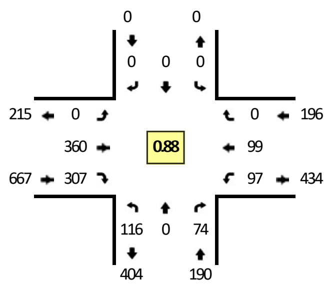
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	144	96	112	0	44	188	0	0	4	724	224	0	180	840	16	0	2572
Heavy Trucks	0	0	4		0	0	0		0	52	0		0	48	0		104
Pedestrians		4				0				0				0			4
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

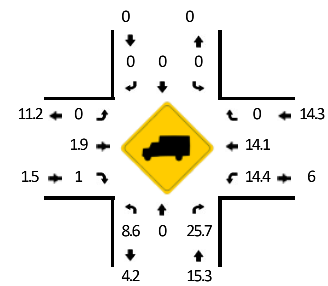
Comments:

Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

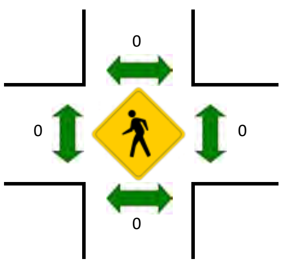
LOCATION: Tonquin Rd -- Oregon St | **QC JOB #:** 14898023
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019

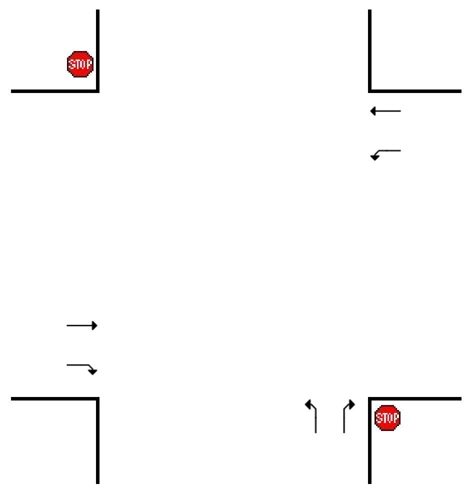
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

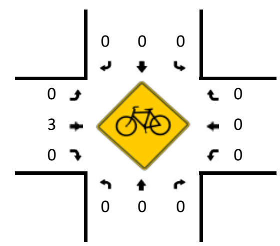


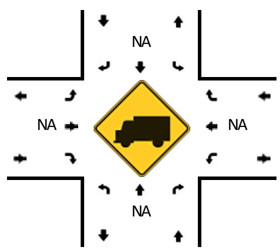


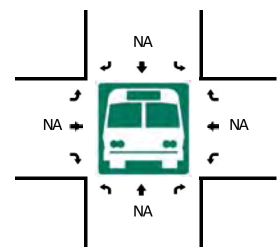
Quality Counts
DATA THAT DRIVES COMMUNITIES











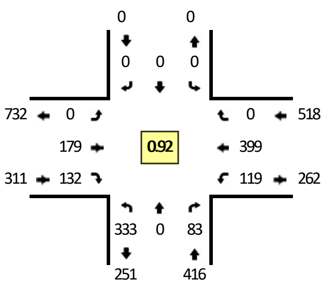
5-Min Count Period Beginning At	Tonquin Rd (Northbound)				Tonquin Rd (Southbound)				Oregon St (Eastbound)				Oregon St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	0	6	0	0	0	0	0	0	36	25	0	6	4	0	0	80	
7:05 AM	9	0	7	0	0	0	0	0	0	30	23	0	9	5	0	0	83	
7:10 AM	8	0	3	0	0	0	0	0	0	37	27	0	5	4	0	0	84	
7:15 AM	9	0	7	0	0	0	0	0	0	40	24	0	10	6	0	0	96	
7:20 AM	11	0	5	0	0	0	0	0	0	26	33	0	9	6	0	0	90	
7:25 AM	13	0	3	0	0	0	0	0	0	29	35	0	10	14	0	0	104	
7:30 AM	12	0	7	0	0	0	0	0	0	31	24	0	14	8	0	0	96	
7:35 AM	5	0	2	0	0	0	0	0	0	25	36	0	8	7	0	0	83	
7:40 AM	7	0	7	0	0	0	0	0	0	28	25	0	6	7	0	0	80	
7:45 AM	18	0	8	0	0	0	0	0	0	36	25	0	10	12	0	0	109	
7:50 AM	5	0	7	0	0	0	0	0	0	39	24	0	4	10	0	0	89	
7:55 AM	13	0	9	0	0	0	0	0	0	43	27	0	1	9	0	0	102	1096
8:00 AM	10	0	5	0	0	0	0	0	0	30	37	0	6	9	0	0	97	1113
8:05 AM	10	0	5	0	0	0	0	0	0	25	17	0	11	6	0	0	74	1104
8:10 AM	5	0	9	0	0	0	0	0	0	26	13	0	7	4	0	0	64	1084
8:15 AM	7	0	7	0	0	0	0	0	0	22	11	0	11	7	0	0	65	1053
8:20 AM	11	0	4	0	0	0	0	0	0	19	21	0	7	12	0	0	74	1037
8:25 AM	5	0	5	0	0	0	0	0	0	28	11	0	6	14	0	0	69	1002
8:30 AM	7	0	5	0	0	0	0	0	0	19	16	0	11	14	0	0	72	978
8:35 AM	8	0	6	0	0	0	0	0	0	21	8	0	3	11	0	0	57	952
8:40 AM	4	0	10	0	0	0	0	0	0	30	10	0	7	7	0	0	68	940
8:45 AM	13	0	6	0	0	0	0	0	0	31	11	0	5	9	0	0	75	906
8:50 AM	8	0	7	0	0	0	0	0	0	22	9	0	4	9	0	0	59	876
8:55 AM	9	0	7	0	0	0	0	0	0	10	2	0	0	10	0	1	39	813

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	144	0	96	0	0	0	0	0	0	472	304	0	60	124	0	0	1200
Heavy Trucks	16	0	32		0	0	0		0	4	4		4	16	0		76
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

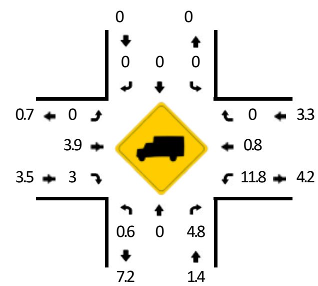
Comments:

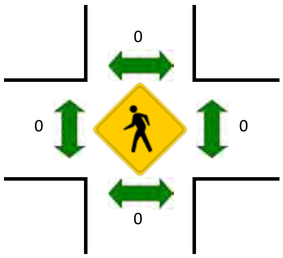
Report generated on 2/26/2019 10:21 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

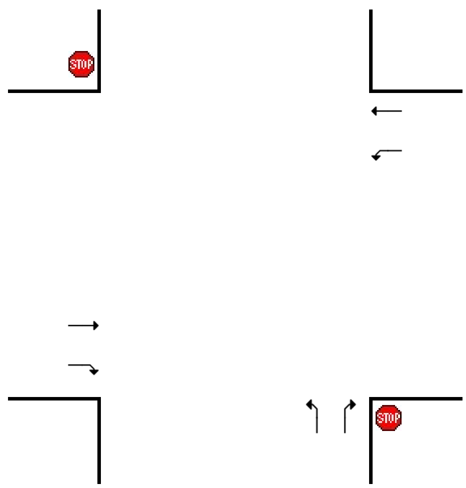
LOCATION: Tonquin Rd -- Oregon St **QC JOB #:** 14898024
CITY/STATE: Washington, OR **DATE:** Wed, Feb 13 2019

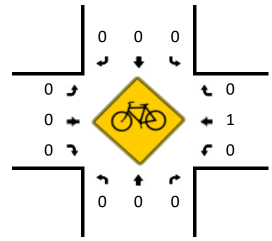


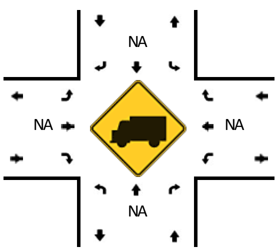
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:05 PM -- 5:20 PM

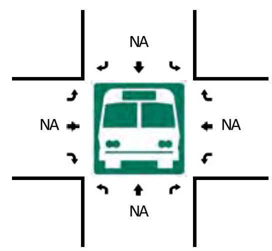












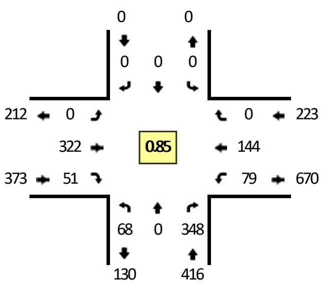
5-Min Count Period Beginning At	Tonquin Rd (Northbound)				Tonquin Rd (Southbound)				Oregon St (Eastbound)				Oregon St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	21	0	9	0	0	0	0	0	0	10	13	0	13	24	0	0	90	
4:05 PM	20	0	7	0	0	0	0	0	0	13	10	0	10	28	0	0	88	
4:10 PM	25	0	7	0	0	0	0	0	0	19	10	0	10	28	0	0	99	
4:15 PM	21	0	7	0	0	0	0	0	0	12	11	0	11	23	0	0	85	
4:20 PM	31	0	6	0	0	0	0	0	0	8	8	0	10	34	0	0	97	
4:25 PM	31	0	4	0	0	0	0	0	0	12	16	0	9	20	0	0	92	
4:30 PM	25	0	10	0	0	0	0	0	0	7	14	0	12	30	0	0	98	
4:35 PM	23	0	5	0	0	0	0	0	0	16	18	0	6	26	0	0	94	
4:40 PM	16	0	8	0	0	0	0	0	0	14	12	0	7	44	0	0	101	
4:45 PM	26	0	4	0	0	0	0	0	0	10	8	0	11	31	0	0	90	
4:50 PM	42	0	9	0	0	0	0	0	0	13	10	0	10	23	0	0	107	
4:55 PM	23	0	13	0	0	0	0	0	0	10	9	0	10	34	0	0	99	1140
5:00 PM	27	0	2	0	0	0	0	0	0	17	5	0	13	29	0	0	93	1143
5:05 PM	19	0	7	0	0	0	0	0	0	23	16	0	17	28	0	0	110	1165
5:10 PM	25	0	8	0	0	0	0	0	0	24	8	0	15	44	0	0	124	1190
5:15 PM	35	0	7	0	0	0	0	0	0	12	12	0	8	31	0	0	105	1210
5:20 PM	27	0	9	0	0	0	0	0	0	14	15	0	7	32	0	0	104	1217
5:25 PM	26	0	4	0	0	0	0	0	0	10	8	0	10	37	0	0	95	1220
5:30 PM	24	0	8	0	0	0	0	0	0	17	18	0	10	34	0	0	111	1233
5:35 PM	33	0	9	0	0	0	0	0	0	14	12	0	6	38	0	0	112	1251
5:40 PM	26	0	3	0	0	0	0	0	0	15	11	0	2	38	0	0	95	1245
5:45 PM	14	0	5	0	0	0	0	0	0	13	7	0	6	38	0	0	83	1238
5:50 PM	24	0	9	0	0	0	0	0	0	16	7	0	2	27	0	0	85	1216
5:55 PM	25	0	5	0	0	0	0	0	0	15	11	0	9	22	0	0	87	1204

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	316	0	88	0	0	0	0	0	0	236	144	0	160	412	0	0	1356
Heavy Trucks	0	0	4		0	0	0		0	0	4		12	4	0		24
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

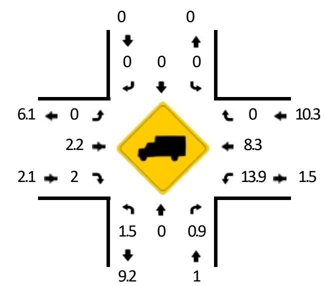
Type of peak hour being reported: User-Defined | Method for determining peak hour: Total Entering Volume

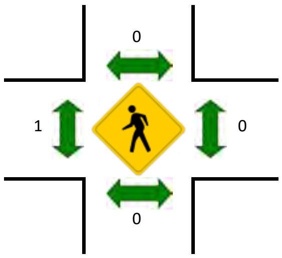
LOCATION: Murdock Rd -- Oregon St | **QC JOB #:** 14898025
CITY/STATE: Washington, OR | **DATE:** Wed, Feb 13 2019

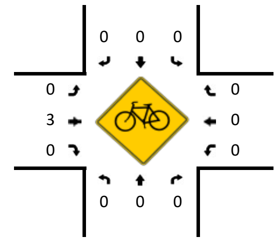


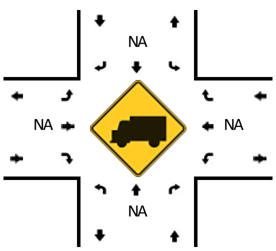
Peak-Hour: 7:20 AM -- 8:20 AM
Peak 15-Min: 7:45 AM -- 8:00 AM

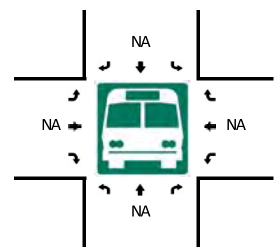
Quality Counts
DATA THAT DRIVES COMMUNITIES











5-Min Count Period Beginning At	Murdock Rd (Northbound)				Murdock Rd (Southbound)				Oregon St (Eastbound)				Oregon St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
7:00 AM	3	0	35	0	0	0	0	0	0	29	2	0	4	4	0	0	77	
7:05 AM	4	0	29	0	0	0	0	0	0	21	2	0	3	10	0	0	69	
7:10 AM	3	0	38	0	0	0	0	0	0	27	5	0	4	9	0	0	86	
7:15 AM	3	0	38	0	0	0	0	0	0	26	3	0	3	11	0	0	84	
7:20 AM	6	0	27	0	0	0	0	0	0	32	2	0	3	15	0	0	85	
7:25 AM	6	0	31	0	0	0	0	0	0	36	2	0	13	15	0	0	103	
7:30 AM	12	0	32	0	0	0	0	0	0	24	4	0	6	19	0	0	97	
7:35 AM	14	0	26	0	0	0	0	0	0	33	5	0	6	7	0	0	91	
7:40 AM	7	0	30	0	0	0	0	0	0	25	5	0	1	12	0	0	80	
7:45 AM	6	0	29	0	0	0	0	0	0	32	5	0	8	19	0	0	99	
7:50 AM	3	0	35	0	0	0	0	0	0	27	7	1	6	14	0	0	93	
7:55 AM	4	0	40	0	0	0	0	0	0	34	7	0	9	11	0	0	105	1069
8:00 AM	7	0	33	0	0	0	0	0	0	32	1	0	8	12	0	0	93	1085
8:05 AM	1	0	22	0	0	0	0	0	0	19	5	0	8	9	0	0	64	1080
8:10 AM	1	0	26	0	0	0	0	0	0	11	7	0	4	5	0	0	54	1048
8:15 AM	1	0	17	0	0	0	0	0	0	16	1	0	7	6	0	0	48	1012
8:20 AM	2	0	19	0	0	0	0	0	0	22	3	0	10	12	0	0	68	995
8:25 AM	7	0	25	0	0	0	0	0	0	13	1	0	11	9	0	0	66	958
8:30 AM	1	0	21	0	0	0	0	0	0	13	4	0	12	7	0	1	59	920
8:35 AM	5	0	18	0	0	0	0	0	0	10	2	0	13	6	0	0	54	883
8:40 AM	4	0	25	1	0	0	0	0	0	15	5	0	5	9	0	0	64	867
8:45 AM	2	0	30	0	0	0	0	0	0	11	2	0	12	10	0	0	67	835
8:50 AM	2	0	21	0	0	0	0	0	0	10	1	0	8	9	0	0	51	793
8:55 AM	8	0	8	0	0	0	0	0	0	2	2	0	8	10	0	0	38	726

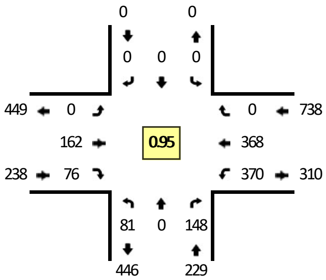
Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	52	0	416	0	0	0	0	0	0	376	76	4	92	176	0	0	1192
Heavy Trucks	4	0	4		0	0	0		0	4	4		16	16	0		48
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

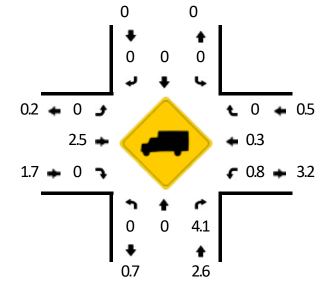
Comments:

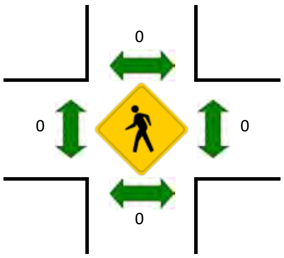
Report generated on 2/26/2019 10:21 AM | SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

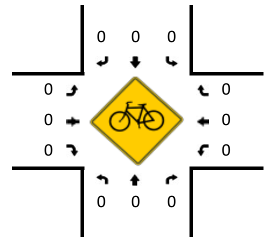
LOCATION: Murdock Rd -- Oregon St **QC JOB #:** 14898026
CITY/STATE: Washington, OR **DATE:** Wed, Feb 13 2019

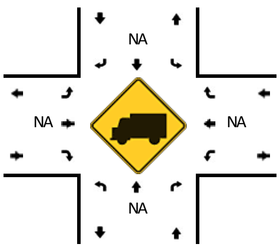
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:10 PM -- 5:25 PM

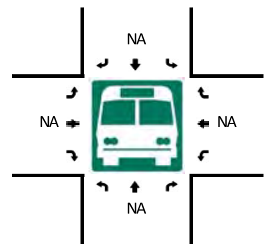












5-Min Count Period Beginning At	Murdock Rd (Northbound)				Murdock Rd (Southbound)				Oregon St (Eastbound)				Oregon St (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	6	0	12	0	0	0	0	0	0	10	4	0	27	21	0	0	80	
4:05 PM	4	0	12	0	0	0	0	0	0	10	5	0	13	34	0	0	78	
4:10 PM	1	0	17	0	0	0	0	0	0	12	2	0	32	22	0	0	86	
4:15 PM	3	0	14	0	0	0	0	0	0	9	13	0	28	17	0	0	84	
4:20 PM	5	0	8	0	0	0	0	0	0	8	17	0	30	34	0	0	102	
4:25 PM	3	0	11	0	0	0	0	0	0	17	9	0	23	31	0	0	94	
4:30 PM	1	0	12	0	0	0	0	0	0	10	8	0	31	24	0	0	86	
4:35 PM	2	0	13	0	0	0	0	0	0	19	4	0	21	30	0	0	89	
4:40 PM	5	0	10	0	0	0	0	0	0	16	11	0	32	25	0	0	99	
4:45 PM	7	0	10	0	0	0	0	0	0	8	6	0	27	32	0	0	90	
4:50 PM	5	0	14	0	0	0	0	0	0	11	5	0	30	40	0	0	105	
4:55 PM	10	0	10	0	0	0	0	0	0	7	8	0	28	28	0	0	91	1084
5:00 PM	18	0	14	0	0	0	0	0	0	8	9	0	25	34	0	0	108	1112
5:05 PM	4	0	17	0	0	0	0	0	0	21	4	0	23	21	0	0	90	1124
5:10 PM	9	0	14	0	0	0	0	0	0	18	5	0	38	32	0	0	116	1154
5:15 PM	2	0	7	0	0	0	0	0	0	21	10	0	36	31	0	0	107	1177
5:20 PM	4	0	15	0	0	0	0	0	0	13	7	0	29	26	0	0	94	1169
5:25 PM	5	0	7	0	0	0	0	0	0	13	3	0	31	34	0	0	93	1168
5:30 PM	10	0	16	0	0	0	0	0	0	16	8	0	32	28	0	0	110	1192
5:35 PM	7	0	14	0	0	0	0	0	0	11	5	0	37	34	0	0	108	1211
5:40 PM	0	0	10	0	0	0	0	0	0	15	6	0	34	28	0	0	93	1205
5:45 PM	4	0	18	0	0	0	0	0	0	8	12	0	30	26	0	0	98	1213
5:50 PM	1	0	17	0	0	0	0	0	0	7	3	0	22	26	0	0	76	1184
5:55 PM	3	0	10	0	0	0	0	0	0	17	11	0	21	30	0	0	92	1185

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	60	0	144	0	0	0	0	0	0	208	88	0	412	356	0	0	1268
Heavy Trucks	0	0	4		0	0	0		0	12	0		4	0	0		20
Pedestrians		0				0				0				0			0
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Appendix D Year 2019 Existing Conditions Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	743	161	68	460	35	93	104	111	15	39	7
Future Volume (vph)	11	743	161	68	460	35	93	104	111	15	39	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1795	1540	1703	1546		1751	1776	1568	1504	1739	
Flt Permitted	0.38	1.00	1.00	0.12	1.00		0.46	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	724	1795	1540	222	1546		853	1776	1568	1078	1739	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	12	844	183	77	523	40	106	118	126	17	44	8
RTOR Reduction (vph)	0	0	46	0	2	0	0	0	103	0	6	0
Lane Group Flow (vph)	13	844	137	77	561	0	106	118	23	17	46	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	49.1	48.4	59.3	56.1	51.9		22.0	16.1	16.1	9.0	7.1	
Effective Green, g (s)	49.1	48.4	59.3	56.1	51.9		22.0	16.1	16.1	9.0	7.1	
Actuated g/C Ratio	0.55	0.55	0.67	0.63	0.59		0.25	0.18	0.18	0.10	0.08	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	409	980	1030	210	905		322	322	284	118	139	
v/s Ratio Prot	0.00	c0.47	0.02	c0.02	0.36		c0.04	c0.07		0.00	0.03	
v/s Ratio Perm	0.02		0.07	0.21			0.04		0.01	0.01		
v/c Ratio	0.03	0.86	0.13	0.37	0.62		0.33	0.37	0.08	0.14	0.33	
Uniform Delay, d1	9.2	17.2	5.3	13.5	11.9		26.7	31.8	30.1	36.2	38.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	8.0	0.0	0.4	1.3		0.2	3.0	0.5	0.2	0.5	
Delay (s)	9.2	25.3	5.3	13.9	13.3		27.0	34.8	30.6	36.4	39.0	
Level of Service	A	C	A	B	B		C	C	C	D	D	
Approach Delay (s)		21.6			13.3			30.9			38.4	
Approach LOS		C			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	88.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	676	117	109	525	6	84	3	338	4	0	0
Future Volume (vph)	8	676	117	109	525	6	84	3	338	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	1729	1448	1556	1639			1531	1525	1442		
Flt Permitted	0.95	1.00	1.00	0.20	1.00			0.86	1.00	0.70		
Satd. Flow (perm)	1805	1729	1448	324	1639			1373	1525	1065		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	712	123	115	553	6	88	3	356	4	0	0
RTOR Reduction (vph)	0	0	41	0	0	0	0	0	148	0	0	0
Lane Group Flow (vph)	8	712	82	115	559	0	0	91	208	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	27.5	27.5	38.8	34.2			4.6	11.8	5.7		
Effective Green, g (s)	0.6	27.5	27.5	38.8	34.2			4.6	11.8	5.7		
Actuated g/C Ratio	0.01	0.51	0.51	0.72	0.63			0.09	0.22	0.11		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	20	882	738	397	1039			117	333	112		
v/s Ratio Prot	0.00	c0.41		0.04	0.34				c0.08			
v/s Ratio Perm			0.06	0.17				c0.07	0.05	0.00		
v/c Ratio	0.40	0.81	0.11	0.29	0.54			0.78	0.62	0.04		
Uniform Delay, d1	26.5	11.0	6.9	5.1	5.5			24.1	19.0	21.6		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	4.7	5.6	0.1	0.1	0.6			25.0	2.6	0.0		
Delay (s)	31.2	16.6	6.9	5.2	6.1			49.1	21.6	21.7		
Level of Service	C	B	A	A	A			D	C	C		
Approach Delay (s)		15.3			5.9			27.2			21.7	
Approach LOS		B			A			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	53.9	Sum of lost time (s)	14.5
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1021	645	10	6	3
Future Volume (Veh/h)	10	1021	645	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1086	686	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.84				0.71	0.84
vC, conflicting volume	697				1800	692
vC1, stage 1 conf vol					692	
vC2, stage 2 conf vol					1108	
vCu, unblocked vol	546				1422	540
tC, single (s)	4.2				7.1	6.5
tC, 2 stage (s)					6.1	
tF (s)	2.3				4.1	3.6
p0 queue free %	99				97	99
cM capacity (veh/h)	828				181	410

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	11	1086	697	6	3
Volume Left	11	0	0	6	0
Volume Right	0	0	11	0	3
cSH	828	1700	1700	181	410
Volume to Capacity	0.01	0.64	0.41	0.03	0.01
Queue Length 95th (ft)	1	0	0	3	1
Control Delay (s)	9.4	0.0	0.0	25.5	13.9
Lane LOS	A			D	B
Approach Delay (s)	0.1		0.0	21.6	
Approach LOS				C	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	63.7%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	917	606	75	47	30
Future Volume (vph)	110	917	606	75	47	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1703	1745	1639	1418	1289	1242
Flt Permitted	0.36	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	642	1745	1639	1418	1289	1242
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	955	631	78	49	31
RTOR Reduction (vph)	0	0	0	16	0	29
Lane Group Flow (vph)	115	955	631	62	49	2
Heavy Vehicles (%)	6%	8%	15%	13%	40%	30%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Prot	Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases	2					
Actuated Green, G (s)	100.7	100.7	89.8	89.8	8.8	8.8
Effective Green, g (s)	100.7	100.7	89.8	89.8	8.8	8.8
Actuated g/C Ratio	0.84	0.84	0.75	0.75	0.07	0.07
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	599	1464	1226	1061	94	91
v/s Ratio Prot	0.01	c0.55	0.39	0.04	c0.04	0.00
v/s Ratio Perm	0.15					
v/c Ratio	0.19	0.65	0.51	0.06	0.52	0.02
Uniform Delay, d1	2.7	3.4	6.2	4.0	53.6	51.6
Progression Factor	1.00	1.00	0.61	0.54	1.00	1.00
Incremental Delay, d2	0.2	2.3	1.3	0.1	5.1	0.1
Delay (s)	2.9	5.7	5.1	2.2	58.7	51.7
Level of Service	A	A	A	A	E	D
Approach Delay (s)		5.4	4.8		56.0	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	7.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	854	50	16	523	95	110	180	58	131	138	48
Future Volume (vph)	60	854	50	16	523	95	110	180	58	131	138	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1228	1203	1639	1366	1626	1591		1612	1696	1282
Flt Permitted	0.30	1.00	1.00	0.08	1.00	1.00	0.59	1.00		0.31	1.00	1.00
Satd. Flow (perm)	521	1729	1228	105	1639	1366	1010	1591		520	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	65	918	54	17	562	102	118	194	62	141	148	52
RTOR Reduction (vph)	0	0	20	0	0	40	0	11	0	0	0	40
Lane Group Flow (vph)	65	918	34	17	562	62	118	245	0	141	148	12
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	71.6	66.4	75.5	65.8	63.5	73.3	31.6	22.5		33.0	23.2	28.4
Effective Green, g (s)	71.6	66.4	75.5	65.8	63.5	73.3	31.6	22.5		33.0	23.2	28.4
Actuated g/C Ratio	0.60	0.55	0.63	0.55	0.53	0.61	0.26	0.19		0.28	0.19	0.24
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	360	956	772	78	867	834	312	298		232	327	303
v/s Ratio Prot	c0.01	c0.53	0.00	0.00	0.34	0.01	0.03	c0.15		c0.05	0.09	0.00
v/s Ratio Perm	0.10		0.02	0.11		0.04	0.07			0.12		0.01
v/c Ratio	0.18	0.96	0.04	0.22	0.65	0.07	0.38	0.82		0.61	0.45	0.04
Uniform Delay, d1	12.6	25.5	8.5	22.2	20.2	9.5	35.1	46.8		35.2	42.8	35.3
Progression Factor	0.79	0.89	0.65	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	18.1	0.0	0.5	3.7	0.0	0.3	15.9		3.1	0.4	0.0
Delay (s)	10.0	41.0	5.5	22.7	24.0	9.5	35.4	62.7		38.3	43.2	35.3
Level of Service	B	D	A	C	C	A	D	E		D	D	D
Approach Delay (s)		37.2			21.8			54.1			39.9	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1005	39	11	632	17	15
Future Volume (Veh/h)	1005	39	11	632	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1069	41	12	672	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1110		1765	1069
vC1, stage 1 conf vol					1069	
vC2, stage 2 conf vol					696	
vCu, unblocked vol			1110		1765	1069
tC, single (s)			4.9		7.4	7.1
tC, 2 stage (s)					6.4	
tF (s)			2.9		4.4	4.1
p0 queue free %			97		90	91
cM capacity (veh/h)			409		185	182

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1069	41	12	672	18	16
Volume Left	0	0	12	0	18	0
Volume Right	0	41	0	0	0	16
cSH	1700	1700	409	1700	185	182
Volume to Capacity	0.63	0.02	0.03	0.40	0.10	0.09
Queue Length 95th (ft)	0	0	2	0	8	7
Control Delay (s)	0.0	0.0	14.1	0.0	26.5	26.7
Lane LOS			B		D	D
Approach Delay (s)	0.0		0.2		26.6	
Approach LOS					D	

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	916	99	117	609	10	32	0	73	3	1	2
Future Volume (vph)	5	916	99	117	609	10	32	0	73	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1743	1242	2918	1675			1250	1145	1805	1011	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	1743	1242	2918	1675			995	1145	1396	1011	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	985	106	126	655	11	34	0	78	3	1	2
RTOR Reduction (vph)	0	0	10	0	0	0	0	0	73	0	2	0
Lane Group Flow (vph)	5	985	96	126	666	0	0	34	5	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2	2	1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.4	107.1	107.1	9.9	115.6			9.0	9.0	9.0	9.0	
Effective Green, g (s)	1.4	107.1	107.1	9.9	115.6			9.0	9.0	9.0	9.0	
Actuated g/C Ratio	0.01	0.76	0.76	0.07	0.83			0.06	0.06	0.06	0.06	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	18	1333	950	206	1383			63	73	89	64	
v/s Ratio Prot	0.00	c0.57	0.08	c0.04	0.40						0.00	
v/s Ratio Perm								c0.03	0.00	0.00		
v/c Ratio	0.28	0.74	0.10	0.61	0.48			0.54	0.07	0.03	0.02	
Uniform Delay, d1	68.8	8.9	4.2	63.2	3.5			63.5	61.6	61.4	61.4	
Progression Factor	1.00	1.00	1.00	1.04	0.81			1.00	1.00	1.00	1.00	
Incremental Delay, d2	8.3	3.7	0.2	3.0	1.0			4.4	0.1	0.1	0.0	
Delay (s)	77.1	12.6	4.4	68.9	3.8			67.9	61.7	61.5	61.4	
Level of Service	E	B	A	E	A			E	E	E	E	
Approach Delay (s)		12.1			14.2			63.6			61.4	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	15.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	20	717	263	18	513	48	216	30	16	15	6	5
Future Volume (vph)	20	717	263	18	513	48	216	30	16	15	6	5
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.95		1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1667	1500	1543	1624	1491	1656	1656		1043	1278	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	1667	1500	1543	1624	1491	1656	1656		1043	1278	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	22	797	292	20	570	53	240	33	18	17	7	6
RTOR Reduction (vph)	0	0	38	0	0	18	0	15	0	0	6	0
Lane Group Flow (vph)	22	797	254	20	570	35	240	36	0	17	7	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	4.1	92.0	92.0	4.2	92.1	92.1	22.7	22.2		3.1	2.6	
Effective Green, g (s)	4.1	92.0	92.0	4.2	92.1	92.1	22.7	22.2		3.1	2.6	
Actuated g/C Ratio	0.03	0.66	0.66	0.03	0.66	0.66	0.16	0.16		0.02	0.02	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	50	1095	985	46	1068	980	268	262		23	23	
v/s Ratio Prot	0.01	c0.48		c0.01	0.35		c0.14	0.02		0.02	c0.01	
v/s Ratio Perm			0.17			0.02						
v/c Ratio	0.44	0.73	0.26	0.43	0.53	0.04	0.90	0.14		0.74	0.31	
Uniform Delay, d1	66.8	15.8	9.9	66.7	12.6	8.4	57.5	50.7		68.0	67.8	
Progression Factor	1.19	0.66	0.58	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.6	3.1	0.5	2.4	1.9	0.1	28.7	0.1		69.6	2.8	
Delay (s)	81.4	13.5	6.2	69.1	14.5	8.5	86.2	50.7		137.7	70.6	
Level of Service	F	B	A	E	B	A	F	D		F	E	
Approach Delay (s)		12.9			15.7			80.0			108.6	
Approach LOS		B			B			E			F	

Intersection Summary			
HCM 2000 Control Delay	24.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	140.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	361	308	97	103	120	74
Future Volume (Veh/h)	361	308	97	103	120	74
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	410	350	110	117	136	84
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			410		747	410
vC1, stage 1 conf vol					410	
vC2, stage 2 conf vol					337	
vCu, unblocked vol			410		747	410
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			90		74	86
cM capacity (veh/h)			1087		528	593

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	410	350	110	117	136	84
Volume Left	0	0	110	0	136	0
Volume Right	0	350	0	0	0	84
cSH	1700	1700	1087	1700	528	593
Volume to Capacity	0.24	0.21	0.10	0.07	0.26	0.14
Queue Length 95th (ft)	0	0	8	0	25	12
Control Delay (s)	0.0	0.0	8.7	0.0	14.2	12.1
Lane LOS			A		B	B
Approach Delay (s)	0.0		4.2		13.4	
Approach LOS					B	

Intersection Summary			
Average Delay	3.2		
Intersection Capacity Utilization	41.0%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2019 - Existing AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	80	1.0	0.531	10.9	LOS B	3.6	91.7	0.69	0.67	30.4
18	R2	409	1.0	0.531	10.9	LOS B	3.6	91.7	0.69	0.67	28.9
Approach		489	1.0	0.531	10.9	LOS B	3.6	91.7	0.69	0.67	29.1
East: Oregon St											
1	L2	93	14.0	0.227	5.2	LOS A	1.1	28.6	0.24	0.11	32.6
6	T1	169	8.0	0.227	5.2	LOS A	1.1	28.6	0.24	0.11	32.1
Approach		262	10.1	0.227	5.2	LOS A	1.1	28.6	0.24	0.11	32.3
West: Oregon St.											
2	T1	378	2.0	0.360	6.4	LOS A	2.1	54.3	0.33	0.18	32.6
12	R2	60	2.0	0.360	6.4	LOS A	2.1	54.3	0.33	0.18	31.4
Approach		438	2.0	0.360	6.4	LOS A	2.1	54.3	0.33	0.18	32.4
All Vehicles		1189	3.4	0.531	8.0	LOS A	3.6	91.7	0.46	0.37	31.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	611	223	185	786	13	176	92	102	29	169	13
Future Volume (vph)	13	611	223	185	786	13	176	92	102	29	169	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1778	1586	1770	1826		1786	1900	1568	1752	1848	
Flt Permitted	0.14	1.00	1.00	0.18	1.00		0.29	1.00	1.00	0.69	1.00	
Satd. Flow (perm)	259	1778	1586	343	1826		554	1900	1568	1279	1848	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	14	650	237	197	836	14	187	98	109	31	180	14
RTOR Reduction (vph)	0	0	82	0	0	0	0	0	86	0	3	0
Lane Group Flow (vph)	14	650	155	197	850	0	187	98	23	31	191	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	44.8	43.2	53.4	55.4	49.8		27.2	19.9	19.9	16.3	13.0	
Effective Green, g (s)	44.8	43.2	53.4	55.4	49.8		27.2	19.9	19.9	16.3	13.0	
Actuated g/C Ratio	0.48	0.47	0.58	0.60	0.54		0.29	0.21	0.21	0.18	0.14	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	152	829	914	331	982		298	408	336	241	259	
v/s Ratio Prot	0.00	0.37	0.02	c0.05	c0.47		c0.07	0.05		0.00	0.10	
v/s Ratio Perm	0.04		0.08	0.30			c0.11		0.01	0.02		
v/c Ratio	0.09	0.78	0.17	0.60	0.87		0.63	0.24	0.07	0.13	0.74	
Uniform Delay, d1	16.2	20.8	9.2	13.5	18.5		26.3	30.1	29.0	32.0	38.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	5.0	0.0	1.9	8.2		3.0	1.3	0.4	0.1	9.1	
Delay (s)	16.3	25.8	9.2	15.4	26.7		29.3	31.4	29.3	32.1	47.3	
Level of Service	B	C	A	B	C		C	C	C	C	D	
Approach Delay (s)		21.3			24.6			29.8			45.2	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	26.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	92.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	685	115	377	829	8	122	1	175	11	10	8
Future Volume (vph)	7	685	115	377	829	8	122	1	175	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1803	1830	1464	1770	1827			1739	1568	1805	1755	
Flt Permitted	0.95	1.00	1.00	0.13	1.00			0.33	1.00	0.71	1.00	
Satd. Flow (perm)	1803	1830	1464	242	1827			611	1568	1357	1755	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	737	124	405	891	9	131	1	188	12	11	9
RTOR Reduction (vph)	0	0	40	0	0	0	0	0	111	0	8	0
Lane Group Flow (vph)	8	737	84	405	900	0	0	132	77	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	37.2	37.2	49.4	44.8			11.9	27.4	5.6	5.6	
Effective Green, g (s)	0.6	37.2	37.2	49.4	44.8			11.9	27.4	5.6	5.6	
Actuated g/C Ratio	0.01	0.52	0.52	0.69	0.62			0.17	0.38	0.08	0.08	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	15	948	758	496	1139			101	598	105	136	
v/s Ratio Prot	0.00	0.40		c0.18	0.49				0.03		0.01	
v/s Ratio Perm			0.06	c0.39				c0.22	0.02	0.01		
v/c Ratio	0.53	0.78	0.11	0.82	0.79			1.31	0.13	0.11	0.09	
Uniform Delay, d1	35.5	14.0	8.8	16.8	10.0			29.9	14.4	30.8	30.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.0	4.2	0.1	9.5	3.8			192.6	0.0	0.2	0.1	
Delay (s)	52.5	18.1	8.9	26.4	13.8			222.5	14.5	31.0	30.8	
Level of Service	D	B	A	C	B			F	B	C	C	
Approach Delay (s)		17.1			17.7			100.3			30.9	
Approach LOS		B			B			F			C	

Intersection Summary			
HCM 2000 Control Delay	28.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	71.8	Sum of lost time (s)	14.5
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	878	1198	3	12	18
Future Volume (Veh/h)	3	878	1198	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	944	1288	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.28				0.46	0.28
vC, conflicting volume	1293				2242	1292
vC1, stage 1 conf vol					1292	
vC2, stage 2 conf vol					950	
vCu, unblocked vol	762				1380	756
tC, single (s)	4.4				6.5	6.3
tC, 2 stage (s)					5.5	
tF (s)	2.5				3.6	3.4
p0 queue free %	99				89	83
cM capacity (veh/h)	203				122	112

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	3	944	1291	13	19
Volume Left	3	0	0	13	0
Volume Right	0	0	3	0	19
cSH	203	1700	1700	122	112
Volume to Capacity	0.01	0.56	0.76	0.11	0.17
Queue Length 95th (ft)	1	0	0	9	15
Control Delay (s)	23.0	0.0	0.0	38.1	43.5
Lane LOS	C			E	E
Approach Delay (s)	0.1		0.0	41.3	
Approach LOS				E	

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	73.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	860	1090	14	63	124
Future Volume (vph)	37	860	1090	14	63	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1812	1830	1405	1703	1583
Flt Permitted	0.10	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	186	1812	1830	1405	1703	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	935	1185	15	68	135
RTOR Reduction (vph)	0	0	0	1	0	124
Lane Group Flow (vph)	40	935	1185	14	68	11
Confl. Peds. (#/hr)	2			2		
Confl. Bikes (#/hr)				4		
Heavy Vehicles (%)	3%	4%	3%	14%	6%	2%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Prot	Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases	2					
Actuated Green, G (s)	102.8	102.8	92.6	92.6	10.2	10.2
Effective Green, g (s)	102.8	102.8	92.6	92.6	10.2	10.2
Actuated g/C Ratio	0.83	0.83	0.75	0.75	0.08	0.08
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	233	1508	1372	1053	140	130
v/s Ratio Prot	0.01	c0.52	c0.65	0.01	c0.04	0.01
v/s Ratio Perm	0.13					
v/c Ratio	0.17	0.62	0.86	0.01	0.49	0.09
Uniform Delay, d1	16.7	3.6	11.0	3.9	54.1	52.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.8	5.9	0.0	2.6	0.3
Delay (s)	17.0	4.4	16.9	3.9	56.8	52.6
Level of Service	B	A	B	A	E	D
Approach Delay (s)		4.9	16.7		54.0	
Approach LOS		A	B		D	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	123.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	772	103	24	823	83	98	105	8	98	173	183
Future Volume (vph)	48	772	103	24	823	83	98	105	8	98	173	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1427	1805	1830	1550	1752	1843		1734	1827	1583
Flt Permitted	0.15	1.00	1.00	0.22	1.00	1.00	0.43	1.00		0.57	1.00	1.00
Satd. Flow (perm)	278	1812	1427	409	1830	1550	793	1843		1044	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	50	804	107	25	857	86	102	109	8	102	180	191
RTOR Reduction (vph)	0	0	34	0	0	25	0	2	0	0	0	154
Lane Group Flow (vph)	50	804	73	25	857	61	102	115	0	102	180	37
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	85.3	79.1	87.8	78.5	75.7	85.2	26.4	17.7		28.0	18.5	24.7
Effective Green, g (s)	85.3	79.1	87.8	78.5	75.7	85.2	26.4	17.7		28.0	18.5	24.7
Actuated g/C Ratio	0.67	0.62	0.69	0.61	0.59	0.67	0.21	0.14		0.22	0.14	0.19
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	259	1118	978	281	1081	1030	228	254		279	263	305
v/s Ratio Prot	c0.01	c0.44	0.01	0.00	c0.47	0.00	c0.03	0.06		0.03	c0.10	0.01
v/s Ratio Perm	0.12		0.05	0.05		0.03	0.06			0.05		0.02
v/c Ratio	0.19	0.72	0.07	0.09	0.79	0.06	0.45	0.45		0.37	0.68	0.12
Uniform Delay, d1	16.1	16.9	6.7	13.5	20.2	7.5	43.0	50.8		41.6	52.0	42.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	2.6	0.0	0.1	4.5	0.0	0.5	0.5		0.3	5.8	0.1
Delay (s)	16.2	19.4	6.7	13.6	24.7	7.5	43.5	51.2		41.9	57.8	42.8
Level of Service	B	B	A	B	C	A	D	D		D	E	D
Approach Delay (s)		17.8			22.9			47.6			48.3	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	128.1	Sum of lost time (s)	19.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	858	22	3	885	27	17
Future Volume (Veh/h)	858	22	3	885	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	913	23	3	941	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			936		1860	913
vC1, stage 1 conf vol					913	
vC2, stage 2 conf vol					947	
vCu, unblocked vol			936		1860	913
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		90	95
cM capacity (veh/h)			740		278	334

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	913	23	3	941	29	18
Volume Left	0	0	3	0	29	0
Volume Right	0	23	0	0	0	18
cSH	1700	1700	740	1700	278	334
Volume to Capacity	0.54	0.01	0.00	0.55	0.10	0.05
Queue Length 95th (ft)	0	0	0	0	9	4
Control Delay (s)	0.0	0.0	9.9	0.0	19.5	16.4
Lane LOS			A		C	C
Approach Delay (s)	0.0		0.0		18.3	
Approach LOS					C	

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	56.6%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	810	53	42	786	16	87	0	154	16	1	15
Future Volume (vph)	12	810	53	42	786	16	87	0	154	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1827	1533	2894	1839			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.62	1.00	
Satd. Flow (perm)	1805	1827	1533	2894	1839			1390	1568	1178	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	853	56	44	827	17	92	0	162	17	1	16
RTOR Reduction (vph)	0	0	13	0	0	0	0	0	146	0	14	0
Lane Group Flow (vph)	13	853	43	44	844	0	0	92	16	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	89.1	89.1	5.0	90.6			11.9	11.9	11.9	11.9	
Effective Green, g (s)	3.0	89.1	89.1	5.0	90.6			11.9	11.9	11.9	11.9	
Actuated g/C Ratio	0.02	0.74	0.74	0.04	0.75			0.10	0.10	0.10	0.10	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	1356	1138	120	1388			137	155	116	161	
v/s Ratio Prot	0.01	c0.47		c0.02	0.46						0.00	
v/s Ratio Perm			0.03					c0.07	0.01	0.01		
v/c Ratio	0.29	0.63	0.04	0.37	0.61			0.67	0.10	0.15	0.02	
Uniform Delay, d1	57.5	7.5	4.1	56.0	6.7			52.2	49.2	49.4	48.8	
Progression Factor	1.00	1.00	1.00	0.99	0.70			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	2.2	0.1	0.6	1.6			9.7	0.1	0.2	0.0	
Delay (s)	61.0	9.7	4.2	55.9	6.2			61.9	49.3	49.6	48.8	
Level of Service	E	A	A	E	A			E	D	D	D	
Approach Delay (s)		10.1			8.7			53.9			49.2	
Approach LOS		B			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	15.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	15	646	311	5	648	21	180	16	14	44	25	15
Future Volume (vph)	15	646	311	5	648	21	180	16	14	44	25	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.93		1.00	0.94	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1810	1550	1805	1810	1436	1787	1643		1719	1794	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1810	1550	1805	1810	1436	1787	1643		1719	1794	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	16	695	334	5	697	23	194	17	15	47	27	16
RTOR Reduction (vph)	0	0	56	0	0	8	0	14	0	0	15	0
Lane Group Flow (vph)	16	695	278	5	697	15	194	19	0	47	28	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	2.5	78.1	78.1	1.1	76.7	76.7	16.2	12.0		10.3	6.1	
Effective Green, g (s)	2.5	78.1	78.1	1.1	76.7	76.7	16.2	12.0		10.3	6.1	
Actuated g/C Ratio	0.02	0.65	0.65	0.01	0.64	0.64	0.13	0.10		0.09	0.05	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	37	1178	1008	16	1156	917	241	164		147	91	
v/s Ratio Prot	c0.01	0.38		0.00	c0.39		c0.11	0.01		0.03	c0.02	
v/s Ratio Perm			0.18			0.01						
v/c Ratio	0.43	0.59	0.28	0.31	0.60	0.02	0.80	0.11		0.32	0.31	
Uniform Delay, d1	58.0	11.9	8.9	59.1	12.7	7.9	50.4	49.2		51.6	54.9	
Progression Factor	1.09	0.67	0.75	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.4	1.8	0.6	4.0	2.3	0.0	16.6	0.1		0.5	0.7	
Delay (s)	65.8	9.8	7.3	63.1	15.0	7.9	67.0	49.3		52.0	55.6	
Level of Service	E	A	A	E	B	A	E	D		D	E	
Approach Delay (s)		9.8			15.1			64.5			53.7	
Approach LOS		A			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	19.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	179	132	119	402	336	83
Future Volume (Veh/h)	179	132	119	402	336	83
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	195	143	129	437	365	90
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			195		890	195
vC1, stage 1 conf vol					195	
vC2, stage 2 conf vol					695	
vCu, unblocked vol			195		890	195
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			90		15	89
cM capacity (veh/h)			1320		428	839

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	195	143	129	437	365	90
Volume Left	0	0	129	0	365	0
Volume Right	0	143	0	0	0	90
cSH	1700	1700	1320	1700	428	839
Volume to Capacity	0.11	0.08	0.10	0.26	0.85	0.11
Queue Length 95th (ft)	0	0	8	0	211	9
Control Delay (s)	0.0	0.0	8.0	0.0	46.2	9.8
Lane LOS			A		E	A
Approach Delay (s)	0.0		1.8		39.0	
Approach LOS					E	

Intersection Summary			
Average Delay	13.8		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

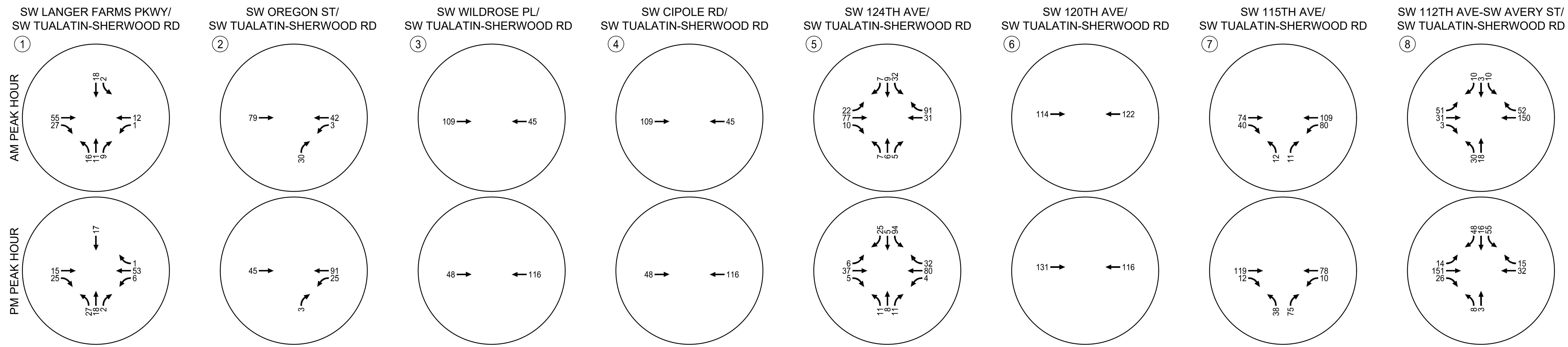
Site: 10 [SW Oregon St & Murdock Rd]

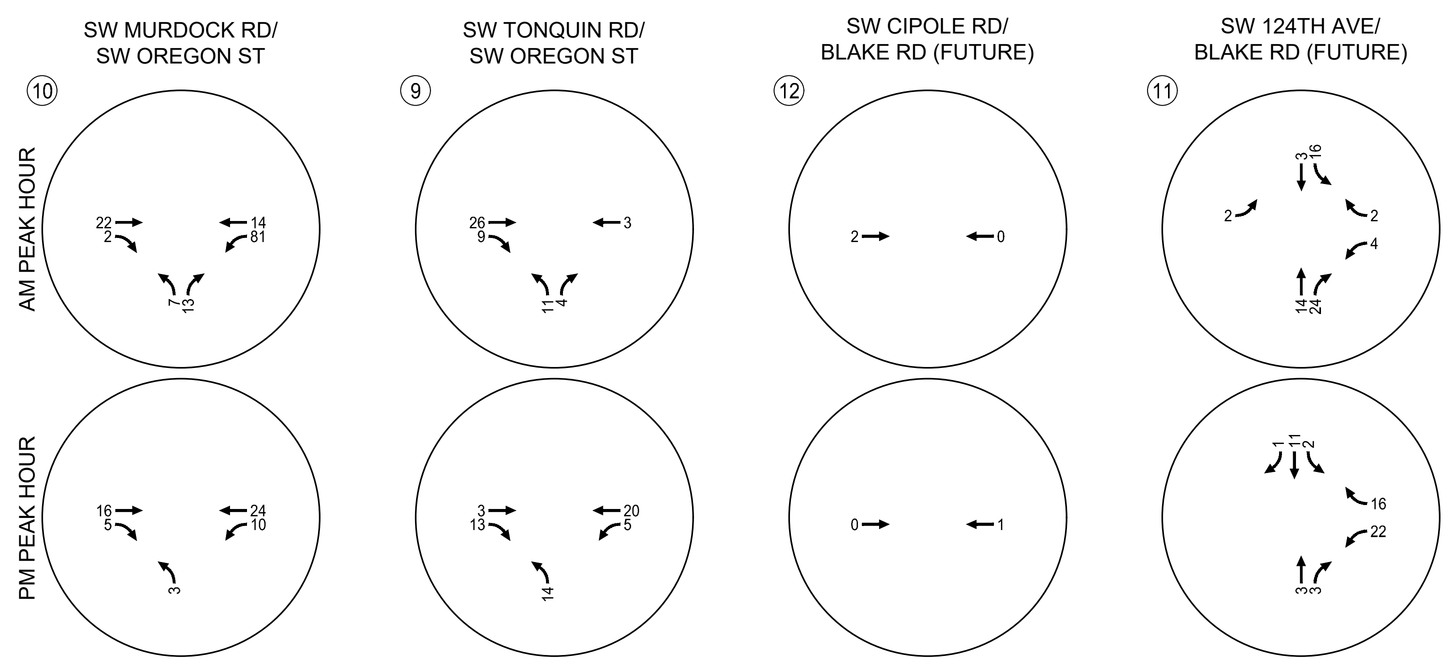
Year 2019 - Existing PM Peak Hour Conditions
Roundabout

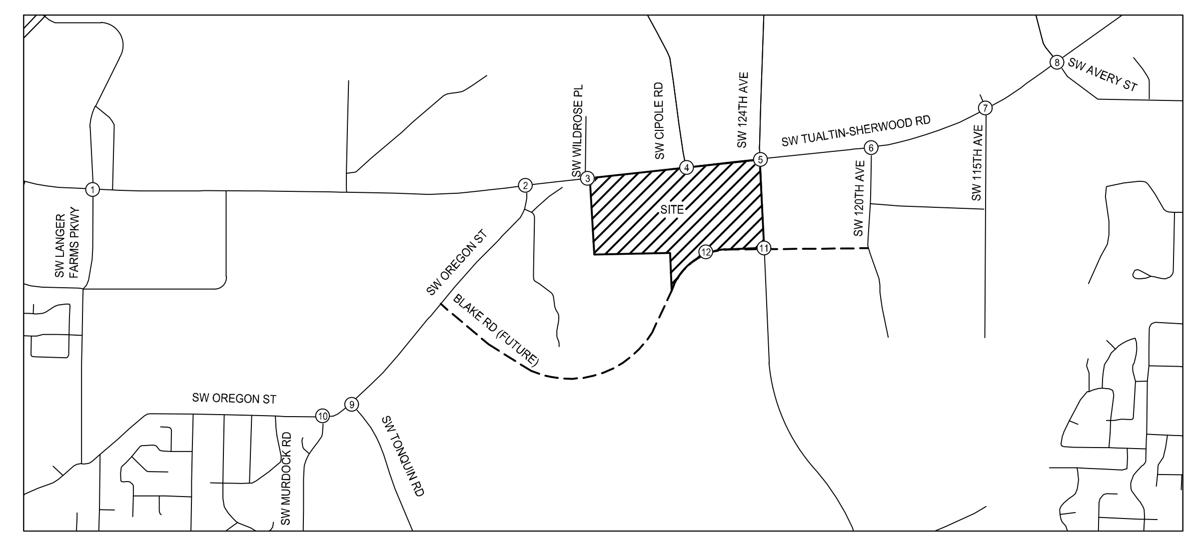
Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	85	0.0	0.214	5.1	LOS A	1.0	26.4	0.36	0.23	32.4
18	R2	156	4.0	0.214	5.1	LOS A	1.0	26.4	0.36	0.23	30.6
Approach		241	2.6	0.214	5.1	LOS A	1.0	26.4	0.36	0.23	31.2
East: Oregon St											
1	L2	389	1.0	0.617	10.4	LOS B	5.8	146.2	0.46	0.24	30.1
6	T1	387	0.0	0.617	10.4	LOS B	5.8	146.2	0.46	0.24	29.6
Approach		777	0.5	0.617	10.4	LOS B	5.8	146.2	0.46	0.24	29.8
West: Oregon St.											
2	T1	172	2.0	0.276	6.8	LOS A	1.3	33.3	0.55	0.48	32.3
12	R2	80	0.0	0.276	6.8	LOS A	1.3	33.3	0.55	0.48	31.2
Approach		252	1.4	0.276	6.8	LOS A	1.3	33.3	0.55	0.48	31.9
All Vehicles		1269	1.1	0.617	8.7	LOS A	5.8	146.2	0.46	0.29	30.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix E Year 2021 Background Conditions Worksheets



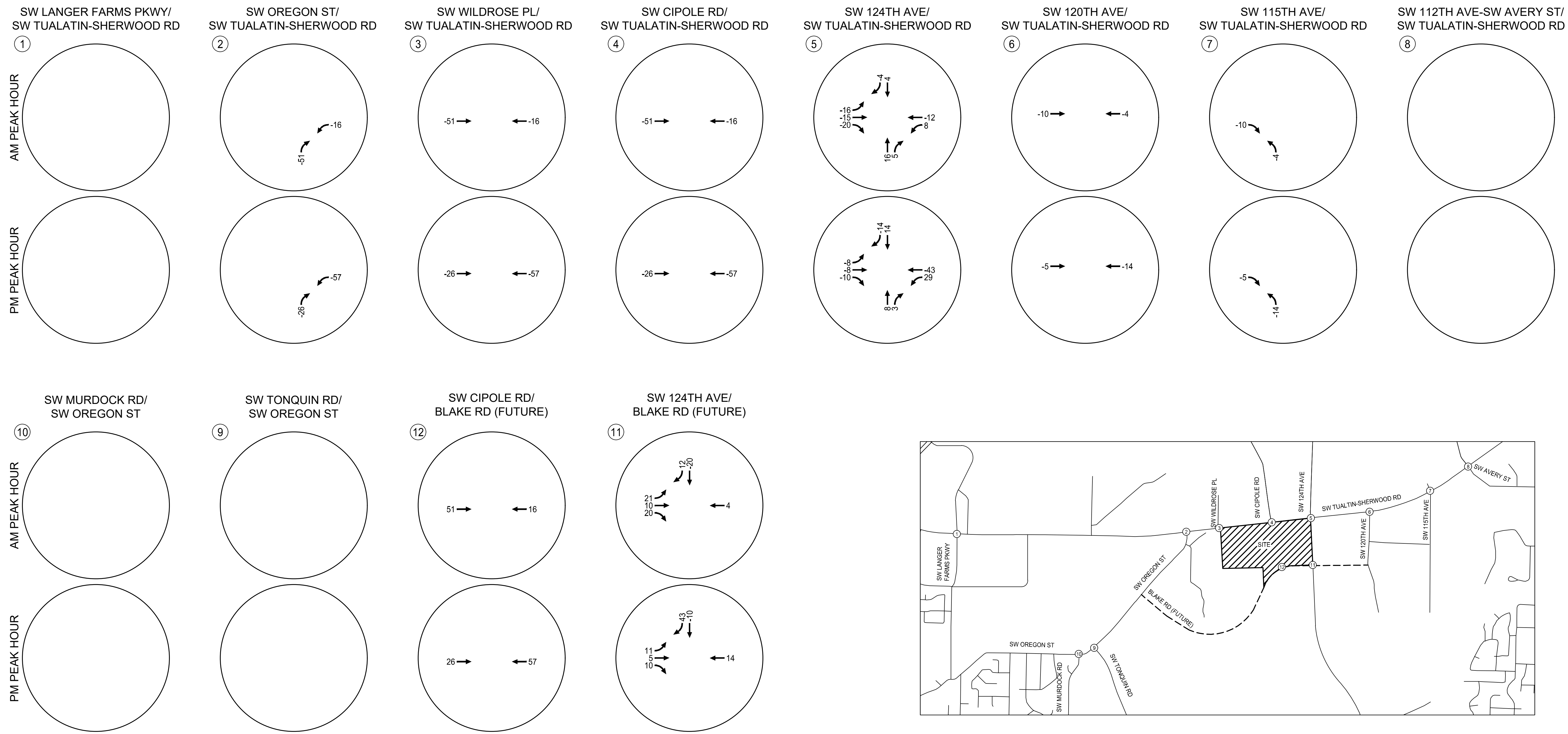




In-Process Trips Included in Background Traffic Volumes
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure
E-1

KITTELSON & ASSOCIATES



Re-distributed Trips for Blake Road Construction
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure
E-2

H:\23\23278 - Orr Property Corporate Park\dwgs\23278_TIA.dwg Jan 02, 2020 - 11:38am - cdougherty Layout Tab: E2 - Blake Redistribution

KITTELSON & ASSOCIATES

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	820	193	71	486	36	112	118	123	17	58	7
Future Volume (vph)	11	820	193	71	486	36	112	118	123	17	58	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1795	1539	1703	1546		1751	1776	1568	1504	1760	
Flt Permitted	0.36	1.00	1.00	0.10	1.00		0.47	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	675	1795	1539	172	1546		867	1776	1568	1063	1760	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	12	932	219	81	552	41	127	134	140	19	66	8
RTOR Reduction (vph)	0	0	46	0	2	0	0	0	115	0	4	0
Lane Group Flow (vph)	13	932	173	81	591	0	127	134	25	19	70	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	58.6	57.0	68.5	63.8	59.6		23.4	17.3	17.3	10.0	7.9	
Effective Green, g (s)	58.6	57.0	68.5	63.8	59.6		23.4	17.3	17.3	10.0	7.9	
Actuated g/C Ratio	0.59	0.58	0.69	0.65	0.60		0.24	0.18	0.18	0.10	0.08	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	419	1037	1069	176	934		308	311	275	117	141	
v/s Ratio Prot	0.00	c0.52	0.02	c0.02	0.38		c0.05	c0.08		0.00	0.04	
v/s Ratio Perm	0.02		0.09	0.28			0.05		0.02	0.01		
v/c Ratio	0.03	0.90	0.16	0.46	0.63		0.41	0.43	0.09	0.16	0.50	
Uniform Delay, d1	8.8	18.3	5.2	16.7	12.5		31.0	36.3	34.1	40.3	43.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	10.6	0.0	0.7	1.5		0.3	4.1	0.6	0.2	1.0	
Delay (s)	8.8	28.8	5.2	17.4	14.0		31.3	40.3	34.7	40.6	44.5	
Level of Service	A	C	A	B	B		C	D	C	D	D	
Approach Delay (s)		24.2			14.4			35.5			43.7	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	98.6	Sum of lost time (s)	18.0
Intersection Capacity Utilization	71.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	775	121	99	583	6	87	3	327	4	0	0
Future Volume (vph)	8	775	121	99	583	6	87	3	327	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	1729	1448	1556	1639			1531	1522	1442		
Flt Permitted	0.95	1.00	1.00	0.18	1.00			0.60	1.00	1.00		
Satd. Flow (perm)	1805	1729	1448	294	1639			957	1522	1518		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	816	127	104	614	6	92	3	344	4	0	0
RTOR Reduction (vph)	0	0	33	0	0	0	0	0	113	0	0	0
Lane Group Flow (vph)	8	816	94	104	620	0	0	95	231	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	37.2	37.2	44.4	39.8			6.6	13.6	3.8		
Effective Green, g (s)	0.6	37.2	37.2	44.4	39.8			6.6	13.6	3.8		
Actuated g/C Ratio	0.01	0.60	0.60	0.72	0.65			0.11	0.22	0.06		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	17	1045	875	355	1060			102	336	93		
v/s Ratio Prot	0.00	c0.47		0.03	0.38				c0.08			
v/s Ratio Perm			0.06	0.18				c0.10	0.07	0.00		
v/c Ratio	0.47	0.78	0.11	0.29	0.58			0.93	0.69	0.04		
Uniform Delay, d1	30.3	9.1	5.1	6.0	6.2			27.2	22.0	27.1		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	7.3	4.0	0.1	0.2	0.9			66.4	4.6	0.1		
Delay (s)	37.6	13.1	5.2	6.2	7.0			93.7	26.6	27.2		
Level of Service	D	B	A	A	A			F	C	C		
Approach Delay (s)		12.2			6.9			41.1			27.2	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	61.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	76.6%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1110	693	10	6	3
Future Volume (Veh/h)	10	1110	693	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1181	737	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.85				0.69	0.85
vC, conflicting volume	748				1946	742
vC1, stage 1 conf vol					742	
vC2, stage 2 conf vol					1203	
vCu, unblocked vol	611				1644	605
tC, single (s)	4.2				7.1	6.5
tC, 2 stage (s)					6.1	
tF (s)	2.3				4.1	3.6
p0 queue free %	99				96	99
cM capacity (veh/h)	787				149	377

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	11	1181	748	6	3
Volume Left	11	0	0	6	0
Volume Right	0	0	11	0	3
cSH	787	1700	1700	149	377
Volume to Capacity	0.01	0.69	0.44	0.04	0.01
Queue Length 95th (ft)	1	0	0	3	1
Control Delay (s)	9.6	0.0	0.0	30.2	14.6
Lane LOS	A			D	B
Approach Delay (s)	0.1		0.0	25.0	
Approach LOS				D	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	68.4%	ICU Level of Service	C
Analysis Period (min)	15		

4: Tualatin-Sherwood Rd & Cipole Rd

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	1005	655	75	47	30
Future Volume (vph)	110	1005	655	75	47	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1703	1745	1639	1418	1289	1242
Flt Permitted	0.35	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	622	1745	1639	1418	1289	1242
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1047	682	78	49	31
RTOR Reduction (vph)	0	0	0	13	0	29
Lane Group Flow (vph)	115	1047	682	65	49	2
Heavy Vehicles (%)	6%	8%	15%	13%	40%	30%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Perm	Perm
Protected Phases	5	2	6	6		
Permitted Phases	2				4	4
Actuated Green, G (s)	129.6	129.6	118.6	118.6	9.9	9.9
Effective Green, g (s)	129.6	129.6	118.6	118.6	9.9	9.9
Actuated g/C Ratio	0.86	0.86	0.79	0.79	0.07	0.07
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	587	1507	1295	1121	85	81
v/s Ratio Prot	0.01	c0.60	0.42	0.05		
v/s Ratio Perm	0.16				c0.04	0.00
v/c Ratio	0.20	0.69	0.53	0.06	0.58	0.03
Uniform Delay, d1	2.7	3.5	5.6	3.4	68.0	65.5
Progression Factor	1.00	1.00	0.74	0.84	1.00	1.00
Incremental Delay, d2	0.2	2.7	1.2	0.1	9.1	0.1
Delay (s)	2.9	6.1	5.4	3.0	77.1	65.7
Level of Service	A	A	A	A	E	E
Approach Delay (s)		5.8	5.2		72.7	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	942	42	24	558	189	120	208	70	167	155	52
Future Volume (vph)	68	942	42	24	558	189	120	208	70	167	155	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1227	1203	1639	1367	1626	1586		1612	1696	1282
Flt Permitted	0.27	1.00	1.00	0.05	1.00	1.00	0.65	1.00		0.19	1.00	1.00
Satd. Flow (perm)	473	1729	1227	63	1639	1367	1115	1586		322	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	73	1013	45	26	600	203	129	224	75	180	167	56
RTOR Reduction (vph)	0	0	18	0	0	73	0	8	0	0	0	40
Lane Group Flow (vph)	73	1013	27	26	600	130	129	291	0	180	167	16
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	87.9	82.3	91.6	83.3	80.0	95.9	38.8	29.5		49.4	36.1	41.7
Effective Green, g (s)	87.9	82.3	91.6	83.3	80.0	95.9	38.8	29.5		49.4	36.1	41.7
Actuated g/C Ratio	0.59	0.55	0.61	0.56	0.53	0.64	0.26	0.20		0.33	0.24	0.28
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	321	948	749	60	874	873	320	311		242	408	356
v/s Ratio Prot	c0.01	c0.59	0.00	c0.01	0.37	0.02	0.02	c0.18		c0.08	0.10	0.00
v/s Ratio Perm	0.12		0.02	0.23		0.08	0.08			0.17		0.01
v/c Ratio	0.23	1.07	0.04	0.43	0.69	0.15	0.40	0.94		0.74	0.41	0.04
Uniform Delay, d1	17.2	33.9	11.6	34.8	25.8	10.8	44.8	59.3		40.0	48.0	39.6
Progression Factor	0.92	1.03	1.12	1.29	0.98	3.19	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	46.0	0.0	1.6	3.7	0.0	0.3	33.9		10.3	0.2	0.0
Delay (s)	15.8	80.7	13.0	46.6	29.0	34.5	45.1	93.2		50.4	48.2	39.6
Level of Service	B	F	B	D	C	C	D	F		D	D	D
Approach Delay (s)		73.8			30.9			78.7			48.0	
Approach LOS		E			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	58.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1139	39	11	771	17	15
Future Volume (Veh/h)	1139	39	11	771	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1212	41	12	820	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1253		2056	1212
vC1, stage 1 conf vol					1212	
vC2, stage 2 conf vol					844	
vCu, unblocked vol			1253		2056	1212
tC, single (s)			4.9		7.4	7.1
tC, 2 stage (s)					6.4	
tF (s)			2.9		4.4	4.1
p0 queue free %			97		88	89
cM capacity (veh/h)			353		151	146

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1212	41	12	820	18	16
Volume Left	0	0	12	0	18	0
Volume Right	0	41	0	0	0	16
cSH	1700	1700	353	1700	151	146
Volume to Capacity	0.71	0.02	0.03	0.48	0.12	0.11
Queue Length 95th (ft)	0	0	3	0	10	9
Control Delay (s)	0.0	0.0	15.6	0.0	32.1	32.6
Lane LOS			C		D	D
Approach Delay (s)	0.0		0.2		32.4	
Approach LOS					D	

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	69.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1020	129	197	740	10	40	0	84	3	1	2
Future Volume (vph)	5	1020	129	197	740	10	40	0	84	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1743	1242	2918	1676			1250	1145	1805	1010	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	1743	1242	2918	1676			995	1145	1385	1010	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	1097	139	212	796	11	43	0	90	3	1	2
RTOR Reduction (vph)	0	0	19	0	0	0	0	0	84	0	2	0
Lane Group Flow (vph)	5	1097	120	212	807	0	0	43	6	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2	2	1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Effective Green, g (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.01	0.73	0.73	0.11	0.83			0.07	0.07	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	16	1272	906	309	1385			70	80	97	71	
v/s Ratio Prot	0.00	c0.63	0.10	c0.07	0.48						0.00	
v/s Ratio Perm								c0.04	0.01	0.00		
v/c Ratio	0.31	0.86	0.13	0.69	0.58			0.61	0.08	0.03	0.02	
Uniform Delay, d1	73.8	14.8	6.1	64.6	4.3			67.7	65.1	64.9	64.8	
Progression Factor	0.85	0.67	0.96	0.97	1.27			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.3	2.6	0.1	2.8	1.0			10.7	0.2	0.0	0.0	
Delay (s)	66.3	12.4	5.9	65.3	6.5			78.4	65.3	65.0	64.9	
Level of Service	E	B	A	E	A			E	E	E	E	
Approach Delay (s)		11.9			18.8			69.5			64.9	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	18.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	79.9%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	770	274	19	679	101	253	49	16	25	9	15
Future Volume (vph)	72	770	274	19	679	101	253	49	16	25	9	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1667	1499	1543	1624	1491	1656	1709		1043	1128	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	1667	1499	1543	1624	1491	1656	1709		1043	1128	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	856	304	21	754	112	281	54	18	28	10	17
RTOR Reduction (vph)	0	0	40	0	0	43	0	9	0	0	17	0
Lane Group Flow (vph)	80	856	264	21	754	69	281	63	0	28	10	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.2	94.7	94.7	4.4	86.9	86.9	28.0	26.7		5.7	4.4	
Effective Green, g (s)	12.2	94.7	94.7	4.4	86.9	86.9	28.0	26.7		5.7	4.4	
Actuated g/C Ratio	0.08	0.63	0.63	0.03	0.58	0.58	0.19	0.18		0.04	0.03	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	139	1052	946	45	940	863	309	304		39	33	
v/s Ratio Prot	c0.05	c0.51		0.01	0.46		c0.17	c0.04		0.03	0.01	
v/s Ratio Perm			0.18			0.05						
v/c Ratio	0.58	0.81	0.28	0.47	0.80	0.08	0.91	0.21		0.72	0.32	
Uniform Delay, d1	66.4	21.0	12.4	71.6	24.8	13.9	59.8	52.6		71.4	71.3	
Progression Factor	1.13	0.49	0.28	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	2.1	4.2	0.4	2.8	7.2	0.2	28.3	0.1		40.9	2.0	
Delay (s)	76.9	14.6	3.9	74.4	32.0	14.1	88.1	52.7		112.2	73.4	
Level of Service	E	B	A	E	C	B	F	D		F	E	
Approach Delay (s)		16.0			30.7			80.9			93.1	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	31.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	399	326	100	109	135	80
Future Volume (Veh/h)	399	326	100	109	135	80
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	453	370	114	124	153	91
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			453		805	453
vC1, stage 1 conf vol					453	
vC2, stage 2 conf vol					352	
vCu, unblocked vol			453		805	453
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			89		70	84
cM capacity (veh/h)			1047		505	560

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	453	370	114	124	153	91
Volume Left	0	0	114	0	153	0
Volume Right	0	370	0	0	0	91
cSH	1700	1700	1047	1700	505	560
Volume to Capacity	0.27	0.22	0.11	0.07	0.30	0.16
Queue Length 95th (ft)	0	0	9	0	32	14
Control Delay (s)	0.0	0.0	8.9	0.0	15.2	12.7
Lane LOS			A		C	B
Approach Delay (s)	0.0		4.2		14.3	
Approach LOS					B	

Intersection Summary			
Average Delay	3.4		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2021 - Background AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	91	1.0	0.596	12.9	LOS B	4.6	116.0	0.75	0.80	29.6
18	R2	438	1.0	0.596	12.9	LOS B	4.6	116.0	0.75	0.80	28.1
Approach		528	1.0	0.596	12.9	LOS B	4.6	116.0	0.75	0.80	28.4
East: Oregon St											
1	L2	95	14.0	0.251	5.5	LOS A	1.2	32.2	0.26	0.13	32.5
6	T1	192	8.0	0.251	5.5	LOS A	1.2	32.2	0.26	0.13	32.1
Approach		287	10.0	0.251	5.5	LOS A	1.2	32.2	0.26	0.13	32.2
West: Oregon St.											
2	T1	416	2.0	0.397	6.9	LOS A	2.5	62.7	0.35	0.20	32.4
12	R2	65	2.0	0.397	6.9	LOS A	2.5	62.7	0.35	0.20	31.2
Approach		481	2.0	0.397	6.9	LOS A	2.5	62.7	0.35	0.20	32.2
All Vehicles		1296	3.4	0.596	9.0	LOS A	4.6	116.0	0.50	0.43	30.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	373	24	16	193	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	373	24	16	193	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	401	26	17	208	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	654	676	214	684	669	414	221			427		
vC1, stage 1 conf vol	248	248		414	414							
vC2, stage 2 conf vol	405	427		270	255							
vCu, unblocked vol	595	619	126	627	612	414	133			427		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	527	501	833	519	514	611	1287			1066		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	427	17	221
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	527	682	519	543	1700	1700	1066	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.25	0.02	0.13
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.2	10.5	12.0	11.7	0.0	0.0	8.4	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.2		11.8		0.0		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	644	255	197	863	14	208	113	107	30	191	13
Future Volume (vph)	13	644	255	197	863	14	208	113	107	30	191	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1778	1586	1770	1826		1786	1900	1568	1752	1852	
Flt Permitted	0.09	1.00	1.00	0.17	1.00		0.24	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	162	1778	1586	312	1826		445	1900	1568	1254	1852	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	14	685	271	210	918	15	221	120	114	32	203	14
RTOR Reduction (vph)	0	0	65	0	0	0	0	0	90	0	2	0
Lane Group Flow (vph)	14	685	206	210	933	0	221	120	24	32	215	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	48.4	46.8	58.2	59.4	53.8		28.3	20.8	20.8	16.4	12.9	
Effective Green, g (s)	48.4	46.8	58.2	59.4	53.8		28.3	20.8	20.8	16.4	12.9	
Actuated g/C Ratio	0.50	0.48	0.60	0.61	0.55		0.29	0.21	0.21	0.17	0.13	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	107	851	944	318	1005		285	404	333	228	244	
v/s Ratio Prot	0.00	0.39	0.03	c0.06	c0.51		c0.09	0.06		0.01	0.12	
v/s Ratio Perm	0.06		0.10	0.34			c0.13		0.02	0.02		
v/c Ratio	0.13	0.80	0.22	0.66	0.93		0.78	0.30	0.07	0.14	0.88	
Uniform Delay, d1	18.9	21.6	9.2	14.8	20.2		28.9	32.3	30.7	34.5	41.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	5.7	0.0	3.9	14.2		11.4	1.8	0.4	0.1	28.3	
Delay (s)	19.1	27.3	9.2	18.8	34.4		40.3	34.1	31.1	34.6	69.9	
Level of Service	B	C	A	B	C		D	C	C	C	E	
Approach Delay (s)		22.1			31.5			36.3			65.4	
Approach LOS		C			C			D			E	

Intersection Summary			
HCM 2000 Control Delay	32.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	97.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	88.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	751	118	356	945	8	126	1	157	11	10	8
Future Volume (vph)	7	751	118	356	945	8	126	1	157	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1803	1830	1464	1770	1828			1739	1568	1805	1754	
Flt Permitted	0.95	1.00	1.00	0.11	1.00			0.30	1.00	0.67	1.00	
Satd. Flow (perm)	1803	1830	1464	207	1828			555	1568	1273	1754	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	808	127	383	1016	9	135	1	169	12	11	9
RTOR Reduction (vph)	0	0	38	0	0	0	0	0	94	0	8	0
Lane Group Flow (vph)	8	808	89	383	1025	0	0	136	75	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	45.2	45.2	58.5	53.8			13.1	30.3	6.2	6.2	
Effective Green, g (s)	0.7	45.2	45.2	58.5	53.8			13.1	30.3	6.2	6.2	
Actuated g/C Ratio	0.01	0.55	0.55	0.71	0.66			0.16	0.37	0.08	0.08	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	15	1007	806	474	1197			88	578	96	132	
v/s Ratio Prot	0.00	0.44		c0.17	c0.56				0.03		0.01	
v/s Ratio Perm			0.06	0.41				c0.24	0.02	0.01		
v/c Ratio	0.53	0.80	0.11	0.81	0.86			1.55	0.13	0.12	0.09	
Uniform Delay, d1	40.5	14.9	8.8	20.5	11.1			34.5	17.2	35.4	35.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	17.0	4.8	0.1	9.2	6.4			293.9	0.0	0.2	0.1	
Delay (s)	57.5	19.7	8.9	29.8	17.5			328.4	17.2	35.6	35.4	
Level of Service	E	B	A	C	B			F	B	D	D	
Approach Delay (s)		18.5			20.8			155.9			35.5	
Approach LOS		B			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	35.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.01		
Actuated Cycle Length (s)	82.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	85.0%	ICU Level of Service	E
Analysis Period (min)	15		
! Phase conflict between lane groups.			
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	927	1293	3	12	18
Future Volume (Veh/h)	3	927	1293	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	997	1390	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.28				0.47	0.28
vC, conflicting volume	1395				2396	1394
vC1, stage 1 conf vol					1394	
vC2, stage 2 conf vol					1003	
vCu, unblocked vol	1119				1536	1113
tC, single (s)	4.4				6.5	6.3
tC, 2 stage (s)					5.5	
tF (s)	2.5				3.6	3.4
p0 queue free %	98				84	72
cM capacity (veh/h)	144				82	68

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	3	997	1393	13	19
Volume Left	3	0	0	13	0
Volume Right	0	0	3	0	19
cSH	144	1700	1700	82	68
Volume to Capacity	0.02	0.59	0.82	0.16	0.28
Queue Length 95th (ft)	2	0	0	13	25
Control Delay (s)	30.6	0.0	0.0	57.2	76.7
Lane LOS	D			F	F
Approach Delay (s)	0.1		0.0	68.8	
Approach LOS				F	

Intersection Summary			
Average Delay	0.9		
Intersection Capacity Utilization	78.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	909	1183	14	63	124
Future Volume (vph)	37	909	1183	14	63	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1812	1830	1405	1703	1583
Flt Permitted	0.05	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	92	1812	1830	1405	1703	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	988	1286	15	68	135
RTOR Reduction (vph)	0	0	0	1	0	124
Lane Group Flow (vph)	40	988	1286	14	68	11
Confl. Peds. (#/hr)	2			2		
Confl. Bikes (#/hr)				4		
Heavy Vehicles (%)	3%	4%	3%	14%	6%	2%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Perm	Perm
Protected Phases	5	2	6	6		
Permitted Phases	2				4	4
Actuated Green, G (s)	102.7	102.7	92.6	92.6	10.2	10.2
Effective Green, g (s)	102.7	102.7	92.6	92.6	10.2	10.2
Actuated g/C Ratio	0.83	0.83	0.75	0.75	0.08	0.08
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	158	1508	1373	1054	140	130
v/s Ratio Prot	0.01	c0.55	c0.70	0.01		
v/s Ratio Perm	0.20				c0.04	0.01
v/c Ratio	0.25	0.66	0.94	0.01	0.49	0.09
Uniform Delay, d1	27.3	3.8	12.9	3.9	54.1	52.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.0	12.1	0.0	2.6	0.3
Delay (s)	28.2	4.9	25.0	3.9	56.7	52.6
Level of Service	C	A	C	A	E	D
Approach Delay (s)		5.8	24.8		54.0	
Approach LOS		A	C		D	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	123.4	Sum of lost time (s)	14.5
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	824	101	58	885	118	112	124	11	195	197	200
Future Volume (vph)	47	824	101	58	885	118	112	124	11	195	197	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1426	1805	1830	1550	1752	1840		1735	1827	1583
Flt Permitted	0.13	1.00	1.00	0.17	1.00	1.00	0.45	1.00		0.35	1.00	1.00
Satd. Flow (perm)	243	1812	1426	328	1830	1550	825	1840		635	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	49	858	105	60	922	123	117	129	11	203	205	208
RTOR Reduction (vph)	0	0	31	0	0	28	0	2	0	0	0	143
Lane Group Flow (vph)	49	858	74	60	922	95	117	138	0	203	205	65
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	98.3	92.4	102.9	96.7	91.6	108.2	26.8	16.3		36.9	22.4	28.3
Effective Green, g (s)	98.3	92.4	102.9	96.7	91.6	108.2	26.8	16.3		36.9	22.4	28.3
Actuated g/C Ratio	0.66	0.62	0.69	0.65	0.61	0.72	0.18	0.11		0.25	0.15	0.19
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	221	1120	982	262	1122	1122	213	200		279	273	299
v/s Ratio Prot	c0.01	0.47	0.01	0.01	c0.50	0.01	0.04	0.08		c0.08	c0.11	0.01
v/s Ratio Perm	0.14		0.05	0.14		0.05	0.06			0.10		0.03
v/c Ratio	0.22	0.77	0.08	0.23	0.82	0.09	0.55	0.69		0.73	0.75	0.22
Uniform Delay, d1	20.4	20.7	7.6	17.3	22.5	6.1	54.0	64.1		48.4	60.8	51.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	3.6	0.0	0.2	5.4	0.0	1.6	8.0		7.8	9.9	0.1
Delay (s)	20.6	24.2	7.6	17.4	28.0	6.1	55.5	72.2		56.1	70.7	51.3
Level of Service	C	C	A	B	C	A	E	E		E	E	D
Approach Delay (s)		22.3			25.0			64.6			59.4	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	149.4	Sum of lost time (s)	19.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1010	22	3	1014	27	17
Future Volume (Veh/h)	1010	22	3	1014	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1074	23	3	1079	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1097		2159	1074
vC1, stage 1 conf vol					1074	
vC2, stage 2 conf vol					1085	
vCu, unblocked vol			1097		2159	1074
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		87	93
cM capacity (veh/h)			644		231	270

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1074	23	3	1079	29	18
Volume Left	0	0	3	0	29	0
Volume Right	0	23	0	0	0	18
cSH	1700	1700	644	1700	231	270
Volume to Capacity	0.63	0.01	0.00	0.63	0.13	0.07
Queue Length 95th (ft)	0	0	0	0	11	5
Control Delay (s)	0.0	0.0	10.6	0.0	22.8	19.3
Lane LOS			B		C	C
Approach Delay (s)	0.0		0.0		21.5	
Approach LOS					C	

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	63.4%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	955	60	52	891	16	111	0	229	16	1	15
Future Volume (vph)	12	955	60	52	891	16	111	0	229	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1827	1533	2894	1840			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.54	1.00	
Satd. Flow (perm)	1805	1827	1533	2894	1840			1390	1568	1030	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1005	63	55	938	17	117	0	241	17	1	16
RTOR Reduction (vph)	0	0	14	0	0	0	0	0	213	0	14	0
Lane Group Flow (vph)	13	1005	49	55	955	0	0	117	28	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Effective Green, g (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Actuated g/C Ratio	0.02	0.72	0.72	0.05	0.74			0.12	0.12	0.12	0.12	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	1318	1106	130	1357			162	182	120	190	
v/s Ratio Prot	0.01	c0.55		c0.02	0.52						0.00	
v/s Ratio Perm			0.03					c0.08	0.02	0.02		
v/c Ratio	0.29	0.76	0.04	0.42	0.70			0.72	0.15	0.14	0.02	
Uniform Delay, d1	57.5	10.3	4.8	55.8	8.6			51.1	47.7	47.6	46.9	
Progression Factor	1.00	1.00	1.00	1.00	0.64			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	4.2	0.1	0.6	2.2			12.6	0.1	0.2	0.0	
Delay (s)	61.0	14.6	4.9	56.1	7.7			63.7	47.8	47.8	46.9	
Level of Service	E	B	A	E	A			E	D	D	D	
Approach Delay (s)		14.5			10.3			53.0			47.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	18.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	80.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	817	346	5	700	37	193	19	14	100	42	63
Future Volume (vph)	29	817	346	5	700	37	193	19	14	100	42	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1810	1550	1805	1810	1436	1787	1648		1719	1728	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1810	1550	1805	1810	1436	1787	1648		1719	1728	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	31	878	372	5	753	40	208	20	15	108	45	68
RTOR Reduction (vph)	0	0	54	0	0	16	0	14	0	0	47	0
Lane Group Flow (vph)	31	878	318	5	753	24	208	21	0	108	66	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	4.3	74.3	74.3	1.1	71.1	71.1	15.4	9.5		16.6	10.7	
Effective Green, g (s)	4.3	74.3	74.3	1.1	71.1	71.1	15.4	9.5		16.6	10.7	
Actuated g/C Ratio	0.04	0.62	0.62	0.01	0.59	0.59	0.13	0.08		0.14	0.09	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	64	1120	959	16	1072	850	229	130		237	154	
v/s Ratio Prot	c0.02	c0.49		0.00	0.42		c0.12	0.01		0.06	c0.04	
v/s Ratio Perm			0.21			0.02						
v/c Ratio	0.48	0.78	0.33	0.31	0.70	0.03	0.91	0.16		0.46	0.43	
Uniform Delay, d1	56.8	16.9	10.9	59.1	17.1	10.1	51.6	51.5		47.5	51.7	
Progression Factor	0.99	0.82	1.04	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	4.0	0.7	4.0	3.9	0.1	34.7	0.2		0.5	0.7	
Delay (s)	57.5	18.0	12.1	63.1	20.9	10.2	86.3	51.8		48.1	52.4	
Level of Service	E	B	B	E	C	B	F	D		D	D	
Approach Delay (s)		17.2			20.6			81.3			50.3	
Approach LOS		B			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	69.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	187	149	128	434	360	86
Future Volume (Veh/h)	187	149	128	434	360	86
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	203	162	139	472	391	93
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			203		953	203
vC1, stage 1 conf vol					203	
vC2, stage 2 conf vol					750	
vCu, unblocked vol			203		953	203
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			89		2	89
cM capacity (veh/h)			1311		400	830

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	203	162	139	472	391	93
Volume Left	0	0	139	0	391	0
Volume Right	0	162	0	0	0	93
cSH	1700	1700	1311	1700	400	830
Volume to Capacity	0.12	0.10	0.11	0.28	0.98	0.11
Queue Length 95th (ft)	0	0	9	0	289	9
Control Delay (s)	0.0	0.0	8.1	0.0	72.1	9.9
Lane LOS			A		F	A
Approach Delay (s)	0.0		1.8		60.2	
Approach LOS					F	

Intersection Summary			
Average Delay	20.7		
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2021 - Background PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	91	1.0	0.229	5.4	LOS A	1.1	28.3	0.39	0.26	32.2
18	R2	160	4.0	0.229	5.4	LOS A	1.1	28.3	0.39	0.26	30.5
Approach		251	2.9	0.229	5.4	LOS A	1.1	28.3	0.39	0.26	31.1
East: Oregon St											
1	L2	412	1.0	0.671	11.9	LOS B	7.0	175.9	0.53	0.29	29.5
6	T1	424	1.0	0.671	11.9	LOS B	7.0	175.9	0.53	0.29	29.0
Approach		836	1.0	0.671	11.9	LOS B	7.0	175.9	0.53	0.29	29.3
West: Oregon St.											
2	T1	194	2.0	0.317	7.5	LOS A	1.5	39.1	0.58	0.52	32.0
12	R2	87	2.0	0.317	7.5	LOS A	1.5	39.1	0.58	0.52	30.9
Approach		281	2.0	0.317	7.5	LOS A	1.5	39.1	0.58	0.52	31.6
All Vehicles		1367	1.6	0.671	9.8	LOS A	7.0	175.9	0.51	0.33	30.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	220	3	2	310	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	220	3	2	310	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	229	3	2	323	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	606	583	347	572	604	234	369			233		
vC1, stage 1 conf vol	350	350		232	232							
vC2, stage 2 conf vol	256	233		340	373							
vCu, unblocked vol	502	477	214	465	501	234	239			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	589	575	733	612	564	796	1175			1316		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	232	2	369
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	589	672	612	667	1700	1700	1316	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.14	0.00	0.22
Queue Length 95th (ft)	1	2	3	4	0	0	0	0
Control Delay (s)	11.2	10.5	11.1	10.7	0.0	0.0	7.7	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	10.8		10.9		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix F Year 2021 Total Traffic Conditions Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	855	193	75	495	38	112	118	140	26	58	7
Future Volume (vph)	11	855	193	75	495	38	112	118	140	26	58	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1795	1538	1703	1546		1751	1776	1568	1504	1760	
Flt Permitted	0.36	1.00	1.00	0.09	1.00		0.46	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	676	1795	1538	156	1546		844	1776	1568	1063	1760	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	12	972	219	85	562	43	127	134	159	30	66	8
RTOR Reduction (vph)	0	0	42	0	2	0	0	0	135	0	4	0
Lane Group Flow (vph)	13	972	177	85	604	0	127	134	24	30	70	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	62.8	61.1	72.6	68.6	64.0		22.8	15.2	15.2	10.9	7.3	
Effective Green, g (s)	62.8	61.1	72.6	68.6	64.0		22.8	15.2	15.2	10.9	7.3	
Actuated g/C Ratio	0.61	0.60	0.71	0.67	0.62		0.22	0.15	0.15	0.11	0.07	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	432	1069	1089	173	965		289	263	232	128	125	
v/s Ratio Prot	0.00	c0.54	0.02	c0.02	0.39		c0.05	c0.08		0.01	0.04	
v/s Ratio Perm	0.02		0.10	0.31			0.05		0.02	0.02		
v/c Ratio	0.03	0.91	0.16	0.49	0.63		0.44	0.51	0.10	0.23	0.56	
Uniform Delay, d1	8.4	18.3	4.9	18.1	11.9		33.5	40.2	37.7	41.8	46.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	11.4	0.0	0.8	1.3		0.4	6.5	0.8	0.3	3.4	
Delay (s)	8.4	29.6	5.0	18.9	13.2		33.9	46.7	38.6	42.1	49.5	
Level of Service	A	C	A	B	B		C	D	D	D	D	
Approach Delay (s)		24.9			13.9			39.7			47.3	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	836	121	105	598	6	87	3	354	4	0	0
Future Volume (vph)	8	836	121	105	598	6	87	3	354	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	1729	1448	1556	1639			1531	1522	1442		
Flt Permitted	0.95	1.00	1.00	0.17	1.00			0.55	1.00	1.00		
Satd. Flow (perm)	1805	1729	1448	279	1639			890	1522	1518		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	880	127	111	629	6	92	3	373	4	0	0
RTOR Reduction (vph)	0	0	29	0	0	0	0	0	96	0	0	0
Lane Group Flow (vph)	8	880	98	111	635	0	0	95	277	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	43.9	43.9	49.5	44.9			7.1	14.8	2.0		
Effective Green, g (s)	0.6	43.9	43.9	49.5	44.9			7.1	14.8	2.0		
Actuated g/C Ratio	0.01	0.65	0.65	0.74	0.67			0.11	0.22	0.03		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	16	1131	947	352	1096			94	335	45		
v/s Ratio Prot	0.00	c0.51		0.04	0.39				c0.09			
v/s Ratio Perm			0.07	0.20				c0.11	0.09	0.00		
v/c Ratio	0.50	0.78	0.10	0.32	0.58			1.01	0.83	0.09		
Uniform Delay, d1	33.1	8.2	4.3	6.5	6.0			30.0	24.9	31.7		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	8.7	3.5	0.1	0.2	0.8			95.7	14.6	0.3		
Delay (s)	41.8	11.7	4.4	6.7	6.8			125.7	39.6	32.0		
Level of Service	D	B	A	A	A			F	D	C		
Approach Delay (s)		11.0			6.8			57.1			32.0	
Approach LOS		B			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	67.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1198	714	10	6	3
Future Volume (Veh/h)	10	1198	714	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1274	760	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.84				0.67	0.84
vC, conflicting volume	771				2062	766
vC1, stage 1 conf vol					766	
vC2, stage 2 conf vol					1296	
vCu, unblocked vol	632				1799	625
tC, single (s)	4.2				7.1	6.5
tC, 2 stage (s)					6.1	
tF (s)	2.3				4.1	3.6
p0 queue free %	99				95	99
cM capacity (veh/h)	767				123	364

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	11	1274	771	6	3
Volume Left	11	0	0	6	0
Volume Right	0	0	11	0	3
cSH	767	1700	1700	123	364
Volume to Capacity	0.01	0.75	0.45	0.05	0.01
Queue Length 95th (ft)	1	0	0	4	1
Control Delay (s)	9.8	0.0	0.0	35.9	15.0
Lane LOS	A			E	B
Approach Delay (s)	0.1		0.0	28.9	
Approach LOS				D	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1005	88	80	655	75	21	2	19	47	9	30
Future Volume (vph)	110	1005	88	80	655	75	21	2	19	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.86		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1715		1597	1639	1418	1597	1452		1289	1331	
Flt Permitted	0.36	1.00		0.15	1.00	1.00	0.73	1.00		0.74	1.00	
Satd. Flow (perm)	638	1715		251	1639	1418	1229	1452		1008	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1047	92	83	682	78	22	2	20	49	9	31
RTOR Reduction (vph)	0	2	0	0	0	14	0	18	0	0	29	0
Lane Group Flow (vph)	115	1137	0	83	682	64	22	4	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	124.0	117.2		123.7	117.3	117.3	11.9	11.9		11.4	11.4	
Effective Green, g (s)	124.0	117.2		123.7	117.3	117.3	11.9	11.9		11.4	11.4	
Actuated g/C Ratio	0.83	0.78		0.82	0.78	0.78	0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	575	1339		264	1281	1108	97	115		76	101	
v/s Ratio Prot	0.01	c0.66		c0.01	0.42	0.05		0.00			0.01	
v/s Ratio Perm	0.16			0.25			0.02			c0.05		
v/c Ratio	0.20	0.85		0.31	0.53	0.06	0.23	0.03		0.64	0.11	
Uniform Delay, d1	3.2	10.7		13.1	6.1	3.7	64.7	63.7		67.3	64.6	
Progression Factor	1.00	1.00		0.40	0.35	0.07	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	6.9		0.5	1.2	0.1	1.2	0.1		17.2	0.5	
Delay (s)	3.4	17.5		5.8	3.4	0.3	65.9	63.8		84.6	65.1	
Level of Service	A	B		A	A	A	E	E		F	E	
Approach Delay (s)		16.2			3.3			64.9			75.8	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	953	46	24	602	189	138	208	70	167	155	70
Future Volume (vph)	72	953	46	24	602	189	138	208	70	167	155	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1227	1203	1639	1367	1626	1586		1612	1696	1282
Flt Permitted	0.24	1.00	1.00	0.05	1.00	1.00	0.64	1.00		0.19	1.00	1.00
Satd. Flow (perm)	416	1729	1227	63	1639	1367	1090	1586		319	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	77	1025	49	26	647	203	148	224	75	180	167	75
RTOR Reduction (vph)	0	0	19	0	0	73	0	8	0	0	0	55
Lane Group Flow (vph)	77	1025	30	26	647	130	148	291	0	180	167	20
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	87.9	82.4	92.7	83.5	80.2	96.1	39.7	29.4		49.3	35.0	40.5
Effective Green, g (s)	87.9	82.4	92.7	83.5	80.2	96.1	39.7	29.4		49.3	35.0	40.5
Actuated g/C Ratio	0.59	0.55	0.62	0.56	0.53	0.64	0.26	0.20		0.33	0.23	0.27
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	289	949	758	60	876	875	325	310		241	395	346
v/s Ratio Prot	c0.01	c0.59	0.00	c0.01	0.39	0.02	0.03	c0.18		c0.08	0.10	0.00
v/s Ratio Perm	0.15		0.02	0.23		0.08	0.09			0.17		0.01
v/c Ratio	0.27	1.08	0.04	0.43	0.74	0.15	0.46	0.94		0.75	0.42	0.06
Uniform Delay, d1	18.3	33.8	11.2	34.8	26.8	10.7	44.7	59.4		40.1	48.9	40.6
Progression Factor	1.14	0.96	2.76	1.53	1.10	1.36	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	47.6	0.0	1.5	4.6	0.0	0.4	34.5		10.5	0.3	0.0
Delay (s)	20.9	79.9	30.9	54.9	34.2	14.6	45.0	93.9		50.6	49.2	40.6
Level of Service	C	E	C	D	C	B	D	F		D	D	D
Approach Delay (s)		73.9			30.3			77.7			48.3	
Approach LOS		E			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	57.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1150	39	11	815	17	15
Future Volume (Veh/h)	1150	39	11	815	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1223	41	12	867	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1264		2114	1223
vC1, stage 1 conf vol					1223	
vC2, stage 2 conf vol					891	
vCu, unblocked vol			1264		2114	1223
tC, single (s)			4.9		7.4	7.1
tC, 2 stage (s)					6.4	
tF (s)			2.9		4.4	4.1
p0 queue free %			97		88	89
cM capacity (veh/h)			349		146	144

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1223	41	12	867	18	16
Volume Left	0	0	12	0	18	0
Volume Right	0	41	0	0	0	16
cSH	1700	1700	349	1700	146	144
Volume to Capacity	0.72	0.02	0.03	0.51	0.12	0.11
Queue Length 95th (ft)	0	0	3	0	10	9
Control Delay (s)	0.0	0.0	15.7	0.0	33.1	33.2
Lane LOS			C		D	D
Approach Delay (s)	0.0		0.2		33.1	
Approach LOS					D	

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1031	129	197	784	10	40	0	84	3	1	2
Future Volume (vph)	5	1031	129	197	784	10	40	0	84	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1743	1242	2918	1676			1250	1145	1805	1010	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	1743	1242	2918	1676			995	1145	1385	1010	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	1109	139	212	843	11	43	0	90	3	1	2
RTOR Reduction (vph)	0	0	19	0	0	0	0	0	84	0	2	0
Lane Group Flow (vph)	5	1109	120	212	854	0	0	43	6	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2	2	1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Effective Green, g (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.01	0.73	0.73	0.11	0.83			0.07	0.07	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	16	1272	906	309	1385			70	80	97	71	
v/s Ratio Prot	0.00	c0.64	0.10	c0.07	0.51						0.00	
v/s Ratio Perm								c0.04	0.01	0.00		
v/c Ratio	0.31	0.87	0.13	0.69	0.62			0.61	0.08	0.03	0.02	
Uniform Delay, d1	73.8	15.0	6.1	64.6	4.6			67.7	65.1	64.9	64.8	
Progression Factor	0.78	1.16	1.81	0.93	1.07			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.1	2.6	0.1	2.5	1.0			10.7	0.2	0.0	0.0	
Delay (s)	60.4	20.0	11.1	62.5	5.9			78.4	65.3	65.0	64.9	
Level of Service	E	C	B	E	A			E	E	E	E	
Approach Delay (s)		19.2			17.2			69.5			64.9	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	21.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	777	278	19	705	101	271	49	16	25	9	15
Future Volume (vph)	72	777	278	19	705	101	271	49	16	25	9	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1667	1499	1543	1624	1491	1656	1709		1043	1128	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	1667	1499	1543	1624	1491	1656	1709		1043	1128	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	863	309	21	783	112	301	54	18	28	10	17
RTOR Reduction (vph)	0	0	39	0	0	42	0	9	0	0	17	0
Lane Group Flow (vph)	80	863	270	21	783	70	301	63	0	28	10	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.4	95.8	95.8	4.4	87.8	87.8	26.9	25.6		5.7	4.4	
Effective Green, g (s)	12.4	95.8	95.8	4.4	87.8	87.8	26.9	25.6		5.7	4.4	
Actuated g/C Ratio	0.08	0.64	0.64	0.03	0.59	0.59	0.18	0.17		0.04	0.03	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	142	1064	957	45	950	872	296	291		39	33	
v/s Ratio Prot	c0.05	c0.52		0.01	0.48		c0.18	c0.04		0.03	0.01	
v/s Ratio Perm			0.18			0.05						
v/c Ratio	0.56	0.81	0.28	0.47	0.82	0.08	1.02	0.22		0.72	0.32	
Uniform Delay, d1	66.2	20.3	11.9	71.6	24.9	13.5	61.5	53.6		71.4	71.3	
Progression Factor	1.23	0.52	0.34	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	4.0	0.4	2.8	8.1	0.2	56.7	0.1		40.9	2.0	
Delay (s)	83.3	14.5	4.5	74.4	33.0	13.7	118.2	53.7		112.2	73.4	
Level of Service	F	B	A	E	C	B	F	D		F	E	
Approach Delay (s)		16.4			31.6			105.8			93.1	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	417	326	102	113	135	89
Future Volume (Veh/h)	417	326	102	113	135	89
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	474	370	116	128	153	101
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			474		834	474
vC1, stage 1 conf vol					474	
vC2, stage 2 conf vol					360	
vCu, unblocked vol			474		834	474
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			89		69	81
cM capacity (veh/h)			1028		494	544

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	474	370	116	128	153	101
Volume Left	0	0	116	0	153	0
Volume Right	0	370	0	0	0	101
cSH	1700	1700	1028	1700	494	544
Volume to Capacity	0.28	0.22	0.11	0.08	0.31	0.19
Queue Length 95th (ft)	0	0	10	0	33	17
Control Delay (s)	0.0	0.0	8.9	0.0	15.5	13.1
Lane LOS			A		C	B
Approach Delay (s)	0.0		4.3		14.6	
Approach LOS					B	

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2021 - Total Culdesac AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	91	1.0	0.615	13.5	LOS B	4.9	123.6	0.77	0.83	29.3
18	R2	448	1.0	0.615	13.5	LOS B	4.9	123.6	0.77	0.83	27.9
Approach		539	1.0	0.615	13.5	LOS B	4.9	123.6	0.77	0.83	28.1
East: Oregon St											
1	L2	98	14.0	0.255	5.5	LOS A	1.2	32.9	0.26	0.13	32.5
6	T1	194	8.0	0.255	5.5	LOS A	1.2	32.9	0.26	0.13	32.1
Approach		292	10.0	0.255	5.5	LOS A	1.2	32.9	0.26	0.13	32.2
West: Oregon St.											
2	T1	427	2.0	0.407	7.0	LOS A	2.6	65.0	0.36	0.20	32.3
12	R2	65	2.0	0.407	7.0	LOS A	2.6	65.0	0.36	0.20	31.2
Approach		492	2.0	0.407	7.0	LOS A	2.6	65.0	0.36	0.20	32.2
All Vehicles		1322	3.4	0.615	9.3	LOS A	4.9	123.6	0.51	0.44	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	391	24	16	197	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	391	24	16	197	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	420	26	17	212	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	676	698	218	706	692	433	225			446		
vC1, stage 1 conf vol	252	252		433	433							
vC2, stage 2 conf vol	424	446		274	259							
vCu, unblocked vol	619	643	129	651	636	433	136			446		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	514	491	829	508	505	596	1282			1049		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	446	17	225
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	514	674	508	532	1700	1700	1049	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.26	0.02	0.13
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.4	10.6	12.1	11.8	0.0	0.0	8.5	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.4		12.0		0.0		0.6	
Approach LOS	B		B					

Intersection Summary				
Average Delay	1.2			
Intersection Capacity Utilization	36.6%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	653	255	214	897	23	208	113	112	32	191	13
Future Volume (vph)	13	653	255	214	897	23	208	113	112	32	191	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1778	1586	1770	1823		1786	1900	1568	1752	1851	
Flt Permitted	0.08	1.00	1.00	0.18	1.00		0.24	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	149	1778	1586	334	1823		453	1900	1568	1254	1851	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	14	695	271	228	954	24	221	120	119	34	203	14
RTOR Reduction (vph)	0	0	59	0	1	0	0	0	95	0	2	0
Lane Group Flow (vph)	14	695	212	228	977	0	221	120	24	34	215	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	52.8	51.1	62.4	64.0	58.3		27.9	20.3	20.3	16.2	12.6	
Effective Green, g (s)	52.8	51.1	62.4	64.0	58.3		27.9	20.3	20.3	16.2	12.6	
Actuated g/C Ratio	0.52	0.50	0.61	0.63	0.57		0.27	0.20	0.20	0.16	0.12	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	104	891	971	335	1042		271	378	312	216	228	
v/s Ratio Prot	0.00	0.39	0.02	c0.06	c0.54		c0.09	0.06		0.01	0.12	
v/s Ratio Perm	0.07		0.11	0.37			c0.13		0.02	0.02		
v/c Ratio	0.13	0.78	0.22	0.68	0.94		0.82	0.32	0.08	0.16	0.94	
Uniform Delay, d1	19.6	20.8	8.8	14.6	20.1		31.5	34.9	33.2	36.8	44.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	4.6	0.0	4.5	15.2		16.2	2.1	0.4	0.1	43.5	
Delay (s)	19.8	25.4	8.9	19.1	35.3		47.6	36.9	33.6	36.9	87.8	
Level of Service	B	C	A	B	D		D	D	C	D	F	
Approach Delay (s)		20.8			32.3			41.2			80.9	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	101.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	767	118	383	1005	8	126	1	163	11	10	8
Future Volume (vph)	7	767	118	383	1005	8	126	1	163	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1803	1830	1464	1770	1828			1739	1568	1805	1754	
Flt Permitted	0.95	1.00	1.00	0.10	1.00			0.26	1.00	0.67	1.00	
Satd. Flow (perm)	1803	1830	1464	177	1828			466	1568	1273	1754	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	825	127	412	1081	9	135	1	175	12	11	9
RTOR Reduction (vph)	0	0	38	0	0	0	0	0	85	0	8	0
Lane Group Flow (vph)	8	825	89	412	1090	0	0	136	90	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	48.6	48.6	62.2	57.5			15.6	35.7	6.1	6.1	
Effective Green, g (s)	0.7	48.6	48.6	62.2	57.5			15.6	35.7	6.1	6.1	
Actuated g/C Ratio	0.01	0.55	0.55	0.70	0.65			0.18	0.40	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	14	1007	805	487	1190			82	633	87	121	
v/s Ratio Prot	0.00	0.45		c0.19	c0.60				0.03		0.01	
v/s Ratio Perm			0.06	0.40				c0.29	0.03	0.01		
v/c Ratio	0.57	0.82	0.11	0.85	0.92			1.66	0.14	0.14	0.10	
Uniform Delay, d1	43.7	16.3	9.5	24.3	13.3			36.4	16.6	38.6	38.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	30.5	5.4	0.1	12.3	11.1			344.0	0.0	0.3	0.1	
Delay (s)	74.1	21.7	9.6	36.6	24.4			380.3	16.7	38.9	38.6	
Level of Service	E	C	A	D	C			F	B	D	D	
Approach Delay (s)		20.5			27.7			175.7			38.7	
Approach LOS		C			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	41.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.09		
Actuated Cycle Length (s)	88.3	Sum of lost time (s)	14.5
Intersection Capacity Utilization	87.4%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	949	1380	3	12	18
Future Volume (Veh/h)	3	949	1380	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	1020	1484	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.29				0.49	0.29
vC, conflicting volume	1489				2514	1488
vC1, stage 1 conf vol					1488	
vC2, stage 2 conf vol					1026	
vCu, unblocked vol	1462				1708	1457
tC, single (s)	4.4				6.5	6.3
tC, 2 stage (s)					5.5	
tF (s)	2.5				3.6	3.4
p0 queue free %	97				78	58
cM capacity (veh/h)	109				58	45

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	3	1020	1487	13	19
Volume Left	3	0	0	13	0
Volume Right	0	0	3	0	19
cSH	109	1700	1700	58	45
Volume to Capacity	0.03	0.60	0.87	0.22	0.42
Queue Length 95th (ft)	2	0	0	19	38
Control Delay (s)	38.8	0.0	0.0	83.6	134.6
Lane LOS	E			F	F
Approach Delay (s)	0.1		0.0	113.9	
Approach LOS				F	

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	909	22	22	1183	14	87	9	77	63	2	124
Future Volume (vph)	37	909	22	22	1183	14	87	9	77	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1803		1671	1830	1405	1671	1523		1703	1586	
Flt Permitted	0.04	1.00		0.17	1.00	1.00	0.52	1.00		0.65	1.00	
Satd. Flow (perm)	79	1803		298	1830	1405	908	1523		1171	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	988	24	24	1286	15	95	10	84	68	2	135
RTOR Reduction (vph)	0	0	0	0	0	4	0	72	0	0	116	0
Lane Group Flow (vph)	40	1012	0	24	1286	11	95	22	0	68	21	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	98.0	92.9		95.0	91.4	91.4	18.1	18.1		18.1	18.1	
Effective Green, g (s)	98.0	92.9		95.0	91.4	91.4	18.1	18.1		18.1	18.1	
Actuated g/C Ratio	0.76	0.72		0.74	0.71	0.71	0.14	0.14		0.14	0.14	
Clearance Time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	1297		257	1295	994	127	213		164	222	
v/s Ratio Prot	c0.01	0.56		0.00	c0.70	0.01		0.01			0.01	
v/s Ratio Perm	0.23			0.07			c0.10			0.06		
v/c Ratio	0.32	0.78		0.09	0.99	0.01	0.75	0.10		0.41	0.09	
Uniform Delay, d1	35.1	11.6		10.9	18.5	5.5	53.3	48.4		50.7	48.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	3.1		0.2	23.2	0.0	21.1	0.2		1.7	0.2	
Delay (s)	36.6	14.7		11.1	41.7	5.6	74.4	48.6		52.4	48.5	
Level of Service	D	B		B	D	A	E	D		D	D	
Approach Delay (s)		15.5			40.8			61.6			49.8	
Approach LOS		B			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	129.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	867	118	58	897	118	117	124	11	195	197	205
Future Volume (vph)	64	867	118	58	897	118	117	124	11	195	197	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1427	1805	1830	1550	1752	1840		1735	1827	1583
Flt Permitted	0.12	1.00	1.00	0.15	1.00	1.00	0.43	1.00		0.35	1.00	1.00
Satd. Flow (perm)	222	1812	1427	281	1830	1550	796	1840		632	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	67	903	123	60	934	123	122	129	11	203	205	214
RTOR Reduction (vph)	0	0	34	0	0	28	0	2	0	0	0	137
Lane Group Flow (vph)	67	903	89	60	934	95	122	138	0	203	205	77
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	99.5	92.9	103.7	96.5	91.4	108.0	27.1	16.3		36.9	22.1	28.7
Effective Green, g (s)	99.5	92.9	103.7	96.5	91.4	108.0	27.1	16.3		36.9	22.1	28.7
Actuated g/C Ratio	0.66	0.62	0.69	0.64	0.61	0.72	0.18	0.11		0.25	0.15	0.19
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	217	1122	987	232	1115	1116	212	200		277	269	303
v/s Ratio Prot	c0.01	0.50	0.01	0.01	c0.51	0.01	0.04	0.08		c0.08	c0.11	0.01
v/s Ratio Perm	0.19		0.06	0.16		0.05	0.06			0.10		0.04
v/c Ratio	0.31	0.80	0.09	0.26	0.84	0.09	0.58	0.69		0.73	0.76	0.26
Uniform Delay, d1	21.9	21.6	7.6	19.2	23.3	6.2	54.2	64.4		48.6	61.4	51.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	4.8	0.0	0.2	6.1	0.0	2.3	8.0		8.3	10.9	0.2
Delay (s)	22.2	26.4	7.6	19.4	29.5	6.3	56.5	72.4		57.0	72.3	51.7
Level of Service	C	C	A	B	C	A	E	E		E	E	D
Approach Delay (s)		24.0			26.4			65.0			60.2	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	149.9	Sum of lost time (s)	19.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1053	22	3	1026	27	17
Future Volume (Veh/h)	1053	22	3	1026	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1120	23	3	1091	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1143		2217	1120
vC1, stage 1 conf vol					1120	
vC2, stage 2 conf vol					1097	
vCu, unblocked vol			1143		2217	1120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		87	93
cM capacity (veh/h)			619		223	254

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1120	23	3	1091	29	18
Volume Left	0	0	3	0	29	0
Volume Right	0	23	0	0	0	18
cSH	1700	1700	619	1700	223	254
Volume to Capacity	0.66	0.01	0.00	0.64	0.13	0.07
Queue Length 95th (ft)	0	0	0	0	11	6
Control Delay (s)	0.0	0.0	10.8	0.0	23.6	20.3
Lane LOS			B		C	C
Approach Delay (s)	0.0		0.0		22.3	
Approach LOS					C	

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	998	60	52	903	16	111	0	229	16	1	15
Future Volume (vph)	12	998	60	52	903	16	111	0	229	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1827	1533	2894	1840			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.54	1.00	
Satd. Flow (perm)	1805	1827	1533	2894	1840			1390	1568	1030	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1051	63	55	951	17	117	0	241	17	1	16
RTOR Reduction (vph)	0	0	15	0	0	0	0	0	155	0	14	0
Lane Group Flow (vph)	13	1051	48	55	968	0	0	117	86	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Effective Green, g (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Actuated g/C Ratio	0.02	0.72	0.72	0.05	0.74			0.12	0.12	0.12	0.12	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	1318	1106	130	1357			162	182	120	190	
v/s Ratio Prot	0.01	c0.58		c0.02	0.53						0.00	
v/s Ratio Perm			0.03					c0.08	0.06	0.02		
v/c Ratio	0.29	0.80	0.04	0.42	0.71			0.72	0.47	0.14	0.02	
Uniform Delay, d1	57.5	10.9	4.8	55.8	8.7			51.1	49.6	47.6	46.9	
Progression Factor	1.00	1.00	1.00	1.09	0.81			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	5.1	0.1	0.6	2.3			12.6	0.7	0.2	0.0	
Delay (s)	61.0	16.0	4.9	61.3	9.3			63.7	50.3	47.8	46.9	
Level of Service	E	B	A	E	A			E	D	D	D	
Approach Delay (s)		15.9			12.1			54.7			47.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	843	363	5	707	37	198	19	14	100	42	63
Future Volume (vph)	29	843	363	5	707	37	198	19	14	100	42	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1810	1550	1805	1810	1436	1787	1648		1719	1728	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1810	1550	1805	1810	1436	1787	1648		1719	1728	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	31	906	390	5	760	40	213	20	15	108	45	68
RTOR Reduction (vph)	0	0	55	0	0	16	0	14	0	0	47	0
Lane Group Flow (vph)	31	906	335	5	760	24	213	21	0	108	66	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	4.3	74.2	74.2	1.1	71.0	71.0	15.5	9.5		16.7	10.7	
Effective Green, g (s)	4.3	74.2	74.2	1.1	71.0	71.0	15.5	9.5		16.7	10.7	
Actuated g/C Ratio	0.04	0.62	0.62	0.01	0.59	0.59	0.13	0.08		0.14	0.09	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	64	1119	958	16	1070	849	230	130		239	154	
v/s Ratio Prot	c0.02	c0.50		0.00	0.42		c0.12	0.01		0.06	c0.04	
v/s Ratio Perm			0.22			0.02						
v/c Ratio	0.48	0.81	0.35	0.31	0.71	0.03	0.93	0.16		0.45	0.43	
Uniform Delay, d1	56.8	17.5	11.2	59.1	17.3	10.2	51.7	51.5		47.4	51.7	
Progression Factor	0.94	0.92	1.20	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	4.4	0.7	4.0	4.0	0.1	38.8	0.2		0.5	0.7	
Delay (s)	54.7	20.6	14.0	63.1	21.3	10.2	90.4	51.8		47.9	52.4	
Level of Service	D	C	B	E	C	B	F	D		D	D	
Approach Delay (s)		19.5			21.0			85.0			50.2	
Approach LOS		B			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	28.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	191	149	137	452	360	88
Future Volume (Veh/h)	191	149	137	452	360	88
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	208	162	149	491	391	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			208		997	208
vC1, stage 1 conf vol					208	
vC2, stage 2 conf vol					789	
vCu, unblocked vol			208		997	208
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			89		0	88
cM capacity (veh/h)			1306		380	825

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	208	162	149	491	391	96
Volume Left	0	0	149	0	391	0
Volume Right	0	162	0	0	0	96
cSH	1700	1700	1306	1700	380	825
Volume to Capacity	0.12	0.10	0.11	0.29	1.03	0.12
Queue Length 95th (ft)	0	0	10	0	320	10
Control Delay (s)	0.0	0.0	8.1	0.0	87.2	9.9
Lane LOS			A		F	A
Approach Delay (s)	0.0		1.9		72.0	
Approach LOS					F	

Intersection Summary			
Average Delay	24.2		
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2021 - Total Culdesac PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	91	1.0	0.231	5.4	LOS A	1.1	28.6	0.39	0.26	32.2
18	R2	162	4.0	0.231	5.4	LOS A	1.1	28.6	0.39	0.26	30.5
Approach		253	2.9	0.231	5.4	LOS A	1.1	28.6	0.39	0.26	31.1
East: Oregon St											
1	L2	421	1.0	0.687	12.4	LOS B	7.4	186.4	0.55	0.30	29.3
6	T1	434	1.0	0.687	12.4	LOS B	7.4	186.4	0.55	0.30	28.9
Approach		855	1.0	0.687	12.4	LOS B	7.4	186.4	0.55	0.30	29.1
West: Oregon St.											
2	T1	196	2.0	0.323	7.7	LOS A	1.6	39.8	0.59	0.53	31.9
12	R2	87	2.0	0.323	7.7	LOS A	1.6	39.8	0.59	0.53	30.8
Approach		283	2.0	0.323	7.7	LOS A	1.6	39.8	0.59	0.53	31.6
All Vehicles		1391	1.6	0.687	10.2	LOS B	7.4	186.4	0.53	0.34	29.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	225	3	2	327	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	225	3	2	327	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	234	3	2	341	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	628	606	365	595	628	238	387			238		
vC1, stage 1 conf vol	368	368		236	236							
vC2, stage 2 conf vol	260	238		358	391							
vCu, unblocked vol	528	503	234	490	527	238	258			238		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	577	564	715	598	553	791	1155			1310		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	237	2	387
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	577	656	598	658	1700	1700	1310	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.14	0.00	0.23
Queue Length 95th (ft)	1	2	3	4	0	0	0	0
Control Delay (s)	11.4	10.6	11.3	10.7	0.0	0.0	7.8	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	10.9		11.0		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix G Year 2021 Total Traffic Conditions - Mitigation Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	417	326	102	113	135	89
Future Volume (vph)	417	326	102	113	135	89
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1565	1583	1667	1656	1282
Flt Permitted	1.00	1.00	0.31	1.00	0.95	1.00
Satd. Flow (perm)	1863	1565	521	1667	1656	1282
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	474	370	116	128	153	101
RTOR Reduction (vph)	0	0	0	0	0	84
Lane Group Flow (vph)	474	370	116	128	153	17
Confl. Bikes (#/hr)		3				
Heavy Vehicles (%)	2%	1%	14%	14%	9%	26%
Turn Type	NA	Free	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		Free	6			8
Actuated Green, G (s)	20.4	45.8	29.0	29.0	7.8	7.8
Effective Green, g (s)	20.4	45.8	29.0	29.0	7.8	7.8
Actuated g/C Ratio	0.45	1.00	0.63	0.63	0.17	0.17
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	829	1565	424	1055	282	218
v/s Ratio Prot	c0.25		0.02	0.08	c0.09	
v/s Ratio Perm		c0.24	0.15			0.01
v/c Ratio	0.57	0.24	0.27	0.12	0.54	0.08
Uniform Delay, d1	9.4	0.0	4.4	3.3	17.4	16.0
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.0	0.4	0.4	0.1	2.1	0.2
Delay (s)	10.4	0.4	4.7	3.4	19.5	16.1
Level of Service	B	A	A	A	B	B
Approach Delay (s)	6.0			4.0	18.2	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	7.9	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	45.8	Sum of lost time (s)	13.5
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	191	149	137	452	360	88
Future Volume (vph)	191	149	137	452	360	88
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1827	1568	1612	1881	1787	1538
Flt Permitted	1.00	1.00	0.46	1.00	0.95	1.00
Satd. Flow (perm)	1827	1568	774	1881	1787	1538
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	208	162	149	491	391	96
RTOR Reduction (vph)	0	0	0	0	0	65
Lane Group Flow (vph)	208	162	149	491	391	31
Heavy Vehicles (%)	4%	3%	12%	1%	1%	5%
Turn Type	NA	Free	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		Free	6			8
Actuated Green, G (s)	12.0	43.2	20.3	20.3	13.9	13.9
Effective Green, g (s)	12.0	43.2	20.3	20.3	13.9	13.9
Actuated g/C Ratio	0.28	1.00	0.47	0.47	0.32	0.32
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	507	1568	437	883	574	494
v/s Ratio Prot	0.11		0.03	c0.26	c0.22	
v/s Ratio Perm		0.10	0.13			0.02
v/c Ratio	0.41	0.10	0.34	0.56	0.68	0.06
Uniform Delay, d1	12.7	0.0	7.0	8.2	12.7	10.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.5	0.1	0.5	0.8	3.3	0.1
Delay (s)	13.3	0.1	7.4	9.0	16.1	10.2
Level of Service	B	A	A	A	B	B
Approach Delay (s)	7.5			8.6	14.9	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	10.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	43.2	Sum of lost time (s)	13.5
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: 9 [SW Oregon St & Tonquin Rd]

Year 2021 - Total Traffic AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Tonquin Rd											
3a	L1	153	3.0	0.371	10.2	LOS B	1.6	44.1	0.65	0.66	31.2
18	R2	101	26.0	0.371	10.2	LOS B	1.6	44.1	0.65	0.66	29.0
Approach		255	12.1	0.371	10.2	LOS B	1.6	44.1	0.65	0.66	30.3
East: Oregon St											
1	L2	1	14.0	0.247	6.1	LOS A	1.1	30.0	0.44	0.32	34.6
16a	R1	244	8.0	0.247	6.1	LOS A	1.1	30.0	0.44	0.32	35.7
Approach		245	8.0	0.247	6.1	LOS A	1.1	30.0	0.44	0.32	35.7
West: Oregon St. EB											
5b	L3	88	3.0	0.593	0.1	LOS A	0.0	0.0	0.00	0.00	36.9
2	T1	474	2.0	0.593	0.1	LOS A	0.0	0.0	0.00	0.00	35.5
12	R2	486	1.0	0.593	0.1	LOS A	0.0	0.0	0.00	0.00	34.2
Approach		1048	1.6	0.593	0.1	LOS A	0.0	0.0	0.00	0.00	35.0
All Vehicles		1548	4.4	0.593	2.7	LOS A	1.6	44.1	0.18	0.16	34.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 9 [SW Oregon St & Tonquin Rd]

Year 2021 - Total Traffic PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Tonquin Rd											
3a	L1	391	1.0	0.493	9.6	LOS A	3.1	78.3	0.62	0.53	31.4
18	R2	96	5.0	0.493	9.6	LOS A	3.1	78.3	0.62	0.53	29.3
Approach		487	1.8	0.493	9.6	LOS A	3.1	78.3	0.62	0.53	31.0
East: Oregon St											
1	L2	1	12.0	0.814	25.3	LOS D	9.3	242.7	0.93	1.15	26.8
16a	R1	640	6.0	0.814	25.3	LOS D	9.3	242.7	0.93	1.15	27.4
Approach		641	6.0	0.814	25.3	LOS D	9.3	242.7	0.93	1.15	27.4
West: Oregon St. EB											
5b	L3	93	4.0	0.358	0.1	LOS A	0.0	0.0	0.00	0.00	36.8
2	T1	208	3.0	0.358	0.1	LOS A	0.0	0.0	0.00	0.00	35.5
12	R2	311	3.0	0.358	0.1	LOS A	0.0	0.0	0.00	0.00	34.2
Approach		612	3.2	0.358	0.1	LOS A	0.0	0.0	0.00	0.00	35.0
All Vehicles		1740	3.8	0.814	12.0	LOS B	9.3	242.7	0.52	0.57	30.7

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Appendix H Year 2025 Background Conditions Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	908	203	75	540	38	118	125	130	18	61	8
Future Volume (vph)	12	908	203	75	540	38	118	125	130	18	61	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3333		1703	2952		1752	1776	1568	1504	1758	
Flt Permitted	0.40	1.00		0.11	1.00		0.53	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	764	3333		206	2952		973	1776	1568	1055	1758	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	14	1032	231	85	614	43	134	142	148	20	69	9
RTOR Reduction (vph)	0	19	0	0	4	0	0	0	118	0	3	0
Lane Group Flow (vph)	14	1244	0	85	653	0	134	142	30	20	75	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	43.1	42.4		50.3	46.0		22.6	16.7	16.7	13.7	11.8	
Effective Green, g (s)	43.1	42.4		50.3	46.0		22.6	16.7	16.7	13.7	11.8	
Actuated g/C Ratio	0.52	0.51		0.60	0.55		0.27	0.20	0.20	0.16	0.14	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5		1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	404	1696		201	1630		327	356	314	183	249	
v/s Ratio Prot	0.00	c0.37		c0.02	0.22		c0.03	0.08		0.00	0.04	
v/s Ratio Perm	0.02			0.23			c0.08		0.02	0.02		
v/c Ratio	0.03	0.73		0.42	0.40		0.41	0.40	0.09	0.11	0.30	
Uniform Delay, d1	9.8	16.0		10.6	10.7		24.1	28.9	27.1	29.5	32.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	1.7		0.5	0.2		0.3	3.1	0.6	0.1	0.2	
Delay (s)	9.8	17.8		11.1	10.9		24.4	32.1	27.7	29.6	32.3	
Level of Service	A	B		B	B		C	C	C	C	C	
Approach Delay (s)		17.7			10.9			28.1			31.7	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	18.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	83.3	Sum of lost time (s)	18.0
Intersection Capacity Utilization	62.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	855	128	106	645	6	92	3	349	4	0	0
Future Volume (vph)	8	855	128	106	645	6	92	3	349	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	3299	1448	1556	3126			1530	1530	1443		
Flt Permitted	0.95	1.00	1.00	0.21	1.00			0.90	1.00	1.00		
Satd. Flow (perm)	1805	3299	1448	349	3126			1437	1530	1519		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	900	135	112	679	6	97	3	367	4	0	0
RTOR Reduction (vph)	0	0	75	0	1	0	0	0	88	0	0	0
Lane Group Flow (vph)	8	900	60	112	684	0	0	100	279	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	18.6	18.6	26.9	22.3			4.4	10.5	3.6		
Effective Green, g (s)	0.6	18.6	18.6	26.9	22.3			4.4	10.5	3.6		
Actuated g/C Ratio	0.01	0.44	0.44	0.64	0.53			0.11	0.25	0.09		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	25	1467	644	400	1667			151	384	130		
v/s Ratio Prot	0.00	c0.27		0.04	0.22				c0.11			
v/s Ratio Perm			0.04	0.14				0.07	0.08	0.00		
v/c Ratio	0.32	0.61	0.09	0.28	0.41			0.66	0.73	0.03		
Uniform Delay, d1	20.4	8.9	6.7	3.6	5.8			18.0	14.3	17.5		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	2.7	0.8	0.1	0.1	0.2			8.2	5.7	0.0		
Delay (s)	23.1	9.7	6.8	3.7	6.0			26.1	20.1	17.5		
Level of Service	C	A	A	A	A			C	C	B		
Approach Delay (s)		9.4			5.7			21.4			17.5	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	10.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	41.8	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
! Phase conflict between lane groups.			
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1230	770	10	6	3
Future Volume (Veh/h)	10	1230	770	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1309	819	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.95				0.84	0.95
vC, conflicting volume	830				1501	415
vC1, stage 1 conf vol					824	
vC2, stage 2 conf vol					676	
vCu, unblocked vol	720				947	284
tC, single (s)	4.3				8.1	7.6
tC, 2 stage (s)					7.1	
tF (s)	2.3				4.2	3.6
p0 queue free %	99				98	99
cM capacity (veh/h)	787				273	598

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1
Volume Total	11	654	654	546	284	9
Volume Left	11	0	0	0	0	6
Volume Right	0	0	0	0	11	3
cSH	787	1700	1700	1700	1700	333
Volume to Capacity	0.01	0.39	0.39	0.32	0.17	0.03
Queue Length 95th (ft)	1	0	0	0	0	2
Control Delay (s)	9.6	0.0	0.0	0.0	0.0	16.1
Lane LOS	A					C
Approach Delay (s)	0.1			0.0		16.1
Approach LOS						C

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	44.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	1126	735	75	47	30
Future Volume (vph)	110	1126	735	75	47	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1703	3329	3088		1289	1242
Flt Permitted	0.31	1.00	1.00		0.95	1.00
Satd. Flow (perm)	557	3329	3088		1289	1242
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1173	766	78	49	31
RTOR Reduction (vph)	0	0	3	0	0	29
Lane Group Flow (vph)	115	1173	841	0	49	2
Heavy Vehicles (%)	6%	8%	15%	13%	40%	30%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2				4	4
Actuated Green, G (s)	129.6	129.6	118.6		9.9	9.9
Effective Green, g (s)	129.6	129.6	118.6		9.9	9.9
Actuated g/C Ratio	0.86	0.86	0.79		0.07	0.07
Clearance Time (s)	4.0	5.5	5.5		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	534	2876	2441		85	81
v/s Ratio Prot	0.01	c0.35	0.27			
v/s Ratio Perm	0.18				c0.04	0.00
v/c Ratio	0.22	0.41	0.34		0.58	0.03
Uniform Delay, d1	1.8	2.1	4.5		68.0	65.5
Progression Factor	1.00	1.00	0.80		1.00	1.00
Incremental Delay, d2	0.2	0.4	0.4		9.1	0.1
Delay (s)	2.0	2.6	4.0		77.1	65.7
Level of Service	A	A	A		E	E
Approach Delay (s)		2.5	4.0		72.7	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	1051	47	26	619	200	133	229	77	182	172	58
Future Volume (vph)	75	1051	47	26	619	200	133	229	77	182	172	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	3299	1252	2334	3127	1381	3155	3013		1612	3007	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.27	1.00	
Satd. Flow (perm)	3242	3299	1252	2334	3127	1381	3155	3013		454	3007	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	81	1130	51	28	666	215	143	246	83	196	185	62
RTOR Reduction (vph)	0	0	15	0	0	59	0	26	0	0	24	0
Lane Group Flow (vph)	81	1130	36	28	666	156	143	303	0	196	223	0
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	7.7	89.7	104.7	4.0	86.0	108.9	9.5	19.9		41.3	27.8	
Effective Green, g (s)	7.7	89.7	104.7	4.0	86.0	108.9	9.5	19.9		41.3	27.8	
Actuated g/C Ratio	0.05	0.60	0.70	0.03	0.57	0.73	0.06	0.13		0.28	0.19	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	166	1972	873	62	1792	1002	199	399		259	557	
v/s Ratio Prot	c0.02	c0.34	0.03	0.01	0.21	0.11	0.05	0.10		c0.09	0.07	
v/s Ratio Perm										c0.12		
v/c Ratio	0.49	0.57	0.04	0.45	0.37	0.16	0.72	0.76		0.76	0.40	
Uniform Delay, d1	69.2	18.4	7.0	71.9	17.4	6.3	68.9	62.7		45.5	53.8	
Progression Factor	0.95	1.03	2.74	1.35	0.49	1.55	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.1	0.0	1.8	0.6	0.0	9.9	7.2		10.6	0.2	
Delay (s)	66.6	20.2	19.3	99.1	9.1	9.9	78.8	69.9		56.1	53.9	
Level of Service	E	C	B	F	A	A	E	E		E	D	
Approach Delay (s)		23.1			12.0			72.6			54.9	
Approach LOS		C			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	32.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1258	39	11	844	17	15
Future Volume (Veh/h)	1258	39	11	844	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1338	41	12	898	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1379		1832	690
vC1, stage 1 conf vol					1358	
vC2, stage 2 conf vol					473	
vCu, unblocked vol			1379		1832	690
tC, single (s)			5.7		8.8	8.8
tC, 2 stage (s)					7.8	
tF (s)			3.0		4.5	4.2
p0 queue free %			95		78	93
cM capacity (veh/h)			223		84	232

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	892	487	12	449	449	18	16
Volume Left	0	0	12	0	0	18	0
Volume Right	0	41	0	0	0	0	16
cSH	1700	1700	223	1700	1700	84	232
Volume to Capacity	0.52	0.29	0.05	0.26	0.26	0.22	0.07
Queue Length 95th (ft)	0	0	4	0	0	19	6
Control Delay (s)	0.0	0.0	22.0	0.0	0.0	59.5	21.7
Lane LOS			C			F	C
Approach Delay (s)	0.0		0.3			41.7	
Approach LOS						E	

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	46.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1136	129	197	811	10	40	0	84	3	1	2
Future Volume (vph)	5	1136	129	197	811	10	40	0	84	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3312	1226	2918	3185			1251	1145	1805	1017	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	3312	1226	2918	3185			996	1145	1385	1017	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	1222	139	212	872	11	43	0	90	3	1	2
RTOR Reduction (vph)	0	0	23	0	0	0	0	0	84	0	2	0
Lane Group Flow (vph)	5	1222	116	212	883	0	0	43	6	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Effective Green, g (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.01	0.73	0.73	0.11	0.83			0.07	0.07	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	16	2417	894	309	2632			70	80	97	71	
v/s Ratio Prot	0.00	c0.37		c0.07	0.28						0.00	
v/s Ratio Perm			0.09					c0.04	0.01	0.00		
v/c Ratio	0.31	0.51	0.13	0.69	0.34			0.61	0.08	0.03	0.02	
Uniform Delay, d1	73.8	8.7	6.0	64.6	3.1			67.7	65.1	64.9	64.8	
Progression Factor	0.82	0.92	1.24	0.81	2.62			1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.1	0.6	0.2	4.0	0.3			10.7	0.2	0.0	0.0	
Delay (s)	69.5	8.6	7.7	56.7	8.5			78.4	65.3	65.0	64.9	
Level of Service	E	A	A	E	A			E	E	E	E	
Approach Delay (s)		8.7			17.8			69.5			64.9	
Approach LOS		A			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	854	291	20	739	104	266	51	17	26	10	15
Future Volume (vph)	73	854	291	20	739	104	266	51	17	26	10	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.96		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	3167	1499	1543	3056		1656	1709		1043	1153	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	3167	1499	1543	3056		1656	1709		1043	1153	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	81	949	323	22	821	116	296	57	19	29	11	17
RTOR Reduction (vph)	0	0	140	0	7	0	0	8	0	0	16	0
Lane Group Flow (vph)	81	949	183	22	930	0	296	68	0	29	12	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	12.3	84.8	84.8	4.4	76.9		37.8	36.1		6.2	4.5	
Effective Green, g (s)	12.3	84.8	84.8	4.4	76.9		37.8	36.1		6.2	4.5	
Actuated g/C Ratio	0.08	0.57	0.57	0.03	0.51		0.25	0.24		0.04	0.03	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0		1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	140	1790	847	45	1566		417	411		43	34	
v/s Ratio Prot	c0.05	0.30		0.01	c0.30		c0.18	0.04		0.03	c0.01	
v/s Ratio Perm			0.12									
v/c Ratio	0.58	0.53	0.22	0.49	0.59		0.71	0.16		0.67	0.34	
Uniform Delay, d1	66.4	20.2	16.1	71.7	25.6		51.1	45.0		70.9	71.3	
Progression Factor	1.15	1.37	4.11	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.2	1.0	0.5	3.0	1.7		4.5	0.1		28.1	2.2	
Delay (s)	79.2	28.8	66.9	74.7	27.3		55.6	45.1		99.0	73.4	
Level of Service	E	C	E	E	C		E	D		F	E	
Approach Delay (s)		40.9			28.4			53.5			86.4	
Approach LOS		D			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	39.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	61.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	421	346	106	116	142	85
Future Volume (Veh/h)	421	346	106	116	142	85
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	478	393	120	132	161	97
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			478		850	478
vC1, stage 1 conf vol					478	
vC2, stage 2 conf vol					372	
vCu, unblocked vol			478		850	478
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			88		67	82
cM capacity (veh/h)			1025		487	541

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	478	393	120	132	161	97
Volume Left	0	0	120	0	161	0
Volume Right	0	393	0	0	0	97
cSH	1700	1700	1025	1700	487	541
Volume to Capacity	0.28	0.23	0.12	0.08	0.33	0.18
Queue Length 95th (ft)	0	0	10	0	36	16
Control Delay (s)	0.0	0.0	9.0	0.0	16.0	13.1
Lane LOS			A		C	B
Approach Delay (s)	0.0		4.3		14.9	
Approach LOS					B	

Intersection Summary			
Average Delay	3.6		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2025 - Background AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	95	1.0	0.646	14.7	LOS B	5.5	137.7	0.80	0.89	28.9
18	R2	464	1.0	0.646	14.7	LOS B	5.5	137.7	0.80	0.89	27.5
Approach		559	1.0	0.646	14.7	LOS B	5.5	137.7	0.80	0.89	27.7
East: Oregon St											
1	L2	101	14.0	0.267	5.6	LOS A	1.3	34.8	0.28	0.14	32.4
6	T1	202	8.0	0.267	5.6	LOS A	1.3	34.8	0.28	0.14	32.0
Approach		304	10.0	0.267	5.6	LOS A	1.3	34.8	0.28	0.14	32.1
West: Oregon St.											
2	T1	440	2.0	0.423	7.3	LOS A	2.7	68.7	0.38	0.22	32.2
12	R2	68	2.0	0.423	7.3	LOS A	2.7	68.7	0.38	0.22	31.1
Approach		508	2.0	0.423	7.3	LOS A	2.7	68.7	0.38	0.22	32.1
All Vehicles		1371	3.4	0.646	9.9	LOS A	5.5	137.7	0.53	0.48	30.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	414	24	16	217	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	414	24	16	217	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	445	26	17	233	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	722	744	240	752	738	458	246			471		
vC1, stage 1 conf vol	274	274		458	458							
vC2, stage 2 conf vol	449	471		294	280							
vCu, unblocked vol	659	683	137	692	676	458	144			471		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	495	475	812	489	489	577	1260			1026		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	471	17	246
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	495	657	489	515	1700	1700	1026	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.28	0.02	0.14
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.7	10.8	12.4	12.1	0.0	0.0	8.6	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.6		12.2		0.0		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	716	269	208	955	15	219	119	114	32	202	14
Future Volume (vph)	14	716	269	208	955	15	219	119	114	32	202	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3296		1770	3483		1787	1900	1568	1752	1853	
Flt Permitted	0.23	1.00		0.13	1.00		0.27	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	441	3296		239	3483		502	1900	1568	1246	1853	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	762	286	221	1016	16	233	127	121	34	215	15
RTOR Reduction (vph)	0	40	0	0	1	0	0	0	89	0	2	0
Lane Group Flow (vph)	15	1008	0	221	1031	0	233	127	32	34	228	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	40.1	39.3		52.5	47.7		32.2	24.9	24.9	18.9	15.6	
Effective Green, g (s)	40.1	39.3		52.5	47.7		32.2	24.9	24.9	18.9	15.6	
Actuated g/C Ratio	0.42	0.41		0.55	0.50		0.34	0.26	0.26	0.20	0.16	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5		1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	198	1367		281	1754		341	499	412	266	305	
v/s Ratio Prot	0.00	0.31		c0.08	0.30		c0.09	0.07		0.00	0.12	
v/s Ratio Perm	0.03			c0.36			c0.14		0.02	0.02		
v/c Ratio	0.08	0.74		0.79	0.59		0.68	0.25	0.08	0.13	0.75	
Uniform Delay, d1	16.1	23.3		15.7	16.6		24.5	27.6	26.3	30.9	37.7	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	2.2		12.5	0.5		4.5	1.2	0.3	0.1	8.5	
Delay (s)	16.2	25.5		28.2	17.1		29.0	28.7	26.6	31.0	46.2	
Level of Service	B	C		C	B		C	C	C	C	D	
Approach Delay (s)		25.4			19.1			28.3			44.2	
Approach LOS		C			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	24.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	94.7	Sum of lost time (s)	18.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	831	126	380	1043	8	133	1	168	11	10	8
Future Volume (vph)	7	831	126	380	1043	8	133	1	168	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1804	3491	1464	1770	3487			1740	1568	1805	1762	
Flt Permitted	0.95	1.00	1.00	0.18	1.00			0.43	1.00	0.91	1.00	
Satd. Flow (perm)	1804	3491	1464	343	3487			783	1568	1727	1762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	894	135	409	1122	9	143	1	181	12	11	9
RTOR Reduction (vph)	0	0	77	0	0	0	0	0	64	0	8	0
Lane Group Flow (vph)	8	894	58	409	1131	0	0	144	117	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	23.6	23.6	34.8	30.1			9.3	22.4	4.4	4.4	
Effective Green, g (s)	0.7	23.6	23.6	34.8	30.1			9.3	22.4	4.4	4.4	
Actuated g/C Ratio	0.01	0.43	0.43	0.64	0.55			0.17	0.41	0.08	0.08	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	23	1508	632	560	1922			133	643	139	141	
v/s Ratio Prot	0.00	0.26		c0.17	0.32				0.04		0.01	
v/s Ratio Perm			0.04	c0.29				c0.18	0.03	0.01		
v/c Ratio	0.35	0.59	0.09	0.73	0.59			1.08	0.18	0.09	0.08	
Uniform Delay, d1	26.7	11.8	9.2	8.6	8.1			22.6	10.3	23.2	23.2	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.3	0.7	0.1	4.2	0.5			101.9	0.0	0.1	0.1	
Delay (s)	30.0	12.5	9.2	12.8	8.6			124.6	10.3	23.3	23.3	
Level of Service	C	B	A	B	A			F	B	C	C	
Approach Delay (s)		12.2			9.7			60.9			23.3	
Approach LOS		B			A			E			C	

Intersection Summary			
HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	54.6	Sum of lost time (s)	14.5
Intersection Capacity Utilization	70.2%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	1030	1434	3	12	18
Future Volume (Veh/h)	3	1030	1434	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	1108	1542	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.69				0.78	0.69
vC, conflicting volume	1547				2106	774
vC1, stage 1 conf vol					1546	
vC2, stage 2 conf vol					560	
vCu, unblocked vol	879				746	0
tC, single (s)	4.8				7.0	7.0
tC, 2 stage (s)					6.0	
tF (s)	2.5				3.6	3.4
p0 queue free %	99				94	97
cM capacity (veh/h)	408				236	733

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	3	554	554	1028	517	13	19
Volume Left	3	0	0	0	0	13	0
Volume Right	0	0	0	0	3	0	19
cSH	408	1700	1700	1700	1700	236	733
Volume to Capacity	0.01	0.33	0.33	0.60	0.30	0.06	0.03
Queue Length 95th (ft)	1	0	0	0	0	4	2
Control Delay (s)	13.9	0.0	0.0	0.0	0.0	21.2	10.0
Lane LOS	B					C	B
Approach Delay (s)	0.0			0.0		14.6	
Approach LOS						B	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	49.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	1018	1313	14	63	124
Future Volume (vph)	37	1018	1313	14	63	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1752	3457	3481		1703	1583
Flt Permitted	0.10	1.00	1.00		0.95	1.00
Satd. Flow (perm)	192	3457	3481		1703	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	1107	1427	15	68	135
RTOR Reduction (vph)	0	0	0	0	0	116
Lane Group Flow (vph)	40	1107	1442	0	68	19
Confl. Peds. (#/hr)	2			2		
Confl. Bikes (#/hr)				4		
Heavy Vehicles (%)	3%	4%	3%	14%	6%	2%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2				4	4
Actuated Green, G (s)	48.5	48.5	40.2		9.5	9.5
Effective Green, g (s)	48.5	48.5	40.2		9.5	9.5
Actuated g/C Ratio	0.71	0.71	0.59		0.14	0.14
Clearance Time (s)	4.0	5.5	5.5		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	233	2447	2042		236	219
v/s Ratio Prot	0.01	c0.32	c0.41			
v/s Ratio Perm	0.11				c0.04	0.01
v/c Ratio	0.17	0.45	0.71		0.29	0.09
Uniform Delay, d1	6.0	4.3	10.0		26.5	25.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	0.1	1.1		0.7	0.2
Delay (s)	6.4	4.4	11.1		27.1	25.9
Level of Service	A	A	B		C	C
Approach Delay (s)		4.5	11.1		26.3	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	68.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	915	113	61	982	127	124	137	12	207	218	221
Future Volume (vph)	53	915	113	61	982	127	124	137	12	207	218	221
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3457	1456	3502	3491	1571	3400	3497		1735	3240	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.49	1.00	
Satd. Flow (perm)	3502	3457	1456	3502	3491	1571	3400	3497		893	3240	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	55	953	118	64	1023	132	129	143	12	216	227	230
RTOR Reduction (vph)	0	0	48	0	0	43	0	4	0	0	94	0
Lane Group Flow (vph)	55	953	70	64	1023	89	129	152	0	216	363	0
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	4.6	41.8	54.7	4.9	42.1	62.3	7.4	11.9		30.6	19.2	
Effective Green, g (s)	4.6	41.8	54.7	4.9	42.1	62.3	7.4	11.9		30.6	19.2	
Actuated g/C Ratio	0.05	0.45	0.59	0.05	0.46	0.67	0.08	0.13		0.33	0.21	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	174	1565	862	185	1592	1060	272	450		430	673	
v/s Ratio Prot	0.02	0.28	0.05	c0.02	c0.29	0.06	0.04	0.04		c0.08	c0.11	
v/s Ratio Perm										0.09		
v/c Ratio	0.32	0.61	0.08	0.35	0.64	0.08	0.47	0.34		0.50	0.54	
Uniform Delay, d1	42.3	19.1	8.0	42.2	19.3	5.2	40.6	36.6		23.7	32.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.9	0.1	0.4	1.1	0.1	0.5	0.2		0.3	0.4	
Delay (s)	42.7	20.0	8.1	42.6	20.4	5.2	41.1	36.8		24.0	33.0	
Level of Service	D	B	A	D	C	A	D	D		C	C	
Approach Delay (s)		19.8			19.9			38.7			30.1	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	92.3	Sum of lost time (s)	19.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1111	22	3	1118	27	17
Future Volume (Veh/h)	1111	22	3	1118	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1182	23	3	1189	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1205		1794	602
vC1, stage 1 conf vol					1194	
vC2, stage 2 conf vol					600	
vCu, unblocked vol			1205		1794	602
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			99		87	96
cM capacity (veh/h)			586		229	447

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	788	417	3	594	594	29	18
Volume Left	0	0	3	0	0	29	0
Volume Right	0	23	0	0	0	0	18
cSH	1700	1700	586	1700	1700	229	447
Volume to Capacity	0.46	0.25	0.01	0.35	0.35	0.13	0.04
Queue Length 95th (ft)	0	0	0	0	0	11	3
Control Delay (s)	0.0	0.0	11.2	0.0	0.0	23.0	13.4
Lane LOS			B			C	B
Approach Delay (s)	0.0		0.0			19.3	
Approach LOS						C	

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	41.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	1054	60	52	991	16	111	0	229	16	1	15
Future Volume (vph)	12	1054	60	52	991	16	111	0	229	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3471	1533	2894	3497			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.54	1.00	
Satd. Flow (perm)	1805	3471	1533	2894	3497			1390	1568	1030	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1109	63	55	1043	17	117	0	241	17	1	16
RTOR Reduction (vph)	0	0	15	0	1	0	0	0	213	0	14	0
Lane Group Flow (vph)	13	1109	48	55	1059	0	0	117	28	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Effective Green, g (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Actuated g/C Ratio	0.02	0.72	0.72	0.05	0.74			0.12	0.12	0.12	0.12	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	2504	1106	130	2579			162	182	120	190	
v/s Ratio Prot	0.01	c0.32		c0.02	0.30						0.00	
v/s Ratio Perm			0.03					c0.08	0.02	0.02		
v/c Ratio	0.29	0.44	0.04	0.42	0.41			0.72	0.15	0.14	0.02	
Uniform Delay, d1	57.5	6.8	4.8	55.8	5.9			51.1	47.7	47.6	46.9	
Progression Factor	1.00	1.00	1.00	0.93	0.73			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	0.6	0.1	0.7	0.4			12.6	0.1	0.2	0.0	
Delay (s)	61.0	7.4	4.9	52.8	4.8			63.7	47.8	47.8	46.9	
Level of Service	E	A	A	D	A			E	D	D	D	
Approach Delay (s)		7.9			7.1			53.0			47.4	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	59.6%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	893	366	5	776	38	205	20	15	103	43	64
Future Volume (vph)	30	893	366	5	776	38	205	20	15	103	43	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3438	1550	1805	3403		1787	1655		1719	1729	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3438	1550	1805	3403		1787	1655		1719	1729	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	960	394	5	834	41	220	22	16	111	46	69
RTOR Reduction (vph)	0	0	172	0	2	0	0	15	0	0	49	0
Lane Group Flow (vph)	32	960	222	5	873	0	220	23	0	111	66	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	4.4	67.5	67.5	1.1	64.2		22.1	11.2		21.7	10.8	
Effective Green, g (s)	4.4	67.5	67.5	1.1	64.2		22.1	11.2		21.7	10.8	
Actuated g/C Ratio	0.04	0.56	0.56	0.01	0.54		0.18	0.09		0.18	0.09	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0		1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	66	1933	871	16	1820		329	154		310	155	
v/s Ratio Prot	c0.02	c0.28		0.00	0.26		c0.12	0.01		0.06	c0.04	
v/s Ratio Perm			0.14									
v/c Ratio	0.48	0.50	0.25	0.31	0.48		0.67	0.15		0.36	0.42	
Uniform Delay, d1	56.7	15.9	13.4	59.1	17.4		45.5	50.0		43.0	51.7	
Progression Factor	1.32	0.61	0.20	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.9	0.8	0.6	4.0	0.9		4.0	0.2		0.3	0.7	
Delay (s)	76.5	10.5	3.3	63.1	18.4		49.5	50.2		43.3	52.3	
Level of Service	E	B	A	E	B		D	D		D	D	
Approach Delay (s)		10.0			18.6			49.6			47.9	
Approach LOS		A			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	51.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	199	157	135	460	381	91
Future Volume (Veh/h)	199	157	135	460	381	91
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	216	171	147	500	414	99
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			216		1010	216
vC1, stage 1 conf vol					216	
vC2, stage 2 conf vol					794	
vCu, unblocked vol			216		1010	216
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			89		0	88
cM capacity (veh/h)			1297		378	816

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	216	171	147	500	414	99
Volume Left	0	0	147	0	414	0
Volume Right	0	171	0	0	0	99
cSH	1700	1700	1297	1700	378	816
Volume to Capacity	0.13	0.10	0.11	0.29	1.09	0.12
Queue Length 95th (ft)	0	0	10	0	372	10
Control Delay (s)	0.0	0.0	8.1	0.0	107.5	10.0
Lane LOS			A		F	B
Approach Delay (s)	0.0		1.8		88.7	
Approach LOS					F	

Intersection Summary			
Average Delay	30.2		
Intersection Capacity Utilization	52.0%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2025 - Background PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	97	1.0	0.247	5.6	LOS A	1.2	30.9	0.41	0.28	32.1
18	R2	171	4.0	0.247	5.6	LOS A	1.2	30.9	0.41	0.28	30.4
Approach		267	2.9	0.247	5.6	LOS A	1.2	30.9	0.41	0.28	31.0
East: Oregon St											
1	L2	437	1.0	0.716	13.4	LOS B	8.2	206.1	0.60	0.34	29.0
6	T1	448	1.0	0.716	13.4	LOS B	8.2	206.1	0.60	0.34	28.5
Approach		885	1.0	0.716	13.4	LOS B	8.2	206.1	0.60	0.34	28.7
West: Oregon St.											
2	T1	204	2.0	0.344	8.1	LOS A	1.7	42.8	0.60	0.56	31.8
12	R2	93	2.0	0.344	8.1	LOS A	1.7	42.8	0.60	0.56	30.7
Approach		297	2.0	0.344	8.1	LOS A	1.7	42.8	0.60	0.56	31.4
All Vehicles		1449	1.6	0.716	10.9	LOS B	8.2	206.1	0.57	0.37	29.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	246	3	2	346	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	246	3	2	346	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	256	3	2	360	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	670	647	384	636	668	260	406			260		
vC1, stage 1 conf vol	387	387		258	258							
vC2, stage 2 conf vol	282	260		378	410							
vCu, unblocked vol	573	548	254	536	572	260	279			260		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	556	547	696	577	537	769	1135			1286		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	259	2	406
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	556	638	577	639	1700	1700	1286	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.15	0.00	0.24
Queue Length 95th (ft)	2	2	3	4	0	0	0	0
Control Delay (s)	11.6	10.8	11.5	10.9	0.0	0.0	7.8	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.1		11.2		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix I Year 2025 Total Traffic Conditions Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	943	203	79	549	40	118	125	147	27	61	8
Future Volume (vph)	12	943	203	79	549	40	118	125	147	27	61	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3336		1703	2951		1752	1776	1568	1504	1758	
Flt Permitted	0.40	1.00		0.11	1.00		0.45	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	755	3336		203	2951		833	1776	1568	1055	1758	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	14	1072	231	90	624	45	134	142	167	31	69	9
RTOR Reduction (vph)	0	17	0	0	4	0	0	0	139	0	4	0
Lane Group Flow (vph)	14	1286	0	90	665	0	134	142	28	31	74	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	46.4	45.7		53.8	49.4		21.9	14.5	14.5	10.5	7.1	
Effective Green, g (s)	46.4	45.7		53.8	49.4		21.9	14.5	14.5	10.5	7.1	
Actuated g/C Ratio	0.54	0.53		0.63	0.57		0.25	0.17	0.17	0.12	0.08	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5		1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	415	1772		203	1695		327	299	264	146	145	
v/s Ratio Prot	0.00	c0.39		c0.02	0.23		c0.05	c0.08		0.01	0.04	
v/s Ratio Perm	0.02			0.25			0.05		0.02	0.02		
v/c Ratio	0.03	0.73		0.44	0.39		0.41	0.47	0.11	0.21	0.51	
Uniform Delay, d1	9.2	15.4		10.4	10.1		26.0	32.3	30.3	33.8	37.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	1.6		0.6	0.2		0.3	5.0	0.8	0.3	1.3	
Delay (s)	9.2	16.9		11.0	10.2		26.3	37.3	31.0	34.1	39.1	
Level of Service	A	B		B	B		C	D	C	C	D	
Approach Delay (s)		16.8			10.3			31.6			37.7	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	916	128	112	660	6	92	3	376	4	0	0
Future Volume (vph)	8	916	128	112	660	6	92	3	376	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	3299	1448	1556	3126			1530	1530	1443		
Flt Permitted	0.95	1.00	1.00	0.19	1.00			0.88	1.00	1.00		
Satd. Flow (perm)	1805	3299	1448	318	3126			1405	1530	1519		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	964	135	118	695	6	97	3	396	4	0	0
RTOR Reduction (vph)	0	0	72	0	0	0	0	0	74	0	0	0
Lane Group Flow (vph)	8	964	63	118	701	0	0	100	322	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	20.4	20.4	28.7	24.1			4.5	11.1	3.2		
Effective Green, g (s)	0.6	20.4	20.4	28.7	24.1			4.5	11.1	3.2		
Actuated g/C Ratio	0.01	0.47	0.47	0.66	0.55			0.10	0.25	0.07		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	24	1540	675	395	1723			144	388	111		
v/s Ratio Prot	0.00	c0.29		0.05	0.22				c0.13			
v/s Ratio Perm			0.04	0.15				0.07	0.09	0.00		
v/c Ratio	0.33	0.63	0.09	0.30	0.41			0.69	0.83	0.04		
Uniform Delay, d1	21.4	8.8	6.5	3.7	5.7			18.9	15.4	18.8		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	3.0	0.8	0.1	0.2	0.2			11.1	13.4	0.0		
Delay (s)	24.3	9.6	6.6	3.8	5.9			30.0	28.8	18.9		
Level of Service	C	A	A	A	A			C	C	B		
Approach Delay (s)		9.4			5.6			29.1			18.9	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	43.7	Sum of lost time (s)	14.5
Intersection Capacity Utilization	64.1%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1318	791	10	6	3
Future Volume (Veh/h)	10	1318	791	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1402	841	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.95				0.82	0.95
vC, conflicting volume	852				1570	426
vC1, stage 1 conf vol					846	
vC2, stage 2 conf vol					723	
vCu, unblocked vol	732				969	282
tC, single (s)	4.3				8.1	7.6
tC, 2 stage (s)					7.1	
tF (s)	2.3				4.2	3.6
p0 queue free %	99				98	99
cM capacity (veh/h)	774				266	597

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	11	701	701	561	291	6	3
Volume Left	11	0	0	0	0	6	0
Volume Right	0	0	0	0	11	0	3
cSH	774	1700	1700	1700	1700	266	597
Volume to Capacity	0.01	0.41	0.41	0.33	0.17	0.02	0.01
Queue Length 95th (ft)	1	0	0	0	0	2	0
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	18.8	11.1
Lane LOS	A					C	B
Approach Delay (s)	0.1			0.0		16.3	
Approach LOS						C	

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1126	88	80	735	75	21	2	19	47	9	30
Future Volume (vph)	110	1126	88	80	735	75	21	2	19	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.86		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3277		1597	3088		1597	1452		1289	1331	
Flt Permitted	0.32	1.00		0.19	1.00		0.73	1.00		0.74	1.00	
Satd. Flow (perm)	577	3277		321	3088		1229	1452		1008	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1173	92	83	766	78	22	2	20	49	9	31
RTOR Reduction (vph)	0	3	0	0	4	0	0	18	0	0	29	0
Lane Group Flow (vph)	115	1262	0	83	840	0	22	4	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	123.2	116.1		124.5	117.0		11.9	11.9		11.4	11.4	
Effective Green, g (s)	123.2	116.1		124.5	117.0		11.9	11.9		11.4	11.4	
Actuated g/C Ratio	0.82	0.77		0.83	0.78		0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	527	2536		330	2408		97	115		76	101	
v/s Ratio Prot	0.01	c0.39		c0.01	0.27			0.00			0.01	
v/s Ratio Perm	0.17			0.20			0.02			c0.05		
v/c Ratio	0.22	0.50		0.25	0.35		0.23	0.03		0.64	0.11	
Uniform Delay, d1	2.6	6.2		3.3	5.0		64.7	63.7		67.3	64.6	
Progression Factor	1.00	1.00		0.97	0.94		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.7		0.4	0.4		1.2	0.1		17.2	0.5	
Delay (s)	2.9	6.9		3.6	5.1		65.9	63.8		84.6	65.1	
Level of Service	A	A		A	A		E	E		F	E	
Approach Delay (s)		6.6			4.9			64.9			75.8	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	1062	51	26	663	200	151	229	77	182	172	76
Future Volume (vph)	79	1062	51	26	663	200	151	229	77	182	172	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	3299	1252	2334	3127	1381	3155	3013		1612	2961	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.27	1.00	
Satd. Flow (perm)	3242	3299	1252	2334	3127	1381	3155	3013		454	2961	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	85	1142	55	28	713	215	162	246	83	196	185	82
RTOR Reduction (vph)	0	0	16	0	0	59	0	26	0	0	37	0
Lane Group Flow (vph)	85	1142	39	28	713	156	162	303	0	196	230	0
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	7.8	89.9	105.8	4.0	86.1	108.8	10.4	19.9		41.1	26.7	
Effective Green, g (s)	7.8	89.9	105.8	4.0	86.1	108.8	10.4	19.9		41.1	26.7	
Actuated g/C Ratio	0.05	0.60	0.71	0.03	0.57	0.73	0.07	0.13		0.27	0.18	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	168	1977	883	62	1794	1001	218	399		257	527	
v/s Ratio Prot	c0.03	c0.35	0.03	0.01	0.23	0.11	0.05	0.10		c0.09	0.08	
v/s Ratio Perm										c0.12		
v/c Ratio	0.51	0.58	0.04	0.45	0.40	0.16	0.74	0.76		0.76	0.44	
Uniform Delay, d1	69.2	18.4	6.7	71.9	17.6	6.4	68.5	62.7		45.6	54.9	
Progression Factor	1.21	0.75	0.30	1.38	0.35	0.90	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.1	0.0	1.8	0.6	0.0	11.3	7.2		11.4	0.2	
Delay (s)	84.3	15.0	2.1	101.3	6.8	5.8	79.8	69.9		57.0	55.2	
Level of Service	F	B	A	F	A	A	E	E		E	E	
Approach Delay (s)		19.0			9.3			73.2			56.0	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1269	39	11	888	17	15
Future Volume (Veh/h)	1269	39	11	888	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1350	41	12	945	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1391		1867	696
vC1, stage 1 conf vol					1370	
vC2, stage 2 conf vol					496	
vCu, unblocked vol			1391		1867	696
tC, single (s)			5.7		8.8	8.8
tC, 2 stage (s)					7.8	
tF (s)			3.0		4.5	4.2
p0 queue free %			95		78	93
cM capacity (veh/h)			220		82	229

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	900	491	12	472	472	18	16
Volume Left	0	0	12	0	0	18	0
Volume Right	0	41	0	0	0	0	16
cSH	1700	1700	220	1700	1700	82	229
Volume to Capacity	0.53	0.29	0.05	0.28	0.28	0.22	0.07
Queue Length 95th (ft)	0	0	4	0	0	19	6
Control Delay (s)	0.0	0.0	22.3	0.0	0.0	61.1	21.9
Lane LOS			C			F	C
Approach Delay (s)	0.0		0.3			42.6	
Approach LOS						E	

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1147	129	197	855	10	40	0	84	3	1	2
Future Volume (vph)	5	1147	129	197	855	10	40	0	84	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3312	1226	2918	3186			1251	1145	1805	1017	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	3312	1226	2918	3186			996	1145	1385	1017	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	1233	139	212	919	11	43	0	90	3	1	2
RTOR Reduction (vph)	0	0	23	0	0	0	0	0	84	0	2	0
Lane Group Flow (vph)	5	1233	116	212	930	0	0	43	6	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Effective Green, g (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.01	0.73	0.73	0.11	0.83			0.07	0.07	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	16	2417	894	309	2633			70	80	97	71	
v/s Ratio Prot	0.00	c0.37		c0.07	0.29						0.00	
v/s Ratio Perm			0.09					c0.04	0.01	0.00		
v/c Ratio	0.31	0.51	0.13	0.69	0.35			0.61	0.08	0.03	0.02	
Uniform Delay, d1	73.8	8.7	6.0	64.6	3.2			67.7	65.1	64.9	64.8	
Progression Factor	0.84	0.90	1.17	0.79	2.87			1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.1	0.6	0.2	3.9	0.3			10.7	0.2	0.0	0.0	
Delay (s)	70.8	8.5	7.3	55.1	9.4			78.4	65.3	65.0	64.9	
Level of Service	E	A	A	E	A			E	E	E	E	
Approach Delay (s)		8.6			17.9			69.5			64.9	
Approach LOS		A			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	861	295	20	765	104	284	51	17	26	10	15
Future Volume (vph)	73	861	295	20	765	104	284	51	17	26	10	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.96		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	3167	1499	1543	3057		1656	1709		1043	1153	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	3167	1499	1543	3057		1656	1709		1043	1153	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	81	957	328	22	850	116	316	57	19	29	11	17
RTOR Reduction (vph)	0	0	150	0	7	0	0	8	0	0	16	0
Lane Group Flow (vph)	81	957	178	22	959	0	316	68	0	29	12	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	12.3	81.5	81.5	4.4	73.6		41.1	39.4		6.2	4.5	
Effective Green, g (s)	12.3	81.5	81.5	4.4	73.6		41.1	39.4		6.2	4.5	
Actuated g/C Ratio	0.08	0.54	0.54	0.03	0.49		0.27	0.26		0.04	0.03	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0		1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	140	1720	814	45	1499		453	448		43	34	
v/s Ratio Prot	c0.05	0.30		0.01	c0.31		c0.19	0.04		0.03	c0.01	
v/s Ratio Perm			0.12									
v/c Ratio	0.58	0.56	0.22	0.49	0.64		0.70	0.15		0.67	0.34	
Uniform Delay, d1	66.4	22.4	17.8	71.7	28.4		48.9	42.5		70.9	71.3	
Progression Factor	1.11	1.43	4.26	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.2	1.2	0.6	3.0	2.1		3.8	0.1		28.1	2.2	
Delay (s)	77.0	33.2	76.2	74.7	30.5		52.6	42.5		99.0	73.4	
Level of Service	E	C	E	E	C		D	D		F	E	
Approach Delay (s)		46.1			31.4			50.7			86.4	
Approach LOS		D			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	42.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	439	346	108	120	142	94
Future Volume (Veh/h)	439	346	108	120	142	94
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	499	393	123	136	161	107
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			499		881	499
vC1, stage 1 conf vol					499	
vC2, stage 2 conf vol					382	
vCu, unblocked vol			499		881	499
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			88		66	80
cM capacity (veh/h)			1006		475	526

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	499	393	123	136	161	107
Volume Left	0	0	123	0	161	0
Volume Right	0	393	0	0	0	107
cSH	1700	1700	1006	1700	475	526
Volume to Capacity	0.29	0.23	0.12	0.08	0.34	0.20
Queue Length 95th (ft)	0	0	10	0	37	19
Control Delay (s)	0.0	0.0	9.1	0.0	16.4	13.6
Lane LOS			A		C	B
Approach Delay (s)	0.0		4.3		15.3	
Approach LOS					C	

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2025 - Total Culdesac AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	95	1.0	0.666	15.5	LOS C	5.8	146.8	0.82	0.93	28.6
18	R2	474	1.0	0.666	15.5	LOS C	5.8	146.8	0.82	0.93	27.2
Approach		569	1.0	0.666	15.5	LOS C	5.8	146.8	0.82	0.93	27.4
East: Oregon St											
1	L2	104	14.0	0.271	5.7	LOS A	1.3	35.5	0.28	0.14	32.4
6	T1	205	8.0	0.271	5.7	LOS A	1.3	35.5	0.28	0.14	32.0
Approach		308	10.0	0.271	5.7	LOS A	1.3	35.5	0.28	0.14	32.1
West: Oregon St.											
2	T1	451	2.0	0.433	7.4	LOS A	2.8	71.2	0.39	0.22	32.1
12	R2	68	2.0	0.433	7.4	LOS A	2.8	71.2	0.39	0.22	31.0
Approach		519	2.0	0.433	7.4	LOS A	2.8	71.2	0.39	0.22	32.0
All Vehicles		1396	3.4	0.666	10.3	LOS B	5.8	146.8	0.54	0.49	30.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	432	24	16	221	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	432	24	16	221	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	465	26	17	238	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	748	770	244	778	763	478	251			491		
vC1, stage 1 conf vol	278	278		478	478							
vC2, stage 2 conf vol	469	491		300	285							
vCu, unblocked vol	683	707	137	716	700	478	144			491		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	483	465	809	478	479	562	1255			1008		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	491	17	251
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	483	649	478	504	1700	1700	1008	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.29	0.02	0.15
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.9	10.8	12.6	12.2	0.0	0.0	8.6	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.7		12.4		0.0		0.5	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	725	269	225	989	24	219	119	119	34	202	14
Future Volume (vph)	14	725	269	225	989	24	219	119	119	34	202	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3296		1770	3479		1787	1900	1568	1752	1853	
Flt Permitted	0.22	1.00		0.13	1.00		0.26	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	410	3296		236	3479		496	1900	1568	1246	1853	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	771	286	239	1052	26	233	127	127	36	215	15
RTOR Reduction (vph)	0	39	0	0	1	0	0	0	94	0	2	0
Lane Group Flow (vph)	15	1018	0	239	1077	0	233	127	33	36	228	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	40.9	40.1		53.6	48.8		32.3	24.9	24.9	19.1	15.7	
Effective Green, g (s)	40.9	40.1		53.6	48.8		32.3	24.9	24.9	19.1	15.7	
Actuated g/C Ratio	0.43	0.42		0.56	0.51		0.34	0.26	0.26	0.20	0.16	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5		1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	186	1378		283	1770		336	493	407	266	303	
v/s Ratio Prot	0.00	0.31		c0.08	0.31		c0.09	0.07		0.00	0.12	
v/s Ratio Perm	0.03			c0.39			c0.14		0.02	0.02		
v/c Ratio	0.08	0.74		0.84	0.61		0.69	0.26	0.08	0.14	0.75	
Uniform Delay, d1	16.2	23.5		16.5	16.8		25.1	28.2	26.8	31.4	38.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	2.2		19.3	0.6		4.9	1.2	0.4	0.1	9.1	
Delay (s)	16.3	25.7		35.8	17.4		30.0	29.4	27.2	31.5	47.3	
Level of Service	B	C		D	B		C	C	C	C	D	
Approach Delay (s)		25.5			20.7			29.1			45.2	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	847	126	407	1103	8	133	1	174	11	10	8
Future Volume (vph)	7	847	126	407	1103	8	133	1	174	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1804	3491	1464	1770	3487			1740	1568	1805	1762	
Flt Permitted	0.95	1.00	1.00	0.18	1.00			0.40	1.00	0.91	1.00	
Satd. Flow (perm)	1804	3491	1464	343	3487			735	1568	1727	1762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	911	135	438	1186	9	143	1	187	12	11	9
RTOR Reduction (vph)	0	0	77	0	0	0	0	0	58	0	8	0
Lane Group Flow (vph)	8	911	58	438	1195	0	0	144	129	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	24.2	24.2	36.3	31.6			9.9	24.5	4.4	4.4	
Effective Green, g (s)	0.7	24.2	24.2	36.3	31.6			9.9	24.5	4.4	4.4	
Actuated g/C Ratio	0.01	0.43	0.43	0.64	0.56			0.17	0.43	0.08	0.08	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	22	1489	624	587	1943			128	677	134	136	
v/s Ratio Prot	0.00	0.26		c0.19	0.34				0.05		0.01	
v/s Ratio Perm			0.04	c0.29				c0.20	0.03	0.01		
v/c Ratio	0.36	0.61	0.09	0.75	0.61			1.12	0.19	0.09	0.09	
Uniform Delay, d1	27.8	12.6	9.7	9.6	8.5			23.4	10.0	24.3	24.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.7	0.8	0.1	4.5	0.6			117.1	0.0	0.1	0.1	
Delay (s)	31.5	13.4	9.8	14.1	9.1			140.5	10.0	24.4	24.4	
Level of Service	C	B	A	B	A			F	B	C	C	
Approach Delay (s)		13.1			10.4			66.8			24.4	
Approach LOS		B			B			E			C	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	56.7	Sum of lost time (s)	14.5
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	1052	1521	3	12	18
Future Volume (Veh/h)	3	1052	1521	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	1131	1635	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.67				0.77	0.67
vC, conflicting volume	1640				2210	821
vC1, stage 1 conf vol					1638	
vC2, stage 2 conf vol					572	
vCu, unblocked vol	980				811	0
tC, single (s)	4.8				7.0	7.0
tC, 2 stage (s)					6.0	
tF (s)	2.5				3.6	3.4
p0 queue free %	99				94	97
cM capacity (veh/h)	362				205	720

