Mandel Farms
Subdivision Application

Date:	January 8, 2016
Submitted to:	City of Sherwood Planning Department 22560 SW Pine Street Sherwood, Oregon 97140
Applicant:	Venture Properties, Inc. 4230 Galewood Street, Suite 100 Lake Oswego, Oregon 97034 Attention: Kelly Ritz

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Mandel Farms
Subdivision Application

Submitted to:	City of Sherwood Planning Department 150 East Main Street, 4th Floor Hillsboro, OR 97123
Owner:	2007 Mandel Family Trust, David Mandel, and Randy Kieling 16990 SW Richen Park Circle Sherwood, OR 97140
Applicant:	Venture Properties, Inc. Kelly Ritz 4230 Galewood Street, Suite 100 Lake Oswego, OR 97034
Applicant's Civil Engineer/ Land Surveyor/ Planner/Natural Resources	AKS Engineering & Forestry, LLC 12965 SW Herman Road, Suite 100 Tualatin, OR 97062 Contact: Mimi Doukas, AICP, RLA (mimid@aks-eng.com) Phone: (503) 563-6151
Transportation Engineer:	Lancaster Engineering Mike Ard 321 SW 4th Avenue, Suite 400 Portland, OR 97204
Site Location:	21340 SW Elwert Road Southeast corner of the intersection of SW Edy Road and SW Elwert Road
Assessor's Information:	Map 2S130CB Tax Lots 00250 and 00251
Site Size/Zone:	+/- 22.35 acres
Zoning:	Medium Density Residential High (MDRH); Medium Density Residential Low (MDRL)

I. Executive Summary

The Applicant proposes to subdivide this approximately 22 acre parcel into 86 residential lots. This resubmittal, reflects the City's recent decision to approve a zone change (Ordinance No. 2015-009, adopted January 5, 2015) for a portion of this site from Neighborhood Commercial to MDRL.

The site is constrained by a number of existing features. First, the pattern of existing development in the surrounding area, particularly the location of high volume vehicular facilities (SW Elwert Road and SW Edy Road), limits the locations for new street connections that are necessary to serve the site. Second, and even more limiting, is the large tributary of Chicken Creek (and associated vegetated corridor) that cuts an approximately 100- to 150-foot wide swath through the site and splits it into distinct east and west sides. This vegetated corridor occupies, and makes undevelopable, more than one-quarter of the site[1]. Finally, the site surrounds an existing regional stormwater facility located west of the intersection of SW Nursery Way and SW Copper Terrace. The location of this stormwater facility creates additional development challenges and further limits options for street connectivity through the site. These existing site conditions result in a developable area that is made up of relatively small and isolated islands.

Early in the conceptualization of this project, the Applicant explored the possibility of constructing a local street between SW Elwert Road and SW Copper Terrace, across the vegetated corridor, however, discovered that significant environmental impacts and financial cost made such a connection impractical. In their recent decision to change the zoning on a portion of this site from NC to MDRL, the City Council agreed with these findings[2].

Through the course of developing this proposal, the Applicant explored a number of street and lot configurations to best address the site's inherent development challenges. This proposal uses the modification process in Section 16.106.020.E. of Sherwood Zoning and Community Development Code (SZCDC), to propose a subdivision that meets all applicable approval criteria, while providing a site that: respects and highlights the unique natural resources on this site, promotes walking and biking, provides numerous opportunities for outdoor recreation, and that accommodates the City's demand for new housing to serve a growing population.

This proposal includes 48,029 square feet of open space in five open space tracts and is the result of close coordination between the Applicant and City staff. The Plan presented in Exhibit B showcases the vegetated corridor that runs through the site and takes advantage of the same constraints that make

[1] Accounting for public right-of-way, sensitive lands, and required open space, the net developable area of the site equals 54 percent of the gross site area.

[2] On October 28, 2015, the City's Engineering Department issued a memo (see Exhibit I) regarding this planned street connection which states in part, "In the case of this connector street between SW Elwert Road and SW Copper Terrace locating it within the subject zone change property would be very expensive on both monetary and environmental levels since it would require crossing a tributary in this area and would likely exceed $2,000,000 for a 700-foot section of roadway. During the design of the [Daybreak Subdivision], south of the subject … property… a future street plan was submitted identifying an interconnect between SW Copper Terrace and SW Elwert Road where a new local street would intersect with SW Elwert Road approximately 730 [feet] north of SW Handley Street. This new interconnect will be fully funded by the development of the property in which it lies (no city funding). Due to the above data, no street crossing of the tributary will be required of the subject property during the land use review process."

vehicular connectivity impractical, to provide a well-connected pedestrian and bicycle network through the site and connecting to adjacent properties.

The 0.71 acre open space in Tract H runs along the western rim of the resource area between SW Elwert Road and SW D Lane and includes a grass play area, picnic tables, and a hard surface pathway that will connect the sidewalk along SW Elwert Road to SW Copper Terrace via a new pedestrian bridge spanning the vegetated corridor. This pedestrian bridge is a key component of this development plan as it provides an effective and convenient transportation linkage through the site and provides access to unique recreational opportunities on- and off-site

Another open space is located immediately west of Laurel Ridge Middle School/Edy Ridge Elementary School off of SW Copper Terrace. This open space includes a picnic shelter, tables, benches and an adaptable lawn play area. A pedestrian connection between Lots 15 and 16 provides ideal pedestrian access between SW Yorkshire Way and this open space and helps minimize the length of this block for improved pedestrian and bicycle circulation. This open space is envisioned as one that will provide both passive and active recreational amenity to residents of this subdivision as well as for residents in the surrounding area; including parents picking up children from school.

A third open space tract (Tract D) is located on the east side of the vegetated corridor immediately south of SW Edy Road. This 0.15 acre open space includes an adaptable lawn play area, a picnic table and a pedestrian and bicycle connection between SW A Lane and sidewalks along SW Edy Road.

Tract G includes a 3-foot wide soft surface path along the eastern rim of the vegetated corridor. This path provides an attractive connection between the pedestrian bridge, Tract D and SW Edy Road. This soft surface path also provides an opportunity for more intimate interaction with the natural assets this site offers.

As mentioned above, certain modifications are necessary to allow the development proposed herein. The requested modifications, as authorized by Section 16.106.020.E, are necessary to: 1) create two hammerheads that exceed the 200-foot maximum allowed in this Code; and, 2) create a new street (SW D Lane) that falls below the required 52-foot wide cross-section for a standard residential street. This application also seeks setback allowances authorized by Chapter 16.144 to reduce the rear yard setback, and create more useful building sites, for seven lots abutting the vegetated corridor (Tracts E and G). In accordance with this provision, the application provides more than 2,100 square feet of additional open space on site in exchange for the setback allowance.

This Plan makes the most of unique site characteristics to provide a truly distinct and highly attractive experience for residents, recreationalists, pedestrians and bicyclists. The combination of open spaces provides important destinations for residents who desire opportunities to get outside and recreate while respecting the function and integrity of the site's important natural resources. This written narrative, together with preliminary plans and other documentation included in the application materials, establishes that the application is in compliance with all applicable approval criteria. This documentation represents substantial evidence and provides the basis for the Planning Commission to approve the application.

II. Site Description

As noted above, the property is located at the southeast corner of the intersection of SW Edy Road and SW Elwert Road. The site is approximately 22 total acres in size, and is comprised of two tax lots (2S130CB 00250 and 00251). A perennial tributary of Chicken Creek bisects the property from south to north and includes an Open Space Overlay. This creek and its associated vegetated corridor consume approximately 5.72 acres of this site. The property has gentle topography outside of the drainageway and is in active farm use with nursery stock and field crops.

City of Sherwood Zoning Map[3]

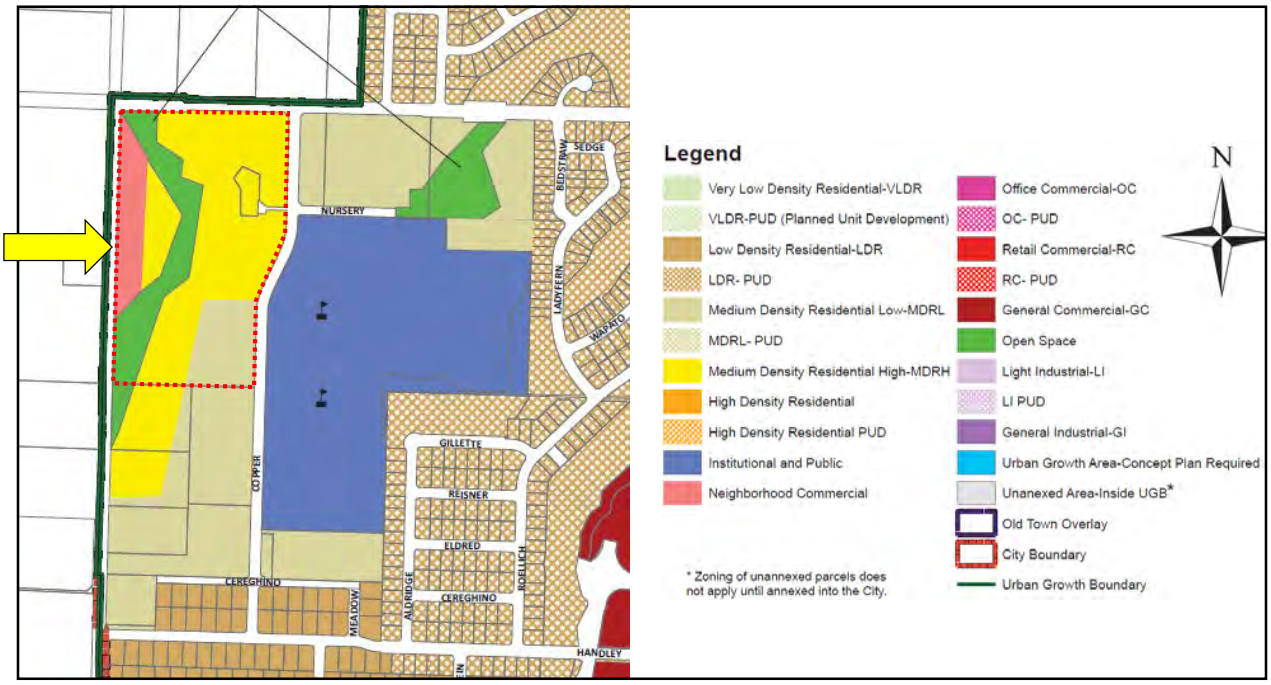


Table A: Surrounding Land Use

Location	Zoning Designation	Use
North	AR-20	Farm Use
South	MDRH	Single-family Residential Detached
East	Institutional and Public	Laurel Ridge Middle School
West	AR-20	Farm Use

[3] The current zoning on this site differs from that shown on the City's most recent zoning map. The NC-zoned portion of this site is now zoned MDRL (see Exhibit A, Sheet P03).

III. Applicable Review Criteria

Zoning and Community Development Code

Chapter 16.12 - RESIDENTIAL LAND USE DISTRICTS

The residential districts are intended to promote the livability, stability and improvement of the City's neighborhoods.

16.12.010 - Purpose and Density Requirements

…

C. Medium Density Residential (MDRL)

The MDRL zoning district provides for single-family and two-family housing, manufactured housing and other related uses with a density of 5.6 to 8 dwelling units per acre. Minor land partitions shall be exempt from the minimum density requirements.

D. Medium Density Residential High (MDRH)

The MDRH zoning district provides for a variety of medium density housing, including single-family, two-family housing, manufactured housing multi-family housing, and other related uses with a density of 5.5 to 11 dwelling units per acre. Minor land partitions are exempt from the minimum density requirement.

…

Response: As shown in Figure 1, the Applicant's site lies beneath portions of both the MDRL and MDRH zoning districts. The proposal includes 86 single-family lots on a net developable site area of 12.81 acres (557,943 square feet) resulting in a net residential density of 6.7 dwelling units per acre. This proposed density falls within the 5.5 dwelling units per acre minimum and 8 dwelling units per acre maximum prescribed in the MDRL and MDRH Districts. The criterion is met.

16.12.020 - Allowed Residential Land Uses

A. Residential Land Uses

The table below identifies the land uses that are allowed in the Residential Districts. The specific land use categories are described and defined in Chapter 16.10.

USES	MDRL	MDRH
Single-Family Attached or Detached Dwellings	P	P
Two Family Dwelling Units	P	P
Multi-family Dwellings	N	P
Townhomes-subject to Chapter 16.44	N	P
Planned Unit Developments (PUDs)-subject to Chapter 16.40	P	P
Manufactured Homes on Individual Lots	P	P
Manufactured Home Park-subject to Chapter 16.46	P	P
Accessory Dwelling Unit-subject to Chapter 16.52	P	P
Group Homes1	P	P

Response: The Applicant is proposing to create 86 single-family residential lots. Single-family attached and detached dwellings are permitted outright in the MDRL and MDRH Districts. The criterion is met.

USES	MDRL	MDRH
Government-Assisted housing [2]	P	P
Home Occupations-subject to Chapter 16.42	P	P
Temporary Uses-subject to Chapter 16.86	P	P
Amateur Radio Tower-subject to § 16.12.060	P	P
Family Daycare Providers	P	P
Agricultural Uses [3]	P	P
Residential Care Facilities	P	P
Special Care Facilities (such as hospitals, sanitariums, and specialized living facilities)	C	C
Plant Nurseries [4]	C	C
Public and Private Schools	C	C
Daycare Facilities	C	C
Any business, service, processing, storage, or display not conducted entirely within an enclosed building that is essential or incidental to any permitted or conditional use	C	C
Raising of Animals other than Household Pets	C	C

B. Any use not otherwise listed that can be shown to be consistent or associated with the permitted uses or conditionally permitted uses identified in the residential zones or contribute to the achievement of the objectives of the residential zones will be allowed or conditionally permitted using the procedure under Chapter 16.88 (Interpretation of Similar Uses).

C. Any use that is not permitted or conditionally permitted under this zone that cannot be found to be consistent with the allowed or conditional uses identified as in B. is prohibited in the residential zone using the procedure under Chapter 16.88 (Interpretation of Similar Uses).

Response: The Applicant is proposing individual lots for single-family residential dwellings, which are permitted outright in the MDRL and MDRH Districts. The Applicant is not proposing an unlisted, non-permissible or conditional use. The criteria do not apply.

16.12.030 - Residential Land Use 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. (Variance and Adjustments)

B. Development Standards

Except as modified under Chapter 16.68 (Infill Development), Section 16.144.030 (Wetland, Habitat and Natural Areas) Chapter 16.44 (Townhomes), or as otherwise provided, required minimum lot areas, dimensions and setbacks shall be provided in the following table.

C. Development Standards per Residential Zone

Table 3 Development Standards in the MDRL and MDRH Districts

Development Standard by Residential Zone-	MDRL	MDRH
Minimum Lot areas (in square ft.)		
Single-Family Detached	5,000	5,000
Single Family Attached	5,000	4,000
Two or Multi-Family: for the first 2 units	10,000	8,000
Multi-Family: each additional unit after first 2	X	3,200
Minimum Lot width at front property line: (in feet)	25	25
Minimum Lot width at building line [1]: (in feet)		
Single-Family	50	50
Two-Family	60	60
Multi-family	X	60
Lot Depth	80	80
Maximum Height [2] (in feet)	30 or 2 stories	35 or 2.5 stories
Amateur Radio Tower	70	70
Chimneys, Solar or Wind Devices, Radio and TV aerials [3]	50	55
Setbacks (in feet)		
Front yard [4]	14	14
Face of garage	20	20
Interior side yard		
Single-Family Detached	5	5
Single-Family Attached	10	5
Two Family	5	5
Multi-Family		
18 ft. or less in height	X	5
Between 18-24 ft. in height	X	7
If over 24 ft. in height	X	§ 16.68 Infill
Corner lot street side		

Single Family or Two Family	15	15
Multi-Family	X	20
Rear yard	20	20

Response: The minimum dimensional standards for newly created lots in the MDRL and MDRH Districts are included in Table 3. As proposed, all lots meet the 25-foot wide minimum frontage, the 50-foot width at the building line, and the 80-foot lot depth requirements. Additionally, all lots meet the 5,000 square foot minimum lot size requirement. The preliminary setback plan (Exhibit A, Sheet P05) illustrates that all setback requirements (including special 14-foot rear yard setbacks near the natural resource area/vegetated corridor per 16.144.030.B.2) can be met at time of building permit submittal. The criterion is met.

16.12.040 - 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, see Divisions V, VIII, IX.

16.12.050 - Flood Plain

Except as otherwise provided, Section 16.134.020 shall apply.

…

Response: A small portion of the Applicant's site is within FEMA Flood Zone C (Areas of Minimal Flooding) and is outside of the base flood zone regulated under this section. The criteria in this section do 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: Although no single-family homes are proposed with this application, as shown on the Applicant's preliminary development plans, all lots and street intersections have been designed to provide sufficient area for a 20-foot clear vision triangle (per this section) as well as a minimum driveway separation of 25-feet from an intersecting street (see Exhibit A, Sheet P11). All applicable clear vision criteria can be met at time of building permit submittal.

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: Although fences, sound walls, and hedges are not proposed as part of this application, the subdivision has been laid-out in a manner that will allow the future placement of these features in accordance with the provisions of this section. All applicable criteria can be met at time of building permit submittal.

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: The Applicant is not proposing any fences as part of this application. The criteria do not apply.

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: The Applicant is not proposing any fences as part of this application. The criteria do not apply.

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: As proposed, Lots 12-14, 55-64, and 76-86 can be considered through lots. As outlined in Table 1 below, Lots 12-14, 55-64, and 79-86 will take access from new internal streets (SW Yorkshire Way, SW A Lane and SW C Terrace) proposed with this subdivision. The front yard requirement for these lots will be measured from the right-of-way, adjacent these new internal streets, from which access to these lots is provided. Proposed Lots 76-78 will take access from a new public alley. Pursuant to the requirements of this section, the front yard requirement for these lots will be applied to the lot line abutting

the street opposite the alley. Table 1 provides a summary of where setbacks will be derived for all proposed through lots. The criterion is met.

Table 1 Proposed Through-lots and where Access will be derived

Lot Nos.	Alley Access	Front Yard Setback Measured from
12-14	No	SW Yorkshire Way
55-64	No	SW A Lane
76-78	Yes	SW Elwert Road
79-86	No	SW C Terrace

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: As proposed, Lots 1, 8, 11, 12, 18, 20, 21, 27, 48, 64, 69, 70, 78, and 79 can be considered corner lots. The MDRL and MDRH zones establish a 14-foot front yard setback and 15-foot street side setback for single- and two-family residences on corner lots (16.12.030.C.). Because the base zone allows an alternative front setback than is prescribed in A., above, that criterion does not apply.

As mentioned above, 16.12.030.C. establishes a street side setback of 15-feet for single- and two-family homes on corner lots. This provision contradicts the requirement in B. above, which requires that the front yard setback (14-feet) of the base zone be applied. The Applicant's preliminary setback plans indicate a 15-foot street side setback for the long street side of all proposed corner lots. Table 2 below, provides a summary of the street side setbacks for all corner lots. The criterion is met.

Table 2 Proposed Corner-lot setbacks

Lot No.	Short-street		Long-street	
	Name	Setback	Name	Setback
1	SW Copper Terrace	14-feet	SW Edy Road	15-feet
8	SW Copper Terrace	14-feet	SW Nursery Way	15-feet
11	SW Yorkshire Way	14-feet	SW Copper Terrace	15-feet
12	SW Yorkshire Way	14-feet	SW Yorkshire Way	15-feet

Lot No.	Short-street		Long-street	
	Name	Setback	Name	Setback
18	SW Yorkshire Way	14-feet	SW B Lane	15-feet
20	SW B Lane	14-feet	SW Copper Terrace	15-feet
21	SW B Lane	14-feet	SW Copper Terrace	15-feet
27	SW Yorkshire Way	14-feet	SW B Lane	15-feet
48	SW A Lane	14-feet	SW Copper Terrace	15-feet
64	SW A Lane	14-feet	SW Copper Terrace	15-feet
69	SW D Lane	14-feet	SW C Terrace	15-feet
70	SW C Terrace	14-feet	SW D Lane	15-feet
78	SW Elwert Road	20-feet	SW C Terrace	15-feet
79	SW Elwert Road	20-feet	SW C Terrace	15-feet

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: No structures are proposed as part of this application. These standards will be reviewed at time of building permit submittal. The criteria do not apply.

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.

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: As proposed, all lots meet the size and dimensional requirements of this Code. The criteria do not apply.

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.

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: The Applicant is proposing a subdivision that includes 86 residential lots. Subsequently, none of the characteristics listed in A.1-6 above will be exhibited as a result of this proposal. Additionally, single-family residential uses are exempt from site plan review, per B.1. above. The criteria do not apply.

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: As discussed in the response above, the Applicant's proposal does not warrant site plan review. Subsequently, a landscaping plan is not required. The criteria do not apply.

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 15) and other applicable City standards. The following table depicts the guidelines for the street characteristics.

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	60-102'	2-5	12'	Limited	6'	6-8'	5'	14' if required
Collector	58-92'	2-3	11'	8' optional	6'	6-8'	5'	14' median turn lane
Neighborhood 1,000 vehicles per day	64'	2	18'	8'	None	8'	5' with 1' buffer	None
Local	52'	2	14'	8' on one side only	None	6'	5' with 1' buffer	None
Alley	16-25'	1-2	10-12'	One side if 20'	None	None	None	None

Response: The Applicant's site fronts SW Elwert Road, SW Edy Road and SW Copper Terrace. The City of Sherwood Transportation System Plan (TSP) classifies these roadways as an arterial, collector, and neighborhood route, respectively. SW Elwert Road and SW Edy Road are under the jurisdiction of Washington County (in the vicinity of the Applicant's site) and therefore the County's standards prevail.

The proposed subdivision would create six new public streets (see Exhibit A, Sheet P11). SW A Lane, SW B Lane, SW C Terrace and SW Yorkshire Way have been designed to the City's Local Street standard. A public alley serving Lots 76-78 has been designed to the City's standard for public alleys. The Applicant is proposing a total right-of-way width for SW D Lane that is 10-feet narrower (42-feet wide) than the standard local street cross-section. The proposed cross-section for SW D Lane includes the standard pavement width, on-street parking on one side and sidewalks but eliminates the landscape strip on either side of the roadway. This narrowed cross-section for SW D Lane is requested in order to create more standard building sites on the lots abutting this proposed new street. Additional discussion regarding this proposed modification for SW D Lane is included later in this narrative.

Finally, and as mentioned earlier, the City's TSP proposes a new neighborhood route through the Applicant's site that would connect SW Elwert Road with SW Copper Terrace

that is no longer supported by the City. The Applicant is proposing a pedestrian and bicycle bridge in place of this planned street connection to promote access through the site while minimizing environmental impacts. With the requested modification to the right-of-way width for SW D Lane (discussed later in this narrative), the public street criteria can be 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.**

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.

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 names SW A Lane, SW B Lane, SW C Terrace, SW D Lane, and Public Alley, as shown on the Applicant's preliminary development plans are for illustrative purposes only. The proposed SW Yorkshire Way is an extension of this street from the adjacent development to the south and satisfies the naming convention of this Section. The Applicant will submit final street names in accordance with this section at time of Final Plat Review. The criteria can be met.

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 15.

Response: The Applicant's site abuts SW Elwert Road, SW Edy Road and SW Copper Terrace. The Applicant is proposing half-street improvements along all property frontages consistent with the Washington County standards as well as the City's design standards in Table 15 (see Exhibit A, Sheet P11). Based on feedback from City and County staff, the Applicant will not make half-street improvements along SW Edy Road and SW Elwert Road in front of the vegetated corridor or adjacent Tracts D and I due to the understanding that more

comprehensive intersection improvements in this area are inevitable. The criterion 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 is proposing half-street improvements along all property frontages consistent with Washington County standards and the City's design standards in Table 15. Based on feedback from City and County staff, the Applicant will not make half-street improvements along SW Edy Road and SW Elwert Road in front of the vegetated corridor or adjacent Tracts D and I due to the understanding that more comprehensive intersection improvements in this area are inevitable. In no case does the pavement improvement on these abutting streets exceed 30-feet (see Exhibit A, Sheets P11-P13). The criterion 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: The Applicant is proposing to create six new streets (SW A Lane, SW B Lane, SW C Terrace, SW D Lane, SW Yorkshire Way, and a Public Alley). No new half-streets will be created as part of this proposal. The proposed local streets include a total pavement width of 28-feet, comprised of two 14-foot wide travel lanes, and one eight-foot wide parking lane. The alleys are proposed to be 20-feet wide. The pavement width for proposed streets is less than the 40-foot wide maximum established here and therefore the criterion 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.

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: The Applicant is proposing to create six new streets (SW A Lane, SW B Lane, SW C Terrace, SW D Lane, SW Yorkshire Way, and a Public Alley). Additionally, the Applicant is proposing half-street improvements along the property's frontage with SW Elwert Road, SW Edy Road and SW Copper Terrace. Based on feedback from City and County staff, the Applicant will not make half-street improvements along SW Edy Road and SW Elwert Road in front of the vegetated corridor or adjacent Tracts D and I due to the understanding that more comprehensive intersection improvements in this area are inevitable. All new streets and half-street improvements are consistent with all applicable standards as described in this narrative, and will be dedicated to the City (see Exhibit A, Sheets P11-P16). The criteria are met.

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.**

Response: The Applicant requests two modifications; one from the standard in 16.106.040.E.1 to permit a hammerhead in excess of the 200-foot maximum length, and the other from the standard in 16.106.010.A. to permit a reduced right-of-way width for SW D Lane. The details of the requested modifications are outlined below.

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**

Response: 16.106.020.E.2 authorizes the City to permit modifications to the standards listed in a-j above as well other similar unlisted standards. The Applicant is requesting to construct a two new hammerheads that exceed the 200-foot length maximum established in 16.106.040.E.1. This request is permissible per 2.d above. Similarly, the Applicant's request to reduce the width for the SW D Lane right-of-way is permissible under 2.d. above.

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.**

Response: The requested modification outlined above will be processed as a Type II application in conjunction with this subdivision proposal.

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.**

Response: The Application requests two modifications to transportation-related standards in the SZCDC. The first modification seeks approval for hammerheads[4] that exceed the 200-maximum length as established in Section 16.106.040.E.1 of the SZCDC. The second modification seeks approval for a reduced right-of-way width (16.106.010.A) in the two hammerhead turnarounds and along SW D Lane.

Modification to cul-de-sac length. The Applicant's site is unique in the context of similar properties in this area because it lies at the intersection of two important traffic facilities

[4] SZCDC Section 16.10.020 defines a Cul-de-Sac as, "A short street that terminates in a vehicular turnaround." Although the proposed turnarounds on SW A Lane and SW C Terrace do not resemble the typical bulb-type turnarounds commonly associated with cul-de-sacs, these roadways nonetheless qualify as such per the City's definition. Additionally, the SZCDC does not contain a maximum length for dead-end streets that are not considered cul-de-sacs. Under such an interpretation, the standard in 16.106.040.E.1 would not apply and the requested modification would be unnecessary.

and is bifurcated by a large natural resource area. The proposed hammerheads (SW A Lane and SW C Terrace) are necessary to serve new residential lots east and west of the vegetated corridor at a level of density as required in the MDRL and MDRH Districts.

As proposed, SW A Lane is a hammerhead (see Exhibit A, Sheet P11) that is approximately 480-feet long. This relatively long hammerhead is necessary for two reasons. First, a connection between this area and SW Yorkshire Way is not feasible given the narrow strip of land that remains between SW Copper Terrace and the existing stormwater facility on Tract A. Second, SW A Lane cannot connect to SW Edy Road in the vicinity of Lots 55-61 as this area either remains in the influence zone of standing queues on SW Edy Road or would not satisfy the access spacing distance (from SW Copper Terrace) along a collector roadway per Washington County Standards. Per 16.106.040.M.2.b., "In all instances, access points near an intersection with a … Collector … shall be located beyond the influence of standing queues in accordance with AASHTO standards."

Additionally, a hammerhead limited to 200-feet in length in the location of the proposed SW A Lane would require direct access onto SW Edy Road for at least six single-family lots. The Applicant believes SW A Lane, as proposed, best preserves the functionality of the local transportation system while providing sufficient access to lots which meet all requirements of the underlying zoning district.

The hammerhead at SW C Terrace warrants a modification from the 200-foot maximum length standard for two reasons. First, a full street connection (as planned in the City's TSP) between SW Elwert Road and SW Copper Terrace is both impractical (given the cost to construct and the relatively close proximity of SW Edy Road) and would result in unreasonable environmental impacts (see Exhibit I). A loop road in place of SW C Terrace is not possible because Washington County requires a minimum of 600-feet between intersections along arterial roadways. There is not sufficient distance between the intersection of SW Edy/SW Elwert and this site frontage on SW Elwert Road to create two new intersections. For these reasons, a hammerhead that exceeds 200-feet in length is necessary to serve proposed lots west of the vegetated corridor.

<u>Modification to width of local street right-of-way.</u> SZCDC Section 16.106.010.A requires a 52-foot wide right-of-way for new local streets in the City of Sherwood. The Applicant requests a modification from this standard for SW D Lane and for turnarounds on SW A Lane and SW Yorkshire Way in order to create more usable development sites. The proposed right-of-way width for these new streets are summarized in Table 3 below.

Table 3 Proposed right-of-way width for new street turnarounds

Turnaround/New Street	Standard right-of-way width	Proposed right-of-way width
SW A Lane	52-feet	44-feet
SW D Lane	52-feet	42-feet
SW Yorkshire Way	52-feet	44-feet

To accommodate the reduced cross-sections, the Applicant proposes to construct standard travel lanes, on-street parking and sidewalks along SW D Lane and would simply eliminate the landscape strip. To accommodate a narrowed cross section in the two turnarounds on SW A Lane and SW Yorkshire Way, the Applicant would eliminate the on-street parking, which is required per TVF&R fire access standards. This modification is the minimum necessary to allow building sites that can accommodate a cohesive residential aesthetic throughout the proposed subdivision. Additionally, a narrower cross-section in these locations is appropriate given the low vehicular traffic that is anticipated on these dead-end streets. The criterion is met.

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.

Response: The Applicant's site is unique in the context of similar properties in this area because it lies at the intersection of two important traffic facilities and is bifurcated by a large natural resource area. This protected resource area occupies more than 25 percent of the total site area and cuts through the center of the site in a manner that isolates developable portions of the site. As mentioned above, these isolated portions of the site warrant the proposed cul-de-sacs because Washington County's access management standards do not permit additional access points on SW Elwert Road and SW Edy Road.

Additionally, the natural resource area poses challenges to the creation of building sites that satisfy applicable SZCDC regulations and which are suitable for the expected market demand in this area. The reduced right-of-way width for SW D Lane and the hammerhead turnarounds on SW A Lane and SW Yorkshire Way are necessary to respect applicable building setback requirements, avoid encroachment into the natural resource area and ensure the lots provide sufficient buildable area to accommodate homes that satisfy the needs and demands of a growing population in the City of Sherwood. The criterion is met.

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.

Response: As described above, the requested modification is necessary to feasibly develop this site given physical and environmental constraints. Also as noted above, the natural resource area consumes more than 25 percent of the Applicant's site, which is unique in the context of surrounding development. Accounting for natural resource area protection and dedication for right-of-way and public open space, the net developable area of this site is less than 55 percent of the gross site area. The requested modifications help to minimize the already significant share of this site that is not developable due to protected natural resources and land dedicated for public streets and open space. The criterion is met.

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: As discussed above, the Applicant believes the proposed hammerheads and reduced right-of-way widths provide a plan that is more environmentally sensitive and that more reasonably accommodates pedestrian, bicycle and vehicle access in and through the site. Further, under this proposal more than 45 percent of the gross site area is set aside for natural resource protection and dedications for right-of-way and public open space.

Absent the requested modifications, application of these transportation standards would result in a disproportionate share of this site being set aside for non-development purposes. The responses above demonstrate that unique site conditions exist which warrant a modification to the cul-de-sac length and right-of-way width standards. The City can find these responses satisfy the requirements to permit a modification prescribed in Section 16.106.020.E.4a-e. The criteria are met.

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: The Applicant's proposed subdivision and the streets that serve the lots therein have been designed and located to respect the access management standards for existing arterial and collector roadways adjacent the site. Additionally, the layout preserves the function and integrity of the existing natural resources on site. Safe and convenient pedestrian and bicycle access through the site is provided by sidewalks and a pedestrian and bicycle bridge spanning the natural resource area. The criterion 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).**

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: The TSP local street connectivity map shows a planned connection between SW Elwert Road and SW Copper Terrace through the Applicant's site. The location of the natural resource area on this site makes a full street connection in this location impractical (See Exhibit I). For this reason and per the option to provide an alternate connection in 2.a above, the Applicant is proposing a bicycle and pedestrian bridge spanning the natural resource area to ensure bicycle and pedestrian connectivity between SW Elwert Road and SW Copper Terrace. The existing vehicle connection between SW Elwert Road and SW Copper Terrace via SW Edy Road is a suitable vehicle alternative to the planned connection.

In their decision to approve the recent zone change on this property, the City Council agreed that the planned connection between SW Elwert Road and SW Copper Terrace, spanning the site's natural resource area, was both impractical and too environmentally impactful. This decision was informed by an October 28, 2015, memo from the City's Engineering Department (Exhibit I) which states in part, "In the case of this connector street between SW Elwert Road and SW Copper Terrace locating it within the subject zone change property would be very expensive on both monetary and environmental levels since it would require crossing a tributary in this area and would likely exceed $2,000,000 for a 700-foot section of roadway. During the design of the [Daybreak Subdivision], south of the subject … property… a future street plan was submitted identifying an interconnect between SW Copper Terrace and SW Elwert Road where a new local street would intersect with SW Elwert Road approximately 730 [feet] north of SW Handley Street. This new interconnect will be fully funded by the development of the property in which it lies (no city funding). Due to the above data, no street crossing of the tributary will be required of the subject property during the land use review process." This memo is included as Exhibit I. The criteria are met.

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.**

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.**

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.**

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: As discussed throughout this section, the planned street connection through this site is proposed to be replaced by a pedestrian and bicycle bridge. This section anticipates that full street connections may not be possible where water features and other natural resources preclude them. Further, per 6. above, this section provides the option to provide paved pedestrian and bicycle accessways when full street connections are not possible. The criteria are 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: The Applicant is not requesting an exception from the standards listed above.

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: All public and private utilities will be constructed prior to the surfacing of streets. The criterion can be 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 Preliminary Subdivision Plat (Exhibit A, Sheet P04) shows the proposed right-of-way dedication to public streets adjacent the site. The Applicant is proposing to dedicate 15-feet of the SW Elwert Road frontage, 10-feet of the SW Edy Road frontage, and 11-feet of the SW Copper Terrace frontage for right-of-way consistent with the County's and the City's current standard cross-sections for arterial, collector and neighborhood routes. The additional setback requirements do not apply.

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.

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.

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."

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: Exhibit A, Sheet P11 illustrates street improvements consistent with the abovementioned standards. The criteria are 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: Due to exceptional topographical constraints, the Applicant is proposing two hammerheads in this subdivision. As outlined in the responses to 16.106.020.E.4a-e, the Applicant is requesting a modification to the 200-foot limit established in E.1 above. The proposed hammerheads have been designed in accordance with the City's standard specifications. Finally, the Applicant is proposing a pedestrian and bicycle connection between proposed SW C Terrace and SW Yorkshire Way. The criteria are met.

F. Grades and Curves

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

Response: Street grades have been designed in accordance with the City's Public Works Design Standards. The criterion 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: The Applicant's site is not adjacent to a railroad. The criterion 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 subject site abuts an arterial, collector and neighborhood route. The applicant is proposing a combination of parallel access streets, hammerheads, public alleys and internal pedestrian and bicycle connections to separate through and local traffic, minimize traffic conflicts and buffer residences from high traffic streets. The applicant is

also providing additional easements along the site's SW Elwert Road and SW Edy Road frontages to accommodate the City's required visual corridors. The criterion is met.

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 Applicant is not proposing median islands on SW Elwert Road or SW Edy Road. The criterion 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: The Applicant's site is not adjacent an existing or planned transit facility. The criterion does not apply.

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 Applicant's Traffic Impact Analysis (TIA) is included in Exhibit K. The TIA shows that the proposed subdivision will generate approximately 65 AM peak hour trips and 86 PM peak hour trips and an ADT of approximately 818 trips. The TIA also demonstrates that all study intersections are projected to operate within the City of Sherwood's performance standards through 2017. Subsequently, the TIA concludes that operational mitigation, including new traffic signals and left turn lanes, are not necessary. The TIA also examined whether mitigation was necessary to address interaction of the existing schools in the site vicinity with the proposed development and concluded that no

significant operational or safety concerns were identified that would warrant mitigation in this regard. The criteria are 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: The Applicant is not proposing any of the above listed traffic calming measures. The criteria do not apply.

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:

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.

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.

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.

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.

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's site plan and accompanying exhibits (Exhibit A, Sheets P11-P16) demonstrate that the vehicular access management standards above are met. The site does not access Highway 99W and is not in the Old Town overlay District. The applicable criteria are met.

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: The Applicant is not proposing any private streets. The criteria do 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: As shown in Exhibit A, Sheets P11-P16, all new streets, except for the proposed alley, include sidewalks on both sides of the street. Existing streets fronting the site will be improved with sidewalks along the property frontage. Based on feedback from City and County staff, the Applicant will not make half-street improvements along SW Edy Road and SW Elwert Road in front of the vegetated corridor or adjacent Tracts D and I due to the understanding that more comprehensive intersection improvements in this area are inevitable. The criteria are met.

B. Design Standards

1. Arterial and Collector Streets

Arterial and collector streets shall have minimum eight (8) foot wide sidewalks/multi- use path, located as required by this Code.

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: SW Elwert Road and SW Edy Road are under the jurisdiction of Washington County. The proposed cross-section for each of these roadways has been designed in consideration of the County's standard for these roadways. Based on feedback from City and County staff, the Applicant will not make half-street improvements along SW Edy Road and SW Elwert Road in front of the vegetated corridor or adjacent Tracts D and I due to the understanding that more comprehensive intersection improvements in this area are inevitable. The Applicant is proposing an eight-foot wide sidewalk along the SW Copper

Terrace frontage and six-foot wide sidewalks for all new local streets internal to the subdivision. The applicable criteria are 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: Because existing topography and environmental features make a full street connection between SW Elwert Road and SW Copper Terrace impractical (see Exhibit I), the Applicant proposes a pedestrian and bicycle bridge in this area instead. The criterion 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: TSP Figure 13 shows a planned bike lane on SW Elwert Road and SW Edy Road, however, both SW Edy Road and SW Elwert Road are under the jurisdiction of Washington County and have been designed to the County's adopted standards. The criterion does not apply.

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 TIA (Exhibit K) anticipates that the proposed subdivision will generate approximately 86 PM peak hour trips on the local transportation system (B.3. above). The Applicant is

not proposing any of the other actions listed in B.1-6 above, and therefore a traffic impact analysis per this section is not required. The criteria do not apply.

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: The proposed sanitary sewer service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City, Clean Water Services, County and State standards. New eight-inch sanitary sewer mains and manholes are proposed in all new public rights-of-way (including Tract F and will be suspended beneath the new pedestrian bridge – final design to be reviewed by public works) with laterals stubbed to all individual lots. The criteria are 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.

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: The proposed sanitary sewer service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City, Clean Water Services, County and State standards. Sewer service has been designed to adequately serve the proposed development. The criteria are 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: The proposed sanitary sewer service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City, Clean Water Services, County and State standards. Sewer service has been designed to adequately serve the proposed development. The criterion can be 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: The proposed water service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City and Tualatin Valley Fire and Rescue standards. The criteria are 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.

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.

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.**

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: The proposed water service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City and Tualatin Valley Fire and Rescue standards. The criteria are met.

Chapter 16.114 - STORM WATER

16.114.010 - Required Improvements

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.

(Note: Section 16.114.015, Street Systems Improvement Fees (SIF) was repealed by Ordinance 91-922 § 19) to be removed from the SZCDC and permanently located in the Municipal Code).

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.

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: The proposed storm water service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City and Clean Water Services standards. As detailed in Exhibit L, stormwater quality for the areas east of the unnamed tributary to Chicken Creek (Phases 1-3) will be provided by the existing regional stormwater facility located on tax lot 300. This regional facility has been sized to treat runoff from the subject site. For areas west of the unnamed tributary (Phase 4), water

quality will be provided by a proposed water quality swale designed and constructed per the requirements of the Clean Water Services Design and Construction Standards for Sanitary Sewer and Surface Water Management (R&O 07-20). The criteria are 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: As proposed, all 86 residential lots are less than 500-feet from an existing or proposed fire hydrant. The proposed fire protection service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City and Tualatin Valley Fire and Rescue standards. The criteria are 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.

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.

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.

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.

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: As proposed, all 86 residential lots are less than 500-feet from an existing or proposed fire hydrant. The proposed fire protection service to the Applicant's site is shown in Exhibit A, Sheet P19 and has been designed in accordance with all applicable City standards. There are no private streets within the proposed subdivision. The criteria are met.

Chapter 16.118 - PUBLIC AND PRIVATE UTILITIES

16.118.010 - Purpose

Public telecommunication conduits as well as conduits for franchise utilities including, but not limited to, electric power, telephone, natural gas, lighting, and cable television shall be installed to serve all newly created lots and developments in Sherwood.

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, Chapter 7 of the Community Development Code, and applicable utility company and City standards.

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.

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).

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

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

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: As illustrated in Exhibit A, Sheet P04, all lots are provided an 8-foot wide public utility easement along the adjacent street frontage. This public utility easement is intended to provide adequate area for all franchise utilities. The criteria can be met.

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.**

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: All new utility facilities will be placed underground. The criteria can be 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: The Applicant is not proposing the construction of any new private streets as part of this application. The criteria do not apply.

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: This submittal constitutes the preliminary plat step of the two step subdivision process. Following approval of the preliminary plat, the Applicant will submit a separate application for final plat approval that will reflect all requirements and conditions of approval from the preliminary plat.

> **B. All subdivision proposals shall conform to all state regulations set forth in ORS Chapter 92, Subdivisions and Partitions.**

Response: The applicable subdivision and partition regulations contained in ORS Chapter 92 are implemented through the City's Zoning Ordinance and are responded to herein. All applicable criteria from ORS Chapter 92 are 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.

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: As proposed, this request includes 86 single-family residential lots. None of these lots are configured in a manner that would permit future re-division under the current zoning regulations. The criteria are met.

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: As proposed, all 86 lots exceed the 5,000 square foot minimum area required for lots in the MDRL and MDRH Zoning Districts. The Applicant is not proposing the use of lot averaging as provided here. The criteria do not apply.

F. Required Setbacks

All required building setback lines as established by this Code, shall be shown in the preliminary subdivision plat.

Response: All required building setbacks are shown in Exhibit A, Sheet P05. The proposed setbacks satisfy all applicable building setback standards in the underlying zoning district including a 14-foot rear yard setback exception for lots abutting natural resources (per 16.144.030.B.2.). The criterion 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 Applicant understands that the property subject to this request may not be disposed of, transferred, or sold until the subdivision is approved. The criterion can be 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 proposed subdivision contains 86 residential lots and will therefore follow a Type IV review process. The Applicant is aware that approval from the City is required prior to recordation of the final plat with Washington County.

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: The Applicant is proposing to construct the subdivision in four phases as shown on the Preliminary Subdivision Plat (Exhibit A, Sheet P04). Each phase is expected to be built within two-years of the start of construction. Public utilities for each phase will be constructed in conjunction with each phase and will not require the City or other property owner to construct any public facilities that are required as part of this request. A preliminary phasing schedule in included in Table 3, below. The criteria are met.

Table 4 Anticipated Phasing Schedule

Phase	Anticipated Start/End Date
1	2016-2018

Phase	Anticipated Start/End Date
2	2016-2018
3	2018-2020
4	2020-2022

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.**

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.**

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).**

D. **Adequate water, sanitary sewer, and other public facilities exist to support the use of land proposed in the plat.**

E. **Development of additional, contiguous property under the same ownership can be accomplished in accordance with this Code.**

F. **Adjoining land can either be developed independently or is provided access that will allow development in accordance with this Code.**

G. **Tree and woodland inventories have been submitted and approved as per Section 16.142.060.**

H. **The plat clearly shows the proposed lot numbers, setbacks, dedications and easements.**

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 criteria listed in 16.120.040.A-F are satisfied as responded to earlier in this narrative. Additionally, the Applicant's Preliminary Development Plans (Exhibit A) illustrate compliance with all of the abovementioned criteria, including a tree inventory (Sheet P06-P08) and required open space (Sheet P04). The criteria are met.

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.

Response: As outlined above, the Applicant's proposal satisfies the applicable block size and length standards where topography and natural resources preclude a standard connection. To facilitate pedestrian and bicycle movement through the site, the Applicant is proposing a pedestrian bridge spanning the natural resource area and connecting SW C Terrace with SW Yorkshire Way. The criteria are met.