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	3	566	566	1090	548	13	19
Volume Left	3	0	0	0	0	13	0
Volume Right	0	0	0	0	3	0	19
cSH	362	1700	1700	1700	1700	205	720
Volume to Capacity	0.01	0.33	0.33	0.64	0.32	0.06	0.03
Queue Length 95th (ft)	1	0	0	0	0	5	2
Control Delay (s)	15.0	0.0	0.0	0.0	0.0	23.8	10.1
Lane LOS	C					C	B
Approach Delay (s)	0.0			0.0		15.7	
Approach LOS						C	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	52.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	1018	22	22	1313	14	87	9	77	63	2	124
Future Volume (vph)	37	1018	22	22	1313	14	87	9	77	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3442		1671	3481		1671	1523		1703	1586	
Flt Permitted	0.10	1.00		0.20	1.00		0.66	1.00		0.70	1.00	
Satd. Flow (perm)	183	3442		358	3481		1160	1523		1248	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	1107	24	24	1427	15	95	10	84	68	2	135
RTOR Reduction (vph)	0	1	0	0	0	0	0	67	0	0	108	0
Lane Group Flow (vph)	40	1130	0	24	1442	0	95	27	0	68	29	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	51.2	47.3		47.2	45.3		16.2	16.2		16.2	16.2	
Effective Green, g (s)	51.2	47.3		47.2	45.3		16.2	16.2		16.2	16.2	
Actuated g/C Ratio	0.64	0.59		0.59	0.57		0.20	0.20		0.20	0.20	
Clearance Time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	193	2037		242	1973		235	308		253	321	
v/s Ratio Prot	c0.01	0.33		0.00	c0.41			0.02			0.02	
v/s Ratio Perm	0.12			0.06			c0.08			0.05		
v/c Ratio	0.21	0.55		0.10	0.73		0.40	0.09		0.27	0.09	
Uniform Delay, d1	8.6	9.9		7.3	12.8		27.7	25.9		26.9	25.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.3		0.2	1.4		1.1	0.1		0.6	0.1	
Delay (s)	9.2	10.2		7.5	14.2		28.8	26.0		27.4	26.0	
Level of Service	A	B		A	B		C	C		C	C	
Approach Delay (s)		10.2			14.1			27.4			26.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	79.9	Sum of lost time (s)	14.5
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	958	130	61	994	127	129	137	12	207	218	226
Future Volume (vph)	70	958	130	61	994	127	129	137	12	207	218	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3457	1456	3502	3491	1571	3400	3497		1735	3238	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.49	1.00	
Satd. Flow (perm)	3502	3457	1456	3502	3491	1571	3400	3497		893	3238	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	73	998	135	64	1035	132	134	143	12	216	227	235
RTOR Reduction (vph)	0	0	54	0	0	43	0	4	0	0	97	0
Lane Group Flow (vph)	73	998	81	64	1035	89	134	152	0	216	365	0
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	5.2	44.1	57.2	4.9	43.8	64.2	7.6	11.9		30.8	19.2	
Effective Green, g (s)	5.2	44.1	57.2	4.9	43.8	64.2	7.6	11.9		30.8	19.2	
Actuated g/C Ratio	0.05	0.47	0.60	0.05	0.46	0.68	0.08	0.13		0.32	0.20	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	192	1608	878	181	1612	1063	272	438		422	655	
v/s Ratio Prot	c0.02	0.29	0.06	0.02	c0.30	0.06	0.04	0.04		c0.08	c0.11	
v/s Ratio Perm										0.09		
v/c Ratio	0.38	0.62	0.09	0.35	0.64	0.08	0.49	0.35		0.51	0.56	
Uniform Delay, d1	43.2	19.1	7.9	43.4	19.5	5.2	41.8	37.9		24.8	34.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	1.0	0.1	0.4	1.1	0.1	0.5	0.2		0.4	0.6	
Delay (s)	43.7	20.0	8.0	43.9	20.6	5.3	42.3	38.1		25.2	34.6	
Level of Service	D	C	A	D	C	A	D	D		C	C	
Approach Delay (s)		20.1			20.2			40.0			31.6	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	94.8	Sum of lost time (s)	19.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1154	22	3	1130	27	17
Future Volume (Veh/h)	1154	22	3	1130	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1228	23	3	1202	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1251		1846	626
vC1, stage 1 conf vol					1240	
vC2, stage 2 conf vol					607	
vCu, unblocked vol			1251		1846	626
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			99		87	96
cM capacity (veh/h)			563		218	432

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	819	432	3	601	601	29	18
Volume Left	0	0	3	0	0	29	0
Volume Right	0	23	0	0	0	0	18
cSH	1700	1700	563	1700	1700	218	432
Volume to Capacity	0.48	0.25	0.01	0.35	0.35	0.13	0.04
Queue Length 95th (ft)	0	0	0	0	0	11	3
Control Delay (s)	0.0	0.0	11.4	0.0	0.0	24.0	13.7
Lane LOS			B			C	B
Approach Delay (s)	0.0		0.0			20.1	
Approach LOS						C	

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	1097	60	52	1003	16	111	0	229	16	1	15
Future Volume (vph)	12	1097	60	52	1003	16	111	0	229	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3471	1533	2894	3497			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.54	1.00	
Satd. Flow (perm)	1805	3471	1533	2894	3497			1390	1568	1030	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1155	63	55	1056	17	117	0	241	17	1	16
RTOR Reduction (vph)	0	0	15	0	1	0	0	0	213	0	14	0
Lane Group Flow (vph)	13	1155	48	55	1072	0	0	117	28	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Effective Green, g (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Actuated g/C Ratio	0.02	0.72	0.72	0.05	0.74			0.12	0.12	0.12	0.12	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	2504	1106	130	2579			162	182	120	190	
v/s Ratio Prot	0.01	c0.33		c0.02	0.31						0.00	
v/s Ratio Perm			0.03					c0.08	0.02	0.02		
v/c Ratio	0.29	0.46	0.04	0.42	0.42			0.72	0.15	0.14	0.02	
Uniform Delay, d1	57.5	7.0	4.8	55.8	6.0			51.1	47.7	47.6	46.9	
Progression Factor	1.00	1.00	1.00	0.93	0.73			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	0.6	0.1	0.7	0.4			12.6	0.1	0.2	0.0	
Delay (s)	61.0	7.6	4.9	52.8	4.8			63.7	47.8	47.8	46.9	
Level of Service	E	A	A	D	A			E	D	D	D	
Approach Delay (s)		8.0			7.1			53.0			47.4	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	919	383	5	783	38	210	20	15	103	43	64
Future Volume (vph)	30	919	383	5	783	38	210	20	15	103	43	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3438	1550	1805	3403		1787	1655		1719	1729	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3438	1550	1805	3403		1787	1655		1719	1729	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	988	412	5	842	41	226	22	16	111	46	69
RTOR Reduction (vph)	0	0	183	0	2	0	0	14	0	0	49	0
Lane Group Flow (vph)	32	988	229	5	881	0	226	24	0	111	66	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	4.4	66.8	66.8	1.1	63.5		22.9	11.3		22.3	10.7	
Effective Green, g (s)	4.4	66.8	66.8	1.1	63.5		22.9	11.3		22.3	10.7	
Actuated g/C Ratio	0.04	0.56	0.56	0.01	0.53		0.19	0.09		0.19	0.09	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0		1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	66	1913	862	16	1800		341	155		319	154	
v/s Ratio Prot	c0.02	c0.29		0.00	0.26		c0.13	0.01		0.06	c0.04	
v/s Ratio Perm			0.15									
v/c Ratio	0.48	0.52	0.27	0.31	0.49		0.66	0.15		0.35	0.43	
Uniform Delay, d1	56.7	16.6	13.8	59.1	17.9		45.0	49.9		42.5	51.7	
Progression Factor	1.31	0.61	0.22	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.9	0.7	4.0	1.0		3.7	0.2		0.2	0.7	
Delay (s)	76.0	11.0	3.7	63.1	18.9		48.7	50.1		42.8	52.4	
Level of Service	E	B	A	E	B		D	D		D	D	
Approach Delay (s)		10.3			19.2			48.9			47.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	203	157	144	478	381	93
Future Volume (Veh/h)	203	157	144	478	381	93
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	221	171	157	520	414	101
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			221		1055	221
vC1, stage 1 conf vol					221	
vC2, stage 2 conf vol					834	
vCu, unblocked vol			221		1055	221
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			88		0	88
cM capacity (veh/h)			1291		359	811

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	221	171	157	520	414	101
Volume Left	0	0	157	0	414	0
Volume Right	0	171	0	0	0	101
cSH	1700	1700	1291	1700	359	811
Volume to Capacity	0.13	0.10	0.12	0.31	1.15	0.12
Queue Length 95th (ft)	0	0	10	0	409	11
Control Delay (s)	0.0	0.0	8.2	0.0	129.1	10.1
Lane LOS			A		F	B
Approach Delay (s)	0.0		1.9		105.8	
Approach LOS					F	

Intersection Summary			
Average Delay	35.2		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2025 - Total Culdesac PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	97	1.0	0.249	5.7	LOS A	1.2	31.3	0.41	0.28	32.1
18	R2	173	4.0	0.249	5.7	LOS A	1.2	31.3	0.41	0.28	30.4
Approach		269	2.9	0.249	5.7	LOS A	1.2	31.3	0.41	0.28	31.0
East: Oregon St											
1	L2	446	1.0	0.731	14.0	LOS B	8.7	218.9	0.63	0.36	28.7
6	T1	458	1.0	0.731	14.0	LOS B	8.7	218.9	0.63	0.36	28.3
Approach		904	1.0	0.731	14.0	LOS B	8.7	218.9	0.63	0.36	28.5
West: Oregon St.											
2	T1	206	2.0	0.350	8.2	LOS A	1.7	43.6	0.61	0.57	31.7
12	R2	93	2.0	0.350	8.2	LOS A	1.7	43.6	0.61	0.57	30.6
Approach		299	2.0	0.350	8.2	LOS A	1.7	43.6	0.61	0.57	31.3
All Vehicles		1473	1.6	0.731	11.3	LOS B	8.7	218.9	0.58	0.39	29.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	251	3	2	363	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	251	3	2	363	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	261	3	2	378	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	692	670	402	659	692	266	424			265		
vC1, stage 1 conf vol	405	405		264	264							
vC2, stage 2 conf vol	288	265		396	428							
vCu, unblocked vol	596	571	271	558	595	266	295			265		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	545	537	679	564	527	764	1116			1281		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	264	2	424
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	545	624	564	631	1700	1700	1281	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.16	0.00	0.25
Queue Length 95th (ft)	2	2	3	4	0	0	0	0
Control Delay (s)	11.7	10.9	11.6	11.0	0.0	0.0	7.8	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.3		11.3		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix J Year 2025 Total Traffic Conditions - Mitigation Worksheets

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	439	346	108	120	142	94
Future Volume (vph)	439	346	108	120	142	94
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.98	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1863	1565	1583	1667	1656	1282
Flt Permitted	1.00	1.00	0.30	1.00	0.95	1.00
Satd. Flow (perm)	1863	1565	494	1667	1656	1282
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	499	393	123	136	161	107
RTOR Reduction (vph)	0	0	0	0	0	89
Lane Group Flow (vph)	499	393	123	136	161	18
Confl. Bikes (#/hr)		3				
Heavy Vehicles (%)	2%	1%	14%	14%	9%	26%
Turn Type	NA	Free	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		Free	6			8
Actuated Green, G (s)	21.1	46.7	29.7	29.7	8.0	8.0
Effective Green, g (s)	21.1	46.7	29.7	29.7	8.0	8.0
Actuated g/C Ratio	0.45	1.00	0.64	0.64	0.17	0.17
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	841	1565	409	1060	283	219
v/s Ratio Prot	c0.27		0.03	0.08	c0.10	
v/s Ratio Perm		c0.25	0.16			0.01
v/c Ratio	0.59	0.25	0.30	0.13	0.57	0.08
Uniform Delay, d1	9.6	0.0	4.6	3.4	17.8	16.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.1	0.4	0.4	0.1	2.6	0.2
Delay (s)	10.7	0.4	5.0	3.4	20.4	16.4
Level of Service	B	A	A	A	C	B
Approach Delay (s)	6.2			4.2	18.8	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	46.7	Sum of lost time (s)	13.5
Intersection Capacity Utilization	48.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	203	157	144	478	381	93
Future Volume (vph)	203	157	144	478	381	93
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.0	4.5	4.5	4.5	4.5
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1827	1568	1612	1881	1787	1538
Flt Permitted	1.00	1.00	0.45	1.00	0.95	1.00
Satd. Flow (perm)	1827	1568	770	1881	1787	1538
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	221	171	157	520	414	101
RTOR Reduction (vph)	0	0	0	0	0	68
Lane Group Flow (vph)	221	171	157	520	414	33
Heavy Vehicles (%)	4%	3%	12%	1%	1%	5%
Turn Type	NA	Free	pm+pt	NA	Prot	Perm
Protected Phases	2		1	6	8	
Permitted Phases		Free	6			8
Actuated Green, G (s)	12.3	43.9	20.5	20.5	14.4	14.4
Effective Green, g (s)	12.3	43.9	20.5	20.5	14.4	14.4
Actuated g/C Ratio	0.28	1.00	0.47	0.47	0.33	0.33
Clearance Time (s)	4.5		4.5	4.5	4.5	4.5
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	511	1568	430	878	586	504
v/s Ratio Prot	0.12		0.03	c0.28	c0.23	
v/s Ratio Perm		0.11	0.14			0.02
v/c Ratio	0.43	0.11	0.37	0.59	0.71	0.07
Uniform Delay, d1	12.9	0.0	7.2	8.6	12.9	10.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6	0.1	0.5	1.1	3.9	0.1
Delay (s)	13.5	0.1	7.7	9.7	16.8	10.2
Level of Service	B	A	A	A	B	B
Approach Delay (s)	7.7			9.2	15.5	
Approach LOS	A			A	B	

Intersection Summary			
HCM 2000 Control Delay	10.9	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	43.9	Sum of lost time (s)	13.5
Intersection Capacity Utilization	53.8%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

MOVEMENT SUMMARY

Site: 9 [SW Oregon St & Tonquin Rd]

Year 2025 - Total Traffic AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Tonquin Rd											
3a	L1	161	3.0	0.403	11.0	LOS B	1.8	50.1	0.67	0.70	30.8
18	R2	107	26.0	0.403	11.0	LOS B	1.8	50.1	0.67	0.70	28.7
Approach		268	12.2	0.403	11.0	LOS B	1.8	50.1	0.67	0.70	29.9
East: Oregon St											
1	L2	1	14.0	0.266	6.3	LOS A	1.2	32.6	0.45	0.34	34.4
16a	R1	259	8.0	0.266	6.3	LOS A	1.2	32.6	0.45	0.34	35.5
Approach		260	8.0	0.266	6.3	LOS A	1.2	32.6	0.45	0.34	35.5
West: Oregon St. EB											
5b	L3	92	3.0	0.626	0.2	LOS A	0.0	0.0	0.00	0.00	36.9
2	T1	499	2.0	0.626	0.2	LOS A	0.0	0.0	0.00	0.00	35.5
12	R2	516	1.0	0.626	0.2	LOS A	0.0	0.0	0.00	0.00	34.2
Approach		1107	1.6	0.626	0.2	LOS A	0.0	0.0	0.00	0.00	35.0
All Vehicles		1635	4.4	0.626	2.9	LOS A	1.8	50.1	0.18	0.17	34.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 9 [SW Oregon St & Tonquin Rd]

Year 2025 - Total Traffic PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Tonquin Rd											
3a	L1	414	1.0	0.533	10.5	LOS B	3.7	92.7	0.66	0.60	31.0
18	R2	101	5.0	0.533	10.5	LOS B	3.7	92.7	0.66	0.60	29.0
Approach		515	1.8	0.533	10.5	LOS B	3.7	92.7	0.66	0.60	30.6
East: Oregon St											
1	L2	1	12.0	0.886	33.9	LOS D	12.6	329.8	1.00	1.36	24.3
16a	R1	676	6.0	0.886	33.9	LOS D	12.6	329.8	1.00	1.36	24.8
Approach		677	6.0	0.886	33.9	LOS D	12.6	329.8	1.00	1.36	24.8
West: Oregon St. EB											
5b	L3	100	4.0	0.379	0.1	LOS A	0.0	0.0	0.00	0.00	36.8
2	T1	221	3.0	0.379	0.1	LOS A	0.0	0.0	0.00	0.00	35.5
12	R2	327	3.0	0.379	0.1	LOS A	0.0	0.0	0.00	0.00	34.1
Approach		648	3.2	0.379	0.1	LOS A	0.0	0.0	0.00	0.00	35.0
All Vehicles		1840	3.8	0.886	15.4	LOS C	12.6	329.8	0.55	0.67	29.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Organisation: KITTELSON AND ASSOCIATES INC | Processed: Friday, January 10, 2020 12:42:55 PM
Project: H:\23\23278 - Orr Property Corporate Park\synchro\Dec 2019 TIA analysis\Sidra\Future 2025\Oregon_Tonquin_Mitigation\January 2020 Rev Test\23278_Total Traffic 2025 PM.sip7

Appendix K Year 2021 SimTraffic Queuing Worksheets

Summary of All Intervals

Run Number	101	102	103	104	105	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5152	5171	5196	5208	5078	5162
Vehs Exited	5199	5157	5145	5129	5120	5152
Starting Vehs	357	364	277	279	310	310
Ending Vehs	310	378	328	358	268	323
Travel Distance (mi)	6971	6931	6954	6853	6955	6933
Travel Time (hr)	335.6	342.9	319.0	346.1	314.8	331.7
Total Delay (hr)	141.6	149.8	126.1	154.4	121.8	138.7
Total Stops	7924	8297	7547	8807	7261	7967
Fuel Used (gal)	252.6	252.2	248.6	252.5	247.0	250.6

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1252	1211	1254	1279	1195	1236
Vehs Exited	1304	1284	1262	1261	1187	1260
Starting Vehs	357	364	277	279	310	310
Ending Vehs	305	291	269	297	318	293
Travel Distance (mi)	1752	1687	1663	1694	1637	1687
Travel Time (hr)	79.9	81.2	76.1	77.3	72.3	77.4
Total Delay (hr)	31.1	34.3	29.9	30.0	27.1	30.5
Total Stops	1859	1944	1771	1761	1603	1788
Fuel Used (gal)	62.4	61.0	59.7	60.9	58.4	60.5

Interval #2 Information Recording1

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1446	1478	1436	1475	1448	1457
Vehs Exited	1371	1368	1358	1381	1360	1369
Starting Vehs	305	291	269	297	318	293
Ending Vehs	380	401	347	391	406	385
Travel Distance (mi)	1804	1834	1783	1834	1848	1821
Travel Time (hr)	91.7	89.1	82.8	87.3	85.4	87.3
Total Delay (hr)	41.3	37.8	33.1	35.6	33.8	36.3
Total Stops	2230	2192	2098	2176	2013	2142
Fuel Used (gal)	66.4	66.2	64.1	66.9	66.2	66.0

Interval #3 Information Recording1

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1233	1187	1245	1232	1258	1230
Vehs Exited	1294	1278	1283	1271	1369	1298
Starting Vehs	380	401	347	391	406	385
Ending Vehs	319	310	309	352	295	317
Travel Distance (mi)	1722	1711	1773	1673	1775	1731
Travel Time (hr)	81.8	84.9	80.9	93.0	84.1	84.9
Total Delay (hr)	33.9	37.5	31.7	46.3	34.6	36.8
Total Stops	1887	1988	1812	2496	2075	2054
Fuel Used (gal)	62.3	62.4	63.0	63.2	63.5	62.9

Interval #4 Information Recording1

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1221	1295	1261	1222	1177	1231
Vehs Exited	1230	1227	1242	1216	1204	1226
Starting Vehs	319	310	309	352	295	317
Ending Vehs	310	378	328	358	268	323
Travel Distance (mi)	1693	1699	1735	1651	1695	1695
Travel Time (hr)	82.2	87.6	79.3	88.5	73.0	82.1
Total Delay (hr)	35.2	40.2	31.3	42.5	26.2	35.1
Total Stops	1948	2173	1866	2374	1570	1986
Fuel Used (gal)	61.4	62.6	61.8	61.4	59.0	61.3

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	105	934	170	198	453	151	177	137	92	134
Average Queue (ft)	11	359	80	58	161	65	74	56	28	51
95th Queue (ft)	54	770	195	135	353	126	145	115	70	108
Link Distance (ft)		1478			5035		1246			614
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175		145	200		375		300	140	
Storage Blk Time (%)		17	0	0	4					0
Queuing Penalty (veh)		36	1	0	3					0

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	L
Maximum Queue (ft)	84	635	175	374	583	224	455	39
Average Queue (ft)	8	226	47	87	241	107	174	4
95th Queue (ft)	50	513	143	243	518	219	376	23
Link Distance (ft)		5035			598		3282	
Upstream Blk Time (%)					1			
Queuing Penalty (veh)					6			
Storage Bay Dist (ft)	250		150	350		200		75
Storage Blk Time (%)		12	0	0	6	5	6	
Queuing Penalty (veh)		15	0	0	6	19	6	

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	62	220	105	88	35
Average Queue (ft)	7	45	8	19	5
95th Queue (ft)	37	275	66	67	25
Link Distance (ft)		598	1104		698
Upstream Blk Time (%)		0			
Queuing Penalty (veh)		1			
Storage Bay Dist (ft)	150			200	
Storage Blk Time (%)		2			
Queuing Penalty (veh)		0			

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	384	963	154	314	100	78	106	193	94
Average Queue (ft)	92	436	67	72	9	22	21	71	20
95th Queue (ft)	291	1005	135	207	48	63	73	154	65
Link Distance (ft)		1104		819			419		805
Upstream Blk Time (%)		0							
Queuing Penalty (veh)		3							
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)		11		2	0			0	
Queuing Penalty (veh)		12		3	0			0	

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	344	829	400	211	663	400	385	446	315	449	92
Average Queue (ft)	89	618	62	34	309	70	123	245	187	150	32
95th Queue (ft)	291	972	277	120	532	242	254	394	319	343	72
Link Distance (ft)		819			1233			922		1894	1894
Upstream Blk Time (%)		3									
Queuing Penalty (veh)		30									
Storage Bay Dist (ft)	375		375	375		375	400		300		
Storage Blk Time (%)	0	26	0		4	0		1	8	1	
Queuing Penalty (veh)	0	30	1		8	0		1	12	1	

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	10	4	95	195	207
Average Queue (ft)	0	0	18	75	60
95th Queue (ft)	8	3	66	203	293
Link Distance (ft)	1233				751
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		130	230	260	
Storage Blk Time (%)				6	1
Queuing Penalty (veh)				1	0

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	L	TR	LT	R	L	TR
Maximum Queue (ft)	71	705	120	227	238	403	157	186	24	22
Average Queue (ft)	4	271	31	93	120	95	48	65	3	1
95th Queue (ft)	43	621	102	181	204	264	116	143	14	12
Link Distance (ft)		1252				957		750		376
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	240		95	225	225		170		90	
Storage Blk Time (%)		13	0	0	1	1	0	1		
Queuing Penalty (veh)		18	1	1	7	2	0	0		

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	264	834	155	143	668	265	160	599	128	84
Average Queue (ft)	94	312	67	26	331	63	153	292	39	25
95th Queue (ft)	201	715	170	104	566	217	175	548	104	67
Link Distance (ft)		957			1290			725		1359
Upstream Blk Time (%)		0						0		
Queuing Penalty (veh)		2						0		
Storage Bay Dist (ft)	240		130	240		240	135		170	
Storage Blk Time (%)	0	14	0		13	0	52	1	0	
Queuing Penalty (veh)	0	49	1		16	0	34	2	0	

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	9	135	96	129	114
Average Queue (ft)	0	11	32	54	47
95th Queue (ft)	5	72	75	93	86
Link Distance (ft)	372				552
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		240	190	210	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	TR	L
Maximum Queue (ft)	60	73	47	59	4	63
Average Queue (ft)	16	27	4	7	0	6
95th Queue (ft)	45	62	23	34	0	34
Link Distance (ft)		807		1348	1018	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150			150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 329

Summary of All Intervals

Run Number	111	112	113	114	115	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5782	5627	5799	5788	5827	5761
Vehs Exited	5699	5622	5666	5763	5807	5714
Starting Vehs	312	346	330	378	338	341
Ending Vehs	395	351	463	403	358	394
Travel Distance (mi)	8059	7847	8056	8099	8131	8038
Travel Time (hr)	422.8	378.1	415.6	412.3	448.9	415.5
Total Delay (hr)	197.4	158.5	189.4	185.6	222.3	190.6
Total Stops	10406	8990	10397	10991	10264	10213
Fuel Used (gal)	296.7	282.3	293.8	294.6	306.0	294.7

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	111	112	113	114	115	Avg
Vehs Entered	1399	1410	1405	1371	1444	1407
Vehs Exited	1364	1387	1408	1371	1381	1382
Starting Vehs	312	346	330	378	338	341
Ending Vehs	347	369	327	378	401	355
Travel Distance (mi)	1918	1891	1952	1907	1970	1928
Travel Time (hr)	86.5	83.0	88.1	88.5	92.5	87.7
Total Delay (hr)	32.9	29.7	33.1	34.9	37.6	33.6
Total Stops	2259	2041	2098	2320	2384	2216
Fuel Used (gal)	67.8	66.6	69.2	68.0	71.2	68.6

Interval #2 Information Recording2

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	111	112	113	114	115	Avg
Vehs Entered	1558	1481	1530	1562	1548	1537
Vehs Exited	1453	1414	1418	1462	1500	1448
Starting Vehs	347	369	327	378	401	355
Ending Vehs	452	436	439	478	449	449
Travel Distance (mi)	2079	2038	2005	2051	2077	2050
Travel Time (hr)	111.5	99.2	103.5	106.1	114.0	106.9
Total Delay (hr)	53.4	42.3	47.1	48.8	56.2	49.5
Total Stops	2871	2441	2540	2908	2700	2689
Fuel Used (gal)	76.8	73.0	73.3	75.1	77.5	75.1

Interval #3 Information Recording2

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	111	112	113	114	115	Avg
Vehs Entered	1432	1396	1412	1425	1482	1430
Vehs Exited	1422	1442	1428	1491	1458	1447
Starting Vehs	452	436	439	478	449	449
Ending Vehs	462	390	423	412	473	431
Travel Distance (mi)	2046	2018	2028	2065	2039	2039
Travel Time (hr)	120.2	103.7	111.9	113.5	120.9	114.1
Total Delay (hr)	63.1	47.4	54.9	55.6	64.0	57.0
Total Stops	2892	2484	2927	3070	2566	2787
Fuel Used (gal)	77.8	74.4	75.3	76.8	78.8	76.6

Interval #4 Information Recording2

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	111	112	113	114	115	Avg
Vehs Entered	1393	1340	1452	1430	1353	1387
Vehs Exited	1460	1379	1412	1439	1468	1430
Starting Vehs	462	390	423	412	473	431
Ending Vehs	395	351	463	403	358	394
Travel Distance (mi)	2015	1900	2071	2077	2046	2022
Travel Time (hr)	104.6	92.2	112.1	104.2	121.4	106.9
Total Delay (hr)	47.9	39.1	54.3	46.3	64.6	50.4
Total Stops	2384	2024	2832	2693	2614	2511
Fuel Used (gal)	74.3	68.3	76.0	74.7	78.5	74.4

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	134	622	170	225	885	239	169	104	165	585
Average Queue (ft)	17	318	123	149	404	133	61	40	60	390
95th Queue (ft)	79	556	221	267	777	225	127	83	173	741
Link Distance (ft)		1478			5041		1246			614
Upstream Blk Time (%)										28
Queuing Penalty (veh)										0
Storage Bay Dist (ft)	175		145	200		375		300	140	
Storage Blk Time (%)		21	0	2	16					66
Queuing Penalty (veh)		57	1	16	35					21

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	LT	R	L	TR
Maximum Queue (ft)	38	606	175	375	606	256	189	46	55
Average Queue (ft)	7	249	56	228	324	105	68	12	15
95th Queue (ft)	28	543	161	405	638	223	137	38	43
Link Distance (ft)		5041			594	3284	3284		369
Upstream Blk Time (%)					2				
Queuing Penalty (veh)					25				
Storage Bay Dist (ft)	250		150	350				75	
Storage Blk Time (%)		14	0	1	8			0	0
Queuing Penalty (veh)		18	0	15	30			0	0

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	49	622	128	150
Average Queue (ft)	5	84	31	48
95th Queue (ft)	27	388	87	137
Link Distance (ft)		1103		698
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150		200	
Storage Blk Time (%)				3
Queuing Penalty (veh)				0

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	152	502	274	819	118	160	148	134	156
Average Queue (ft)	31	209	26	431	6	72	53	46	64
95th Queue (ft)	70	419	118	805	46	138	113	102	128
Link Distance (ft)		1103		819			440		805
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				5					
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)		2		20	0	0	0		
Queuing Penalty (veh)		1		7	0	0	0		

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	124	784	400	400	1131	400	183	204	304	311	260
Average Queue (ft)	59	380	93	80	633	124	91	105	160	156	121
95th Queue (ft)	119	702	337	286	1189	407	160	184	263	261	222
Link Distance (ft)		819			1233			892		1894	1894
Upstream Blk Time (%)		0			1						
Queuing Penalty (veh)		1			7						
Storage Bay Dist (ft)	100		375	375		375	400		300		
Storage Blk Time (%)	3	26	0		21	0			0	1	
Queuing Penalty (veh)	34	48	0		37	0			0	1	

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	WB	WB	NB	NB
Directions Served	L	T	L	R
Maximum Queue (ft)	24	275	117	47
Average Queue (ft)	2	30	38	8
95th Queue (ft)	15	231	98	26
Link Distance (ft)		1252		751
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	230		260	
Storage Blk Time (%)		2		
Queuing Penalty (veh)		0		

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	L	TR	LT	R	L	TR
Maximum Queue (ft)	80	657	120	73	206	406	182	247	52	33
Average Queue (ft)	8	279	22	10	44	179	69	123	12	5
95th Queue (ft)	49	536	86	45	115	330	149	212	34	18
Link Distance (ft)		1252				957		750		376
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	240		95	225	225		170		90	
Storage Blk Time (%)		19	0		0	3	1	3	0	
Queuing Penalty (veh)		14	0		0	2	2	4	0	

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	191	716	155	26	447	68	159	334	171	146
Average Queue (ft)	34	316	96	4	228	12	134	99	81	72
95th Queue (ft)	114	646	193	19	422	43	183	279	149	136
Link Distance (ft)		957			1290			725		1359
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	240		130	240		240	135		170	
Storage Blk Time (%)		15	0		7		28		0	0
Queuing Penalty (veh)		60	2		3		10		0	0

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	4	24	75	235	673
Average Queue (ft)	0	1	25	179	234
95th Queue (ft)	0	17	60	281	682
Link Distance (ft)	371				808
Upstream Blk Time (%)					3
Queuing Penalty (veh)					0
Storage Bay Dist (ft)		240	190	210	
Storage Blk Time (%)				35	0
Queuing Penalty (veh)				32	0

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	TR	L
Maximum Queue (ft)	31	54	46	52	16	17
Average Queue (ft)	8	12	15	22	1	1
95th Queue (ft)	30	38	41	49	9	8
Link Distance (ft)		787		949	1716	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150			150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 487

Summary of All Intervals

Run Number	121	122	123	124	125	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5229	5297	5181	5283	5266	5251
Vehs Exited	5239	5316	5171	5287	5239	5249
Starting Vehs	307	332	295	304	316	309
Ending Vehs	297	313	305	300	343	307
Travel Distance (mi)	6918	7028	6974	6899	6964	6957
Travel Time (hr)	359.3	346.5	348.7	311.4	316.6	336.5
Total Delay (hr)	166.6	151.3	155.2	119.3	122.7	143.0
Total Stops	8877	8216	8584	7164	7294	8028
Fuel Used (gal)	256.3	255.9	254.3	245.6	248.1	252.1

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	121	122	123	124	125	Avg
Vehs Entered	1248	1252	1230	1207	1229	1228
Vehs Exited	1198	1265	1252	1232	1264	1242
Starting Vehs	307	332	295	304	316	309
Ending Vehs	357	319	273	279	281	303
Travel Distance (mi)	1624	1702	1718	1616	1686	1669
Travel Time (hr)	79.8	84.3	75.0	68.1	73.5	76.2
Total Delay (hr)	34.6	37.1	27.4	23.2	26.6	29.8
Total Stops	1939	2050	1671	1483	1676	1762
Fuel Used (gal)	59.4	62.1	60.1	56.4	59.4	59.5

Interval #2 Information Recording2

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	121	122	123	124	125	Avg
Vehs Entered	1481	1496	1471	1486	1479	1486
Vehs Exited	1400	1428	1347	1429	1390	1401
Starting Vehs	357	319	273	279	281	303
Ending Vehs	438	387	397	336	370	380
Travel Distance (mi)	1834	1867	1826	1775	1801	1821
Travel Time (hr)	101.9	97.4	93.2	80.6	84.1	91.4
Total Delay (hr)	50.4	45.2	42.4	30.9	33.5	40.5
Total Stops	2696	2280	2457	1905	2042	2280
Fuel Used (gal)	68.8	69.2	66.6	63.5	65.0	66.6

Interval #3 Information Recording3

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	121	122	123	124	125	Avg
Vehs Entered	1276	1262	1249	1299	1259	1266
Vehs Exited	1391	1338	1281	1288	1330	1324
Starting Vehs	438	387	397	336	370	380
Ending Vehs	323	311	365	347	299	328
Travel Distance (mi)	1769	1758	1748	1762	1755	1758
Travel Time (hr)	96.9	89.4	98.1	81.2	82.3	89.6
Total Delay (hr)	47.7	40.9	49.8	32.3	33.6	40.9
Total Stops	2382	2172	2464	1911	1875	2161
Fuel Used (gal)	67.1	64.5	65.9	63.0	63.2	64.7

Interval #4 Information Recording4

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	121	122	123	124	125	Avg
Vehs Entered	1224	1287	1231	1291	1299	1266
Vehs Exited	1250	1285	1291	1338	1255	1284
Starting Vehs	323	311	365	347	299	328
Ending Vehs	297	313	305	300	343	307
Travel Distance (mi)	1691	1701	1681	1746	1722	1708
Travel Time (hr)	80.7	75.4	82.3	81.4	76.6	79.3
Total Delay (hr)	33.8	28.1	35.7	33.0	28.9	31.9
Total Stops	1860	1714	1992	1865	1701	1830
Fuel Used (gal)	61.1	60.1	61.6	62.7	60.5	61.2

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	28	983	170	197	372	154	184	184	95	122
Average Queue (ft)	6	369	81	60	144	67	72	62	21	49
95th Queue (ft)	25	861	198	151	312	128	143	132	63	99
Link Distance (ft)		1478			5035		1246			614
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175		145	200		375		300	140	
Storage Blk Time (%)		17	0	0	3		0	0	0	0
Queuing Penalty (veh)		35	1	0	2		0	0	0	0

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	T	R	L	TR	LT	R	L
Maximum Queue (ft)	88	534	175	334	567	224	268	47
Average Queue (ft)	8	195	44	78	237	83	130	6
95th Queue (ft)	50	439	137	214	499	176	224	29
Link Distance (ft)		5035			598		3282	
Upstream Blk Time (%)					0			
Queuing Penalty (veh)					2			
Storage Bay Dist (ft)	250		150	350		200		75
Storage Blk Time (%)		9	0	0	4	1	2	0
Queuing Penalty (veh)		11	0	0	4	3	1	0

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	EB	WB	SB	SB
Directions Served	L	T	TR	L	R
Maximum Queue (ft)	58	209	80	67	44
Average Queue (ft)	5	21	4	11	5
95th Queue (ft)	35	162	46	43	26
Link Distance (ft)		598	1104		698
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150			200	
Storage Blk Time (%)		1			
Queuing Penalty (veh)		0			

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	384	817	191	307	93	70	83	264	315
Average Queue (ft)	92	375	57	75	14	18	16	123	95
95th Queue (ft)	288	923	130	218	54	53	54	303	412
Link Distance (ft)		1104		819			419		805
Upstream Blk Time (%)		0							
Queuing Penalty (veh)		2							
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)	0	10		2				13	0
Queuing Penalty (veh)	0	10		3				5	0

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	399	828	400	117	695	400	362	526	318	554	116
Average Queue (ft)	115	636	57	33	310	94	113	275	217	233	43
95th Queue (ft)	348	991	261	88	550	320	242	450	361	628	92
Link Distance (ft)		819			1233			922		1894	1894
Upstream Blk Time (%)		5									
Queuing Penalty (veh)		49									
Storage Bay Dist (ft)	375		375	375		375	400		300		
Storage Blk Time (%)	0	26	0		4	0		3	17	1	
Queuing Penalty (veh)	0	29	1		9	0		4	27	2	

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	4	30	84	159	76
Average Queue (ft)	0	1	15	50	20
95th Queue (ft)	3	16	56	164	60
Link Distance (ft)	1233				751
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		130	230	260	
Storage Blk Time (%)				2	
Queuing Penalty (veh)				0	

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	L	TR	LT	R	L	TR
Maximum Queue (ft)	126	738	119	230	242	527	188	280	23	39
Average Queue (ft)	7	327	35	109	142	125	49	69	2	3
95th Queue (ft)	59	734	107	206	231	341	124	175	13	20
Link Distance (ft)		1252				957		750		376
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	240		95	225	225		170		90	
Storage Blk Time (%)		15	1	0	1	1	0	2		
Queuing Penalty (veh)		20	6	1	11	3	0	1		

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	264	851	155	227	783	265	160	673	148	113
Average Queue (ft)	90	353	64	34	363	83	152	331	39	31
95th Queue (ft)	202	740	164	126	620	253	174	629	105	80
Link Distance (ft)		957			1290			725		1359
Upstream Blk Time (%)		0						0		
Queuing Penalty (veh)		1						0		
Storage Bay Dist (ft)	240		130	240		240	135		170	
Storage Blk Time (%)	0	16	0	0	15	0	51	2	0	
Queuing Penalty (veh)	2	57	0	0	18	0	33	4	0	

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	13	138	87	164	103
Average Queue (ft)	0	6	32	60	43
95th Queue (ft)	6	53	71	117	80
Link Distance (ft)	372				552
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		240	190	210	
Storage Blk Time (%)				0	
Queuing Penalty (veh)				0	

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	NB	SB
Directions Served	L	TR	L	TR	L	TR	L
Maximum Queue (ft)	62	62	39	57	35	10	50
Average Queue (ft)	18	25	3	9	3	0	6
95th Queue (ft)	47	56	20	35	17	8	27
Link Distance (ft)		807		1348		1018	
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150		150		150		150
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Blake Road & Cipole Road

Movement	EB	WB	SB
Directions Served	L	TR	LR
Maximum Queue (ft)	18	4	51
Average Queue (ft)	1	0	10
95th Queue (ft)	8	3	34
Link Distance (ft)		807	546
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	150		
Storage Blk Time (%)			
Queuing Penalty (veh)			

Zone Summary

Zone wide Queuing Penalty: 362

Summary of All Intervals

Run Number	131	132	133	134	135	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5735	5705	5786	5779	5720	5742
Vehs Exited	5731	5741	5705	5800	5689	5732
Starting Vehs	366	380	342	413	372	369
Ending Vehs	370	344	423	392	403	383
Travel Distance (mi)	8016	7955	8027	8168	7851	8003
Travel Time (hr)	412.4	372.9	417.6	415.2	431.4	409.9
Total Delay (hr)	187.4	149.4	193.0	187.5	211.5	185.8
Total Stops	9876	9246	10415	10079	9683	9860
Fuel Used (gal)	294.5	284.7	294.0	297.5	294.6	293.1

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	131	132	133	134	135	Avg
Vehs Entered	1448	1385	1356	1368	1384	1385
Vehs Exited	1423	1421	1362	1440	1410	1413
Starting Vehs	366	380	342	413	372	369
Ending Vehs	391	344	336	341	346	347
Travel Distance (mi)	2032	1954	1946	2035	1931	1980
Travel Time (hr)	101.8	89.8	87.2	94.9	93.7	93.5
Total Delay (hr)	45.0	34.8	32.6	38.2	39.6	38.0
Total Stops	2454	2291	2124	2304	2309	2299
Fuel Used (gal)	73.5	69.4	67.9	72.6	69.6	70.6

Interval #2 Information Recording

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	131	132	133	134	135	Avg
Vehs Entered	1482	1549	1587	1592	1566	1554
Vehs Exited	1436	1454	1455	1464	1417	1444
Starting Vehs	391	344	336	341	346	347
Ending Vehs	437	439	468	469	495	460
Travel Distance (mi)	1966	2057	2048	2082	2019	2034
Travel Time (hr)	102.6	99.1	104.1	111.0	108.1	105.0
Total Delay (hr)	47.2	41.6	46.9	52.8	51.7	48.0
Total Stops	2516	2511	2791	2919	2479	2642
Fuel Used (gal)	72.7	74.2	74.8	76.8	75.0	74.7

Interval #3 Information Recording

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	131	132	133	134	135	Avg
Vehs Entered	1401	1386	1440	1386	1360	1390
Vehs Exited	1416	1461	1453	1439	1443	1443
Starting Vehs	437	439	468	469	495	460
Ending Vehs	422	364	455	416	412	416
Travel Distance (mi)	2026	2004	2032	2025	1942	2006
Travel Time (hr)	109.0	95.7	110.6	108.4	121.4	109.0
Total Delay (hr)	52.0	39.6	53.7	52.1	66.9	52.9
Total Stops	2669	2270	2916	2649	2796	2659
Fuel Used (gal)	75.5	72.2	75.3	74.6	76.2	74.8

Interval #4 Information Recording

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	131	132	133	134	135	Avg
Vehs Entered	1404	1385	1403	1433	1410	1413
Vehs Exited	1456	1405	1435	1457	1419	1432
Starting Vehs	422	364	455	416	412	416
Ending Vehs	370	344	423	392	403	383
Travel Distance (mi)	1992	1941	2001	2026	1959	1984
Travel Time (hr)	99.0	88.2	115.6	101.0	108.2	102.4
Total Delay (hr)	43.2	33.5	59.7	44.4	53.3	46.8
Total Stops	2237	2174	2584	2207	2099	2259
Fuel Used (gal)	72.8	69.0	76.0	73.5	73.8	73.0

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	L	T	R	L	TR
Maximum Queue (ft)	169	733	170	225	912	284	129	113	165	625
Average Queue (ft)	18	311	117	157	418	143	64	41	73	490
95th Queue (ft)	80	604	222	268	807	252	115	82	193	775
Link Distance (ft)		1478			5041		1246			614
Upstream Blk Time (%)										42
Queuing Penalty (veh)										0
Storage Bay Dist (ft)	175		145	200		375		300	140	
Storage Blk Time (%)		20	0	2	18				0	85
Queuing Penalty (veh)		55	1	22	38				0	27

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	TR	LT	R	L	TR
Maximum Queue (ft)	87	740	175	374	604	222	162	41	55
Average Queue (ft)	9	269	49	209	295	102	62	10	14
95th Queue (ft)	64	580	151	384	582	192	116	33	42
Link Distance (ft)		5041			594	3284	3284		369
Upstream Blk Time (%)					1				
Queuing Penalty (veh)					19				
Storage Bay Dist (ft)	250		150	350				75	
Storage Blk Time (%)		14	0	0	6				0
Queuing Penalty (veh)		18	0	5	23				0

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	28	627	78	109
Average Queue (ft)	3	48	25	32
95th Queue (ft)	18	305	71	87
Link Distance (ft)		1103		698
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150		200	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	193	494	273	724	131	110	118	117	171
Average Queue (ft)	32	177	23	345	7	44	36	49	67
95th Queue (ft)	110	385	113	711	52	87	82	101	136
Link Distance (ft)		1103		819			440		805
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				1					
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)		1		15	0				
Queuing Penalty (veh)		0		5	0				

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	273	712	399	399	917	331	159	216	292	423	266
Average Queue (ft)	49	336	51	64	463	84	84	114	171	182	123
95th Queue (ft)	157	593	229	243	888	321	142	198	298	378	225
Link Distance (ft)		819			1233			892		1894	1894
Upstream Blk Time (%)		0			0						
Queuing Penalty (veh)		0			0						
Storage Bay Dist (ft)	375		375	375		375	400		300		
Storage Blk Time (%)		6	0		14	0			7	1	
Queuing Penalty (veh)		9	0		24	0			14	1	

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	WB	WB	NB	NB
Directions Served	L	T	L	R
Maximum Queue (ft)	30	49	82	35
Average Queue (ft)	3	3	27	9
95th Queue (ft)	16	44	77	25
Link Distance (ft)		1252		751
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	230		260	
Storage Blk Time (%)		0		
Queuing Penalty (veh)		0		

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	L	TR	LT	R	L	TR
Maximum Queue (ft)	97	569	120	51	219	382	187	234	60	34
Average Queue (ft)	11	263	17	10	48	164	72	118	13	6
95th Queue (ft)	54	507	76	36	135	305	150	211	44	21
Link Distance (ft)		1252				957		750		376
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	240		95	225	225		170		90	
Storage Blk Time (%)		18	0		0	3	1	3	0	
Queuing Penalty (veh)		13	0		0	1	1	4	0	

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	TR
Maximum Queue (ft)	226	623	155	79	521	265	159	304	159	155
Average Queue (ft)	39	312	102	5	242	28	130	96	79	66
95th Queue (ft)	130	598	202	44	442	138	181	269	143	127
Link Distance (ft)		957			1290			725		1359
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	240		130	240		240	135		170	
Storage Blk Time (%)		16	0		7	0	23		1	0
Queuing Penalty (veh)		62	1		3	0	8		1	0

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	WB	NB	NB
Directions Served	R	L	L	R
Maximum Queue (ft)	23	67	235	550
Average Queue (ft)	1	22	172	172
95th Queue (ft)	17	57	278	519
Link Distance (ft)				808
Upstream Blk Time (%)				0
Queuing Penalty (veh)				0
Storage Bay Dist (ft)	240	190	210	
Storage Blk Time (%)			33	0
Queuing Penalty (veh)			29	0

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	TR	L	L	TR
Maximum Queue (ft)	55	48	56	58	21	10	10
Average Queue (ft)	18	21	16	22	1	0	0
95th Queue (ft)	46	45	43	50	10	5	8
Link Distance (ft)		787		949			892
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150		150		150	150	
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Blake Road & Cipole Road

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	12	72
Average Queue (ft)	0	33
95th Queue (ft)	6	63
Link Distance (ft)		300
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 386

Appendix L Year 2025 SimTraffic Queuing Worksheets

Summary of All Intervals

Run Number	101	102	103	104	105	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5523	5523	5579	5675	5487	5559
Vehs Exited	5558	5593	5583	5669	5458	5569
Starting Vehs	311	318	300	268	266	293
Ending Vehs	276	248	296	274	295	270
Travel Distance (mi)	7539	7605	7595	7675	7484	7580
Travel Time (hr)	304.1	300.7	301.5	307.9	302.1	303.2
Total Delay (hr)	95.2	90.0	91.4	94.9	95.0	93.3
Total Stops	6859	6678	6907	7094	6957	6900
Fuel Used (gal)	269.8	270.0	270.1	275.6	268.9	270.9

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1423	1387	1347	1401	1293	1367
Vehs Exited	1403	1407	1338	1400	1244	1361
Starting Vehs	311	318	300	268	266	293
Ending Vehs	331	298	309	269	315	303
Travel Distance (mi)	1979	1936	1850	1877	1779	1884
Travel Time (hr)	82.3	77.7	72.0	75.6	69.9	75.5
Total Delay (hr)	27.7	24.2	20.9	23.4	20.8	23.4
Total Stops	1875	1711	1592	1792	1640	1725
Fuel Used (gal)	71.5	68.8	65.4	67.8	63.2	67.3

Interval #2 Information Recording2

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1509	1551	1564	1584	1616	1565
Vehs Exited	1550	1526	1543	1503	1541	1535
Starting Vehs	331	298	309	269	315	303
Ending Vehs	290	323	330	350	390	334
Travel Distance (mi)	1985	2011	2046	1990	2036	2014
Travel Time (hr)	80.4	80.4	84.3	81.1	85.9	82.4
Total Delay (hr)	25.0	24.2	27.4	25.5	29.4	26.3
Total Stops	1909	1817	1970	1903	2099	1940
Fuel Used (gal)	71.6	71.8	73.4	71.6	73.9	72.4

Interval #3 Information Recording3

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1278	1313	1306	1336	1277	1300
Vehs Exited	1324	1297	1348	1372	1379	1346
Starting Vehs	290	323	330	350	390	334
Ending Vehs	244	339	288	314	288	289
Travel Distance (mi)	1755	1860	1855	1924	1787	1836
Travel Time (hr)	69.3	72.0	71.9	76.4	71.2	72.2
Total Delay (hr)	20.5	20.7	20.7	23.5	21.5	21.4
Total Stops	1516	1536	1646	1752	1575	1605
Fuel Used (gal)	62.7	64.9	65.6	69.1	64.1	65.3

Interval #4 Information Recording4

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	101	102	103	104	105	Avg
Vehs Entered	1313	1272	1362	1354	1301	1314
Vehs Exited	1281	1363	1354	1394	1294	1335
Starting Vehs	244	339	288	314	288	289
Ending Vehs	276	248	296	274	295	270
Travel Distance (mi)	1820	1800	1845	1884	1881	1846
Travel Time (hr)	72.0	70.6	73.3	74.7	75.1	73.2
Total Delay (hr)	21.9	20.9	22.4	22.5	23.3	22.2
Total Stops	1559	1614	1699	1647	1643	1632
Fuel Used (gal)	64.1	64.5	65.7	67.2	67.7	65.8

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	29	254	267	187	196	209	167	218	126	74	114
Average Queue (ft)	7	138	135	47	55	75	73	80	54	26	53
95th Queue (ft)	27	228	234	108	143	160	138	160	97	62	101
Link Distance (ft)		1478	1478		5034	5034		1246			602
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	175			200			375		300	140	
Storage Blk Time (%)		2			0			0			0
Queuing Penalty (veh)		0			0			0			0

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	L
Maximum Queue (ft)	25	197	214	106	152	261	276	172	238	48
Average Queue (ft)	5	79	78	27	59	88	106	64	103	4
95th Queue (ft)	19	161	168	74	120	211	228	132	184	26
Link Distance (ft)		5034	5034			600	600		3270	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			200	350			200		75
Storage Blk Time (%)			0	0				0	1	0
Queuing Penalty (veh)			0	0				1	1	0

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	WB	SB	SB
Directions Served	L	TR	L	R
Maximum Queue (ft)	33	4	66	48
Average Queue (ft)	5	0	10	5
95th Queue (ft)	23	3	42	26
Link Distance (ft)		1102		685
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150		200	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	87	214	243	126	211	233	68	66	144	75
Average Queue (ft)	42	59	89	49	51	66	19	15	57	29
95th Queue (ft)	75	140	186	101	142	159	53	46	126	65
Link Distance (ft)		1102	1102		813	813		401		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	93	242	407	445	268	71	97	299	304	222	163	175
Average Queue (ft)	29	72	201	224	26	9	33	140	143	75	75	91
95th Queue (ft)	71	181	364	402	125	41	83	250	250	169	141	154
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)		0	4	2	0			0	0	0		
Queuing Penalty (veh)		0	3	1	0			0	0	0		

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	225	280	304	248	247
Average Queue (ft)	114	138	160	99	97
95th Queue (ft)	194	235	280	209	202
Link Distance (ft)	903	903		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)			2		
Queuing Penalty (veh)			2		

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	WB	NB	NB
Directions Served	T	TR	L	L	R
Maximum Queue (ft)	8	8	64	152	88
Average Queue (ft)	0	0	10	41	20
95th Queue (ft)	0	4	43	119	67
Link Distance (ft)	1225	1225			746
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			230	260	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	L	T	TR	LT	R	L	TR
Maximum Queue (ft)	24	275	311	155	203	232	184	204	154	154	22	42
Average Queue (ft)	2	85	117	37	78	104	31	43	45	46	2	3
95th Queue (ft)	15	206	253	119	168	191	105	133	110	110	11	20
Link Distance (ft)		1250	1250				950	950		738		362
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	240			130	225	225			170		90	
Storage Blk Time (%)		0	5	0	0	1	0		1	1		
Queuing Penalty (veh)		0	6	1	2	3	0		1	0		

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	219	412	413	288	202	373	342	160	583	125	94
Average Queue (ft)	67	102	117	46	34	171	158	150	282	40	24
95th Queue (ft)	145	252	261	146	118	316	300	185	533	101	66
Link Distance (ft)		950	950			1290	1290		713		1359
Upstream Blk Time (%)									0		
Queuing Penalty (veh)									0		
Storage Bay Dist (ft)	240			300	240			135		170	
Storage Blk Time (%)	1	1	1	0	0	4		45	2	0	
Queuing Penalty (veh)	2	1	2	0	0	1		30	5	0	

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	9	162	106	138	101
Average Queue (ft)	0	19	39	62	46
95th Queue (ft)	5	100	84	114	84
Link Distance (ft)	372				552
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		240	190	210	
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	TR	L
Maximum Queue (ft)	53	72	40	49	3	44
Average Queue (ft)	16	21	3	8	0	6
95th Queue (ft)	43	56	18	34	2	29
Link Distance (ft)		802		1330	1017	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150			150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 63

Summary of All Intervals

Run Number	106	107	108	109	110	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	6244	6199	6113	6260	6114	6182
Vehs Exited	6207	6199	6126	6229	6080	6168
Starting Vehs	346	373	349	353	344	348
Ending Vehs	383	373	336	384	378	368
Travel Distance (mi)	8840	8743	8625	8816	8696	8744
Travel Time (hr)	393.6	380.4	369.0	378.6	367.9	377.9
Total Delay (hr)	147.4	136.4	127.9	132.6	125.2	133.9
Total Stops	8714	8567	8682	8953	9093	8801
Fuel Used (gal)	321.6	317.3	310.2	318.9	313.7	316.4

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	106	107	108	109	110	Avg
Vehs Entered	1520	1474	1484	1532	1468	1488
Vehs Exited	1530	1536	1482	1513	1474	1505
Starting Vehs	346	373	349	353	344	348
Ending Vehs	336	311	351	372	338	337
Travel Distance (mi)	2154	2116	2130	2158	2141	2140
Travel Time (hr)	90.3	87.1	87.1	87.8	86.1	87.7
Total Delay (hr)	30.5	28.3	27.8	27.7	26.3	28.1
Total Stops	2269	2135	2233	2216	2213	2209
Fuel Used (gal)	77.1	76.0	76.1	77.2	76.3	76.6

Interval #2 Information Recording2

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	106	107	108	109	110	Avg
Vehs Entered	1662	1653	1683	1671	1633	1657
Vehs Exited	1600	1552	1607	1644	1574	1592
Starting Vehs	336	311	351	372	338	337
Ending Vehs	398	412	427	399	397	400
Travel Distance (mi)	2318	2213	2302	2318	2257	2282
Travel Time (hr)	100.1	97.6	99.1	99.6	94.3	98.1
Total Delay (hr)	35.5	35.5	35.0	35.1	31.6	34.5
Total Stops	2437	2186	2301	2488	2288	2338
Fuel Used (gal)	84.0	80.6	82.7	84.3	81.1	82.6

Interval #3 Information Recording3

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	106	107	108	109	110	Avg
Vehs Entered	1536	1547	1489	1519	1486	1515
Vehs Exited	1548	1557	1567	1515	1515	1539
Starting Vehs	398	412	427	399	397	400
Ending Vehs	386	402	349	403	368	374
Travel Distance (mi)	2210	2244	2155	2199	2129	2187
Travel Time (hr)	101.3	101.3	99.4	96.4	95.4	98.8
Total Delay (hr)	39.9	38.9	39.0	35.2	35.8	37.8
Total Stops	2000	2065	2108	2181	2362	2143
Fuel Used (gal)	80.6	81.9	78.6	79.7	78.1	79.8

Interval #4 Information Recording4

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	106	107	108	109	110	Avg
Vehs Entered	1526	1525	1457	1538	1527	1514
Vehs Exited	1529	1554	1470	1557	1517	1524
Starting Vehs	386	402	349	403	368	374
Ending Vehs	383	373	336	384	378	368
Travel Distance (mi)	2158	2170	2037	2142	2169	2135
Travel Time (hr)	101.9	94.4	83.4	94.8	92.0	93.3
Total Delay (hr)	41.5	33.7	26.1	34.7	31.5	33.5
Total Stops	2008	2181	2040	2068	2230	2105
Fuel Used (gal)	79.8	78.8	72.7	77.6	78.2	77.5

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	101	301	360	220	316	312	259	151	112	165	500
Average Queue (ft)	11	188	206	114	142	157	135	81	38	55	260
95th Queue (ft)	54	282	323	199	266	276	229	139	77	152	513
Link Distance (ft)		1478	1478		5042	5042		1246			602
Upstream Blk Time (%)											2
Queuing Penalty (veh)											0
Storage Bay Dist (ft)	175			200			375		300	140	
Storage Blk Time (%)		8		2	2					0	46
Queuing Penalty (veh)		1		8	4					0	15

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	L	TR
Maximum Queue (ft)	32	269	270	214	316	398	404	156	140	39	46
Average Queue (ft)	4	84	92	39	142	119	135	74	52	8	15
95th Queue (ft)	19	186	192	110	251	281	295	133	105	30	38
Link Distance (ft)		5042	5042			594	594	3272	3272		356
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250			200	350					75	
Storage Blk Time (%)		0	1	0	0	1				0	
Queuing Penalty (veh)		0	1	0	0	2				0	

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	31	53	50
Average Queue (ft)	2	12	13
95th Queue (ft)	17	39	38
Link Distance (ft)			685
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	150	200	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	60	201	248	74	285	267	108	105	111	119
Average Queue (ft)	23	66	90	14	95	100	50	39	45	47
95th Queue (ft)	52	150	182	45	198	195	92	79	89	89
Link Distance (ft)		1100	1100		813	813		422		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	87	210	335	354	165	53	79	294	280	132	109	105
Average Queue (ft)	23	51	163	188	45	14	34	174	171	37	49	53
95th Queue (ft)	62	126	290	308	123	42	67	267	266	94	91	95
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)			2	0	0							
Queuing Penalty (veh)			1	0	0							

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	96	99	259	185	280
Average Queue (ft)	43	41	117	97	131
95th Queue (ft)	80	87	202	169	228
Link Distance (ft)	873	873		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	22	67	33
Average Queue (ft)	2	24	14
95th Queue (ft)	12	56	38
Link Distance (ft)			746
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	230	260	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	L	T	TR	LT	R	L	TR
Maximum Queue (ft)	22	217	287	104	53	78	118	155	173	216	52	27
Average Queue (ft)	4	58	82	10	7	31	40	55	69	81	11	5
95th Queue (ft)	16	149	199	51	31	69	94	115	141	159	39	16
Link Distance (ft)		1250	1250				950	950		738		362
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	240			130	225	225			170		90	
Storage Blk Time (%)		0	3	0					1	1	0	
Queuing Penalty (veh)		0	2	0					1	1	0	

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	86	195	206	119	30	260	247	159	314	182	206
Average Queue (ft)	28	75	91	46	6	134	117	131	89	76	68
95th Queue (ft)	67	168	182	92	23	231	221	180	267	145	147
Link Distance (ft)		950	950			1290	1290		713		1359
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	240			300	240			135		170	
Storage Blk Time (%)		0				0		24		1	1
Queuing Penalty (veh)		0				0		9		1	1

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	WB	NB	NB
Directions Served	R	L	L	R
Maximum Queue (ft)	58	71	235	812
Average Queue (ft)	2	23	211	521
95th Queue (ft)	31	58	293	1036
Link Distance (ft)				808
Upstream Blk Time (%)				34
Queuing Penalty (veh)				0
Storage Bay Dist (ft)	240	190	210	
Storage Blk Time (%)			74	0
Queuing Penalty (veh)			69	0

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	SB	SB
Directions Served	L	TR	L	TR	L	TR
Maximum Queue (ft)	42	52	39	68	5	22
Average Queue (ft)	8	13	14	23	0	1
95th Queue (ft)	31	39	35	52	4	10
Link Distance (ft)		781		930		873
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150		150	
Storage Blk Time (%)						
Queuing Penalty (veh)						

Zone Summary

Zone wide Queuing Penalty: 117

Summary of All Intervals

Run Number	116	117	118	119	120	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5332	5667	5615	5497	5509	5528
Vehs Exited	5331	5671	5635	5477	5513	5525
Starting Vehs	261	297	282	279	274	278
Ending Vehs	262	293	262	299	270	276
Travel Distance (mi)	7192	7571	7519	7438	7473	7438
Travel Time (hr)	284.7	304.4	299.1	303.1	300.4	298.3
Total Delay (hr)	85.3	95.0	90.4	97.1	93.0	92.1
Total Stops	6392	7013	6720	6801	6793	6744
Fuel Used (gal)	254.9	271.6	267.8	267.0	267.7	265.8

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	116	117	118	119	120	Avg
Vehs Entered	1332	1348	1360	1313	1337	1337
Vehs Exited	1292	1364	1329	1300	1318	1318
Starting Vehs	261	297	282	279	274	278
Ending Vehs	301	281	313	292	293	293
Travel Distance (mi)	1799	1796	1860	1807	1839	1820
Travel Time (hr)	70.3	72.2	73.6	71.3	73.4	72.2
Total Delay (hr)	20.3	22.3	22.3	21.4	22.2	21.7
Total Stops	1593	1667	1659	1633	1640	1634
Fuel Used (gal)	63.4	63.8	66.4	64.6	66.1	64.9

Interval #2 Information Recording2

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	116	117	118	119	120	Avg
Vehs Entered	1519	1604	1651	1525	1540	1567
Vehs Exited	1492	1554	1633	1496	1496	1536
Starting Vehs	301	281	313	292	293	293
Ending Vehs	328	331	331	321	337	327
Travel Distance (mi)	1943	2029	2130	1964	2044	2022
Travel Time (hr)	79.9	82.0	87.3	82.1	84.4	83.1
Total Delay (hr)	25.6	25.8	27.9	27.1	27.7	26.8
Total Stops	1822	1907	2017	1889	1925	1909
Fuel Used (gal)	69.5	73.5	76.4	71.1	73.1	72.7

Interval #3 Information Recording3

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	116	117	118	119	120	Avg
Vehs Entered	1256	1361	1301	1322	1327	1311
Vehs Exited	1330	1413	1379	1335	1362	1362
Starting Vehs	328	331	331	321	337	327
Ending Vehs	254	279	253	308	302	275
Travel Distance (mi)	1758	1929	1790	1824	1848	1830
Travel Time (hr)	68.7	78.6	71.3	76.0	73.1	73.5
Total Delay (hr)	20.0	25.2	21.5	25.6	22.0	22.9
Total Stops	1532	1837	1570	1704	1628	1652
Fuel Used (gal)	61.8	69.8	63.8	65.7	66.3	65.5

Interval #4 Information Recording4

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	116	117	118	119	120	Avg
Vehs Entered	1225	1354	1303	1337	1305	1302
Vehs Exited	1217	1340	1294	1346	1337	1304
Starting Vehs	254	279	253	308	302	275
Ending Vehs	262	293	262	299	270	276
Travel Distance (mi)	1692	1817	1739	1842	1743	1767
Travel Time (hr)	65.8	71.7	66.9	73.7	69.5	69.5
Total Delay (hr)	19.3	21.6	18.7	23.0	21.0	20.7
Total Stops	1445	1602	1474	1575	1600	1541
Fuel Used (gal)	60.1	64.6	61.1	65.6	62.1	62.7

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	33	254	271	145	230	244	159	183	99	82	114
Average Queue (ft)	7	142	143	41	66	88	67	84	45	25	50
95th Queue (ft)	28	229	239	95	168	189	124	155	80	66	95
Link Distance (ft)		1478	1478		5034	5034		1246			602
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	175			200			375		300	140	
Storage Blk Time (%)		3			0						0
Queuing Penalty (veh)		0			0						0

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	L
Maximum Queue (ft)	29	168	163	83	134	298	344	157	209	27
Average Queue (ft)	6	65	68	27	52	77	99	65	93	2
95th Queue (ft)	22	133	138	63	107	208	227	131	163	14
Link Distance (ft)		5034	5034			600	600		3270	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	250			200	350			200		75
Storage Blk Time (%)			0			0		0	0	
Queuing Penalty (veh)			0			0		1	0	

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	EB	SB	SB
Directions Served	L	T	L	R
Maximum Queue (ft)	37	11	52	55
Average Queue (ft)	5	0	8	7
95th Queue (ft)	24	8	37	33
Link Distance (ft)		600		685
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	150		200	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	81	183	204	98	205	200	68	50	165	87
Average Queue (ft)	39	63	87	36	56	64	15	11	51	29
95th Queue (ft)	71	141	174	77	157	156	45	37	120	66
Link Distance (ft)		1102	1102		813	813		401		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	124	273	363	396	69	72	111	335	339	230	148	165
Average Queue (ft)	37	69	166	194	14	9	32	144	141	69	67	83
95th Queue (ft)	88	166	306	337	51	41	84	272	274	162	126	140
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)			3	0				0	0	0		
Queuing Penalty (veh)			2	0				0	0	0		

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	263	289	312	344	278
Average Queue (ft)	118	136	199	140	130
95th Queue (ft)	206	246	334	355	295
Link Distance (ft)	903	903		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)	0		9	0	
Queuing Penalty (veh)	0		8	0	

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	EB	WB	NB	NB
Directions Served	TR	L	L	R
Maximum Queue (ft)	19	69	122	76
Average Queue (ft)	1	14	38	21
95th Queue (ft)	10	52	98	64
Link Distance (ft)	1225			746
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)		230	260	
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	L	T	TR	LT	R	L	TR
Maximum Queue (ft)	81	280	362	145	202	214	210	183	143	151	15	44
Average Queue (ft)	5	78	107	32	77	103	29	41	43	42	1	3
95th Queue (ft)	44	189	246	107	162	178	111	116	105	103	9	20
Link Distance (ft)		1250	1250				950	950		738		362
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	240			130	225	225			170		90	
Storage Blk Time (%)		0	4	0	0	0	0		0	0		0
Queuing Penalty (veh)		0	5	0	1	2	0		0	0		0

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	180	313	354	293	174	354	331	160	575	130	88
Average Queue (ft)	72	113	128	63	35	178	155	148	258	40	25
95th Queue (ft)	150	268	291	193	120	324	291	183	523	101	71
Link Distance (ft)		950	950			1290	1290		713		1359
Upstream Blk Time (%)									0		
Queuing Penalty (veh)									0		
Storage Bay Dist (ft)	240			300	240			135		170	
Storage Blk Time (%)	0	2	0	0		3		43	1		
Queuing Penalty (veh)	0	1	1	0		1		29	2		

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	EB	WB	NB	NB
Directions Served	T	R	L	L	R
Maximum Queue (ft)	13	132	100	145	113
Average Queue (ft)	1	12	36	58	48
95th Queue (ft)	7	74	80	111	87
Link Distance (ft)	372				552
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)		240	190	210	
Storage Blk Time (%)				0	
Queuing Penalty (veh)				0	

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	52	71	29	52	26	24	45	427
Average Queue (ft)	15	25	2	6	3	0	5	15
95th Queue (ft)	43	57	15	28	16	2	27	224
Link Distance (ft)		802		1330		1017		903
Upstream Blk Time (%)								0
Queuing Penalty (veh)								0
Storage Bay Dist (ft)	150		150		150		150	
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 12: Blake Road & Cipole Road

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	23	49
Average Queue (ft)	1	9
95th Queue (ft)	9	32
Link Distance (ft)		546
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 56

Summary of All Intervals

Run Number	126	127	128	129	130	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	6257	6236	6173	6323	6422	6284
Vehs Exited	6229	6244	6125	6309	6368	6256
Starting Vehs	333	354	309	345	338	335
Ending Vehs	361	346	357	359	392	359
Travel Distance (mi)	8870	8819	8616	8940	8943	8838
Travel Time (hr)	376.3	386.6	368.9	372.0	395.0	379.8
Total Delay (hr)	129.0	140.2	128.5	123.0	145.1	133.2
Total Stops	9009	8967	8337	9056	9232	8927
Fuel Used (gal)	319.4	320.3	309.5	321.9	326.9	319.6

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	126	127	128	129	130	Avg
Vehs Entered	1557	1559	1584	1534	1617	1565
Vehs Exited	1504	1575	1528	1532	1563	1540
Starting Vehs	333	354	309	345	338	335
Ending Vehs	386	338	365	347	392	362
Travel Distance (mi)	2189	2235	2163	2224	2279	2218
Travel Time (hr)	90.6	91.4	88.9	91.0	94.0	91.2
Total Delay (hr)	29.6	29.5	28.5	29.2	30.4	29.4
Total Stops	2251	2241	2140	2261	2310	2240
Fuel Used (gal)	78.4	79.7	77.1	80.0	82.2	79.5

Interval #2 Information Recording2

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	126	127	128	129	130	Avg
Vehs Entered	1651	1652	1661	1668	1693	1665
Vehs Exited	1623	1577	1618	1608	1672	1621
Starting Vehs	386	338	365	347	392	362
Ending Vehs	414	413	408	407	413	401
Travel Distance (mi)	2276	2284	2303	2293	2289	2289
Travel Time (hr)	99.3	102.6	97.4	94.6	101.1	99.0
Total Delay (hr)	35.9	38.5	33.2	31.2	36.9	35.1
Total Stops	2361	2438	2287	2268	2423	2360
Fuel Used (gal)	82.6	83.2	82.9	82.2	83.0	82.8

Interval #3 Information Recording3

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	126	127	128	129	130	Avg
Vehs Entered	1563	1545	1454	1582	1557	1540
Vehs Exited	1595	1610	1512	1624	1580	1583
Starting Vehs	414	413	408	407	413	401
Ending Vehs	382	348	350	365	390	358
Travel Distance (mi)	2271	2247	2070	2250	2209	2209
Travel Time (hr)	98.8	99.3	92.2	96.4	101.0	97.6
Total Delay (hr)	35.6	36.3	34.5	33.3	39.3	35.8
Total Stops	2240	2152	1928	2329	2339	2194
Fuel Used (gal)	82.5	81.7	74.8	81.8	81.8	80.5

Interval #4 Information Recording4

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	126	127	128	129	130	Avg
Vehs Entered	1486	1480	1474	1539	1555	1506
Vehs Exited	1507	1482	1467	1545	1553	1511
Starting Vehs	382	348	350	365	390	358
Ending Vehs	361	346	357	359	392	359
Travel Distance (mi)	2135	2053	2080	2173	2167	2121
Travel Time (hr)	87.6	93.3	90.4	90.0	98.9	92.0
Total Delay (hr)	27.9	35.9	32.3	29.4	38.5	32.8
Total Stops	2157	2136	1982	2198	2160	2120
Fuel Used (gal)	75.9	75.6	74.7	77.9	79.9	76.8

Intersection: 1: Langer Farms Pkwy & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	T	R	L	TR
Maximum Queue (ft)	131	314	337	224	331	323	268	156	94	165	482
Average Queue (ft)	14	192	204	127	134	149	144	77	42	62	309
95th Queue (ft)	76	291	316	214	266	273	240	127	74	167	582
Link Distance (ft)		1478	1478		5042	5042		1246			602
Upstream Blk Time (%)											11
Queuing Penalty (veh)											0
Storage Bay Dist (ft)	175			200			375		300	140	
Storage Blk Time (%)		9		3	2					0	60
Queuing Penalty (veh)		1		13	4					0	20

Intersection: 2: Oregon St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	LT	R	L	TR
Maximum Queue (ft)	81	265	285	195	284	306	304	192	138	39	47
Average Queue (ft)	9	85	93	43	145	112	123	84	48	11	15
95th Queue (ft)	50	185	207	127	254	244	249	155	102	35	40
Link Distance (ft)		5042	5042			594	594	3272	3272		356
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	250			200	350					75	
Storage Blk Time (%)		0	1	0	0	0				0	
Queuing Penalty (veh)		0	1	0	1	0				0	

Intersection: 3: Tualatin-Sherwood Rd & Wildrose Pl

Movement	EB	SB	SB
Directions Served	L	L	R
Maximum Queue (ft)	28	52	70
Average Queue (ft)	2	11	16
95th Queue (ft)	15	37	48
Link Distance (ft)			685
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	150	200	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	71	166	214	42	265	266	105	83	111	104
Average Queue (ft)	23	60	84	12	92	99	36	30	45	46
95th Queue (ft)	54	129	168	35	193	210	83	65	89	85
Link Distance (ft)		1100	1100		813	813		422		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	75	233	338	374	131	66	92	307	326	114	96	115
Average Queue (ft)	21	49	170	191	35	13	35	169	164	35	45	50
95th Queue (ft)	55	136	294	314	87	42	68	266	270	85	82	93
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)			2	0								
Queuing Penalty (veh)			1	0								

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	116	138	250	233	295
Average Queue (ft)	48	51	124	102	146
95th Queue (ft)	95	103	213	190	261
Link Distance (ft)	873	873		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 6: 120th Ave & Tualatin-Sherwood Rd

Movement	WB	NB	NB
Directions Served	L	L	R
Maximum Queue (ft)	22	63	42
Average Queue (ft)	2	26	13
95th Queue (ft)	13	58	37
Link Distance (ft)			746
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (ft)	230	260	
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 7: 115th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	L	T	TR	LT	R	L	TR
Maximum Queue (ft)	33	260	294	130	53	104	160	176	166	193	47	20
Average Queue (ft)	5	81	107	16	7	37	45	59	68	80	11	5
95th Queue (ft)	21	199	232	79	29	85	112	131	141	159	33	16
Link Distance (ft)		1250	1250				950	950		738		362
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	240			130	225	225			170		90	
Storage Blk Time (%)		0	3	0					0	1		
Queuing Penalty (veh)		0	2	0					0	1		

Intersection: 8: 112th Ave/Avery St & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	T	R	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	102	192	203	129	29	317	301	160	357	160	170
Average Queue (ft)	29	72	88	45	4	136	117	130	99	77	61
95th Queue (ft)	76	160	166	90	20	247	227	184	287	140	127
Link Distance (ft)		950	950			1290	1290		713		1359
Upstream Blk Time (%)											
Queuing Penalty (veh)											
Storage Bay Dist (ft)	240			300	240			135		170	
Storage Blk Time (%)		0				1		25	0	1	0
Queuing Penalty (veh)		0				0		9	1	1	0

Intersection: 9: Tonquin Rd & Oregon St

Movement	EB	WB	NB	NB
Directions Served	R	L	L	R
Maximum Queue (ft)	56	86	235	787
Average Queue (ft)	2	29	217	460
95th Queue (ft)	30	72	285	936
Link Distance (ft)				808
Upstream Blk Time (%)				19
Queuing Penalty (veh)				0
Storage Bay Dist (ft)	240	190	210	
Storage Blk Time (%)			71	0
Queuing Penalty (veh)			66	0

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	42	61	42	59	20	10	10	16
Average Queue (ft)	18	21	13	21	1	1	1	1
95th Queue (ft)	44	48	35	48	10	10	7	12
Link Distance (ft)		781		930		1716		873
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		150		150		150	
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 12: Blake Road & Cipole Road

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	6	66
Average Queue (ft)	0	30
95th Queue (ft)	4	58
Link Distance (ft)		300
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 125

Appendix M Year 2021 Total Traffic Conditions – Alternative Access Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	11	855	193	75	495	38	112	118	140	26	58	7
Future Volume (vph)	11	855	193	75	495	38	112	118	140	26	58	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1795	1538	1703	1546		1751	1776	1568	1504	1760	
Flt Permitted	0.36	1.00	1.00	0.09	1.00		0.46	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	676	1795	1538	156	1546		844	1776	1568	1063	1760	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	12	972	219	85	562	43	127	134	159	30	66	8
RTOR Reduction (vph)	0	0	42	0	2	0	0	0	135	0	4	0
Lane Group Flow (vph)	13	972	177	85	604	0	127	134	24	30	70	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	62.8	61.1	72.6	68.6	64.0		22.8	15.2	15.2	10.9	7.3	
Effective Green, g (s)	62.8	61.1	72.6	68.6	64.0		22.8	15.2	15.2	10.9	7.3	
Actuated g/C Ratio	0.61	0.60	0.71	0.67	0.62		0.22	0.15	0.15	0.11	0.07	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	432	1069	1089	173	965		289	263	232	128	125	
v/s Ratio Prot	0.00	c0.54	0.02	c0.02	0.39		c0.05	c0.08		0.01	0.04	
v/s Ratio Perm	0.02		0.10	0.31			0.05		0.02	0.02		
v/c Ratio	0.03	0.91	0.16	0.49	0.63		0.44	0.51	0.10	0.23	0.56	
Uniform Delay, d1	8.4	18.3	4.9	18.1	11.9		33.5	40.2	37.7	41.8	46.1	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	11.4	0.0	0.8	1.3		0.4	6.5	0.8	0.3	3.4	
Delay (s)	8.4	29.6	5.0	18.9	13.2		33.9	46.7	38.6	42.1	49.5	
Level of Service	A	C	A	B	B		C	D	D	D	D	
Approach Delay (s)		24.9			13.9			39.7			47.3	
Approach LOS		C			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	25.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	102.5	Sum of lost time (s)	18.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	836	121	99	598	6	87	3	334	4	0	0
Future Volume (vph)	8	836	121	99	598	6	87	3	334	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	1729	1448	1556	1639			1531	1522	1442		
Flt Permitted	0.95	1.00	1.00	0.17	1.00			0.58	1.00	1.00		
Satd. Flow (perm)	1805	1729	1448	281	1639			929	1522	1518		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	880	127	104	629	6	92	3	352	4	0	0
RTOR Reduction (vph)	0	0	29	0	0	0	0	0	97	0	0	0
Lane Group Flow (vph)	8	880	98	104	635	0	0	95	255	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	43.2	43.2	48.8	44.1			6.8	14.1	2.1		
Effective Green, g (s)	0.7	43.2	43.2	48.8	44.1			6.8	14.1	2.1		
Actuated g/C Ratio	0.01	0.65	0.65	0.74	0.67			0.10	0.21	0.03		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	19	1129	946	348	1093			95	324	48		
v/s Ratio Prot	0.00	c0.51		0.03	0.39				c0.09			
v/s Ratio Perm			0.07	0.19				c0.10	0.08	0.00		
v/c Ratio	0.42	0.78	0.10	0.30	0.58			1.00	0.79	0.08		
Uniform Delay, d1	32.5	8.1	4.3	6.3	6.0			29.6	24.6	31.1		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	5.4	3.6	0.1	0.2	0.8			92.3	11.1	0.3		
Delay (s)	37.9	11.7	4.3	6.5	6.8			122.0	35.7	31.3		
Level of Service	D	B	A	A	A			F	D	C		
Approach Delay (s)		11.0			6.8			54.0			31.3	
Approach LOS		B			A			D			C	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	66.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1178	708	10	6	3
Future Volume (Veh/h)	10	1178	708	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1253	753	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.84				0.67	0.84
vC, conflicting volume	764				2034	758
vC1, stage 1 conf vol					758	
vC2, stage 2 conf vol					1275	
vCu, unblocked vol	624				1760	617
tC, single (s)	4.2				7.1	6.5
tC, 2 stage (s)					6.1	
tF (s)	2.3				4.1	3.6
p0 queue free %	99				95	99
cM capacity (veh/h)	773				128	368

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	11	1253	764	6	3
Volume Left	11	0	0	6	0
Volume Right	0	0	11	0	3
cSH	773	1700	1700	128	368
Volume to Capacity	0.01	0.74	0.45	0.05	0.01
Queue Length 95th (ft)	1	0	0	4	1
Control Delay (s)	9.7	0.0	0.0	34.6	14.9
Lane LOS	A			D	B
Approach Delay (s)	0.1		0.0	28.0	
Approach LOS				D	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	72.0%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1005	68	62	655	75	15	2	11	47	9	30
Future Volume (vph)	110	1005	68	62	655	75	15	2	11	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1721		1597	1639	1418	1597	1468		1289	1331	
Flt Permitted	0.35	1.00		0.17	1.00	1.00	0.73	1.00		0.75	1.00	
Satd. Flow (perm)	632	1721		279	1639	1418	1229	1468		1017	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1047	71	65	682	78	16	2	11	49	9	31
RTOR Reduction (vph)	0	1	0	0	0	14	0	10	0	0	29	0
Lane Group Flow (vph)	115	1117	0	65	682	64	16	3	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	125.3	118.5		122.6	117.4	117.4	11.8	11.8		11.3	11.3	
Effective Green, g (s)	125.3	118.5		122.6	117.4	117.4	11.8	11.8		11.3	11.3	
Actuated g/C Ratio	0.84	0.79		0.82	0.78	0.78	0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	576	1359		273	1282	1109	96	115		76	100	
v/s Ratio Prot	c0.01	c0.65		0.01	0.42	0.05		0.00			0.01	
v/s Ratio Perm	0.16			0.19			0.01			c0.05		
v/c Ratio	0.20	0.82		0.24	0.53	0.06	0.17	0.02		0.64	0.11	
Uniform Delay, d1	3.1	9.4		10.5	6.1	3.7	64.5	63.8		67.4	64.7	
Progression Factor	1.00	1.00		0.44	0.39	0.12	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	5.7		0.3	1.2	0.1	0.8	0.1		17.2	0.5	
Delay (s)	3.3	15.1		4.9	3.6	0.5	65.3	63.9		84.6	65.2	
Level of Service	A	B		A	A	A	E	E		F	E	
Approach Delay (s)		14.0			3.4			64.7			75.9	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	950	42	24	602	189	120	209	73	167	155	70
Future Volume (vph)	71	950	42	24	602	189	120	209	73	167	155	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1227	1203	1639	1367	1626	1583		1612	1696	1282
Flt Permitted	0.23	1.00	1.00	0.05	1.00	1.00	0.65	1.00		0.19	1.00	1.00
Satd. Flow (perm)	410	1729	1227	64	1639	1367	1113	1583		322	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	76	1022	45	26	647	203	129	225	78	180	167	75
RTOR Reduction (vph)	0	0	18	0	0	74	0	8	0	0	0	54
Lane Group Flow (vph)	76	1022	27	26	647	129	129	295	0	180	167	21
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	87.4	81.8	91.6	82.8	79.5	95.4	39.8	30.0		49.9	36.1	41.7
Effective Green, g (s)	87.4	81.8	91.6	82.8	79.5	95.4	39.8	30.0		49.9	36.1	41.7
Actuated g/C Ratio	0.58	0.55	0.61	0.55	0.53	0.64	0.27	0.20		0.33	0.24	0.28
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	285	942	749	60	868	869	328	316		243	408	356
v/s Ratio Prot	c0.01	c0.59	0.00	c0.01	0.39	0.02	0.03	c0.19		c0.08	0.10	0.00
v/s Ratio Perm	0.15		0.02	0.23		0.08	0.08			0.17		0.01
v/c Ratio	0.27	1.08	0.04	0.43	0.75	0.15	0.39	0.93		0.74	0.41	0.06
Uniform Delay, d1	18.6	34.1	11.6	34.8	27.4	11.0	44.0	59.0		39.7	48.0	39.7
Progression Factor	1.11	0.92	3.23	1.53	1.10	1.37	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	50.1	0.0	1.5	4.8	0.0	0.3	33.2		10.1	0.2	0.0
Delay (s)	20.8	81.6	37.6	54.8	34.9	15.0	44.3	92.2		49.8	48.2	39.8
Level of Service	C	F	D	D	C	B	D	F		D	D	D
Approach Delay (s)		75.9			30.9			77.9			47.4	
Approach LOS		E			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	58.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1150	39	11	815	17	15
Future Volume (Veh/h)	1150	39	11	815	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1223	41	12	867	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1264		2114	1223
vC1, stage 1 conf vol					1223	
vC2, stage 2 conf vol					891	
vCu, unblocked vol			1264		2114	1223
tC, single (s)			4.9		7.4	7.1
tC, 2 stage (s)					6.4	
tF (s)			2.9		4.4	4.1
p0 queue free %			97		88	89
cM capacity (veh/h)			349		146	144

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1223	41	12	867	18	16
Volume Left	0	0	12	0	18	0
Volume Right	0	41	0	0	0	16
cSH	1700	1700	349	1700	146	144
Volume to Capacity	0.72	0.02	0.03	0.51	0.12	0.11
Queue Length 95th (ft)	0	0	3	0	10	9
Control Delay (s)	0.0	0.0	15.7	0.0	33.1	33.2
Lane LOS			C		D	D
Approach Delay (s)	0.0		0.2		33.1	
Approach LOS					D	

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1031	129	197	784	10	40	0	84	3	1	2
Future Volume (vph)	5	1031	129	197	784	10	40	0	84	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	0.98	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1743	1242	2918	1676			1250	1145	1805	1010	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	1743	1242	2918	1676			995	1145	1385	1010	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	1109	139	212	843	11	43	0	90	3	1	2
RTOR Reduction (vph)	0	0	19	0	0	0	0	0	84	0	2	0
Lane Group Flow (vph)	5	1109	120	212	854	0	0	43	6	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Prot	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2	2	1	6			8			4	
Permitted Phases							8		8	4		
Actuated Green, G (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Effective Green, g (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.01	0.73	0.73	0.11	0.83			0.07	0.07	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	16	1272	906	309	1385			70	80	97	71	
v/s Ratio Prot	0.00	c0.64	0.10	c0.07	0.51						0.00	
v/s Ratio Perm								c0.04	0.01	0.00		
v/c Ratio	0.31	0.87	0.13	0.69	0.62			0.61	0.08	0.03	0.02	
Uniform Delay, d1	73.8	15.0	6.1	64.6	4.6			67.7	65.1	64.9	64.8	
Progression Factor	0.79	1.15	1.80	0.93	1.07			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.1	2.6	0.1	2.5	1.0			10.7	0.2	0.0	0.0	
Delay (s)	61.0	19.8	11.0	62.5	5.9			78.4	65.3	65.0	64.9	
Level of Service	E	B	B	E	A			E	E	E	E	
Approach Delay (s)		19.0			17.2			69.5			64.9	
Approach LOS		B			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	777	278	19	705	101	271	49	16	25	9	15
Future Volume (vph)	72	777	278	19	705	101	271	49	16	25	9	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00	0.98	1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	1667	1499	1543	1624	1491	1656	1709		1043	1128	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	1667	1499	1543	1624	1491	1656	1709		1043	1128	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	80	863	309	21	783	112	301	54	18	28	10	17
RTOR Reduction (vph)	0	0	39	0	0	42	0	9	0	0	17	0
Lane Group Flow (vph)	80	863	270	21	783	70	301	63	0	28	10	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	12.4	95.8	95.8	4.4	87.8	87.8	26.9	25.6		5.7	4.4	
Effective Green, g (s)	12.4	95.8	95.8	4.4	87.8	87.8	26.9	25.6		5.7	4.4	
Actuated g/C Ratio	0.08	0.64	0.64	0.03	0.59	0.59	0.18	0.17		0.04	0.03	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	142	1064	957	45	950	872	296	291		39	33	
v/s Ratio Prot	c0.05	c0.52		0.01	0.48		c0.18	c0.04		0.03	0.01	
v/s Ratio Perm			0.18			0.05						
v/c Ratio	0.56	0.81	0.28	0.47	0.82	0.08	1.02	0.22		0.72	0.32	
Uniform Delay, d1	66.2	20.3	11.9	71.6	24.9	13.5	61.5	53.6		71.4	71.3	
Progression Factor	1.23	0.52	0.34	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	4.0	0.4	2.8	8.1	0.2	56.7	0.1		40.9	2.0	
Delay (s)	83.3	14.6	4.5	74.4	33.0	13.7	118.2	53.7		112.2	73.4	
Level of Service	F	B	A	E	C	B	F	D		F	E	
Approach Delay (s)		16.5			31.6			105.8			93.1	
Approach LOS		B			C			F			F	

Intersection Summary			
HCM 2000 Control Delay	36.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	78.8%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	417	326	102	113	135	89
Future Volume (Veh/h)	417	326	102	113	135	89
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	474	370	116	128	153	101
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			474		834	474
vC1, stage 1 conf vol					474	
vC2, stage 2 conf vol					360	
vCu, unblocked vol			474		834	474
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			89		69	81
cM capacity (veh/h)			1028		494	544

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	474	370	116	128	153	101
Volume Left	0	0	116	0	153	0
Volume Right	0	370	0	0	0	101
cSH	1700	1700	1028	1700	494	544
Volume to Capacity	0.28	0.22	0.11	0.08	0.31	0.19
Queue Length 95th (ft)	0	0	10	0	33	17
Control Delay (s)	0.0	0.0	8.9	0.0	15.5	13.1
Lane LOS			A		C	B
Approach Delay (s)	0.0		4.3		14.6	
Approach LOS					B	

Intersection Summary			
Average Delay	3.5		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2021 - Total Cipole Extension AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles												
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	91	1.0	0.615	13.5	LOS B	4.9	123.6	0.77	0.83	29.3
18	R2	448	1.0	0.615	13.5	LOS B	4.9	123.6	0.77	0.83	27.9
Approach		539	1.0	0.615	13.5	LOS B	4.9	123.6	0.77	0.83	28.1
East: Oregon St											
1	L2	98	14.0	0.255	5.5	LOS A	1.2	32.9	0.26	0.13	32.5
6	T1	194	8.0	0.255	5.5	LOS A	1.2	32.9	0.26	0.13	32.1
Approach		292	10.0	0.255	5.5	LOS A	1.2	32.9	0.26	0.13	32.2
West: Oregon St.											
2	T1	427	2.0	0.407	7.0	LOS A	2.6	65.0	0.36	0.20	32.3
12	R2	65	2.0	0.407	7.0	LOS A	2.6	65.0	0.36	0.20	31.2
Approach		492	2.0	0.407	7.0	LOS A	2.6	65.0	0.36	0.20	32.2
All Vehicles		1322	3.4	0.615	9.3	LOS A	4.9	123.6	0.51	0.44	30.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	10	24	4	4	2	18	373	24	16	193	12
Future Volume (Veh/h)	27	10	24	4	4	2	18	373	24	16	193	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	29	11	26	4	4	2	19	401	26	17	208	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	692	714	214	726	707	414	221			427		
vC1, stage 1 conf vol	248	248		452	452							
vC2, stage 2 conf vol	443	465		274	255							
vCu, unblocked vol	636	660	126	672	653	414	133			427		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	94	98	97	99	99	100	99			98		
cM capacity (veh/h)	498	477	833	489	488	611	1287			1066		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	29	37	4	6	19	427	17	221
Volume Left	29	0	4	0	19	0	17	0
Volume Right	0	26	0	2	0	26	0	13
cSH	498	682	489	523	1287	1700	1066	1700
Volume to Capacity	0.06	0.05	0.01	0.01	0.01	0.25	0.02	0.13
Queue Length 95th (ft)	5	4	1	1	1	0	1	0
Control Delay (s)	12.7	10.6	12.4	12.0	7.8	0.0	8.4	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	11.5		12.1		0.3		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	53	16	18	8	6
Future Volume (Veh/h)	20	53	16	18	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	57	17	19	9	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				128	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				128	26
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				99	99
cM capacity (veh/h)	1507				829	1018

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	57	36	15
Volume Left	22	0	0	9
Volume Right	0	0	19	6
cSH	1507	1700	1700	896
Volume to Capacity	0.01	0.03	0.02	0.02
Queue Length 95th (ft)	1	0	0	1
Control Delay (s)	7.4	0.0	0.0	9.1
Lane LOS	A			A
Approach Delay (s)	2.1		0.0	9.1
Approach LOS				A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	13	653	255	214	897	23	208	113	112	32	191	13
Future Volume (vph)	13	653	255	214	897	23	208	113	112	32	191	13
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1778	1586	1770	1823		1786	1900	1568	1752	1851	
Flt Permitted	0.08	1.00	1.00	0.18	1.00		0.24	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	149	1778	1586	334	1823		453	1900	1568	1254	1851	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	14	695	271	228	954	24	221	120	119	34	203	14
RTOR Reduction (vph)	0	0	59	0	1	0	0	0	95	0	2	0
Lane Group Flow (vph)	14	695	212	228	977	0	221	120	24	34	215	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2	3	1	6		3	8		7	4	
Permitted Phases	2		2	6			8		8	4		
Actuated Green, G (s)	52.8	51.1	62.4	64.0	58.3		27.9	20.3	20.3	16.2	12.6	
Effective Green, g (s)	52.8	51.1	62.4	64.0	58.3		27.9	20.3	20.3	16.2	12.6	
Actuated g/C Ratio	0.52	0.50	0.61	0.63	0.57		0.27	0.20	0.20	0.16	0.12	
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5	1.5	1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	104	891	971	335	1042		271	378	312	216	228	
v/s Ratio Prot	0.00	0.39	0.02	c0.06	c0.54		c0.09	0.06		0.01	0.12	
v/s Ratio Perm	0.07		0.11	0.37			c0.13		0.02	0.02		
v/c Ratio	0.13	0.78	0.22	0.68	0.94		0.82	0.32	0.08	0.16	0.94	
Uniform Delay, d1	19.6	20.8	8.8	14.6	20.1		31.5	34.9	33.2	36.8	44.3	
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.2	4.6	0.0	4.5	15.2		16.2	2.1	0.4	0.1	43.5	
Delay (s)	19.8	25.4	8.9	19.1	35.3		47.6	36.9	33.6	36.9	87.8	
Level of Service	B	C	A	B	D		D	D	C	D	F	
Approach Delay (s)		20.8			32.3			41.2			80.9	
Approach LOS		C			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	34.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	101.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	90.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑	↱	↰	↑↱			↰↑	↱	↰	↑↱	
Traffic Volume (vph)	7	767	118	356	1005	8	126	1	159	11	10	8
Future Volume (vph)	7	767	118	356	1005	8	126	1	159	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1803	1830	1464	1770	1828			1739	1568	1805	1754	
Flt Permitted	0.95	1.00	1.00	0.11	1.00			0.26	1.00	0.67	1.00	
Satd. Flow (perm)	1803	1830	1464	201	1828			482	1568	1273	1754	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	825	127	383	1081	9	135	1	171	12	11	9
RTOR Reduction (vph)	0	0	36	0	0	0	0	0	89	0	8	0
Lane Group Flow (vph)	8	825	91	383	1090	0	0	136	82	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	49.5	49.5	61.4	56.7			15.1	33.1	6.0	6.0	
Effective Green, g (s)	0.7	49.5	49.5	61.4	56.7			15.1	33.1	6.0	6.0	
Actuated g/C Ratio	0.01	0.57	0.57	0.71	0.65			0.17	0.38	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	14	1041	832	466	1191			83	596	87	120	
v/s Ratio Prot	0.00	0.45		c0.17	c0.60				0.03		0.01	
v/s Ratio Perm			0.06	0.41				c0.28	0.02	0.01		
v/c Ratio	0.57	0.79	0.11	0.82	0.91			1.64	0.14	0.14	0.10	
Uniform Delay, d1	43.0	14.7	8.6	22.3	13.1			36.0	17.6	38.1	38.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	30.5	4.3	0.1	10.6	11.0			335.1	0.0	0.3	0.1	
Delay (s)	73.5	19.0	8.7	33.0	24.1			371.0	17.7	38.3	38.1	
Level of Service	E	B	A	C	C			F	B	D	D	
Approach Delay (s)		18.1			26.4			174.2			38.2	
Approach LOS		B			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	40.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	87.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	85.9%	ICU Level of Service	E
Analysis Period (min)	15		

! Phase conflict between lane groups.

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	945	1353	3	12	18
Future Volume (Veh/h)	3	945	1353	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	1016	1455	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.29				0.48	0.29
vC, conflicting volume	1460				2480	1458
vC1, stage 1 conf vol					1458	
vC2, stage 2 conf vol					1022	
vCu, unblocked vol	1362				1711	1357
tC, single (s)	4.4				6.5	6.3
tC, 2 stage (s)					5.5	
tF (s)	2.5				3.6	3.4
p0 queue free %	98				80	63
cM capacity (veh/h)	120				65	52

Direction, Lane #	EB 1	EB 2	WB 1	SB 1	SB 2
Volume Total	3	1016	1458	13	19
Volume Left	3	0	0	13	0
Volume Right	0	0	3	0	19
cSH	120	1700	1700	65	52
Volume to Capacity	0.02	0.60	0.86	0.20	0.37
Queue Length 95th (ft)	2	0	0	17	33
Control Delay (s)	35.6	0.0	0.0	73.2	110.8
Lane LOS	E			F	F
Approach Delay (s)	0.1		0.0	95.5	
Approach LOS				F	

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	81.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	909	18	17	1183	14	60	9	45	63	2	124
Future Volume (vph)	37	909	18	17	1183	14	60	9	45	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1805		1671	1830	1405	1671	1540		1703	1586	
Flt Permitted	0.04	1.00		0.20	1.00	1.00	0.46	1.00		0.72	1.00	
Satd. Flow (perm)	77	1805		352	1830	1405	815	1540		1288	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	988	20	18	1286	15	65	10	49	68	2	135
RTOR Reduction (vph)	0	0	0	0	0	4	0	44	0	0	120	0
Lane Group Flow (vph)	40	1008	0	18	1286	11	65	15	0	68	17	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	101.1	95.9		95.3	93.0	93.0	13.9	13.9		13.9	13.9	
Effective Green, g (s)	101.1	95.9		95.3	93.0	93.0	13.9	13.9		13.9	13.9	
Actuated g/C Ratio	0.80	0.76		0.75	0.73	0.73	0.11	0.11		0.11	0.11	
Clearance Time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	130	1367		288	1344	1032	89	169		141	174	
v/s Ratio Prot	c0.01	0.56		0.00	c0.70	0.01		0.01			0.01	
v/s Ratio Perm	0.23			0.05			c0.08			0.05		
v/c Ratio	0.31	0.74		0.06	0.96	0.01	0.73	0.09		0.48	0.10	
Uniform Delay, d1	31.1	8.4		7.8	15.0	4.5	54.5	50.7		53.0	50.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	2.1		0.1	15.3	0.0	26.2	0.2		2.6	0.2	
Delay (s)	32.4	10.5		7.9	30.3	4.5	80.8	50.9		55.6	50.9	
Level of Service	C	B		A	C	A	F	D		E	D	
Approach Delay (s)		11.4			29.7			66.5			52.5	
Approach LOS		B			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	126.6	Sum of lost time (s)	14.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	856	101	58	897	118	112	128	22	195	197	205
Future Volume (vph)	60	856	101	58	897	118	112	128	22	195	197	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1426	1805	1830	1550	1752	1821		1735	1827	1583
Flt Permitted	0.11	1.00	1.00	0.15	1.00	1.00	0.46	1.00		0.32	1.00	1.00
Satd. Flow (perm)	215	1812	1426	285	1830	1550	844	1821		576	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	892	105	60	934	123	117	133	23	203	205	214
RTOR Reduction (vph)	0	0	30	0	0	28	0	4	0	0	0	139
Lane Group Flow (vph)	63	892	75	60	934	95	117	152	0	203	205	75
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	99.0	92.6	103.1	96.4	91.3	107.9	27.9	17.4		38.0	23.5	29.9
Effective Green, g (s)	99.0	92.6	103.1	96.4	91.3	107.9	27.9	17.4		38.0	23.5	29.9
Actuated g/C Ratio	0.66	0.61	0.68	0.64	0.61	0.72	0.19	0.12		0.25	0.16	0.20
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	208	1113	975	233	1108	1109	219	210		272	284	314
v/s Ratio Prot	c0.01	0.49	0.01	0.01	c0.51	0.01	0.04	0.08		c0.08	0.11	0.01
v/s Ratio Perm	0.19		0.05	0.16		0.05	0.06			c0.11		0.04
v/c Ratio	0.30	0.80	0.08	0.26	0.84	0.09	0.53	0.73		0.75	0.72	0.24
Uniform Delay, d1	22.5	22.1	7.9	19.4	23.9	6.5	53.7	64.3		48.2	60.5	50.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	4.7	0.0	0.2	6.5	0.0	1.3	10.1		9.4	7.5	0.1
Delay (s)	22.8	26.8	7.9	19.6	30.4	6.5	55.0	74.4		57.6	67.9	51.0
Level of Service	C	C	A	B	C	A	D	E		E	E	D
Approach Delay (s)		24.7			27.2			66.1			58.7	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.7	Sum of lost time (s)	19.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1053	22	3	1026	27	17
Future Volume (Veh/h)	1053	22	3	1026	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1120	23	3	1091	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1143		2217	1120
vC1, stage 1 conf vol					1120	
vC2, stage 2 conf vol					1097	
vCu, unblocked vol			1143		2217	1120
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.2		3.5	3.3
p0 queue free %			100		87	93
cM capacity (veh/h)			619		223	254

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	1120	23	3	1091	29	18
Volume Left	0	0	3	0	29	0
Volume Right	0	23	0	0	0	18
cSH	1700	1700	619	1700	223	254
Volume to Capacity	0.66	0.01	0.00	0.64	0.13	0.07
Queue Length 95th (ft)	0	0	0	0	11	6
Control Delay (s)	0.0	0.0	10.8	0.0	23.6	20.3
Lane LOS			B		C	C
Approach Delay (s)	0.0		0.0		22.3	
Approach LOS					C	

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	65.4%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	998	60	52	903	16	111	0	229	16	1	15
Future Volume (vph)	12	998	60	52	903	16	111	0	229	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	1827	1533	2894	1840			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.54	1.00	
Satd. Flow (perm)	1805	1827	1533	2894	1840			1390	1568	1030	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1051	63	55	951	17	117	0	241	17	1	16
RTOR Reduction (vph)	0	0	15	0	0	0	0	0	155	0	14	0
Lane Group Flow (vph)	13	1051	48	55	968	0	0	117	86	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Effective Green, g (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Actuated g/C Ratio	0.02	0.72	0.72	0.05	0.74			0.12	0.12	0.12	0.12	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	1318	1106	130	1357			162	182	120	190	
v/s Ratio Prot	0.01	c0.58		c0.02	0.53						0.00	
v/s Ratio Perm			0.03					c0.08	0.06	0.02		
v/c Ratio	0.29	0.80	0.04	0.42	0.71			0.72	0.47	0.14	0.02	
Uniform Delay, d1	57.5	10.9	4.8	55.8	8.7			51.1	49.6	47.6	46.9	
Progression Factor	1.00	1.00	1.00	1.09	0.81			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	5.1	0.1	0.6	2.3			12.6	0.7	0.2	0.0	
Delay (s)	61.0	16.0	4.9	61.3	9.3			63.7	50.3	47.8	46.9	
Level of Service	E	B	A	E	A			E	D	D	D	
Approach Delay (s)		15.9			12.1			54.7			47.4	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	20.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	29	843	363	5	707	37	198	19	14	100	42	63
Future Volume (vph)	29	843	363	5	707	37	198	19	14	100	42	63
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.98	1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1810	1550	1805	1810	1436	1787	1648		1719	1728	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	1810	1550	1805	1810	1436	1787	1648		1719	1728	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	31	906	390	5	760	40	213	20	15	108	45	68
RTOR Reduction (vph)	0	0	55	0	0	16	0	14	0	0	47	0
Lane Group Flow (vph)	31	906	335	5	760	24	213	21	0	108	66	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2			6						
Actuated Green, G (s)	4.3	74.2	74.2	1.1	71.0	71.0	15.5	9.5		16.7	10.7	
Effective Green, g (s)	4.3	74.2	74.2	1.1	71.0	71.0	15.5	9.5		16.7	10.7	
Actuated g/C Ratio	0.04	0.62	0.62	0.01	0.59	0.59	0.13	0.08		0.14	0.09	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0	4.0	1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	64	1119	958	16	1070	849	230	130		239	154	
v/s Ratio Prot	c0.02	c0.50		0.00	0.42		c0.12	0.01		0.06	c0.04	
v/s Ratio Perm			0.22			0.02						
v/c Ratio	0.48	0.81	0.35	0.31	0.71	0.03	0.93	0.16		0.45	0.43	
Uniform Delay, d1	56.8	17.5	11.2	59.1	17.3	10.2	51.7	51.5		47.4	51.7	
Progression Factor	0.94	0.92	1.20	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.4	4.4	0.7	4.0	4.0	0.1	38.8	0.2		0.5	0.7	
Delay (s)	54.7	20.6	14.0	63.1	21.3	10.2	90.4	51.8		47.9	52.4	
Level of Service	D	C	B	E	C	B	F	D		D	D	
Approach Delay (s)		19.5			21.0			85.0			50.2	
Approach LOS		B			C			F			D	

Intersection Summary			
HCM 2000 Control Delay	28.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	191	149	137	452	360	88
Future Volume (Veh/h)	191	149	137	452	360	88
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	208	162	149	491	391	96
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			208		997	208
vC1, stage 1 conf vol					208	
vC2, stage 2 conf vol					789	
vCu, unblocked vol			208		997	208
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			89		0	88
cM capacity (veh/h)			1306		380	825

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	208	162	149	491	391	96
Volume Left	0	0	149	0	391	0
Volume Right	0	162	0	0	0	96
cSH	1700	1700	1306	1700	380	825
Volume to Capacity	0.12	0.10	0.11	0.29	1.03	0.12
Queue Length 95th (ft)	0	0	10	0	320	10
Control Delay (s)	0.0	0.0	8.1	0.0	87.2	9.9
Lane LOS			A		F	A
Approach Delay (s)	0.0		1.9		72.0	
Approach LOS					F	

Intersection Summary			
Average Delay	24.2		
Intersection Capacity Utilization	50.4%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2021 - Total Cipole Extension PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	91	1.0	0.231	5.4	LOS A	1.1	28.6	0.39	0.26	32.2
18	R2	162	4.0	0.231	5.4	LOS A	1.1	28.6	0.39	0.26	30.5
Approach		253	2.9	0.231	5.4	LOS A	1.1	28.6	0.39	0.26	31.1
East: Oregon St											
1	L2	421	1.0	0.687	12.4	LOS B	7.4	186.4	0.55	0.30	29.3
6	T1	434	1.0	0.687	12.4	LOS B	7.4	186.4	0.55	0.30	28.9
Approach		855	1.0	0.687	12.4	LOS B	7.4	186.4	0.55	0.30	29.1
West: Oregon St.											
2	T1	196	2.0	0.323	7.7	LOS A	1.6	39.8	0.59	0.53	31.9
12	R2	87	2.0	0.323	7.7	LOS A	1.6	39.8	0.59	0.53	30.8
Approach		283	2.0	0.323	7.7	LOS A	1.6	39.8	0.59	0.53	31.6
All Vehicles		1391	1.6	0.687	10.2	LOS B	7.4	186.4	0.53	0.34	29.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	5	27	22	14	16	5	220	3	2	310	44
Future Volume (Veh/h)	26	5	27	22	14	16	5	220	3	2	310	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	27	5	28	23	15	17	5	229	3	2	323	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	616	593	347	600	614	234	369			233		
vC1, stage 1 conf vol	350	350		242	242							
vC2, stage 2 conf vol	266	243		358	373							
vCu, unblocked vol	514	489	215	497	513	234	240			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	99	96	96	97	98	100			100		
cM capacity (veh/h)	583	570	733	582	557	796	1175			1316		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	27	33	23	32	5	232	2	369
Volume Left	27	0	23	0	5	0	2	0
Volume Right	0	28	0	17	0	3	0	46
cSH	583	702	582	663	1175	1700	1316	1700
Volume to Capacity	0.05	0.05	0.04	0.05	0.00	0.14	0.00	0.22
Queue Length 95th (ft)	4	4	3	4	0	0	0	0
Control Delay (s)	11.5	10.4	11.4	10.7	8.1	0.0	7.7	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	10.9		11.0		0.2		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	26	58	5	32	27
Future Volume (Veh/h)	4	26	58	5	32	27
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	4	27	60	5	33	28
Pedestrians			1		2	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	67				100	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	67				100	64
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				96	97
cM capacity (veh/h)	1494				879	981

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	4	27	65	61
Volume Left	4	0	0	33
Volume Right	0	0	5	28
cSH	1494	1700	1700	923
Volume to Capacity	0.00	0.02	0.04	0.07
Queue Length 95th (ft)	0	0	0	5
Control Delay (s)	7.4	0.0	0.0	9.2
Lane LOS	A			A
Approach Delay (s)	1.0		0.0	9.2
Approach LOS				A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix N Year 2025 Total Traffic Conditions – Alternative Access Scenario

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	943	203	79	549	40	118	125	147	27	61	8
Future Volume (vph)	12	943	203	79	549	40	118	125	147	27	61	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.97		1.00	0.99		1.00	1.00	0.85	1.00	0.98	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3336		1703	2951		1752	1776	1568	1504	1758	
Flt Permitted	0.40	1.00		0.11	1.00		0.45	1.00	1.00	0.67	1.00	
Satd. Flow (perm)	755	3336		203	2951		833	1776	1568	1055	1758	
Peak-hour factor, PHF	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
Adj. Flow (vph)	14	1072	231	90	624	45	134	142	167	31	69	9
RTOR Reduction (vph)	0	17	0	0	4	0	0	0	139	0	4	0
Lane Group Flow (vph)	14	1286	0	90	665	0	134	142	28	31	74	0
Confl. Peds. (#/hr)			2	2			1					1
Confl. Bikes (#/hr)			1									
Heavy Vehicles (%)	0%	5%	2%	6%	20%	29%	3%	7%	3%	20%	5%	14%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	46.4	45.7		53.8	49.4		21.9	14.5	14.5	10.5	7.1	
Effective Green, g (s)	46.4	45.7		53.8	49.4		21.9	14.5	14.5	10.5	7.1	
Actuated g/C Ratio	0.54	0.53		0.63	0.57		0.25	0.17	0.17	0.12	0.08	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5		1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	415	1772		203	1695		327	299	264	146	145	
v/s Ratio Prot	0.00	c0.39		c0.02	0.23		c0.05	c0.08		0.01	0.04	
v/s Ratio Perm	0.02			0.25			0.05		0.02	0.02		
v/c Ratio	0.03	0.73		0.44	0.39		0.41	0.47	0.11	0.21	0.51	
Uniform Delay, d1	9.2	15.4		10.4	10.1		26.0	32.3	30.3	33.8	37.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.0	1.6		0.6	0.2		0.3	5.0	0.8	0.3	1.3	
Delay (s)	9.2	16.9		11.0	10.2		26.3	37.3	31.0	34.1	39.1	
Level of Service	A	B		B	B		C	D	C	C	D	
Approach Delay (s)		16.8			10.3			31.6			37.7	
Approach LOS		B			B			C			D	

Intersection Summary			
HCM 2000 Control Delay	18.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	86.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	64.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	916	128	106	660	6	92	3	356	4	0	0
Future Volume (vph)	8	916	128	106	660	6	92	3	356	4	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95			1.00	1.00	1.00		
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	0.99	1.00		
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00		
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95		
Satd. Flow (prot)	1805	3299	1448	1556	3126			1530	1530	1443		
Flt Permitted	0.95	1.00	1.00	0.19	1.00			0.88	1.00	1.00		
Satd. Flow (perm)	1805	3299	1448	317	3126			1405	1530	1519		
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	8	964	135	112	695	6	97	3	375	4	0	0
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	74	0	0	0
Lane Group Flow (vph)	8	964	62	112	701	0	0	100	301	4	0	0
Confl. Peds. (#/hr)			1	1					1	1		
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	9%	9%	16%	15%	0%	19%	0%	5%	25%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm		
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.6	20.0	20.0	28.4	23.8			4.5	10.9	3.5		
Effective Green, g (s)	0.6	20.0	20.0	28.4	23.8			4.5	10.9	3.5		
Actuated g/C Ratio	0.01	0.46	0.46	0.65	0.55			0.10	0.25	0.08		
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0		
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0		
Lane Grp Cap (vph)	24	1520	667	390	1714			145	384	122		
v/s Ratio Prot	0.00	c0.29		0.04	0.22				c0.12			
v/s Ratio Perm			0.04	0.15				0.07	0.08	0.00		
v/c Ratio	0.33	0.63	0.09	0.29	0.41			0.69	0.78	0.03		
Uniform Delay, d1	21.2	8.9	6.6	3.7	5.7			18.8	15.1	18.4		
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00		
Incremental Delay, d2	3.0	0.9	0.1	0.1	0.2			10.4	9.3	0.0		
Delay (s)	24.2	9.8	6.7	3.8	5.9			29.2	24.4	18.4		
Level of Service	C	A	A	A	A			C	C	B		
Approach Delay (s)		9.5			5.6			25.4			18.4	
Approach LOS		A			A			C			B	

Intersection Summary			
HCM 2000 Control Delay	11.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	43.4	Sum of lost time (s)	14.5
Intersection Capacity Utilization	62.9%	ICU Level of Service	B
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	10	1298	785	10	6	3
Future Volume (Veh/h)	10	1298	785	10	6	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	11	1381	835	11	6	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.95				0.82	0.95
vC, conflicting volume	846				1553	423
vC1, stage 1 conf vol					840	
vC2, stage 2 conf vol					712	
vCu, unblocked vol	726				943	279
tC, single (s)	4.3				8.1	7.6
tC, 2 stage (s)					7.1	
tF (s)	2.3				4.2	3.6
p0 queue free %	99				98	99
cM capacity (veh/h)	779				270	600

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	11	690	690	557	289	6	3
Volume Left	11	0	0	0	0	6	0
Volume Right	0	0	0	0	11	0	3
cSH	779	1700	1700	1700	1700	270	600
Volume to Capacity	0.01	0.41	0.41	0.33	0.17	0.02	0.01
Queue Length 95th (ft)	1	0	0	0	0	2	0
Control Delay (s)	9.7	0.0	0.0	0.0	0.0	18.6	11.0
Lane LOS	A					C	B
Approach Delay (s)	0.1			0.0		16.1	
Approach LOS						C	

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	45.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1126	68	62	735	75	15	2	11	47	9	30
Future Volume (vph)	110	1126	68	62	735	75	15	2	11	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3288		1597	3088		1597	1468		1289	1331	
Flt Permitted	0.32	1.00		0.20	1.00		0.73	1.00		0.75	1.00	
Satd. Flow (perm)	567	3288		341	3088		1229	1468		1017	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1173	71	65	766	78	16	2	11	49	9	31
RTOR Reduction (vph)	0	2	0	0	4	0	0	10	0	0	29	0
Lane Group Flow (vph)	115	1242	0	65	840	0	16	3	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	125.3	118.2		122.4	117.0		11.9	11.9		11.4	11.4	
Effective Green, g (s)	125.3	118.2		122.4	117.0		11.9	11.9		11.4	11.4	
Actuated g/C Ratio	0.84	0.79		0.82	0.78		0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	527	2590		323	2408		97	116		77	101	
v/s Ratio Prot	c0.01	c0.38		0.01	0.27			0.00			0.01	
v/s Ratio Perm	0.17			0.16			0.01			c0.05		
v/c Ratio	0.22	0.48		0.20	0.35		0.16	0.02		0.64	0.11	
Uniform Delay, d1	2.4	5.4		3.2	5.0		64.4	63.7		67.3	64.6	
Progression Factor	1.00	1.00		0.86	0.88		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.6		0.3	0.4		0.8	0.1		16.0	0.5	
Delay (s)	2.6	6.1		3.0	4.7		65.2	63.8		83.2	65.1	
Level of Service	A	A		A	A		E	E		F	E	
Approach Delay (s)		5.8			4.6			64.6			75.1	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	1059	47	26	663	200	133	230	80	182	172	76
Future Volume (vph)	78	1059	47	26	663	200	133	230	80	182	172	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	3299	1252	2334	3127	1381	3155	3006		1612	2961	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.26	1.00	
Satd. Flow (perm)	3242	3299	1252	2334	3127	1381	3155	3006		449	2961	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	84	1139	51	28	713	215	143	247	86	196	185	82
RTOR Reduction (vph)	0	0	15	0	0	59	0	27	0	0	37	0
Lane Group Flow (vph)	84	1139	36	28	713	156	143	306	0	196	230	0
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	7.8	89.6	104.6	4.0	85.8	108.6	9.5	20.1		41.4	27.9	
Effective Green, g (s)	7.8	89.6	104.6	4.0	85.8	108.6	9.5	20.1		41.4	27.9	
Actuated g/C Ratio	0.05	0.60	0.70	0.03	0.57	0.72	0.06	0.13		0.28	0.19	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	168	1970	873	62	1788	999	199	402		258	550	
v/s Ratio Prot	c0.03	c0.35	0.03	0.01	0.23	0.11	0.05	0.10		c0.09	0.08	
v/s Ratio Perm										c0.12		
v/c Ratio	0.50	0.58	0.04	0.45	0.40	0.16	0.72	0.76		0.76	0.42	
Uniform Delay, d1	69.2	18.6	7.1	71.9	17.8	6.4	68.9	62.6		45.4	53.9	
Progression Factor	1.14	0.78	0.47	1.38	0.35	0.93	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.1	0.0	1.8	0.6	0.0	9.9	7.5		10.8	0.2	
Delay (s)	80.0	15.7	3.3	101.1	6.9	6.0	78.8	70.1		56.2	54.1	
Level of Service	E	B	A	F	A	A	E	E		E	D	
Approach Delay (s)		19.4			9.4			72.7			55.0	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1269	39	11	888	17	15
Future Volume (Veh/h)	1269	39	11	888	17	15
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1350	41	12	945	18	16
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1391		1867	696
vC1, stage 1 conf vol					1370	
vC2, stage 2 conf vol					496	
vCu, unblocked vol			1391		1867	696
tC, single (s)			5.7		8.8	8.8
tC, 2 stage (s)					7.8	
tF (s)			3.0		4.5	4.2
p0 queue free %			95		78	93
cM capacity (veh/h)			220		82	229

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	900	491	12	472	472	18	16
Volume Left	0	0	12	0	0	18	0
Volume Right	0	41	0	0	0	0	16
cSH	1700	1700	220	1700	1700	82	229
Volume to Capacity	0.53	0.29	0.05	0.28	0.28	0.22	0.07
Queue Length 95th (ft)	0	0	4	0	0	19	6
Control Delay (s)	0.0	0.0	22.3	0.0	0.0	61.1	21.9
Lane LOS			C			F	C
Approach Delay (s)	0.0		0.3			42.6	
Approach LOS						E	

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	46.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	5	1147	129	197	855	10	40	0	84	3	1	2
Future Volume (vph)	5	1147	129	197	855	10	40	0	84	3	1	2
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3312	1226	2918	3186			1251	1145	1805	1017	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.76	1.00	0.73	1.00	
Satd. Flow (perm)	1805	3312	1226	2918	3186			996	1145	1385	1017	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	5	1233	139	212	919	11	43	0	90	3	1	2
RTOR Reduction (vph)	0	0	23	0	0	0	0	0	84	0	2	0
Lane Group Flow (vph)	5	1233	116	212	930	0	0	43	6	3	1	0
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)			4			1						
Heavy Vehicles (%)	0%	9%	30%	20%	13%	20%	44%	0%	41%	0%	100%	50%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Effective Green, g (s)	1.4	109.5	109.5	15.9	124.0			10.6	10.6	10.6	10.6	
Actuated g/C Ratio	0.01	0.73	0.73	0.11	0.83			0.07	0.07	0.07	0.07	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	16	2417	894	309	2633			70	80	97	71	
v/s Ratio Prot	0.00	c0.37		c0.07	0.29						0.00	
v/s Ratio Perm			0.09					c0.04	0.01	0.00		
v/c Ratio	0.31	0.51	0.13	0.69	0.35			0.61	0.08	0.03	0.02	
Uniform Delay, d1	73.8	8.7	6.0	64.6	3.2			67.7	65.1	64.9	64.8	
Progression Factor	0.84	0.90	1.18	0.79	2.87			1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.1	0.6	0.2	3.9	0.3			10.7	0.2	0.0	0.0	
Delay (s)	71.2	8.5	7.4	55.1	9.4			78.4	65.3	65.0	64.9	
Level of Service	E	A	A	E	A			E	E	E	E	
Approach Delay (s)		8.6			17.9			69.5			64.9	
Approach LOS		A			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	15.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.0
Intersection Capacity Utilization	57.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	73	861	295	20	765	104	284	51	17	26	10	15
Future Volume (vph)	73	861	295	20	765	104	284	51	17	26	10	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	1.00		1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.96		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1719	3167	1499	1543	3057		1656	1709		1043	1153	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1719	3167	1499	1543	3057		1656	1709		1043	1153	
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	81	957	328	22	850	116	316	57	19	29	11	17
RTOR Reduction (vph)	0	0	150	0	7	0	0	8	0	0	16	0
Lane Group Flow (vph)	81	957	178	22	959	0	316	68	0	29	12	0
Confl. Peds. (#/hr)			1	1			1					1
Confl. Bikes (#/hr)			4			2						
Heavy Vehicles (%)	5%	14%	5%	17%	17%	6%	9%	3%	19%	73%	0%	80%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	12.3	81.5	81.5	4.4	73.6		41.1	39.4		6.2	4.5	
Effective Green, g (s)	12.3	81.5	81.5	4.4	73.6		41.1	39.4		6.2	4.5	
Actuated g/C Ratio	0.08	0.54	0.54	0.03	0.49		0.27	0.26		0.04	0.03	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0		1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	140	1720	814	45	1499		453	448		43	34	
v/s Ratio Prot	c0.05	0.30		0.01	c0.31		c0.19	0.04		0.03	c0.01	
v/s Ratio Perm			0.12									
v/c Ratio	0.58	0.56	0.22	0.49	0.64		0.70	0.15		0.67	0.34	
Uniform Delay, d1	66.4	22.4	17.8	71.7	28.4		48.9	42.5		70.9	71.3	
Progression Factor	1.11	1.43	4.27	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	3.2	1.2	0.6	3.0	2.1		3.8	0.1		28.1	2.2	
Delay (s)	77.0	33.2	76.4	74.7	30.5		52.6	42.5		99.0	73.4	
Level of Service	E	C	E	E	C		D	D		F	E	
Approach Delay (s)		46.2			31.4			50.7			86.4	
Approach LOS		D			C			D			F	

Intersection Summary			
HCM 2000 Control Delay	42.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	63.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	439	346	108	120	142	94
Future Volume (Veh/h)	439	346	108	120	142	94
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	499	393	123	136	161	107
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			499		881	499
vC1, stage 1 conf vol					499	
vC2, stage 2 conf vol					382	
vCu, unblocked vol			499		881	499
tC, single (s)			4.2		6.5	6.5
tC, 2 stage (s)					5.5	
tF (s)			2.3		3.6	3.5
p0 queue free %			88		66	80
cM capacity (veh/h)			1006		475	526

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	499	393	123	136	161	107
Volume Left	0	0	123	0	161	0
Volume Right	0	393	0	0	0	107
cSH	1700	1700	1006	1700	475	526
Volume to Capacity	0.29	0.23	0.12	0.08	0.34	0.20
Queue Length 95th (ft)	0	0	10	0	37	19
Control Delay (s)	0.0	0.0	9.1	0.0	16.4	13.6
Lane LOS			A		C	B
Approach Delay (s)	0.0		4.3		15.3	
Approach LOS					C	

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	47.0%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2025 - Total Cipole Extension AM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	95	1.0	0.666	15.5	LOS C	5.8	146.8	0.82	0.93	28.6
18	R2	474	1.0	0.666	15.5	LOS C	5.8	146.8	0.82	0.93	27.2
Approach		569	1.0	0.666	15.5	LOS C	5.8	146.8	0.82	0.93	27.4
East: Oregon St											
1	L2	104	14.0	0.271	5.7	LOS A	1.3	35.5	0.28	0.14	32.4
6	T1	205	8.0	0.271	5.7	LOS A	1.3	35.5	0.28	0.14	32.0
Approach		308	10.0	0.271	5.7	LOS A	1.3	35.5	0.28	0.14	32.1
West: Oregon St.											
2	T1	451	2.0	0.433	7.4	LOS A	2.8	71.2	0.39	0.22	32.1
12	R2	68	2.0	0.433	7.4	LOS A	2.8	71.2	0.39	0.22	31.0
Approach		519	2.0	0.433	7.4	LOS A	2.8	71.2	0.39	0.22	32.0
All Vehicles		1396	3.4	0.666	10.3	LOS B	5.8	146.8	0.54	0.49	30.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	10	24	4	4	2	18	414	24	16	217	12
Future Volume (Veh/h)	27	10	24	4	4	2	18	414	24	16	217	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	29	11	26	4	4	2	19	445	26	17	233	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	760	782	240	794	776	458	246			471		
vC1, stage 1 conf vol	274	274		496	496							
vC2, stage 2 conf vol	487	509		298	280							
vCu, unblocked vol	698	722	133	735	715	458	140			471		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	94	98	97	99	99	100	98			98		
cM capacity (veh/h)	468	452	814	460	464	577	1260			1026		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	29	37	4	6	19	471	17	246
Volume Left	29	0	4	0	19	0	17	0
Volume Right	0	26	0	2	0	26	0	13
cSH	468	657	460	496	1260	1700	1026	1700
Volume to Capacity	0.06	0.06	0.01	0.01	0.02	0.28	0.02	0.14
Queue Length 95th (ft)	5	4	1	1	1	0	1	0
Control Delay (s)	13.2	10.8	12.9	12.3	7.9	0.0	8.6	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	11.9		12.6		0.3		0.6	
Approach LOS	B		B					

Intersection Summary				
Average Delay	1.5			
Intersection Capacity Utilization	38.1%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	53	16	18	8	6
Future Volume (Veh/h)	20	53	16	18	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	57	17	19	9	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				128	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				128	26
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				99	99
cM capacity (veh/h)	1507				829	1018

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	57	36	15
Volume Left	22	0	0	9
Volume Right	0	0	19	6
cSH	1507	1700	1700	896
Volume to Capacity	0.01	0.03	0.02	0.02
Queue Length 95th (ft)	1	0	0	1
Control Delay (s)	7.4	0.0	0.0	9.1
Lane LOS	A			A
Approach Delay (s)	2.1		0.0	9.1
Approach LOS				A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	14	725	269	225	989	24	219	119	119	34	202	14
Future Volume (vph)	14	725	269	225	989	24	219	119	119	34	202	14
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt	1.00	0.96		1.00	1.00		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3296		1770	3479		1787	1900	1568	1752	1853	
Flt Permitted	0.22	1.00		0.13	1.00		0.26	1.00	1.00	0.68	1.00	
Satd. Flow (perm)	410	3296		236	3479		496	1900	1568	1246	1853	
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	15	771	286	239	1052	26	233	127	127	36	215	15
RTOR Reduction (vph)	0	39	0	0	1	0	0	0	94	0	2	0
Lane Group Flow (vph)	15	1018	0	239	1077	0	233	127	33	36	228	0
Confl. Peds. (#/hr)	1					1	2					2
Confl. Bikes (#/hr)												1
Heavy Vehicles (%)	0%	6%	1%	2%	3%	0%	1%	0%	3%	3%	1%	8%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	Perm	pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8		8	4		
Actuated Green, G (s)	40.9	40.1		53.6	48.8		32.3	24.9	24.9	19.1	15.7	
Effective Green, g (s)	40.9	40.1		53.6	48.8		32.3	24.9	24.9	19.1	15.7	
Actuated g/C Ratio	0.43	0.42		0.56	0.51		0.34	0.26	0.26	0.20	0.16	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	4.5	4.5	4.0	4.5	
Vehicle Extension (s)	1.5	3.5		1.5	3.5		1.5	8.0	8.0	1.5	2.0	
Lane Grp Cap (vph)	186	1378		283	1770		336	493	407	266	303	
v/s Ratio Prot	0.00	0.31		c0.08	0.31		c0.09	0.07		0.00	0.12	
v/s Ratio Perm	0.03			c0.39			c0.14		0.02	0.02		
v/c Ratio	0.08	0.74		0.84	0.61		0.69	0.26	0.08	0.14	0.75	
Uniform Delay, d1	16.2	23.5		16.5	16.8		25.1	28.2	26.8	31.4	38.3	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2	0.1	2.2		19.3	0.6		4.9	1.2	0.4	0.1	9.1	
Delay (s)	16.3	25.7		35.8	17.4		30.0	29.4	27.2	31.5	47.3	
Level of Service	B	C		D	B		C	C	C	C	D	
Approach Delay (s)		25.5			20.7			29.1			45.2	
Approach LOS		C			C			C			D	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	95.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	7	847	126	380	1103	8	133	1	170	11	10	8
Future Volume (vph)	7	847	126	380	1103	8	133	1	170	11	10	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00			1.00	1.00	1.00	0.99	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.93	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1804	3491	1464	1770	3487			1740	1568	1805	1762	
Flt Permitted	0.95	1.00	1.00	0.18	1.00			0.42	1.00	0.85	1.00	
Satd. Flow (perm)	1804	3491	1464	333	3487			758	1568	1617	1762	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	8	911	135	409	1186	9	143	1	183	12	11	9
RTOR Reduction (vph)	0	0	76	0	0	0	0	0	61	0	8	0
Lane Group Flow (vph)	8	911	59	409	1195	0	0	144	122	12	12	0
Confl. Peds. (#/hr)	2					2	1					1
Confl. Bikes (#/hr)			1			3						
Heavy Vehicles (%)	0%	3%	8%	2%	3%	0%	4%	0%	3%	0%	0%	0%
Bus Blockages (#/hr)	0	2	0	0	2	0	0	0	0	0	0	0
Turn Type	Prot	NA	Perm	pm+pt	NA		Perm	NA	pm+ov	Perm	NA	
Protected Phases	5!	2!		1!	6!			8!	1		4!	
Permitted Phases			2	6!			8!		8	4!		
Actuated Green, G (s)	0.7	24.3	24.3	35.5	30.8			9.6	22.7	4.7	4.7	
Effective Green, g (s)	0.7	24.3	24.3	35.5	30.8			9.6	22.7	4.7	4.7	
Actuated g/C Ratio	0.01	0.44	0.44	0.64	0.55			0.17	0.41	0.08	0.08	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5			5.0	4.0	4.0	4.0	
Vehicle Extension (s)	1.0	3.5	3.5	1.0	3.5			1.0	1.0	1.0	1.0	
Lane Grp Cap (vph)	22	1525	639	551	1931			130	640	136	148	
v/s Ratio Prot	0.00	0.26		c0.17	0.34				0.04		0.01	
v/s Ratio Perm			0.04	c0.30				c0.19	0.03	0.01		
v/c Ratio	0.36	0.60	0.09	0.74	0.62			1.11	0.19	0.09	0.08	
Uniform Delay, d1	27.2	11.9	9.2	9.2	8.4			23.0	10.6	23.5	23.5	
Progression Factor	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.7	0.7	0.1	4.7	0.6			110.8	0.1	0.1	0.1	
Delay (s)	30.9	12.6	9.3	13.9	9.0			133.8	10.6	23.6	23.5	
Level of Service	C	B	A	B	A			F	B	C	C	
Approach Delay (s)		12.3			10.3			64.8			23.6	
Approach LOS		B			B			E			C	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	55.6	Sum of lost time (s)	14.5
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		

! Phase conflict between lane groups.
c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	1048	1494	3	12	18
Future Volume (Veh/h)	3	1048	1494	3	12	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	3	1127	1606	3	13	19
Pedestrians					2	
Lane Width (ft)					12.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					0	
Right turn flare (veh)						
Median type		None	TWLTL			
Median storage veh)			2			
Upstream signal (ft)		676	1178			
pX, platoon unblocked	0.68				0.78	0.68
vC, conflicting volume	1611				2179	806
vC1, stage 1 conf vol					1610	
vC2, stage 2 conf vol					570	
vCu, unblocked vol	959				810	0
tC, single (s)	4.8				7.0	7.0
tC, 2 stage (s)					6.0	
tF (s)	2.5				3.6	3.4
p0 queue free %	99				94	97
cM capacity (veh/h)	374				212	728

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	3	564	564	1071	538	13	19
Volume Left	3	0	0	0	0	13	0
Volume Right	0	0	0	0	3	0	19
cSH	374	1700	1700	1700	1700	212	728
Volume to Capacity	0.01	0.33	0.33	0.63	0.32	0.06	0.03
Queue Length 95th (ft)	1	0	0	0	0	5	2
Control Delay (s)	14.7	0.0	0.0	0.0	0.0	23.1	10.1
Lane LOS	B					C	B
Approach Delay (s)	0.0			0.0		15.4	
Approach LOS						C	

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	51.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	1018	18	17	1313	14	60	9	45	63	2	124
Future Volume (vph)	37	1018	18	17	1313	14	60	9	45	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3444		1671	3481		1671	1540		1703	1586	
Flt Permitted	0.10	1.00		0.21	1.00		0.67	1.00		0.72	1.00	
Satd. Flow (perm)	194	3444		375	3481		1173	1540		1288	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	1107	20	18	1427	15	65	10	49	68	2	135
RTOR Reduction (vph)	0	1	0	0	0	0	0	41	0	0	112	0
Lane Group Flow (vph)	40	1126	0	18	1442	0	65	18	0	68	25	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	48.9	44.9		44.7	42.8		12.6	12.6		12.6	12.6	
Effective Green, g (s)	48.9	44.9		44.7	42.8		12.6	12.6		12.6	12.6	
Actuated g/C Ratio	0.66	0.61		0.60	0.58		0.17	0.17		0.17	0.17	
Clearance Time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	212	2092		260	2016		199	262		219	270	
v/s Ratio Prot	c0.01	0.33		0.00	c0.41			0.01			0.02	
v/s Ratio Perm	0.11			0.04			c0.06			0.05		
v/c Ratio	0.19	0.54		0.07	0.72		0.33	0.07		0.31	0.09	
Uniform Delay, d1	7.2	8.5		6.1	11.2		26.9	25.7		26.8	25.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.1	1.2		1.0	0.1		0.8	0.1	
Delay (s)	7.6	8.7		6.3	12.4		27.9	25.8		27.7	26.0	
Level of Service	A	A		A	B		C	C		C	C	
Approach Delay (s)		8.7			12.3			26.9			26.5	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	14.5
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	947	113	61	994	127	124	141	23	207	218	226
Future Volume (vph)	66	947	113	61	994	127	124	141	23	207	218	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3457	1456	3502	3491	1571	3400	3468		1735	3238	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.48	1.00	
Satd. Flow (perm)	3502	3457	1456	3502	3491	1571	3400	3468		884	3238	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	69	986	118	64	1035	132	129	147	24	216	227	235
RTOR Reduction (vph)	0	0	47	0	0	43	0	8	0	0	97	0
Lane Group Flow (vph)	69	986	71	64	1035	89	129	163	0	216	365	0
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	5.1	43.8	56.8	4.9	43.6	64.0	7.5	12.1		31.0	19.5	
Effective Green, g (s)	5.1	43.8	56.8	4.9	43.6	64.0	7.5	12.1		31.0	19.5	
Actuated g/C Ratio	0.05	0.46	0.60	0.05	0.46	0.68	0.08	0.13		0.33	0.21	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	188	1598	873	181	1607	1061	269	443		423	666	
v/s Ratio Prot	c0.02	0.29	0.05	0.02	c0.30	0.06	0.04	0.05		c0.08	c0.11	
v/s Ratio Perm										0.09		
v/c Ratio	0.37	0.62	0.08	0.35	0.64	0.08	0.48	0.37		0.51	0.55	
Uniform Delay, d1	43.2	19.1	8.0	43.4	19.6	5.3	41.7	37.8		24.6	33.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.9	0.1	0.4	1.1	0.1	0.5	0.2		0.4	0.5	
Delay (s)	43.7	20.1	8.0	43.8	20.7	5.3	42.2	38.0		25.0	34.2	
Level of Service	D	C	A	D	C	A	D	D		C	C	
Approach Delay (s)		20.2			20.3			39.8			31.2	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	94.7	Sum of lost time (s)	19.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	1154	22	3	1130	27	17
Future Volume (Veh/h)	1154	22	3	1130	27	17
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	1228	23	3	1202	29	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1251		1846	626
vC1, stage 1 conf vol					1240	
vC2, stage 2 conf vol					607	
vCu, unblocked vol			1251		1846	626
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)			2.2		3.5	3.3
p0 queue free %			99		87	96
cM capacity (veh/h)			563		218	432

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	WB 3	NB 1	NB 2
Volume Total	819	432	3	601	601	29	18
Volume Left	0	0	3	0	0	29	0
Volume Right	0	23	0	0	0	0	18
cSH	1700	1700	563	1700	1700	218	432
Volume to Capacity	0.48	0.25	0.01	0.35	0.35	0.13	0.04
Queue Length 95th (ft)	0	0	0	0	0	11	3
Control Delay (s)	0.0	0.0	11.4	0.0	0.0	24.0	13.7
Lane LOS			B			C	B
Approach Delay (s)	0.0		0.0			20.1	
Approach LOS						C	

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	42.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	12	1097	60	52	1003	16	111	0	229	16	1	15
Future Volume (vph)	12	1097	60	52	1003	16	111	0	229	16	1	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	0.95	1.00	0.97	0.95			1.00	1.00	1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.99	1.00	1.00			1.00	1.00	1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00			1.00	1.00	1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00			1.00	0.85	1.00	0.86	
Flt Protected	0.95	1.00	1.00	0.95	1.00			0.95	1.00	0.95	1.00	
Satd. Flow (prot)	1805	3471	1533	2894	3497			1770	1568	1805	1632	
Flt Permitted	0.95	1.00	1.00	0.95	1.00			0.75	1.00	0.54	1.00	
Satd. Flow (perm)	1805	3471	1533	2894	3497			1390	1568	1030	1632	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	13	1155	63	55	1056	17	117	0	241	17	1	16
RTOR Reduction (vph)	0	0	15	0	1	0	0	0	213	0	14	0
Lane Group Flow (vph)	13	1155	48	55	1072	0	0	117	28	17	3	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			2									
Heavy Vehicles (%)	0%	4%	4%	21%	3%	0%	2%	0%	3%	0%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Perm	NA	Perm	Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases			2				8		8	4		
Actuated Green, G (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Effective Green, g (s)	3.0	86.6	86.6	5.4	88.5			14.0	14.0	14.0	14.0	
Actuated g/C Ratio	0.02	0.72	0.72	0.05	0.74			0.12	0.12	0.12	0.12	
Clearance Time (s)	4.5	5.5	5.5	4.0	5.5			4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.5	3.5	1.5	3.5			1.5	1.5	1.5	1.5	
Lane Grp Cap (vph)	45	2504	1106	130	2579			162	182	120	190	
v/s Ratio Prot	0.01	c0.33		c0.02	0.31						0.00	
v/s Ratio Perm			0.03					c0.08	0.02	0.02		
v/c Ratio	0.29	0.46	0.04	0.42	0.42			0.72	0.15	0.14	0.02	
Uniform Delay, d1	57.5	7.0	4.8	55.8	6.0			51.1	47.7	47.6	46.9	
Progression Factor	1.00	1.00	1.00	0.93	0.73			1.00	1.00	1.00	1.00	
Incremental Delay, d2	3.5	0.6	0.1	0.7	0.4			12.6	0.1	0.2	0.0	
Delay (s)	61.0	7.6	4.9	52.8	4.8			63.7	47.8	47.8	46.9	
Level of Service	E	A	A	D	A			E	D	D	D	
Approach Delay (s)		8.0			7.1			53.0			47.4	
Approach LOS		A			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	14.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.49		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	60.8%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	30	919	383	5	783	38	210	20	15	103	43	64
Future Volume (vph)	30	919	383	5	783	38	210	20	15	103	43	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00		1.00	0.99		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.94		1.00	0.91	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	3438	1550	1805	3403		1787	1655		1719	1729	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1805	3438	1550	1805	3403		1787	1655		1719	1729	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	32	988	412	5	842	41	226	22	16	111	46	69
RTOR Reduction (vph)	0	0	183	0	2	0	0	14	0	0	49	0
Lane Group Flow (vph)	32	988	229	5	881	0	226	24	0	111	66	0
Confl. Peds. (#/hr)									1	1		
Confl. Bikes (#/hr)			2			3						
Heavy Vehicles (%)	0%	5%	2%	0%	5%	10%	1%	12%	0%	5%	0%	0%
Turn Type	Prot	NA	Perm	Prot	NA		Prot	NA		Prot	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases			2									
Actuated Green, G (s)	4.4	66.8	66.8	1.1	63.5		22.9	11.3		22.3	10.7	
Effective Green, g (s)	4.4	66.8	66.8	1.1	63.5		22.9	11.3		22.3	10.7	
Actuated g/C Ratio	0.04	0.56	0.56	0.01	0.53		0.19	0.09		0.19	0.09	
Clearance Time (s)	4.0	5.5	5.5	4.0	5.5		4.0	5.0		4.0	5.0	
Vehicle Extension (s)	1.5	4.0	4.0	1.5	4.0		1.5	1.5		1.5	1.5	
Lane Grp Cap (vph)	66	1913	862	16	1800		341	155		319	154	
v/s Ratio Prot	c0.02	c0.29		0.00	0.26		c0.13	0.01		0.06	c0.04	
v/s Ratio Perm			0.15									
v/c Ratio	0.48	0.52	0.27	0.31	0.49		0.66	0.15		0.35	0.43	
Uniform Delay, d1	56.7	16.6	13.8	59.1	17.9		45.0	49.9		42.5	51.7	
Progression Factor	1.31	0.61	0.22	1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.8	0.9	0.7	4.0	1.0		3.7	0.2		0.2	0.7	
Delay (s)	76.0	11.0	3.7	63.1	18.9		48.7	50.1		42.8	52.4	
Level of Service	E	B	A	E	B		D	D		D	D	
Approach Delay (s)		10.3			19.2			48.9			47.7	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.55		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	18.5
Intersection Capacity Utilization	52.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑	↱	↰	↑	↰	↱
Traffic Volume (veh/h)	203	157	144	478	381	93
Future Volume (Veh/h)	203	157	144	478	381	93
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	221	171	157	520	414	101
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL			TWLTL		
Median storage veh)	2			2		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			221		1055	221
vC1, stage 1 conf vol					221	
vC2, stage 2 conf vol					834	
vCu, unblocked vol			221		1055	221
tC, single (s)			4.2		6.4	6.2
tC, 2 stage (s)					5.4	
tF (s)			2.3		3.5	3.3
p0 queue free %			88		0	88
cM capacity (veh/h)			1291		359	811

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2
Volume Total	221	171	157	520	414	101
Volume Left	0	0	157	0	414	0
Volume Right	0	171	0	0	0	101
cSH	1700	1700	1291	1700	359	811
Volume to Capacity	0.13	0.10	0.12	0.31	1.15	0.12
Queue Length 95th (ft)	0	0	10	0	409	11
Control Delay (s)	0.0	0.0	8.2	0.0	129.1	10.1
Lane LOS			A		F	B
Approach Delay (s)	0.0		1.9		105.8	
Approach LOS					F	

Intersection Summary			
Average Delay	35.2		
Intersection Capacity Utilization	52.9%	ICU Level of Service	A
Analysis Period (min)	15		

MOVEMENT SUMMARY

Site: 10 [SW Oregon St & Murdock Rd]

Year 2025 - Total Cipole Extension PM Peak Hour Conditions
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: Murdock Road											
3	L2	97	1.0	0.249	5.7	LOS A	1.2	31.3	0.41	0.28	32.1
18	R2	173	4.0	0.249	5.7	LOS A	1.2	31.3	0.41	0.28	30.4
Approach		269	2.9	0.249	5.7	LOS A	1.2	31.3	0.41	0.28	31.0
East: Oregon St											
1	L2	446	1.0	0.731	14.0	LOS B	8.7	218.9	0.63	0.36	28.7
6	T1	458	1.0	0.731	14.0	LOS B	8.7	218.9	0.63	0.36	28.3
Approach		904	1.0	0.731	14.0	LOS B	8.7	218.9	0.63	0.36	28.5
West: Oregon St.											
2	T1	206	2.0	0.350	8.2	LOS A	1.7	43.6	0.61	0.57	31.7
12	R2	93	2.0	0.350	8.2	LOS A	1.7	43.6	0.61	0.57	30.6
Approach		299	2.0	0.350	8.2	LOS A	1.7	43.6	0.61	0.57	31.3
All Vehicles		1473	1.6	0.731	11.3	LOS B	8.7	218.9	0.58	0.39	29.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	5	27	22	14	16	5	246	3	2	346	44
Future Volume (Veh/h)	26	5	27	22	14	16	5	246	3	2	346	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	27	5	28	23	15	17	5	256	3	2	360	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	680	657	384	664	678	260	406			260		
vC1, stage 1 conf vol	387	387		268	268							
vC2, stage 2 conf vol	292	270		396	410							
vCu, unblocked vol	582	557	252	565	581	260	277			260		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	99	96	96	97	98	100			100		
cM capacity (veh/h)	550	543	696	548	531	769	1135			1286		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	27	33	23	32	5	259	2	406
Volume Left	27	0	23	0	5	0	2	0
Volume Right	0	28	0	17	0	3	0	46
cSH	550	668	548	635	1135	1700	1286	1700
Volume to Capacity	0.05	0.05	0.04	0.05	0.00	0.15	0.00	0.24
Queue Length 95th (ft)	4	4	3	4	0	0	0	0
Control Delay (s)	11.9	10.7	11.9	11.0	8.2	0.0	7.8	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	11.2		11.3		0.2		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.7		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	26	58	5	32	27
Future Volume (Veh/h)	4	26	58	5	32	27
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	4	27	60	5	33	28
Pedestrians			1		2	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	67				100	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	67				100	64
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				96	97
cM capacity (veh/h)	1494				879	981

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	4	27	65	61
Volume Left	4	0	0	33
Volume Right	0	0	5	28
cSH	1494	1700	1700	923
Volume to Capacity	0.00	0.02	0.04	0.07
Queue Length 95th (ft)	0	0	0	5
Control Delay (s)	7.4	0.0	0.0	9.2
Lane LOS	A			A
Approach Delay (s)	1.0		0.0	9.2
Approach LOS				A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

WASHINGTON COUNTY
OREGON

January 9, 2020

Jeff Shoemaker, P.E.
DOWL
720 SW Washington Street, Suite 750
Portland, OR 97205

RE: **DESIGN EXCEPTION**
T-S CORPORATE PARK PROPERTY
CITY OF SHERWOOD

The following is in response to your November 25, 2019 Request for Exception to Section 220 of the Washington County Road Design & Construction Standards, subsection 340.070 for one proposed access on the south side of SW Cipole Road on SW Tualatin-Sherwood Road, an arterial, for the subject development in the city of Sherwood.

XX Your request is approved with the following conditions.

1. Construct the access on SW Tualatin-Sherwood Road with two outbound lanes (one left lane and one shared through/right-turn lane) and one inbound lane. Coordinate with Washington County, design and construct the new added traffic signal for the proposed access and modify the existing intersection traffic signal as needed.

Please be advised that all exceptions granted to the W.C.R.D.C.S. are considered unique and are not uniformly applicable.

NOTE: See Section 220.020.4 for appeal procedures should you wish to appeal.

Sincerely,

Stacy A. Shetler

Stacy Shetler, P.E.
County Engineer

Reviewed By: Jinde Zhu JZ

Approved By: John Fasana JF

SS:JZ:tf

c: John Fasana
Jinde Zhu
Naomi Vogel
Plan Review File
c/File

DOWL

November 25, 2019

Mr. Stacy Shetler, County Engineer
Engineering, Traffic and Survey Division
Washington County
1400 SW Walnut Street, MS 17
Hillsboro, Oregon 97123

VIA Email

RE: T-S Corporate Park Property (Lot 2S128D001100)
Request for Exception to County Road Design and Construction Standards
For Local Access to SW Tualatin-Sherwood Rd., a County Arterial

Please accept this letter with attachments as a formal request for approval of a Design Exception to the Washington County Community Development Code Section 501-8.5(B)(4) pertaining to the subject property, a 46.5-acre parcel at 12822 SW Tualatin-Sherwood Road (T-S Rd.). Specifically, we are requesting a Design Exception for direct access to an arterial, T-S Rd., that is not from a collector or other arterial street.

Background

Trammell Crow Company (TCC), the developer and Applicant, is planning to develop a multi-building industrial park containing approximately 535,000 square feet on the subject site located at the southwest corner of T-S Rd. and SW 124th Avenue (124th). The southern boundary of the site is the future SW Blake Road (Blake). The site, currently in Washington County, is being annexed to the City of Sherwood. Annexation of the site is expected to become effective in early 2020.

The proposed industrial park development at the site supports Metro, County, and City objectives for economic development, existing business support, employment opportunity, and land development. The guiding documents for site development and vehicular access – to occur after it is annexed to the City of Sherwood – are as follows:

TEA Implementation Plan, the Tonquin Employment Area Market Analysis, Business Recruitment Strategy, and Implementation Plan

- Project partners were Metro, Washington County, and the City of Sherwood
- Sherwood City Council accepted on June 16, 2015 (Resolution 2015-051)
- Washington County Board of Commissioners acknowledged as part of the Washington County Industrial Sites Assessment and Implementation Project on June 23, 2015 (Resolution & Order 15-48)

TSPV1, the Sherwood Transportation System Plan, Volume 1

- Sherwood City Council adopted on June 17, 2014 (Ordinance 2014-012)

TSPV2, the Sherwood Transportation System Plan, Volume 2

- Sherwood City Council adopted on June 17, 2014 (Ordinance 2014-012)
- City of Sherwood updated in April 2018

These Transportation Plans call for one vehicular access point for the site from/to T-S Rd. at the Cipole intersection. Vehicular access to the site is not permitted from/to 124th. The Transportation Plans do not specify a roadway of any classification to be extended into the site. The TEA Implementation Plan (page 27) assumes that "an internal drive will be located here." Mackenzie, a consultant team member of the TEA Implementation Plan, provided a summary review of the Transportation Plans associated with the property in its *Letter dated August 29, 2019*, attached hereto as Exhibit A.

Developer Traffic Studies

Preliminary Findings Memorandum dated April 2019
Sherwood city officials are familiar with TCC's consideration to subdivide the site into multiple lots to support the multi-building development. The developer may submit a subdivision application to the City upon annexation of the property to Sherwood. Since each of the future lots resulting from a subdivision must front and be accessible from a public street, in 2018, the City of Sherwood asked the developer to analyze two possible conditions of an access road from T-S Rd. at the Cipole intersection (aka, the Cipole extension):

1) The access road terminates on-site in a cul-de-sac, and
2) The access road connects through the site to Blake

In response to this request from Sherwood, Kittelson and Associates, Inc. (KAI) produced a *Preliminary Findings Memorandum dated April 2019*, a copy of which is included in Exhibit B. This technical document found the following:

a) Traffic Operations: All studied intersections in the area are anticipated to meet the regional mobility standard in either scenario. There appears to be no significant system-wide benefit whether the road terminates in a cul-de-sac or whether it extends and connects to Blake.
b) Traffic Safety: If the access road is extended through the site to Blake, this new intersection would introduce an unprotected left-turn movement on the system, thereby reducing traffic safety, particularly with large trucks.

Support Memo for Washington County DLUT Design Exception dated November 15, 2019
Following guidance of Washington County in preparation of this Request, KAI produced a subsequent technical document, the *Support Memorandum for Washington County DLUT Design Exception dated November 15, 2019*, attached hereto as Exhibit B. This report analyzed the proposed access road for 2021 and 2025 operations and left-turn queuing conditions along T-S Rd. at the Cipole intersection. The findings of this report are summarized below.

Reasons For Request

Washington County Community Development Code Section 501-8.5(B)(4) states that "direct access to arterial roads shall be from a collector or other arterial streets." Since the Transportation Plans do not call for an arterial or collector at the site's sole access point to T-S Rd., an arterial road, a design exception is requested.

The County applies the approval criteria of Section 220.020.1 of the Design and Construction Standards (DCS) to determine whether to allow a requested design exception. These standards are provided below with a response regarding how this request satisfies the applicable criteria. Per DCS 220.020.1, the exception can be granted when one of three conditions is met.

A. The specification or standard does not apply in the particular application

Response: This condition is met because the Transportation Plans do not present a planned arterial or collector connection through the subject property at the Cipole intersection of T-S Rd. as presented in the following reference material:

- TSPV1 Figure 17, Street Functional Classification, shows no proposed roadway of any classification at this access point,
- TSPV2 Section D, Project Options Technical Report, Figure 1, Motor Vehicle Projects (updated 10/30/17), shows no proposed roadway of any classification at this access point,
- TEA Implementation Plan Figure 18, Implementation Plan, shows only "Anticipated Access" and no proposed roadway of any classification at this access point,
- TEA Implementation Plan specifically notes that this connection is assumed to be "an internal drive" (page 27),
- Washington County TSP Functional Classification Urban Area Map 6 does not illustrate an existing or proposed Arterial, Collector, or Neighborhood Route south of T-S Rd. between Oregon Street and 124th.

The Transportation Plans do not call for any roadway, much less one classified as an arterial or collector to serve the subject site at the T-S Rd.-Cipole intersection. Therefore, the standard in this particular application does not apply since it is inconsistent with the Transportation Plans.

B. Topography, right-of-way or other geographic conditions impose an economic hardship on the applicant and an equivalent alternative is available which can accomplish the same design objective

Response: This condition is met as evidenced by the TEA Implementation Plan, which considered numerous factors, such as those listed in this condition, and concluded that no arterial or collector roadway should be located south of the Cipole intersection with T-S Rd. The *Mackenzie letter* (Exhibit A) reinforces this conclusion.

Recently, the planned alignment of Blake has shifted north by approximately 600 feet, compared to the Transportation Plans. This new alignment exacerbates the conditions, such as topography, considered in the TEA Implementation Plan.

As referenced in the *KAI Memo* (Exhibit B), access into the site via an arterial or collector is "impracticable" because a roadway of either classification would need to have limited curvature and connect to Blake. A roadway connected to Blake would have curvature to avoid the wetlands present on the site, and it would have a steep trajectory at a grade of approximately 12%, which would be incompatible with the City of Sherwood Employment Industrial (EI) zoning applicable to this site and neighboring properties. Future uses at the site will require large trucks and the steep grade would be nonfunctional and dangerous. See Exhibit C for a *site plan* that illustrates a local access road terminating in a cul-de-sac and the steep grade from the cul-de-sac south to Blake.

In addition to being impracticable, nonfunctional and dangerous, an arterial or collector roadway constructed between T-S Rd. and Blake would impose an economic hardship and create side slopes that would drastically reduce the amount of building area on the site. Reduced building area limits the economic development, existing business support, and employment opportunity objectives of the governmental stakeholders.

As an abutting arterial, 124th provides the alternative north-south through-put on the transportation system for the immediate area, and in fact is superior because it does not suffer from the grade differential challenges that a Cipole connection to Blake would experience.

C. A minor change to a specification or standard is required to address a specific design or construction problem which if not allowed will result in an undue economic hardship

Response: This criterion is not applicable to this design exception request.

Comparison (Existing Standard v. Proposed)

Table 1. Comparison – Existing Standard v. Proposed Access

	Standard	Proposed
CDC 501-8.5(B)(4)	Access to arterial roads must come from Arterial or Collector	No access provided by an Arterial or Collector

Public Safety

No adverse impacts to traffic operations or public safety are anticipated. See the *KAI Memo* that addresses the anticipated intersection operations and left turn queues at key intersections around the future TCC development site, both under a 2021 condition and a 2025 condition. These conditions are provided in the memorandum to represent the condition of T-S Rd. before and after the planned widening of the corridor[1] and intersection improvements anticipated at 124th, where dual eastbound left turn lanes are planned with the county's upcoming T-S Rd. widening project.

2021 and 2025 Operations

The intersections adjacent to the site will operate during the weekday AM and PM peak hours at levels which meet the governing regional or City operating standard under year 2021 and 2025 conditions with the site fully developed.

As noted in the *KAI Memo* the following queuing conditions are anticipated under the 2021 and 2025 conditions.

[1] Tualatin Sherwood Road (Teton Avenue to Langer Farms Parkway) Project

2021 Left Turn Queue Condition (between Cipole and 124th)

Under the peak hour queueing scenarios modeled in the 2021 condition, eastbound left turn lane 95th percentile queues on T-S Rd. at 124th could reach 400 feet in the AM peak hour and 125 feet in the PM peak hour. As noted in the *KAI Memo*, the existing queue storage and taper space can accommodate this queue.

The westbound left turn queue for vehicles entering the TCC site is anticipated to reach a 95th percentile queue of up to 175 feet during the AM peak hour and 150 feet in the PM peak hour. These queues can be contained within the approximately 250-feet of turn bay storage at Cipole.

As a consequence, no left-turn conflicts are anticipated in the back-to-back turn lanes between the proposed site access at Cipole and the 124th intersection under the AM and PM peak hour scenarios in the 2021 condition of T-S Rd. including the buildout of the TCC development.

2025 Left Turn Queue Condition (between Cipole and 124th)

The *KAI Memo* also addresses queueing conditions that are expected in 2025 after completion of the county's T-S Rd. widening project. As noted on page 14 of the *KAI Memo*, it is expected that the 95th percentile queue lengths at the eastbound left turn approach at 124th would reach 150 feet in the AM peak hour and 125 feet during the PM peak hour, which can be accommodated by the future design storage.

Additionally, the turn-bay storage for the westbound left turn onto the new access into the TCC site provides 250 feet of storage, significantly more than needed to accommodate the anticipated 95th percentile queues of 100 feet in the AM peak hour and 75 feet in the PM peak hour.

As discussed in the findings on pages 14 and 15 of the *KAI Memo*, eastbound and westbound left turn queues will have adequate storage bays for anticipated peak hour queues under the 2025 (after construction) condition of T-S Rd. including the buildout of the TCC development.

Performance

See the *KAI Memo* and KAI's *Preliminary Findings Memorandum dated April 2019,* a part of the *KAI Memo*, for further detail regarding the performance of the affected intersections upon completion of the industrial park project and the extension of the southern leg of Cipole into the site, terminating in a cul-de-sac. As noted in the KAI documentation, the proposed Cipole intersection and 124th intersections are projected to operate acceptably under both 2021 and 2025 conditions.

Conclusion

As demonstrated in this letter and attached materials, the proposed Design Exception Request satisfies the approval criteria of DCS Section 220.020.1 and will not result in any safety or operational performance deficiencies on the adjacent and regional transportation system. The requested design exception is also consistent with the long-term vision of the City's TSP and associated TEA Implementation Study. Therefore, we respectfully request your approval of this request. If you have any further questions or need any further supplemental information, please do not hesitate to contact me at 971-280-8646 or at jshoemaker@dowl.com

Sincerely,
DOWL

Jeff Shoemaker, P.E.
Senior Project Manager

Attachment(s): As stated

cc: Kirk Olsen, Trammell Crow Company

REGISTERED PROFESSIONAL ENGINEER
80059PE
OREGON
DECEMBER 31, 2007
JEFFREY R. SHOEMAKER
EXPIRATION DATE: 06/30/2020

MACKENZIE.

DESIGN DRIVEN | CLIENT FOCUSED

August 19, 2019 (***Revised August 29, 2019***)

Trammell Crow Company
Attention: Kirk Olsen
1300 SW 5th Avenue, Suite 3050
Portland, OR 97201

Re: **TCC - Sherwood Corporate Park**
LTR-Kirk Olsen
Project Number: 2180459.00

Dear Kirk:

At your request, Mackenzie has reviewed prior transportation planning documents and the current Sherwood Industrial Park site plan concept in relation to a potential extension of Cipole Road south of Tualatin-Sherwood Road to the future Blake Street.

BACKGROUND

The Sherwood Industrial Park development is proposed at the southwest corner of Tualatin-Sherwood Road and SW 124th Avenue. Both roadways are classified as Washington County Arterials, which are intended to serve through traffic and have limited access to adjacent land uses. The future Blake Street to the south is classified as a collector roadway and parallel to Tualatin-Sherwood Road to provide access to adjacent parcels.

Washington County does not typically allow private driveways at signalized intersections, so a public cul-de-sac has been proposed to allow access to Tualatin-Sherwood Road at the existing signalized intersection with Cipole Road.

The site plan with the proposed cul-de-sac is enclosed.

TRANSPORTATION PLANNING

A number of documents have been prepared over the years as development has been considered for the area. A concept plan for the Tonquin employment area was initially prepared in 2010 which provided an overview of general roadway alignments and development potential of the area. The current City of Sherwood Transportation Plan (TSP) from 2014 shows Local Street Connectivity in Figure 18, with "proposed roadway" alignments shown with a dashed line and arrows identifying "conceptual street connection" locations. The south approach of the Cipole Road intersection with Tualatin-Sherwood Road is shown with an arrow, indicating it is a conceptual street connection, not a proposed roadway. Blake Street, as well as SW 124th Avenue, are shown with dashed lines, indicating they are proposed roadways. On page 59 of the TSP, local street connectivity as shown in Figure 18 is described as "It specifies the general location where new local streets could potentially be installed as nearby areas are developed or as the opportunity arises. The conceptual locations shown consider block length and access spacing requirements but do not necessarily reflect develop-ability due to topographic, environmental or manmade constraints. Locations identified are conceptual…" A copy of Figure 18 is enclosed.

The Tonquin Employment Area (TEA) Plan prepared by Mackenzie in 2015 built off of the earlier documents and looked at development potential of the area in more detail, considering site layouts, circulation needs and physical constrains such as grades, wetlands, utilities and property boundaries. The plan presents recommended road alignments with the intent to serve all parcels and development sites with those roads. The arrows show anticipated access locations to serve each development node. An alignment of Blake Street is shown similar to the City's Plan and in conformance with Washington County's plan for an intersection on the new SW 124th Avenue alignment. It was not intended that additional roadways would be needed, nor access provided on Tualatin-Sherwood Road "except opposite the Cipole Road signalized intersection" as noted on page 26. Page 27 of the TEA document, a copy of which is attached and highlighted, notes "based on this update, we are assuming an internal driveway will be located here instead" of an extension of Cipole Road south of Tualatin-Sherwood Road. A copy of the relevant pages and Figure 17 from the TEA document are enclosed.

The area shown between Tualatin-Sherwood Road and the original Blake Street alignment was originally one large parcel/development site, which has since been divided for development of the subject project and the Willamette Water Supply facility. When the site was one large parcel, it was intended to simply provide access locations on both Blake Street and Tualatin Sherwood Road, due to the distance between roadways, significant grades across the site and to take advantage of the existing Cipole Road intersection. There was no need for a public street connection to serve the site.

CURRENT PROPOSAL

City staff had originally agreed to the cul-de-sac concept for the site layout with no other driveways on public streets. As noted above, access to both SW 124th Avenue and Tualatin-Sherwood Road is limited, and a public street connection at Cipole Road would provide a protected access location for the site. It is understood the cul-de-sac needs a variance from the 250 ft minimum standard and Washington County must still approve the new approach to the signal.

The current cul-de-sac design results in about a 4% grade south of Tualatin-Sherwood Road. Extension of the road as a public street south to Blake Street would not only require additional ROW, but would necessitate slope easements and/or retaining walls, both of which will severely reduce the available development area for a site already impacted by grades and wetlands. The new location of Blake Street makes providing a public street connection difficult due to the grades, especially for an industrial use. A concept alignment has been prepared that shows grades of about 12%, which is acceptable for residential development, but not the intended industrial use of the zone. The proposed Blake alignment is currently about 20 feet above the finished floor elevation of Building E, a distance of approximately 20-30 ft to the fire access road around the building.

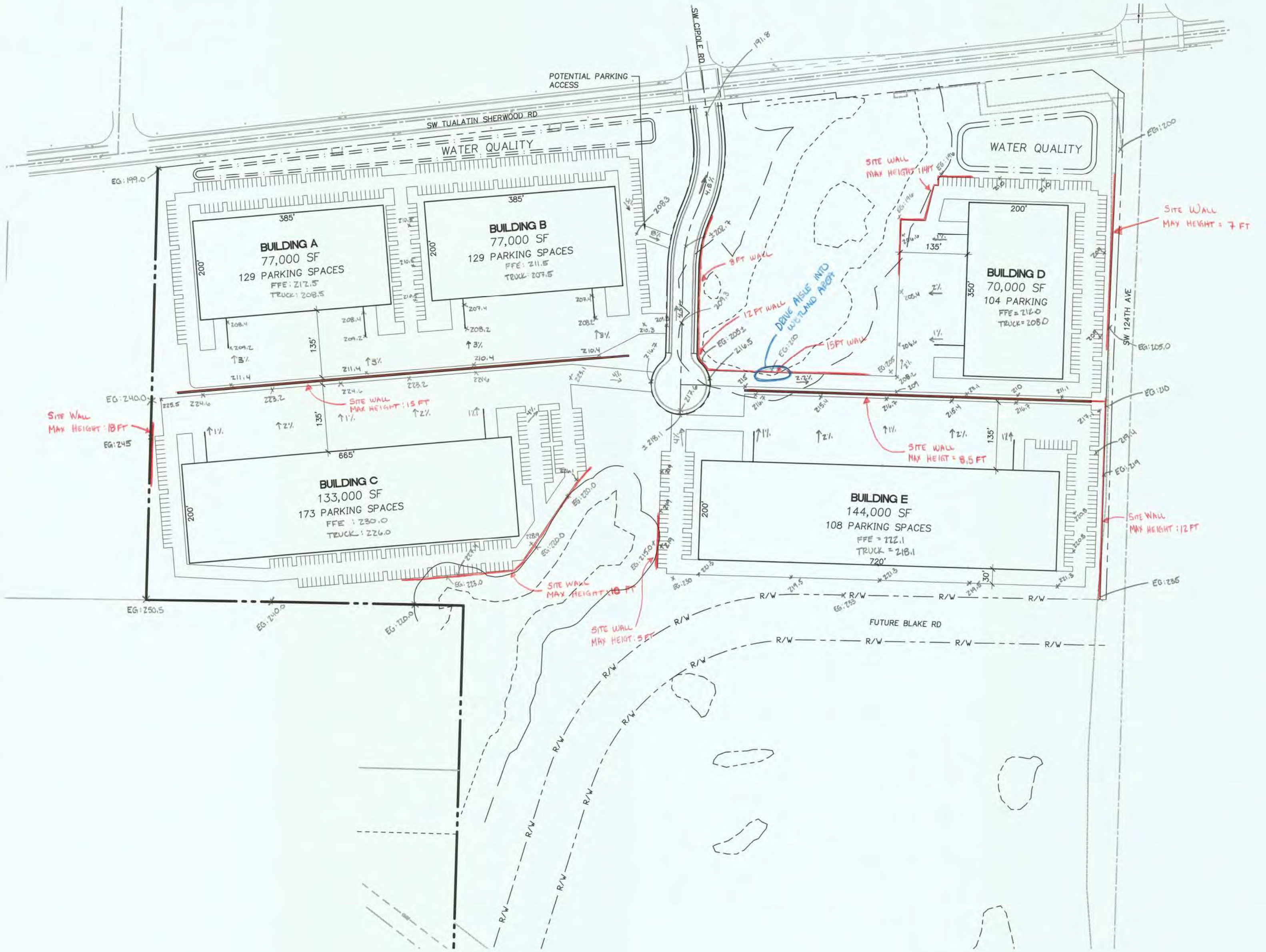
In summary, the City's Transportation Plan does not dictate a public street connection, and more recent and thorough planning for the area in the Tonquin Employment Area specifically notes a public street connection is not needed. Further, there is no benefit or need for a public street connection through a site. Even if a public street had been envisioned at one point, the new location of Blake Street makes providing such a connection unnecessary and impractical.

Sincerely,

Brent Ahrend, PE
Associate Principal | Traffic Engineer

Enclosures: Sherwood Industrial Park Site Plan
City of Sherwood TSP - Figure 18 Local Street Connectivity
Tonquin Employment Area – Pages 26-27, Figure 17 Conceptual Road Layout
Cipole Road Concept Plan and Profile
Willamette Water Supply Plan
Partition Plat

c: Gabriela Frask, Scott Moore - Mackenzie



SITE DATA

BUILDING	BLDG AREA	PARKING COUNT	PARKING PER 1000 SF
BUILDING A	77,000 SF	129	1.68
BUILDING B	77,000 SF	129	1.68
BUILDING C	133,000 SF	173	1.30
BUILDING D	70,000 SF	104	1.49
BUILDING E	142,000 SF	108	0.76
TOTAL	499,000 SF	643	1.29

0 50 100 200

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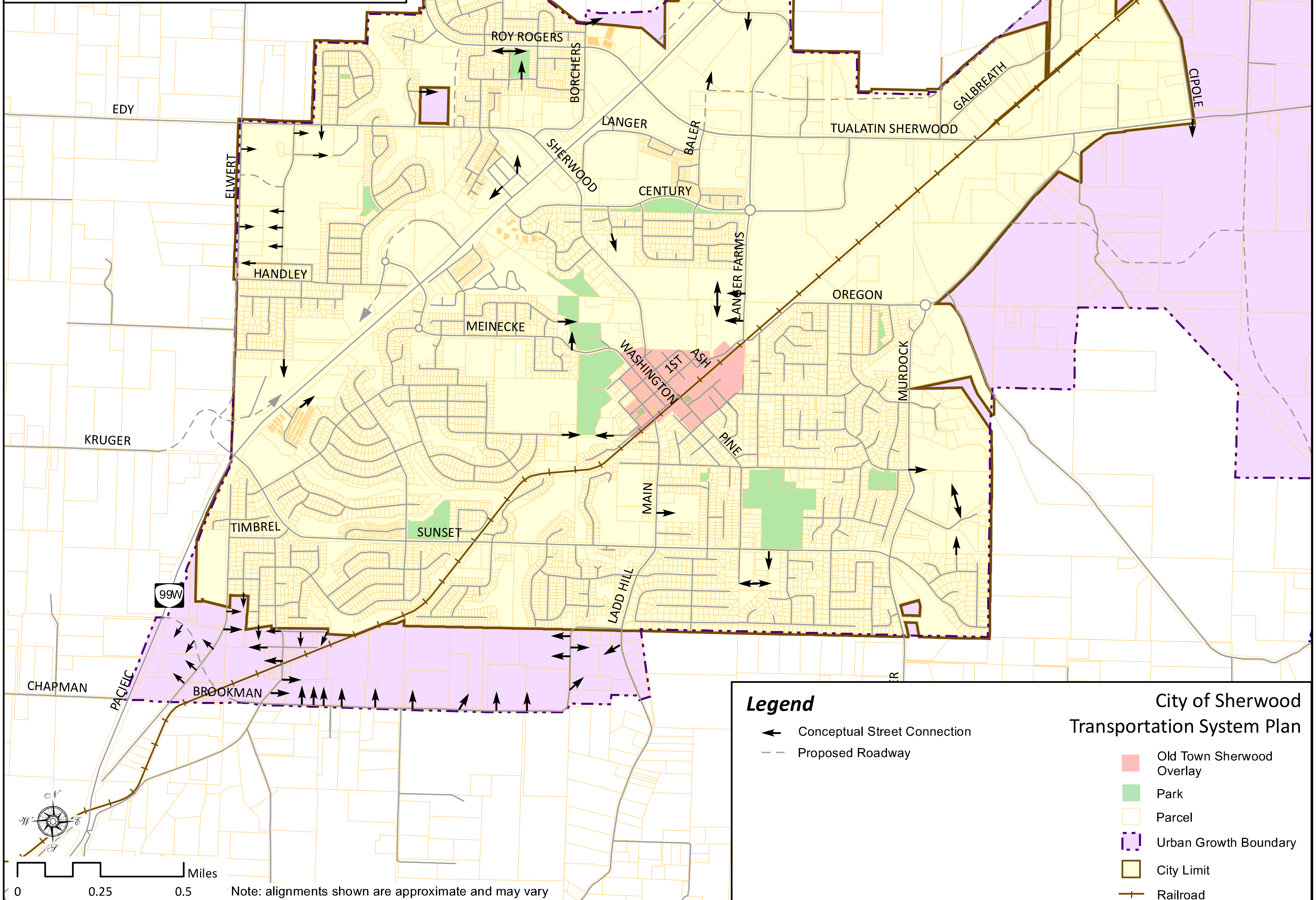
6/26/19 2180459.00

SHERWOOD INDUSTRIAL PARK - OPTION 1

Figure 18

Local Street Connectivity



Note: alignments shown are approximate and may vary

Legend

- Conceptual Street Connection
- Proposed Roadway

City of Sherwood
Transportation System Plan

- Old Town Sherwood Overlay
- Park
- Parcel
- Urban Growth Boundary
- City Limit
- Railroad

Employment Industrial Zone

Following adoption of the 2010 Preferred Concept Plan, the site was designated Employment Industrial (EI) in the Comprehensive Plan and a new EI zone was incorporated into the Development Code. Properties within the TEA that annex into the City would be zoned EI. The EI zone was created specifically for the Tonquin Employment Area to ensure that properties develop in a manner consistent with applicable Metro regulations for designated Industrial Areas and with the vision outlined in the Concept Plan.