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.

Response: All new public utility mains required to serve the proposed subdivision are proposed to be located within the rights-of-way adjacent individual lots (see Exhibit A, Sheet P19). An eight-foot wide public utility easement is proposed along the frontage of all lots to accommodate future franchise utilities. Easements along the side and/or rear property lines, as described in B. above, are not necessary to accommodate the proposed or future utilities. The criteria do not apply.

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: In large part, the layout of lots and public rights-of-way is dictated by the perennial tributary of Chicken Creek that traverses this site. As discussed above, the Applicant has carefully arranged the layout of new streets, lots and other elements of this subdivision to minimize impacts to this resource area. The criterion 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: Exhibit A, Sheet P11 shows the proposed connection between SW D Lane and SW Yorkshire Way as well as the pedestrian connection between SW A Lane and SW Edy Road. The criterion 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 discussed above and as illustrated in Exhibit A, Sheet P04, lot dimensions and orientation are consistent with the standards established for residential lots in the MDRH and MDRL Zoning Districts. All lots are served by public sewer and water supply. The criteria are met.

B. Access

All lots in a subdivision shall abut a public street, except as allowed for infill development under Chapter 16.68.

Response: Section 16.10.020 of the Sherwood Zoning and Community Development Code (SZCDC) defines a Street as, "A public or private road, easement or right-of-way that is created to provide access to one or more lots, parcels, areas or tracts of land. Categories of streets include [Alleys, Arterials, Bikeways, Collectors, Cul-de-sacs, Half-streets, Local Streets, Marginal Access Streets, Neighborhood Routes, and Principal Arterials]." As shown in Exhibit A, Sheet P11, all proposed lots abut an existing or planned public street for a minimum width of 25-feet. The criterion 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: Due to the proximity to high volume traffic arteries, the Applicant is proposing a number of double frontage lots along the perimeter of the site. All such lots are proposed to take access from the lower classification street interior to the site. A 4.5-foot landscape strip and ten-foot wide visual corridor are proposed along the SW Edy Road frontage; a 4.5-foot landscape strip, nine-foot landscape buffer and 15-foot visual corridor are proposed along the SW Elwert Road frontage; and, a 4.5-foot landscape strip and an eight-foot wide public utility easement are proposed along the SW Copper Terrace frontage. The criterion 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: To the extent practical, all side lot lines are perpendicular to the fronting street (see Exhibit A, Sheet P04). The criterion 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: The proposed site grading is illustrated in Exhibit A, Sheet P10. The proposed cut and fill slopes do not exceed the standards in E.1. and E.2. above. The criteria are met.

Chapter 16.142 - PARKS, TREES AND OPEN SPACES

16.142.030 - Single-Family or Duplex Residential Subdivisions

A. A minimum of five percent (5%) of the net buildable site (after exclusion of public right-of-way and environmentally constrained areas) shall be maintained as "open space". Open space must include usable areas such as public parks, swimming and wading pools, grass areas for picnics and recreational play, walking paths, and other like space. The following may not be used to calculate open space:

1. Required yards or setbacks.

2. Required visual corridors.

3. Required sensitive areas and buffers.

4. Any area required to meet a standard found elsewhere in this code.

Response: The net developable area of the site is approximately 560,183 square feet. The five percent open space requirement in this section yields a minimum required open space of 28,009 square feet (see Exhibit A, Sheet P05). The Applicant's proposal includes 48,029 square feet of open space in five open space tracts (Tracts A, B, D, F and H).

The Applicant's Open Space Plan (Exhibit B) is the result of close coordination between the Applicant and City staff. The Plan presented in Exhibit B showcases the vegetated corridor that runs through the site and takes advantage of the same constraints that make vehicular connectivity impractical, to provide a well-connected pedestrian and bicycle network through the site and connecting to adjacent properties.

The 0.71 acre open space in Tract H is located immediately west of the vegetated corridor and runs along the rim of the resource area between SW Elwert Road and SW D Lane. This open space includes an adaptable lawn play area, picnic tables, and a hard surface pathway that will connect the sidewalk along SW Elwert Road to SW Copper Terrace via a new pedestrian bridge spanning the vegetated corridor. The pedestrian bridge is a key component of the Applicant's development plan as it provides an effective and convenient transportation linkage through the site and provides access to unique recreational opportunities via the hard surface path along the west rim of the vegetated corridor and the soft surface path which extends north to Tract D and Edy Road.

A smaller (0.14 acres) open space is located in Tract A, immediately west of Laurel Ridge Middle School/Edy Ridge Elementary School off of SW Copper Terrace. This open space includes a picnic shelter, tables, benches and an adaptable lawn play area. A pedestrian connection between Lots 15 and 16 provides ideal pedestrian access between SW Yorkshire Way and this open space and helps minimize the length of this block for improved pedestrian and bicycle circulation. This open space is envisioned as one that will provide both passive and active recreational amenity to residents of this subdivision as well as for residents in the surrounding area; including parents picking up children from school.

A third open space tract (Tract D) is located on the east side of the vegetated corridor immediately south of SW Edy Road. This 0.13 acre open space includes an adaptable lawn

play area, a picnic table and a pedestrian and bicycle connection between SW A Lane and sidewalks along SW Edy Road.

Finally, although not officially designated as one of the required open space tracts[5], Tract G includes a 3-foot wide soft surface path along the eastern rim of the vegetated corridor. This path provides an attractive connection between the pedestrian bridge, Tract D and SW Edy Road. This soft surface path also provides an opportunity for more intimate interaction with the natural assets this site offers.

Again, the Applicant's Plan makes the most of unique site characteristics to provide a truly distinct and highly attractive experience for recreationalists as well pedestrians and bicyclists. The combination of open spaces provides important destinations for residents who desire opportunities to get outside and recreate. The criteria are met.

B. Enhanced streetscapes such as "boulevard treatments" in excess of the minimum public street requirements may count toward a maximum of 10,000 square feet of the open space requirement.

1. Example: if a 52-foot-wide right-of-way [ROW] is required for a 1,000 foot-longstreet and a 62-foot wide ROW with 5-foot additional plantings/meandering pathway is provided on each side of the street, the additional 10-foot-wide area x 1,000 linear feet, or 10,000 square feet, counts toward the open space requirement.

Response: The Applicant is not proposing enhanced streetscapes as outlined in B. above. Further, open space is provided in excess of the five percent minimum through five open space tracts. The criterion does not apply.

C. The open space shall be conveyed in accordance with one of the following methods:

1. By dedication to the City as public open space (if acceptable to the City). Open space proposed for dedication to the City must be acceptable to the City Manager or the Manager's designee with regard to the size, shape, location, improvement, environmental condition, and budgetary and maintenance abilities;

2. By leasing or conveying title (including beneficial ownership) to a corporation, homeowners' association or other legal entity, with the City retaining the development rights to the open space. The terms of such lease or other instrument of conveyance must include provisions (e.g., maintenance, property tax payment, etc.) suitable to the City.

Response: Tracts A, B, D, F, and H, are proposed to be conveyed to the homeowners' association per the provisions in C.2. above. The criteria can be met.

D. The density of a single-family residential subdivision shall be calculated based on the net buildable site prior to exclusion of open space per this Section.

[5] The vegetated corridor is protected under standards governed by Clean Water Services and may therefore not be used to account for the City's required open space.

1. Example: a 40,000 square foot net buildable site would be required to maintain 2,000 square feet (5%) of open space but would calculate density based on 40,000 square feet.

Response: The net residential density of the proposed subdivision has been calculated using this methodology. The criterion is met.

E. If a proposed residential subdivision contains or is adjacent to a site identified as "parks" on the Acquisition Map of the Parks Master Plan (2006) or has been identified for acquisition by the Sherwood Parks and Recreation Board, establishment of open space shall occur in the designated areas if the subdivision contains the park site, or immediately adjacent to the parks site if the subdivision is adjacent to it.

Response: The Applicant's site is not adjacent a site identified as "parks" on the Acquisition Map of the City's 2006 Parks Master Plan. The criterion does not apply.

F. If the proposed residential subdivision does not contain or is not adjacent to a site identified on the Parks Master Plan map or otherwise identified for acquisition by the Parks and Recreation Board, the applicant may elect to convey off-site park/open space.

Response: The Applicant is not proposing to convey any off-site park or open space. The criterion is not applicable.

G. This standard does not apply to a residential partition provided that a development may not use phasing or series partitions to avoid the minimum open space requirement. A partition of land that was part of an approved partition within the previous five (5) years shall be required to provide the minimum five percent (5%) open space in accordance with subsection (A) above.

H. The value of the open space conveyed under Subsection (A) above may be eligible for Parks System Development Charges (SDCs) credits based on the methodology identified in the most current Parks and Recreation System Development Charges Methodology Report.

Response: The Applicant is not proposing a partition with this application. Eligibility for SDC credits will be reviewed and applied at time of building permit submittal. The applicable criteria can be met.

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:

	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.

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.

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.

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).

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: Per A. above, the Applicant is proposing a 15-foot wide visual corridor along the site's SW Elwert Road (arterial) frontage and a 10-foot wide visual corridor along the site's SW Edy Road (collector) frontage (see Exhibit A, Sheet P11). Proposed landscaping and street trees in these visual corridors is depicted in Exhibit A, Sheet P21[6]. As shown in Sheet P05, the front and rear yard setback for lots abutting the visual corridor exceeds the width of the visual corridor on abutting lots and therefore no buildings will occupy the visual

[6] The Visual Corridor setback and required yard setback are measured from two different locations. Per 16.142.040.A., "… In residential developments where fences are typically desired adjoining the above described major street the [visual] 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." Per this standard, the Visual Corridor may be measured from the edge of the sidewalk. The required yard setback is measured from the right-of-way.

corridor along SW Elwert or SW Edy Road. The site is not in the Highway 99 Visual Corridor. The applicable criteria are met.

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: As mentioned above, the Applicant's site is not shown on the City's Parks Acquisition Map. The criterion does not apply. On-site open space will be conveyed to a homeowners' association and the natural resource areas in Tracts E and G will be conveyed to the City of Sherwood. The criterion is met.

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.**
>
> **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.**
>
> **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.**
>
> **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: Exhibit A, Sheet 21 illustrates the proposed installation of street trees pursuant to these standards. The criteria are met.

B. Removal and Replacement of Street Trees.

The removal of a street tree shall be limited and in most cases, necessitated by the tree. A person may remove a street tree as provided in this section. The person removing the tree is responsible for all costs of removal and replacement. Street trees less than five (5) inches DBH can be removed by right by the property owner or his or her assigns, provided that they are replaced. A street tree that is removed must be replaced within six (6) months of the removal date.

1. Criteria for All Street Tree Removal for trees over five (5) inches DBH. No street tree shall be removed unless it can be found that the tree is:

a. Dying, becoming severely diseased, or infested or diseased so as to threaten the health of other trees, or

b. Obstructing public ways or sight distance so as to cause a safety hazard, or

c. Interfering with or damaging public or private utilities, or

d. Defined as a nuisance per City nuisance abatement ordinances.

2. Street trees between five (5) and ten (10) inches DBH may be removed if any of the criteria in 1. above are met and a tree removal permit is obtained.

a. The Tree Removal Permit Process is a Type I land use decision and shall be approved subject to the following criteria:

(1) The person requesting removal shall submit a Tree Removal Permit application that identifies the location of the tree, the type of tree to be removed, the proposed replacement and how it qualifies for removal per Section 1. above.

(2) The person shall post a sign, provided by the City, adjacent to the tree for ten (10) calendar days prior to removal that provides notice of the removal application and the process to comment on the application.

(3) If an objection to the removal is submitted by the City or to the City during the ten (10) calendar day period, an additional evaluation of the tree will be conducted by an arborist to determine whether the tree meets the criteria for street tree removal in Section 1. above. The person requesting the Tree Removal Permit shall be responsible for providing the arborist report and associated costs.

(4) Upon completion of the additional evaluation substantiating that the tree warrants removal per Section 1. above or if no objections are received within the ten-day period, the tree removal permit shall be approved.

(5) If additional evaluation indicates the tree does not warrant removal, the Tree Removal Permit will be denied.

Response: As shown on Sheets P06-P08 of Exhibit A, the Applicant is proposing to remove 16 street trees along SW Copper Terrace to accommodate construction of the newly proposed residential lots. These basswood trees range in size from 6- to 8-inches in diameter at breast height and are therefore subject to the standards in Subsection 2 above. These trees obstruct construction access and egress to proposed Lots 1-8. These trees are unlikely to survive given the proximity and anticipated frequency of heavy equipment in this area during residential and street construction. Following construction, the Applicant is proposing to replace these street trees with 2-inch caliper Chancellor Linden Trees. The five trees proposed for removal along SW Elwert Road cannot be considered street trees. The criteria are met.

3. Street trees over ten (10) inches DBH may be removed through a Type I review process subject to the following criteria.

a. The applicant shall provide a letter from a certified arborist identifying:

(1) The tree's condition,

(2) How it warrants removal using the criteria listed in Section 1. above, and identifying any reasonable actions that could be taken to allow the retention of the tree.

b. The applicant shall provide a statement that describes whether and how the applicant sought assistance from the City, HOA or neighbors to address any issues or actions that would enable the tree to be retained.

c. The person shall post a sign, provided by the City, adjacent to the tree for ten (10) calendar days prior to removal that provides notice of the removal application and the process to comment on the application.

d. Review of the materials and comments from the public confirm that the tree meets the criteria for removal in Section 1. above.

Response: The Applicant is not proposing the removal of any street trees in excess of 10-inches DBH. The criteria do 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 proposing an HOA managed tree removal and replacement program as described above. All street trees will be located in public rights-of-way, or within an easement for Lots 65-69, and will be the responsibility of the abutting property owner to maintain. The criteria do 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.

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.

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.

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: The Applicant is not proposing removal of street trees for any of the reasons listed above. Further, the Applicant is aware of the penalty for illegal abuse, destruction or removal of street trees.

16.142.070 - Trees on Property Subject to Certain Land Use Applications

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 Applicant's proposal for a subdivision consisting of 86 residential lots qualifies for a Type IV review and is therefore subject to the provisions of this Section.

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 Applicant's tree inventory is contained in Exhibit A, Sheets P06-P08 and includes the information listed above. Please note that due to the heavily wooded nature of the vegetated corridor, particularly Tract G, not all trees in the corridor have been included in the tree inventory. Further, all trees in the vegetated corridor are proposed for protection/retention. The criteria are 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.**

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 πr2 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 Applicant is proposing to remove a total of 52 trees on site, 16 of which are street trees on SW Copper Terrace that must be removed to accommodate home construction on proposed Lots 1-8. The remaining 36 trees proposed to be removed are necessary to accommodate site grading and single-family residential construction. The total canopy area of newly planted and preserved trees on-site totals 59 percent (327,734) of the net site development area (see Exhibit A, Sheet P22). The criteria are 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.

…

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, which may be removed or shall be retained as per subsection D of this Section and any limitations or conditions attached thereto.

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 is aware of the City's authority to restrict tree removal in the manner described above.

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).

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.

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.

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 is not pursuing any of the above-listed incentives. The criteria do not apply.

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: A tree removal and preservation plan, pursuant to G. above is included in Exhibit A, Sheets P06-P08. The criterion 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 aware of the penalty for the unlawful removal of trees protected by this ordinance.

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.

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: The Applicant's proposal will not eliminate or reduce the area of wetlands on site and development is separated from wetlands pursuant to Clean Water Service standards. The criteria are 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.

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.

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.

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

d. Identify the riparian habitat classes applicable to all areas on the property using Table 8-1 below:

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: The Applicant's Natural Resource Assessment (Exhibit G) identifies and describes the significance of onsite wetlands as well as the limited impacts and significant restoration that is proposed as part of this subdivision. Further, this report responds to all applicable criteria as outlined in this Section. The criteria are 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.

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.

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: Although the construction of residential dwellings are not proposed with this application, the Applicant is planning to utilize the 30 percent rear yard setback reduction (per 16.144.030.B.2.) for Lots 28-31, 36, 37 and 53 (see Exhibit A, Sheet P05). Use of this flexibility requires that (B.2.a. above) the setback reduction result in an equal or greater amount of fish and/or wildlife habitat protection and said protection shall be guaranteed with deed restrictions or within public or private tracts. As mitigation for this setback reduction, the Applicant proposes 2,155 square feet of additional resource land protection in Tract C. The criteria are met.

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 Applicant's density calculations have been developed after excluding environmentally sensitive lands. These areas total 5.72 acres and are shown in Exhibit A as Tracts E and G.

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.**

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 requesting an exception to the required parking or landscaping requirements. The criteria do not apply.

Chapter 16.156 - ENERGY CONSERVATION

16.156.010 - Purpose

This Chapter and applicable portions of Chapter 5 of the Community Development Plan provide for natural heating and cooling opportunities in new development. The requirements of this Chapter shall not result in development exceeding allowable densities or lot coverage, or the destruction of existing trees.

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: As proposed, streets run on a general north/south axis with abutting homes facing east and west. A majority of the homes in this subdivision will benefit from passive solar heating through this east/west orientation. The criterion 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: The proximity of this proposed development to the vegetated corridor provides opportunities for evapotranspirative cooling that will benefit homes adjacent the corridor. Additionally mandatory building setbacks along all proposed property lines will ensure adequate air circulation and cooling. The criterion 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 requesting a variance from any applicable standards. This criterion does not apply.

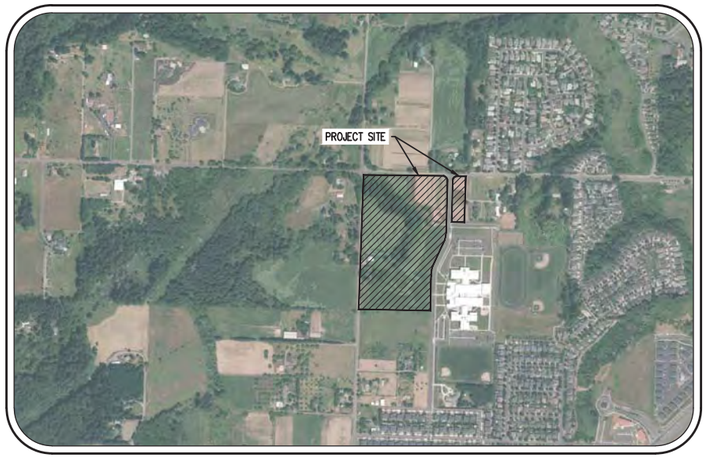
IV. Conclusion

As evidenced throughout this project narrative and associated documents, this proposed subdivision meets or exceeds all applicable development regulations and therefore the City can find sufficient evidence to approve this request.

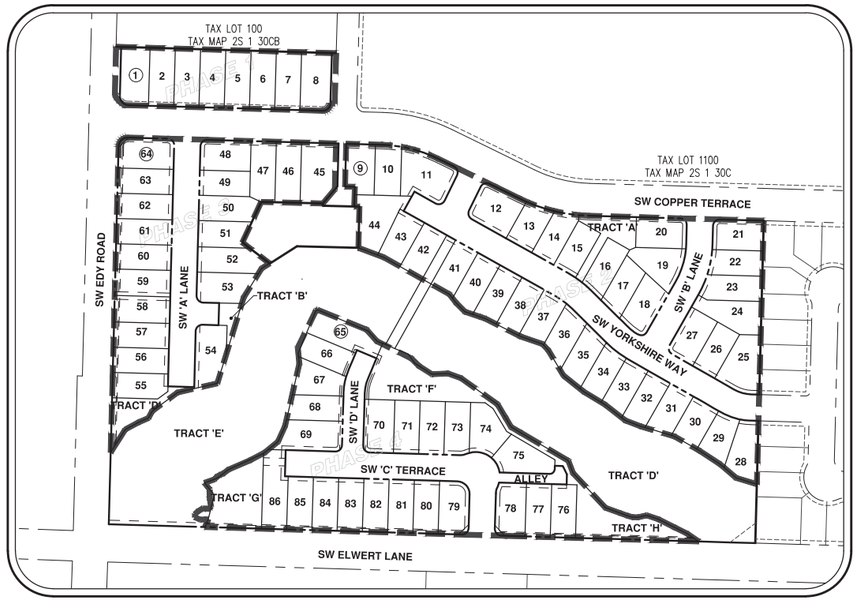
Exhibit A: Preliminary Development Plans

MANDEL FARMS

SUBDIVISION APPLICATION



VICINITY MAP
NOT TO SCALE



SITE MAP
1"=150'

APPLICANT/PLANNING

VENTURE PROPERTIES, INC.
CONTACT: KELLY RITZ
4230 GALEWOOD STREET, SUITE 100
LAKE OSWEGO, OR 97035

PLANNING/ENGINEERING/SURVEYING/ NATURAL RESOURCE/ARBORIST/ LANDSCAPE ARCHITECTURE FIRM

AKS ENGINEERING & FORESTRY, LLC
CONTACT: MIMI DOUKAS, AICP, RLA
12965 SW HERMAN ROAD, SUITE 100
TUALATIN, OR 97062
PH: 503-563-6151
FAX: 503-563-6152

LEGEND

	EXISTING	PROPOSED		EXISTING	PROPOSED
DECIDUOUS TREE			STORM SEWER CLEAN OUT		
CONIFEROUS TREE			STORM SEWER CATCH BASIN		
FIRE HYDRANT			STORM SEWER AREA DRAIN		
WATER BLOWOFF			STORM SEWER MANHOLE		
WATER METER			GAS METER		
WATER VALVE			GAS VALVE		
DOUBLE CHECK VALVE			GUY WIRE ANCHOR		
AIR RELEASE VALVE			POWER POLE		
SANITARY SEWER CLEAN OUT			POWER VAULT	P	P
SANITARY SEWER MANHOLE			POWER JUNCTION BOX		
SIGN			POWER PEDESTAL		
STREET LIGHT			COMMUNICATIONS VAULT	C	C
MAILBOX	MB	MB	COMMUNICATIONS JUNCTION BOX		
			COMMUNICATIONS RISER		

	EXISTING	PROPOSED
RIGHT-OF-WAY LINE		
BOUNDARY LINE		
PROPERTY LINE		
CENTERLINE		
DITCH		
CURB		
EDGE OF PAVEMENT		
EASEMENT		
FENCE LINE		
GRAVEL EDGE		
POWER LINE	PWR	PWR
OVERHEAD WIRE	OHW	OHW
COMMUNICATIONS LINE	COM	COM
FIBER OPTIC LINE	CFO	CFO
GAS LINE	GAS	GAS
STORM SEWER LINE	STM	STM
SANITARY SEWER LINE	SAN	SAN
WATER LINE	WAT	WAT

SHEET INDEX

P01 – COVER SHEET WITH VICINITY AND SITE MAPS
P02 – EXISTING CONDTIONS PLAN
P03 – EXISTING CITY ZONE MAP
P04 – PRELIMINARY SUBDIVISION PLAT
P05 – PRELIMINARY BUILDING SETBACKS PLAN
P06 – PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN
P07 – PRELIMINARY TREE NOTES
P08 – PRELIMINARY DETAILED TREE INVENTORY TABLE
P09 – PRELIMINARY DEMOLITION PLAN
P10 – PRELIMINARY GRADING AND EROSION AND SEDIMENT CONTROL PLAN
P11 – PRELIMINARY STREET PLAN
P12 – PRELIMINARY STREET PROFILES AND CROSS-SECTIONS
P13 – PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)
P14 – PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)
P15 – PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)
P16 – PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)
P17 – PRELIMINARY PHOTOMETRIC PLAN
P18 – PRELIMINARY PHOTOMETRIC CALCULATION SUMMARY
P19 – PRELIMINARY COMPOSITE UTILITY PLAN
P20 – CONCEPTUAL FUTURE CONNECTIVITY PLAN
P21 – PRELIMINARY STREET TREE & OPEN SPACE PLAN
P22 – PRELIMINARY TREE CANOPY PLAN
P23 – CONCEPTUAL OPEN SPACE PLAN

PROJECT LOCATION: WEST AND NORTH OF LAUREL RIDGE MIDDLE SCHOOL, SOUTHEAST CORNER OF INTERSECTION BETWEEN SW ELWERT AND EDY ROADS IN SHERWOOD, OREGON 97140

PROPERTY DESCRIPTION: TAX LOTS 250 AND 251, TAX MAP 2S130CB LOCATED IN THE SOUTHWEST 1/4 OF SECTION 30, TOWNSHIP 1 NORTH, RANGE 4 WEST, WILLAMETTE MERIDIAN, CITY OF SHERWOOD, WASHINGTON COUNTY, OREGON

EXISTING LAND USE: FARM AND RESIDENTIAL PROPERTY WITH GRAVEL DRIVEWAY, HOUSE, ASSOCIATED BUILDINGS AND LANDSCAPE AREA

PROJECT PURPOSE: SINGLE-FAMILY DETACHED RESIDENTIAL 86 LOT SUBDIVISION

DATUM: ELEVATIONS ARE BASED ON WASHINGTON COUNTY BENCHMARK NO. 101, A 2-1/2" BRASS DISK AT THE SOUTHEAST CORNER OF THE INTERSECTION OF SW EDY ROAD AND SW ELWERT ROAD WITH A NGVD 29 ELEVATION OF 158.238 FEET.

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD STE 100
TUALATIN, OR 97062
P: 503.563.6151
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aks-eng.com

AKS
ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

MANDEL FARMS SUBDIVISION
SHERWOOD OREGON
TAX LOTS 250 AND 251 — WASHINGTON COUNTY TAX MAP 2S 1 30CB

COVER SHEET WITH VICINITY AND SITE MAPS

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL ENGINEER — PRELIMINARY NOT FOR CONSTRUCTION — OREGON — PAUL A. SELLAE
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

SHEET
P01

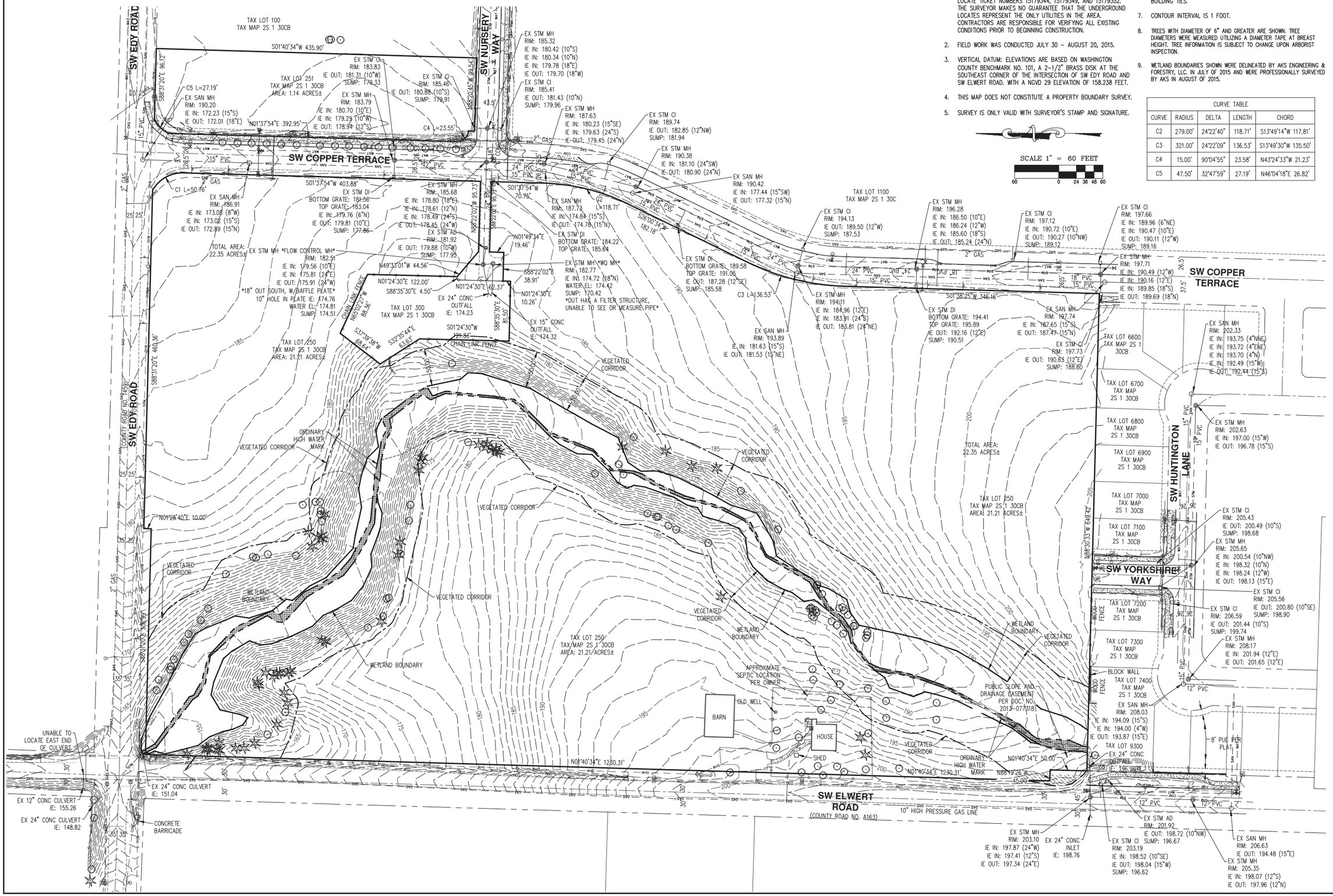
AKS DRAWING FILE: P01 TITLE.DWG | LAYOUT: P01

NOTES:

1. UTILITIES SHOWN ARE BASED ON UNDERGROUND UTILITY LOCATE MARKINGS AS PROVIDED BY OTHERS, PROVIDED PER UTILITY LOCATE TICKET NUMBERS 15179344, 15179349, AND 15179352. THE SURVEYOR MAKES NO GUARANTEE THAT THE UNDERGROUND LOCATES REPRESENT THE ONLY UTILITIES IN THE AREA. CONTRACTORS ARE RESPONSIBLE FOR VERIFYING ALL EXISTING CONDITIONS PRIOR TO BEGINNING CONSTRUCTION.
2. FIELD WORK WAS CONDUCTED JULY 30 – AUGUST 20, 2015.
3. VERTICAL DATUM: ELEVATIONS ARE BASED ON WASHINGTON COUNTY BENCHMARK NO. 101, A 2-1/2" BRASS DISK AT THE SOUTHEAST CORNER OF THE INTERSECTION OF SW EDY ROAD AND SW ELWERT ROAD. WITH A NGVD 29 ELEVATION OF 158.238 FEET.
4. THIS MAP DOES NOT CONSTITUTE A PROPERTY BOUNDARY SURVEY.
5. SURVEY IS ONLY VALID WITH SURVEYOR'S STAMP AND SIGNATURE.
6. BUILDING FOOTPRINTS ARE MEASURED TO SIDING UNLESS NOTED OTHERWISE. CONTACT SURVEYOR WITH QUESTIONS REGARDING BUILDING TIES.
7. CONTOUR INTERVAL IS 1 FOOT.
8. TREES WITH DIAMETER OF 6" AND GREATER ARE SHOWN. TREE DIAMETERS WERE MEASURED UTILIZING A DIAMETER TAPE AT BREAST HEIGHT. TREE INFORMATION IS SUBJECT TO CHANGE UPON ARBORIST INSPECTION.
9. WETLAND BOUNDARIES SHOWN WERE DELINEATED BY AKS ENGINEERING & FORESTRY, LLC. IN JULY OF 2015 AND WERE PROFESSIONALLY SURVEYED BY AKS IN AUGUST OF 2015.

SCALE 1" = 60 FEET

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C2	279.00'	24°22'40"	118.71'	S13°49'14"W 117.81'
C3	321.00'	24°22'09"	136.53'	S13°49'30"W 135.50'
C4	15.00'	90°04'55"	23.58'	N43°24'33"W 21.23'
C5	47.50'	32°47'59"	27.19'	N46°04'18"E 26.82'



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ENGINEERING - SURVEYING - NATURAL RESOURCES
FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

MANDEL FARMS SUBDIVISION

SHERWOOD, OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

EXISTING CONDITIONS PLAN

DESIGNED BY:
DRAWN BY: MSK
CHECKED BY: SRB/NSW
SCALE: AS NOTED
DATE: 01-08-2016

REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JULY 08, 2003 ALEXANDER H. HURLEY 58539LS
RENEWS: 6/30/17

REVISIONS

JOB NUMBER 4570

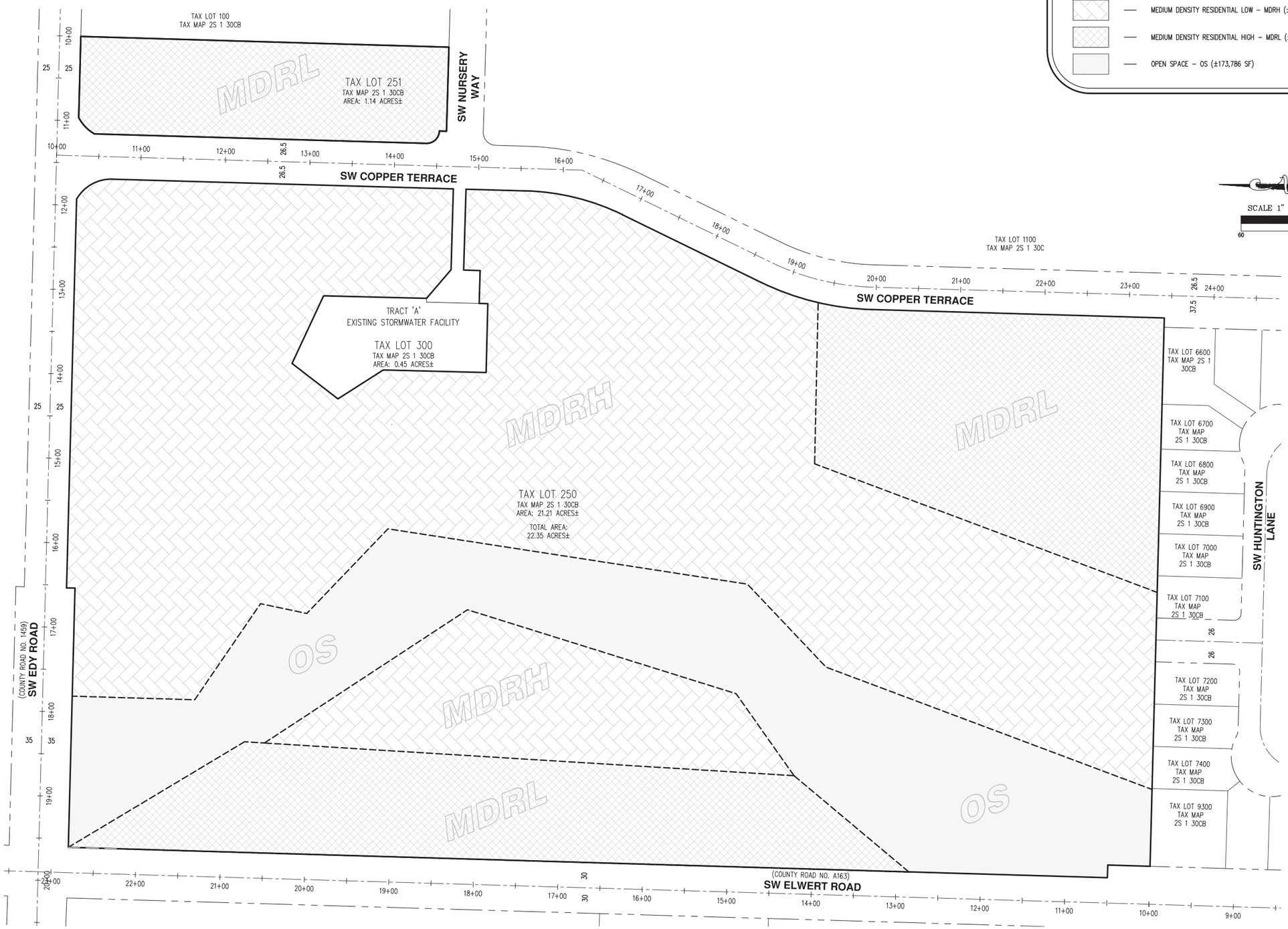
SHEET P02

AKS DRAWING FILE: P02 EX CONDWG | LAYOUT: P02

CITY ZONE LIMITS DEPICTED ON THIS EXHIBIT ARE BASED OF SCALED DIMENSIONS AND ZONING LAYOUT PROVIDED ON THE SHERWOOD PLAN AND ZONE MAP OBTAINED FROM THE CITY OF SHERWOOD WEBSITE.

LEGEND

- MEDIUM DENSITY RESIDENTIAL LOW – MDRH (±546,194 SF)
- MEDIUM DENSITY RESIDENTIAL HIGH – MDRL (±253,680 SF)
- OPEN SPACE – OS (±173,786 SF)



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

EXISTING CITY ZONE MAP

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
JULY 28, 2003
ALEXANDER H. HURLEY
58539LS
RENEWS: 6/30/17

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P03

AKS DRAWING FILE: P03 EX ZONING.DWG | LAYOUT: P03

SW COPPER TERRACE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T1	10+00.00		622.21'			S01°37'54"W
T2	16+22.21		248.16'			S26°00'34"W
C1	18+70.37	294.50'	125.26'	24°22'09"	124.32	S13°49'30"W
T3	19+95.63		604.37'			S01°38'25"W

SW EDY ROAD						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T4	10+00.00		1428.46'			N88°31'20"W

SW ELWERT ROAD						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T5	10+00.00		1591.58'			N01°40'34"E

SW YORKSHIRE WAY						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T6	8+74.08		125.92'			N01°43'10"E
C2	10+15.59	100.00'	48.89'	28°00'35"	48.40	N15°43'28"E
T7	10+64.47		210.38'			N29°43'46"E
C3	12+74.86	185.00'	48.46'	15°00'32"	48.32	N37°14'02"E
T8	13+23.32		95.12'			N44°44'18"E
C4	14+18.44	185.00'	50.01'	15°29'18"	49.86	N36°59'39"E

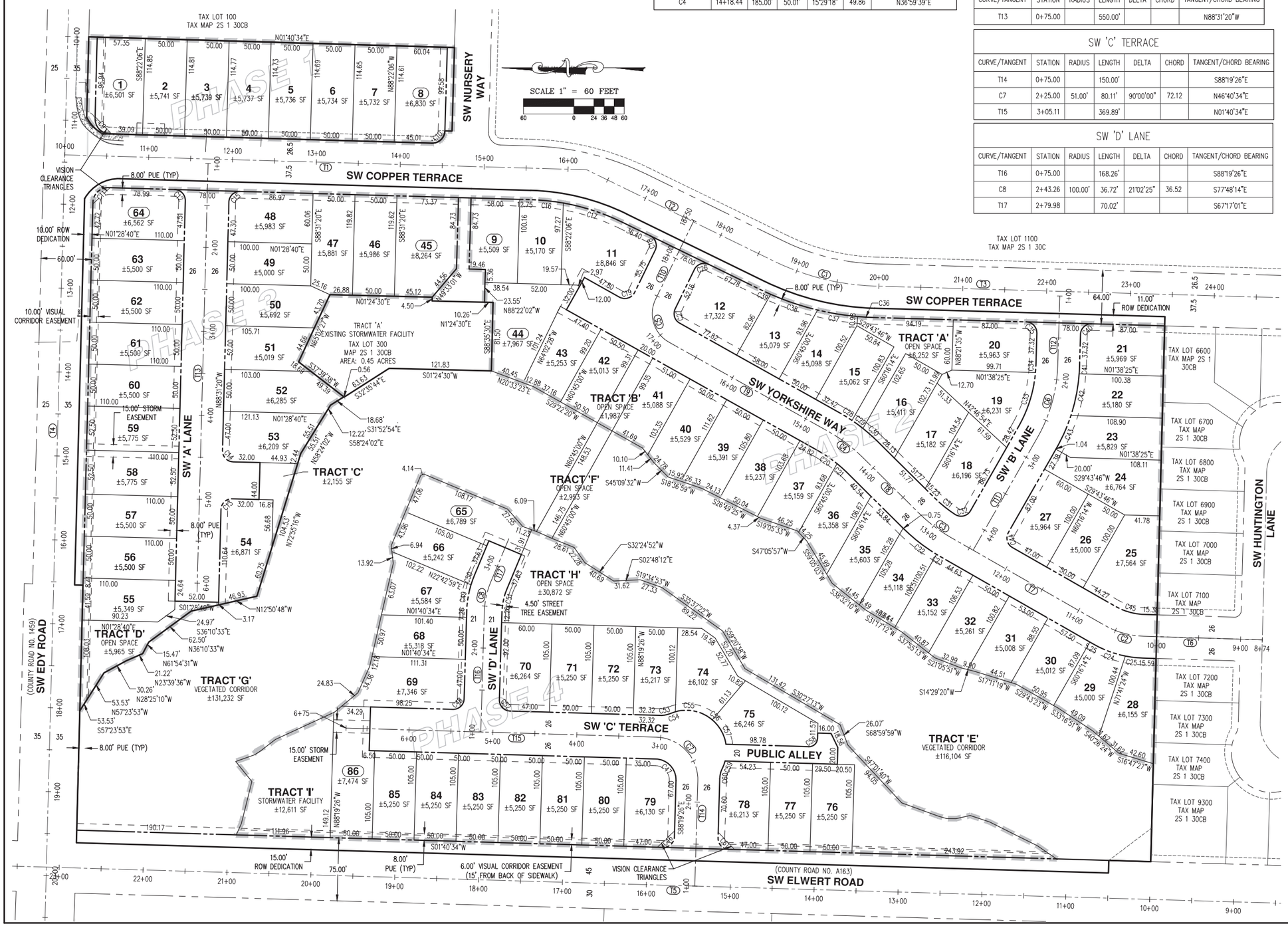
SW 'B' LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T11	2+73.02		176.98'			N60°16'14"W
C6	1+82.32	185.00'	90.70'	28°05'20"	89.79	N74°18'54"W
T12	0+75.00		107.32'			N88°21'35"W

SW 'A' LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T13	0+75.00		550.00'			N88°31'20"W

SW 'C' TERRACE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T14	0+75.00		150.00'			S88°19'26"E
C7	2+25.00	51.00'	80.11'	90°00'00"	72.12	N46°40'34"E
T15	3+05.11		369.89'			N01°40'34"E

SW 'D' LANE						
CURVE/TANGENT	STATION	RADIUS	LENGTH	DELTA	CHORD	TANGENT/CHORD BEARING
T16	0+75.00		168.26'			S88°19'26"E
C8	2+43.26	100.00'	36.72'	21°02'25"	36.52	S77°48'14"E
T17	2+79.98		70.02'			S67°17'01"E

CURVE TABLE				
CURVE	RADIUS	DELTA	LENGTH	CHORD
C9	18.00'	89°50'45"	28.23'	N46°33'17"E 25.42'
C10	15.00'	89°57'02"	23.55'	S43°20'36"E 21.20'
C11	18.00'	90°09'15"	28.32'	N43°26'43"W 25.49'
C12	13.00'	89°50'45"	20.39'	N46°33'17"E 18.36'
C13	13.00'	90°00'00"	20.42'	S43°31'20"E 18.38'
C14	13.00'	90°00'00"	20.42'	N46°28'40"E 18.38'
C15	13.00'	90°09'15"	20.46'	N43°26'43"W 18.41'
C16	268.00'	8°25'18"	39.39'	S5°50'33"W 39.36'
C17	268.00'	15°57'22"	74.63'	S18°01'53"W 74.39'
C18	13.00'	90°00'00"	20.42'	S71°00'34"W 18.38'
C19	13.00'	93°14'26"	21.16'	N17°22'13"W 18.90'
C20	159.00'	9°50'28"	27.31'	N34°10'14"E 27.28'
C21	159.00'	5°38'50"	15.67'	N41°54'53"E 15.67'
C22	211.00'	13°33'05"	49.91'	S37°57'45"W 49.79'
C23	211.00'	1°27'27"	5.37'	S30°27'29"W 5.37'
C24	126.00'	18°23'54"	40.46'	S20°31'49"W 40.29'
C25	126.00'	9°36'42"	21.14'	S6°31'31"W 21.11'
C26	13.00'	90°00'00"	20.42'	S18°59'26"E 18.38'
C27	13.00'	86°45'34"	19.69'	N72°37'47"E 17.86'
C28	211.00'	4°46'37"	17.59'	N31°38'18"E 17.59'
C29	211.00'	4°22'25"	16.11'	N36°12'50"E 16.10'
C30	211.00'	6°20'16"	23.34'	N41°34'10"E 23.33'
C31	158.00'	11°35'33"	31.97'	N38°58'24"E 31.91'
C32	13.00'	93°29'23"	21.21'	N13°31'34"W 18.94'
C33	159.00'	24°35'55"	68.26'	N72°34'12"W 67.74'
C34	159.00'	3°29'26"	9.69'	N86°36'52"W 9.68'
C35	13.00'	90°00'00"	20.42'	S46°38'25"W 18.38'
C36	332.00'	3°24'27"	19.74'	S3°20'39"W 19.74'
C37	332.00'	8°21'53"	48.47'	S9°13'49"W 48.43'
C38	332.00'	10°12'05"	59.11'	S18°30'47"W 59.03'
C39	332.00'	2°23'44"	13.88'	S24°48'42"W 13.88'
C40	13.00'	90°00'00"	20.42'	S43°21'35"E 18.38'
C41	211.00'	2°37'46"	9.68'	S87°02'42"E 9.68'
C42	211.00'	13°48'02"	50.82'	S78°49'47"E 50.70'
C43	211.00'	11°39'32"	42.94'	S66°06'00"E 42.86'
C44	13.00'	90°00'00"	20.42'	N74°43'46"E 18.38'
C45	74.00'	28°00'35"	36.18'	N15°43'28"E 35.82'
C46	13.00'	90°00'00"	20.42'	S43°19'26"E 18.38'
C47	25.00'	90°00'00"	39.27'	S46°40'34"W 35.36'
C48	13.00'	90°00'00"	20.42'	N43°19'26"W 18.38'
C49	121.00'	15°10'29"	32.05'	N80°44'11"W 31.95'
C50	121.00'	5°51'56"	12.39'	N70°12'59"W 12.38'
C51	79.00'	21°02'25"	29.01'	N77°48'14"W 28.85'
C52	13.00'	90°00'00"	20.42'	N46°40'35"E 18.38'
C53	28.00'	24°53'47"	12.17'	N10°46'18"W 12.07'
C54	48.00'	7°33'06"	6.33'	N19°26'39"W 6.32'
C55	48.00'	56°00'38"	46.92'	N12°20'13"E 45.08'
C56	48.00'	56°00'38"	46.92'	N12°20'13"E 45.08'
C57	48.00'	40°36'10"	34.02'	N60°38'37"E 33.31'
C58	10.00'	89°59'58"	15.71'	S43°19'27"E 14.14'
C59	48.00'	10°11'48"	8.54'	N69°54'04"W 8.53'
C60	28.00'	28°12'31"	13.79'	N75°25'46"W 13.65'
C61	13.00'	90°00'00"	20.42'	N46°40'34"E 18.38'



NOTES:

1. TRACTS A, B, D, F, H, AND I SHALL BE CONVEYED TO MANDEL FARMS HOMEOWNER'S ASSOCIATION.
2. TRACTS C, E, AND G SHALL BE CONVEYED TO THE CITY OF SHERWOOD.
3. TRACTS C, E, F, G AND I SHALL HAVE A STORM SEWER, SURFACE WATER, DRAINAGE AND DETENTION EASEMENT TO CWS OVER ITS ENTIRETY.