The EI zone is intended to complement the City's EOA by targeting preferred industry sectors including Clean Technology, Technology and Advanced Manufacturing, and Outdoor Gear and Active Wear. The permitted uses within the EI zone are more restrictive than the uses allowed in the City's Light Industrial or General Industrial zones. Furthermore, to provide sufficient space for the target industries, the EI zone requires new sites to have a minimum area of three acres (with minor exceptions for selected commercial uses and existing lots of record), while the one site over 50 acres has restrictions limiting the ability to subdivide into smaller parcels. Retail and professional services that cater to daily customers are restricted in size, and commercial development must be located near Blake Road rather than near Oregon Street or 124th Avenue.

Transportation Review

The consultant team reviewed documentation of the existing transportation conditions as well as proposed improvements. This section discusses the transportation network that serves the Tonquin Employment Area illustrated in Figure 17.

Tualatin-Sherwood Road

This County Arterial is currently three lanes wide adjacent to the site. Widening is anticipated to a five-lane section in the near future, but no funds are currently identified. We have assumed no driveway access will be allowed for development in the TEA except opposite the Cipole Road signalized intersection, as all development areas would have access to lower classification roadways.

124th Avenue

The alignment has been determined for the extension south of Tualatin-Sherwood Road to Grahams Ferry Road. Construction will begin in summer 2015 on a core road for this County Arterial. No driveway access will be allowed per agreement with the Cities.

Blake Street

This road, which is identified as a need in the 2010 TEA Concept Plan, would serve as an east-west collector through the area, providing an alternate to Tualatin-Sherwood Road between 124th Avenue and Oregon Street in Sherwood (see Figure 17). Based on recent review of the area, it is now recommended the roadway alignment be altered to avoid wetland areas. Through the TEA, the alignment would head southwest from 124th Avenue on the west side of the wetland and cross the power line easements perpendicularly. From that point, the road would turn 90 degrees along the west side of the power line easements to a roundabout intersection with Oregon Street. At the 90 degree bend, future extensions to the south and west could be accommodated.

Tonquin Road

This two-lane County arterial does not have bike lanes or sidewalks, and is not currently planned for improvements as it is primarily outside the city limits. No access is proposed to Tonquin Road for the TEA as it is located at the bottom of a steep slope.

Oregon Street

This roadway is classified as a three-lane arterial and is built to its planned width. Sidewalks do not exist for most of the south frontage and will need to be provided with development.

Local Street Connections

City of Sherwood TSP Figure 18 identifies future extension of Cipole Road south of Tualatin-Sherwood Road into the TEA. Based on this update, we are assuming an internal drive will be located here instead.

Transit Service

Tri-Met serves downtown Sherwood with routes 12 and 94. TriMet's Southwest Service Enhancement Plan is anticipated to provide service along Tualatin-Sherwood Road and 124th Avenue.

Access Spacing Standards

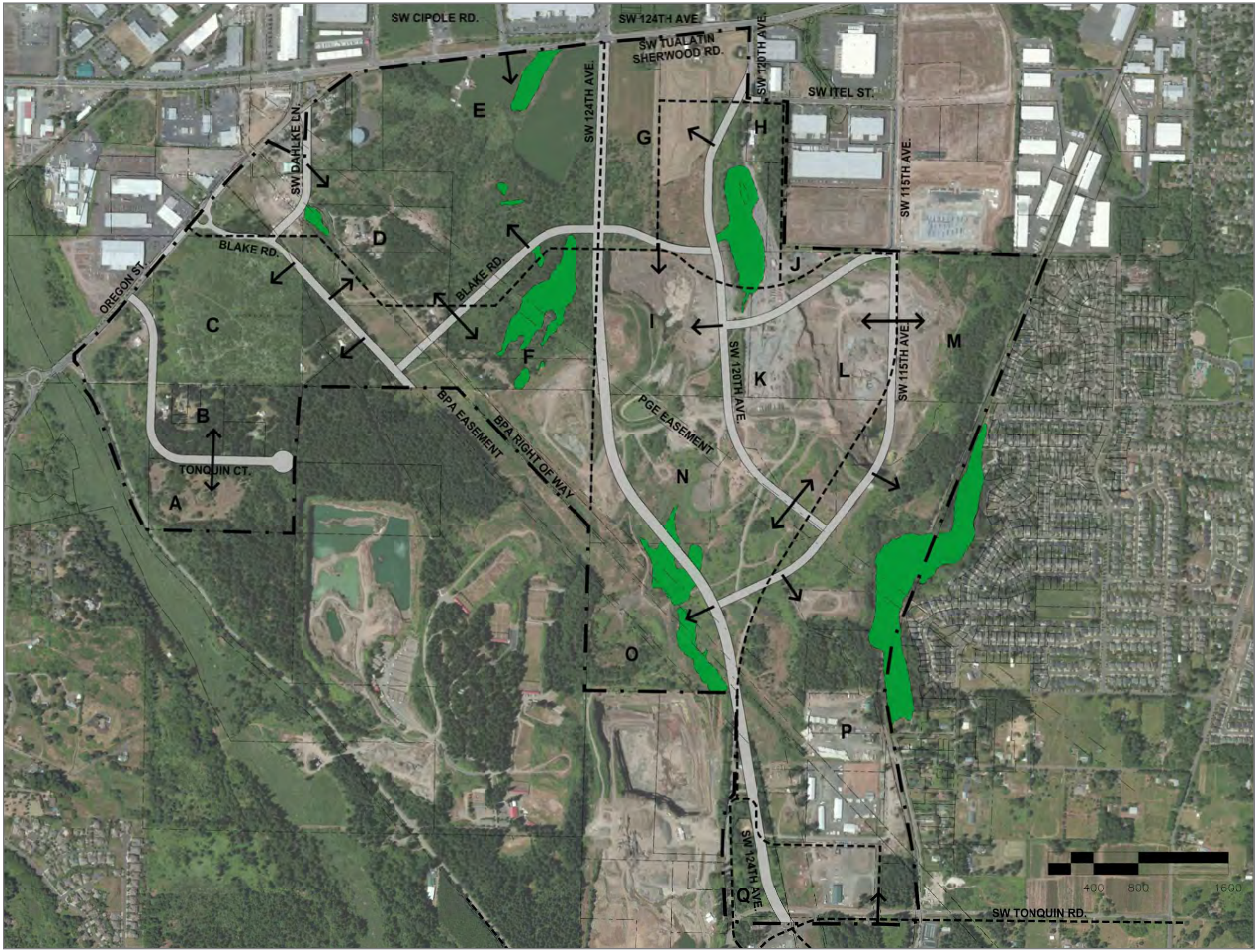
The following spacing standards generally apply to new driveway and roadway access points:

- Local streets – 10 feet from the point of curvature or 25 feet if no radius exists
- Neighborhood routes – 50 feet
- Collectors – 100 feet
- Arterials – 600 feet

Additional access restrictions apply to Tualatin-Sherwood Road (which would prohibit new driveways except opposite Cipole Road) and 124th Avenue (which would prohibit all driveways and only allow access at Blake Road).

Infrastructure Review

The consultant team reviewed documentation of the existing infrastructure conditions, as well as proposed improvements for water distribution, sewer collection and treatment, and storm drainage systems. In addition to location and sizes of the proposed improvements, the team reviewed the assumptions used to determine the presented utility sizing and alignments, such as expected development density, industrial utility profiles, and utility system corridor alignments. The Development Nodes and phases referenced in the discussion below are illustrated on Figure 18 in Chapter 5.



SHERWOOD TONQUIN EMPLOYMENT AREA AND SW TUALATIN CONCEPTUAL ROAD LAYOUT

Washington County, OR

FIGURE 17

LEGEND:

- SHERWOOD-TUALATIN JOINT PLAN AREA BOUNDARY
- CONCEPT PLAN ROAD ALIGNMENTS
- PROPOSED REFINED ROAD ALIGNMENTS
- WETLANDS AND 50 FOOT BUFFER
- ANTICIPATED ACCESS
- DEVELOPMENT NODE — A

0 400 800 1,600 Feet

N

1 inch = 800 feet

SOURCE DATA:
Metro RLIS Lite Base Data, Nov 2014

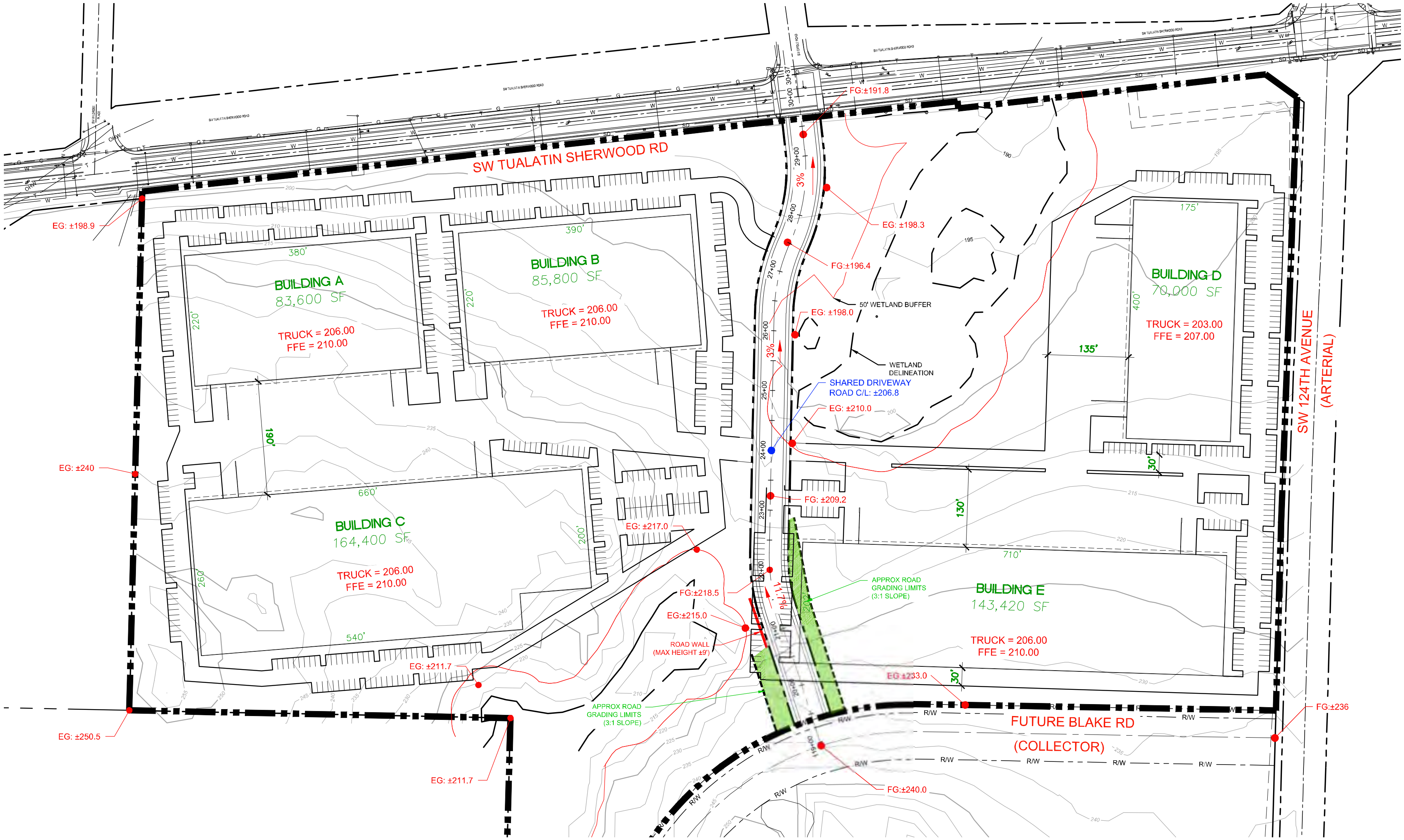
GEOGRAPHIC PROJECTION:
NAD 83 HARN, Oregon North
Lambert Conformal Conic

Date: 6/4/2015
File: TEA_SWCP_ConceptualRoadLayout

Map Created By: GF
Project No: 2130069.04

MACKENZIE.

P 503.224.9560 • F 503.228.1285 • W MCKNZE.COM
RiverEast Center, 1515 SE Water Avenue, #100, Portland, OR 97214
Portland, Oregon • Vancouver, Washington • Seattle, Washington



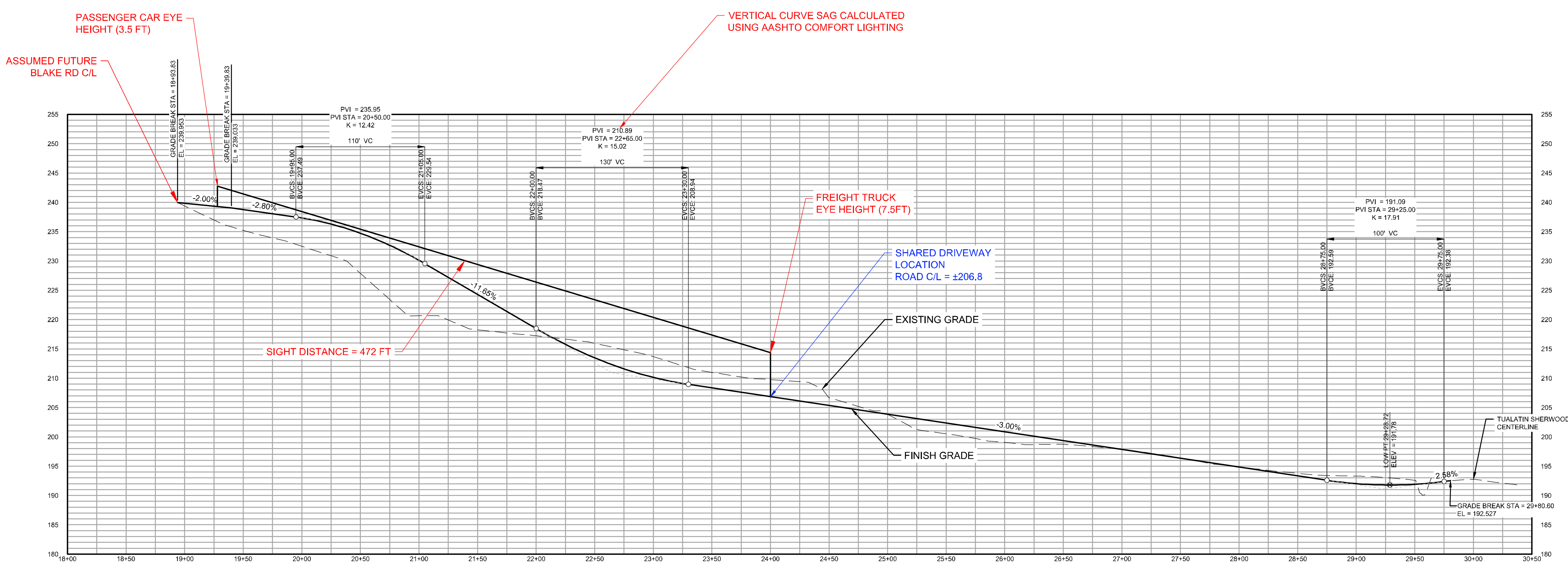
DOWL
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641
Project No. 2322.14347
Contact: Jeff Shoemaker, PE

10/15/2018

Trammell Crow Company

Sherwood Corporate Park

CIPOLE RD CONNECTION TO BLAKE RD TEST FIT (1 OF 2)



CIPOLE ROAD TEST FIT PROFILE

SCALE: 1"=40' (H)
1"=5' (V)

RED = ROAD DESIGN TO CITY OF SHERWOOD ROADWAY STANDARDS

BLUE = CRITICAL TIE-IN LOCATIONS FOR BUILDINGS AND WETLANDS

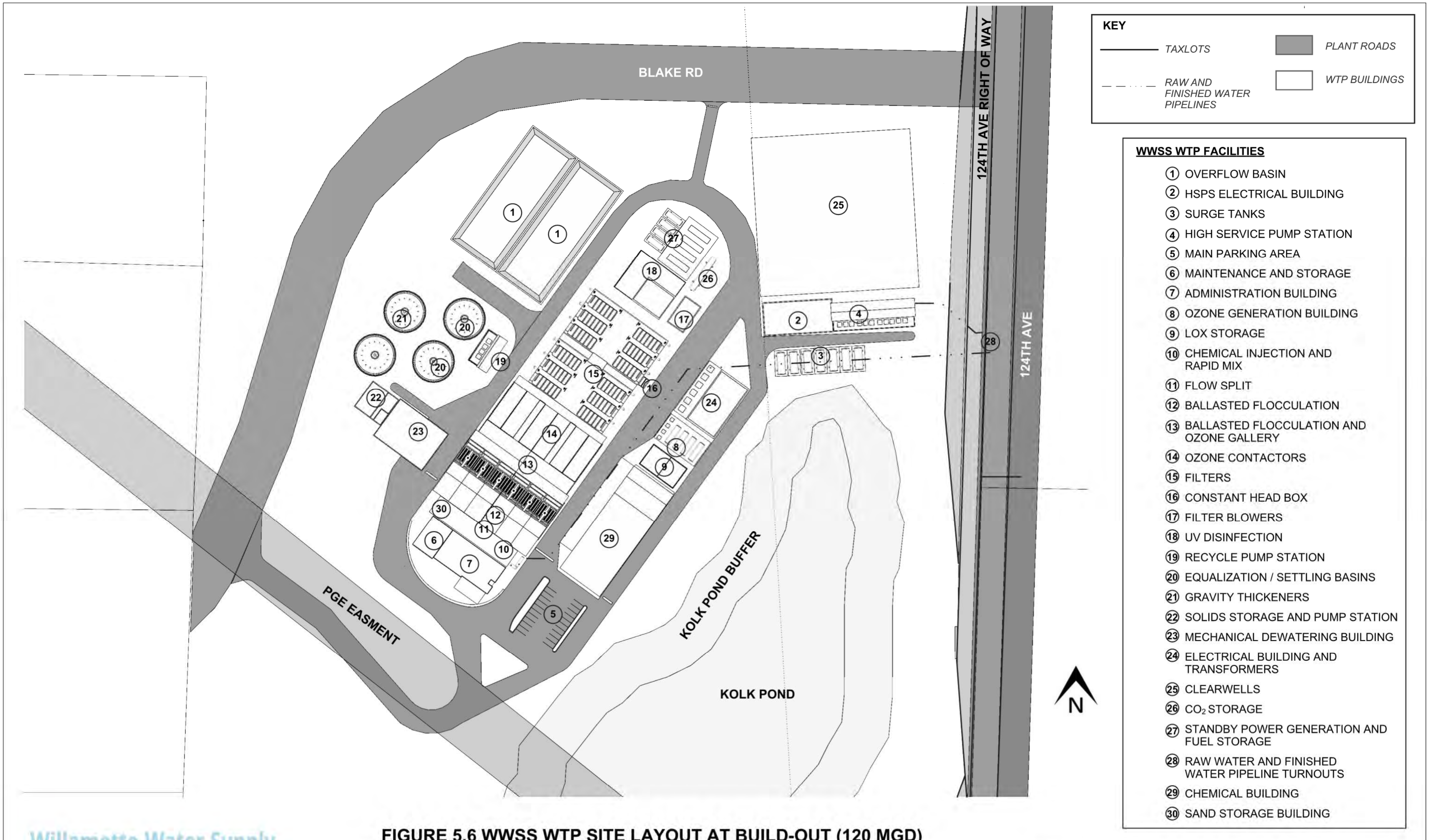
DOWL

720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641
Project No. 2322.14347
Contact: Jeff Shoemaker, PE
10/15/2018

TrammellCrowCompany

Sherwood Corporate Park

CIPOLE RD CONNECTION TO BLAKE RD TEST FIT (2 OF 2)



Willamette Water Supply
Our Reliable Water

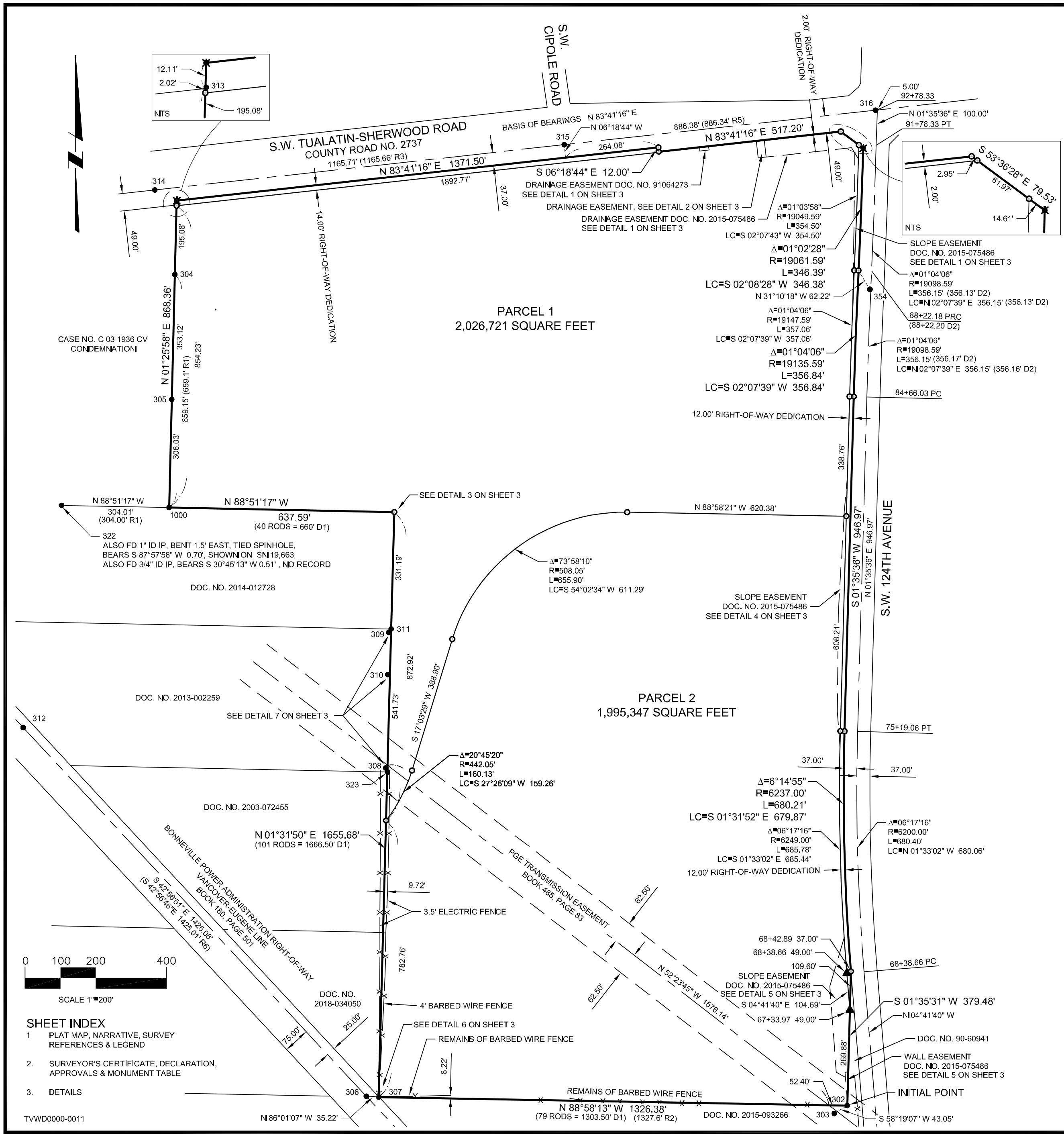
FIGURE 5.6 WWSS WTP SITE LAYOUT AT BUILD-OUT (120 MGD)

INITIAL CONCEPT SUBJECT TO CHANGE

WILLAMETTE WATER SUPPLY PROGRAM
FEBRUARY 2018

PARTITION PLAT NO. ________________
RECORDED AS DOCUMENT NO. ________________

LOCATED IN THE NORTHEAST AND SOUTHEAST ONE-QUARTERS
OF SECTION 28, TOWNSHIP 2 SOUTH, RANGE 1 WEST,
WILLAMETTE MERIDIAN, WASHINGTON COUNTY, OREGON
SHEET 1 OF 3
JULY 25, 2019



SHEET INDEX

1. PLAT MAP, NARRATIVE, SURVEY REFERENCES & LEGEND
2. SURVEYOR'S CERTIFICATE, DECLARATION, APPROVALS & MONUMENT TABLE
3. DETAILS

NARRATIVE

THE PURPOSE OF THIS SURVEY IS TO PARTITION THAT PROPERTY DESCRIBED IN DOCUMENT NO. 2017-086558, WASHINGTON COUNTY DEED RECORDS.

THE BASIS OF BEARINGS IS OREGON STATE PLANE COORDINATE SYSTEM, NORTH ZONE, NORTH AMERICAN DATUM OF 1983(2011) EPOCH 2010. THE CENTERLINE OF S.W. TUALATIN-SHERWOOD ROAD WAS FOUND TO HAVE A BEARING OF NORTH 83°41'16" EAST BASED ON THE FOUND MONUMENTS AS SHOWN. TO CONVERT LDP COORDINATES TO NAD 83(2011) EPOCH 2010 GRID COORDINATES, MULTIPLY THEM BY 0.99989352 PER SURVEY NUMBER 32,248, WASHINGTON COUNTY SURVEY RECORDS.

HELD MONUMENTS 314 AND 316 TO RE-ESTABLISH THE CENTERLINE OF S.W. TUALATIN-SHERWOOD ROAD (COUNTY ROAD NO. 2737) PER SN 25,092 AND SN 31,293. HELD RECORD RIGHT-OF-WAY WIDTH OF 37.00 FEET TO RE-ESTABLISH A PORTION OF THE SOUTHERLY RIGHT-OF-WAY OF S.W. TUALATIN-SHERWOOD ROAD, ALSO BEING THE NORTHERLY LINE OF SAID PROPERTY. HELD STATION125+82.10 AT MONUMENT 316 PER SN 32,248, ALONG WITH STATIONS AND OFFSETS IN DOCUMENT NO. 2015-075486, WASHINGTON COUNTY DEED RECORDS, TO RE-ESTABLISH A PORTION OF SAID SOUTHERLY RIGHT-OF-WAY, WEST OF SW 124TH AVENUE.

THE CENTERLINE OF S.W. 124TH AVENUE WAS RE-ESTABLISHED BY HOLDING 5.00' EAST OF MONUMENT 316 PER SN 32,248 WITH RECORD ALIGNMENT PER DOCUMENT NO. 2015-075486. OFFSET 37.00 FEET FROM SAID CENTERLINE TO RE-ESTABLISH THE WEST RIGHT-OF-WAY LINE OF S.W. 124TH AVENUE, ALSO BEING A PORTION OF THE EAST PROPERTY LINE. HELD MONUMENTS 302 AND 354 TO RE-ESTABLISH THE SOUTHERLY PORTION OF THE EAST PROPERTY LINE PER DOCUMENT NO. 2017-086558, WASHINGTON COUNTY DEED RECORDS.

HELD MONUMENTS 302 AND 307 TO RE-ESTABLISH THE SOUTH LINE OF THE PROPERTY PER SN 22,674.

HELD MONUMENTS 307 AND 311 TO RE-ESTABLISH THE INTERIOR WEST LINE OF THE PROPERTY PER SN 22,674. A THOROUGH SEARCH WAS PERFORMED AT THE INNER SOUTHWEST CORNER. THE CORNER LOCATION LOOKS TO BE WELL USED BY MOTOR VEHICLES. REMNANTS OF TWO BEARING TREES (BOTH FALLEN) WERE FOUND IN THE VICINITY PER FIELD NOTES IN SN 1,026. THE APPROXIMATE CENTER WAS TIED OF A 12" FIR TREE WITH A SCRIBED FACE, WHICH BEARS NORTH 33°00'19" EAST 15.28 FEET AND REMNANTS OF A FIR TREE BEARS SOUTH 27°06'07" WEST 10.08 FEET FROM THE CORNER. SEE DETAIL ON SHEET 3. A CALCULATED POSITION FROM THE BEARING TREES FALLS 4.08' EAST OF THE INTERIOR WEST LINE OF THE PROPERTY. DISTANCES FROM THE VESTING DEED AND EARLIER SURVEYS (SN 1,026 AND SN 22,674) DO NOT AGREE. I HELD A BEARING-BEARING INTERSECTION USING SAID INTERIOR WEST LINE AND A LINE ESTABLISHED FROM MONUMENTS 322 AND 1,000 PER SN 19,633 TO RE-ESTABLISH THE INNER SOUTHWEST CORNER.

HELD MONUMENTS 304 AND 1000 FOR THE EXTERIOR WEST PROPERTY LINE PER SN 19,633.

HELD MONUMENTS 306 AND 312 TO RE-ESTABLISH BONNEVILLE POWER ADMINISTRATION VANCOUVER-EUGENE RIGHT-OF-WAY LINE PER DRAWING SERIAL NO. 4444. HELD RECORD RIGHT-OF-WAY WIDTH EXCEPT AT THE SOUTHWEST CORNER OF PROPERTY SINCE NO FEE ACQUISITION WAS ACQUIRED FROM THIS PROPERTY, SEE DETAIL 6 ON SHEET 3.

ADJACENT PROPERTY LINES ARE SHOWN FOR GRAPHICAL PURPOSES ONLY.

SURVEY REFERENCES

SURVEYS	COUNTY ROAD	U.S.B.T.	BONNEVILLE POWER ADMINISTRATION
1,026	2737	2002-010	VANCOUVER - EUGENE LINE SERIAL NO. 4444
5,636		2019-001	
19,663 (R1)			
22,514	DOCUMENTS		
22,674 (R2)	2017-086558 (D1)		
25,092 (R3)	2015-075486 (D2)		
30,190			
30,192 (R4)			
31,293 (R5)			
31,910			
31,973 (R6)			
32,248			

LEGEND

●	FOUND MONUMENT AS NOTED IN MONUMENT TABLE, SEE SHEET 2
○	SET 5/8" X 30" IRON ROD W/YPC STAMPED "D.E.A. INC."
⌘	SET 1-1/8" BRASS DISK STAMPED "D.E.A. INC."
▲	CALCULATED POINT
BPA	BONNEVILLE POWER ADMINISTRATION
DOC. NO.	DOCUMENT NUMBER
D1	DOCUMENT REFERENCE
FD	FOUND
ID	INSIDE DIAMETER
IP	IRON PIPE
IR	IRON ROD
OD	OUTSIDE DIAMETER
NTS	NOT TO SCALE
PC	POINT OF CURVATURE
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
RPC	RED PLASTIC CAP
SN	SURVEY NUMBER
U.S.B.T.	UNITED STATES BEARING TREE
W/	WITH
YPC	YELLOW PLASTIC CAP
Δ	DELTA
R	RADIUS
L	LENGTH
LC	CHORD BEARING AND DISTANCE
R2	REFERENCE NUMBER
( )	RECORD DATA

— — — — EASEMENT LINE
——X——X—— FENCE LINE
——— — ——— CENTERLINE

DAVID EVANS AND ASSOCIATES INC.
2100 SW River Parkway
Portland Oregon 97201
Phone: 503.223.6663

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
JUNE 15, 2003
NGO SUE TSOI
58569
RENEWS:

KITTELSON & ASSOCIATES
851 SW 6th AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

REGISTERED PROFESSIONAL ENGINEER
60027PE
OREGON
July 13, 1999
BRIAN JOSEPH DUNN
EXPIRES: 12-31-19

MEMORANDUM

Date: November 15, 2019 Project #: 23278

To: Kirk Olsen – Trammel Crow Company

From: Brian J. Dunn, PE, Kristine Connolly, PE, & Claire Dougherty

Project: Sherwood Industrial Park

Subject: Support Memorandum for Washington County DLUT Design Exception

This memorandum supplements our comprehensive transportation impact analysis documented in the April 2019 *Preliminary Findings Memorandum* (See Appendix "A") for the proposed Sherwood Industrial Park development located in the southwest quadrant of the SW Tualatin-Sherwood Road and SW 124th Avenue intersection in Sherwood, Oregon. It is intended to serve as the technical analysis necessary to support an exception to Washington County's access standards to allow a local access on the south side of the signalized SW Tualatin-Sherwood Road/SW Cipole Road intersection, which is under the jurisdiction of the Washington County Department of Land Use & Transportation (DLUT).

As summarized herein, the requested design exception can be approved as it will not result in adverse intersection operation or queuing-related impacts at the following 3 key study intersections immediately adjacent to the site:

- SW Tualatin-Sherwood Road / SW Cipole Road (site access);
- SW Tualatin-Sherwood Road / SW 124th Avenue; and,
- SW Blake Road / SW 124th Avenue (future intersection).

A final comprehensive Transportation Impact Analysis (TIA) report, inclusive of all study intersections identified through a scoping process with City of Sherwood staff in December 2018, will be provided at a later time to support a site development application.

PROPOSED DEVELOPMENT

The Applicant, Trammell Crow Company, is in the process of preparing an application to develop up to 547,200 square feet of industrial buildings on the subject property. The site is currently vacant and is bordered by the recent extension of SW 124th Avenue to the east, SW Tualatin-Sherwood Road to the north, future industrial land uses to the west and a future east-west collector, Blake Road, to the south. A site vicinity map is shown on Figure 1, with two alternative site plan exhibits provided in the *Preliminary Findings Memorandum*. As shown in those exhibits, no site access is envisioned along the SW 124th

Avenue site frontage. Rather, access to the site is proposed at a single location on the south side of SW Tualatin Sherwood Road, at the signalized SW Cipole Road intersection.

Need for Design Exception Request

SW Tualatin-Sherwood Road is under the jurisdiction of the Washington County Department of Land Use and Transportation (DLUT), which has access permitting authority. According Washington County's Functional Classification System Map (Reference 1), SW Tualatin-Sherwood Road is designated as an *Arterial* roadway. Therefore, a new access to this roadway must conform to Washington County Community Development Code (CDC, Reference 2) Section 501-8.5(B)(4), which states:

> *"Direct access to arterial roads shall be from collector or other arterial streets. Exceptions for local streets and private accesses may be allowed through a Type II process when collector access is found to be unavailable and impracticable by the Director. New Arterial Street alignments identified in the TSP may be adjusted within the subject property, as approved by the County Engineer."*

Based on the CDC standards above, a design exception is necessary, as the proposed site access to SW Tualatin-Sherwood Road is not from an *Arterial* or *Collector* street, but by a local access connection that serves only localized traffic associated with this development. As described in this memorandum, the requested design exception is expected to result in no adverse impacts to intersection operations, safety, and vehicle queuing conditions along the SW Tualatin-Sherwood Road corridor. Therefore, it is our professional opinion that Washington County DLUT should grant the requested design exception and allow a local access to SW Tualatin-Sherwood Road.

The following are additional supportive reasons to justify the requested design exception:

1. Access to SW Tualatin-Sherwood Road via a public street designed to an *Arterial* or *Collector* standards is "unavailable" because higher-functioning roadways of these classifications are not envisioned either in the adopted City of Sherwood *Transportation System Plan* (TSP, Reference 3) or in the adopted *Tonquin Employment Area (TEA) Implementation Plan* (Reference 4). Both studies identify only a localized access to SW Tualatin-Sherwood Road across from SW Cipole Road.
    - Figure 17 of the Sherwood TSP does not contemplate or designate a public road access into the site.
    - See Conceptual Road Layout (Figure 17) of the TEA Implementation Plan.
        - This figure identifies an unclassified access point for the subject property (Development Node E) to Tualatin-Sherwood Road at the SW Cipole Rd intersection. No road of any type is contemplated connecting the subject property to Tualatin-Sherwood Road.

- Page 27 of the TEA Implementation Plan states that the property's access point is assumed to be an "internal drive."

2. Access to SW Tualatin-Sherwood Road via public *Arterial* or *Collector* is also "impracticable" because a roadway of either classification would need to be continuous, of limited curvature, and connect through the site along steep grades in order to connect with the future Blake Road collector street. If this connection were made, it has been demonstrated by the applicant's civil engineer (DOWL) that roadway grading would reach approximately 11.7%, which is not conducive for truck travel on the roadway or to/from the future industrial uses planned for this site.

3. If a continuous street connection built to *Collector* or *Arterial* standards were to be constructed through the site, it could elicit undesirable vehicular cut-through patterns through the industrial park complex. SW 124th Avenue should be the primary north-south arterial in the immediate area.

Site Vicinity Map
Sherwood, Oregon

Figure
1

H:\23\23278 - Orr Property Corporate Park\dwgs\23278_design exception memo.dwg   Oct 23, 2019 - 10:08am - cdougherty   Layout Tab: Site Vicinity Map

KITTELSON & ASSOCIATES

TRAFFIC ANALYSIS SCOPE AND METHODOLOGY

As the purpose of this memorandum is to inform the design exception process with Washington County, Kittelson has performed additional technical analyses beyond what is already provided in the attached *Preliminary Findings Assessment,* with a revised focus on the following scenarios:

- Existing Year 2019 Traffic Conditions
  - No site development with SW Tualatin-Sherwood Road in current condition as 3-lane cross section
- Year 2021 Total Traffic Conditions
  - SW Cipole Road as a local access cul-de-sac and SW Tualatin-Sherwood Road remains as 3-lane cross section
  - SW Cipole Road as a local access extension to Blake Road and SW Tualatin-Sherwood Road remains as 3-lane cross section
- Year 2025 Total Traffic Conditions
  - SW Cipole Road as a local access cul-de-sac and SW Tualatin-Sherwood Road is widened to 5-lane cross section
  - SW Cipole Road as a local access extension to Blake Road and SW Tualatin-Sherwood Road is widened to 5-lane cross section

It should be emphasized that the existing and future intersection operation and queueing analyses in this memorandum are different than the results documented in the *Preliminary Findings Memorandum* as they reflect the following recent updates:

- Signal timing changes were recently implemented during the PM peak hour at the SW Tualatin-Sherwood Road/SW Cipole Road and SW Tualatin-Sherwood Road/SW 124th Avenue intersections, such that both intersections now operate as fully-actuated, uncoordinated signals, with AutoMax enabled during the PM peak hour, and,

- Revisions to the SW Tualatin Sherwood Road widening project now indicate a build-out year of 2025, with dual left-turn lanes planned at the SW 124th Avenue intersection, as published on the Washington County project website in August 2019.

The methodologies and assumptions used to update the existing and future traffic conditions at the 3 adjacent study intersections integral to the design exception discussion are consistent with those documented in the attached *Preliminary Findings Memorandum*.

EXISTING TRAFFIC CONDITIONS

Table 1 summarizes the updated operational analysis for the existing study intersections under current traffic conditions for the weekday AM and PM peak hours, considering the recent signal timing changes. As shown, the two existing intersections along SW Tualatin-Sherwood Road currently operate at acceptable levels and meet the mobility standards of the governing agency. However, as observed in the field, and reported within the queuing outputs in the Synchro worksheets, vehicle queueing is prevalent east-west along the SW Tualatin-Sherwood Road corridor during both AM and PM peak hours.

Appendix "B" contains the year 2019 existing traffic level-of-service and queuing worksheets.

Table 1: Existing Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operational Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (7.3)	B (15.0)	0.67	0.82	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	D (35.9)	C (27.7)	0.88	0.71	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay at two-way stop control (TWSC).
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.
N/A = Not applicable. Intersection does not yet exist.

YEAR 2021 BACKGROUND TRAFFIC CONDITIONS

The year 2021 background traffic conditions analysis assumes the same traffic attributed to general growth in the region (application of a 1.5 percent annual growth rate), and in-process trips as documented in *Preliminary Findings Memorandum*. Additionally, it was still assumed that Blake Road would be in place by 2021 from SW Oregon Street to SW 124th Avenue, with some re-distribution of trips at the SW Oregon Street/SW Tualatin-Sherwood Road and SW 124th Avenue/SW Tualatin-Sherwood Road intersections.

Table 2 summarizes the updated operational analysis for the study intersections under the weekday AM and PM peak hour background 2021 traffic conditions, considering the recent PM signal timing changes. As indicated in Table 2, all study intersections are forecast to operate at levels which meet the mobility standards of the governing agency during both weekday AM and PM peak hours.

Appendix "C" contains the year 2021 background traffic level-of-service worksheets.

Table 2: Year 2021 Background Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (8.2)	B (19.4)	0.71	0.89	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (58.1)	C (34.6)	0.98	0.79	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	B (12.2)	B (11.2)	0.05 (EB)	0.04 (EB)	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC).
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

YEAR 2021 TOTAL TRAFFIC ANALYSIS

The year 2021 total traffic conditions analysis results are shown below for the two alternative site development and access scenarios. Both scenarios continue to assume that Blake Road would be in place from SW Oregon Street to SW 124th Avenue, with limited re-distribution of system trips from the SW Oregon Street/SW Tualatin-Sherwood Road and SW 124th Avenue/SW Tualatin-Sherwood Road intersections. Consistent with the *Preliminary Findings Memorandum*, the total traffic scenarios assume full build-out of the 547,220 SF Industrial Park.

SW Cipole Road Cul-De-Sac

Updated year 2021 total traffic conditions are presented in Table 3 for the scenario in which SW Cipole Road is a local access cul-de-sac street. *Appendix "D" contains the updated year 2021 Total Traffic Cul-de-sac Site Plan level-of-service worksheets.*

Table 3: Year 2021 Total Traffic Conditions – SW Cipole Road Cul-De-Sac Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	B (14.7)	C (33.3)	0.81	0.92	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (57.5)	D (35.6)	0.99	0.81	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	B (12.4)	B (11.4)	0.05(EB)	0.02 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road/Blake Road	Not Applicable to SW Cipole Road Cul-de-sac Scenario						

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC).
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

SW Cipole Road Extension to Blake Road

Updated year 2021 total traffic conditions are presented in Table 4 for the scenario in which SW Cipole Road extends to Blake Road as a local access street. *Appendix "E" contains the updated year 2021 Total Traffic – SW Cipole Road Extension Site Plan level-of-service worksheets.*

Table 4: Year 2021 Total Traffic Conditions – SW Cipole Road Extension Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	B (13.2)	C (26.0)	0.78	0.90	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (58.3)	D (36.2)	0.99	0.81	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	B (12.7)	B (11.5)	0.06 (EB)	0.05 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road/Blake Road	A (9.1)	B (9.2)	0.02 (SB)	0.07 (SB)	City of Sherwood	LOS "E" or V/C of 0.90	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC).
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

As indicated in Tables 3 and 4, the adjacent study intersections around the site are anticipated to meet the applicable regional or City of Sherwood operating standards with site development, considering both scenarios for the termination of SW Cipole Road as a local access cul-de-sac street and the potential SW Cipole Road extension to Blake Road.

YEAR 2025 BACKGROUND TRAFFIC CONDITIONS

The year 2025 background traffic conditions analysis identifies how the study area's transportation system will operate without the proposed development. Similar to the year 2021 background analysis, the year 2025 analysis includes trips from traffic attributed to general growth in the region (application of a 1.5 percent annual growth rate), trips from the in-process and some re-distribution of trips, assuming the connection of Blake Road from SW Oregon Street to SW 124th Avenue.

Additionally, the 2025 background analysis includes the planned widening of SW Tualatin-Sherwood Road to five lanes, as defined by Project #318 in the Washington County MSTIP 3e (Reference 9). Volumes on SW Tualatin-Sherwood Road and SW 124th Avenue were increased an additional 5 percent on top of regional growth, to account for increased future demand.

Assumed lane configurations for SW Tualatin Sherwood Road signalized intersections to be widened as part of the planned project were updated to match the preliminary design layouts posted on the Washington County website for Project #318 in August 2019 (Reference 10). Additionally, as dual left-turn lanes are now planned for the eastbound, westbound and northbound approaches to the SW 124th Avenue intersection, it was assumed that these movements would become controlled by protected-only left turn phasing.

Table 5 summarizes the operational analysis for the study intersections under the weekday AM and PM peak hour 2025 background traffic conditions and shows that all study intersections are forecast to operate at levels which meet the mobility standards of the governing agency during both weekday AM and PM peak hours. *Appendix "F" contains the year 2025 background traffic level-of-service worksheets.*

Table 5: Year 2025 Background Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (5.6)	A (9.5)	0.43	0.62	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (32.0)	C (23.6)	0.64	0.60	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	B (12.7)	B (11.6)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC).
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

YEAR 2025 TOTAL TRAFFIC CONDITIONS

The year 2025 total traffic conditions analysis results are shown below for the two alternative site access scenarios. Both scenarios continue to assume that Blake Road would be in place from SW Oregon Street to SW 124th Avenue, and assume the planned widening of SW Tualatin-Sherwood Road and associated intersection modifications. Consistent with the *Preliminary Findings Memorandum*, the total traffic scenarios assume full build-out of the 547,220 SF Industrial Park.

SW Cipole Road Cul-De-Sac

Updated year 2025 total traffic conditions are reported in Table 6 for the scenario in which SW Cipole Road is a local access cul-de-sac street. *Appendix "G" contains the year 2025 Total Traffic Cul-de-sac Site Plan level-of-service worksheets.*

Table 6: Year 2025 Total Traffic Conditions – SW Cipole Road Cul-De-Sac Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (9.5)	B (14.3)	0.50	0.62	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (29.8)	C (24.1)	0.65	0.61	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	B (12.9)	B (11.7)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road/Blake Road	Not Applicable to Cipole Road Cul-de-sac Scenario						

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC).
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

SW Cipole Road Extension to Blake Road

Updated year 2025 total traffic conditions are presented in Table 7 for the scenario in which SW Cipole Road extends to Blake Road as a local access street. *Appendix "H" contains the year 2025 Total Traffic Cipole Road Extension Site Plan level-of-service worksheets.*

Table 7: Year 2025 Total Traffic Conditions – SW Cipole Road Extension Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (8.6)	B (12.5)	0.48	0.60	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (29.6)	C (24.1)	0.65	0.61	Regional	V/C of 0.99	Yes
11	SW 124th Avenue/Blake Road	B (13.2)	B (11.9)	0.06 (EB)	0.05 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road/Blake Road	A (9.1)	A (9.2)	0.02 (SB)	0.07 (SB)	City of Sherwood	LOS "E" or v/c of 0.90	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC.
[2] HCM 2000 Volume-to-Capacity ratio (signalized). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

As indicated in Tables 6 and 7, the three or four site-adjacent study intersections are anticipated to meet the applicable regional or City of Sherwood operating standards with the site development place, considering both the termination of SW Cipole Road as a cul-de-sac and the potential SW Cipole Road extension to Blake Road.

VEHICLE QUEUING ANALYSIS

An updated 95th-percentile vehicle queuing analysis was completed for two site access scenarios under future build-out years 2021 and 2025. Consistent with the methodology applied in the *Preliminary Assessment Report,* for the SimTraffic analysis, four 15-minute periods were recorded, with the second period representative of the peak 15-minute period, with the report results averaging five runs. *Appendix "I" contains the updated Year 2021 Total Traffic SimTraffic worksheets and Appendix "J" contains the Year 2025 Total Traffic Simtraffic worksheets.*

As shown in Tables 8, under year 2021 total traffic conditions, most 95th percentile queues can generally be accommodated by the existing or assumed lane storage capacities, considering both site access scenarios. In the few instances where demand in the striped turn bay storage is exceeded, as measured by the length of the white gore stripe, additional queue storage is available in the adjacent striped median or two-way left-turn lane (TWLTL) area, with the exception of the eastbound right-turn lane at the SW Tualatin Sherwood Road/SW 124th Avenue intersection during the AM peak hour. The eastbound right-turn lane 95th percentile queue is estimated 400 feet, whereas the striped turn bay storage, as measured by the length of the white gore stripe, is 350 feet. Inclusive of the taper length, there is adequate storage to accommodate a 400-foot-long queue before potentially impacting the adjacent bike lane or eastbound through lane. Additionally, eastbound SW Tualatin-Sherwood Road through lane queues may extend to adjacent intersections during the AM peak hour and westbound through lane queues may extend to adjacent intersections during the PM peak hour.

Table 8: Year 2021 Total Traffic Conditions – SimTraffic 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	1100	-	250	790	125	200	200	-	300	725	-
	SW Cipole Road Cul-de-Sac	AM Queue	325	***1225***	-	175	225	75	75	75	-	250	225	-
		PM Queue	125	600	-	150	775	50	150	125	-	125	150	
	SW Cipole Road Extension	AM Queue	***375***	***1225***	-	125	175	100	75	75	-	175	75	-
		PM Queue	100	400	-	75	653	75	125	100	-	100	150	-
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)	360[1]	790	350	375	1180	375	460	1000	-	240[3]	730	-
	SW Cipole Road Cul-de-Sac	AM Queue	300	***975***	275	125	600	300	325	600	-	***325***	325	-
		PM Queue	125	750	***400***	275	***1225***	375	175	200	-	***325***	350	-
	SW Cipole Road Extension	AM Queue	***400***	***975***	-	175	475	350	350	525	-	***275***	200	-
		PM Queue	125	575	275	300	1000	350	150	200	-	***275***	275	-
SW 124th Avenue / Blake Road		Storage (feet)[4]	150	800	-	150	-	-	150	1000	-	150	1000	-
	SW Cipole Road Cul-de-Sac	AM Queue	50	75	-	25	-	-	-	75	-	25	-	-
		PM Queue	50	50	-	50	-	-	-	25	-	-	-	-
	SW Cipole Road Extension	AM Queue	50	75	-	25	-	-	-	-	-	25	-	-
		PM Queue	50	50	-	75	-	-	25	25	-	25	-	-

Notes:
95th percentile queue lengths are reported in feet and have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;
Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;
[1]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in striped median;
[2]Storage for future intersection left-turn lanes assumed to be 150 feet;
[3]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in left-most southbound through lane, as only the right southbound through lane continues through the intersection.
[4]Storage for future intersection eastbound left-turn lanes assumed to be 150 feet.

As detailed in Table 9, under year 2025 total traffic conditions, all 95th percentile queues can be accommodated by the planned lane configuration storage capacity, considering both site access scenarios, except for the southbound left-turn movement at the SW Tualatin Sherwood Road/SW 124th Avenue intersection during the AM peak hour.

Table 9: Year 2025 Total Traffic Conditions AM Peak Hour – SimTraffic 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360	1100	-	250	790	-	200	200	-	300	725	-
	SW Cipole Road Cul-de-Sac	AM Queue	100	175	-	100	175	-	75	50	-	150	-	-
		PM Queue	75	150	-	50	-	-	125	75	-	100	-	-
	SW Cipole Road Extension	AM Queue	100	175	-	100	175		50	50	-	50	50	-
		PM Queue	50	150	-	75	225	-	100	75	-	100	100	-
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)	250[1]	790	350	375[1]	1180	375	300[1]	1000	-	240	730	-
	SW Cipole Road Cul-de-Sac	AM Queue	150	350	150	100	275	150	175	225	-	***325***	-	-
		PM Queue	100	300	125	75	175	75	100	100	-	225	-	-
	SW Cipole Road Extension	AM Queue	150	400	100	100	275	175	150	225	-	***275***	225	-
		PM Queue	125	325	150	50	300	100	100	100	-	225	200	-
SW 124th Avenue / Blake Road		Storage (feet)[2]	150	800	-	150	-	-	150	1000	-	150	1000	-
	SW Cipole Road Cul-de-Sac	AM Queue	50	100	-	25	-	-	-	25	-	50	-	-
		PM Queue	50	50	-	50	-	-	-	25	-	-	-	-
	SW Cipole Road Extension	AM Queue	50	75	-	25	-	-	25	-	-	25	-	-
		PM Queue	50	50	-	50	-	-	25	-	-	25	-	-

Notes:
95th percentile queue lengths are reported in feet and have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;
Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;
[1]Storage measured as the length of white gore stripe for turn lane, assuming dual left-turn lane as published on Washington County widening project website. Northbound dual left-storage capacity estimated, additional storage available in striped median to the south;
[2]Storage for future intersection left-turn lanes assumed to be 150 feet.

Vehicle Queueing Impact Considerations

Year 2021 Total Traffic Conditions – Back-to-Back Left-turn Lanes

Looking specifically at the potential eastbound and westbound back-to-back left-turn queue interaction along SW Tualatin-Sherwood Road between SW 124th Avenue and SW Cipole Road, the existing eastbound approach to the SW 124th Avenue / SW Tualatin- Sherwood Road intersection includes 360 feet of turn bay storage and an approximately 150-foot-long taper, as detailed in Figure 2. The 95th percentile eastbound left-turn movement peak hour queues in the worst-case scenario are estimated at 400 feet during the AM peak hour and 125 feet during the PM peak hour, both of which can be accommodated by the existing queue storage and taper space provided. Additionally, the westbound left-turn lane at the SW Cipole Road / SW Tualatin-Sherwood Road intersection is assumed to have turn bay storage length of approximately 250 feet. A turn lane of this length can accommodate the 95th percentile queues estimated at 175 feet, approximately 7 vehicle lengths, during the AM peak hour and 150 feet, approximately 6 vehicles lengths, during the PM peak hour.

Figure 2. Existing Year 2019 SW 124th Ave Eastbound Left-Turn Lane Configuration

Year 2025 Total Traffic Conditions – Back-to-Back Left-turn Lanes

Updated information available on the Washington County SW Tualatin-Sherwood Road Widening project now indicates the use of dual-left turn lanes on most approaches to the SW Tualatin-Sherwood Road / SW 124th Avenue intersection, as reproduced below as Figure 3.

Figure 3. Future Year 2025 SW 124th Ave Eastbound Left-Turn Lane Configuration

With the widening of SW Tualatin-Sherwood Road, the northbound, eastbound and westbound intersection approaches are shown as converted to dual-left turn lanes. The eastbound approach includes 250 feet of dual left-turn bay storage and an approximately 190-foot-long taper. With this revised eastbound approach configuration, there is approximately 310 feet of space that is sufficient for the left-turn movement at the westbound approach to the SW Cipole Road / SW Tualatin-Sherwood Road intersection. The 95th percentile eastbound left-turn movement peak hour queues in the worst-case scenario are estimated at 150 feet during the AM peak hour and 125 feet during the PM peak hour, both of which can be accommodated by the existing queue storage and taper space provided. Additionally, a future westbound left-turn lane at the SW Cipole Road / SW Tualatin-Sherwood Road intersection can have a single lane left-turn bay with storage of approximately 250 feet, which would accommodate the 95th percentile queues estimated at 100 feet (or approximately 4 vehicle lengths) during the AM peak hour and 75 feet (or approximately 3 vehicles lengths) during the PM peak hour.

SUMMARY OF FINDINGS

The findings of our updated intersection operations and vehicle queueing analyses indicate there is no significant difference between impacts of the two site access options contemplated for this development. Our findings relative to impacts on intersection operations and vehicle queueing are as follows:

- The three study intersections adjacent to the site will operate during the weekday AM and PM peak hours at levels which meet the governing regional operating standard under all scenarios studied, including:
    - Year 2019 Existing Traffic Conditions
    - Year 2021 Background Traffic Conditions
    - Year 2021 Total Traffic Conditions
        - With SW Cipole Road as a local access cul-de-sac, or
        - With SW Cipole Road as a local access street connecting to Blake Road.
    - Year 2025 Background Traffic Conditions
    - Year 2025 Total Traffic Conditions
        - With SW Cipole Road as a local access cul-de-sac, or
        - With SW Cipole Road as a local access street connecting to Blake Road.
- Under current traffic conditions, the eastbound left-turn lane at the SW Tualatin-Sherwood Road / SW 124th Avenue intersection includes 360 feet of turn bay storage and an approximately 150-foot-long taper. The 275 feet of additional distance to the west before the SW Cipole Road intersection could be utilized as a single westbound left-turn lane to the planned extension of SW Cipole Road into the site without creating any operational or safety deficiencies.
- Estimated year 2021 total traffic queues within the back-to-back eastbound and westbound left-turn lanes along SW Tualatin-Sherwood Road, between SW Cipole Road and SW 124th Avenue, can be adequately accommodated under either SW Cipole Road site access scenario without creating any operational or safety deficiencies.
- The planned widening along SW Tualatin-Sherwood Road by the year 2025 includes dual eastbound left-turn lanes on the approach to SW 124th Avenue with 250 feet of striped storage and an approximately 190-foot-long taper. This revised configuration would leave approximately 310 feet of additional space to the west available for a single left-turn lane on the westbound approach to the SW Cipole Road / SW 124th Avenue intersection.

- Estimated year 2025 total traffic queues within the back-to-back eastbound and westbound left-turn lanes along SW Tualatin-Sherwood Road, between SW Cipole Road and SW 124th Avenue, can be adequately accommodated under either SW Cipole Road site access scenario without creating any operational or safety deficiencies.

Aside from the minor differences between technical findings for the two site access scenarios, it is our professional opinion that the termination of SW Cipole Road as a local access cul-de-sac would be the best option. Besides the design challenges associated with steep grades throughout the site and the need to facilitate safe truck movements, a cul-de-sac ending will also eliminate the potential for long-term cut-through traffic through the site, thus, establishing a finite limit to the queues that could result within the associated turn lanes at the SW Tualatin-Sherwood Road/SW Cipole Road intersection.

CONCLUSIONS

In summary, the requested design exception associated with the proposed Sherwood Industrial Park can be approved by Washington County DLUT while maintaining acceptable levels of mobility and safety at the adjacent study intersections under either site access scenario at SW Cipole Road, assuming agency-planned improvements are in place.

If you have any questions, please give us a call at (503) 228-5230.

REFERENCES

1) Washington County. *Washington County Functional Classification System and Lane Numbers*. https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/upload/UserFriendlyTSP_Maps_FC_Lanes_ExProp.pdf
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4) City of Sherwood. *Tonquin Employment Area Market Analysis, Business Recruitment Strategy and Implementation Plan,* June 5, 2015. https://www.sherwoodoregon.gov/sites/default/files/fileattachments/ordinance/4146/resolution_2015-051_accepting_tea_implementation_plan_06.16.15.pdf
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9) Washington County. *MSTIP 3e Adopted Funding Program and Project List.* 2016.
10) Washington County. *Tualatin Sherwood Road (Teton Avenue to Langer Farms Parkway).* https://www.co.washington.or.us/LUT/TransportationProjects/tualatinsherwoodroad.cfm

ATTACHMENTS

Appendix A: Preliminary Findings Memorandum - April 2019

Appendix B: Year 2019 Existing Operations Worksheets

Appendix C: Year 2021 Background Operations Worksheets

Appendix D: Year 2021 Total Traffic – Cipole Road Cul-de-sac Operations Worksheets

Appendix E: Year 2021 Total Traffic – Cipole Road Extension Operations Worksheets

Appendix F: Year 2025 Background Operations Worksheets

Appendix G: Year 2025 Total Traffic – Cipole Road Cul-de-sac Operations Worksheets

Appendix H: Year 2025 Total Traffic – Cipole Road Extension Operations Worksheets

Appendix I: Year 2021 Total Traffic – SimTraffic Worksheets

Appendix J: Year 2025 Total Traffic – SimTraffic Worksheets

Appendix A Preliminary Findings Memorandum (April 2019)

KITTELSON & ASSOCIATES
851 SW 6th AVENUE, SUITE 600
PORTLAND, OR 97204
P 503.228.5230 F 503.273.8169

MEMORANDUM

Date:	April 19, 2019	Project #: 23278
To:	Kirk Olsen – Trammel Crow Company	
From:	Brian J. Dunn, PE, Kristine Connolly, PE, & Claire Dougherty	
Project:	Sherwood Industrial Park	
Subject:	Traffic Impact Study – Preliminary Findings Memorandum – Revision 1	

This memorandum presents the preliminary transportation impact analysis findings for the proposed Sherwood Industrial Park development, to be located the southwest quadrant of the SW Tualatin-Sherwood Road and SW 124th Avenue intersection in Sherwood, Oregon. This interim memorandum was revised in response to City comments on the memorandum dated March 15, 2019. It is provided to facilitate discussions regarding the operational impacts of site development to the surrounding street network under two scenarios:

- Limiting SW Cipole Road to a cul-de-sac ending within the site; and,
- Extension of SW Cipole Road through the site to Blake Road (future east-west collector).

A comparison of these two potential scenarios led to the following findings which support limiting SW Cipole Road to a cul-de-sac ending, rather than extending it through the site to Blake Road:

- Traffic Operations: Regardless of whether or not SW Cipole Road is extended through the site, the adjacent study intersections are all anticipated to meet the regional mobility standard. While the extension of SW Cipole Road results in slightly improved operations at the SW Cipole Road / SW Tualatin-Sherwood Road intersection, operations remain the same or slightly deteriorate at the SW 124th Avenue / SW Tualatin-Sherwood Road, SW Cipole Road/Blake Road and SW 124th Avenue / Blake Road intersections. Therefore, there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road.
- Traffic Safety: A connection to Blake Road would add an access point to the roadway network, introducing conflict. Limiting SW Cipole Road to a cul-de-sac ending would result in fewer unprotected left-turn conflict points on the surrounding roadway network, especially those involving large trucks.

Based on the results of the preliminary transportation impact analysis detailed herein, and considering the planned widening of SW Tualatin-Sherwood Road, the proposed Sherwood Industrial Park can be developed while maintaining acceptable levels of mobility at the study intersections, with the exception of the SW Oregon Street / SW Tonquin Road intersection. This two-way stop-controlled intersection is anticipated to exceed the regional operating standard during the PM peak hour with site development, regardless of whether or not SW Cipole Road is extended through the site. The SW Oregon Street / SW Tonquin Road intersection can meet the regional operating standards with either a signal or a roundabout installed.

INTRODUCTION

Proposed Development

The Applicant, Trammell Crow Company, is in the process of preparing an application to develop 547,220 square feet of industrial buildings on the subject property. The site is currently vacant and is bordered by the recent extension of SW 124th Avenue to the east, SW Tualatin-Sherwood Road to the north, future industrial land uses to the west and a future east-west collector, Blake Road, to the south.

Figure 1 displays a site vicinity map and Figures 2 and 3 display two site plan alternatives. The site plan as shown in Figure 2 details a possible extension of Cipole Road into the site terminating as a private cul-de-sac, whereas Figure 3 shows Cipole Road bisecting the site as a public street, extending to intersect with the future Blake Road. As shown in both site plans, no site access driveways are planned on SW 124th Avenue.

Site Vicinity Map
Sherwood, Oregon

Figure
1

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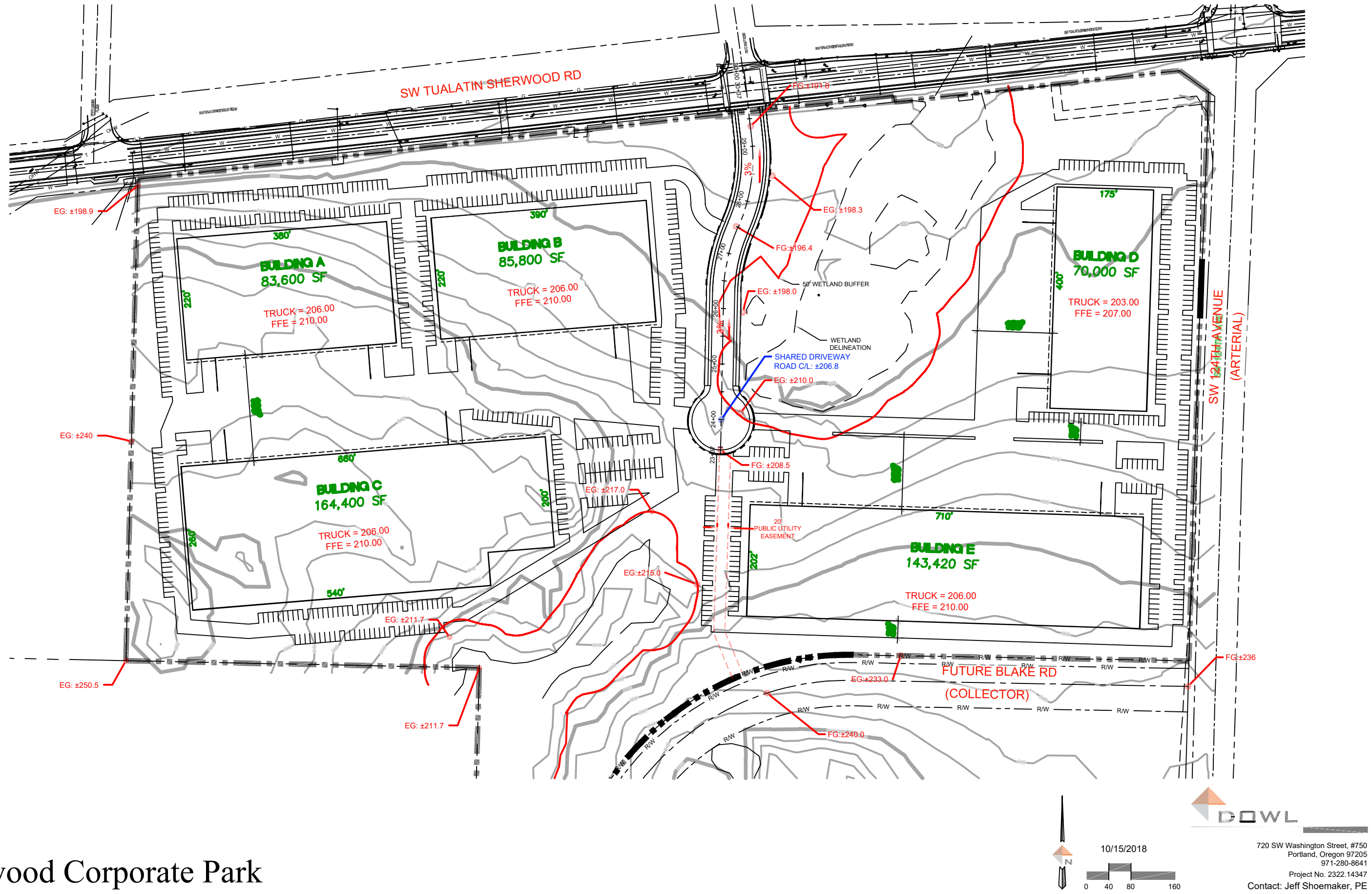

Sherwood Corporate Park

CIPOLE RD CUL-DE-SAC (1 OF 2)

RECEIVED FROM TCC : October 23, 2018

Proposed Site Plan
Cipole Road Cul-de-sac
Sherwood, OR

Figure
2

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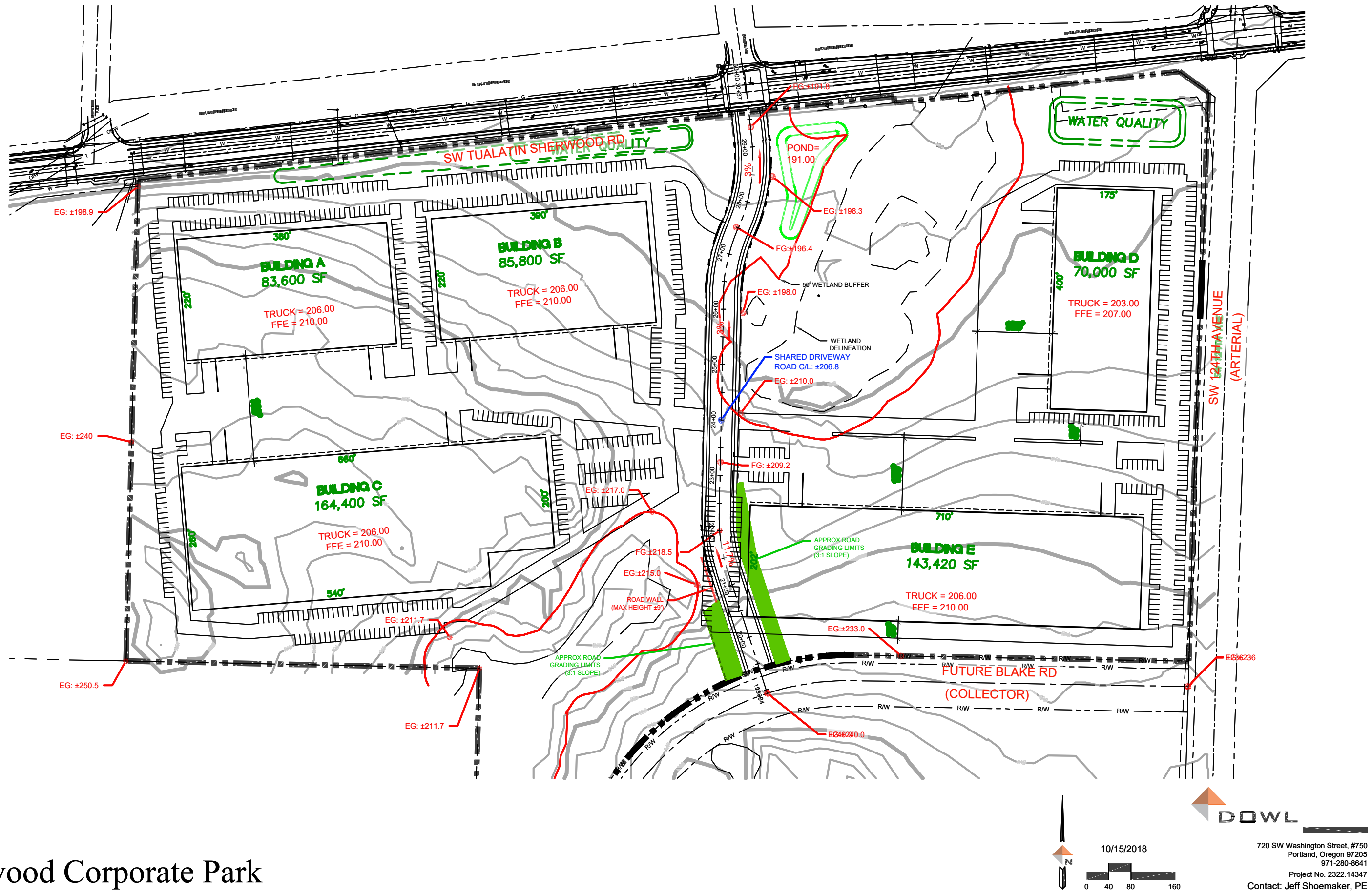
KITTELSON & ASSOCIATES



Sherwood Corporate Park

CIPOLE RD CONNECTION TO BLAKE RD TEST FIT (1 OF 2)

RECEIVED FROM TCC : October 23, 2018

Proposed Site Plan
Cipole Road Connection
Sherwood, OR

Figure 3

H:\23\23278 - Orr Property Corporate Park\dwgs\23278_interim memo.dwg Apr 05, 2019 - 8:26am - cdougherty Layout Tab: Proposed Site Plan_Cipole Connect

Scope of Study

The following study intersections were identified in a scoping memorandum submitted to the City of Sherwood and Washington County Department of Land Use and Transportation (DLUT) for review:

- SW Tualatin-Sherwood Road/SW Oregon Street;
- SW Tualatin-Sherwood Road/SW Wildrose Place;
- SW Tualatin-Sherwood Road/SW Cipole Road;
- SW Tualatin-Sherwood Road/SW 124th Avenue;
- SW Tualatin-Sherwood Road/SW 120th Avenue;
- SW Tualatin-Sherwood Road/SW 115th Avenue; and,
- SW Tualatin-Sherwood Road/SW 112th Avenue-SW Avery Street.

After further discussions with the City of Sherwood, the following intersections were added for analysis:

- SW Tualatin-Sherwood Road/SW Langer Farms Parkway;
- SW Oregon Street/SW Tonquin Road;
- SW Oregon Street/SW Murdock Road;
- Blake Road / SW Cipole Road (future year scenarios only); and,
- Blake Road / SW 124th Avenue (future year scenarios only).

Analysis Scenarios

This preliminary study evaluated transportation conditions for the following scenarios:

- Year 2019 existing traffic within the study area during the weekday AM and PM peak hours;
- Year 2021 background traffic conditions (without the proposed development) during the weekday AM and PM peak hours, assuming that the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place;
- Year 2021 total traffic operations (with full build-out of the proposed development, assuming SW Cipole Road terminates within the site) during the weekday AM and PM peak hours;
- Year 2021 total traffic operations (with full build-out of the proposed development, assuming SW Cipole Road bisects the site to connect to Blake Road) during the weekday AM and PM peak hours;
- Year 2023 background traffic conditions (without the proposed development) during the weekday AM and PM peak hours, assuming the Blake Road connection from SW Oregon Street to SW 124th Avenue is in place, that SW Tualatin-Sherwood Road has been widened to five lanes;
- Year 2023 total traffic operations (with full build-out of the proposed development, assuming Cipole Road terminates within the site) during the weekday AM and PM peak hours;

- Year 2023 total traffic operations (with full build-out of the proposed development, assuming Cipole Road bisects the site to connect to Blake Road) during the weekday AM and PM peak hours.

TRAFFIC ANALYSIS

The site vicinity was visited and inventoried in February 2019. At that time, site conditions, adjacent land uses, existing traffic operations, and transportation facilities in the study area were collected.

Analysis Methodology

All level-of-service analyses of signalized and stop-controlled intersections described in this report were performed in accordance with the procedures stated in the *2000 Highway Capacity Manual* (HCM, Reference 1). The peak 15-minute flow rates were used in the evaluation of all intersection level-of-service (LOS) and volume-to-capacity (V/C) ratios. For this reason, the analyses reflect conditions that are only likely to occur for 15 minutes out of each average peak hour. Traffic conditions during typical weekday hours are expected to operate with lower levels of delay than those described in this report. Operational analyses for the signalized and stop-controlled intersections presented in this report were completed using Synchro 10 software. The roundabout intersection operations analyses were completed using SIDRA 7 software, based on the procedures stated in the *Highway Capacity Manual 6th Edition* (HCM 6th Ed., Reference 2).

Operating Standards

Per Section 8 of Sherwood's 2014 Transportation System Plan (TSP, Reference 3), *"The City target for signalized, all way stop (AWSC), or roundabout intersections is level of service D or volume to capacity ratio equal to or less than 0.85. The target for unsignalized two way stop control (TWSC) intersections is level of service E or a volume to capacity ratio equal to or less than 0.90."* For the future year analysis assuming the extension of SW Cipole Road to Blake Road, the assumed future TWSC intersection of SW Cipole Road and Blake Road will be compared to the City of Sherwood unsignalized two way stop control (TWSC) intersection standards, under the assumption properties west of SW 124th Avenue are brought into the City limits of Sherwood as planned.

For streets owned by Washington County or city-owned streets on the Arterial and Throughway Network Map within the 2014 Regional Transportation Plan (Reference 4), the Regional 0.99 volume to capacity (V/C) operating standard will be used. The Arterial and Throughway Network Map identifies SW Tualatin-Sherwood Road as a Major Arterial and SW Oregon Street as a Minor Arterial. As all existing study intersections are along SW Tualatin-Sherwood Road or SW Oregon Street, the 0.99 V/C operating standard will be used. Additionally, as SW 124th Avenue extension is also identified as a Minor Arterial on the Arterial and Throughway Network, the 0.99 V/C standard will also be used for the assumed future TWSC intersection of Blake Road and SW 124th Avenue.

Existing Traffic Operations

Intersection turning-movement counts were conducted at the study intersections when local area schools were in session in February 2019. All the weekday counts were conducted on a typical mid-week day during the morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak time periods. From the counts, the weekday AM peak hour was found to occur from 7:20 to 8:20 AM and the PM peak hour occurs from 4:45 to 5:55 PM. *Appendix "A" contains the February 2019 traffic count worksheets.*

Table 1 summarizes the operational analysis for the study intersections under existing traffic conditions for the weekday AM and PM peak hours. As shown, all of the study intersections currently operate at acceptable levels and meet the mobility standards of the governing agency. However, as observed in the field, and reported within the queuing outputs in the Synchro worksheets, vehicle queueing is prevalent east-west along the SW Tualatin-Sherwood Road corridor during both AM and PM peak hours.

Appendix "B" contains the year 2019 existing traffic level-of-service and queuing worksheets.

Table 1: Existing Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operational Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (21.2)	C (26.1)	0.72	0.82	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (14.8)	C (28.2)	0.77	0.96	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	D (25.5)	E (43.5)	0.03 (SB)	0.17 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (7.3)	B (15.8)	0.67	0.82	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	D (35.9)	C (27.3)	0.88	0.72	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (26.5)	C (19.5)	0.10 (NB)	0.10 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (15.9)	B (13.5)	0.71	0.62	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	C (24.6)	B (19.5)	0.74	0.61	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	B (14.2)	E (46.2)	0.26 (NB)	0.85 (NB)	Regional	V/C of 0.99	Yes
10	SW Oregon Street/ SW Murdock Road	A (8.0)	A (8.7)	0.53	0.62	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

Year 2021 Background Traffic Conditions

The year 2021 background traffic conditions analysis identifies how the study area's transportation system will operate without the proposed development. This analysis includes trips from traffic attributed to general growth in the region (application of a 1.5 percent annual growth rate), but does not include traffic from the proposed development. In-process trips from the following developments were including in the background traffic volumes:

- Parkway Village South (SW Langer Farms Parkway)
- Spring Creek Industrial
- Four-S Corporate Warehouse
- IPT Tualatin
- Majestic SW 115th Avenue Industrial Park
- Hedges C Building
- Tualatin Business Park

Additionally, it was assumed that Blake Road would be in place from SW Oregon Street to SW 124th Avenue, with some re-distribution of trips from the SW Oregon Street / SW Tualatin-Sherwood Road and SW 124th Avenue / SW Tualatin-Sherwood Road intersections.

As Washington County plans to update the timing of signals along SW Tualatin-Sherwood Road later in 2019 to account for the recent opening of the SW 124th Avenue extension, the future year analysis assumes the re-coordination of the traffic signals in the corridor at the SW Cipole Road, SW 124th Avenue, SW 115th Avenue and SW 112th Avenue /SW Avery Street intersections. While the existing signal timing parameters show that during the AM peak hour, the SW Cipole Road and SW 124th Avenue signals operate with a coordinated 120 second cycle length and the SW 115th and SW 112th/SW Avery Street signals operate with a coordinated 140 second cycle, the future years analysis assumed that all four signals would be coordinated with 150 second cycle length during the AM peak, accounting for the addition of the northbound approach at the SW 124th Avenue intersection and regional growth. No cycle length changes were assumed in the future year PM peak hour analysis, as the existing signal timing parameters show that all four signals operate with a coordinated 120 second cycle length, though the coordination offset was optimized to account for future traffic patterns.

Table 2 summarizes the operational analysis for the study intersections under the weekday AM and PM peak hour background 2021 traffic conditions. As indicated in Table 2, all study intersections except for the SW Oregon Street / SW Tualatin- Sherwood Road intersection are forecast to operate at levels which meet the mobility standards of the governing agency during both weekday AM and PM peak hours.

Appendix "C" contains the year 2021 background traffic level-of-service worksheets.

Table 2: Year 2021 Background Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (24.1)	C (32.1)	0.78	0.92	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (16.4)	D (35.5)	0.84	**1.01**	Regional	V/C of 0.99	**No**
3	SW Wildrose Place/SW Tualatin-Sherwood Road	D(30.1)	F (75.7)	0.04 (SB)	0.27 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (8.1)	C (24.9)	0.72	0.90	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (56.8)	D (36.4)	0.98	0.82	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (32.6)	C (22.8)	0.11 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (18.1)	B (15.9)	0.82	0.74	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	C (31.9)	C (27.5)	0.82	0.77	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.2)	F (72.1)	0.30 (NB)	0.98 (NB)	Regional	V/C of 0.99	Yes
10	SW Oregon Street/ SW Murdock Road	A (9.0)	B (10.3)	0.60	0.68	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (11.8)	B (11.1)	0.01 (WB)	0.04 (WB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	Future Access (Cipole Extension Scenario)						

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

Trip Generation

A preliminary trip generation estimate for the proposed development was prepared based on the Institute of Transportation Engineers' (ITE) *Trip Generation Manual*, 10th Edition (Reference 5). Table 3 displays the preliminary trip generation for the proposed site.

Table 3. Preliminary Trip Generation Estimate

Land Use Category	ITE Code	Size (SF)	Total Daily Trips	Weekday AM Peak Hour			Weekday PM Peak Hour		
				Total	In	Out	Total	In	Out
Industrial Park	130	547,200	1,844	219	177	42	219	46	173

Per comments received from the City of Sherwood on the scoping memorandum, weekday peak hour driveway counts were conducted at a similar industrial development nearby, to confirm that the ITE land use code for *Industrial Park* would not underestimate trips for the planned development. Counts were collected during peak periods for three consecutive weekdays and analysis showed an average trip generation rate of approximately half that of ITE *Industrial Park* land use code. Therefore, for a conservative analysis, the ITE trip generation as presented in Table 3 was carried forward for the traffic analysis.

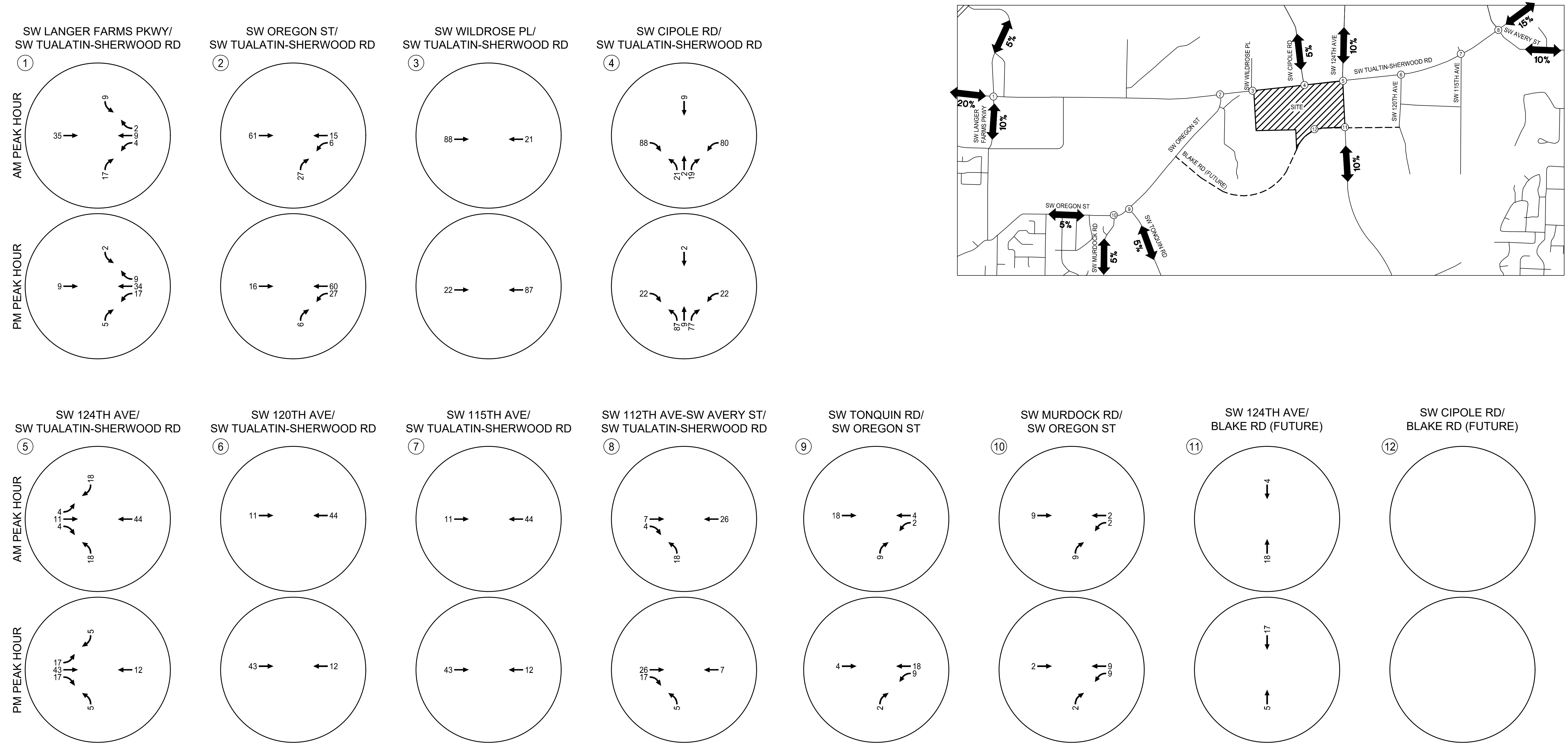
Trip Distribution

Based on a review of general traffic patterns in the region, the proposed land use and external site access patterns, and prior history of our firm's involvement on other development projects in the City of Sherwood, the following site trip distributions are proposed:

- 10 percent to/from the west via SW Tualatin-Sherwood Road,
- 5 percent to/from the southwest via SW Oregon Street,
- 10 percent to/from the southwest via the future Blake Road,
- 20 percent to/from the southeast via the future Blake Road and SW 124th Avenue extension,
- 5 percent to/from the north via Cipole Road,
- 15 percent to/from the north via SW 124th Avenue,
- 10 percent to/from the east via SW 112th Avenue – SW Avery Street, and
- 25 percent to/from the east via SW Tualatin-Sherwood Road.

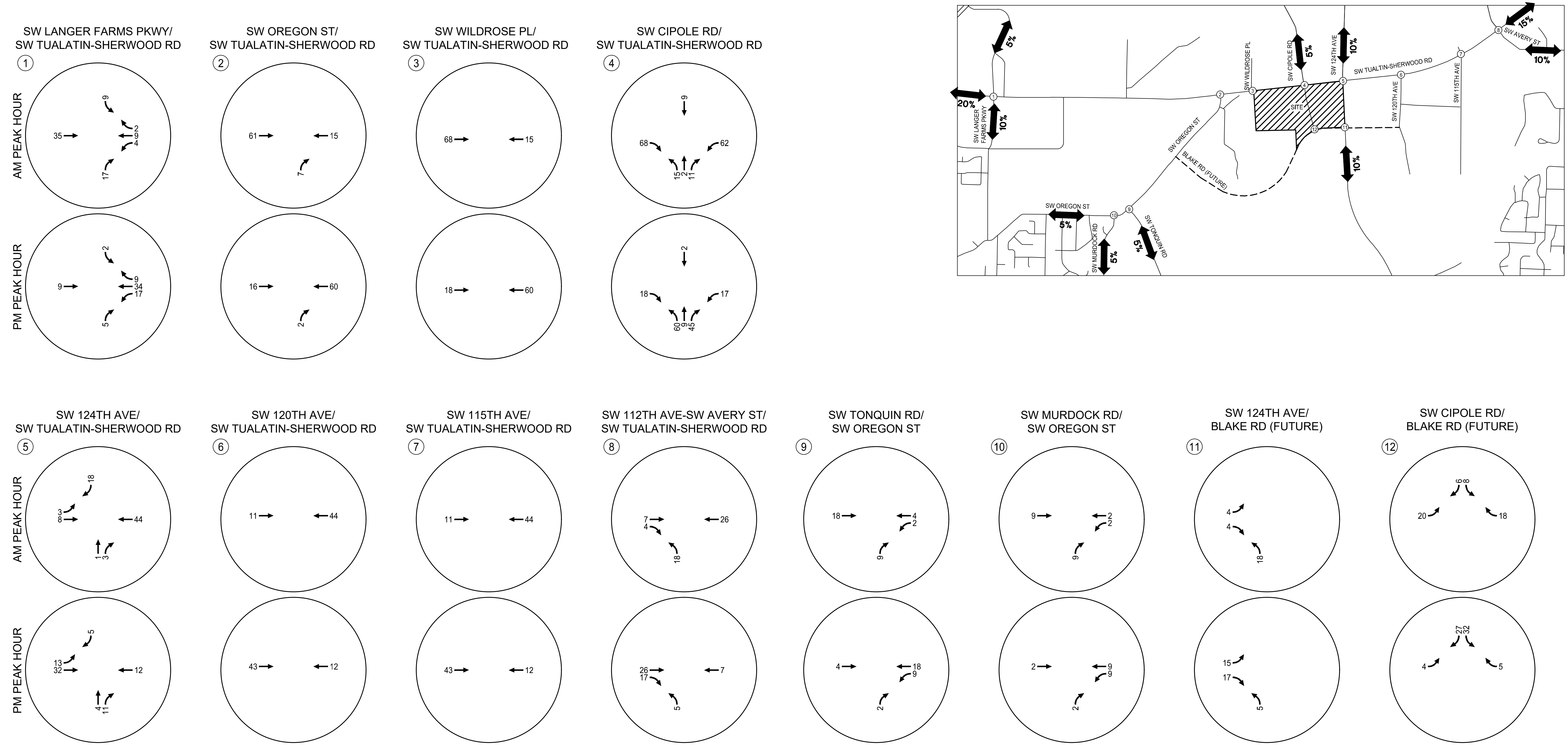
For both site plan scenarios (SW Cipole Road termination or SW Cipole Road termination extension to Blake Road), the same trip distribution was used, though routing to and from the site varied. The trip distribution pattern for each site plan concept are displayed in Figures 4 and 5.

Site truck traffic percentage and distribution was estimated by review of the nearby industrial development driveway counts heavy vehicle percentage and turning movement counts collected at the NE 115th Avenue / SW Tualatin Sherwood Road intersection. During the AM peak hour, it was estimated that 13 percent of the proposed development traffic would be heavy vehicles, and for the PM peak hour, it was estimated that 8 percent of the site traffic would be heavy vehicles. The east/west directional distribution of heavy vehicles at the NE 115th Avenue / SW Tualatin Sherwood Road intersection generally even, therefore the heavy percentages listed above were applied evenly to each movement to and from the study site. *More details on the percent heavy vehicles calculations and distribution is provided in Appendix D.*



Site Trip Distribution - Cipole Cul-de-sac
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure 4



Site Trip Distribution - Cipole Extension
Weekday AM and PM Peak Hours
Sherwood, Oregon

Figure 5

Year 2021 Total Traffic Conditions

The year 2021 total traffic conditions analysis identifies how the study area's transportation system will operate with the proposed development trips added to the background traffic volumes. Similar to the background year 2021 analysis, this analysis assumed that Blake Road would be in place from SW Oregon Street to SW 124th Avenue, with limited re-distribution of trips from the SW Oregon Street / SW Tualatin-Sherwood Road and SW 124th Avenue/SW Tualatin-Sherwood Road intersections.

SW Cipole Road Cul-de-sac Termination Site Plan

Addition of the site trips shown in Figure 4 to the background 2021 volumes results in the operational results presented in Table 4. *Appendix "E" contains the year 2021 Total Traffic Cul-de-sac Site Plan level-of-service worksheets.*

Table 4: Year 2021 Total Traffic Conditions – Cul-de-sac Site Plan Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (25.3)	C (34.0)	0.81	0.94	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (19.3)	D (41.8)	0.86	**1.09**	Regional	V/C of 0.99	**No**
3	SW Wildrose Place/SW Tualatin-Sherwood Road	E (35.9)	F (132.9)	0.05 (SB)	0.42 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	B (14.7)	C (34.8)	0.81	0.94	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (57.5)	D (37.9)	0.99	0.83	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (33.1)	C (23.6)	0.12 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	C (21.2)	B (18.1)	0.83	0.77	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (36.2)	C (29.0)	0.83	0.79	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.5)	F (87.2)	0.31 (NB)	**1.03 (NB)**	Regional	V/C of 0.99	**No**
10	SW Oregon Street/ SW Murdock Road	A (9.3)	B (12.5)	0.62	0.75	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (12.4)	B (11.4)	0.05(EB)	0.02 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	Not Applicable to Cul-de-sac Site Plan Scenario						

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

SW Cipole Road Extension to Blake Road Site Plan

Addition of the site trips shown in Figure 5 to the background 2021 volumes results in the operational results presented in Table 5. *Appendix "F" contains the year 2021 Total Traffic – Cipole Road Extension Site Plan level-of-service worksheets.*

Table 5: Year 2021 Total Traffic Conditions – Cipole Road Extension Site Plan Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	C (25.3)	C (34.0)	0.81	0.94	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (18.3)	D (40.0)	0.85	**1.08**	Regional	V/C of 0.99	**No**
3	SW Wildrose Place/SW Tualatin-Sherwood Road	D (34.6)	F (109.6)	0.05 (SB)	0.37 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	B (13.2)	C (30.0)	0.78	0.91	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	E (58.3)	D (38.5)	0.99	0.84	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	D (33.2)	C (23.6)	0.11 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	C (21.1)	B (18.1)	0.83	0.77	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (36.3)	C (28.9)	0.83	0.79	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.5)	F (87.2)	0.31 (NB)	**1.03 (NB)**	Regional	V/C of 0.99	**No**
10	SW Oregon Street/ SW Murdock Road	A (9.3)	B (12.5)	0.62	0.75	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (12.7)	B (11.5)	0.06 (EB)	0.05 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	A (9.1)	A (9.2)	0.02 (SB)	0.07 (SB)	City of Sherwood	LOS "E" or V/C of 0.90	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

As indicated in Tables 2, 4 and 5, the SW Oregon Street / SW Tualatin-Sherwood Road intersection v/c ratio is anticipated to exceed the regional operating standard during the PM peak hour, in year 2021 background conditions and with site development, considering both the SW Cipole Road cul-de-sac site plan and the SW Cipole Road extension site plan.

Additionally, the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the regional operating standard during the PM peak hour with site development of either the SW Cipole Road cul-de-sac site plan or the SW Cipole Road extension site plan.

Year 2021 Total Traffic - Mitigation

As shown in Tables 4 and 5, the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the regional operating standard during the PM peak hour with site development, independent of the site plan scenario pursued.

The City of Sherwood Transportation System Plan (TSP) identifies the reconstruction of the SW Oregon Street / SW Tonquin Road intersection as a roundabout as a "short-term" improvement. Additionally, Washington County's Transportation Development Tax (TDT) Road Project List identifies the reconstruction of the SW Oregon Street / SW Tonquin Road intersection as a roundabout in the 2014-2024 timeframe.

However, as the timeframe of the project and funding is unclear, mitigation of the SW Oregon Street / SW Tonquin Road intersection with either the installation of a traffic signal or roundabout was investigated. As summarized in Table 6, the SW Oregon Street / SW Tonquin Road intersection can meet the regional operating standards as a signalized or roundabout intersection. *Appendix "G" contains the Year 2021 Total Traffic – Tonquin/Oregon Mitigation level-of-service worksheets.*

Table 6: Year 2021 Total Traffic Conditions – Mitigation Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
9	SW Oregon Street/ SW Tonquin Road (signal)	A (7.9)	B (10.4)	0.55	0.70	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road (roundabout)	B (11.3)	B (11.6)	0.71	0.72	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds critical movement delay (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout);
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

Year 2023 Background Traffic Conditions

The year 2023 background traffic conditions analysis identifies how the study area's transportation system will operate without the proposed development. Similar to the year 2021 background analysis, the year 2023 analysis includes trips from traffic attributed to general growth in the region (application of a 1.5 percent annual growth rate), trips from the in-process developments listed in the year 2021 background analysis section and some re-distribution of trips, assuming the connection of Blake Road from SW Oregon Street to SW 124th Avenue.

Additionally, the 2023 background analysis includes the planned Widening of SW Tualatin-Sherwood Road to five lanes, project number 318 in the Washington County MSTIP 3e (Reference 6). Volumes on SW Tualatin-Sherwood Road and SW 124th Avenue were increased an additional 5 percent on top of regional growth, to account for increased future demand.

Table 7 summarizes the operational analysis for the study intersections under the weekday AM and PM peak hour background 2023 traffic conditions and shows that all study intersections except for the SW Oregon Street/ SW Tonquin Road intersection are forecast to operate at levels which meet the mobility standards of the governing agency during both weekday AM and PM peak hours. Additionally, estimated queue lengths east-west along the SW Tualatin-Sherwood Road corridor are much lower than in the existing year 2019 and year 2021. *Appendix "H" contains the year 2023 background traffic level-of-service worksheets.*

Table 7: Year 2023 Background Conditions Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	B (17.7)	C (24.0)	0.63	0.77	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (10.7)	B (17.4)	0.73	0.83	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	C (17.9)	C (14.7)	0.02 (SB)	0.07 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (6.2)	A (7.3)	0.43	0.54	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (34.5)	C (26.0)	0.73	0.62	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	F (55.6)	C (22.2)	0.20 (NB)	0.12 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (18.8)	B (13.2)	0.58	0.49	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (36.9)	C (20.1)	0.68	0.66	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (15.6)	F (87.7)	0.32 (NB)	**1.03 (NB)**	Regional	V/C of 0.99	**No**
10	SW Oregon Street/ SW Murdock Road	A (9.4)	B (12.7)	0.62	0.76	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (12.5)	B (11.5)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	Future Access (Cipole Extension Scenario)						

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

Year 2023 Total Traffic Conditions

The year 2023 total traffic conditions analysis identifies how the study area's transportation system will operate with the proposed development trips added to the 2023 background traffic volumes.

SW Cipole Road Cul-de-sac Termination Site Plan

Addition of the site trips shows in Figure 4 to the year 2023 background volumes results in the operational results presented in Table 8. *Appendix "I" contains the year 2023 Total Traffic Cul-de-sac Site Plan level-of-service worksheets.*

Table 8: Year 2023 Total Traffic Conditions – Cul-de-sac Site Plan Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	B (18.0)	C (24.7)	0.65	0.81	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (12.0)	B (19.0)	0.78	0.85	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	C (18.4)	C (27.0)	0.02 (SB)	0.07 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (9.0)	B (13.8)	0.48	0.58	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (32.2)	C (28.0)	0.74	0.63	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	F (57.0)	C (23.3)	0.21 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (18.7)	B (13.0)	0.59	0.51	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (39.2)	C (20.7)	0.70	0.68	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (16.0)	F (105.7)	0.33 (NB)	**1.09 (NB)**	Regional	V/C of 0.99	**No**
10	SW Oregon Street/ SW Murdock Road	B (9.8)	B (13.4)	0.64	0.78	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (12.7)	B (11.6)	0.05 (EB)	0.02 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	Not Applicable to Cul-de-sac Site Plan Scenario						

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

SW Cipole Road Extension to Blake Road Site Plan

Addition of the site trips shows in Figure 5 to the year 2023 background volumes results in the operational results presented in Table 9. *Appendix "J" contains the year 2023 Total Traffic Cipole Road Extension Site Plan level-of-service worksheets.*

Table 9: Year 2023 Total Traffic Conditions – Cipole Road Extension Site Plan Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
1	SW Langer Farms Parkway/SW Tualatin-Sherwood Road	B (18.0)	C (24.7)	0.65	0.81	Regional	V/C of 0.99	Yes
2	SW Oregon Street/SW Tualatin Sherwood Road	B (11.5)	B (17.5)	0.76	0.83	Regional	V/C of 0.99	Yes
3	SW Wildrose Place/SW Tualatin-Sherwood Road	C (18.2)	D (26.6)	0.02 (SB)	0.07 (SB)	Regional	V/C of 0.99	Yes
4	SW Cipole Road/SW Tualatin-Sherwood Road	A (8.3)	B (11.0)	0.47	0.56	Regional	V/C of 0.99	Yes
5	SW 124th Avenue/SW Tualatin-Sherwood Road	C (32.4)	C (26.9)	0.74	0.64	Regional	V/C of 0.99	Yes
6	SW 120th Avenue/SW Tualatin-Sherwood Road	F (57.0)	C (23.3)	0.21 (NB)	0.13 (NB)	Regional	V/C of 0.99	Yes
7	SW 115th Avenue/SW Tualatin-Sherwood Road	B (18.7)	B (13.0)	0.59	0.51	Regional	V/C of 0.99	Yes
8	SW 112th Avenue-SW Avery Street/SW Tualatin-Sherwood Road	D (39.1)	C (20.6)	0.70	0.68	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road	C (16.0)	F (105.7)	0.33 (NB)	**1.09 (NB)**	Regional	V/C of 0.99	**No**
10	SW Oregon Street/ SW Murdock Road	A (9.8)	B (13.4)	0.64	0.78	Regional	V/C of 0.99	Yes
11	Blake Road / SW 124th Avenue	B (13.1)	B (11.8)	0.06 (EB)	0.05 (EB)	Regional	V/C of 0.99	Yes
12	SW Cipole Road / Blake Road	A (9.1)	A (9.2)	0.02 (SB)	0.07 (SB)	City of Sherwood	LOS "E" or V/C of 0.90	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or critical movement delay (TWSC), HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio (signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout). For TWSC intersections, the critical movement is shown;
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan.

Year 2023 Total Traffic - Mitigation

As indicated in Tables 7, 8 and 9, the SW Oregon Street / SW Tonquin Road TWSC intersection v/c ratio is anticipated to exceed the regional operating standard during the PM peak hour in Year 2023 with or without site development.

As previously discussed, the timing and funding of the planned conversion of the SW Oregon Street / SW Tonquin Road intersection to a roundabout is unclear, therefore mitigation with either the installation of a traffic signal or roundabout was investigated. As summarized in Table 10, the SW Oregon Street / SW Tonquin Road intersection can meet the regional operating standards during the AM and PM peak hours as a signalized or roundabout intersection. *Appendix "K" contains the Year 2023 Total Traffic – Tonquin/Oregon Mitigation level-of-service worksheets.*

Table 10: Year 2023 Total Traffic Conditions – Mitigation Operational Analysis Results

#	Intersection	LOS[1]		V/C[2]		Jurisdiction[3]	Operating Standard	Standard Met?
		AM	PM	AM	PM			
9	SW Oregon Street/ SW Tonquin Road (signal)	A (8.1)	B (10.6)	0.57	0.72	Regional	V/C of 0.99	Yes
9	SW Oregon Street/ SW Tonquin Road (roundabout)	B (11.9)	B (12.5)	0.73	0.75	Regional	V/C of 0.99	Yes

[1] HCM 2000 Level-of-Service and average delay per vehicle in seconds (signalized) or HCM 6th Ed. Level-of-Service and average delay per vehicle in seconds critical movement delay (roundabout);
[2] HCM 2000 Volume-to-Capacity ratio(signalized) or HCM 6th Ed. Volume-to-Capacity ratio (roundabout);
[3] Regional jurisdiction is governed by the Regional Transportation Functional Plan (RTFP).

Year 2023 Cipole Road Scenario Comparison

As shown in Tables 4, 5, 8 and 9, and summarized below in Table 11, the connection of SW Cipole Road to Blake Road has mixed impacts to the operations of the immediately adjacent intersections. Intersection operations that deteriorate with the extension of SW Cipole Road are highlighted in red, and operations that improve with the extension of SW Cipole Road are highlighted in green.

Table 11: Comparison of Cipole Road Extension Impacts on Total Traffic Operations (V/C)

Scenario	SW Cipole Road / SW Tualatin-Sherwood Road		SW 124th Avenue / SW Tualatin-Sherwood Road		SW Cipole Road / Blake Road		SW 124th Avenue / Blake Road	
	AM	PM	AM	PM	AM	PM	AM	PM
Year 2021								
Cipole Road Cul-de-sac	0.81	0.94	0.99	0.83	-	-	0.01	0.04
Cipole Road Extension	0.78	0.91	0.99	0.84	0.02	0.07	0.06	0.04
Year 2023*								
Cipole Road Cul-de-sac	0.48	0.58	0.74	0.63	-	-	0.05	0.05
Cipole Road Extension	0.47	0.56	0.74	0.64	0.02	0.07	0.06	0.05

* Accounts for planned 5-lane widening along Tualatin-Sherwood Road.

As shown above, regardless of whether or not SW Cipole Road is extended through the site, the adjacent study intersections are all anticipated to meet the regional mobility standard of v/c of 0.99 or less. Nevertheless, while the extension of SW Cipole Road results in slightly improved operations at the SW Cipole Road / SW Tualatin-Sherwood Road intersection, operations remain the same or slightly deteriorate at the SW 124th Avenue / SW Tualatin-Sherwood Road, SW Cipole Road/Blake Road and SW 124th Avenue / Blake Road intersections. Therefore, there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road.

In addition to the operational impacts of the SW Cipole Road extension, the impacts on traffic safety should also be considered. A connection to Blake Road would add an access point to the roadway network, introducing conflict. Were the connection to be made, vehicles (including large trucks) associated with the Sherwood Industrial Park would enter or leave the site by making unprotected left turns across a collector street (Blake Road) and arterial roadway (124th Avenue), whereas, without the connection to Blake Road, left-turning vehicles would have the added protection of traffic signal phasing at both the SW Cipole Road / SW Tualatin-Sherwood Road and SW 124th Avenue/SW Tualatin-Sherwood Road intersections. In our opinion, limiting Cipole Road to a cul-de-sac ending would result in fewer unprotected left-turn conflict points on the surrounding roadway network, especially those involving large trucks.

SimTraffic Queuing Analysis

A Simtraffic queuing analysis was completed for four build scenarios (Year 2021, Year 2023, for both SW Cipoole Road Scenarios) during the PM peak hour, inclusive of the following study intersections:

- SW Cipole Road / SW Tualatin-Sherwood Road
- SW 124th Avenue / SW Tualatin-Sherwood Road
- SW 124th Avenue / Blake Road
- SW Cipole Road / Blake Road

For the SimTraffic analysis, four 15-minute periods were recorded, with the second period representative of the peak 15-minute period, with the report results averaging five runs. *Appendix "L" contains the Year 2021 Total Traffic SimTraffic worksheets and Appendix "M" contains the Year 2023 Total Traffic Simtraffic worksheets.*

Estimated 95th percentile queues improve significantly from year 2021 to 2023, as would be expected with the widening of the SW Tualatin-Sherwood Road corridor. As summarized in Table 12 below, by year 2023, all queues would be accommodated for both SW Cipole Road scenarios.

Table 12: Year 2023 Total Traffic Conditions PM Peak Hour – SimTraffic 95th Percentile Queue Summary

Intersection	Scenario		Eastbound			Westbound			Northbound			Southbound		
			Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
SW Cipole Road / SW Tualatin-Sherwood Road		Storage (feet)	360	1100	-	250	790	-	200	500	-	300	725	-
	SW Cipole Road Cul-de-Sac	Queue (feet)	50	175	-	50	200	-	150	100	-	125	100	-
	SW Cipole Road Extension	Queue (feet)	75	150	-	50	175	-	125	100	-	125	125	-
SW 124th Avenue / SW Tualatin-Sherwood Road		Storage (feet)	100[1]	790	-	375	1180	-	400	1000	-	300	730	-
	SW Cipole Road Cul-de-Sac	Queue (feet)	125	325	-	75	300	-	175	200	-	275	275	-
	SW Cipole Road Extension	Queue (feet)	100	325	-	75	325	-	150	200	-	250	250	-
SW 124th Avenue / Blake Road		Storage (feet)[2]	150	800	-	150	-	-	-	1000	-	-	1000	-
	SW Cipole Road Cul-de-Sac	Queue (feet)	50	50	-	50	-	-	-	-	-	-	25	-
	SW Cipole Road Extension	Queue (feet)	50	50	-	50	-	-	-	25	-	-	25	-
SW Cipole Road / Blake Road		Storage (feet)[3]	150	-	-	-	-	-	-	-	-	-	400	-
	SW Cipole Road Cul-de-Sac	Queue (feet)	-	-	-	-	-	-	-	-	-	-	-	-
	SW Cipole Road Extension	Queue (feet)	25	-	-	-	-	-	-	-	-	-	-	-

Notes:
95th percentile queue lengths have been rounded up to the nearest car length, assuming one vehicle equals 25 feet;
Bold and highlighted cells indicate 95th percentile queue lengths greater than the storage length;
[1]Storage measured as the length of white gore stripe for turn lane, additional queue storage available in TWLTL;
[2]Storage for future intersection left-turn lanes assumed to be 150 feet;
[3]Storage for future intersection eastbound left-turn lanes assumed to be 150.

FINDINGS

In summary, the proposed Sherwood Industrial Park can be developed while maintaining acceptable levels of mobility at the study intersections, with and without the connection of SW Cipole Road to Blake Road through the study site, by future year 2023, assuming agency-planned improvements are in place. However, in the interim period between now and the site build-out year 2021, two intersections are forecast to exceed governing agency standards:

- The SW Oregon Street / SW Tualatin-Sherwood Road intersection is anticipated to exceed Regional operating standards by 2021, with or without the Sherwood Industrial Park development. However, when SW Tualatin-Sherwood Road is widening to five lanes by year 2023, the SW Oregon Street / SW Tualatin-Sherwood Road intersection will meet Regional operating standards.

- With the proposed development in place, the SW Oregon Street / SW Tonquin Road TWSC intersection is anticipated to exceed the Regional operating standard during the PM peak hour of year 2021. The SW Oregon Street / SW Tonquin Road intersection can meet the regional operating standards with either a signal or a roundabout installed.

Therefore, the following mitigation is recommended in conjunction with site development:

- Provision of a proportionate share fee-in-lieu for the provision of a temporary signal at the SW Oregon Street / SW Tonquin Road intersection.

As shown in the two total traffic year 2023 analyses, the connection of SW Cipole Road to the future Blake Road through the study site will not materially impact the ability of the study intersections to operate within the operational thresholds. A comparison of these two potential scenarios led to the following findings which support limiting SW Cipole Road to a cul-de-sac ending, rather than extending it through the site to Blake Road:

- Traffic Operations: Regardless of whether or not SW Cipole Road is extended through the site, the adjacent study intersections are all anticipated to meet the regional mobility standard. While the extension of SW Cipole Road results in slightly improved operations at the SW Cipole Road / SW Tualatin-Sherwood Road intersection, operations remain the same or slightly deteriorate at the SW 124th Avenue / SW Tualatin-Sherwood Road, SW Cipole Road/Blake Road and SW 124th Avenue / Blake Road intersections. Therefore, there appears to be no significant system-wide benefit to extending SW Cipole Road through the site to connect with the future Blake Road.
- Traffic Safety: A connection to Blake Road would add an access point to the roadway network, introducing conflict. Limiting SW Cipole Road to a cul-de-sac ending would result in fewer unprotected left-turn conflict points on the surrounding roadway network, especially those involving large trucks.

Following completion of this preliminary findings memorandum, Kittelson and Associates, Inc. (KAI) will prepare a full TIS per the requirements enumerated in Sherwood's Development Code Section 16.106.080, Washington County's Resolution & Order 86-95, and scoping direction received from the City and County staff.

If you have any questions, please give us a call at (503) 535-7447.

REFERENCES

1) Transportation Research Board. *2000 Highway Capacity Manual*. 2000.
2) Transportation Research Board. *Highway Capacity Manual, 6th Edition*. 2016.
3) City of Sherwood. *Transportation System Plan.* 2014.
4) Metro. *Regional Transportation Plan Update*. 2014.
5) Institute of Transportation Engineers. *Trip Generation Manual, 10th Edition*. 2017.
6) Washington County. *MSTIP 3e Adopted Funding Program and Project List.* 2016.
7) City of Sherwood. *Capital Improvement Plan*. 2018
8) Washington County. *Transportation Development Tax Road Project List.* 2018.

ATTACHMENTS

Appendix A: Traffic Count Data

Appendix B: Year 2019 Existing Operations Worksheets

Appendix C: Year 2021 Background Operations Worksheets

Appendix D: Driveway Count Heavy Vehicle Data

Appendix E: Year 2021 Total Traffic – Cipole Road Cul-de-sac Operations Worksheets

Appendix F: Year 2021 Total Traffic – Cipole Road Extension Operations Worksheets

Appendix G: Year 2021 Total Traffic – Tonquin/Oregon Mitigation Worksheets

Appendix H: Year 2023 Background Operations Worksheets

Appendix I: Year 2023 Total Traffic – Cipole Road Cul-de-sac Operations Worksheets

Appendix J: Year 2023 Total Traffic – Cipole Road Extension Operations Worksheets

Appendix K: Year 2023 Total Traffic – Tonquin/Oregon Mitigation Worksheets

Appendix L: Year 2021 Total Traffic – SimTraffic Worksheets

Appendix M: Year 2023 Total Traffic – SimTraffic Worksheets

Appendix B Year 2019 Existing Operations Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	917	606	75	47	30
Future Volume (vph)	110	917	606	75	47	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1703	1745	1639	1418	1289	1242
Flt Permitted	0.36	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	642	1745	1639	1418	1289	1242
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	955	631	78	49	31
RTOR Reduction (vph)	0	0	0	16	0	29
Lane Group Flow (vph)	115	955	631	62	49	2
Heavy Vehicles (%)	6%	8%	15%	13%	40%	30%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Prot	Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases	2					
Actuated Green, G (s)	100.7	100.7	89.8	89.8	8.8	8.8
Effective Green, g (s)	100.7	100.7	89.8	89.8	8.8	8.8
Actuated g/C Ratio	0.84	0.84	0.75	0.75	0.07	0.07
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	599	1464	1226	1061	94	91
v/s Ratio Prot	0.01	c0.55	0.39	0.04	c0.04	0.00
v/s Ratio Perm	0.15					
v/c Ratio	0.19	0.65	0.51	0.06	0.52	0.02
Uniform Delay, d1	2.7	3.4	6.2	4.0	53.6	51.6
Progression Factor	1.00	1.00	0.61	0.54	1.00	1.00
Incremental Delay, d2	0.2	2.3	1.3	0.1	5.1	0.1
Delay (s)	2.9	5.7	5.1	2.2	58.7	51.7
Level of Service	A	A	A	A	E	D
Approach Delay (s)		5.4	4.8		56.0	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	7.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	61.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	854	50	16	523	95	110	180	58	131	138	48
Future Volume (vph)	60	854	50	16	523	95	110	180	58	131	138	48
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1228	1203	1639	1366	1626	1591		1612	1696	1282
Flt Permitted	0.30	1.00	1.00	0.08	1.00	1.00	0.59	1.00		0.31	1.00	1.00
Satd. Flow (perm)	521	1729	1228	105	1639	1366	1010	1591		520	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	65	918	54	17	562	102	118	194	62	141	148	52
RTOR Reduction (vph)	0	0	20	0	0	40	0	11	0	0	0	40
Lane Group Flow (vph)	65	918	34	17	562	62	118	245	0	141	148	12
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	71.6	66.4	75.5	65.8	63.5	73.3	31.6	22.5		33.0	23.2	28.4
Effective Green, g (s)	71.6	66.4	75.5	65.8	63.5	73.3	31.6	22.5		33.0	23.2	28.4
Actuated g/C Ratio	0.60	0.55	0.63	0.55	0.53	0.61	0.26	0.19		0.28	0.19	0.24
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	360	956	772	78	867	834	312	298		232	327	303
v/s Ratio Prot	c0.01	c0.53	0.00	0.00	0.34	0.01	0.03	c0.15		c0.05	0.09	0.00
v/s Ratio Perm	0.10		0.02	0.11		0.04	0.07			0.12		0.01
v/c Ratio	0.18	0.96	0.04	0.22	0.65	0.07	0.38	0.82		0.61	0.45	0.04
Uniform Delay, d1	12.6	25.5	8.5	22.2	20.2	9.5	35.1	46.8		35.2	42.8	35.3
Progression Factor	0.79	0.89	0.65	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	18.1	0.0	0.5	3.7	0.0	0.3	15.9		3.1	0.4	0.0
Delay (s)	10.0	41.0	5.5	22.7	24.0	9.5	35.4	62.7		38.3	43.2	35.3
Level of Service	B	D	A	C	C	A	D	E		D	D	D
Approach Delay (s)		37.2			21.8			54.1			39.9	
Approach LOS		D			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	82.6%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	860	1090	14	63	124
Future Volume (vph)	37	860	1090	14	63	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1812	1830	1405	1703	1583
Flt Permitted	0.10	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	186	1812	1830	1405	1703	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	935	1185	15	68	135
RTOR Reduction (vph)	0	0	0	1	0	124
Lane Group Flow (vph)	40	935	1185	14	68	11
Confl. Peds. (#/hr)	2			2		
Confl. Bikes (#/hr)				4		
Heavy Vehicles (%)	3%	4%	3%	14%	6%	2%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Prot	Prot
Protected Phases	5	2	6	6	4	4
Permitted Phases	2					
Actuated Green, G (s)	102.8	102.8	92.6	92.6	10.2	10.2
Effective Green, g (s)	102.8	102.8	92.6	92.6	10.2	10.2
Actuated g/C Ratio	0.83	0.83	0.75	0.75	0.08	0.08
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	233	1508	1372	1053	140	130
v/s Ratio Prot	0.01	c0.52	c0.65	0.01	c0.04	0.01
v/s Ratio Perm	0.13					
v/c Ratio	0.17	0.62	0.86	0.01	0.49	0.09
Uniform Delay, d1	16.7	3.6	11.0	3.9	54.1	52.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.8	5.9	0.0	2.6	0.3
Delay (s)	17.0	4.4	16.9	3.9	56.8	52.6
Level of Service	B	A	B	A	E	D
Approach Delay (s)		4.9	16.7		54.0	
Approach LOS		A	B		D	

Intersection Summary			
HCM 2000 Control Delay	15.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	123.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	73.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	48	772	103	24	823	83	98	105	8	98	173	183
Future Volume (vph)	48	772	103	24	823	83	98	105	8	98	173	183
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1427	1805	1830	1550	1752	1843		1734	1827	1583
Flt Permitted	0.15	1.00	1.00	0.22	1.00	1.00	0.43	1.00		0.57	1.00	1.00
Satd. Flow (perm)	278	1812	1427	409	1830	1550	793	1843		1044	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	50	804	107	25	857	86	102	109	8	102	180	191
RTOR Reduction (vph)	0	0	34	0	0	25	0	2	0	0	0	154
Lane Group Flow (vph)	50	804	73	25	857	61	102	115	0	102	180	37
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	85.3	79.1	87.8	78.5	75.7	85.2	26.4	17.7		28.0	18.5	24.7
Effective Green, g (s)	85.3	79.1	87.8	78.5	75.7	85.2	26.4	17.7		28.0	18.5	24.7
Actuated g/C Ratio	0.67	0.62	0.69	0.61	0.59	0.67	0.21	0.14		0.22	0.14	0.19
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	259	1118	978	281	1081	1030	228	254		279	263	305
v/s Ratio Prot	c0.01	c0.44	0.01	0.00	c0.47	0.00	c0.03	0.06		0.03	c0.10	0.01
v/s Ratio Perm	0.12		0.05	0.05		0.03	0.06			0.05		0.02
v/c Ratio	0.19	0.72	0.07	0.09	0.79	0.06	0.45	0.45		0.37	0.68	0.12
Uniform Delay, d1	16.1	16.9	6.7	13.5	20.2	7.5	43.0	50.8		41.6	52.0	42.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	2.6	0.0	0.1	4.5	0.0	0.5	0.5		0.3	5.8	0.1
Delay (s)	16.2	19.4	6.7	13.6	24.7	7.5	43.5	51.2		41.9	57.8	42.8
Level of Service	B	B	A	B	C	A	D	D		D	E	D
Approach Delay (s)		17.8			22.9			47.6			48.3	
Approach LOS		B			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	27.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	128.1	Sum of lost time (s)	19.0
Intersection Capacity Utilization	71.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Appendix C Year 2021 Background Operations Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	1005	655	75	47	30
Future Volume (vph)	110	1005	655	75	47	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1703	1745	1639	1418	1289	1242
Flt Permitted	0.35	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	622	1745	1639	1418	1289	1242
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1047	682	78	49	31
RTOR Reduction (vph)	0	0	0	13	0	29
Lane Group Flow (vph)	115	1047	682	65	49	2
Heavy Vehicles (%)	6%	8%	15%	13%	40%	30%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Perm	Perm
Protected Phases	5	2	6	6		
Permitted Phases	2				4	4
Actuated Green, G (s)	129.6	129.6	118.6	118.6	9.9	9.9
Effective Green, g (s)	129.6	129.6	118.6	118.6	9.9	9.9
Actuated g/C Ratio	0.86	0.86	0.79	0.79	0.07	0.07
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	587	1507	1295	1121	85	81
v/s Ratio Prot	0.01	c0.60	0.42	0.05		
v/s Ratio Perm	0.16				c0.04	0.00
v/c Ratio	0.20	0.69	0.53	0.06	0.58	0.03
Uniform Delay, d1	2.7	3.5	5.6	3.4	68.0	65.5
Progression Factor	1.00	1.00	0.74	0.84	1.00	1.00
Incremental Delay, d2	0.2	2.7	1.2	0.1	9.1	0.1
Delay (s)	2.9	6.1	5.4	3.0	77.1	65.7
Level of Service	A	A	A	A	E	E
Approach Delay (s)		5.8	5.2		72.7	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	8.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	65.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	68	942	42	24	558	189	120	208	70	167	155	52
Future Volume (vph)	68	942	42	24	558	189	120	208	70	167	155	52
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1227	1203	1639	1367	1626	1586		1612	1696	1282
Flt Permitted	0.27	1.00	1.00	0.05	1.00	1.00	0.65	1.00		0.19	1.00	1.00
Satd. Flow (perm)	473	1729	1227	63	1639	1367	1115	1586		322	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	73	1013	45	26	600	203	129	224	75	180	167	56
RTOR Reduction (vph)	0	0	18	0	0	73	0	8	0	0	0	40
Lane Group Flow (vph)	73	1013	27	26	600	130	129	291	0	180	167	16
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	87.9	82.3	91.6	83.3	80.0	95.9	38.8	29.5		49.4	36.1	41.7
Effective Green, g (s)	87.9	82.3	91.6	83.3	80.0	95.9	38.8	29.5		49.4	36.1	41.7
Actuated g/C Ratio	0.59	0.55	0.61	0.56	0.53	0.64	0.26	0.20		0.33	0.24	0.28
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	321	948	749	60	874	873	320	311		242	408	356
v/s Ratio Prot	c0.01	c0.59	0.00	c0.01	0.37	0.02	0.02	c0.18		c0.08	0.10	0.00
v/s Ratio Perm	0.12		0.02	0.23		0.08	0.08			0.17		0.01
v/c Ratio	0.23	1.07	0.04	0.43	0.69	0.15	0.40	0.94		0.74	0.41	0.04
Uniform Delay, d1	17.2	33.9	11.6	34.8	25.8	10.8	44.8	59.3		40.0	48.0	39.6
Progression Factor	0.92	1.03	1.12	1.29	0.98	3.19	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	46.0	0.0	1.6	3.7	0.0	0.3	33.9		10.3	0.2	0.0
Delay (s)	15.8	80.7	13.0	46.6	29.0	34.5	45.1	93.2		50.4	48.2	39.6
Level of Service	B	F	B	D	C	C	D	F		D	D	D
Approach Delay (s)		73.8			30.9			78.7			48.0	
Approach LOS		E			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	58.1	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	373	24	16	193	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	373	24	16	193	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	401	26	17	208	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	654	676	214	684	669	414	221			427		
vC1, stage 1 conf vol	248	248		414	414							
vC2, stage 2 conf vol	405	427		270	255							
vCu, unblocked vol	595	619	126	627	612	414	133			427		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	527	501	833	519	514	611	1287			1066		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	427	17	221
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	527	682	519	543	1700	1700	1066	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.25	0.02	0.13
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.2	10.5	12.0	11.7	0.0	0.0	8.4	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.2		11.8		0.0		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	35.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	909	1183	14	63	124
Future Volume (vph)	37	909	1183	14	63	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	1.00	1.00	0.85	1.00	0.85
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1752	1812	1830	1405	1703	1583
Flt Permitted	0.05	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	92	1812	1830	1405	1703	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	988	1286	15	68	135
RTOR Reduction (vph)	0	0	0	1	0	124
Lane Group Flow (vph)	40	988	1286	14	68	11
Confl. Peds. (#/hr)	2			2		
Confl. Bikes (#/hr)				4		
Heavy Vehicles (%)	3%	4%	3%	14%	6%	2%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA	Prot	Perm	Perm
Protected Phases	5	2	6	6		
Permitted Phases	2				4	4
Actuated Green, G (s)	102.7	102.7	92.6	92.6	10.2	10.2
Effective Green, g (s)	102.7	102.7	92.6	92.6	10.2	10.2
Actuated g/C Ratio	0.83	0.83	0.75	0.75	0.08	0.08
Clearance Time (s)	4.0	5.5	5.5	5.5	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	158	1508	1373	1054	140	130
v/s Ratio Prot	0.01	c0.55	c0.70	0.01		
v/s Ratio Perm	0.20				c0.04	0.01
v/c Ratio	0.25	0.66	0.94	0.01	0.49	0.09
Uniform Delay, d1	27.3	3.8	12.9	3.9	54.1	52.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.8	1.0	12.1	0.0	2.6	0.3
Delay (s)	28.2	4.9	25.0	3.9	56.7	52.6
Level of Service	C	A	C	A	E	D
Approach Delay (s)		5.8	24.8		54.0	
Approach LOS		A	C		D	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.89		
Actuated Cycle Length (s)	123.4	Sum of lost time (s)	14.5
Intersection Capacity Utilization	78.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	47	824	101	58	885	118	112	124	11	195	197	200
Future Volume (vph)	47	824	101	58	885	118	112	124	11	195	197	200
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1426	1805	1830	1550	1752	1840		1735	1827	1583
Flt Permitted	0.13	1.00	1.00	0.17	1.00	1.00	0.45	1.00		0.35	1.00	1.00
Satd. Flow (perm)	243	1812	1426	328	1830	1550	825	1840		635	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	49	858	105	60	922	123	117	129	11	203	205	208
RTOR Reduction (vph)	0	0	31	0	0	28	0	2	0	0	0	143
Lane Group Flow (vph)	49	858	74	60	922	95	117	138	0	203	205	65
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	98.3	92.4	102.9	96.7	91.6	108.2	26.8	16.3		36.9	22.4	28.3
Effective Green, g (s)	98.3	92.4	102.9	96.7	91.6	108.2	26.8	16.3		36.9	22.4	28.3
Actuated g/C Ratio	0.66	0.62	0.69	0.65	0.61	0.72	0.18	0.11		0.25	0.15	0.19
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	221	1120	982	262	1122	1122	213	200		279	273	299
v/s Ratio Prot	c0.01	0.47	0.01	0.01	c0.50	0.01	0.04	0.08		c0.08	c0.11	0.01
v/s Ratio Perm	0.14		0.05	0.14		0.05	0.06			0.10		0.03
v/c Ratio	0.22	0.77	0.08	0.23	0.82	0.09	0.55	0.69		0.73	0.75	0.22
Uniform Delay, d1	20.4	20.7	7.6	17.3	22.5	6.1	54.0	64.1		48.4	60.8	51.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.2	3.6	0.0	0.2	5.4	0.0	1.6	8.0		7.8	9.9	0.1
Delay (s)	20.6	24.2	7.6	17.4	28.0	6.1	55.5	72.2		56.1	70.7	51.3
Level of Service	C	C	A	B	C	A	E	E		E	E	D
Approach Delay (s)		22.3			25.0			64.6			59.4	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	34.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	149.4	Sum of lost time (s)	19.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	220	3	2	310	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	220	3	2	310	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	229	3	2	323	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	606	583	347	572	604	234	369			233		
vC1, stage 1 conf vol	350	350		232	232							
vC2, stage 2 conf vol	256	233		340	373							
vCu, unblocked vol	502	477	214	465	501	234	239			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	589	575	733	612	564	796	1175			1316		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	232	2	369
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	589	672	612	667	1700	1700	1316	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.14	0.00	0.22
Queue Length 95th (ft)	1	2	3	4	0	0	0	0
Control Delay (s)	11.2	10.5	11.1	10.7	0.0	0.0	7.7	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	10.8		10.9		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D Year 2021 Total Traffic – Cipole Road Cul-de-sac Operations Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1005	88	80	655	75	21	2	19	47	9	30
Future Volume (vph)	110	1005	88	80	655	75	21	2	19	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.86		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1715		1597	1639	1418	1597	1452		1289	1331	
Flt Permitted	0.36	1.00		0.15	1.00	1.00	0.73	1.00		0.74	1.00	
Satd. Flow (perm)	638	1715		251	1639	1418	1229	1452		1008	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1047	92	83	682	78	22	2	20	49	9	31
RTOR Reduction (vph)	0	2	0	0	0	14	0	18	0	0	29	0
Lane Group Flow (vph)	115	1137	0	83	682	64	22	4	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	124.0	117.2		123.7	117.3	117.3	11.9	11.9		11.4	11.4	
Effective Green, g (s)	124.0	117.2		123.7	117.3	117.3	11.9	11.9		11.4	11.4	
Actuated g/C Ratio	0.83	0.78		0.82	0.78	0.78	0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	575	1339		264	1281	1108	97	115		76	101	
v/s Ratio Prot	0.01	c0.66		c0.01	0.42	0.05		0.00			0.01	
v/s Ratio Perm	0.16			0.25			0.02			c0.05		
v/c Ratio	0.20	0.85		0.31	0.53	0.06	0.23	0.03		0.64	0.11	
Uniform Delay, d1	3.2	10.7		13.1	6.1	3.7	64.7	63.7		67.3	64.6	
Progression Factor	1.00	1.00		0.40	0.35	0.07	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	6.9		0.5	1.2	0.1	1.2	0.1		17.2	0.5	
Delay (s)	3.4	17.5		5.8	3.4	0.3	65.9	63.8		84.6	65.1	
Level of Service	A	B		A	A	A	E	E		F	E	
Approach Delay (s)		16.2			3.3			64.9			75.8	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	14.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	84.4%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	72	953	46	24	602	189	138	208	70	167	155	70
Future Volume (vph)	72	953	46	24	602	189	138	208	70	167	155	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1227	1203	1639	1367	1626	1586		1612	1696	1282
Flt Permitted	0.24	1.00	1.00	0.05	1.00	1.00	0.64	1.00		0.19	1.00	1.00
Satd. Flow (perm)	416	1729	1227	63	1639	1367	1090	1586		319	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	77	1025	49	26	647	203	148	224	75	180	167	75
RTOR Reduction (vph)	0	0	19	0	0	73	0	8	0	0	0	55
Lane Group Flow (vph)	77	1025	30	26	647	130	148	291	0	180	167	20
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	87.9	82.4	92.7	83.5	80.2	96.1	39.7	29.4		49.3	35.0	40.5
Effective Green, g (s)	87.9	82.4	92.7	83.5	80.2	96.1	39.7	29.4		49.3	35.0	40.5
Actuated g/C Ratio	0.59	0.55	0.62	0.56	0.53	0.64	0.26	0.20		0.33	0.23	0.27
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	289	949	758	60	876	875	325	310		241	395	346
v/s Ratio Prot	c0.01	c0.59	0.00	c0.01	0.39	0.02	0.03	c0.18		c0.08	0.10	0.00
v/s Ratio Perm	0.15		0.02	0.23		0.08	0.09			0.17		0.01
v/c Ratio	0.27	1.08	0.04	0.43	0.74	0.15	0.46	0.94		0.75	0.42	0.06
Uniform Delay, d1	18.3	33.8	11.2	34.8	26.8	10.7	44.7	59.4		40.1	48.9	40.6
Progression Factor	1.14	0.96	2.76	1.53	1.10	1.36	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	47.6	0.0	1.5	4.6	0.0	0.4	34.5		10.5	0.3	0.0
Delay (s)	20.9	79.9	30.9	54.9	34.2	14.6	45.0	93.9		50.6	49.2	40.6
Level of Service	C	E	C	D	C	B	D	F		D	D	D
Approach Delay (s)		73.9			30.3			77.7			48.3	
Approach LOS		E			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	57.5	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	94.6%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	391	24	16	197	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	391	24	16	197	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	420	26	17	212	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.93	0.93	0.93	0.93	0.93		0.93					
vC, conflicting volume	676	698	218	706	692	433	225			446		
vC1, stage 1 conf vol	252	252		433	433							
vC2, stage 2 conf vol	424	446		274	259							
vCu, unblocked vol	619	643	129	651	636	433	136			446		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	514	491	829	508	505	596	1282			1049		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	446	17	225
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	514	674	508	532	1700	1700	1049	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.26	0.02	0.13
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.4	10.6	12.1	11.8	0.0	0.0	8.5	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.4		12.0		0.0		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	36.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	909	22	22	1183	14	87	9	77	63	2	124
Future Volume (vph)	37	909	22	22	1183	14	87	9	77	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1803		1671	1830	1405	1671	1523		1703	1586	
Flt Permitted	0.04	1.00		0.17	1.00	1.00	0.52	1.00		0.65	1.00	
Satd. Flow (perm)	79	1803		298	1830	1405	908	1523		1171	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	988	24	24	1286	15	95	10	84	68	2	135
RTOR Reduction (vph)	0	0	0	0	0	4	0	72	0	0	116	0
Lane Group Flow (vph)	40	1012	0	24	1286	11	95	22	0	68	21	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	98.0	92.9		95.0	91.4	91.4	18.1	18.1		18.1	18.1	
Effective Green, g (s)	98.0	92.9		95.0	91.4	91.4	18.1	18.1		18.1	18.1	
Actuated g/C Ratio	0.76	0.72		0.74	0.71	0.71	0.14	0.14		0.14	0.14	
Clearance Time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	126	1297		257	1295	994	127	213		164	222	
v/s Ratio Prot	c0.01	0.56		0.00	c0.70	0.01		0.01			0.01	
v/s Ratio Perm	0.23			0.07			c0.10			0.06		
v/c Ratio	0.32	0.78		0.09	0.99	0.01	0.75	0.10		0.41	0.09	
Uniform Delay, d1	35.1	11.6		10.9	18.5	5.5	53.3	48.4		50.7	48.4	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.5	3.1		0.2	23.2	0.0	21.1	0.2		1.7	0.2	
Delay (s)	36.6	14.7		11.1	41.7	5.6	74.4	48.6		52.4	48.5	
Level of Service	D	B		B	D	A	E	D		D	D	
Approach Delay (s)		15.5			40.8			61.6			49.8	
Approach LOS		B			D			E			D	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	129.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	87.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	64	867	118	58	897	118	117	124	11	195	197	205
Future Volume (vph)	64	867	118	58	897	118	117	124	11	195	197	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1427	1805	1830	1550	1752	1840		1735	1827	1583
Flt Permitted	0.12	1.00	1.00	0.15	1.00	1.00	0.43	1.00		0.35	1.00	1.00
Satd. Flow (perm)	222	1812	1427	281	1830	1550	796	1840		632	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	67	903	123	60	934	123	122	129	11	203	205	214
RTOR Reduction (vph)	0	0	34	0	0	28	0	2	0	0	0	137
Lane Group Flow (vph)	67	903	89	60	934	95	122	138	0	203	205	77
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	99.5	92.9	103.7	96.5	91.4	108.0	27.1	16.3		36.9	22.1	28.7
Effective Green, g (s)	99.5	92.9	103.7	96.5	91.4	108.0	27.1	16.3		36.9	22.1	28.7
Actuated g/C Ratio	0.66	0.62	0.69	0.64	0.61	0.72	0.18	0.11		0.25	0.15	0.19
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	217	1122	987	232	1115	1116	212	200		277	269	303
v/s Ratio Prot	c0.01	0.50	0.01	0.01	c0.51	0.01	0.04	0.08		c0.08	c0.11	0.01
v/s Ratio Perm	0.19		0.06	0.16		0.05	0.06			0.10		0.04
v/c Ratio	0.31	0.80	0.09	0.26	0.84	0.09	0.58	0.69		0.73	0.76	0.26
Uniform Delay, d1	21.9	21.6	7.6	19.2	23.3	6.2	54.2	64.4		48.6	61.4	51.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	4.8	0.0	0.2	6.1	0.0	2.3	8.0		8.3	10.9	0.2
Delay (s)	22.2	26.4	7.6	19.4	29.5	6.3	56.5	72.4		57.0	72.3	51.7
Level of Service	C	C	A	B	C	A	E	E		E	E	D
Approach Delay (s)		24.0			26.4			65.0			60.2	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	35.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	149.9	Sum of lost time (s)	19.0
Intersection Capacity Utilization	84.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	225	3	2	327	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	225	3	2	327	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	234	3	2	341	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	628	606	365	595	628	238	387			238		
vC1, stage 1 conf vol	368	368		236	236							
vC2, stage 2 conf vol	260	238		358	391							
vCu, unblocked vol	528	503	234	490	527	238	258			238		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	577	564	715	598	553	791	1155			1310		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	237	2	387
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	577	656	598	658	1700	1700	1310	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.14	0.00	0.23
Queue Length 95th (ft)	1	2	3	4	0	0	0	0
Control Delay (s)	11.4	10.6	11.3	10.7	0.0	0.0	7.8	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	10.9		11.0		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	34.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix E Year 2021 Total Traffic – Cipole Road Extension Operations Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1005	68	62	655	75	15	2	11	47	9	30
Future Volume (vph)	110	1005	68	62	655	75	15	2	11	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	1.00	0.85	1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	1721		1597	1639	1418	1597	1468		1289	1331	
Flt Permitted	0.35	1.00		0.17	1.00	1.00	0.73	1.00		0.75	1.00	
Satd. Flow (perm)	632	1721		279	1639	1418	1229	1468		1017	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1047	71	65	682	78	16	2	11	49	9	31
RTOR Reduction (vph)	0	1	0	0	0	14	0	10	0	0	29	0
Lane Group Flow (vph)	115	1117	0	65	682	64	16	3	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	125.3	118.5		122.6	117.4	117.4	11.8	11.8		11.3	11.3	
Effective Green, g (s)	125.3	118.5		122.6	117.4	117.4	11.8	11.8		11.3	11.3	
Actuated g/C Ratio	0.84	0.79		0.82	0.78	0.78	0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5	5.5	4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	576	1359		273	1282	1109	96	115		76	100	
v/s Ratio Prot	c0.01	c0.65		0.01	0.42	0.05		0.00			0.01	
v/s Ratio Perm	0.16			0.19			0.01			c0.05		
v/c Ratio	0.20	0.82		0.24	0.53	0.06	0.17	0.02		0.64	0.11	
Uniform Delay, d1	3.1	9.4		10.5	6.1	3.7	64.5	63.8		67.4	64.7	
Progression Factor	1.00	1.00		0.44	0.39	0.12	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	5.7		0.3	1.2	0.1	0.8	0.1		17.2	0.5	
Delay (s)	3.3	15.1		4.9	3.6	0.5	65.3	63.9		84.6	65.2	
Level of Service	A	B		A	A	A	E	E		F	E	
Approach Delay (s)		14.0			3.4			64.7			75.9	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	13.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	71	950	42	24	602	189	120	209	73	167	155	70
Future Volume (vph)	71	950	42	24	602	189	120	209	73	167	155	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1671	1729	1227	1203	1639	1367	1626	1583		1612	1696	1282
Flt Permitted	0.23	1.00	1.00	0.05	1.00	1.00	0.65	1.00		0.19	1.00	1.00
Satd. Flow (perm)	410	1729	1227	64	1639	1367	1113	1583		322	1696	1282
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	76	1022	45	26	647	203	129	225	78	180	167	75
RTOR Reduction (vph)	0	0	18	0	0	74	0	8	0	0	0	54
Lane Group Flow (vph)	76	1022	27	26	647	129	129	295	0	180	167	21
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	87.4	81.8	91.6	82.8	79.5	95.4	39.8	30.0		49.9	36.1	41.7
Effective Green, g (s)	87.4	81.8	91.6	82.8	79.5	95.4	39.8	30.0		49.9	36.1	41.7
Actuated g/C Ratio	0.58	0.55	0.61	0.55	0.53	0.64	0.27	0.20		0.33	0.24	0.28
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	285	942	749	60	868	869	328	316		243	408	356
v/s Ratio Prot	c0.01	c0.59	0.00	c0.01	0.39	0.02	0.03	c0.19		c0.08	0.10	0.00
v/s Ratio Perm	0.15		0.02	0.23		0.08	0.08			0.17		0.01
v/c Ratio	0.27	1.08	0.04	0.43	0.75	0.15	0.39	0.93		0.74	0.41	0.06
Uniform Delay, d1	18.6	34.1	11.6	34.8	27.4	11.0	44.0	59.0		39.7	48.0	39.7
Progression Factor	1.11	0.92	3.23	1.53	1.10	1.37	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.1	50.1	0.0	1.5	4.8	0.0	0.3	33.2		10.1	0.2	0.0
Delay (s)	20.8	81.6	37.6	54.8	34.9	15.0	44.3	92.2		49.8	48.2	39.8
Level of Service	C	F	D	D	C	B	D	F		D	D	D
Approach Delay (s)		75.9			30.9			77.9			47.4	
Approach LOS		E			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	58.3	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	94.7%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	10	24	4	4	2	18	373	24	16	193	12
Future Volume (Veh/h)	27	10	24	4	4	2	18	373	24	16	193	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	29	11	26	4	4	2	19	401	26	17	208	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.94	0.94	0.94	0.94	0.94		0.94					
vC, conflicting volume	692	714	214	726	707	414	221			427		
vC1, stage 1 conf vol	248	248		452	452							
vC2, stage 2 conf vol	443	465		274	255							
vCu, unblocked vol	636	660	126	672	653	414	133			427		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	94	98	97	99	99	100	99			98		
cM capacity (veh/h)	498	477	833	489	488	611	1287			1066		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	29	37	4	6	19	427	17	221
Volume Left	29	0	4	0	19	0	17	0
Volume Right	0	26	0	2	0	26	0	13
cSH	498	682	489	523	1287	1700	1066	1700
Volume to Capacity	0.06	0.05	0.01	0.01	0.01	0.25	0.02	0.13
Queue Length 95th (ft)	5	4	1	1	1	0	1	0
Control Delay (s)	12.7	10.6	12.4	12.0	7.8	0.0	8.4	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	11.5		12.1		0.3		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	35.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	53	16	18	8	6
Future Volume (Veh/h)	20	53	16	18	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	57	17	19	9	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				128	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				128	26
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				99	99
cM capacity (veh/h)	1507				829	1018

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	57	36	15
Volume Left	22	0	0	9
Volume Right	0	0	19	6
cSH	1507	1700	1700	896
Volume to Capacity	0.01	0.03	0.02	0.02
Queue Length 95th (ft)	1	0	0	1
Control Delay (s)	7.4	0.0	0.0	9.1
Lane LOS	A			A
Approach Delay (s)	2.1		0.0	9.1
Approach LOS				A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	909	18	17	1183	14	60	9	45	63	2	124
Future Volume (vph)	37	909	18	17	1183	14	60	9	45	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85	1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	1805		1671	1830	1405	1671	1540		1703	1586	
Flt Permitted	0.04	1.00		0.20	1.00	1.00	0.46	1.00		0.72	1.00	
Satd. Flow (perm)	77	1805		352	1830	1405	815	1540		1288	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	988	20	18	1286	15	65	10	49	68	2	135
RTOR Reduction (vph)	0	0	0	0	0	4	0	44	0	0	120	0
Lane Group Flow (vph)	40	1008	0	18	1286	11	65	15	0	68	17	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA	Prot	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6	6		8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	101.1	95.9		95.3	93.0	93.0	13.9	13.9		13.9	13.9	
Effective Green, g (s)	101.1	95.9		95.3	93.0	93.0	13.9	13.9		13.9	13.9	
Actuated g/C Ratio	0.80	0.76		0.75	0.73	0.73	0.11	0.11		0.11	0.11	
Clearance Time (s)	4.0	5.5		4.0	5.5	5.5	5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	130	1367		288	1344	1032	89	169		141	174	
v/s Ratio Prot	c0.01	0.56		0.00	c0.70	0.01		0.01			0.01	
v/s Ratio Perm	0.23			0.05			c0.08			0.05		
v/c Ratio	0.31	0.74		0.06	0.96	0.01	0.73	0.09		0.48	0.10	
Uniform Delay, d1	31.1	8.4		7.8	15.0	4.5	54.5	50.7		53.0	50.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	1.3	2.1		0.1	15.3	0.0	26.2	0.2		2.6	0.2	
Delay (s)	32.4	10.5		7.9	30.3	4.5	80.8	50.9		55.6	50.9	
Level of Service	C	B		A	C	A	F	D		E	D	
Approach Delay (s)		11.4			29.7			66.5			52.5	
Approach LOS		B			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	26.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	126.6	Sum of lost time (s)	14.5
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	60	856	101	58	897	118	112	128	22	195	197	205
Future Volume (vph)	60	856	101	58	897	118	112	128	22	195	197	205
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.98	1.00	1.00	0.99	1.00	1.00		1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00
Satd. Flow (prot)	1805	1812	1426	1805	1830	1550	1752	1821		1735	1827	1583
Flt Permitted	0.11	1.00	1.00	0.15	1.00	1.00	0.46	1.00		0.32	1.00	1.00
Satd. Flow (perm)	215	1812	1426	285	1830	1550	844	1821		576	1827	1583
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	62	892	105	60	934	123	117	133	23	203	205	214
RTOR Reduction (vph)	0	0	30	0	0	28	0	4	0	0	0	139
Lane Group Flow (vph)	63	892	75	60	934	95	117	152	0	203	205	75
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA		pm+pt	NA	pm+ov
Protected Phases	5	2	3	1	6	7	3	8		7	4	5
Permitted Phases	2		2	6		6	8			4		4
Actuated Green, G (s)	99.0	92.6	103.1	96.4	91.3	107.9	27.9	17.4		38.0	23.5	29.9
Effective Green, g (s)	99.0	92.6	103.1	96.4	91.3	107.9	27.9	17.4		38.0	23.5	29.9
Actuated g/C Ratio	0.66	0.61	0.68	0.64	0.61	0.72	0.19	0.12		0.25	0.16	0.20
Clearance Time (s)	4.0	5.5	4.0	4.0	5.5	4.0	4.0	5.5		4.0	5.5	4.0
Vehicle Extension (s)	1.5	4.5	0.2	1.5	4.5	0.2	0.2	2.0		0.2	2.0	1.5
Lane Grp Cap (vph)	208	1113	975	233	1108	1109	219	210		272	284	314
v/s Ratio Prot	c0.01	0.49	0.01	0.01	c0.51	0.01	0.04	0.08		c0.08	0.11	0.01
v/s Ratio Perm	0.19		0.05	0.16		0.05	0.06			c0.11		0.04
v/c Ratio	0.30	0.80	0.08	0.26	0.84	0.09	0.53	0.73		0.75	0.72	0.24
Uniform Delay, d1	22.5	22.1	7.9	19.4	23.9	6.5	53.7	64.3		48.2	60.5	50.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00
Incremental Delay, d2	0.3	4.7	0.0	0.2	6.5	0.0	1.3	10.1		9.4	7.5	0.1
Delay (s)	22.8	26.8	7.9	19.6	30.4	6.5	55.0	74.4		57.6	67.9	51.0
Level of Service	C	C	A	B	C	A	D	E		E	E	D
Approach Delay (s)		24.7			27.2			66.1			58.7	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	36.2	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	150.7	Sum of lost time (s)	19.0
Intersection Capacity Utilization	81.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	5	27	22	14	16	5	220	3	2	310	44
Future Volume (Veh/h)	26	5	27	22	14	16	5	220	3	2	310	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	27	5	28	23	15	17	5	229	3	2	323	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	616	593	347	600	614	234	369			233		
vC1, stage 1 conf vol	350	350		242	242							
vC2, stage 2 conf vol	266	243		358	373							
vCu, unblocked vol	514	489	215	497	513	234	240			233		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	99	96	96	97	98	100			100		
cM capacity (veh/h)	583	570	733	582	557	796	1175			1316		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	27	33	23	32	5	232	2	369
Volume Left	27	0	23	0	5	0	2	0
Volume Right	0	28	0	17	0	3	0	46
cSH	583	702	582	663	1175	1700	1316	1700
Volume to Capacity	0.05	0.05	0.04	0.05	0.00	0.14	0.00	0.22
Queue Length 95th (ft)	4	4	3	4	0	0	0	0
Control Delay (s)	11.5	10.4	11.4	10.7	8.1	0.0	7.7	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	10.9		11.0		0.2		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.8		
Intersection Capacity Utilization	33.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	26	58	5	32	27
Future Volume (Veh/h)	4	26	58	5	32	27
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	4	27	60	5	33	28
Pedestrians			1		2	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	67				100	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	67				100	64
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				96	97
cM capacity (veh/h)	1494				879	981

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	4	27	65	61
Volume Left	4	0	0	33
Volume Right	0	0	5	28
cSH	1494	1700	1700	923
Volume to Capacity	0.00	0.02	0.04	0.07
Queue Length 95th (ft)	0	0	0	5
Control Delay (s)	7.4	0.0	0.0	9.2
Lane LOS	A			A
Approach Delay (s)	1.0		0.0	9.2
Approach LOS				A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix F Year 2025 Background Operations Worksheets

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	110	1126	735	75	47	30
Future Volume (vph)	110	1126	735	75	47	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frt	1.00	1.00	0.99		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1703	3329	3088		1289	1242
Flt Permitted	0.31	1.00	1.00		0.95	1.00
Satd. Flow (perm)	557	3329	3088		1289	1242
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1173	766	78	49	31
RTOR Reduction (vph)	0	0	3	0	0	29
Lane Group Flow (vph)	115	1173	841	0	49	2
Heavy Vehicles (%)	6%	8%	15%	13%	40%	30%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2				4	4
Actuated Green, G (s)	129.6	129.6	118.6		9.9	9.9
Effective Green, g (s)	129.6	129.6	118.6		9.9	9.9
Actuated g/C Ratio	0.86	0.86	0.79		0.07	0.07
Clearance Time (s)	4.0	5.5	5.5		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	534	2876	2441		85	81
v/s Ratio Prot	0.01	c0.35	0.27			
v/s Ratio Perm	0.18				c0.04	0.00
v/c Ratio	0.22	0.41	0.34		0.58	0.03
Uniform Delay, d1	1.8	2.1	4.5		68.0	65.5
Progression Factor	1.00	1.00	0.80		1.00	1.00
Incremental Delay, d2	0.2	0.4	0.4		9.1	0.1
Delay (s)	2.0	2.6	4.0		77.1	65.7
Level of Service	A	A	A		E	E
Approach Delay (s)		2.5	4.0		72.7	
Approach LOS		A	A		E	

Intersection Summary			
HCM 2000 Control Delay	5.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	14.5
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	75	1051	47	26	619	200	133	229	77	182	172	58
Future Volume (vph)	75	1051	47	26	619	200	133	229	77	182	172	58
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.96	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	3299	1252	2334	3127	1381	3155	3013		1612	3007	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.27	1.00	
Satd. Flow (perm)	3242	3299	1252	2334	3127	1381	3155	3013		454	3007	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	81	1130	51	28	666	215	143	246	83	196	185	62
RTOR Reduction (vph)	0	0	15	0	0	59	0	26	0	0	24	0
Lane Group Flow (vph)	81	1130	36	28	666	156	143	303	0	196	223	0
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	7.7	89.7	104.7	4.0	86.0	108.9	9.5	19.9		41.3	27.8	
Effective Green, g (s)	7.7	89.7	104.7	4.0	86.0	108.9	9.5	19.9		41.3	27.8	
Actuated g/C Ratio	0.05	0.60	0.70	0.03	0.57	0.73	0.06	0.13		0.28	0.19	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	166	1972	873	62	1792	1002	199	399		259	557	
v/s Ratio Prot	c0.02	c0.34	0.03	0.01	0.21	0.11	0.05	0.10		c0.09	0.07	
v/s Ratio Perm										c0.12		
v/c Ratio	0.49	0.57	0.04	0.45	0.37	0.16	0.72	0.76		0.76	0.40	
Uniform Delay, d1	69.2	18.4	7.0	71.9	17.4	6.3	68.9	62.7		45.5	53.8	
Progression Factor	0.95	1.03	2.74	1.35	0.49	1.55	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.1	0.0	1.8	0.6	0.0	9.9	7.2		10.6	0.2	
Delay (s)	66.6	20.2	19.3	99.1	9.1	9.9	78.8	69.9		56.1	53.9	
Level of Service	E	C	B	F	A	A	E	E		E	D	
Approach Delay (s)		23.1			12.0			72.6			54.9	
Approach LOS		C			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	32.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	63.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	414	24	16	217	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	414	24	16	217	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	445	26	17	233	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	722	744	240	752	738	458	246			471		
vC1, stage 1 conf vol	274	274		458	458							
vC2, stage 2 conf vol	449	471		294	280							
vCu, unblocked vol	659	683	137	692	676	458	144			471		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	495	475	812	489	489	577	1260			1026		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	471	17	246
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	495	657	489	515	1700	1700	1026	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.28	0.02	0.14
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.7	10.8	12.4	12.1	0.0	0.0	8.6	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.6		12.2		0.0		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	37.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	37	1018	1313	14	63	124
Future Volume (vph)	37	1018	1313	14	63	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5		5.0	5.0
Lane Util. Factor	1.00	0.95	0.95		1.00	1.00
Frpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	1.00		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	1752	3457	3481		1703	1583
Flt Permitted	0.10	1.00	1.00		0.95	1.00
Satd. Flow (perm)	192	3457	3481		1703	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	1107	1427	15	68	135
RTOR Reduction (vph)	0	0	0	0	0	116
Lane Group Flow (vph)	40	1107	1442	0	68	19
Confl. Peds. (#/hr)	2			2		
Confl. Bikes (#/hr)				4		
Heavy Vehicles (%)	3%	4%	3%	14%	6%	2%
Bus Blockages (#/hr)	0	2	2	2	0	0
Turn Type	pm+pt	NA	NA		Perm	Perm
Protected Phases	5	2	6			
Permitted Phases	2				4	4
Actuated Green, G (s)	48.5	48.5	40.2		9.5	9.5
Effective Green, g (s)	48.5	48.5	40.2		9.5	9.5
Actuated g/C Ratio	0.71	0.71	0.59		0.14	0.14
Clearance Time (s)	4.0	5.5	5.5		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	233	2447	2042		236	219
v/s Ratio Prot	0.01	c0.32	c0.41			
v/s Ratio Perm	0.11				c0.04	0.01
v/c Ratio	0.17	0.45	0.71		0.29	0.09
Uniform Delay, d1	6.0	4.3	10.0		26.5	25.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	0.4	0.1	1.1		0.7	0.2
Delay (s)	6.4	4.4	11.1		27.1	25.9
Level of Service	A	A	B		C	C
Approach Delay (s)		4.5	11.1		26.3	
Approach LOS		A	B		C	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	68.5	Sum of lost time (s)	14.5
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	53	915	113	61	982	127	124	137	12	207	218	221
Future Volume (vph)	53	915	113	61	982	127	124	137	12	207	218	221
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3457	1456	3502	3491	1571	3400	3497		1735	3240	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.49	1.00	
Satd. Flow (perm)	3502	3457	1456	3502	3491	1571	3400	3497		893	3240	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	55	953	118	64	1023	132	129	143	12	216	227	230
RTOR Reduction (vph)	0	0	48	0	0	43	0	4	0	0	94	0
Lane Group Flow (vph)	55	953	70	64	1023	89	129	152	0	216	363	0
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	4.6	41.8	54.7	4.9	42.1	62.3	7.4	11.9		30.6	19.2	
Effective Green, g (s)	4.6	41.8	54.7	4.9	42.1	62.3	7.4	11.9		30.6	19.2	
Actuated g/C Ratio	0.05	0.45	0.59	0.05	0.46	0.67	0.08	0.13		0.33	0.21	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	174	1565	862	185	1592	1060	272	450		430	673	
v/s Ratio Prot	0.02	0.28	0.05	c0.02	c0.29	0.06	0.04	0.04		c0.08	c0.11	
v/s Ratio Perm										0.09		
v/c Ratio	0.32	0.61	0.08	0.35	0.64	0.08	0.47	0.34		0.50	0.54	
Uniform Delay, d1	42.3	19.1	8.0	42.2	19.3	5.2	40.6	36.6		23.7	32.6	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.9	0.1	0.4	1.1	0.1	0.5	0.2		0.3	0.4	
Delay (s)	42.7	20.0	8.1	42.6	20.4	5.2	41.1	36.8		24.0	33.0	
Level of Service	D	B	A	D	C	A	D	D		C	C	
Approach Delay (s)		19.8			19.9			38.7			30.1	
Approach LOS		B			B			D			C	

Intersection Summary			
HCM 2000 Control Delay	23.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	92.3	Sum of lost time (s)	19.0
Intersection Capacity Utilization	58.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	246	3	2	346	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	246	3	2	346	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	256	3	2	360	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.90	0.90	0.90	0.90	0.90		0.90					
vC, conflicting volume	670	647	384	636	668	260	406			260		
vC1, stage 1 conf vol	387	387		258	258							
vC2, stage 2 conf vol	282	260		378	410							
vCu, unblocked vol	573	548	254	536	572	260	279			260		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	556	547	696	577	537	769	1135			1286		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	259	2	406
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	556	638	577	639	1700	1700	1286	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.15	0.00	0.24
Queue Length 95th (ft)	2	2	3	4	0	0	0	0
Control Delay (s)	11.6	10.8	11.5	10.9	0.0	0.0	7.8	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.1		11.2		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix G Year 2025 Total Traffic – Cipole Road Cul-de-sac Operations Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1126	88	80	735	75	21	2	19	47	9	30
Future Volume (vph)	110	1126	88	80	735	75	21	2	19	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.86		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3277		1597	3088		1597	1452		1289	1331	
Flt Permitted	0.32	1.00		0.19	1.00		0.73	1.00		0.74	1.00	
Satd. Flow (perm)	577	3277		321	3088		1229	1452		1008	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1173	92	83	766	78	22	2	20	49	9	31
RTOR Reduction (vph)	0	3	0	0	4	0	0	18	0	0	29	0
Lane Group Flow (vph)	115	1262	0	83	840	0	22	4	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	123.2	116.1		124.5	117.0		11.9	11.9		11.4	11.4	
Effective Green, g (s)	123.2	116.1		124.5	117.0		11.9	11.9		11.4	11.4	
Actuated g/C Ratio	0.82	0.77		0.83	0.78		0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	527	2536		330	2408		97	115		76	101	
v/s Ratio Prot	0.01	c0.39		c0.01	0.27			0.00			0.01	
v/s Ratio Perm	0.17			0.20			0.02			c0.05		
v/c Ratio	0.22	0.50		0.25	0.35		0.23	0.03		0.64	0.11	
Uniform Delay, d1	2.6	6.2		3.3	5.0		64.7	63.7		67.3	64.6	
Progression Factor	1.00	1.00		0.97	0.94		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.7		0.4	0.4		1.2	0.1		17.2	0.5	
Delay (s)	2.9	6.9		3.6	5.1		65.9	63.8		84.6	65.1	
Level of Service	A	A		A	A		E	E		F	E	
Approach Delay (s)		6.6			4.9			64.9			75.8	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	9.5	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.50		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	60.1%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	79	1062	51	26	663	200	151	229	77	182	172	76
Future Volume (vph)	79	1062	51	26	663	200	151	229	77	182	172	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	3299	1252	2334	3127	1381	3155	3013		1612	2961	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.27	1.00	
Satd. Flow (perm)	3242	3299	1252	2334	3127	1381	3155	3013		454	2961	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	85	1142	55	28	713	215	162	246	83	196	185	82
RTOR Reduction (vph)	0	0	16	0	0	59	0	26	0	0	37	0
Lane Group Flow (vph)	85	1142	39	28	713	156	162	303	0	196	230	0
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	7.8	89.9	105.8	4.0	86.1	108.8	10.4	19.9		41.1	26.7	
Effective Green, g (s)	7.8	89.9	105.8	4.0	86.1	108.8	10.4	19.9		41.1	26.7	
Actuated g/C Ratio	0.05	0.60	0.71	0.03	0.57	0.73	0.07	0.13		0.27	0.18	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	168	1977	883	62	1794	1001	218	399		257	527	
v/s Ratio Prot	c0.03	c0.35	0.03	0.01	0.23	0.11	0.05	0.10		c0.09	0.08	
v/s Ratio Perm										c0.12		
v/c Ratio	0.51	0.58	0.04	0.45	0.40	0.16	0.74	0.76		0.76	0.44	
Uniform Delay, d1	69.2	18.4	6.7	71.9	17.6	6.4	68.5	62.7		45.6	54.9	
Progression Factor	1.21	0.75	0.30	1.38	0.35	0.90	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.1	0.0	1.8	0.6	0.0	11.3	7.2		11.4	0.2	
Delay (s)	84.3	15.0	2.1	101.3	6.8	5.8	79.8	69.9		57.0	55.2	
Level of Service	F	B	A	F	A	A	E	E		E	E	
Approach Delay (s)		19.0			9.3			73.2			56.0	
Approach LOS		B			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	29.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	65.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	23	10	20	4	4	2	0	432	24	16	221	12
Future Volume (Veh/h)	23	10	20	4	4	2	0	432	24	16	221	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	25	11	22	4	4	2	0	465	26	17	238	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	748	770	244	778	763	478	251			491		
vC1, stage 1 conf vol	278	278		478	478							
vC2, stage 2 conf vol	469	491		300	285							
vCu, unblocked vol	683	707	137	716	700	478	144			491		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	95	98	97	99	99	100	100			98		
cM capacity (veh/h)	483	465	809	478	479	562	1255			1008		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	25	33	4	6	0	491	17	251
Volume Left	25	0	4	0	0	0	17	0
Volume Right	0	22	0	2	0	26	0	13
cSH	483	649	478	504	1700	1700	1008	1700
Volume to Capacity	0.05	0.05	0.01	0.01	0.00	0.29	0.02	0.15
Queue Length 95th (ft)	4	4	1	1	0	0	1	0
Control Delay (s)	12.9	10.8	12.6	12.2	0.0	0.0	8.6	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.7		12.4		0.0		0.5	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	38.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	1018	22	22	1313	14	87	9	77	63	2	124
Future Volume (vph)	37	1018	22	22	1313	14	87	9	77	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.87		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3442		1671	3481		1671	1523		1703	1586	
Flt Permitted	0.10	1.00		0.20	1.00		0.66	1.00		0.70	1.00	
Satd. Flow (perm)	183	3442		358	3481		1160	1523		1248	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	1107	24	24	1427	15	95	10	84	68	2	135
RTOR Reduction (vph)	0	1	0	0	0	0	0	67	0	0	108	0
Lane Group Flow (vph)	40	1130	0	24	1442	0	95	27	0	68	29	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	51.2	47.3		47.2	45.3		16.2	16.2		16.2	16.2	
Effective Green, g (s)	51.2	47.3		47.2	45.3		16.2	16.2		16.2	16.2	
Actuated g/C Ratio	0.64	0.59		0.59	0.57		0.20	0.20		0.20	0.20	
Clearance Time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	193	2037		242	1973		235	308		253	321	
v/s Ratio Prot	c0.01	0.33		0.00	c0.41			0.02			0.02	
v/s Ratio Perm	0.12			0.06			c0.08			0.05		
v/c Ratio	0.21	0.55		0.10	0.73		0.40	0.09		0.27	0.09	
Uniform Delay, d1	8.6	9.9		7.3	12.8		27.7	25.9		26.9	25.9	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	0.3		0.2	1.4		1.1	0.1		0.6	0.1	
Delay (s)	9.2	10.2		7.5	14.2		28.8	26.0		27.4	26.0	
Level of Service	A	B		A	B		C	C		C	C	
Approach Delay (s)		10.2			14.1			27.4			26.5	
Approach LOS		B			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	14.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	79.9	Sum of lost time (s)	14.5
Intersection Capacity Utilization	62.3%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	958	130	61	994	127	129	137	12	207	218	226
Future Volume (vph)	70	958	130	61	994	127	129	137	12	207	218	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.99		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3457	1456	3502	3491	1571	3400	3497		1735	3238	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.49	1.00	
Satd. Flow (perm)	3502	3457	1456	3502	3491	1571	3400	3497		893	3238	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	73	998	135	64	1035	132	134	143	12	216	227	235
RTOR Reduction (vph)	0	0	54	0	0	43	0	4	0	0	97	0
Lane Group Flow (vph)	73	998	81	64	1035	89	134	152	0	216	365	0
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	5.2	44.1	57.2	4.9	43.8	64.2	7.6	11.9		30.8	19.2	
Effective Green, g (s)	5.2	44.1	57.2	4.9	43.8	64.2	7.6	11.9		30.8	19.2	
Actuated g/C Ratio	0.05	0.47	0.60	0.05	0.46	0.68	0.08	0.13		0.32	0.20	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	192	1608	878	181	1612	1063	272	438		422	655	
v/s Ratio Prot	c0.02	0.29	0.06	0.02	c0.30	0.06	0.04	0.04		c0.08	c0.11	
v/s Ratio Perm										0.09		
v/c Ratio	0.38	0.62	0.09	0.35	0.64	0.08	0.49	0.35		0.51	0.56	
Uniform Delay, d1	43.2	19.1	7.9	43.4	19.5	5.2	41.8	37.9		24.8	34.0	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.5	1.0	0.1	0.4	1.1	0.1	0.5	0.2		0.4	0.6	
Delay (s)	43.7	20.0	8.0	43.9	20.6	5.3	42.3	38.1		25.2	34.6	
Level of Service	D	C	A	D	C	A	D	D		C	C	
Approach Delay (s)		20.1			20.2			40.0			31.6	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	94.8	Sum of lost time (s)	19.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	5	10	22	14	16	0	251	3	2	363	44
Future Volume (Veh/h)	11	5	10	22	14	16	0	251	3	2	363	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	11	5	10	23	15	17	0	261	3	2	378	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	692	670	402	659	692	266	424			265		
vC1, stage 1 conf vol	405	405		264	264							
vC2, stage 2 conf vol	288	265		396	428							
vCu, unblocked vol	596	571	271	558	595	266	295			265		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	96	97	98	100			100		
cM capacity (veh/h)	545	537	679	564	527	764	1116			1281		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	11	15	23	32	0	264	2	424
Volume Left	11	0	23	0	0	0	2	0
Volume Right	0	10	0	17	0	3	0	46
cSH	545	624	564	631	1700	1700	1281	1700
Volume to Capacity	0.02	0.02	0.04	0.05	0.00	0.16	0.00	0.25
Queue Length 95th (ft)	2	2	3	4	0	0	0	0
Control Delay (s)	11.7	10.9	11.6	11.0	0.0	0.0	7.8	0.0
Lane LOS	B	B	B	B			A	
Approach Delay (s)	11.3		11.3		0.0		0.0	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.2		
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix H Year 2025 Total Traffic – Cipole Road Extension Operations Worksheets

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	110	1126	68	62	735	75	15	2	11	47	9	30
Future Volume (vph)	110	1126	68	62	735	75	15	2	11	47	9	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	0.99		1.00	0.99		1.00	0.87		1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1703	3288		1597	3088		1597	1468		1289	1331	
Flt Permitted	0.32	1.00		0.20	1.00		0.73	1.00		0.75	1.00	
Satd. Flow (perm)	567	3288		341	3088		1229	1468		1017	1331	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	115	1173	71	65	766	78	16	2	11	49	9	31
RTOR Reduction (vph)	0	2	0	0	4	0	0	10	0	0	29	0
Lane Group Flow (vph)	115	1242	0	65	840	0	16	3	0	49	11	0
Confl. Bikes (#/hr)			5									
Heavy Vehicles (%)	6%	8%	13%	13%	15%	13%	13%	13%	13%	40%	13%	30%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	125.3	118.2		122.4	117.0		11.9	11.9		11.4	11.4	
Effective Green, g (s)	125.3	118.2		122.4	117.0		11.9	11.9		11.4	11.4	
Actuated g/C Ratio	0.84	0.79		0.82	0.78		0.08	0.08		0.08	0.08	
Clearance Time (s)	4.0	5.5		4.5	5.5		4.5	4.5		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	527	2590		323	2408		97	116		77	101	
v/s Ratio Prot	c0.01	c0.38		0.01	0.27			0.00			0.01	
v/s Ratio Perm	0.17			0.16			0.01			c0.05		
v/c Ratio	0.22	0.48		0.20	0.35		0.16	0.02		0.64	0.11	
Uniform Delay, d1	2.4	5.4		3.2	5.0		64.4	63.7		67.3	64.6	
Progression Factor	1.00	1.00		0.86	0.88		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.2	0.6		0.3	0.4		0.8	0.1		16.0	0.5	
Delay (s)	2.6	6.1		3.0	4.7		65.2	63.8		83.2	65.1	
Level of Service	A	A		A	A		E	E		F	E	
Approach Delay (s)		5.8			4.6			64.6			75.1	
Approach LOS		A			A			E			E	

Intersection Summary			
HCM 2000 Control Delay	8.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.48		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	59.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	78	1059	47	26	663	200	133	230	80	182	172	76
Future Volume (vph)	78	1059	47	26	663	200	133	230	80	182	172	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3242	3299	1252	2334	3127	1381	3155	3006		1612	2961	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.26	1.00	
Satd. Flow (perm)	3242	3299	1252	2334	3127	1381	3155	3006		449	2961	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	84	1139	51	28	713	215	143	247	86	196	185	82
RTOR Reduction (vph)	0	0	15	0	0	59	0	27	0	0	37	0
Lane Group Flow (vph)	84	1139	36	28	713	156	143	306	0	196	230	0
Confl. Bikes (#/hr)			3			1						
Heavy Vehicles (%)	8%	9%	28%	50%	15%	16%	11%	10%	31%	12%	12%	26%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	7.8	89.6	104.6	4.0	85.8	108.6	9.5	20.1		41.4	27.9	
Effective Green, g (s)	7.8	89.6	104.6	4.0	85.8	108.6	9.5	20.1		41.4	27.9	
Actuated g/C Ratio	0.05	0.60	0.70	0.03	0.57	0.72	0.06	0.13		0.28	0.19	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	168	1970	873	62	1788	999	199	402		258	550	
v/s Ratio Prot	c0.03	c0.35	0.03	0.01	0.23	0.11	0.05	0.10		c0.09	0.08	
v/s Ratio Perm										c0.12		
v/c Ratio	0.50	0.58	0.04	0.45	0.40	0.16	0.72	0.76		0.76	0.42	
Uniform Delay, d1	69.2	18.6	7.1	71.9	17.8	6.4	68.9	62.6		45.4	53.9	
Progression Factor	1.14	0.78	0.47	1.38	0.35	0.93	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.8	1.1	0.0	1.8	0.6	0.0	9.9	7.5		10.8	0.2	
Delay (s)	80.0	15.7	3.3	101.1	6.9	6.0	78.8	70.1		56.2	54.1	
Level of Service	E	B	A	F	A	A	E	E		E	D	
Approach Delay (s)		19.4			9.4			72.7			55.0	
Approach LOS		B			A			E			D	