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY SUBDIVISION PLAT

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL LAND SURVEYOR
OREGON
JULY 08, 2003
ALEXANDER H. HURLEY
56559LS
RENEWS: 6/30/17

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P04

AKS DRAWING FILE: P05 PLAT.DWG | LAYOUT: P05

REQUIRED SETBACKS

FRONT YARD:	14 FT
FRONT GARAGE:	20 FT
SIDE YARD:	5 FT
CORNER LOT SIDE YARD:	15 FT
*REAR YARD:	20 FT

*14' REAR YARD SETBACK PROPOSED ADJACENT TO VEGETATED CORRIDOR FOR LOTS 28–31, 36–37, & 53.

REDUCED SETBACK AREA: ±2,034 SF

PROPOSED SETBACK MITIGATION AREA (TRACT 'C'): ±2,155 SF

DENSITY CALCULATIONS

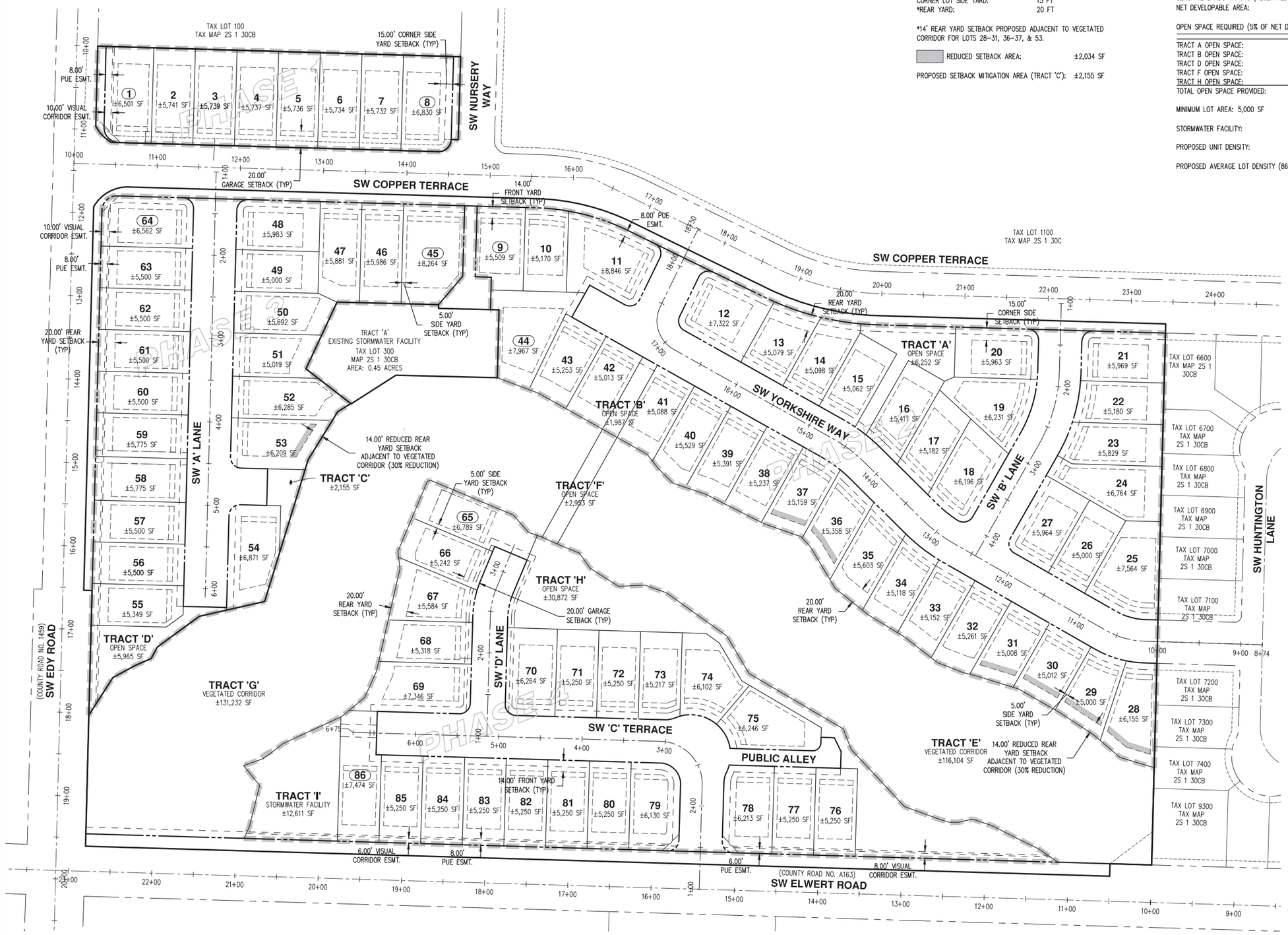
GROSS SITE AREA:	±973,600 SF (±22.35 AC)
PUBLIC R.O.W. DEDICATION:	±166,166 SF (±3.81 AC)
SENSITIVE LANDS TRACTS (VEGETATED CORRIDOR & WETLANDS):	±249,491 SF (±5.72 AC)
NET DEVELOPABLE AREA:	±557,943 SF (±12.81 AC)
OPEN SPACE REQUIRED (5% OF NET DEVELOPABLE):	±27,897 SF
TRACT A OPEN SPACE:	±6,252 SF
TRACT B OPEN SPACE:	±1,987 SF
TRACT D OPEN SPACE:	±5,965 SF
TRACT F OPEN SPACE:	±2,953 SF
TRACT H OPEN SPACE:	±30,872 SF
TOTAL OPEN SPACE PROVIDED:	±48,029 SF

MINIMUM LOT AREA: 5,000 SF

STORMWATER FACILITY: ±12,611 SF (±0.29 AC)

PROPOSED UNIT DENSITY: 86 UNITS

PROPOSED AVERAGE LOT DENSITY (86 UNITS/12.81 AC): ±6.71 UNITS/AC



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY BUILDING SETBACKS PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

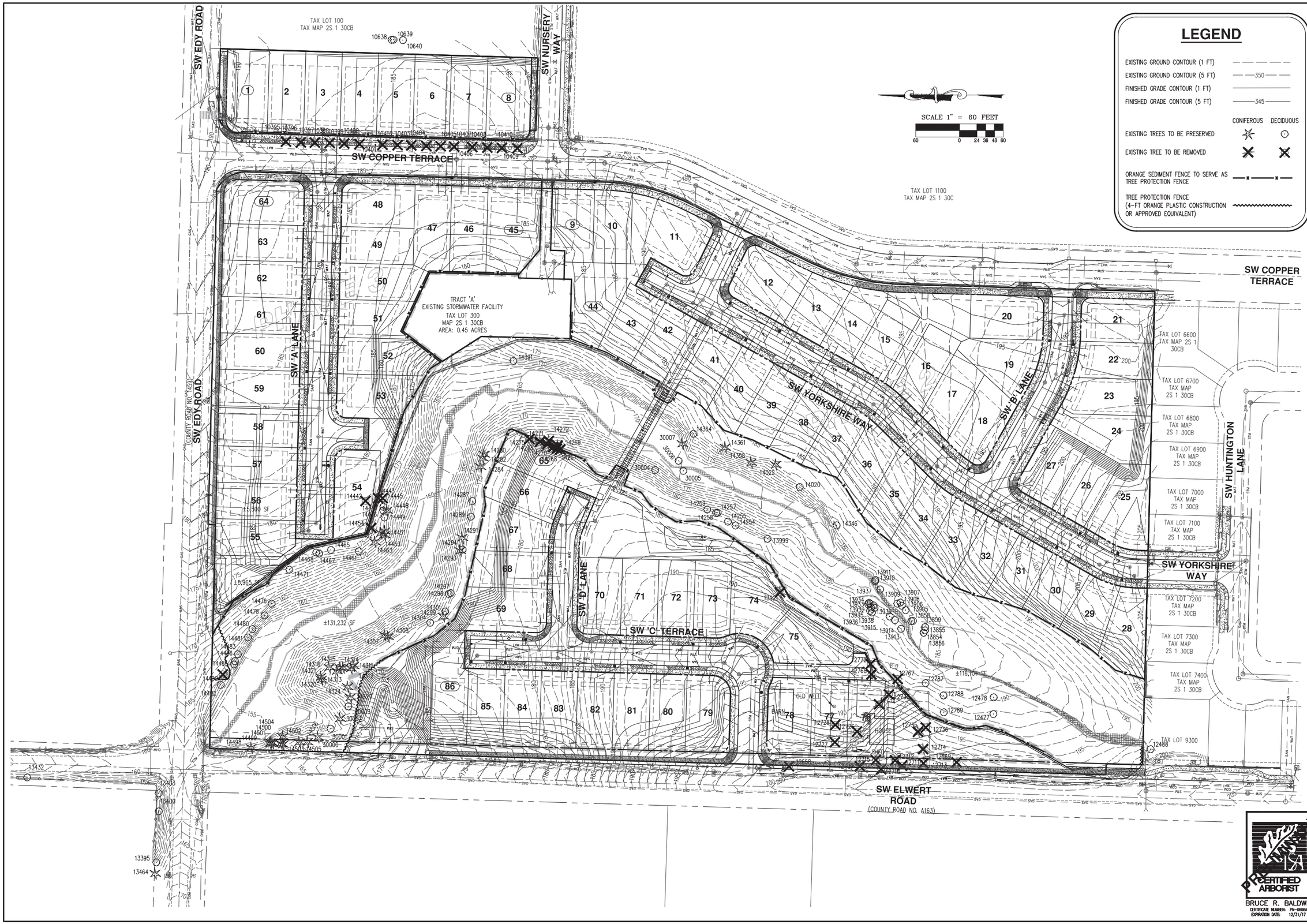
REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JULY 09, 2003 ALEXANDER H. HURLEY 58539LS
RENEWS: 6/30/17

REVISIONS

JOB NUMBER
4570

SHEET
P05

AKS DRAWING FILE: P04 SETBACKS.DWG | LAYOUT: P04



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY TREE PRESERVATION AND REMOVAL PLAN

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	BRB
SCALE:	AS NOTED
DATE: 01-08-2016	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P06

PROFESSIONAL CERTIFIED ARBORIST

BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-5666A
EXPIRATION DATE: 12/31/17

AKS DRAWING FILE: P05 TREE.DWG | LAYOUT: P05

PRUNING/TREE REMOVAL NOTES:

THE WORK TO BE COMPLETED UNDER THIS PROJECT SHALL CONSIST OF TREE REMOVAL AND TREE TRIMMING AS LISTED.

1. THE CONTRACTOR SHALL PROVIDE ADEQUATE CREW OF MEN, EQUIPMENT AND MATERIALS TO SAFELY AND EFFICIENTLY COMPLETE THE ASSIGNED WORK. EACH SUCH CREW SHALL INCLUDE AN INDIVIDUAL WHO SHALL BE DESIGNATED AS THE CREW SUPERVISOR AND WHO SHALL BE RESPONSIBLE FOR THE CREW'S ACTIVITIES AND WHO SHALL RECEIVE INSTRUCTION FROM THE OWNER OR THE OWNER'S REPRESENTATIVE AND DIRECT THE CREW TO ACCOMPLISH SUCH WORK.

2. WHENEVER A TREE, WHICH IS NOT SCHEDULED TO BE REMOVED, MUST BE TRIMMED OR PRUNED, THE CONTRACTOR SHALL ENSURE THAT SUCH TRIMMING AND PRUNING IS CARRIED OUT UNDER THE DIRECT SUPERVISION OF A CERTIFIED ARBORIST. ALL PRUNING AND TRIMMING SHALL BE PERFORMED IN ACCORDANCE WITH THE PROVISIONS OF ANSI A 300 "STANDARD PRACTICES FOR TREE, SHRUB AND OTHER WOODY PLANT MAINTENANCE".

3. THE CONTRACTOR SHALL BE REQUIRED TO CUT TREES TO A HEIGHT OF APPROXIMATELY 12". THE STUMPS AND ROOTS SHALL BE GROUND DOWN A MINIMUM OF TWELVE (12) INCHES BELOW NORMAL GROUND LEVEL.

4. ALL STUMPS OF TREES TO BE REMOVED WITHIN TREE ROOT PROTECTION ZONES OF TREES TO BE PRESERVED ARE TO BE GROUND OR LEFT IN PLACE SO AS NOT TO DISTURB THE ROOTS OF ADJACENT TREES TO BE PRESERVED.

5. THE CONTRACTOR SHALL PERFORM ALL WORK IN ACCORDANCE WITH THE LATEST GOVERNMENTAL SAFETY REGULATIONS. ALL WORK SHALL BE PERFORMED IN STRICT ACCORDANCE WITH ANSI Z133.1 "PRUNING, TRIMMING, REPAIRING, MAINTAINING AND REMOVING TREES AND CUTTING BRUSH–SAFETY REQUIREMENTS" WITH SPECIAL EMPHASIS GIVEN TO THE REQUIREMENT THAT ONLY QUALIFIED LINE–CLEARANCE TREE TRIMMERS BE ASSIGNED TO WORK WHERE A POTENTIAL ELECTRICAL HAZARD EXISTS.

6. THE CONTRACTOR SHALL MAKE ALL THE NECESSARY ARRANGEMENTS WITH ANY UTILITY THAT MUST BE PROTECTED OR RELOCATED IN ORDER TO ACCOMPLISH THE WORK. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE PROTECTION OF THE OPERATING CONDITION OF ALL ACTIVE UTILITIES WITHIN THE AREA OF CONSTRUCTION AND HE SHALL TAKE ALL NECESSARY PRECAUTIONS TO AVOID DAMAGE TO EXISTING UTILITIES.

7. ANY MATERIAL RESULTING FROM THE TRIMMING OR REMOVAL OF ANY TREES SHALL BECOME THE RESPONSIBILITY OF THE CONTRACTOR.

8. HAZARDOUS TREES–REPORTING – ANY PERSON ENGAGED IN TRIMMING OR PRUNING WHO BECOMES AWARE OF A TREE OF DOUBTFUL STRENGTH, THAT COULD BE DANGEROUS TO PERSONS OR PROPERTY, SHALL REPORT SUCH TREE(S) TO THE OWNER OR THE OWNERS REPRESENTATIVE. SUCH TREES SHALL INCLUDE THOSE THAT ARE OVER MATURE, DISEASED, OR SHOWING SIGNS OF DECAY.

9. DAMAGES–ANY DAMAGE CAUSED BY THE CONTRACTOR, INCLUDING, BUT NOT LIMITED TO, BROKEN SIDEWALK, CURB, RUTTED LAWN, BROKEN WATER SHUT–OFFS, WIRE DAMAGE, BUILDING DAMAGE, STREET DAMAGE, ETC., WILL BE REPAIRED OR REPLACED IN A TIMELY MANNER, TO THE OWNER'S SATISFACTION, AND ALL COSTS PAID BY THE CONTRACTOR.

10. ANY BRUSH CLEARING REQUIRED WITHIN THE TREE PROTECTION ZONE SHALL BE ACCOMPLISHED WITH HAND OPERATED EQUIPMENT.

11. TREES TO BE REMOVED SHALL BE FELLED SO AS TO FALL AWAY FROM TREE ROOT PROTECTION ZONES AND TO AVOID PULLING AND BREAKING OF ROOTS TO REMAIN.

12. ALL DOWNED BRUSH AND TREES SHALL BE REMOVED FROM THE TREE ROOT PROTECTION ZONE EITHER BY HAND OR WITH EQUIPMENT SITTING OUTSIDE THE TREE ROOT PROTECTION ZONE. EXTRACTION SHALL OCCUR BY LIFTING THE MATERIAL OUT, NOT BY SKIDDING IT ACROSS THE GROUND.

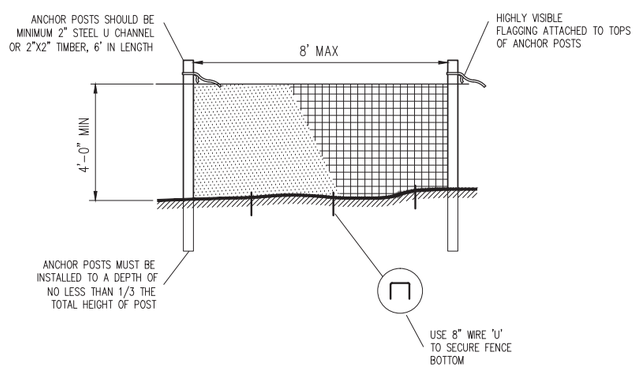
13. IF TEMPORARY HAUL OR ACCESS ROADS MUST PASS OVER THE ROOT AREA OF TREES TO BE RETAINED A ROADBED OF 6 INCHES OF MULCH OR GRAVEL SHALL BE CREATED TO PROTECT THE SOIL. THE ROADBED MATERIAL SHALL BE REPLENISHED AS NECESSARY TO MAINTAIN A 6–INCH DEPTH.

14. PRUNING. TREES SHALL BE PRUNED PRIOR TO THE START OF CONSTRUCTION. TREES SHALL BE CROWN CLEANED TO REMOVE THE DEADWOOD 2 INCHES IN DIAMETER AND OVER. TREES SHALL BE CROWN THINNED BY 10–20%. CROWNS MAY BE RAISED BY REMOVING BOTTOM BRANCHES AS NECESSARY UP TO 14 FEET HIGH TO GIVE CLEARANCE FOR ANY CONSTRUCTION TRAFFIC, ACTIVITIES, ETC. ALL WORK TO BE DONE IN ACCORDANCE WITH ANSI A300 PRUNING STANDARDS.

15. CUT BRANCHES AND ROOTS WITH SHARP PRUNING INSTRUMENTS THAT DO NOT CHOP OR TEAR.

16. LARGE HOLES FROM ROOT BALL REMOVAL SHALL BE REPLACED WITH COMPACTED STRUCTURAL FILL TO FINISHED GRADE.

17. **STUMPS SHALL BE GROUND AS NECESSARY SO AS NOT TO CAUSE DAMAGE TO THE ROOT ZONES OF ADJACENT TREES TO BE PRESERVED ON THE SUBJECT PARCEL OR ABUTTING PARCELS. STUMPS NEAR PROPERTY LINES SHALL ALSO BE GROUND AS NECESSARY SO AS NOT TO CAUSE DISTURBANCE TO ADJACENT PARCELS.**



NOTES:
1. BLAZE ORANGE OR BLUE PLASTIC MESH FENCE FOR TREE PROTECTION DEVICE, ONLY.
2. BOUNDARIES OF PROTECTION AREA SHALL BE MARKED IN THE FIELD BY THE ARBORIST PRIOR TO CONSTRUCTION
3. BOUNDARIES OF PROTECTION AREA SHOULD BE STAKED AND FLAGGED BY THE ARBORIST PRIOR TO INSTALLING DEVICES.
4. AVOID DAMAGE TO CRITICAL ROOT ZONE. DO NOT DAMAGE OR SEVER LARGE ROOTS WHEN INSTALLING POSTS.
5. DEVICE SHOULD BE MAINTAINED THROUGHOUT CONSTRUCTION.

TREE PROTECTION FENCE DETAIL

TREE PRESERVATION NOTES:

A. PLACING MATERIALS NEAR TREES.
NO PERSON MAY CONDUCT ANY ACTIVITY WITHIN THE PROTECTED AREA OF ANY TREE DESIGNATED TO REMAIN, INCLUDING, BUT NOT LIMITED TO, PARKING EQUIPMENT, PLACING SOLVENTS, STORING BUILDING MATERIAL AND SOIL DEPOSITS AND DUMPING CONCRETE WASHOUT.

B. ATTACHMENTS TO TREES.
DURING CONSTRUCTION, NO PERSON SHALL ATTACH ANY OBJECT TO ANY TREE DESIGNATED FOR PROTECTION.

C. PROTECTIVE BARRIER.
BEFORE DEVELOPMENT, LAND CLEARING, FILLING, OR ANY LAND ALTERATION FOR WHICH A TREE REMOVAL PERMIT IS REQUIRED, THE CONTRACTOR:

1. SHALL ERECT AND MAINTAIN READILY VISIBLE PROTECTIVE TREE FENCING ALONG THE OUTER EDGE AND COMPLETELY SURROUNDING THE PROTECTED AREA OF ALL PROTECTED TREES. A CONSTRUCTION FENCE MUST BE PLACED AROUND EACH TREE AT THE EDGE OF THE TREE ROOT PROTECTION ZONE. THE FENCE MUST BE PLACED BEFORE CONSTRUCTION STARTS AND REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETE. SEE TREE PROTECTION FENCE DETAIL.

2. MAY BE REQUIRED TO COVER WITH MULCH TO A DEPTH OF AT LEAST SIX (6) INCHES OR WITH PLYWOOD OR SIMILAR MATERIAL TO THE AREAS ADJOINING THE TREE ROOT PROTECTION ZONE IN ORDER TO PROTECT ROOTS FROM DAMAGE CAUSED BY HEAVY EQUIPMENT.

3. SHALL PROHIBIT EXCAVATION OR COMPACTING OF EARTH OR OTHER POTENTIALLY DAMAGING ACTIVITIES WITHIN THE BARRIERS.

4. MAY BE REQUIRED TO MINIMIZE ROOT DAMAGE BY EXCAVATING A TWO (2) FOOT DEEP TRENCH, AT EDGE OF TREE ROOT PROTECTION ZONE, TO CLEANLY SEVER THE ROOTS OF TREES TO BE RETAINED. ROOTS 1" IN DIAMETER OR GREATER SHALL BE CLEANLY CUT WITH A SAW OR PRUNERS.

5. MAY BE REQUIRED TO HAVE CORRECTIVE PRUNING PERFORMED ON PROTECTED TREES IN ORDER TO AVOID DAMAGE FROM MACHINERY OR BUILDING ACTIVITY. MAY BE REQUIRED TO MAINTAIN TREES THROUGHOUT CONSTRUCTION PERIOD BY WATERING AND FERTILIZING.

6. SHALL MAINTAIN THE PROTECTIVE BARRIERS IN PLACE UNTIL THE PROJECT ARBORIST AUTHORIZES THEIR REMOVAL OR A FINAL CERTIFICATE OF OCCUPANCY IS ISSUED, WHICHEVER OCCURS FIRST.

7. SHALL ENSURE THAT ANY LANDSCAPING DONE IN THE TREE ROOT PROTECTION ZONE SUBSEQUENT TO THE REMOVAL OF THE BARRIERS SHALL BE ACCOMPLISHED WITH LIGHT MACHINERY OR HAND LABOR. SEE NOTES ON THE LANDSCAPE PLAN.

D. GRADE

1. THE GRADE SHALL NOT BE ELEVATED OR REDUCED WITHIN THE TREE ROOT PROTECTION ZONE OF TREES TO BE PRESERVED WITHOUT THE PROJECT ARBORIST'S AUTHORIZATION. THE PROJECT ARBORIST MAY ALLOW COVERAGE OF UP TO ONE HALF OF THE AREA OF THE TREE'S ROOT PROTECTION ZONE WITH LIGHT SOILS (NO CLAY) TO THE MINIMUM DEPTH NECESSARY TO CARRY OUT GRADING OR LANDSCAPING PLANS, IF IT WILL NOT IMPERIL THE SURVIVAL OF THE TREE. AERATION DEVICES MAY BE REQUIRED TO ENSURE THE TREE'S SURVIVAL.

2. IF THE GRADE ADJACENT TO A PRESERVED TREE IS RAISED SUCH THAT IT COULD SLOUGH OR ERODE INTO THE TREE'S ROOT PROTECTION ZONE, IT SHALL BE PERMANENTLY STABILIZED TO PREVENT SUFFOCATION OF THE ROOTS.

3. THE APPLICANT SHALL NOT INSTALL AN IMPERVIOUS SURFACE WITHIN THE TREE ROOT PROTECTION ZONE OF ANY TREE TO BE RETAINED WITHOUT THE AUTHORIZATION OF THE PROJECT ARBORIST. THE PROJECT ARBORIST MAY REQUIRE SPECIFIC CONSTRUCTION METHODS AND/OR USE OF AERATION DEVICES TO ENSURE THE TREE'S SURVIVAL AND TO MINIMIZE THE POTENTIAL FOR ROOT INDUCED DAMAGE TO THE IMPERVIOUS SURFACE.

4. TO THE GREATEST EXTENT PRACTICAL, UTILITY TRENCHES SHALL BE LOCATED OUTSIDE OF THE TREE ROOT PROTECTION ZONE OF TREES TO BE RETAINED. THE PROJECT ARBORIST MAY REQUIRE THAT UTILITIES BE TUNNELED UNDER THE ROOTS OF TREES TO BE RETAINED IF THE PROJECT ARBORIST DETERMINES THAT TRENCHING WOULD SIGNIFICANTLY REDUCE THE CHANCES OF THE TREES SURVIVAL.

5. TREES AND OTHER VEGETATION TO BE RETAINED SHALL BE PROTECTED FROM EROSION AND SEDIMENTATION. CLEARING OPERATIONS SHALL BE CONDUCTED SO AS TO EXPOSE THE SMALLEST PRACTICAL AREA OF SOIL TO EROSION FOR THE LEAST POSSIBLE TIME. TO CONTROL EROSION, SHRUBS, AND GROUND COVER SHALL BE MAINTAINED WHERE FEASIBLE. WHERE NOT FEASIBLE APPROPRIATE EROSION CONTROL PRACTICES SHALL BE IMPLEMENTED.

E. DIRECTIONAL FELLING OF TREES SHALL BE USED TO AVOID DAMAGE TO TREES DESIGNATED FOR RETENTION.

F. ADDITIONAL REQUIREMENTS.
THE PROJECT ARBORIST MAY REQUIRE ADDITIONAL TREE PROTECTION MEASURES WHICH ARE CONSISTENT WITH ACCEPTED URBAN FORESTRY PRACTICES.

GENERAL TREE NOTES:

1. THE TREE INFORMATION SHOWN IN THE TREE PRESERVATION AND REMOVAL TABLES IS BASED ON A TOPOGRAPHIC SURVEY PERFORMED IN JAN–FEB 2014.

2. TREE PROTECTION SHALL BE INSTALLED PRIOR TO CONSTRUCTION AND REMAIN IN PLACE UNTIL CONSTRUCTION IS COMPLETED.

3. THE PROJECT ARBORIST MUST BE ON SITE DURING ANY WORK WITHIN THE TREE ROOT PROTECTION ZONE.

4. CONSTRUCTION WITHIN THE TREE ROOT PROTECTION ZONE IS ACCEPTABLE WITH PROJECT ARBORIST APPROVAL. ENCROACHMENT INTO THE TREE ROOT PROTECTION ZONE IS ALLOWED WITH PROJECT ARBORIST APPROVAL AS DESCRIBED IN THE FOLLOWING NOTES:

A. EXCAVATION IN THE TOP 24" OF THE SOIL IN THE TREE ROOT PROTECTION ZONE AREA SHOULD BEGIN AT THE EXCAVATION LINE THAT IS CLOSEST TO THE TREE.

B. THE EXCAVATION SHOULD BE DONE BY HAND/SHOVEL OR WITH A BACKHOE AND A MAN WITH A SHOVEL, PRUNING SHEARS, AND A PRUNING SAW.

C. IF DONE BY HAND, ALL ROOTS 1" OR LARGER SHOULD BE PRUNED AT THE EXCAVATION LINE.

D. IF DONE WITH A BACKHOE (MOST LIKELY SCENARIO), THEN THE OPERATOR SHALL START THE CUT AT THE EXCAVATION LINE AND CAREFULLY "FEEL" FOR ROOTS/RESISTANCE. WHEN THERE IS RESISTANCE, THE MAN WITH THE SHOVEL HAND DIGS AROUND THE ROOTS AND PRUNES THE ROOTS LARGER THAN 1" DIAMETER.

E. THE BACKHOE IS TO REMAIN OFF OF THE TREE ROOTS TO BE PRESERVED AT ALL TIMES.

F. ALL ROOTS SHALL BE CUT CLEANLY WITH PRUNING SHEARS OR A PRUNING SAW.

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FORESTRY - PLANNING - LANDSCAPE ARCHITECTURE

MANDEL FARMS SUBDIVISION
SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY TREE NOTES

DESIGNED BY:	DS
DRAWN BY:	DS
CHECKED BY:	BRB
SCALE:	AS NOTED
DATE: 01–08–2016	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P07

PROFESSIONAL CERTIFIED ARBORIST
BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN–5666A
EXPIRATION DATE: 12/31/17

AKS DRAWING FILE: P05 TREE.DWG | LAYOUT: P09

Detailed Tree Inventory for Mandel Farms Subdivision

AKS JOB NO. 4570

Tree ID	DBH (in.)	Tree Species (Common Name / Scientific name)	Condition/Comments	Hazard Rating (1-4)*	Wind-throw Rating**	Remove / Preserve
10595	8	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10596	7	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10597	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10598	7	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10599	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10600	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10601	7	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10602	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10603	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10604	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10605	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10606	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10607	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10608	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10609	7	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10610	6	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Pruned, Fair condition	2	B	Remove
10638	10	Cherry (Prunus sp.)	**OFFSITE** Pruned, Fair condition	2	B	Preserve
10639	11	Cherry (Prunus sp.)	**OFFSITE** Pruned, Sparse foliage, Fair condition	2	B	Preserve
10640	6	Cherry (Prunus sp.)	**OFFSITE** Pruned, Fair, Crooked, Some decay, Fair condition	2	B	Preserve
12477	7,7,8,12	Apple (Malus sp.)	Codominant, Pruned, Cracks, Decay, Poor condition	3	C	Preserve
12478	12	Cherry (Prunus sp.)	Covered in Blackberry, Some dead foliage, Fair condition	2	B	Preserve
12488	6,7,7,7,7,7	Oregon Ash (Fraxinus latifolia)	**OFFSITE** Codominant, Some dead foliage, Fair condition	2	B	Preserve
12498	9	Bigleaf Maple (Acer macrophyllum)	Cavities with decay, Some broken branches, Fair condition	2	B	Remove
12499	10,10,11	Apple (Malus sp.)	Codominant, Support, Pruned, Cracked bark, Decay, Bore holes, Poor condition	3	C	Remove
12700	10,11	Plum (Prunus sp.)	Codominant, Pruned, Cavity with decay at base, Fair condition	2	B	Remove
12710	5	Black Locust (Robinia pseudoacacia)	Crooked, Many snags, Codominant, Bifurcation base, Fair condition	2	B	Remove
12711	21	Black Locust (Robinia pseudoacacia)	Leans W, Crooked, Fair condition	2	B	Remove
12712	15	Maple (Acer sp.)	Leans SW, Dead, Poor condition	3	C	Remove
12713	15	Cherry (Prunus sp.)	Many large bulges, Decay, Crooked, Bore holes, Pruned, Topped, Poor condition	3	C	Remove
12714	30	Douglas-fir (Pseudotsuga menziesii)	Pruned, Fair condition	3	B	Remove
12715	22	Maple (Acer sp.)	Codominant, Snag in canopy with included bark, Crooked, Pruned, Fair condition	2	B	Remove
12726	21	Sweet Cherry (Prunus avium)	Pruned, Broken branches, Large bulge at base, Cracks, Decay, Poor condition	3	C	Remove
12727	25	Pear (Pyrus sp.)	Pruned with decay, Large cavity at base with decay, Bulge at base, Poor condition	1	C	Remove
12728	28	Pear (Pyrus sp.)	Large cavities with decay, Dead branches, Decay, Pruned, Poor condition	1	C	Remove
12733	6,6,8	Holly (Ilex sp.)	Codominant, Bore holes, Topped, Pruned, Broken branches, Poor condition	3	C	Remove
12734	32	Black Locust (Robinia pseudoacacia)	Good condition	2	B	Remove
12735	30	Engelmann Spruce (Picea engelmannii)	Upcoming branching, Pruned with sap flow, Some dead foliage, Fair condition	3	B	Remove
12736	11	Cherry (Prunus sp.)	Large cavity, Decay, Bore holes, Broken branches, Topped, Poor condition	3	C	Remove
12767	9,11,13,17	Cherry (Prunus sp.)	Pruned, Cracked bark, Decay, Poor condition	3	C	Remove
12768	18,18	Black Locust (Robinia pseudoacacia)	Codominant with included bark, Good condition	2	B	Remove
12773	17	Black Locust (Robinia pseudoacacia)	Leans N, Crooked, Fair condition	2	B	Remove
12787	6	Cherry (Prunus sp.)	Pruned, Fair condition	2	B	Preserve
12788	11,11	Apple (Malus sp.)	Codominant, Some decay, Fair condition	2	B	Preserve
12789	7,8	Apple (Malus sp.)	Leans N, Crooked, Good condition	1	A	Preserve
13395	28	Bigleaf Maple (Acer macrophyllum)	**OFFSITE** Codominant, Sap bleed base, Pruned, Cracked bark, Fair condition	2	B	Preserve
13400	21,23	Cherry (Prunus sp.)	**OFFSITE** Cavity with decay, Conk, Pruned, Crooked, Fair condition	2	B	Preserve
13408	11	Cherry (Prunus sp.)	**OFFSITE** Leans N, Pruned, Crooked, Fair condition	2	B	Preserve
13432	17	Oregon Ash (Fraxinus latifolia)	**OFFSITE** Cavity, Cracked bark, Fair condition	2	B	Preserve
13484	36	Douglas-fir (Pseudotsuga menziesii)	**OFFSITE** Pruned, Bulge at base, Good condition	1	B	Preserve
13485	7,10,12,12	Cherry (Prunus sp.)	Codominant, Cracks with decay, Some branches on ground, Fair condition	2	B	Preserve
13495	8	Cherry (Prunus sp.)	Crooked, Leans W, Fair condition	2	B	Preserve
13496	6	Cherry (Prunus sp.)	Leans O, Almost uprooted, Fair condition	2	B	Preserve
13498	10,13,14	Cherry (Prunus sp.)	Cracks, Decay, Poor condition	3	C	Preserve
13499	11,11	Cherry (Prunus sp.)	Cracks, Decay, Resting on ground, Poor condition	3	C	Preserve
13505	6	Cherry (Prunus sp.)	Crooked, Fair condition	2	B	Preserve
13506	9	Cherry (Prunus sp.)	Codominant, Leans W, Hooked butt, Fair condition	2	B	Preserve
13507	11	Cherry (Prunus sp.)	Several leans W, Hooked butt, Cracks, Cavity, Decay, Poor condition	3	B	Preserve

Detailed Tree Inventory for Mandel Farms Subdivision

AKS JOB NO. 4570

Tree ID	DBH (in.)	Tree Species (Common Name / Scientific name)	Condition/Comments	Hazard Rating (1-4)*	Wind-throw Rating**	Remove / Preserve
13508	6	Cherry (Prunus sp.)	Several leans W, Sparse foliage, Poor condition	2	B	Preserve
13509	6	Cherry (Prunus sp.)	Codominant, Snag from base, Good condition	1	A	Preserve
13510	6	Cherry (Prunus sp.)	Leans E, Crooked, Fair condition	2	B	Preserve
13511	6	Cherry (Prunus sp.)	Leans NE, Crooked, Fair condition	2	B	Preserve
13513	7,7	Cherry (Prunus sp.)	Codominant, Leans NW, Some decay, Fair condition	2	B	Preserve
13514	11	Cherry (Prunus sp.)	Leans NE, Crooked, Fair condition	2	B	Preserve
13515	7	Cherry (Prunus sp.)	Ground Decay, Cracks, Cavity, Poor condition	3	C	Preserve
13521	18	Western Redcedar (Thuja plicata)	Crooked, Cavity, Bore holes, 25% of foliage dead, Fair condition	2	B	Remove
13522	10	Black Hawthorn (Crataegus douglasii)	Leans NE, Fair condition	2	B	Preserve
13523	8,8	Black Hawthorn (Crataegus douglasii)	Leans NE, Fair condition	2	B	Preserve
13524	9	Black Hawthorn (Crataegus douglasii)	Leans NE, Fair condition	2	B	Preserve
13525	6	Black Hawthorn (Crataegus douglasii)	Leans NE, Cracks, Cavity with decay, Sparse foliage, Poor condition	3	C	Preserve
13526	10	Black Hawthorn (Crataegus douglasii)	Leans E, Crooked, Fair condition	2	B	Preserve
13527	7	Black Hawthorn (Crataegus douglasii)	Leans NE, Crooked, Fair condition	2	B	Preserve
13528	9	Black Hawthorn (Crataegus douglasii)	Leans NW, Fair condition	2	B	Preserve
13529	7	Black Hawthorn (Crataegus douglasii)	Leans NE, Suppressed, Fair condition	2	B	Preserve
13560	22,23	Bigleaf Maple (Acer macrophyllum)	Codominant with included bark, Crooked, Fair condition	2	B	Preserve
13623	6,9,12,13	Bigleaf Maple (Acer macrophyllum)	Codominant, Cracks, Decay, Cracked bark, Fair condition	3	B	Preserve
13625	6,8	Douglas-fir (Pseudotsuga menziesii)	Codominant, 15 sap bleed base with included bark, Pruned, Fair condition	3	B	Preserve
13254	6,7	Cherry (Prunus sp.)	Dead, Poor condition	3	C	Preserve
13255	2x24	Sweet Cherry (Prunus avium)	Codominant with included bark, Sap flow, Fair condition	2	B	Preserve
13257	8,11	Sweet Cherry (Prunus avium)	Codominant, Leans W, Some decay, Fair condition	2	B	Preserve
13258	12	Sweet Cherry (Prunus avium)	Crooked, Leans W, Fair condition	2	B	Preserve
13259	6	Cherry (Prunus sp.)	Sparse foliage, Fair condition	2	B	Preserve
13267	31	Douglas-fir (Pseudotsuga menziesii)	Crooked, Good condition	2	B	Remove
13268	12	Douglas-fir (Pseudotsuga menziesii)	Suppressed, Fair condition	1	A	Remove
13269	12	Douglas-fir (Pseudotsuga menziesii)	Suppressed, Fair condition	1	A	Remove
13270	17	Douglas-fir (Pseudotsuga menziesii)	Good condition	2	B	Remove
13271	11	Douglas-fir (Pseudotsuga menziesii)	Good condition	1	A	Remove
13272	7	Douglas-fir (Pseudotsuga menziesii)	Suppressed, Fair condition	1	A	Remove
13273	15	Douglas-fir (Pseudotsuga menziesii)	Good condition	1	A	Remove
13275	9	Sweet Cherry (Prunus avium)	Crooked, Leans SW, Fair condition	2	B	Remove
13276	9	Douglas-fir (Pseudotsuga menziesii)	Pruned, Suppressed, Fair condition	1	A	Preserve
13282	25	Douglas-fir (Pseudotsuga menziesii)	Pruned, Good condition	2	B	Preserve
13284	18	Douglas-fir (Pseudotsuga menziesii)	Good condition	2	B	Preserve
13287	6	Bigleaf Maple (Acer macrophyllum)	Leans N, Good condition	1	A	Preserve
13289	7	Bigleaf Maple (Acer macrophyllum)	Leans N, Good condition	1	A	Preserve
13291	33	Douglas-fir (Pseudotsuga menziesii)	Good condition	2	B	Preserve
13293	20	Douglas-fir (Pseudotsuga menziesii)	Upcoming branching, Crooked, Sweep, Fair condition	2	B	Preserve
13294	6,7	Bigleaf Maple (Acer macrophyllum)	Leans N, Good condition	1	A	Preserve
13297	19	Bigleaf Maple (Acer macrophyllum)	Bulge at base, Dead top, Sparse foliage, Poor condition	3	C	Preserve
13298	16	Bigleaf Maple (Acer macrophyllum)	Crooked, Fair condition	2	B	Preserve
13299	12	Douglas-fir (Pseudotsuga menziesii)	Good condition	1	A	Preserve
13301	8	Cherry (Prunus sp.)	Dead, Poor condition	3	C	Preserve
13304	11,12,13,15	Bigleaf Maple (Acer macrophyllum)	Codominant, Crooked, Fair condition	2	B	Preserve
13307	25	Western Redcedar (Thuja plicata)	Good condition	2	B	Preserve
13308	12	Western Redcedar (Thuja plicata)	Suppressed, Fair condition	1	A	Preserve
13311	21	Douglas-fir (Pseudotsuga menziesii)	Good condition	2	B	Preserve
13312	22	Western Redcedar (Thuja plicata)	Crooked, Codominant 8 sap bleed base, Bore holes, Fair condition	2	B	Preserve
13313	9,10	Western Redcedar (Thuja plicata)	Many large bore holes, Codominant with included bark, Poor condition	3	C	Preserve
13314	28	Western Redcedar (Thuja plicata)	Crooked, Bore holes, Codominant top, Fair condition	2	B	Preserve
13315	23	Western Redcedar (Thuja plicata)	Leans W, Dead lower limbs, Broken branches, Fair condition	2	B	Preserve
13316	22	Western Redcedar (Thuja plicata)	Leans NW, Good condition	2	B	Preserve
13320	27	Douglas-fir (Pseudotsuga menziesii)	Sweep, Crooked, Upcoming branching, Fair condition	2	B	Preserve
13321	37	Douglas-fir (Pseudotsuga menziesii)	Sweep, Upcoming branching, Fair condition	2	B	Preserve
13322	14,17	Douglas-fir (Pseudotsuga menziesii)	Codominant, Good condition	2	B	Preserve
13327	28	Douglas-fir (Pseudotsuga menziesii)	Crooked, Fair condition	2	B	Preserve
13346	7,8,11,12	Bigleaf Maple (Acer macrophyllum)	Crooked, Fair condition	2	B	Preserve
13358	48	Douglas-fir (Pseudotsuga menziesii)	Some Broken branches, Upcoming branching, Fair condition	3	B	Preserve
13361	7,13,16	Pacific Madrone (Arbutus menziesii)	Codominant, Crooked, 10" diam Hole NW, Fair condition	2	B	Preserve
13364	6	Cherry (Prunus sp.)	Some dead foliage, Leans E, Fair condition	2	B	Preserve
13391	28	Cherry (Prunus sp.)	Bulge at base, Cracks, Fair condition	2	B	Preserve
13412	10,10,10,10	Bigleaf Maple (Acer macrophyllum)	Cracks, Severely pruned, Decay, Poor condition	3	C	Remove
13413	6	Bigleaf Maple (Acer macrophyllum)	Crooked, Good condition	1	A	Remove