Intersection Summary			
HCM 2000 Control Delay	29.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	10	24	4	4	2	18	414	24	16	217	12
Future Volume (Veh/h)	27	10	24	4	4	2	18	414	24	16	217	12
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	29	11	26	4	4	2	19	445	26	17	233	13
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh)								2			2	
Upstream signal (ft)											1007	
pX, platoon unblocked	0.92	0.92	0.92	0.92	0.92		0.92					
vC, conflicting volume	760	782	240	794	776	458	246			471		
vC1, stage 1 conf vol	274	274		496	496							
vC2, stage 2 conf vol	487	509		298	280							
vCu, unblocked vol	698	722	133	735	715	458	140			471		
tC, single (s)	7.2	6.7	6.4	7.2	6.7	6.4	4.2			4.2		
tC, 2 stage (s)	6.2	5.7		6.2	5.7							
tF (s)	3.6	4.1	3.4	3.6	4.1	3.4	2.3			2.3		
p0 queue free %	94	98	97	99	99	100	98			98		
cM capacity (veh/h)	468	452	814	460	464	577	1260			1026		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	29	37	4	6	19	471	17	246
Volume Left	29	0	4	0	19	0	17	0
Volume Right	0	26	0	2	0	26	0	13
cSH	468	657	460	496	1260	1700	1026	1700
Volume to Capacity	0.06	0.06	0.01	0.01	0.02	0.28	0.02	0.14
Queue Length 95th (ft)	5	4	1	1	1	0	1	0
Control Delay (s)	13.2	10.8	12.9	12.3	7.9	0.0	8.6	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	11.9		12.6		0.3		0.6	
Approach LOS	B		B					

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	38.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	20	53	16	18	8	6
Future Volume (Veh/h)	20	53	16	18	8	6
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	22	57	17	19	9	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	36				128	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	36				128	26
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				99	99
cM capacity (veh/h)	1507				829	1018

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	22	57	36	15
Volume Left	22	0	0	9
Volume Right	0	0	19	6
cSH	1507	1700	1700	896
Volume to Capacity	0.01	0.03	0.02	0.02
Queue Length 95th (ft)	1	0	0	1
Control Delay (s)	7.4	0.0	0.0	9.1
Lane LOS	A			A
Approach Delay (s)	2.1		0.0	9.1
Approach LOS				A

Intersection Summary			
Average Delay	2.3		
Intersection Capacity Utilization	17.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	37	1018	18	17	1313	14	60	9	45	63	2	124
Future Volume (vph)	37	1018	18	17	1313	14	60	9	45	63	2	124
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	1.00		1.00	1.00	
Frpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Frt	1.00	1.00		1.00	1.00		1.00	0.88		1.00	0.85	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1752	3444		1671	3481		1671	1540		1703	1586	
Flt Permitted	0.10	1.00		0.21	1.00		0.67	1.00		0.72	1.00	
Satd. Flow (perm)	194	3444		375	3481		1173	1540		1288	1586	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	40	1107	20	18	1427	15	65	10	49	68	2	135
RTOR Reduction (vph)	0	1	0	0	0	0	0	41	0	0	112	0
Lane Group Flow (vph)	40	1126	0	18	1442	0	65	18	0	68	25	0
Confl. Peds. (#/hr)	2					2						
Confl. Bikes (#/hr)			1			4						
Heavy Vehicles (%)	3%	4%	8%	8%	3%	14%	8%	8%	8%	6%	8%	2%
Bus Blockages (#/hr)	0	2	0	0	2	2	0	0	0	0	0	0
Turn Type	pm+pt	NA		pm+pt	NA		Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	48.9	44.9		44.7	42.8		12.6	12.6		12.6	12.6	
Effective Green, g (s)	48.9	44.9		44.7	42.8		12.6	12.6		12.6	12.6	
Actuated g/C Ratio	0.66	0.61		0.60	0.58		0.17	0.17		0.17	0.17	
Clearance Time (s)	4.0	5.5		4.0	5.5		5.0	5.0		5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	212	2092		260	2016		199	262		219	270	
v/s Ratio Prot	c0.01	0.33		0.00	c0.41			0.01			0.02	
v/s Ratio Perm	0.11			0.04			c0.06			0.05		
v/c Ratio	0.19	0.54		0.07	0.72		0.33	0.07		0.31	0.09	
Uniform Delay, d1	7.2	8.5		6.1	11.2		26.9	25.7		26.8	25.8	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.3		0.1	1.2		1.0	0.1		0.8	0.1	
Delay (s)	7.6	8.7		6.3	12.4		27.9	25.8		27.7	26.0	
Level of Service	A	A		A	B		C	C		C	C	
Approach Delay (s)		8.7			12.3			26.9			26.5	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.5	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	73.9	Sum of lost time (s)	14.5
Intersection Capacity Utilization	61.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	66	947	113	61	994	127	124	141	23	207	218	226
Future Volume (vph)	66	947	113	61	994	127	124	141	23	207	218	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	5.5	5.5	4.0	5.5	5.5	4.0	5.5		4.0	5.5	
Lane Util. Factor	0.97	0.95	1.00	0.97	0.95	1.00	0.97	0.95		1.00	0.95	
Frpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.98		1.00	0.92	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	3502	3457	1456	3502	3491	1571	3400	3468		1735	3238	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.48	1.00	
Satd. Flow (perm)	3502	3457	1456	3502	3491	1571	3400	3468		884	3238	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	69	986	118	64	1035	132	129	147	24	216	227	235
RTOR Reduction (vph)	0	0	47	0	0	43	0	8	0	0	97	0
Lane Group Flow (vph)	69	986	71	64	1035	89	129	163	0	216	365	0
Confl. Peds. (#/hr)	2		1	1		2			1	1		
Confl. Bikes (#/hr)			1			2						
Heavy Vehicles (%)	0%	4%	10%	0%	3%	2%	3%	2%	0%	4%	4%	2%
Bus Blockages (#/hr)	0	2	2	0	2	2	0	0	0	0	0	0
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA		pm+pt	NA	
Protected Phases	5	2	2 3	1	6	6 7	3	8		7	4	
Permitted Phases										4		
Actuated Green, G (s)	5.1	43.8	56.8	4.9	43.6	64.0	7.5	12.1		31.0	19.5	
Effective Green, g (s)	5.1	43.8	56.8	4.9	43.6	64.0	7.5	12.1		31.0	19.5	
Actuated g/C Ratio	0.05	0.46	0.60	0.05	0.46	0.68	0.08	0.13		0.33	0.21	
Clearance Time (s)	4.0	5.5		4.0	5.5		4.0	5.5		4.0	5.5	
Vehicle Extension (s)	1.5	4.5		1.5	4.5		0.2	2.0		0.2	2.0	
Lane Grp Cap (vph)	188	1598	873	181	1607	1061	269	443		423	666	
v/s Ratio Prot	c0.02	0.29	0.05	0.02	c0.30	0.06	0.04	0.05		c0.08	c0.11	
v/s Ratio Perm										0.09		
v/c Ratio	0.37	0.62	0.08	0.35	0.64	0.08	0.48	0.37		0.51	0.55	
Uniform Delay, d1	43.2	19.1	8.0	43.4	19.6	5.3	41.7	37.8		24.6	33.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		1.00	1.00	
Incremental Delay, d2	0.4	0.9	0.1	0.4	1.1	0.1	0.5	0.2		0.4	0.5	
Delay (s)	43.7	20.1	8.0	43.8	20.7	5.3	42.2	38.0		25.0	34.2	
Level of Service	D	C	A	D	C	A	D	D		C	C	
Approach Delay (s)		20.2			20.3			39.8			31.2	
Approach LOS		C			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	24.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	94.7	Sum of lost time (s)	19.0
Intersection Capacity Utilization	59.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	26	5	27	22	14	16	5	246	3	2	346	44
Future Volume (Veh/h)	26	5	27	22	14	16	5	246	3	2	346	44
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	27	5	28	23	15	17	5	256	3	2	360	46
Pedestrians					1			1			2	
Lane Width (ft)					12.0			12.0			12.0	
Walking Speed (ft/s)					3.5			3.5			3.5	
Percent Blockage					0			0			0	
Right turn flare (veh)												
Median type								None			TWLTL	
Median storage veh)											2	
Upstream signal (ft)											978	
pX, platoon unblocked	0.89	0.89	0.89	0.89	0.89		0.89					
vC, conflicting volume	680	657	384	664	678	260	406			260		
vC1, stage 1 conf vol	387	387		268	268							
vC2, stage 2 conf vol	292	270		396	410							
vCu, unblocked vol	582	557	252	565	581	260	277			260		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	99	96	96	97	98	100			100		
cM capacity (veh/h)	550	543	696	548	531	769	1135			1286		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2
Volume Total	27	33	23	32	5	259	2	406
Volume Left	27	0	23	0	5	0	2	0
Volume Right	0	28	0	17	0	3	0	46
cSH	550	668	548	635	1135	1700	1286	1700
Volume to Capacity	0.05	0.05	0.04	0.05	0.00	0.15	0.00	0.24
Queue Length 95th (ft)	4	4	3	4	0	0	0	0
Control Delay (s)	11.9	10.7	11.9	11.0	8.2	0.0	7.8	0.0
Lane LOS	B	B	B	B	A		A	
Approach Delay (s)	11.2		11.3		0.2		0.0	
Approach LOS	B		B					

Intersection Summary				
Average Delay	1.7			
Intersection Capacity Utilization	35.8%	ICU Level of Service		A
Analysis Period (min)	15			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	26	58	5	32	27
Future Volume (Veh/h)	4	26	58	5	32	27
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Hourly flow rate (vph)	4	27	60	5	33	28
Pedestrians			1		2	
Lane Width (ft)			12.0		12.0	
Walking Speed (ft/s)			3.5		3.5	
Percent Blockage			0		0	
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	67				100	64
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	67				100	64
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				96	97
cM capacity (veh/h)	1494				879	981

Direction, Lane #	EB 1	EB 2	WB 1	SB 1
Volume Total	4	27	65	61
Volume Left	4	0	0	33
Volume Right	0	0	5	28
cSH	1494	1700	1700	923
Volume to Capacity	0.00	0.02	0.04	0.07
Queue Length 95th (ft)	0	0	0	5
Control Delay (s)	7.4	0.0	0.0	9.2
Lane LOS	A			A
Approach Delay (s)	1.0		0.0	9.2
Approach LOS				A

Intersection Summary			
Average Delay	3.8		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix I Year 2021 Total Traffic SimTraffic Worksheets

Summary of All Intervals

Run Number	21	22	23	24	25	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5193	5265	5137	5179	5199	5193
Vehs Exited	5166	5175	5092	5210	5161	5160
Starting Vehs	283	296	334	324	302	302
Ending Vehs	310	386	379	293	340	337
Travel Distance (mi)	7002	6994	6905	6840	6948	6938
Travel Time (hr)	343.3	340.4	349.2	307.4	363.4	340.7
Total Delay (hr)	148.1	145.8	157.8	116.9	170.5	147.8
Total Stops	8334	8479	8875	7095	9188	8391
Fuel Used (gal)	254.1	253.9	253.2	244.1	259.1	252.9

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	21	22	23	24	25	Avg
Vehs Entered	1258	1228	1175	1224	1257	1226
Vehs Exited	1227	1272	1220	1288	1269	1258
Starting Vehs	283	296	334	324	302	302
Ending Vehs	314	252	289	260	290	276
Travel Distance (mi)	1734	1687	1638	1652	1690	1680
Travel Time (hr)	76.5	78.0	73.8	72.8	75.9	75.4
Total Delay (hr)	28.5	31.3	28.6	26.8	29.0	28.8
Total Stops	1714	1785	1630	1577	1742	1689
Fuel Used (gal)	61.3	60.9	58.1	58.9	60.9	60.0

Interval #2 Information Recording1

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	21	22	23	24	25	Avg
Vehs Entered	1466	1446	1418	1437	1484	1445
Vehs Exited	1432	1350	1277	1329	1351	1348
Starting Vehs	314	252	289	260	290	276
Ending Vehs	348	348	430	368	423	381
Travel Distance (mi)	1857	1808	1820	1781	1812	1816
Travel Time (hr)	89.7	84.1	90.3	81.9	93.6	87.9
Total Delay (hr)	37.5	33.3	39.9	32.3	42.9	37.2
Total Stops	2219	2074	2258	2002	2436	2195
Fuel Used (gal)	67.2	64.6	65.7	63.6	67.4	65.7

Interval #3 Information Recording1

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	21	22	23	24	25	Avg
Vehs Entered	1288	1292	1274	1259	1241	1268
Vehs Exited	1275	1309	1340	1360	1246	1304
Starting Vehs	348	348	430	368	423	381
Ending Vehs	361	331	364	267	418	342
Travel Distance (mi)	1758	1768	1762	1761	1747	1759
Travel Time (hr)	90.0	87.6	97.1	79.7	97.2	90.3
Total Delay (hr)	40.9	38.4	48.1	30.5	48.9	41.4
Total Stops	2196	2215	2610	1863	2477	2272
Fuel Used (gal)	64.0	64.3	66.5	63.0	65.6	64.7

Interval #4 Information Recording1

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	21	22	23	24	25	Avg
Vehs Entered	1181	1299	1270	1259	1217	1241
Vehs Exited	1232	1244	1255	1233	1295	1251
Starting Vehs	361	331	364	267	418	342
Ending Vehs	310	386	379	293	340	337
Travel Distance (mi)	1653	1731	1685	1646	1699	1683
Travel Time (hr)	87.1	90.7	88.1	73.0	96.6	87.1
Total Delay (hr)	41.2	42.8	41.1	27.4	49.8	40.5
Total Stops	2205	2405	2377	1653	2533	2233
Fuel Used (gal)	61.5	64.0	62.9	58.5	65.3	62.4

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	328	979	203	354	135	95	68	234	225
Average Queue (ft)	101	536	76	72	15	26	20	101	66
95th Queue (ft)	316	1209	153	219	68	68	53	246	316
Link Distance (ft)		1104		819			419		805
Upstream Blk Time (%)		1							0
Queuing Penalty (veh)		10							0
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)		14	0	2	0			7	0
Queuing Penalty (veh)		15	0	4	0			3	0

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	399	833	400	180	666	400	338	533	316	394	118
Average Queue (ft)	85	640	56	32	310	84	144	303	184	147	42
95th Queue (ft)	289	975	261	110	581	293	319	595	318	313	92
Link Distance (ft)		819			1233			922		1894	1894
Upstream Blk Time (%)		4						1			
Queuing Penalty (veh)		47						3			
Storage Bay Dist (ft)	375		375	375		375	400		300		
Storage Blk Time (%)	0	26	0	0	5	0	0	6	4	0	
Queuing Penalty (veh)	0	31	1	0	11	0	0	8	6	0	

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	TR	L
Maximum Queue (ft)	59	79	43	47	64	46
Average Queue (ft)	15	26	3	7	8	5
95th Queue (ft)	43	63	21	31	70	23
Link Distance (ft)		807		1348	1018	
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150			150
Storage Blk Time (%)					0	
Queuing Penalty (veh)					0	

Intersection: 12: Blake Road & Cipole Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 140

Summary of All Intervals

Run Number	31	32	33	34	35	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5722	5870	5837	5863	5735	5803
Vehs Exited	5690	5795	5777	5818	5668	5750
Starting Vehs	346	394	345	383	364	362
Ending Vehs	378	469	405	428	431	417
Travel Distance (mi)	7959	8121	8206	8155	7908	8070
Travel Time (hr)	399.8	445.2	435.2	433.0	392.4	421.1
Total Delay (hr)	177.0	217.4	205.5	204.5	171.2	195.1
Total Stops	9931	10707	10745	10277	9772	10283
Fuel Used (gal)	290.9	303.1	303.2	301.3	286.8	297.0

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording1

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	31	32	33	34	35	Avg
Vehs Entered	1447	1433	1452	1452	1417	1440
Vehs Exited	1377	1412	1430	1432	1431	1414
Starting Vehs	346	394	345	383	364	362
Ending Vehs	416	415	367	403	350	384
Travel Distance (mi)	1973	1956	2002	2038	1956	1985
Travel Time (hr)	97.1	93.3	94.9	101.3	89.1	95.1
Total Delay (hr)	41.8	38.4	38.7	44.1	34.1	39.4
Total Stops	2481	2332	2292	2656	2212	2395
Fuel Used (gal)	71.3	70.1	72.2	73.9	69.1	71.3

Interval #2 Information Recording2

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	31	32	33	34	35	Avg
Vehs Entered	1504	1555	1580	1551	1487	1536
Vehs Exited	1481	1468	1441	1505	1438	1465
Starting Vehs	416	415	367	403	350	384
Ending Vehs	439	502	506	449	399	460
Travel Distance (mi)	2046	2127	2145	2096	2004	2084
Travel Time (hr)	110.5	118.0	113.7	113.2	97.1	110.5
Total Delay (hr)	53.5	58.5	54.1	54.7	41.0	52.4
Total Stops	2728	3040	2810	2872	2426	2776
Fuel Used (gal)	76.2	79.4	78.8	78.0	72.0	76.9

Interval #3 Information Recording2

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	31	32	33	34	35	Avg
Vehs Entered	1354	1421	1390	1418	1416	1400
Vehs Exited	1462	1500	1471	1475	1366	1455
Starting Vehs	439	502	506	449	399	460
Ending Vehs	331	423	425	392	449	396
Travel Distance (mi)	1995	2026	2051	1983	1944	2000
Travel Time (hr)	97.1	117.3	117.5	106.2	96.4	106.9
Total Delay (hr)	41.1	60.4	60.0	50.5	42.1	50.8
Total Stops	2331	2610	2980	2309	2406	2527
Fuel Used (gal)	72.3	76.5	77.3	73.8	70.5	74.1

Interval #4 Information Recording2

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	31	32	33	34	35	Avg
Vehs Entered	1417	1461	1415	1442	1415	1427
Vehs Exited	1370	1415	1435	1406	1433	1409
Starting Vehs	331	423	425	392	449	396
Ending Vehs	378	469	405	428	431	417
Travel Distance (mi)	1945	2012	2009	2038	2003	2001
Travel Time (hr)	95.0	116.6	109.1	112.3	109.8	108.6
Total Delay (hr)	40.6	60.1	52.7	55.3	54.0	52.5
Total Stops	2391	2725	2663	2440	2728	2591
Fuel Used (gal)	71.0	77.0	74.9	75.6	75.2	74.7

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	220	727	189	787	130	170	138	136	174
Average Queue (ft)	33	265	29	402	7	77	57	51	76
95th Queue (ft)	113	598	127	756	47	146	113	107	147
Link Distance (ft)		1103		819			440		805
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				3					
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)		5	0	20	0	0			
Queuing Penalty (veh)		2	0	7	0	0			

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	124	787	400	399	958	400	207	213	320	434	222
Average Queue (ft)	53	409	117	71	542	99	87	111	192	178	112
95th Queue (ft)	112	738	391	262	1020	359	165	187	323	333	200
Link Distance (ft)		819			1233			892		1894	1894
Upstream Blk Time (%)		0			0						
Queuing Penalty (veh)		2			3						
Storage Bay Dist (ft)	100		375	375		375	400		300		
Storage Blk Time (%)	1	27	0		17	0			4	0	
Queuing Penalty (veh)	14	50	1		30	0			8	1	

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	TR	TR
Maximum Queue (ft)	50	59	36	58	14	7
Average Queue (ft)	11	15	14	22	1	0
95th Queue (ft)	37	43	38	51	11	5
Link Distance (ft)		787		949	1716	892
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Blake Road & Cipole Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 120

Summary of All Intervals

Start Time	7:10
End Time	8:20
Total Time (min)	70
Time Recorded (min)	60
# of Intervals	5
# of Recorded Intervals	4
Vehs Entered	5199
Vehs Exited	5163
Starting Vehs	281
Ending Vehs	317
Travel Distance (mi)	6824
Travel Time (hr)	325.0
Total Delay (hr)	135.2
Total Stops	8132
Fuel Used (gal)	245.7

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Vehs Entered	1250
Vehs Exited	1270
Starting Vehs	281
Ending Vehs	261
Travel Distance (mi)	1653
Travel Time (hr)	72.4
Total Delay (hr)	26.4
Total Stops	1705
Fuel Used (gal)	58.8

Interval #2 Information Recording2

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Vehs Entered	1457
Vehs Exited	1333
Starting Vehs	261
Ending Vehs	385
Travel Distance (mi)	1786
Travel Time (hr)	85.3
Total Delay (hr)	35.5
Total Stops	2256
Fuel Used (gal)	64.8

Interval #3 Information Recording3

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Vehs Entered	1217
Vehs Exited	1288
Starting Vehs	385
Ending Vehs	314
Travel Distance (mi)	1667
Travel Time (hr)	84.7
Total Delay (hr)	38.4
Total Stops	2146
Fuel Used (gal)	61.1

Interval #4 Information Recording4

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Vehs Entered	1275
Vehs Exited	1272
Starting Vehs	314
Ending Vehs	317
Travel Distance (mi)	1717
Travel Time (hr)	82.6
Total Delay (hr)	34.8
Total Stops	2025
Fuel Used (gal)	61.1

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	385	1104	173	318	155	51	51	215	65
Average Queue (ft)	129	512	47	58	18	21	17	74	21
95th Queue (ft)	374	1225	113	171	82	54	45	174	51
Link Distance (ft)		1104		819			419		805
Upstream Blk Time (%)		0							
Queuing Penalty (veh)		2							
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)	0	14		1	0				
Queuing Penalty (veh)	0	15		1	0				

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	400	837	400	399	534	400	424	730	282	260	85
Average Queue (ft)	128	675	80	33	267	104	128	315	160	116	32
95th Queue (ft)	388	970	327	154	459	333	340	525	267	200	73
Link Distance (ft)		819			1233			922		1894	1894
Upstream Blk Time (%)		6									
Queuing Penalty (veh)		62									
Storage Bay Dist (ft)	375		375	375		375	400		300		
Storage Blk Time (%)	0	29	0	0	3	0		7	0		
Queuing Penalty (veh)	0	33	0	0	6	0		9	0		

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	SB
Directions Served	L	TR	L	TR	L
Maximum Queue (ft)	50	70	30	31	49
Average Queue (ft)	19	29	2	6	4
95th Queue (ft)	45	61	15	25	19
Link Distance (ft)		807		1348	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	150		150		150
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 12: Blake Road & Cipole Road

Movement	SB
Directions Served	LR
Maximum Queue (ft)	41
Average Queue (ft)	13
95th Queue (ft)	35
Link Distance (ft)	546
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (ft)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Zone Summary

Zone wide Queuing Penalty: 129

Summary of All Intervals

Run Number	1	2	3	4	5	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5767	5907	5813	5697	5821	5797
Vehs Exited	5754	5827	5786	5572	5760	5742
Starting Vehs	335	385	336	339	352	348
Ending Vehs	348	465	363	464	413	411
Travel Distance (mi)	7900	8090	7988	7769	8069	7963
Travel Time (hr)	382.6	445.5	382.8	369.7	406.0	397.3
Total Delay (hr)	161.1	219.2	159.8	152.2	179.9	174.4
Total Stops	8972	11534	9568	8959	9404	9687
Fuel Used (gal)	284.0	302.5	286.3	276.8	293.5	288.6

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1392	1442	1451	1332	1406	1403
Vehs Exited	1387	1438	1407	1367	1396	1398
Starting Vehs	335	385	336	339	352	348
Ending Vehs	340	389	380	304	362	351
Travel Distance (mi)	1961	1985	1937	1850	1973	1941
Travel Time (hr)	87.2	96.0	90.3	82.5	89.0	89.0
Total Delay (hr)	32.1	40.4	36.2	30.7	34.0	34.7
Total Stops	2059	2497	2293	2002	2117	2190
Fuel Used (gal)	68.9	71.8	68.4	65.4	69.2	68.7

Interval #2 Information Recording

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1641	1581	1543	1480	1604	1565
Vehs Exited	1516	1464	1477	1387	1495	1468
Starting Vehs	340	389	380	304	362	351
Ending Vehs	465	506	446	397	471	455
Travel Distance (mi)	2080	2048	2098	1947	2065	2048
Travel Time (hr)	104.1	107.1	102.8	88.2	104.9	101.4
Total Delay (hr)	45.9	49.9	44.4	33.8	46.8	44.1
Total Stops	2551	2797	2689	2216	2613	2569
Fuel Used (gal)	74.8	75.4	75.5	67.9	75.9	73.9

Interval #3 Information Recording

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1361	1399	1378	1386	1407	1385
Vehs Exited	1470	1454	1480	1432	1502	1466
Starting Vehs	465	506	446	397	471	455
Ending Vehs	356	451	344	351	376	372
Travel Distance (mi)	1997	2024	2033	1954	2063	2014
Travel Time (hr)	103.4	119.5	98.9	91.5	109.6	104.6
Total Delay (hr)	47.5	62.8	42.2	36.8	52.0	48.3
Total Stops	2446	3169	2369	2148	2571	2536
Fuel Used (gal)	73.4	77.3	73.4	69.9	76.6	74.1

Interval #4 Information Recording

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	1	2	3	4	5	Avg
Vehs Entered	1373	1485	1441	1499	1404	1437
Vehs Exited	1381	1471	1422	1386	1367	1405
Starting Vehs	356	451	344	351	376	372
Ending Vehs	348	465	363	464	413	411
Travel Distance (mi)	1863	2034	1920	2018	1968	1961
Travel Time (hr)	87.9	122.8	90.8	107.5	102.5	102.3
Total Delay (hr)	35.6	66.0	37.0	51.0	47.1	47.3
Total Stops	1916	3071	2217	2593	2103	2383
Fuel Used (gal)	66.9	77.9	69.1	73.7	71.8	71.9

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	T	R	L	TR	L	TR
Maximum Queue (ft)	201	501	86	748	122	135	100	132	157
Average Queue (ft)	33	170	13	320	11	52	38	47	65
95th Queue (ft)	95	391	69	653	70	104	80	98	130
Link Distance (ft)		1103		819			440		805
Upstream Blk Time (%)				0					
Queuing Penalty (veh)				3					
Storage Bay Dist (ft)	360		250		130	200		300	
Storage Blk Time (%)		1		16	0				
Queuing Penalty (veh)		0		5	0				

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB	SB
Directions Served	L	T	R	L	T	R	L	TR	L	T	R
Maximum Queue (ft)	332	722	400	400	914	399	168	211	296	312	254
Average Queue (ft)	61	309	65	79	456	84	77	111	166	157	107
95th Queue (ft)	203	558	271	279	976	327	136	196	270	264	206
Link Distance (ft)		819			1233			892		1894	1894
Upstream Blk Time (%)		0			1						
Queuing Penalty (veh)		0			13						
Storage Bay Dist (ft)	375		375	375		375	400		300		
Storage Blk Time (%)		5	0		13	0			1	0	
Queuing Penalty (veh)		7	0		22	0			1	1	

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	43	65	50	67	10	11	6	6
Average Queue (ft)	17	22	17	22	1	1	0	0
95th Queue (ft)	42	50	43	54	8	6	4	4
Link Distance (ft)		787		949		1716		892
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		150		150		150	
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 12: Blake Road & Cipole Road

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	6	69
Average Queue (ft)	0	31
95th Queue (ft)	5	57
Link Distance (ft)		300
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 54

Appendix J Year 2025 Total Traffic – SimTraffic Worksheets

Summary of All Intervals

Run Number	71	72	73	74	75	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5476	5452	5576	5598	5534	5526
Vehs Exited	5465	5477	5517	5597	5579	5525
Starting Vehs	294	302	286	310	317	301
Ending Vehs	305	277	345	311	272	298
Travel Distance (mi)	7498	7427	7652	7601	7594	7554
Travel Time (hr)	300.1	297.6	307.0	305.6	306.2	303.3
Total Delay (hr)	93.0	91.0	95.1	94.8	96.2	94.0
Total Stops	6825	6900	7085	6920	7074	6960
Fuel Used (gal)	267.4	263.8	273.4	272.0	272.5	269.8

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	71	72	73	74	75	Avg
Vehs Entered	1293	1273	1267	1325	1287	1289
Vehs Exited	1329	1259	1258	1339	1314	1299
Starting Vehs	294	302	286	310	317	301
Ending Vehs	258	316	295	296	290	289
Travel Distance (mi)	1846	1739	1823	1855	1808	1814
Travel Time (hr)	72.4	68.8	72.9	71.9	71.5	71.5
Total Delay (hr)	21.9	20.4	22.8	20.9	21.6	21.5
Total Stops	1604	1596	1628	1494	1649	1589
Fuel Used (gal)	65.5	61.5	64.4	65.3	64.8	64.3

Interval #2 Information Recording2

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	71	72	73	74	75	Avg
Vehs Entered	1545	1563	1614	1617	1602	1586
Vehs Exited	1473	1535	1591	1554	1511	1529
Starting Vehs	258	316	295	296	290	289
Ending Vehs	330	344	318	359	381	346
Travel Distance (mi)	2019	2043	2118	2129	2028	2067
Travel Time (hr)	84.6	83.4	88.0	88.8	83.6	85.7
Total Delay (hr)	28.4	26.4	29.0	29.7	27.2	28.2
Total Stops	1967	1987	2051	2012	1990	2003
Fuel Used (gal)	73.0	72.5	77.4	77.0	73.0	74.6

Interval #3 Information Recording3

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	71	72	73	74	75	Avg
Vehs Entered	1317	1361	1324	1342	1332	1331
Vehs Exited	1356	1397	1378	1421	1461	1404
Starting Vehs	330	344	318	359	381	346
Ending Vehs	291	308	264	280	252	277
Travel Distance (mi)	1797	1907	1857	1823	1937	1864
Travel Time (hr)	72.1	77.7	71.7	74.5	78.6	74.9
Total Delay (hr)	22.5	24.7	20.2	23.7	25.0	23.2
Total Stops	1674	1830	1612	1738	1730	1715
Fuel Used (gal)	64.1	68.4	65.7	66.1	69.4	66.7

Interval #4 Information Recording4

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	71	72	73	74	75	Avg
Vehs Entered	1321	1255	1371	1314	1313	1311
Vehs Exited	1307	1286	1290	1283	1293	1292
Starting Vehs	291	308	264	280	252	277
Ending Vehs	305	277	345	311	272	298
Travel Distance (mi)	1836	1738	1854	1794	1822	1809
Travel Time (hr)	71.0	67.7	74.5	70.4	72.5	71.2
Total Delay (hr)	20.3	19.5	23.0	20.5	22.4	21.1
Total Stops	1580	1487	1794	1676	1705	1649
Fuel Used (gal)	64.8	61.4	66.0	63.6	65.3	64.2

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	120	198	280	139	215	222	73	55	165	84
Average Queue (ft)	43	68	95	46	56	70	18	17	55	28
95th Queue (ft)	92	162	204	94	140	156	53	47	129	64
Link Distance (ft)		1102	1102		813	813		401		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	91	206	384	440	337	67	110	319	315	216	151	196
Average Queue (ft)	30	59	171	192	26	7	34	147	147	61	75	96
95th Queue (ft)	69	132	315	345	137	37	87	265	264	149	140	166
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)			3	1	0			0	0	0		0
Queuing Penalty (veh)			2	0	0			0	0	0		0

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	256	279	318	376	324
Average Queue (ft)	120	136	185	121	113
95th Queue (ft)	208	237	320	273	238
Link Distance (ft)	903	903		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)	0		5	0	
Queuing Penalty (veh)	0		5	0	

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB	SB
Directions Served	L	TR	L	TR	TR	L	TR
Maximum Queue (ft)	54	81	24	59	8	53	3
Average Queue (ft)	16	26	2	8	0	7	0
95th Queue (ft)	44	65	14	37	4	31	3
Link Distance (ft)		802		1330	1017		903
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150		150			150	
Storage Blk Time (%)							
Queuing Penalty (veh)							

Intersection: 12: Blake Road & Cipole Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 8

Summary of All Intervals

Run Number	81	82	83	84	85	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	6156	6200	6024	6274	6158	6159
Vehs Exited	6164	6142	6001	6239	6136	6138
Starting Vehs	341	302	335	347	343	332
Ending Vehs	333	360	358	382	365	354
Travel Distance (mi)	8765	8848	8516	8750	8718	8719
Travel Time (hr)	432.6	372.7	348.0	386.4	408.7	389.7
Total Delay (hr)	188.5	126.1	110.5	141.7	165.1	146.4
Total Stops	8905	8758	8745	8799	8336	8710
Fuel Used (gal)	329.7	317.6	304.6	318.1	322.1	318.4

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	81	82	83	84	85	Avg
Vehs Entered	1514	1562	1460	1513	1531	1511
Vehs Exited	1504	1483	1465	1496	1474	1485
Starting Vehs	341	302	335	347	343	332
Ending Vehs	351	381	330	364	400	364
Travel Distance (mi)	2140	2175	2043	2145	2143	2129
Travel Time (hr)	88.2	87.8	83.6	90.0	92.4	88.4
Total Delay (hr)	28.7	27.0	26.4	29.8	32.5	28.9
Total Stops	2161	2241	2184	2164	2042	2161
Fuel Used (gal)	76.7	77.9	73.6	77.3	77.1	76.5

Interval #2 Information Recording2

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	81	82	83	84	85	Avg
Vehs Entered	1698	1612	1590	1689	1649	1645
Vehs Exited	1607	1624	1523	1657	1606	1606
Starting Vehs	351	381	330	364	400	364
Ending Vehs	442	369	397	396	443	405
Travel Distance (mi)	2327	2269	2187	2227	2253	2252
Travel Time (hr)	110.0	95.3	91.3	99.2	105.0	100.2
Total Delay (hr)	45.2	32.5	30.3	36.6	42.1	37.3
Total Stops	2452	2270	2301	2359	2175	2308
Fuel Used (gal)	86.2	81.7	78.6	80.8	83.4	82.1

Interval #3 Information Recording3

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	81	82	83	84	85	Avg
Vehs Entered	1473	1565	1432	1545	1493	1499
Vehs Exited	1537	1533	1507	1535	1543	1530
Starting Vehs	442	369	397	396	443	405
Ending Vehs	378	401	322	406	393	376
Travel Distance (mi)	2180	2220	2144	2179	2204	2186
Travel Time (hr)	115.8	95.1	87.9	100.4	109.5	101.7
Total Delay (hr)	54.9	33.3	28.0	39.6	48.0	40.8
Total Stops	2203	2182	2118	2059	2109	2131
Fuel Used (gal)	84.3	79.4	76.6	80.3	83.0	80.7

Interval #4 Information Recording4

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	81	82	83	84	85	Avg
Vehs Entered	1471	1461	1542	1527	1485	1493
Vehs Exited	1516	1502	1506	1551	1513	1517
Starting Vehs	378	401	322	406	393	376
Ending Vehs	333	360	358	382	365	354
Travel Distance (mi)	2117	2185	2141	2199	2118	2152
Travel Time (hr)	118.6	94.4	85.2	96.9	101.8	99.4
Total Delay (hr)	59.6	33.4	25.8	35.7	42.5	39.4
Total Stops	2089	2065	2142	2217	2010	2108
Fuel Used (gal)	82.5	78.6	75.9	79.7	78.7	79.1

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	86	211	208	63	262	282	146	89	112	98
Average Queue (ft)	22	68	91	14	97	101	56	39	43	47
95th Queue (ft)	56	150	179	42	201	207	109	74	88	84
Link Distance (ft)		1100	1100		813	813		422		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0		0			
Queuing Penalty (veh)					0		0			

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	70	157	339	337	169	46	73	303	304	92	103	103
Average Queue (ft)	19	42	161	176	41	12	35	162	158	30	42	50
95th Queue (ft)	50	99	292	297	112	39	66	263	256	75	80	89
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)			2	0				0				
Queuing Penalty (veh)			1	0				0				

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	99	95	247	182	264
Average Queue (ft)	51	45	116	96	134
95th Queue (ft)	91	90	211	163	233
Link Distance (ft)	873	873		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	TR	TR
Maximum Queue (ft)	38	52	38	55	4	10
Average Queue (ft)	8	13	13	19	0	0
95th Queue (ft)	30	43	34	47	3	5
Link Distance (ft)		781		930	1716	873
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150			
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Blake Road & Cipole Road

Movement
Directions Served
Maximum Queue (ft)
Average Queue (ft)
95th Queue (ft)
Link Distance (ft)
Upstream Blk Time (%)
Queuing Penalty (veh)
Storage Bay Dist (ft)
Storage Blk Time (%)
Queuing Penalty (veh)

Zone Summary

Zone wide Queuing Penalty: 2

Summary of All Intervals

Run Number	51	52	53	54	55	Avg
Start Time	7:10	7:10	7:10	7:10	7:10	7:10
End Time	8:20	8:20	8:20	8:20	8:20	8:20
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	5615	5645	5678	5604	5548	5615
Vehs Exited	5622	5679	5673	5606	5570	5631
Starting Vehs	307	302	282	280	312	290
Ending Vehs	300	268	287	278	290	282
Travel Distance (mi)	7631	7662	7719	7588	7572	7634
Travel Time (hr)	306.3	308.3	307.9	310.7	299.3	306.5
Total Delay (hr)	95.1	95.6	94.4	101.0	89.7	95.2
Total Stops	6829	7200	7043	7332	6776	7036
Fuel Used (gal)	271.8	274.4	274.7	272.3	267.9	272.2

Interval #0 Information Seeding

Start Time	7:10
End Time	7:20
Total Time (min)	10

Volumes adjusted by Growth Factors.
No data recorded this interval.

Interval #1 Information Recording1

Start Time	7:20
End Time	7:35
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	51	52	53	54	55	Avg
Vehs Entered	1297	1350	1330	1377	1281	1329
Vehs Exited	1337	1348	1331	1376	1343	1348
Starting Vehs	307	302	282	280	312	290
Ending Vehs	267	304	281	281	250	272
Travel Distance (mi)	1844	1843	1819	1858	1841	1841
Travel Time (hr)	73.4	72.1	70.5	74.8	72.0	72.6
Total Delay (hr)	22.6	20.8	20.3	23.4	21.0	21.6
Total Stops	1641	1660	1625	1778	1582	1657
Fuel Used (gal)	65.6	65.1	64.3	66.5	64.5	65.2

Interval #2 Information Recording2

Start Time	7:35
End Time	7:50
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	51	52	53	54	55	Avg
Vehs Entered	1581	1634	1631	1641	1580	1612
Vehs Exited	1491	1604	1567	1579	1484	1548
Starting Vehs	267	304	281	281	250	272
Ending Vehs	357	334	345	343	346	344
Travel Distance (mi)	1954	2150	2124	2057	1992	2055
Travel Time (hr)	80.4	89.7	87.8	89.4	80.7	85.6
Total Delay (hr)	26.2	29.7	28.7	32.0	25.5	28.4
Total Stops	1883	2116	2032	2206	1916	2028
Fuel Used (gal)	70.0	77.3	76.2	75.2	71.3	74.0

Interval #3 Information Recording3

Start Time	7:50
End Time	8:05
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	51	52	53	54	55	Avg
Vehs Entered	1407	1337	1361	1295	1325	1341
Vehs Exited	1472	1360	1419	1323	1384	1393
Starting Vehs	357	334	345	343	346	344
Ending Vehs	292	311	287	315	287	295
Travel Distance (mi)	2002	1834	1881	1852	1879	1890
Travel Time (hr)	79.9	74.4	75.1	74.0	74.7	75.6
Total Delay (hr)	24.6	23.6	23.0	23.2	22.9	23.5
Total Stops	1704	1790	1687	1678	1646	1698
Fuel Used (gal)	71.1	66.3	67.2	66.0	66.7	67.5

Interval #4 Information Recording4

Start Time	8:05
End Time	8:20
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	51	52	53	54	55	Avg
Vehs Entered	1330	1324	1356	1291	1362	1332
Vehs Exited	1322	1367	1356	1328	1359	1343
Starting Vehs	292	311	287	315	287	295
Ending Vehs	300	268	287	278	290	282
Travel Distance (mi)	1831	1836	1895	1821	1860	1848
Travel Time (hr)	72.7	72.2	74.5	72.5	71.9	72.7
Total Delay (hr)	21.8	21.5	22.4	22.4	20.2	21.6
Total Stops	1601	1634	1699	1670	1632	1648
Fuel Used (gal)	65.1	65.7	67.1	64.6	65.3	65.6

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	116	212	299	112	182	213	68	46	118	118
Average Queue (ft)	46	64	92	40	55	70	17	12	50	33
95th Queue (ft)	86	152	198	85	142	159	49	38	107	82
Link Distance (ft)		1102	1102		813	813		401		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					0					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	90	242	413	492	154	80	115	304	326	219	140	183
Average Queue (ft)	31	64	186	216	21	9	31	138	139	75	64	80
95th Queue (ft)	72	154	334	378	90	45	80	245	251	169	130	147
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)		0	3	1				0	0			
Queuing Penalty (veh)		0	2	0				0	0			

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	237	279	269	234	246
Average Queue (ft)	126	142	151	100	109
95th Queue (ft)	210	240	260	184	209
Link Distance (ft)	903	903		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 11: 124th Ave & Blake Road

Movement	EB	EB	WB	WB	NB	SB
Directions Served	L	TR	L	TR	L	L
Maximum Queue (ft)	61	70	30	56	33	38
Average Queue (ft)	17	22	3	8	4	5
95th Queue (ft)	44	56	17	34	19	24
Link Distance (ft)		802		1330		
Upstream Blk Time (%)						
Queuing Penalty (veh)						
Storage Bay Dist (ft)	150		150		150	150
Storage Blk Time (%)						
Queuing Penalty (veh)						

Intersection: 12: Blake Road & Cipole Road

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	14	46
Average Queue (ft)	1	11
95th Queue (ft)	12	36
Link Distance (ft)		546
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 4

Summary of All Intervals

Run Number	61	62	63	64	65	Avg
Start Time	4:45	4:45	4:45	4:45	4:45	4:45
End Time	5:55	5:55	5:55	5:55	5:55	5:55
Total Time (min)	70	70	70	70	70	70
Time Recorded (min)	60	60	60	60	60	60
# of Intervals	5	5	5	5	5	5
# of Recorded Intervals	4	4	4	4	4	4
Vehs Entered	6410	6121	6307	6203	6166	6240
Vehs Exited	6335	6114	6241	6217	6189	6218
Starting Vehs	341	337	321	340	339	332
Ending Vehs	416	344	387	326	316	353
Travel Distance (mi)	8863	8647	8988	8831	8684	8803
Travel Time (hr)	399.3	366.6	393.1	387.1	372.1	383.6
Total Delay (hr)	151.1	125.8	143.9	141.2	129.4	138.3
Total Stops	8865	8662	9094	9088	8964	8938
Fuel Used (gal)	324.1	311.7	329.1	322.6	315.0	320.5

Interval #0 Information Seeding

Start Time	4:45
End Time	4:55
Total Time (min)	10

Volumes adjusted by Growth Factors.

No data recorded this interval.

Interval #1 Information Recording1

Start Time	4:55
End Time	5:10
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	61	62	63	64	65	Avg
Vehs Entered	1605	1470	1530	1560	1498	1523
Vehs Exited	1586	1516	1480	1526	1482	1516
Starting Vehs	341	337	321	340	339	332
Ending Vehs	360	291	371	374	355	347
Travel Distance (mi)	2209	2125	2195	2188	2140	2171
Travel Time (hr)	89.2	85.4	88.3	90.2	87.1	88.0
Total Delay (hr)	27.5	26.4	27.5	29.0	27.5	27.6
Total Stops	2153	2064	2136	2225	2109	2137
Fuel Used (gal)	78.7	75.7	78.2	78.5	75.9	77.4

Interval #2 Information Recording2

Start Time	5:10
End Time	5:25
Total Time (min)	15

Volumes adjusted by PHF, Growth Factors.

Run Number	61	62	63	64	65	Avg
Vehs Entered	1723	1670	1624	1658	1658	1667
Vehs Exited	1626	1571	1569	1610	1571	1591
Starting Vehs	360	291	371	374	355	347
Ending Vehs	457	390	426	422	442	425
Travel Distance (mi)	2334	2231	2301	2341	2190	2280
Travel Time (hr)	106.9	95.7	103.2	102.2	94.2	100.4
Total Delay (hr)	41.9	33.3	39.6	37.4	33.0	37.1
Total Stops	2429	2326	2525	2406	2443	2426
Fuel Used (gal)	85.9	80.2	85.0	85.4	80.0	83.3

Interval #3 Information Recording3

Start Time	5:25
End Time	5:40
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	61	62	63	64	65	Avg
Vehs Entered	1538	1513	1558	1549	1547	1538
Vehs Exited	1619	1542	1603	1594	1620	1595
Starting Vehs	457	390	426	422	442	425
Ending Vehs	376	361	381	377	369	366
Travel Distance (mi)	2224	2181	2257	2224	2228	2223
Travel Time (hr)	105.0	95.5	100.4	100.8	101.0	100.5
Total Delay (hr)	42.3	34.8	37.6	38.8	38.5	38.4
Total Stops	2178	2262	2123	2398	2253	2241
Fuel Used (gal)	81.9	80.1	82.6	82.6	82.4	81.9

Interval #4 Information Recording4

Start Time	5:40
End Time	5:55
Total Time (min)	15

Volumes adjusted by Growth Factors, Anti PHF.

Run Number	61	62	63	64	65	Avg
Vehs Entered	1544	1468	1595	1436	1463	1500
Vehs Exited	1504	1485	1589	1487	1516	1517
Starting Vehs	376	361	381	377	369	366
Ending Vehs	416	344	387	326	316	353
Travel Distance (mi)	2095	2110	2235	2078	2125	2129
Travel Time (hr)	98.2	90.0	101.2	93.8	89.8	94.6
Total Delay (hr)	39.4	31.3	39.1	35.9	30.4	35.2
Total Stops	2105	2010	2310	2059	2159	2133
Fuel Used (gal)	77.7	75.7	83.3	76.0	76.7	77.9

Intersection: 4: Cipole Rd & Tualatin-Sherwood Rd

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	TR	L	TR
Maximum Queue (ft)	59	162	206	96	285	287	100	83	98	98
Average Queue (ft)	20	60	81	13	101	101	39	30	42	48
95th Queue (ft)	48	137	173	57	219	215	83	64	84	85
Link Distance (ft)		1100	1100		813	813		422		800
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	360			250			200		300	
Storage Blk Time (%)					1					
Queuing Penalty (veh)					0					

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	EB	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB
Directions Served	L	L	T	T	R	L	L	T	T	R	L	L
Maximum Queue (ft)	66	169	315	388	243	46	72	318	335	124	107	102
Average Queue (ft)	18	47	167	195	47	15	38	174	172	30	45	52
95th Queue (ft)	50	112	284	312	138	40	65	283	281	83	89	92
Link Distance (ft)			813	813				1225	1225			
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	250	250			375	375	375			375	300	300
Storage Blk Time (%)			1	0	0				0			
Queuing Penalty (veh)			1	0	0				0			

Intersection: 5: 124th Ave & Tualatin-Sherwood Rd

Movement	NB	NB	SB	SB	SB
Directions Served	T	TR	L	T	TR
Maximum Queue (ft)	97	115	247	260	286
Average Queue (ft)	46	44	121	95	136
95th Queue (ft)	87	90	205	183	235
Link Distance (ft)	873	873		1875	1875
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)			300		
Storage Blk Time (%)			0		
Queuing Penalty (veh)			0		

Intersection: 11: 124th Ave & Blake Road

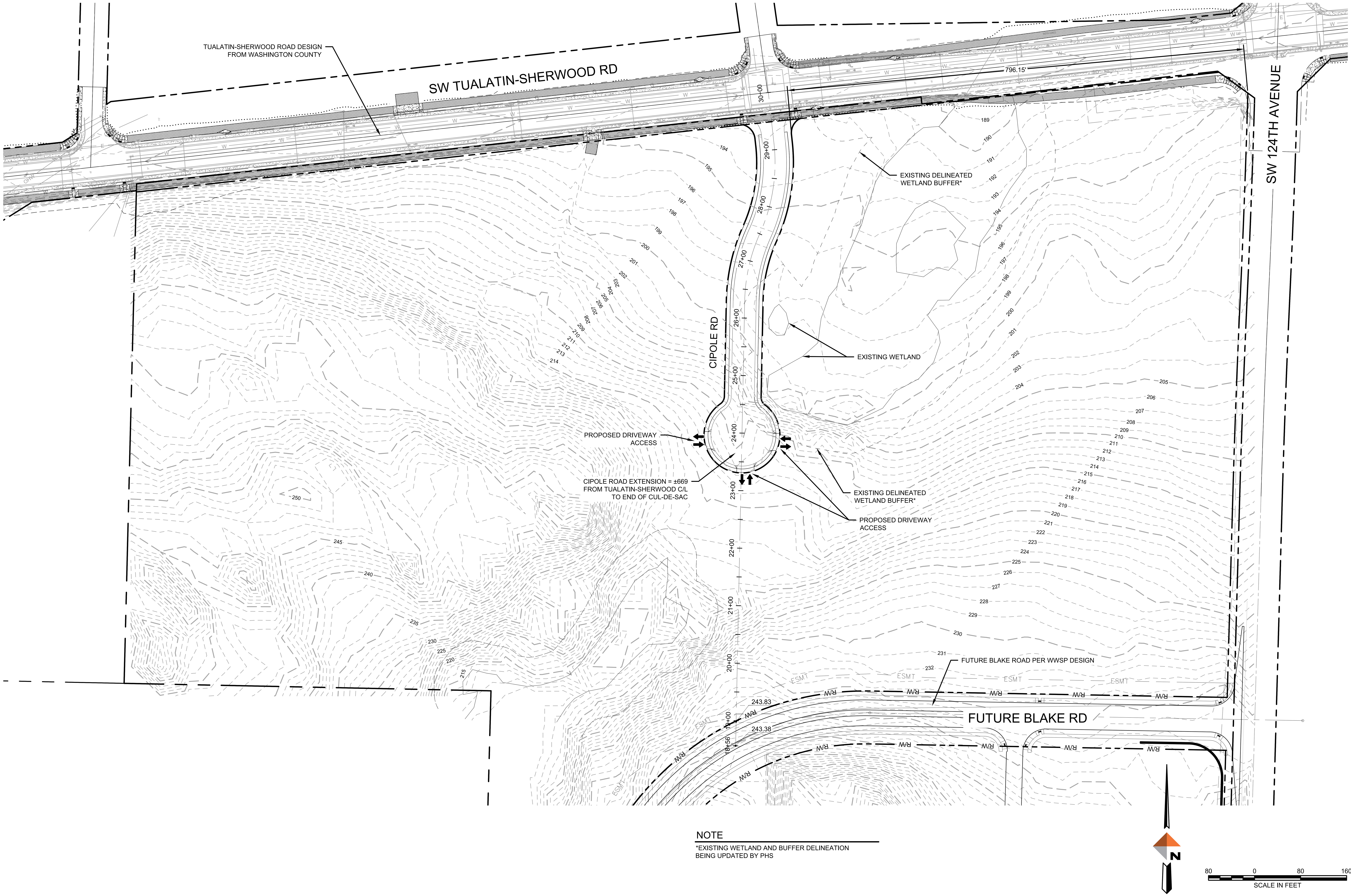
Movement	EB	EB	WB	WB	NB	NB	SB	SB
Directions Served	L	TR	L	TR	L	TR	L	TR
Maximum Queue (ft)	43	50	52	53	26	10	5	15
Average Queue (ft)	15	20	14	20	1	0	0	1
95th Queue (ft)	40	45	40	47	10	7	4	11
Link Distance (ft)		781		930		1716		873
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	150		150		150		150	
Storage Blk Time (%)								
Queuing Penalty (veh)								

Intersection: 12: Blake Road & Cipole Road

Movement	EB	SB
Directions Served	L	LR
Maximum Queue (ft)	12	63
Average Queue (ft)	0	31
95th Queue (ft)	6	54
Link Distance (ft)		300
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)	150	
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 1



NOTE

*EXISTING WETLAND AND BUFFER DELINEATION BEING UPDATED BY PHS

REV	DATE	DESCRIPTION	BY

REVISIONS

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

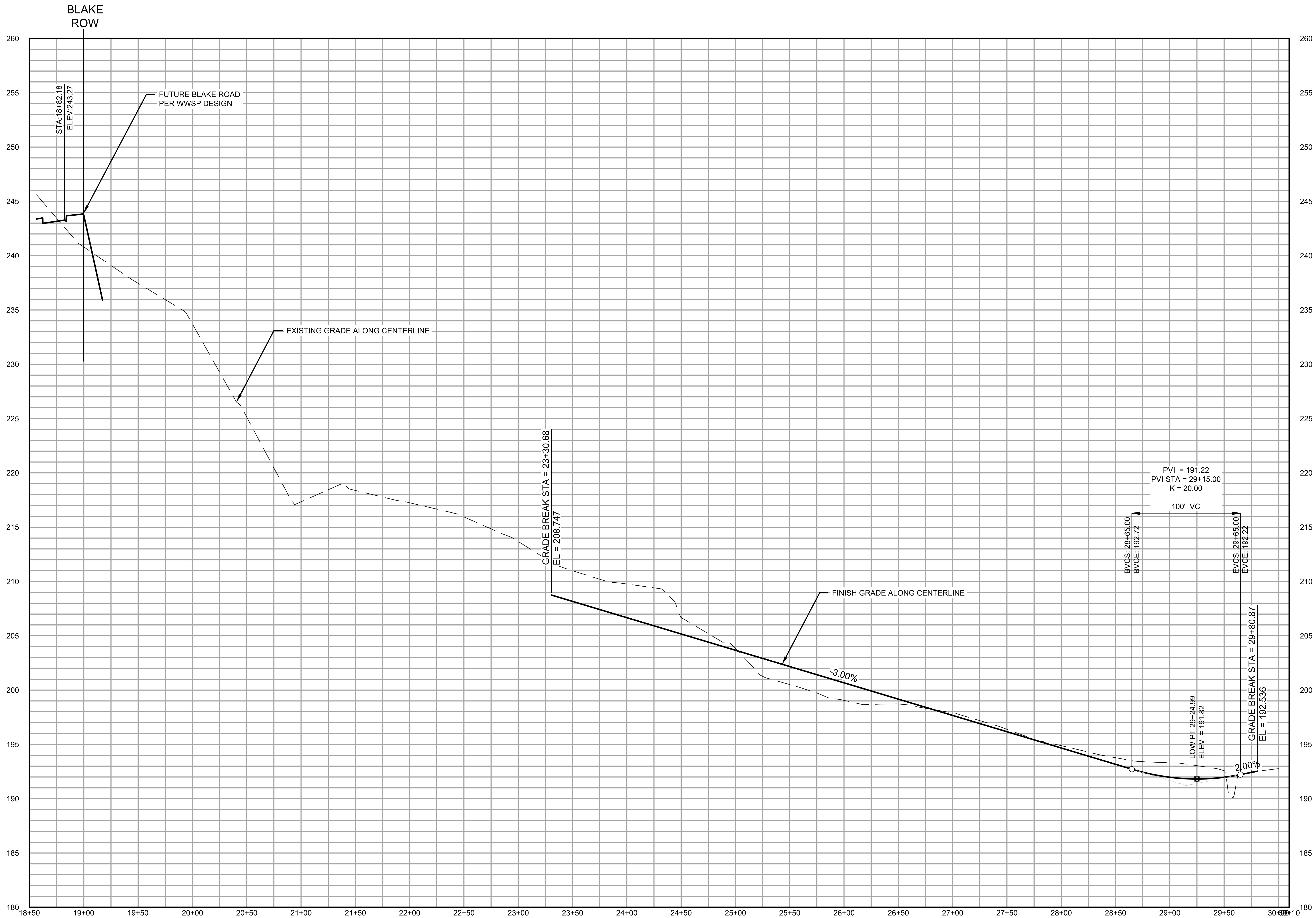
TUALATIN-SHERWOOD INDUSTRIAL PARK
SHERWOOD, OREGON

SW CIPOLE ROAD EXHIBIT

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 11/5/2015

SHEET
EXHIBIT 1



SW CIPOLE ROAD EXTENSION - PROFILE

SCALE: 1"=50' (H)
1"=5' (V)

RE V	DATE	REVISIONS DESCRIPTION	BY

DOWL
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Portland, Oregon 97205
971-280-8641

TUALATIN-SHERWOOD INDUSTRIAL PARK
SHERWOOD, OREGON

SW CIPOLE ROAD PORFILE AND EXISTING GRADES

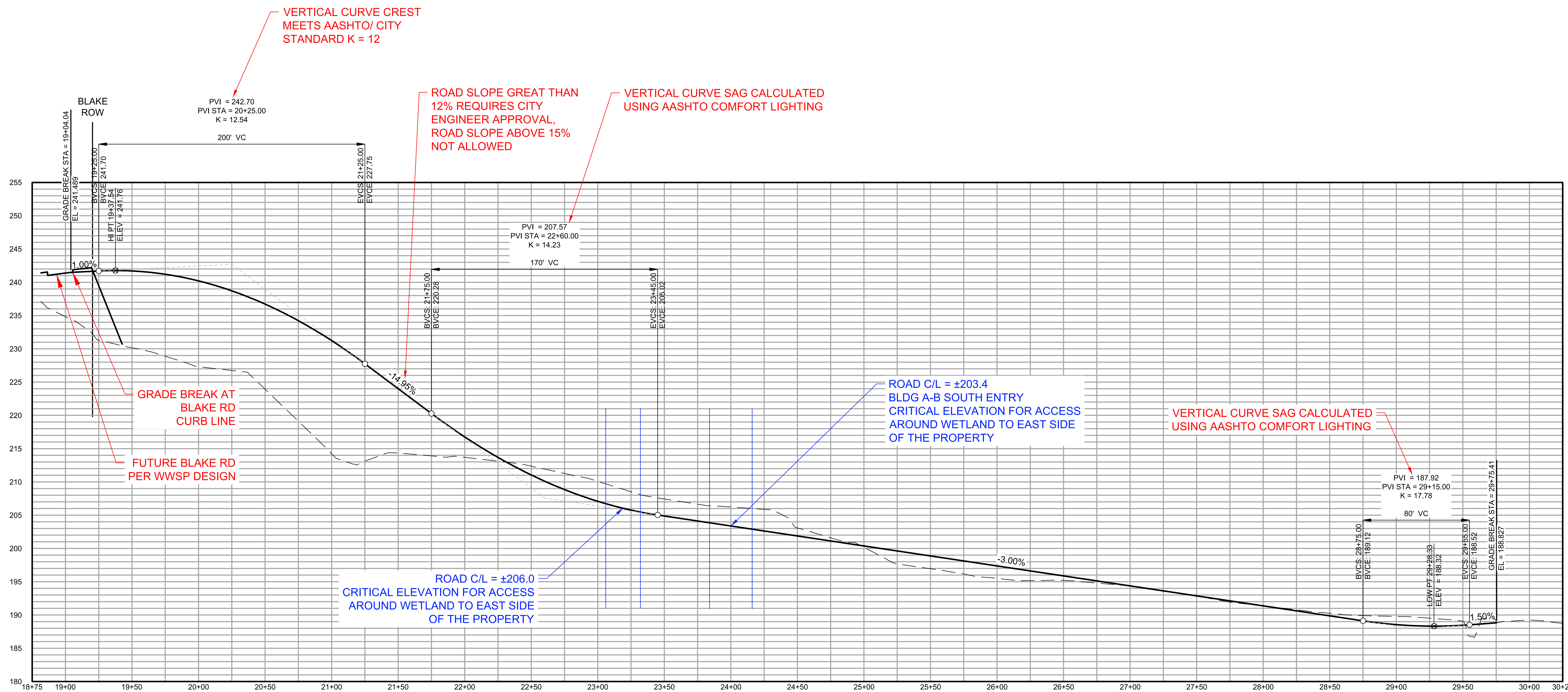
SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 11/5/2015

SHEET

EXHIBIT 2


SW TUALATIN SHERWOOD RD
MAX WALL HEIGHT = 11'
MAX WALL HEIGHT = 10'
MAX WALL HEIGHT = 6'
MAX WALL HEIGHT = 8'
BUILDING A
FFE=205.5
BUILDING B
FFE=204.5
BUILDING C
FFE=206.5
BUILDING D
FFE=206.5
BUILDING E
FFE=203.5
WETLAND BUFFER
WETLAND DELINEATION
WETLAND DELINEATION
MAX WALL HEIGHT = 6'
ROAD C/L = ±203.4
EAST BUILDING ENTRY
RAISES SITE BY
APPROXIMATELY
5.5 FEET
ROAD C/L = ±203.4
BLDG A-B SOUTH ENTRY
WETLAND BUFFER
ROAD C/L = ±206.0
BLDG C SOUTH ENTRY
ROAD C/L = ±206.0
BLDG D SOUTH ENTRY
APPROX ROAD
GRADING LIMITS
(3:1 SLOPE)
APPROX ROAD
GRADING LIMITS
(3:1 SLOPE)
ROAD SLOPE DOES NOT
MEET CITY STANDARDS
MAX WALL HEIGHT = 20'
MAX WALL HEIGHT = 25'
WETLAND BUFFER
WETLAND DELINEATION
ESMT
FUTURE BLAKE RD
(COLLECTOR)
804' INTERSECTION
TO INTERSECTION
SW 124TH AVENUE
(ARTERIAL)
N
80 0 80 160
SCALE IN FEET
REV DATE REVISIONS DESCRIPTION BY
DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641
SHERWOOD INDUSTRIAL PARK
SHERWOOD, OREGON
CIPOLE EXTENSION SITE IMPACT EXHIBIT -
PLAN VIEW OPTION A
SHERWOOD, OREGON
PROJECT 14347-01
DATE 01/08/2020
©DOWL 2019
SHEET
EX-1



CIPOLE ROAD SITE IMPACT - PROFILE

SCALE: 1"=40' (H)
1"=5' (V)

RED = ROAD DESIGN TO CITY OF SHERWOOD ROADWAY STANDARDS

BLUE = CRITICAL TIE-IN LOCATIONS FOR BUILDINGS AND WETLANDS

REVISIONS

REV	DATE	DESCRIPTION	BY

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720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

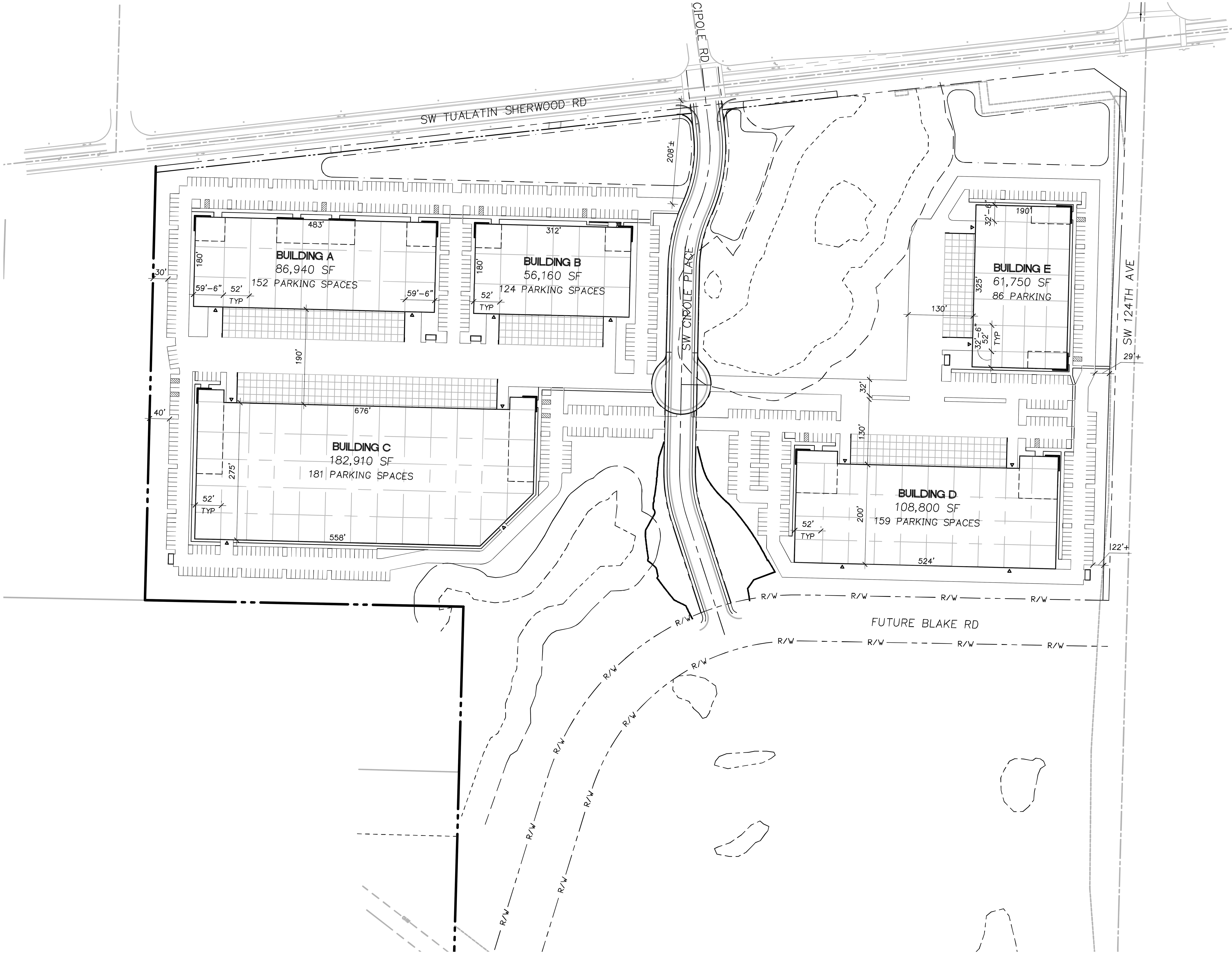
SHERWOOD INDUSTRIAL PARK
SHERWOOD, OREGON

CIPOLE EXTENSION SITE IMPACT EXHIBIT - PROFILE VIEW OPTION A

SHERWOOD, OREGON

PROJECT 14347-01
DATE 01/08/2020

SHEET
EX-2



SITE DATA

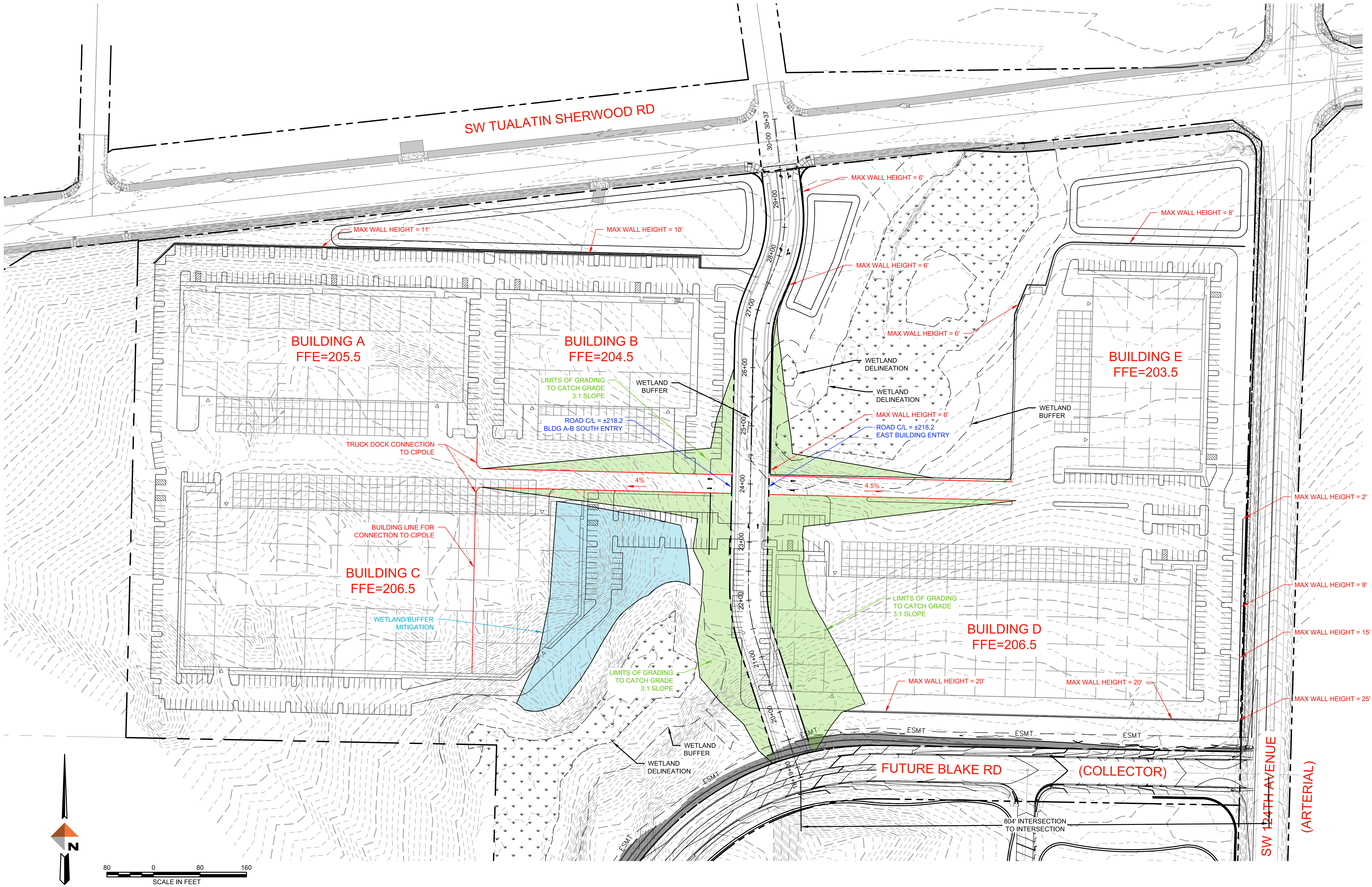
BUILDING	BLDG AREA	PARKING COUNT	PARKING PER 1000 SF
BUILDING A	86,940 SF	152	1.75
BUILDING B	56,160 SF	124	2.21
BUILDING C	182,910 SF	181	0.99
BUILDING D	108,800 SF	159	1.46
BUILDING E	61,750 SF	86	1.39
TOTAL	496,560 SF	702	1.41

TRAMMELL CROW COMPANY | T-S CORPORATE PARK

12.06.19

ALTERNATE SITE PLAN WITH CIPOLE EXTENSION

218045900



REV	DATE	DESCRIPTION	BY

REVISIONS

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720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

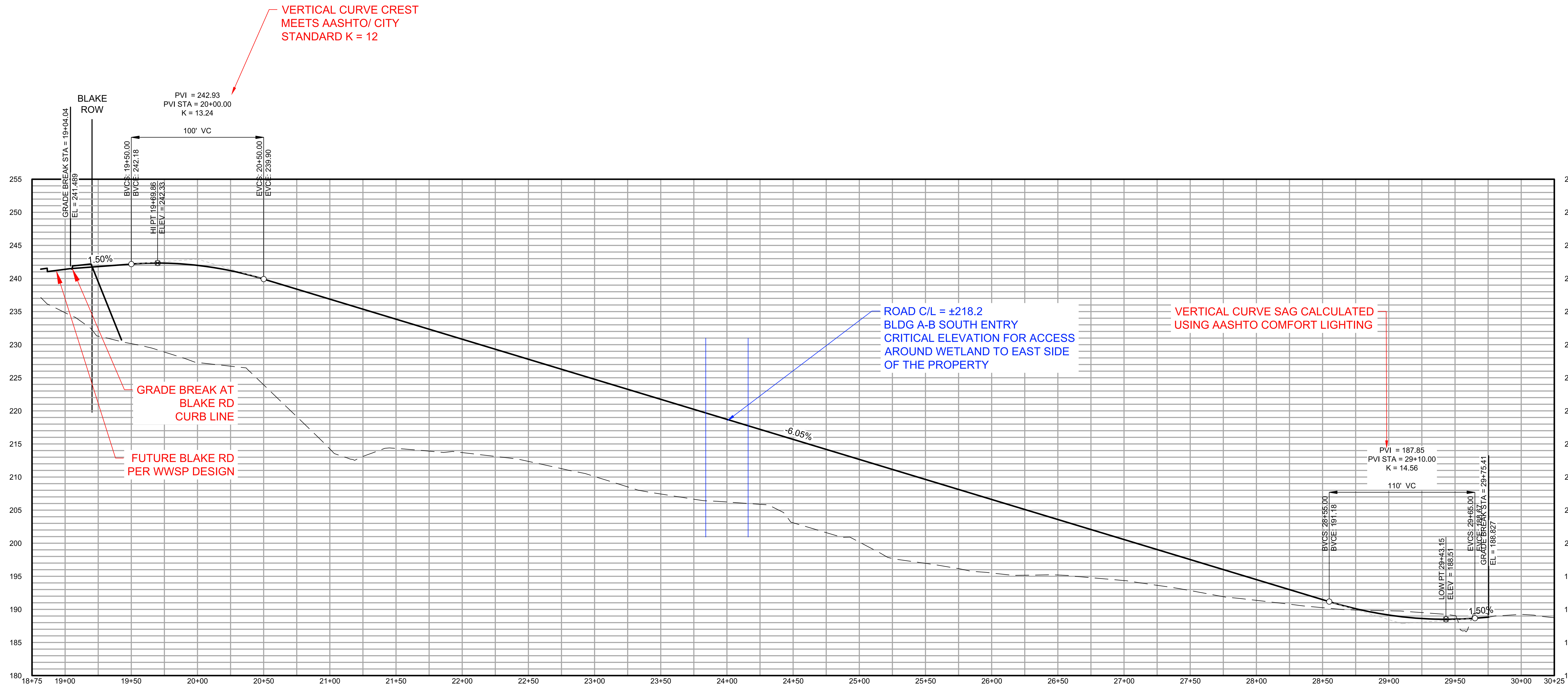
T-S CORPORATE PARK
SHERWOOD, OREGON

CIPOLE EXTENSION SITE IMPACT EXHIBIT - PLAN VIEW OPTION B

SHERWOOD, OREGON

PROJECT 14347-01
DATE 01/08/2020

SHEET
EX-1



CIPOLE PLACE SITE IMPACT - PROFILE

SCALE: 1"=40' (H)
1"=5' (V)

RED = ROAD DESIGN TO CITY OF SHERWOOD ROADWAY STANDARDS

BLUE = CRITICAL TIE-IN LOCATIONS FOR BUILDINGS AND WETLANDS

REVISIONS

REV	DATE	DESCRIPTION	BY

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

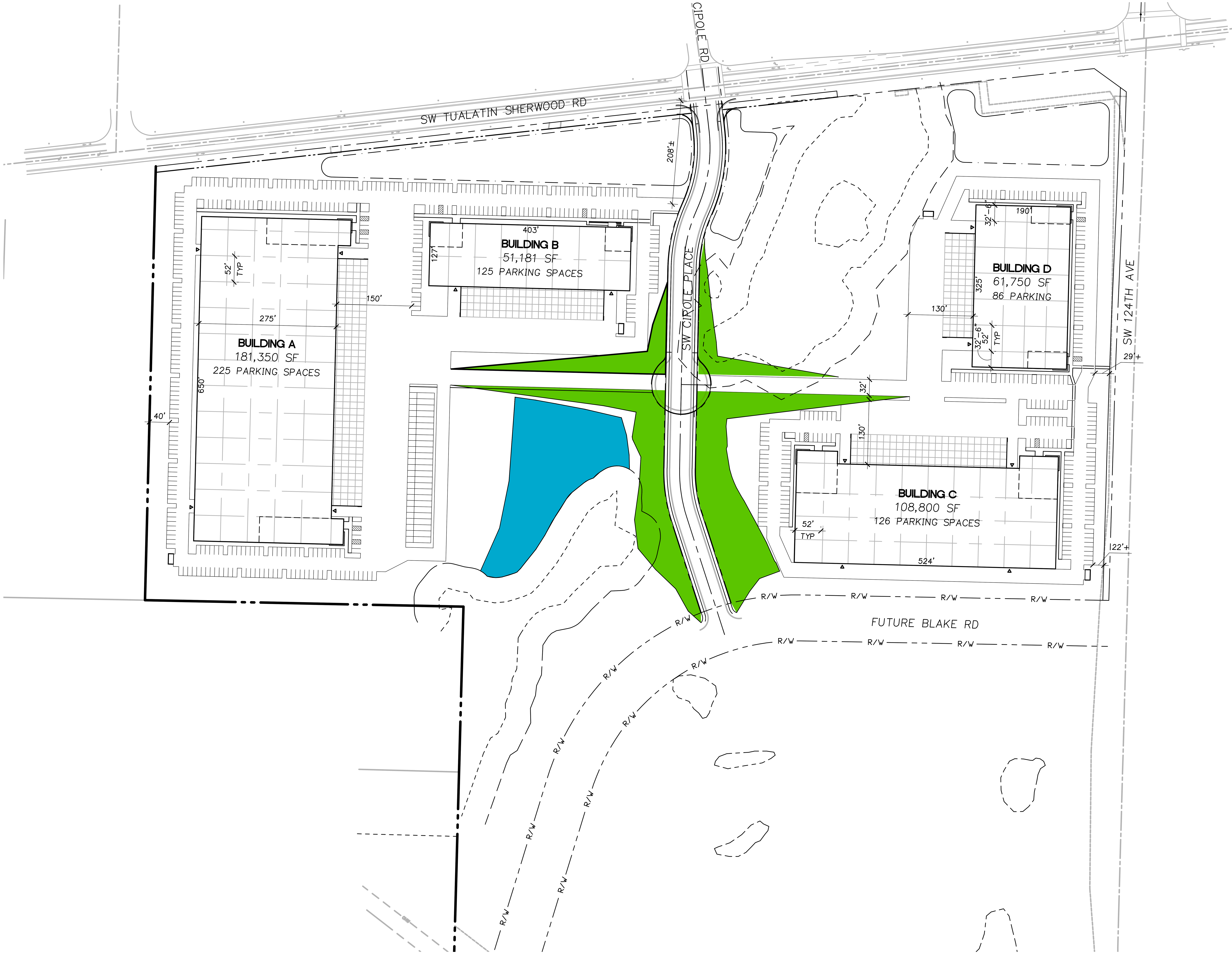
T-S CORPORATE PARK
SHERWOOD, OREGON

CIPOLE EXTENSION SITE IMPACT EXHIBIT - PROFILE VIEW OPTION B

SHERWOOD, OREGON

PROJECT 14347-01
DATE 01/08/2020

SHEET
EX-2



SITE DATA			
BUILDING	BLDG AREA	PARKING COUNT	PARKING PER 1000 SF
BUILDING A	181,350 SF	225	1.24
BUILDING B	51,181 SF	125	2.44
BUILDING C	108,800 SF	126	1.16
BUILDING D	61,750 SF	86	1.39
TOTAL	403,081 SF	562	1.39

Wetland Delineation
T-S Corporate Park
in Sherwood, Oregon

Prepared for

Trammell Crow Company
Attn: Kirk Olsen
1300 SW Fifth Avenue, Suite 3050
Portland, Oregon 97201

Prepared by

Fred Small
Shawn Eisner
John van Staveren
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, Oregon 97070
(503) 570-0800
(503) 570-0855 FAX
PHS Project Number: 6163

January 7, 2020

TABLE OF CONTENTS

I. INTRODUCTION

Pacific Habitat Services, Inc. (PHS) conducted a wetland delineation for a potential development parcel on SW Tualatin-Sherwood Road in Sherwood, Washington County, Oregon (Township 2 South, Range 1 West, Section 28D, portion of tax lot 1100). Delineation fieldwork began in 2017 when lot 1100 was the northern portion of a larger lot (lot 100). Lot 100 has since been partitioned into lots 1100, the northern extent, and 1200, the southern extent.

David Evans and Associates (DEA) delineated the southern portion of tax lot 1100 in 2017 in conjunction with the Willamette Water Supply Program pipeline and water treatment facility. The Department of State Lands (DSL) approved the DEA delineation in 2017 (DSL WD# 2017-0008). That delineation encompassed the current boundary of tax lot 1200 to the south as well as the southern portion of tax lot 1100.

This report presents the results of PHS' wetland delineation of the study area. Figures, including a map depicting the location of wetlands within the study area, are located in Appendix A. Data sheets in Appendix B document onsite conditions. Ground-level photos of the site are located in Appendix C. A discussion of the wetland delineation methodology is provided for the client in Appendix D.

II. RESULTS AND DISCUSSION

A. Landscape Setting and Land Use

The study area borders SW Tualatin-Sherwood Road to the north; on the west by a partially developed site including a municipal water storage facility; on the east by SW 124th Avenue; and on the south by a partially developed industrial storage site. Nearby land uses include partially landscaped rural residential lots, aggregate mining operations, and small-scale commercial/ industrial activities. Until the summer of 2019, the site included a former farmhouse and other structures in the west-central portion of the site.

Vegetation communities upslope of the formerly farmed area near Tualatin-Sherwood Road have formed in the relatively rocky, hilly terrain of the 'Tonquin Scablands, an area between Sherwood and Tualatin that was scoured by the enormous Bretz flood events during the Pleistocene era. More recent human disturbance (both logging and farming) has also helped shape the current vegetation cover.

The mostly forested to shrubby upland areas upslope of the agricultural fields are comprised of a relatively young to mature overstory of Douglas fir (*Pseudotsuga menziesii*, FACU), with bigleaf maple (*Acer macrophyllum*, FACU), Oregon white oak (*Quercus garryana*, FACU), and madrone (*Arbutus menziesii*, UPL) also present. The shrub understory is dense and commonly dominated by poison oak (*Toxicodendron diversilobum*, FAC), tall Oregon grape (*Mahonia aquifolium*, FACU), oceanspray (*Holodiscus discolor*, FACU), snowberry (*Symphoricarpos albus*, FACU), and Saskatoon serviceberry (*Amelanchier alnifolia*, FACU). Sword fern (*Polystichum munitum*, FACU) is a common groundcover species. Invasive shrubs such as Himalayan blackberry (*Rubus armeniacus*, FAC) and Scotch broom (*Cytisus scoparius*, UPL) are common in more recently disturbed edge habitats.

Scoured depressions within the more hilly terrain above the open fields can be poorly drained and seasonally ponded, often supporting wetland plant assemblages. The overstory consists of Oregon ash (*Fraxinus latifolia*, FACW), with shrubs such as hardhack spirea (*Spiraea douglasii*, FACW), rose (*Rosa* spp., FAC), willows (*Salix* spp., FAC to FACW) and snowberry often present. Common emergent species include slough sedge (*Carex obnupta*, OBL), soft rush (*Juncus effusus*, FACW), spreading rush (*Juncus patens*, FACW), reed canarygrass (*Phalaris arundinacea*, FACW), and fringed willow-herb (*Epilobium ciliatum*, FACW).

A broad seasonal swale extends northward from a hillside seep zone dividing the formerly farmed area into two large fields. The hillside seep zone was only accessible after an excavator cleared trails through dense Himalayan blackberry and poison oak thickets. The seepage may result from slow subsurface drainage of a seasonally ponded depression (Wetland C) further upslope near the southern edge of the study area.

The seasonal swale supports a stand of mature and sapling Oregon ash, willows, hardhack spirea, ninebark (*Physocarpus capitatus*, FAC), blackberries, reed canarygrass, soft rush, tall fescue (*Schedonorus arundinaceus*, FAC), and creeping buttercup (*Ranunculus repens*, FACW). The seasonally charged surface flows are culverted beneath Tualatin-Sherwood Road, ultimately feeding to Hedges Creek.

B. Site Alterations

Despite a long history of agricultural activities within most of the northern portion of the lot, wetland features within the parcel have been mostly undisturbed in recent years. This is likely due to the excessive seasonal wetness along the seasonal swale in particular, with clearing and cultivation activities mostly avoiding the lower wet areas. At the same time, the relatively steep, rocky slopes in the southwest portion of the lot provide poor soils and appear to have been left alone, except as a timber source. A former farmhouse and other agricultural structures were sited along the transition from tillable soil to rocky conditions. These structures are still visible on maps and recent air photos, though all were removed in the summer of 2019. All that remains of prior development is the gravel driveway from Tualatin-Sherwood Road and the various remains of building foundations.

The areas adjoining a seasonally ponded depression (Wetland C) have been forested since at least the early 1950s; however, much of that same area was logged in the late 1980s or early 1990s. The logging did not appear to change land use patterns as the boundary between farmed land and the forested area seems little changed since 1952. Ground disturbance north-northeast of Wetland C is evident from aerial photographs dating to the early 2000s (available on GoogleEarth). The movement of soil and/or aggregate appears to have occurred only between 2002 and 2005, but there is no evidence that any wetlands were filled during that period. The slopes east and west of Wetland C are naturally steep (based upon the extent of naturally occurring rock at and near the surface). At Wetland C’s northern extent, the slopes are less steep and there was no evidence of fill at or near the wetland boundary.

C. Precipitation Data and Analysis

Precipitation histories reviewed for both the original delineation and subsequent field work. Tables 1 and 2 compare the monthly precipitation amounts recorded at the Portland KGW TV station to the average monthly precipitation records, as well as to the normal precipitation range as identified in the Natural Resource Conservation Service's (NRCS) WETS climate table. This data reveals that conditions were observed on this site during periods of excessive rainfall (in the spring of 2017) and during an unusually dry fall (in 2019).

For the period tabulated in Table 1, observed precipitation in February, March and April were not within the normal range of variability; instead, each month was much higher than the average.

Table 1: Comparison of average and observed monthly precipitation at Portland's KGW TV, prior to the March through April 2017 delineation fieldwork.

Month	Average Precipitation[1]	30% Chance Will Have		Observed Precipitation[1]	Percent of Normal
		Less Than Average[1]	More Than Average[1]		
February	4.93	3.03	5.97	12.18	247%
March	5.30	4.08	6.15	8.40	158%
April	3.61	2.74	4.20	4.63	128%
May	2.51	1.46	3.05	2.25	90%
June	1.51	0.80	1.84	1.12	74%

1. *Source: NRCS WETS Table (period from 1995 to 2018) and Climatological Data for KGW-TV in Portland, OR (http:// http://agacis.rcc-acis.org/?fips=41051)*

The 2.6 inches of precipitation observed over the two weeks prior to the late April fieldwork was also higher than normal for the time of year, however, the weeks preceding a final visit to Wetland C in late June 2017 were lower than normal yet still within the normal range of variability. As such, PHS personnel believe that relatively "normal circumstances" in terms of site hydrology have prevailed for PHS's delineation fieldwork, despite the wide variation from normal rainfall amounts during previous months. Site gradients provided reasonable drainage through the northern reaches of the site. Wetland C, however, likely ponded to a greater depth and for a longer period than normal, delaying effective data collection until early summer.

Table 2: Comparison of average and observed monthly precipitation at Portland's KGW TV, prior to the October through December 2019 delineation fieldwork.

Month	Average Precipitation[1]	30% Chance Will Have		Observed Precipitation[1]	Percent of Normal
		Less Than Average[1]	More Than Average[1]		
July	0.42	0.32	0.53	0.26	62%
August	0.57	0.13	0.56	0.59	104%
September	1.71	0.76	2.09	4.40	257%
October	4.12	2.49	5.00	1.81	44%
November	6.78	4.74	8.06	1.58	23%

1. *Source: NRCS WETS Table (period from 1995 to 2018) and Climatological Data for KGW-TV in Portland, OR (http:// http://agacis.rcc-acis.org/?fips=41051)*

Rainfall totals for the two-week period prior to each of the 2019 field dates where data was collected were 0.19 inches for October 15, and 1.96 inches for December 13. These totals are both lower than normal for any two week period at that time of year; however, as 2019 field work occurred in the fall of the year, significantly drier conditions were anticipated as a result of seasonal variability. As the 2019 field work was focused on confirming the prior delineation and collecting supporting, updated sample points, the drier than normal conditions in October through early December were of less importance as these wetlands would not normally have been recharged hydrologically by the late fall, even under normal precipitation patterns.

D. Methods

PHS determined the location of wetlands within the study area based on the presence of wetland hydrology, hydric soils, and hydrophytic vegetation. This approach is in accordance with the Routine On-site Determination, as described in the *Corps of Engineers Wetland Delineation Manual, Wetlands Research Program Technical Report Y-87-1* ("The 1987 Manual") and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*, May 2010). The study area was originally delineated on March 2 and March 26, 2017, with additional site data collected on April 28 and June 28, 2017. In order to submit the results of the delineation to the agencies for concurrence, the wetland boundaries were confirmed and/or additional data collected on October 15, November 8 and December 13, 2019.

The entire study area was investigated for the presence of wetlands or other waters. The northern portion of the seasonal swale (Wetland A) was flagged on March 2, 2017; its upper wetland edge was determined by the relatively sharp topographic break at the spring/seep edge, vegetation changes, and the presence of flowing surface water, near surface free water, and saturation. Hydric soil indicators typically included redoximorphic features in this area.

Data for both Wetland A and Wetland B was collected during early April 2017, both to allow water levels to recede and to again see each site under more typical weather conditions (since both February and March 2017 were exceedingly wet months).

The southern ponded depression (Wetland C) was flagged on March 26, 2017, in an attempt to allow water levels to recede somewhat from the first visit. At that time, much of the boundary (based on vegetation transitions) was obscured by high water, which was inundating areas dominated by mostly upland plants and could not be confirmed for hydric soils. As such, a rough boundary slightly within the inundated area was flagged to include some FACU vegetation.

Data for Wetland C was collected at a later date in April 2017 to allow full drawdown of this seasonally ponded area.

The 2019 field visits largely confirmed the prior delineation, with a portion of the southern boundary of Wetland A moved about 25 feet to the north where the area lacked indicators for both hydric soils and hydrology.

E. Description of all Wetlands and Other Non-Wetland Waters

PHS delineated three wetlands in the study area.

Wetland A

Wetland A is a broad seasonal swale (2.34 acres) that extends northward to Tualatin-Sherwood Road. The swale originates from a band of hillside seeps or springs. The seepage band was not initially accessible due to dense poison oak and blackberry cover; however, access trails were cut using a tracked excavator. LIDAR imagery also indicated a short, confined area where the surface water originates; this feature was verified once the site could be accessed. Its origin is likely percolation through porous soils from the large depression further upslope to the south (Wetland C), which is discussed below.

Several shallow incised channels extend northward from the seeps through the broad swale, ultimately to form a single larger channel near Tualatin Sherwood Road. Wetland conditions extend for some distance to either side of the channels, supporting a mature stand of Oregon ash. The seasonally charged surface flows are culverted beneath Tualatin-Sherwood Road, ultimately flowing to Hedges Creek (a Tualatin River tributary).

The swale's Cowardin class ranges from palustrine emergent through scrub-shrub and forested, saturated/semipermanent/seasonal (PEMY/PSSY/PFOY) wetland, while the Hydrogeomorphic (HGM) class is Slope, largely due to its moderate to shallow gradient and upslope seepage/groundwater spring origins.

Vegetation within Wetland A is dominated by a mature Oregon ash stand, as mentioned above. Also present are a variety of shrubs and herbaceous species that include willows, hardhack spirea, Pacific ninebark, Himalayan blackberry, reed canarygrass, soft rush, Cooley's hedgenettle (*Stachys chamissonis*, FACW), tall fescue and creeping velvetgrass (*Holcus mollis*, FACW).

Species encountered in uplands adjacent to Wetland A include Himalayan blackberry, St. John's wort (*Hypericum perforatum*, FACU), bedstraw (*Galium aparine*, FACU), shiny geranium (*Geranium lucidum*, UPL), clovers (*Trifolium* spp., FAC-FACU), perennial ryegrass (*Lolium perenne*, FAC), and Queen Anne's lace (*Daucus carota*, FACU).

Soils within Wetland A were typically silt loams and silty clay loams, and generally met the redox dark surface hydric soil indicator. The swale's seasonally charged hydrology is largely driven by upslope groundwater seepage and to some extent direct rainfall onto the site. Scattered shallow inundation, flowing surface water (in small channels), near surface water tables and saturation, and oxidized rhizospheres were all in evidence at the time of sampling.

Wetland B

Wetland B is a small, arguably isolated concave wetland (0.03 acre) on a gentle slope in the now fallow field west of Wetland A. This location was actively farmed prior to 2017, but appears to have been left fallow since at least Fall 2017. The wetland appears to be fed by seasonally charged upslope groundwater seepage and overland sheet flow. Its Cowardin class is palustrine emergent, saturated/ semipermanent/ seasonal (PEMY) wetland, while the HGM class is Slope-Flats.

Vegetation within Wetland B is dominated by weakly emergent, mostly non-native species that includes a hybrid clover (*Trifolium* sp., FAC), perennial ryegrass (*Lolium perenne*, FAC), and lesser hawkbit (*Leontodon saxatilis*, FACU).

Less common species in the wetland, as well as within the adjacent uplands included the hybrid clover, red clover (*Trifolium pratense*, FACU), sheep sorrel (*Rumex acetosella*, FACU), common velvetgrass (*Holcus lanatus,* FAC) and hairy cats-ear (*Hypochaeris radicata*, FACU).

Soils within Wetland B were silt to silt loam that met the redox dark surface hydric soil indicator. This subtly shallow, depressional area exhibited seasonally charged hydrology driven by upslope groundwater seepage and overland sheetflow. Shallow inundation, near surface water tables and saturation, and oxidized rhizospheres were in evidence at the time of sampling.

Wetland C

Wetland C is a 0.54 acre depressional feature at the south end of the site that extends outside property boundaries. The depression is likely an old scour feature from the Bretz flood events, with relatively steep sideslopes on the west and east sides. The north edge is comparatively low in elevation, but topography rises several feet just to the north, sufficient to contain seasonal rainfall accumulations and act as an impoundment. Its Cowardin class is primarily forested, seasonally flooded/saturated (PFOE) wetland, while the HGM class is Depressional Closed Non-Permanent (DCNP).

Vegetation within Wetland C is dominated by a mostly mature Oregon ash stand, with relatively sparse understory in many places due to prolonged seasonal ponding. Scattered Pacific willow (*Salix lasiandra*, FACW) trees are also present within the depression. Shrubs include willows, hardhack spirea, and clustered rose (*Rosa pisocarpa*, FAC). Emergent cover is sparser at the north end of the wetland, due to increased duration and depth of inundation, in addition to a dense ash overstory. Observed vegetation is limited to small percentages of shiny geranium, annual bluegrass (*Poa annua*, FAC) and bedstraw. The south end includes spreading rush (*Juncus patens*, FACW), taperfruit shortscale sedge (*Carex leptopoda*, FAC), largeleaf avens (*Geum macrophyllum*, FAC), shiny geranium, and slough sedge (*Carex obnupta*, OBL).

Woody species encountered along the upland edge included Oregon white oak, madrone, Saskatoon serviceberry, beaked hazelnut (*Corylus cornuta*, FACU), snowberry, salal (*Gaultheria shallon*, FACU), California dewberry (*Rubus ursinus*, FACU), and poison oak. Herbaceous species included shiny geranium and sword fern.

The soils within Wetland C were silt loams that generally met the redox dark surface and/or depleted matrix hydric soil indicators. The large depressional area was deeply ponded (over 3 feet deep in some places) for most of the winter and spring months of 2017; access to soils along the wetland edge (as indicated by hydrophytic vegetation) was not feasible until the month of June. Indicators of the extensive seasonal ponding (observed after waters had receded) included algal mats, sparsely vegetated concave surface, water stained leaves, and oxidized rhizospheres. Fieldwork in the fall of 2019 confirmed the prior delineation and a sample pit near the north end, where seasonal ponding would be the deepest revealed the presence of hydric soils beginning just below the organic horizon and extending to a depth of at least the documented depth of 16 inches.

Roadside Ditch

An excavated roadside ditch extends for much of the northern boundary of the study area west of Wetland A along Tualatin-Sherwood Road. The ditch conveys stormwater runoff from the road as well as groundwater inputs from the study area. It also receives seasonal runoff from Wetland A, though it is not possible to determine the extent of backwater flooding from Wetland A from inflow down the ditch from the west. A 36-inch diameter culvert beneath Tualatin-Sherwood Road conveys these combined flows northward beneath the roadway and toward Hedges Creek. The ditch has been excavated from uplands, with the exception of the portion of ditch immediately adjacent to Wetland A. A 12-inch culvert allows stormwater flows within the ditch to pass beneath the site's driveway. This culvert, however, is well upslope from the section of ditch that meets all three wetland indicators. A total of 0.03 acre of the roadside ditch, the section closest to Wetland A, meets wetland criteria.

F. Deviation from Local Wetland Inventory or Nationa Wetland Inventory

A Local Wetland Inventory (LWI) has been prepared for both the cities of Sherwood and Tualatin; however, neither inventory's scope included the study area. The National Wetland Inventory (NWI) mapping depicts a single, narrow emergent wetland within Tax Lot 1100. This feature extends unbroken from south of the property through both Wetland C and Wetland A. PHS' findings, by contrast, show both features with significant widths and with no surface connection between them.

G. Mapping Method

PHS flagged the limits of the wetlands within the study area with blue tape flagging, while sample points were flagged using lime-green tape. The accuracy of the surveyed wetland boundaries is sub-centimeter (survey provided by Northwest Survey, Inc.); accuracy of sample points is +/-3 feet.

H. Additional Information

Roadside ditches are regulated by the Department of State Lands (DSL) according to specific criteria outlined in OAR 141-085-515 (10). Ditches are exempt from regulation if they are:

a) Ten feet wide or less at the ordinary high water line;
b) Artificially created from upland or from wetlands;
c) Not adjacent and connected or contiguous with other wetlands; and
d) Do not contain food or game fish.

All lengths of roadside ditch within the study area are less than 10 feet wide and do not contain food or game fish. A portion of ditch immediately west of Wetland A also satisfies all three wetland criteria. This section was delineated for the benefit of the Corps of Engineers (Corps) but will not be jurisdictional by DSL per the aforementioned criteria.

Ditches are evaluated for Corps regulatory jurisdiction based upon connection and flow, as well as the presence of wetland characteristics. The Corps is likely to assume jurisdiction over a roadside ditch as a water of the US if it displays evidence of an Ordinary High Water Mark (OHWM), ultimately discharges to other waters of the US, and is a Relatively Permanent Water (RPW), (i.e., is estimated to carry water for more than three months of the year). Lacking these, the Corps may also assume jurisdiction over sections of ditch that otherwise satisfy the three wetland criteria.

No portion of onsite ditch has relatively permanent flow and likewise, none provides a hydrologic connection between jurisdictional features. A portion of the roadside ditch does, however, meet all wetland criteria and has been delineated accordingly.

The identification of jurisdictional wetland within the ditch west of Wetland A is counter to a prior delineation. A delineation completed for Washington County associated with the extension of SW 124th Avenue included a portion of the right-of-way along Tualatin Sherwood Road (DSL WD# 2014-0448; Corps number is unknown). That delineation identified a much more limited connection between roadside ditches and Wetland A (the wetland was also designated as Wetland A for the County project). The delineation also identified just a few feet of roadside ditch west of the wetland, but about 340 feet of potentially jurisdictional ditch east of the wetland. The section of roadside ditch east of Wetland A was eliminated in late 2017 or early 2018 as part of road widening activities along Tualatin Sherwood Road approaching its intersection with SW 124th Avenue. Both sections of ditch were exempt from DSL jurisdiction per OAR 141-085-0515 (10).

I. Results and Conclusions

As described in Section D above, PHS delineated three potentially jurisdictional wetlands within the study area, plus a roadside ditch. The total area of wetlands is 2.94 acres, as summarized in the following table.

Table 3. Total wetland within T-S Corporate Park in Sherwood, Oregon

Water Feature	Area (square feet / acre)	Cowardin Class	HGM Class
Wetland A	102,074 / 2.34	PFOY/PSSY/PEMY	Slope
Wetland B	1,318 / 0.03	PEMY	Slope/Flat
Wetland C	23,442 / 0.54	PFOY	DCNP
Roadside Ditch	1,213 / 0.03	PEMY	Slope
Total Wetlands	**128,047 / 2.94**		

Of these features, it is likely that both Wetlands A and C will be regulated by DSL and the Corps, while Wetland B is arguably isolated and may fall outside of Corps jurisdiction. In addition, the roadside ditch is likely to be regulated throughout is length by the Corps; however, DSL may only take jurisdiction of those portions of the ditch immediately adjacent to Wetland A.

J. Required Disclaimer

This report documents the investigation, best professional judgment and conclusions of the investigators. It is correct and complete to the best of our knowledge. It should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and used at your own risk unless it has been reviewed and approved in writing by the Oregon Department of State Lands in accordance with OAR 141-090-0005 through 141-090-0055.

III. REFERENCES

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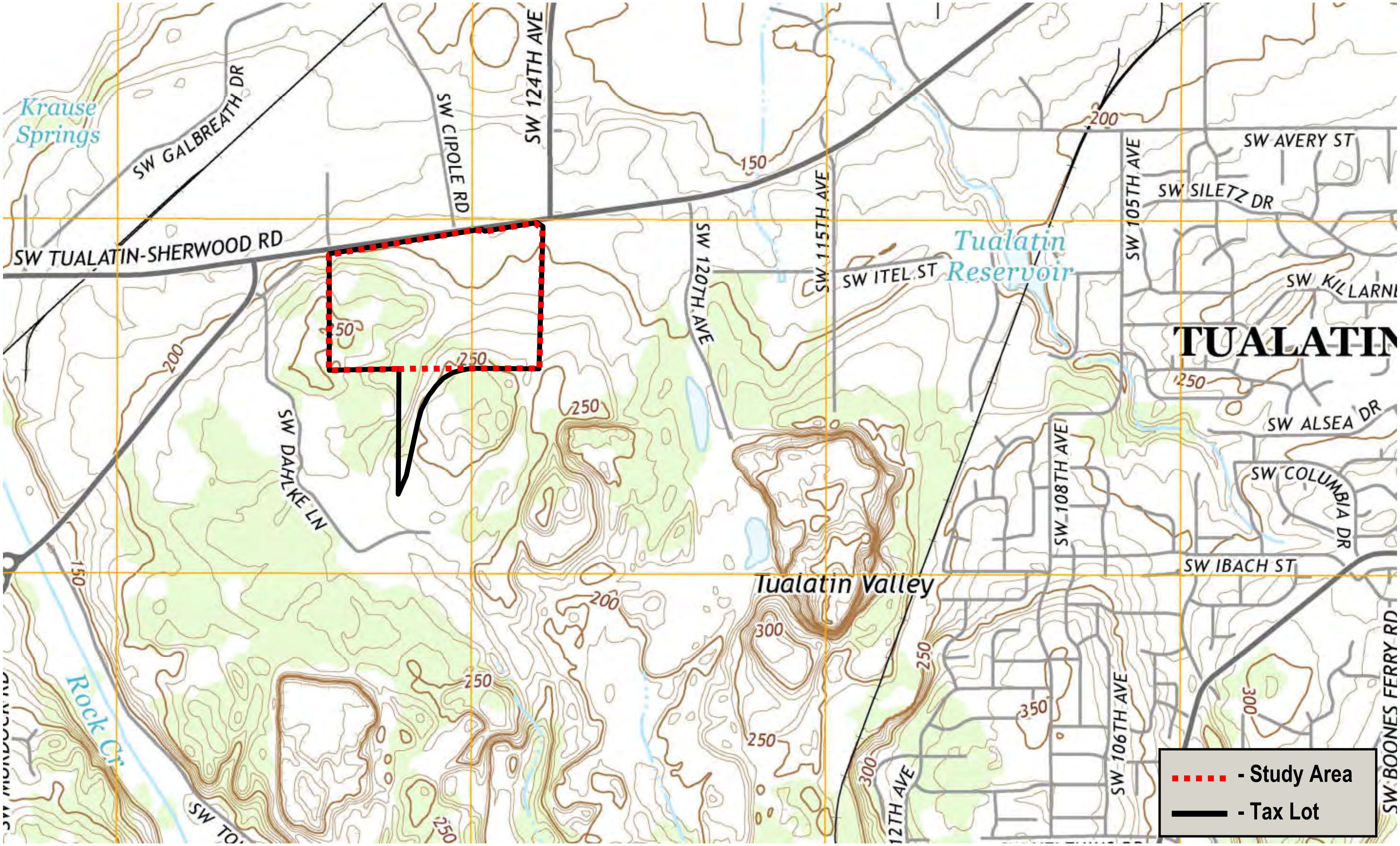
Appendix A

Figures

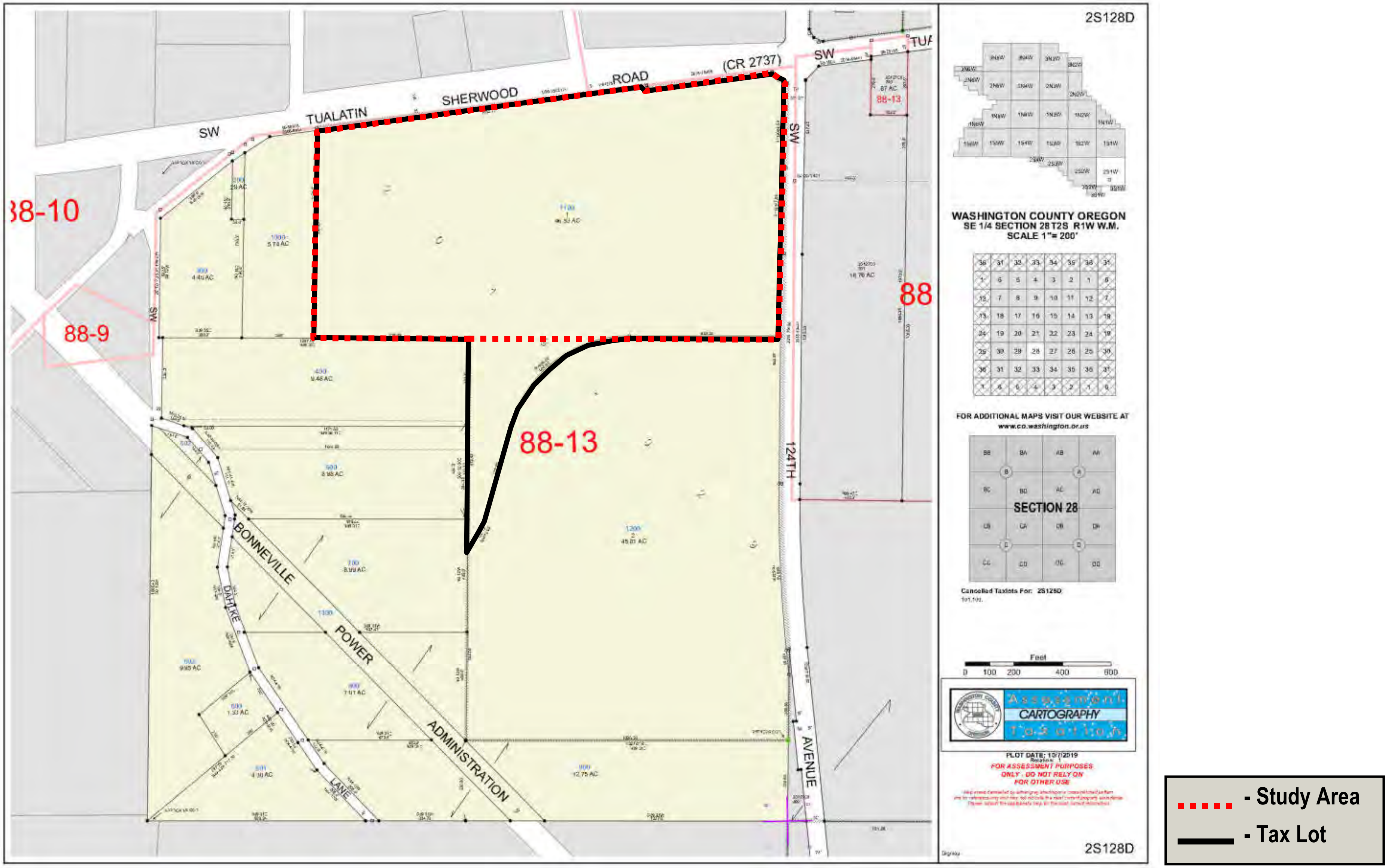


#6163
12/19/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

General Location and Topography
T-S Corporate Park—Sherwood, Oregon
United States Geological Survey (USGS), Sherwood, Oregon, 7.5 Quadrangle, 2014
(viewer/nationalmap.gov/basic)

FIGURE
1



#6163
12/19/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

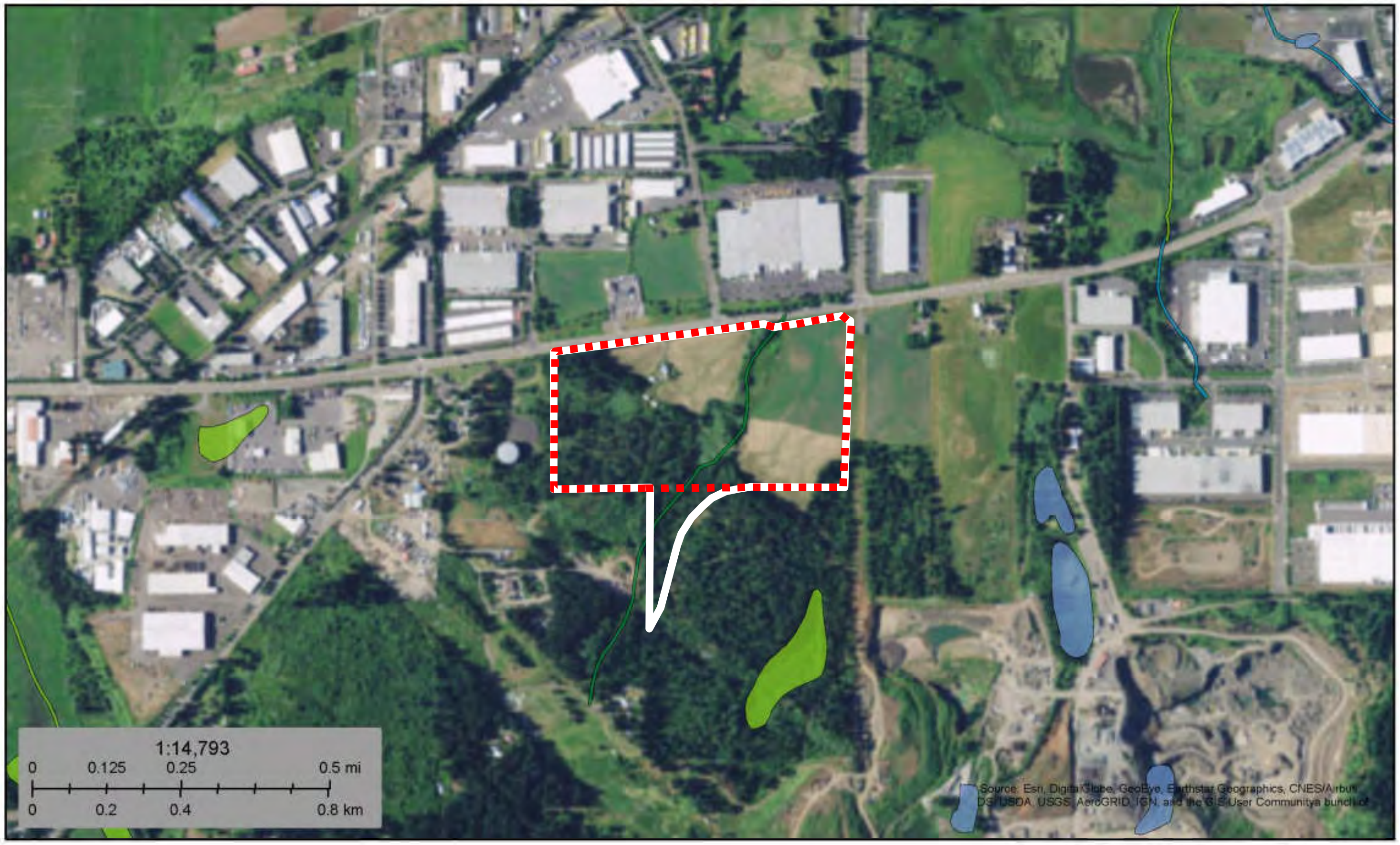
Tax Lot Map
T-S Corporate Park—Sherwood, Oregon
The Oregon Map (ormap.net)

FIGURE
2

U.S. Fish and Wildlife Service

National Wetlands Inventory

Wetlands



February 24, 2017

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

- Study Area
- Tax Lot

#6163
12/19/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

National Wetland Inventory Map
T-S Corporate Park—Sherwood, Oregon
United States Fish and Wildlife Service, Online Wetland Mapper V2, 2017

FIGURE 3

#6163
12/19/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Soils
T-S Corporate Park—Sherwood, Oregon
Natural Resources Conservation Services, Web Soil Survey, 2017
(websoilsurvey.sc.egov.usda.gov)

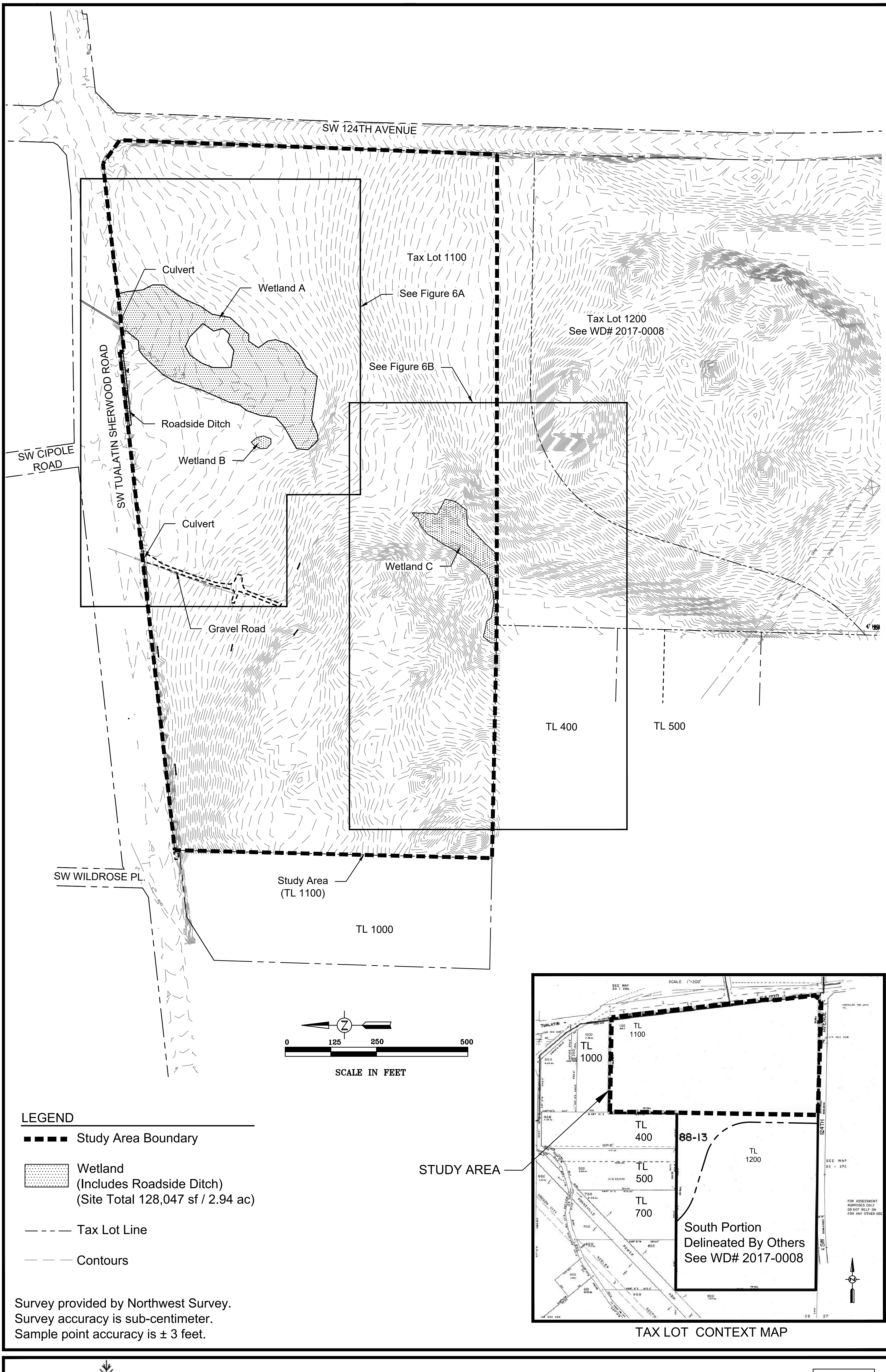
FIGURE 4

#6163
12/19/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Aerial Photo—May 8, 2019
T-S Corporate Park—Sherwood, Oregon
GoogleEarth, 2019

FIGURE
5



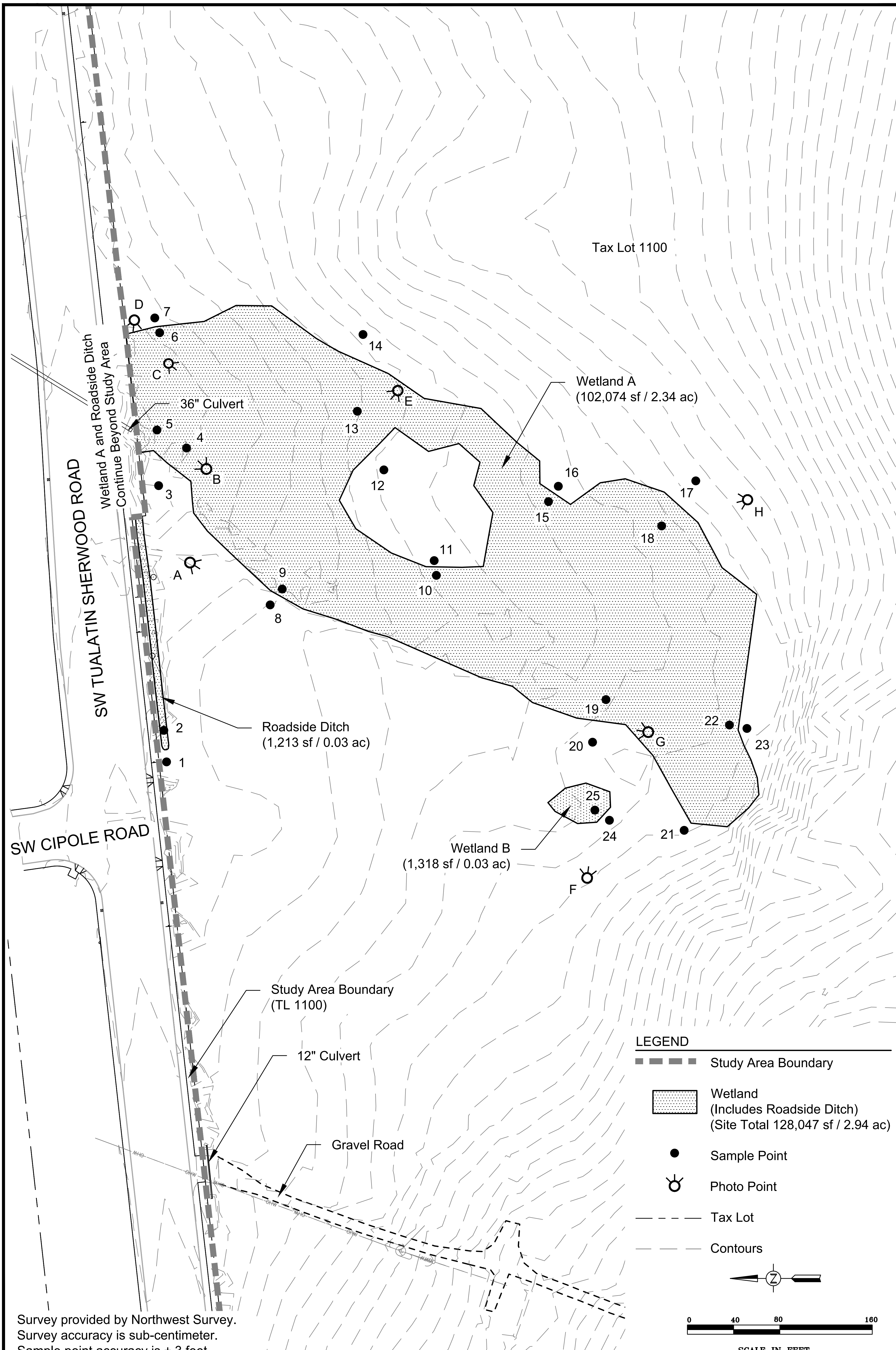
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Wetland Delineation Overview and Sheet Index

T-S Corporate Park - Sherwood, Oregon

FIGURE 6

1-3-2020



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9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

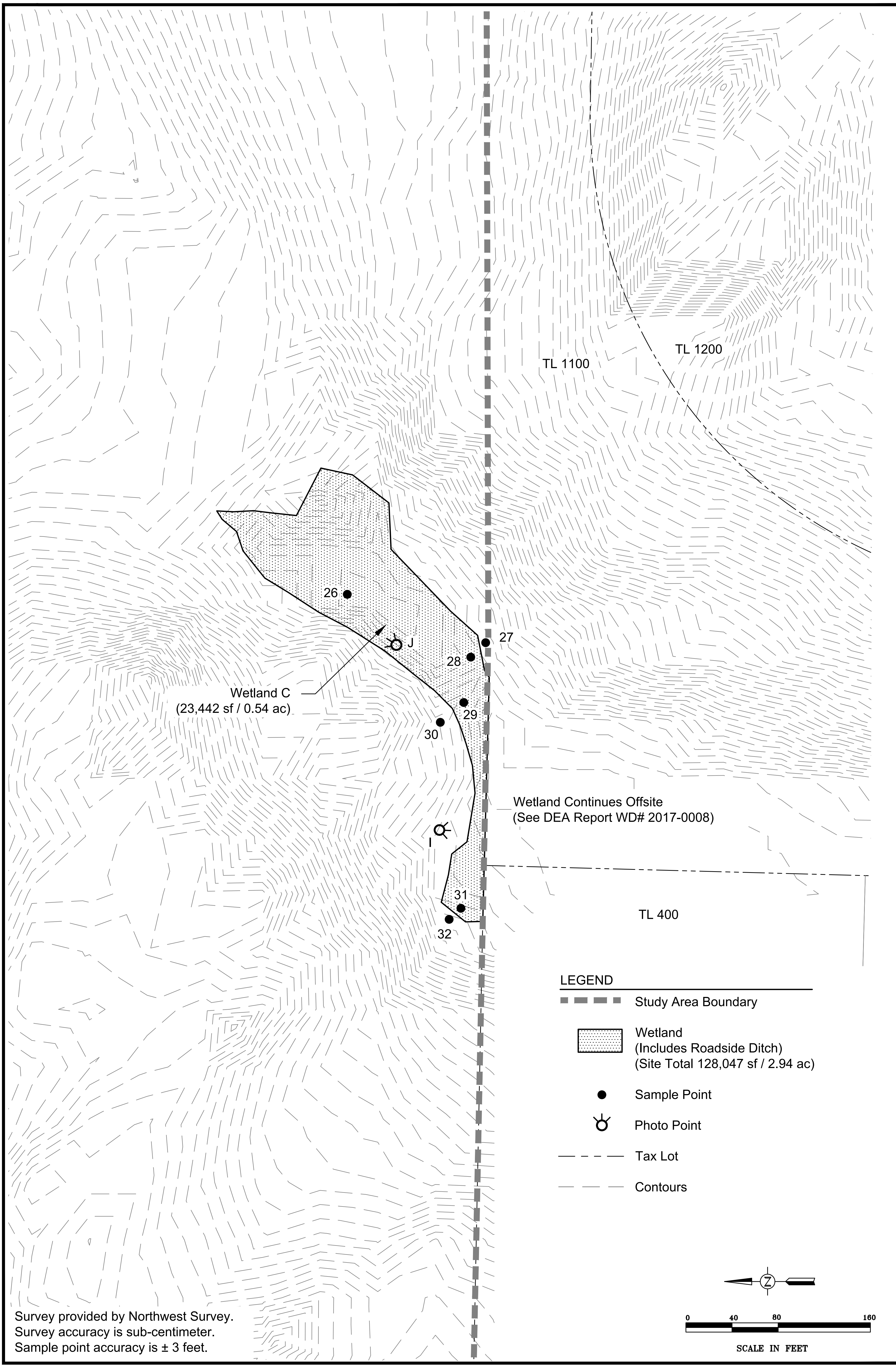
Wetland Delineation

T-S Corporate Park - Sherwood Oregon

FIGURE 6A

1-3-2020

X:\Project Directories\6100\6163 ORR Property\AutoCAD\Plot Dwgs\Fig6A WetDel.dwg, 1/7/2020 12:48:19 PM, AutoCAD PDF (High Quality Print).pc3



PHS
Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Wetland Delineation
T-S Corporate Park - Sherwood, Oregon

FIGURE
6B

1-3-2020

Appendix B

Wetland Determination Data Sheets

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **12/13/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **1**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **ditch** Local relief (concave, convex, none): **concave** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3690** Long: **-122.8085** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ____ No **X**

Remarks:
Sample pit in roadside ditch

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
= Total Cover	0		
Sapling/Shrub Stratum (plot size: 10)			
1 ***Rubus armeniacus***	15	X	FAC
2			
3			
4			
5			
= Total Cover	15		
Herb Stratum (plot size: 5)			
1 ***Holcus lanatus***	45	X	FAC
2 ***Agrostis stolonifera***	40	X	FAC
3 ***Senecio sp***	5		(FAC)
4 ***Vicia sp***	5		(FAC)
5 ***Galium aparine***	5		FACU
6			
7			
8			
= Total Cover	100		
Woody Vine Stratum (plot size:)			
1			
2			
= Total Cover	0		
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	**10YR 3/2**	**100**					**Silt loam**	**Medium**
4-8	**10YR 3/3**	**100**					**Silty Clay loam**	**Medium**
8-10	**10YR 3/2**	**100**					**Silt loam**	**Medium**
10-16	**10YR 4/3**	**100**					**Sand**	**Coarse; Bulky**

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** **X**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- **X** Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		**X**	
Water Table Present?		**X**	**>16**
Saturation Present? (includes capillary fringe)		**X**	**>16**

Wetland Hydrology Present? Yes ___ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **12/13/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **2**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **ditch** Local relief (concave, convex, none): **concave** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3690** Long: **-122.8085** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes **X** No ____	**Is Sampled Area within a Wetland?**	Yes **X** No ____
Hydric Soil Present?	Yes **X** No ____		
Wetland Hydrology Present?	Yes **X** No ____		

Remarks:
Sample pit in roadside ditch

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 *Salix lasiandra*	50	X	FACW
2			
3			
4			
	50	= Total Cover	
Sapling/Shrub Stratum (plot size: 15)			
1 *Rubus armeniacus*	25	X	FAC
2			
3			
4			
5			
	25	= Total Cover	
Herb Stratum (plot size: 5)			
1 *Juncus effusus*	25	X	FACW
2			
3			
4			
5			
6			
7			
8			
	25	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum 75			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:
Rubus armeniacus is primarily rooted above the bottom of the ditch. Salix lasiandra and Juncus effusus are actually in the ditch.

SOIL PHS # 6163 Sampling Point: 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-3	10YR 2/2	100					Loam	With leaf and tiwg debris
3-10	10YR 3/2	90	10YR 4/6	5	C	M	Loam	Fine
	10YR 3/2		10YR 4/6	5	C	PL		ORs; Fine
10-14	10YR 4/1	90	10YR 4/4	10	C	M	Silt	Medium; Big roots

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: **Large Roots**

Depth (inches): **14**

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	9

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Bottom of ditch ~6 feet wide at this location.

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **3**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **terrace** Local relief (concave, convex, none): **none** Slope (%): **2**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Huberly silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?	X	
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:
Marginally hydric soils, lacking other indicators

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 ***Rubus armeniacus***	10	X	FAC
2			
3			
4			
5			
	10	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Galium aparine***	20	X	FACU
2 ***Geranium lucidum***	20	X	UPL
3 ***Agrostis stolonifera***	20	X	FAC
4 ***Lolium perenne***	10		FAC
5 ***Hypericum perforatum***	10		FACU
6 ***Cardamine oligosperma***	5		FAC
7 ***Epilobium ciliatum***	5		FACW
8 ***Rumex crispus***	5		FAC
	95	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum **5**

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **4** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **50%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species	5	x 2 =	10
FAC Species	50	x 3 =	150
FACU Species	30	x 4 =	120
UPL Species	20	x 5 =	100
Column Totals	105 (A)		380 (B)

Prevalence Index =B/A = **3.62**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
____ 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No **X**

Remarks:

SOIL

PHS # 6163 — Sampling Point: 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 3/3	100					Silt Loam	
4-8	7.5YR 3/2	80	7.5YR 3/4	20	C	PL	Silt Loam	Fine
8-16	10YR 4/3	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?	X		14
Saturation Present? (includes capillary fringe)	X		12

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Marginal hydrology, probably high due to heavy rains

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **4**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **terrace** Local relief (concave, convex, none): **concave** Slope (%): **2**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Huberly silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is Sampled Area within a Wetland?**	Yes X No
Hydric Soil Present?	Yes X	No		
Wetland Hydrology Present?	Yes X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 15)			
1 ***Fraxinus latifolia***	80	X	FACW
2			
3			
4			
	80	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 ***Crataegus monogyna***	40	X	FAC
2 ***Rubus armeniacus***	30	X	FAC
3 ***Rubus ursinus***	10		FACU
4 ***Rosa pisocarpa***	5		FAC
5			
	85	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Stachys chamissonis***	20	X	FACW
2 ***Poa palustris***	20	X	FAC
3 ***Epilobium ciliatum***	5		FACW
4 ***Galium aparine***	T		FACU
5			
6			
7			
8			
	45	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum	55		

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **5** (A)

Total Number of Dominant Species Across All Strata: **5** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 2/1	100					Silty Clay Loam	
4-8	10YR 2/2	80	10YR 3/3	20	C	M	Silt Loam	Medium
8-12	10YR 3/2	60	10YR 3/4	40	C	M	Silt Loam	Medium
12-16	10YR 3/1	50	10YR 3/6	50	C	M	Silt Loam	Medium-Coarse

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___	Histosol (A1)
___	Histic Epipedon (A2)
___	Black Histic (A3)
___	Hydrogen Sulfide (A4)
___	Depleted Below Dark Surface (A11)
___	Thick Dark Surface (A12)
___	Sandy Mucky Mineral (S1)
___	Sandy Gleyed Matrix (S4)
___	Sandy Redox (S5)
___	Stripped Matrix (S6)
___	Loamy Mucky Mineral (F1) **(except MLRA 1)**
___	Loamy Gleyed Matrix (F2)
___	Depleted Matrix (F3)
X	Redox Dark Surface (F6)
___	Depleted Dark Surface (F7)
___	Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___	2 cm Muck (A10)
___	Red Parent Material (TF2)
___	Very Shallow Dark Surface (TF12)
___	Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___	Surface Water (A1)
X	High Water Table (A2)
X	Saturation (A3)
___	Water Marks (B1)
___	Sediment Deposits (B2)
___	Drift Deposits (B3)
___	Algal Mat or Crust (B4)
___	Iron Deposits (B5)
___	Surface Soil Cracks (B6)
___	Inundation Visible on Aerial Imagery (B7)
___	Sparsely Vegetated Concave Surface (B8)
___	Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___	Salt Crust (B11)
___	Aquatic Invertebrates (B13)
___	Hydrogen Sulfide Odor (C1)
___	Oxidized Rhizospheres along Living Roots (C3)
___	Presence of Reduced Iron (C4)
___	Recent Iron Reduction in Plowed Soils (C6)
___	Stunted or Stressed Plants (D1) **(LRR A)**
___	Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___	Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___	Drainage Patterns (B10)
___	Dry-Season Water Table (C2)
___	Saturation Visible on Aerial Imagery (C9)
___	Geomorphic Position (D2)
___	Shallow Aquitard (D3)
___	Fac-Neutral Test (D5)
___	Raised Ant Mounds (D6) **(LRR A)**
___	Frost-Heave Hummocks (D7)

Field Observations:

	Yes		No		Depth (inches):	
Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	6
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Flowing surface of 1 inch depth within 12 inches of pit, after rainy period was within 10 feet of primary channel

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **12/13/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **5**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **swale** Local relief (concave, convex, none): **none** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3690** Long: **-122.8078** Datum: **WSG85**

Soil Map Unit Name: **Huberly silt loam** NWI Classification: **PFO1C**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 ***Fraxinus latifolia***	70	X	FACW
2 ***Crataegus monogyna***	20	X	FAC
3			
4			
	90	= Total Cover	
Sapling/Shrub Stratum (plot size: 15)			
1 ***Rosa nutkana***	5	X	FAC
2 ***Rubus ursinus***	15	X	FACU
3			
4			
5			
	20	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Phalaris arundinacea***	100	X	FACW
2 ***Galium aparine***	T		FACU
3			
4			
5			
6			
7			
8			
	100	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **4** (A)

Total Number of Dominant Species Across All Strata: **5** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **80%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
____ 2- Dominance Test is >50%
X 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes X** **No** ____

Remarks:

SOIL PHS # 6163 Sampling Point: 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-6	10YR 2/2	100					Silt loam	Many roots
6-10	10YR 3/2	75	7.5YR 4/6	20	C	M	Silt loam	Medium; Roots
			7.5YR 4/6	5	C	PL		Fine ORs
10-17	10YR 3/1	90	7.5YR 3/4	10	C	M	Silt loam	Fine-Medium

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
X High Water Table (A2)
X Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes		No		Depth (inches):	
Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	2
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Orr Property, Tualatin   City/County: Tualatin/Washington   Sampling Date: 12/13/2019

Applicant/Owner: Trammel Crow   State: OR   Sampling Point: 6

Investigator(s): FS/DG   Section, Township, Range: Section 28D, Township T2S, Range 1W

Landform (hillslope, terrace, etc.:) base of slope   Local relief (concave, convex, none): none   Slope (%): 1

Subregion (LRR): LRR A   Lat: 45.3690   Long: -122.8076   Datum: WSG85

Soil Map Unit Name: Huberly silt loam   NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed?   Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes X No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: ____)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 15)			
1 ***Fraxinus latifolia***	30	X	FACW
2 ***Rubus armeniacus***	25	X	FAC
3			
4			
5			
	55	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Agrostis stolonifera***	50	X	FAC
2 ***Schedonorus arundinaceus***	20	X	FAC
3 ***Vicia sp***	10		(FAC)
4 ***Epilobium ciliatum***	7		FACW
5 ***Hypochaeris radicata***	5		FACU
6 ***Festuca rubra***	5		FAC
7 ***Phalaris arundinacea***	5		FACW
8 ***Daucus carota***	2		FACU
	104	= Total Cover	
Woody Vine Stratum (plot size: ____)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-7	10YR 2/2	100					Silt loam	
7-11	10YR 2/2	96	7.5YR 3/4	3	C	M	Silt loam	Fine
7-11	10YR 2/2		7.5YR 3/4	1	C	PL		Fine Ors
11-18	10YR 3/1	95	7.5YR 4/4	5	C	M	Silt loam	Fine-Medium

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		2 cm Muck (A10)
	Histic Epipedon (A2)		Stripped Matrix (S6)		Red Parent Material (TF2)
	Black Histic (A3)		Loamy Mucky Mineral (F1) **(except MLRA 1)**		Very Shallow Dark Surface (TF12)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Other (explain in Remarks)
	Depleted Below Dark Surface (A11)		Depleted Matrix (F3)		
	Thick Dark Surface (A12)	X	Redox Dark Surface (F6)		
	Sandy Mucky Mineral (S1)		Depleted Dark Surface (F7)		
	Sandy Gleyed Matrix (S4)		Redox Depressions (F8)		

Indicators for Problematic Hydric Soils[3]: (right column above)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply) | Secondary Indicators (2 or more required)

	Surface Water (A1)		Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**		Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
X	High Water Table (A2)				
X	Saturation (A3)		Salt Crust (B11)		Drainage Patterns (B10)
	Water Marks (B1)		Aquatic Invertebrates (B13)		Dry-Season Water Table (C2)
	Sediment Deposits (B2)		Hydrogen Sulfide Odor (C1)		Saturation Visible on Aerial Imagery (C9)
	Drift Deposits (B3)		Oxidized Rhizospheres along Living Roots (C3)		Geomorphic Position (D2)
	Algal Mat or Crust (B4)		Presence of Reduced Iron (C4)		Shallow Aquitard (D3)
	Iron Deposits (B5)		Recent Iron Reduction in Plowed Soils (C6)	X	Fac-Neutral Test (D5)
	Surface Soil Cracks (B6)		Stunted or Stressed Plants (D1) **(LRR A)**		Raised Ant Mounds (D6) **(LRR A)**
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remarks)		Frost-Heave Hummocks (D7)
	Sparsely Vegetated Concave Surface (B8)				

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	11
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	6

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **12/13/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **7**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **none** Local relief (concave, convex, none): **none** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3690** Long: **-122.8076** Datum: **WSG85**

Soil Map Unit Name: **Huberly silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: ____)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: ____)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 5)			
1 *Agrostis stolonifera*	25	X	FAC
2 *Holcus lanatus*	20	X	FAC
3 *Vicia sp*	20	X	(FAC)
4 *Festuca rubra*	10		FAC
5 *Hypericum perforatum*	5		FACU
6 *Taraxacum sp*	5		(FAC)
7 *Daucus carota*	5		FACU
8			
	90	= Total Cover	
Woody Vine Stratum (plot size: ____)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL **PHS #** 6163 Sampling Point: 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	**10YR 3/2**	**100**					**silt loam**	**Fine**
4-8	**10YR 3/2**	**100**					**silt loam**	**Medium**
8-14	**10YR 2/2**	**100**					**silt loam**	**Medium**

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes		No	X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes		No	X	Depth (inches):	>14

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **8**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **flat** Local relief (concave, convex, none): **none** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3687** Long: **-122.8082** Datum: **WSG85**

Soil Map Unit Name: **Huberly silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 ***Prunus avium***	15	X	FACU
2			
3			
4			
	15	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 ***Prunus avium***	15	X	FACU
2 ***Rubus armeniacus***	10	X	FAC
3 ***Corylus cornuta***	5		FACU
4			
5			
	30	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Agrostis exarata***	40	X	FACW
2 ***Cirsium arvense***	25	X	FAC
3 ***Daucus carota***	15		FACU
4 ***Rumex crispus***	5		FAC
5 ***Holcus lanatus***	5		FAC
6			
7			
8			
	90	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **5** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **60%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:
Sample right at the edge of the thicket; represents shrub and herb areas.

SOIL PHS # 6163 Sampling Point: 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-5	10YR 3/2	100					Silt Loam	
5-15	7.5YR 3/2	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>15
Saturation Present? (includes capillary fringe)		X	>15

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **9**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **flat** Local relief (concave, convex, none): **none** Slope (%): **2**

Subregion (LRR): **LRR A** Lat: **45.3687** Long: **-122.8082** Datum: **WSG85**

Soil Map Unit Name: **Huberly silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 *Crataegus monogyna*	25	X	FAC
2 *Malus fusca*	20	X	FACW
3 *Prunus avium*	10		FACU
4 *Salix sp*	5		(FAC)
	60	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 *Rubus armeniacus*	50	X	FAC
2 *Rosa sp*	30	X	(FAC)
3 *Rubus ursinus*	10		FACU
4			
5			
	90	= Total Cover	
Herb Stratum (plot size:)			
1			
2			
3			
4			
5			
6			
7			
8			
	0	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **4** (A)

Total Number of Dominant Species Across All Strata: **4** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # **6163** Sampling Point: **9**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-14	**10YR 2/2**	**100**					**silt loam**	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		2 cm Muck (A10)
	Histic Epipedon (A2)		Stripped Matrix (S6)		Red Parent Material (TF2)
	Black Histic (A3)		Loamy Mucky Mineral (F1) **(except MLRA 1)**		Very Shallow Dark Surface (TF12)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)	X	Other (explain in Remarks)
	Depleted Below Dark Surface (A11)		Depleted Matrix (F3)		
	Thick Dark Surface (A12)		Redox Dark Surface (F6)		
	Sandy Mucky Mineral (S1)		Depleted Dark Surface (F7)		
	Sandy Gleyed Matrix (S4)		Redox Depressions (F8)		

Indicators for Problematic Hydric Soils[3]: (right column above)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

Soils are well drained due to proximity to ditch.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply) | Secondary Indicators (2 or more required)

	Surface Water (A1)		Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**		Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
	High Water Table (A2)				
	Saturation (A3)		Salt Crust (B11)		Drainage Patterns (B10)
	Water Marks (B1)		Aquatic Invertebrates (B13)		Dry-Season Water Table (C2)
	Sediment Deposits (B2)		Hydrogen Sulfide Odor (C1)		Saturation Visible on Aerial Imagery (C9)
	Drift Deposits (B3)		Oxidized Rhizospheres along Living Roots (C3)	X	Geomorphic Position (D2)
	Algal Mat or Crust (B4)		Presence of Reduced Iron (C4)		Shallow Aquitard (D3)
	Iron Deposits (B5)		Recent Iron Reduction in Plowed Soils (C6)		Fac-Neutral Test (D5)
	Surface Soil Cracks (B6)		Stunted or Stressed Plants (D1) **(LRR A)**		Raised Ant Mounds (D6) **(LRR A)**
	Inundation Visible on Aerial Imagery (B7)	X	Other (Explain in Remarks)		Frost-Heave Hummocks (D7)
	Sparsely Vegetated Concave Surface (B8)				

Field Observations:

Surface Water Present?	Yes	No	X	Depth (inches):	
Water Table Present?	Yes	No	X	Depth (inches):	>14
Saturation Present? (includes capillary fringe)	Yes	No	X	Depth (inches):	>14

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

This pit is within a few feet of a narrow ditch about two feet deep located near the western wetland boundary. When full this area would be saturated, with a shallow water table. When not full of water the ditch likely lowers local water tables and results in drier conditions immediately along it.

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **10**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **flat** Local relief (concave, convex, none): **none** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3684** Long: **-122.8080** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 ***Amelanchier alnifolia***	30	X	FACU
2 ***Crataegus monogyna***	10	X	FAC
3			
4			
	40	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 ***Rubus armeniacus***	30	X	FAC
2 ***Fraxinus latifolia***	20	X	FACW
3 ***Rubus ursinus***	10		FACU
4			
5			
	60	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Agrostis capillaris***	35	X	FAC
2 ***Schedonorus arundinaceus***	30	X	FAC
3 ***Phalaris arundinacea***	20	X	FACW
4 ***Cirsium arvense***	3		FAC
5 ***Phleum pratense***	2		FAC
6 ***Carex leptopoda***	2		FAC
7 ***Lotus corniculatus***	1		FAC
8 ***Hypochaeris radicata***	1		FACU
	94	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **6** (A)

Total Number of Dominant Species Across All Strata: **7** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **86%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

Herbs continued: Vicia sp = 1%

SOIL PHS # 6163 Sampling Point: 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-3	10YR 3/2	100					silt loam	
3-9	10YR 3/2	93	5YR 5/8	5	C	PL	silt loam	Fine ORs
3-9			5YR 5/8	2	C	M	silt loam	Medium
9-12	7.5YR 4/2	90	5YR 2/8	10	C	M	silt loam	Medium, Nodules
12-16+	10YR 5/1	85	7.5YR 5/8	15	C	M	Sandy Loam	Medium

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **11**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **flat** Local relief (concave, convex, none): **none** Slope (%): **2**

Subregion (LRR): **LRR A** Lat: **45.3684** Long: **-122.8080** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 *Rubus armeniacus*	40	X	FAC
2 *Crataegus monogyna*	2		FAC
3 *Fraxinus latifolia*	1		FACW
4			
5			
	43	= Total Cover	
Herb Stratum (plot size: 10)			
1 *Holcus lanatus*	60	X	FAC
2 *Cirsium arvense*	35	X	FAC
3 *Daucus carota*	10		FACU
4 *Equisetum arvense*	1		FAC
5 *Rumex acetosella*	1		FACU
6			
7			
8			
	107	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL **PHS #** 6163 Sampling Point: 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10YR 3/3	100					silt loam	
10-14	10YR 4/2	90	7.5YR 4/6	10	C	M	silt loam	Coarse

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	>14
Saturation Present? (includes capillary fringe)		X	>14

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **12**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **terrace** Local relief (concave, convex, none): **none** Slope (%): **3**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ____ No **X**

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: ____)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 *Crataegus monogyna*	5	X	FAC
2 *Malus domestica*	1		UPL
3			
4			
5			
	6	= Total Cover	
Herb Stratum (plot size: 5)			
1 *Holcus mollis*	40	X	FACW
2 *Vicia tetrasperma*	20	X	UPL
3 *Equisetum arvense*	10		FAC
4 *Galium aparine*	5		FACU
5 *Rumex acetosella*	5		FACU
6 *Jacobaea vulgaris*	1		FACU
7			
8			
	81	= Total Cover	
Woody Vine Stratum (plot size: ____)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum **20**

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **67%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

Weakly hydrophytic; doesn't meet PI<3.0

SOIL **PHS #** 6163 Sampling Point: 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	**10YR 3/3**	**100**					**Silt Loam**	**Fine substrate**
4-12	**10YR 3/3**	**100**					**Silt Loam**	**Medium substrate**
12-16	**10YR 4/3**	**100**					**Silt Loam**	**Medium bulky**

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No **X** Depth (inches): ___
Water Table Present? Yes ___ No **X** Depth (inches): **>16**
Saturation Present? (includes capillary fringe) Yes ___ No **X** Depth (inches): **>16**

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **13**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **swale** Local relief (concave, convex, none): **none** Slope (%): **3**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 15)			
1 ***Fraxinus latifolia***	**50**	**X**	**FACW**
2			
3			
4			
5			
	50	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Holcus mollis***	**95**	**X**	**FACW**
2 ***Holcus lanatus***	**5**		**FAC**
3 ***Galium aparine***	**T**		**FACU**
4 ***Vicia sp.***	**T**		**(FAC)**
5			
6			
7			
8			
	100	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	**0**
FACW species		x 2 =	**0**
FAC Species		x 3 =	**0**
FACU Species		x 4 =	**0**
UPL Species		x 5 =	**0**
Column Totals	**0** (A)		**0** (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

At edge of Fraxinus latifolia seedling/sapling stand; dense growth of 1-3 inch diameter ash, nothing over 12 feet tall

SOIL PHS # 6163 Sampling Point: 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-8	7.5YR 3/1	95	7.5YR 3/4	5	C	M	Silt Loam	Fine-Medium
8-16	7.5YR 4/1	78	7.5YR 4/4	20	C	M	Silty Clay Loam	Medium-Coarse
8-16			7.5YR 2.5/2	2	C	M		Mg nodules

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- X Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes		No		Depth (inches):	
Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	1
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	0

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **14**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **hillslope** Local relief (concave, convex, none): **none** Slope (%): **5**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ____ No **X**

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Lolium perenne***	60	X	FAC
2 ***Schedonorus arundinaceus***	10		FAC
3 ***Trifolium pratense***	10		FACU
4 ***Rumex acetosella***	10		FACU
5 ***Daucus carota***	5		FACU
6 ***Hypochaeris radicata***	5		FACU
7			
8			
	100	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **1** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species	70	x 3 =	210
FACU Species	30	x 4 =	120
UPL Species		x 5 =	0
Column Totals	100 (A)		330 (B)

Prevalence Index =B/A = **3.30**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

Marginally hydrophytic based on dominants; does not meet PI<3.0

SOIL PHS # 6163 Sampling Point: 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 3/3	100					Silt Loam	Fine substrate
5-12	7.5YR 3/2	100					Silt Loam	Medium substrate
12-16	10YR 5/3	70	5YR 4/4	30	C	M	Silty Clay Loam	Medium, coarse, bulky

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No X	Depth (inches):	
Water Table Present?	Yes ___	No X	Depth (inches):	>16
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches):	>16

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **15**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **edge of swale** Local relief (concave, convex, none): **convex** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.3682** Long: **-122.8077** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: ____)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 10)			
1 ***Crataegus monogyna***	6	X	FAC
2 ***Rubus armeniacus***	2	X	FAC
3			
4			
5			
	8	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Schedonorus arundinaceus***	50	X	FAC
2 ***Holcus lanatus***	35	X	FAC
3 ***Alopecurus pratensis***	15		FAC
4 ***Daucus carota***	15		FACU
5 ***Jacobaea vulgaris***	3		FACU
6 ***Rumex acetosella***	3		FACU
7			
8			
	121	= Total Cover	
Woody Vine Stratum (plot size: ____)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **4** (A)

Total Number of Dominant Species Across All Strata: **4** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation

X 2- Dominance Test is >50%

____ 3-Prevalence Index is ≤ 3.0[1]

____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

____ 5- Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 3/2	100					Silt loam	
7-12	10YR 3/2	94	5YR 3/4	6	C	M	Silt loam	Medium to Coarse
12-15	10YR 3/1	98	7.5YR 3/4	2	C	M	Silt loam	Fine

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
X Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No	X	Depth (inches):	
Water Table Present?	Yes ___	No	X	Depth (inches):	>15
Saturation Present? (includes capillary fringe)	Yes ___	No	X	Depth (inches):	>15

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Orr Property, Tualatin | City/County: Tualatin/Washington | Sampling Date: 10/15/2019

Applicant/Owner: Trammel Crow | State: OR | Sampling Point: 16

Investigator(s): MS/SE | Section, Township, Range: Section 28D, Township T2S, Range 1W

Landform (hillslope, terrace, etc.:) slope | Local relief (concave, convex, none): none | Slope (%): 2-3

Subregion (LRR): LRR A | Lat: | Long: | Datum: WSG85

Soil Map Unit Name: Aloha silt loam | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 ***Rubus armeniacus***	15	X	FAC
2			
3			
4			
5			
	15	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Schedonorus arundinaceus***	30	X	FAC
2 ***Holcus lanatus***	25	X	FAC
3 ***Jacobaea vulgaris***	20	X	FACU
4 ***Daucus carota***	10		FACU
5 ***Plantago lanceolata***	5		FACU
6 ***Cirsium arvense***	5		FAC
7 ***Lotus corniculatus***	5		FAC
8			
	100	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 75% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- X 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-11	10YR 3/2	100					Silt loam	
11-16+	10YR 5/2	95	10YR 4/3	5	C	M	Silt loam	Medium

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

____ Histosol (A1)
____ Histic Epipedon (A2)
____ Black Histic (A3)
____ Hydrogen Sulfide (A4)
____ Depleted Below Dark Surface (A11)
____ Thick Dark Surface (A12)
____ Sandy Mucky Mineral (S1)
____ Sandy Gleyed Matrix (S4)
____ Sandy Redox (S5)
____ Stripped Matrix (S6)
____ Loamy Mucky Mineral (F1) **(except MLRA 1)**
____ Loamy Gleyed Matrix (F2)
____ Depleted Matrix (F3)
____ Redox Dark Surface (F6)
____ Depleted Dark Surface (F7)
____ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

____ 2 cm Muck (A10)
____ Red Parent Material (TF2)
____ Very Shallow Dark Surface (TF12)
____ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____
Depth (inches): ____

Hydric Soil Present? Yes ____ **No** X

Remarks:

Depleted Matrix starts below 11 inches therefore does not meet depth requirement for F3.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

____ Surface Water (A1)
____ High Water Table (A2)
____ Saturation (A3)
____ Water Marks (B1)
____ Sediment Deposits (B2)
____ Drift Deposits (B3)
____ Algal Mat or Crust (B4)
____ Iron Deposits (B5)
____ Surface Soil Cracks (B6)
____ Inundation Visible on Aerial Imagery (B7)
____ Sparsely Vegetated Concave Surface (B8)
____ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
____ Salt Crust (B11)
____ Aquatic Invertebrates (B13)
____ Hydrogen Sulfide Odor (C1)
____ Oxidized Rhizospheres along Living Roots (C3)
____ Presence of Reduced Iron (C4)
____ Recent Iron Reduction in Plowed Soils (C6)
____ Stunted or Stressed Plants (D1) **(LRR A)**
____ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

____ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
____ Drainage Patterns (B10)
____ Dry-Season Water Table (C2)
____ Saturation Visible on Aerial Imagery (C9)
____ Geomorphic Position (D2)
____ Shallow Aquitard (D3)
____ Fac-Neutral Test (D5)
____ Raised Ant Mounds (D6) **(LRR A)**
____ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: ORR Property | City/County: Tualatin/Washington | Sampling Date: 4/28/2017

Applicant/Owner: Trammel Crow Co. | State: OR | Sampling Point: 17

Investigator(s): FS/DG | Section, Township, Range: Section 28D, Township T2S, Range 1W

Landform (hillslope, terrace, etc.:) hillslope | Local relief (concave, convex, none): none | Slope (%): 3

Subregion (LRR): LRR A | Lat: 45.36861 | Long: -122.80821 | Datum: WGS84

Soil Map Unit Name: Aloha silt loam | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 *Rubus armeniacus*	5	X	FAC
2			
3			
4			
5			
	5	= Total Cover	
Herb Stratum (plot size: 5)			
1 *Holcus lanatus*	45	X	FAC
2 *Vicia sp.*	15	X	(FAC)
3 *Daucus carota*	10		FACU
4 *Trifolium pratense*	10		FACU
5 *Jacobaea vulgaris*	10		FACU
6 *Schedonorus arundinaceus*	5		FAC
7			
8			
	95	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species	70	x 3 =	210
FACU Species	30	x 4 =	120
UPL Species		x 5 =	0
Column Totals	100 (A)		330 (B)

Prevalence Index =B/A = 3.30

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- X 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

Marginally hydrophytic; does not meet PI<3.0

SOIL

PHS # 6163 | Sampling Point: 17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 3/2	100					Silt Loam	Fine subangular
6-2	10YR 3/2	100					Silt Loam	Medium subangular
12-16	10YR 3/2	100					Silt Loam	Medium bulky

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

No redox features

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?	X		12
Saturation Present? (includes capillary fringe)	X		10

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Active hydrology indicators appear to be in response to recent heavy precipitation, not wetland condition

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **18**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **swale** Local relief (concave, convex, none): **none** Slope (%): **2**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is Sampled Area within a Wetland?**	Yes X No
Hydric Soil Present?	Yes X	No		
Wetland Hydrology Present?	Yes X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 ***Rubus armeniacus***	10	X	FAC
2 ***Crataegus monogyna***	3	X	FAC
3			
4			
5			
	13	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Schedonorus arundinaceus***	30	X	FAC
2 ***Holcus lanatus***	20	X	FAC
3 ***Holcus mollis***	20	X	FACW
4 ***Galium aparine***	10		FACU
5 ***Vicia sp.***	10		(FAC)
6 ***Cirsium arvense***	5		FAC
7			
8			
	95	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum **5 (thatch)**

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **5** (A)

Total Number of Dominant Species Across All Strata: **5** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL **PHS #** 6163 Sampling Point: 18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-7	7.5YR 2.5/1	92	7.5YR 3/4	5	C	M	Silt Loam	Fine-Medium
0-7			7.5YR 3/4	3	C	PL		ORs
7-16	7.5YR 3/1	80	7.5YR 4/4	15			Silty Clay Loam	
7-16			7.5YR 2.5/2	5				Mg sharp edged nodes

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		2 cm Muck (A10)
	Histic Epipedon (A2)		Stripped Matrix (S6)		Red Parent Material (TF2)
	Black Histic (A3)		Loamy Mucky Mineral (F1) **(except MLRA 1)**		Very Shallow Dark Surface (TF12)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Other (explain in Remarks)
	Depleted Below Dark Surface (A11)		Depleted Matrix (F3)		
	Thick Dark Surface (A12)	X	Redox Dark Surface (F6)		
	Sandy Mucky Mineral (S1)		Depleted Dark Surface (F7)		
	Sandy Gleyed Matrix (S4)		Redox Depressions (F8)		

Indicators for Problematic Hydric Soils[3]: (see right column above)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes X **No**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply) | Secondary Indicators (2 or more required)

	Surface Water (A1)		Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**		Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
X	High Water Table (A2)				
X	Saturation (A3)		Salt Crust (B11)		Drainage Patterns (B10)
	Water Marks (B1)		Aquatic Invertebrates (B13)		Dry-Season Water Table (C2)
	Sediment Deposits (B2)		Hydrogen Sulfide Odor (C1)		Saturation Visible on Aerial Imagery (C9)
	Drift Deposits (B3)	X	Oxidized Rhizospheres along Living Roots (C3)		Geomorphic Position (D2)
	Algal Mat or Crust (B4)		Presence of Reduced Iron (C4)		Shallow Aquitard (D3)
	Iron Deposits (B5)		Recent Iron Reduction in Plowed Soils (C6)		Fac-Neutral Test (D5)
	Surface Soil Cracks (B6)		Stunted or Stressed Plants (D1) **(LRR A)**		Raised Ant Mounds (D6) **(LRR A)**
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remarks)		Frost-Heave Hummocks (D7)
	Sparsely Vegetated Concave Surface (B8)				

Field Observations:

Surface Water Present?	Yes		No X	Depth (inches):	
Water Table Present?	Yes	X	No	Depth (inches):	6
Saturation Present? (includes capillary fringe)	Yes	X	No	Depth (inches):	2

Wetland Hydrology Present? Yes X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **4/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **19**

Investigator(s): **FS/DG** Section, Township, Range: **Section 28D, Township T2S, Range 1W**

Landform (hillslope, terrace, etc.:) **swale** Local relief (concave, convex, none): **none** Slope (%): **2**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes		No	
Hydrophytic Vegetation Present?	Yes	X	No	
Hydric Soil Present?	Yes	X	No	
Wetland Hydrology Present?	Yes	X	No	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 15)			
1 *Crataegus monogyna*	10	X	FAC
2 *Crataegus douglasii*	10	X	FAC
3			
4			
	20	= Total Cover	
Sapling/Shrub Stratum (plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 5)			
1 *Phalaris arundinacea*	80	X	FACW
2			
3			
4			
5			
6			
7			
8			
	80	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **3** (A)

Total Number of Dominant Species Across All Strata: **3** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **100%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- **X** 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 3/1	90	10YR 3/6	10	C	PL	Silt Loam	Fine substrate
4-8	10YR 3/1	100					Silt Loam	Medium substrate
8-16	10YR 3/2	100					Silt Loam	Coarse, bulky

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes		No		Depth (inches):	
Surface Water Present?	Yes		No	X	Depth (inches):	
Water Table Present?	Yes	X	No		Depth (inches):	3
Saturation Present? (includes capillary fringe)	Yes	X	No		Depth (inches):	1

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: ORR Property City/County: Tualatin/Washington Sampling Date: 4/28/2017

Applicant/Owner: Trammel Crow Co. State: OR Sampling Point: 20

Investigator(s): FS/DG Section, Township, Range: Section 28D, Township T2S, Range 1W

Landform (hillslope, terrace, etc.:) terrace Local relief (concave, convex, none): none Slope (%): 2

Subregion (LRR): LRR A Lat: 45.36861 Long: -122.80821 Datum: WGS84

Soil Map Unit Name: Aloha silt loam NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes ____ No X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: ____)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size: ____)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Rumex acetosella***	40	X	FACU
2 ***Hypochaeris radicata***	40	X	FACU
3 ***Trifolium pratense***	15		FACU
4 ***Rumex crispus***	5		FAC
5			
6			
7			
8			
	100	= Total Cover	
Woody Vine Stratum (plot size: ____)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation

____ 2- Dominance Test is >50%

____ 3-Prevalence Index is ≤ 3.0[1]

____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

____ 5- Wetland Non-Vascular Plants[1]

____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No X

Remarks:

SOIL

PHS # 6163 Sampling Point: 20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	**10YR 3/3**	**100**					**Silt Loam**	**Fine Substrate**
4-12	**10YR 3/3**	**100**					**Silt Loam**	**Medium Substrate**
12-16	**10YR 4/1**	**80**	**10YR 4/6**	**20**	**C**	**M**	**Silty Clay Loam**	**Medium, Coarse, Bulky**

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** **X**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes		No		Depth (inches):	
Surface Water Present?	Yes		No	**X**	Depth (inches):	
Water Table Present?	Yes	**X**	No		Depth (inches):	**12**
Saturation Present? (includes capillary fringe)	Yes	**X**	No		Depth (inches):	**10**

Wetland Hydrology Present? Yes **X** **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Hydrology present due to recent rains; possibly perched on tight soil layer

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **21**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **slope** Local relief (concave, convex, none): **none** Slope (%): **10%**

Subregion (LRR): **LRR A** Lat: **45.3677** Long: **-122.8085** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ____ No **X**

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 ***Malus pumila***	30	X	UPL
2 ***Crataegus monogyna***	20	X	FAC
3			
4			
	50	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 ***Toxicodendron diversilobum***	20	X	FAC
2 ***Rubus armeniacus***	10	X	FAC
3			
4			
5			
	30	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Poa pratensis***	85	X	FAC
2 ***Cirsium arvense***	10		FAC
3 ***Galium aparine***	5		FACU
4			
5			
6			
7			
8			
	100	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **4** (A)

Total Number of Dominant Species Across All Strata: **5** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **80%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL

PHS # 6163 | Sampling Point: 21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16+	7.5YR 3/2	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Orr Property, Tualatin   City/County: Tualatin/Washington   Sampling Date: 10/15/2019

Applicant/Owner: Trammel Crow   State: OR   Sampling Point: 22

Investigator(s): MS/SE   Section, Township, Range: Section 28D, Township 2S, Range 1W

Landform (hillslope, terrace, etc.:) slope   Local relief (concave, convex, none): none   Slope (%): 2

Subregion (LRR): LRR A   Lat: 45.3676   Long: -122.8086   Datum: WSG85

Soil Map Unit Name: Aloha silt loam   NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed?   Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes X No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 *Salix sitchensis*	60	X	FACW
2			
3			
4			
	60	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 *Crataegus monogyna*	50	X	FAC
2 *Rubus armeniacus*	35	X	FAC
3 *Rubus ursinus*	30	X	FACU
4			
5			
	115	= Total Cover	
Herb Stratum (plot size: 10)			
1 *Agrostis capillaris*	10	X	FAC
2 *Holcus lanatus*	5	X	FAC
3 *Schedonorus arundinaceus*	2		FAC
4 *Phalaris arundinacea*	2		FACW
5 *Carex leptopoda*	1		FAC
6			
7			
8			
	20	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 83% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-7	10YR 2/2	100					Silt loam	
7-14	7.5YR 2/2	95	7.5YR 3/4	5	C	M	Silt loam	Fine

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Indicator		Indicator
	Histosol (A1)		Sandy Redox (S5)
	Histic Epipedon (A2)		Stripped Matrix (S6)
	Black Histic (A3)		Loamy Mucky Mineral (F1) **(except MLRA 1)**
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)
	Depleted Below Dark Surface (A11)		Depleted Matrix (F3)
	Thick Dark Surface (A12)	X	Redox Dark Surface (F6)
	Sandy Mucky Mineral (S1)		Depleted Dark Surface (F7)
	Sandy Gleyed Matrix (S4)		Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

	Indicator
	2 cm Muck (A10)
	Red Parent Material (TF2)
	Very Shallow Dark Surface (TF12)
	Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

	Indicator		Indicator
	Surface Water (A1)		Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
	High Water Table (A2)		
	Saturation (A3)		Salt Crust (B11)
	Water Marks (B1)		Aquatic Invertebrates (B13)
	Sediment Deposits (B2)		Hydrogen Sulfide Odor (C1)
	Drift Deposits (B3)		Oxidized Rhizospheres along Living Roots (C3)
	Algal Mat or Crust (B4)		Presence of Reduced Iron (C4)
	Iron Deposits (B5)		Recent Iron Reduction in Plowed Soils (C6)
	Surface Soil Cracks (B6)		Stunted or Stressed Plants (D1) **(LRR A)**
	Inundation Visible on Aerial Imagery (B7)	X	Other (Explain in Remarks)
	Sparsely Vegetated Concave Surface (B8)		

Secondary Indicators (2 or more required)

	Indicator
	Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
	Drainage Patterns (B10)
	Dry-Season Water Table (C2)
	Saturation Visible on Aerial Imagery (C9)
X	Geomorphic Position (D2)
	Shallow Aquitard (D3)
	Fac-Neutral Test (D5)
	Raised Ant Mounds (D6) **(LRR A)**
	Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	>14
Saturation Present? (includes capillary fringe)		X	>14

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Observations in the spring of 2017 confirmed the presence of seasonally high water table in this vicinity.

Remarks:

This sample point is located at the base of a slope break. It is also at the former edge of acricultural activities and has been disturbed for decades. Vegetation has therefore been disturbed and might otherwise satisfy the FAC-Neutral test.