Detailed Tree Inventory for Mandel Farms Subdivision

AKS JOB NO. 4570

Tree ID	DBH (in.)	Tree Species (Common Name / Scientific name)	Condition/Comments	Hazard Rating (1-4)*	Wind-throw Rating**	Remove / Preserve
13415	7	Bigleaf Maple (Acer macrophyllum)	Crooked, Good condition	1	A	Remove
13416	8	Bigleaf Maple (Acer macrophyllum)	Suppressed, Fair condition	1	A	Preserve
13417	15	Bigleaf Maple (Acer macrophyllum)	Leans N, Sparse foliage, Dead top, Poor condition	3	C	Preserve
13418	8	Douglas-fir (Pseudotsuga menziesii)	Suppressed, Fair condition	1	A	Preserve
13419	10	Bigleaf Maple (Acer macrophyllum)	Leans N, Codominant top, 50% of hole covered with Ivy, Fair condition	2	B	Preserve
13451	15	Douglas-fir (Pseudotsuga menziesii)	Suppressed, 50% of hole covered with Ivy, Fair condition	1	B	Preserve
13452	17	Douglas-fir (Pseudotsuga menziesii)	Sap flow, Fair condition	3	B	Preserve
13453	22	Douglas-fir (Pseudotsuga menziesii)	Suppressed, Upcoming branching, Fair condition	2	B	Remove
13454	6,6	Pacific Yew (Taxus brevifolia)	Codominant, Severely pruned, Fair condition	2	B	Remove
13461	12	Sweet Cherry (Prunus avium)	Crooked, Leans N, Fair condition	2	B	Preserve
13463	25	Douglas-fir (Pseudotsuga menziesii)	Broken branches, Upcoming branching, Fair condition	3	B	Preserve
13465	6	Sweet Cherry (Prunus avium)	Leans E, Crooked, High crown, Fair condition	2	B	Preserve
13467	6,7,7,8	Bigleaf Maple (Acer macrophyllum)	Pruned, Bulge at base, Crooked, Fair condition	2	B	Preserve
13468	6,6,7,7,8	Bigleaf Maple (Acer macrophyllum)	Pruned, Bulge at base, Crooked, Fair condition	2	B	Preserve
13471	6,7,7,8,8	Bigleaf Maple (Acer macrophyllum)	Codominant, Crooked, Some decay, Fair condition	2	B	Preserve
13476	15	Bigleaf Maple (Acer macrophyllum)	Very crooked, Decay at base, Poor condition	3	C	Preserve
13478	8,10	Bigleaf Maple (Acer macrophyllum)	Broken branches with decay, Leans NE, Fair condition	2	B	Preserve
13480	6,7	Bigleaf Maple (Acer macrophyllum)	Leans NE, Scars, Bulge at base, Fair condition	2	B	Preserve
13481	6,6	Bigleaf Maple (Acer macrophyllum)	Leans NE, Decay at base, Fair condition	2	B	Preserve
13483	7,13	Bigleaf Maple (Acer macrophyllum)	Codominant, Scar at base with decay, Fair condition	2	B	Preserve
13485	9,11	Bigleaf Maple (Acer macrophyllum)	Pruned with decay, Crooked, Fair condition	2	B	Preserve
13486	12	Bigleaf Maple (Acer macrophyllum)	Codominant top, Good condition	2	A	Preserve
13490	6,6,6	Bigleaf Maple (Acer macrophyllum)	Codominant, Good condition	1	A	Remove
13493	8	Cherry (Prunus sp.)	Several leans N, Sparse foliage, Fair condition	2	B	Preserve
13498	27,30	Western Redcedar (Thuja plicata)	Codominant, Leans E, Some broken branches, Fair condition	3	B	Preserve
13499	30	Douglas-fir (Pseudotsuga menziesii)	Good condition	2	B	Preserve
13500	18	Douglas-fir (Pseudotsuga menziesii)	Sweep, Dead lower limbs, Fair condition	2	B	Preserve
13501	12	Western Redcedar (Thuja plicata)	Suppressed, Fair condition	2	B	Preserve
13503	19	Douglas-fir (Pseudotsuga menziesii)	50% of hole covered with Ivy, Fair condition	2	B	Preserve
13504	35	Douglas-fir (Pseudotsuga menziesii)	Large bulge, Upcoming branching, Pruned, Fair condition	3	B	Preserve
13504	12	Western Redcedar (Thuja plicata)	Suppressed, Fair condition	1	A	Preserve
13505	22	Douglas-fir (Pseudotsuga menziesii)	25% of hole covered with Ivy, Upcoming branching, Pruned, Fair condition	2	B	Preserve
13506	38	Douglas-fir (Pseudotsuga menziesii)	25% of hole covered with Ivy, Upcoming branching, Pruned, Fair condition	3	B	Preserve
13507	37	Douglas-fir (Pseudotsuga menziesii)	Sweep, Upcoming branching, Pruned, Fair condition	2	B	Preserve
13001	14,15,16	Bigleaf Maple (Acer macrophyllum)	50% of hole covered with Ivy, Crooked, Fair condition	2	B	Preserve
13002	16	Western Redcedar (Thuja plicata)	Sparse foliage, No Good condition	2	B	Preserve
13003	10	Sweet Cherry (Prunus avium)	Leans N, Suppressed, Fair condition	1	A	Preserve
13004	13	Hawthorn (Crataegus sp.)	Bore holes, Fair condition	2	B	Preserve
13005	13	Cherry (Prunus sp.)	Some dead foliage, Fair condition	2	B	Preserve
13006	9,9,9	Walnut (Juglans sp.)	Leans E, Crooked, Fair condition	2	B	Preserve
13007	36	Western Redcedar (Thuja plicata)	Good condition	2	B	Preserve

Total # of Existing Trees Surveyed = 162

Total # of Existing Trees Onsite = 137

Total # of Trees to be Removed Onsite = 55

Total # of Trees to be Preserved Onsite = 104

Total # of Trees Offsite = 25

Total # of Trees to be Removed Offsite = 16

Total # of Trees to be Preserved Offsite = 9

***Hazard Rating:**

1 - Low Risk
2 - Moderate Risk
3 - High Risk
4 - Extreme Risk

****Wind-throw Rating:**

A - Most Wind-throw Resistant
B - Moderate Wind-throw Resistant
C - Least Wind-throw Resistant

Arborist Disclosure Statement:

Arborists are tree specialists who use their education, knowledge, training, and experience to examine trees, recommend measures to enhance the health of trees, and attempt to reduce the risk of living near trees. The Client and/or Jurisdiction may choose to accept or disregard the recommendations of the arborist, or seek additional advice. Arborists cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that exhibit ways we do not fully understand. Conditions are often hidden within trees and below ground. Arborists cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise, remedial treatments, like medicine, cannot be guaranteed. Trees can be managed, but they cannot be controlled. To live near trees is to accept some degree of risk. The only way to eliminate all risk associated with trees is to eliminate all trees. Neither this author nor AKS Engineering & Forestry, LLC have assumed any responsibility for liability associated with the trees on or adjacent to this site.

At the completion of construction, all trees should once again be reviewed to evaluate their hazard rating. Land clearing and removal of adjacent trees can expose previously unseen defects and otherwise healthy trees can be damaged during construction.

CERTIFIED ARBORIST

BRUCE R. BALDWIN
CERTIFICATE NUMBER: PN-6666A
EXPIRATION DATE: 12/31/17

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MANDEL FARMS SUBDIVISION

SHERWOOD
TAX LOTS 250 AND 251

OREGON
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY DETAILED TREE INVENTORY TABLE

DESIGNED BY: DS
DRAWN BY: DS
CHECKED BY: BRB
SCALE: AS NOTED
DATE: 01-08-2016

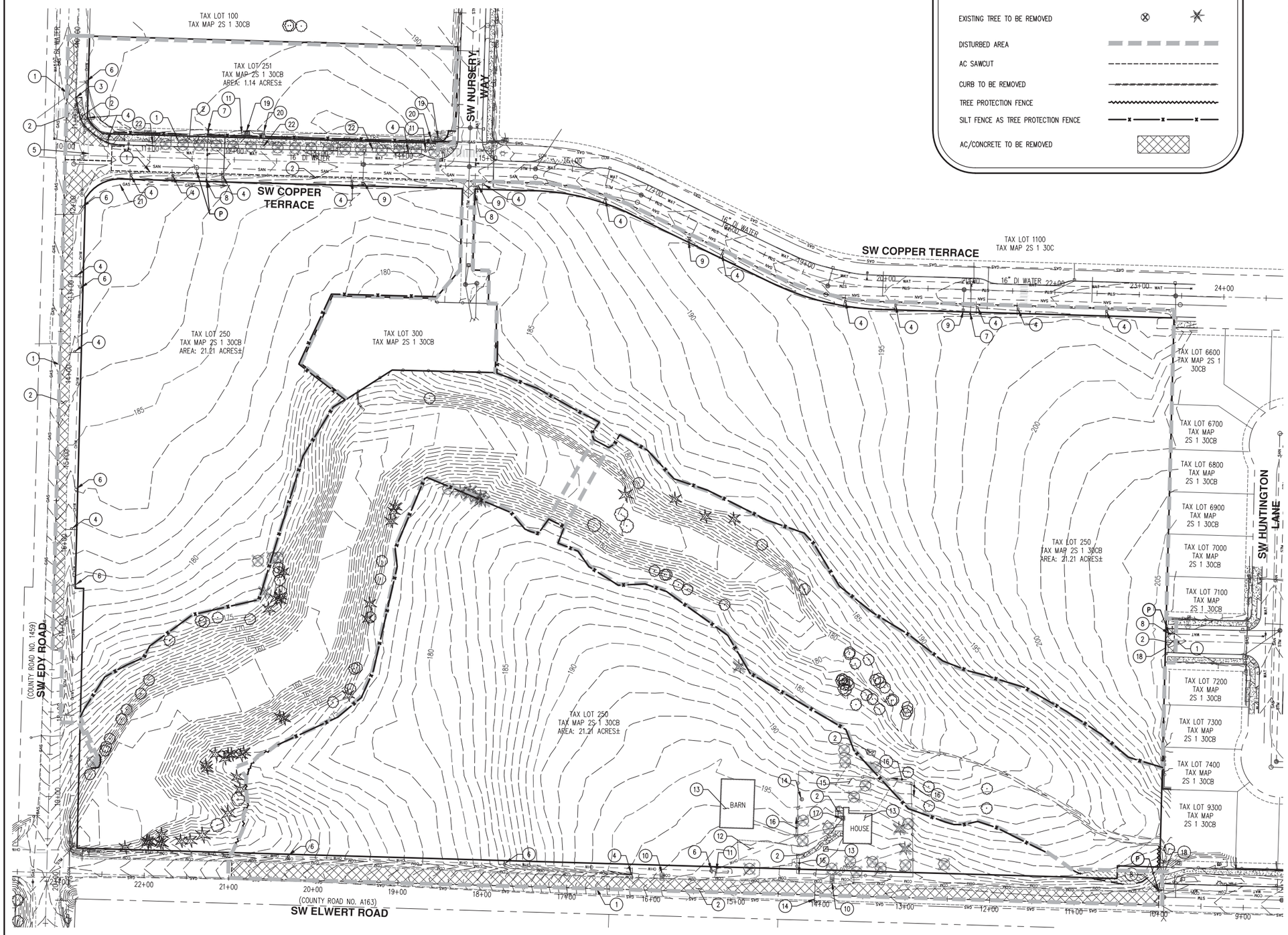
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P08

AKS DRAWING FILE: P05 TREEDWG | LAYOUT: P07



LEGEND

EXISTING GROUND CONTOUR (1 FT)	
EXISTING GROUND CONTOUR (5 FT)	200
EXISTING TREE TO REMAIN	
EXISTING TREE TO BE REMOVED	
DISTURBED AREA	
AC SAWCUT	
CURB TO BE REMOVED	
TREE PROTECTION FENCE	
SILT FENCE AS TREE PROTECTION FENCE	
AC/CONCRETE TO BE REMOVED	

KEYED DEMOLITION NOTES (#)

1. AC SAWCUT (TYP) – SAWCUT EXISTING AC/SIDEWALK AND CURB AS NEEDED FOR PROPOSED IMPROVEMENTS
2. REMOVE AND HAUL OFF EXISTING AC/SIDEWALK
3. REMOVE EXISTING CURB FOR PROPOSED IMPROVEMENTS
4. REMOVE/RELOCATE EXISTING ROAD SIGNS
5. REMOVE EXISTING STREET PAVEMENT MARKING
6. RELOCATE EXISTING POWER POLES/LIGHTS AND ASSOCIATED OHWS – CONTRACTOR TO COORDINATE WITH UTILITY PROVIDER AND DEVELOPER PRIOR TO BEGINNING WORK
7. REMOVE WATER BLOW-OFF VALVE ASSEMBLY AND CAP EXISTING WATER MAIN – CONTRACTOR TO COORDINATE WITH CITY OF SHERWOOD PROJECT INSPECTOR
8. REMOVE WATER BLOW-OFF VALVE ASSEMBLY AND EXTEND WATER MAIN PER PROPOSED UTILITY PLANS – CONTRACTOR TO COORDINATE WITH CITY SHERWOOD PROJECT INSPECTOR
9. REMOVE EXISTING STORM DRAIN DITCH INLET FOR STORM IMPROVEMENTS
10. REMOVE EXISTING MAIL BOX
11. REMOVE/RELOCATE EXISTING COMMUNICATION BOX AND CABLES – CONTRACTOR TO COORDINATE WITH UTILITY PROVIDER
12. REMOVE EXISTING GRAVEL AREA – CONTRACTOR TO COORDINATE WITH PROJECT GEOTECHNICAL ENGINEER AND DEVELOPER FOR POTENTIAL GRAVEL REUSE PRIOR TO HAULING OFFSITE
13. DEMOLISH AND HAUL OFF EXISTING BUILDING
14. DECOMMISSION AND CAP EXISTING WATER WELL
15. REMOVE EXISTING SEPTIC TANK/FIELD
16. REMOVE EXISTING FENCE AS SHOWN
17. COORDINATE WITH UTILITY PROVIDER TO REMOVE EXISTING GAS STRUCTURE
18. REMOVE EXISTING STREET/SIDEWALK BARRICADE
19. COORDINATE WITH UTILITY PROVIDER TO RELOCATE EXISTING POWER VAULT AND UNDERGROUND CABLES
20. COORDINATE WITH UTILITY PROVIDER TO RELOCATE EXISTING COMMUNICATION VAULT AND UNDERGROUND CABLES
21. COORDINATE WITH UTILITY PROVIDER TO REMOVE/RELOCATE EXISTING GAS LINE
22. EXISTING STREET LIGHTS TO BE RELOCATED – CONTRACTOR TO COORDINATE WITH UTILITY PROVIDER

NOTES:

1. CONTRACTOR TO COORDINATE THE REMOVAL OF ALL NECESSARY PRIVATE UTILITIES WITH THE APPROPRIATE UTILITY PROVIDERS
2. CONTRACTOR TO ABANDON EXISTING WELLS, SEPTIC TANKS, AND DRAIN FIELDS FOUND DURING CONSTRUCTION PER APPLICABLE LOCAL, STATE, AND FEDERAL REQUIREMENTS.

(P) CONTRACTOR TO POTHOLE AND VERIFY ALL UTILITY TIE IN ELEVATIONS PRIOR TO ORDERING STRUCTURES, PIPES AND ALL MATERIALS

SCALE 1" = 60 FEET

60 0 24 36 48 60

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SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY DEMOLITION PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

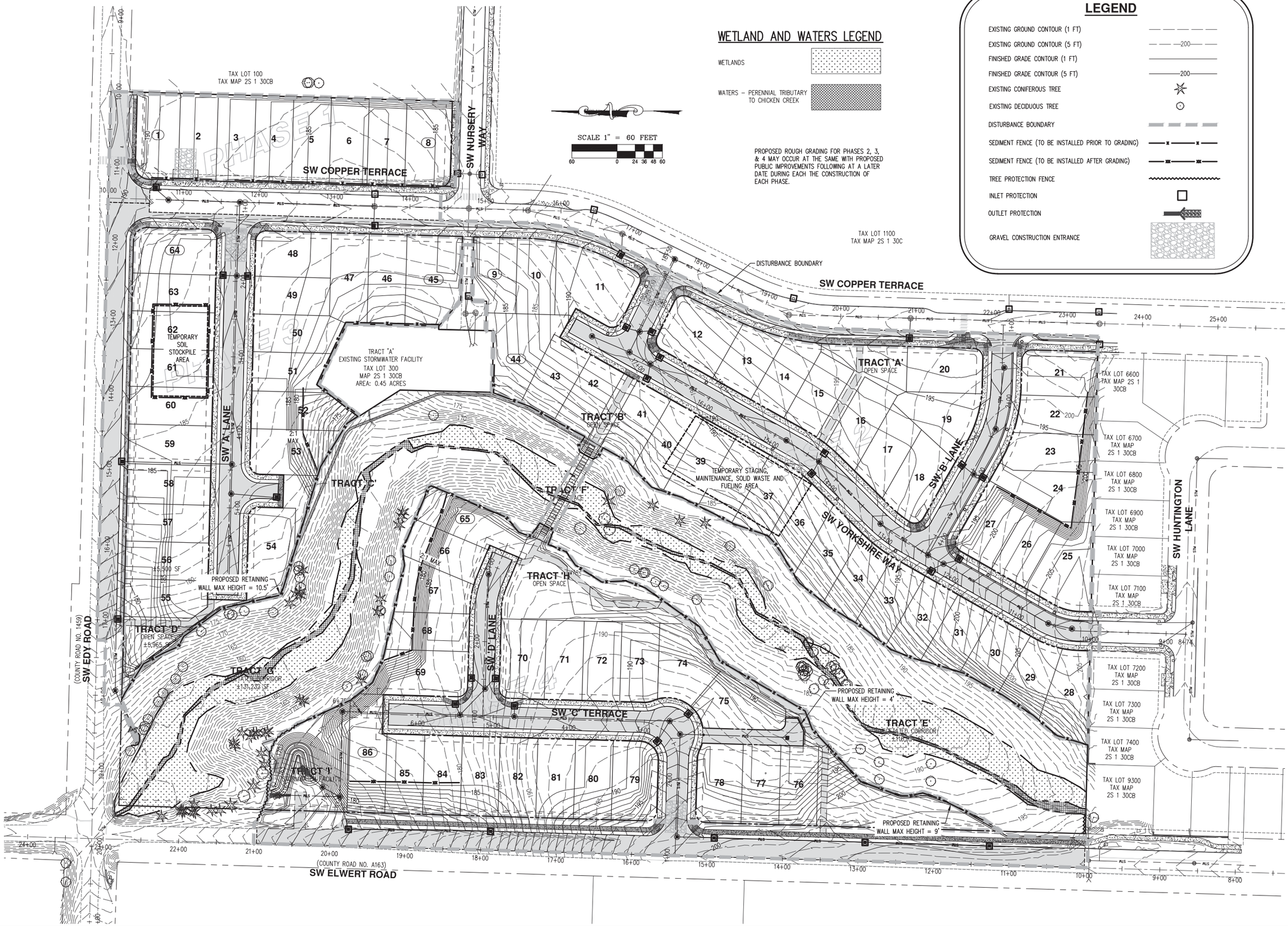
REGISTERED PROFESSIONAL ENGINEER
PAUL A. SELLNE
OREGON
JANUARY 8, 2011
PRELIMINARY NOT FOR CONSTRUCTION
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

SHEET
P09

AKS DRAWING FILE: P07 DEMOLDWG | LAYOUT: P09



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY GRADING AND EROSION AND SEDIMENT CONTROL PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JAN. 8, 2011
PAMELA A. SELLKE

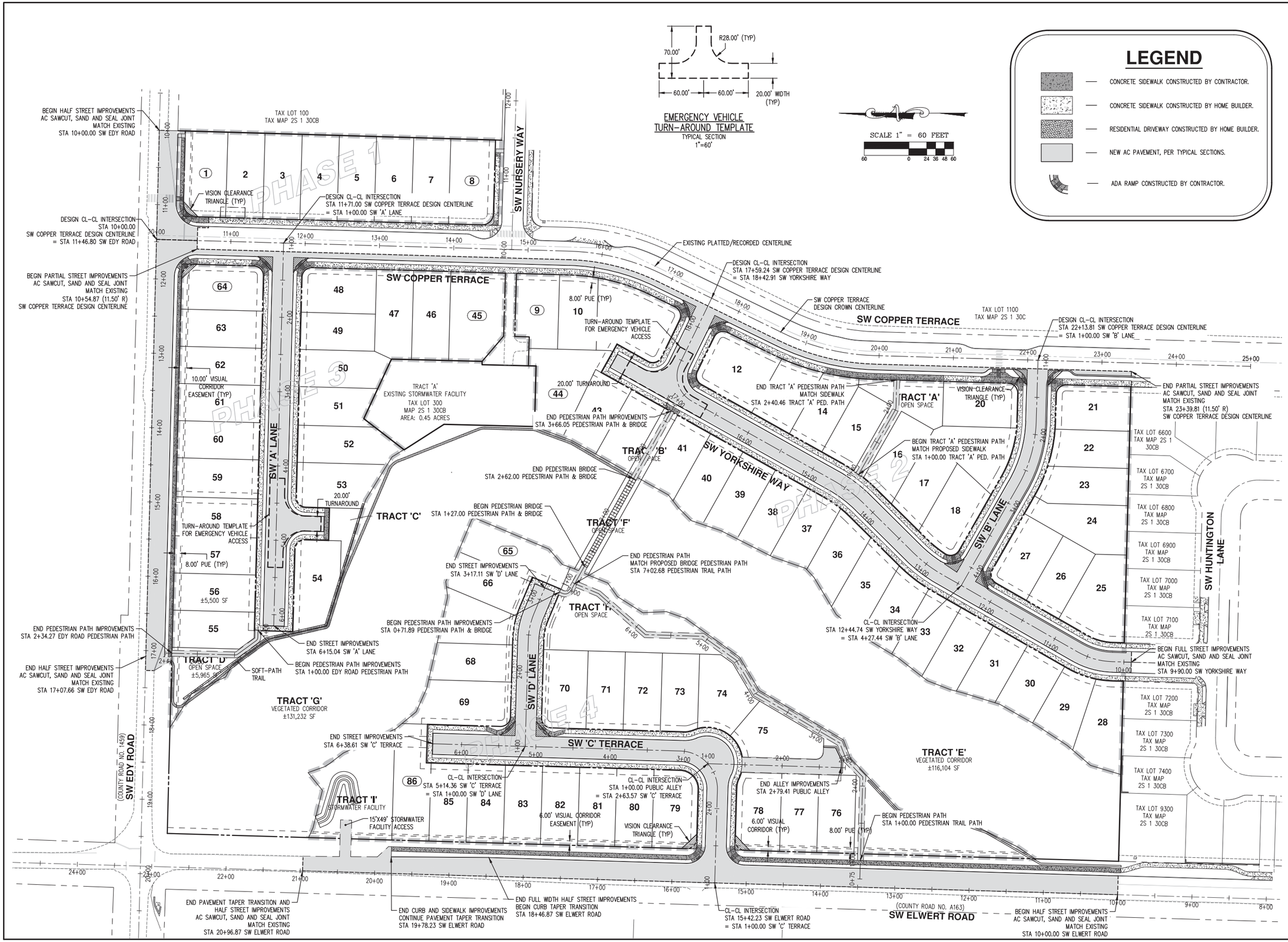
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