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **23**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **slope** Local relief (concave, convex, none): **none** Slope (%): **3**

Subregion (LRR): **LRR A** Lat: **45.3676** Long: **-122.8086** Datum: **WSG85**

Soil Map Unit Name: **Aloha silt loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ____ No **X**

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 ***Crataegus monogyna***	60	X	FAC
2 ***Salix sitchensis***	50	X	FACW
3			
4			
	110	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 ***Rubus ursinus***	25	X	FACU
2 ***Rubus armeniacus***	20	X	FAC
3 ***Crataegus monogyna***	20	X	FAC
4 ***Corylus cornuta***	15		FACU
5 ***Oemleria cerasiformis***	1		FACU
	81	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Jacobaea vulgaris***	5	X	FACU
2 ***Tellima grandiflora***	5	X	FACU
3 ***Carex leptopoda***	2		FAC
4			
5			
6			
7			
8			
	12	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **4** (A)

Total Number of Dominant Species Across All Strata: **7** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **57%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	**10YR 3/2**	**100**					**Silt loam**	
12-16	**7.5YR 2.5/2**	**95**	**7.5YR 3/4**	**5**	**C**	**M**	**Silt loam**	**Fine**

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ___	No **X**	Depth (inches):	
Water Table Present?	Yes ___	No **X**	Depth (inches):	**>16**
Saturation Present? (includes capillary fringe)	Yes ___	No **X**	Depth (inches):	**>16**

Wetland Hydrology Present? Yes ___ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Orr Property, Tualatin   City/County: Tualatin/Washington   Sampling Date: 10/15/2019

Applicant/Owner: Trammel Crow   State: OR   Sampling Point: 24

Investigator(s): MS/SE   Section, Township, Range: Section 28D, Township 2S, Range 1W

Landform (hillslope, terrace, etc.:) gently slope   Local relief (concave, convex, none): none   Slope (%): 2

Subregion (LRR): LRR A   Lat: 45.3679   Long: -122.8088   Datum: WSG85

Soil Map Unit Name: Aloha silt loam   NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0 = Total Cover		
Sapling/Shrub Stratum (plot size: 30)			
1 *Rubus armeniacus*	5	X	FAC
2			
3			
4			
5			
	5 = Total Cover		
Herb Stratum (plot size: 10)			
1 *Trifolium pratense*	20	X	FACU
2 *Holcus lanatus*	20	X	FAC
3 *Hypochaeris radicata*	15	X	FACU
4 *Leontodon saxatilis*	5		FACU
5 *Poa annua*	5		FAC
6 *Jacobaea vulgaris*	5		FACU
7 *Rumex crispus*	5		FAC
8 *Anthoxanthum odoratum*	5		FACU
	82 = Total Cover		
Woody Vine Stratum (plot size:)			
1			
2			
	0 = Total Cover		
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
____ 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:
Herbs continued: Epilobium ciliatum - FACW = 1%, Plantago lanceolata - FACU = 1%

SOIL

PHS # 6163

Sampling Point: 24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-16	10YR 3/2	100					Silt Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Orr Property, Tualatin — City/County: Tualatin/Washington — Sampling Date: 10/15/2019

Applicant/Owner: Trammel Crow — State: OR — Sampling Point: 25

Investigator(s): MS/SE — Section, Township, Range: Section 28D, Township 2S, Range 1W

Landform (hillslope, terrace, etc.:) flat — Local relief (concave, convex, none): none — Slope (%): 2

Subregion (LRR): LRR A — Lat: 45.3679 — Long: -122.8088 — Datum: WSG85

Soil Map Unit Name: Aloha silt loam — NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes X No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size:)			
1			
2			
3			
4			
	0	= Total Cover	
Sapling/Shrub Stratum (plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 10)			
1 *Trifolium sp.*	45	X	(FAC)
2 *Leontodon saxatilis*	45	X	FACU
3 *Lolium perenne*	40	X	FAC
4 *Agrostis exarata*	12		FACW
5 *Trifolium pratense*	5		FACU
6 *Rumex crispus*	1		FAC
7 *Jacobaea vulgaris*	1		FACU
8 *Crataegus monogyna*	1		FAC
	150	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- X 2- Dominance Test is >50%
- ____ 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	10YR 3/2	100					Silt loam	
2-9	7.5YR 3/2	95	7.5YR 3/4	3	C	M	Silt loam	Fine
2-9			5YR 3/4	2	C	PL		ORs
9-14	10YR 3/2	97	10YR 3/4	3	C	M	Silt loam	Fine to Medium

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- X Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Plowed Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Fac-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>14
Saturation Present? (includes capillary fringe)		X	>14

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **26**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **depression** Local relief (concave, convex, none): **concave** Slope (%): **1%**

Subregion (LRR): **LRR A** Lat: **45.3665** Long: **-122.8090** Datum: **WSG85**

Soil Map Unit Name: **Quatama loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 *Fraxinus latifolia*	80	X	FACW
2			
3			
4			
	80	= Total Cover	
Sapling/Shrub Stratum (plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 10)			
1 *Geranium ludicum*	5	X	UPL
2 *Poa annua*	5	X	FAC
3 *Galium aparine*	5	X	FACU
4			
5			
6			
7			
8			
	15	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum ____

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **4** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **50%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species	80	x 2 =	160
FAC Species	5	x 3 =	15
FACU Species	5	x 4 =	20
UPL Species	5	x 5 =	25
Column Totals	95 (A)		220 (B)

Prevalence Index =B/A = **2.32**

Hydrophytic Vegetation Indicators:

	1- Rapid Test for Hydrophytic Vegetation
	2- Dominance Test is >50%
X	3-Prevalence Index is ≤ 3.0[1]
	4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
	5- Wetland Non-Vascular Plants[1]
	Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2.5/1	100					Silt loam	Organic 0-horizon
2-9	10YR 3/2	95	10YR 4/4	5	C	M	Silt loam	Fine
10-16	7.5YR 5/1	95	2.5YR 5/6	5	C	M	Silt loam	Fine

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

	Histosol (A1)		Sandy Redox (S5)		2 cm Muck (A10)
	Histic Epipedon (A2)		Stripped Matrix (S6)		Red Parent Material (TF2)
	Black Histic (A3)		Loamy Mucky Mineral (F1) **(except MLRA 1)**		Very Shallow Dark Surface (TF12)
	Hydrogen Sulfide (A4)		Loamy Gleyed Matrix (F2)		Other (explain in Remarks)
	Depleted Below Dark Surface (A11)		Depleted Matrix (F3)		
	Thick Dark Surface (A12)	X	Redox Dark Surface (F6)		
	Sandy Mucky Mineral (S1)	X	Depleted Dark Surface (F7)		
	Sandy Gleyed Matrix (S4)		Redox Depressions (F8)		

Indicators for Problematic Hydric Soils[3]: (third column above)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type:

Depth (inches):

Hydric Soil Present? Yes X No

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply) | Secondary Indicators (2 or more required)

	Surface Water (A1)		Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**		Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
	High Water Table (A2)				
	Saturation (A3)		Salt Crust (B11)		Drainage Patterns (B10)
X	Water Marks (B1)		Aquatic Invertebrates (B13)		Dry-Season Water Table (C2)
	Sediment Deposits (B2)		Hydrogen Sulfide Odor (C1)		Saturation Visible on Aerial Imagery (C9)
	Drift Deposits (B3)		Oxidized Rhizospheres along Living Roots (C3)	X	Geomorphic Position (D2)
	Algal Mat or Crust (B4)		Presence of Reduced Iron (C4)		Shallow Aquitard (D3)
	Iron Deposits (B5)		Recent Iron Reduction in Plowed Soils (C6)		Fac-Neutral Test (D5)
	Surface Soil Cracks (B6)		Stunted or Stressed Plants (D1) **(LRR A)**		Raised Ant Mounds (D6) **(LRR A)**
	Inundation Visible on Aerial Imagery (B7)		Other (Explain in Remarks)		Frost-Heave Hummocks (D7)
X	Sparsely Vegetated Concave Surface (B8)				

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes X No

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **6/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **27**

Investigator(s): **DG** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **hillslope** Local relief (concave, convex, none): **none** Slope (%): **9**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Quatama loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 15)			
1 ***Pseudotsuga menziesii***	20	X	FACU
2 ***Acer macrophyllum***	20	X	FACU
3			
4			
	40	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 ***Corylus cornuta***	50	X	FACU
2 ***Symphoricarpos albus***	20	X	FACU
3 ***Mahonia aquifolium***	10		FACU
4 ***Oemleria cerasiformis***	5		FACU
5 ***Rubus armeniacus***	5		FAC
	90	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Maianthemum stellatum***	5	X	FAC
2 ***Carex hendersonii***	5	X	FAC
3 ***Rubus ursinus***	5	X	FACU
4			
5			
6			
7			
8			
	15	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum **85**

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **2** (A)

Total Number of Dominant Species Across All Strata: **7** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **29%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
____ 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No **X**

Remarks:

SOIL PHS # 6163 Sampling Point: 27

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-3	**7.5YR 3/2**	**100**					**Silt Loam**	
3-9	**5YR 3/3**	**100**					**Silt Loam**	
9-16	**5YR 3/4**	**100**					**Silt Loam**	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** **X**

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		**X**	
Water Table Present?		**X**	**>16**
Saturation Present? (includes capillary fringe)		**X**	**>16**

Wetland Hydrology Present? Yes ___ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: ORR Property | City/County: Tualatin/Washington | Sampling Date: 6/28/2017

Applicant/Owner: Trammel Crow Co. | State: OR | Sampling Point: 28

Investigator(s): DG | Section, Township, Range: Section 28D, Township 2S, Range 1W

Landform (hillslope, terrace, etc.:) depression | Local relief (concave, convex, none): none | Slope (%): 1

Subregion (LRR): LRR A | Lat: 45.36861 | Long: -122.80821 | Datum: WGS84

Soil Map Unit Name: Quatama loam | NWI Classification: None

Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes X No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 15)			
1 *Fraxinus latifolia*	90	X	FACW
2			
3			
4			
	90	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 *Rosa pisocarpa*	40	X	FAC
2			
3			
4			
5			
	40	= Total Cover	
Herb Stratum (plot size:)			
1			
2			
3			
4			
5			
6			
7			
8			
	0	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum 100

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 28

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 4/1	50	5YR 3/3	50	C	M	Silt Loam	Coarse
3-9	10YR 3/2	50	7.5YR 3/4	50	C	M	Silt Loam	Medium
9-16	10YR 4/1	50	7.5YR 4/4	50	C	M	Silt Loam	Coarse

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
X Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
X Sparsely Vegetated Concave Surface (B8)
X Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches)
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Ponding observed for extended period during winter and spring months

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **6/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **29**

Investigator(s): **DG** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **depression** Local relief (concave, convex, none): **none** Slope (%): **1**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Quatama loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?	X	
Hydric Soil Present?	X	
Wetland Hydrology Present?	X	

Is Sampled Area within a Wetland? Yes **X** No ____

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 15)			
1 ***Fraxinus latifolia***	80	X	FACW
2			
3			
4			
	80	= Total Cover	
Sapling/Shrub Stratum (plot size:)			
1			
2			
3			
4			
5			
	0	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Rubus ursinus***	10	X	FACU
2			
3			
4			
5			
6			
7			
8			
	10	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	

% Bare Ground in Herb Stratum **90**

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **2** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **50%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species	80	x 2 =	160
FAC Species		x 3 =	0
FACU Species	10	x 4 =	40
UPL Species		x 5 =	0
Column Totals	90 (A)		200 (B)

Prevalence Index =B/A = **2.22**

Hydrophytic Vegetation Indicators:

- ____ 1- Rapid Test for Hydrophytic Vegetation
- ____ 2- Dominance Test is >50%
- **X** 3-Prevalence Index is ≤ 3.0[1]
- ____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
- ____ 5- Wetland Non-Vascular Plants[1]
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes **X** No ____

Remarks:

Meets PI<3.0 (not dominance test); sparse groundcover due to extended seasonal ponding

SOIL **PHS #** **6163** Sampling Point: **29**

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	**7.5YR 3/1**	**90**	**7.5YR 4/6**	**10**	**C**	**PL**	**Silt Loam**	**Fine**
4-9	**7.5YR 3/1**	**70**	**7.5YR 3/4**	**30**	**C**	**M**	**Silt Loam**	**Medium**
9-16	**7.5YR 3/2**	**60**	**7.5YR 4/3**	**40**	**C**	**M**	**Silt Loam**	**Medium**

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
X Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
X Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
X Sparsely Vegetated Concave Surface (B8)
X Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes X No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Ponding observed for extended period during winter and spring months

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **ORR Property** City/County: **Tualatin/Washington** Sampling Date: **6/28/2017**

Applicant/Owner: **Trammel Crow Co.** State: **OR** Sampling Point: **30**

Investigator(s): **DG** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **hillslope** Local relief (concave, convex, none): **none** Slope (%): **9**

Subregion (LRR): **LRR A** Lat: **45.36861** Long: **-122.80821** Datum: **WGS84**

Soil Map Unit Name: **Quatama loam** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ____ (if no, explain in Remarks)

Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X
Is Sampled Area within a Wetland?		X

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 15)			
1 ***Quercus garryana***	20	X	FACU
2 ***Arbutus menziesii***	5	X	UPL
3			
4			
	25	= Total Cover	
Sapling/Shrub Stratum (plot size: 5)			
1 ***Amelanchier alnifolia***	40	X	FACU
2 ***Corylus cornuta***	20	X	FACU
3 ***Gaultheria shallon***	10		FACU
4 ***Toxicodendron diversilobum***	10		FAC
5			
	80	= Total Cover	
Herb Stratum (plot size: 5)			
1 ***Geranium lucidum***	30	X	UPL
2 ***Polystichum munitum***	10	X	FACU
3 ***Rubus ursinus***	10	X	FACU
4			
5			
6			
7			
8			
	50	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum	50		

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **0** (A)

Total Number of Dominant Species Across All Strata: **7** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **0%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
____ 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ____ **No** **X**

Remarks:

SOIL PHS # 6163 Sampling Point: 30

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 2/2	100					Silt Loam	Mostly accumulated duff

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: **Basalt**

Depth (inches): **4**

Hydric Soil Present? Yes ___ **No X**

Remarks:

Refusal on basalt bedrock; primarily accumulated organic debris, some airborne silt on top

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>4
Saturation Present? (includes capillary fringe)		X	>4

Wetland Hydrology Present? Yes ___ **No X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Based on landscape position and lack of hydrophytic vegetation, presumed to lack hydrologic indicators despite limited depth of sampling.

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: Orr Property, Tualatin City/County: Tualatin/Washington Sampling Date: 10/15/2019
Applicant/Owner: Trammel Crow State: OR Sampling Point: 31
Investigator(s): MS/SE Section, Township, Range: Section 28D, Township 2S, Range 1W
Landform (hillslope, terrace, etc.:) base of slope Local relief (concave, convex, none): concave Slope (%): 2-3
Subregion (LRR): LRR A Lat: 45.3662 Long: -122.8110 Datum: WSG85
Soil Map Unit Name: Xerochrepts rock outcrop complex NWI Classification: None
Are climatic/hydrologic conditions on the site typical for this time of year? Yes X No ____ (if no, explain in Remarks)
Are vegetation ____ Soil ____ or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? (Y/N) Y
Are vegetation ____ Soil ____ or Hydrology ____ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is Sampled Area within a Wetland?**	Yes X No
Hydric Soil Present?	Yes X	No		
Wetland Hydrology Present?	Yes X	No		

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 *Fraxinus latifolia*	40	X	FACW
2 *Salix sitchensis*	10	X	FACW
3			
4			
	50	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 *Rubus ursinus*	35	X	FACU
2 *Physocarpus capitatus*	15	X	FACW
3 *Symphoricarpos albus*	10		FACU
4 *Alnus rubra*	10		FAC
5 *Gaultheria humifusa*	5		FACW
	75	= Total Cover	
Herb Stratum (plot size: 10)			
1 *Juncus patens*	30	X	FACW
2 *Carex leptopoda*	20	X	FAC
3 *Geum macrophyllum*	15		FAC
4 *Geranium ludicum*	15		(FAC)
5 *Carex obnupta*	10		OBL
6 *Cinna arundinacea*	5		(FAC)
7			
8			
	95	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That are OBL, FACW, or FAC: 83% (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = #DIV/0!

Hydrophytic Vegetation Indicators:

____ 1- Rapid Test for Hydrophytic Vegetation
X 2- Dominance Test is >50%
____ 3-Prevalence Index is ≤ 3.0[1]
____ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)
____ 5- Wetland Non-Vascular Plants[1]
____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes X No ____

Remarks:

SOIL PHS # 6163 Sampling Point: 31

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(Inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-4	10YR 3/2	100					Silt loam	
4-10	10YR 4/2	95	7.5YR 5/8	5	C	PL	Silt loam	Fine ORs
10-16	10YR 4/3	90	7.5YR 4/6	10	C	M	Silt loam	Medium

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
X Depleted Matrix (F3)
X Redox Dark Surface (F6)
X Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes X **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
X Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
X Geomorphic Position (D2)
___ Shallow Aquitard (D3)
X Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes	No	Depth (inches):
Surface Water Present?		X	
Water Table Present?		X	>16
Saturation Present? (includes capillary fringe)		X	>16

Wetland Hydrology Present? Yes X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

PHS # 6163

WETLAND DETERMINATION DATA FORM - Western Mountains, Valleys, and Coast Region

Project/Site: **Orr Property, Tualatin** City/County: **Tualatin/Washington** Sampling Date: **10/15/2019**

Applicant/Owner: **Trammel Crow** State: **OR** Sampling Point: **32**

Investigator(s): **MS/SE** Section, Township, Range: **Section 28D, Township 2S, Range 1W**

Landform (hillslope, terrace, etc.:) **slope** Local relief (concave, convex, none): **none** Slope (%): **10%**

Subregion (LRR): **LRR A** Lat: **45.3662** Long: **-122.8110** Datum: **WSG85**

Soil Map Unit Name: **Xerochrepts rock outcrop complex** NWI Classification: **None**

Are climatic/hydrologic conditions on the site typical for this time of year? Yes **X** No ___ (if no, explain in Remarks)

Are vegetation ___ Soil ___ or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? (Y/N) **Y**

Are vegetation ___ Soil ___ or Hydrology ___ naturally problematic? If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

	Yes	No
Hydrophytic Vegetation Present?		X
Hydric Soil Present?		X
Wetland Hydrology Present?		X

Is Sampled Area within a Wetland? Yes ___ No **X**

Remarks:

VEGETATION - Use scientific names of plants.

	absolute % cover	Dominant Species?	Indicator Status
Tree Stratum (plot size: 30)			
1 ***Pseudotsuga menziesii***	25	X	FACU
2 ***Prunus avium***	15	X	FACU
3 ***Quercus garryana***	15	X	FACU
4 ***Salix sitchensis***	10		FACW
	65	= Total Cover	
Sapling/Shrub Stratum (plot size: 30)			
1 ***Corylus cornuta***	60	X	FACU
2 ***Rubus ursinus***	20		FACU
3 ***Mahonia aquifolium***	10		FACU
4 ***Rubus armeniacus***	10		FAC
5 ***Toxicodendron diversilobum***	5		FAC
	110	= Total Cover	
Herb Stratum (plot size: 10)			
1 ***Geranium ludicum***	70	X	UPL
2 ***Carex leptopoda***	25	X	FAC
3			
4			
5			
6			
7			
8			
	95	= Total Cover	
Woody Vine Stratum (plot size:)			
1			
2			
	0	= Total Cover	
% Bare Ground in Herb Stratum			

Dominance Test worksheet:

Number of Dominant Species That are OBL, FACW, or FAC: **1** (A)

Total Number of Dominant Species Across All Strata: **6** (B)

Percent of Dominant Species That are OBL, FACW, or FAC: **17%** (A/B)

Prevalence Index Worksheet:

Total % Cover of		Multiply by:	
OBL Species		x 1 =	0
FACW species		x 2 =	0
FAC Species		x 3 =	0
FACU Species		x 4 =	0
UPL Species		x 5 =	0
Column Totals	0 (A)		0 (B)

Prevalence Index =B/A = **#DIV/0!**

Hydrophytic Vegetation Indicators:

___ 1- Rapid Test for Hydrophytic Vegetation

___ 2- Dominance Test is >50%

___ 3-Prevalence Index is ≤ 3.0[1]

___ 4-Morphological Adaptations[1] (provide supporting data in Remarks or on a separate sheet)

___ 5- Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ___ No **X**

Remarks:

Shrubs continued: Holodiscus discolor - FACU = 2%, Polystichum munitum - FACU - 2%, Mahonia nervosa - (FACU) - 1%.

SOIL **PHS #** 6163 Sampling Point: 32

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (Inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/3	100					Silt loam	
9-14	10YR 3/4	100					Silt loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF12)
___ Other (explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ **No** X

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water stained Leaves (B9) **(Except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Plowed Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water stained Leaves (B9) **(MLRA1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ Fac-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

	Yes		No		Depth (inches):
Surface Water Present?	Yes		No	X	
Water Table Present?	Yes		No	X	>14
Saturation Present? (includes capillary fringe)	Yes		No	X	>14

Wetland Hydrology Present? Yes ___ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Appendix C

Site Photos

Photo A:

Looking south along western edge of Wetland A, from near Tualatin-Sherwood Road.

Photo taken: April 28, 2017

Photo B:

Looking northeast into Wetland A, near Sample point #4.

Photo taken: April 28, 2017

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Photo documentation

T-S Corporate Park—Sherwood, Oregon

Photo C:

Looking southwest into Wetland A, with young ash saplings (left) and mature ash stand (right).

Photo taken: April 28, 2017

Photo D:

Looking west at lower (north) end of Wetland A and culvert feeding under Tualatin-Sherwood Road.

Photo taken: December 13, 2019

Photo E:

Looking northwest across Wetland A toward isolated upland area.

Photo taken: April 28, 2017

Photo F:

Looking east across Wetland B in agricultural field, toward Wetland A. Sample points visible in this photo reflect the location of data collected in 2017 and are not in the same locations as data collected in 2019.

Photo taken: April 28, 2017

Photo G:

Looking north along west edge of Wetland A; Sample point #19 visible at right.

Photo taken: April 28, 2017

Photo H:

Looking north into eastern edge of Wetland A, with primarily reed canarygrass, tall fescue and Himalayan blackberry in foreground.

Photo taken: December 13, 2019

Photo I:

Looking south across Wetland C in southern portion of study area; wetland continues offsite.

Photo taken: March 7, 2017

Photo J:

Looking northwest along the western boundary of Wetland C.

Photo taken: October 15, 2019

Appendix D

Wetland Definitions and Methodology

WATERS OF THE STATE AND WETLAND DEFINITION AND CRITERIA

Regulatory Jurisdiction

Wetlands and water resources in Oregon are regulated by the Oregon Department of State Lands (DSL) under the Removal-Fill Law (ORS 196.800-196.990) and by the U.S. Army Corps of Engineers (COE) through Section 404 of the Clean Water Act.

The primary source documents for wetland delineations within Oregon is the *Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1* (Environmental Laboratory 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region,* which are recognized by both DSL and COE.

Waters of the State and Wetland Definition

Waters of the State are defined as “natural waterways including all tidal and non-tidal bays, intermittent streams, constantly flowing streams, lakes, wetlands and other bodies of water in this state, navigable and non-navigable...”. “Natural waterways” is further defined as waterways created naturally by geological and hydrological processes, waterways that would be natural but for human-caused disturbances (e.g. channelized or culverted streams, impounded waters, partially drained wetlands or ponds created in wetlands)...”(DSL, 2001).

Wetlands are defined as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions” (DSL 2001).

Wetland Criteria

Based on the above definition, three major factors characterize a wetland: hydrology, substrate, and biota.

Wetland Hydrology

Wetland hydrology is related to duration of saturation, frequency of saturation, and critical depth of saturation. The 1987 manual defines wetland hydrology as inundation or saturation within a major portion of the root zone (usually above 12 inches), typically for at least 12.5% of the growing season. The wetland hydrology criterion can be met, however, if saturation within the major portion of the root zone is present for only 5% of the growing season, depending on other evidence.

The growing season is defined as the portion of the year when soil temperatures at 12.0 inches below the soil surface are higher than biological zero (41 degrees Fahrenheit, 5 degrees Celsius), but also allows approximation from frost free days, based on air temperature. The growing season for any given site or location is determined from US Natural Resources Conservation Service, (formerly Soil Conservation Service) data and information.

Wetland hydrologic indicators include the following: visual observation of inundation or saturation, watermarks, drift lines, sediment deposits, and/or oxidized rhizospheres with living roots. Oxidized rhizospheres are defined as yellowish-red zones around the roots and rhizomes of some plants that grow in frequently saturated soils. Other indicators of hydrology, including algal mats or crust, iron deposits, surface soil cracks, sparsely vegetated concave surface, salt crust, aquatic invertebrates, hydrogen sulfide odor, reduced iron, iron reduction in tilled soils, and stunted or stressed plants can also be used to determine the presence of wetland hydrology.

Wetland Substrate (Soils)

Most wetlands are characterized by hydric soils. Hydric soils are those that are ponded, flooded, or saturated for long enough during the growing season to develop anaerobic conditions. Periodic saturation of soils causes alternation of reduced and oxidized conditions, which leads to the formation of redoximorphic features (gleying and mottling). Mineral hydric soils will be either gleyed or will have bright mottles and/or low matrix chroma. The redoximorphic feature known as gley is a result of greatly reduced soil conditions, which result in a characteristic grayish, bluish or greenish soil color. The term mottling is used to describe areas of contrasting color within a soil matrix. The soil matrix is the portion of the soil layer that has the predominant color. Soils that have brightly colored mottles and a low matrix chroma are indicative of a fluctuating water table.

Hydric soil indicators include: organic content of greater than 50% by volume, and/or presence of redoximorphic features and dark soil matrix, as determined by the use of a Munsell Soil Color Chart. This chart establishes the chroma, value and hue of soils based on comparison with color chips. Mineral hydric soil must meet one of the 16 definitions for hydric soil indicators, or be classified as a "problem soil" in the Regional Supplement.

Wetland Biota (Vegetation)

Wetland biota is defined as hydrophytic vegetation. A hydrophyte is a plant species that is capable of growing in substrates that are periodically deficient in oxygen as a result of saturated soil conditions. The U.S. Fish and Wildlife Service, in the *National List of Plant Species that Occur in Wetlands*, has established five basic groups of vegetation based on their frequency of occurrence in wetlands. These categories, referred to as the "wetland indicator status", are as follows: obligate wetland plants (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), and obligate upland (UPL). Table 1 gives a definition of the plant indicator codes.

Table 1. Description of Wetland Plant Indicator Status Codes

Indicator Code	Status
OBL	Obligate wetland. Plants that always occur in standing water or in saturated soils.
FACW	Facultative wetland. Plants that nearly always occur in areas of prolonged flooding or require standing water or saturated soils but may, on rare occasions, occur in non-wetlands.
FAC	Facultative. Plants that occur in a variety of habitats, including wetland and mesic to xeric non-wetland habitats but commonly occur in standing water or saturated soils.
FACU	Facultative upland. Plants that typically occur in xeric or mesic non-wetland habitats but may frequently occur in standing water or saturated soils.
UPL	Obligate upland. Plants that rarely occur in water or saturated soils.

Observations of hydrology, soils, and vegetation, were made using the "Routine On-site" delineation method as defined in the 1987 manual and the Regional Supplement for areas that were not currently in agricultural production. One-foot diameter soil pits were excavated to 20 inches and soil profiles were examined for hydric soil and wetland hydrology field indicators. In addition, a visual absolute-cover estimate of the dominant species of the plant community was performed using soil pit locations as a center of reference. Dominant plant species are based on estimates of absolute cover for herbaceous, and shrub species within a 5 foot radius of the sample point, and basal area cover for tree and woody vine species within a 30 foot radius of the sample point. Plant species in each vegetative layer, which are estimated at less than 20% of the total cover, are not considered to be dominant. The wetland indicator status is then used to determine if there is an overall dominance (greater than 50%) of wetland or upland plant species. If less than 50% of the dominant species are hydrophytic, then the prevalence index may be used to determine if the subdominant species are hydrophytic. If the prevalence index is less than or equal to 3, hydrophytic vegetation criterion is met.

During data collection, the soil profiles were examined for hydric soil and wetland hydrology field indicators. Plant species and cover were recorded. Data was recorded on standard data sheets, which contain the information specified in the 1987 Corps Manual and the Regional Supplement.

WETLAND DELINEATION / DETERMINATION REPORT COVER FORM

This form must be included with any wetland delineation report submitted to the Department of State Lands for review and approval. A wetland delineation report submittal is not "complete" unless the fully completed and signed report cover form and the required fee are submitted. Attach this form to the front of an unbound report or include a hard copy of the completed form with a CD/DVD that includes a single PDF file of the report cover form and report (minimum 300 dpi resolution) and submit to: **Oregon Department of State Lands, 775 Summer Street NE, Suite 100, Salem, OR 97301-1279.** A single PDF attachment of the completed cover from and report may be e-mailed to **Wetland_Delineation@dsl.state.or.us**. For submittal of PDF files larger than 10 MB, e-mail instructions on how to access the file from your ftp or other file sharing website. Fees can be paid by check or credit card. Make the check payable to the Oregon Department of State Lands. To pay the fee by credit card, call 503-986-5200.

☒ Applicant ☐ Owner Name, Firm and Address: **Niki Iverson, Water Resource Manager** **City of Hillsboro Water Department** **150 E. Main Street** **Beaverton, OR 97006**	Business phone # **(503) 615-6770** Mobile phone # (optional) E-mail: **niki.iverson@hillsboro-oregon.gov**
☒ Authorized Legal Agent, Name and Address: **Niki Iverson, Water Resource Manager** **City of Hillsboro Water Department**	Business phone # **(503) 615-6770** Mobile phone # E-mail: **niki.iverson@hillsboro-oregon.gov**

I either own the property described below or I have legal authority to allow access to the property. I authorize the Department to access the property for the purpose of confirming the information in the report, after prior notification to the primary contact.

Typed/Printed Name: **Niki Iverson** Signature: [signature]

Date: 1/5/17 Special instructions regarding site access: ______

Project and Site Information (using decimal degree format for lat/long.,enter centroid of site or start & end points of linear project)

Project Name: **Willamette Water Supply Program**	Latitude: **45.365033**	Longitude: **-122.808787**
Proposed Use: **Water Treatment Plant for Willamette Water Supply Program**	Tax Map # **2S128D000100**	
Project Street Address (or other descriptive location): **12900 SW Tualatin-Sherwood Rd**	Township **2S** Range **1W** Section **28** QQ **SE/SE** Tax Lot(s) **100**	
City: **Sherwood** County: **Washington**	Waterway: **None** NWI Quad(s):	River Mile: --

Wetland Delineation Information

Wetland Consultant Name, Firm and Address: **John Macklin** **David Evans and Associates, Inc.** **2100 SW River Parkway** **Portland, OR 97201**	Phone # **503-223-6663** Mobile phone # E-mail: **jdm@deainc.com**

The information and conclusions on this form and in the attached report are true and correct to the best of my knowledge.

Consultant Signature: John Macklin | Date: 01-04-2017

Primary Contact for report review and site access is ☒ Consultant ☐ Applicant/Owner ☐ Authorized Agent

Wetland/Waters Present? ☒ Yes ☐ No | Study Area size: **31.06 ac** | Total Wetland Acreage: **.16**

Check Box Below if Applicable:	**Fees:**
☐ R-F permit application submitted	☐ Fee payment submitted **$ 419**
☐ Mitigation bank site	☐ Fee ($100) for resubmittal of rejected report
☐ Wetland restoration/enhancement project (not mitigation)	☐ No fee for request for reissuance of an expired report
☐ Industrial Land Certification Program Site	
☐ Reissuance of a recently expired delineation Previous DSL # Expiration date _____	

Other Information:	Y	N	
Has previous delineation/application been made on parcel?	☐	☐	If known, previous DSL #
Does LWI, if any, show wetland or waters on parcel?	☐	☐	

For Office Use Only

DSL Reviewer: PR	Fee Paid Date: 1 / 17 / 17	DSL WD # 2017-0008
Date Delineation Received: 1 / 9 / 17	DSL Project #	DSL Site #
Scanned: ☒ Final Scan: ☐	DSL WN #	DSL App. #

Electronic Submittal

Form Updated 01/03/2013

NOTICE: REPORTS ARE CONSIDERED DRAFT DOCUMENTS UNTIL REVIEW IS COMPLETED BY DSL. WETLAND MAPS MAY CHANGE AS A RESULT OF DSL REVIEW.

Wetland Delineation Report

Willamette Water Supply Program

Willamette Water Supply System Water Treatment Plant Site

Prepared for:

Willamette Water Supply
Our Reliable Water

9600 SW Oak Street, Suite 238
Tigard, OR 97223

Prepared by:

DAVID EVANS AND ASSOCIATES INC

David Evans and Associates, Inc.
2100 SW River Parkway
Portland, Oregon 97201

January 2017

Table of Contents

List of Tables

1 INTRODUCTION

The Willamette Water Supply Program (WWSP) has been identified by the Tualatin Valley Water District (TVWD) and the City of Hillsboro ((Hillsboro), collectively referred to as the Partners)) as the next infrastructure project to deliver drinking water to municipalities in Washington County by developing the mid-Willamette River at Wilsonville as an additional water supply source.

This delineation report is one of several produced by David Evans and Associates, Inc. (DEA) for the Program. The Program has been divided into work packages (i.e., construction projects) that cover pipeline alignments (including potential alternate alignments), water reservoirs (tanks), and a new water treatment plant facility. Separate delineation reports have been prepared to match each work package study area.

This wetland delineation report only covers the study area for the proposed Willamette Water Supply System Water Treatment Plant (WWSS WTP or WTP). DEA conducted an on-site Wetland Delineation for the proposed WTP site on November 3 and 4, 2016. The site is located in unincorporated Washington County, Oregon (Township 2 South, Range 1 West, Section 28D, Willamette Meridian) (see maps in Appendix A). The site is located east of the City of Sherwood at tax lot ID 2S128D00100. Seven wetlands and no waters were delineated within the study area. In addition, one inaccessible area may contain additional wetlands.

2 LANDSCAPE SETTING AND LAND USE

The 49.7-acre study area is located east of the City of Sherwood, south of SW Tualatin-Sherwood Road, and between Dahlke Lane and SW 120th Avenue. A gravel operation and a future SW 124th Avenue extension (currently under construction) lie to the east, and a farmed field lies north of the study area. The site is densely forested with undulating topography and rocky outcroppings. Upland vegetation consists primarily of Oregon oak (*Quercus garryana*), Pacific madrone (*Arbutus menziesii*), and Douglas fir (*Pseudotsuga menziesii*) trees, with extensive thickets of poison oak (*Toxicodendron diversilobum*) in the understory. Delineated wetlands were observed in depressions and are further described in Section 6. A power line corridor that crosses the south part of the study area is maintained as shrub habitat.

3 SITE ALTERATIONS

The study area is situated in an undulating, undeveloped area. At the time of survey, an extension of SW 124th Avenue was being constructed along the eastern boundary.

A power line right of way crosses the study area diagonally across the southern half. Several trails existed previous to the survey, and more were established to access the areas of potential wetlands as described in Section 5.2 Field Methods.

4 PRECIPITATION DATA AND ANALYSIS

Wetland delineation field work occurred on November 3 and 4, 2016. Daily and monthly precipitation data was taken from the National Weather Service (NWS) station in Portland due to a lack of WETS climate data in Beaverton for these dates. Table 1 shows the two-week precipitation total prior to the field dates. The precipitation record reveals that precipitation was within the range of normal for the short term, but was well above normal in the medium and long term. August was well below normal for precipitation, September was normal, and October was well above normal (Table 2)

Precipitation for the water year at the time of survey was 258%, well above normal (Table 3). Because most of the heavy precipitation occurred in early October, site conditions were assumed to be somewhat wetter than normal. Care was given to recognize abnormal hydrologic patterns in the field, but it was not apparent that the soil profile was saturated outside of typical areas.

Table 1: Precipitation for November 2016 Field Investigations and Two Weeks Prior, in Inches

Oct 20	Oct 21	Oct 22	Oct 23	Oct 24	Oct 25	Oct 26
0.26	0.48	0.04	0.07	0.07	Trace	0.67
Oct 27	**Oct 28**	**Oct 29**	**Oct 30**	**Oct 31**	**Nov 1**	**Nov 2**
0.16	0.01	0.16	0.11	0.19	Trace	0.05
Nov 3 *	**Nov 4***	**2-wk Total**				
0.00	**0.00**	**2.27**				

**Days of field investigation. Source: (NWS 2016)*

Table 2: Percent of Normal Precipitation for the 3 Months Preceding the November Field Investigation

Month	Normal Precipitation for Month (Inches)	Observed Precipitation for Month (Inches)	Departure from Normal (inches)	Within 30% of Normal Precipitation for Water Year?
August	0.71	0.16	-0.55	No (23% of normal)
September	1.54	1.26	-0.28	Yes (82% of normal)
October	3.54	10.11	+6.69	No (296% of normal)

Source: (NWS 2016)

Suitable required climatological data for wetland delineations is not available for the Sherwood area. Therefore, alternate nearby data were used as follows. Daily, monthly, and water-year precipitation data were obtained from the Portland, Oregon, National Weather Service climatological data (NWS 2016). As per Oregon Department of State Lands (DSL) methods, because the WETS table was not available for Sherwood, the closest location (BEAVERTON 2 SSW, OR0595) is provided in Appendix D. For consistency, the percent of normal totals for the above tables were taken from the Portland, Oregon NWS climatological data (NWS 2016) rather than from the WETS table. The NWS does not provide readily available compiled precipitation data for Beaverton.

Table 3: Percent of Normal Precipitation for the Water Year Preceding the November Field Investigations

Month	Normal Precipitation (Inches)	Observed Precipitation (Inches)	Departure from Normal (inches)	Within 30% of Normal Precipitation for Water Year?
November 3 and 4, 2016*	3.95	10.19	+6.24	No (258% of normal)

**No precipitation on these dates (NWS 2016).*

5 METHODS

5.1 PRELIMINARY RESOURCE REVIEW

Reference materials were reviewed prior to the field investigation to provide information regarding the possible presence of wetlands, water features, hydric soils, wetland hydrology, and site topography. The materials reviewed are referenced in Appendix E, and included the following:

- Precipitation data for Portland, Oregon (National Weather Service 2016).
- ESRI, ArcGIS Online, USA area Topographic Maps, Sherwood Valley, Oregon 1961
- ESRI, World Imagery, Aerials Express, 2010
- US Fish and Wildlife Service (USFWS), NWI, Wetlands Mapper V2, 2016
- Natural Resource Conservation Service (NCRS). 2014. Web Soil Survey, Washington County Area, Oregon.
- Tax Lots for Washington County Area, Oregon (Metro RLIS Data, 2016).

The USGS Quadrangles were examined to determine water features and topography of the site and adjacent properties that might influence on-site conditions (Appendix A: Figure 1). Figure 2 displays the study area tax lot boundaries. The NWI maps (Appendix A: Figure 3) were examined to determine if wetlands are mapped on site. The local wetland inventory (LWI) for the Sherwood area did not extend to the study area and was not examined further (DEA 1992). The Soil Survey map (Appendix A: Figure 4) was reviewed to determine if any hydric soils are mapped on site. Table 4 summarizes the soils mapped within the study area.

Table 4: Soils Mapped (NRCS 2014) as Occuring in the Project Study Area

Map Unit	Soil Series	Hydric Status	SCS Drainage Description
37C	Quatama loam, 7 to 12 percent slopes	Non-hydric	Moderately well drained
38C	Saum silt loam, 7 to 12 percent slopes	Non-hydric	Well drained
38E	Saum silt loam, 20 to 30 percent slopes	Non-hydric	Well drained
47D	Xerochrepts-Rock outcrop complex	Non-hydric	Well drained

5.2 FIELD METHODS

Wetland areas were delineated on November 3 and 4, 2016, according to the Level 2 Routine On-Site Method described in the *1987 U.S. Army Corps of Engineers* (USACE) *Wetland Delineation Manual* (Environmental Laboratory 1987) and the Regional Supplement to the USACE Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (USACE 2010). This method requires an area to possess a prevalence of hydrophytic vegetation, hydric soils, and wetland hydrology. Under normal circumstances, positive indicators of each of these three parameters must be present for an area to satisfy the criteria for jurisdictional wetlands. Soils, vegetation, and hydrologic indicators were inspected throughout the site and were documented at six data plots (Appendix B: Wetland Delineation Data Forms). Representative site photographs are included in Appendix C: Ground Level Color Photographs). Methods and information specific to the site are provided below.

A preliminary site reconnaissance revealed that the thick shrub-level vegetation included a significant component of poison oak to the extent that foot travel through the site was not possible beyond existing trails. Therefore, field investigation was based on preliminary resource review to a greater extent than usual. In addition to wetland inventory and soils inventory, detailed two-foot contour LIDAR topography was reviewed. Areas mapped as inventoried wetland, as hydric soils, and/or simply low-lying areas based on LIDAR topography (Figure 6) were considered potential wetlands requiring field inspection. Due to the extremely rocky geology and shallow soils on the site, it appeared unlikely for wetlands to form elsewhere on the site, and due to the thick coverage of poison oak it was not possible to inspect areas unlikely to contain wetlands. The potential wetland areas were accessed on existing trails where possible. Locations with no access route were investigated by clearing new trails using equipment.

5.2.1 Hydrology

All data was collected during the growing season, which ends November 24, and no problematic conditions prevail. The entire project study area was examined for indicators of hydrology as established by the Corps 1987 Manual and Supplement.

It was recognized that precipitation was high for the water year prior to survey, and that saturation may have occurred in upland areas.

5.2.2 Soils

Soils were inspected throughout the site and documented in each data plot (Appendix B). Soil pits were dug to a depth of 20 inches, when not hindered by the presence of rock or hardpan. Soil was analyzed for color using the Munsell Soil Color Charts (Munsell Color 2009).

5.2.3 Vegetation

Vegetation was inspected and identified throughout the site, and was documented in each data plot (Appendix B) in order to define wetland boundaries and document homogenous vegetation communities. In accordance with the USACE 1987 Manual (Environmental Laboratory 1987), vegetation plots were established in areas supporting a single plant community. Plant species observed were identified using Flora of the Pacific Northwest (Hitchcock and Cronquist 1973) and assigned their indicator status using the Western Mountains, Valleys, and Coast indicators from the 2016 National Wetland Plant List (Lichvar et al. 2016).

Percent cover of each plant species was visually estimated. Plots were sized at 5-foot radius for herbaceous layer and 30-foot radius for shrubs, saplings, vines, and trees. Plot sizes and shapes, however, were altered to assure that they represented only a single plant community as identified in descriptions below. Overhanging tree and shrub canopies were not documented if the trees were rooted in a different community.

5.2.4 Atypical Situations

The 1987 Manual and Regional Supplement define wetlands in which wetland indicators for one or more of the three parameters are absent due to recent human activities as "atypical situations". Although vegetation had been cleared in the site for access, all parameters were intact and the site had not undergone recent significant disturbance near the wetland boundaries. Therefore, the procedures for atypical situations as described in the Supplement Chapter 5 were not needed.

6 WETLANDS AND NON-WETLAND WATERS

Seven wetlands and one potential wetland were delineated in the study area (Wetlands A, B, C, D, E, F, G, and PW-H) and are described below. Their locations are shown on Figure 6 in Appendix A. One inaccessible area was mapped as potential wetland (i.e. PW-H). PW-H was not accessed at the time of survey due to a lack of a cleared access route through the extremely dense poison oak and the uncertainty of future project-related disturbance. No other waters (e.g. creeks) occur within the study area.

All wetlands (A through G) would be classified as depressional wetlands according to the HGM classification system. The wetlands receive hydrology from precipitation runoff from surrounding slopes and groundwater discharge. Based on the closed depression topography of PW-H, it is assumed that it would also be classified as depressional. Wetland C continues offsite to the north and west. Wetland C is likely jurisdictional to both DSL and USACE because of its connectivity to other waters off-site to the north. All other wetlands appear to be isolated and are thus under the jurisdiction of DSL but likely not the USACE.

6.1 WETLAND A

Wetland A (0.1 acre) was delineated in the north central portion of the study area (Appendix A: Figure 6). The wetland is isolated in a depression, roughly half of which is surrounded by rocky slopes and rock overhangs. Wetland A would be classified as a palustrine scrub-shrub wetland with some forested canopy based on the Cowardin classification system (Cowardin et al. 1979). Wetland A is dominated by hardhack (*Spiraea douglassii*), Oregon ash (*Fraxinus latifolia*), Pacific crabapple (*Malus fusca*), and slough sedge (*Carex obnupta*). Also present in the wetland plant community were swamp rose (*Rosa pisocarpa*) and Pacific willow (*Salix lasiandra*). Soils were determined to be hydric based on the histic epipedon (A2) indicator (USACE 2010) as represented by Plot 1. The wetland boundary was determined by the steep slopes leading down to the wetland and the change from hardhack to Douglas-fir , salal (*Gaultheria shallon*), and dull Oregon-grape (*Mahonia nervosa*) in the adjacent upland community (Plot 2), as well as hydrologic indicators (the extent of saturation and high water table, which were lacking in Plot 2).

6.2 WETLAND B

Wetland B (0.1 acre) was delineated northwest of Wetland A in the northwest portion of the study area. The wetland is isolated in a depression, consists largely of unvegetated ponded water over two feet deep, and is surrounded by rocky outcroppings, steep rock faces, and boulders. Wetland B would be classified as a palustrine unconsolidated bottom wetland (Cowardin et al 1979). Plot 3 is representative of the vegetated portion of Wetland B and was dominated by reed canarygrass (*Phalaris arundinacea*), colonial bentgrass (*Agrostis capillaris*), and swamp rose. Wetland vegetation generally occurred in patches of soil within the inundated perimeter. The vegetation outside of the inundated perimeter is non-hydrophytic and is dominated by Oregon white oak, Douglas-fir, serviceberry poison oak, licorice fern (*Polypodium glycyrrhiza*), and dovefoot geranium (*Geranium molle*). The wetland boundary was determined by the steep rock slopes and the change from reed canarygrass to serviceberry, Douglas-fir, and licorice fern in the adjacent upland community (Plot 4), as well as hydrologic indicators (the extent of saturation and high water table, which were lacking in Plot 4). Approximately half of the wetland boundary is defined by nearly vertical rock slopes.

6.3 WETLAND C

Wetland C (0.3 acre) lies in the far northwest corner of the study area and continues off-site to the north and east. It appears to flow northeasterly (off-site) and constitutes "Oregon ash swale" habitat in some stretches. Wetland C would be classified as a palustrine forested and scrub-shrub wetland (Cowardin et al 1979). Plots 6 and 7 represent Wetland C. Plot 6 was dominated by Oregon ash. Also present in this wetland plant community were swamp rose, hardhack, and slough sedge. Plot 6 met the hydric soils criteria by the histic epipedon indicator, and met the hydrology indicator by the presence of surface water. Bitter cherry (*Prunus emarginata*) and salal were dominant in the adjacent upland community described by Plot 5.

Plot 7 was representative of the scrub-shrub portions of Wetland C and was dominated by hardhack, swamp rose, and Oregon ash. Plot 7 met the loamy mucky mineral (F1) hydric soil indicator and was underlain by a rock layer. Standing water and saturation were present throughout.

The wetland boundary was determined by the topographic break, a sharp difference between upland and hydrophytic vegetation communities, and the presence of hydrology indicators.

6.4 WETLAND D

Wetland D (0.2 acre) occurs near the center of the study area and is a closed depression with standing water. Wetland D is a palustrine scrub-shrub wetland but also has a large palustrine unconsolidated bottom component of open water (Cowardin et al. 1979).

The scrub-shrub component is represented by Plot 9, which is dominated by hardhack, Pacific crabapple, and swamp rose. Wetland D unconsolidated bottom is represented by Plot 11, which was primarily six-inch deep water with no vegetation except Oregon Ash canopy. Both plots showed the histic epipedon hydric soil indicator and had standing water within the plot. Plots 10 and 12 represent the transition to an upland Oregon white oak and Douglas-fir community upslope from Wetland D. The wetland boundary was determined by a transition in plant community, a topographic change, and a lack of wetland hydrology upslope.

6.5 WETLAND E

Wetland E (0.1 acre) is located near the center of the study area and is an inundated closed depression. Wetland E would be classified as a palustrine scrub-shrub wetland (Cowardin et al. 1979).

The plot was dominated by hardhack with smaller amounts of Nootka rose (*Rosa nutkana*), Pacific crabapple, and Oregon white oak present. Plot 13 is representative of the wetland, which was primarily six-inch deep water with dense hardhack. The histic epipedon (A2) hydric soil indicator was present. Plot 14 represents the adjacent upland with no hydrologic indicators and a Douglas-fir and Oregon white oak community. The wetland boundary was determined by a transition in plant community, a topographic change, and a lack of wetland hydrology upslope.

6.6 WETLAND F

Wetland F (0.2 acre) occupies a closed depression in the northeast portion of the study area. It would be classified primarily as palustrine forested wetland, with some areas of palustrine scrub-shrub and emergent (Cowardin et al. 1979). Wetland F is represented by plots 15 and 17. Plot 15 is dominated by Oregon ash. Plot 17 represents an area of past disturbance by tree and shrub clearing, and is dominated by colonial bentgrass, toad rush (*Juncus bufonius*), and Oregon ash saplings. Both plots meet the depleted matrix (F3) hydric soil indicator, while Plot 15 also met the loamy mucky mineral (F1) hydric soil indicator. Both had hydrology indicators of a high water table (A2) and saturation (A3) to the surface. The wetland boundary was determined by a transition in plant community, a topographic change, and a lack of wetland hydrology upslope.

6.7 WETLAND G

Wetland G (4.7 acres) is a large depression with three different palustrine plant communities occurring in roughly concentric circles: forested along the wetland/upland boundary, scrub-shrub transition, and persistent emergent and scrub-shrub vegetation in the central inundated areas. Some portions of the center of Wetland G would be considered muddy unconsolidated bottom. The northern half of the wetland, especially, had steep rocky terrain with slopes up to 100% from between 5 and 30 feet from the wetland boundary. The remainder of the wetland had more gentle slopes with wider wetland transition areas.

Plots 19, 23, and 25 are representative of the scrub-shrub and forested communities and are dominated by Pacific willow, hardhack, swamp rose, and Pacific crabapple. Plots 21 and 24 are nearer the center of the wetland and are dominated by hardhack, Pacific willow, tall mannagrass (*Glyceria striata*), and cattail (*Typha latifolia*). Plots 20, 22, and 26 represent the adjacent upland communities and were dominated by Oregon white oak, beaked hazelnut (*Corylus cornuta*), Pacific madrone, Douglas-fir, serviceberry, cascara (*Rhamnus purshiana*), and sword fern (*Polystichum munitum*). Plots 19, 21, 23, and 24 showed the histic epipedon (A2) hydric soil indicator, while Plot 25 showed the loamy mucky material (F1) hydric soil indicator. The wetland boundary was determined by a transition in plant community, a topographic change, and a lack of wetland hydrology upslope.

6.8 POTENTIAL WETLAND H

Review of LIDAR 2-foot contour topography showed this location to be a closed depression similar to those that were found to contain Wetlands A, B, D, E, and F. However, this location was not inspected due to particularly thick growth of poison oak surrounding it, and because the steep slopes on the north, east, and west sides made it difficult to clear trail access using equipment. As shown on Figure 6, it is assumed for now that wetland conditions prevail throughout the entire closed depression. It may be possible to access Area H in the future by clearing a trail through the powerline corridor with permission of that utility.

7 DEVIATION FROM LWI OR NWI

The LWI for Sherwood, OR, did not extend to the study area. (David Evans and Associates 1992). The NWI shows a seasonally flooded persistent palustrine emergent wetland (PEM1C) in the approximate location of Wetland G (USFWS 2016). No waters are described on the NWI.

8 MAPPING METHOD

All features were collected by DEA biologists using a handheld Trimble GPS unit with typical horizontal accuracy of three feet or better..

9 ADDITIONAL INFORMATION

No additional information.

10 RESULTS AND CONCLUSIONS

Seven wetlands and one potential wetland were delineated within the study area, and are summarized in Table 5. All wetlands had some inundation, but no waters were delineated within the study area. Although rainfall was exceptionally high for the month of October, there were no indications of excess precipitation influencing the wetland boundary determination. Of the seven wetlands, only Wetland C continues off-site.

Table 5: Summary of Wetlands within the Study Area

ID	Size (acres)	Cowardin Class	HGM Class	Preliminary Jurisdictional Determination
Wetland A	0.1	Palustrine scrub-shrub/ Palustrine unconsolidated bottom	Depression	DSL
Wetland B	0.1	Palustrine scrub-shrub/ Palustrine emergent	Depression	DSL
Wetland C	0.3	Palustrine forested/ Palustrine scrub-shrub	Depression	DSL and USACE
Wetland D	0.2	Palustrine scrub-shrub/ Palustrine unconsolidated bottom	Depression	DSL
Wetland E	0.1	Palustrine scrub-shrub	Depression	DSL
Wetland F	0.2	Palustrine forested/ Palustrine scrub-shrub/ Palustrine emergent	Depression	DSL
Wetland G	4.7	Palustrine forested/ Palustrine scrub-shrub/ Palustrine emergent	Depression	DSL
Potential Wetland H	0.3	Unknown- appears to be Palustrine scrub-shrub	Depression	DSL
Total	**6.0**			

11 DISCLAIMER

This report documents the investigation, best professional judgment, and conclusions of the investigator. It is correct and complete to the best of my knowledge. It should be considered a Preliminary Jurisdictional Determination of wetlands and other waters and used at your own risk until it has been reviewed and approved in writing by the Oregon Department of State Lands in Accordance with OAR 141-090-0005 through OAR 141-090-0555.

12 PREPARERS AND CONTRIBUTORS

John Macklin, DEA Biologist, and Tony Vingiello, DEA Biologist, performed the site delineation. Mr. Vingiello is the primary author of the report, and Mr. Macklin provided quality assurance review. Dawn Afman, DEA Project Assistant, provided editing assistance. Sara Gilbert, DEA Geographic Information System Specialist, prepared the report graphics.

13 LITERATURE CITATIONS

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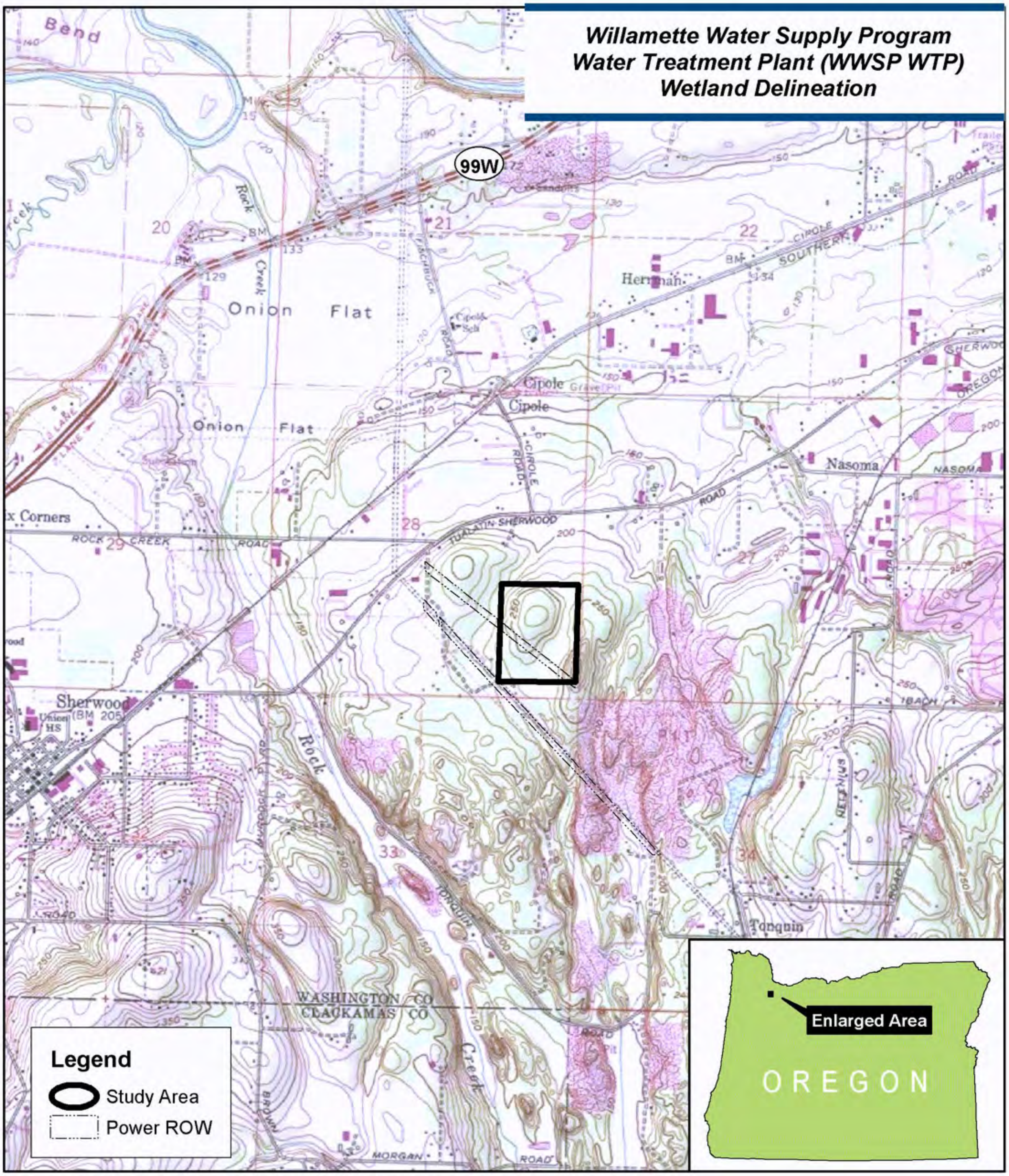
14 APPENDICES

APPENDIX A: FIGURES

Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation



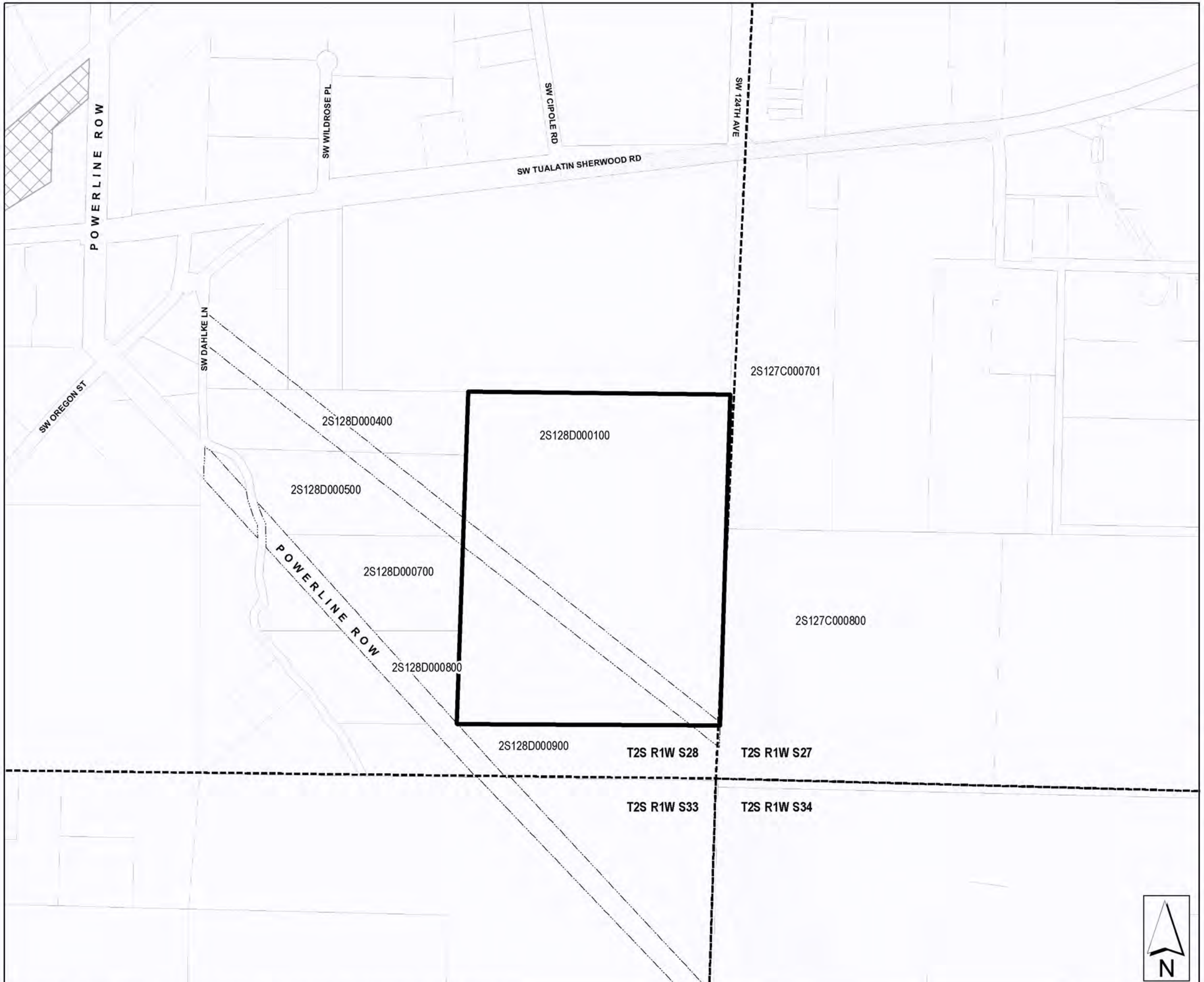
ESRI, ArcGIS Online, USA Topographic Maps. 30x60 GRID Quadrangles

Figure 1
Vicinity Map

N
0 0.25 0.5 Miles

Willamette Water Supply Program Water Treatment Plant (WWSP WTP) Wetland Delineation

Figure 2
Tax Lots



Legend
- Study Area
- Area delineated by others
- No access as of 10/24/2016
- PLSS
- Power ROW

0 — 0.1 Miles

Metro RLIS Data. 2016.

Document Path: \\Pdxfs1\project\T\TVWD00000006\0600INFO\GS\Maps\Wetland Delineation WWSP WTP II\WTPSite_Fig_02_Taxlots.mxd
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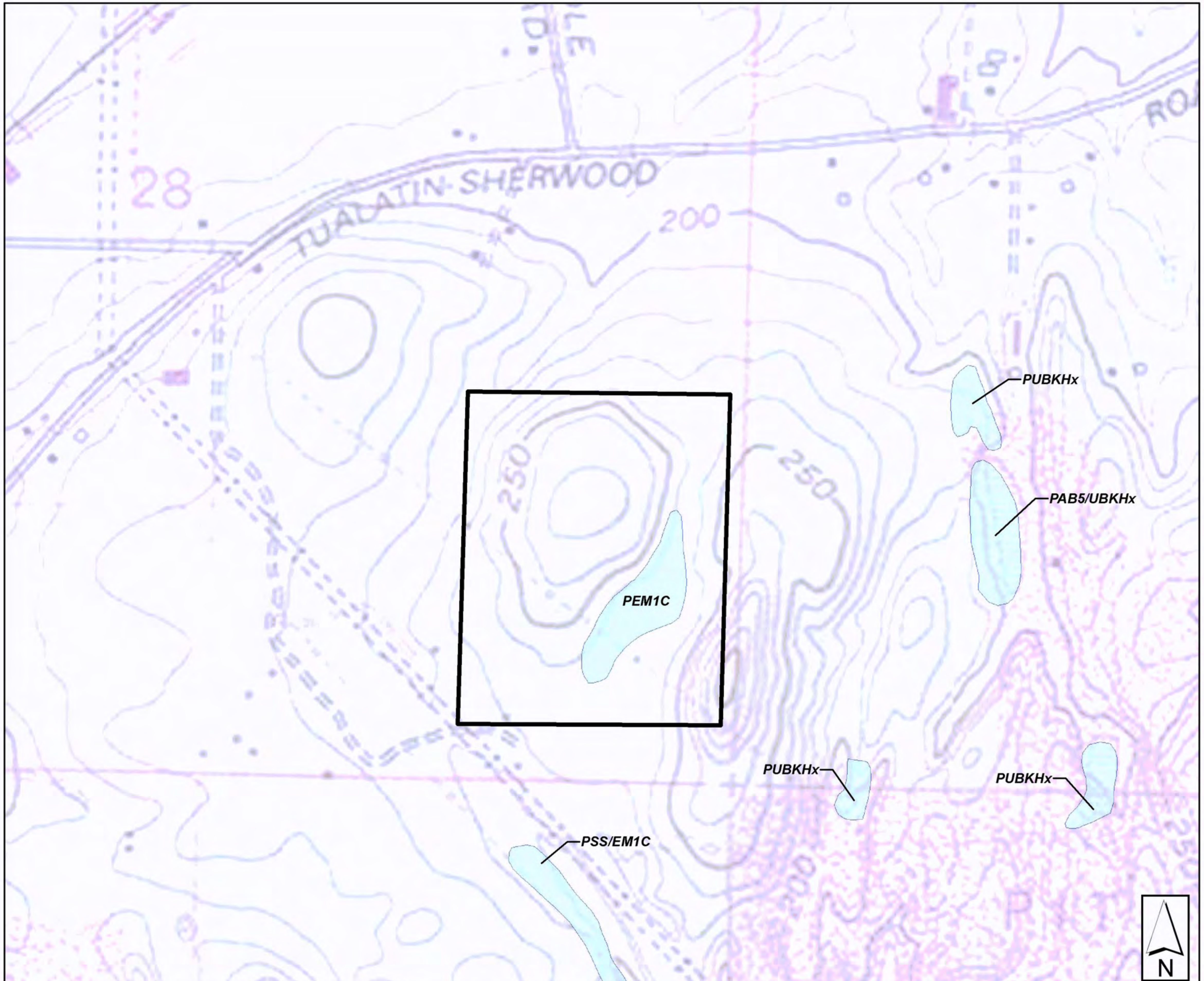
Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 3b
National Wetlands Inventory



Legend

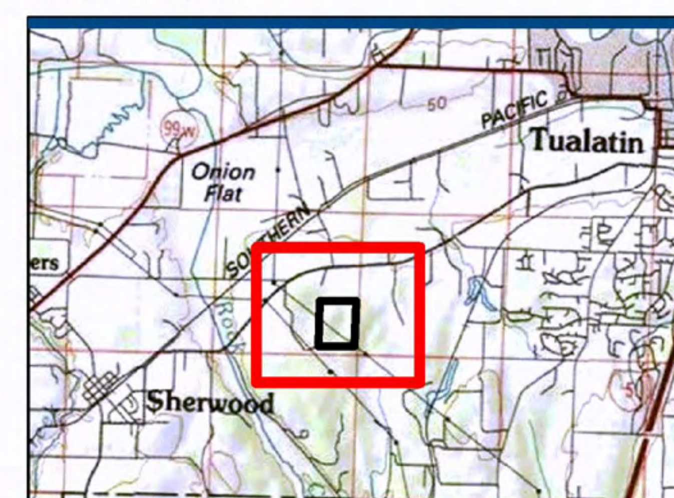
Study Area

USFWS NWI Wetland

0 0.1
Miles

NWI Wetland Types exist within the Study Area
PEM1C - Freshwater Emergent Wetland

Metro RLIS Data, 2015.



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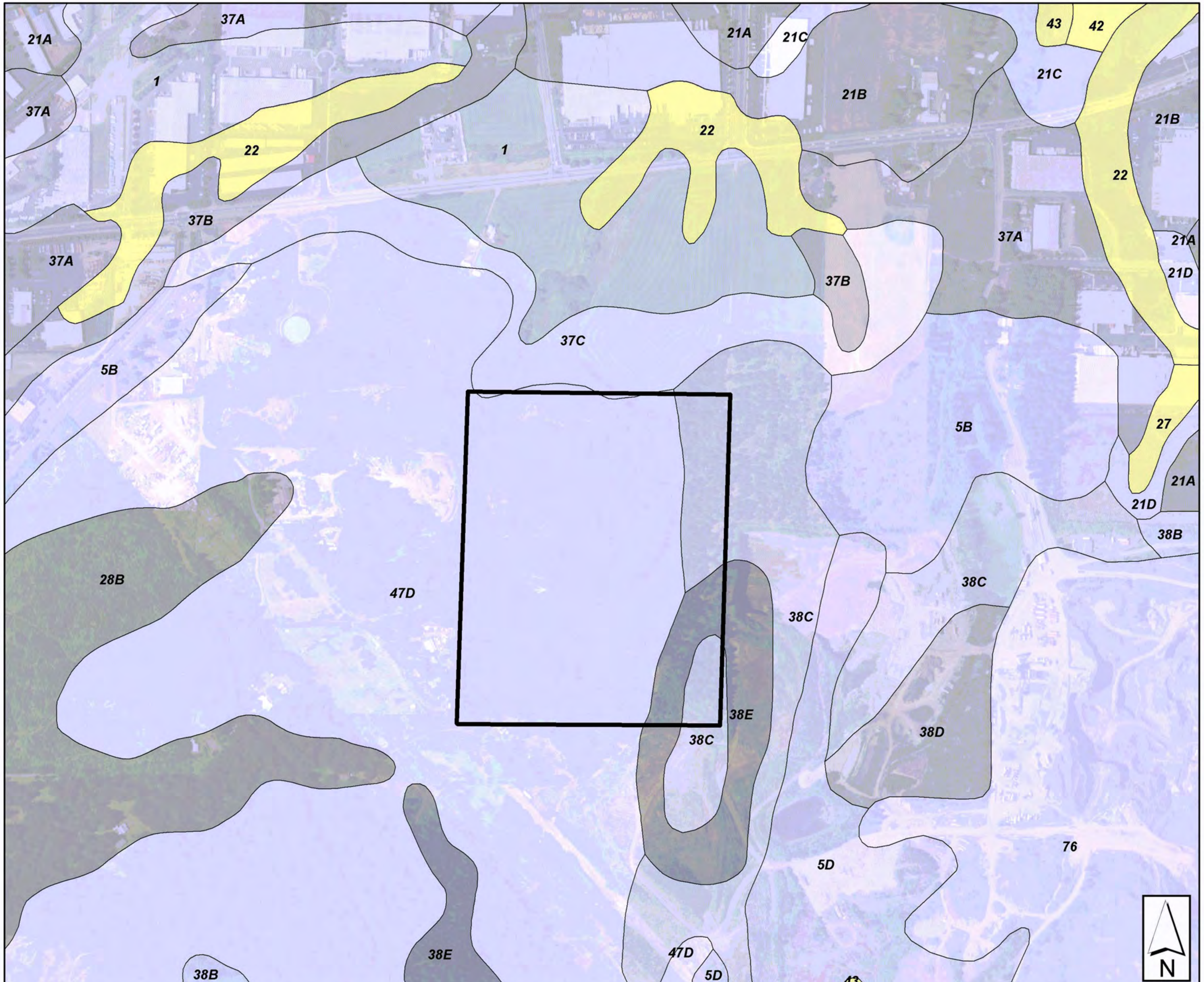
Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 4
Soil Survey



Legend

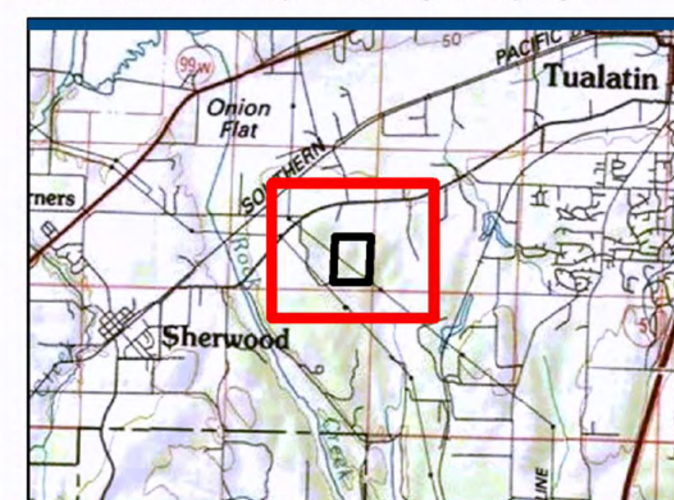
- Study Area
- Soil Unit
- Hydric Soil

0 0.1
Miles

NRCS Soil Units within the Study Area

37C	Quatama loam, 7 to 12 percent slopes
38C	Saum silt loam, 7 to 12 percent slopes
38E	Saum silt loam, 20 to 30 percent slopes
47D	Xerochrepts-Rock outcrop complex

ESRI, ArcGIS Online, World Imagery. Microsoft. 2010. Portland, Oregon. Natural Resources Conservation Service (NRCS). 2014. Soil Survey Geographic (SSURGO) database for Clackamas County Area & Washington County Oregon.



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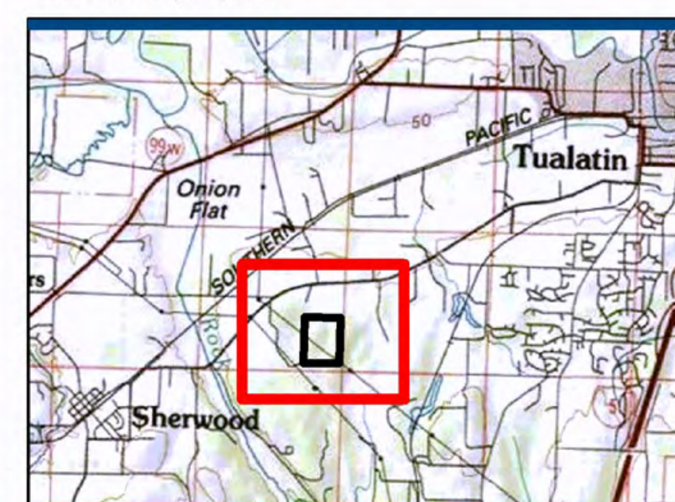
Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 5
Aerial Photo

Legend
Study Area

0 0.1
Miles

USDA NAIP orthophoto, 2016.



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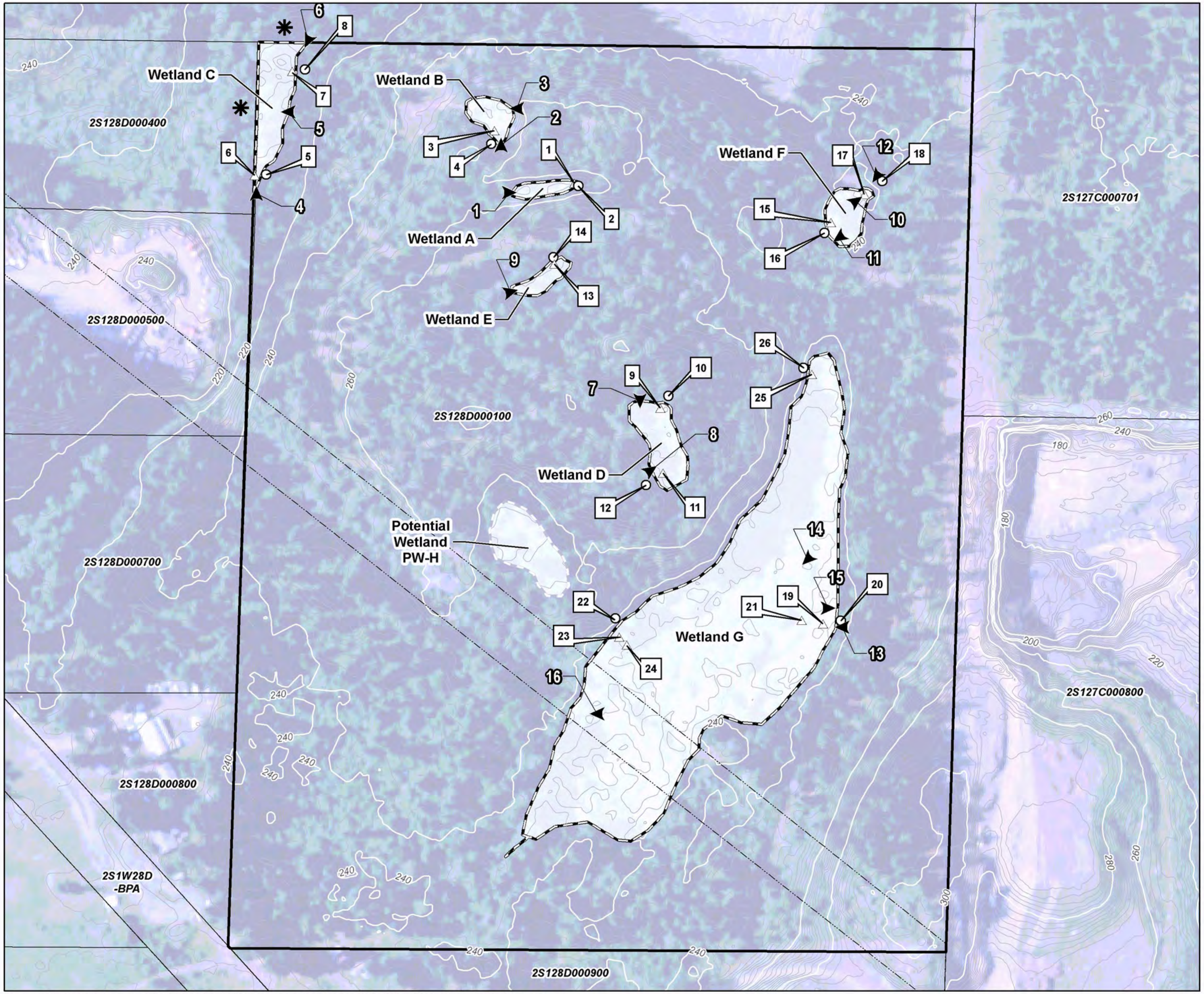
Date: 11/29/2016 Time: 1:51:16 PM User Name: Sast

NOTICE: REPORTS ARE CONSIDERED DRAFT DOCUMENTS UNTIL REVIEW IS COMPLETED BY DSL. WETLAND MAPS MAY CHANGE AS A RESULT OF DSL REVIEW.

Willamette Water Supply Program
Water Treatment Plant (WWSP WTP)
Wetland Delineation

Figure 6
Delineated Wetlands

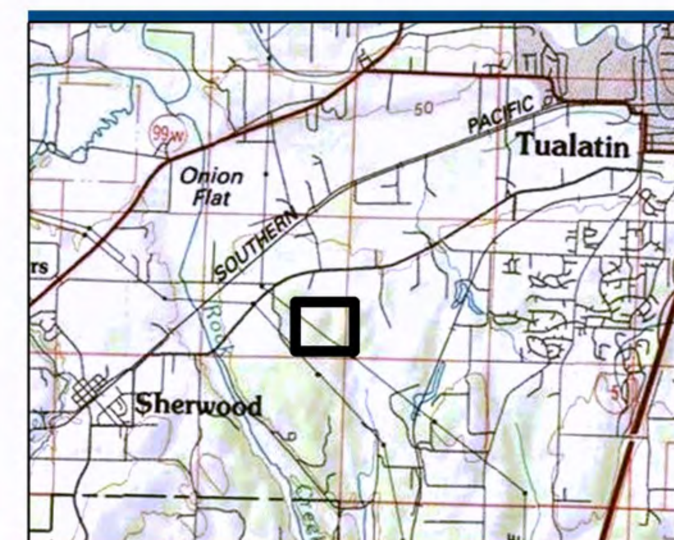


Delineated Features
- Wetland
- Potential Wetland
- Wetland Area
- Study Area
- Photo location and direction
- Wetland extends beyond study area
- Upland Data Plot
- Wetland Data Plot
- Power ROW
- Taxlot
- Contour (20 ft intervals)
- Contour (2 ft intervals)

On-site features (wetlands, ditches, streams, culverts, and data plots) were mapped with a Trimble Pathfinder GEO XH receiver with typical accuracy of 3 feet or better. Off-site boundaries are approximate and were mapped based on field review from adjacent public right of way and aerial photo interpretation. An asterisk was included where jurisdictional features, with the exclusion of upland ditches, extend off site. Only taxlots which intersect the study area are labeled. Imagery: USDA NAIP 2016.

N

0 95 190 380
Feet



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Date: 12/6/2016 Time: 6:38:30 PM User Name: ejro

APPENDIX B: DATA FORMS

Plot ID	Latitude	Longitude	PLSS	Soil ID	Soil Type	Wetland ID	Wetland Type	City
1	45.365377	-122.808450	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
2	45.365365	-122.808423	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
3	45.365629	-122.809030	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
4	45.365562	-122.809049	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
9	45.364263	-122.807795	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
10	45.364325	-122.807739	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
11	45.363939	-122.807763	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
12	45.363875	-122.807879	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
13	45.364971	-122.808576	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
14	45.365004	-122.808584	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
15	45.365218	-122.806620	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
16	45.365165	-122.806662	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
17	45.365362	-122.806388	T2S R1W S28	38C	Saum silt loam, 7 to 12 percent slopes	--	--	Unicorp. WA. Cty
18	45.365432	-122.806264	T2S R1W S28	38C	Saum silt loam, 7 to 12 percent slopes	--	--	Unicorp. WA. Cty
19	45.363206	-122.806596	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	PEM1C	Freshwater Emergent Wetland	Unicorp. WA. Cty
20	45.363224	-122.806469	T2S R1W S28	38E	Saum silt loam, 20 to 30 percent slopes	PEM1C	Freshwater Emergent Wetland	Unicorp. WA. Cty
21	45.363221	-122.806748	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	PEM1C	Freshwater Emergent Wetland	Unicorp. WA. Cty
22	45.363202	-122.808071	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
23	45.363110	-122.808041	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
24	45.363071	-122.807986	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	PEM1C	Freshwater Emergent Wetland	Unicorp. WA. Cty
25	45.364454	-122.806724	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty
26	45.364484	-122.806784	T2S R1W S28	47D	Xerochrepts-Rock outcrop complex	--	--	Unicorp. WA. Cty

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 1

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: See spreadsheet

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave Slope (%): 10

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ___ (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___	Is the Sampled Area within a Wetland? Yes ✓ No ___
Hydric Soil Present?	Yes ✓	No ___	
Wetland Hydrology Present?	Yes ✓	No ___	

Remarks:
Wetland plot in Wetland A at toe of slope. Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Fraxinus latifolia	25	Y	FACW
2. Malus fusca	10	Y	FACW
3.			
4.			
	35	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Spiraea douglasii	40	Y	FACW
2. Rosa pisocarpa	10	N	FAC
3. Salix lasiandra	5	N	FACW
4.			
5.			
	55	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Carex obnupta	20	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 80

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: Plot 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-18	10YR 3/1	100	--	--	--	--	Mucky Loam	Histic with peaty inclusions

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? Yes ✓ No ___

Remarks:

Some fibrous peaty nodules present (1"). Large rocks occasionally present in matrix, but less restrictive than in upland plots.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ✓ No ___ Depth (inches): 6

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 4

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Plot is 10 feet from ponded water in concave wetland.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 2

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: See spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 20

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Plot 2 is 2 ft. higher than Plot 1 and on face of slope. Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30)			
1. Pseudotsuga menziesii	60	Y	FACU
2. Arbutus menziesii	25	Y	UPL
3. Crataegus douglasii	10	N	FAC
4.			
	95	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30)			
1. Gaultheria shallon	35	Y	FACU
2. Mahonia nervosa	30	Y	FACU
3. Rubus ursinus	10	N	FACU
4.			
5.			
	75	= Total Cover	
Herb Stratum (Plot size: 5)			
1. Polypodium glycyrrhiza	5	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	= Total Cover	
Woody Vine Stratum (Plot size: 30)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 95

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: Plot 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10/YR 2/1	100	--	--	--	--	Organic	moderately decomposed litter
2-7	10YR 3/3	100	--	--	--	--	Loam	
7-18+	7.5YR 4/4	100	--	--	--	--	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF-12)
__ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ______
Water Table Present? Yes ____ No ✓ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ______

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 3

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): rocky depression Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks:
Precipitation is high for water year; Plot representative of Wetland B

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Rosa pisocarpa	25	Y	FAC
2.			
3.			
4.			
5.			
	25	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Phalaris arundinacea	50	Y	FACW
2. Agrostis capillaris	15	Y	FAC
3. Geranium molle	T	N	UPL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	65	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 35

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:
Plots reshaped to avoid open water; wetland vegetation inclusions are typical within defined rocky depression.

SOIL

Sampling Point: Plot 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR 2/2	100	--	--	--	--	Loamy Sandy Gvl	Histic muck
6+							bedrock	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF-12)
___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 6

Hydric Soil Present? Yes ✓ No ___

Remarks:

Underlain by rock, not mineral soil; soils similar to Plot 1 in color and texture

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
✓ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
✓ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___
Water Table Present? Yes ✓ No ___ Depth (inches): 1
Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 4

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): rocky hillslope Local relief (concave, convex, none): none Slope (%): 3

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Pseudotsuga menziesii	40	Y	FACU
2. Quercus garryana	20	Y	FACU
3.			
4.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Amalanchier alnifolia	60	Y	FACU
2. Toxicodendron diversilobum	Trace	N	FAC
3.			
4.			
5.			
	60	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Polypodium glycyrrhiza	60	Y	UPL
2. Geranium molle	40	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Rubus ursinus	5	Y	FACU
2.			
	5	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: Plot 4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/2	100	--	--	--	--	Organic	duff and leaf litter over rock

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 4

Hydric Soil Present? Yes ___ No ✓

Remarks:

no significant moisture between solid rock layer and surface.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) **(LRR A)**
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) **(LRR A)**
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Clear wetland boundary defined by hydrology; rock present at varying depths in upland areas surrounding depressions

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 5

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year. Upland plot for Wetland C.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Prunus emarginata	35	Y	FACU
2. Pseudotsuga menziesii	15	Y	FACU
3. Arbutus menziesii	10	Y	UPL
4.			
	60	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Gaultheria shallon	25	Y	FACU
2. Holodiscus discolor	15	Y	FACU
3. Rubus ursinus	10	Y	FACU
4. Symphoricarpos albus	10	Y	FACU
5. Corylus cornuta	10	Y	FACU
	70	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	5	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 95

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-9	10YR 3/2	100	--	--	--	--	Silt Loam	
9-12	7.5YR 4/4	98	7.5YR 5/6	2	C	M	Silt Loam	
12-20	7.5YR 5/6	95	7.5YR 5/6	5	C	M	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF-12)
___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______________

Depth (inches): ______________

Hydric Soil Present? **Yes** _____ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes _____ No ✓ Depth (inches): __________
Water Table Present? Yes _____ No ✓ Depth (inches): __________
Saturation Present? (includes capillary fringe) Yes _____ No ✓ Depth (inches): __________

Wetland Hydrology Present? **Yes** _____ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 6

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): concave Slope (%): <3

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks:
Precipitation is high for water year. Plots 6 and 7 are representative of Wetland C.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Fraxinus latifolia	80	Y	FACW
2.			
3.			
4.			
	80	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Rosa pisocarpa	10	Y	FAC
2. Spiraea douglasii	5	Y	FACW
3.			
4.			
5.			
	15	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Carex obnupta	15	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	15	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Rubus ursinus	Trace	N	FACU
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 85

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:
Bare ground is leaf litter and inundated substrate.

SOIL

Sampling Point: Plot 6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-10	10YR 2/1	100	--	--	--	--	S. Mucky Loam	Histic
10-12	10YR 3/1	100	--	--	--	--	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF-12)
__ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: Rock
Depth (inches): 12

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

✓ Surface Water (A1)
✓ High Water Table (A2)
✓ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 2
Water Table Present? Yes ✓ No ___ Depth (inches): surface
Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 7

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? Yes ✓ No ____

Remarks:
Precipitation is high for water year. Plots 6 and 7 are representative of Wetland C which continues off-site.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Fraxinus latifolia	15	Y	FACW
2.			
3.			
4.			
	15	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Spiraea douglasii	20	Y	FACW
2. Rosa pisocarpa	20	Y	FAC
3. Fraxinus latifolia	10	Y	FACW
4. Symphoricarpos albus	5	N	FACU
5.			
	55	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Carex obnupta	50	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Rubus ursinus	10	Y	FACU
2.			
	10	= Total Cover	

% Bare Ground in Herb Stratum 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:
Bare ground cover is inundated substrate and leaf litter.

SOIL

Sampling Point: Plot 7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100	--	--	--	--	Sandy Loam	Histic
4 +							bedrock	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 4

Hydric Soil Present? Yes ✓ No ___

Remarks:

Underlain by rock, not mineral soil; soil similar to other histic plots.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 6

Water Table Present? Yes ✓ No ___ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 8

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes ____ No X

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year but did not alter indicators. 10 feet east of Wetland C boundary.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Prunus emarginata	30	Y	FACU
2. Corylus cornuta	15	Y	FACU
3. Pseudotsuga menziesii	10	N	FACU
4.			
	55	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Populus balsamifera	10	Y	FAC
2. Mahonia aquifolium	5	Y	FACU
3. Malus fusca	5	Y	FACW
4.			
5.			
	20	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	1	N	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	1	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 99

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species		x 1 =
FACW species	5	x 2 = 10
FAC species	10	x 3 = 30
FACU species	60	x 4 = 240
UPL species		x 5 =
Column Totals:	75 (A)	280 (B)

Prevalence Index = B/A = 3.73

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100	--	--	--	--	Litter	
2-10	10YR 3/2	100	--	--	--	--	Silt Loam	
10-18+	10YR 3/3	100	--	--	--	--	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 9

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks:
Precipitation is high for water year but did not alter indicators.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Malus fusca	5	Y	FACW
2.			
3.			
4.			
	5	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Spiraea douglasii	40	Y	FACW
2. Malus fusca	20	Y	FACW
3. Rosa pisocarpa	15	Y	FAC
4.			
5.			
	75	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Carex obnupta	10	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	10	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 90

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 9

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100	--	--			Silt Loam	
2-14	10YR 2/1	100	--	--			Mucky SCL	Histic muck
14-18+	10YR 4/4	95	10YR 5/6	5	C	M	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- __ Histosol (A1)
- ✓ Histic Epipedon (A2)
- __ Black Histic (A3)
- __ Hydrogen Sulfide (A4)
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1)
- __ Sandy Gleyed Matrix (S4)
- __ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- __ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- __ Loamy Gleyed Matrix (F2)
- __ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- __ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- __ 2 cm Muck (A10)
- __ Red Parent Material (TF2)
- __ Very Shallow Dark Surface (TF-12)
- __ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ____

Remarks:

defined redox mineral layer below histic muck

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- __ Salt Crust (B11)
- __ Aquatic Invertebrates (B13)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- __ Stunted or Stressed Plants (D1) (**LRR A**)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- __ Drainage Patterns (B10)
- __ Dry-Season Water Table (C2)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)
- __ Raised Ant Mounds (D6) (**LRR A**)
- __ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ✓ No ____ Depth (inches): 1

Water Table Present? Yes ✓ No ____ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 4, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 10

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 10

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Pseudotsuga menziesii	70	Y	FACU
2. Arbutus menziesii	30	Y	UPL
3.			
4.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Gaultheria shallon	40	Y	FACU
2. Holodiscus discolor	25	Y	FACU
3. Amalanchier alnifolia	10	N	FACU
4. Malus fusca	5	N	FACW
5.			
	80	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	95	Y	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Rubus ursinus	20	Y	FACU
2.			
	20	= Total Cover	

% Bare Ground in Herb Stratum 95

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:

SOIL

Sampling Point: Plot 10

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100	--	--	--	--	Silt Loam	
2-7	10YR 3/3	100	--	--	--	--	Loam	
7-18+	7.5YR 4/4 100	100	--	--	--	--	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF-12)
__ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____
Water Table Present? Yes ____ No ✓ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 11

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ______ Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ____
Hydric Soil Present?	Yes ✓	No ____	
Wetland Hydrology Present?	Yes ✓	No ____	

Remarks:
Precipitation is high for water year but did not alter indicators.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus latifolia	5	Y	FACW
2.			
3.			
4.			
	5 = Total Cover		
Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	Trace	N	UPL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	1 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 99

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:
Bare ground cover is inundated substrate

SOIL

Sampling Point: Plot 11

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100	--	--	--	--	Silt Loam	
2-14	10YR 2/1	100	--	--	--	--	Mucky SCL	Histic muck
14-18+	10YR 4/4	95	10YR 5/6	5	C	M	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- __ Histosol (A1)
- __ Histic Epipedon (A2)
- __ Black Histic (A3)
- __ Hydrogen Sulfide (A4)
- __ Depleted Below Dark Surface (A11)
- __ Thick Dark Surface (A12)
- __ Sandy Mucky Mineral (S1)
- __ Sandy Gleyed Matrix (S4)
- __ Sandy Redox (S5)
- __ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- __ Loamy Gleyed Matrix (F2)
- __ Depleted Matrix (F3)
- __ Redox Dark Surface (F6)
- __ Depleted Dark Surface (F7)
- __ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- __ 2 cm Muck (A10)
- __ Red Parent Material (TF2)
- __ Very Shallow Dark Surface (TF-12)
- __ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- __ Water Marks (B1)
- __ Sediment Deposits (B2)
- __ Drift Deposits (B3)
- __ Algal Mat or Crust (B4)
- __ Iron Deposits (B5)
- __ Surface Soil Cracks (B6)
- __ Inundation Visible on Aerial Imagery (B7)
- __ Sparsely Vegetated Concave Surface (B8)
- __ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- __ Salt Crust (B11)
- __ Aquatic Invertebrates (B13)
- __ Hydrogen Sulfide Odor (C1)
- __ Oxidized Rhizospheres along Living Roots (C3)
- __ Presence of Reduced Iron (C4)
- __ Recent Iron Reduction in Tilled Soils (C6)
- __ Stunted or Stressed Plants (D1) (**LRR A**)
- __ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- __ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- __ Drainage Patterns (B10)
- __ Dry-Season Water Table (C2)
- __ Saturation Visible on Aerial Imagery (C9)
- __ Geomorphic Position (D2)
- __ Shallow Aquitard (D3)
- __ FAC-Neutral Test (D5)
- __ Raised Ant Mounds (D6) (**LRR A**)
- __ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 6

Water Table Present? Yes ✓ No ___ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site   City/County: Washington Co.   Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro   State: OR   Sampling Point: Plot 12

Investigator(s): John Macklin, Tony Vingiello   Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): ____   Local relief (concave, convex, none): none   Slope (%): 20

Subregion (LRR): A- Northwest Forests and Coast   Lat: See spreadsheet   Long: See spreadsheet   Datum: NAVD88

Soil Map Unit Name: See spreadsheet   NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed?   Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic?   (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Quercus garryana	25	Y	FACU
2. Arbutus menziesii	20	Y	UPL
3. Pseudotsuga menziesii	10	N	FACU
4.			
	55	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Holodiscus discolor	15	Y	FACU
2. Mahonia aquilifolium	15	Y	FACU
3. Amalanchier alnifolia	10	Y	FACU
4. Malus fusca	5	N	FACW
5.			
	45	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Polypodium glycyrrhiza	15	Y	UPL
2. Lonicera ciliosa	5	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
		= Total Cover	

% Bare Ground in Herb Stratum 80

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 12

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-2	10YR 2/1	100	--	--	--	--	Silt Loam	
2-7	10YR 3/3	100	--	--	--	--	Loam	
7-18+	7.5YR 4/4	100	--	--	--	--	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF-12)
___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 13

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): concave Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:
Precipitation is high for water year. Representative of Wetland E.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Spiraea douglasii	100	Y	FACW
2. Rosua nutkana	10	N	FAC
3. Malus fusca	3	N	FACW
4. Quercus garryana	3	N	FACU
5.			
	116	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 100

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤ 3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:
Bare ground cover is inundated substrate

SOIL

Sampling Point: Plot 13

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-8	10YR 2/1	100	--	--	--	--	Mucky loam	Histic
8-18	10YR 3/2	100	--	--	--	--	Sandy loam	Histic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): 6

Water Table Present? Yes ✓ No ___ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 14

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pseudotsuga menziesii	25	Y	FACU
2. Quercus garryana	10	Y	FACU
3.			
4.			
	35	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Amalancier alnifolia	30	Y	FACU
2. Holodiscus discolor	30	Y	FACU
3. Mahonia aquilifolium	Trace	N	FACU
4. Populus balsamifera	Trace	N	FAC
5.			
	60	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	95	Y	UPL
2. Polypodium glycyhrrhiza	15	N	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	110	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 95

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: ____ (A)

Total Number of Dominant Species Across All Strata: ____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: ____ (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ____

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 14

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/1	100	--	--	--	--	Organic	moderately decomposed litter
1-4	10YR 3/3	100	--	-	--	--	Loam	
4-8	7.5YR 4/4	100	--	--	--	--	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF-12)
__ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):
Type: Rock
Depth (inches): 8

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ______
Water Table Present? Yes ____ No ____ Depth (inches): ______
Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ______

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 15

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): none Slope (%): <3

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks:
Precipitation is high for water year. Plot is representative of west side of Wetland F.

VEGETATION – Use scientific names of plants.

Stratum / Species	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Fraxinus latifolia	75	Y	FACW
2.			
3.			
4.			
	75	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Rosa pisocarpa	20	Y	FAC
2. Spiraea douglasii	15	Y	FACW
3. Symphoricarpos albus	10	Y	FACU
4.			
5.			
	45	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Rubus ursinus	5	Y	FACU
2.			
	5	= Total Cover	

% Bare Ground in Herb Stratum 55

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 75 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:

SOIL

Sampling Point: Plot 15

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-5	10YR 2/2	100	--	--	--	--	Mucky Loam	many roots
5-18	10YR 4/2	85	7.5YR 3/4	15	C	M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes ✓ No ____

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ______

Water Table Present? Yes ✓ No ____ Depth (inches): 1"

Saturation Present? (includes capillary fringe) Yes ✓ No ____ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 16

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): hillslope towards swale Local relief (concave, convex, none): none Slope (%): 10

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes ✓** **No ____**

Remarks:
Precipitation is high for water year. Upslope of Plot 15.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Mahonia aqufolium	35	Y	FACU
2. Arbutus menziesii	25	Y	UPL
3. Quercus garryana	5	N	FACU
4.			
5.			
	65	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	60	Y	UPL
2. Polypodium glycyhrrhiza	30	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Toxicodendron diversilobum	30	Y	FAC
2.			
	30	= Total Cover	

% Bare Ground in Herb Stratum 95

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Wetland Non-Vascular Plants[1]
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ____** **No ✓**

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 16

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/2	100	--	--	--	--	Loam	
2-18	10YR 3/3	100	--	--	--	--	Silt Loam	Gravels at 15"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) **(except MLRA 1)**
___ Loamy Gleyed Matrix (F2)
___ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF-12)
___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? **Yes** ___ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
___ High Water Table (A2)
___ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) **(except MLRA 1, 2, 4A, and 4B)**
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) **(LRR A)**
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) **(MLRA 1, 2, 4A, and 4B)**
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) **(LRR A)**
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? **Yes** ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 17

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	Is the Sampled Area within a Wetland? Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	

Remarks:
Precipitation is high for water year. Representative of Wetland F.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Fraxinus latifolia	10	Y	FACW
2.			
3.			
4.			
5.			
	10	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Agrostis capillaris	20	Y	FAC
2. Juncus bufonius	10	Y	FACW
3. Leucanthemum vulgare	5	N	FACU
4. Cirsium arvense	5	N	FAC
5. Varbascum thapsus	5	N	FACU
6.			
7.			
8.			
9.			
10.			
11.			
	45	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	
% Bare Ground in Herb Stratum 55			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: ____ (A)		____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:
Bare ground cover is leaf litter.

SOIL

Sampling Point: Plot 17

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 3/1	90	7.5YR 4/6	10	C	M	Sandy Loam	
3-18	10YR 4/2	85	7.5YR 4/6	15	C	M	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

___ Histosol (A1)
___ Histic Epipedon (A2)
___ Black Histic (A3)
___ Hydrogen Sulfide (A4)
___ Depleted Below Dark Surface (A11)
___ Thick Dark Surface (A12)
___ Sandy Mucky Mineral (S1)
___ Sandy Gleyed Matrix (S4)
___ Sandy Redox (S5)
___ Stripped Matrix (S6)
___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
___ Loamy Gleyed Matrix (F2)
_✓_ Depleted Matrix (F3)
___ Redox Dark Surface (F6)
___ Depleted Dark Surface (F7)
___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

___ 2 cm Muck (A10)
___ Red Parent Material (TF2)
___ Very Shallow Dark Surface (TF-12)
___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___________

Depth (inches): ___________

Hydric Soil Present? Yes _✓_ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

___ Surface Water (A1)
_✓_ High Water Table (A2)
_✓_ Saturation (A3)
___ Water Marks (B1)
___ Sediment Deposits (B2)
___ Drift Deposits (B3)
___ Algal Mat or Crust (B4)
___ Iron Deposits (B5)
___ Surface Soil Cracks (B6)
___ Inundation Visible on Aerial Imagery (B7)
___ Sparsely Vegetated Concave Surface (B8)
___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
___ Salt Crust (B11)
___ Aquatic Invertebrates (B13)
___ Hydrogen Sulfide Odor (C1)
___ Oxidized Rhizospheres along Living Roots (C3)
___ Presence of Reduced Iron (C4)
___ Recent Iron Reduction in Tilled Soils (C6)
___ Stunted or Stressed Plants (D1) (**LRR A**)
___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
___ Drainage Patterns (B10)
___ Dry-Season Water Table (C2)
___ Saturation Visible on Aerial Imagery (C9)
___ Geomorphic Position (D2)
___ Shallow Aquitard (D3)
___ FAC-Neutral Test (D5)
___ Raised Ant Mounds (D6) (**LRR A**)
___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No _✓_ Depth (inches): ___

Water Table Present? Yes _✓_ No ___ Depth (inches): 1

Saturation Present? (includes capillary fringe) Yes _✓_ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes _✓_ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 18

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Prunus emarginata	10	Y	FACU
2. Fraxinus latifolia	10	Y	FACU
3. Quercus garryana	10	Y	FACU
4.			
	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Rosa nutkana	20	Y	FAC
2. Amalanchier alnifolia	10	Y	FACU
3. Fraxinus latifolia	5	N	FACW
4.			
5.			
		= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Geranium molle	70	Y	UPL
2. Polypodium glycyhrrhiza	5	N	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	5	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 95

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 18

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 2/2	100	--	--	--	--	Loam	surface thin layer fallen leaves/litter
12+							rock	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: rock

Depth (inches): 12

Hydric Soil Present? Yes ___ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 19

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ___
Hydric Soil Present?	Yes ✓	No ___
Wetland Hydrology Present?	Yes ✓	No ___

Is the Sampled Area within a Wetland? Yes ✓ No ___

Remarks:
Precipitation is high for water year . Representative of Wetland G shrub layer.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Malus fusca	30	Y	FACW
2. Fraxinus latifolia	20	Y	FACW
3.			
4.			
	50	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Spiraea douglasii	80	Y	FACW
2. Salix lasiandra	80	Y	FACW
3.			
4.			
5.			
	160	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ___	x 1 = ___
FACW species ___	x 2 = ___
FAC species ___	x 3 = ___
FACU species ___	x 4 = ___
UPL species ___	x 5 = ___
Column Totals: ___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Wetland Non-Vascular Plants[1]

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ___

Remarks:

SOIL

Sampling Point: Plot 19

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10YR 2/1	100	--	--	--	--	Org. Loam	50% mod. decomposed litter
4-8	10YR 2/1	100	--	--	--	--	Mucky Loam	
8-18	10YR 3/2	98	7.5YR 4/6	2	C	M	Clay Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ✓ No ___ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 20

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 10

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Arbutus menziesii	50	Y	UPL
2. Pseudotsuga menziesii	50	Y	FACU
3.			
4.			
	100	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Amalanchier alnifolia	50	Y	FACU
2. Corylus cornuta	20	N	FACU
3. Gaultheria shallon	20	N	FACU
4. Mahonia aquifolium	20	N	FACU
5. Malus fusca	10	N	FACU
	120	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Polystichum munitum	30	Y	FACU
2. Geranium molle	20	Y	FACU
3. Glyceria striata	10	N	FACW
4. Pteridium aquilinum	10	N	FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1. Toxicodendron diversilobum	20	Y	FAC
2.			
	20	= Total Cover	

% Bare Ground in Herb Stratum 30

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 20

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/1	100	--	--	--	--	Org. litter	
1-12	10YR 3/2	100	--	--	--	--	Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 12

Hydric Soil Present? Yes ______ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ______ No ______ Depth (inches): ____________

Water Table Present? Yes ______ No ______ Depth (inches): ____________

Saturation Present? (includes capillary fringe) Yes ______ No ______ Depth (inches): ____________

Wetland Hydrology Present? Yes ______ No ______

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 21

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks:
Precipitation is high for water year . Representative of deeper inundated part of Wetland G.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 30 ft)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1. Glyceria striata	50	Y	FACW
2. Typha latifolia	30	Y	OBL
3. Nuphar advena	20	N	OBL
4. Polygonum hydropiperoides	15	N	OBL
5. Veronica americana	5	N	OBL
6.			
7.			
8.			
9.			
10.			
11.			
	120 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 0

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:

SOIL

Sampling Point: Plot 21

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-12	10YR 2/1	100	--	--	--	--	Mucky Loam	
12+							rock	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF-12)
__ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: Rock

Depth (inches): 12

Hydric Soil Present? Yes ✓ No __

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

✓ Surface Water (A1)
✓ High Water Table (A2)
✓ Saturation (A3)
✓ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ✓ No __ Depth (inches): 12
Water Table Present? Yes ✓ No __ Depth (inches): surface
Saturation Present? (includes capillary fringe) Yes ✓ No __ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No __

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Water marks on adjacent willow thicket indicates water level reaches 3 ft deep.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 22

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): hillslope toward wetland fringe Local relief (concave, convex, none): none Slope (%): 40

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year. Southwest side of Wetland G; immediately north of powerlines.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Quercus garryana	90	Y	FACU
2. Rhamnus purshiana	50	Y	FAC
3. Arbutus menziesii	20	N	UPL
4.			
	160	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Corylus cornuta	60	Y	FACU
2. Gaultheria shallon	50	Y	FACU
3. Rosa nutkana	10	N	FAC
4. Amalanchier alnifolia	10	N	FACU
5. Symphoicarpos albus	10	N	FACU
	150	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Polystichum munitum	30	Y	FACU
2. Geranium molle	20	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

__ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 22

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/2	100	--	--	--	--	Org. litter	moderately decomposed
1-5	10YR 2/2	100	--	--	--	--	Loam	
5 +							Rock	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: rock

Depth (inches): 5

Hydric Soil Present? Yes ___ **No** ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ___ **No** ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 23

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): none Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? Yes ✓ No ____

Remarks:
Precipitation is high for water year. Plot at southwest part of Wetland G near boundary. Paired with upland plot 22.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Malus fusca	70	Y	FACW
2.			
3.			
4.			
	70	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Salix lasiandra	90	Y	FACW
2. Spiraea douglasii	40	Y	FACW
3.			
4.			
5.			
	130	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Carex obnupta	20	Y	OBL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	20	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 80

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%

__ Prevalence Index is ≤3.0[1]

__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

__ Wetland Non-Vascular Plants[1]

__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks:
Bare ground cover is leaf litter

SOIL

Sampling Point: Plot 23

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-2	10YR 2/1	100	--	--	--	--	Org. Litter	moderately decomposed
2-6	10YR 2/1	100	--	--	--	--	Mucky loam	
6-18+	10YR 4/1	98	10YR 4/4	2	C	M	Silt	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ____________

Depth (inches): ____________

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ✓ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ✓ Depth (inches): ___

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 24

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): wetland depression Local relief (concave, convex, none): none Slope (%): 0

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ___ No X (If no, explain in Remarks.)

Are Vegetation ___, Soil ___, or Hydrology ___ significantly disturbed? Are "Normal Circumstances" present? Yes X No ___

Are Vegetation ___, Soil ___, or Hydrology ___ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ___	**Is the Sampled Area within a Wetland?** **Yes** ✓ **No** ___
Hydric Soil Present?	Yes ✓ No ___	
Wetland Hydrology Present?	Yes ✓ No ___	

Remarks:
Precipitation is high for water year Represents inundated portion of west side of Wetland G.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Spiraea douglasii	60	Y	FACW
2. Salix lasiandra	50	Y	FACW
3.			
4.			
5.			
	110	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	
% Bare Ground in Herb Stratum 0			

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	___	x 1 = ___
FACW species	___	x 2 = ___
FAC species	___	x 3 = ___
FACU species	___	x 4 = ___
UPL species	___	x 5 = ___
Column Totals:	___ (A)	___ (B)

Prevalence Index = B/A = ___

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Wetland Non-Vascular Plants[1]
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ___

Remarks:
Bare ground is inundated organic substrate

SOIL

Sampling Point: Plot 24

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12+	10YR 2/1	100	--	--	--	--	Mucky Loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ✓ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ___

Depth (inches): ___

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present?	Yes ✓	No ___	Depth (inches): 12
Water Table Present?	Yes ✓	No ___	Depth (inches): surface
Saturation Present? (includes capillary fringe)	Yes ✓	No ___	Depth (inches): surface

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 25

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): concave Slope (%): 5

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No ____
Hydric Soil Present?	Yes ✓	No ____
Wetland Hydrology Present?	Yes ✓	No ____

Is the Sampled Area within a Wetland? **Yes** ✓ **No** ____

Remarks:
Precipitation is high for water year.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Rosa pisocarpa	60	Y	FAC
2. Spiraea douglasii	30	Y	FACW
3.			
4.			
5.			
	90 = Total Cover		
Herb Stratum (Plot size: 5 ft)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	0 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 100

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:
OBL species	____	x 1 = ____
FACW species	____	x 2 = ____
FAC species	____	x 3 = ____
FACU species	____	x 4 = ____
UPL species	____	x 5 = ____
Column Totals:	____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

✓ Dominance Test is >50%
__ Prevalence Index is ≤3.0[1]
__ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
__ Wetland Non-Vascular Plants[1]
__ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes** ✓ **No** ____

Remarks:
Bare ground cover is leaf litter and inundated substrate.

SOIL

Sampling Point: Plot 25

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features				Texture	Remarks
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]		
0-14	10YR 2/1	100	--	--	--	--	Mucky loam	
14-18+	10YR 3/1	95	10YR 5/3	5	C	M	Clay loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ___ Histosol (A1)
- ✓ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF-12)
- ___ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: ______

Depth (inches): ______

Hydric Soil Present? Yes ✓ **No** ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Surface Soil Cracks (B6)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
- ___ Salt Crust (B11)
- ___ Aquatic Invertebrates (B13)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres along Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Stunted or Stressed Plants (D1) (**LRR A**)
- ___ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ___ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
- ___ Drainage Patterns (B10)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ✓ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ FAC-Neutral Test (D5)
- ___ Raised Ant Mounds (D6) (**LRR A**)
- ___ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ______

Water Table Present? Yes ✓ No ___ Depth (inches): surface

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): surface

Wetland Hydrology Present? Yes ✓ **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: WWSS WTP Site City/County: Washington Co. Sampling Date: November 3, 2016

Applicant/Owner: Tualatin Valley Water District and City of Hillsboro State: OR Sampling Point: Plot 26

Investigator(s): John Macklin, Tony Vingiello Section, Township, Range: see spreadsheet

Landform (hillslope, terrace, etc.): hillslope toward wetland fringe Local relief (concave, convex, none): none Slope (%): 100

Subregion (LRR): A- Northwest Forests and Coast Lat: See spreadsheet Long: See spreadsheet Datum: NAVD88

Soil Map Unit Name: See spreadsheet NWI classification: See spreadsheet

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No X (If no, explain in Remarks.)

Are Vegetation ____, Soil ____, or Hydrology ____ significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓
Hydric Soil Present?	Yes ____	No ✓
Wetland Hydrology Present?	Yes ____	No ✓

Is the Sampled Area within a Wetland? Yes ____ No ✓

Remarks:
Precipitation is high for water year Adjoins Wetland G.

VEGETATION – Use scientific names of plants.

	Absolute % Cover	Dominant Species?	Indicator Status
Tree Stratum (Plot size: 30 ft)			
1. Quercus garryana	90	Y	FACU
2. Rhamnus purshiana	50	Y	FAC
3. Arbutus menziesii	20	N	UPL
4.			
	160	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Corylus cornuta	60	Y	FACU
2. Gaultheria shallon	50	Y	FACU
3. Rosa nutkana	10	N	FAC
4. Amalanchier alnifolia	10	N	FACU
5. Symphoicarpos albus	10	N	FACU
	150	= Total Cover	
Herb Stratum (Plot size: 5 ft)			
1. Polystichum munitum	30	Y	FACU
2. Geranium molle	20	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 50

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 17 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:

- __ Dominance Test is >50%
- __ Prevalence Index is ≤3.0[1]
- __ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- __ Wetland Non-Vascular Plants[1]
- __ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks:
Bare ground cover is leaf litter and moss covered rock.

SOIL

Sampling Point: Plot 26

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0-1	10YR 2/2	100	--	--	--	--	Org. litter	moderately decomposed
1-5	10YR 2/2	100	--	--	--	--	Loam	
5+							rock	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

__ Histosol (A1)
__ Histic Epipedon (A2)
__ Black Histic (A3)
__ Hydrogen Sulfide (A4)
__ Depleted Below Dark Surface (A11)
__ Thick Dark Surface (A12)
__ Sandy Mucky Mineral (S1)
__ Sandy Gleyed Matrix (S4)
__ Sandy Redox (S5)
__ Stripped Matrix (S6)
__ Loamy Mucky Mineral (F1) (**except MLRA 1**)
__ Loamy Gleyed Matrix (F2)
__ Depleted Matrix (F3)
__ Redox Dark Surface (F6)
__ Depleted Dark Surface (F7)
__ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

__ 2 cm Muck (A10)
__ Red Parent Material (TF2)
__ Very Shallow Dark Surface (TF-12)
__ Other (Explain in Remarks

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: rock

Depth (inches): 5

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

__ Surface Water (A1)
__ High Water Table (A2)
__ Saturation (A3)
__ Water Marks (B1)
__ Sediment Deposits (B2)
__ Drift Deposits (B3)
__ Algal Mat or Crust (B4)
__ Iron Deposits (B5)
__ Surface Soil Cracks (B6)
__ Inundation Visible on Aerial Imagery (B7)
__ Sparsely Vegetated Concave Surface (B8)
__ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B)**
__ Salt Crust (B11)
__ Aquatic Invertebrates (B13)
__ Hydrogen Sulfide Odor (C1)
__ Oxidized Rhizospheres along Living Roots (C3)
__ Presence of Reduced Iron (C4)
__ Recent Iron Reduction in Tilled Soils (C6)
__ Stunted or Stressed Plants (D1) (**LRR A**)
__ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

__ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B)**
__ Drainage Patterns (B10)
__ Dry-Season Water Table (C2)
__ Saturation Visible on Aerial Imagery (C9)
__ Geomorphic Position (D2)
__ Shallow Aquitard (D3)
__ FAC-Neutral Test (D5)
__ Raised Ant Mounds (D6) (**LRR A**)
__ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ____ No ✓ Depth (inches): ____
Water Table Present? Yes ____ No ✓ Depth (inches): ____
Saturation Present? (includes capillary fringe) Yes ____ No ✓ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX C: SITE PHOTOGRAPHS

Photo 1: Facing east at the inundated portion of Wetland A (November 3, 2016).

Photo 2: Facing north at Wetland B (November 3, 2016).

Photo 3: Facing west at Wetland B (November 3, 2016).

Photo 2: Facing north at the west side of the Wetland C boundary marked by orange flagging. (November 3, 2016).

Photo 5: Facing west towards Wetland C (November 3, 2016

Photo 6: Facing southwest along the Wetland C boundary. (November 3, 2016).

Photo 7: Facing south toward the inundated portion of Wetland D (November 3, 2016).

Photo 8: Facing northeast at Wetland D (November 3, 2016).

Photo 9: Facing east at the western end of Wetland E (November 3, 2016).

Photo 10: Facing northwest toward the northern boundary of Wetland F (November 3, 2016).

Photo 11: Facing southwest at the southern end of Wetland F (November 3, 2016).

Photo 12: Facing southwest toward the northern boundary of Wetland F (November 3, 2016).

Photo 13: Facing west at the eastern boundary of Wetland G (November 4, 2016).

Photo 14: Facing southwest toward the center of Wetland G (November 4, 2016).

Photo 15: Facing east from the eastern boundary of Wetland G toward Plot 20 (November 4, 2016).

Photo 16: Facing west from within Wetland G toward the western boundary (November 4, 2016).

APPENDIX D: WETS TABLE

WETS Station : BEAVERTON 2 SSW, OR0595 Creation Date: 04/06/2015
Latitude: 4527 Longitude: 12249 Elevation: 00270
State FIPS/County(FIPS): 41067 County Name: Washington
Start yr. - 1971 End yr. - 2000

Month	Temperature (Degrees F.) avg daily max	avg daily min	avg	Precipitation (Inches) avg	30% chance will have less than	30% chance will have more than	avg # of days w/.1 or more	avg total snow fall
January	46.1	33.8	40.0	5.83	3.53	7.07	12	0.6
February	50.7	35.3	43.0	4.84	3.06	5.84	12	0.7
March	56.1	37.3	46.7	4.06	3.03	4.74	11	0.1
April	61.1	40.2	50.7	2.79	1.90	3.32	9	0.0
May	67.2	45.4	56.3	2.25	1.40	2.72	7	0.0
June	72.7	50.5	61.6	1.62	1.02	1.95	5	0.0
July	79.2	54.3	66.8	0.68	0.27	0.84	2	0.0
August	79.9	54.3	67.1	0.84	0.22	0.98	2	0.0
September	74.8	50.3	62.6	1.64	0.70	2.03	5	0.0
October	63.8	43.4	53.6	2.92	1.52	3.57	8	0.0
November	52.0	38.5	45.3	6.07	4.08	7.25	13	0.5
December	46.0	34.5	40.3	6.41	4.42	7.64	12	0.5
Annual	———	———	———	———	34.88	44.05	——	———
Average	62.5	43.2	52.8	———	———	———	——	———
Average	———	———	———	39.95	———	———	92	2.2

GROWING SEASON DATES

Probability	Temperature 24 F or higher	28 F or higher	32 F or higher
	Beginning and Ending Dates Growing Season Length		
50 percent *	1/29 to 12/21 326 days	3/ 3 to 11/24 265 days	4/12 to 11/ 4 206 days
70 percent *	1/20 to 12/30 343 days	2/20 to 12/ 5 287 days	4/ 4 to 11/12 222 days

Natural Resource Assessment for T-S Corporate Park in Sherwood, Oregon

Prepared for

Trammell Crow Company
Attn: Kirk Olsen
1300 SW Fifth Avenue, Suite 3050
Portland, Oregon 97201

Prepared by

Shawn Eisner
Fred Small
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, Oregon 97070
(503) 570-0800
(503) 570-0855 FAX

PHS Project Number: 6163

January 9, 2020
[Revised March 19, 2020]

TABLE OF CONTENTS

1.0 INTRODUCTION

Pacific Habitat Services, Inc. (PHS) conducted a Natural Resources Assessment (NRA) on an existing, undeveloped light industrial property on SW Tualatin-Sherwood Road in Sherwood, Washington County, Oregon (Township 2 South, Range 1 West, Section 28D, tax lot 1100). The property, proposed for T-S Corporate Park, is a former farm site, with fallow fields along Tualatin-Sherwood Road and forest lands proven to be too rocky to cultivate in the south.

The parcel south of the site was recently delineated by David Evans and Associates (DEA) in conjunction with the Willamette Water Supply Program pipeline and water treatment facility. The DEA delineation was approved by DSL in 2017 (DSL DET#2017-0008). Copies of both PHS' and DEA's delineation reports are being provided to CWS as part of the Natural Resources Assessment (NRA) submittal.

This report presents the definitions and the methodology used to assess the natural resources within the project site as required by CWS. Figure 1 shows the project location; Figures 2-2D include existing conditions, including slopes and the corresponding limits of vegetated corridor (VC); Figures 3-3D includes a detail of the VC plant communities, data and photo point locations; and Figures 4-4C includes the location of proposed development actions and activities, as well as project related encroachments, mitigation and enhancement areas. All figures are located in Appendix A.

2.0 EXISTING CONDITIONS

The study area is bordered on the north by SW Tualatin-Sherwood Road; to the west by a partially developed site including a municipal water storage facility; on the east by SW 124th Avenue; and on the south by a partially developed industrial storage site. Nearby land uses include partially landscaped rural residential lots, aggregate mining operations, and small-scale commercial/industrial activities. Until the summer of 2019, when they were removed, the site included a farmhouse and other structures in the west-central portion of the site.

Vegetation communities upslope of the formerly farmed areas along Tualatin-Sherwood Road have formed in the relatively rocky, hilly terrain of the Tonquin Scablands, an area between Sherwood and Tualatin that was scoured by the enormous Bretz flood events during the Pleistocene era. More recent human disturbance (both logging and farming) has also helped shape the current vegetation cover.

The mostly forested to shrubby upland areas upslope of the agricultural fields are comprised of a relatively young to mature overstory of Douglas fir (*Pseudotsuga menziesii*), with bigleaf maple (*Acer macrophyllum*), Oregon white oak (*Quercus garryana*), and madrone (*Arbutus menziesii*) also present. The shrub understory is dense and commonly dominated by poison oak (*Toxicodendron diversilobum*), tall Oregon grape (*Mahonia aquifolium*), oceanspray (*Holodiscus discolor*), snowberry (*Symphoricarpos albus*), and Saskatoon serviceberry (*Amelanchier alnifolia*). Sword fern (*Polystichum munitum*) is a common groundcover species. Invasive shrubs such as Himalayan blackberry (*Rubus armeniacus*) and Scotch broom (*Cytisus scoparius*) are common in more recently disturbed edge habitats.

3.0 DISCUSSION OF WATER QUALITY SENSITIVE AREAS

PHS delineated sensitive areas within the study area based on the presence of wetland hydrology, hydric soils, and hydrophytic vegetation; in accordance with the Routine On-site Determination, as described in the *Corps of Engineers Wetland Delineation Manual*, *Wetlands Research Program Technical Report Y-87-1* ("The 1987 Manual") and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region*, May 2010). The study area was originally delineated on March 2 and March 26, 2017, with additional site data collected on April 28 and June 28, 2017. In order to submit the results of the delineation to the agencies for concurrence, the wetland boundaries were confirmed and/or additional data collected on October 15, November 8 and December 13, 2019.

As the results of the delineation are included in a separate report provided to CWS, only a brief description of each sensitive area is included below.

Wetland A

Wetland A (2.34 acres) is a broad seasonal swale that extends northward to Tualatin-Sherwood Road. The swale originates from a band of hillside seeps or springs along its southern boundary. Its origin may include percolation through porous soils from the large depression further upslope to the south (Wetland C). Several shallow incised channels extend northward from the seeps through the broad swale, ultimately to form a single larger channel near Tualatin-Sherwood Road. Wetland conditions extend for some distance to either side of the channels, supporting a mature stand of Oregon ash. The seasonally charged surface flows are culverted beneath Tualatin-Sherwood Road, ultimately flowing to Hedges Creek (a Tualatin River tributary).

The swale's Cowardin class ranges from palustrine emergent through scrub-shrub and forested, saturated/semipermanent/seasonal (PEMY/PSSY/PFOY) wetland, while the hydrogeomorphic (HGM) class is Slope, largely due to its moderate to shallow gradient and upslope seepage/groundwater spring origins.

Wetland B

Wetland B is a small isolated concave wetland (0.03 acre) on a gentle slope in the now fallow field west of Wetland A. This location was actively farmed prior to 2017, but appears to have been left fallow since at least Fall 2017. The wetland appears to be fed by seasonally charged upslope groundwater seepage and overland sheet flow. Its Cowardin class is palustrine emergent, saturated/ semipermanent/ seasonal (PEMY) wetland, while the HGM class is Slope-Flats. It is dominated by weakly emergent, mostly non-native species, including a hybrid clover (*Trifolium* sp.), perennial ryegrass (*Lolium perenne*), and lesser hawkbit (*Leontodon saxatilis*).

Wetland C

Wetland C is a 1.29 acre depressional feature at the south end of the site that extends outside property boundaries (the southern portion of the wetland was delineated by DEA in 2017). The depression is likely an old scour feature from the Bretz flood events, with relatively steep sideslopes on the west and east sides. The north edge is comparatively low in elevation, but topography rises several feet just to the north, sufficient to contain seasonal rainfall accumulations and act as an impoundment. Its Cowardin class is primarily forested, seasonally flooded/saturated (PFOE) wetland, while the HGM class is Depressional Closed Non-Permanent (DCNP).

Vegetation within Wetland C is dominated by a mostly mature Oregon ash stand, with relatively sparse understory in many places due to prolonged seasonal ponding. Scattered Pacific willow (*Salix lasiandra*) trees are also present within the depression. Shrubs include willows, hardhack spirea (*Spiraea douglasii*), and clustered rose (*Rosa pisocarpa*). Emergent cover is sparser at the north end of the wetland, due to increased duration and depth of inundation, in addition to a dense ash overstory. Observed vegetation is limited to small percentages of shiny geranium (*Geranium lucidum*), annual bluegrass (*Poa annua*) and bedstraw (*Galium aparine*). The south end includes spreading rush (*Juncus patens*), taperfruit shortscale sedge (*Carex leptopoda*), largeleaf avens (*Geum macrophyllum*), shiny geranium, and slough sedge (*Carex obnupta*).

4.0 VEGETATED CORRIDOR ASSESSMENT

The following assessment includes VCs associated with each of the onsite wetlands.

4.1 Vegetated Corridor Width Determination

The slopes adjacent to the sensitive areas were assessed to determine the regulated width of the VC. The location of the VC, adjacent slopes and corridor widths are shown on Figures 2-2D. The regulated VC widths of identified sensitive areas were determined as follows:

Table 1. Summary of VC Widths

Sensitive Area	VC Width	Justification
Wetland A	50 feet	• >0.5 acres • Slopes <25%
Wetland B	25 feet	• ≤0.5 acres and isolated • Slopes <25%
Wetland C	50 feet or greater	• >0.5 acres • Slopes variable; > and <25%

Slopes are generally quite gentle across the north end of the site but increase to the south. Slopes adjoining Wetland C are steeper, but generally still less than 25 percent. There is one narrow point where slopes exceed 25 percent over the first 50 feet, but are less than over the next 25 feet. At this location a break in slope has been identified and the full setback of 35 feet from the break has been identified (Figure 2C).

4.2 Vegetated Corridor Plant Communities

There are three plant communities within the project area (Figures 3-3D). A brief discussion of each community is below. A table of all species documented at each sample point selected as representative of the community it is located in is provided in Appendix B, along with photo documentation. Assessment data includes wetland delineation upland sample plots as well as additional data collected in areas where delineation sample points were not taken.

Plant Community A (85,392 square feet / 1.96 acre) encapsulates the herbaceous dominated areas including the formerly farmed lands adjoining Wetlands A and B (Sample Point VC1). The community itself has no trees but it does have a measureable tree canopy in some areas where it adjoins Communities B and C, as well as forested portions of Wetland A. Himalayan blackberry is common with variable cover and not always present; its percent cover generally decreases with distance from Wetland A. Common herbaceous species include soft velvetgrass (*Holcus lanatus*), tall fescue (*Schedonorus arundinaceus*), bentgrass (*Agrostis sp.*), Queen Anne's lace (*Daucus carota*), red clover (*Trifolium pratense*) and tansy ragwort (*Senecio jacobaea*).

Plant Community B (62,366 square feet / 1.43 acre) includes the native forested areas surrounding much of Wetland C. The tree canopy is rather dense with two to four species present at each assessment site. Douglas fir is most common, with big leaf maple, madrone, Oregon white oak, bitter cherry (*Prunus emarginata*) and Sitka willow (*Salix sitchensis*) also documented. The understory shrub cover averaged nearly 100 percent and was dominated by natives including beaked hazelnut (*Corylus cornuta*), trailing blackberry (*Rubus ursinus*), poison oak, serviceberry, tall Oregon grape and snowberry. Herbaceous cover was sparse, largely because of the extent of tree and shrub cover. Taperfruit shortscale sedge was the single most common native plant, with shiny geranium, a somewhat invasive species, a dominant where it is present.

Plant Community C (23,086 square feet / 0.53 acres) is a shrub community bordering portions of Wetland A as well as portions of VC north and east of Wetland C. It is typified by non-native shrubs and small trees, with variable herbaceous cover. Himalayan blackberry is the single most common species, though English hawthorn (*Crataegus monogyna*), Sitka willow, apple (*Malus pumila*), sweet cherry (*Prunus avium*) and hazelnut trees and shrubs are also present throughout. Where this community borders the formerly farmed portions of the property herbaceous species are common, though not in formerly forested areas where blackberry seems to have moved in to dominate since logging activities in 2003 and more recently in 2016.

4.3 Vegetated Corridor Plant Community Condition

Table 2 summarizes the condition of the plant communities in accordance with Clean Water Services' standards.

Table 2. Summary of Plant Communities

		Plant Communities		
Corridor Condition		**A**	**B**	**C**
Good	>80% cover of native plants, and >50% tree canopy		**82% native plants 83% tree canopy**	**52% tree canopy**
Marginal	50% - 80% cover of native plants, and 26-50% tree canopy			
Degraded	<50% cover of native plants, and ≤ 25% tree canopy	**3% native plants 6% tree canopy**		**27% native plants**

The condition of VC is defined by the percentages of native species and canopy cover.

- Community A is in degraded corridor condition, as the community lacks adequate tree canopy and is overwhelmingly dominated by non-native herbaceous species.
- Plant Community B has both a good native tree canopy, and high overall coverage of native species. As such, this community is in good corridor condition.
- Plant Community C is comprised of only 27 percent native species but has a variable tree canopy. As a result of this variability the tree canopy is 53 percent, just enough to fall within the lower range of good condition. The variability of tree canopy relative to the lower percent cover of plants justifies a corridor condition of marginal for Community C.

5.0 PROPOSED PROJECT

The purpose of the project is to construct light industrial buildings within the City of Sherwood's industrial area. The proposed project will construct five light industrial buildings totaling greater than 525,000 square feet, with associated infrastructure and utilities, parking, and stormwater treatment, within the City of Sherwood (Figure 4). The stormwater plan will adhere to CWS' design and construction standards (D&C Standards).

5.1 Proposed Vegetated Corridor Encroachments

Approximately 10,699 square feet of permanent VC encroachment will result from site development (Figures 4-4C); to facilitate proposed grades. Individual encroachments are associated with the construction of Cipole Place (the onsite extension of Cipole Road), the access drive across the north side of Building D, a small area of grading west of Building E, as well as grading and a retaining wall behind (south of) Building C.

The total area of permanent encroachment also includes 100 square feet associated with each of three separate rip rap stilling basins associated with the site's stormwater outfalls. As each is a minor encroachment associated with utility infrastructure, and not more than 100 square feet in size, replacement mitigation is not necessary (per current CWS D&C Standards, Chapter 3, Section 3.05.5c and d).

Temporary encroachments will be limited to a trio of stormwater outfall lines that lead to rip rap stilling basins; one each to the west and east sides of Wetland A, just south of Tualatin-Sherwood Road, and one at the south end of Wetland A. The alignments of associated pipelines have been sited to facilitate proper drainage. The installation of these pipelines will require a combined area of temporary encroachment of 4,917 square feet. The footprint of temporary encroachment is defined by a 20 foot wide construction corridor centered roughly along the proposed pipe alignments. Each of the three rip rap pads for the storm outfalls will require permanent encroachment of 100 square feet.

5.2 Vegetated Corridor Mitigation

Encroachment of 10,699 square feet for site development will be mitigated for through the expansion of an equivalent area of VC (Figures 4-4C). Though mitigation is not required for the 300 square feet of riprap stilling basins, mitigation will nonetheless be provided for these encroachments. In total, 35,654 square feet of VC expansion will be provided. This includes a 1 to 1 replacement for proposed encroachments, as well as an additional 24,955 square feet of mitigation; proposed as a water quality benefit to the project.

VC expansion will occur within six separate areas. The largest and widest is located southeast of Wetland A. There are three additional areas west of Wetland A; the two smaller ones also adjoining VC associated with Wetland B. The two remaining areas will expand existing VC north and northwest of Wetland C. Proposed expansions will widen existing VC by up to 105 feet. As enhancements will be required throughout the first 50 feet of existing VC, enhancement of the proposed mitigation and water quality benefit expansion areas will occur concurrent with other invasive species control and plant installation improvements.

5.3 Tier 2 Alternative Analysis

As discussed above, the purpose of the project is to develop five light industrial building sites at the proposed T-S Corporate Park within the City of Sherwood. Site design has taken great efforts to avoid even temporary impacts to sensitive areas but due to constraints resulting from the required access point and onsite topography, avoidance of VCs is not achievable. Due to the depth of necessary encroachments along the proposed alignment of Cipole Place, a Tier 2 Alternatives Analysis is required. The proposed project will meet all Tier 2 Alternative Analysis criteria, as detailed below.

The proposed reductions in the width of VC meet the following criteria, as required under a Tier 2 analysis:

1. The proposed encroachment area is mitigated in accordance with Section 3.08.

As previously discussed, mitigation for permanent impacts to the VC will be achieved through on-site VC expansion at a replacement ratio of 1:1, as outlined in Section 3.08c of CWS D&C Standards. An additional 24,955 square feet of VC expansion contiguous with existing VC is also proposed. The extent of mitigation is intended to protect water quality for public benefit.

Temporary encroachment to facilitate installation of site utilities will be mitigated in place. As the vicinity of these utilities is in degraded or marginal condition and dominated by non-native species, disturbance of native vegetation will not occur. All temporary encroachments will take place prior to the onset of enhancement actions, with disturbed areas to be vegetated with a native seed mix upon completion of project related activities. Remaining efforts for enhancement of the VC will occur in accordance with the site's landscape plan.

2. The replacement mitigation protects the functions and values of the Vegetated Corridor and Sensitive Area.

The VC to be impacted includes corridor in marginal or degraded condition. The replacement mitigation areas will be located immediately adjacent to the outer boundary of existing VC, functionally expanding the VC where much of the area is currently dominated by Himalayan blackberry. All proposed mitigation and required enhancements on-site will protect the functioning of adjoining VC and sensitive areas.

3. Enhancement of the replacement area, if not already in Good Corridor Condition, and either the remaining Vegetated Corridor on the site or the first 50 feet of width closest to the resource, whichever is less, to a Good Corridor Condition.

A replacement mitigation area of 10,699 square feet will be enhanced to "good" corridor condition in accordance with CWS standards. An additional 24,955 square feet of mitigation is proposed as a water quality benefit to the project. The proposed replacement areas were identified based upon the location and limits of the existing VC.

Enhancement to good condition will occur as required for all remaining areas of VC within 50 feet of identified sensitive areas. In total, 193,203 square feet (4.4 acres) of VC will be mitigated or enhanced.

4. A District Stormwater Connection Permit is likely to be issued based on proposed plans.

The applicant reasonably expects to obtain a District Stormwater Connection Permit based on proposed plans for the project, which were designed in accordance with CWS standards.

5. Location of development and site planning minimizes incursion into the Vegetated Corridor.

Encroachment into the onsite VC has been minimized to the maximum extent practicable. Vegetated corridor encroachments are limited to those necessary for site access improvements, construction of the buildings as proposed, as well as to accommodate access roads, parking areas, stormwater treatment, and other required infrastructure.

The overall development has sought to maximize the developable area of the site. The applicant has taken great strides to avoid impacts to the wetlands themselves but unfortunately complete avoidance of VCs was not possible.

Preliminary site design confirmed that the areas where encroachments would be the most difficult to avoid were along Cipole Place, which is required for site access, and south of Building C.

- Building C. The initial site design including the utilization of steep slopes to avoid impacts to Wetland C, while still providing a stable slope above which the building could be constructed. The necessary contouring required 4,843 square feet of VC encroachment. It was later determined that a retaining wall could be utilized at that location, thereby reducing VC encroachments to 1,057 square feet. The retaining wall reduced the depth of encroachment from 47 feet down to a maximum depth of 15 feet. Similarly, the frontage length of encroachment was reduced from 150 feet, down to 100 feet.

- Cipole Place. This access street is necessary for site development and as a result of the existing intersection of Cipole Road and Tualatin Sherwood Road the applicant cannot alter the location where it enters the site. A typical intersection alignment would result in the perpendicular alignment of Cipole Place off of Tualatin Sherwood Road. The street alignment would then be modified south of that point, to facilitate access to the remainder of the site. Alternative Alignment Option 1 (on Figure 1) reveals what a typical alignment scenario would entail. The result would have been the elimination of Wetland B and significant encroachment within the VC. The applicant however determined early on in the site design process to avoid all impacts to wetlands. The proposed roadway alignment shifts westward to avoid Wetland B and minimize encroachments to adjoining VC. The roadway design incorporates a retaining wall to eliminate the need for embankment slopes east of the street, as even with the modified alignment, Wetland B could not have been avoided without a wall, and VC encroachments would increase without a wall. The most recent minimization efforts associated with Cipole Place include the elimination of a sidewalk on the east side of the road. This change could only be achieved through an Engineering Design Modification with the City as their standards require sidewalks on both sides of the street.

The remaining encroachments proposed for the development are required to adequately site the proposed access roads, buildings, parking areas, stormwater treatment, and other required infrastructure within the developable portion of the site. The development as proposed on-site is dimensioned to meet the requirements of needed light industrial buildings within the City of Sherwood. Any changes to the site plan as proposed will impact the ability to maximize the site's usage for light industrial development. As such, proposed encroachments are limited to the greatest practical extent to make this project feasible. Section 6, below, details the reasons why this property was chosen for development of the buildings, and why encroachment into the VC is necessary.

6. No practicable alternative to the location of the development exists that will not disturb the Sensitive Area or Vegetated Corridor.

Oregon Statewide Planning Goals and Guidelines provide a framework for Oregon's municipalities to balance various public policies through a series of goals and guidelines that cover a variety of broad subjects, including economic development. Statewide Planning Goal 9 requires municipalities to "provide adequate opportunities throughout the state for a variety of economic activities, vital to the health, welfare, and prosperity of Oregon's Citizens." Among the guidelines for Goal 9 is that Comprehensive Plans for urban areas "provide for at least an adequate supply of sites of suitable sizes, types, locations, and service levels for a variety of industrial and commercial uses with plan policies."

The 2018 Sherwood Economic Opportunities Analysis (EOA) compares demand and supply of employment lands to evaluate the land inventory over a 20-year period. This report indicates that within the 282-acre Tonquin Employment Area, 144 acres are constrained (by factors such as wetlands), a category that includes the subject site. The City of Sherwood's (City) 20-year demand for vacant employment land is 116 acres and the 20-year supply is 127 acres. The subject site is included in the City's inventory of land anticipated to meet the demand for industrial land.

The applicant has investigated additional properties within the Sherwood area. This corridor along Tualatin-Sherwood Road is developing rapidly, attesting to the market need for additional industrial property in the greater Sherwood and Tualatin areas. Existing underutilized industrial properties in this area are generally smaller parcels that will not support the larger sized industrial buildings proposed as part of the T-S Corporate Park.

Sites of this size are in short supply throughout the Portland Metropolitan Region, a situation that has been the subject of extensive analysis by Metro and the State of Oregon. As part of the broader state and regional studies, the City of Sherwood has prepared and updated its Economic Opportunities Analysis, which inventories and discusses land availability and constraints within its jurisdiction. This analysis indicates that subdivision of larger industrial sites (including those in the Tonquin Employment Area) or development of multiple buildings to accommodate small and mid-sized sites will help ensure opportunities for small and mid-sized businesses. The applicant's proposed T-S Corporate Park is entirely consistent with this approach as it will result in five buildings with sizes ranging from 56,000 to 183,000 square feet.

The goal of the development is generally twofold: 1) to supply the existing strong demand for 50,000 to 180,000 square foot industrial buildings that accommodate light manufacturing, regional suppliers of parts and services (region to include the Willamette and Tualatin Valleys), and related or standalone office uses; and 2) to create quality employment opportunities within the City of Sherwood in a location that has access to essential services, alternative modes of transportation, and existing housing. The City of Sherwood views the development of the Tonquin Employment Area (which includes this site) as a critical piece of its economic development strategy.

The size of the buildings and the orientation of the site development plan have been chosen to create an efficient use of the usable portion of the property. Smaller buildings or multi-story buildings that might occupy smaller parcels would not address the market in the area, which is for single story industrial buildings in the 50,000 square foot and larger range. It is typical that many of the lessees or purchasers of buildings of this type are locally owned or regional offices of national companies. Employees may live throughout the region, but the presence of nearby housing in Sherwood encourages living nearby. Companies that would occupy these buildings would choose this location for its access to Tualatin-Sherwood Road, Oregon Highway 99W, and I-5, which allow for rapid transportation of goods and services to customers in the Willamette and Tualatin Valleys without the delays of Portland freeway congestion.

The site layout as proposed will result in a very efficient use of the site and allow the construction of buildings that meet current marketplace demands and accomplish planning goals within the City of Sherwood.

Three alternatives were considered for the site. The primary encroachments for site development are associated with the proposed alignment of Cipole Place; Alternatives 2 and 3 focus on that element of the project. As the County is not allowing access to SW 124th Avenue, access from the intersection of Cipole Road and Tualatin Sherwood Road is the only option. All development options must balance the constraints of site development with avoidance of existing sensitive areas and VC.

Alternative 1: "No build" alternative. The no build alternative means that the project would not be constructed. Needed light industrial buildings within the City of Sherwood area would not be constructed, and there would continue to be limited light industrial buildings available for lease or purchase within the City of Sherwood.

Alternative 2: The Applicant considered alternative layouts for the project design to meet the Applicant's needs, while minimizing, to the extent feasible, the impact to VC on the project site. As mentioned above, the location of the intersection of Cipole Place with the development site cannot be modified. The intersection is determined by the existing location of Cipole Road relative to Tualatin-Sherwood Road. Avoiding the VC entirely for the construction of Cipole Place would result in a horizontal curve on the proposed street that would be too tight to reasonable accommodate the anticipated semi-trailer trucks that will access the street. The eastbound to southbound right turn moment from Tualatin-Sherwood onto Cipole is particularly problematic due the large radius of the WB-67 truck trailers that will frequent the site. Additionally, shifting the alignment of Cipole Place west of the proposed location to avoid VC encroachment would also alter the location of a public utility easement to provide future utility access for water, sewer, and storm from Tualatin Sherwood Road to Blake Road required for future development (by others) south of the site. The utility easement is a 35-foot public easement required by the City of Sherwood. The installation of these utilities would require future encroachment through the regulated VC and proposed VC mitigation area (see Figure 2, Alternative Alignment Option 2). The utility easement alignment is shown as a straight line to match the geometry of the easement requested by WWSP (Willamette Water Supply Program), who is designing Blake Road and the water treatment facility to be constructed south of this project.

Additional reduction of encroachment through narrowing of the roadway profile was also investigated. The cross-section for the public street is determined by City Engineering standards, providing few options for minimization. A few opportunities were identified and are discussed in Alternative 3. The applicant also explored re-aligning Cipole Place, but other alignments did not ultimately allow for the construction of a safe, functional alignment that would also reduce VC encroachments.

Alternative 3: Preferred alternative. Alternative 3 is the construction of five industrial buildings, required parking, and stormwater treatment, as described above in Section 5. This alternative proposes VC encroachment sufficient to facilitate the project's five industrial buildings with sizes ranging from 56,000 square feet to 183,000 square feet and VC expansion mitigation. The five buildings will accommodate a range of light industrial, manufacturing, or warehouse/distribution uses. This alternative proposeds an alignment of Cipole Place that avoids wetland impacts and minimizes VC encroachment.

The proposed design avoids roadside LIDA facilities, as stormwater will be managed in centralized facilities in Tracts B, C, and E (outside the VC). City Engineering staff has indicated that street parking would not be allowed unless the roadway were widened. Since a wider roadway would either increase VC encroachment or cause ripple effects on the site plan that compromise the functionality of the industrial park, the applicant chose to eliminate on-street parking. City of Sherwood Engineering staff initially indicated that they would not approve eliminating a sidewalk on the east side of Cipole Place, and as a result that minimization option was not available at the time of initial submittal. The City is now willing to review an Engineering Design Modification and the elimination of the eastern sidewalk is now reflected in the revised development plan figures (Figures 4 through 4C). The original and current designs utilize retaining walls between the sidewalk and Wetland A rather than 3:1 side slopes (see Figure 2 Cipole Street Section). The applicant did examine shifting the cul-de-sac bulb southward to minimize or eliminate VC impacts from the Building D/Building E driveway, but due to the site's steep topography, this had negative impacts on the site design (e.g., building orientation changes, impacts on finished floor elevations, and changes to site grades and dimensions that inhibit truck circulation).

7. The proposed encroachment provides public benefits.

The public benefit of VC encroachment includes supporting Regional, County, and City Goals for employment growth via construction within the urban growth boundary (UGB). The site is a designated Industrial area in Metro's Urban Growth Management Functional Plan (UGMFP) Title 4 *Industrial and Other Employment Areas* map (October 2014). Section 3.07.410 of the UGMFP stipulates in part that "To improve the economy, Title 4 seeks to provide and protect a supply of sites for employment…" Accordingly, after the Tonquin Employment Area (TEA) was brought into the UGB, the City designated the TEA for industrial development and established the Employment Industrial (EI) zone with limits on the size and scope of non-industrial uses. Now that the property has been annexed into the City and zoned EI, the applicant seeks to maximize opportunities for industrial development and employment. The proposed VC encroachment will provide a public benefit by allowing for increased building sizes than could not be accommodated without the encroachment. Because usable square footage will be higher, employment opportunities will also increase for area residents.

Full build out of this site will allow the City to maximize development within the City's UGB. This is a financial benefit to the City, as the City will accrue taxes from the proposed development. The taxes can be used to fund public schools, infrastructure, police and fire, and other expenses related to City management.

Currently, the majority of Sherwood's workforce commutes to locations outside the City. The social benefits to the City include the development of additional industrial development opportunities in an area already dedicated to that use. The site will not result in increased traffic within an existing residential area or degrade the quality of life in an adjoining residential or commercial area as there are none in the immediate vicinity. The site is, however, located within just few miles of residential and retail areas in Sherwood, to the west, and Tualatin, to the east.

Close in development (i.e. within the UGB) allows people to work in close proximity to their residence. This reduces the need for longer commutes, reducing air and water pollutants generated by auto travel. Air and water quality benefits are possible because the project will offer additional local jobs, creating an opportunity for local employment and a potential decrease in the generation of pollutants associated with auto travel to job opportunities elsewhere in the Portland Metro area.

Allowing encroachment into the VCs allows for maximum build out of the site, which requires adequate space for the buildings, parking, stormwater, and additional infrastructure necessary to construct needed light industrial buildings within the City of Sherwood.

Finally, in order to provide an additional water quality benefit beyond the required 10,699 square feet of VC mitigation, the VC will be expanded by an additional 24,955 square feet to encompass a combined mitigation area of 35,654 square feet, which is above and beyond the mitigation area required for project related encroachments.

5.4 Discussion of Wetland and Vegetated Corridors Functions and Values

As a requirement of the Tier 2 analysis, a function and values assessment is required for the sensitive areas and VCs on site. The functions and values of Wetlands A, B, and C, as well as the adjoining VCs were assessed within the study area using the Hydrogeomorphic (HGM) Classification Judgmental Assessment Method.

Water Quality and Quantity

Functions: Water Storage and Delay, Sediment Stabilization and Phosphorus Retention, Nitrogen Removal

Groundwater and precipitation contribute to hydrology within all three wetlands. Observed flooding in Wetland C would suggest an upslope source of seasonal hydrology though it is possible that much of the water is sourced by groundwater discharge from the adjoining rocky substrate. Wetland B is functionally isolated due to its size and distance from the other two wetlands. There is no opportunity for water storage and delay functions in Wetland B as it is a slope/flat wetland with no opportunity to intercept or detain water from upslope sources. Wetland A has only a limited opportunity for water retention as there is a ditch along its west side that conveys water directly to the culvert under Tualatin-Sherwood Road. Wetland C does however provide a water quality function as it does retain floodwaters seasonally.

Water quality functionality is currently limited for Wetlands A and C as stormwater runoff is from largely undeveloped areas and water quality is presumed to be quite good. As development increases to the south the opportunity for the filtration and removal of sediment and pollutants will increase.

The VCs to be impacted by this project rate low for water quality because they are rarely inundated with water; the forested portions of the VCs along Wetland C provide shade but as the wetland is already forested, and inundation occurs in the winter when many of the trees lack leaves, the VC provides little benefit than what can be found within the wetland itself.

Fish and Wildlife

Functions: Primary Production, Thermoregulation, Resident Fish Habitat Support, Anadromous Fish Habitat Support, Invertebrate Habitat Support, Amphibian and Turtle Habitat, Breeding Waterbird Support, Wintering and Migratory Waterbird Support, Songbird Habitat Support

The mix of open and wooded or shrub areas next to Wetlands A and B, make those areas of limited use for waterbird support, or amphibians and turtles, though seasonal use by a couple pair of ducks or geese may be possible.

Community B surrounding Wetland C includes a variety of native food sources. The density of tree and shrub cover would provide habitat for large and small mammals, and bird species. There is no habitat support for fish or waterfowl, due to the limited seasonality of surface water and extent of woody cover and steep, rocky conditions bordering the wetland.

The mix of herbaceous and shrub communities to the north, with proximity to forested areas to the south, make the entire site good for songbird habitat support. Forested conditions exist along the channel through Wetland A, as well as within and adjoining Wetland C, but the limitation of water presence to just the winter and spring means there is little opportunity for these forested resources to provide a thermoregulation benefit; by the time that water cooling is of benefit these features no longer retain surface water. Though the grasslands likely provide good habitat for common invertebrate species, the extent of historical disturbance and lack of unique habitat make it of no particular benefit to more than common species.

Native Plant Communities and Species Diversity

Function: Support of Characteristic Vegetation

Wetland A includes some native tree and shrub species but otherwise Wetlands A and B and their adjoining VCs are dominated by non-native species. Wetland C on the other hand is predominantly comprised of native tree and shrub species, as is VC Community B that borders it.

Recreation and Education

The site is located on private property. Additionally, Himalayan blackberry and poison oak are both common on the site, creating conditions that make accessing the wetlands difficult. As such, recreation and educational opportunities are limited.

5.5 Vegetated Corridor Enhancement

As required, enhancement of all areas within 50 feet of existing sensitive areas will be enhanced. A short section of regulated VC near the south end of the site does exceed 50 feet in width and will not be enhanced. In total, 157,549 square feet of enhancement will occur on the lot.

The overall goal of enhancement is to improve the corridor to 'Good' condition. Enhancement activities will be consistent with Clean Water Services' standards (Appendix A: Planting Requirements of CWS current D&C standards). Required enhancement measures for the marginal and degraded portions of the VC include removing invasive/noxious vegetation, with a focus on removing Himalayan blackberry, Scotch broom, and lesser amounts of thistle and reed canarygrass. Invasive removal will occur in all communities, including Community B, which is already in good condition. Following invasive species removal it will be necessary to plant native trees, shrubs and groundcover.

As Community B is already in good condition, it is not anticipated that supplemental tree or shrub plantings will be necessary, though groundcover species may be appropriate in limited areas greater than 25 square feet in size following invasive species removal. Communities A and C include few native trees or shrubs, so unless indicated otherwise by a landscape architect, standard CWS densities for trees and shrubs should be utilized, with groundcover species in the form of a native grass seed mix recommended following invasive species removal and the installation of woody species.

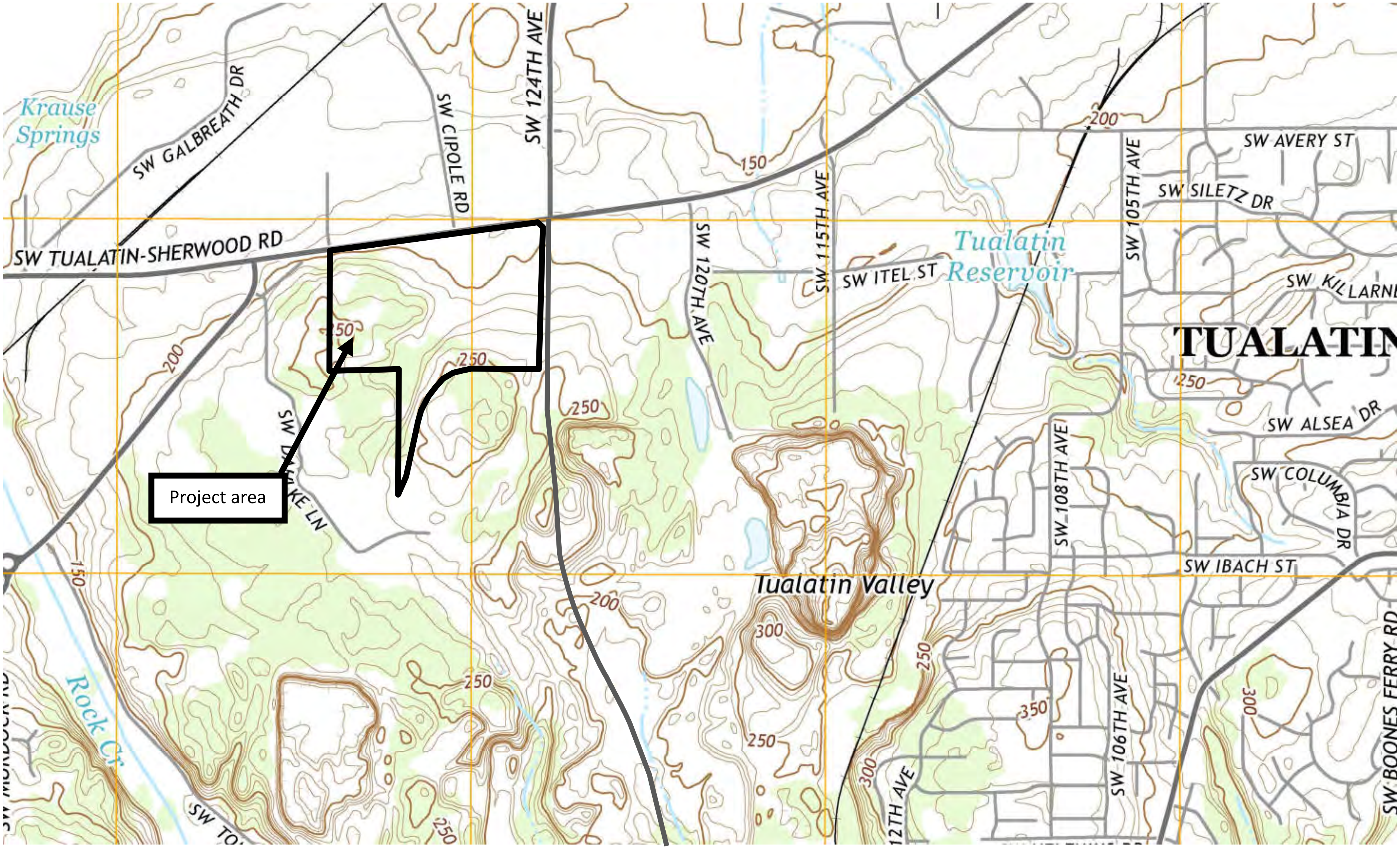
6.0 REFERENCES

Clean Water Services, 2019. Design and Construction Standards (R&O 19-5 as Amended by R&O 19-22).

US Geologic Survey, *The National Map Viewer,* 2014 (Sherwood quadrangle).

Appendix A

Figures

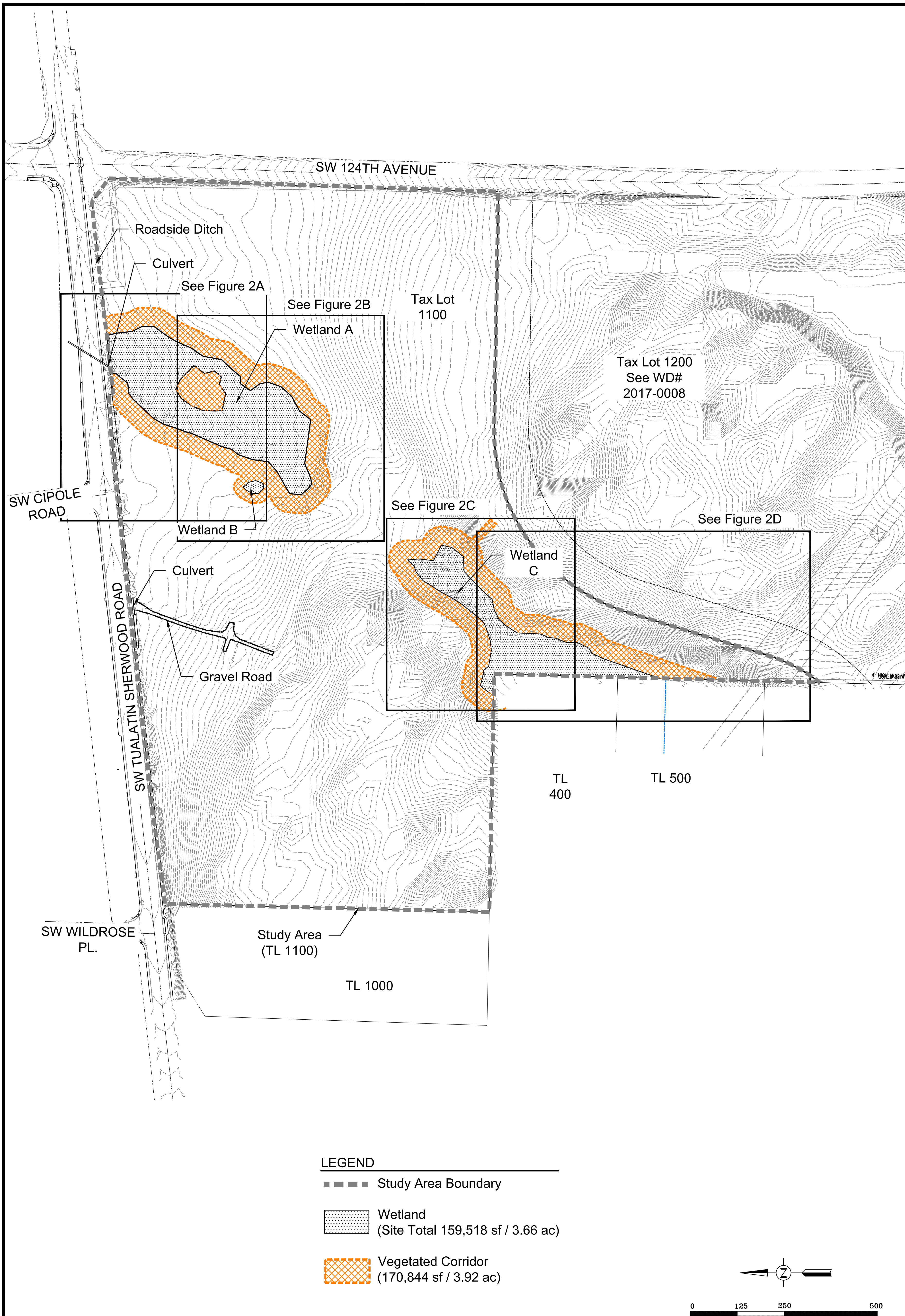


#6163
12/26/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

General Location and Topography
T-S Corporate Park - Sherwood, Oregon
United States Geological Survey (USGS), Sherwood, Oregon, 7.5 Quadrangle, 2014
(viewer/nationalmap.gov/basic)

FIGURE
1



Survey provided by Northwest Survey.

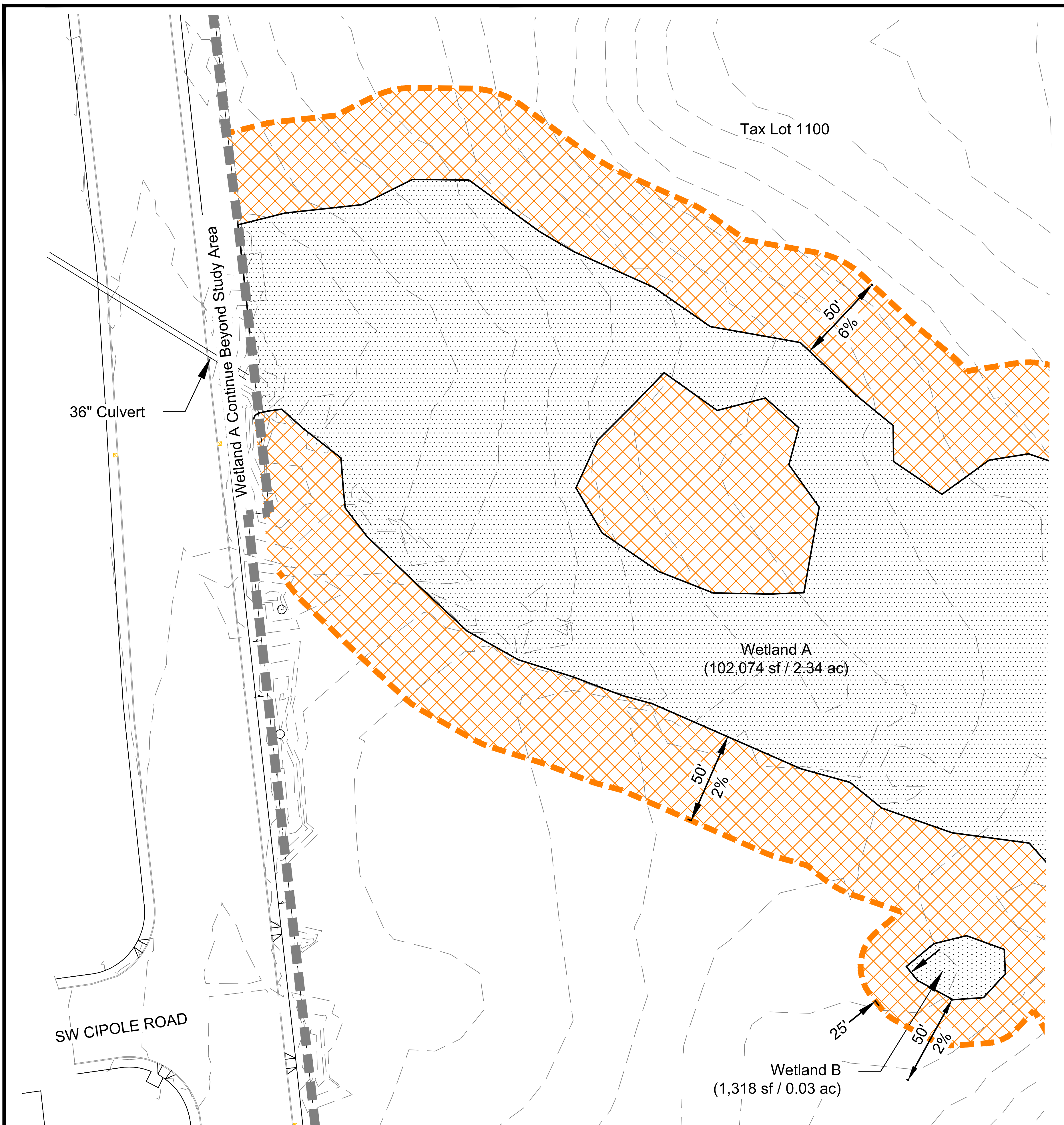
PHS
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Existing Conditions Overview and Sheet Index

T-S Corporate Park - Sherwood, Oregon

FIGURE
2

12-26-2019



LEGEND

Study Area Boundary

Wetland
(Site Total 159,518 sf / 3.66 ac)

Vegetated Corridor
(170,844 sf / 3.92 ac)

0'
%
Slope Measurement

0 30 60 120
SCALE IN FEET

Survey provided by Northwest Survey.

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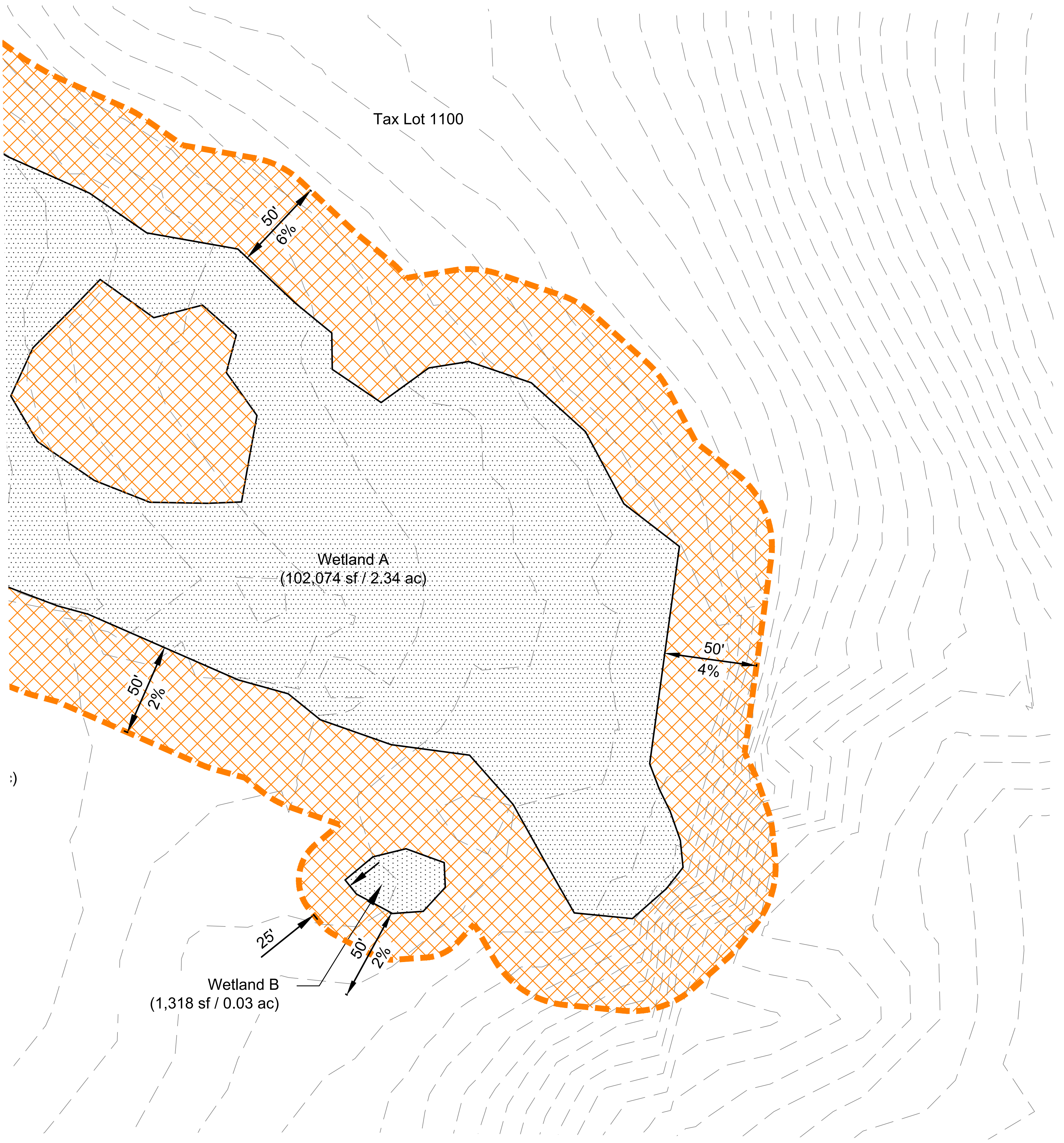
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Existing Conditions
T-S Corporate Park - Sherwood, Oregon

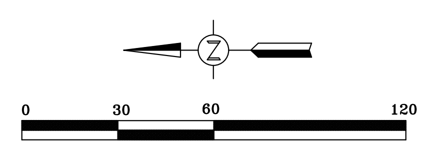
FIGURE
2A

12-26-2019



LEGEND

- Study Area Boundary
- Wetland (Site Total 159,518 sf / 3.66 ac)
- Vegetated Corridor (170,844 sf / 3.92 ac)
- 0' / % — Slope Measurement



Survey provided by Northwest Survey.

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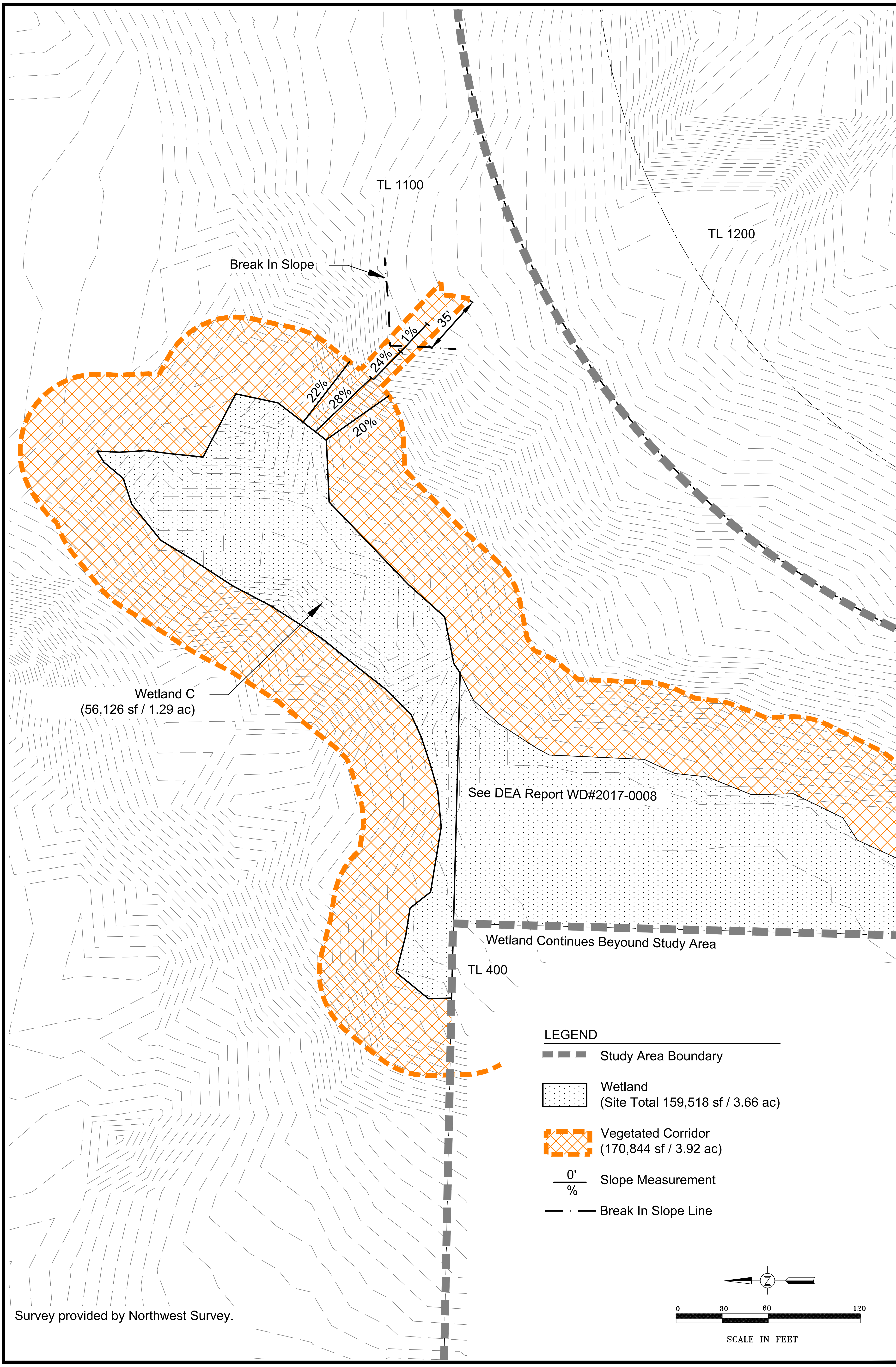
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Existing Conditions
T-S Corporate Park - Sherwood, Oregon

FIGURE 2B

12-26-2019



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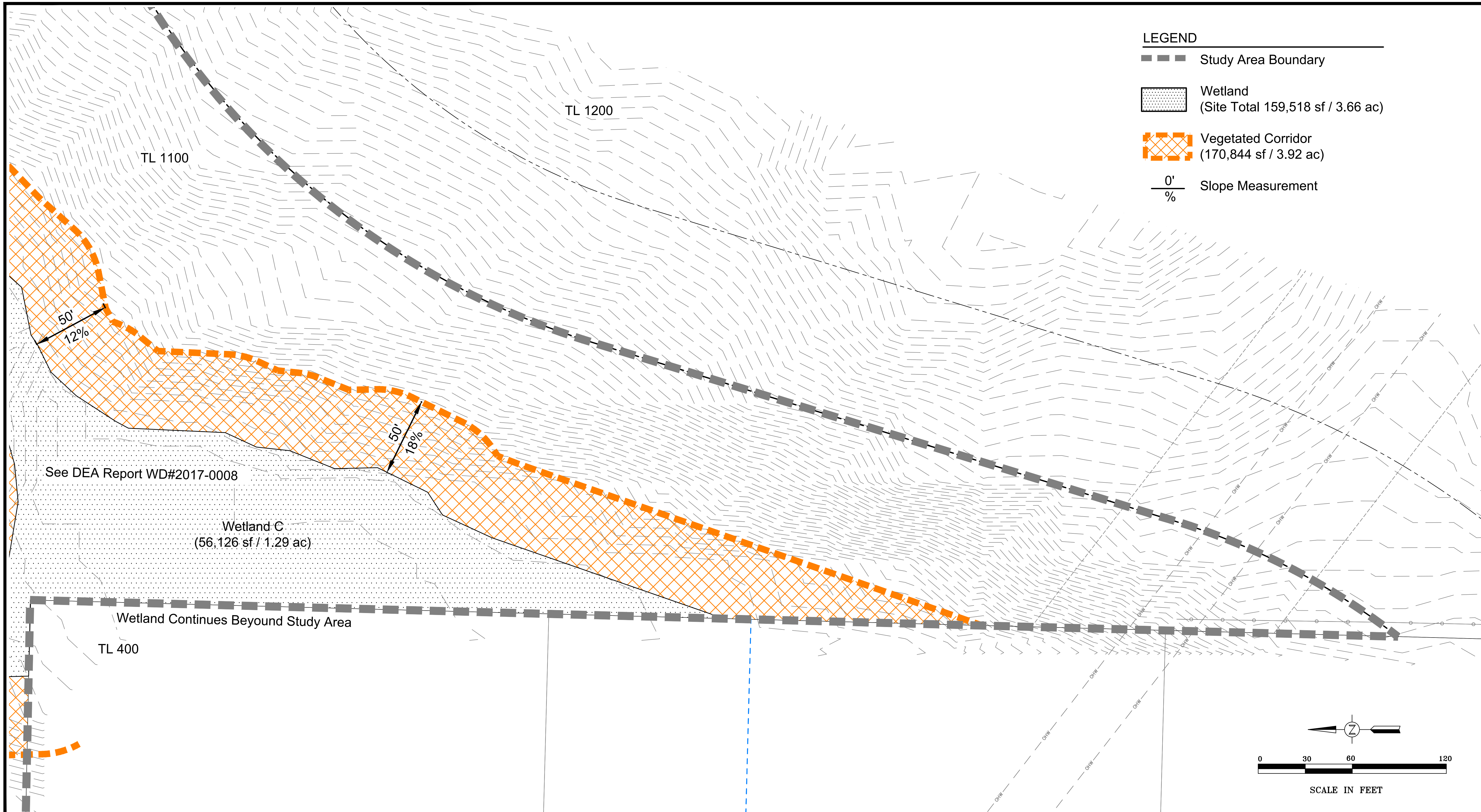
Existing Conditions
T-S Corporate Park - Sherwood, Oregon

FIGURE
2C

12-19-2019

X:\Project Directories\6100\6163 ORR Property\AutoCAD\Plot Dwgs\NRA Figures\Fig2C ExistCond.dwg, 1/7/2020 2:40:51 PM, AutoCAD PDF (Smallest File).pc3



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9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
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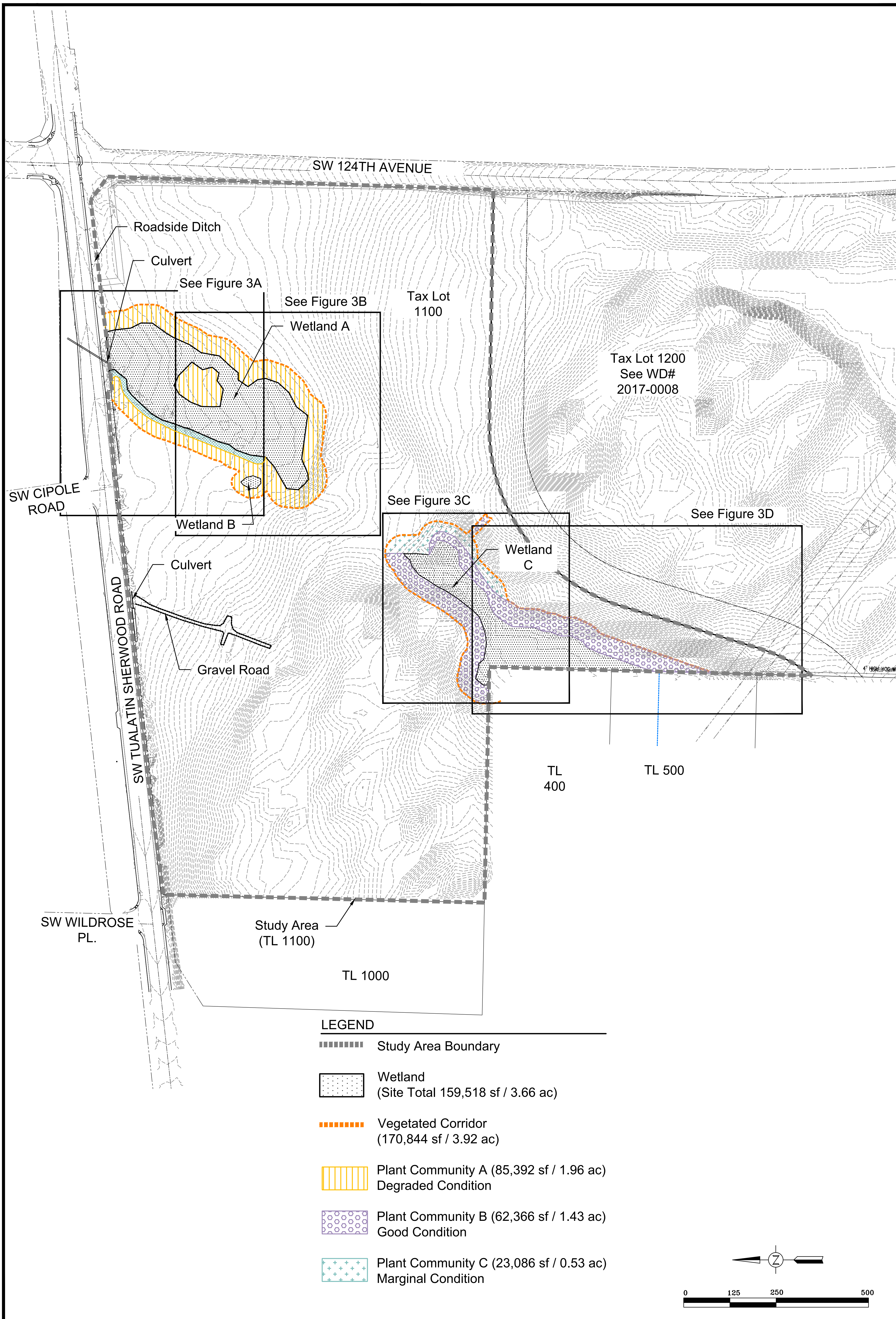
Survey provided by Northwest Survey.

Existing Conditions

T-S Corporate Park - Sherwood, Oregon

FIGURE 2D

1-3-2020



Survey provided by Northwest Survey.

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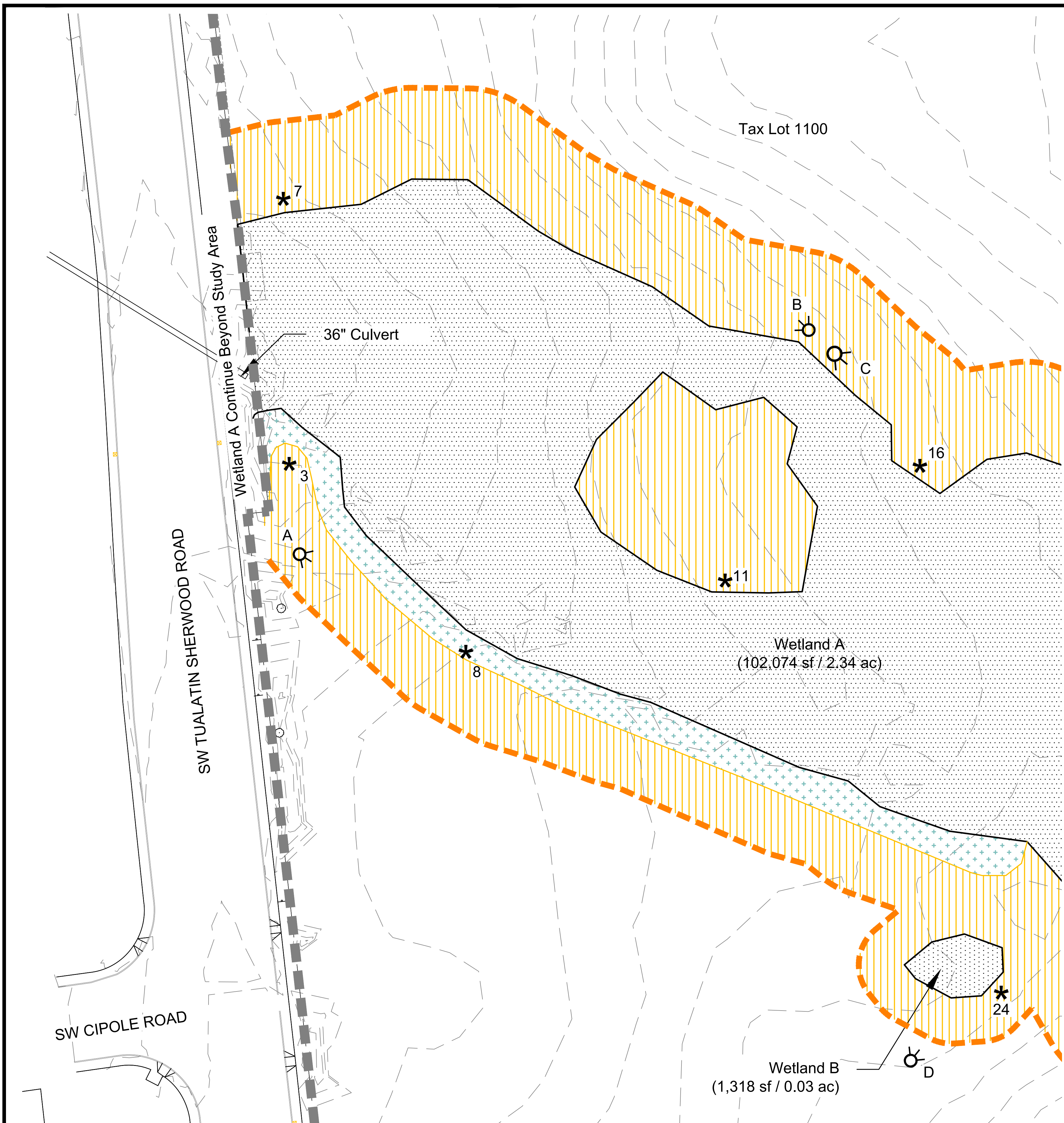
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Vegetated Corridor Plant Communities Overview and Sheet Index

T-S Corporate Park - Sherwood, Oregon

FIGURE 3

1-3-2020



LEGEND

- Study Area Boundary
- Wetland (Site Total 159,518 sf / 3.66 ac)
- Vegetated Corridor (170,844 sf / 3.92 ac)
- Vegetation Sample Point
- Photo Point
- Plant Community A (85,392 sf / 1.96 ac) Degraded Condition
- Plant Community B (62,366 sf / 1.43 ac) Good Condition
- Plant Community C (23,086 sf / 0.53 ac) Marginal Condition

0 30 60 120

SCALE IN FEET

Survey provided by Northwest Survey.

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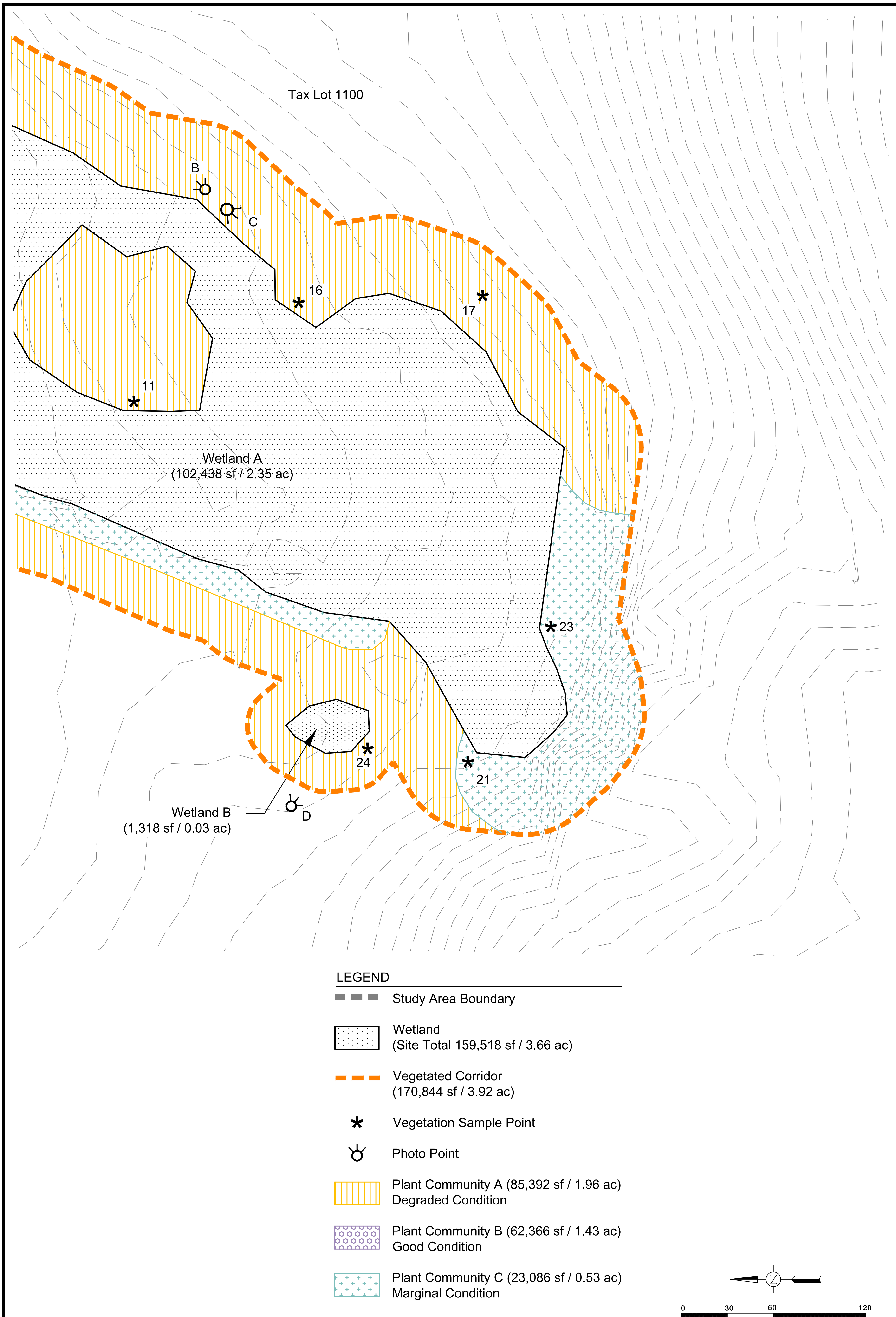
Vegetated Corridor Plant Communities
T-S Corporate Park - Sherwood, Oregon

FIGURE
3A

1-3-2020



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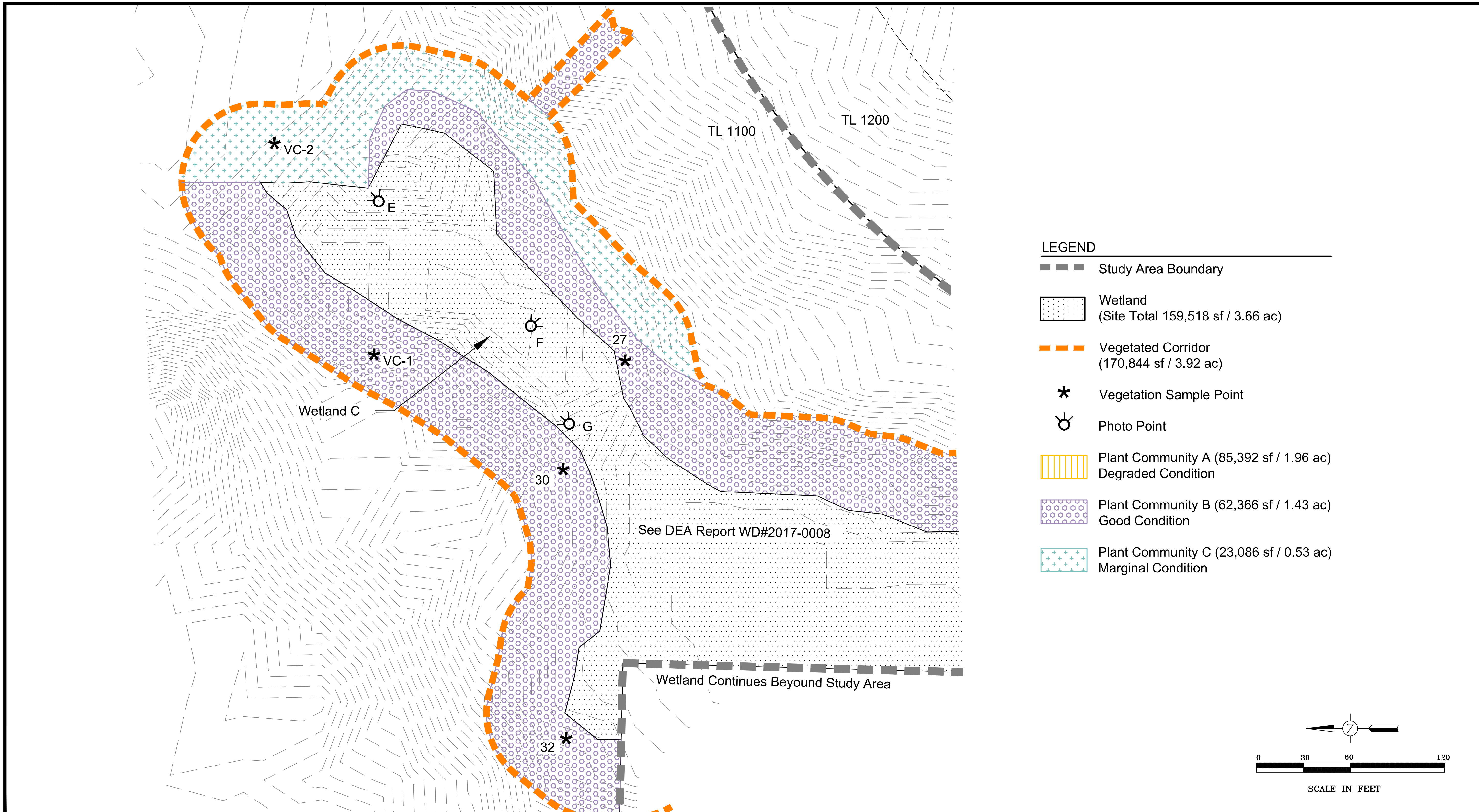
Vegetated Corridor Plant Communities

T-S Corporate Park - Sherwood, Oregon

FIGURE 3B

1-3-2020

X:\Project Directories\6100\6163 ORR Property\AutoCAD\Plot Dwgs\NRA Figures\Fig3B PlantComm.dwg, 1/7/2020 1:26:40 PM, AutoCAD PDF (High Quality Print).pc3



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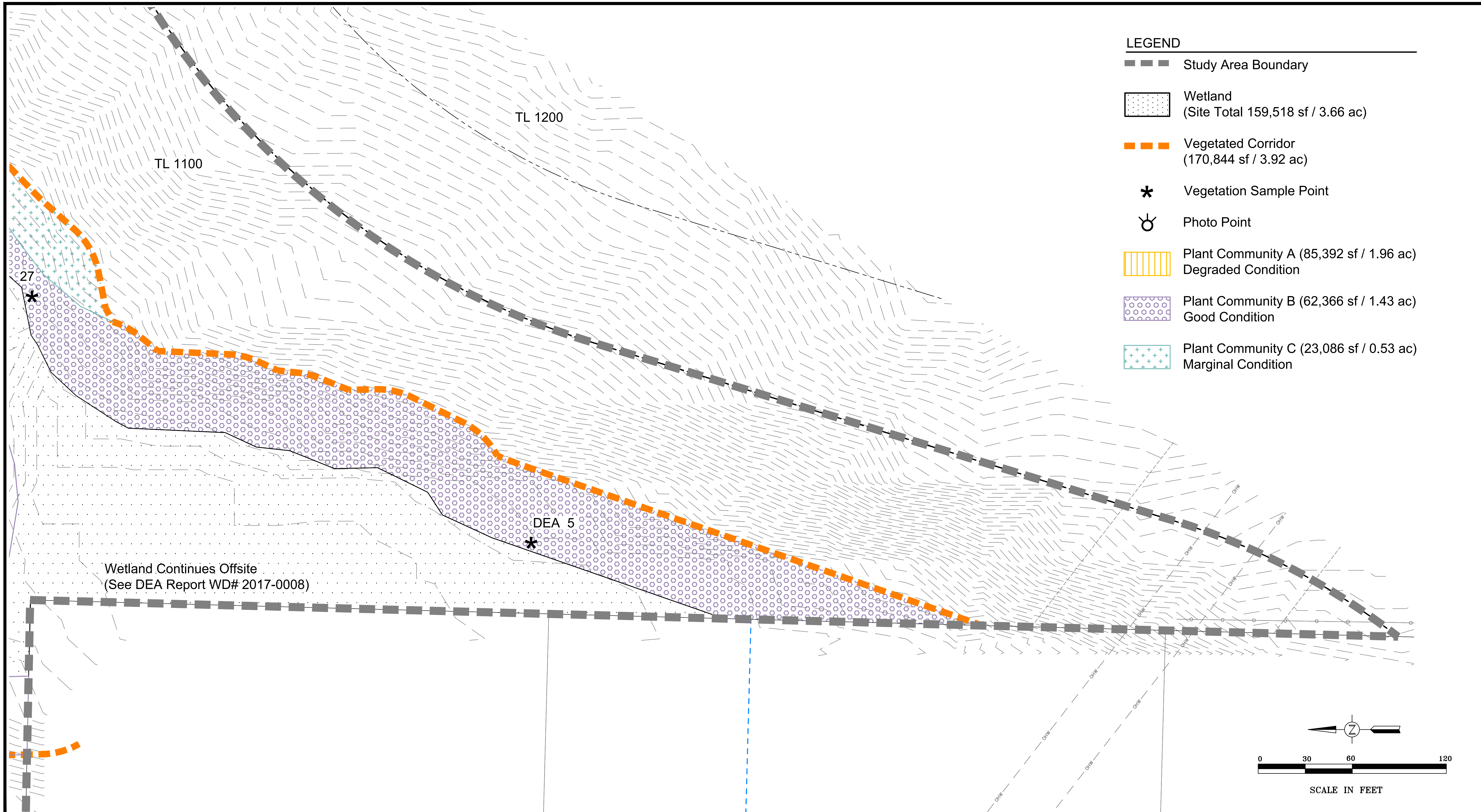
Survey provided by Northwest Survey.

Vegetated Corridor Plant Communities
T-S Corporate Park - Sherwood, Oregon

FIGURE 3C

1-3-2020



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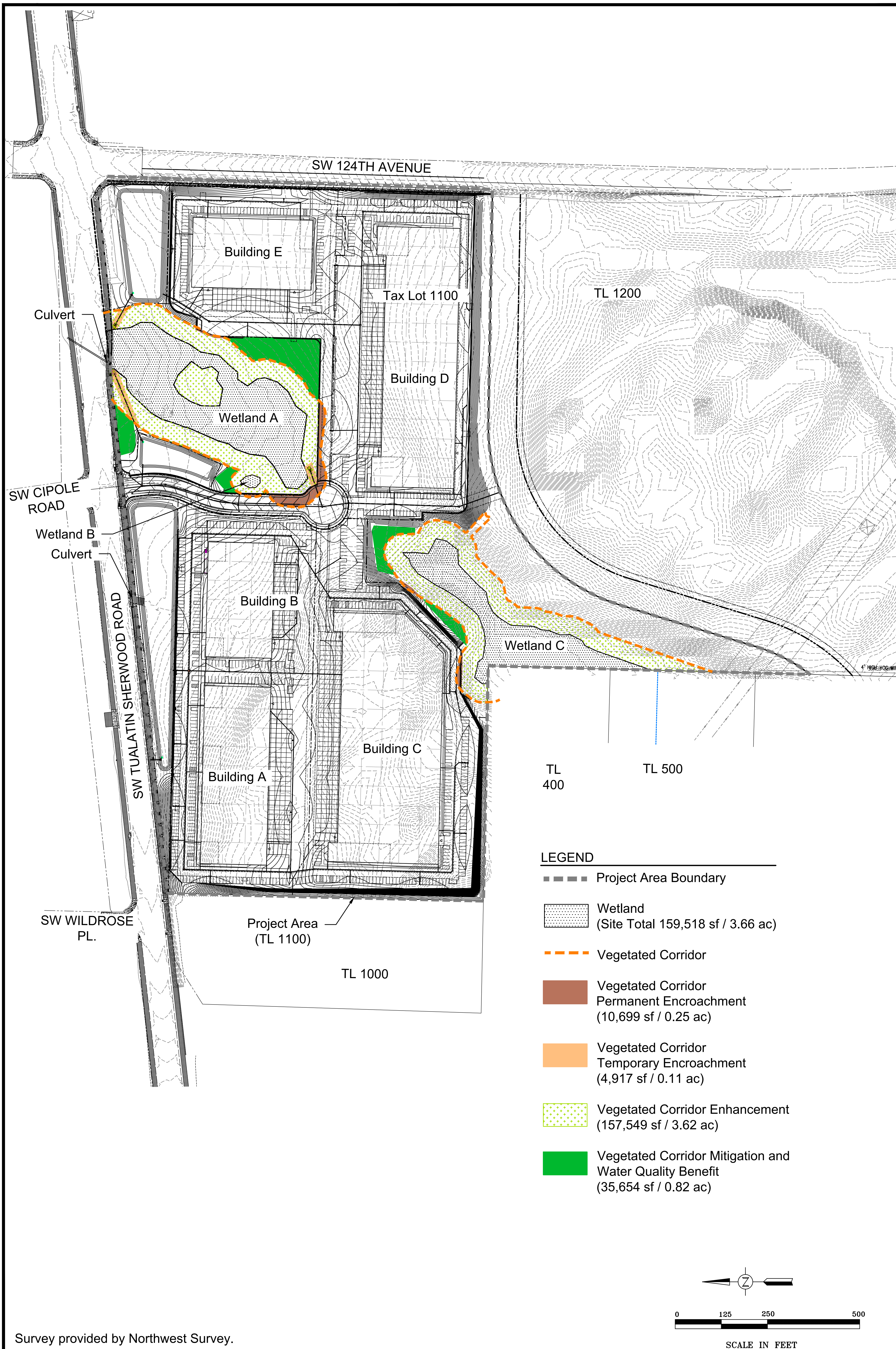
Survey provided by Northwest Survey.

Vegetated Corridor Plant Communities

T-S Corporate Park - Sherwood, Oregon

FIGURE
3D

1-3-2020



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Phone: (503) 570-0800 Fax (503) 570-0855

Site Development Plan Overview
T-S Corporate Park - Sherwood, Oregon

FIGURE 4

3-19-2020

LEGEND

- Project Area Boundary
- Wetland (Site Total 159,518 sf / 3.66 ac)
- Vegetated Corridor
- Vegetated Corridor Permanent Encroachment (10,699 sf / 0.25 ac)
- Vegetated Corridor Temporary Encroachment (4,917 sf / 0.11 ac)
- Vegetated Corridor Enhancement (157,549 sf / 3.62 ac)
- Vegetated Corridor Mitigation and Water Quality Benefit (35,654 sf / 0.82 ac)

N

0 30 60 120

SCALE IN FEET

Site Plan Provided by DOWL

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Phone: (503) 570-0800 Fax (503) 570-0855

Site Development Plan and Vegetated Corridor Encroachment

T-S Corporate Park - Sherwood, Oregon

FIGURE 4A

3-19-2020

LEGEND

- Project Area Boundary
- Wetland (Site Total 159,518 sf / 3.66 ac)
- Vegetated Corridor
- Vegetated Corridor Permanent Encroachment (10,699 sf / 0.25 ac)
- Vegetated Corridor Temporary Encroachment (4,917 sf / 0.11 ac)
- Vegetated Corridor Enhancement (157,549 sf / 3.62 ac)
- Vegetated Corridor Mitigation and Water Quality Benefit (35,654 sf / 0.82 ac)

0 30 60 120
SCALE IN FEET

Site Plan Provided by DOWL

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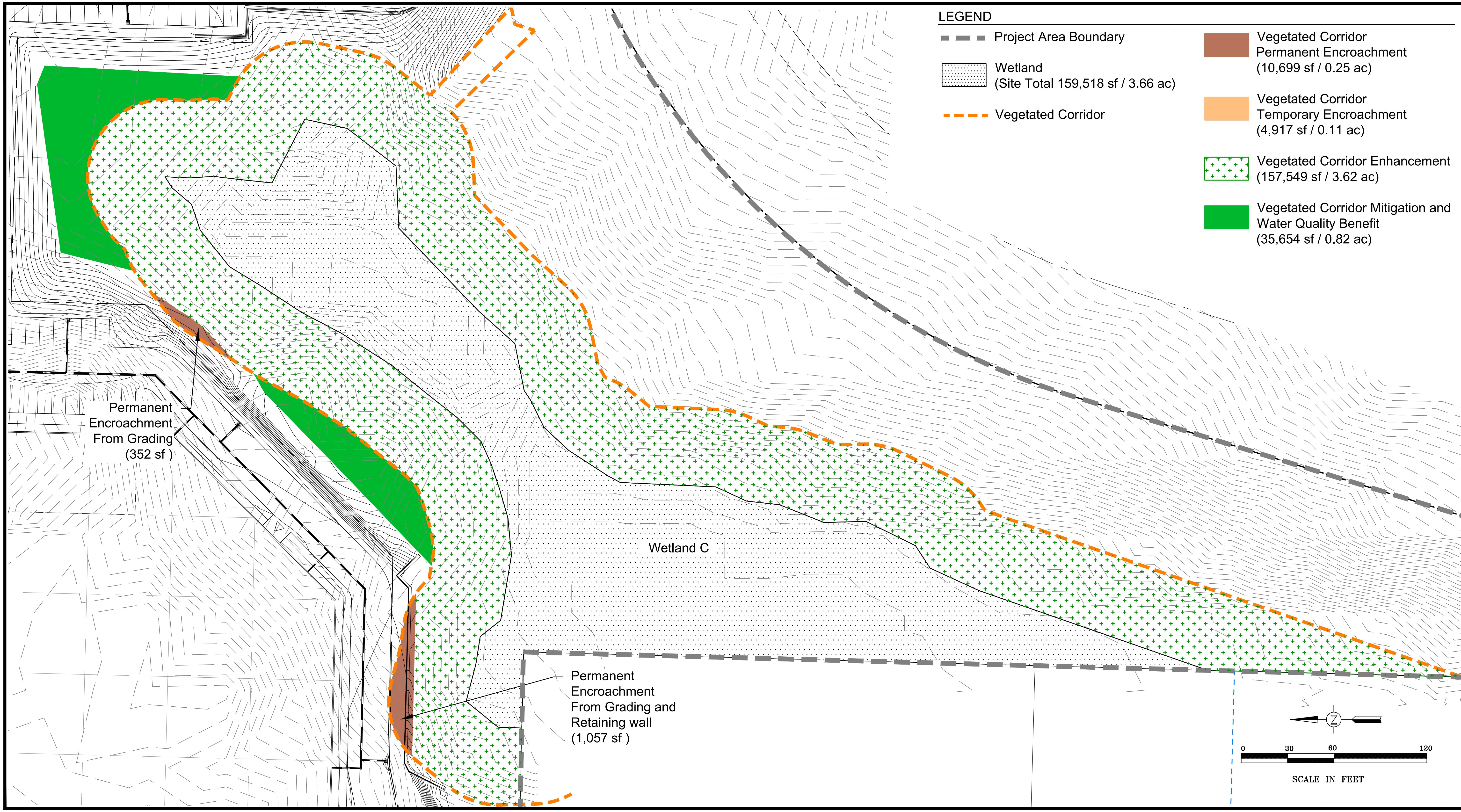
Phone: (503) 570-0800 Fax (503) 570-0855

Site Development Plan and Vegetated Corridor Encroachment

T-S Corporate Park - Sherwood, Oregon

FIGURE
4B

3-19-2020



Site Plan Provided by DOWL

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Site Development Plan and Vegetated Corridor Encroachment

T-S Corporate Park - Sherwood, Oregon

FIGURE 4C

3-19-2020

Appendix B

Vegetated Corridor Sample Points Table and Photo documentation

T-S Corporate Park - Vegetated Corridor Sample Sites

Plant Community	Community A - Herbaceous							Community B - Native Forest						Community C - Scrub Shrub				
Sample Point	**3**	**7**	**11**	**16**	**17**	**24**		**27**	**30**	**32**	**VC-1**	**DEA-5**		**8**	**21**	**23**	**VC-2**	
TREES																		
Native																		
Acer macrophyllum								20			30							
Arbutus menziesii									5		5							
Fraxinus latifolia																	5	
Prunus emarginata												35						
Pseudotsuga menziesii								20		25	15	15						
Quercus garyanna									20	15	25							
Salix lasiandra																		
Salix sitchensis										10		10				50	10	
Non native																		
Crataegus monogyna															20	60		
Malus pumila (apple)															30			
Prunus avium										15				15				
SHRUBS & SAPLINGS																		
Native																		
Amelanchier alnifolia									40		5							
Corylus cornuta								50	20	60	35	10		5		15		
Fraxinus latifolia			1															
Gaultheria shallon									10			25						
Holodiscus discolor										2	10	15						
Mahonia aquifolium								10		10								
Oemleria cerasiformis								5								1		
Polystichum munitum									10	2								
Rosa pisocarpa											5							
Rubus ursinus								5	10	20	10	10				25		
Symphoricarpos albus								20				10						
Toxicodendron diversilobum									10	5	60				20			
Invasive																		
Rubus armeniacus	10		40	15	5	5		5		10	5			10	10	20	100	
Non native																		
Crataegus monogyna			2													20		
Prunus avium														15			10	
HERBS																		
Native																		
Agrostis exarata														40				
Carex hendersonii								5										
Carex leptopoda										25	5							
Equisetum arvense			1															
Galium aparine	20														5			
Maiathemum stellatum								5										
Polypodium glycyrrhiza											50							
Invasive																		
Cirsium arvense			35	5										25	10			
Non Native																		
Agrostis capillaris	20																	
Agrostis stolonifera		25																
Anthoxanthum odoratum						5												
Cardamine oligosperma	5																	
Daucus carota		5	10	10	10									15				
Epilobium ciliatum	5					1												
Festuca rubra		10																
Geranium lucidum	20								30	70	90							
Geranium molle												5						
Holcus lanatus		20	60	20	45	20								5				
Hypericum perforatum	10	5				15												
Jacobaea vulgaris				20	10	5												
Leontodon saxatillis						5												
Lolium sp.	10																	
Lotus corniculatus				5														
Plantago lanceolata				5		1												
Poa annua						5												
Poa pratensis															85			
Rumex acetosella			1															
Rumex crispus	5					5								5				
Schedonorus arundinaceus				30	5													
Taraxacum officinale		5																
Trifolium pratense					10	20												
Vica sp.		20			15													
	Community A						**Average**	**Community B**					**Average**	**Community C**				**Average**
Canopy cover*	**30**	**0**	**5**	**0**	**0**	**0**	**6**	**80**	**85**	**100**	**70**	**80**	**83**	**70**	**40**	**90**	**10**	**53**
% Native Species	**19**	**0**	**1**	**0**	**0**	**0**	**3**	**97**	**81**	**65**	**73**	**96**	**82**	**33**	**14**	**48**	**12**	**27**
% Invasive Species	**10**	**0**	**50**	**18**	**5**	**6**	**15**	**3**	**0**	**4**	**1**	**0**	**2**	**26**	**11**	**10**	**80**	**32**
Total cover	**105**	**90**	**150**	**110**	**100**	**87**		**145**	**155**	**269**	**350**	**135**		**135**	**180**	**191**	**125**	

* Canopy cover includes trees located beyond 30 feet from the assessment area; including trees upslope and within or across adjoining sensitive areas. Tall shrubs and small trees up to 20 feet tall also contribute to canopy cover.

Photo A:

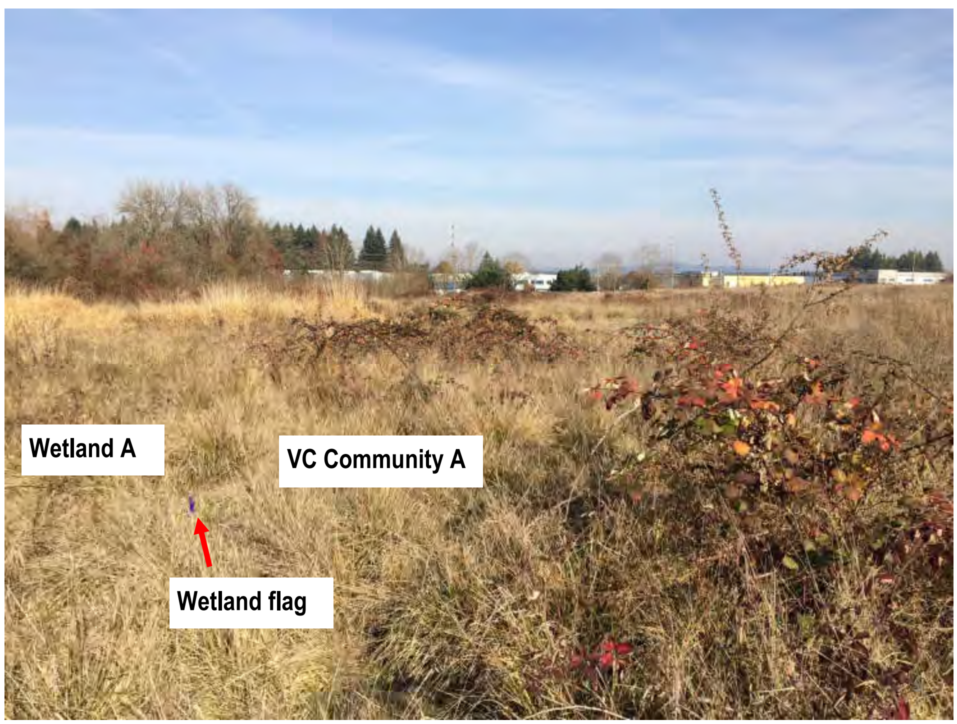
Looking south, west of Wetland A. To the right is Community A, and to the left, Community B.

Photo taken: November 8, 2019

Photo B:

Looking northeast; east of Wetland A.

Photo taken: November 8, 2019



Project #6163
12/27/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Photo documentation

T-S Corporate Park - Sherwood, Oregon

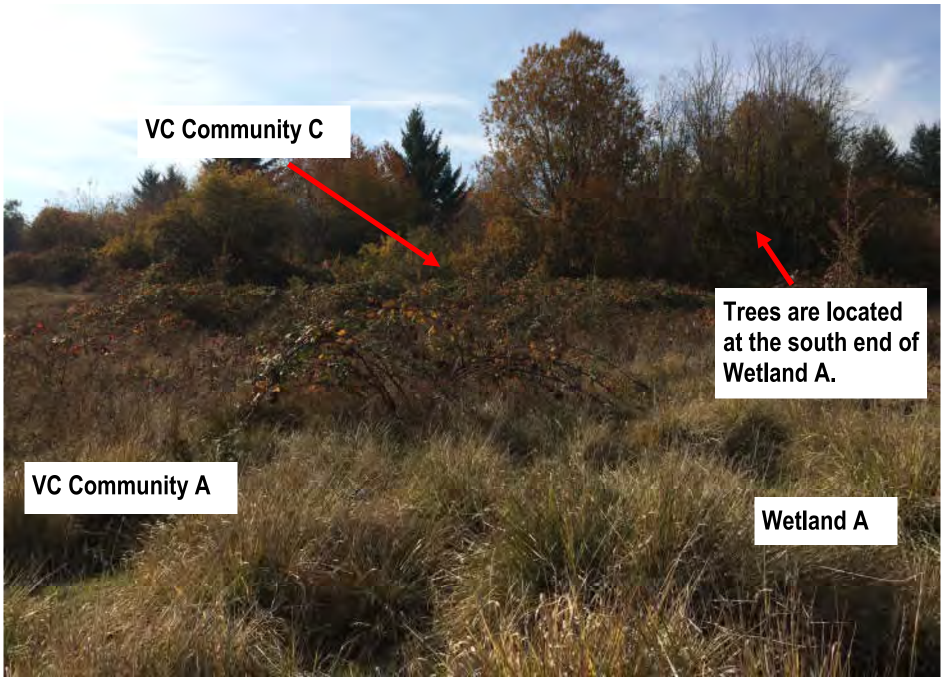


Photo C:

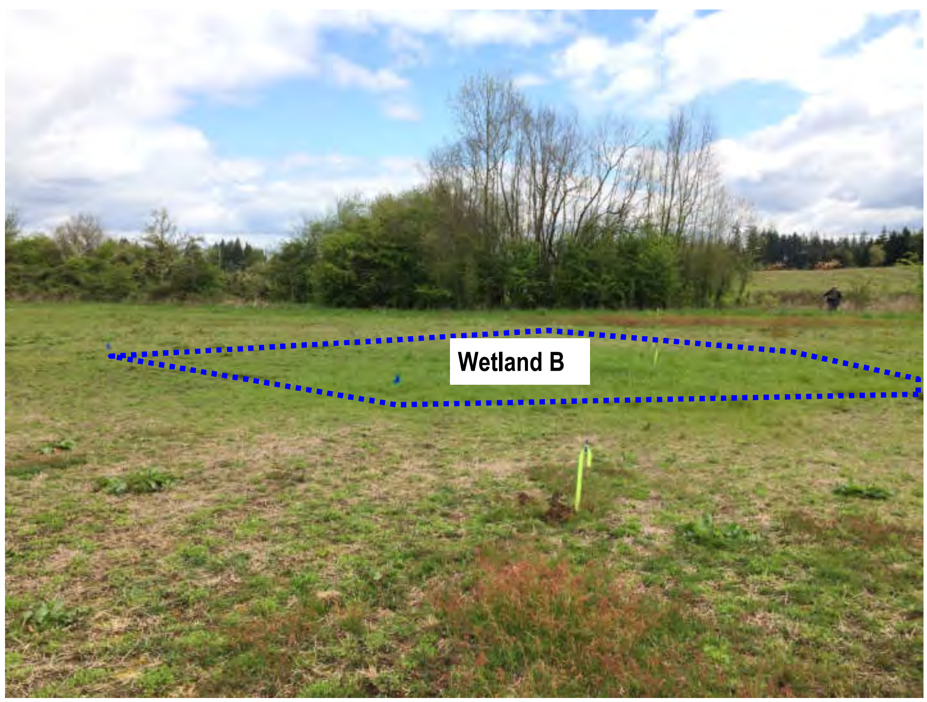
Looking southwest along Wetland A. Community A is located in the left foreground. The more contiguous thicket of blackberries is the beginning of Community C.

Photo taken: November 8, 2019

Photo D:

Looking east across Wetland B in agricultural field, toward Wetland A. This is an older photo but it still accurately represents the transition from herbaceous Community A to Community C (the shrubs in the background).

Photo taken: April 28, 2017



Project #6163
12/27/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Photo documentation

T-S Corporate Park - Sherwood, Oregon

Photo E:

Looking north into Community C north of Wetland C.

Photo taken: October 15, 2019

Photo F:

Looking east along edge of Wetland C; depression dries out later in spring. Community B begins beyond the limits of inundation, which corresponds to the edge of wetland in this area.

Photo taken: March 23, 2017

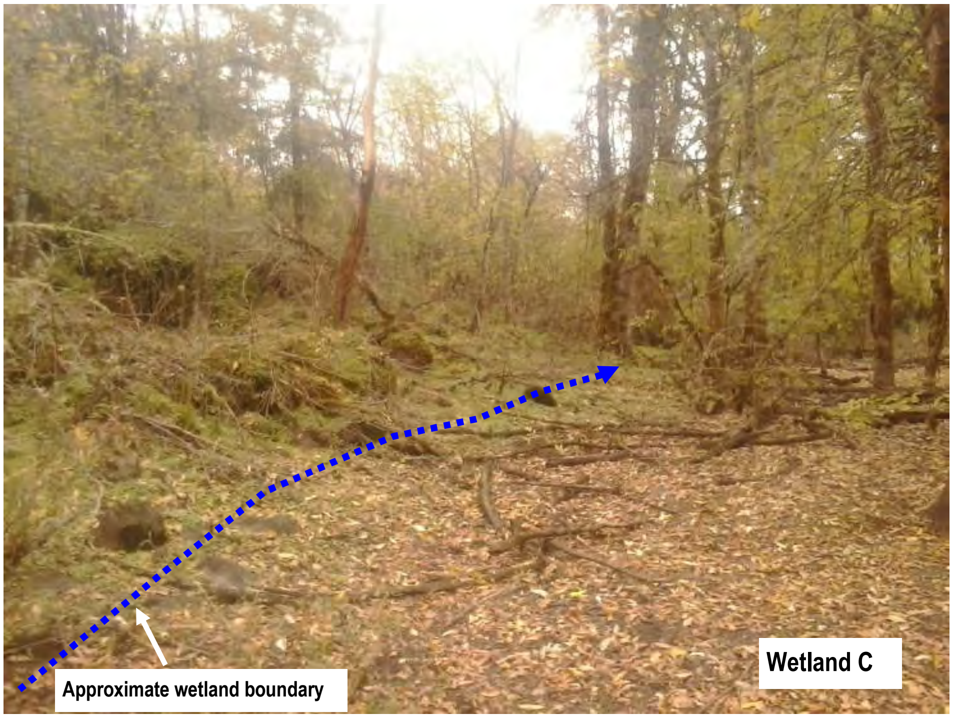


Photo G:

Looking north along the west edge of Wetland C. Community B begins at the wetland edge.

Photo taken: October 15, 2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Preliminary Drainage Report

T-S Corporate Park

2322.14347.01

REGISTERED PROFESSIONAL ENGINEER
78906PE
OREGON
Sept. 11, 2012
RYAN HAJIME HALVORSON
EXPIRES: 6/30/21

Prepared for

Trammell Crow Company

1300 SW 5th Avenue, Suite 3050

Portland, OR 97201

March 4, 2020

Prepared for	Trammell Crow Company
Project Name	Drainage Report
Job Number	2322.14347.01
Date	March 4, 2020

DOWL
720 SW Washington Street, Suite 750
Portland, Oregon
97205

Telephone: 971-280-8641
Facsimile: 800-865-9847
rhalvorson@dowl.com

Name	Title	Date	Revision	Reviewer
Mike Gillette	Civil Designer	01/15/2020	0	Ryan Halvorson
Mike Gillette	Civil Designer	03/4/2020	1	Ryan Halvorson

Executive Summary

The proposed project will develop a new industrial park on the undeveloped land at the southwest corner of SW Tualatin-Sherwood Road and SW 124th Avenue in Sherwood, Oregon. The proposed development includes five new buildings, associated parking, landscape, utility connections, and stormwater facilities.

The proposed storm design will meet the requirements of the Clean Water Services as *Design and Construction Standards for Sanitary Sewer and Surface Water Management,* December 2019. The project proposes to create over 1,000 sf of impervious area; therefore, a hydromodification assessment is required. Using Clean Water Services Hydromod Planning Tool, the development is located within an expansion area, and the site has a hydromodification risk of both low and high (resulting in a high-risk designation). Since the site development is approximately 32.02 acres, the development is classified as a Category 3 large project based on Clean Water Services Table 4-2. As a result, the development is required to have at least 30 percent of the proposed impervious area be treated and detained in LIDA facilities.

The proposed site is split into three overall main drainage basins, West, Cipole, and East (see appendix Figure 2). On-site water quality treatment and water quantity flow control will be provided by three proposed extended dry basin LIDA facilities, treating and detaining for 100 percent of the proposed development. Water quantity detention and flow control systems were designed to limit the 2, 5, and 10-year 24-hour storms to discharge per Clean Water Services standards. Under the hydromodification requirements, the 2-yr post developed flow must be released equal to or less than 50% of the 2-yr predeveloped flow. In addition, the 5-year and 10-year post developed storm events are released to less than the respective 5-year and 10-year predeveloped storm event flows. The proposed private conveyance system will be designed using the 25-year storm event in the final drainage report.

Treated and detained runoff will exit the extended basin facilities at two locations both connecting to the existing storm lines in SW Tualatin-Sherwood Rd. The west basin (development west of Cipole Place) consists of lots 1, 2, and 3, discharging to an existing 18” storm line which goes under Tualatin-Sherwood north. This 18” storm line connects to an existing conveyance system in Wildrose Place traveling north more than ¼ mile from the site. The central overall basin (Cipole Place) and the east basin (development east of Cipole) discharge to the existing wetland. Stormwater from the existing wetland is conveyed by a 36” storm line under Tualatin-Sherwood to the north side, where it enters a large road side ditch. Stormwater is conveyed east and is collected in an 18” storm line and connects to the existing 24” storm line in Tualatin-Sherwood Rd. A final downstream analysis will be provided in the final stormwater report.

The proposed private conveyance will be designed using the 25-year storm event in the final drainage report. The proposed public conveyance will be designed to convey the 25-year storm event without surcharging in the final drainage report.

The proposed storm design will meet the requirements of both the City of Sherwood and Clean Water Services as listed in the *Design and Construction Standards for Sanitary Sewer and Surface Water Management* issued December 2019.

Table of Contents

Tables

Figures

1 Project Overview

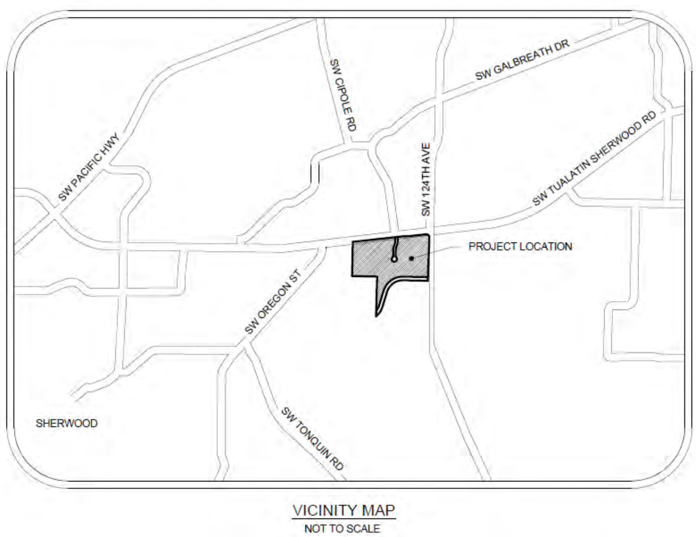
1.1 Project Overview

The proposed project will develop a new industrial park on the undeveloped land at the southwest corner of SW Tualatin-Sherwood Road and SW 124th Avenue. The proposed development includes five new buildings, associated parking, landscape, utility connections, and stormwater facilities.

1.2 Location

The project is located at the southwest corner of SW Tualatin-Sherwood Road and SW 124th Avenue in Sherwood, Oregon (See Figure 1-1 - Vicinity Map).

Figure 1-1 Vicinity Map



1.3 Methodology

The proposed storm design will meet the requirements of Clean Water Services as listed in the *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, December 2019.

2 Existing Conditions

2.1 Topography

The existing property is undeveloped pervious area with grass, trees, dense brush, or wetlands. The site has gradual slopes between 1 and 8% generally draining north. The highest elevation of 255' is located on the west side of the property. The lowest elevation of 185' is located along the north property line.

2.2 Climate

The site is in Sherwood, Oregon and is located approximately 52 miles inland from the Pacific Ocean. There is a gradual change in seasons with defined seasonal characteristics. Average daily temperatures range from 48°F to 71°F. Record temperatures recorded for this region of the state are 7°F and 108°F. Average annual rainfall recorded in this area is 40-inches. Average annual snowfall is approximately 5.3-inches between December and February.

2.3 Site Geology

The underlying soil types on the site, as classified by the United States Department of Agriculture Soil Survey of Washington County, Oregon are identified in Table 2-1 (See Technical Appendix: Hydrologic Soils Map - Washington County).

Table 2-1 Soil Characteristics

Soil Type	Hydrologic Group
Aloha Silt Loam	C/D
Huberly Silt Loam	C/D
Quatama loam, 7 to 12% slopes	C
Saum silt loam, 7 to 12% slopes	C
Xerochrepts-Rock outcrop complex	D

The site is assigned a soil Group D. Group D soils have very slow infiltration rates when thoroughly saturated and a very slow rate of water transmission.

2.4 Curve Number

The curve number represents runoff potential from the soil. The major factors for determining the curve number values are hydrologic soil group, cover type, treatment, hydrologic condition and antecedent runoff condition. The pervious curve number of 77 representing a brush, weed, and grass mixture was used at the site. (See Technical Appendix: Table 2-2c – Runoff Curve Numbers for Other Agricultural Lands).

2.5 Time of Concentration

The time of concentration (T_C) as described in NEH4 Chapter 15 is defined as the time for runoff to travel from the furthermost point of the watershed to the point in question, and the time from the end of excess rainfall to the point of inflection on the trailing limb of the unit hydrograph. Time of concentration can be estimated from several formulas. Clean Water Services guidelines which are based on the NRCS method were used in this analysis. A time of concentration was calculated for the site in existing conditions and found to be 26 and 31 minutes for Basins 1 and 2. (See Technical Appendix: Time of Concentration).

2.6 Hydrology

Stormwater runoff from the existing site that does not infiltrate generally drains to two outlet locations on the site. Basin 1 is on the west side and drains north to a ditch in the ROW that connects to the public storm system. Basin 2 generally drains to the wetlands in the center of the site. At the lower end of the wetlands, there is a 36” concrete storm pipe that runs north under Tualatin Sherwood Road into a ditch on the north side of the road.

2.7 Basin Area

Impervious and pervious surface areas for the existing site are shown in Table 2-2. The site is 100% pervious is existing conditions (See Technical Appendix: Figure 1 – Existing Conditions).

Table 2-2 Existing Basin Areas

Basin ID	Impervious Area, ac	Pervious Area, ac	Total Area, ac
Basin 1	0.00	10.28	10.28
Basin 2	0.00	21.74	21.74

3 Proposed Conditions

3.1 Curve Number

The pervious curve number of 80 was used for the landscaped areas, and an impervious curve number of 98 will be used for proposed roofs, asphalt, and concrete surfaces.

3.2 Time of Concentration

A time of concentration of 5 minutes was used for the developed basins.

3.3 Basin Area

Impervious and pervious surface areas for proposed conditions are shown in Table 3-1. The site is 83% impervious in proposed conditions (See Technical Appendix: Figure 2 – Proposed Conditions).

Table 3-1 Proposed Basin Areas

Basin	Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)
Lot 1	4.51	0.80	5.31
Lot 2	3.16	0.55	3.71
Lot 3	7.40	1.53	8.93
Lot 4	6.71	1.81	8.52
Lot 5	3.85	0.66	4.51
SW Cipole Pl	0.91	0.13	1.04
SW 124th Ave	1.13	0.11	1.24
Total	**27.67**	**5.59**	**33.26**

3.4 Hydrology

On-site runoff will be collected in trapped catch basins before being routed to stormwater LIDA facilities sized to meet CWS water quality and flow control requirements. Runoff will be treated and detained through these systems before exiting the site at one of two locations (See Technical Appendix: Figure 2 – Proposed Conditions). The stormwater system was designed to meet CWS hydromodification requirements, which classify this as a Category 3 (large) project. To meet this requirement, LIDA facilities must be used to treat at least 30% of the impervious area on site and post developed release rates must match predeveloped release rates for 50% of the 2-yr, 5-yr, and 10-yr 24 hours storms (Table 4-7 in the CWS *Design and Construction Standards*, December 2019).

On-site treatment will be provided in three LID stormwater treatment and detention ponds designed per Section 4.09.2 of the CWS *Design and Construction Standards*, December 2019 (See Technical Appendix: Figure 2 – Proposed Conditions). Flow control structures will be at the outlet end of the ponds, with orifice controls and standpipes designed to meet CWS requirements for post developed release rates.

Treated and detained runoff from the Tract B pond will exit the site at the existing Basin 1 outlet into an existing 18” pipe that runs under Tualatin-Sherwood Road and eventually connects to an existing ditch north of SW Wildrose Place. Treated and detained runoff from the Tract C and E ponds will exit the site at the existing Basin 2 outlet into the existing 36” concrete pipe that runs under Tualatin-Sherwood Road and outlets to a ditch along the north side of the road. A full analysis of the downstream conditions will be provided in the final storm report.

4 Hydrologic and Hydraulic Analysis

4.1 Design Guidelines

The analysis and design criteria used for stormwater management described in this section will follow the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, December 2019. Section 5.04.2 describes the allowable flow determination methods including the selected TR-55 NRCS method.

4.2 Hydrologic Method

Naturally occurring rainstorms dissipate over long periods of time. The most effective way of estimating storm rainfall is by using the hydrograph method. The NRCS Curve Number method is described in the *NRCS National Engineering Handbook* - Section 4. The NRCS runoff method equation is:

$$Q = \frac{(P - I_a)^2}{(P - I_a) + S}$$

Where:

Q =	Runoff (cfs)	P =	Rainfall (inches)
S =	Potential maximum retention after runoff begins	I_a =	Initial abstraction

During the development of a runoff hydrograph, the above equation is used to compute the incremental runoff depth for each time step from the incremental runoff depth given by the design storm hydrograph.

The runoff function of XPSWMM generates surface and subsurface runoff based on design or measured rainfall conditions, land use and topography. XPSWMM version 16.1 was used for our hydrology and hydraulics analysis. XPSWMM is based on the public EPA SWMM program and is an approved method of analysis by Clean Water Services.

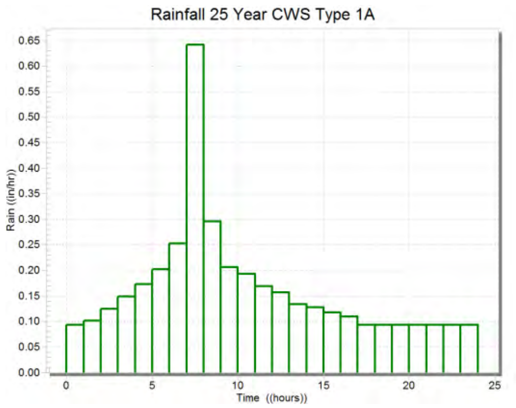
4.3 Design Storm

The rainfall distribution to be used within the Clean Water Services jurisdiction is the design storm of 24-hour duration based on the standard Type 1A rainfall distribution. Table 4-1 shows total precipitation depths for different storm events. The CWS Design Storm Distribution for a type 1A 24-hour rainfall distribution for a 25-year storm event is shown in Figure 4-1.

Table 4-1 Precipitation Depth

Recurrence interval (years)	Total Precipitation Depth (in)
2	2.50
5	3.10
10	3.45
25	3.90
100	4.50

Figure 4-1 25-Year Clean Water Services Type 1A Rainfall Ditribution



4.4 Basin Runoff

Table 4-2 lists the runoff rates for proposed conditions for the entire site during the 2, 5, 10 and 25-year storm events as calculated from the XPSWMM model. These values do not include on site detention.

Table 4-2 Proposed Discharge Flow Rates

Recurrence interval (years)	Existing Peak Runoff Rate (cfs)	Proposed Peak Runoff Rate (cfs)
2	2.64	11.79
5	4.88	15.06
10	6.34	16.99
25	8.32	17.74

5 Conveyance Analysis

5.1 Design Guidelines

The analysis and design criteria described in this section will follow the Clean Water Services as listed in the *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, December 2019. The manual requires storm drainage system and facilities be designed to convey the 25-year storm event without surcharge.

5.2 System Capacity

The proposed conveyance system will be designed to convey and contain the peak runoff from a 25-year design storm. The proposed conveyance system will have sufficient capacity to handle all storm events up to and including the 100-year storm event.

5.3 System Performance

A full conveyance analysis will be provided in the final report.

6 Water Quality

6.1 Design Guidelines

The proposed water quality facilities were designed per the requirements set forth in the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, December 2019. The facilities were designed using a rainfall depth of 0.36" over a 4-hour period with a return period of 96-hours. Per Section 4.08.5, the water quality volume and flow rate are calculated according to the equations below:

$$\text{Water Quality Volume (cf)} = \frac{0.36\text{ (in)} \times \text{Area (sf)}}{12\text{ (in/ft)}} \qquad \text{Water Quality Flow} = \frac{\text{WQV (cf)}}{14{,}400}$$

Clean Water Services requires pre-treatment prior to proposed water quality facilities. Trapped catch basins are an approved pre-treatment facility and will provide utilized on the site.

6.2 Water Quality Facilities

Water quality treatment will be provided in the proposed LIDA ponds, which will be designed as extended dry basins per Section 4.09.5. See Table 6-1 below for facility information. Hydrographs and pond stage graphs can be found in the Technical Appendix

Table 6-1 Extended Dry Basin Table

Facility	Bottom Area (sf)	Side Slopes	WQ Storage Depth (ft)	Total Storage Depth (ft)	Required WQ Detention Volume (cf)	WQ Orifice Diameter (in)
Pond B	40,075	9ft @ 3:1	1.00	2.5	19,693	1.75
Pond C	8,145	3ft @ 3:1	0.75	1.0	1,189	0.50
Pond E	25,177	9ft @ 3:1	1.00	2.5	13,800	1.50

7 Water Quantity

7.1 Design Guidelines

The water quantity facilities were designed in accordance with Section 4.03.5(c) of the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, December 2019. The detention standards require the post-developed runoff rates do not exceed the pre-developed runoff rates as listed in Section 4.08.6(c) and as shown in Table 7-1 below. In accordance with section 4.09.2(c), the water quantity facility will be combined with the water quality facility.

Table 7-1 Required Release Rates

Post-Development Peak Runoff Rate	Pre-Development Peak Runoff Rate Target
2-year, 24-hour	50% of 2-year, 24-hour
5-year, 24-hour	5-year, 24-hour
10-year, 24-hour	10-year, 24-hour

7.2 Water Quantity Facilities

Table 7-2 lists the predeveloped and the proposed design release rates generated at each detention pond. In all cases, the proposed release rates meet the criteria listed in Section 4.08.6(c).

Table 7-2 Existing and Proposed Release Rates

Basin ID	Storm Event	Existing Flow (cfs)		Released Rate (cfs)
Basin 1	2	0.88	>	0.39
	5	1.62	>	1.21
	10	2.09	>	1.63
Basin 2	2	1.79	>	0.77
	5	3.32	>	1.32
	10	4.30	>	1.85

Each pond will have its own control structure with orifice and weir controls as described in Table 7-3. In each control structure, the bottom orifice was designed as the WQ orifice and sized using the criteria listed in Section 4.09.5. The second orifice and overflow weir were designed to meet the flow control standard. Max stage during the 25-year storm event does not exceed the minimum freeboard requirement of 1.0' listed in Section 4.09.2(c) (See Technical Appendix: XPSWMM Results).

Table 7-3 Control Structures

Facility	Orifice/Weir Size	Elevation (ft)
Pond B	1.75" orifice	189.00
	3" orifice	190.00
	18" standpipe	191.50
Pond C	0.5" orifice	185.25
	2" orifice	185.75
	12" standpipe	186.25
Pond E	1.50" orifice	187.00
	5" orifice	188.00
	18" standpipe	189.50

8 Downstream Analysis

8.1 Design Guidelines

Clean Water Services requires a review of the downstream conveyance system for sites that add greater than 12,000 sf of new impervious area. Section 2.04.2 m.4(b) requires the downstream analysis meet the following standard:

- The analysis shall follow the conveyance system to the Point of Discharge and extend downstream for ¼ mile from the Point of Discharge, which is the Receiving Reach

The project is classified as hydromodification category 3.

8.2 Hydraulic Analysis

The proposed project will discharge at two locations, one at the northwest corner of the site, and the other at the northeast corner of the site.

West Outlet: This basin includes the on-site Lot 1, Lot 2, and Lot 3 basins, and developed industrial properties north of SW Tualatin-Sherwood Rd. Treated and detained runoff exits the site to the northwest through an existing 18” pipe, which runs north under SW Wildrose Place and daylights in a ditch roughly ¼ mile downstream from the site.

East Outlet: This basin includes the on-site Lot 4, Lot 5, Cipole Place, and SW 124th Ave basins, and a portion of SW Tualatin-Sherwood Hwy. Treated and detained runoff exits the site to the northeast through the existing 36” concrete pipe, which then daylights to a ditch on the north side of the road (See Technical Appendix: Figure 2).

8.3 Results

The downstream analysis was performed using XPSWMM to model the 25-year storm event over the downstream contributing basin. The proposed development on the T-S Corporate Park site does not cause any deficiencies in the existing downstream system at either outfall location. Additional detention is not required for this project.

The downstream system was analyzed to ¼ mile downstream from the site. This corresponds with the end of the 27” storm line in Wildrose Pl where the pipe outfalls to a ditch. The only inlet to the system downstream of the proposed development is from a ditch on the north end of Tax Lot 2S128A001800, which is undeveloped. This basin contributes roughly five acres of pervious area. Results from the XPSWMM model shows the conveyance system downstream of the T-S Corporate Park site does not surcharge during the 25-year storm event (See Technical Appendix: XPSWMM Results).

The east outlet was analyzed through the 36” culvert downstream of the wetland where both detention ponds outlet to. Results from the XPSWMM model shows the culvert has sufficient capacity to handle runoff from the site under proposed conditions during the 25-yr storm event.

9 Summary

The proposed stormwater management design follows Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management*, December 2019.

On-site water quality treatment and flow control will be provided by proposed extended dry basin LIDA facilities. The proposed private conveyance system will be designed using the 25-year storm event in the final drainage report. Treated and detained runoff will exit the site and connect to the existing storm systems in SW Tualatin-Sherwood Rd.

This project will meet the intent of the standards set forth by Clean Water Services.

Technical Appendix

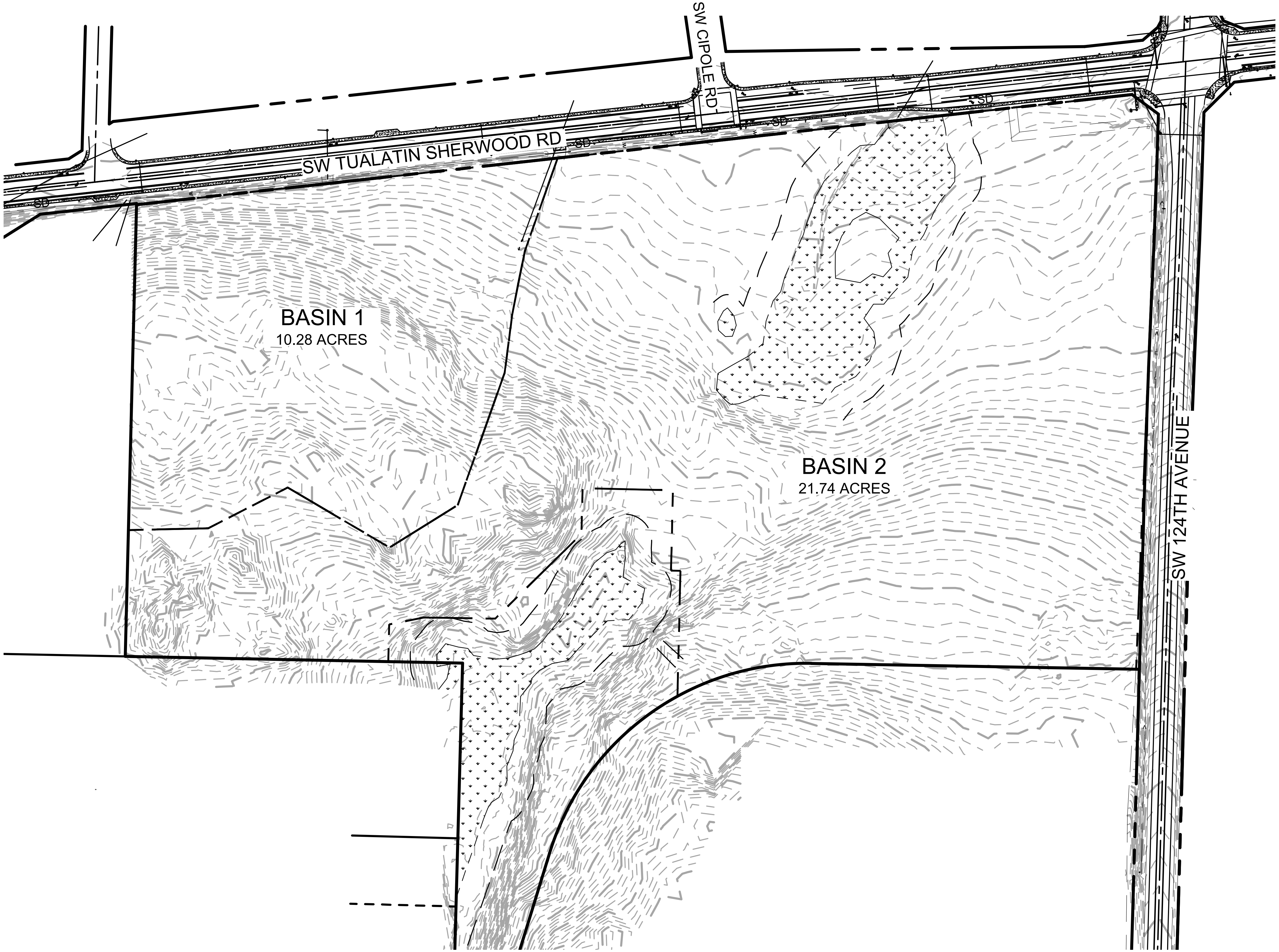
Technical Appendix

- > Figure 1 – Existing Basin Areas
- > Figure 2 – Proposed Basin Areas

- > Hydrologic Soils Map – Washington County
- > Table 2-2a – Runoff Curve Numbers
- > Time of Concentration

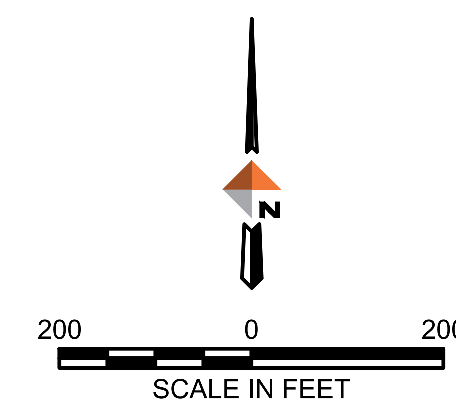
- > XPSWMM Results
    - o Schematic
    - o Basin 1
    - o Basin 2
    - o Pond Stage Graphs
    - o Flow Control Graphs
    - o Downstream Analysis

- > SW 124th Ave & SW Tualatin-Sherwood Rd Preliminary Geotechnical Report by GeoDesign dated February 6, 2018
- > SW 124th Ave & SW Tualatin-Sherwood Rd Geotechnical Data Memorandum by GeoDesign dated December 23, 2019



EXISTING BASIN AREAS

BASIN 1:		
	IMPERVIOUS AREA:	0.00 AC
	PERVIOUS AREA:	10.28 AC
	TOTAL AREA:	10.28 AC
BASIN 2:		
	IMPERVIOUS AREA:	0.00 AC
	PERVIOUS AREA:	21.74 AC
	TOTAL AREA:	21.74 AC



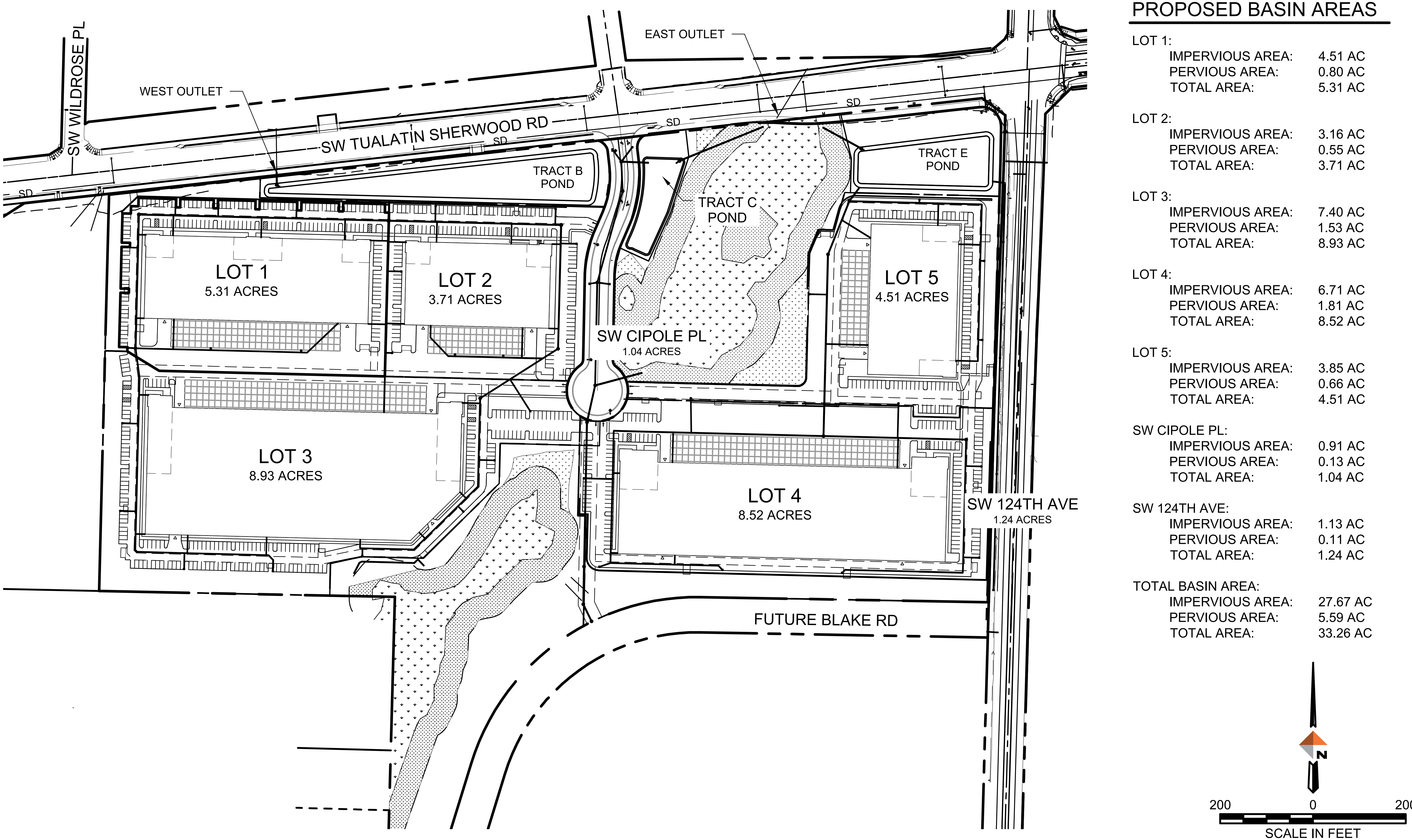
DOWL
WWW.DOWL.COM

T-S CORPORATE PARK
EXISTING CONDITIONS
SHERWOOD, OREGON

PROJECT	14347.01
DATE	02/18/2020

FIGURE 1

\\BIL-FS\BIL-projects\22\14347-01\40Study\Drain\Exhibit\14347_existing.dwg PLOT DATE 2020-2-18 13:10 SAVED DATE 2020-02-18 12:21 USER: mgillette



PROPOSED BASIN AREAS

LOT 1:

IMPERVIOUS AREA:	4.51 AC
PERVIOUS AREA:	0.80 AC
TOTAL AREA:	5.31 AC

LOT 2:

IMPERVIOUS AREA:	3.16 AC
PERVIOUS AREA:	0.55 AC
TOTAL AREA:	3.71 AC

LOT 3:

IMPERVIOUS AREA:	7.40 AC
PERVIOUS AREA:	1.53 AC
TOTAL AREA:	8.93 AC

LOT 4:

IMPERVIOUS AREA:	6.71 AC
PERVIOUS AREA:	1.81 AC
TOTAL AREA:	8.52 AC

LOT 5:

IMPERVIOUS AREA:	3.85 AC
PERVIOUS AREA:	0.66 AC
TOTAL AREA:	4.51 AC

SW CIPOLE PL:

IMPERVIOUS AREA:	0.91 AC
PERVIOUS AREA:	0.13 AC
TOTAL AREA:	1.04 AC

SW 124TH AVE:

IMPERVIOUS AREA:	1.13 AC
PERVIOUS AREA:	0.11 AC
TOTAL AREA:	1.24 AC

TOTAL BASIN AREA:

IMPERVIOUS AREA:	27.67 AC
PERVIOUS AREA:	5.59 AC
TOTAL AREA:	33.26 AC

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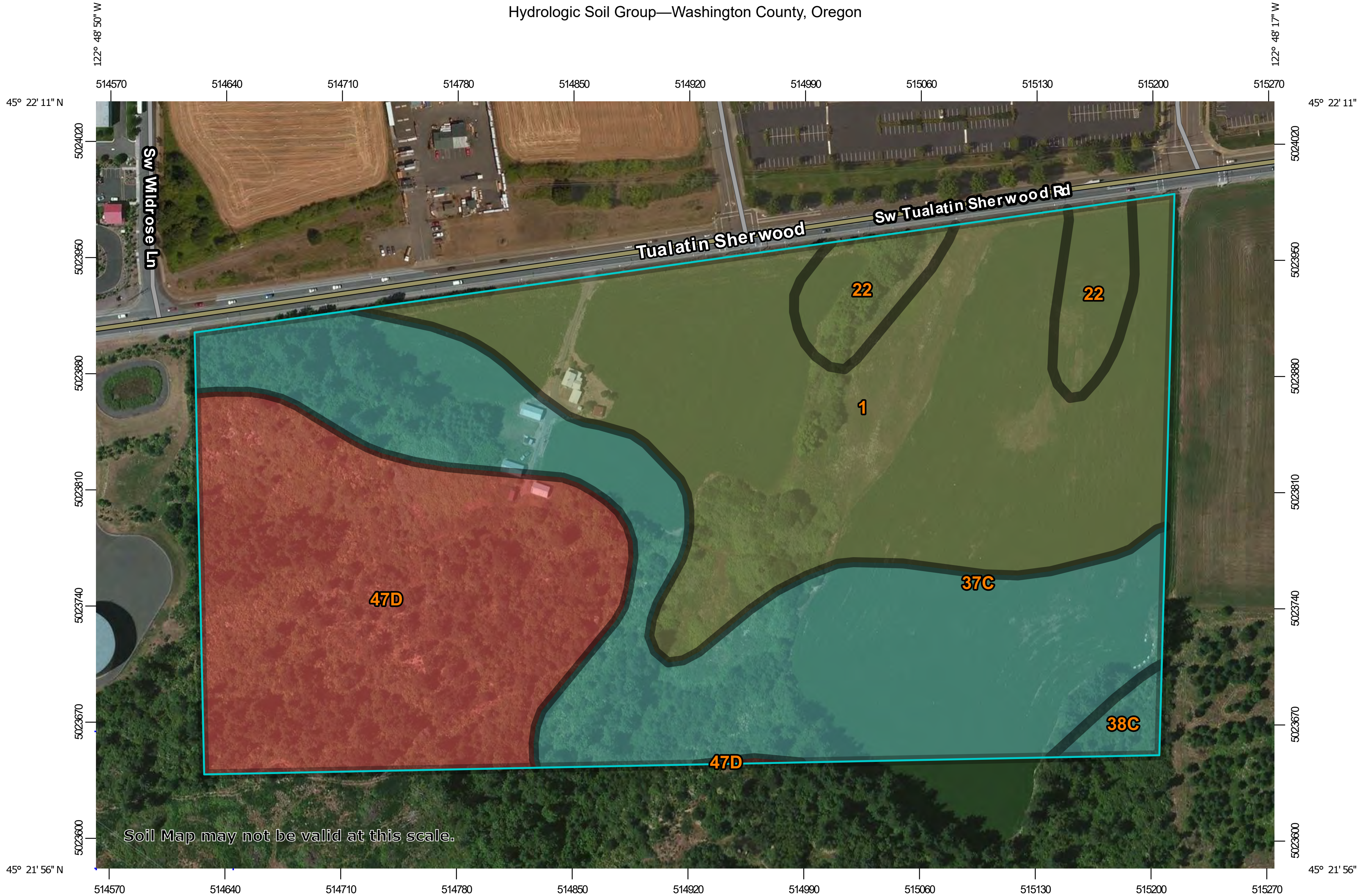
T-S CORPORATE PARK
PROPOSED CONDITIONS
SHERWOOD, OREGON

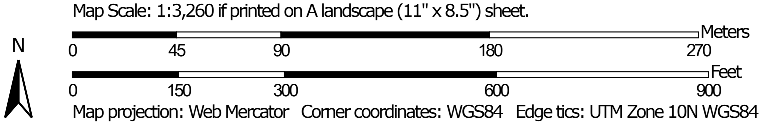
PROJECT	14347.01
DATE	02/18/2020

FIGURE 2

\\BIL-FS\BIL-projects\22\14347-01\40Study\Drain\Exhibit\14347_proposed.dwg PLOT DATE 2020-2-18 13:12 SAVED DATE 2020-02-18 13:11 USER: mgillette



Map Scale: 1:3,260 if printed on A landscape (11" x 8.5") sheet.



Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 14, Sep 16, 2016

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 8, 2010—Aug 23, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Washington County, Oregon (OR067)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Aloha silt loam	C/D	16.0	36.5%
22	Huberly silt loam	C/D	2.3	5.1%
37C	Quatama loam, 7 to 12 percent slopes	C	13.5	30.8%
38C	Saum silt loam, 7 to 12 percent slopes	C	0.5	1.1%
47D	Xerochrepts-Rock outcrop complex	D	11.6	26.5%
Totals for Area of Interest			**43.9**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 2-2c Runoff curve numbers for other agricultural lands [1/]

Cover description		Curve numbers for hydrologic soil group			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. [2/]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. [3/]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30 [4/]	48	65	73
Woods—grass combination (orchard or tree farm). [5/]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods. [6/]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30 [4/]	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

1 Average runoff condition, and $I_a = 0.2S$.
2 *Poor:* <50%) ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: > 75% ground cover and lightly or only occasionally grazed.
3 *Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.
4 Actual curve number is less than 30; use CN = 30 for runoff computations.
5 CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.
6 *Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2a Runoff curve numbers for urban areas [1/]

Cover description: Cover type and hydrologic condition	Average percent impervious area [2/]	Curve numbers for hydrologic soil group: A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.) [3/]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	$\boxed{80}$
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	$\boxed{98}$
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only) [4/]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation) [5/]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

1 Average runoff condition, and $I_a = 0.2S$.

2 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.

3 CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

4 Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.

5 Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4 based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

Time of Concentration

SUBJECT	Time of Concentration - Basin 1		
PROJECT NO. 14347	**BY** MSG	**DATE** 1/7/2020	

	T-S Corporate Park	
SHEET FLOW		
INPUT	**VALUE**	
Surface Description	**Type**	**6**
	Grass (dense)	
Manning's "n"	**0.24**	
Flow Length, L (<300 ft)	**300**	ft
2-Yr 24 Hour Rainfall, P_2	**2.5**	in
Land Slope, s	**0.064**	ft/ft
OUTPUT		
Travel Time	0.41	hr
SHALLOW CONCENTRATED FLOW		
INPUT	**VALUE**	
Surface Description	**Unpaved**	
Flow Length, L	**400**	ft
Watercourse Slope*, s	**0.04**	ft/ft
OUTPUT		
Average Velocity, V	3.23	ft/s
Travel Time	0.034	hr
CHANNEL FLOW		
INPUT	**VALUE**	
Cross Sectional Flow Area, a	**0**	ft^2
Wetted Perimeter, P_w	**0**	ft
Channel Slope, s	**0**	ft/ft
Manning's "n"	**0.013**	
Flow Length, L	**0**	ft
OUTPUT		
Average Velocity	0.00	ft/s
Hydraulic Radius, $r = a / P_w$	0.00	ft
Travel Time	0.00	hr
Watershed or Subarea T_c =	**0.44**	**hr**
Watershed or Subarea T_c =	**26**	**minutes**

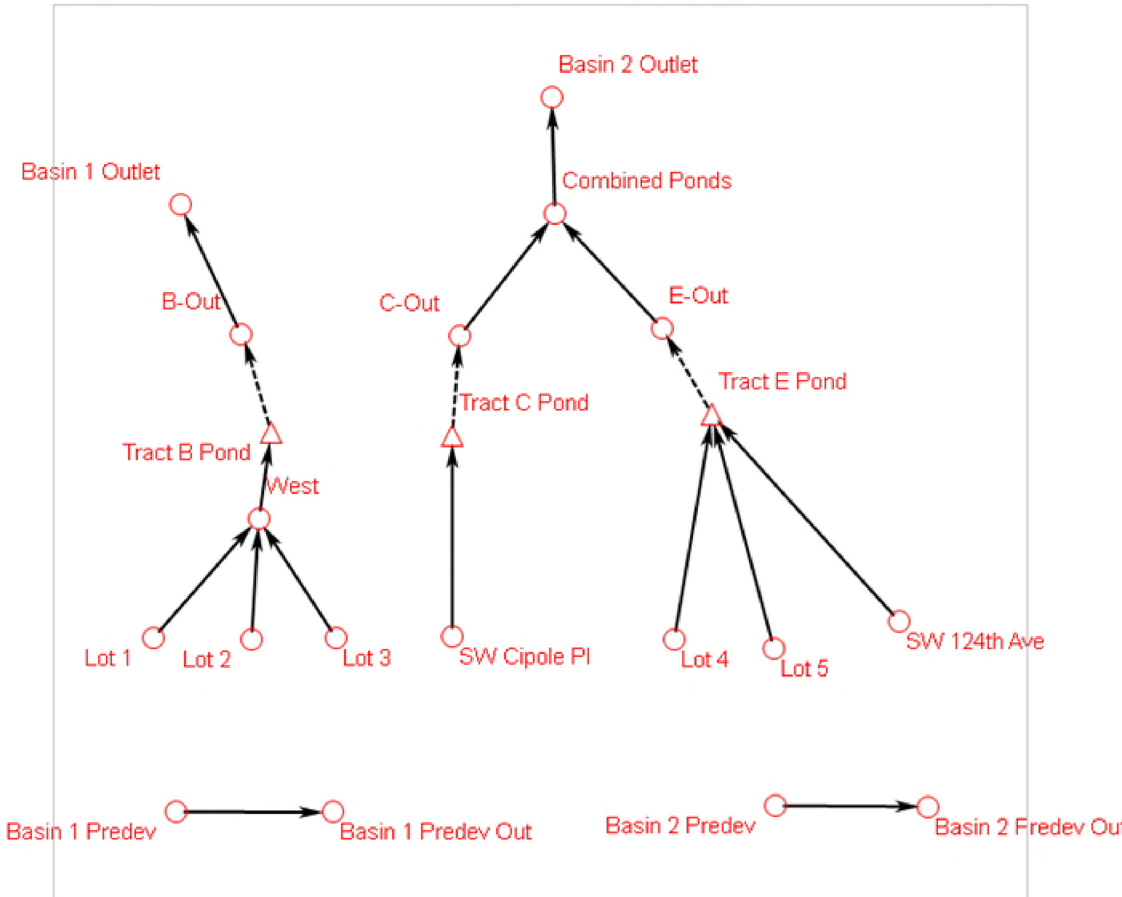
Time of Concentration

SUBJECT	Time of Concentration - Basin 2		
PROJECT NO. 14347		**BY** MSG	**DATE** 1/7/2020

	T-S Corporate Park	
SHEET FLOW		
INPUT	**VALUE**	
Surface Description	**Type**	**6**
	Grass (dense)	
Manning's "n"	**0.24**	
Flow Length, L (<300 ft)	**300**	ft
2-Yr 24 Hour Rainfall, P_2	**2.5**	in
Land Slope, s	**0.064**	ft/ft
OUTPUT		
Travel Time	0.41	hr
SHALLOW CONCENTRATED FLOW		
INPUT	**VALUE**	
Surface Description	**Unpaved**	
Flow Length, L	**1300**	ft
Watercourse Slope*, s	**0.04**	ft/ft
OUTPUT		
Average Velocity, V	3.23	ft/s
Travel Time	0.112	hr
CHANNEL FLOW		
INPUT	**VALUE**	
Cross Sectional Flow Area, a	**0**	ft^2
Wetted Perimeter, P_w	**0**	ft
Channel Slope, s	**0**	ft/ft
Manning's "n"	**0.013**	
Flow Length, L	**0**	ft
OUTPUT		
Average Velocity	0.00	ft/s
Hydraulic Radius, $r = a / P_w$	0.00	ft
Travel Time	0.00	hr
Watershed or Subarea T_c =	**0.52**	**hr**
Watershed or Subarea T_c =	**31**	**minutes**

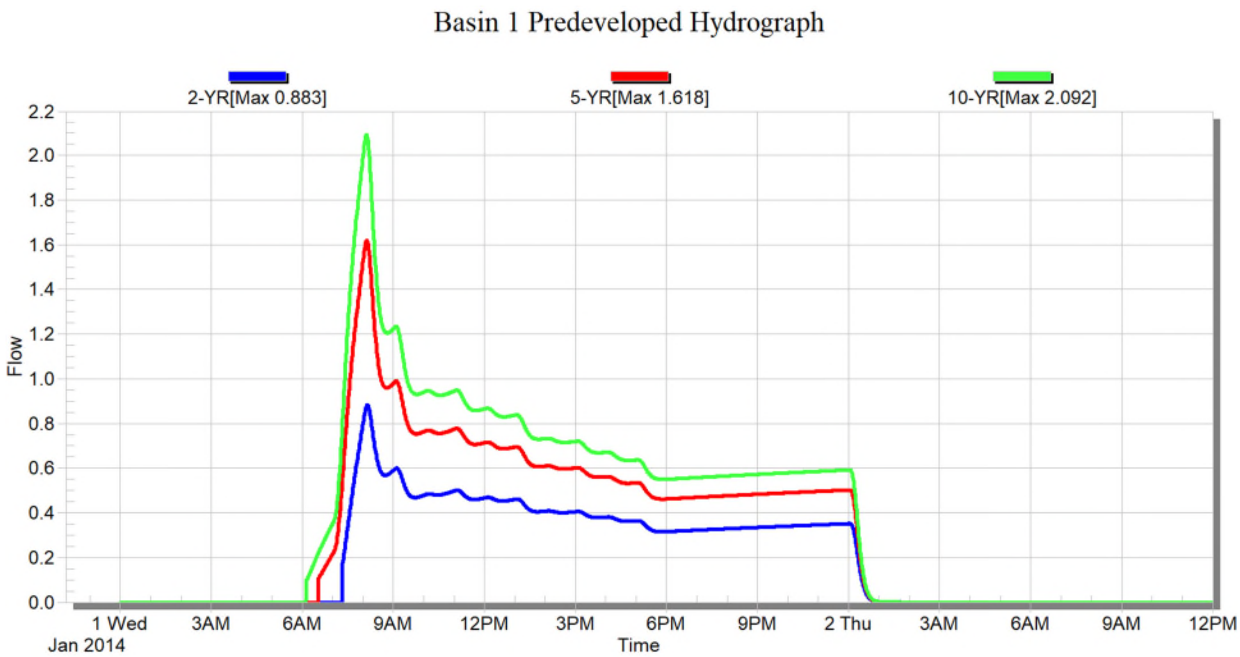
XPSWMM Results: T-S Corporate Park

Schematic Layout:



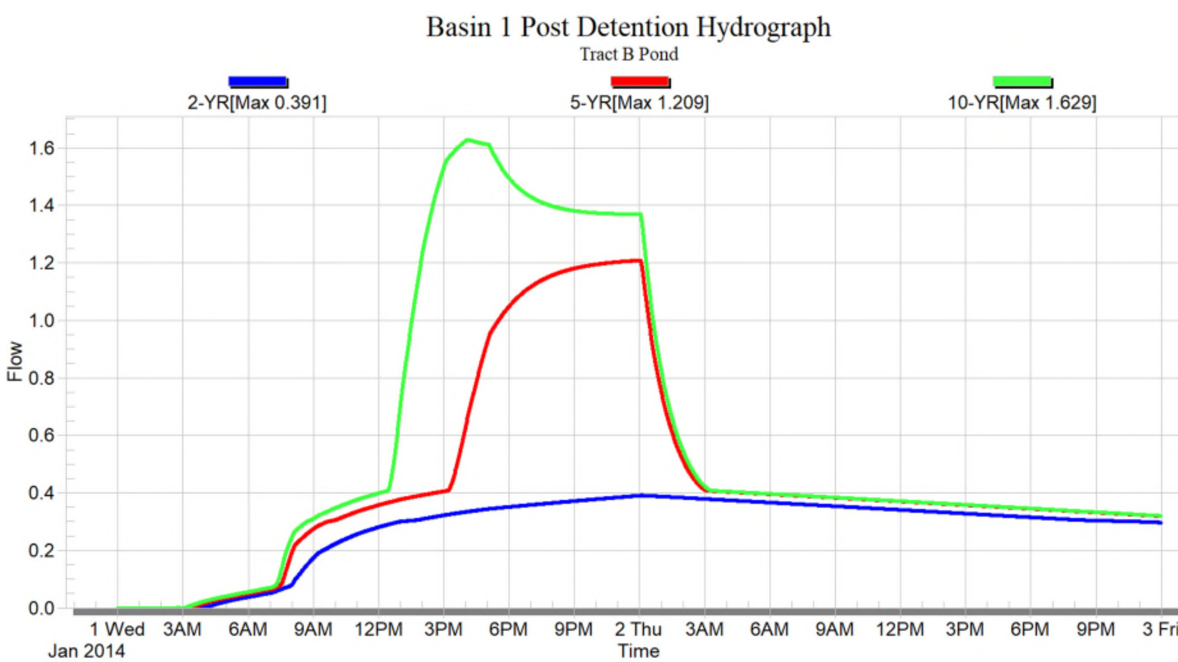
XPSWMM Results: T-S Corporate Park

Basin 1 Predeveloped Area: 10.28 ac pervious



Basin 1 Post Developed Area: 15.07 ac impervious; 2.88 ac pervious

Contributing Basins: Lot 1, Lot 2, and Lot 3



XPSWMM Results: T-S Corporate Park

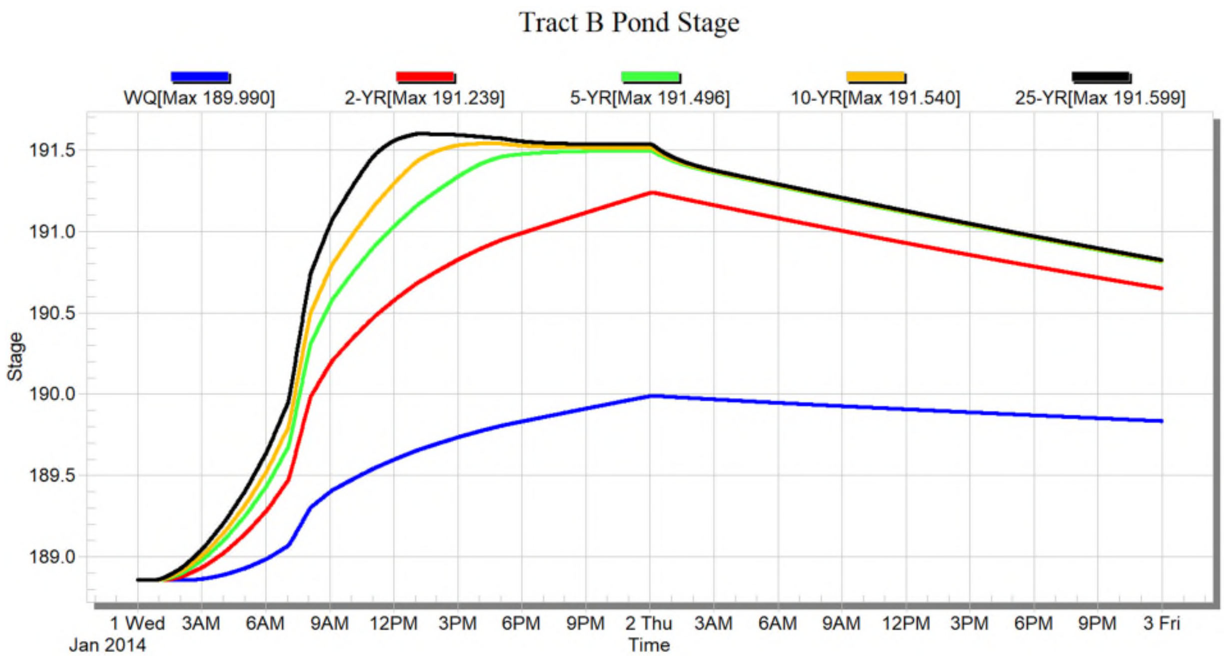
<u>Tract B Detention System Sizing:</u>

Pond Bottom Area: 40,075 SF

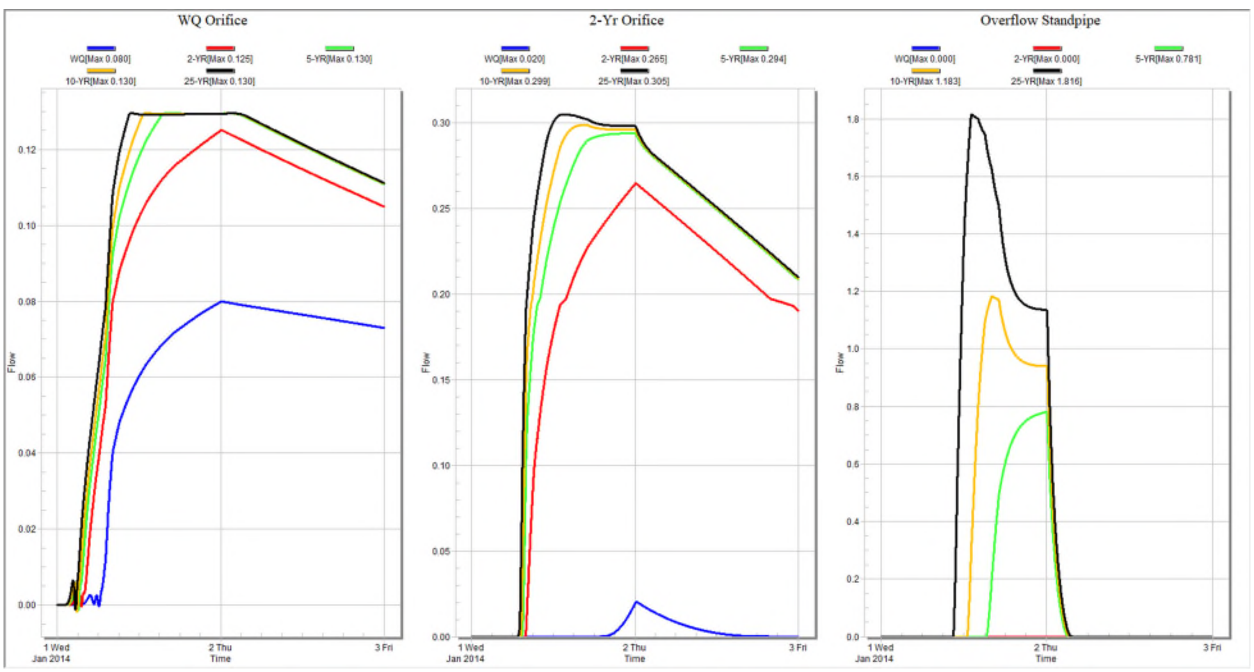
WQ Orifice: 1.75” diameter at pond bottom

2-yr Orifice: 3” diameter at 1.0’ above pond bottom

Bypass Standpipe: 18” diameter at 2.5’ above pond bottom

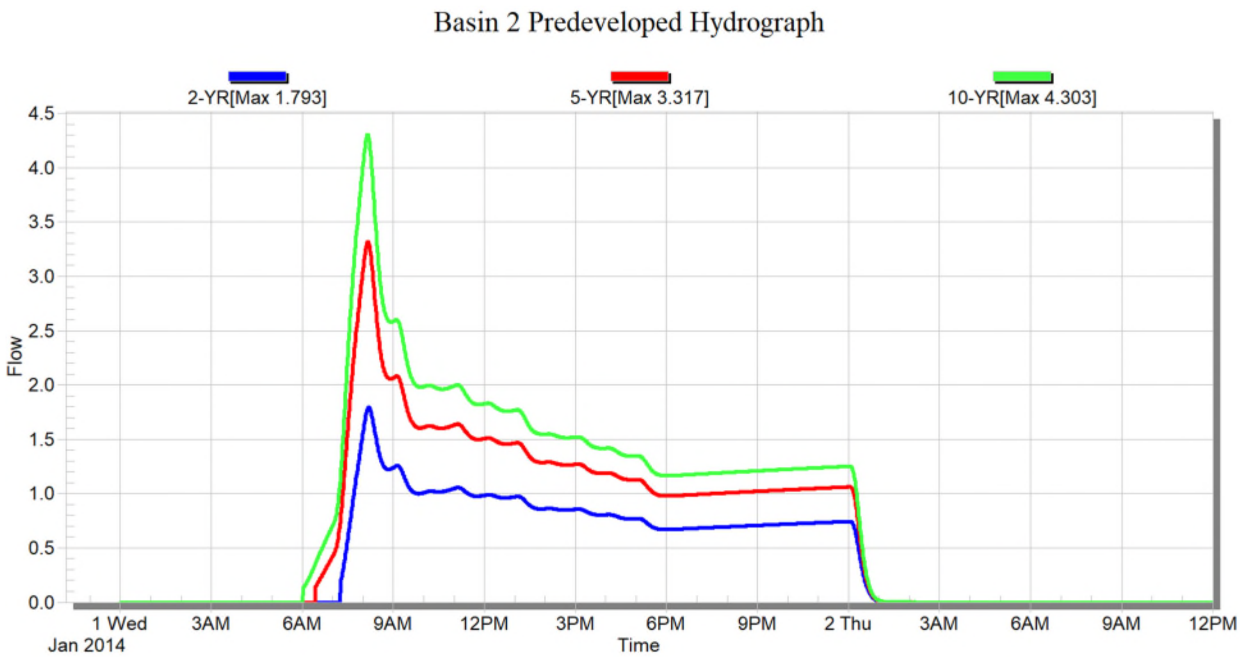


<u>Tract B Pond Flow Control:</u>



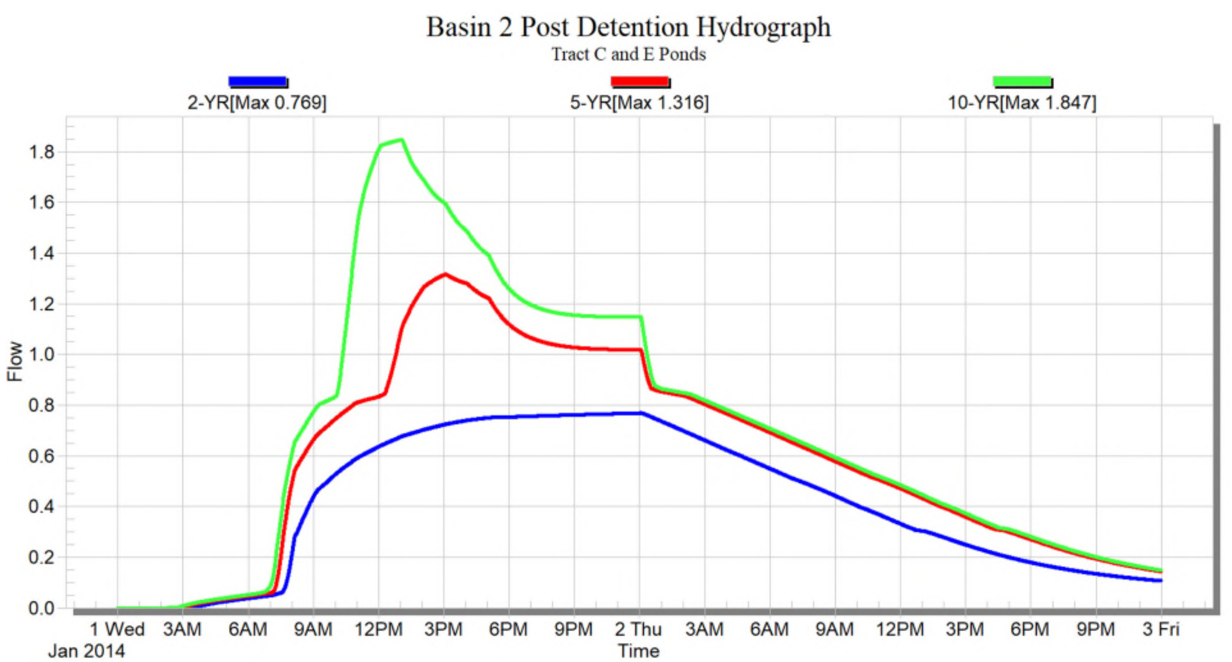
XPSWMM Results: T-S Corporate Park

Basin 2 Predeveloped Area: 21.74 ac pervious



Basin 2 Post Developed Area: 12.60 ac impervious; 2.71 ac pervious

Contributing Basins: Lot 4, Lot 5, SW Cipole Pl, and SW 124th Ave



XPSWMM Results: T-S Corporate Park

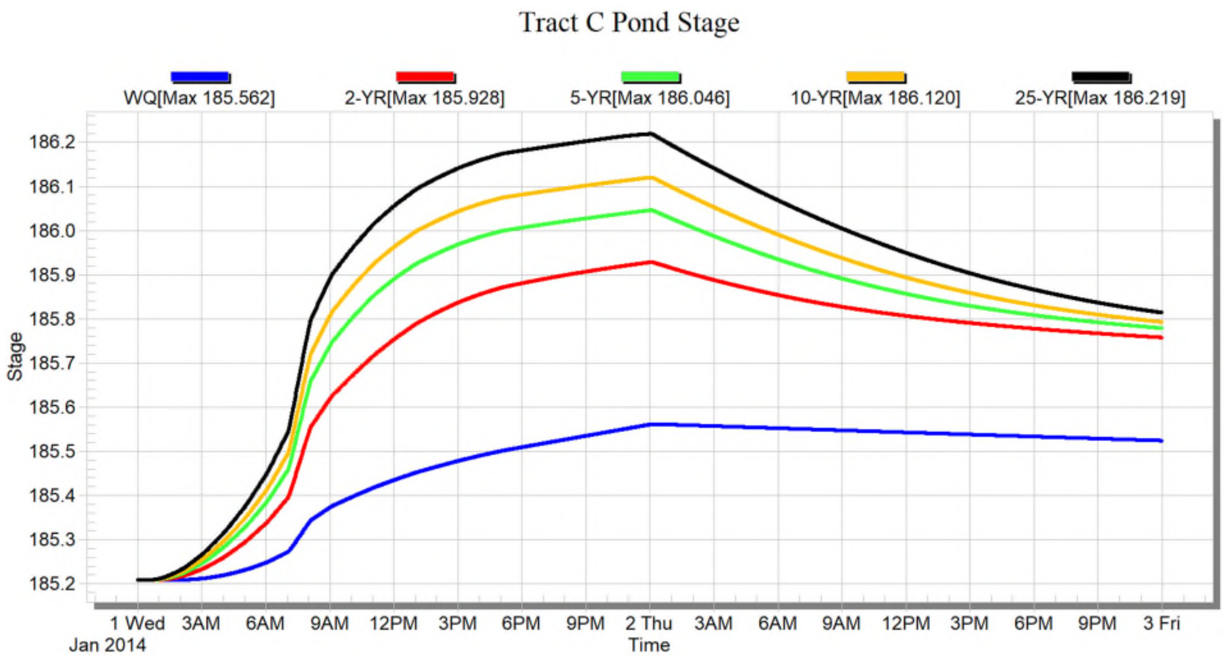
Tract C Detention System Sizing:

Pond Bottom Area: 8,145 SF

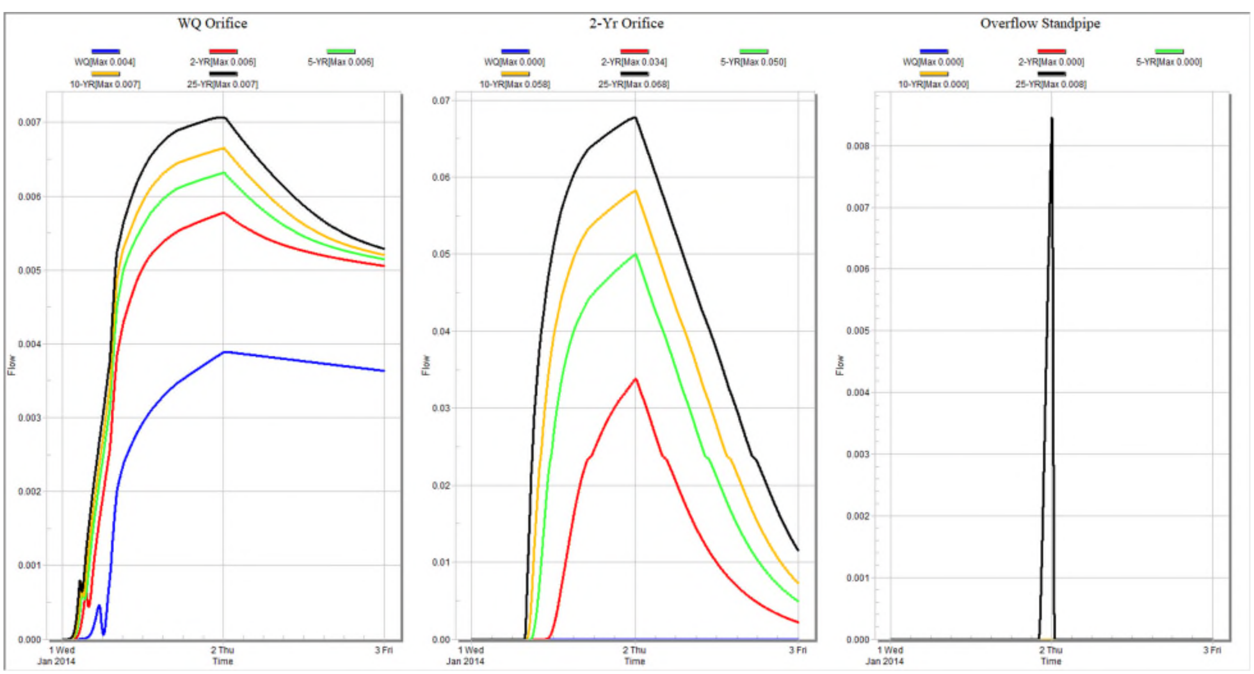
WQ Orifice: 0.5” diameter at pond bottom

2-yr Orifice: 2” diameter at 0.5’ above pond bottom

Bypass Standpipe: 12” diameter at 1.0’ above pond bottom



Tract C Pond Flow Control:



XPSWMM Results: T-S Corporate Park

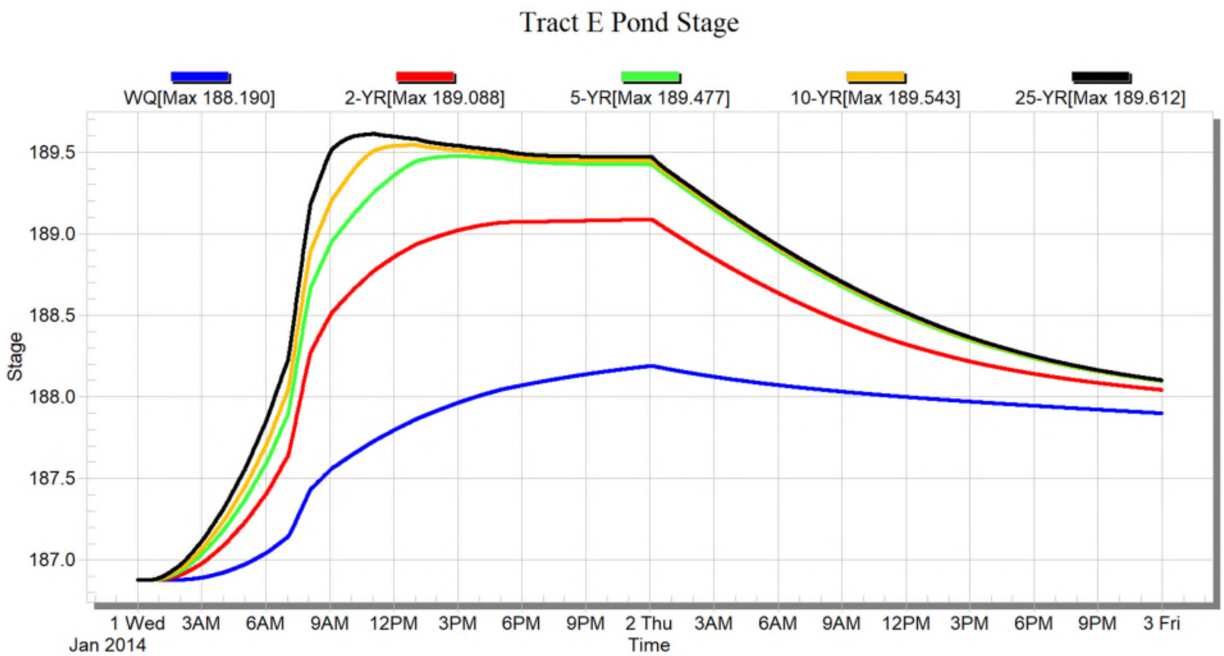
Tract E Detention System Sizing:

Pond Bottom Area: 25,177 SF

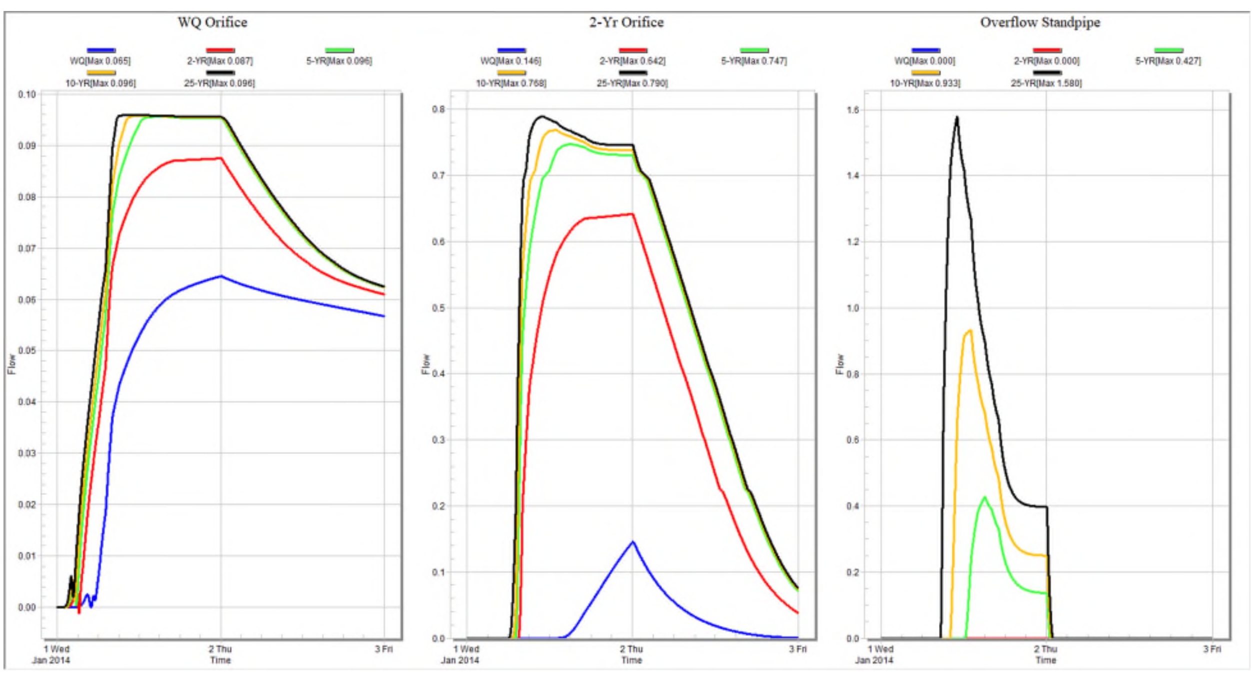
WQ Orifice: 1.50” diameter at pond bottom

2-yr Orifice: 5” diameter at 1.0’ above pond bottom

Bypass Standpipe: 18” diameter at 2.5’ above pond bottom



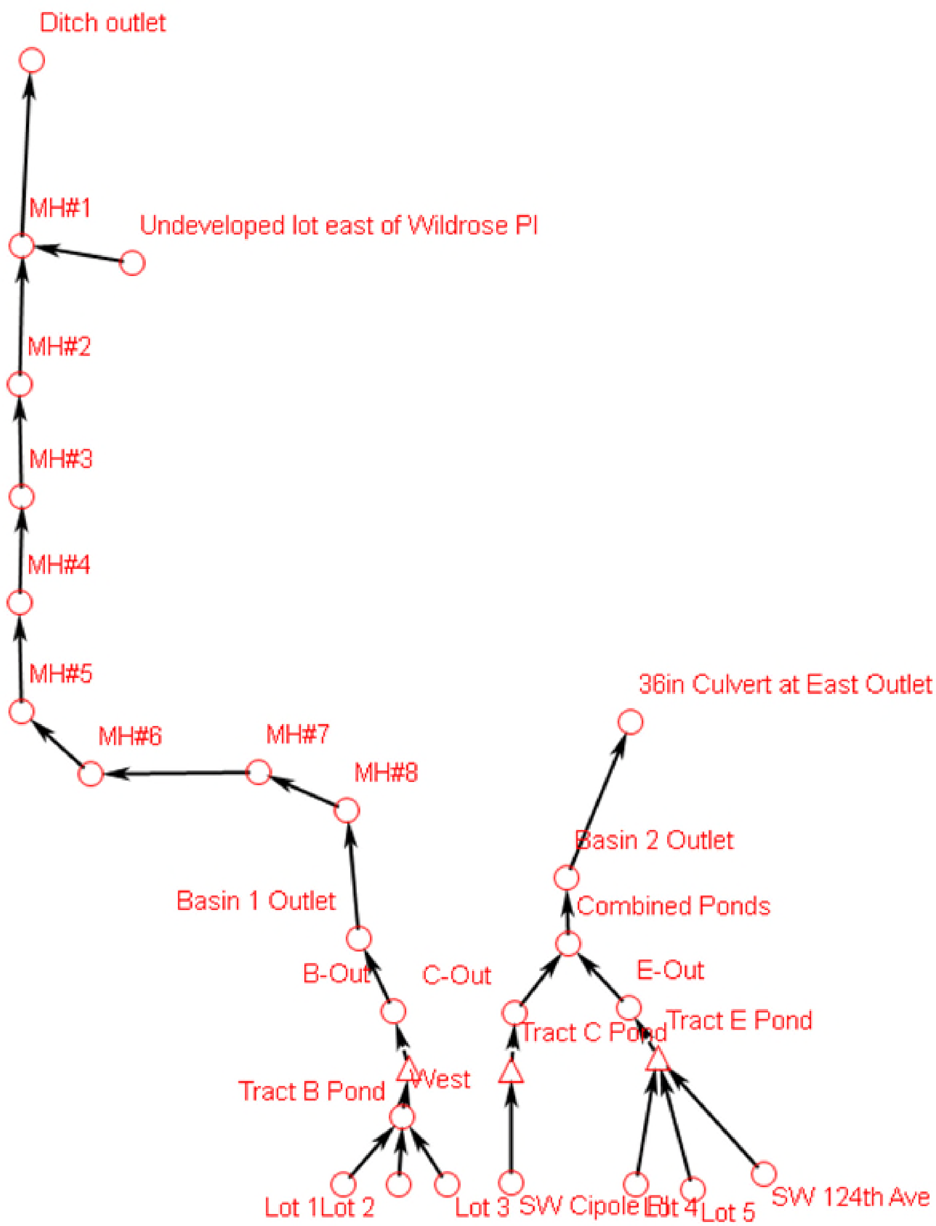
Tract E Pond Flow Control:



XPSWMM Results: T-S Corporate Park

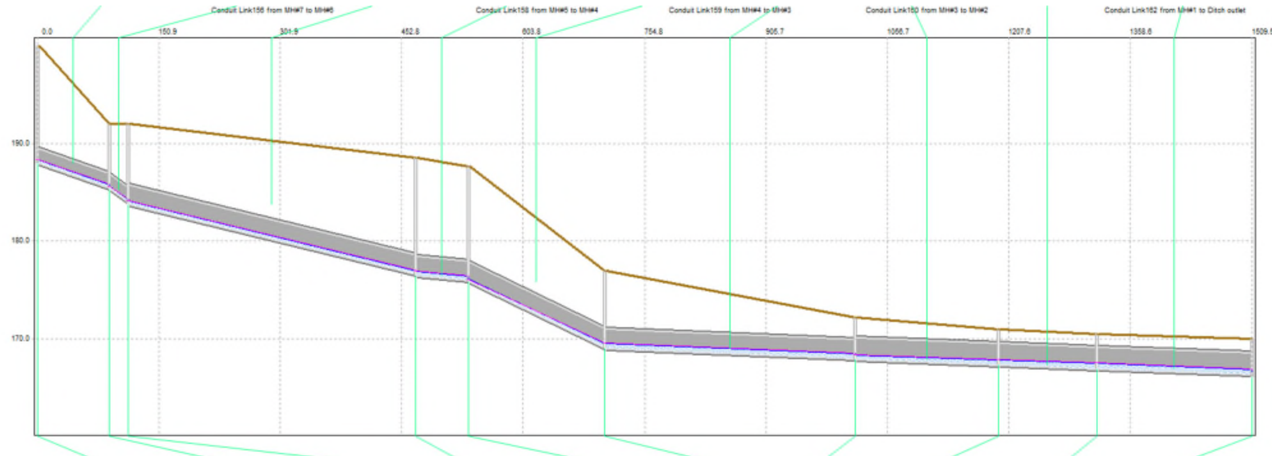
Downstream Analysis:

Schematic:

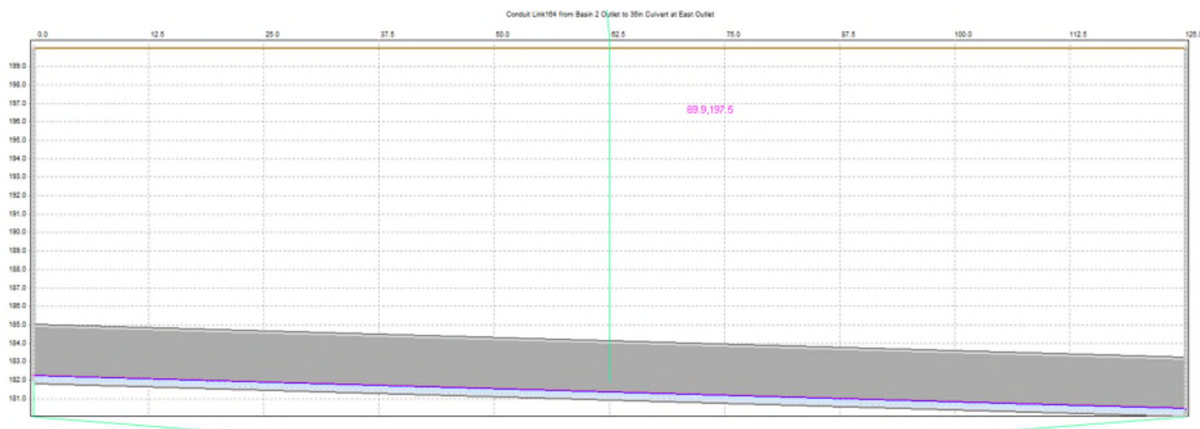


XPSWMM Results: T-S Corporate Park

West Outlet Pipe Network during 25-yr event



East Outlet Pipe Network during 25-yr event



February 6, 2018

Trammell Crow Company
1300 SW 5th Avenue, Suite 3050
Portland, OR 97201

Attention: Kirk Olsen

Preliminary Geotechnical Engineering Services
Orr Property
SW 124th Avenue and SW Tualatin-Sherwood Road
Washington County, Oregon
GeoDesign Project: TrammellCr-74-01

INTRODUCTION

This report presents the results of our preliminary geotechnical engineering services for the Orr Property project located in Washington County, Oregon. This report has been prepared in general accordance with our revised proposal dated September 19, 2018. The approximately 47.3-acre site is located south of the intersection at SW 124th Avenue and SW Tualatin-Sherwood Road. The location of and existing conditions surrounding the site are shown on Figure 1. The boundaries of the site, topography, and location of site explorations are shown on Figure 2.

Based on conceptual plans provided by DOWL, the proposed project will consist of six buildings with an aggregate footprint of 458,155 square feet. Several options have been considered in the past. The options generally involve two approaches: (1) complete the development with a relative consistent grade across the site (reference as the one-tier approach) and (2) two benches (referenced as the two-tier approach). We understand that the current focus is on the one-tier approach, with an estimated finished rough grade of elevation 210 feet (excluding utility cuts). Retaining walls around the site perimeter and paved access roads and parking areas will be required depending on the development plans adopted.

We understand the buildings will be one story and likely concrete tilt-up structures. Foundation loads were not available at the time of this report; however, we have assumed maximum column loads will be less than 150 kips and maximum wall loads will be less than 4.5 kips per linear foot. We understand the distributed slab live load is unknown at this time; however, 350 pounds per square foot is assumed and will be confirmed later by the proposed end user.

PURPOSE AND SCOPE

The purpose of our geotechnical services was to develop preliminary geotechnical recommendations for planning purposes and preliminary cost estimating of the proposed development. The specific scope of our services is summarized as follows:

- Reviewed readily available published geologic data and our in-house files for existing information on subsurface conditions in the site vicinity.
- Reviewed reports of previous geotechnical studies completed at and near the site.
- Coordinated and managed the field investigation, including utility locates and scheduling subcontractors and GeoDesign field staff.
- Completed two test pits to depths of 2.5 and 5.0 feet below ground surface (BGS). The test pits were terminated at final depths when practical refusal was encountered.
- Classified the materials encountered in the explorations and maintained a detailed log of each exploration.
- Observed groundwater conditions in the explorations.
- Conducted in situ seismic refraction surveying at the site to measure P-wave velocity of the geologic units. We performed 22 refraction lines, which comprise 5 subsurface profiles.
- Analyzed the collected seismic refraction data and interpreted the P-wave velocities to estimate bedrock depth and potential means of rock excavation.
- Prepared this preliminary geotechnical report summarizing the findings of the above-reference work.

This preliminary report will be followed by a design-level geotechnical report following the development of the site layout, grading plan, and estimated foundation loads.

BACKGROUND

GeoDesign has completed several projects in the area, including a 2014 geotechnical report (GeoDesign, 2014) for the SW 124th Avenue extension that runs along the eastern edge of the site boundary (construction recently completed). We also completed several phases for the Koch Corporate Center located at SW 115th Avenue and SW Boones Ferry Road, approximately 3,000 feet east of the site. In addition, you provided us with a geotechnical memorandum for the site, dated April 13, 2016, which included subsurface information from 48 borings completed in March 2016 (GRI, 2016). Our recent explorations are presented in Attachment A, our seismic refraction surveying results are presented in Attachment B, the 2016 GRI memorandum is presented in Attachment C, and excerpts from the 2014 GeoDesign report are presented in Attachment D.

SITE CONDITIONS

SURFACE CONDITIONS

The proposed site is bordered by SW Tualatin-Sherwood Road to the north, the extension to SW 124th Avenue to the east, municipal property to the west, and undeveloped property to the south. The property immediately south of the site is currently being developed as a water treatment plant by the Willamette Water Supply Program.

An existing house with several small outbuildings are present in the north-central portion of the site. The remainder of the site is undeveloped. The northeast half of the site slopes gently to the northeast and is currently covered with tall grass and brush and was likely used for agricultural pasture. A small drainage ravine with small- to medium-sized trees and heavy brush bisects the site and trends from south to northeast. The ravine forms steep slopes along the southern portion of the site and widens to the northeast into a pasture area.

The southwest portion of the site is currently covered with small- to medium-sized trees and heavy brush with a few trails cleared through the vegetation. The topography rises steeply to the south from the edge of the tree line and flattens to form a low ridge trending from the drainage west to the site boundary. The ground surface contains isolated areas of scattered boulders covered by vegetation and thin soil cover. The shallow ridge contains rough, rocky ground with boulder patches and evidence of shallow bedrock with little-to-no soil cover. Boulders up to 5 feet in diameter are prevalent across the ground surface in this area. The approximate extent of near-surface (or surface) boulders and bedrock is shown on Figure 2.

GEOLOGIC SETTING

Regional Setting

The site is located in the Tualatin Basin physiographic province, which is a northwest-southeast trending, pull-apart sub-basin of the Willamette Valley (Wilson, 1998). The Tualatin Basin is separated from adjacent sub-basins of the Willamette Valley by slightly folded and faulted basalt flows of the Columbia River Basalt Group (CRBG), which form topographic divides between adjacent basins (Popowski, 1997). The Coast Range and Chehalem Mountains bound the Tualatin Basin to the west and south, respectively, and the Tualatin Mountains (Portland Hills) bound the Portland Basin to the north and east. The region has undergone large-scale and localized tectonic activity, which has contributed to form the hills and valleys in the Willamette Valley.

Site Geology

The generalized geologic profile of the site consists of recent alluvium, catastrophic Missoula flood deposits, and basalt bedrock of the CRBG. The mapped geologic units are generally composed of unconsolidated sediments derived from transport and deposition processes and from in-place weathering of volcanic bedrock. The CRBG underlies the sedimentary deposits along the proposed alignment and is considered the basement material for the site (Burns et al., 1997; Schlicker and Deacon, 1967).

The following sections describe the specific geologic units that are mapped at the site and were also described in subsurface explorations conducted by others on the site.

Recent Alluvium

Holocene alluvium consists of unconsolidated gravel, sand, silt, and clay soil deposited in the last 10,000 years along stream and river drainages and is found within the site vicinity in the Tualatin Valley and along Rock and Coffee Lake creeks.

Missoula Flood Deposits

The recent alluvium is underlain by Pleistocene Age (15,500 to 13,000 years before present) catastrophic Missoula flood deposits, which consist of poorly consolidated, fine- to coarse-grained sand, silt, and clay. The Missoula flood deposits resulted from a series of catastrophic late Pleistocene glacial outburst floods. During this time interval, enormous floods would periodically flow across eastern Washington and down the Columbia River Valley caused by failures of a glacial ice dam that impounded a large lake located in southwestern Montana (Lake Missoula). Floodwater would inundate the Willamette Valley and Tualatin Basin, leaving deposits of gravel, sand, and silt to elevations ranging from 250 to 400 feet.

In the general vicinity of the site, the Missoula flood waters were large enough to overtop the pre-existing topographic divide between the Tualatin Valley and Willamette Valley near Sherwood, Oregon. High velocity flood waters carved deep channels into the CRBG in the area, creating what is known as the Tonquin Scablands (Wilson, 1998). In places, the floodwaters removed decomposed and weathered basalt and eventually down cut and entrenched into less weathered material. Evidence of numerous scoured bedrock channels near the site are identifiable using LiDAR data.

Based on subsurface explorations located in the site vicinity, fine sand and silt (fine facies) of the Missoula flood deposits are located in the pasture areas south of SW Tualatin-Sherwood Road. The flood deposits are generally thin and lap onto the weathered surface of the CRBG, which occupies higher elevations at the site.

CRBG

Underlying the alluvium and flood deposits is the middle Miocene Age (20 million to 10 million years before present) CRBG. The CRBG represents the oldest geologic unit encountered at the site, which is exposed in outcrops and quarry excavations on the site and forms many of the topographic highlands within the Tualatin Valley (Wilson, 1998). The CRBG is up to 1,000 feet thick within the Tualatin Valley (Schlicker and Deacon, 1967) with individual flows ranging between 10 to 100 feet thick. The CRBG is composed of a series of basalt flows erupted from linear vent systems in southeastern Washington that flowed down the course of the ancestral Columbia River until reaching the Pacific Ocean. Some of these lava flows ponded and cooled in the northern Willamette Valley, resulting in a stacked series of basalt units. Sediments deposited on the surface of an individual basalt flow would be covered by subsequent flows, resulting in a stacked sequence of basalt flows and sedimentary interbeds. These thick flows were subsequently folded and faulted by compressional tectonics in the region.

An idealized CRBG lava flow consists of two sub-units, termed the flow top and flow interior. The flow top is often a porous, vesicular zone resulting from gas bubbles trapped during rapid cooling of the lava surface. This zone is typically intensely to moderately fractured or brecciated, the result of rapid cooling, and both vesicles and fractures may be partially filled by secondary mineralization. The flow bottom is similar to the flow top, except the weathering may not be as severe. The flow interior typically consists of very dense, moderately fractured basalt with a high mechanical strength due to crystalline mineral formation resulting from slower cooling of the lava.

A hiatus between lava flow emplacements can create conditions of deep weathering of the basalt, resulting in a breakdown of the rock minerals to clay components forming a soil horizon (saprolite). The hiatus periods may have resulted in thick sections of severely weathered basalt and deposition of sedimentary interbeds between basalt flow units. Unweathered exposures of Columbia River basalt flow interiors are excellent sources of crushed aggregate. A number of active quarries in the CRBG are located north and east of the study area (Tigard Sand and Gravel Quarry and Knife River-Coffee Lake Quarry). Where the CRBG was exposed for an extensive period of time, the rock is decomposed to form a thick, lateritic soil consisting of clayey gravel or clayey sand containing cobbles and boulders.

SUBSURFACE CONDITIONS

General

The subsurface conditions are summarized based on the information from several sources. We explored subsurface conditions at the site by excavating two test pits (TP-1 and TP-2) to depths of 2.5 and 5.0 feet BGS. The trackhoe used to complete the above-referenced test pits was primarily used to clear the heavy brush along the refraction lines. The exploration locations are shown on Figure 2 and associated exploration logs are presented in Attachment A.

We completed a seismic wave refraction survey at the site. The purpose of the seismic wave refraction survey was to further characterize the extent and characteristics as well as estimate the depth and rippability of the basalt rock at the site. The location of the five subsurface profiles generated from this survey are shown on Figure 2 and a detailed summary of our seismic wave refraction survey is presented in Attachment B. Important aspects of the five subsurface profiles (A-A', B-B''', C-C', C''-C''', and D-D'), presented in Attachment B) generated in this study include the following:

- The shallowest velocity layer corresponds to the transition between the soil (alluvium) unit, which is interpreted to have a P-wave velocity less than 3,000 feet per second (fps).
- The subsequent layers showing increasing P-wave velocity are interpreted to represent the top of the underlying volcanic bedrock.
- The increase in P-wave velocity with depth shown on the profiles corresponds to a transition from low strength, intensely weathered, and intensely fractured bedrock to higher strength, fresh, intact bedrock.
- The deepest refracting layer corresponds to the highest velocity layer detected in the refraction survey line.

The GRI borings were drilled to depths of between 15 and 30 feet BGS using open-hole, air rotary methods to determine the depth to bedrock and to estimate the weathering and hardness of the bedrock encountered. The April 13, 2016 memorandum is presented in Attachment C and the locations of the explorations are shown on Figure 2.

GeoDesign prepared a geotechnical report for the SW 124th Avenue Extension Project located along the eastern edge of the project site (GeoDesign, 2014). Five borings from this report were completed adjacent to the eastern edge of the site, at the approximate location shown on Figure 2. The site plan, exploration logs, and laboratory test results from this report are presented in Attachment D.

Subsurface conditions generally consist of alluvium overlying decomposed basalt and weathered basalt to fresh basalt. The following sections provide a summary of the subsurface units encountered.

Topsoil/Tilled Zone

A tilled zone was encountered in borings B-1, B-2, and INF-1 (GeoDesign 2014, Attachment D) that extended to approximately 12 inches BGS. This zone included a surficial topsoil layer having a thickness of approximately 6 inches and an associated root zone of approximately 3 inches. Thick stripping and topsoil layers are anticipated in the heavily vegetated areas of the site. In addition, we anticipate up to 3- to 4-foot-deep root wads in the treed area of the site.

Alluvium

Alluvial deposits were generally encountered below the topsoil. These deposits extend to a depth of approximately 16 feet BGS in the northeast corner of the site and gradually decrease in thickness toward the southwest until they taper to less than 1 foot thick near rock outcroppings located in the southwest corner of the site. The shallowest velocity layer from the seismic wave refraction survey likely corresponds to the transition between the soil and weathered rock units, which is interpreted to have a P-wave velocity less than 3,000 fps. Boulders are likely in the 3,000 fps material, as encountered at TP-1.

Alluvial deposits generally consist of soft to very stiff silt and clay with varying amounts of fine sand, but also note that very loose, silty sand was encountered at INF-1. Very loose, silty sand deposits were observed within the deeper deposits located along the eastern edge of the site boundary. Laboratory testing indicates that the alluvial deposits in the eastern portion of the site had moisture contents in the range of 27 to 36 percent and a dry density of 94 pounds per cubic foot. Atterberg limits testing indicates the alluvium generally has a low to medium plasticity.

Decomposed Basalt

Decomposed basalt was generally encountered below the alluvium, The depth to decomposed basalt varies considerably across the site, with depths greater than 26.5 feet BGS in the northeast corner of the site, and gradually decreases toward the southwest where it tapers to at/near the ground surface toward the southwest corner of the site (as mapped on Figure 2).

The decomposed basalt generally consists of a medium dense to very dense, brown and gray, silty gravel; medium dense to dense, clayey to silty sand; and stiff, blue-gray, sandy clay. The decomposed basalt is interpreted to represent the deeply weathered surface of a lava flow of the CRBG. The decomposed basalt may have been generated through a variety of processes, including weathering of in-place basalt, weathering of flow top breccia derived from the CRBG, and erosion and deposition of CRBG material close to the original flow. The weathering of this material is variable and dependent upon the ability of surface water and groundwater to penetrate the unit and chemically break it down. The decomposition process can include highly variable amounts of relatively resistant gravel- to boulder-sized clasts in a matrix of silt and clay.

The velocity ranging from approximately 3,000 to 5,000 fps is interpreted to represent the top of the weathered bedrock exhibiting relatively low strength, intense weathering, and intense fracturing. The fractures may have wide separations with soil filling that result in a slower P-wave velocity. This layer may also represent a transition from tightly packed boulders in a clay or silt matrix to weathered, intact rock structure.

Laboratory testing indicates that the decomposed basalt located along the eastern portion of the site had moisture contents ranging from 11 to 63 percent, with the higher moisture contents corresponding to more clay-rich soil.

Weathered Basalt and Basalt Bedrock (Fractured and Competent)

We encountered weathered basalt and fresh basalt bedrock underlying the alluvium and decomposed basalt along the eastern edge of the site boundary (GeoDesign, 2014). The weathered basalt generally consists of very dense, brown, gray, and red-brown gravel or silty to clayey sand that is generally characterized by a significant change to hard, consistent drilling and refusal SPT blow counts. The weathered basalt is a transition zone from the overlying relatively softer, decomposed basalt to generally medium hard to hard, slightly weathered to fresh basalt observed in the continuous rock core samples.

Rock coring was completed in boring B-4 (GeoDesign 2014) where mud rotary drilling met practical refusal. In general, the rock cores consist of soft (R2) to medium hard (R3), gray, fine-grained basalt. The basalt cores exhibit varying degrees of weathering from decomposed to moderately weathered, which is usually associated with position of the core within a lava flow and the degree of contact with groundwater. The basalt cores also exhibit a varying degree of fracturing and jointing, which is reflected on the log as percent rock quality designation (RQD). Rock cores with low RQD values generally exhibit an intense to very intense fracture density. Competent basalt generally has moderate to very slight fracture density and high RQD values greater than 50 percent. Typical standards for rippability are presented in Attachment E. Note that marginal rippability is encountered in basalt rock at velocities of 6,500 to 7,500 fps (standard D8 CAT with single- or multiple-shank rippers). The lowest refraction layer detected in most of the profiles was a maximum P-wave velocity of 6,000 fps; however, profile B-B' detected a hard basalt layer (greater than 7,000 fps) in the northwest portion of the site where we encountered shallow basalt in test pit TP-2.

Groundwater

Groundwater was observed within the explorations across the site at depth ranging from 0.4 foot to 29.5 feet BGS, corresponding to elevations (NAVD 88) ranging from 192.1 to 246.2 feet. These groundwater observations likely reflect perched groundwater conditions. According to the estimated depth to groundwater mapping published by the U.S. Geological Survey (Snyder, 2008), the regional groundwater table is located at a depth of approximately 53.5 feet BGS, corresponding to an elevation (NAVD 88) of 150.5 feet. Perched groundwater zones are likely to occur in the upper soil at the site, particularly during extended periods of wet weather. The depth to groundwater may fluctuate in response to prolonged rainfall, seasonal changes, changes in surface topography, and other factors not observed during this study.

CONCLUSIONS

We anticipate the following geotechnical factors will have an impact on design and construction of the proposed development:

- We completed seismic wave refraction survey along five subsurface profiles (A-A', B-B''', C-C', C''-C''', and D-D'), as shown on Figure 2. An expanded discussion on the methodologies and results are presented in Attachment B.
- As discussed in further detail above and in Attachment B:
  - The shallowest velocity layer from the seismic wave refraction survey likely corresponds to the transition between the soil and weathered rock units, which is interpreted to have a P-wave velocity less than 3,000 fps.
  - The velocity ranging from approximately 3,000 to 5,000 fps is interpreted to represent the top of the weathered bedrock exhibiting relatively low strength, intense weathering, and intense fracturing. The fractures may have wide separations with soil filling that result in a slower P-wave velocity. This layer may also represent a transition from tightly packed boulders in a clay or silt matrix to weathered, intact rock structure.
  - Marginal rippability basalt is generally encountered in basalt rock at velocities of 6,500 to 7,500 fps (standard D8 CAT with single- or multiple-shank rippers). The lowest refraction layer detected in most of the profiles was a maximum P-wave velocity of 6,000 fps; however, profile B-B' detected a hard basalt layer (greater than 7,000 fps).
  - Boulders may occasionally be encountered in the material with P-wave velocities less than 3,000 fps material and are anticipated in the material above 3,000 fps.
- As discussed above, unweathered exposures of CRBG are excellent sources of crushed aggregate. A number of active quarries in the CRBG are located north and east of the study area (Tigard Sand and Gravel Quarry and Knife River-Coffee Lake Quarry). However, where the CRBG was exposed for an extensive period of time, the rock is decomposed to form a thick, lateritic soil consisting of clayey gravel or clayey sand containing cobbles and boulders. The seismic wave refraction survey suggests that both conditions should be expected.
- Tilled zones should be anticipated in the agricultural areas located in the eastern portion of the site. Tilled and topsoil zones not removed from cuts and site stripping will need to be removed or stabilized. Scarification and compaction of the tilled and topsoil zones will likely not be possible unless completed during the summer dry period. Removal and replacement of the tilled and topsoil zones with granular material or cement amendment will be necessary if stabilization through moisture conditioning is not possible.
- The fine-grained soil at the site can be sensitive to small changes in moisture content and difficult, if not impossible, to adequately compact during wet weather or when the moisture content of the soil is more than a few percent above the optimum required for compaction. The moisture content of the soil encountered at the site is above that required for compaction and drying will likely be required for use as structural fill. Accordingly, the on-site soil can typically only be placed as structural fill during dry summer months.

- Fine-grained soil present on this site is easily disturbed during the wet season. If not carefully executed, site earthwork can create extensive soft areas and significant repair costs can result. Subgrade protection will be required when the subgrade is wet.
- Cobbles and boulders are present at the surface and shallow depths below the ground surface. The presence of cobbles and boulders may make excavations difficult and will likely need pre-processing if crushing is attempted.

LIMITATIONS

We have prepared this preliminary report for use by Trammell Crow Company and members of the design and construction teams for use in cost estimating and preliminary design. The data and report can be used for estimating purposes, but our report, conclusions, and interpretations should not be construed as a warranty of the subsurface conditions and are not applicable to other sites.

The scope of our services does not include services related to construction safety precautions, and our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with the generally accepted practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

♦ ♦ ♦

We appreciate the opportunity to be of continued service to you. Please call if you have questions concerning this report or if we can provide additional services.

Sincerely,

GeoDesign, Inc.

Gregory J. Schaertl, P.E. (California)
Project Engineer

George Saunders, P.E., G.E.
Principal Engineer

CMC:GJS:GPS:kt
Attachments
One copy submitted (via email only)
Document ID: TrammellCr-74-01-020619-geolr.docx

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GRI, 2016. DRAFT *Memorandum; Preliminary Subsurface Investigation for Pre-purchase Due Diligence; 90-Acre Site; 12900 SW Tualatin-Sherwood Road; Sherwood, Oregon*, dated April 13, 2016. GRI Project No.: 5838.

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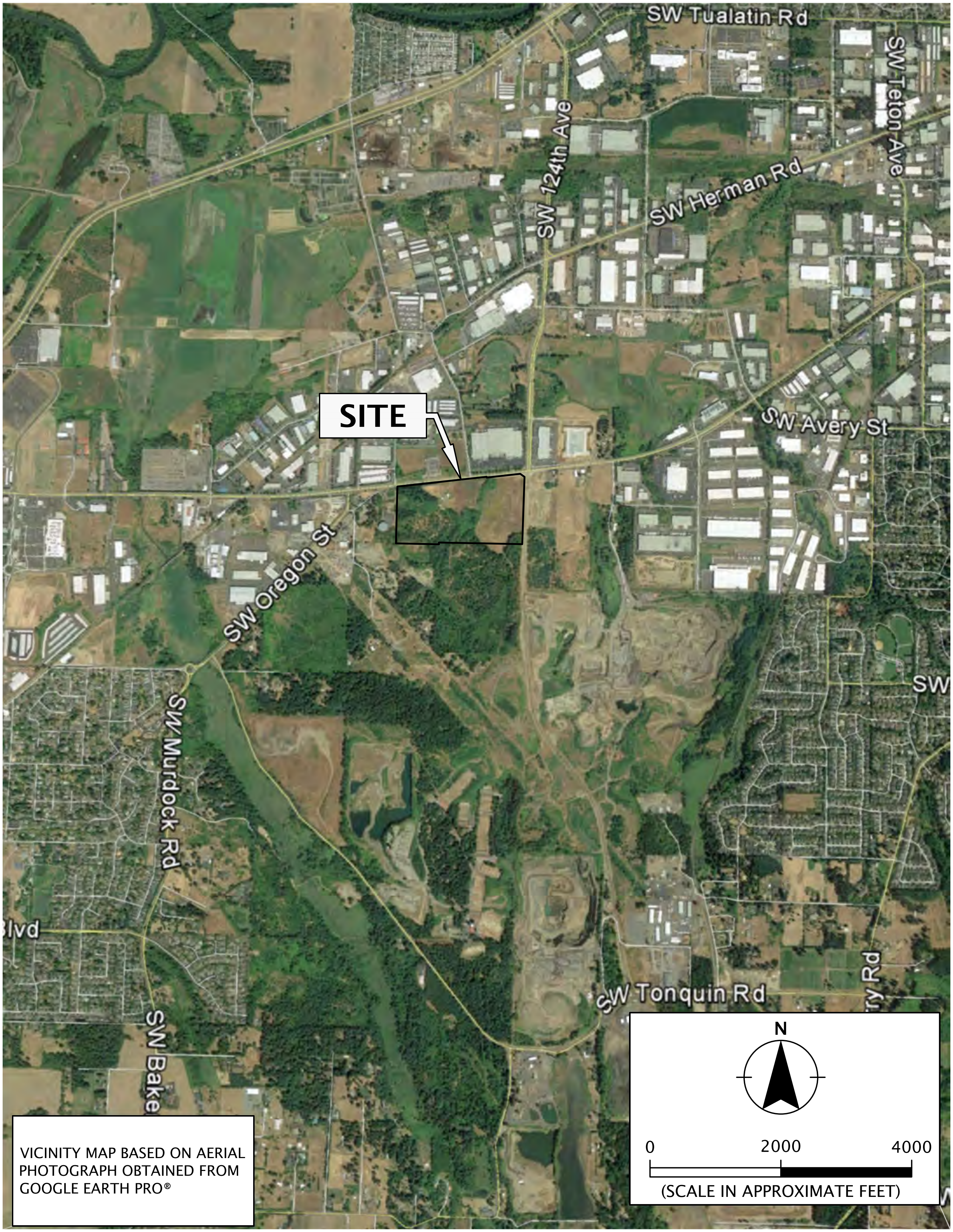
Wilson, Doyle C., 1998, Post-middle Miocene Geologic Evolution of the Tualatin Basin, Oregon, Oregon Geology, vol. 60, no. 5., p. 99-116.

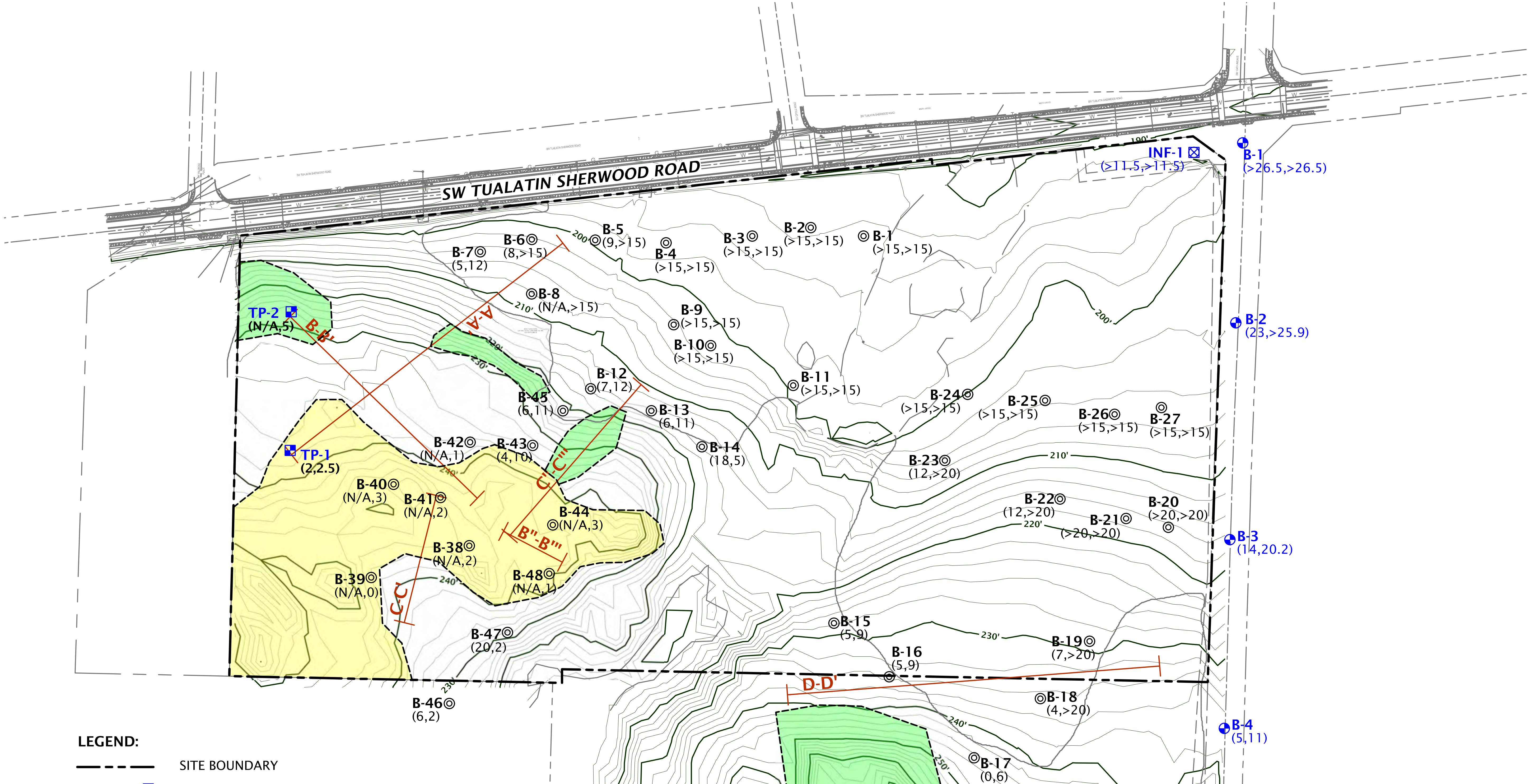
FIGURES



VICINITY MAP BASED ON AERIAL PHOTOGRAPH OBTAINED FROM GOOGLE EARTH PRO®

GEODESIGN INC 9450 SW Commerce Circle - Suite 300 Wilsonville OR 97070 503.968.8787 www.geodesigninc.com	TRAMMELLCR-74-01	VICINITY MAP	
	FEBRUARY 2019	ORR PROPERTY WASHINGTON COUNTY, OR	FIGURE 1

Printed By: mmiller | Print Date: 1/31/2019 3:42:01 PM
File Name: J:\S-Z\TrammellCr\TrammellCr-74\TrammellCr-74-01\Figures\CAD\TrammellCr-74-01-VM01.dwg | Layout: FIGURE 1



LEGEND:

- SITE BOUNDARY
- TP-1 — TEST PIT
- B-1 — PRIOR BORING (GEODESIGN 2013)
- INF-1 — INFILTRATION TEST (GEODESIGN 2014)
- B-5 — PRIOR BORING (GRI MARCH 2016)
- (9,>15) — DEPTH IN FEET TO MODERATELY WEATHERED TO SLIGHTLY WEATHERED ROCK/DEPTH IN FEET TO SLIGHTLY WEATHERED TO FRESH ROCK (SEE ATTACHMENT C FOR ORIGINAL DATA)
- A-A' — SEISMIC REFRACTION LINE
- AREA OF SHALLOW BOULDERS
- AREA OF SHALLOW BOULDERS AND BEDROCK

SITE PLAN BASED ON DRAWING PROVIDED BY DOWL JANUARY 3, 2019

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SITE PLAN

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FIGURE 2

ATTACHMENT A

ATTACHMENT A

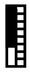
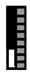
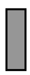
FIELD EXPLORATIONS

GENERAL

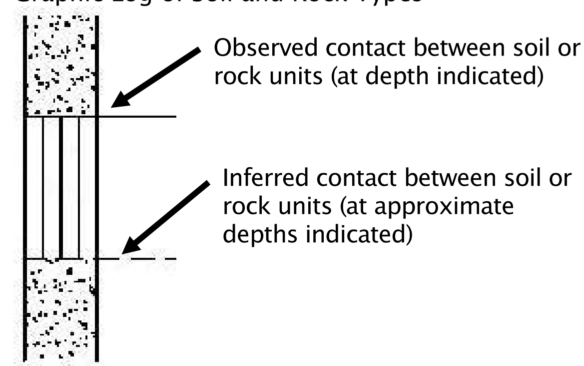
We explored subsurface conditions at the site by excavating two test pits (TP-1 and TP-2) at the approximate locations shown on Figure 2. Excavation services were provided by Dan J. Fischer Excavating, Inc. of Forest Grove, Oregon, on December 10, 2018. A member of our geology staff observed the explorations. The exploration locations were determined in the field using a Trimble hand-held differential global positioning system (GPS) unit with sub-meter accuracy and should be considered accurate to the degree implied by the methods used. The exploration logs are presented in this attachment.

SOIL CLASSIFICATION

We collected samples of the soil encountered at representative intervals. The soil samples were classified in accordance with the "Explorations Key" (Table A-1) and "Soil Classification System" (Table A-2), which are presented in this attachment. The exploration logs indicate the depths at which the soils or their characteristics change, although the change could be gradual. If the change occurred between sample locations, the depth was interpreted. Classifications are shown on the exploration logs.

SYMBOL	SAMPLING DESCRIPTION
	Location of sample obtained in general accordance with ASTM D 1586 Standard Penetration Test with recovery
	Location of sample obtained using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D 1587 with recovery
	Location of sample obtained using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample obtained using Dames & Moore sampler and 140-pound hammer or pushed with recovery
	Location of sample obtained using 3-inch-O.D. California split-spoon sampler and 140-pound hammer
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	P	Pushed Sample
CBR	California Bearing Ratio	PP	Pocket Penetrometer
CON	Consolidation	P200	Percent Passing U.S. Standard No. 200 Sieve
DD	Dry Density		
DS	Direct Shear	RES	Resilient Modulus
HYD	Hydrometer Gradation	SIEV	Sieve Gradation
MC	Moisture Content	TOR	Torvane
MD	Moisture-Density Relationship	UC	Unconfined Compressive Strength
NP	Nonplastic	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

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EXPLORATION KEY

TABLE A-1

RELATIVE DENSITY - COARSE-GRAINED SOIL

Relative Density	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very Loose	0 – 4	0 - 11	0 - 4
Loose	4 – 10	11 - 26	4 - 10
Medium Dense	10 – 30	26 - 74	10 - 30
Dense	30 – 50	74 - 120	30 - 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOIL

Consistency	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 - 4	3 – 6	2 - 5	0.25 - 0.50
Medium Stiff	4 - 8	6 – 12	5 - 9	0.50 - 1.0
Stiff	8 - 15	12 – 25	9 - 19	1.0 - 2.0
Very Stiff	15 - 30	25 – 65	19 – 31	2.0 - 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOIL (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVEL WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SAND (<5% fines)	SW or SP	SAND
		SAND WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SAND WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOIL (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOIL			PT	PEAT

MOISTURE CLASSIFICATION

Term	Field Test
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

ADDITIONAL CONSTITUENTS

Secondary granular components or other materials such as organics, man-made debris, etc.

Percent	Silt and Clay In: Fine-Grained Soil	Silt and Clay In: Coarse-Grained Soil	Percent	Sand and Gravel In: Fine-Grained Soil	Sand and Gravel In: Coarse-Grained Soil
< 5	trace	trace	< 5	trace	trace
5 – 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	Indicate %

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SOIL CLASSIFICATION SYSTEM

TABLE A-2

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT (%)	COMMENTS

TP-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	MOISTURE CONTENT (%) 0 50 100	COMMENTS
0.0	Soft to medium stiff, dark brown SILT with cobbles, boulders, and organics (ML); moist, cobbles are approximately 10%, boulders are approximately 10% (3-inch-thick root zone).	1.0		
	Medium dense, brown, silty GRAVEL with cobbles (GM), minor sand; moist, cobbles are approximately 15%, gravel is fine to coarse and subangular.	2.5		
2.5	Dense to very dense, light brown, silty GRAVEL with cobbles and boulders (GM); moist, cobbles are approximately 10%, boulders are approximately 15% (decomposed basalt).	5.0		
5.0	Exploration terminated at a depth of 5.0 feet due to refusal.			No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
7.5				

TP-2

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION DEPTH	MOISTURE CONTENT (%) 0 50 100	COMMENTS
0.0	Medium stiff, dark brown, gravelly SILT with sand (ML); moist (3-inch-thick root zone).	1.0		
	Medium dense to dense, brown, silty GRAVEL with sand (GM); moist, gravel is fine to coarse and subangular.	2.0		
2.5	Very dense, gray GRAVEL (GP); moist, gravel is coarse (weathered basalt).	2.5		
	Exploration terminated at a depth of 2.5 feet due to refusal.			No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
5.0				
7.5				

EXCAVATED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: C. Clough COMPLETED: 12/10/18

EXCAVATION METHOD: trackhoe (see document text)

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TEST PIT

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FIGURE A-1

ATTACHMENT B

ATTACHMENT B

SEISMIC REFRACTION SURVEY

GENERAL

We conducted a seismic wave refraction survey by collecting seismic data along 22 refraction lines, which comprise five subsurface profiles (A-A', B-B''', C-C', C''-C''', and D-D'), as shown on Figure 2. The survey was conducted to expand and correlate with subsurface data collected from GRI's and our test pit explorations. The seismic refraction study was conducted on December 10, 13, 19, and 21, 2018.

FIELD METHODOLOGY

The field work consisted of collecting 22 P-wave refraction survey lines that comprised five subsurface profiles (A-A', B-B''', C-C', C''-C''', and D-D'), as shown on Figure 2. The location and alignment of each profile was chosen based on areas of deep cuts for the development. The refraction survey alignments were cleared of brush consisting of thick blackberry vines, down trees, limbs, poison oak, small trees, and shrubs using a trackhoe operated by Dan J. Fischer Excavating. Survey alignments were adjusted in the field to minimize vegetation removal, avoid groups of large trees, avoid rough or difficult terrain, and avoid a group of abandoned cars. The larger obstructions resulted in gaps for survey profiles B and C, as shown on Figure 2.

Field measurements were completed using a 300-foot tape. Cross section endpoints were located using a Trimble hand-held differential GPS unit with sub-meter accuracy. The surfaces for individual lines ranged from flat-lying to moderately steep slopes with elevation changes across survey alignments ranging from 7 to 37 feet. We corrected the refraction data for change in topography using the site survey elevation data from the drawings. The individual survey lines were laid out using geophone spacings of 7 and 9 feet. The survey lines used for each profile were overlapped by two geophone spacings to maintain continuity between individual refraction lines. We observed boulders and the top of basalt exposed in portions of the survey lines, indicating that the top of the bedrock varies in elevation across the site.

Compressional waves used in this refraction survey were produced by striking an approximately 1-foot-square steel plate that was placed on the ground surface. For each refraction line, an array of 16 vertical geophones spaced 7 or 9 feet apart was placed along the profile alignment. The waveforms were recorded on a 16-channel Geode seismograph manufactured by Geometrics, Inc. Waveforms were recorded for five separate source locations. Two of the source locations were near the ends of the geophone array and three source locations were at the one-quarter, mid-point, and three-quarter point of the array. Acquisition of the P-wave refraction data followed the general methods and procedures provided in ASTM D5777-00[1].

DATA REDUCTION AND INTERPRETATION

The refraction data for each survey line was reduced and subsurface depth profiles generated using the SeisImager software provided by Geometrics, Inc. The direct P-wave arrivals were manually picked from the geophone waveform display for the five source locations and were

[1] ASTM, 2006, D-5777-00 Standard Guide for Using the Seismic Refraction Method for Subsurface Investigation.

used to generate travel time curves for each of these source positions. Slope breaks observed on the travel time curves define the direct P-wave propagating within the surface low velocity layer (LVL) of the soil unit and within the high velocity layer (HVL) of the underlying bedrock. The slope breaks from the travel time curves were used to generate an initial two-layer velocity model for each refraction line.

A tomographic inversion was used on the two-layer velocity model to generate a set of gradual velocity layers representing the transition of the surficial LVL to the underlying HVL interpreted from subsurface explorations to represent intact, weathered basalt. The velocity layers for each survey line model were used to construct five subsurface profiles (A-A', B-B''', C-C', C''-C''', and D-D'), which are presented in this attachment. Note:

- The shallowest velocity layer corresponds to the transition between the soil (alluvium) unit, which is interpreted to have a P-wave velocity less than 3,000 fps.
- The subsequent layers showing increasing P-wave velocity are interpreted to represent the top of the underlying volcanic bedrock.
- The increase in P-wave velocity with depth shown on the profiles corresponds to a transition from low strength, intensely weathered, and intensely fractured bedrock to higher strength, fresh, intact bedrock.
- The deepest refracting layer corresponds to the highest velocity layer detected in the refraction survey line.

The depth of detection for a survey line is based on the length of the total individual refraction line and geophone spacing. In general, the practical depth of signal return is estimated to be one-third of the total distance of the geophone spread, which is approximately 35 feet BGS and is shown as the signal limit line on the subsurface profiles. The P-wave velocities for each refraction profile are presented in Table C-1.

Table C-1. Refraction P-Wave Velocities

Survey Profile	LVL Soil Unit (fps)	HVL Basalt Bedrock (fps)
A-A'	< 3,000	3,000 to 6,000+
B-B'''	< 3,000	3,000 to 7,000+
C-C'	< 3,000	3,000 to 6,000+
C''-C'''	< 3,000	3,000 to 6,000+
D-D'	< 3,000	3,000 to 6,000+

In general, the P-wave velocity for the soil layer appeared to be less than 3,000 fps. The P-wave velocity ranging from approximately 3,000 to 5,000 fps is interpreted to represent the top of the variably weathered bedrock exhibiting relatively low strength, intense weathering, and intense fracturing. The fractures may have wide separations with soil filling that result in a slower P-wave velocity. This layer may also represent a transition from tightly packed boulders in a clay or silt matrix to weathered, intact rock structure. Refraction layers with P-wave velocities greater than 5,000 fps are interpreted to represent moderately strong, intact rock that is moderately weathered to fresh and moderately fractured to unfractured. The lowest refraction layer detected in most of the profiles appeared to exhibit a maximum P-wave velocity of 6,000 fps. However, refraction profile B-B' detected a hard basalt layer (greater than 7,000 fps) in the northwest portion of the site where we encountered shallow basalt in test pit TP-2.

The varying P-wave velocities observed within the volcanic rock, both vertically and horizontally, are interpreted to be caused by relative changes in rock density resulting from weathering, rock joint and fracture separation and density, relative rock hardness, flow contacts, and bedrock geometries or conditions that were not observed from the subsurface explorations.

In general, the thickness of the overlying LVL soil layer ranged from approximately less than 2 to 10 feet. The range in depth to the top of the hard basalt layer (lowest HVL detected) along each profile is shown in Table C-2. The velocity model profiles indicate that an HVL with P-wave velocities exceeding 6,000 fps underlies the soil layer generally within 5 to 7 feet BGS. Proposed earthwork activity may encounter bedrock or difficult excavation conditions depending on the depth of cut.

Table C-2. Seismic Refraction Layer Depths

Survey Profile	LVL Top of Bedrock (feet BGS)	Lowest HVL Intact Basalt (feet BGS)
A-A'	2 - 9	5 - 11
B-B'''	2 - 6	5 - 22
C-C'	2 - 8	5 - 21
C''-C'''	2 - 8	5 - 13
D-D'	2 - 10	7 – 18

The depth to intact basalt observed in the GRI boring data (GRI, 2016) and depth to refusal in our test pits appear to correlate with the depth to basalt estimated from the seismic refraction. The transition from soil to weathered, intact basalt exhibits a rapid change with depth, as observed in the refraction profiles. The top of the intact, weathered basalt (lowest HVL) depicted in the refraction surveys generally appeared as a gradual increase in P-wave velocity over a distance of 3 to 16 feet below the soil layer.

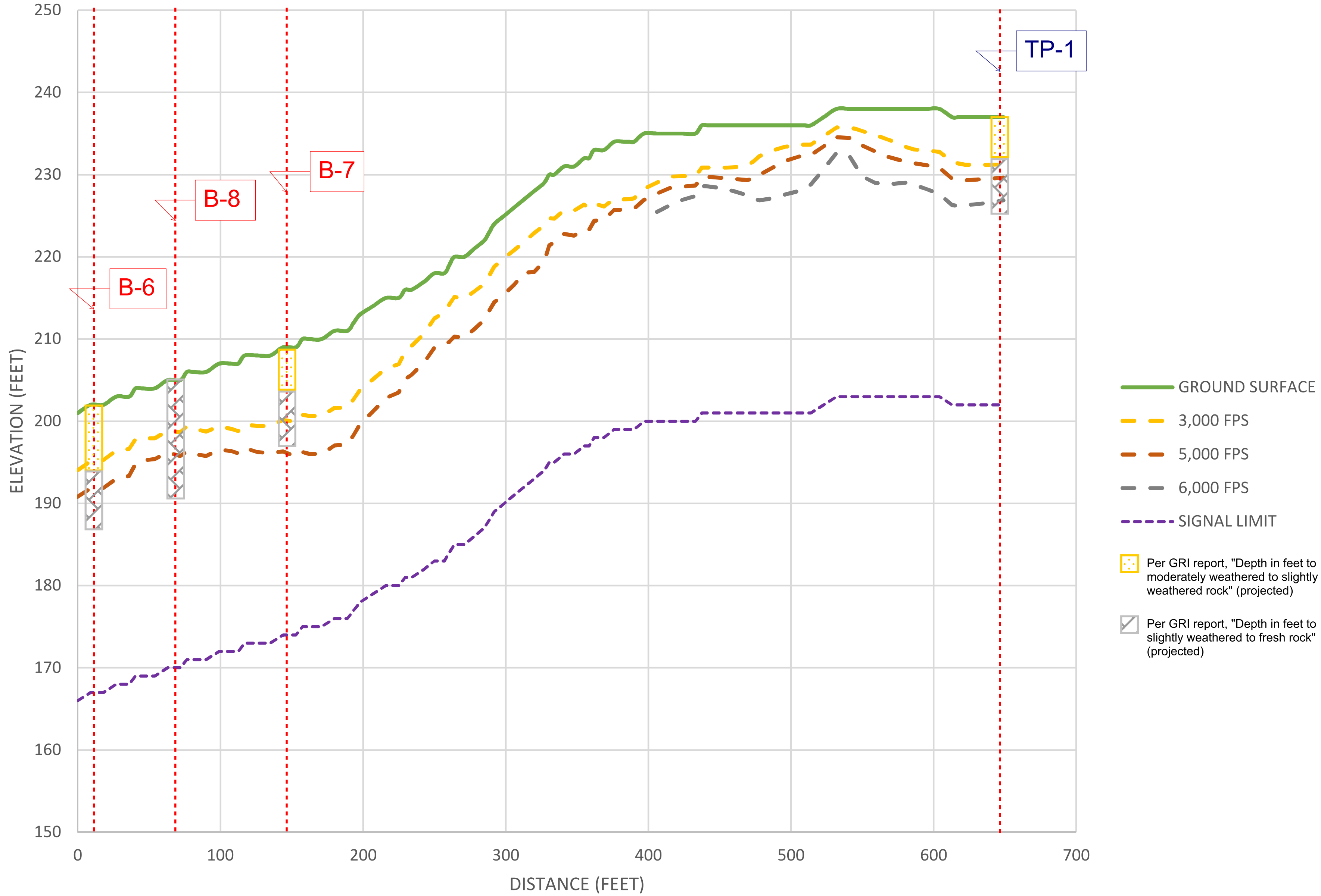
RIPPABILITY

Rippability is the ease with which soil or rock can be mechanically excavated. Rippability is influenced by numerous rock parameters, including uniaxial compressive strength, degree of weathering, abrasiveness, and spacing of discontinuities. Seismic refraction is commonly used to indirectly determine the degree of rippability. Rock that is too hard to be ripped is typically fragmented with explosives and excavated.

Basalt rock is considered as potentially rippable by a Caterpillar model D-8 bulldozer with a single- or double-ripping shank when the P-wave velocity is less than approximately 6,500 to 7,000 fps and by a Caterpillar model D-9 bulldozer with a single- or double-ripping shank when the P-wave velocity is less than approximately 7,000 to 7,500 fps[2]. This relationship is only appropriate if the bulldozer is operating in an open, unrestrained area where boulders that are too hard to rip can be isolated and removed by other means. P-wave velocity relationships are typically not valid for other types of equipment and situations, such as an excavator digging a utility trench. In general, the seismic refraction method used for this project does not discriminate between rippable weathered, intensely fractured rock and boulders located in the decomposed basalt. Excavations with small or confined limits, such as utility trenches or footings may encounter boulders requiring limited rock excavation methods or over-excavation.

Rock rippability depends on both the mechanical strength of the rock material and the degree of fracturing of the rock mass. The P-wave velocity of a rock provides an indirect measure of both the rock material strength and the degree of fracturing. The results of this geophysical survey can be used to evaluate where difficult excavation conditions exist and whether additional geophysical or direct subsurface investigation is warranted.

[2] Handbook of Ripping, 1997; Caterpillar, Inc., 11th edition, Peoria, IL, 30 p.



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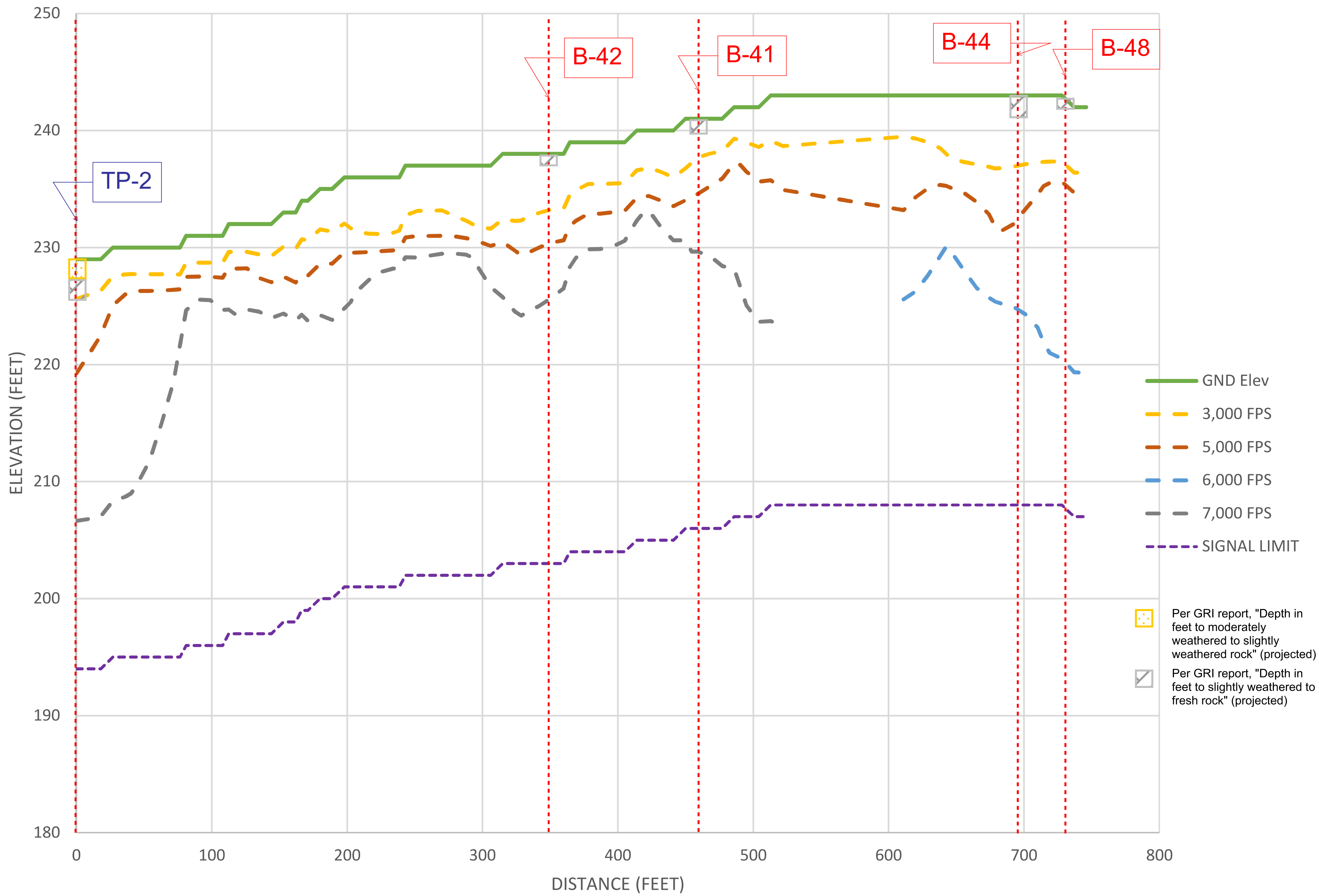
TRAMMELLCR-74-01	**SEISMIC REFRACTION SURVEY PROFILE A-A'**
FEBRUARY 2019	ORR PROPERTY WASHINGTON COUNTY, OR

FIGURE B-1



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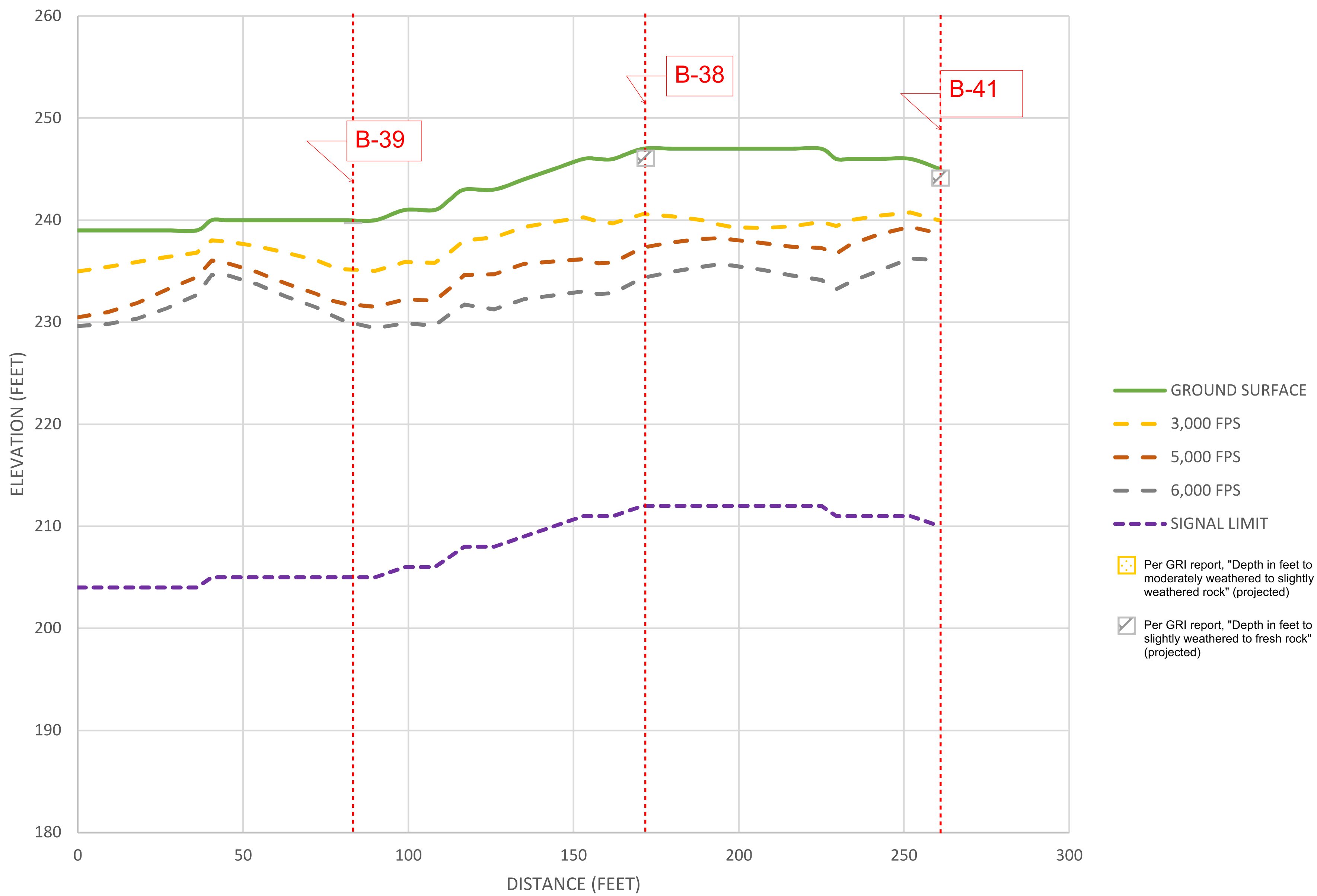
TRAMMELLCR-74-01	**SEISMIC REFRACTION SURVEY PROFILE B-B' AND B"-B'"**	
FEBRUARY 2019	ORR PROPERTY WASHINGTON COUNTY, OR	**FIGURE B-2**



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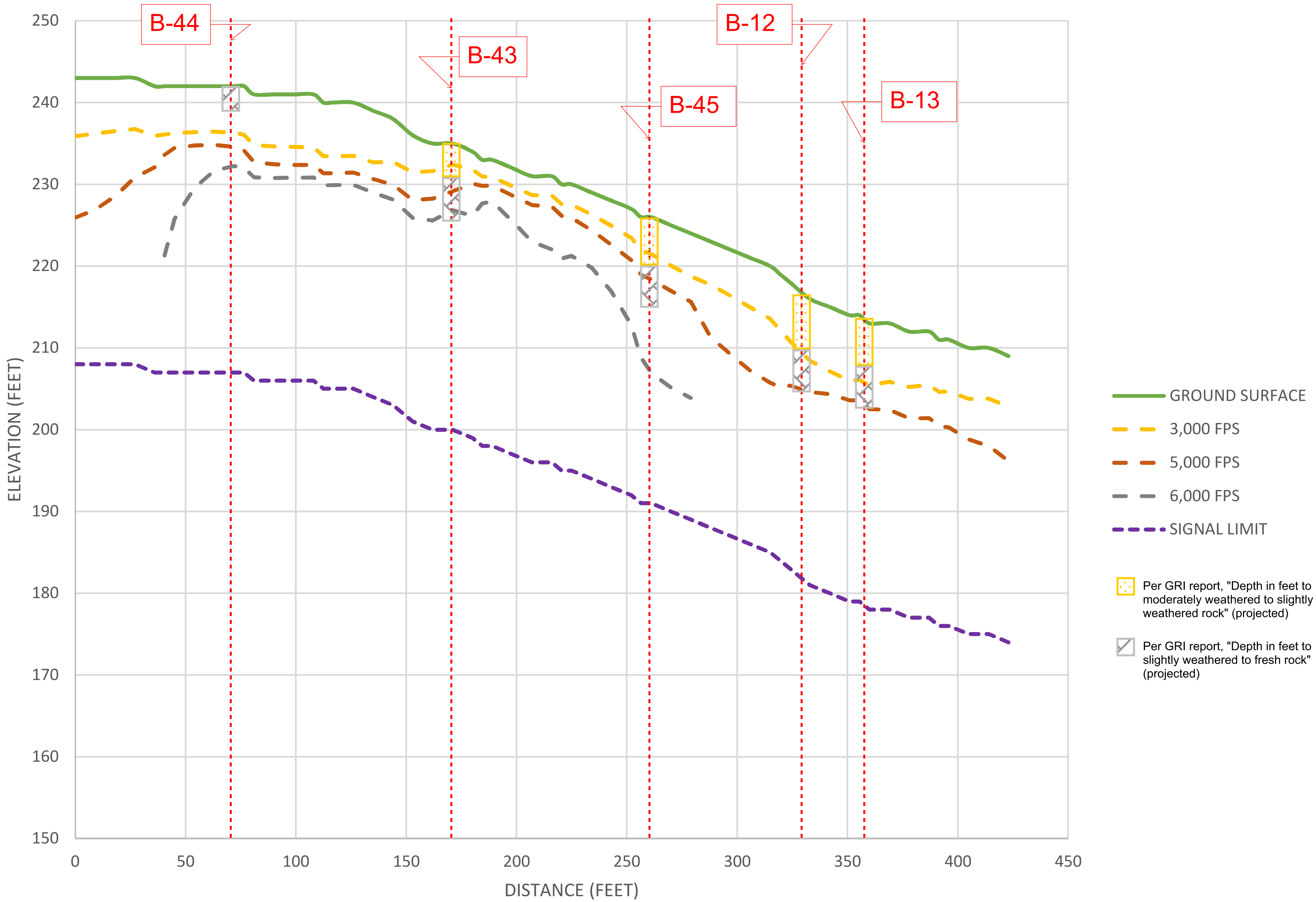
	FEBRUARY 2019	ORR PROPERTY WASHINGTON COUNTY, OR — **FIGURE B-3**



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SEISMIC REFRACTION SURVEY PROFILE C”-C”’

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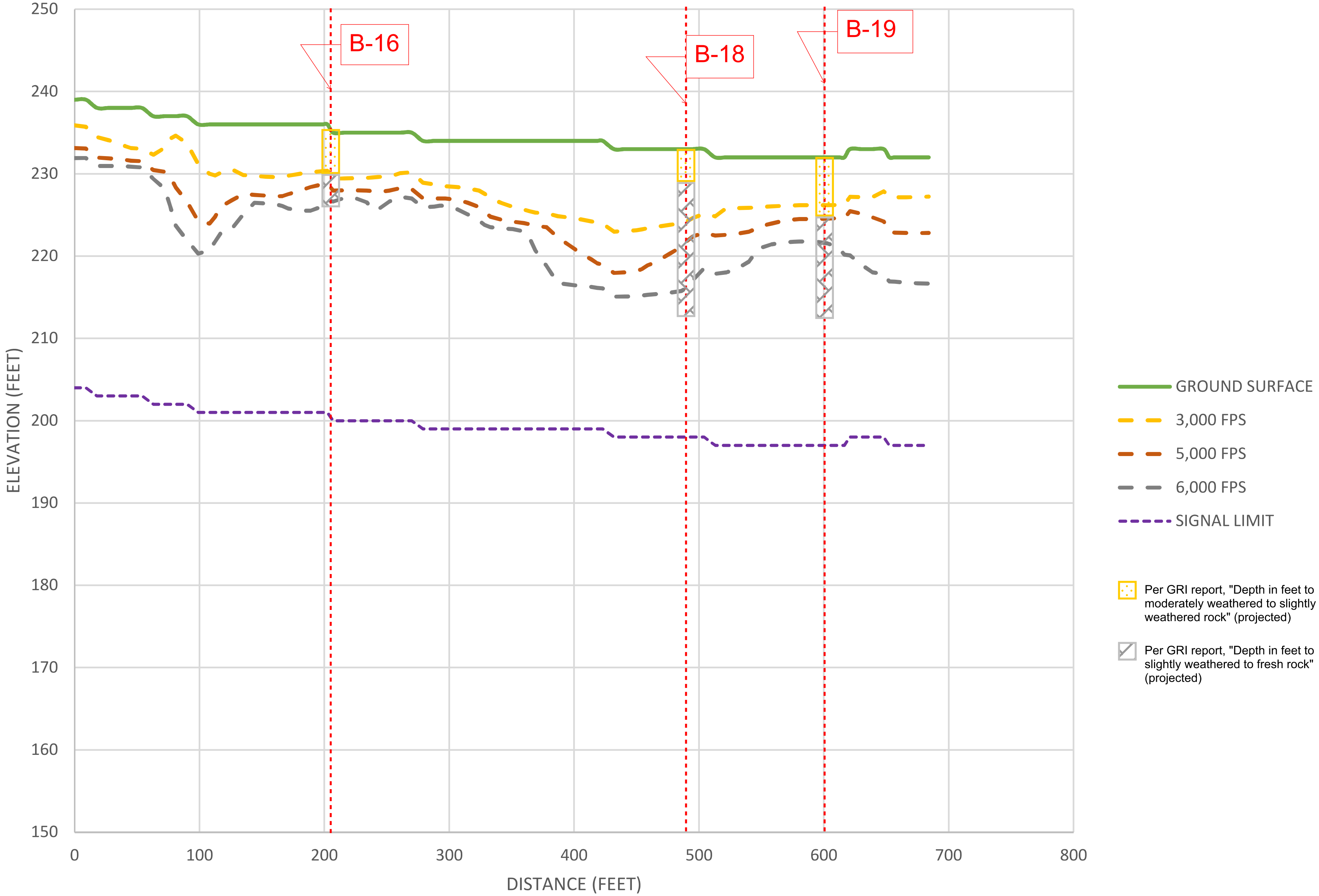
FIGURE B-4



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TRAMMELLCR-74-01	**SEISMIC REFRACTION SURVEY PROFILE D-D’**	
FEBRUARY 2019	ORR PROPERTY WASHINGTON COUNTY, OR	**FIGURE B-5**

ATTACHMENT C

ATTACHMENT C

EXPLORATIONS BY OTHERS

The site map with depth to bedrock data completed for the site by GRI (GRI, 2016) is presented in this attachment.

GRI
9750 SW Nimbus Avenue
Beaverton, OR 97008-7172
p| 503-641-3478 f| 503-644-8034

MEMORANDUM

To: Ken Leahy / Ken Leahy Construction, Inc.

Date: April 13, 2016

GRI Project No.: 5838

From: Michael Reed, PE, GE; Brian Bayne, PE; and Seth Reddy, PhD, EIT

Re: Preliminary Subsurface Investigation for Pre-purchase Due Diligence
90-Acre Site
12900 SW Tualatin-Sherwood Road
Sherwood, Oregon

DRAFT

At your request, GRI has conducted a preliminary subsurface investigation as part of a pre-purchase due diligence evaluation for a 90-acre site at 12900 SW Tualatin-Sherwood Road in Sherwood, Oregon. Our services included a review of existing geotechnical data for the area and limited subsurface explorations. This memorandum describes the work accomplished and provides a site plan with table showing approximate depths to basalt and groundwater encountered in the borings.

PROJECT DESCRIPTION

Ken Leahy Construction, Inc. (Leahy) is considering acquiring the 90-acre site for development into multiple buildable lots for commercial development. Preliminary site grades for the lots are unavailable.

SITE DESCRIPTION

Topography and Surface Conditions

The existing ground surface elevation varies significantly across the site from about elevation 192 ft (North American Vertical Datum of 1988 [NAVD88]) on the northern edge of the site to about elevation 280 ft near the southeast corner of the site. An existing farmhouse and several out-buildings are located near the north edge of the property. The northeast portion of the site is covered with grass in an area that was previously used for agricultural purposes. The remainder of the site is heavily wooded with mature trees and shrubs. Basalt outcroppings were observed most predominately near the northwest quarter and middle of site, but are present throughout the heavily wooded areas. Cobbles and boulders are present at the ground surface in the wooded areas.

Geology

This site is at the northern edge of an area known as the Tonquin Scablands, where Pleistocene-age catastrophic floods from the Columbia River scoured away the soil, leaving rock exposed at the ground surface or covered by only a thin layer of soil. Portions of the area may be mantled with a thin layer of Pleistocene-age lacustrine (floodplain) deposits of the Columbia River, consisting of interlayered sand, silt, and gravel. Below the thin zone of surficial soil, the site is underlain by Columbia River Basalt, a thick sequence of dark gray, basalt lava flows of mid-Miocene age. Based on our experience with other nearby projects and our observations while onsite, we anticipate basalt is present at relatively shallow depths.

SUBSURFACE CONDITIONS

General

Subsurface materials and conditions were investigated on a preliminary basis on March 28 and 29, 2016, with 48 borings, designated B-1 through B-48. The borings were advanced to depths of 15 to 30 ft at the approximate locations shown on the Site Plan, Figure 1. The borings were completed by McCallum Rock Drilling, Inc. of Albany, Oregon using a track-mounted FRD Furukawa HCR 900-ES II drilling rig. The rock drilling rig used open-hole air-rotary impact drilling methods typically used for production blasting in aggregate quarries and large rock cuts. The driller was contracted directly by Leahy, and the exploration locations and depths of the borings were selected by a representative of Leahy. The drill cuttings were diverted to a cyclone to allow collection of disturbed samples of soil and rock. GRI was on site on a full-time basis during drilling and recorded the GPS coordinates and depth to basalt at each boring location. Disturbed soil and rock cuttings were collected as bulk samples removed by hand from the cyclone on an intermittent basis, saved in airtight jars and bags, and returned to our lab for further examination. The depth to rock and estimates of rock weathering and hardness were approximated based on rate of advancement of the drill, color of the drill cuttings, and evaluation of the cuttings samples collected. Following drilling, each hole was left open to allow measurements of static groundwater.

Subsurface Conditions

Based on the disturbed soil cuttings collected during drilling and our observations while onsite, the site is typically mantled with silt or sand soils with varying percentages of clay. We anticipate fill soils may be encountered locally. Basalt was encountered at the ground surface in borings B-28, B-29, B-31, B-33, B-35, and B-39 and beneath the silt and sand soils at depths ranging from 0.5 to 15 ft in borings B-5 through B-8, B-12 through B-19, B-22, B-23, B-30, B-32, B-34, B-36 through B-38, and B-40 through B-48. Basalt was not encountered in borings B-1 through B-4, B-9 through B-11, B-20, B-21, and B-24 through B-27. The approximate depths and relatively hardness of the basalt is presented in a table on Figure 1. Terms used to describe the soil and rock are defined on Tables 1 and 2. For the purpose of discussion, the basalt has been grouped into two categories: very soft (R1) to medium hard (R3), moderately weathered to predominantly decomposed basalt, and soft (R2) to hard (R4), slightly weathered to fresh basalt.

Based on the rate of advancement of the drill rig, color of the drill cuttings, and subsequent evaluation of the cutting samples collected during drilling, the surface of the basalt is typically very soft (R1) to soft (R2), moderately weathered to predominately decomposed, and likely contains some medium hard (R3) zones. Drill cuttings in the moderately weathered to predominately decomposed basalt are typically red-brown to brown and contain few angular pieces of basalt. Borings B-5, B-6, B-18, B-19, B-22, and B-23 were terminated in the moderately weathered to predominantly decomposed basalt at depths ranging from 15 to 20 ft. Zones of moderately weathered to predominantly decomposed basalt were encountered below fresh to slightly weathered basalt at depths of 6 to 21 ft in borings B-14, B-28, B-46, and B-47.

Fresh to slightly weathered, soft (R2) to medium hard (R3) basalt was generally encountered beneath the more weathered basalt at depths ranging from 9 to 18 ft and likely contains zones of hard (R4) basalt. Drill cuttings in the basalt were typically light gray silt- and sand-sized pieces with frequent small fine gravel-sized rock fragments.

Following completion of the drilling, the holes were left open to allow measurements of depth to groundwater. Groundwater depths are provided on Figure 1 and vary considerably across the site. All groundwater measurements were taken in the afternoon of March 29 and indicate perched groundwater conditions.

EXCAVATION METHODS

Final site grading and depth of utilities for the proposed development are currently unknown. We anticipate conventional excavation equipment can be used to excavate the silty and sandy soils overlying the basalt. We anticipate some of the near-surface very soft to soft (R1 to R2) basalt can be excavated with a sufficiently large track-mounted excavator equipped with a rock excavation bucket and rock teeth, or by ripping with a CAT D8 bulldozer, or equivalent, equipped with a single-shank ripper. It should be noted that although the slightly weathered to predominately decomposed basalt is typically very soft (R1) to soft (R2), zones of medium hard (R3) basalt are likely present within this unit. Rock excavation methods, such as hydraulic splitters and chippers or pneumatic hammers, may be needed to excavate the rock in these areas of medium hard (R3) rock. We anticipate the fresh to slightly weathered, soft (R2) to medium hard (R3) basalt with zones of hard (R4) basalt will likely require blasting or other rock excavation methods to excavate.

Rock hardness designations provided in this memorandum are based on visual observation of drilling spoils and the rate of drilling. If significant excavation into the basalt is planned, coring of the basalt should be performed to obtain samples for completion of compressive strength testing and to evaluate fracture spacing.

OTHER CONSIDERATIONS

Properties to the south of this site have previously been quarried for aggregate production. We anticipate that some of the rock removed during site grading could be crushed for aggregate. In general, the quality of aggregate decreases as weathering of the source rock increases. The proportion of clay, silt, and sand produced during crushing for aggregate will typically increase as the weathering in the source rock increases. Reduced material strength and chemical changes in the rock mineralogy can result in decreased durability of aggregates produced from weathered rock. In general, a rock mass that is classified as moderately weathered using the relative rock weathering scale on Table 2 can be considered marginal to poor for aggregate production. Rock weathered to the range of predominantly decomposed or decomposed is unsuitable for aggregate production.

LIMITATIONS

This preliminary memorandum has been prepared to aid in the pre-purchase evaluation of the subject property described herein. The findings, conclusions, and recommendations presented in this memorandum are based on our interpretation of the information obtained through the assessment procedures described in this memorandum, based on 48 widely spaced borings advanced at the locations shown on Figure 1. It should be noted that there are significant limitations associated with using air-rotary percussion methods to characterize subsurface conditions. While slower than the air rotary drill, conventional geotechnical drilling methods, especially rock coring, would more accurately characterize rock hardness, fracture spacing, and rock weathering. Due to the method of drilling used for this preliminary evaluation, the estimated thickness, degree of weathering, and hardness of the rock at each exploration should be considered approximate.

In the performance of subsurface investigations, specific information is obtained at specific times, and variations in subsurface conditions may exist across the site. This preliminary report does not reflect any variations that may occur between exploration locations. The nature and extent of variation may not become evident until site development is underway. Consequently, any material volume estimates developed using the information provided in this memorandum should be considered approximations intended for planning purposes only.

The information presented herein is preliminary and provides our general conclusions regarding the depth to rock and excavation methods with respect to the observed site conditions. This information is intended for preliminary planning purposes. Additional geotechnical investigation should be completed as specific projects are developed for specific locations on the property.

Please contact the undersigned if you have any questions.

Submitted for GRI,

Michael W. Reed, PE, GE
Principal

Brian J. Bayne, PE
Senior Engineer

Seth C. Reddy, PhD, EIT
Staff Engineer

5838-PRELIM EVAL MEMO

Table 1: GUIDELINES FOR CLASSIFICATION OF SOIL

Description of Relative Density for Granular Soil

Relative Density	Standard Penetration Resistance (N-values) blows per foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	over 50

Description of Consistency for Fine-Grained (Cohesive) Soils

Consistency	Standard Penetration Resistance (N-values) blows per foot	Torvane or Undrained Shear Strength, tsf
Very Soft	0 - 2	less than 0.125
Soft	2 - 4	0.125 - 0.25
Medium Stiff	4 - 8	0.25 - 0.50
Stiff	8 - 15	0.50 - 1.0
Very Stiff	15 - 30	1.0 - 2.0
Hard	over 30	over 2.0

Grain-Size Classification

Boulders:
>12 in.

Cobbles:
3 - 12 in.

Gravel:
1/4 - 3/4 in. (fine)
3/4 - 3 in. (coarse)

Sand:
No. 200 - No. 40 sieve (fine)
No. 40 - No. 10 sieve (medium)
No. 10 - No. 4 sieve (coarse)

Silt/Clay:
pass No. 200 sieve

Modifier for Subclassification

Adjective	Primary Constituent SAND or GRAVEL	Primary Constituent SILT or CLAY
	Percentage of Other Material (by weight)	
trace:	5 - 15 (sand, gravel)	5 - 15 (sand, gravel)
some:	15 - 30 (sand, gravel)	15 - 30 (sand, gravel)
sandy, gravelly:	30 - 50 (sand, gravel)	30 - 50 (sand, gravel)
trace:	<5 (silt, clay)	*Relationship of clay and silt determined by plasticity index test*
some:	5 - 12 (silt, clay)	
silty, clayey:	12 - 50 (silt, clay)	

GRI

Table 2: GUIDELINES FOR CLASSIFICATION OF ROCK

RELATIVE ROCK WEATHERING SCALE

Term	Field Identification
Fresh	Crystals are bright. Discontinuities may show some minor surface staining. No discoloration in rock fabric.
Slightly Weathered	Rock mass is generally fresh. Discontinuities are stained and may contain clay. Some discoloration in rock fabric. Decomposition extends up to 1 in. into rock.
Moderately Weathered	Rock mass is decomposed 50% or less. Significant portions of rock show discoloration and weathering effects. Crystals are dull and show visible chemical alteration. Discontinuities are stained and may contain secondary mineral deposits.
Predominantly Decomposed	Rock mass is more than 50% decomposed. Rock can be excavated with geologist's pick. All discontinuities exhibit secondary mineralization. Complete discoloration of rock fabric. Surface of core is friable and usually pitted due to washing out of highly altered minerals by drilling water.
Decomposed	Rock mass is completely decomposed. Original rock "fabric" may be evident. May be reduced to soil with hand pressure.

RELATIVE ROCK HARDNESS SCALE

Term	Hardness Designation	Field Identification	Approximate Unconfined Compressive Strength
Extremely Soft	R0	Can be indented with difficulty by thumbnail. May be moldable or friable with finger pressure.	< 100 psi
Very Soft	R1	Crumbles under firm blows with point of a geology pick. Can be peeled by a pocket knife and scratched with fingernail.	100 - 1,000 psi
Soft	R2	Can be peeled by a pocket knife with difficulty. Cannot be scratched with fingernail. Shallow indentation made by firm blow of geology pick.	1,000 - 4,000 psi
Medium Hard	R3	Can be scratched by knife or pick. Specimen can be fractured with a single firm blow of hammer/geology pick.	4,000 - 8,000 psi
Hard	R4	Can be scratched with knife or pick only with difficulty. Several hard hammer blows required to fracture specimen.	8,000 - 16,000 psi
Very Hard	R5	Cannot be scratched by knife or sharp pick. Specimen requires many blows of hammer to fracture or chip. Hammer rebounds after impact.	> 16,000 psi

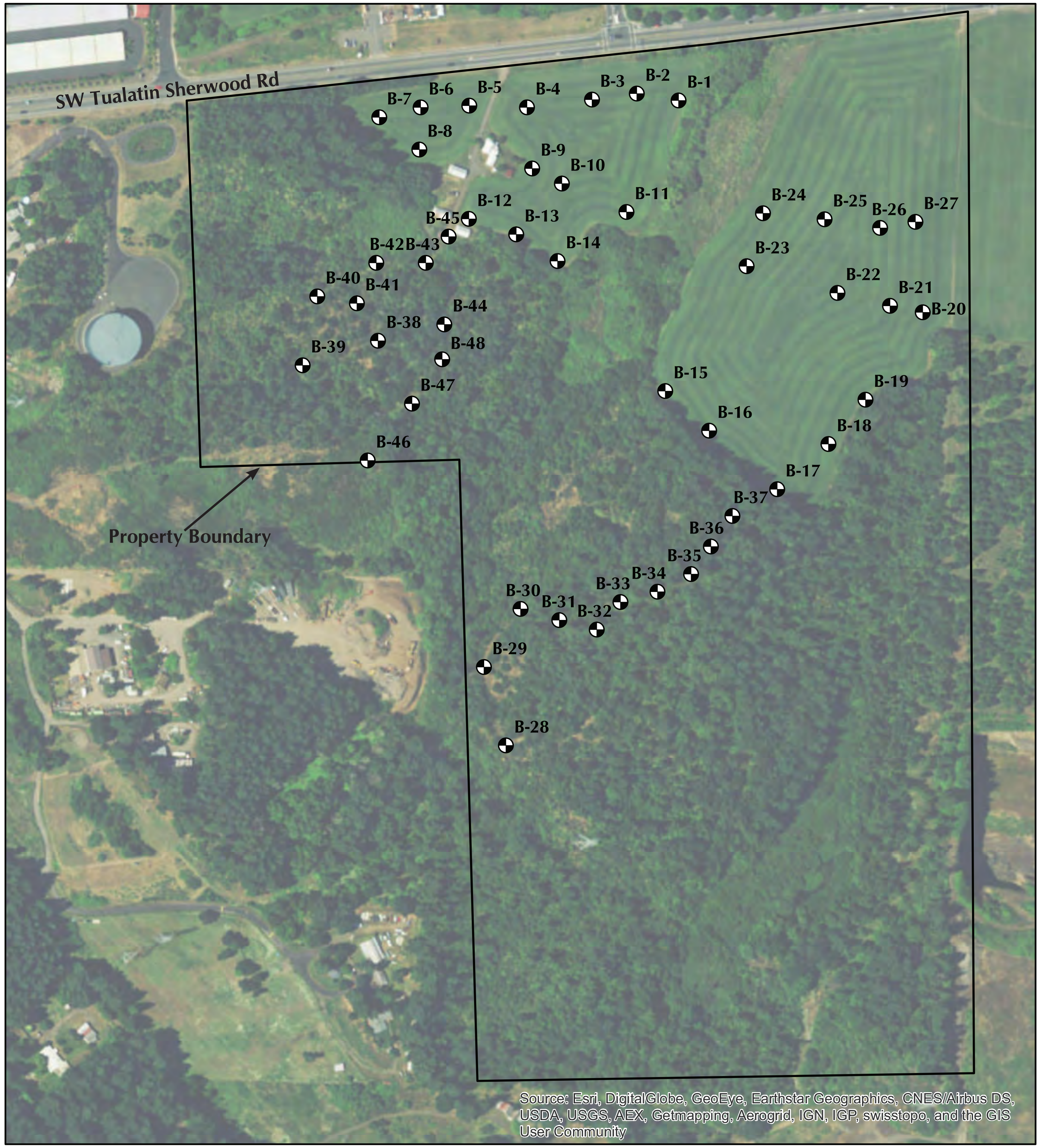
RQD AND ROCK QUALITY

Relation of RQD and Rock Quality

RQD (Rock Quality Designation), %	Description of Rock Quality
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 - 100	Excellent

Terminology for Planar Surface

Bedding	Joints and Fractures	Spacing
Laminated	Very Close	< 2 in.
Thin	Close	2 in. – 12 in.
Medium	Moderately Close	12 in. – 36 in.
Thick	Wide	36 in. – 10 ft
Massive	Very Wide	> 10 ft



BORING COMPLETED BY GRI
(MARCH 28 - 29, 2016)

North

0 300 600 FT

Boring	Latitude[5]	Longitude[5]	Ground Surface Elev. (ft)[6]	Total Depth (ft)	Depth to Very Soft (R1) to Medium Hard (R3), Moderately Weathered to Predominantly Decomposed Basalt (ft)	Depth to Soft (R2) to hard (R4), Slightly Weathered to Fresh Basalt (ft)	Depth to Groundwater (ft)
B-1	45.36863	-122.80848	195.1	15	>15	>15	3
B-2	45.36867	-122.80890	194.3	15	>15	>15	N/A
B-3	45.36862	-122.80935	195.3	15	>15	>15	N/A
B-4	45.36855	-122.81000	197.1	15	>15	>15	2.5
B-5	45.36855	-122.81058	200.1	15	9	>15	7
B-6	45.36853	-122.81107	203.4	15	8	>15	>15
B-7	45.36845	-122.81148	205.7	15	5	12	>15
B-8	45.36823	-122.81107	209.3	15	N/A	13	9.7
B-9	45.36812	-122.80993	202.6	15	>15	>15	N/A
B-10	45.36802	-122.80963	201.0	15	>15	>15	N/A
B-11	45.36783	-122.80897	199.6	15	>15	>15	N/A
B-12	45.36775	-122.81055	215.6	20	7	12	10.8
B-13	45.36765	-122.81007	214.2	20	6	11	18.2
B-14	45.36747	-122.80965	215.6	20	18	5[2]	14.8
B-15	45.36657	-122.80853	227.0	20	5	9	19.1
B-16	45.36630	-122.80808	232.8	20	5[4]	9	10.9
B-17	45.36590	-122.80738	241.1	20	N/A	6	15.9
B-18	45.36623	-122.80688	234.1	20	4	>20	16
B-19	45.36655	-122.80652	228.5	20	7	>20	8.3
B-20	45.36718	-122.80597	213.8	20	>20[3]	>20	N/A
B-21	45.36722	-122.80630	215.1	20	>20	>20	6.8
B-22	45.36730	-122.80683	214.6	20	12	>20	7.7
B-23	45.36747	-122.80775	204.4	20	12	>20	N/A
B-24	45.36785	-122.80760	200.1	15	>15	>15	2.2
B-25	45.36782	-122.80698	203.5	15	>15	>15	N/A
B-26	45.36777	-122.80642	205.1	15	>15	>15	0.4
B-27	45.36782	-122.80607	204.3	15	>15	>15	1.1
B-28	45.36403	-122.81003	256.8	23	21	0[2]	18.6
B-29	45.36458	-122.81027	249.2	23	N/A	0	>23
B-30	45.36500	-122.80992	246.6	23	2	7	7.9
B-31	45.36493	-122.80953	257.7	30	N/A	0	6.2
B-32	45.36487	-122.80915	264.7	30	2	18	9.5
B-33	45.36507	-122.80892	266.1	30	0	10	15.5
B-34	45.36515	-122.80855	267.1	30	N/A	1.5	26.3
B-35	45.36528	-122.80822	265.6	30	N/A	0	11
B-36	45.36548	-122.80803	260.1	23	N/A	3	4.9
B-37	45.36570	-122.80782	254.3	23	N/A	0.5	10.2
B-38	45.36687	-122.81143	244.5	30	N/A	2	1.9
B-39	45.36668	-122.81218	243.5	30	N/A	0	15.9
B-40	45.36717	-122.81205	248.1	30	N/A	3	1.9
B-41	45.36713	-122.81165	244.7	30	N/A	2	27.7
B-42	45.36742	-122.81147	235.6	30	N/A	1	14.7
B-43	45.36743	-122.81097	231.8	30	4	10	28.6
B-44	45.36700	-122.81077	243.5	30	N/A	3	22.4
B-45	45.36762	-122.81075	222.8	30	6	11	29.5
B-46	45.36602	-122.81150	228.7	30	6[1]	2[2]	18
B-47	45.36643	-122.81107	233.3	30	20[1]	2[2]	22
B-48	45.36675	-122.81078	242.6	30	N/A	1	>30

Notes:

1. Clay seams were observed in B-46 and B-47 at a depth of about 20 ft.
2. Zones of moderately weathered to predominantly decomposed basalt beneath fresh to slightly weathered basalt in B-14, B-28, B-46, and B-47.
3. Boulder encountered between 8 and 14 ft in boring B-20.
4. Very soft (R1) to Medium hard (R3) basalt encountered below 18 ft in boring B-16.
5. Geographic Coordinate System: North American Datum of 1983 (NAD 83). Accuracy within 15 ft horizontal for hand held unit.
6. Elevation Datum: North American Vertical Datum of 1988 (NAD 88). Accuracy within 1 ft vertical for GIS lidar.

GRI

KEN LEAHY CONSTRUCTION
90-ACRE SITE

SITE MAP

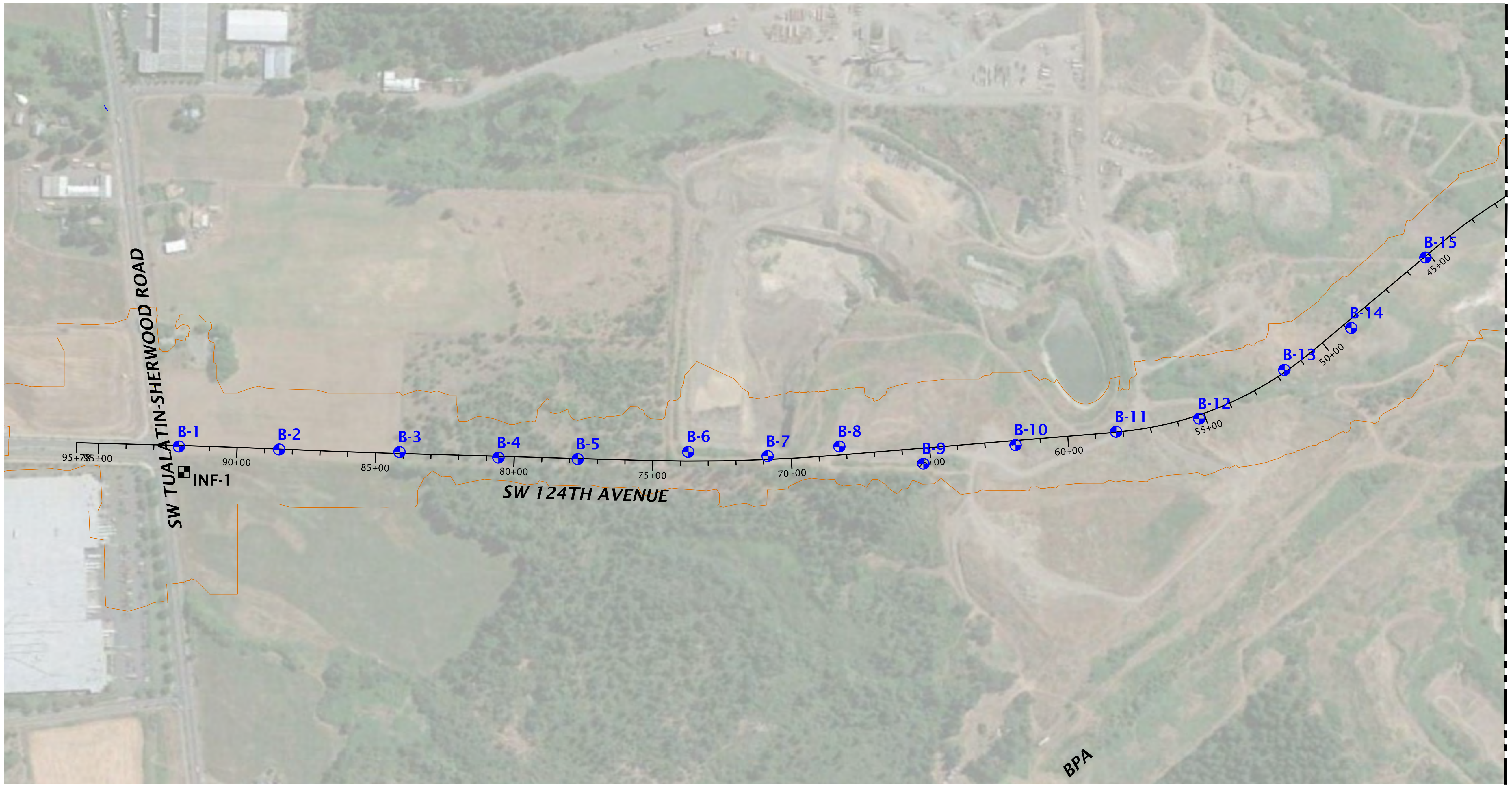
APR. 2016 | JOB NO. 5838 | FIG. 1

ATTACHMENT D

ATTACHMENT D

NEARBY EXPLORATIONS

The site plan and exploration logs completed by GeoDesign in the site vicinity for the SW 124th Avenue Extension Project (GeoDesign, 2014) are presented in this attachment.



LEGEND:

ALIGNMENT
(500' MAJOR STATIONING; 100' MINOR STATIONING)

EXISTING TOPOGRAPHY EXTENTS

200'
EXISTING TOPOGRAPHY
(2' INTERVALS; 10' INDEX CONTOURS)

B-1 BORING

INF-1 INFILTRATION TEST

N

0 400 800
(SCALE IN FEET)

SITE PLAN BASED ON DRAWING PROVIDED BY
DAVID EVANS AND ASSOCIATES, INC.
OCTOBER 2013

GEODESIGN INC
15575 SW Sequoia Parkway - Suite 100
Portland OR 97224
Off 503.968.8787 Fax 503.968.3068

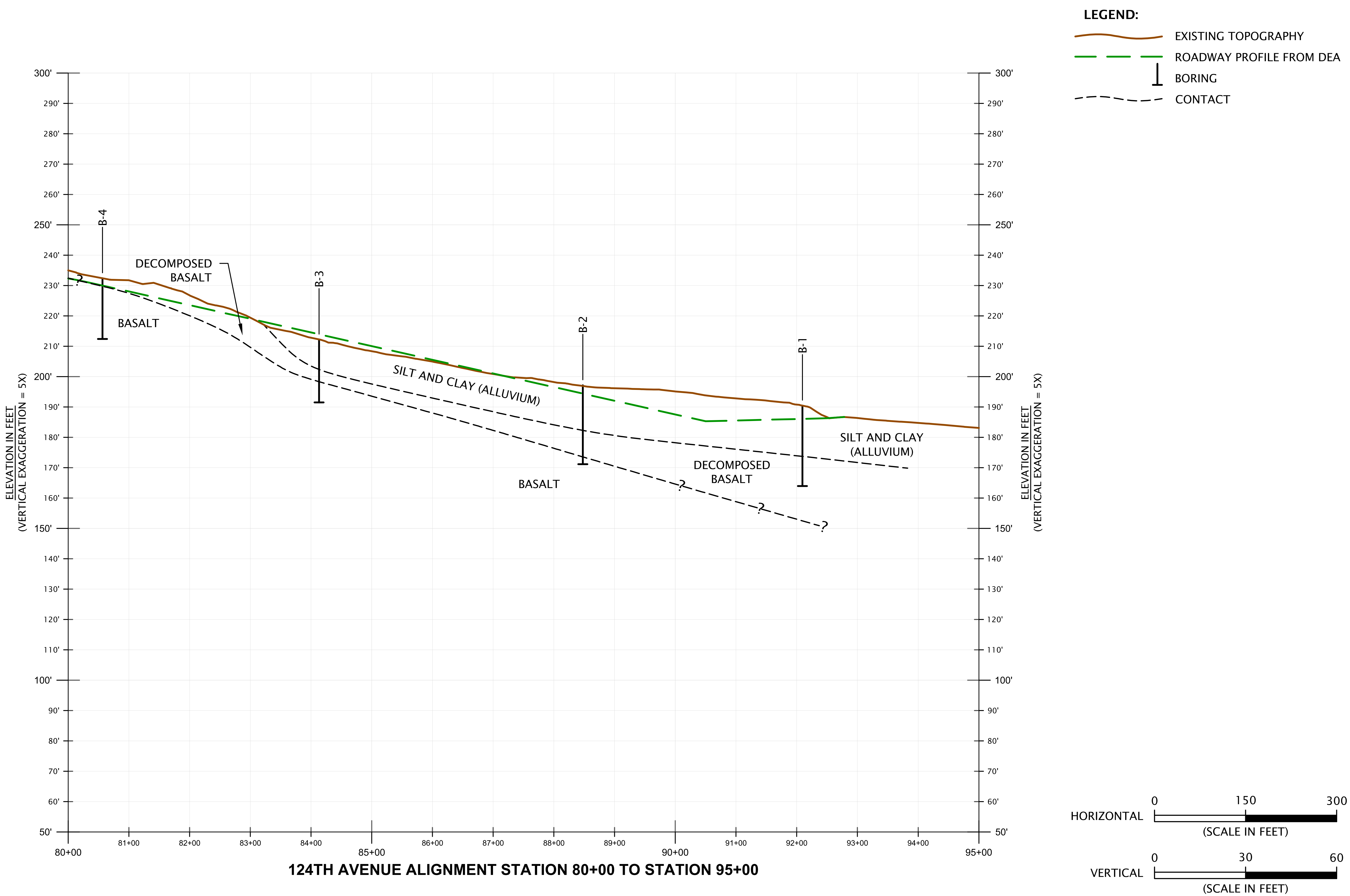
DEA-118-02-5.12

NOVEMBER 2014

SITE PLAN

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE 2



GEODESIGN INC
15575 SW Sequoia Parkway - Suite 100
Portland OR 97224
Off 503.968.8787 Fax 503.968.3068

DEA-118-02-5.12

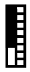
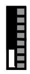
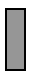
NOVEMBER 2014

PROFILE 5

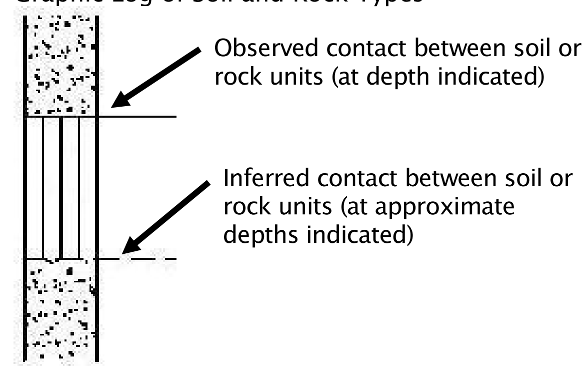
SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE 9

Printed By: mmiller | Print Date: 11/3/2014 9:24:51 AM
File Name: J:\A-D\DEA\DEA-118\DEA-118-02\DEA-118-02-5.12-Geotech_Assessment\Figures\CAD\DEA-118-02-5.12-CS02.dwg | Layout: FIGURE 9

SYMBOL	SAMPLING DESCRIPTION
	Location of sample obtained in general accordance with ASTM D 1586 Standard Penetration Test with recovery
	Location of sample obtained using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D 1587 with recovery
	Location of sample obtained using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample obtained using Dames & Moore and 140-pound hammer or pushed with recovery
	Location of sample obtained using 3-inch-O.D. California split-spoon sampler and 140-pound hammer
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	PP	Pocket Penetrometer
CBR	California Bearing Ratio	P200	Percent Passing U.S. Standard No. 200 Sieve
CON	Consolidation		
DD	Dry Density	RES	Resilient Modulus
DS	Direct Shear	SIEV	Sieve Gradation
HYD	Hydrometer Gradation	TOR	Torvane
MC	Moisture Content	UC	Unconfined Compressive Strength
MD	Moisture-Density Relationship	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal
P	Pushed Sample		

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

RELATIVE DENSITY - COARSE-GRAINED SOILS

Relative Density	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)
Very Loose	0 – 4	0 - 11	0 - 4
Loose	4 – 10	11 - 26	4 - 10
Medium Dense	10 – 30	26 - 74	10 - 30
Dense	30 – 50	74 - 120	30 - 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOILS

Consistency	Standard Penetration Resistance	Dames & Moore Sampler (140-pound hammer)	Dames & Moore Sampler (300-pound hammer)	Unconfined Compressive Strength (tsf)
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 - 4	3 – 6	2 - 5	0.25 - 0.50
Medium Stiff	4 - 8	6 – 12	5 - 9	0.50 - 1.0
Stiff	8 - 15	12 – 25	9 - 19	1.0 - 2.0
Very Stiff	15 - 30	25 – 65	19 – 31	2.0 - 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOILS (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVELS (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVELS WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SANDS (<5% fines)	SW or SP	SAND
		SANDS WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SANDS WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOILS (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOILS			PT	PEAT

MOISTURE CLASSIFICATION

Term	Field Test
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

ADDITIONAL CONSTITUENTS

Secondary granular components or other materials such as organics, man-made debris, etc.

Percent	Silt and Clay In: Fine-Grained Soils	Silt and Clay In: Coarse-Grained Soils	Percent	Sand and Gravel In: Fine-Grained Soils	Sand and Gravel In: Coarse-Grained Soils
< 5	trace	trace	< 5	trace	trace
5 – 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	Indicate %

GEODESIGN INC
15575 SW Sequoia Parkway - Suite 100
Portland OR 97224
Off 503.968.8787 Fax 503.968.3068

SOIL CLASSIFICATION SYSTEM

TABLE A-2

HARDNESS	DESCRIPTION
Extremely Soft (R0)	Indented by thumbnail
Very Soft (R1)	Can be peeled by pocket knife or scratched with finger nail
Soft (R2)	Can be peeled by a pocket knife with difficulty
Medium Hard (R3)	Can be scratched by knife or pick
Hard (R4)	Can be scratched with knife or pick only with difficulty
Very Hard (R5)	Cannot be scratched with knife or sharp pick

WEATHERING	DESCRIPTION
Decomposed	Rock mass is completely decomposed
Predominantly Decomposed	Rock mass is more than 50% decomposed
Moderately Weathered	Rock mass is decomposed locally
Slightly Weathered	Rock mass is generally fresh
Fresh	No discoloration in rock fabric

JOINT SPACING	DESCRIPTION
Very Close	Less than 2 inches
Close	2 inches to 1 foot
Moderate Close	1 foot to 3 feet
Wide	3 feet to 10 feet
Very Wide	Greater than 10 feet

FRACTURING	FRACTURE SPACING
Very Intensely Fractured	Chips and fragments with a few scattered short core lengths
Intensely Fractured	0.1 foot to 0.3 foot with scattered fragments intervals
Moderately Fractured	0.3 foot to 1 foot with most lengths 0.6 foot
Slightly Fractured	1 foot to 3 feet
Very Slightly Fractured	Greater than 3 feet
Unfractured	No fractures

HEALING	DESCRIPTION
Not Healed	Discontinuity surface, fractured zone, sheared material or filling not re-cemented
Partly Healed	Less than 50% of fractured or sheared material
Moderately Healed	Greater than 50% of fractured or sheared material
Totally Healed	All fragments bonded

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 – 50 – 100)	INSTALLATION AND COMMENTS
0.0		Medium stiff, brown SILT (ML), minor sand; moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
2.5							
							Infiltration test: ~0 inches per hour at 4.0 feet
5.0						6	▽ 6.3 feet, during drilling
7.5		Very loose, brown, silty SAND (SM); wet, fine.	7.0				Encountered groundwater at 7.5 feet, rose to 6.3 in borehole. Driller Comment: soft at 7.0 feet.
10.0						3	
12.5		Exploration completed at a depth of 11.5 feet.	11.5				Surface elevation was not measured at the time of exploration.
15.0							
17.5							
20.0							

DRILLED BY: Dan J. Fischer Excavating, Inc. LOGGED BY: CMC COMPLETED: 12/30/13

BORING METHOD: solid-stem auger (see report text) BORING BIT DIAMETER: 6-inch

GEODESIGN INC
15575 SW Sequoia Parkway - Suite 100
Portland OR 97224
Off 503.968.8787 Fax 503.968.3068

DEA-118-02-5.12

NOVEMBER 2014

BORING INF-1

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-69

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 – 50 – 100)	INSTALLATION AND COMMENTS
0.0		Medium stiff, brown with gray mottled CLAY (CL), trace sand; moist, sand is fine (12-inch-thick tilled zone; alluvium).	190.4				
2.5						7	
5.0		becomes brown, minor sand at 5.0 feet		ATT		6	LL = 38% PL = 24%
7.5						4	Slight increase in sand percentage at 7.5 feet.
10.0					P		~11.0 feet (perched)
12.5		grades to sandy; wet at 12.0 feet				6	
15.0		very stiff, brown with orange mottles, some sand; moist, sand is fine to medium at 15.0 feet				17	Easy drilling from 15.0 to 25.0 feet.
		Stiff, brown with blue-gray, sandy CLAY (CL), some silt; moist to wet, sand is fine to medium (decomposed basalt).	174.4 16.0				Possible decomposed bedrock at approximately 16.0 feet.
17.5							
20.0							

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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NOVEMBER 2014

BORING B-1

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 – 50 – 100)	INSTALLATION AND COMMENTS
20.0	(continued from previous page)				10	Sample highly variable in clay and sand percentage at 20.0 feet.
22.5						
	Medium dense, brown with blue-gray and black mottled, clayey SAND (SC), some silt, trace gravel; moist, fine to coarse, relict rock structure.	167.4 / 23.0				
25.0					24	Sample highly variable in sand, silt, and clay percentage at 25.0 feet.
	Exploration completed at a depth of 26.5 feet.	163.9 / 26.5				
27.5						
30.0						
32.5						
35.0						
37.5						
40.0						

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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NOVEMBER 2014

BORING B-1
(continued)

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-1

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	BLOW COUNT	INSTALLATION AND COMMENTS
0.0	Medium stiff, brown with gray mottled SILT (ML), trace sand; moist, sand is fine (12-inch-thick tilled zone; alluvium).	197.1			
2.5				5	
5.0			ATT	7	LL = 37% PL = 25%
7.0	Very loose, brown, silty SAND (SM), some clay; wet, fine to medium. fine at 7.5 feet	190.1 / 7.0			Driller comment: Sandy at 7.0 feet.
7.5				6	
10.0				0	
12.5			DD	P	DD = 94 pcf
14.5	Medium dense, brown, silty GRAVEL with sand (GM); wet (decomposed basalt).	182.6 / 14.5			
15.0				20	Gravel in cuttings from 15.0 to 20.0 feet.
18.0	Medium dense, gray with orange mottled, clayey SAND (SC), trace gravel; moist, relict rock structure.	179.1 / 18.0			
20.0					

Legend: ▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (scale 0 – 50 – 100)

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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NOVEMBER 2014

BORING B-2

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-2

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
20.0		(continued from previous page)		SIEV		▲ 29	
22.5							
		Very dense, gray, silty GRAVEL with sand (GM); moist, sand is fine to medium, relict rock structure (weathered basalt).	174.1 / 23.0				
25.0						26-50/5" ▲	
		Exploration completed at a depth of 25.9 feet.	171.2 / 25.9				
27.5							
30.0							
32.5							
35.0							
37.5							
40.0							

DRILLED BY: Western States Soil Conservation, Inc.   LOGGED BY: CR   COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text)   BORING BIT DIAMETER: 4 7/8-inch

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DEA-118-02-5.12

NOVEMBER 2014

BORING B-2
(continued)

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-2

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	BLOW COUNT	INSTALLATION AND COMMENTS
0.0	Medium stiff, brown CLAY (CL), trace sand; moist, sand is fine (topsoil to 6 inches, 2-inch-thick root zone; alluvium).	212.2			
2.5				7	
5.0	minor sand at 5.5 feet		ATT	7	LL = 40% PL = 25%
10.0	Dense, gray with orange mottled, clayey SAND with gravel (SC); moist, fine to coarse, relict rock structure (decomposed basalt).	202.2 / 10.0	SIEV	35	Driller comment: Harder at 10.0 feet.
14.0	Very dense, gray with orange mottled, silty GRAVEL with sand (GM); moist (weathered basalt).	198.2 / 14.0		22-50/5"	
16.5	Very dense, dark gray GRAVEL (GP), trace sand; moist.	195.7 / 16.5			Increase in drill resistance at 16.5 feet.
20.0					

▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 – 50 – 100)

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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BORING B-3

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-3

BORING LOG DEA-118-02-5.12-B1_32_36-38_56-TWWD1_13-INF1_2.GPJ GEODESIGN.GDT PRINT DATE: 11/3/14:KT

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
20.0		(continued from previous page)	192.0 / 20.2			50/2" ▲	
		Exploration completed at a depth of 20.2 feet.					
22.5							
25.0							
27.5							
30.0							
32.5							
35.0							
37.5							
40.0						0 50 100	

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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DEA-118-02-5.12

NOVEMBER 2014

BORING B-3
(continued)

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-3

BORING B-4

DEPTH FEET	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	BLOW COUNT / MOISTURE CONTENT % / RQD% / CORE REC% (0–50–100)	INSTALLATION AND COMMENTS
0.0	Dense, gray with brown mottled, clayey SAND with gravel (SC); moist, fine to medium, relict rock structure (decomposed basalt).	232.4			Boulders outcropping on surface. Easy drilling from 0.0 to 10.0 feet.
2.5				48	
5.0	Very dense, gray with brown mottled, clayey SAND (SC), trace gravel; moist, fine to medium, relict rock structure (weathered basalt).	227.4 / 5.0	SIEV	34-50/5"	
7.5				50/5"	Rock is too soft to core at 7.0 feet.
10.0				50/2"	
11.0	Soft to medium hard (R2-R3), gray BASALT; moderately weathered, intensely fractured joints and fractures 30-40º, fractures not healed.	221.4 / 11.0			Switching to rock coring at 11.0 feet.
16.0	Medium hard (R3), gray, BASALT; moderately weathered, intensely to very intensely fractured, thin infilling (core is all small random chips and fragments).	216.4 / 16.0			
20.0					

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

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SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-4

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	▲ BLOW COUNT ● MOISTURE CONTENT % RQD% CORE REC% (0 50 100)	INSTALLATION AND COMMENTS
20.0		Exploration completed at depth of 20.0 feet.	212.4 / 20.0				
22.5							
25.0							
27.5							
30.0							
32.5							
35.0							
37.5							
40.0							

DRILLED BY: Western States Soil Conservation, Inc. LOGGED BY: CR COMPLETED: 06/19/13

BORING METHOD: mud rotary (see report text) BORING BIT DIAMETER: 4 7/8-inch

GEODESIGN INC

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DEA-118-02-5.12

NOVEMBER 2014

BORING B-4
(continued)

SW 124TH AVENUE EXTENSION PROJECT
WASHINGTON COUNTY, OR

FIGURE A-4

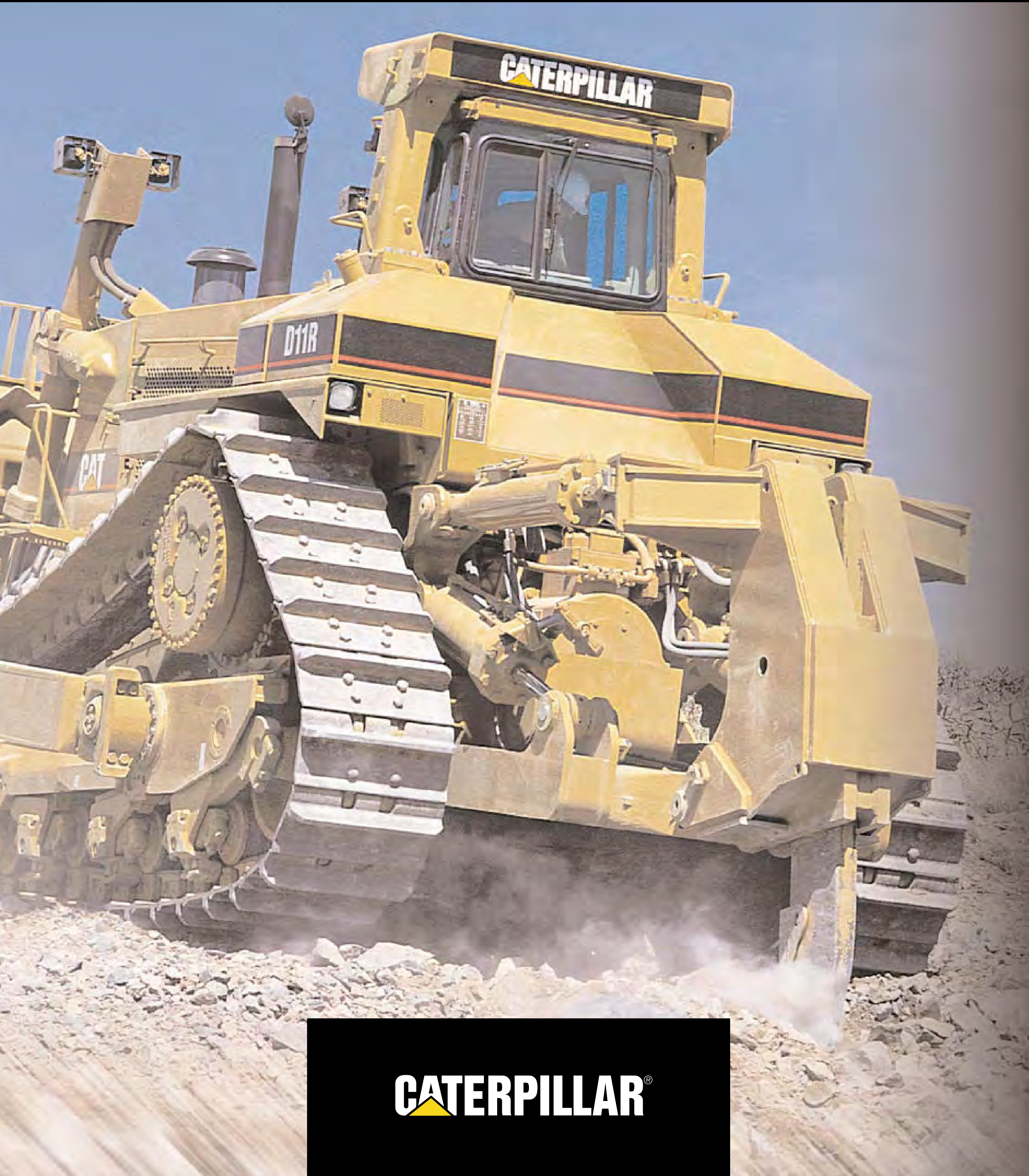
ATTACHMENT E

ATTACHMENT E

EXCERPTS FROM HANDBOOK OF RIPPING.

Twelfth Edition

HANDBOOK OF RIPPING



CATERPILLAR®

Rippability Investigation & Prediction Service

Although visible laminations, faults, and fractures may indicate rippability and are usually helpful, conditions which are not visible are also important. That's because surface features give only a clue as to what lies underneath. To determine rippability when a field trial is not feasible, a method of estimating underlying characteristics is required.

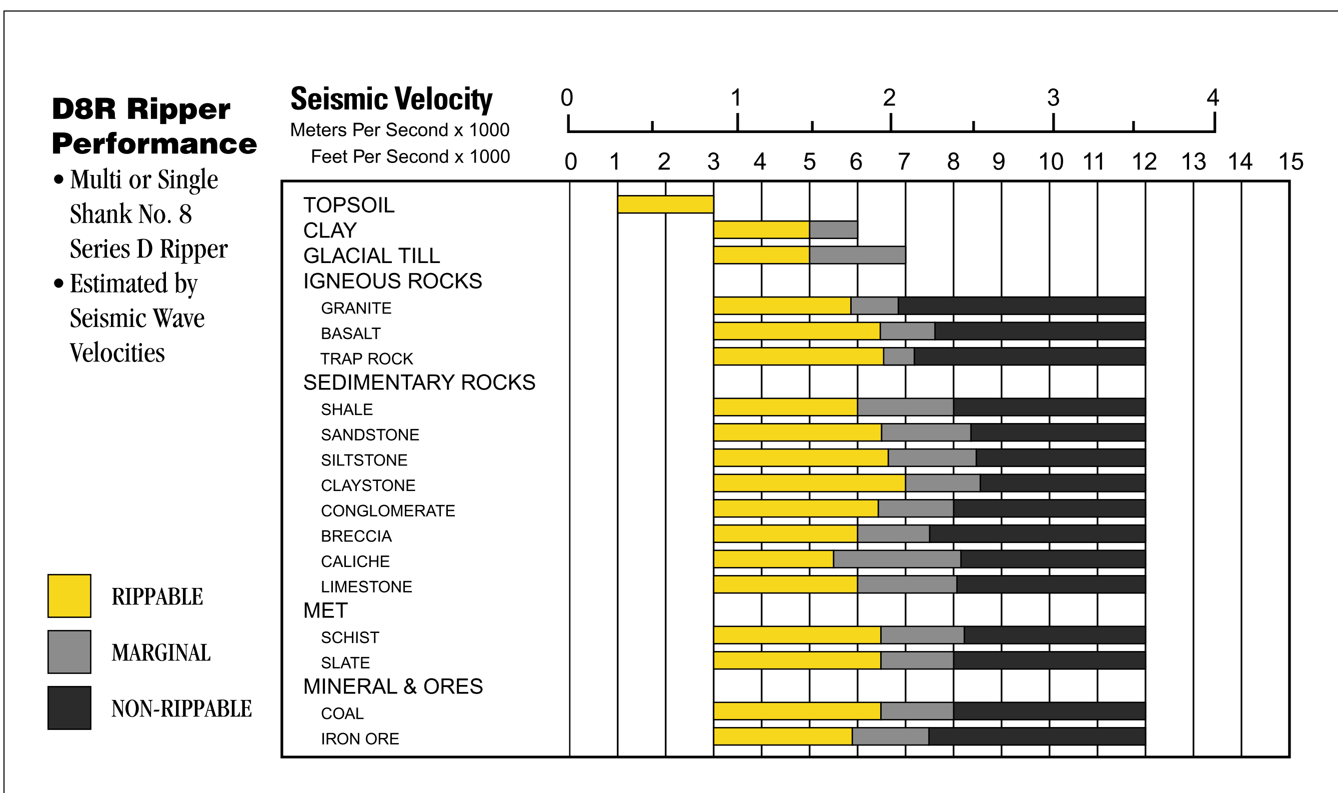
Caterpillar has developed a systematic analysis procedure to predict the rippability of a rock formation which combines new technology with geological and ripping experience. Our process for gathering the information necessary to make a prediction is called the Rippability Investigation and Prediction (RIP) service and is available through Caterpillar research. (Contact your district office.) The service consists of three steps:

1. Rock analysis
2. Site inspection
3. Seismic analysis

Rock Mechanics Analysis

A rock mechanics analysis is the first phase of the RIP service and requires that a fresh rock sample be submitted to our lab for analysis along with other pertinent information about the site. (Minimum sample size should be 10" x 10" x 10".)

Rippers



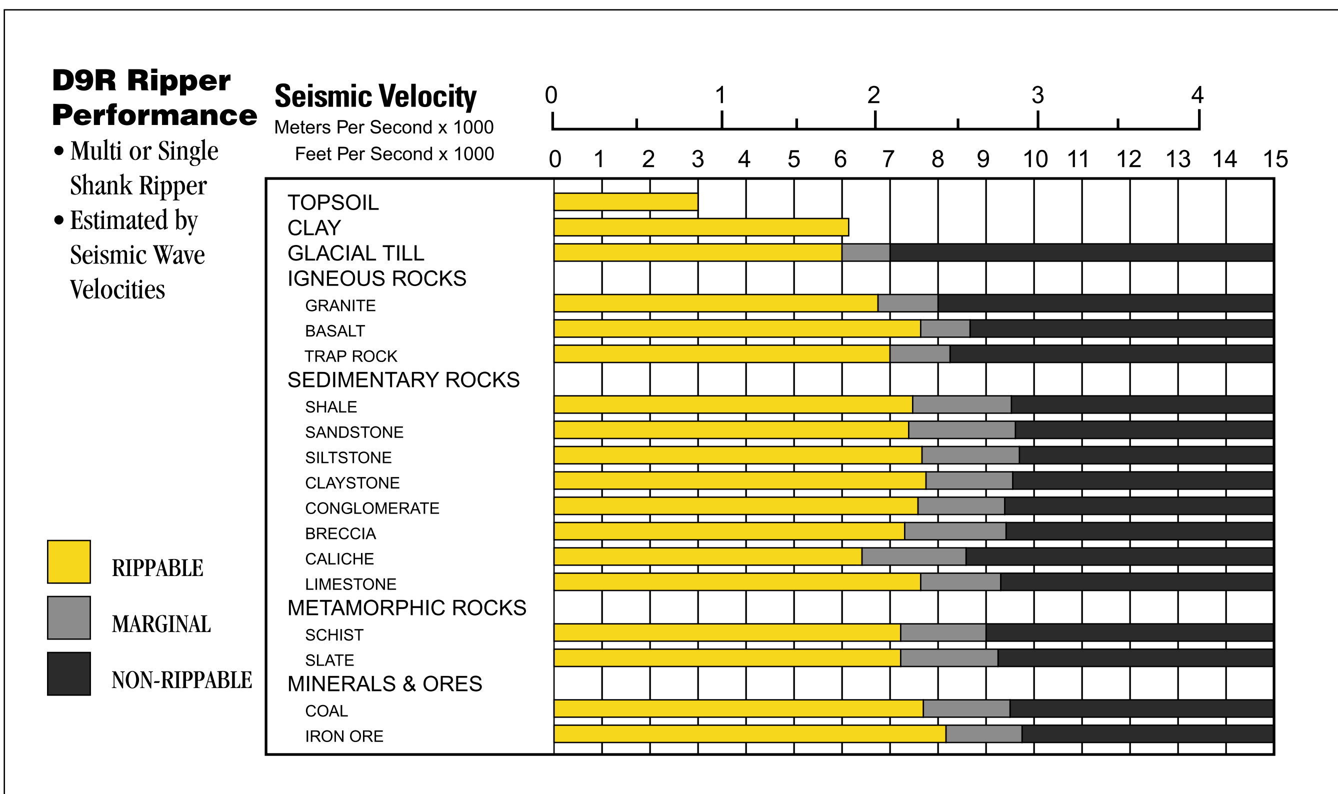
Geological Site Inspection

The second phase of the RIP service consists of a site visit by Caterpillar personnel which includes a geological inspection. During the site inspection, the rock formation in question is examined for in-place rock mass characteristics that may affect a ripping tractor's performance. These may include rock type, degree of weathering, bedding features, joint characteristics, and many other pertinent geological features.

Seismic Evaluation

The third phase of the RIP service includes a seismic evaluation. Caterpillar introduced the use of the refraction seismograph in 1958 as an aid to determine rippability of materials. The instrument functions by measuring seismic velocity, an indicator of the degree of consolidation of rock formations. Caterpillar continues to offer this service, along with many independent firms.

Rippers



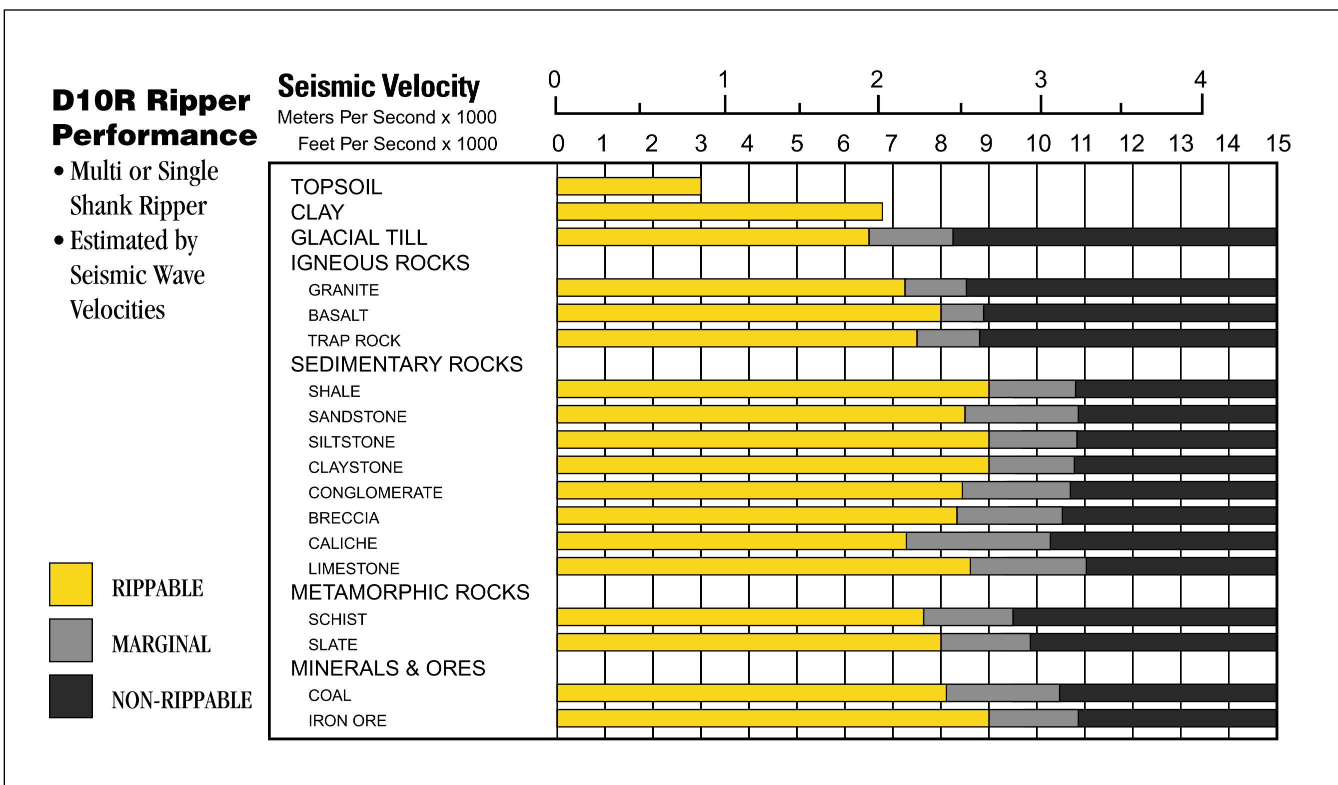
Rippability Investigation & Prediction Service

Caterpillar Systematic Analysis

Not all material conditions are visible from the surface. To determine the rippability of below-the-surface material and formations, Caterpillar Inc. developed a systematic analysis procedure based on technology and field experience. The service consists of three steps:

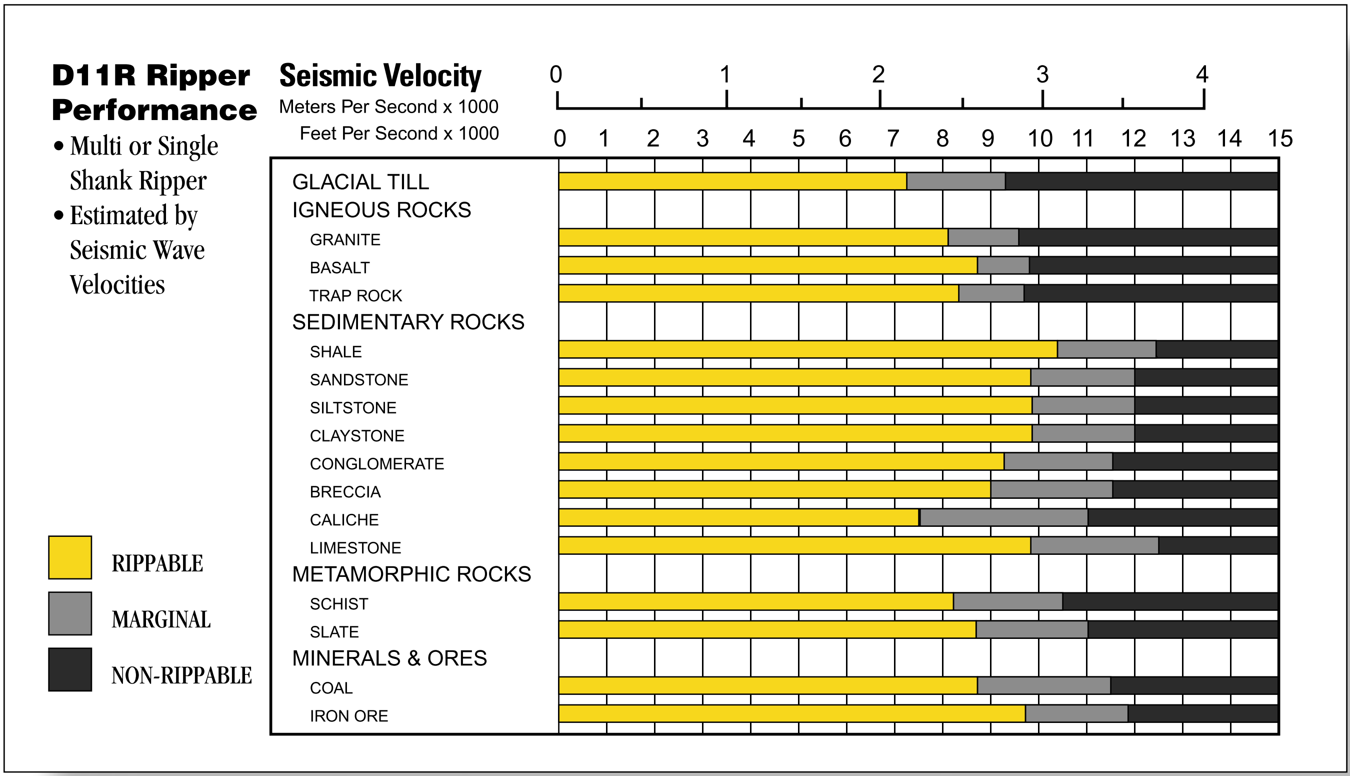
1. Rock analysis
2. Site inspection
3. Seismic evaluation

Rippers



CATERPILLAR
D10R

Rippers



D11R Ripper Performance
• Multi or Single Shank Ripper
• Estimated by Seismic Wave Velocities
Seismic Velocity
Meters Per Second x 1000
Feet Per Second x 1000
0 1 2 3 4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
GLACIAL TILL
IGNEOUS ROCKS
GRANITE
BASALT
TRAP ROCK
SEDIMENTARY ROCKS
SHALE
SANDSTONE
SILTSTONE
CLAYSTONE
CONGLOMERATE
BRECCIA
CALICHE
LIMESTONE
METAMORPHIC ROCKS
SCHIST
SLATE
MINERALS & ORES
COAL
IRON ORE
RIPPABLE
MARGINAL
NON-RIPPABLE

GeoDesign INC
AN NV5 COMPANY

Memorandum

To:	Kirk Olsen	From:	Gregory J. Schaertl, P.E. George Saunders, P.E., G.E.
Company:	Trammell Crow Company	Date:	December 23, 2019
Address:	1300 SW 5th Avenue, Suite 3050 Portland, OR 97201		

cc:	Tom Nieswander, Trammell Crow Company (via email only) Jeff Shoemaker, DOWL (via email only)

GDI Project:	TrammellCr-74-01
RE:	Geotechnical Data Memorandum Orr Property SW 124th Avenue and SW Tualatin-Sherwood Road Washington County, Oregon

INTRODUCTION

This memorandum provides a summary of observations made during supplemental explorations at the Orr Property located in Washington County, Oregon. We prepared a preliminary geotechnical report for the site dated February 6, 2019.[1] The boundaries of the site, topography, and location of site explorations are shown on Figure 1.

DISCUSSION

We observed subsurface explorations performed by Kerr Contractors on December 11, 2019, which consisted of 20 test pit excavations (TP-1 through TP-20) to depths between 2 and 19 feet BGS. Nine of the locations were chosen by Kerr Contractors and the remaining locations were chosen by a combination of DOWL and GeoDesign. The exploration locations are shown relative to site boundaries and topography on Figure 1. Associated exploration logs are presented in the Attachment.

Subsurface conditions were generally consistent with observations made previously at the site during geotechnical subsurface explorations performed by GeoDesign and GRI. These explorations are summarized in our preliminary geotechnical report. Further results from the recent work is in general agreement with the prior work in areas where the recent explorations are in close proximity to prior explorations or seismic refraction profiles.

[1] GeoDesign, Inc., 2019. *Preliminary Geotechnical Engineering Services; Orr Property; SW 124th Avenue and SW Tualatin-Sherwood Road; Washington County, Oregon*, dated February 6, 2019. GeoDesign Project: TrammellCr-74-01

LIMITATIONS

We have prepared this memorandum report for use by Trammell Crow Company and members of their design and construction team. The data and report can be used for bidding or estimating purposes, but our conclusions and interpretations should not be construed as warranty of the subsurface conditions and are not applicable to other nearby sites.

Within the limitations of scope, schedule, and budget, our services have been executed in accordance with generally accepted practices in this area at the time this memorandum was prepared. No warranty, express or implied, should be understood.

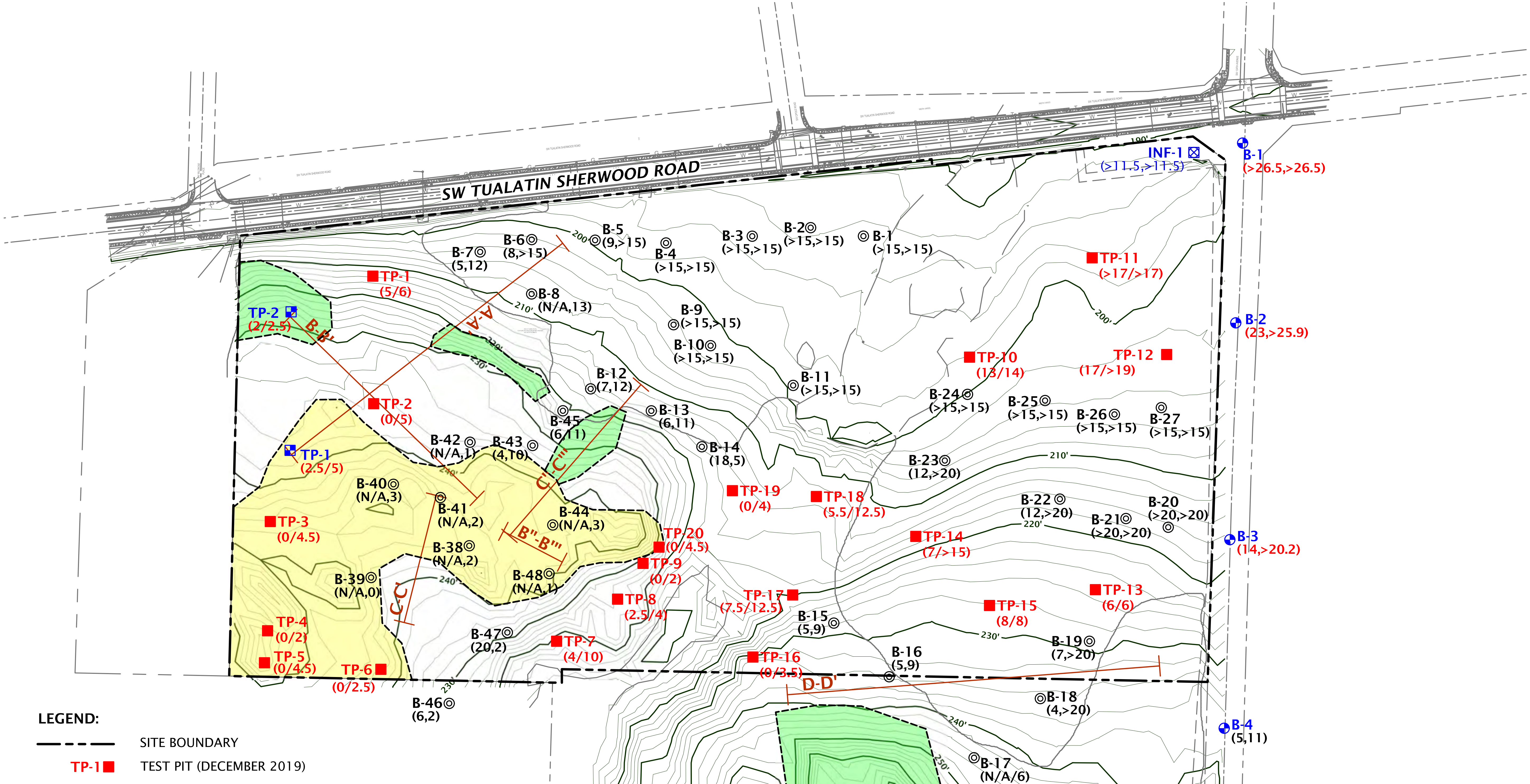
GJS:GPS:kt

Attachment

One copy submitted (via email only)

Document ID: TrammellCr-74-01-122319-geom.docx

FIGURES



LEGEND:

(dash-dot line)	SITE BOUNDARY
TP-1 (red square)	TEST PIT (DECEMBER 2019)
(5/6)	DEPTH IN FEET TO GRAVEL (WEATHERED BASALT)/REFUSAL
TP-1 (blue checkered square)	TEST PIT (DECEMBER 2019)
B-1 (blue circle)	PRIOR BORING (GEODESIGN 2013)
INF-1	INFILTRATION TEST (GEODESIGN 2014)
B-1 ◎	PRIOR BORING (GRI MARCH 2016)
(9,>15)	DEPTH IN FEET TO MODERATELY WEATHERED TO SLIGHTLY WEATHERED ROCK/DEPTH IN FEET TO SLIGHTLY WEATHERED TO FRESH ROCK (SEE PRELIMINARY REPORT FOR DATA)
A-A'	SEISMIC REFRACTION LINE
(green area)	AREA OF SHALLOW BOULDERS
(yellow area)	AREA OF SHALLOW BOULDERS AND BEDROCK

SITE PLAN BASED ON DRAWING
PROVIDED BY DOWL JANUARY 3, 2019

GEODESIGN INC
9450 SW Commerce Circle - Suite 300
Wilsonville OR 97070
503.968.8787 www.geodesigninc.com

TRAMMELLCR-74-01

DECEMBER 2019

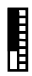
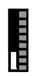
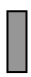
SITE PLAN

ORR PROPERTY
WASHINGTON COUNTY, OR

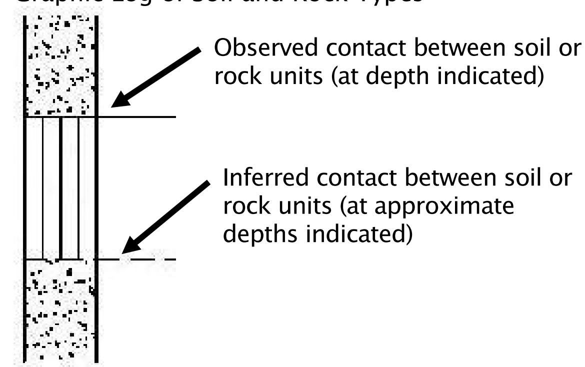
FIGURE 1

Printed By: mmiller | Print Date: 12/23/2019 9:26:56 AM
File Name: J:\S-Z\TrammellCr\TrammellCr-74\TrammellCr-74-01\Figures\CAD\TrammellCr-74-01-WD01.dwg | Layout: FIGURE 1

ATTACHMENT

SYMBOL	SAMPLING DESCRIPTION
	Location of sample collected in general accordance with ASTM D1586 using Standard Penetration Test with recovery
	Location of sample collected using thin-wall Shelby tube or Geoprobe® sampler in general accordance with ASTM D1587 with recovery
	Location of sample collected using Dames & Moore sampler and 300-pound hammer or pushed with recovery
	Location of sample collected using Dames & Moore sampler and 140-pound hammer or pushed with recovery
	Location of sample collected using 3-inch-O.D. California split-spoon sampler and 140-pound hammer with recovery
	Location of grab sample
	Rock coring interval
	Water level during drilling
	Water level taken on date shown

Graphic Log of Soil and Rock Types



GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits	P	Pushed Sample
CBR	California Bearing Ratio	PP	Pocket Penetrometer
CON	Consolidation	P200	Percent Passing U.S. Standard No. 200 Sieve
DD	Dry Density		
DS	Direct Shear	RES	Resilient Modulus
HYD	Hydrometer Gradation	SIEV	Sieve Gradation
MC	Moisture Content	TOR	Torvane
MD	Moisture-Density Relationship	UC	Unconfined Compressive Strength
NP	Non-Plastic	VS	Vane Shear
OC	Organic Content	kPa	Kilopascal

ENVIRONMENTAL TESTING EXPLANATIONS

CA	Sample Submitted for Chemical Analysis	ND	Not Detected
P	Pushed Sample	NS	No Visible Sheen
PID	Photoionization Detector Headspace Analysis	SS	Slight Sheen
		MS	Moderate Sheen
ppm	Parts per Million	HS	Heavy Sheen

RELATIVE DENSITY - COARSE-GRAINED SOIL			
Relative Density	**Standard Penetration Resistance**	**Dames & Moore Sampler (140-pound hammer)**	**Dames & Moore Sampler (300-pound hammer)**
Very Loose	0 – 4	0 – 11	0 – 4
Loose	4 – 10	11 – 26	4 – 10
Medium Dense	10 – 30	26 – 74	10 – 30
Dense	30 – 50	74 – 120	30 – 47
Very Dense	More than 50	More than 120	More than 47

CONSISTENCY - FINE-GRAINED SOIL				
Consistency	**Standard Penetration Resistance**	**Dames & Moore Sampler (140-pound hammer)**	**Dames & Moore Sampler (300-pound hammer)**	**Unconfined Compressive Strength (tsf)**
Very Soft	Less than 2	Less than 3	Less than 2	Less than 0.25
Soft	2 – 4	3 – 6	2 – 5	0.25 – 0.50
Medium Stiff	4 – 8	6 – 12	5 – 9	0.50 – 1.0
Stiff	8 – 15	12 – 25	9 – 19	1.0 – 2.0
Very Stiff	15 – 30	25 – 65	19 – 31	2.0 – 4.0
Hard	More than 30	More than 65	More than 31	More than 4.0

PRIMARY SOIL DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE-GRAINED SOIL (more than 50% retained on No. 200 sieve)	GRAVEL (more than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (< 5% fines)	GW or GP	GRAVEL
		GRAVEL WITH FINES (≥ 5% and ≤ 12% fines)	GW-GM or GP-GM	GRAVEL with silt
			GW-GC or GP-GC	GRAVEL with clay
		GRAVEL WITH FINES (> 12% fines)	GM	silty GRAVEL
			GC	clayey GRAVEL
			GC-GM	silty, clayey GRAVEL
	SAND (50% or more of coarse fraction passing No. 4 sieve)	CLEAN SAND (<5% fines)	SW or SP	SAND
		SAND WITH FINES (≥ 5% and ≤ 12% fines)	SW-SM or SP-SM	SAND with silt
			SW-SC or SP-SC	SAND with clay
		SAND WITH FINES (> 12% fines)	SM	silty SAND
			SC	clayey SAND
			SC-SM	silty, clayey SAND
FINE-GRAINED SOIL (50% or more passing No. 200 sieve)	SILT AND CLAY	Liquid limit less than 50	ML	SILT
			CL	CLAY
			CL-ML	silty CLAY
			OL	ORGANIC SILT or ORGANIC CLAY
		Liquid limit 50 or greater	MH	SILT
			CH	CLAY
			OH	ORGANIC SILT or ORGANIC CLAY
HIGHLY ORGANIC SOIL			PT	PEAT

MOISTURE CLASSIFICATION	
Term	**Field Test**
dry	very low moisture, dry to touch
moist	damp, without visible moisture
wet	visible free water, usually saturated

ADDITIONAL CONSTITUENTS					
Secondary granular components or other materials such as organics, man-made debris, etc.					
	Silt and Clay In:			**Sand and Gravel In:**	
Percent	**Fine-Grained Soil**	**Coarse-Grained Soil**	**Percent**	**Fine-Grained Soil**	**Coarse-Grained Soil**
< 5	trace	trace	< 5	trace	trace
5 – 12	minor	with	5 – 15	minor	minor
> 12	some	silty/clayey	15 – 30	with	with
			> 30	sandy/gravelly	Indicate %

GEODESIGN INC
AN NV5 COMPANY

SOIL CLASSIFICATION SYSTEM

TABLE A-2

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, orange-brown SILT (ML); moist (topsoil to 8 inches, 2-inch-thick root zone).					
2.5							
		with sand and gravel at 4.0 feet					
5.0		Very dense, light brown-gray, silty GRAVEL with cobbles (GM); moist (weathered basalt).	5.0				
		Exploration terminated at a depth of 6.0 feet due to refusal on basalt.	6.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0						0 50 100	

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	**TEST PIT TP-1**	
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	**FIGURE A-1**

TEST PIT LOG - GDI-NV5 - 1 PER PAGE TRAMMELLCR-74-01-TP1_20.GPJ GDI_NV5.GDT PRINT DATE: 12/20/19:KM

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS
0.0 – 5.0		Dense to very dense, red-brown, silty GRAVEL with cobbles and boulders (GM); moist, gravel is fine to coarse and subangular to angular, boulders are approximately 2 to 3 feet in diameter (topsoil to 6 inches, 3-inch-thick root zone) (decomposed to intensely weathered, intensely fractured basalt).					
5.0		Exploration terminated at a depth of 5.0 feet due to refusal on basalt.	5.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	**TEST PIT TP-2**	
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	**FIGURE A-2**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Dense to very dense, gray-brown COBBLES and BOULDERS with silt and gravel; moist, boulders are approximately 1 to 3 feet in diameter, gravel is fine to coarse and subangular to angular (topsoil to 6 inches, 1-inch-thick root zone) (decomposed to intensely weathered, intensely fractured basalt).					
5.0		Exploration terminated at a depth of 4.5 feet due to refusal on basalt.	4.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

Moisture content scale: 0, 50, 100

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC — AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-3

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-3

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS
0.0		Very dense, gray-brown COBBLES and BOULDERS with silt and gravel; moist, boulders are approximately 1 to 4 feet in diameter, gravel is subangular to angular (topsoil to 3 inches, 1-inch-thick root zone).					
2.5		Exploration terminated at a depth of 2.0 feet due to refusal on basalt.	2.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC
AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-4

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-4

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Dense to very dense, gray-brown, silty GRAVEL with cobbles and boulders (GM); moist, gravel is fine to coarse and subangular to angular, boulders are approximately 1 to 4 feet in diameter (decomposed to intensely weathered, intensely fractured basalt).					
		Exploration terminated at a depth of 4.5 feet due to refusal on basalt.	4.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors   LOGGED BY: C. Clough   COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	TEST PIT TP-5	
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	FIGURE A-5

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very dense, gray-brown COBBLES and BOULDERS with silt and gravel; moist, boulders are approximately 1 to 4 feet in diameter, gravel is subangular to angular (decomposed to intensely weathered, intensely fractured basalt).					
2.5		Exploration terminated at a depth of 2.5 feet due to refusal on basalt.	2.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							

0 50 100

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC
AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-6

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-6

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, brown SILT with sand (ML), minor gravel; moist (topsoil to 10 inches, 3-inch-thick root zone).					
2.5		gravelly at 3.0 feet					
5.0		Dense to very dense, light brown-gray, silty GRAVEL with cobbles (GM); moist, gravel is fine to coarse and subangular to angular (decomposed to intensely weathered, intensely fractured basalt).	4.0				
10.0		Exploration terminated at a depth of 10.0 feet due to refusal on basalt.	10.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0							

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	**TEST PIT TP-7**	
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	**FIGURE A-7**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, red-brown SILT with sand, gravel, cobbles, and boulders (ML); moist (topsoil to 6 inches, 2-inch-thick root zone).					
2.5		Dense, brown, silty GRAVEL with sand, cobbles, and boulders (GM); moist, gravel is fine to coarse and angular (decomposed to intensely weathered, intensely fractured basalt).	2.5				
		Exploration terminated at a depth of 4.0 feet due to refusal on basalt.	4.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
5.0							
7.5							
10.0							
12.5							
15.0							
17.5							
20.0							
22.5							
25.0							
27.5							
30.0						0 50 100	

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC — AN NV5 COMPANY	TRAMMELLCR-74-01	TEST PIT TP-8	
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	FIGURE A-8

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 – 50 – 100)	COMMENTS
0.0 – 2.0		Dense, brown, silty GRAVEL with sand, cobbles, and boulders (GM); moist, gravel is fine to coarse and angular (decomposed to intensely weathered, intensely fractured basalt).	2.0				
		Exploration terminated at a depth of 2.0 feet due to refusal on basalt.					No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC
AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-9

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-9

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, gray with brown mottled SILT (ML); moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
5.0		Medium stiff, brown with orange mottled SILT (ML), minor sand; moist.	5.0				Slow groundwater seepage observed at 5.0 feet. Severe caving observed at 5.0 feet.
13.0		Dense, brown-gray, silty GRAVEL (GM); moist, gravel is fine to coarse and subangular (decomposed basalt).	13.0				
14.0		Exploration terminated at a depth of 14.0 feet due to refusal on basalt.	14.0				Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC — AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-10

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-10

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, gray-brown with dark brown mottled SILT (ML); moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
8.0		boulder at 8.0 feet					
12.0		red-brown oxidized zone at 12.0 feet					
14.0		stiff at 14.0 feet					
17.0		Exploration terminated at a depth of 17.0 feet due to end of reach.	17.0				Slow groundwater seepage observed at 17.0 feet. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC
AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-11

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-11

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, brown with orange mottled SILT (ML); moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
15.0		sandy at 15.0 feet					Minor caving observed at 15.0 feet.
17.0		Dense, gray, silty GRAVEL with sand (GM); wet, gravel is fine to coarse and subangular (decomposed basalt).	17.0				Slow groundwater seepage observed at 17.0 feet.
19.0		Exploration terminated at a depth of 19.0 feet due to end of reach.	19.0				Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

Moisture content scale: 0 50 100

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC — AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-12

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-12

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff to stiff, brown SILT (ML); moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
6.0		Exploration terminated at a depth of 6.0 feet due to refusal on basalt.	6.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/11/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-13

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-13

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, brown with orange mottled SILT (ML); moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
7.0		Dense, brown-gray, silty GRAVEL with cobbles (GM); moist, gravel is fine to coarse and subangular (decomposed basalt).	7.0				
15.0		Exploration completed at a depth of 15.0 feet.	15.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC
AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-14

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-14

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, brown with orange mottled SILT (ML); moist (12-inch-thick tilled zone, 2-inch-thick root zone).					
8.0		Exploration terminated at a depth of 8.0 feet due to refusal on basalt.	8.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors   LOGGED BY: C. Clough   COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC
AN NV5 COMPANY

TRAMMELLCR-74-01	**TEST PIT TP-15**	
DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	**FIGURE A-15**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very dense, gray-brown COBBLES and BOULDERS with silt and gravel; moist, cobbles are approximately 1 to 3 feet in diameter, boulders are approximately 1 to 3 feet in diameter, gravel is subangular to angular (decomposed to intensely weathered, intensely fractured basalt).	3.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.
		Exploration terminated at a depth of 3.5 feet due to refusal on basalt.					

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

Moisture content scale: 0 50 100

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC — AN NV5 COMPANY	TRAMMELLCR-74-01	**TEST PIT TP-16**
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR — **FIGURE A-16**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, red-brown SILT (ML), minor sand; moist (topsoil to 18 inches, 2-inch-thick root zone).					
		sandy, with gravel at 6.0 feet					
7.5		Dense, brown, silty GRAVEL with sand (GM); moist, gravel is fine to coarse and subrounded to subangular (decomposed basalt).	7.5				
		dense to very dense at 11.0 feet					
12.5		Exploration terminated at a depth of 12.5 feet due to refusal on basalt.	12.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors | LOGGED BY: C. Clough | COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC — AN NV5 COMPANY

TRAMMELLCR-74-01

DECEMBER 2019

TEST PIT TP-17

ORR PROPERTY
WASHINGTON COUNTY, OR

FIGURE A-17

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Medium stiff, brown with orange mottled SILT (ML), minor sand; moist (topsoil to 12 inches, 3-inch-thick root zone).					
5.5		Dense to very dense, light brown, silty GRAVEL with sand, cobbles, and boulders (GM); moist, gravel is fine to coarse and subangular to angular.	5.5				
12.5		Exploration terminated at a depth of 12.5 feet due to refusal on basalt.	12.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	**TEST PIT TP-18**
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR — **FIGURE A-18**

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Dense, brown, silty GRAVEL with cobbles and boulders (GM); moist, gravel is fine to coarse and subrounded to subangular, boulders are approximately 1 to 3 in feet diameter (topsoil to 6 inches, 2-inch-thick root zone).					
		Exploration terminated at a depth of 4.0 feet due to refusal on basalt.	4.0				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

0 50 100

EXCAVATED BY: Kerr Contractors LOGGED BY: C. Clough COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	TEST PIT TP-19	
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR	FIGURE A-19

DEPTH FEET	GRAPHIC LOG	MATERIAL DESCRIPTION	ELEVATION / DEPTH	TESTING	SAMPLE	● MOISTURE CONTENT % (0 50 100)	COMMENTS
0.0		Very dense, gray-brown COBBLES and BOULDERS with silt and gravel; moist, cobbles are approximately 1 to 3 feet diameter, boulders are approximately 1 to 3 in feet diameter, gravel is subangular to angular (decomposed to intensely weathered, intensely fractured basalt).					
		Exploration terminated at a depth of 4.5 feet due to refusal on basalt.	4.5				No groundwater seepage observed to the depth explored. No caving observed to the depth explored. Surface elevation was not measured at the time of exploration.

Depth scale: 0.0, 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0, 27.5, 30.0

Moisture content scale: 0 50 100

EXCAVATED BY: Kerr Contractors

LOGGED BY: C. Clough

COMPLETED: 12/12/19

EXCAVATION METHOD: excavator (see document text)

GEODESIGN INC AN NV5 COMPANY	TRAMMELLCR-74-01	**TEST PIT TP-20**
	DECEMBER 2019	ORR PROPERTY WASHINGTON COUNTY, OR — **FIGURE A-20**

TEST PIT LOG - GDI-NV5 - 1 PER PAGE TRAMMELLCR-74-01-TP1_20.GPJ GDI_NV5.GDT PRINT DATE: 12/20/19:KM

P★R★I★D★E
DISPOSAL COMPANY
P.O. Box 820 Sherwood, OR 97140
Phone: (503) 625-6177 Fax: (503) 625-6179

December 27, 2019

Jennifer Scola
Mackenzie
1515 SE Water Ave #100
Portland, OR 97214

Re: 12822 SW Tualatin Sherwood Rd Sherwood, OR 97140

We have reviewed the site plan for the above-mentioned project. The site plan shows 5 enclosures; 1 enclosure by building A, 1 enclosure by building B, 1 enclosure by building C, 1 enclosure by building D and 1 enclosure by building E each measuring 10' deep and 20' wide, which allows for straight on access.

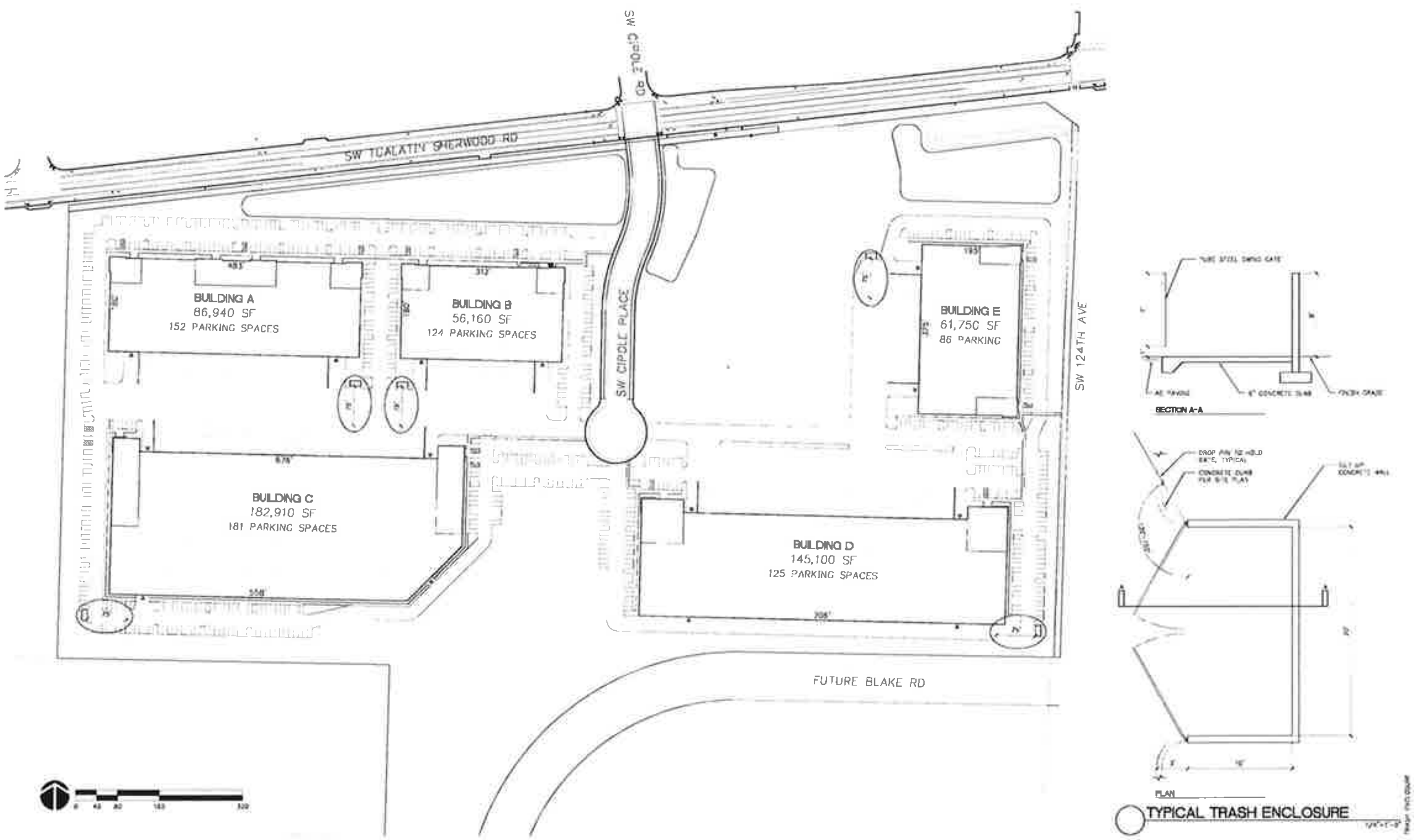
The other details on the site plan are not shown. These requirements will need to be met to ensure our access:

- The gates need to be hinged in front of the enclosure walls to allow for the full 20' width. This will also allow for the 120 degree opening angle that is required.
- No center post at the gate access point.
- The gates need cane bolts and holes put in place for the gates to be locked in the open and closed position. The holes for the gates to be held open need to be at the full 120 degree opening angle.
- There must be 25' of overhead clearance.

If you have any questions, feel free to contact me.

Sincerely,

Kristen Tabscott
Pride Disposal Co.
(503) 625-6177



TRAMMELL CROW COMPANY | T-S CORPORATE PARK

12.19.19 ©2019 Mackenzie

WASTE RECEPTACLE EXHIBIT

218045900

TERAGAN & ASSOCIATES, INC.
ARBORICULTURAL CONSULTANTS

MEMORANDUM

DATE: January 15, 2020

TO: Kirk Olsen (Trammell Crow Company)

FROM: Todd Prager, AICP, RCA #597, ISA Board Certified Master Arborist

RE: Tree Plan for T-S Corporate Park

Summary

This report includes tree removal and protection recommendations to meet the requirements in section 16.142.070 (Trees on Property Subject to Certain Land Use Applications) of the City of Sherwood Code for the T-S Corporate Park project.

The total canopy provided through the preservation of onsite trees will be 60.8 percent. The minimum canopy requirement for the proposed development is 30 percent. Therefore, no additional trees are required to be planted to meet the minimum canopy requirement.

Background

Trammell Crow Company is proposing to develop the T-S Corporate Park at SW Tualatin Sherwood Road and SW 124th Avenue in Sherwood. Existing trees are present on the property in the area of the proposed development. The proposed site plan with grading, streets, buildings, and parking in relation to the existing trees is provided in Attachment 1.

The assignment requested of our firm for this project was to:

- Assess the existing trees at the project site;
- Identify the trees to be removed and retained based on construction impacts;
- Provide tree protection recommendations for the trees to be retained; and
- Provide recommendations for meeting the tree canopy requirements in section 16.142.070 of the City of Sherwood Code.

Teragan & Associates, Inc.
3145 Westview Circle • Lake Oswego, OR 97034
Phone: 971.295.4835 • Fax: 503.697.1976
Email: todd@teragan.com • Website: teragan.com

Tree Assessment

In December 2019 and January 2020 our firm completed the inventory of existing trees outside and at the edges of proposed construction impacts at the project site.

The complete inventory data for each tree is provided in Attachment 2 and includes the tree number, common name, scientific name, trunk diameter (DBH), crown radius, crown area (canopy), mature crown radius for the species, mature crown area (canopy) for the species, canopy credit for preserved trees (2x crown area), health condition, structural condition, pertinent comments, and treatment recommendations (remove or protect).

The tree numbers in the inventory in Attachment 2 correspond to the tree numbers on the proposed site plan in Attachment 1.

Tree Removal and Retention

The standard tree protection requirement in the City of Sherwood Code is to limit construction activities within the driplines of the trees to be retained unless otherwise approved by the project arborist. A typical alternative minimum tree protection zone allows encroachments no closer than a radius from a tree of .5 feet per inch of DBH as long as no more than 25 percent of the root protection zone area (estimated at one foot radius per inch of DBH) is impacted. Figure 1 illustrates this concept. This standard may need to be adjusted on a case by case basis due to tree health, species, root distribution, whether the tree will be impacted on multiple sides, and other factors.

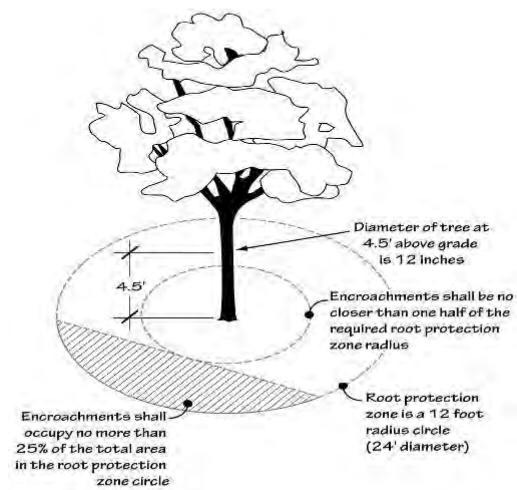


Figure 1: Typical minimum protection zone

Using the criteria described above and the locations of the trees relative to grading, paving, construction, and other site improvements, 508 of the assessed trees will be removed and 505 trees will be retained.

Tree protection recommendations for the trees to be retained are provided in the next section of this report.

Tree Protection Recommendations

The critical root zone radii of .5 feet per inch of DBH are shown on the site plan in Attachment 1 for the trees directly adjacent to proposed construction. The trees to be retained can be adequately protected by placing tree protection fencing at or beyond their critical root zones wherever possible as shown in Attachment 1. No grading, stockpiling, storage, disposal, or any other construction related activity shall occur in the tree protection zones unless specifically reviewed and approved by the project arborist.

The following additional tree protection measures shall apply to the trees to be retained:

- *Tree Protection Fencing*: Tree protection fencing shall be placed in the locations shown in Attachment 1. Note that there are several locations on the site plan in Attachment 1 where grading is recommended to be shifted to outside the tree protection zones. If the grading cannot be shifted, it shall be completed under arborist supervision to minimize root impacts. Also, trees within the north wetland shown on sheet C7.2 in Attachment 1 may be protected with orange work limit fencing that is already required around the wetland. Note that it will need to be expanded in a few places to better protect the tree root zones.
- *Directional Felling*: Fell the trees to be removed away from the trees to be retained so they do not contact or otherwise damage the trunks or branches of the trees to be retained. No vehicles or heavy equipment shall be permitted within the tree protection zones during tree removal operations.
- *Protect Tree Crowns*: Care will need to be taken to not contact or otherwise damage the crowns of the trees that may extend into the construction area.
- *Pruning*: It may be necessary or desirable to prune trees at the site. All pruning should be completed by a qualified tree service with an ISA Certified Arborist on site. All pruning should be in accordance with ANSI A300 pruning standards and Z133.1 safety standards and approved in coordination with the project arborist.
- *Sediment Fencing*: Sediment fencing shall be installed outside the protection zones of the trees to be retained to minimize root disturbances. If erosion control is required inside the protection zones, straw wattles shall be used on the soil surface.

Additional tree protection recommendations that are consistent with section 16.142.070.G for the trees to be retained are provided in Attachment 3.

Tree Canopy Requirements

Section 16.142.070.D of the City of Sherwood Code requires the proposed development type to achieve a minimum total tree canopy of 30 percent. Trees that are retained receive credit for double their mature canopy area, and trees that are planted receive credit for the expected mature canopy area as determined by a certified arborist. Street trees are eligible for full canopy credit even though they are planted in the public right of way.

Retained Trees

The canopy area for each of the 505 retained trees is provided in the tree inventory in Attachment 2. Their total combined canopy area is 492,114.5 square feet. Since retained trees receive double canopy credit, the credit from preservation of the trees is 984,229 square feet. The total net site area is 1,618,892 square feet. Therefore, the canopy provided by the preserved trees represents 60.8 percent of the site area.

Planted Trees

The minimum canopy requirement for the development is 30 percent. Since the canopy provided through preservation of existing trees is 60.8 percent, no additional trees are required to be planted to meet the canopy requirement.

Conclusion

The total canopy provided through the preservation of trees at the site will be 60.8 percent. The minimum canopy requirement for the proposed development is 30 percent. Therefore, no additional trees are required to be planted to meet the minimum canopy requirement.

The trees to be retained will be adequately protected by adhering to the recommendations in this report. Any change to the tree protection plan should be approved by the project arborist to ensure that the trees to be retained are adequately protected.

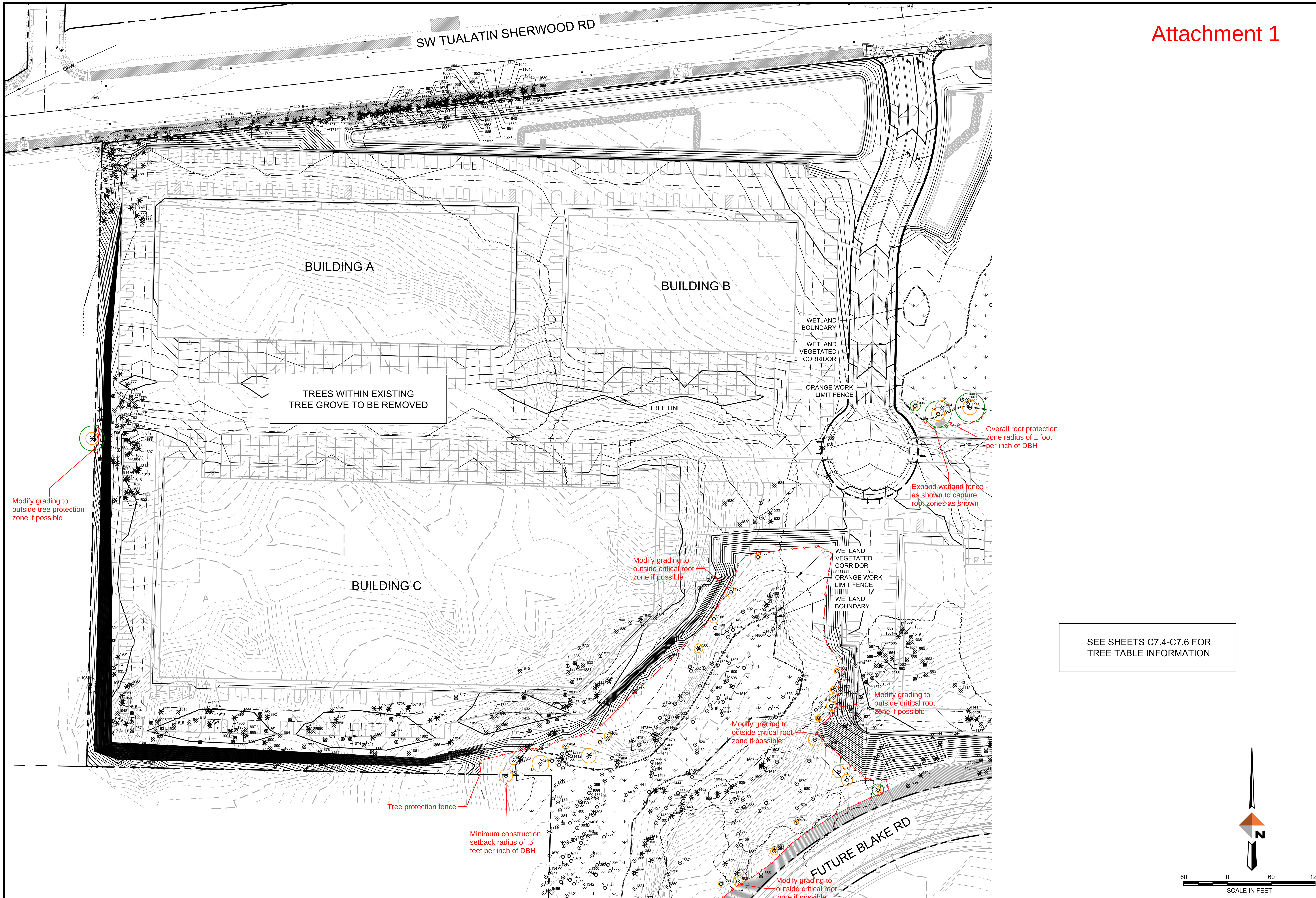
Please contact me if you have questions, concerns, or need any additional information.

Sincerely,

Todd Prager

Todd Prager
ASCA Registered Consulting Arborist #597
ISA Board Certified Master Arborist, WE-6723B
ISA Qualified Tree Risk Assessor
AICP, American Planning Association

Attachments: Attachment 1 - Site Plan with Trees
Attachment 2 - Tree Inventory
Attachment 3 - Tree Protection Recommendations
Attachment 4 - Assumptions and Limiting Conditions



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720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

SHERWOOD CORPORATE PARK
SHERWOOD, OREGON

SENSITIVITY PLAN WEST HALF

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020
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SHEET
C7.1

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Attachment 1
SW TUALATIN SHERWOOD RD
SW 124TH AVENUE
FUTURE BLAKE RD
BUILDING E
BUILDING D
Expand wetland fence as shown to capture root zones as shown
Expand wetland fence as shown to capture root zones as shown
Expand wetland fence as shown to capture root zones as shown
Expand wetland fence as shown to capture root zones as shown
Overall root protection zone radius of 1 foot per inch of DBH
Tree protection fence
Modify grading to outside critical root zone if possible
Modify grading to outside critical root zone if possible
Modify grading to outside critical root zone if possible
WETLAND VEGETATED CORRIDOR
WETLAND BOUNDARY
ORANGE WORK LIMIT FENCE
WETLAND BUFFER
WETLAND BOUNDARY
ORANGE WORK LIMIT FENCE
TREE LINE
WETLAND VEGETATED CORRIDOR
ORANGE WORK LIMIT FENCE
WETLAND BOUNDARY
TREE LINE
PROPERTY LINE
76.00' FUTURE ROW
GRADING UNDER FUTURE BLAKE ROAD
GRADING UNDER FUTURE BLAKE ROAD
SEE SHEETS C7.4-C7.6 FOR TREE TABLE INFORMATION
N
60 0 60 120
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Portland, Oregon 97205
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SHERWOOD CORPORATE PARK
SHERWOOD, OREGON
SENSITIVITY PLAN EAST HALF
SHERWOOD, OREGON
PROJECT 2322.14347.01
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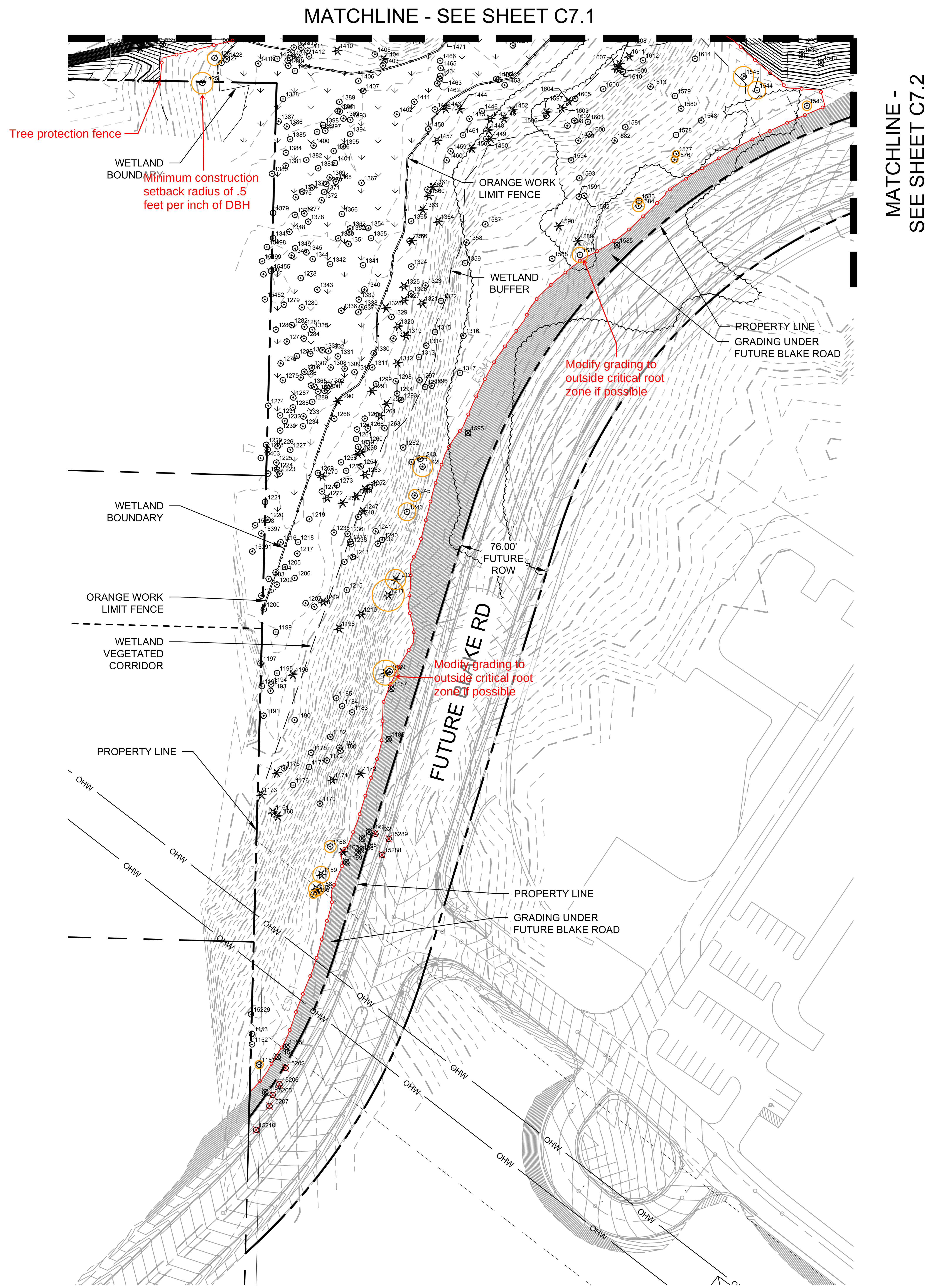
SHEET
C7.2

Attachment 1



SEE SHEETS C7.4-C7.6 FOR TREE TABLE INFORMATION

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SCALE IN FEET

REV	DATE	DESCRIPTION	BY
		REVISIONS	

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SHERWOOD CORPORATE PARK
SHERWOOD, OREGON

SENSITIVITY PLAN SOUTH

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

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C7.3

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Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1000	Willow	*Salix sp.*	19	14	616	20	1257	2513	Good	Good	6 stems 6,6,7,8,9,10.	Protect
1001	Willow	*Salix sp.*	13	10	314	20	1257	2513	Good	Good	3 stems 7,8,8.	Protect
1002	Willow	*Salix sp.*	6	5	79	20	1257	2513	Poor	Poor	Suppressed	Protect
1003	Willow	*Salix sp.*	20	21	1385	21	1385	2771	Fair	Fair	6 stems 6,6,8,8,10,10. Severe decay in smaller stems.	Protect
1004	Willow	*Salix sp.*	20	13	531	20	1257	2513	Good	Good	4 stems 6,6,7,10.	Protect
1005	Willow	*Salix sp.*	18	24	1810	24	1810	3619	Good	Good	2 stems 10,15.	Protect
1006	Willow	*Salix sp.*	7	14	616	20	1257	2513	Good	Good		Protect
1007	Oregon Ash	*Fraxinus latifolia*	10	14	616	15	707	1414	Good	Good		Protect
1008	Common Hawthorn	*Crataegus monogyna*	6	7	154	7	154	308	Good	Good		Protect
1009	Common Hawthorn	*Crataegus monogyna*	10	10	314	10	314	628	Poor	Poor	Cracks in trunk. Decline. 2 stems 7,7.	Protect
1010	Common Hawthorn	*Crataegus monogyna*	14	20	1257	20	1257	2513	Good	Good	4 stems 8,7,7,7.	Protect
1011	Common Hawthorn	*Crataegus monogyna*	12	15	707	15	707	1414	Good	Good	2 stems 8,9.	Protect
1012	Common Hawthorn	*Crataegus monogyna*	6	8	201	8	201	402	Good	Good		Protect
1013	Common Apple	*Malus sp.*	16	9	254	12	452	905	Poor	Poor	2 stems 14,8. Partial uproot	Protect
1014	Sweet Cherry	*Prunus avium*	9	10	314	15	707	1414	Poor	Poor	2 stems 6,7. Suppressed	Protect
1015	Common Hawthorn	*Crataegus monogyna*	6	9	254	9	254	509	Good	Good		Protect
1016	Common Hawthorn	*Crataegus monogyna*	6	12	452	12	452	905	Good	Good		Protect
1017	Common Apple	*Malus sp.*	6	5	79	12	452	905	Poor	Poor	Suppressed	Protect
1018	Oregon Ash	*Fraxinus latifolia*	12	12	452	15	707	1414	Good	Good	2 stems 7,10.	Protect
1019	Sweet Cherry	*Prunus avium*	6	9	254	15	707	1414	Good	Good		Protect
1020	Common Hawthorn	*Crataegus monogyna*	7	9	254	9	254	509	Poor	Poor	Suppressed	Protect
1021	Sweet Cherry	*Prunus avium*	7	6	113	15	707	1414	Good	Good		Protect
1022	Common Hawthorn	*Crataegus monogyna*	9	15	707	15	707	1414	Good	Good	2 stems 6,7.	Protect
1023	Willow	*Salix sp.*	9	7	154	20	1257	2513	Poor	Poor	Suppressed.	Protect
1024	Sweet Cherry	*Prunus avium*	7	8	201	15	707	1414	Good	Good		Protect
1025	Common Hawthorn	*Crataegus monogyna*	6		0		0	0	Good	Good		Protect
1026	Sweet Cherry	*Prunus avium*	7	9	254	15	707	1414	Good	Good		Protect
1027	Common Hawthorn	*Crataegus monogyna*	14	17	908	17	908	1816	Poor	Poor	Broken tops. 2 stems 7,12.	Protect
1028	Sweet Cherry	*Prunus avium*	13	11	380	15	707	1414	Poor	Poor	Broken top	Protect
1029	Common Hawthorn	*Crataegus monogyna*			0		0	0	Dead			Protect
1030	Oregon Ash	*Fraxinus latifolia*	7	7	154	15	707	1414	Good	Good		Protect
1031	Common Hawthorn	*Crataegus monogyna*	10	7	154	7	154	308	Poor	Poor	Suppressed. 2 stems 6,8.	Protect
1032	Common Hawthorn	*Crataegus monogyna*	8	5	79	7	154	308	Poor	Poor	2 stems 6,6. Severe lean east.	Protect
1033	Common Hawthorn	*Crataegus monogyna*	9	7	154	7	154	308	Poor	Poor	2 stems 6,7. Suppressed	Protect
1034	Common Hawthorn	*Crataegus monogyna*	7	8	201	8	201	402	Poor	Poor	Suppressed	Protect
1035	Common Hawthorn	*Crataegus monogyna*	9	8	201	8	201	402	Poor	Poor	2 stems 6,7. Suppressed	Protect
1036	Common Hawthorn	*Crataegus monogyna*	6	4	50	7	154	308	Poor	Poor	Suppressed.	Protect
1037	Common Hawthorn	*Crataegus monogyna*	6	4	50	7	154	308	Poor	Poor	Suppressed.	Protect
1038	Oregon Ash	*Fraxinus latifolia*	20	18	1018	15	707	1414	Good	Good		Protect
1039	Oregon Ash	*Fraxinus latifolia*	19	19	1134	15	707	1414	Good	Good		Protect
1040	Common Hawthorn	*Crataegus monogyna*	6	5	79	7	154	308	Fair	Fair		Protect
1041	Common Hawthorn	*Crataegus monogyna*	6	5	79	7	154	308	Fair	Fair		Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1042	Oregon Ash	*Fraxinus latifolia*	35	28	2463	15	707	1414	Fair	Fair	9 stems 7,12,7,13,11,14,11,12,15. History of larger limb failure.	Protect
1043	Sweet Cherry	*Prunus avium*	6	4	50	15	707	1414	Poor	Poor	Suppressed.	Protect
1044	Sweet Cherry	*Prunus avium*	9	4	50	15	707	1414	Good	Good	2 stems 6,7.	Protect
1045	Sweet Cherry	*Prunus avium*	6	3	28	15	707	1414	Fair	Poor	Suppressed.	Protect
1050	Sweet Cherry	*Prunus avium*	8	14	616	15	707	1414	Good	Good		Protect
1051	Sweet Cherry	*Prunus avium*	8	6	113	15	707	1414	Good	Good	2 stems 6,6.	Protect
1052	Sweet Cherry	*Prunus avium*	6	4	50	15	707	1414	Good	Good		Protect
1053	Cascara	*Rhamnus purshiana*	8	9	254	12	452	905	Good	Good	2 stems 6,6.	Protect
1151	Pacific Madrone	*Arbutus menziesii*	7	7	154	15	707	1414	Good	Good		Protect
1152	Pacific Madrone	*Arbutus menziesii*	11	13	531	15	707	1414	Good	Good		Protect
1153	Pacific Madrone	*Arbutus menziesii*	7	5	79	15	707	1414	Good	Good		Protect
1156	Oregon White Oak	*Quercus garrayana*	7	9	254	25	1963	3927	Good	Good		Protect
1157	Douglas Fir	*Pseudotsuga menziesii*	8	4	50	20	1257	2513	Good	Good		Protect
1158	Douglas Fir	*Pseudotsuga menziesii*	11	7	154	20	1257	2513	Good	Good		Protect
1159	Douglas Fir	*Pseudotsuga menziesii*	14	12	452	20	1257	2513	Good	Good		Protect
1160	Douglas Fir	*Pseudotsuga menziesii*	18	12	452	20	1257	2513	Good	Good		Protect
1161	Douglas Fir	*Pseudotsuga menziesii*	18	8	201	20	1257	2513	Good	Good		Protect
1168	Pacific Madrone	*Arbutus menziesii*	10	14	616	15	707	1414	Good	Good		Protect
1170	Oregon White Oak	*Quercus garrayana*	22	15	707	25	1963	3927	Good	Good	2 stems 13,18.	Protect
1171	Douglas Fir	*Pseudotsuga menziesii*	21	20	1257	20	1257	2513	Poor	Poor	Thin crown.	Protect
1172	Douglas Fir	*Pseudotsuga menziesii*	16	14	616	20	1257	2513	Very Poor	Very Poor	Broken top. Severe crown die back.	Protect
1173	Douglas Fir	*Pseudotsuga menziesii*	23		0		0	0	Dead			Protect
1174	Douglas Fir	*Pseudotsuga menziesii*	23		0		0	0	Dead			Protect
1175	Sweet Cherry	*Prunus avium*	6	5	79	15	707	1414	Good	Good		Protect
1176	Sweet Cherry	*Prunus avium*	14	13	531	15	707	1414	Good	Good		Protect
1177	Sweet Cherry	*Prunus avium*	7	5	79	15	707	1414	Good	Good		Protect
1178	Sweet Cherry	*Prunus avium*	6	5	79	15	707	1414	Good	Good		Protect
1179	Sweet Cherry	*Prunus avium*	6	8	201	15	707	1414	Good	Good		Protect
1180	Pacific Madrone	*Arbutus menziesii*	7	11	380	15	707	1414	Good	Good		Protect
1181	Sweet Cherry	*Prunus avium*	7	10	314	15	707	1414	Good	Good		Protect
1182	Sweet Cherry	*Prunus avium*	8	10	314	15	707	1414	Good	Good		Protect
1183	Oregon White Oak	*Quercus garrayana*	8	9	254	25	1963	3927	Good	Good	2 stems 6,6.	Protect
1184	Sweet Cherry	*Prunus avium*	8	13	531	15	707	1414	Good	Good		Protect
1185	Pacific Madrone	*Arbutus menziesii*	14	15	707	15	707	1414	Good	Good	3 stems 7,8,9.	Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1188	Douglas Fir	*Pseudotsuga menziesii*	21	18	1018	20	1257	2513	Good	Good		Protect
1189	Pacific Madrone	*Arbutus menziesii*	9	13	531	15	707	1414	Good	Good	2 stems 8,5.	Protect
1190	Cascara	*Rhamnus purshiana*	7	5	79	12	452	905	Good	Good		Protect
1191	Oregon Ash	*Fraxinus latifolia*	9	12	452	15	707	1414	Good	Good	2 stems 7,8.	Protect
1192	Oregon Ash	*Fraxinus latifolia*	25	18	1018	18	1018	2036	Good	Good		Protect
1193	Oregon Ash	*Fraxinus latifolia*	18	22	1521	22	1521	3041	Good	Good		Protect
1194	Oregon Ash	*Fraxinus latifolia*	24	16	804	16	804	1608	Good	Good		Protect
1195	Oregon Ash	*Fraxinus latifolia*	15	12	452	15	707	1414	Good	Good		Protect
1196	Douglas Fir	*Pseudotsuga menziesii*	21		0		0	0	Dead			Protect
1197	Oregon Ash	*Fraxinus latifolia*	9	10	314	15	707	1414	Good	Good		Protect
1198	Douglas Fir	*Pseudotsuga menziesii*	25	23	1662	23	1662	3324	Good	Good		Protect
1199	Oregon Ash	*Fraxinus latifolia*	23	18	1018	18	1018	2036	Good	Good	2 stems 6,22.	Protect
1200	Cascara	*Rhamnus purshiana*	6	10	314	12	452	905	Poor	Poor	Trunk decay. Epicormic sprouts.	Protect
1201	Cascara	*Rhamnus purshiana*	6	10	314	12	452	0	Poor	Poor	Trunk decay. Epicormic sprouts. Offsite.	Protect
1202	Oregon Ash	*Fraxinus latifolia*	12	10	314	15	707	1414	Good	Good		Protect
1203	Oregon Ash	*Fraxinus latifolia*	16	10	314	15	707	1414	Good	Good		Protect
1204	Oregon Ash	*Fraxinus latifolia*	12	8	201	15	707	1414	Fair	Fair	Thin crown.	Protect
1205	Oregon Ash	*Fraxinus latifolia*	15	11	380	15	707	1414	Good	Good		Protect
1206	Oregon Ash	*Fraxinus latifolia*	25	15	707	15	707	1414	Good	Good		Protect
1207	Oregon Ash	*Fraxinus latifolia*	12	9	254	15	707	1414	Good	Good		Protect
1208	Bigleaf Maple	*Acer macrophyllum*	7	8	201	25	1963	3927	Good	Good		Protect
1209	Douglas Fir	*Pseudotsuga menziesii*	13		0		0	0	Dead			Protect
1210	Douglas Fir	*Pseudotsuga menziesii*	19	13	531	20	1257	2513	Good	Good		Protect
1211	Douglas Fir	*Pseudotsuga menziesii*	27	24	1810	24	1810	3619	Good	Good		Protect
1212	Douglas Fir	*Pseudotsuga menziesii*	17	20	1257	20	1257	2513	Good	Good		Protect
1213	Sweet Cherry	*Prunus avium*	6	4	50	15	707	1414	Poor	Poor	Partial uproot.	Protect
1214	Sweet Cherry	*Prunus avium*	6	9	254	15	707	1414	Good	Good		Protect
1215	Bigleaf Maple	*Acer macrophyllum*	12	18	1018	25	1963	3927	Good	Good	2 stems 8,9.	Protect
1216	Oregon Ash	*Fraxinus latifolia*	10	8	201	15	707	1414	Good	Good		Protect
1217	Oregon Ash	*Fraxinus latifolia*	6	7	154	15	707	1414	Good	Good		Protect
1218	Oregon Ash	*Fraxinus latifolia*	9	10	314	15	707	1414	Good	Good		Protect
1219	Oregon Ash	*Fraxinus latifolia*	9	10	314	15	707	1414	Good	Good		Protect
1220	Oregon Ash	*Fraxinus latifolia*	25	16	804	15	707	1414	Poor	Poor	Trunk decay.	Protect
1221	Oregon Ash	*Fraxinus latifolia*	48	20	1257	15	707	1414	Poor	Poor	Trunk decay Broken top.	Protect
1222	Oregon Ash	*Fraxinus latifolia*	29	22	1521	15	707	1414	Good	Good		Protect
1223	Oregon Ash	*Fraxinus latifolia*	19	12	452	15	707	1414	Good	Good	2 stems 9,17.	Protect

TERAGAN & ASSOCIATES, INC.
ARBORICULTURAL CONSULTANTS

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1224	Oregon Ash	*Fraxinus latifolia*	12		0	15	707	1414	Dead			Protect
1225	Oregon Ash	*Fraxinus latifolia*	10	13	531	15	707	1414	Good	Good		Protect
1226	Oregon Ash	*Fraxinus latifolia*	8	9	254	15	707	1414	Good	Good		Protect
1227	Oregon Ash	*Fraxinus latifolia*	14	8	201	15	707	1414	Fair	Fair	Trunk decay.	Protect
1228	Oregon Ash	*Fraxinus latifolia*	12	12	452	15	707	1414	Good	Good		Protect
1229	Oregon Ash	*Fraxinus latifolia*	23	15	707	15	707	1414	Good	Good		Protect
1230	Oregon Ash	*Fraxinus latifolia*	25	20	1257	15	707	1414	Poor	Poor	Trunk decay	Protect
1231	Oregon Ash	*Fraxinus latifolia*	17	13	531	15	707	1414	Good	Good		Protect
1232	Oregon Ash	*Fraxinus latifolia*	11	5	79	15	707	1414	Poor	Poor	Trunk decay. Suppressed	Protect
1233	Oregon Ash	*Fraxinus latifolia*	9		0	15	707	1414	Dead			Protect
1234	Oregon Ash	*Fraxinus latifolia*	11	11	380	15	707	1414	Good	Good		Protect
1235	Willow	*Salix sp.*	8	9	254	20	1257	2513	Poor	Poor	Trunk decay.	Protect
1236	Sweet Cherry	*Prunus avium*	6	7	154	15	707	1414	Good	Good		Protect
1237	Willow	*Salix sp.*	6	5	79	20	1257	2513	Poor	Poor	Trunk decay.	Protect
1238	Sweet Cherry	*Prunus avium*	10	14	616	15	707	1414	Good	Good	2 stems 7,7.	Protect
1239	Cascara	*Rhamnus purshiana*	6	8	201	12	452	905	Good	Good		Protect
1240	Willow	*Salix sp.*	7	8	201	20	1257	2513	Good	Good		Protect
1241	Sweet Cherry	*Prunus avium*	13	19	1134	19	1134	2268	Good	Good	3 stems 6,8,8.	Protect
1242	Bigleaf Maple	*Acer macrophyllum*	17	20	1257	25	1963	3927	Good	Good	5 stems 6,7,8,8,8.	Protect
1243	Bigleaf Maple	*Acer macrophyllum*	17	12	452	25	1963	3927	Good	Good	4 stems 7,8,9,9.	Protect
1244	Bigleaf Maple	*Acer macrophyllum*	16	20	1257	25	1963	3927	Good	Good	6 stems 6,6,7,7,7,7.	Protect
1245	Sweet Cherry	*Prunus avium*	10	10	314	15	707	1414	Good	Good	2 stems 7,7.	Protect
1246	Sweet Cherry	*Prunus avium*	15	10	314	15	707	1414	Good	Good	4 stems 6,7,8,8.	Protect
1247	Douglas Fir	*Pseudotsuga menziesii*	13	12	452	20	1257	2513	Good	Good		Protect
1248	Willow	*Salix sp.*	12	12	452	20	1257	2513	Good	Good		Protect
1249	Douglas Fir	*Pseudotsuga menziesii*	10	11	380	20	1257	2513	Good	Good		Protect
1250	Douglas Fir	*Pseudotsuga menziesii*	19	15	707	20	1257	2513	Good	Good		Protect
1251	Douglas Fir	*Pseudotsuga menziesii*	7	9	254	20	1257	2513	Good	Good		Protect
1252	Willow	*Salix sp.*	7	8	201	20	1257	2513	Poor	Poor	Trunk decay.	Protect
1253	Douglas Fir	*Pseudotsuga menziesii*	6	8	201	20	1257	2513	Good	Good		Protect
1254	Willow	*Salix sp.*	6	4	50	20	1257	2513	Poor	Poor	Suppressed	Protect
1255	Willow	*Salix sp.*	10	6	113	20	1257	2513	Poor	Poor	Partial uproot.	Protect
1256	Willow	*Salix sp.*	7	4	50	20	1257	2513	Poor	Poor	Suppressed	Protect
1257	Douglas Fir	*Pseudotsuga menziesii*	10		0		0	0	Dead			Protect
1258	Douglas Fir	*Pseudotsuga menziesii*	17		0		0	0	Dead			Protect
1259	Willow	*Salix sp.*	8	10	314	20	1257	2513	Good	Good		Protect
1260	Willow	*Salix sp.*	7	11	380	20	1257	2513	Good	Good		Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1261	Willow	*Salix sp.*	6	8	201	20	1257	2513	Good	Good		Protect
1262	Sweet Cherry	*Prunus avium*	7	7	154	15	707	1414	Good	Good	2 stems 4,6.	Protect
1263	Willow	*Salix sp.*	7	8	201	20	1257	2513	Good	Good		Protect
1264	Douglas Fir	*Pseudotsuga menziesii*	8	8	201	20	1257	2513	Good	Good		Protect
1265	Willow	*Salix sp.*	6	5	79	20	1257	2513	Fair	Fair	Thin crown.	Protect
1266	Willow	*Salix sp.*	6	8	201	20	1257	2513	Good	Good		Protect
1267	Willow	*Salix sp.*	6	8	201	20	1257	2513	Good	Good		Protect
1268	Sweet Cherry	*Prunus avium*	6	7	154	15	707	1414	Good	Good		Protect
1269	Willow	*Salix sp.*	8	3	28	20	1257	2513	Poor	Poor	Crown die back.	Protect
1270	Douglas Fir	*Pseudotsuga menziesii*	15		0		0	0	Dead			Protect
1271	Sweet Cherry	*Prunus avium*	6	5	79	15	707	1414	Poor	Poor	Crown die back.	Protect
1272	Douglas Fir	*Pseudotsuga menziesii*	15		0		0	0	Dead			Protect
1273	Sweet Cherry	*Prunus avium*		13	531	15	707	1414	Good	Good	2 stems 6,8.	Protect
1274	Oregon Ash	*Fraxinus latifolia*	16	8	201	15	707	1414	Poor	Poor	Lost top.	Protect
1275	Oregon Ash	*Fraxinus latifolia*		11	380	15	707	1414	Poor	Poor	Thin crown. 2 stems 13,17.	Protect
1276	Oregon Ash	*Fraxinus latifolia*	8	6	113	15	707	1414	Good	Good		Protect
1277	Oregon Ash	*Fraxinus latifolia*	8	10	314	15	707	1414	Good	Good		Protect
1278	Oregon Ash	*Fraxinus latifolia*	13	7	154	15	707	1414	Poor	Poor	Partial uproot.	Protect
1279	Oregon Ash	*Fraxinus latifolia*	8	6	113	15	707	1414	Good	Good		Protect
1280	Oregon Ash	*Fraxinus latifolia*	6	3	28	15	707	1414	Very Poor	Very Poor	Severe trunk decay.	Protect
1281	Oregon Ash	*Fraxinus latifolia*	10		0	15	707	1414	Dead			Protect
1282	Oregon Ash	*Fraxinus latifolia*	12	8	201	15	707	1414	Good	Good		Protect
1283	Oregon Ash	*Fraxinus latifolia*	9	8	201	15	707	1414	Good	Good		Protect
1284	Oregon Ash	*Fraxinus latifolia*	6	4	50	15	707	1414	Poor	Poor	Suppressed.	Protect
1285	Oregon Ash	*Fraxinus latifolia*	13	10	314	15	707	1414	Fair	Fair	History of limb failure.	Protect
1286	Oregon Ash	*Fraxinus latifolia*	10	5	79	15	707	1414	Poor	Poor	Broken top.	Protect
1287	Oregon Ash	*Fraxinus latifolia*	11	12	452	15	707	1414	Good	Good		Protect
1288	Oregon Ash	*Fraxinus latifolia*	7	4	50	15	707	1414	Poor	Poor	Suppressed	Protect
1289	Oregon Ash	*Fraxinus latifolia*	22	15	707	15	707	1414	Good	Good		Protect
1290	Douglas Fir	*Pseudotsuga menziesii*	10		0		0	0	Dead			Protect
1291	Douglas Fir	*Pseudotsuga menziesii*	15	12	452	20	1257	2513	Fair	Fair	Thinning crown.	Protect
1292	Douglas Fir	*Pseudotsuga menziesii*	8	9	254	20	1257	2513	Fair	Fair	Thinning crown.	Protect
1293	Bigleaf Maple	*Acer macrophyllum*	6	9	254	25	1963	3927	Good	Good		Protect
1294	Willow	*Salix sp.*	6	6	113	20	1257	2513	Poor	Poor	Trunk decay	Protect
1295	Bigleaf Maple	*Acer macrophyllum*		19	1134	25	1963	3927	Good	Good		Protect
1296	Bigleaf Maple	*Acer macrophyllum*	6	10	314	25	1963	3927	Good	Good		Protect
1297	Bigleaf Maple	*Acer macrophyllum*	7	10	314	25	1963	3927	Good	Good		Protect
1298	Willow	*Salix sp.*	8	9	254	20	1257	2513	Good	Good		Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1299	Willow	*Salix sp.*	9	10	314	20	1257	2513	Good	Good		Protect
1300	Oregon Ash	*Fraxinus latifolia*	7	5	79	15	707	1414	Poor	Poor	Suppressed.	Protect
1301	Oregon Ash	*Fraxinus latifolia*	10	10	314	15	707	1414	Good	Good		Protect
1302	Oregon Ash	*Fraxinus latifolia*	11	9	254	15	707	1414	Good	Good		Protect
1303	Oregon Ash	*Fraxinus latifolia*	13	8	201	15	707	1414	Fair	Fair	Suppressed	Protect
1304	Oregon Ash	*Fraxinus latifolia*	6	6	113	15	707	1414	Poor	Poor	Suppressed	Protect
1305	Oregon Ash	*Fraxinus latifolia*	8		0	15	707	1414	Dead			Protect
1306	Oregon Ash	*Fraxinus latifolia*	11	7	154	15	707	1414	Poor	Poor	Partial uproot.	Protect
1307	Oregon Ash	*Fraxinus latifolia*	14	8	201	15	707	1414	Good	Good		Protect
1308	Oregon Ash	*Fraxinus latifolia*	8	8	201	15	707	1414	Fair	Fair	Suppressed	Protect
1309	Oregon Ash	*Fraxinus latifolia*	18	12	452	15	707	1414	Good	Good		Protect
1310	Oregon Ash	*Fraxinus latifolia*	9	8	201	15	707	1414	Good	Good		Protect
1311	Bigleaf Maple	*Acer macrophyllum*	9	11	380	25	1963	3927	Good	Good		Protect
1311.1	Oregon Ash	*Oregon Ash*	10	7	154	15	707	1414	Good	Good		Protect
1312	Douglas Fir	*Pseudotsuga menziesii*	8	9	254	20	1257	2513	Good	Good		Protect
1313	Bigleaf Maple	*Acer macrophyllum*	7	9	254	25	1963	3927	Poor	Fair	Thin crown	Protect
1314	Bigleaf Maple	*Acer macrophyllum*	7	12	452	25	1963	3927	Good	Good		Protect
1315	Bigleaf Maple	*Acer macrophyllum*	6	12	452	25	1963	3927	Good	Good		Protect
1316	Bigleaf Maple	*Acer macrophyllum*	8	14	616	25	1963	3927	Good	Good		Protect
1317	Bigleaf Maple	*Acer macrophyllum*	12	16	804	25	1963	3927	Good	Good	3 stems 6,6,8.	Protect
1318	Bigleaf Maple	*Acer macrophyllum*	7	8	201	25	1963	3927	Good	Good		Protect
1319	Douglas Fir	*Pseudotsuga menziesii*	10	12	452	20	1257	2513	Good	Good		Protect
1320	Douglas Fir	*Pseudotsuga menziesii*	9	9	254	20	1257	2513	Good	Good		Protect
1321	Douglas Fir	*Pseudotsuga menziesii*	20	17	908	20	1257	2513	Good	Good		Protect
1322	Bigleaf Maple	*Acer macrophyllum*	7	9	254	25	1963	3927	Good	Good		Protect
1323	Willow	*Salix sp.*	8		0		0	0	Dead			Protect
1324	Willow	*Salix sp.*	7	9	254	20	1257	2513	Poor	Poor	Trunk decay.	Protect
1325	Douglas Fir	*Pseudotsuga menziesii*	6	8	201	20	1257	2513	Good	Good		Protect
1326	Oregon Ash	*Oregon Ash*	10	8	201	15	707	1414	Good	Good		Protect

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Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1327	Douglas Fir	*Pseudotsuga menziesii*	6	5	79	20	1257	2513	Poor	Poor	Suppressed	Protect
1328	Douglas Fir	*Pseudotsuga menziesii*	6	5	79	20	1257	2513	Poor	Poor	Suppressed	Protect
1329	Willow	*Salix sp.*	8	9	254	20	1257	2513	Poor	Poor	Trunk decay.	Protect
1330	Willow	*Salix sp.*	6	7	154	20	1257	2513	Good	Good		Protect
1331	Oregon Ash	*Fraxinus latifolia*	9	7	154	15	707	1414	Good	Good		Protect
1332	Oregon Ash	*Fraxinus latifolia*	18	13	531	15	707	1414	Good	Good		Protect
1333	Oregon Ash	*Fraxinus latifolia*	8	8	201	15	707	1414	Good	Good		Protect
1334	Oregon Ash	*Fraxinus latifolia*	12	8	201	15	707	1414	Good	Good		Protect
1335	Oregon Ash	*Fraxinus latifolia*	18	13	531	15	707	1414	Good	Good		Protect
1336	Oregon Ash	*Fraxinus latifolia*	26	19	1134	19	1134	2268	Good	Good	2 stems 6,25.	Protect
1337	Oregon Ash	*Fraxinus latifolia*	7	5	79	15	707	1414	Good	Good		Protect
1338	Oregon Ash	*Fraxinus latifolia*	7	5	79	15	707	1414	Good	Good		Protect
1339	Oregon Ash	*Fraxinus latifolia*	12	9	254	15	707	1414	Good	Good		Protect
1340	Oregon Ash	*Fraxinus latifolia*	8	9	254	15	707	1414	Good	Good		Protect
1341	Oregon Ash	*Fraxinus latifolia*	30	25	1963	25	1963	3927	Good	Good		Protect
1342	Oregon Ash	*Fraxinus latifolia*	14	7	154	15	707	1414	Poor	Poor	Thinning crown Broken top.	Protect
1343	Oregon Ash	*Fraxinus latifolia*	27		0		0	0	Poor	Poor	History of large limb failure	Protect
1344	Oregon Ash	*Fraxinus latifolia*	8	8	201	15	707	1414	Good	Good		Protect
1345	Oregon Ash	*Fraxinus latifolia*	9		0		0	0	Dead			Protect
1346	Oregon Ash	*Fraxinus latifolia*	13	9	254	15	707	1414	Good	Good		Protect
1347	Oregon Ash	*Fraxinus latifolia*	12	10	314	15	707	1414	Good	Good		Protect
1348	Oregon Ash	*Fraxinus latifolia*	17	14	616	15	707	1414	Fair	Fair	History of large limb failure.	Protect
1349	Oregon Ash	*Fraxinus latifolia*	13	9	254	15	707	1414	Poor	Poor	2 stems 6,12. History of large limb failure.	Protect
1350	Oregon Ash	*Fraxinus latifolia*	10	5	79	15	707	1414	Poor	Poor	Thinning crown. Limb loss.	Protect
1351	Oregon Ash	*Fraxinus latifolia*	22	18	1018	18	1018	2036	Good	Good		Protect
1352	Oregon Ash	*Fraxinus latifolia*	11	7	154	15	707	1414	Good	Good		Protect
1353	Oregon Ash	*Fraxinus latifolia*	10	11	380	15	707	1414	Good	Good		Protect
1354	Willow	*Salix sp.*	6	6	113	20	1257	2513	Good	Good		Protect
1355	Oregon Ash	*Fraxinus latifolia*	10	7	154	15	707	1414	Good	Good		Protect
1356	Douglas Fir	*Pseudotsuga menziesii*	8	10	314	20	1257	2513	Good	Good		Protect
1357	Willow	*Salixsp.*	6	6	113	20	1257	2513	Good	Good		Protect
1358	Bigleaf Maple	*Acer macrophyllum*	17	14	616	25	1963	3927	Good	Good	6 stems 6,6,6,7,8,9.	Protect
1359	Pacific Madrone	*Arbutus menziesii*	12	11	380	15	707	1414	Good	Good	4 stems 7,7,5,5.	Protect
1360	Douglas Fir	*Pseudotsuga menziesii*	9	6	113	20	1257	2513	Good	Good		Protect
1361	Douglas Fir	*Pseudotsuga menziesii*	6	6	113	20	1257	2513	Good	Good		Protect
1362	Willow	*Salix sp.*	8	12	452	20	1257	2513	Fair	Fair	Trunk cavity.	Protect
1363	Douglas Fir	*Pseudotsuga menziesii*	6	6	113	20	1257	2513	Good	Good		Protect

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Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1364	Douglas Fir	*Pseudotsuga menziesii*	17	14	616	20	1257	2513	Good	Good		Protect
1365	Willow	*Salixsp.*	8	5	79	20	1257	2513	Good	Good		Protect
1366	Oregon Ash	*Fraxinus latifolia*	13		0		0	0	Dead			Protect
1367	Oregon Ash	*Fraxinus latifolia*	26	10	314	15	707	1414	Poor	Poor	2 stems 16,20. Broken tops.	Protect
1368	Oregon Ash	*Fraxinus latifolia*	10	8	201	15	707	1414	Poor	Poor	Thin crown	Protect
1369	Oregon Ash	*Fraxinus latifolia*	12	8	201	15	707	1414	Poor	Poor	Broken top	Protect
1370	Oregon Ash	*Fraxinus latifolia*	12	7	154	15	707	1414	Poor	Poor	Thin crown. Crown die back.	Protect
1371	Oregon Ash	*Fraxinus latifolia*	12	4	50	15	707	1414	Poor	Poor	Dead top.	Protect
1372	Oregon Ash	*Fraxinus latifolia*	13	10	314	15	707	1414	Good	Good		Protect
1373	Oregon Ash	*Fraxinus latifolia*	16	15	707	15	707	1414	Good	Good		Protect
1374	Oregon Ash	*Fraxinus latifolia*	8	4	50	15	707	1414	Poor	Poor	Suppressed.	Protect
1375	Oregon Ash	*Fraxinus latifolia*	17	10	314	15	707	1414	Good	Good		Protect
1376	Oregon Ash	*Fraxinus latifolia*	17	15	707	15	707	1414	Good	Good		Protect
1377	Oregon Ash	*Fraxinus latifolia*	6	4	50	15	707	1414	Poor	Poor	Broken top.	Protect
1378	Oregon Ash	*Fraxinus latifolia*	12		0		0	0	Dead			Protect
1379	Oregon Ash	*Fraxinus latifolia*	6		0		0	0	Dead			Protect
1380	Oregon Ash	*Fraxinus latifolia*	17	20	1257	20	1257	0	Good	Good	Offsite.	Protect
1381	Oregon Ash	*Fraxinus latifolia*	9	6	113	15	707	1414	Poor	Poor	Broken top.	Protect
1382	Oregon Ash	*Fraxinus latifolia*	6	8	201	15	707	1414	Good	Good		Protect
1383	Oregon Ash	*Fraxinus latifolia*	8	8	201	15	707	1414	Good	Good		Protect
1384	Oregon Ash	*Fraxinus latifolia*	15	13	531	15	707	1414	Fair	Fair	Crown die back. History of limb loss.	Protect
1385	Oregon Ash	*Fraxinus latifolia*	8	8	201	15	707	1414	Good	Good		Protect
1386	Oregon Ash	*Fraxinus latifolia*	8	7	154	15	707	1414	Poor	Poor	Suppressed.	Protect
1387	Oregon Ash	*Fraxinus latifolia*	17	12	452	15	707	1414	Good	Good	2 stems 6,16.	Protect
1387.1	Oregon Ash	*Fraxinus latifolia*	7	7	154	15	707	1414	Good	Good		Protect
1388	Oregon Ash	*Fraxinus latifolia*	17	18	1018	18	1018	2036	Good	Good		Protect
1389	Oregon Ash	*Fraxinus latifolia*	14	15	707	15	707	1414	Good	Good		Protect
1390	Oregon Ash	*Fraxinus latifolia*	10	12	452	15	707	1414	Good	Good		Protect
1391	Oregon Ash	*Fraxinus latifolia*	15	14	616	15	707	1414	Good	Good		Protect
1392	Oregon Ash	*Fraxinus latifolia*	7	9	254	15	707	1414	Good	Good		Protect
1393	Oregon Ash	*Fraxinus latifolia*	13		0		0	0	Dead			Protect
1394	Oregon Ash	*Fraxinus latifolia*	10	10	314	15	707	1414	Good	Good		Protect
1395	Oregon Ash	*Fraxinus latifolia*	14	7	154	15	707	1414	Poor	Poor	Broken top.	Protect
1396	Oregon Ash	*Fraxinus latifolia*	15	13	531	15	707	1414	Good	Good		Protect
1397	Oregon Ash	*Fraxinus latifolia*	10	7	154	15	707	1414	Poor	Poor	Broken top.	Protect

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Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1398	Oregon Ash	*Fraxinus latifolia*	14	16	804	16	804	1608	Good	Good		Protect
1399	Oregon Ash	*Fraxinus latifolia*	9	10	314	15	707	1414	Good	Good		Protect
1400	Oregon Ash	*Fraxinus latifolia*	9	10	314	15	707	1414	Good	Good		Protect
1401	Oregon Ash	*Fraxinus latifolia*	7	10	314	15	707	1414	Good	Good		Protect
1402	Oregon Ash	*Fraxinus latifolia*	10	9	254	15	707	1414	Good	Good		Protect
1403	Oregon White Oak	*Quercus garrayana*	29	42	5542	42	5542	11084	Good	Good	2 stems 17,23.	Protect
1404	Douglas Fir	*Pseudotsuga menziesii*	17	15	707	20	1257	2513	Good	Good		Protect
1405	Bigleaf Maple	*Acer macrophyllum*	6	12	452	25	1963	3927	Good	Good		Protect
1406	Oregon Ash	*Fraxinus latifolia*	8	9	254	15	707	1414	Good	Good		Protect
1407	Bigleaf Maple	*Acer macrophyllum*	15	13	531	25	1963	3927	Fair	Fair	Broken top. Thin crown. 2 stems 7,13.	Protect
1408	Oregon White Oak	*Quercus garrayana*	9	10	314	25	1963	3927	Good	Good	3 stems 6,5,5.	Protect
1409	Oregon Ash	*Fraxinus latifolia*	6	9	254	15	707	1414	Good	Good		Protect
1410	Douglas Fir	*Pseudotsuga menziesii*	20	20	1257	20	1257	2513	Good	Good		Protect
1411	Sweet Cherry	*Prunus avium*	7	9	254	15	707	1414	Good	Good		Protect
1412	Oregon White Oak	*Quercus garrayana*	10	12	452	25	1963	3927	Good	Good		Protect
1413	Sweet Cherry	*Prunus avium*	6	8	201	15	707	1414	Good	Good		Protect
1414	Willow	*Salix sp.*	8	12	452	20	1257	2513	Good	Good		Protect
1418	Oregon Ash	*Fraxinus latifolia*	23	18	1018	18	1018	2036	Good	Good	2 stems 8,22	Protect
1419	Oregon Ash	*Fraxinus latifolia*	13	17	908	17	908	1816	Good	Good	2 stems 6,12.	Protect
1420	Sweet Cherry	*Prunus avium*	8	6	113	15	707	1414	Good	Good		Protect
1421	Sweet Cherry	*Prunus avium*	7	8	201	15	707	1414	Good	Good		Protect
1422	Sweet Cherry	*Prunus avium*	6	6	113	15	707	1414	Poor	Poor	Broken top.	Protect
1423	Sweet Cherry	*Prunus avium*	7	8	201	15	707	1414	Poor	Poor	Broken top	Protect
1424	Sweet Cherry	*Prunus avium*	6	6	113	15	707	1414	Poor	Poor	Broken top.	Protect
1425	Willow	*Salix sp.*	18	21	1385	21	1385	2771	Good	Good		Protect
1426	Willow	*Salix sp.*	12	15	707	20	1257	2513	Good	Good		Protect
1427	Willow	*Salix sp.*	6	6	113	20	1257	2513	Poor	Poor	Suppressed.	Protect
1428	Willow	*Salix sp.*	9	8	201	20	1257	2513	Good	Good		Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1429	Willow	*Salix sp.*	8	12	452	20	1257	2513	Good	Good		Protect
1430	Willow	*Salix sp.*	7	12	452	20	1257	2513	Good	Good		Protect
1441	Willow	*Salix sp.*	16	11	380	20	1257	2513	Poor	Poor	5 stems 4,4,4,6,13. Trunk decay.	Protect
1442	Bigleaf Maple	*Acer macrophyllum*	14	10	314	25	1963	3927	Poor	Poor	Dead top. 2 stems 8,12.	Protect
1443	Douglas Fir	*Pseudotsuga menziesii*	14	9	254	20	1257	2513	Poor	Poor	Thin crown.	Protect
1444	Douglas Fir	*Pseudotsuga menziesii*	20	16	804	20	1257	2513	Good	Good		Protect
1445	Willow	*Salix sp.*	6	7	154	20	1257	2513	Fair	Good	Trunk cavity.	Protect
1446	Bigleaf Maple	*Acer macrophyllum*	6	11	380	25	1963	3927	Good	Good		Protect
1447	Douglas Fir	*Pseudotsuga menziesii*	8	12	452	20	1257	2513	Good	Good		Protect
1448	Douglas Fir	*Pseudotsuga menziesii*	13	14	616	20	1257	2513	Good	Good		Protect
1449	Douglas Fir	*Pseudotsuga menziesii*	7	8	201	20	1257	2513	Good	Good		Protect
1450	Willow	*Salix sp.*	6	4	50	20	1257	2513	Poor	Poor	Suppressed.	Protect
1451	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	2513	Good	Good		Protect
1452	Douglas Fir	*Pseudotsuga menziesii*	11	12	452	20	1257	2513	Good	Good		Protect
1453	Willow	*Salix sp.*	6	4	50	20	1257	2513	Poor	Poor	Broken top.	Protect
1454	Sweet Cherry	*Prunus avium*	7	4	50	15	707	1414	Poor	Poor	Broken top.	Protect
1455	Sweet Cherry	*Prunus avium*	6	5	79	15	707	1414	Good	Good		Protect
1456	Douglas Fir	*Pseudotsuga menziesii*	12	15	707	20	1257	2513	Good	Good		Protect
1457	Douglas Fir	*Pseudotsuga menziesii*	17	16	804	20	1257	2513	Good	Good		Protect
1458	Willow	*Salix sp.*	6	8	201	20	1257	2513	Good	Good		Protect
1459	Willow	*Salix sp.*	6	9	254	20	1257	2513	Good	Good		Protect
1460	Willow	*Salix sp.*	6	6	113	20	1257	2513	Good	Good		Protect
1461	Willow	*Salix sp.*	6	6	113	20	1257	2513	Good	Good		Protect
1462	Oregon Ash	*Fraxinus latifolia*	11	12	452	15	707	1414	Good	Good	2 stems 7,8.	Protect
1463	Oregon Ash	*Fraxinus latifolia*	7	9	254	15	707	1414	Good	Good		Protect
1464	Oregon Ash	*Fraxinus latifolia*	8	14	616	15	707	1414	Good	Good		Protect
1465	Willow	*Salix sp.*	6	7	154	20	1257	2513	Poor	Poor	Broken top.	Protect
1466	Willow	*Salix sp.*	6	10	314	20	1257	2513	Good	Good		Protect
1467	Bigleaf Maple	*Acer macrophyllum*	7	6	113	25	1963	3927	Poor	Poor	Broken top.	Protect
1468	Bigleaf Maple	*Acer macrophyllum*	6	4	50	25	1963	3927	Poor	Poor	Broken top.	Protect
1469	Bigleaf Maple	*Acer macrophyllum*	8	5	79	25	1963	3927	Poor	Poor	Dead top.	Protect
1470	Bigleaf Maple	*Acer macrophyllum*	13	16	804	25	1963	3927	Poor	Poor	Thin crown.	Protect
1471	Bigleaf Maple	*Acer macrophyllum*	10		0		0	0	Dead			Protect
1472	Bigleaf Maple	*Acer macrophyllum*	15	11	380	25	1963	3927	Poor	Poor	Thin crown.	Protect
1473	Bigleaf Maple	*Acer macrophyllum*	7	10	314	25	1963	3927	Poor	Poor	Dead top.	Protect

Teragan Associates, Inc.
3145 Westview Circle • Lake Oswego, OR 97034
Phone: 971.295.4835 • Fax: 503.697.1976
Email: todd@teragan.com • Website: teragan.com

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1474	Bigleaf Maple	*Acer macrophyllum*	7	7	154	25	1963	3927	Poor	Poor	Thin crown.	Protect
1475	Oregon White Oak	*Quercus garrayana*	12	9	254	25	1963	3927	Good	Good		Protect
1476	Douglas Fir	*Pseudotsuga menziesii*	16	9	254	20	1257	2513	Poor	Poor	Broken top	Protect
1477	Pacific Madrone	*Arbutus menziesii*	8	13	531	15	707	1414	Good	Good		Protect
1478	Pacific Madrone	*Arbutus menziesii*	9	12	452	15	707	1414	Good	Good		Protect
1479	Bigleaf Maple	*Acer macrophyllum*	9	14	616	25	1963	3927	Good	Good		Protect
1480	Oregon Ash	*Fraxinus latifolia*	12	12	452	15	707	1414	Good	Good		Protect
1481	Sweet Cherry	*Prunus avium*	8		0		0	0	Dead			Protect
1481.1	Sweet Cherry	*Prunus avium*	10	10	314	15	707	1414	Good	Good		Protect
1482	Sweet Cherry	*Prunus avium*	11	12	452	15	707	1414	Good	Good		Protect
1483	Sweet Cherry	*Prunus avium*	9	10	314	15	707	1414	Good	Good	2 stems 6,7.	Protect
1484	Sweet Cherry	*Prunus avium*	6	8	201	15	707	1414	Good	Good		Protect
1485	Sweet Cherry	*Prunus avium*	6	4	50	15	707	1414	Poor	Poor	Suppressed.	Protect
1486	Douglas Fir	*Pseudotsuga menziesii*	9		0		0	0				Protect
1487	Douglas Fir	*Pseudotsuga menziesii*	11	8	201	20	1257	2513	Poor	Poor	Suppressed.	Protect
1488	Oregon White Oak	*Quercus garrayana*	22	25	1963	25	1963	3927	Good	Good		Protect
1489	Sweet Cherry	*Prunus avium*	16	25	1963	25	1963	3927	Good	Good		Protect
1490	Oregon White Oak	*Quercus garrayana*	10	8	201	25	1963	3927	Good	Good	2 stems 6,8.	Protect
1491	Douglas Fir	*Pseudotsuga menziesii*	8		0		0	0	Dead			Protect
1492	Willow	*Salix sp.*	6	5	79	20	1257	2513	Poor	Poor	Trunk decay.	Protect
1493	Oregon White Oak	*Quercus garrayana*	14	14	616	25	1963	3927	Good	Good	5 stems 6,6,6,7,7.	Protect
1494	Oregon White Oak	*Quercus garrayana*	26	35	3848	35	3848	7697	Good	Good	2 stems 13,23.	Protect
1495	Oregon White Oak	*Quercus garrayana*	13	4	50	25	1963	3927	Poor	Poor	3 stems 7,8,8. Broken tops	Protect
1496	Sweet Cherry	*Prunus avium*	6	5	79	15	707	1414	Good	Good		Protect
1497	Oregon White Oak	*Quercus garrayana*	14	12	452	25	1963	3927	Fair	Fair	Epicormic sprouts.	Protect
1498	Sweet Cherry	*Prunus avium*	11	13	531	15	707	1414	Good	Good	2 stems 8,8.	Protect
1499	Sweet Cherry	*Prunus avium*	11	13	531	15	707	1414	Good	Good	2 stems 6,7.	Protect
1500	Douglas Fir	*Pseudotsuga menziesii*	12	15	707	20	1257	2513	Good	Good		Protect
1501	Oregon White Oak	*Quercus garrayana*	13	12	452	25	1963	3927	Good	Good	4 stems 5,6,7,7.	Protect
1502	Oregon White Oak	*Quercus garrayana*	8	6	113	25	1963	3927	Good	Good	2 stems 6,6.	Protect
1503	Sweet Cherry	*Prunus avium*	6	9	254	15	707	1414	Good	Good		Protect
1504	Sweet Cherry	*Prunus avium*	7	8	201	15	707	1414	Good	Good		Protect
1505	Oregon White Oak	*Quercus garrayana*	32	23	1662	25	1963	3927	Good	Good	2 stems 16,28.	Protect
1506	Oregon Ash	*Fraxinus latifolia*	18	17	908	17	908	1816	Good	Good		Protect
1507	Oregon Ash	*Fraxinus latifolia*	18	12	452	15	707	1414	Poor	Poor	7 stems 5,5,6,6,7,7,11. Broken top	Protect
1508	Oregon Ash	*Fraxinus latifolia*	7		0		0	0	Dead			Protect
1509	Oregon Ash	*Fraxinus latifolia*	12	9	254	15	707	1414	Good	Good		Protect
1510	Oregon Ash	*Fraxinus latifolia*	17	10	314	15	707	1414	Poor	Poor	Broken top.	Protect
1511	Oregon Ash	*Fraxinus latifolia*	19	13	531	15	707	1414	Good	Good		Protect

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Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1512	Oregon Ash	*Fraxinus latifolia*	13	9	254	15	707	1414	Good	Good	2 stems 6,12.	Protect
1513	Oregon Ash	*Fraxinus latifolia*	15	12	452	15	707	1414	Fair	Fair	Broken stem.	Protect
1514	Oregon Ash	*Fraxinus latifolia*	18	13	531	15	707	1414	Good	Good	2 stems 7,17	Protect
1515	Oregon Ash	*Fraxinus latifolia*	16	14	616	15	707	1414	Fair	Fair	Trunk decay.	Protect
1516	Oregon Ash	*Fraxinus latifolia*	16	18	1018	18	1018	2036	Good	Good		Protect
1517	Oregon Ash	*Fraxinus latifolia*	17	12	452	15	707	1414	Good	Good		Protect
1518	Oregon Ash	*Fraxinus latifolia*	16	9	254	15	707	1414	Poor	Poor	Broken top.	Protect
1519	Oregon Ash	*Fraxinus latifolia*	9	8	201	15	707	1414	Good	Good		Protect
1520	Oregon Ash	*Fraxinus latifolia*	28	19	1134	19	1134	2268	Poor	Poor	2 stems 11,26. Broken decay. Broken tops	Protect
1521	Oregon Ash	*Fraxinus latifolia*	22	15	707	15	707	1414	Poor	Poor	Broken top.	Protect
1522	Douglas Fir	*Pseudotsuga menziesii*	22	13	531	20	1257	2513	Poor	Poor	Dead top.	Protect
1523	Oregon White Oak	*Quercus garrayana*	25	23	1662	25	1963	3927	Good	Good	3 stems 6,15,19.	Protect
1524	Douglas Fir	*Pseudotsuga menziesii*	15	14	616	20	1257	2513	Fair	Fair	Thin crown.	Protect
1525	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	1414	Good	Good		Protect
1526	Pacific Madrone	*Arbutus menziesii*	10	8	201	15	707	1414	Fair	Fair	Trunk decay.	Protect
1527	Oregon Ash	*Fraxinus latifolia*	7	9	254	15	707	1414	Good	Good		Protect
1542	Willow	*Salix sp.*	7	8	201	20	1257	2513	Poor	Poor	Trunk decay	Protect
1543	Oregon White Oak	*Quercus garrayana*	8	8	201	25	1963	3927	Good	Good	2 stems 6,6.	Protect
1544	Pacific Madrone	*Arbutus menziesii*	15	14	616	15	707	1414	Good	Good	3 stems 9,10,11.	Protect
1545	Pacific Madrone	*Arbutus menziesii*	17	14	616	15	707	1414	Good	Good	8 stems 5,5,5,5,6,6,8,I.	Protect
1548	Pacific Madrone	*Arbutus menziesii*	10	12	452	15	707	1414	Good	Good	3 stems 5,6,7.	Protect
1558	Sweet Cherry	*Prunus avium*	11	10	314	15	707	1414	Good	Good	3 stems 4,7,8,	Protect
1559	Sweet Cherry	*Prunus avium*	7	4	50	15	707	1414	Poor	Poor	Partial uproot	Protect
1560	Sweet Cherry	*Prunus avium*	7	6	113	15	707	1414	Good	Good		Protect
1561	Douglas Fir	*Pseudotsuga menziesii*	17	16	804	20	1257	2513	Good	Good		Protect
1562	Douglas Fir	*Pseudotsuga menziesii*	16	16	804	20	1257	2513	Good	Good		Protect
1563	Willow	*Salix sp.*	6	5	79	20	1257	2513	Poor	Poor	Suppressed.	Protect
1564	Willow	*Salix sp.*	8	12	452	20	1257	2513	Good	Good	2 stems 6,6.	Protect
1565	Willow	*Salix sp.*	8	8	201	20	1257	2513	Poor	Poor	Crown die back. Trunk cavity	Protect
1566	Willow	*Salix sp.*	6	6	113	20	1257	2513	Poor	Poor	Crown die back	Protect
1567	Willow	*Salix sp.*	17	18	1018	20	1257	2513	Good	Good	2 stems 12,12.	Protect
1568	Douglas Fir	*Pseudotsuga menziesii*	13	14	616	20	1257	2513	Good	Good		Protect
1569	Willow	*Salix sp.*	11	9	254	20	1257	2513	Good	Good		Protect
1570	Sweet Cherry	*Prunus avium*	9	12	452	15	707	1414	Good	Good	2 stems 6,8.	Protect
1571	Willow	*Salix sp.*	8		0		0	0	Dead			Protect
1572	Willow	*Salix sp.*	10	7	154	20	1257	2513	Poor	Poor	2 stems 6,7. Crown die back	Protect
1573	Willow	*Salix sp.*	12	14	616	20	1257	2513	Good	Good	2 stems 8,9.	Protect
1574	Willow	*Salix sp.*	8	11	380	20	1257	2513	Good	Good	2 stems 6,6.	Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1575	Bigleaf Maple	*Acer macrophyllum*	18	20	1257	25	1963	3927	Good	Good	4 stems 7,8,10,11.	Protect
1576	Oregon White Oak	*Quercus garrayana*	6	9	254	25	1963	3927	Good	Good		Protect
1577	Oregon White Oak	*Quercus garrayana*	6	8	201	25	1963	3927	Good	Good		Protect
1578	Pacific Madrone	*Arbutus menziesii*	15	15	707	15	707	1414	Good	Good	4 stems 5,5,9,9.	Protect
1579	Pacific Madrone	*Arbutus menziesii*	12	19	1134	15	707	1414	Good	Good	4 stems 4,6,6,7.	Protect
1580	Oregon White Oak	*Quercus garrayana*	8	11	380	25	1963	3927	Good	Good		Protect
1581	Pacific Madrone	*Arbutus menziesii*	7	11	380	15	707	1414	Good	Good		Protect
1582	Willow	*Salix sp.*	13	13	531	20	1257	2513	Poor	Poor	2 stems 9,9. Trunk decay. History of limb failure	Protect
1583	Oregon White Oak	*Quercus garrayana*	6	11	380	25	1963	3927	Good	Good		Protect
1584	Oregon White Oak	*Quercus garrayana*	10	13	531	25	1963	3927	Good	Good	4 stems 6,5,4,4.	Protect
1586	Oregon White Oak	*Quercus garrayana*	13	14	616	25	1963	3927	Good	Good	3 stems 6,7,8.	Protect
1587	Pacific Madrone	*Arbutus menziesii*	7	14	616	15	707	1414	Good	Good		Protect
1588	Pacific Madrone	*Arbutus menziesii*	7	11	380	15	707	1414	Good	Fair	Severe lean.	Protect
1589	Douglas Fir	*Pseudotsuga menziesii*	13	13	531	20	1257	2513	Good	Good		Protect
1590	Douglas Fir	*Pseudotsuga menziesii*	15	16	804	20	1257	2513	Good	Good		Protect
1591	Sweet Cherry	*Prunus avium*	7	8	201	15	707	1414	Good	Good		Protect
1592	Sweet Cherry	*Prunus avium*	7	9	254	15	707	1414	Good	Good	2 stems 6,4.	Protect
1593	Willow	*Salix sp.*	11	14	616	20	1257	2513	Good	Good		Protect
1594	Willow	*Salix sp.*	10	9	254	20	1257	2513	Good	Good	3 stems 4,6,7.	Protect
1595	Bigleaf Maple	*Acer macrophyllum*	8	6	113	25	1963	3927	Good	Good	2 stems 6,6.	Protect
1596	Willow	*Salix sp.*	6	5	79	20	1257	2513	Poor	Poor	2 stems 6,5. Trunk decay	Protect
1597	Douglas Fir	*Pseudotsuga menziesii*	13	12	452	20	1257	2513	Good	Good		Protect
1598	Willow	*Salix sp.*	11	9	254	20	1257	2513	Poor	Poor	Trunk decay. 2 stems 7,8.	Protect
1599	Willow	*Salix sp.*	6	8	201	20	1257	2513	Poor	Poor	Trunk decay	Protect
1600	Sweet Cherry	*Prunus avium*	6	8	201	15	707	1414	Good	Good		Protect
1601	Sweet Cherry	*Prunus avium*	8	12	452	15	707	1414	Good	Good		Protect
1602	Willow	*Salix sp.*	6	9	254	20	1257	2513	Fair	Fair	Trunk lesions	Protect
1603	Douglas Fir	*Pseudotsuga menziesii*	11	8	201	20	1257	2513	Good	Good		Protect
1604	Douglas Fir	*Pseudotsuga menziesii*	6	5	79	20	1257	2513	Good	Good		Protect
1605	Sweet Cherry	*Prunus avium*	9	12	452	15	707	1414	Good	Good		Protect
1606	Willow	*Salix sp.*	6	11	380	20	1257	2513	Good	Good		Protect
1606.1	Willow	*Salix sp.*	9	9	254	20	1257	2513	Good	Good	Stems 5,5,5.	Protect
1607	Douglas Fir	*Pseudotsuga menziesii*	10	10	314	20	1257	2513	Good	Good		Protect
1608	Douglas Fir	*Pseudotsuga menziesii*	9	8	201	20	1257	2513	Good	Good		Protect
1609	Douglas Fir	*Pseudotsuga menziesii*	11	14	616	20	1257	2513	Good	Good		Protect

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Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1610	Willow	*Salix sp.*	7	6	113	20	1257	2513	Poor	Poor	Suppressed	Protect
1611	Douglas Fir	*Pseudotsuga menziesii*	14	14	616	20	1257	2513	Good	Good		Protect
1612	Willow	*Salix sp.*	6	7	154	20	1257	2513	Poor	Poor	Dead top	Protect
1613	Pacific Madrone	*Arbutus menziesii*	13	12	452	15	707	1414	Good	Good	3 stems 7,8,8.	Protect
1614	Oregon White Oak	*Quercus garrayana*	12	18	1018	25	1963	3927	Good	Good		Protect
1615	Pacific Madrone	*Arbutus menziesii*	18	17	908	15	707	1414	Good	Good	3 stems 10,10,11.	Protect
1616	Sweet Cherry	*Prunus avium*	6	8	201	15	707	1414	Good	Good		Protect
1617	Sweet Cherry	*Prunus avium*	7	8	201	15	707	1414	Good	Good		Protect
1618	Sweet Cherry	*Prunus avium*	8	9	254	15	707	1414	Good	Good		Protect
1619	Willow	*Salix sp.*	7	10	314	20	1257	2513	Good	Good		Protect
1620	Sweet Cherry	*Prunus avium*	13	18	1018	18	1018	2036	Good	Good		Protect
1621	Willow	*Salix sp.*	11	9	254	20	1257	2513	Good	Good	2 stems 8,8.	Protect
1622	Willow	*Salix sp.*	6		0		0	0	Dead			Protect
1623	Willow	*Salix sp.*	8	9	254	20	1257	2513	Good	Good	2 stems 4,7.	Protect
1624	Oregon Ash	*Fraxinus latifolia*	6	6	113	15	707	1414	Good	Good		Protect
1625	Sweet Cherry	*Prunus avium*	6	8	201	15	707	1414	Good	Good		Protect
1626	Sweet Cherry	*Prunus avium*	6	7	154	15	707	1414	Good	Good		Protect
1627	Willow	*Salix sp.*	6	4	50	20	1257	2513	Poor	Poor	Trunk decay	Protect
1628	Willow	*Salix sp.*	8	11	380	20	1257	2513	Good	Good		Protect
1629	Willow	*Salix sp.*	12	12	452	20	1257	2513	Good	Good	3 stems 6,7,7.	Protect
1630	Willow	*Salix sp.*	9	10	314	20	1257	2513	Good	Good		Protect
1631	Sweet Cherry	*Prunus avium*	8	10	314	15	707	1414	Good	Good		Protect
1632	Willow	*Salix sp.*	8	9	254	20	1257	2513	Good	Good	2 stems 6,6.	Protect
1633	Willow	*Salix sp.*	12	14	616	20	1257	2513	Good	Good	2 stems 7,10.	Protect
1634	Willow	*Salix sp.*	9	12	452	20	1257	2513	Good	Good		Protect
1635	Willow	*Salix sp.*	8	10	314	20	1257	2513	Good	Good		Protect
1636	Douglas Fir	*Pseudotsuga menziesii*	12	9	254	20	1257	2513	Poor	Poor	Thin crown	Protect
1637	Willow	*Salix sp.*	6	6	113	20	1257	2513	Fair	Fair		Protect
15229	Pacific Madrone	*Arbutus menziesii*	6	6	113	15	707	1414	Good	Good		Protect
15391	Oregon Ash	*Oregon Ash*	21	15	707	15	707	0	Good	Good	2 stems 13,16. Offsite.	Protect
15397	Oregon Ash	*Fraxinus latifolia*	22	19	1134	15	707	0	Good	Good	2 stems 6,20. Offsite.	Protect
15398	Oregon Ash	*Fraxinus latifolia*	21	20	1257	15	707	0	Good	Good	Offsite.	Protect
15403	Oregon Ash	*Fraxinus latifolia*	14	10	314	15	707	0	Poor	Poor	Severe trunk decay. Offsite.	Protect
15452	Oregon Ash	*Fraxinus latifolia*	18	14	616	15	707	0	Good	Good	Offsite.	Protect
15455	Oregon Ash	*Fraxinus latifolia*	7	3	28	15	707	1414	Poor	Poor	Suppressed.	Protect
15498	Oregon Ash	*Fraxinus latifolia*	12		0		0	0	Dead			Protect
15499	Oregon Ash	*Fraxinus latifolia*	20	15	707	15	707	0	Good	Good	Offsite.	Protect
15500	Oregon Ash	*Fraxinus latifolia*	16	12	452	15	707	0	Fair	Fair	History of large limb failure. Offsite.	Protect
15603	Douglas Fir	*Pseudotsuga menziesii*	7	7	154	20	1257	2513	Good	Good		Protect

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
15603	Douglas Fir	*Pseudotsuga menziesii*	7	7	154	20	1257	2513	Good	Good		Protect
15639	Douglas Fir	*Pseudotsuga menziesii*	17	13	531	20	1257	2513	Good	Good		Protect
15697	Pacific Madrone	*Arbutus menziesii*	7	9	254	15	707	1414	Good	Good		Protect
1046	Oregon Ash	*Fraxinus latifolia*	35	38	4536	15	707	0	Good	Good	6 stems 12,13,13,15,15,16.	Remove
1047	Sweet Cherry	*Prunus avium*	11	5	79	15	707	0	Good	Good	2 stems 6,9.	Remove
1048	Oregon Ash	*Fraxinus latifolia*	8	13	531	15	707	0	Good	Good		Remove
1049	Oregon Ash	*Fraxinus latifolia*	10	13	531	15	707	0	Good	Poor	2 stems 7,7. Topped.	Remove
1054	Oregon Ash	*Fraxinus latifolia*	7	10	314	15	707	0	Good	Good		Remove
1055	Oregon Ash	*Fraxinus latifolia*	6	10	314	15	707	0	Good	Good		Remove
1056	Oregon Ash	*Fraxinus latifolia*	7	11	380	15	707	0	Good	Good		Remove
1057	Oregon Ash	*Fraxinus latifolia*	6	13	531	15	707	0	Good	Good		Remove
1058	European White Birch	*Betula pendula*	11	10	314	12	452	0	Good	Good		Remove
1059	European White Birch	*Betula pendula*	20	12	452	12	452	0	Good	Good	4 stems 6,8,11,13	Remove
1060	Common Hawthorn	*Crataegus monogyna*	8	9	254	9	254	0	Good	Good		Remove
1061	Pacific Madrone	*Arbutus menziesii*	21	22	1521	22	1521	0	Good	Good		Remove
1062	Pacific Madrone	*Arbutus menziesii*	8	10	314	15	707	0	Good	Fair	Severe lean north	Remove
1063	Douglas Fir	*Pseudotsuga menziesii*	32	24	1810	24	1810	0	Good	Good		Remove
1064	Pacific Madrone	*Arbutus menziesii*	11	10	314	15	707	0	Good	Good		Remove
1065	Pacific Madrone	*Arbutus menziesii*	14	13	531	15	707	0	Good	Good	2 stems 8,13.	Remove
1066	Pacific Madrone	*Arbutus menziesii*	18	16	804	16	804	0	Good	Good	2 stems 13,13.	Remove
1067	Douglas Fir	*Pseudotsuga menziesii*	18	16	804	20	1257	0	Good	Good		Remove
1068	Pacific Madrone	*Arbutus menziesii*	7	6	113	15	707	0	Good	Good		Remove
1069	Sweet Cherry	*Prunus avium*	6	9	254	15	707	0	Good	Good		Remove
1070	Oregon White Oak	*Quercus garrayana*	19	15	707	25	1963	0	Good	Good		Remove
1071	Pacific Madrone	*Arbutus menziesii*	14	14	616	15	707	0	Good	Good		Remove
1072	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1073	Douglas Fir	*Pseudotsuga menziesii*	8	9	254	20	1257	0	Good	Good		Remove
1074	Douglas Fir	*Pseudotsuga menziesii*	10	12	452	20	1257	0	Good	Good		Remove
1075	Douglas Fir	*Pseudotsuga menziesii*	12	0	0	20	1257	0	Dead			Remove
1076	Pacific Madrone	*Arbutus menziesii*	11	15	707	15	707	0	Good	Good		Remove
1077	Cascara	*Rhamnus purshiana*	6	4	50	12	452	0	Good	Good		Remove
1078	Douglas Fir	*Pseudotsuga menziesii*	21	14	616	20	1257	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1079	Douglas Fir	*Pseudotsuga menziesii*	38	20	1257	20	1257	0	Good	Good		Remove
1080	Sweet Cherry	*Prunus avium*	6	8	201	15	707	0	Good	Good		Remove
1081	Douglas Fir	*Pseudotsuga menziesii*	24	15	707	20	1257	0	Good	Good		Remove
1082	Douglas Fir	*Pseudotsuga menziesii*	11	8	201	20	1257	0	Good	Good		Remove
1083	Douglas Fir	*Pseudotsuga menziesii*	32	18	1018	20	1257	0	Good	Good		Remove
1084	Douglas Fir	*Pseudotsuga menziesii*	31	15	707	20	1257	0	Good	Good		Remove
1085	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Poor	Poor	Broken top.	Remove
1086	Oregon White Oak	*Quercus garrayana*	15	15	707	25	1963	0	Good	Good		Remove
1087	Douglas Fir	*Pseudotsuga menziesii*	28	26	2124	26	2124	0	Good	Good		Remove
1088	Sweet Cherry	*Prunus avium*	6	5	79	15	707	0	Good	Good		Remove
1089	Sweet Cherry	*Prunus avium*	10	8	201	15	707	0	Good	Good		Remove
1090	Sweet Cherry	*Prunus avium*	13	10	314	15	707	0	Good	Good		Remove
1091	Douglas Fir	*Pseudotsuga menziesii*	15	15	707	20	1257	0	Good	Good		Remove
1092	Pacific Madrone	*Arbutus menziesii*	11	14	616	15	707	0	Good	Good		Remove
1093	Sweet Cherry	*Prunus avium*	11	9	254	15	707	0	Good	Good		Remove
1094	Sweet Cherry	*Prunus avium*	22	12	452	15	707	0	Poor	Poor	Lost tops. History of large limb failure.	Remove
1095	Sweet Cherry	*Prunus avium*	13	10	314	15	707	0	Good	Good		Remove
1096	Sweet Cherry	*Prunus avium*	7	5	79	15	707	0	Poor	Poor	Suppressed	Remove
1097	Douglas Fir	*Pseudotsuga menziesii*	37	17	908	20	1257	0	Good	Good		Remove
1098	Pacific Madrone	*Arbutus menziesii*	13	12	452	15	707	0	Good	Good	2 stems 6,12.	Remove
1099	Pacific Madrone	*Arbutus menziesii*	8	7	154	15	707	0	Good	Good		Remove
1100	Douglas Fir	*Pseudotsuga menziesii*	24	10	314	20	1257	0	Good	Good		Remove
1101	Douglas Fir	*Pseudotsuga menziesii*	20	18	1018	20	1257	0	Good	Good		Remove
1101.1	Sweet Cherry	*Prunus avium*	7	6	113	15	707	0	Good	Good		Remove
1102	Douglas Fir	*Pseudotsuga menziesii*	17	15	707	20	1257	0	Poor	Good	Red Ring Rot conk.	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1103	Douglas Fir	*Pseudotsuga menziesii*	24	18	1018	20	1257	0	Good	Good		Remove
1104	Douglas Fir	*Pseudotsuga menziesii*	9	8	201	20	1257	0	Fair	Fair	Thin crown.	Remove
1105	Elderberry	*Sambucus sp.*	12	11	380	11	380	0	Good	Good		Remove
1106	Sweet Cherry	*Prunus avium*	8	14	616	15	707	0	Good	Good		Remove
1107	Sweet Cherry	*Prunus avium*	8	10	314	15	707	0	Good	Good		Remove
1108	Oregon White Oak	*Quercus garrayana*	14	10	314	25	1963	0	Good	Good		Remove
1109	Douglas Fir	*Pseudotsuga menziesii*	28	11	380	20	1257	0	Good	Good		Remove
1110	Pacific Madrone	*Arbutus menziesii*	13	5	79	15	707	0	Good	Good	2 stems 9,9.	Remove
1111	Pacific Madrone	*Arbutus menziesii*	9	7	154	15	707	0	Good	Good		Remove
1112	Douglas Fir	*Pseudotsuga menziesii*	28	15	707	20	1257	0	Good	Good		Remove
1113	Douglas Fir	*Pseudotsuga menziesii*	28	20	1257	20	1257	0	Good	Good		Remove
1114	Douglas Fir	*Pseudotsuga menziesii*	11	6	113	20	1257	0	Poor	Poor	Suppressed	Remove
1115	Pacific Madrone	*Arbutus menziesii*	8	5	79	15	707	0	Good	Good		Remove
1116	Douglas Fir	*Pseudotsuga menziesii*	20	20	1257	20	1257	0	Good	Good	2 stems 14,15.	Remove
1117	Pacific Madrone	*Arbutus menziesii*	6	5	79	15	707	0	Good	Good		Remove
1118	Douglas Fir	*Pseudotsuga menziesii*	20	15	707	20	1257	0	Good	Good		Remove
1119	Pacific Madrone	*Arbutus menziesii*	15	12	452	15	707	0	Good	Good		Remove
1120	Sweet Cherry	*Prunus avium*	9	7	154	15	707	0	Poor	Poor	Suppressed	Remove
1121	Sweet Cherry	*Prunus avium*	12	10	314	15	707	0	Fair	Fair		Remove
1122	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Poor	Poor	Suppressed	Remove
1123	Sweet Cherry	*Prunus avium*	9	8	201	15	707	0	Good	Good		Remove
1124	Douglas Fir	*Pseudotsuga menziesii*	26	23	1662	23	1662	0	Good	Good		Remove
1125	Pacific Madrone	*Arbutus menziesii*	6	3	28	15	707	0	Poor	Poor	Broken top.	Remove
1126	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Good	Good		Remove
1127	Sweet Cherry	*Prunus avium*	7	8	201	15	707	0	Good	Good		Remove
1128	Sweet Cherry	*Prunus avium*	7	10	314	15	707	0	Good	Good		Remove
1129	Douglas Fir	*Pseudotsuga menziesii*	26	24	1810	24	1810	0	Good	Good		Remove
1130	Sweet Cherry	*Prunus avium*	6	8	201	15	707	0	Good	Good		Remove
1131	Pacific Madrone	*Arbutus menziesii*	11	11	380	15	707	0	Good	Good		Remove
1132	Pacific Madrone	*Arbutus menziesii*	12	12	452	15	707	0	Good	Good		Remove
1133	Pacific Madrone	*Arbutus menziesii*	10	15	707	15	707	0	Good	Good	2 stems 6,8.	Remove
1134	Pacific Madrone	*Arbutus menziesii*	7	6	113	15	707	0	Good	Good		Remove
1135	Douglas Fir	*Pseudotsuga menziesii*	25	16	804	20	1257	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1136	Douglas Fir	*Pseudotsuga menziesii*	15	17	908	20	1257	0	Good	Good		Remove
1137	Douglas Fir	*Pseudotsuga menziesii*	13	10	314	20	1257	0	Good	Good		Remove
1138	Douglas Fir	*Pseudotsuga menziesii*	9	4	50	20	1257	0	Poor	Poor	Suppressed.	Remove
1139	Douglas Fir	*Pseudotsuga menziesii*	28	24	1810	24	1810	0	Good	Good		Remove
1140	Pacific Madrone	*Arbutus menziesii*	9	9	254	15	707	0	Good	Good		Remove
1141	Douglas Fir	*Pseudotsuga menziesii*	23	18	1018	20	1257	0	Good	Good		Remove
1142	Sweet Cherry	*Prunus avium*	10	10	314	15	707	0	Good	Good		Remove
1143	Common Hawthorn	*Crataegus monogyna*	10	9	254	9	254	0	Good	Good		Remove
1144	Douglas Fir	*Pseudotsuga menziesii*	15		0		0	0	Dead			Remove
1145	Oregon White Oak	*Quercus garrayana*	11	10	314	25	1963	0	Good	Good	2 stems 7,8.	Remove
1146	Douglas Fir	*Pseudotsuga menziesii*	16		0		0	0	Dead			Remove
1147	Pacific Madrone	*Arbutus menziesii*	14	16	804	16	804	0	Good	Good		Remove
1148	Douglas Fir	*Pseudotsuga menziesii*			0		0	0	Dead			Remove
1149	Douglas Fir	*Pseudotsuga menziesii*	29	24	1810	24	1810	0	Good	Good		Remove
1150	Pacific Madrone	*Arbutus menziesii*	10	5	79	15	707	0	Good	Good		Remove
1154	Pacific Madrone	*Arbutus menziesii*	13	14	616	15	707	0	Good	Good	2 stems 6,11.	Remove
1155	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Good	Good		Remove
1162	Pacific Madrone	*Arbutus menziesii*	7	6	113	15	707	0	Good	Good		Remove
1163	Pacific Madrone	*Arbutus menziesii*	6	6	113	15	707	0	Good	Good		Remove
1164	Pacific Madrone	*Arbutus menziesii*	6	9	254	15	707	0	Good	Good		Remove
1165	Pacific Madrone	*Arbutus menziesii*	10	12	452	15	707	0	Good	Good		Remove
1166	Pacific Madrone	*Arbutus menziesii*	6	6	113	15	707	0	Good	Good		Remove
1167	Douglas Fir	*Pseudotsuga menziesii*	12	8	201	20	1257	0	Poor	Poor	Dead top.	Remove
1169	Oregon White Oak	*Quercus garrayana*	7	7	154	25	1963	0	Good	Good		Remove
1186	Pacific Madrone	*Arbutus menziesii*	13	15	707	15	707	0	Good	Good	4 stems 6,6,6,8.	Remove
1187	Pacific Madrone	*Arbutus menziesii*	11	14	616	15	707	0	Good	Good	3 stems 6,6,7.	Remove
1415	Douglas Fir	*Pseudotsuga menziesii*	10	13	531	20	1257	0	Poor	Poor	Thin crown.	Remove
1416	Douglas Fir	*Pseudotsuga menziesii*	10	12	452	20	1257	0	Poor	Poor	Thin crown.	Remove
1417	Willow	*Salix sp.*	9	12	452	20	1257	0	Good	Good	2 stems and	Remove
1431	Willow	*Salix sp.*	6	5	79	20	1257	0	Poor	Poor	Thin crown.	Remove
1432	Willow	*Salix sp.*	7	5	79	20	1257	0	Poor	Poor	History of limb loss.	Remove
1433	Willow	*Salix sp.*	6	5	79	20	1257	0	Poor	Poor	Thin crown.	Remove

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Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1434	Willow	*Salix sp.*	6	15	707	20	1257	0	Good	Good		Remove
1435	Willow	*Salix sp.*	8	12	452	20	1257	0	Good	Good		Remove
1436	Willow	*Salix sp.*	6		0		0	0	Dead			Remove
1437	Douglas Fir	*Pseudotsuga menziesii*	13	15	707	20	1257	0	Good	Good		Remove
1438	Douglas Fir	*Pseudotsuga menziesii*	9	8	201	20	1257	0	Good	Good		Remove
1439	Sweet Cherry	*Prunus avium*	7	9	254	15	707	0	Good	Good		Remove
1440	Sweet Cherry	*Prunus avium*	10	12	452	15	707	0	Good	Good	2 stems 6,8.	Remove
1528	Oregon Ash	*Fraxinus latifolia*	8	10	314	15	707	0	Good	Good	2 stems 6,6.	Remove
1529	Oregon Ash	*Fraxinus latifolia*	8	12	452	15	707	0	Good	Good	2 stems 6,6.	Remove
1530	Oregon White Oak	*Quercus garrayana*	11	14	616	25	1963	0	Good	Good	4 stems 6,6,5,5.	Remove
1531	Sweet Cherry	*Prunus avium*	6	8	201	15	707	0	Good	Good		Remove
1532	Douglas Fir	*Pseudotsuga menziesii*	12	14	616	20	1257	0	Fair	Fair	Thin crown	Remove
1533	Douglas Fir	*Pseudotsuga menziesii*	6		0		0	0	Dead			Remove
1534	Willow	*Salix sp.*	10	13	531	20	1257	0	Good	Good		Remove
1535	Pacific Madrone	*Arbutus menziesii*	10	11	380	15	707	0	Good	Good		Remove
1536	Pacific Madrone	*Arbutus menziesii*	13	12	452	15	707	0	Good	Good	2 stems 9,11.	Remove
1537	Douglas Fir	*Pseudotsuga menziesii*	18	17	908	20	1257	0	Good	Good		Remove
1538	Oregon White Oak	*Quercus garrayana*	8	9	254	25	1963	0	Good	Good	2 stems 6,6.	Remove
1539	Oregon White Oak	*Quercus garrayana*	8	9	254	25	1963	0	Good	Good	2 stems 6,6.	Remove
1540	Pacific Madrone	*Arbutus menziesii*	13	12	452	15	707	0	Good	Good	5 stems 5,5,6,6,7.	Remove
1541	Oregon White Oak	*Quercus garrayana*	7	8	201	25	1963	0	Good	Good		Remove
1546	Pacific Madrone	*Arbutus menziesii*	11	13	531	15	707	0	Good	Good	3 stems 5,6,8.	Remove
1547	Pacific Madrone	*Arbutus menziesii*	14	16	804	16	804	0	Good	Good	3 stems 6,9,9.	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1549	Sweet Cherry	*Prunus avium*	14	18	1018	18	1018	0	Good	Good	6 stems 4,4,5,6,7,7.	Remove
1550	Willow	*Salix sp.*	7		0		0	0	Dead			Remove
1551	Pacific Madrone	*Arbutus menziesii*	10	10	314	15	707	0	Good	Good		Remove
1552	Pacific Madrone	*Arbutus menziesii*	6	4	50	15	707	0	Poor	Poor	Suppressed	Remove
1553	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Good	Good		Remove
1554	Pacific Madrone	*Arbutus menziesii*	13	14	616	15	707	0	Good	Good	4 stems 6,6,7,7.	Remove
1555	Willow	*Salix sp.*	8	7	154	20	1257	0	Poor	Poor		Remove
1556	Willow	*Salix sp.*	6	7	154	20	1257	0	Good	Good	Crown die back	Remove
1557	Willow	*Salix sp.*	11	10	314	20	1257	0	Good	Good		Remove
1585	Pacific Madrone	*Arbutus menziesii*	14	15	707	15	707	0	Good	Good	4 stems 5,6,8,8.	Remove
1638	Douglas Fir	*Pseudotsuga menziesii*	10	13	531	20	1257	0	Good	Good		Remove
1639	Douglas Fir	*Pseudotsuga menziesii*	6	15	707	20	1257	0	Good	Good		Remove
1640	Douglas Fir	*Pseudotsuga menziesii*	12	15	707	20	1257	0	Good	Good		Remove
1641	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good	2 stems 7,10.	Remove
1642	Douglas Fir	*Pseudotsuga menziesii*	10	15	707	20	1257	0	Good	Good		Remove
1643	Douglas Fir	*Pseudotsuga menziesii*	14	12	452	20	1257	0	Good	Good	2 stems 9,10.	Remove
1644	Douglas Fir	*Pseudotsuga menziesii*	7	6	113	20	1257	0	Poor	Poor	Suppressed.	Remove
1645	Douglas Fir	*Pseudotsuga menziesii*	13	14	616	20	1257	0	Good	Good		Remove
1646	Douglas Fir	*Pseudotsuga menziesii*	9	8	201	20	1257	0	Good	Good		Remove
1647	Douglas Fir	*Pseudotsuga menziesii*	18	13	531	20	1257	0	Good	Good	3 stems 8,11,12.	Remove
1648	Douglas Fir	*Pseudotsuga menziesii*	13	13	531	20	1257	0	Good	Good		Remove
1649	Douglas Fir	*Pseudotsuga menziesii*	11	12	452	20	1257	0	Good	Good		Remove
1650	Douglas Fir	*Pseudotsuga menziesii*	9	6	113	20	1257	0	Good	Good		Remove
1651	Douglas Fir	*Pseudotsuga menziesii*	10	8	201	20	1257	0	Good	Good		Remove
1652	Douglas Fir	*Pseudotsuga menziesii*	7	5	79	20	1257	0	Good	Good		Remove
1653	Douglas Fir	*Pseudotsuga menziesii*	8	4	50	20	1257	0	Poor	Poor	Suppressed.	Remove
1654	Douglas Fir	*Pseudotsuga menziesii*	11	12	452	20	1257	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1655	Douglas Fir	*Pseudotsuga menziesii*	15	15	707	20	1257	0	Good	Good		Remove
1656	Douglas Fir	*Pseudotsuga menziesii*	9	6	113	20	1257	0	Fair	Fair	Suppressed.	Remove
1657	Douglas Fir	*Pseudotsuga menziesii*	11	9	254	20	1257	0	Good	Good		Remove
1658	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1659	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1660	Douglas Fir	*Pseudotsuga menziesii*	9	8	201	20	1257	0	Good	Good		Remove
1661	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1662	Douglas Fir	*Pseudotsuga menziesii*	12	8	201	20	1257	0	Good	Good		Remove
1663	Douglas Fir	*Pseudotsuga menziesii*	10	8	201	20	1257	0	Good	Good		Remove
1664	Douglas Fir	*Pseudotsuga menziesii*	8	8	201	20	1257	0	Good	Good		Remove
1665	Douglas Fir	*Pseudotsuga menziesii*	8	8	201	20	1257	0	Good	Good		Remove
1666	Douglas Fir	*Pseudotsuga menziesii*	14	15	707	20	1257	0	Good	Good		Remove
1667	Douglas Fir	*Pseudotsuga menziesii*	8	4	50	20	1257	0	Fair	Fair	Suppressed.	Remove
1668	Douglas Fir	*Pseudotsuga menziesii*	8	8	201	20	1257	0	Good	Good		Remove
1669	Douglas Fir	*Pseudotsuga menziesii*	8	4	50	20	1257	0	Poor	Poor	Suppressed.	Remove
1670	Douglas Fir	*Pseudotsuga menziesii*	8	6	113	20	1257	0	Fair	Fair	Suppressed.	Remove
1671	Douglas Fir	*Pseudotsuga menziesii*	9	9	254	20	1257	0	Good	Good		Remove
1672	Douglas Fir	*Pseudotsuga menziesii*	7	8	201	20	1257	0	Good	Good		Remove
1673	Douglas Fir	*Pseudotsuga menziesii*	6	6	113	20	1257	0	Poor	Poor	Suppressed.	Remove
1674	Douglas Fir	*Pseudotsuga menziesii*	11	8	201	20	1257	0	Good	Good		Remove
1675	Douglas Fir	*Pseudotsuga menziesii*	9	7	154	20	1257	0	Good	Good		Remove
1676	Douglas Fir	*Pseudotsuga menziesii*	10	8	201	20	1257	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1677	Douglas Fir	*Pseudotsuga menziesii*	7	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1678	Douglas Fir	*Pseudotsuga menziesii*	9	8	201	20	1257	0	Good	Good		Remove
1679	Douglas Fir	*Pseudotsuga menziesii*	12	10	314	20	1257	0	Good	Good		Remove
1680	Douglas Fir	*Pseudotsuga menziesii*	12	10	314	20	1257	0	Good	Good		Remove
1681	Douglas Fir	*Pseudotsuga menziesii*	8	5	79	20	1257	0	Good	Good		Remove
1682	Douglas Fir	*Pseudotsuga menziesii*	9	7	154	20	1257	0	Good	Good		Remove
1683	Douglas Fir	*Pseudotsuga menziesii*	16	13	531	20	1257	0	Good	Good		Remove
1684	Douglas Fir	*Pseudotsuga menziesii*	13	8	201	20	1257	0	Good	Good		Remove
1685	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1686	Douglas Fir	*Pseudotsuga menziesii*	12	10	314	20	1257	0	Good	Good		Remove
1687	Douglas Fir	*Pseudotsuga menziesii*	7	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1688	Douglas Fir	*Pseudotsuga menziesii*	11	7	154	20	1257	0	Good	Good		Remove
1689	Douglas Fir	*Pseudotsuga menziesii*	9	6	113	20	1257	0	Good	Good		Remove
1690	Douglas Fir	*Pseudotsuga menziesii*	7	3	28	20	1257	0	Fair	Fair	Suppressed.	Remove
1691	Douglas Fir	*Pseudotsuga menziesii*	8	4	50	20	1257	0	Good	Good		Remove
1692	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1693	Douglas Fir	*Pseudotsuga menziesii*	14	10	314	20	1257	0	Good	Good		Remove
1694	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1695	Black Cottonwood	*Populus trichocarpa*	23	20	1257	20	1257	0	good	Good	2 stems 16,17.	Remove
1696	Douglas Fir	*Pseudotsuga menziesii*	6	2	13	20	1257	0	Poor	Poor	Suppressed.	Remove
1697	Douglas Fir	*Pseudotsuga menziesii*	6	2	13	20	1257	0	Poor	Poor	Suppressed.	Remove
1698	Douglas Fir	*Pseudotsuga menziesii*	12	8	201	20	1257	0	Good	Good		Remove
1712	Sweet Cherry	*Prunus avium*	8		0		0	0	Dead			Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1713	Douglas Fir	*Pseudotsuga menziesii*	6	2	13	20	1257	0	Poor	Poor	Suppressed.	Remove
1714	Douglas Fir	*Pseudotsuga menziesii*	11	8	201	20	1257	0	Good	Good		Remove
1715	Douglas Fir	*Pseudotsuga menziesii*	11	9	254	20	1257	0	Good	Good		Remove
1716	Douglas Fir	*Pseudotsuga menziesii*	10	4	50	20	1257	0	Fair	Fair	Suppressed.	Remove
1717	Douglas Fir	*Pseudotsuga menziesii*	6		0		0	0	Dead			Remove
1718	Douglas Fir	*Pseudotsuga menziesii*	8	6	113	20	1257	0	Good	Good		Remove
1719	Douglas Fir	*Pseudotsuga menziesii*	16	9	254	20	1257	0	Good	Good		Remove
1720	Douglas Fir	*Pseudotsuga menziesii*	10	9	254	20	1257	0	Good	Good		Remove
1721	Douglas Fir	*Pseudotsuga menziesii*	7	6	113	20	1257	0	Good	Good		Remove
1722	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1723	Black Cottonwood	*Populus trichocarpa*	21	20	1257	20	1257	0	Good	Good		Remove
1724	Pacific Madrone	*Arbutus menziesii*	6	3	28	15	707	0	Good	Good		Remove
1725	Douglas Fir	*Pseudotsuga menziesii*	12	9	254	20	1257	0	Good	Good		Remove
1726	Black Cottonwood	*Populus trichocarpa*	16	15	707	20	1257	0	Good	Good		Remove
1727	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1728	Douglas Fir	*Pseudotsuga menziesii*	6	6	113	20	1257	0	Good	Good		Remove
1729	Douglas Fir	*Pseudotsuga menziesii*	6	5	79	20	1257	0	Good	Good		Remove
1730	Black Cottonwood	*Populus trichocarpa*	14	12	452	20	1257	0	Good	Good		Remove
1731	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1732	Black Cottonwood	*Populus trichocarpa*	13	12	452	20	1257	0	Good	Good		Remove
1733	Pacific Madrone	*Arbutus menziesii*	6	5	79	15	707	0	Good	Good		Remove
1733.1	Pacific Madrone	*Arbutus menziesii*	7	10	314	15	707	0	Good	Good	2 stems 5,5.	Remove
1734	Pacific Madrone	*Arbutus menziesii*	8	8	201	15	707	0	Good	Good		Remove
1735	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Good	Good		Remove
1736	Pacific Madrone	*Arbutus menziesii*	6	5	79	15	707	0	Good	Good		Remove
1737	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1738	Sweet Cherry	*Prunus avium*	9	9	254	15	707	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1739	Douglas Fir	*Pseudotsuga menziesii*	6	2	13	20	1257	0	Poor	Poor	Suppressed.	Remove
1740	Douglas Fir	*Pseudotsuga menziesii*	7	6	113	20	1257	0	Good	Good		Remove
1741	Douglas Fir	*Pseudotsuga menziesii*	7	6	113	20	1257	0	Good	Good		Remove
1742	Black Cottonwood	*Populus trichocarpa*	8	6	113	20	1257	0	Good	Good		Remove
1743	Pacific Madrone	*Arbutus menziesii*	6		0		0	0	Good	Good	2 stems 6,0.	Remove
1744	Douglas Fir	*Pseudotsuga menziesii*	6	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1745	Douglas Fir	*Pseudotsuga menziesii*	7	3	28	20	1257	0	Poor	Poor	Thin crown.	Remove
1746	Black Cottonwood	*Populus trichocarpa*	6	7	154	20	1257	0	Good	Good		Remove
1747	Douglas Fir	*Pseudotsuga menziesii*	9	9	254	20	1257	0	Good	Good		Remove
1748	Black Cottonwood	*Populus trichocarpa*	6	4	50	20	1257	0	Poor	Poor	Suppressed.	Remove
1749	Douglas Fir	*Pseudotsuga menziesii*	11	9	254	20	1257	0	Good	Good		Remove
1750	Black Cottonwood	*Populus trichocarpa*	9	4	50	20	1257	0	Good	Good		Remove
1751	Black Cottonwood	*Populus trichocarpa*	8	7	154	20	1257	0	Good	Good	2 stems,6.	Remove
1752	Douglas Fir	*Pseudotsuga menziesii*	8	4	50	20	1257	0	Poor	Poor	Suppressed.	Remove
1753	Douglas Fir	*Pseudotsuga menziesii*	13	12	452	20	1257	0	Good	Good		Remove
1754	Douglas Fir	*Pseudotsuga menziesii*	7	4	50	20	1257	0	Poor	Poor	Broken top.	Remove
1755	Douglas Fir	*Pseudotsuga menziesii*	9	6	113	20	1257	0	Good	Good		Remove
1756	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1757	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1758	Douglas Fir	*Pseudotsuga menziesii*	11	12	452	20	1257	0	Good	Good		Remove
1759	Douglas Fir	*Pseudotsuga menziesii*	10	12	452	20	1257	0	Good	Good		Remove
1760	Douglas Fir	*Pseudotsuga menziesii*	14	12	452	20	1257	0	Good	Good		Remove
1761	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1762	Black Cottonwood	*Populus trichocarpa*	10	10	314	20	1257	0	Good	Good		Remove
1762	Black Cottonwood	*Populus trichocarpa*	10	10	314	20	1257	0	Good	Good		Remove
1763	Sweet Cherry	*Prunus avium*	6	5	79	15	707	0	Good	Good		Remove
1763	Sweet Cherry	*Prunus avium*	6	5	79	15	707	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1764	Douglas Fir	*Pseudotsuga menziesii*	13	14	616	20	1257	0	Good	Good		Remove
1764	Douglas Fir	*Pseudotsuga menziesii*	13	14	616	20	1257	0	Good	Good		Remove
1765	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1765	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1766	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1766	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1767	Douglas Fir	*Pseudotsuga menziesii*	14	13	531	20	1257	0	Good	Good		Remove
1767	Douglas Fir	*Pseudotsuga menziesii*	14	13	531	20	1257	0	Good	Good		Remove
1768	Pacific Madrone	*Arbutus menziesii*	6	6	113	15	707	0	Good	Good		Remove
1768	Pacific Madrone	*Arbutus menziesii*	6	6	113	15	707	0	Good	Good		Remove
1769	Douglas Fir	*Pseudotsuga menziesii*	14	14	616	20	1257	0	Good	Good		Remove
1769	Douglas Fir	*Pseudotsuga menziesii*	14	14	616	20	1257	0	Good	Good		Remove
1770	Douglas Fir	*Pseudotsuga menziesii*	7	9	254	20	1257	0	Good	Good		Remove
1770	Douglas Fir	*Pseudotsuga menziesii*	7	9	254	20	1257	0	Good	Good		Remove
1771	Douglas Fir	*Pseudotsuga menziesii*	11	12	452	20	1257	0	Good	Good		Remove
1771	Douglas Fir	*Pseudotsuga menziesii*	11	12	452	20	1257	0	Good	Good		Remove
1772	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1772	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1773	Douglas Fir	*Pseudotsuga menziesii*	10	8	201	20	1257	0	Good	Good		Remove
1773	Douglas Fir	*Pseudotsuga menziesii*	10	8	201	20	1257	0	Good	Good		Remove
1774	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1774	Douglas Fir	*Pseudotsuga menziesii*	12	12	452	20	1257	0	Good	Good		Remove
1775	Douglas Fir	*Pseudotsuga menziesii*	21	15	707	20	1257	0	Poor	Poor	Dead top.	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1776	Western Red Cedar	*Thuja plicata*	22		0		0	0	Dead		2 stems ,12,18.	Remove
1777	Douglas Fir	*Pseudotsuga menziesii*	12		0		0	0	Dead			Remove
1778	Sweet Cherry	*Prunus avium*	6	5	79	15	707	0	Good	Good		Remove
1779	Sweet Cherry	*Prunus avium*	8	11	380	15	707	0	Good	Good		Remove
1780	Sweet Cherry	*Prunus avium*	7	11	380	15	707	0	Good	Good		Remove
1781	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Good	Good		Remove
1782	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Good	Good		Remove
1783	Douglas Fir	*Pseudotsuga menziesii*	7	8	201	20	1257	0	Good	Good		Remove
1784	Douglas Fir	*Pseudotsuga menziesii*	10	8	201	20	1257	0	Poor	Poor	Thin crown	Remove
1785	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Good	Good		Remove
1786	Willow	*Salix sp.*	6	8	201	20	1257	0	Good	Good		Remove
1787	Douglas Fir	*Pseudotsuga menziesii*	16	18	1018	20	1257	0	Good	Good		Remove
1788	Douglas Fir	*Pseudotsuga menziesii*	22	16	804	20	1257	0	Good	Good		Remove
1789	Douglas Fir	*Pseudotsuga menziesii*	22	13	531	20	1257	0	Good	Good		Remove
1790	Sweet Cherry	*Prunus avium*	6	5	79	15	707	0	Good	Good		Remove
1791	Douglas Fir	*Pseudotsuga menziesii*	6	8	201	20	1257	0	Good	Good		Remove
1792	Douglas Fir	*Pseudotsuga menziesii*	9	10	314	20	1257	0	Good	Good		Remove
1793	Douglas Fir	*Pseudotsuga menziesii*	10	12	452	20	1257	0	Good	Good		Remove
1794	Douglas Fir	*Pseudotsuga menziesii*	12	14	616	20	1257	0	Good	Good		Remove
1795	Douglas Fir	*Pseudotsuga menziesii*	9	10	314	20	1257	0	Good	Good		Remove
1796	Sweet Cherry	*Prunus avium*	9	11	380	15	707	0	Good	Good	2 stems 6,7.	Remove
1797	Douglas Fir	*Pseudotsuga menziesii*	15	14	616	20	1257	0	Good	Good		Remove
1798	Douglas Fir	*Pseudotsuga menziesii*	9	9	254	20	1257	0	Good	Good		Remove
1799	Willow	*Salix sp.*	11	12	452	20	1257	0	Good	Good		Remove
1800	Sweet Cherry	*Prunus avium*	6	6	113	15	707	0	Good	Good		Remove
1801	Douglas Fir	*Pseudotsuga menziesii*	10	11	380	20	1257	0	Good	Good		Remove
1802	Douglas Fir	*Pseudotsuga menziesii*	6		0		0	0	Dead			Remove
1803	Willow	*Salix sp.*	10	10	314	20	1257	0	Poor	Poor	3 stems 6,6,6. Trunk decay	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1804	Douglas Fir	*Pseudotsuga menziesii*	8	7	154	20	1257	0	Good	Good		Remove
1805	Douglas Fir	*Pseudotsuga menziesii*	9	7	154	20	1257	0	Good	Good		Remove
1806	Douglas Fir	*Pseudotsuga menziesii*	6	4	50	20	1257	0	Poor	Poor	Suppressed.	Remove
1807	Douglas Fir	*Pseudotsuga menziesii*	11	10	314	20	1257	0	Good	Good		Remove
1808	Douglas Fir	*Pseudotsuga menziesii*	11	11	380	20	1257	0	Good	Good		Remove
1809	Douglas Fir	*Pseudotsuga menziesii*	7		0		0	0	Dead			Remove
1810	Douglas Fir	*Pseudotsuga menziesii*	7	7	154	20	1257	0	Good	Good		Remove
1811	Sweet Cherry	*Prunus avium*	8	8	201	15	707	0	Good	Good		Remove
1812	Douglas Fir	*Pseudotsuga menziesii*	8		0		0	0	Dead			Remove
1813	Douglas Fir	*Pseudotsuga menziesii*	18	16	804	20	1257	0	Good	Good		Remove
1814	Douglas Fir	*Pseudotsuga menziesii*	11	7	154	20	1257	0	Good	Good		Remove
1815	Douglas Fir	*Pseudotsuga menziesii*	15	8	201	20	1257	0	Good	Good		Remove
1816	Douglas Fir	*Pseudotsuga menziesii*	21	13	531	20	1257	0	Good	Good		Remove
1817	Sweet Cherry	*Prunus avium*	7	14	616	15	707	0	Good	Good		Remove
1818	Douglas Fir	*Pseudotsuga menziesii*	14	15	707	20	1257	0	Good	Good	2 stems 10,10.	Remove
1819	Douglas Fir	*Pseudotsuga menziesii*	21	10	314	20	1257	0	Good	Good	stems 7,20.	Remove
1820	Douglas Fir	*Pseudotsuga menziesii*	21	14	616	20	1257	0	Good	Good		Remove
1821	Douglas Fir	*Pseudotsuga menziesii*	7	3	28	20	1257	0	Poor	Poor	Suppressed.	Remove
1822	Willow	*Salix sp.*	11	6	113	20	1257	0	Poor	Poor	Trunk decay. stems 6,7.	Remove
1823	Douglas Fir	*Pseudotsuga menziesii*	24	18	1018	20	1257	0	Good	Good		Remove
1824	Pacific Madrone	*Arbutus menziesii*	8	11	380	15	707	0	Good	Good		Remove
1825	Douglas Fir	*Pseudotsuga menziesii*	17	14	616	20	1257	0	Poor	Poor	Thin crown.	Remove
1826	Douglas Fir	*Pseudotsuga menziesii*	15	12	452	20	1257	0	Poor	Poor	Thin crown.	Remove
1827	Bigleaf Maple	*Acer macrophyllum*	7	8	201	25	1963	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1828	Douglas Fir	*Pseudotsuga menziesii*	19	20	1257	20	1257	0	Poor	Poor	Thin crown.	Remove
1829	Douglas Fir	*Pseudotsuga menziesii*	17	16	804	20	1257	0	Poor	Poor	Broken top.	Remove
1830	Oregon White Oak	*Quercus garrayana*	11	6	113	25	1963	0	Good	Good	2 stems 6,7.	Remove
1831	Pacific Madrone	*Arbutus menziesii*	11	14	616	15	707	0	Good	Good	2 stems 7,9.	Remove
1832	Oregon White Oak	*Quercus garrayana*	18	23	1662	25	1963	0	Good	Good		Remove
1833	Pacific Madrone	*Arbutus menziesii*	8	10	314	15	707	0	Good	Good		Remove
1834	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Good	Good		Remove
1835	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Good	Good		Remove
1836	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Good	Good		Remove
1837	Pacific Madrone	*Arbutus menziesii*	16	18	1018	15	707	0	Poor	Poor	Trunk cavity.	Remove
1838	Pacific Madrone	*Arbutus menziesii*	13	15	707	15	707	0	Good	Good		Remove
1839	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Good	Good		Remove
1840	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Good	Good		Remove
1841	Oregon White Oak	*Quercus garrayana*	6	5	79	25	1963	0	Good	Good		Remove
1842	Oregon White Oak	*Quercus garrayana*	11	10	314	25	1963	0	Good	Good	2 stems 7,8.	Remove
1843	Oregon White Oak	*Quercus garrayana*	21	23	1662	25	1963	0	Good	Good	2 stems 15,15.	Remove
1844	Pacific Madrone	*Arbutus menziesii*	11	13	531	15	707	0	Good	Good	2 stems 7,9.	Remove
1845	Oregon White Oak	*Quercus garrayana*	14	12	452	25	1963	0	Good	Good	5 stems 6,6,6,7,7.	Remove
1846	Oregon White Oak	*Quercus garrayana*	8	9	254	25	1963	0	Good	Good	2 stems 6,6.	Remove
1847	Oregon White Oak	*Quercus garrayana*	20	14	616	25	1963	0	Good	Good	5 stems 6,7,9,10,11.	Remove
1848	Pacific Madrone	*Arbutus menziesii*	13	10	314	15	707	0	Poor	Poor	Partial uproot	Remove
1849	Oregon White Oak	*Quercus garrayana*	10	13	531	25	1963	0	Good	Good		Remove
1850	Sweet Cherry	*Prunus avium*	7	12	452	15	707	0	Good	Good		Remove
1851	Willow	*Salix sp.*	6	9	254	20	1257	0	Good	Good		Remove
1852	Willow	*Salix sp.*	11	16	804	20	1257	0	Good	Good		Remove
1853	Douglas Fir	*Pseudotsuga menziesii*	14	13	531	20	1257	0	Good	Good		Remove
1854	Oregon White Oak	*Quercus garrayana*	10	12	452	25	1963	0	Good	Good		Remove
1855	Douglas Fir	*Pseudotsuga menziesii*	19	10	314	20	1257	0	Good	Good		Remove
1856	Douglas Fir	*Pseudotsuga menziesii*	30	16	804	20	1257	0	Good	Good		Remove
1857	Douglas Fir	*Pseudotsuga menziesii*	21		0	20	1257	0	Dead			Remove
1858	Douglas Fir	*Pseudotsuga menziesii*	21		0	20	1257	0	Dead			Remove
1859	Oregon White Oak	*Quercus garrayana*	10	12	452	25	1963	0	Good	Good	2 stems 7,7.	Remove
1860	Oregon White Oak	*Quercus garrayana*	8	7	154	25	1963	0	Good	Good	2 stems 5,6.	Remove
1861	Pacific Madrone	*Arbutus menziesii*	8	9	254	15	707	0	Good	Good		Remove
1862	Pacific Madrone	*Arbutus menziesii*	12	8	201	15	707	0	Poor	Poor	Broken top	Remove
1863	Pacific Madrone	*Arbutus menziesii*	10	8	201	15	707	0	Good	Good		Remove
1864	Pacific Madrone	*Arbutus menziesii*	15	13	531	15	707	0	Poor	Poor	Crown die back.	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1865	Pacific Madrone	*Arbutus menziesii*	13		0	15	707	0	Dead			Remove
1866	Oregon White Oak	*Quercus garrayana*	9	10	314	25	1963	0	Good	Good		Remove
1867	Oregon White Oak	*Quercus garrayana*		17	908	25	1963	0	Good	Good	3 stems 7,10,14.	Remove
1868	Oregon White Oak	*Quercus garrayana*	17	11	380	25	1963	0	Good	Good		Remove
1869	Douglas Fir	*Pseudotsuga menziesii*	13		0	20	1257	0	Dead			Remove
1870	Oregon White Oak	*Quercus garrayana*	13	15	707	25	1963	0	Poor	Poor	Thin crown.	Remove
1871	Douglas Fir	*Pseudotsuga menziesii*	23		0	20	1257	0	Dead			Remove
1872	Pacific Madrone	*Arbutus menziesii*	21	6	113	15	707	0	Poor	Poor	4 stems 7,10,12,12. die back.	Remove
1873	Pacific Madrone	*Arbutus menziesii*			0	15	707	0	Dead			Remove
1874	Oregon White Oak	*Quercus garrayana*	14	14	616	25	1963	0	Good	Good		Remove
1875	Pacific Madrone	*Arbutus menziesii*	6	5	79	15	707	0	Good	Good		Remove
1876	Pacific Madrone	*Arbutus menziesii*	11		0	15	707	0	Dead			Remove
1877	Oregon White Oak	*Quercus garrayana*	23	24	1810	25	1963	0	Good	Good	3 stems 12,14,14.	Remove
1878	Pacific Madrone	*Arbutus menziesii*	6	3	28	15	707	0	Poor	Poor	Crown die back.	Remove
1879	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Good	Good		Remove
1880	Pacific Madrone	*Arbutus menziesii*	11	13	531	15	707	0	Poor	Poor	Crown die back.	Remove
1881	Pacific Madrone	*Arbutus menziesii*	8	6	113	15	707	0	Poor	Poor	Crown die back.	Remove
1882	Pacific Madrone	*Arbutus menziesii*	8		0	15	707	0	Dead			Remove
1883	Pacific Madrone	*Arbutus menziesii*	8	7	154	15	707	0	Poor	Poor	Crown die back.	Remove
1884	Pacific Madrone	*Arbutus menziesii*	9	12	452	15	707	0	Poor	Poor	Crown die back.	Remove
1885	Oregon White Oak	*Quercus garrayana*	13	18	1018	25	1963	0	Good	Good	3 stems 7,8,8.	Remove
1886	Pacific Madrone	*Arbutus menziesii*	8		0	15	707	0	Dead			Remove
1887	Pacific Madrone	*Arbutus menziesii*	9	7	154	15	707	0	Poor	Poor	Crown die back.	Remove
1888	Pacific Madrone	*Arbutus menziesii*	7	3	28	15	707	0	Poor	Poor	Dead top.	Remove
1889	Pacific Madrone	*Arbutus menziesii*	7	9	254	15	707	0	Good	Good		Remove
1890	Pacific Madrone	*Arbutus menziesii*	7	7	154	15	707	0	Poor	Poor	Crown die back.	Remove
1891	Pacific Madrone	*Arbutus menziesii*	17		0	15	707	0	Dead		4 stems 8,8,9,9.	Remove
1892	Douglas Fir	*Pseudotsuga menziesii*	13		0	20	1257	0	Dead			Remove
1893	Oregon White Oak	*Quercus garrayana*	14	26	2124	25	1963	0	Good	Good	2 stems 10,10.	Remove
1894	Pacific Madrone	*Arbutus menziesii*	7	15	707	15	707	0	Poor	Poor	Thin crown.	Remove
1895	Pacific Madrone	*Arbutus menziesii*	8	10	314	15	707	0	Poor	Poor	Crown die back.	Remove
1896	Douglas Fir	*Pseudotsuga menziesii*	16		0	20	1257	0	Dead			Remove
1897	Pacific Madrone	*Arbutus menziesii*	6		0	15	707	0	Dead			Remove
1898	Pacific Madrone	*Arbutus menziesii*	6		0	15	707	0	Dead			Remove
1899	Douglas Fir	*Pseudotsuga menziesii*	11		0	20	1257	0	Dead			Remove
1900	Douglas Fir	*Pseudotsuga menziesii*	17		0	20	1257	0	Dead			Remove
1901	Pacific Madrone	*Arbutus menziesii*	8	12	452	15	707	0	Poor	Poor	Crown die back.	Remove
1902	Pacific Madrone	*Arbutus menziesii*	6	11	380	15	707	0	Poor	Poor	Crown die back.	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1903	Pacific Madrone	*Arbutus menziesii*	12	18	1018	15	707	0	Poor	Poor	Thin crown	Remove
1904	Pacific Madrone	*Arbutus menziesii*	9	16	804	15	707	0	Poor	Poor	Crown die back.	Remove
1905	Pacific Madrone	*Arbutus menziesii*	10		0	15	707	0	Dead			Remove
1906	Douglas Fir	*Pseudotsuga menziesii*	18	14	616	20	1257	0	Fair	Fair	Thin crown.	Remove
1907	Pacific Madrone	*Arbutus menziesii*	7		0	15	707	0	Dead			Remove
1908	Douglas Fir	*Pseudotsuga menziesii*	19	14	616	20	1257	0	Poor	Poor	Thin crown.	Remove
1909	Pacific Madrone	*Arbutus menziesii*	8		0	15	707	0	Dead			Remove
1910	Pacific Madrone	*Arbutus menziesii*	7	11	380	15	707	0	Good	Good		Remove
1911	Pacific Madrone	*Arbutus menziesii*	8	6	113	15	707	0	Poor	Poor	Dead top.	Remove
1912	Douglas Fir	*Pseudotsuga menziesii*	21		0	20	1257	0	Dead			Remove
1913	Douglas Fir	*Pseudotsuga menziesii*	12	16	804	20	1257	0	Poor	Poor	Thin crown.	Remove
1914	Pacific Madrone	*Arbutus menziesii*	9	14	616	15	707	0	Poor	Poor	Thin crown.	Remove
1915	Pacific Madrone	*Arbutus menziesii*	6	9	254	15	707	0	Good	Good		Remove
1916	Oregon White Oak	*Quercus garrayana*	9	10	314	25	1963	0	Good	Good		Remove
1917	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Good	Good		Remove
1918	Pacific Madrone	*Arbutus menziesii*	10	12	452	15	707	0	Good	Good		Remove
1919	Pacific Madrone	*Arbutus menziesii*	9	9	254	15	707	0	Poor	Poor	Dead top.	Remove
1920	Oregon White Oak	*Quercus garrayana*	15	15	707	25	1963	0	Good	Good	3 stems 6,9,10.	Remove
1921	Pacific Madrone	*Arbutus menziesii*	8	7	154	15	707	0	Poor	Poor	Crown die back.	Remove
1922	Pacific Madrone	*Arbutus menziesii*	8	11	380	15	707	0	Good	Good		Remove
1923	Pacific Madrone	*Arbutus menziesii*	8	8	201	15	707	0	Poor	Poor	Crown die back.	Remove
1924	Pacific Madrone	*Arbutus menziesii*	10	8	201	15	707	0	Poor	Poor	Crown die back.	Remove
1925	Pacific Madrone	*Arbutus menziesii*	10	10	314	15	707	0	Poor	Poor	Thin crown.	Remove
1926	Douglas Fir	*Pseudotsuga menziesii*	14		0	20	1257	0	Dead			Remove
1927	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Poor	Poor	Thin crown.	Remove
1928	Oregon White Oak	*Quercus garrayana*	9	12	452	25	1963	0	Good	Good		Remove
1929	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Poor	Poor	Crown die back.	Remove
1930	Douglas Fir	*Pseudotsuga menziesii*	13	7	154	20	1257	0	Poor	Poor	2 stem 7,11. Dead top.	Remove
1931	Douglas Fir	*Pseudotsuga menziesii*	23	13	531	20	1257	0	Poor	Poor	Dead top.	Remove
1932	Douglas Fir	*Pseudotsuga menziesii*	7	7	154	20	1257	0	Poor	Poor	Dead top.	Remove
1933	Pacific Madrone	*Arbutus menziesii*	6	8	201	15	707	0	Good	Good		Remove
1934	Pacific Madrone	*Arbutus menziesii*	6	10	314	15	707	0	Good	Good		Remove
1935	Douglas Fir	*Pseudotsuga menziesii*	17	13	531	20	1257	0	Poor	Poor	Thin crown.	Remove
1936	Douglas Fir	*Pseudotsuga menziesii*	18	17	908	20	1257	0	Poor	Poor	Thin crown.	Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
1937	Pacific Madrone	*Arbutus menziesii*	11	16	804	15	707	0	Good	Good		Remove
1938	Douglas Fir	*Pseudotsuga menziesii*	20		0	20	1257	0	Dead			Remove
1939	Douglas Fir	*Pseudotsuga menziesii*	15		0	20	1257	0	Dead			Remove
1940	Douglas Fir	*Pseudotsuga menziesii*	20		0	20	1257	0	Dead			Remove
1941	Oregon White Oak	*Quercus garrayana*	19	19	1134	25	1963	0	Good	Good		Remove
1942	Oregon White Oak	*Quercus garrayana*	23	25	1963	25	1963	0	Good	Good	2 stems 12,20.	Remove
1943	Pacific Madrone	*Arbutus menziesii*	13	17	908	15	707	0	Good	Good	2 stems 6,12.	Remove
1944	Douglas Fir	*Pseudotsuga menziesii*	13		0	20	1257	0	Dead			Remove
1945	Douglas Fir	*Pseudotsuga menziesii*	22	16	804	20	1257	0	Poor	Poor	Thin crown.	Remove
1946	Pacific Madrone	*Arbutus menziesii*	10	12	452	15	707	0	Good	Good		Remove
1947	Douglas Fir	*Pseudotsuga menziesii*	24	18	1018	20	1257	0	Poor	Poor	Thin crown.	Remove
1948	Pacific Madrone	*Arbutus menziesii*	10	12	452	15	707	0	Good	Good		Remove
1949	Douglas Fir	*Pseudotsuga menziesii*	13	14	616	20	1257	0	Poor	Poor	Thin crown.	Remove
1950	Douglas Fir	*Pseudotsuga menziesii*	14	10	314	20	1257	0	Poor	Poor	Suppressed.	Remove
1951	Douglas Fir	*Pseudotsuga menziesii*	24	12	452	20	1257	0	Good	Good	2 stems 10,22.	Remove
1952	Douglas Fir	*Pseudotsuga menziesii*	20	18	1018	20	1257	0	Good	Good		Remove
1953	Douglas Fir	*Pseudotsuga menziesii*	16	12	452	20	1257	0	Poor	Poor	Broken top.	Remove
1954	Pacific Madrone	*Arbutus menziesii*	8	8	201	15	707	0	Poor	Poor	Thin crown.	Remove
1955	Douglas Fir	*Pseudotsuga menziesii*	10	10	314	20	1257	0	Poor	Poor	Dead top.	Remove
1956	Pacific Madrone	*Arbutus menziesii*	6		0	15	707	0	Dead			Remove
1957	Pacific Madrone	*Arbutus menziesii*	13		0	15	707	0	Dead			Remove
11003					0		0	0			Not found	Remove
11004					0		0	0			Not found	Remove
11011					0		0	0			Not found	Remove
11016					0		0	0			Not found	Remove
11030					0		0	0			Not found	Remove
11519					0		0	0			Not found	Remove
11529					0		0	0			Not found	Remove
15032	Pacific Madrone	*Arbutus menziesii*	9	10	314	15	707	0	Good	Good		Remove
15033	Oregon White Oak	*Quercus garrayana*	16	15	707	25	1963	0	Good	Good	2 stems 10,13.	Remove
15035	Pacific Madrone	*Arbutus menziesii*	7	8	201	15	707	0	Good	Good	2 stems 5,5.	Remove
15036	Pacific Madrone	*Arbutus menziesii*	13	13	531	15	707	0	Good	Good		Remove

Attachment 2

Tree No.	Common Name	Scientific Name	DBH[1]	C-Rad[2]	Canopy Area (sq. ft.)	Mature C-Rad[3]	Mature Canopy Area (sq. ft.)	Canopy Credit[4]	Condition[5]	Structure[5]	Comments	Treatment
15039	Pacific Madrone	*Arbutus menziesii*	8	17	908	17	908	0	Good	Good		Remove
15043	Pacific Madrone	*Arbutus menziesii*	10	15	707	15	707	0	Good	Good	2 stems 7,7.	Remove
15135	Douglas Fir	*Pseudotsuga menziesii*	25	18	1018	20	1257	0	Good	Good		Remove
15135.1	Douglas Fir	*Pseudotsuga menziesii*	23	16	804	20	1257	0	Good	Good		Remove
15135.2	Douglas Fir	*Pseudotsuga menziesii*	19	16	804	20	1257	0	Good	Good		Remove
15135.3	Pacific Madrone	*Arbutus menziesii*	9	5	79	15	707	0	Good	Good		Remove
15136	Pacific Madrone	*Arbutus menziesii*	10	15	707	15	707	0	Good	Good		Remove
15137	Douglas Fir	*Pseudotsuga menziesii*	6	4	50	20	1257	0	Fair	Fair	Suppressed	Remove
15138	Pacific Madrone	*Arbutus menziesii*	5	7	154	15	707	0	Good	Good		Remove
15139	Sweet Cherry	*Prunus avium*	5	4	50	15	707	0	Poor	Poor	Suppressed	Remove
15140	Douglas Fir	*Pseudotsuga menziesii*	17	15	707	20	1257	0	Good	Good		Remove
15202	Pacific Madrone	*Arbutus menziesii*	6	4	50	15	707	0	Good	Good		Remove
15205	Pacific Madrone	*Arbutus menziesii*	9	12	452	15	707	0	Good	Good		Remove
15206	Pacific Madrone	*Arbutus menziesii*	9	13	531	15	707	0	Good	Good		Remove
15207	Pacific Madrone	*Arbutus menziesii*	13	12	452	15	707	0	Good	Good		Remove
15210	Oregon White Oak	*Quercus garrayana*	9	13	531	25	1963	0	Good	Good		Remove
15288	Pacific Madrone	*Arbutus menziesii*	8	12	452	15	707	0	Good	Good		Remove
15289	Oregon White Oak	*Quercus garrayana*	13	10	314	25	1963	0	Good	Good	2 stems 7,8.	Remove
15718	Oregon White Oak	*Quercus garrayana*	18	18	1018	25	1963	0	Good	Good		Remove
15719	Douglas Fir	*Pseudotsuga menziesii*	27	17	908	20	1257	0	Poor	Poor	Thin crown.	Remove
15723	Douglas Fir	*Pseudotsuga menziesii*	16	11	380	20	1257	0	Good	Good		Remove
15724	Douglas Fir	*Pseudotsuga menziesii*	18	12	452	20	1257	0	Fair	Fair	Thin crown.	Remove
15728	Douglas Fir	*Pseudotsuga menziesii*	21		0	20	1257	0	Dead			Remove
15735	Pacific Madrone	*Arbutus menziesii*	18	9	254	15	707	0	Poor	Poor	2 stems 12,14. crown die back.	Remove
							Total	**984229**				

[1]**DBH** is the trunk diameter measured according to the International Society of Arboriculture standards in inches. In cases where the tree splits into multiple trunks at ground level, DBH is the square root of the sum of the squared DBH of each stem.

[2]**C-rad** is the approximate crown radius in feet.

[3]**Mature C-rad** is the mature crown radius in feet based on scientific literature. If the existing crown is larger than the mature crown listed in the scientific literature, the existing crown size is used.

[4]**Canopy Credit** is 2x the mature canopy for onsite trees that are preserved.

[5]**Condition** and **Structure** ratings range from very poor, poor, fair, to good.

Attachment 3
Additional Tree Protection Recommendations

The following recommendations meet City of Sherwood Code requirements:

Before Construction Begins

1. Notify all contractors of tree protection procedures. For successful tree protection on a construction site, all contractors must know and understand the goals of tree protection.
    a. Hold a tree protection meeting with all contractors to explain the goals of tree protection.
    c. Have all contractors sign memoranda of understanding regarding the goals of tree protection. The memoranda should include a penalty for violating the tree protection plan. The penalty should equal the resulting fines issued by the local jurisdiction plus the appraised value of the tree(s) within the violated tree protection zone per the current Trunk Formula Method as outline in the current edition of the ***Guide for Plant Appraisal*** by the Council of Tree & Landscape Appraisers. The penalty should be paid to the owner of the property.
2. Fencing
    a. Trees to remain on site should be protected by installation of tree protection fencing at the dripline. Alternatively, tree protection fencing may be set as shown in Attachment 1.
    b. The fencing should be put in place before the ground is cleared in order to protect the trees and the soil around the trees from disturbances.
    c. Fencing should be established by the project arborist based on the needs of the trees to be protected and to facilitate construction.
    d. Fencing should consist of 6-foot high steel fencing on concrete blocks or 6-foot metal fencing secured to the ground with 8-foot metal posts to prevent it from being moved by contractors, sagging, or falling down. Trees within the north wetland may be protected with orange work limit fencing.
    e. Fencing should remain in the position that is established by the project arborist and not be moved without approval from the project arborist until final project approval.
3. Signage
    a. All tree protection fencing should have signage as follows so that all contractors understand the purpose of the fencing:

TREE PROTECTION ZONE

DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION FENCING.

Please contact the project arborist if alterations to the approved location of the tree protection fencing are necessary.

Todd Prager, Project Arborist - 971-295-4835

    b. Signage should be placed every 75-feet or less.

During Construction

1. Protection Guidelines Within the Tree Protection Zones:
   a. No new buildings; grade change or cut and fill, during or after construction; new impervious surfaces; or utility or drainage field placement should be allowed within the tree protection zones.
   b. No traffic should be allowed within the tree protection zones. This includes but is not limited to vehicle, heavy equipment, or even repeated foot traffic.
   c. No storage of materials including but not limiting to soil, construction material, or waste from the site should be permitted within the tree protection zones. Waste includes but is not limited to concrete wash out, gasoline, diesel, paint, cleaner, thinners, etc.
   d. Construction trailers should not to be parked/placed within the tree protection zones.
   e. No vehicles should be allowed to park within the tree protection zones.
   f. No other activities should be allowed that will cause soil compaction within the tree protection zones.
2. The trees should be protected from any cutting, skinning or breaking of branches, trunks or woody roots.
3. The project arborist should be notified prior to the cutting of woody roots from trees that are to be retained to evaluate and oversee the proper cutting of roots with sharp cutting tools. Cut roots should be immediately covered with soil or mulch to prevent them from drying out.
4. Trees that have roots cut should be provided supplemental water during the summer months.
5. Any necessary passage of utilities through the tree protection zones should be by means of tunneling under woody roots by hand digging or boring with oversight by the project arborist.
6. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

After Construction

1. Carefully landscape the areas within the tree protection zones. Do not allow trenching for irrigation or other utilities within the tree protection zones.
2. Carefully plant new plants within the tree protection zones. Avoid cutting the woody roots of trees that are retained.
3. Do not install permanent irrigation within the tree protection zones unless it is drip irrigation to support a specific planting or the irrigation is approved by the project arborist.
4. Provide adequate drainage within the tree protection zones and do not alter soil hydrology significantly from existing conditions for the trees to be retained.
5. Provide for the ongoing inspection and treatment of insect and disease populations that are capable of damaging the retained trees and plants.
6. The retained trees may need to be fertilized if recommended by the project arborist.
7. Any deviation from the recommendations in this section should receive prior approval from the project arborist.

Attachment 4
Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. The site plans and other information provided by Trammell Crow Company and their consultants was the basis of the information provided in this report.
2. It is assumed that this property is not in violation of any codes, statutes, ordinances, or other governmental regulations.
3. The consultant is not responsible for information gathered from others involved in various activities pertaining to this project. Care has been taken to obtain information from reliable sources.
4. Loss or alteration of any part of this delivered report invalidates the entire report.
5. Drawings and information contained in this report may not be to scale and are intended to be used as display points of reference only.
6. The consultant's role is only to make recommendations. Inaction on the part of those receiving the report is not the responsibility of the consultant.
7. The purpose of this report is to:
   - Assess the existing trees at the project site;
   - Identify the trees to be removed and retained based on construction impacts;
   - Provide tree protection recommendations for the trees to be retained; and
   - Provide recommendations for meeting the tree canopy requirements in section 16.142.070 of the City of Sherwood Code.

MEMORANDUM

TO: Bob Galati, P.E. – City Engineer
City of Sherwood

FROM: Ryan Halvorson, P.E. – Design Engineer

DATE: March 4th, 2020

SUBJECT: Design Modification Request for Cul-de-sac 200 Foot Maximum Length

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Location of Requested Design Modification

The new SW Cipole Place street between Tualatin-Sherwood Rd and future Blake Rd.

Current Standards

Section 210.7.C of the City of Sherwood Engineering Manual states "Cul-de-sacs shall not be more than 200 feet in length, except for the modified infill design cul-de-sac, which shall not be more than 150 feet in length. The length of a cul-de-sac shall be measured along the center line of the cul-de-sac from the near side right-of-way of the nearest through traffic intersecting street to the farthest point of the cul-de-sac right-of-way. See standard details for cul-de-sac right-of-way and pavement requirements."

Design Modification Being Requested

We are requesting approval for a 619-foot long cul-de-sac as measured from the southern right-of-way line of Tualatin-Sherwood Road to the most southernly point the cul-de-sac right-of-way. This 619-foot length would exceed the City standard 200-foot maximum length.

Existing Conditions

The existing site is an undeveloped site, consisting of forested sections and grass land sloping from the southwest corner to the north east corner. In addition to the site being undeveloped, there are existing sensitive area consisting of wetlands and vegetated corridor buffers are located on the site limiting the development of the site.

Where Cipole Place cul-de-sac is proposed, the existing topography of the site is approximately 3 percent. As a result, the proposed Cipole Place is proposed at 3 percent grade and has minimal impact to sensitive areas, only impacting a small section of vegetated corridor.

Result of Meeting Standards

To meet the City's standard cul-de-sac length, SW Cipole Place would be limited to 200 feet from the southern right-of-way line of Tualatin Sherwood Road. At 200 feet long, the cul-de-sac central access to the subdivision lots would be located significantly further north of the proposed location, limiting the access to the lots and limiting the overall development of the site. As a result, the cul-de-sac full access would be in the middle of one of the existing wetlands and require additional impact to the wetlands for development. To avoid impacting the wetlands would require nearly eliminating access to subdivision lots, making the site undevelopable.

In addition, the Traffic Impact Analysis completed by Kittelson & Associates, dated January 15, 2020, found the development needs to have a minimum queue length of 150 feet. This required queue length and the minimum radius for the WB-67 truck movements (approximately 130 feet), the total length of the cul-de-sac needs to be a minimum of 300 feet to serve the development.

Proposed Design Modification

The proposed cul-de-sac street length of 619 feet is to provide access to the subdivision layout and to accommodate the required traffic queue length for the industrial development.

Reason Why Design Request Should be Approved

The design exception meets the criteria of Section 145.1.5.A.2 because the existing vegetated corridor and wetland create a hardship on the site to meet the City standard. To avoid impacting the existing wetland, and minimize the impact of the vegetated corridor, the cul-de-sac needs to be extended beyond the City 200-foot standard to provide access to the subdivision lots. The proposed 619-foot cul-de-sac will provide full access to the subdivision lots and avoid impacting the existing sensitive areas, while minimizing the length of the cul-de-sac to greatest extent possible.

Additionally, the 619-foot cul-de-sac will provide the required queue storage for the development traffic per the Kittelson & Associates TIA and allow for proper truck movements with the actual cul-de-sac outside the queue storage.

The proposed design will meet the City cul-des-sac design intent and improve safety for the public beyond the City standard cul-de-sac.

- Design Engineer — 3/4/2020 Date

Craig Christensen, P.E. - City Project Manager — Date

- ☐ Approved
- ☐ Approved with Conditions (conditions below or on attached sheet)
- ☐ Denied

Bob Galati, P.E. - City Engineer — Date

MEMORANDUM

TO:	Bob Galati, P.E. – City Engineer City of Sherwood
FROM:	Ryan Halvorson, P.E. – Design Engineer
DATE:	March 4th, 2020
SUBJECT:	Design Modification Request for Cul-de-sac Geometry

Location of Requested Design Modification

The new SW Cipole Place street between Tualatin-Sherwood Rd and future Blake Rd.

Current Standards

Section 210.7.A of the City of Sherwood Engineering Manual states "The following specifies the minimum requirements for cul-de-sac, eyebrows, and turnaround areas. Other turnaround geometrics may be used when conditions warrant and the City Engineer and TVF&R Fire Marshal approve the design and application of its use."

Design Modification Being Requested

We are requesting a revision to the geometry of City's standard cul-de-sac design because SW Cipole Place is industrial street and the City's standard is for a residential local road.

Existing Conditions

The existing site is an undeveloped site, consisting of forested sections and grass land sloping from the southwest corner to the north east corner. In addition to the site being undeveloped, there are existing sensitive area consisting of wetlands and vegetated corridor buffers are located on the site limiting the development of the site.

Where Cipole Place cul-de-sac is proposed, the existing topography of the site is approximately 3 percent. As a result, the proposed Cipole Place is proposed at 3 percent grade and has minimal impact to sensitive areas, only impacting a small section of vegetated corridor.

Result of Meeting Standards

The City's standards cul-de-sac dimensions are designed for a residential street and a fire truck. The site is zoned industrial, and SW Cipole Place is designated as a commercial/industrial street. The City's standard cul-de-sac is adequate for passenger cars and fire truck movements but is too small for WB-67 tuck to turn around.

As a result, a WB-67 would be required to make multiple truck movements, including reversing, to complete a full turn around movement with the City's standard cul-de-sac.

Proposed Design Modification

The proposed cul-de-sac radius will be modified from 48-foot radius to the face of curb City standard to 54-foot radius to the face of curb to accommodate WB-67 truck movements. Attached are Autoturn truck turning movements showing a fire truck and a WB-67 truck can maneuver the enlarged 54-foot radius without having to make multiple movements.

The proposed landscape strip, sidewalk, and monument strip width are proposed at the City standards. As a result, the proposed 54-foot radius will result in 66-foot radius right-of-way.

Reason Why Design Request Should be Approved

The proposed industrial park will see vehicular traffic, including WB-67 traffic. The design exception meets the criteria of Section 145.1.5.A.1 because the City standard cul-de-sac of a 48-foot radius is too small to accommodate truck maneuvering and the standard is not applicable in this situation. A WB-67 truck movement will require multiple movements, including reversing, which is a safety concern to the general public. The City standard is inadequate for this project and will cause potential harm to the public.

By increasing the cul-de-sac radius from 48-foot City standard to 54-foot radius will allow for WB-67 trucks to fully maneuver within the cul-de-sac and reduce the safety risk of associated with extra truck maneuvers. The proposed cul-de-sac will meet all other City and TVF&R dimensions.

_______________________ - Design Engineer   3/4/2020 Date

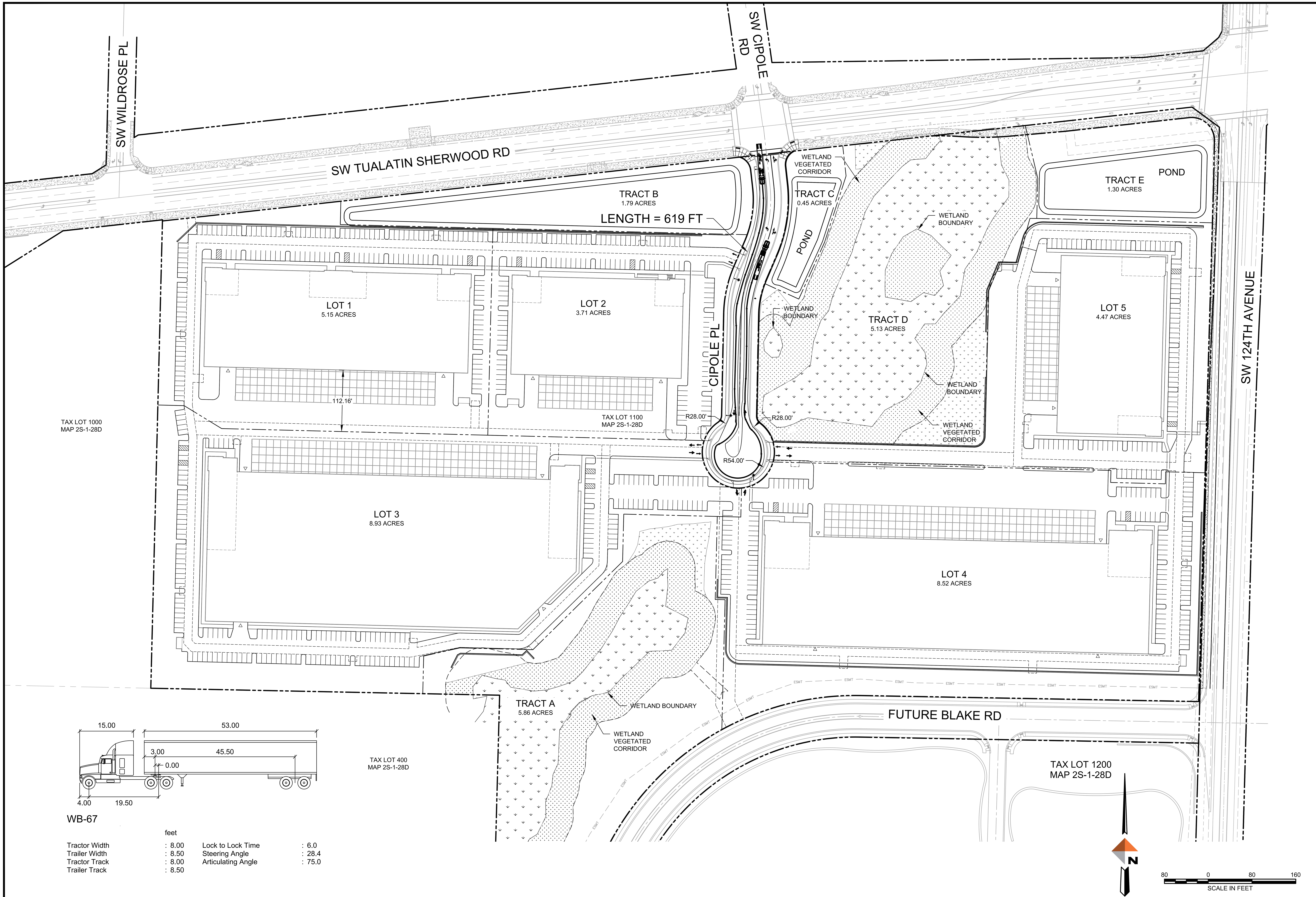
____

Craig Christensen, P.E. - City Project Manager   Date

- ☐ Approved
- ☐ Approved with Conditions (conditions below or on attached sheet)
- ☐ Denied

____

Bob Galati, P.E. - City Engineer   Date



REV	DATE	REVISIONS DESCRIPTION	BY

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

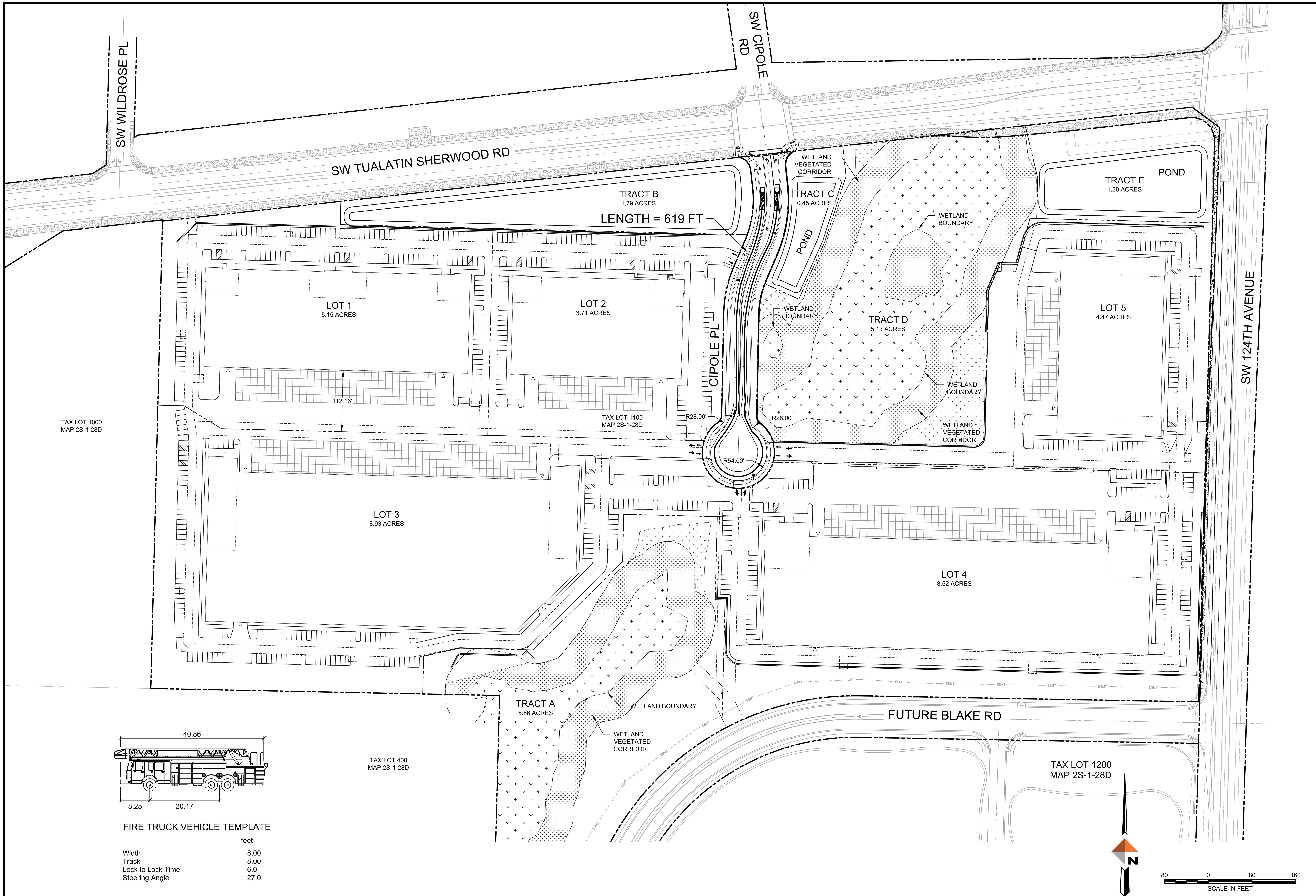
T-S CORPORATE PARK

TRUCK TURNING - WB-67

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 02/10/2020

SHEET
EX-1



\\BIL-FS\BIL-PROJECTS\22\14347-01\65CAD\CIVIL\EXHIBITS\2020-02-10 - TRUCK TURNING\SC-CS-SP-TCC.DWG SAVED: 2/12/2020 5:15 PM PLOTTED: 2/12/2020 5:33 PM BY: OGAYET

REV	DATE	DESCRIPTION	BY
		REVISIONS	

DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK

TRUCK TURNING - FIRE TRUCK

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 02/10/2020

SHEET
EX-2

DOWL

MEMORANDUM

TO:	Bob Galati, P.E. – City Engineer City of Sherwood
FROM:	Ryan Halvorson, P.E. – Design Engineer
DATE:	March 4th, 2020
SUBJECT:	Design Modification Request for SW Cipole Block Length on Blake Road

Location of Requested Design Modification

The new SW Cipole Place street connecting to future Blake Road.

Current Standards

Section 210.6.E of the City of Sherwood Engineering Manual states the minimum and maximum distance between streets.

Street Classification	Roadways & Driveways Spacing (max)	Full Access Intersections Spacing (min)	Limited Access* Intersections Spacing (min)	Driveway Spacing (min)
Major Arterial	N/A	1,000 feet	500 feet	500 feet
Minor Arterial	N/A	600 feet	300 feet	300 feet
Collector	530 feet	400 feet	400 feet	200 feet
Neighborhood	530 feet	200 feet	N/A	N/A
Local	530 feet	200 feet	N/A	N/A

Note: Street Classifications are identified in the City TSP

*Limited Access – Vehicles are restricted to right-in/right-out turn movements. In some cases, left-in turn movements may be permitted.

1. Distance between streets is measures form the centerline of the subject street to the centerline of the adjacent street.
2. Local street connections are based on the Metro RTP requirements for new residential or mixed used developments.
3. Provide full street connections with spacing of no more than 530 feet between connections except where prohibited by barriers.
4. Provide bike and pedestrian access ways in-lieu-of streets with spacing of no more than 330 feet except where prevented by barriers.

Design Modification Being Requested

The block length being 800 feet from the intersection of future Blake Road and SW 124th Ave.
We are requesting approval for SW Cipole Place not to connect to future Blake Road (collector) and exceeding the 530-foot maximum roadway spacing.

Existing Conditions

The existing site is an undeveloped site, consisting of forested sections and grass land sloping from the southwest corner to the north east corner. In addition to the site being undeveloped, there are existing sensitive area consisting of wetlands and vegetated corridor buffers are located on the site limiting the development of the site.

Where Cipole Place cul-de-sac is proposed, the existing topography of the site is approximately 3 percent. As a result, the proposed Cipole Place is proposed at 3 percent grade and has minimal impact to sensitive areas, only impacting a small section of vegetated corridor. The topography from the end of the cul-de-sac to the future Blake Road is approximately 37 feet. This results in an average slope of 9 percent and would require significant earthworks.

Result of Meeting Standards

To meet the City's standard block length of 530 feet on future Blake Rd, SW Cipole Place's alignment would need to be extended southward to Blake and its alignment would need to be revised east ward, impacting the existing wetlands and vegetated corridor located on the site. SW Cipole Road would need to be revised approximately 300 feet east encroaching further into the existing vegetated corridor and impacting the existing wetlands (see attached EX-1 Cipole Extension Site Impact Exhibit – Option A).

The road grade from Tualatin-Sherwood Road to the main vehicular entries at the cul-de-sac bulb is set at 3 percent to facilitate truck maneuvering and allow reasonable access to the lots without having to impact the wetlands. From the main vehicular entries to connect to Blake Rd, the road profile would need to be at 14.9 percent slope, thus requiring City Engineer approval (City standard dictate slope cannot exceed 15 percent, and any slopes above 12 percent require special approval from the City Engineer). Vertical curves required for the road profile would be designed at minimum K values (meeting AASHTO and City of Sherwood standards) and street lighting would be required (see attached EX-2 Cipole Extension Site Impact Exhibit – Profile View Option A).

In addition to the general non-desire for a 14.9 percent road, a secondary issue is safety. The 14.9 percent road presents a steep grade for vehicular traffic navigating the road, especially any potential truck traffic. Truck traffic navigating from Blake Rd on to Cipole and being able to stop on the steep grade for any vehicles leaving the main access driveway points is a safety concern, as increased stopping sight distance is needed to make the stop. In conjunction, standard vehicles traveling from Blake to Cipole will not be able to see the full access driveway due to the vertical curve, only being able to see the driveways once the vehicle has crested the vertical curve. Both situations create a hazardous traffic condition for the connection to Blake.

Proposed Design Modification

The proposed SW Cipole Place will not connect to the future Blake Road at the maximum 530-foot block length to avoid impacting the existing wetlands and vegetated corridor.

Reason Why Design Request Should be Approved

The design exception meets the criteria of Section 145.1.5.A.2 because the existing topography and sensitive areas within the site cause a hardship of connecting SW Cipole Place to Future Blake Road. The existing topography from the end of the cul-de-sac to the future Blake Road will require a road profile of the connection is beyond the City's and AASHTO normal design standards. Whereas the 14.9 percent road grade and comfort vertical curves could be approved under a special exemption, the local industrial traffic makes this an unsafe roadway to exempt out of the standard. In addition, this extension of Cipole Place would impact additional vegetated corridor for the additional grading. This allow for the maximum developable area, minimize impacts to the existing sensitive areas (vegetated corridor and wetland) on the site, and maintain a safe road for the public, we propose not connecting SW Cipole Place to Blake Road.

Additionally, the design exception meets the criteria of Section 145.1.5.A.3 because the connection of SW Cipole Place to future Blake Road will impose undue hardship of the project and have no material benefit to the public. The Kittelson & Associates Traffic Impact Analysis, dated January 15, 2020, found if Cipole Place were to connect to Blake Rd, there would no material change in the traffic volumes going to all of the intersections evaluated. The TIS shows the connection does not provide significant volumes going to Blake Rd and the traffic volumes will utilize the intersection at Tualatin-Sherwood Rd.

In addition, TVF&R Fire Marshal has indicated a secondary connection to a public street is not required to provide coverage to the site, and the cul-de-sac is allowed if the buildings are fully sprinklered (all the proposed buildings are to be fully sprinklered).

____________________ - Design Engineer   3/4/2020 Date

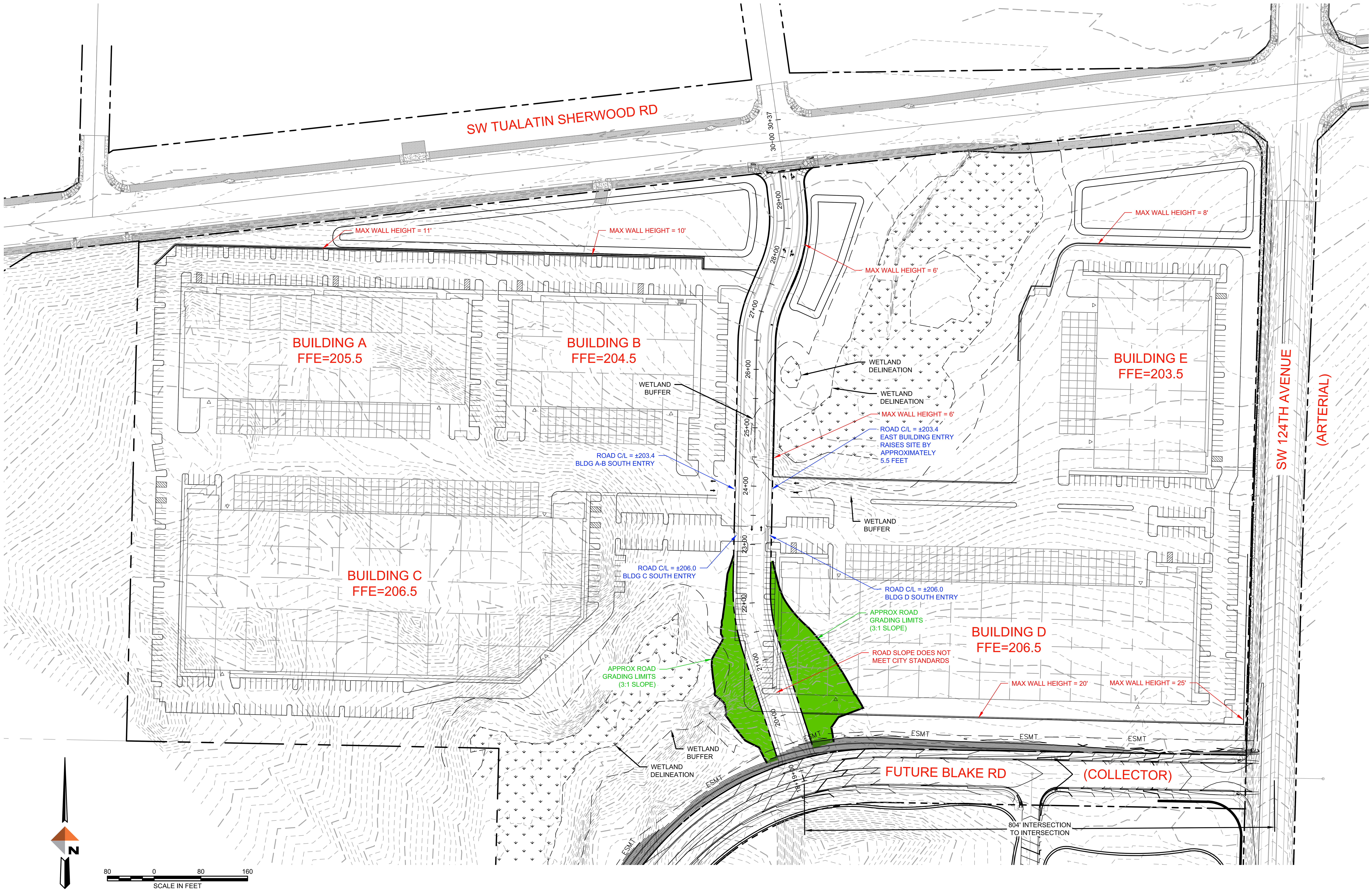
____

Craig Christensen, P.E. - City Project Manager   Date

- ☐ Approved
- ☐ Approved with Conditions (conditions below or on attached sheet)
- ☐ Denied

____

Bob Galati, P.E. - City Engineer   Date



REV	DATE	DESCRIPTION	BY

REVISIONS

DOWL

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720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

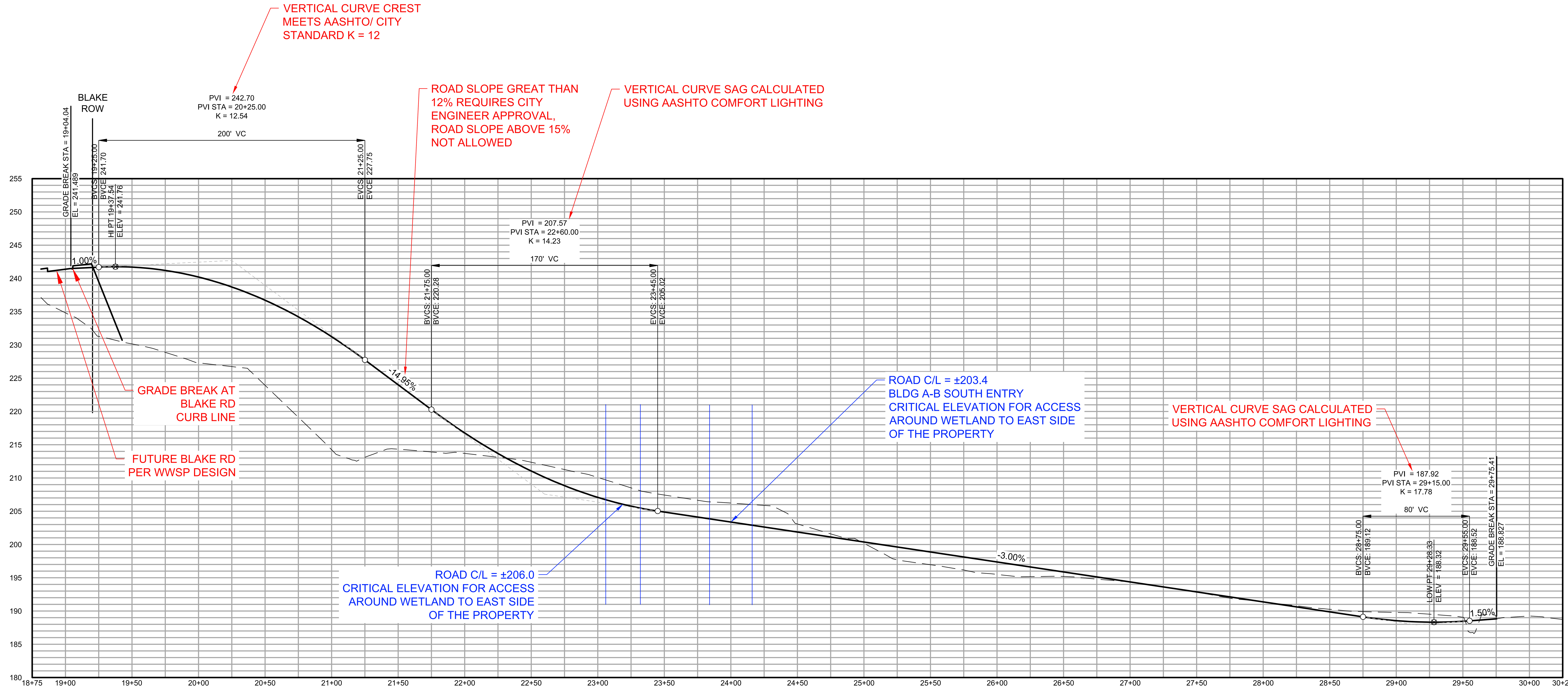
SHERWOOD INDUSTRIAL PARK
SHERWOOD, OREGON

CIPOLE EXTENSION SITE IMPACT EXHIBIT - PLAN VIEW OPTION A

SHERWOOD, OREGON

PROJECT 14347-01
DATE 01/08/2020

SHEET
EX-1



CIPOLE ROAD SITE IMPACT - PROFILE

SCALE: 1"=40' (H)
1"=5' (V)

RED = ROAD DESIGN TO CITY OF SHERWOOD ROADWAY STANDARDS

BLUE = CRITICAL TIE-IN LOCATIONS FOR BUILDINGS AND WETLANDS

REV	DATE	REVISIONS DESCRIPTION	BY

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WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

SHERWOOD INDUSTRIAL PARK
SHERWOOD, OREGON

CIPOLE EXTENSION SITE IMPACT EXHIBIT - PROFILE VIEW OPTION A

SHERWOOD, OREGON

PROJECT 14347-01
DATE 01/08/2020

SHEET
EX-2

MEMORANDUM

TO:	Bob Galati, P.E. – City Engineer City of Sherwood
FROM:	Ryan Halvorson, P.E. – Design Engineer
DATE:	March 4th, 2020
SUBJECT:	Design Modification Request to Exclude Sidewalk and PUE on East Side of Street

Location of Requested Design Modification

The new SW Cipole Place street between Tualatin-Sherwood Rd and future Blake Rd.

Current Standards

Standard Drawing RD-1 of the City of Sherwood Engineering Manual states for Standard Commercial/Industrial Streets Not Exceeding 3,000 Vehicles Per Day are to have 6-foot sidewalks on both sides of the street.

Under Section 16.118.020.B of the Sherwood Zoning and Community Development Code states public utility easements shall be a minimum of eight (8) feet in width unless a reduced with is specifically exempted by the City Engineer. An eight-foot-wide public utility easement (PUE) shall be provided on private property along all public street frontages. This standard does not apply to developments within the Old Town Overlay.

Design Modification Being Requested

We are requesting approval to exclude the 6-foot sidewalk and 8-foot PUE on the east side of SW Cipole Place.

Existing Conditions

The existing site is an undeveloped site, consisting of forested sections and grass land sloping from the southwest corner to the north east corner. In addition to the site being undeveloped, there are existing sensitive area consisting of wetlands and vegetated corridor buffers are located on the site limiting the development.

Result of Meeting Standards

To meet the City's standard with having an 6-foot sidewalk on the east side of SW Cipole Place would place the sidewalk over existing vegetated corridor. As a result, the 6-foot sidewalk would impact additional vegetated corridor.

To meet the City's standard with having an 8-foot PUE on the east side of SW Cipole Place would place the PUE over existing vegetated corridor. As a result, the 8-foot PUE would impact additional vegetated corridor to install private franchise utilities, and the vegetated corridor would be impacted in the future by the private franchise utility providers installing additional lines within the PUE.

Proposed Design Modification

We propose to alter the standard section, removing the 6-foot sidewalk and 8-foot PUE long the east side of the Cipole Place north of the cul-de-sac. The 6-foot sidewalk along the west side of Cipole will provide pedestrian access to Lots 2 through 5. Since the private franchise utilities which would be installed on this side of the street within the PUE would only serve the TSCP development.

Reason Why Design Request Should be Approved

The design exception meets the criteria of Section 145.1.5.A.2 because the existing wetlands and vegetated corridor will create a short and long term maintenance cost over the life of the project. The 6-foot sidewalk and 8-foot PUE on the east side of Cipole Place would be located over the existing vegetated corridor, impacting additional vegetated corridor for the project. In the future, the private franchise utility providers would impact the vegetated corridor to as potential additional utilities would need to be installed with the PUE.

The 6-foot sidewalk on the west side of the Cipole Place will remain to provide connectivity to all the lots fronting Cipole Place, providing pedestrian access within the right-of-way. The 8-foot PUE on the west side of Cipole Place will adequately provide a backbone between Tualatin-Sherwood Road and Blake Road, as well as serve the TSCP development. The private franchise utilities installed on the east side of Cipole Place would serve only the TSCP development. As a result, we propose to eliminate the 6-foot sidewalk and the 8-foot PUE on the east side of Cipole Place north of the cul-de-sac.

______________________________ 3/4/2020
- Design Engineer Date

______________________________ ______________
Craig Christensen, P.E. - City Project Manager Date

- ❑ Approved
- ❑ Approved with Conditions (conditions below or on attached sheet)
- ❑ Denied

______________________________ ______________
Bob Galati, P.E. - City Engineer Date

Oregon
Kate Brown, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 986-5200
FAX (503) 378-4844
www.oregon.gov/dsl

March 11, 2020

Trammel Crow Company
Attn: Kirk Olsen
1300 SW Fifth Avenue, Suite 3050
Portland, OR 97201

Re: WD # 2020-0015 **Approved**
Wetland Delineation Report for the T-S Corporate Park
Washington County; T2S R1W S28D TL1100 (Portion)

Dear Mr. Olsen:

The Department of State Lands has reviewed the wetland delineation report prepared by Pacific Habitat Services for the site referenced above. Please note that the study area includes only a portion of the tax lot described above (see the attached maps). Based upon the information presented in the report, and additional information submitted upon request, we concur with the wetland and waterway boundaries as mapped in revised Figure 6, 6A, and 6B of the report. Please replace all copies of the preliminary wetland maps with these final Department-approved maps.

Within the study area, 3 wetlands (Wetland A, B and C, totaling approximately 2.91 acres) and one roadside ditch were identified. The wetlands are subject to the permit requirements of the state Removal-Fill Law. Under current regulations, a state permit is required for cumulative fill or annual excavation of 50 cubic yards or more in wetlands or below the ordinary high-water line (OHWL) of the waterway (or the 2-year recurrence interval flood elevation if OHWL cannot be determined). The roadside ditch is exempt per OAR 141-085-0515(10) except for the area that may be contiguous with Wetland A offsite.

This concurrence is for purposes of the state Removal-Fill Law only. We recommend that you attach a copy of this concurrence letter to any subsequent state permit application to speed application review. Federal or local permit requirements may apply as well. The U.S. Army Corps of Engineers will determine jurisdiction under the Clean Water Act, which may require submittal of a complete Wetland Delineation Report.

Please be advised that state law establishes a preference for avoidance of wetland impacts. Since measures to avoid and minimize wetland impacts may include reconfiguring parcel layout and size or development design, we recommend that you work with Department staff on appropriate site design before completing the city or county land use approval process.

This concurrence is based on information provided to the agency. The jurisdictional determination is valid for five years from the date of this letter unless new information necessitates a revision. Circumstances under which the Department may change a determination are found in OAR 141-090-0045 (available on our web site or upon request). In addition, laws enacted by the legislature and/or rules adopted by the Department may result in a change in jurisdiction; individuals and applicants are subject to the regulations that are in effect at the time of the removal-fill activity or complete permit application. The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within six months of the date of this letter.

Thank you for having the site evaluated. If you have any questions, please contact Chris Stevenson, the Jurisdictional Coordinator for Clackamas County at (503) 986-5246.

Sincerely,

Peter Ryan, PWS
Aquatic Resource Specialist

Enclosures

ec: Shawn Eisner, Pacific Habitat Services
City of Sherwood Planning Department
Carrie Bond, Corps of Engineers
Anita Huffman, DSL
Lindsey Obermiller, Clean Water Services

WETLAND DELINEATION / DETERMINATION REPORT COVER FORM

Fully completed and signed report cover forms and applicable fees are required before report review timelines are initiated by the Department of State Lands. Make the checks payable to the Oregon Department of State Lands. To pay fees by credit card, go online at: https://apps.oregon.gov/DSL/EPS/program?key=4.

Attach this completed and signed form to the front of an unbound report or include a hard copy with a digital version (single PDF file of the report cover from and report, minimum 300 dpi resolution) and submit to, **Oregon Department of State Lands, 775 Summer Street NE, Suite 100, Salem, OR 97301-1279.** A single PDF of the completed cover form and report may be e-mailed to **Wetland_Delineation@dsl.state.or.us**. For submittal of PDF files larger than 10 MB, e-mail DSL instructions on how to access the file from your ftp or other file sharing website.

Contact and Authorization Information

☒ Applicant ☐ Owner Name, Firm and Address:
Trammel Crow Company
Attn: Kirk Olsen
1300 SW Fifth Avenue, Suite 3050
Portland, OR 97201

Business phone # **503-946-4981**
Mobile phone # (optional)
E-mail: **KOlsen@trammellcrow.com**

☐ Authorized Legal Agent, Name and Address:

Business phone #
Mobile phone #
E-mail:

I either own the property described below or I have legal authority to allow access to the property. I authorize the Department to access the property for the purpose of confirming the information in the report, after prior notification to the primary contact.

Typed/Printed Name: Kirk L. Olsen Signature: Kirk L. Olsen
Date: 1/7/20 Special instructions regarding site access:

Project and Site Information

Project Name: **T-S Corporate Park**	Latitude: **45.3682° N** Longitude: **-122.8103° W** **decimal degree** - centroid of site or start & end points of linear project Tax Map # **2S128D** Tax Lot(s) **1100 (portion)**
Proposed Use: **Light Industrial**	Tax Map # Tax Lot(s)
Project Street Address (or other descriptive location): **12900 SW Tualatin-Sherwood Road, North portion of tax lot** City: **Sherwood** County: **Washington**	Township **2S** Range **1W** Section **28** QQ **SE 1/4** Waterway: **NA** River Mile: n/a NWI Quad(s): **Sherwood**

Wetland Delineation Information

Wetland Consultant Name, Firm and Address:
Pacific Habitat Services
Attn: Shawn Eisner
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Phone # **503-570-0800**
Mobile phone #
E-mail: **se@pacifichabitat.com**

The information and conclusions on this form and in the attached report are true and correct to the best of my knowledge.
Consultant Signature: Shawn Eisner Date: **1/3/20**

Primary Contact for report review and site access is ☒ Consultant ☐ Applicant/Owner ☐ Authorized Agent

Wetland/Waters Present? ☒ Yes ☐ No | Study Area size: **44 acre** Wetland Acreage: **2.94 ac** Waters Acreage: **0 ac**

Check Applicable Boxes Below

☐ R-F permit application submitted
☐ Mitigation bank site
☐ Industrial Land Certification Program Site
☐ Wetland restoration/enhancement project (not mitigation)
☒ Previous delineation/application on parcel?
If Known, previous DSL # **2014-0448, 2017-0006 & 0008**

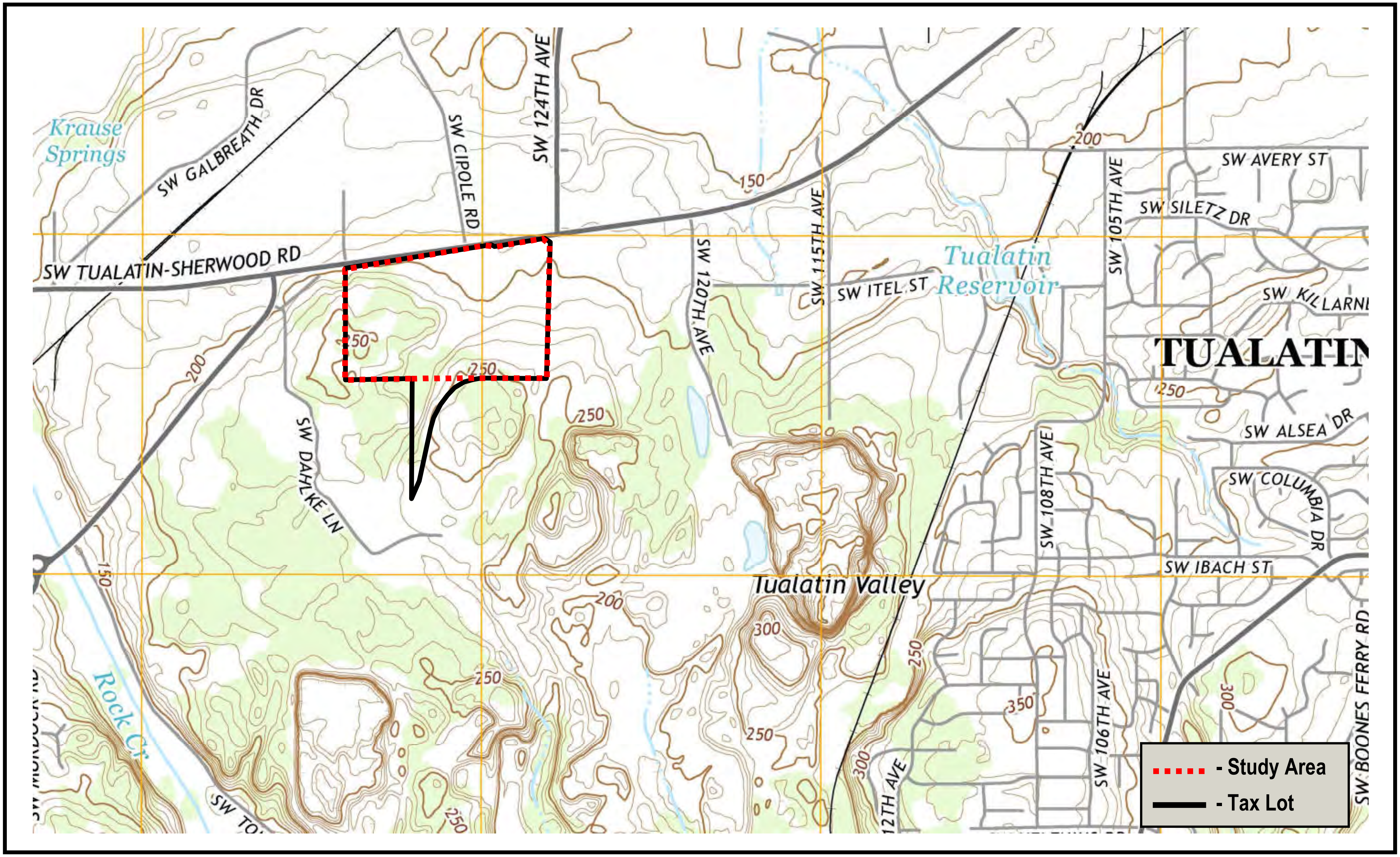
☐ Fee payment submitted **$466**
☐ Fee ($100) for resubmittal of rejected report
☐ Request for Reissuance. See eligibility criteria (no fee)
DSL # ________ Expiration Date ________
☐ LWI shows wetlands or waters on parcel?
Wetland ID Code

For Office Use Only

DSL Reviewer: C.S. Fee Paid Date: ___ / ___ / ___ DSL WD # 2020-0015
Date Delineation Received: 1 / 9 / 20 Scanned: ☒ Final Scan: ☐ DSL App. # ________

Proj #79274

March 2018



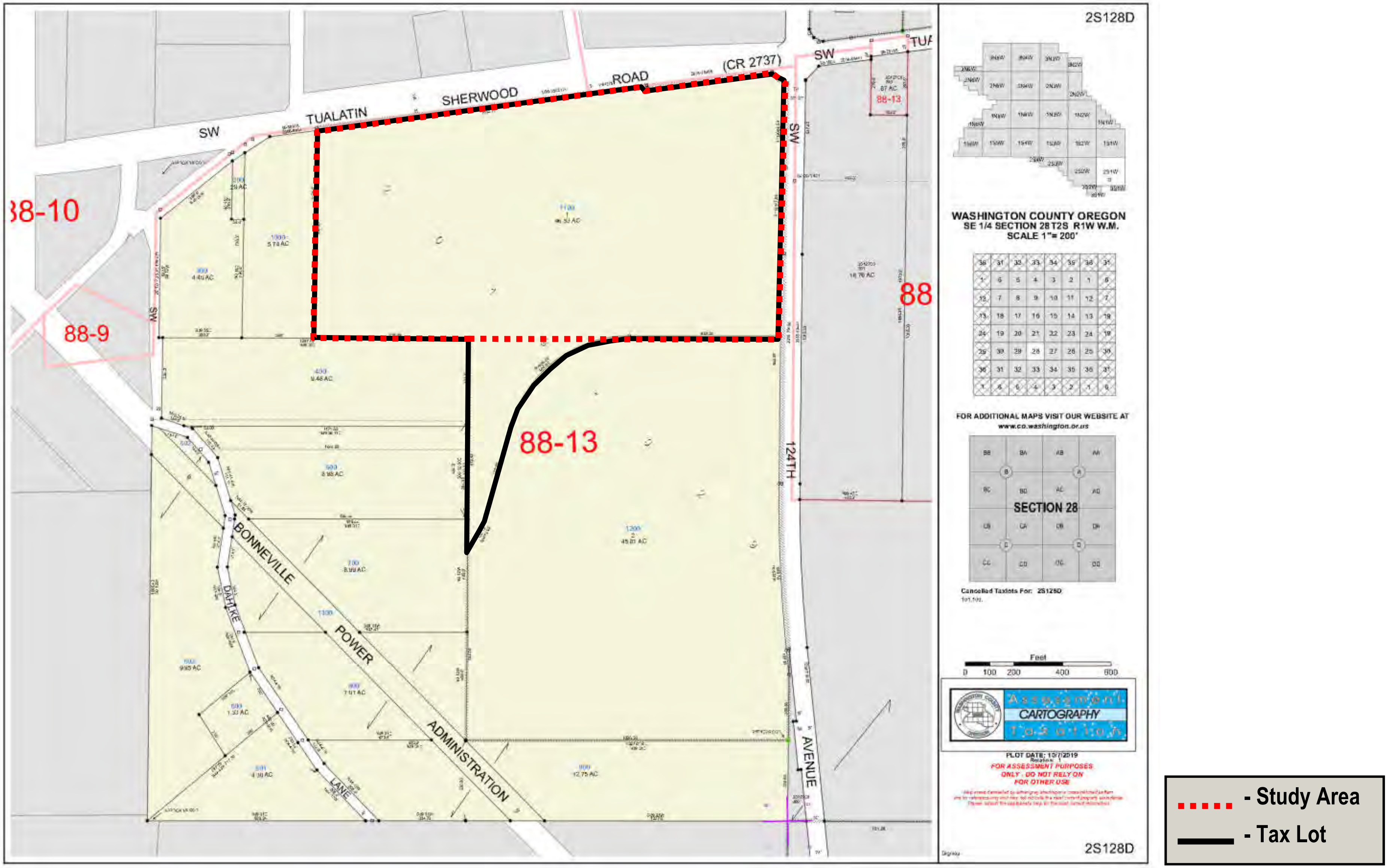
#6163
12/19/2019

PHS

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

General Location and Topography
T-S Corporate Park—Sherwood, Oregon
United States Geological Survey (USGS), Sherwood, Oregon, 7.5 Quadrangle, 2014
(viewer/nationalmap.gov/basic)

FIGURE
1

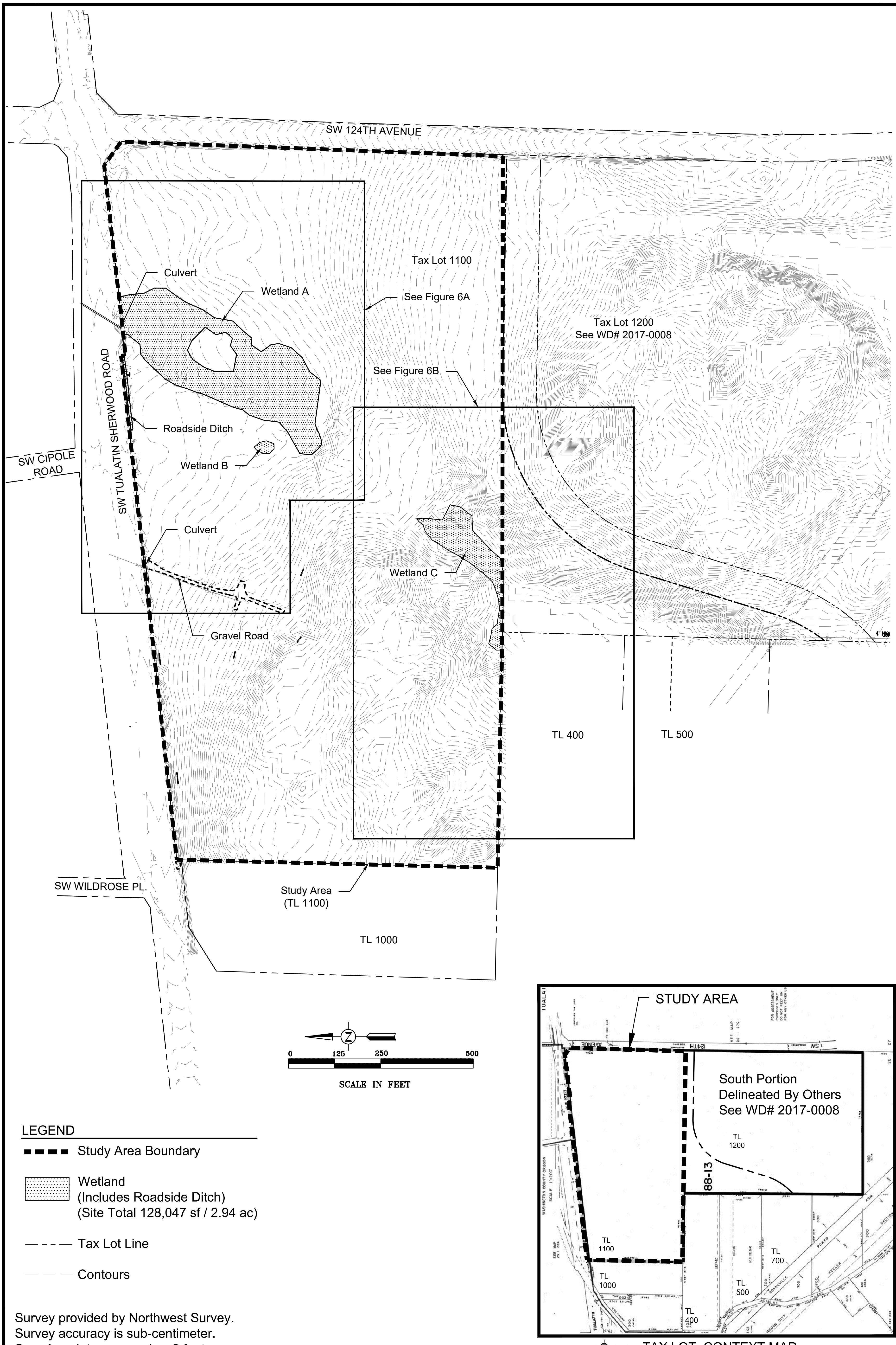


#6163
12/19/2019

Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180
Wilsonville, OR 97070

Tax Lot Map
T-S Corporate Park—Sherwood, Oregon
The Oregon Map (ormap.net)

FIGURE
2



PHS
Pacific Habitat Services,Inc.

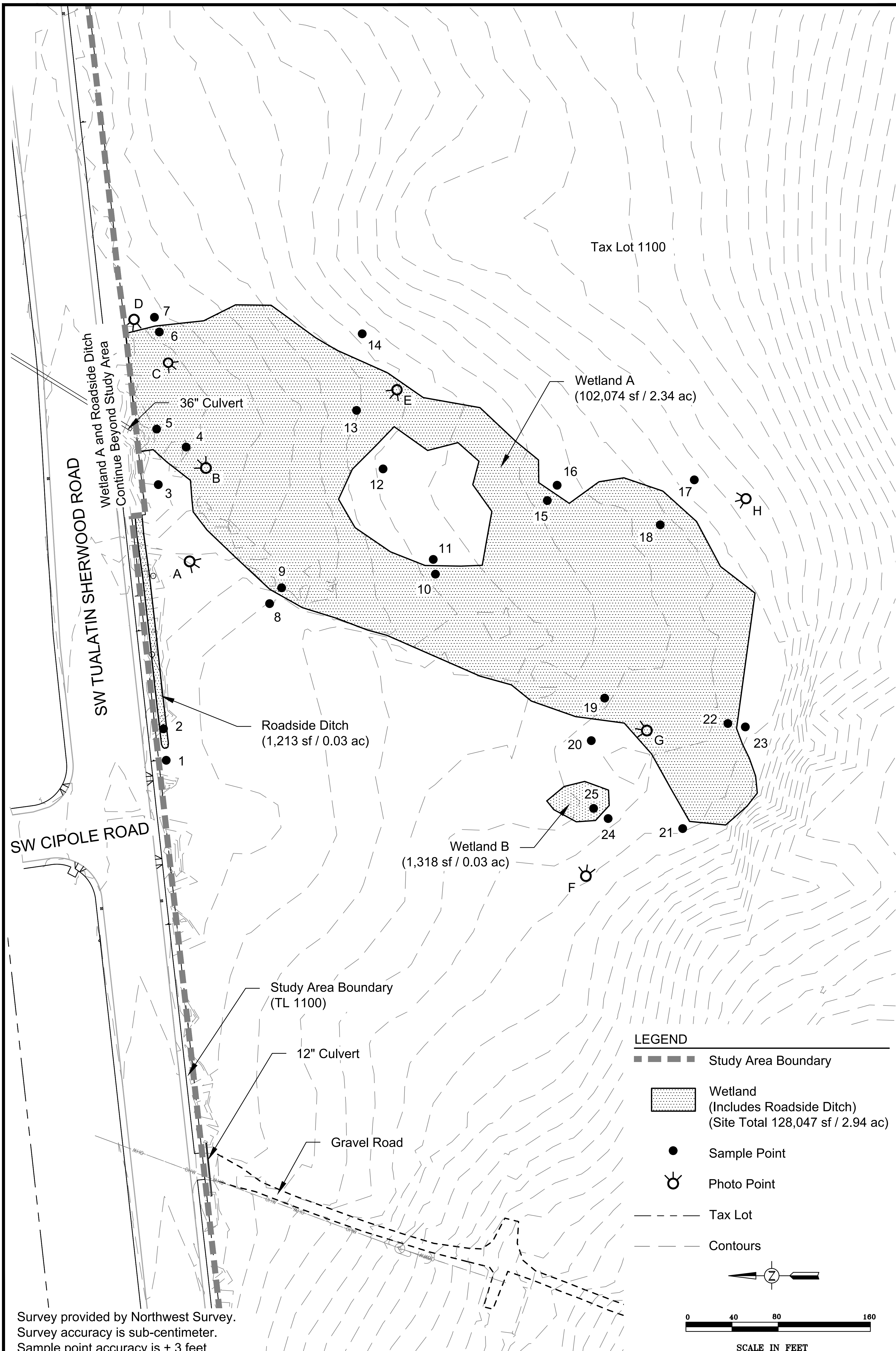
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

DSL WD # 2020-0015
Approval Issued 3/11/2020
Approval Expires 3/11/2025

Wetland Delineation Overview and Sheet Index
Orr Property - Washington County, Oregon

FIGURE
6

3-6-2020



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Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

DSL WD # 2020-0015
Approval Issued 3/11/2020
Approval Expires 3/11/2025

Wetland Delineation
T-S Corporate Park - Sherwood Oregon

FIGURE
6A

1-3-2020

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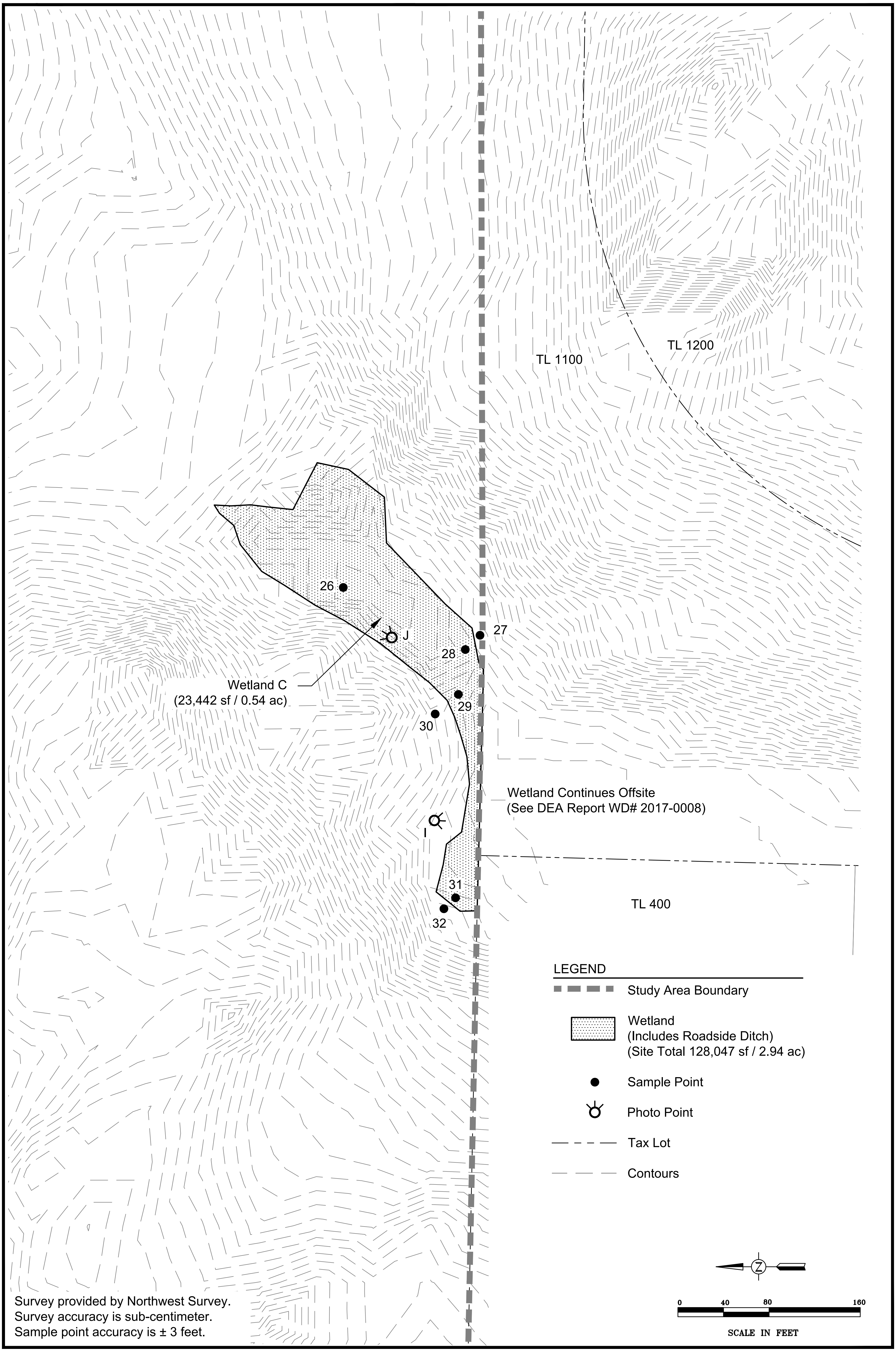

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9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

DSL WD # 2020-0015
Approval Issued 3/11/2020
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Wetland Delineation
T-S Corporate Park - Sherwood, Oregon

FIGURE 6B

1-3-2020


Proposed Right Turn Construction Access
SW TUALATIN SHERWOOD RD
POND
TRACT B
1.79 ACRES
POND
TRACT C
0.45 ACRES
TRACT E
1.30 ACRES
POND
LOT 1
5.15 ACRES
LOT 2
3.71 ACRES
TRACT D
5.13 ACRES
LOT 5
4.47 ACRES
SW 124TH AVENUE
SW CIPOLE PL
1.04 ACRES
LOT 3
8.93 ACRES
LOT 4
8.52 ACRES
Proposed Construction Access
TRACT A
5.86 ACRES
FUTURE BLAKE RD
Tree Removal, Mass Excavation, Mass Grading - 8/20-8-21
SCALE IN FEET
LAND-USE SET - NOT FOR CONSTRUCTION
T-S CORPORATE PARK
SEQUENCING PLAN
SHERWOOD, OREGON
REVISIONS
REV
DATE
DESCRIPTION
BY
DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641
PROJECT 2322.14347.01
DATE 01/17/2020
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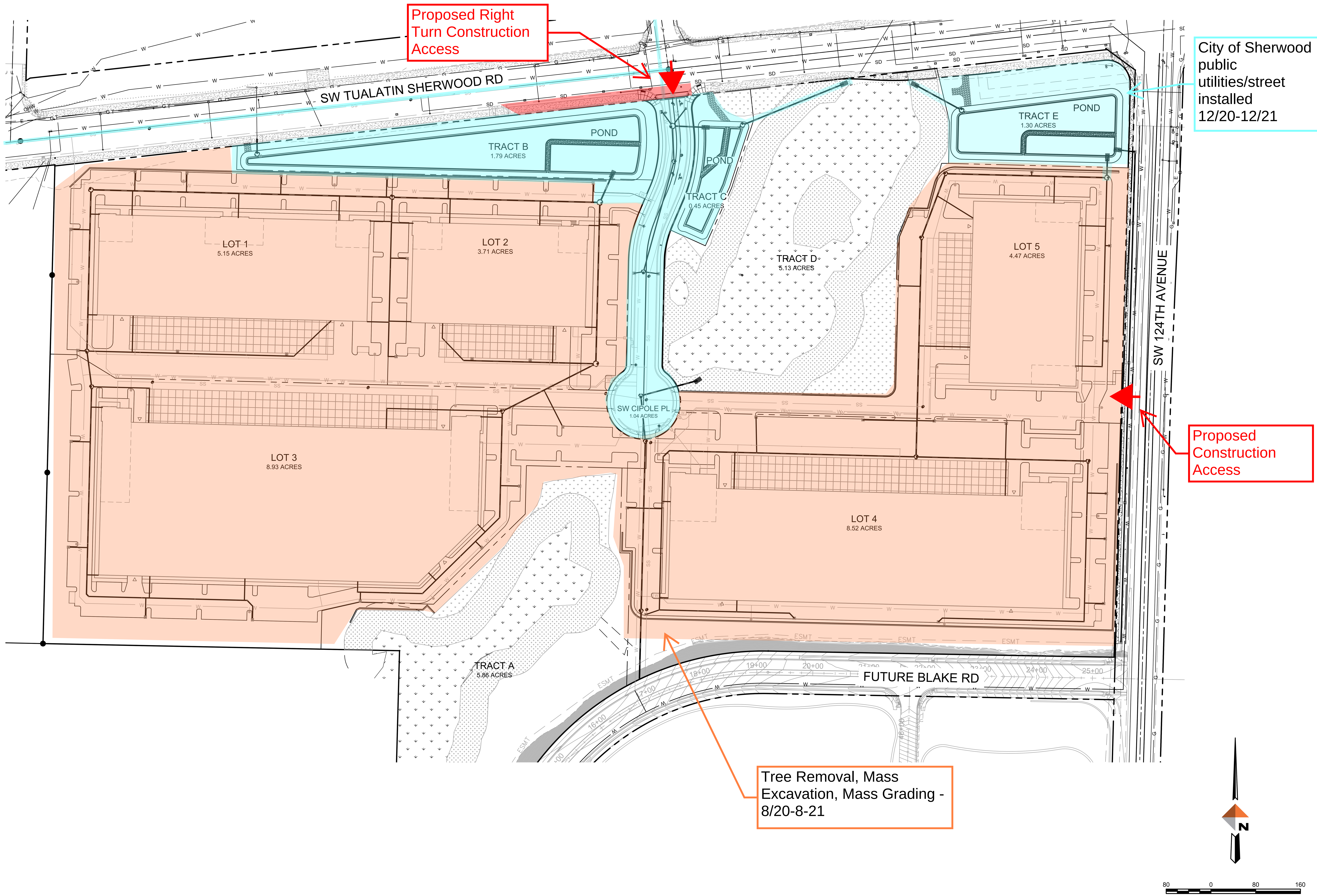

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY
		REVISIONS	

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WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

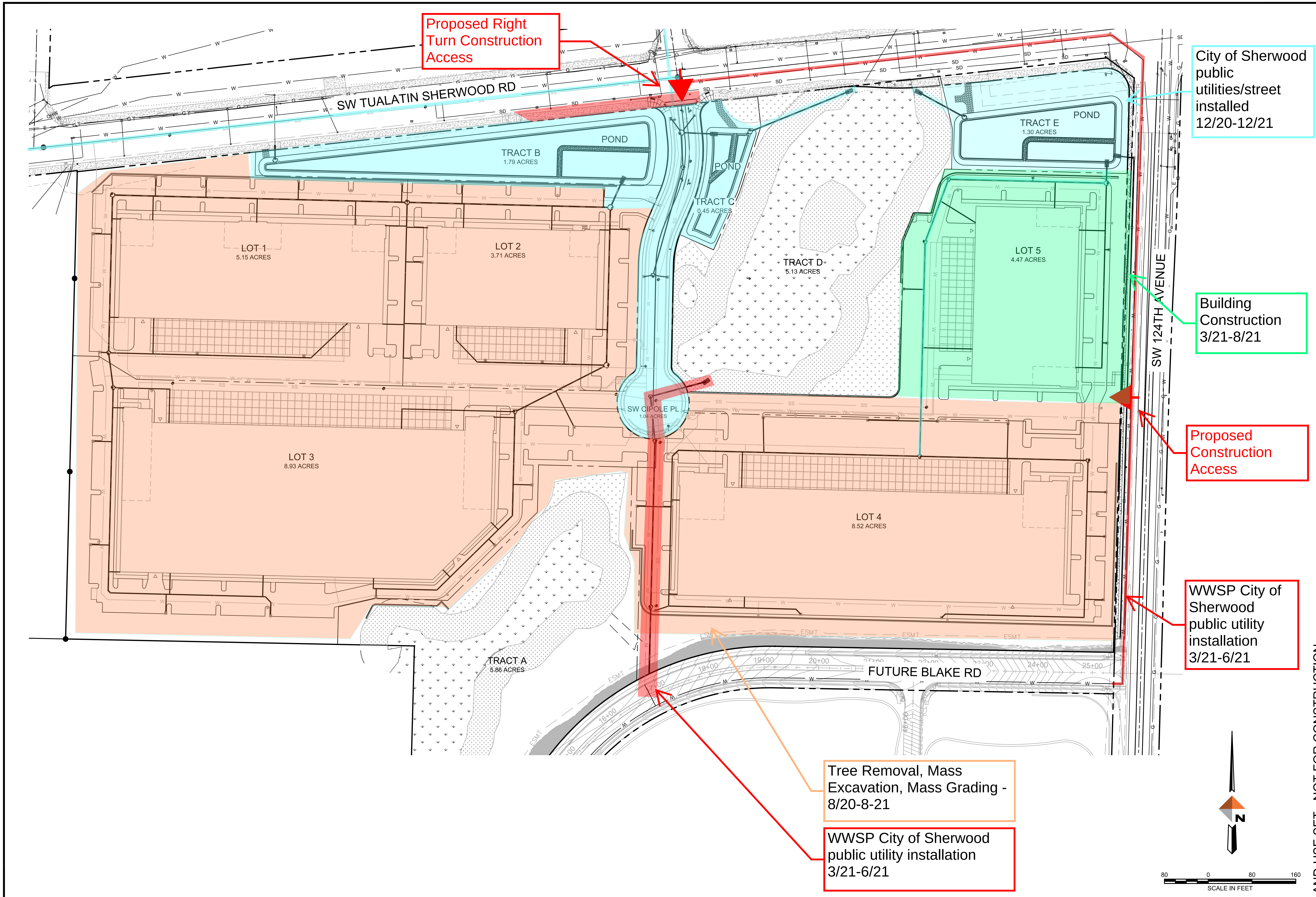
T-S CORPORATE PARK

SEQUENCING PLAN

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
EX-1



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REVISIONS

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T-S CORPORATE PARK
SEQUENCING PLAN
SHERWOOD, OREGON

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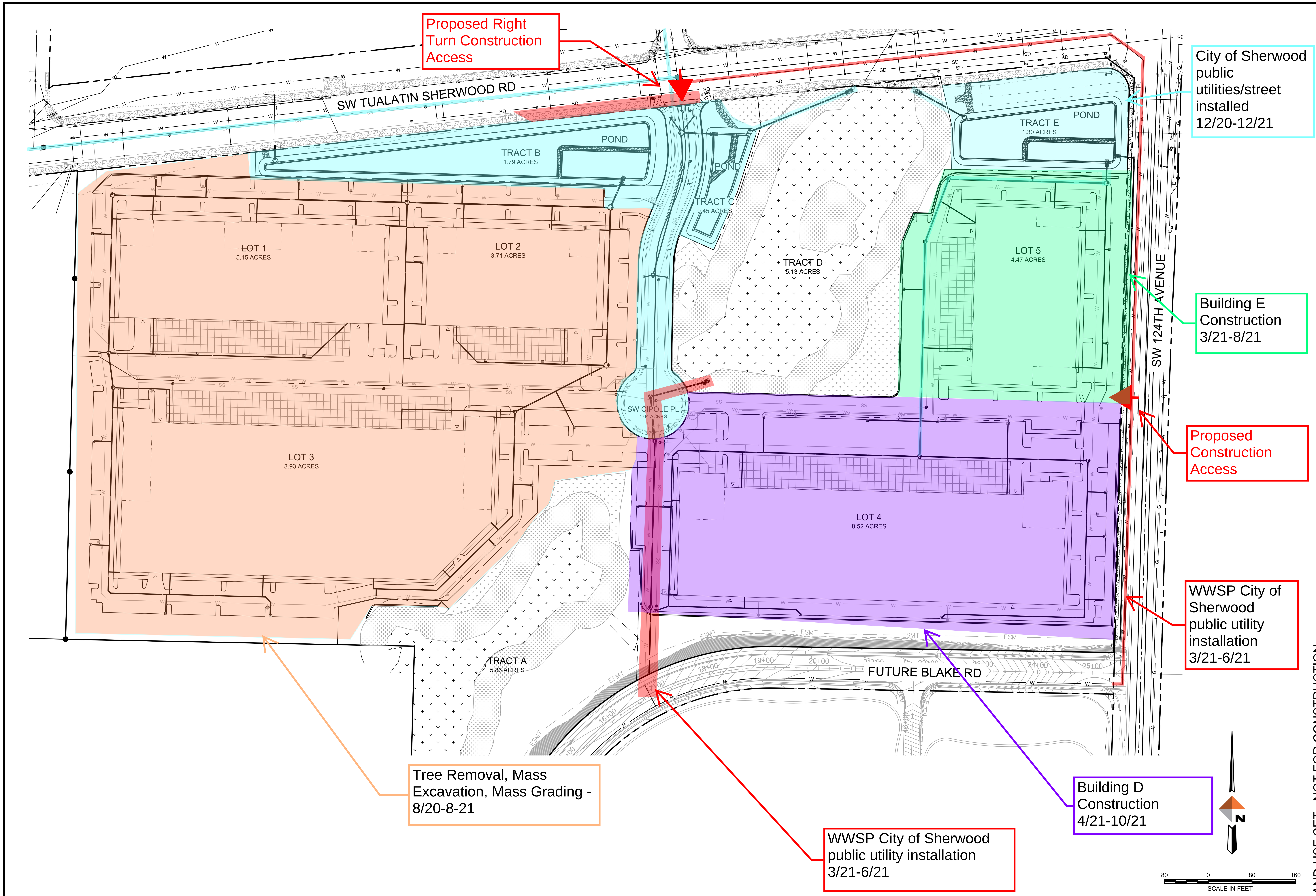
DATE 01/17/2020

SHEET
EX-1



LAND-USE SET - NOT FOR CONSTRUCTION

T-S CORPORATE PARK

SEQUENCING PLAN

SHERWOOD, OREGON

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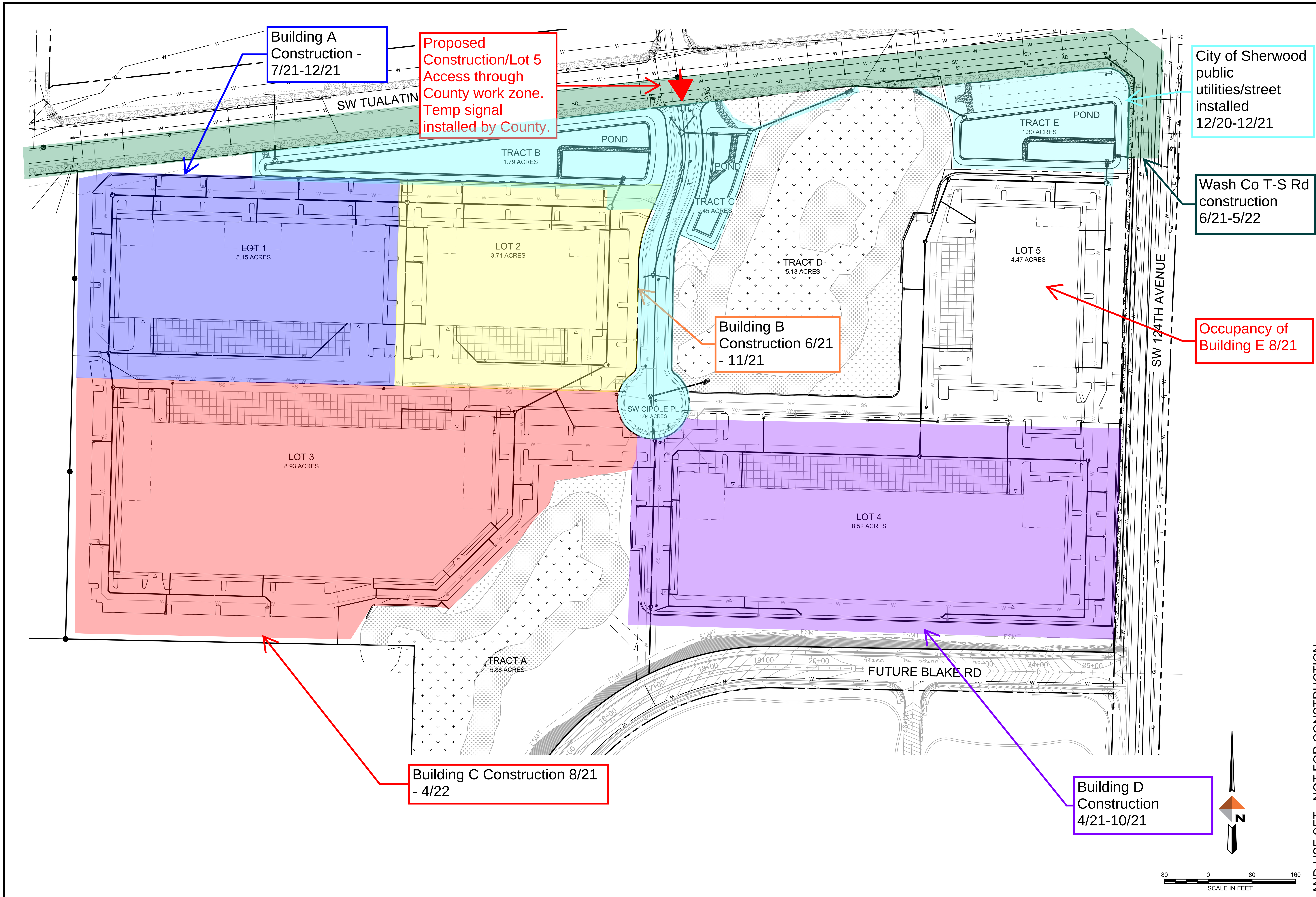
PROJECT	2322.14347.01
DATE	01/17/2020

SHEET
EX-1

\\BIL-FS\BIL-PROJECTS\22\14347-01\65CAD\CIVIL\EXHIBITS\2020-03-04 - PHASING PLAN\SC-CU-SD-TCC.DWG SAVED: 3/4/2020 7:31 PM PLOTTED: 3/4/2020 7:36 PM BY: RHALVORSON

Proposed Construction Access through County work zone
SW TUALATIN SHERWOOD RD
City of Sherwood public utilities/street installed 12/20-12/21
Wash Co T-S Rd construction 6/21-5/22
POND
TRACT B
1.79 ACRES
POND
TRACT C
0.45 ACRES
POND
TRACT E
1.30 ACRES
LOT 1
5.15 ACRES
LOT 2
3.71 ACRES
TRACT D
5.13 ACRES
LOT 5
4.47 ACRES
Building E Construction 3/21-8/21
Building B Construction 6/21 - 11/21
SW 124TH AVENUE
SW CIPOLE PL
1.04 ACRES
LOT 3
8.93 ACRES
Proposed Construction Access
LOT 4
8.52 ACRES
TRACT A
5.86 ACRES
FUTURE BLAKE RD
Tree Removal, Mass Excavation, Mass Grading - 8/20-8-21
Building D Construction 4/21-10/21
N
SCALE IN FEET
LAND-USE SET - NOT FOR CONSTRUCTION
T-S CORPORATE PARK
SEQUENCING PLAN
SHERWOOD, OREGON
DOWL
WWW.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641
REVISIONS
REV
DATE
DESCRIPTION
BY
PROJECT 2322.14347.01
DATE 01/17/2020
©DOWL 2019
SHEET
EX-1



LAND-USE SET - NOT FOR CONSTRUCTION

REV | DATE | DESCRIPTION | BY
REVISIONS

DOWL
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720 SW Washington Street, #750
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T-S CORPORATE PARK
SEQUENCING PLAN
SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
EX-1

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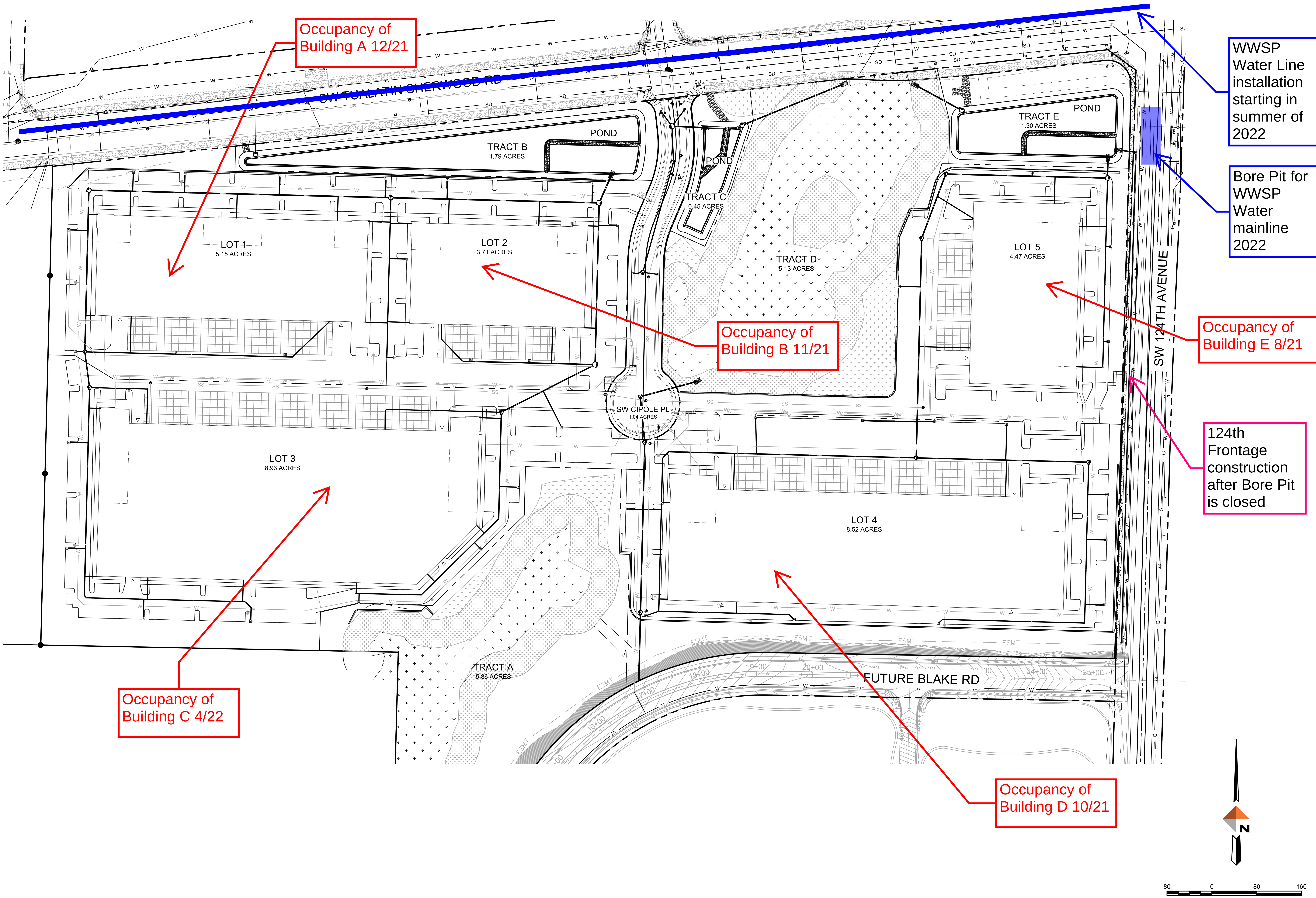

\\BIL-FS\BIL-PROJECTS\22\14347-01\65CAD\CIVIL\EXHIBITS\2020-03-04 - PHASING PLAN\SC-CU-SD-TCC.DWG SAVED: 3/4/2020 7:31 PM PLOTTED: 3/4/2020 7:36 PM BY: RHALVORSON

LAND-USE SET - NOT FOR CONSTRUCTION

REV	DATE	DESCRIPTION	BY
		REVISIONS	

DOWL
www.DOWL.COM
720 SW Washington Street, #750
Portland, Oregon 97205
971-280-8641

T-S CORPORATE PARK

SEQUENCING PLAN

SHERWOOD, OREGON

PROJECT 2322.14347.01
DATE 01/17/2020

SHEET
EX-1

Clean Water Services
Our commitment is clear.

CWS File Number
20-000203

Service Provider Letter

This form and the attached conditions will serve as your Service Provider Letter in accordance with Clean Water Services Design and Construction Standards (R&O 19-5, as amended by R&O 19-22).

Jurisdiction:	City of Sherwood	**Review Type:**	Tier 2 Analysis
Site Address / Location:	12822 SW Tualatin Sherwood Rd Sherwood, OR 97140	**SPL Issue Date:**	April 13, 2020
		SPL Expiration Date:	April 13, 2022

Applicant Information:		**Owner Information:**	
Name	KIRK OLSEN	Name	DAVID KRASKA
Company	TRAMMELL CROW COMPANY	Company	WILLAMETTE WATER SUPPLY SYSTEM COMMINSION
Address	1300 SW FIFTH AVE SUITE 3050 PORTLAND OR 97201	Address	1850 SW 170TH AVE PORTLAND OR 97003
Phone/Fax	(503) 946-4981	Phone/Fax	(503) 941-4569
E-mail:	kolsen@trammellcrow.com	E-mail:	David.raska@tvwd.org

Tax lot ID		Development Activity
2S128D001100		T-S Corporate Park
		Commercial Multi Lot Development

Pre-Development Site Conditions:		**Post Development Site Conditions:**	
Sensitive Area Present:	[X] On-Site [X] Off-Site	Sensitive Area Present:	[X] On-Site [X] Off-Site
Vegetated Corridor Width:	Variable	Vegetated Corridor Width:	Variable
Vegetated Corridor Condition:	Good/Marginal/Degraded		

Enhancement of Remaining Vegetated Corridor Required: [X] **Square Footage to be enhanced:** 157,549

Encroachments into Pre-Development Vegetated Corridor:

Type and location of Encroachment:	Square Footage:
Grading & retaining walls for road, parking lots, & stormwater outfalls (Permanent encroachment; Mitigation required)	10,699
Storm pipe installation (Temporary encroachment; Restoration and planting in-place required)	4,917

Mitigation Requirements:

Type/Location	Sq. Ft./Ratio/Cost
On-site Replacement Mitigation	35,654/3.3:1

[X] Conditions Attached [X] Development Figures Attached (4) [ ] Planting Plan Attached [ ] Geotech Report Required

This Service Provider Letter does NOT eliminate the need to evaluate and protect water quality sensitive areas if they are subsequently discovered on your property.

In order to comply with Clean Water Services water quality protection requirements the project must comply with the following conditions:

1. No structures, development, construction activities, gardens, lawns, application of chemicals, uncontained areas of hazardous materials as defined by Oregon Department of Environmental Quality, pet wastes, dumping of materials of any kind, or other activities shall be permitted within the sensitive area or Vegetated Corridor which may negatively impact water quality, except those allowed in R&O 19-5, Chapter 3, as amended by R&O 19-22.
2. Prior to any site clearing, grading or construction the Vegetated Corridor and water quality sensitive areas shall be surveyed, staked, and temporarily fenced per approved plan. During construction the Vegetated Corridor shall remain fenced and undisturbed except as allowed by R&O 19-5, Section 3.06.1, as amended by R&O 19-22 and per approved plans.
3. If there is any activity within the sensitive area, the applicant shall gain authorization for the project from the Oregon Department of State Lands (DSL) and US Army Corps of Engineers (USACE). The applicant shall provide Clean Water Services or its designee (appropriate city) with copies of all DSL and USACE project authorization permits. **No wetland or non-wetland work proposed with this project.**
4. An approved Oregon Department of Forestry Notification is required for one or more trees harvested for sale, trade, or barter, on any non-federal lands within the State of Oregon.
5. **Prior to ground disturbing activities, an erosion control permit is required. Appropriate Best Management Practices (BMP's) for Erosion Control, in accordance with Clean Water Services' Erosion Prevention and Sediment Control Planning and Design Manual, shall be used prior to, during, and following earth disturbing activities.**
6. Prior to construction, a Stormwater Connection Permit from Clean Water Services or its designee is required pursuant to Ordinance 27, Section 4.B.
7. Activities located within the 100-year floodplain shall comply with R&O 19-5, Section 5.10, as amended by R&O 19-22.
8. Removal of native, woody vegetation shall be limited to the greatest extent practicable.
9. The water quality swale and detention pond shall be planted with Clean Water Services approved native species, and designed to blend into the natural surroundings.
10. **Should final development plans differ significantly from those submitted for review by Clean Water Services, the applicant shall provide updated drawings, and if necessary, obtain a revised Service Provider Letter.**
11. The Vegetated Corridor width for sensitive areas within the project site shall be a minimum of 25-50 feet wide, as measured horizontally from the delineated boundary of the sensitive area.
12. For Vegetated Corridors that extend 35 feet from the break in slope, the width of Vegetated Corridors may be reduced to 15 feet wide if a stamped geotechnical report confirms that slope stability can be maintained with the reduced setback from the break in slope.
13. **For Vegetated Corridors greater than 50 feet in width, the applicant shall enhance the first 50 feet closest to the sensitive area to meet or exceed good corridor condition as defined in R&O 19-5, Section 3.14.2, Table 3-3, as amended by R&O 19-22.**
14. **Removal of invasive non-native species by hand is required in all Vegetated Corridors rated ""good."" Replanting is required in any cleared areas larger than 25 square feet using low impact methods. The applicant shall calculate all cleared areas larger than 25 square feet prior to the preparation of the required Vegetated Corridor enhancement/restoration plan**.
15. Prior to any site clearing, grading or construction, the applicant shall provide Clean Water Services with a Vegetated Corridor enhancement/restoration plan. Enhancement/restoration of the Vegetated Corridor shall be provided in accordance with R&O 19-5, Appendix A, as amended by R&O 19-22, and shall include planting specifications for all Vegetated Corridor, including any cleared areas larger than 25 square feet in Vegetated Corridor rated ""good.""

16. Prior to installation of plant materials, all invasive vegetation within the Vegetated Corridor shall be removed per methods described in Clean Water Services' Integrated Pest Management Plan, 2019. During removal of invasive vegetation care shall be taken to minimize impacts to existing native tree and shrub species.
17. **Clean Water Services and/or the City shall be notified 72 hours prior to the start and completion of enhancement/restoration activities. Enhancement/restoration activities shall comply with the guidelines provided in Planting Requirements (R&0 19-5, Appendix A, as amended by R&O 19-22).**
18. **Maintenance and monitoring requirements shall comply with R&O 19-5, Section 2.12.2, as amended by R&O 19-22. If at any time during the warranty period the landscaping falls below the 80% survival level, the owner shall reinstall all deficient planting at the next appropriate planting opportunity and the two year maintenance period shall begin again from the date of replanting.**
19. **Performance assurances for the Vegetated Corridor shall comply with R&O 19-5, Section 2.07.2, Table 2-1 and Section 2.11, Table 2-2, as amended by R&O 19-22.**
20. **For any developments which create multiple parcels or lots intended for separate ownership, Clean Water Services shall require that the sensitive area and Vegetated Corridor be contained in a separate tract and subject to a ""STORM SEWER, SURFACE WATER, DRAINAGE AND DETENTION EASEMENT OVER ITS ENTIRETY"" to be granted to the City or Clean Water Services.**
21. **Clean Water Services shall require an easement over the Vegetated Corridor conveying storm and surface water management to Clean Water Services or the City that would prevent the owner of the Vegetated Corridor from activities and uses inconsistent with the purpose of the corridor and any easements therein.**

FINAL PLANS

22. **Final construction plans shall include landscape plans.** In the details section of the plans, a description of the methods for removal and control of exotic species, location, distribution, condition and size of plantings, existing plants and trees to be preserved, and installation methods for plant materials is required. Plantings shall be tagged for dormant season identification and shall remain on plant material after planting for monitoring purposes.
23. **A Maintenance Plan shall be included on final plans** including methods, responsible party contact information, and dates (minimum two times per year, by June 1 and September 30).
24. **Final construction plans shall clearly depict the location and dimensions of the sensitive area and the Vegetated Corridor** (indicating good, marginal, or degraded condition). Sensitive area boundaries shall be marked in the field.
25. Protection of the Vegetated Corridors and associated sensitive areas shall be provided by the installation of permanent fencing and signage between the development and the outer limits of the Vegetated Corridors. **Fencing and signage details to be included on final construction plans.**

<u>This Service Provider Letter is not valid unless CWS-approved site plan is attached.</u>

Please call (503) 681-3653 with any questions.

Lindsey Obermiller

Lindsey Obermiller
Environmental Plan Review

Attachments (4)

COLOR COPY

CWS FILE NO. 20-000203
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By LO Date 04/13/2020
SPL ATTACHMENT 1 OF 4

0 125 250 500
SCALE IN FEET

Survey provided by Northwest Survey.

PHS
Pacific Habitat Services, Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Site Development Plan Overview
T-S Corporate Park - Sherwood, Oregon

FIGURE 4

3-19-2020

LEGEND

- Project Area Boundary
- Wetland (Site Total 159,518 sf / 3.66 ac)
- Vegetated Corridor
- Vegetated Corridor Permanent Encroachment (10,699 sf / 0.25 ac)
- Vegetated Corridor Temporary Encroachment (4,917 sf / 0.11 ac)
- Vegetated Corridor Enhancement (157,549 sf / 3.62 ac)
- Vegetated Corridor Mitigation and Water Quality Benefit (35,654 sf / 0.82 ac)

COLOR COPY

CWS FILE NO. 20-000203
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By LO Date 04/13/2020
SPL ATTACHMENT 2 OF 4

0 30 60 120
SCALE IN FEET

Site Plan Provided by DOWL

PHS
Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
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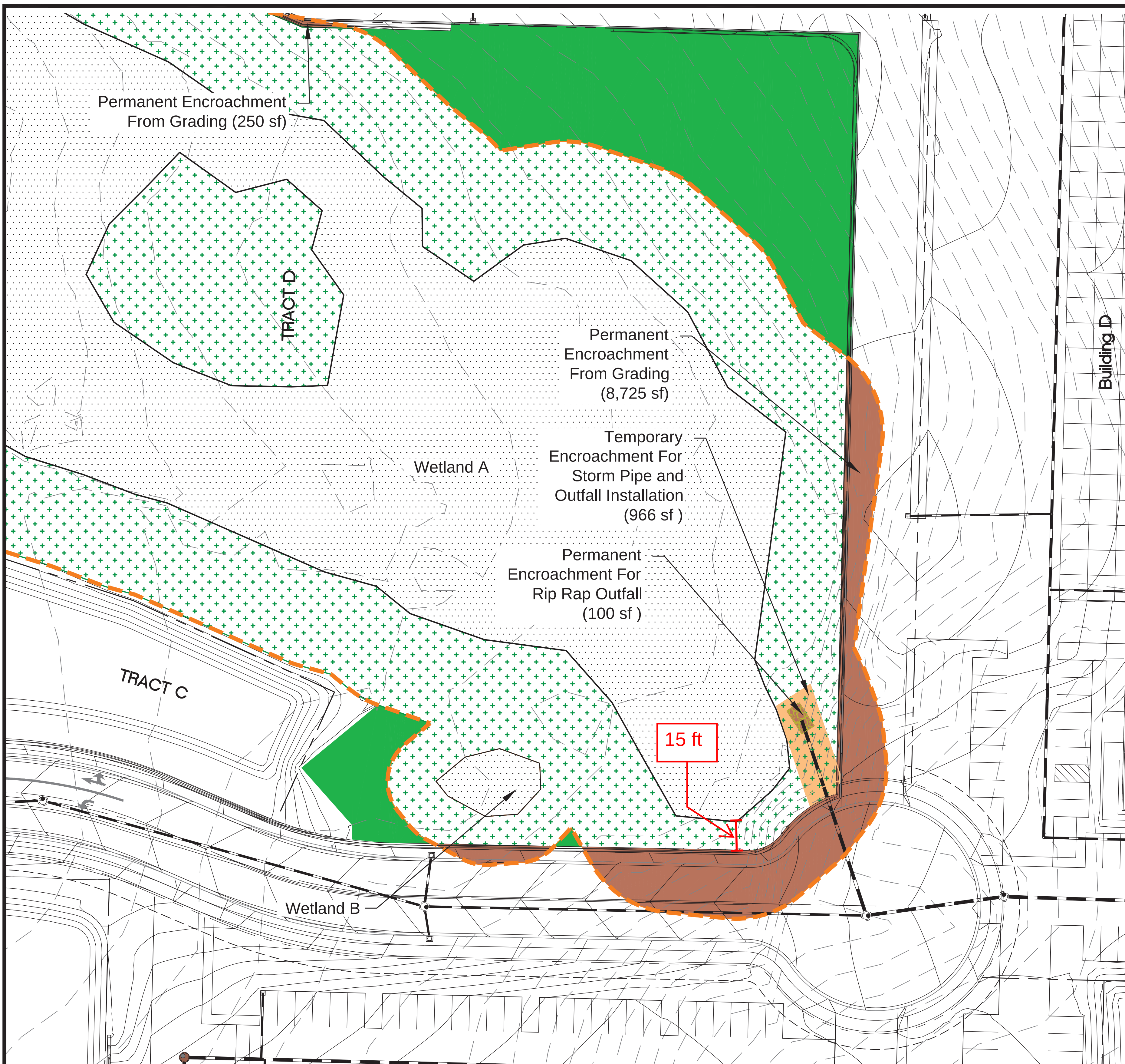
Site Development Plan and Vegetated Corridor Encroachment
T-S Corporate Park - Sherwood, Oregon

FIGURE
4A

3-19-2020



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COLOR COPY

CWS FILE NO. 20-000203
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By LO Date 04/13/2020
SPL ATTACHMENT 3 OF 4

0 30 60 120
SCALE IN FEET

Site Plan Provided by DOWL

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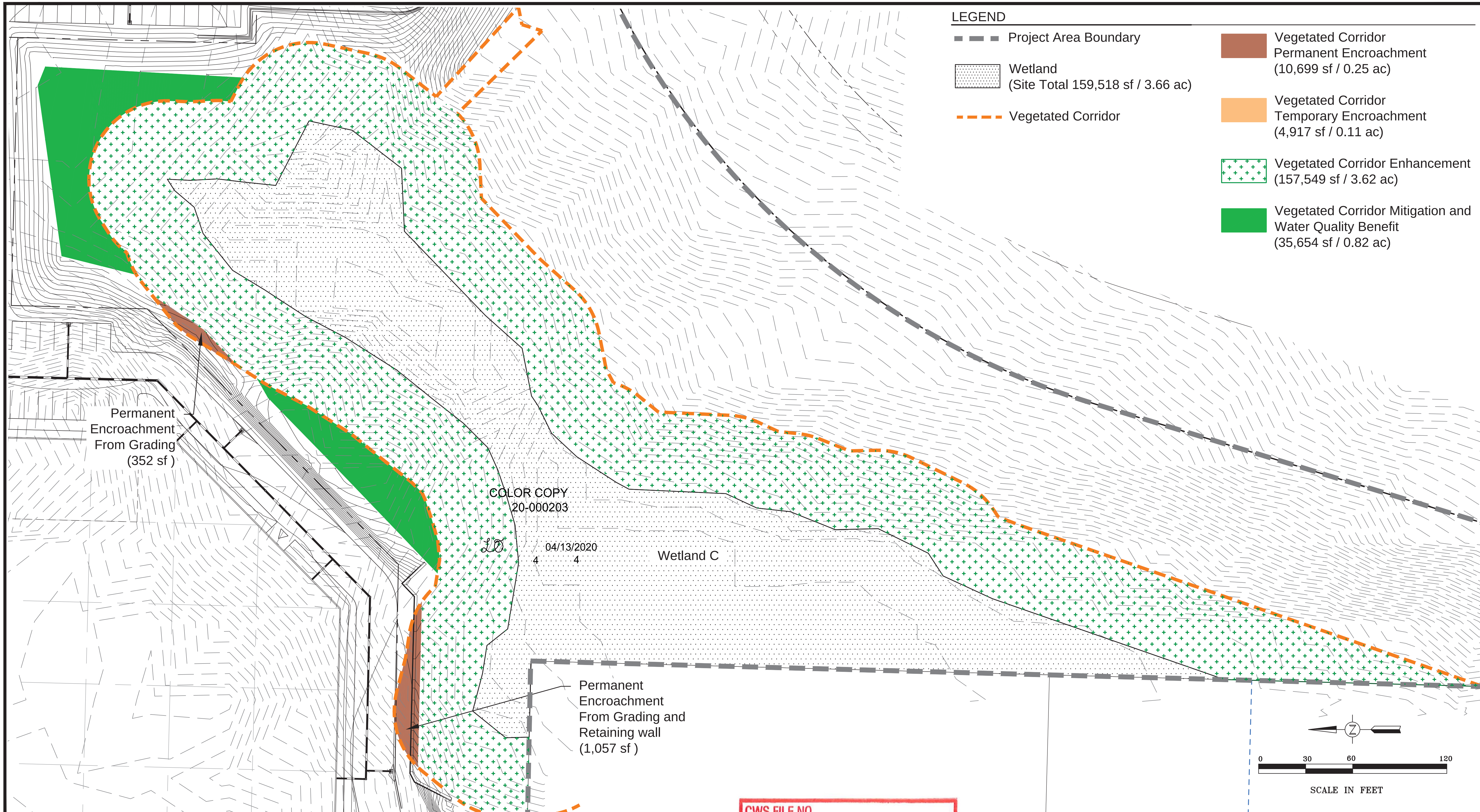
Pacific Habitat Services,Inc.
9450 SW Commerce Circle, Suite 180 Wilsonville, Oregon 97070
Phone: (503) 570-0800 Fax (503) 570-0855

Site Development Plan and Vegetated Corridor Encroachment

T-S Corporate Park - Sherwood, Oregon

FIGURE 4B

3-19-2020



PHS

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Phone: (503) 570-0800 Fax (503) 570-0855

Site Plan Provided by DOWL

CWS FILE NO.__________
Approved
Clean Water Services
FOR ENVIRONMENTAL REVIEW
By__________ Date__________
SPL ATTACHMENT ______ OF ______

Site Development Plan and Vegetated Corridor Encroachment

T-S Corporate Park - Sherwood, Oregon

FIGURE
4C

3-19-2020

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