SHEET
P10

AKS DRAWING FILE: P08 GRADING.DWG | LAYOUT: P10



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY STREET PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
PAUL A. SELLKE

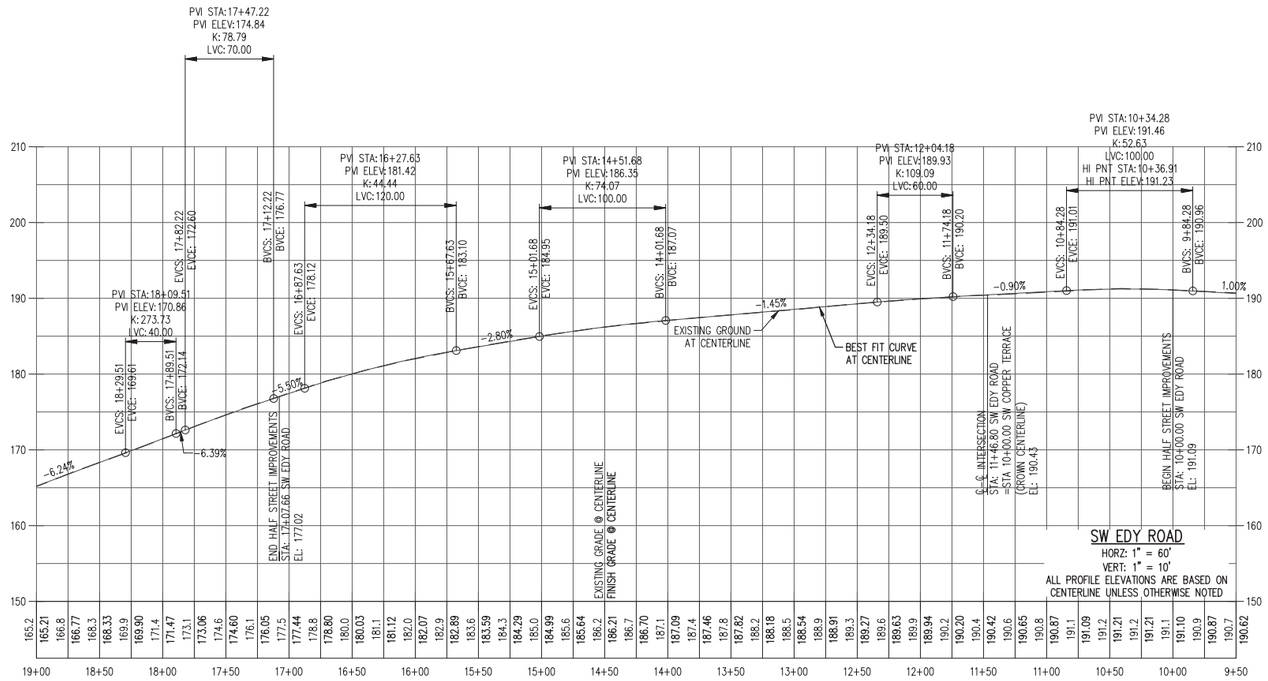
RENEWAL DATE: 6/30/16

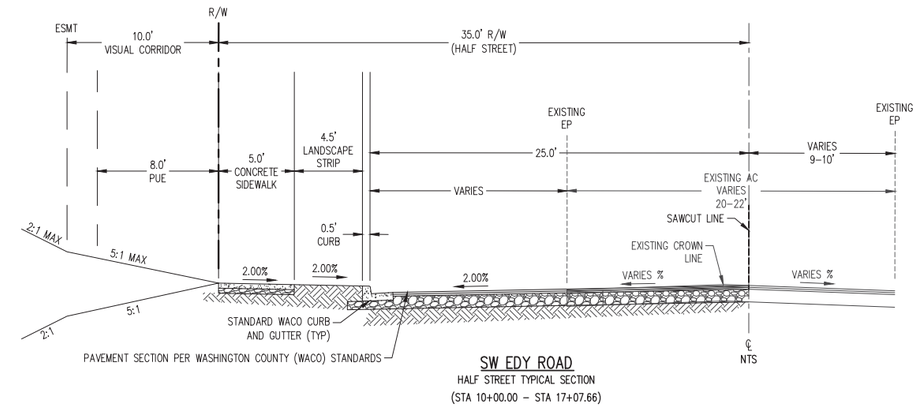
REVISIONS:

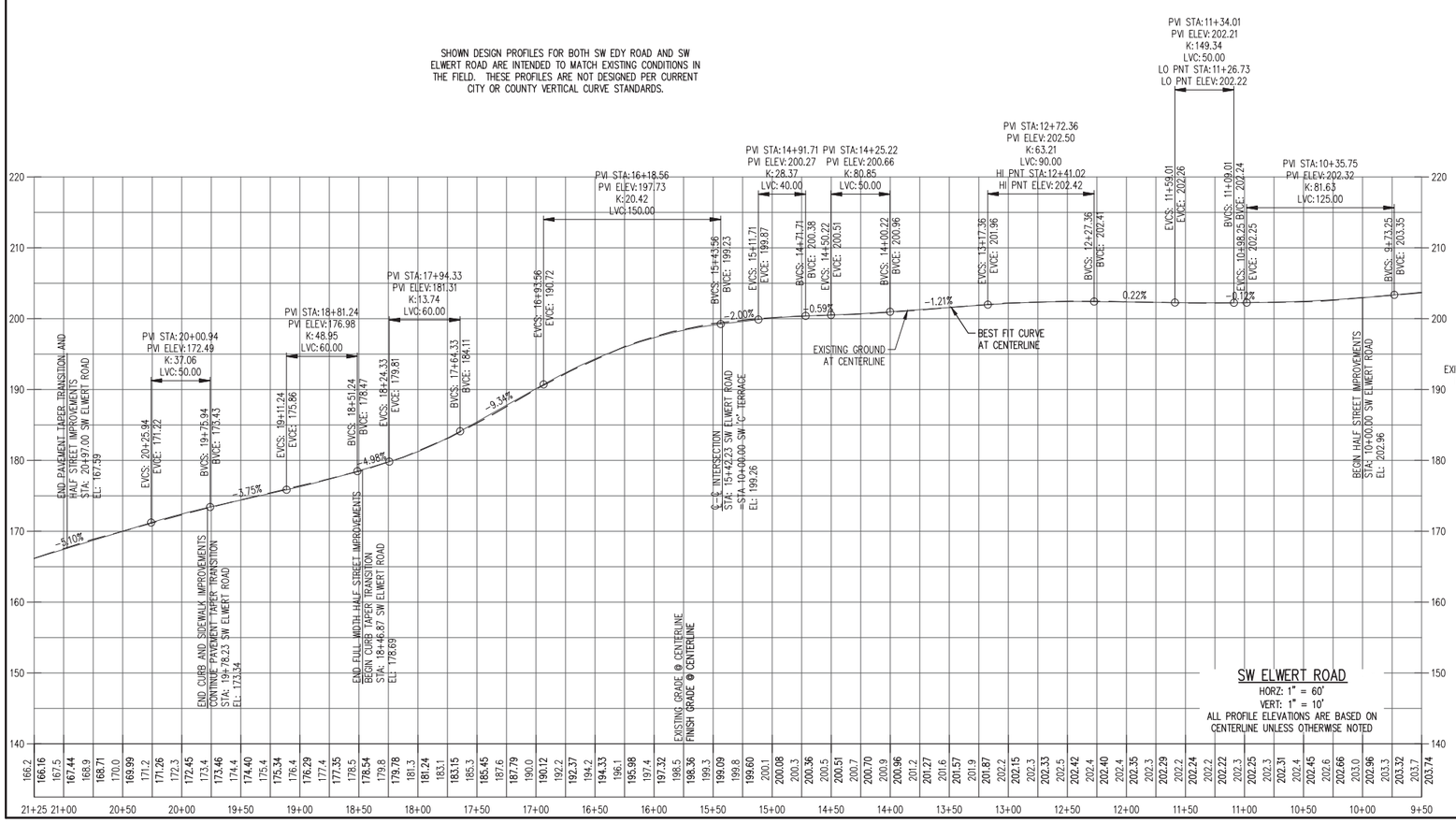
JOB NUMBER
4570

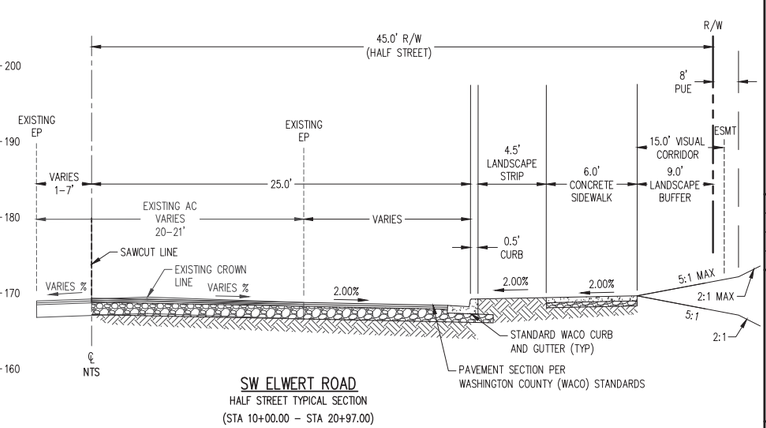
SHEET
P11

AKS DRAWING FILE: P09 STREET.DWG | LAYOUT: P09









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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY STREET PROFILES AND CROSS-SECTIONS

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

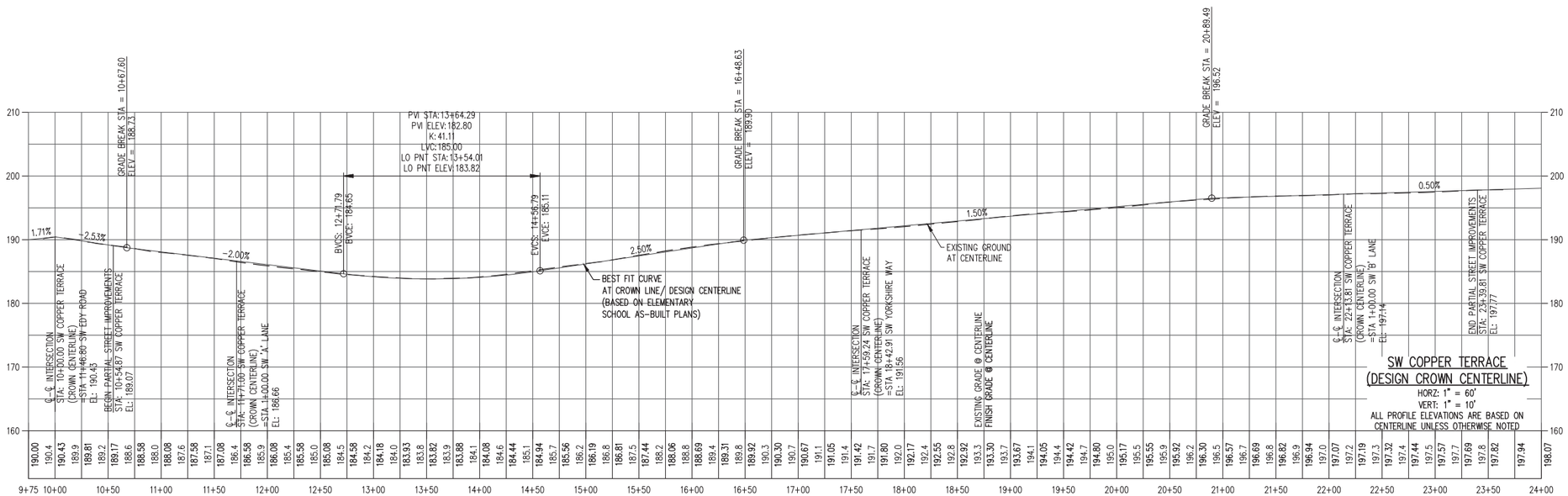
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
PAUL A. SELLAK
RENEWAL DATE: 6/30/16

REVISIONS

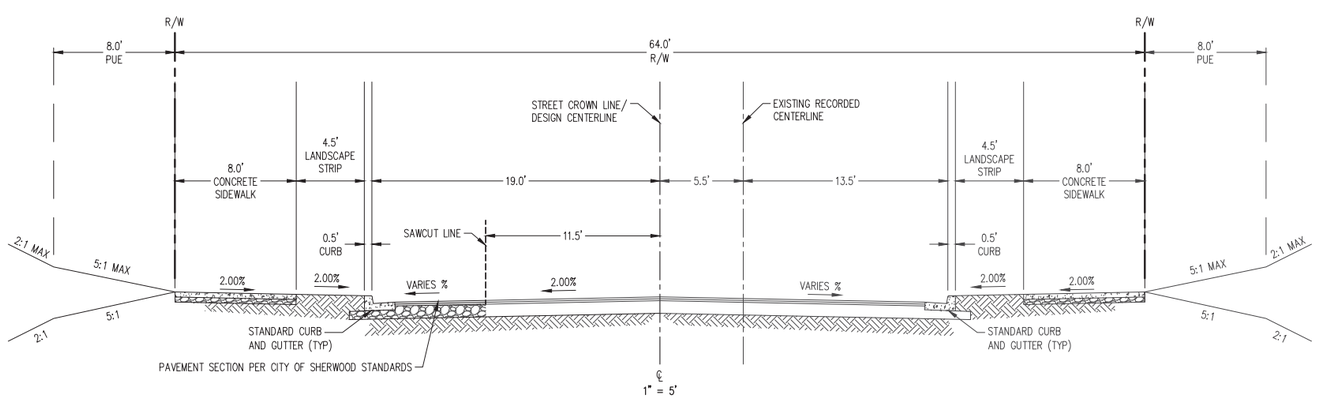
JOB NUMBER
4570

SHEET
P12

AKS DRAWING FILE: P09 STREET.DWG | LAYOUT: P10



SHOWN DESIGN PROFILE FOR SW COPPER TERRACE IS INTENDED TO MATCH EXISTING CONDITIONS IN THE FIELD. THIS PROFILE IS NOT DESIGNED PER CURRENT CITY VERTICAL CURVE STANDARDS.



SW COPPER TERRACE
TYPICAL SECTION
(STA 10+54.88 – STA 23+41.82)

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SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30DB

PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 8, 2001
PAUL A. SELLAE

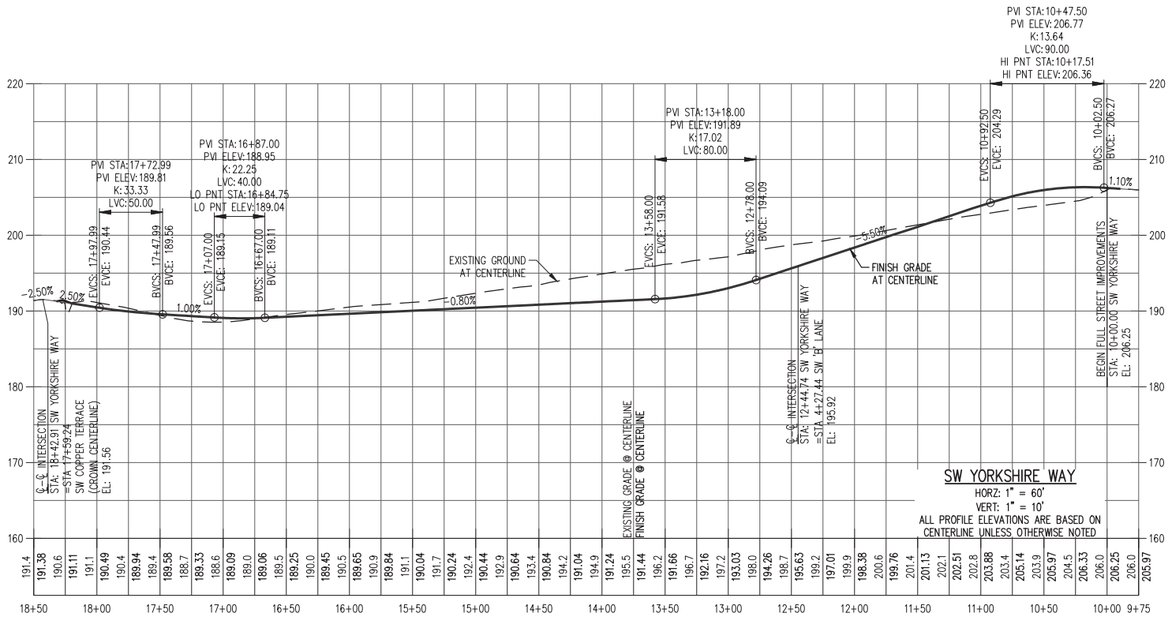
RENEWAL DATE: 6/30/16

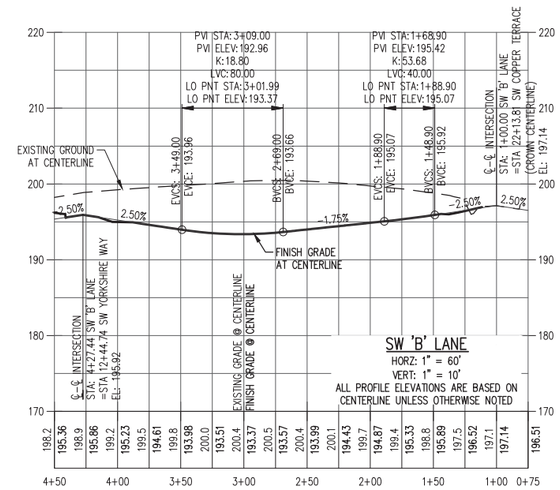
REVISIONS

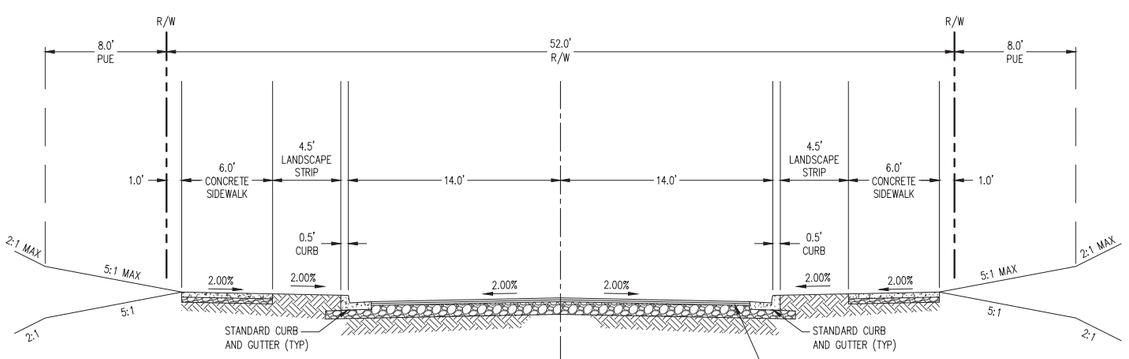
JOB NUMBER
4570

SHEET
P13

AKS DRAWING FILE: P09 STREET.DWG | LAYOUT: P11



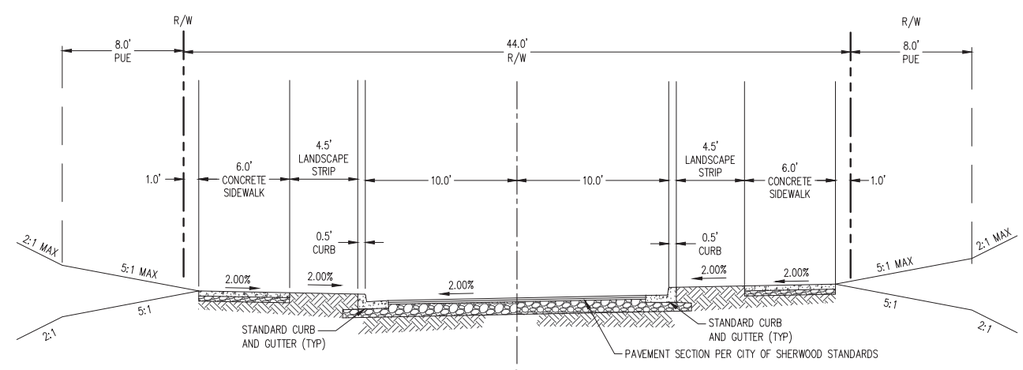




SW YORKSHIRE WAY
TYPICAL SECTION
(STA 10+00.00 – STA 17+72.62)

℄
1" = 5'

SW 'B' LANE
TYPICAL SECTION
(STA 1+38.50 – STA 3+93.67)



℄
1" = 5'

SW YORKSHIRE WAY–TURNAROUND
TYPICAL SECTION

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 8, 2001
PAUL A. SELLAK

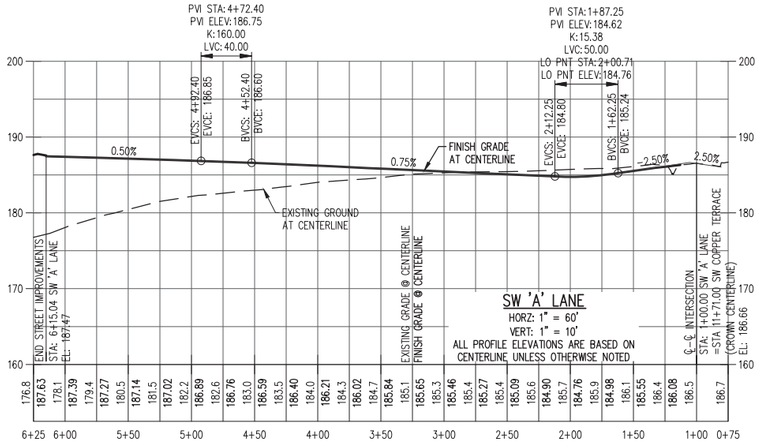
RENEWAL DATE: 6/30/16

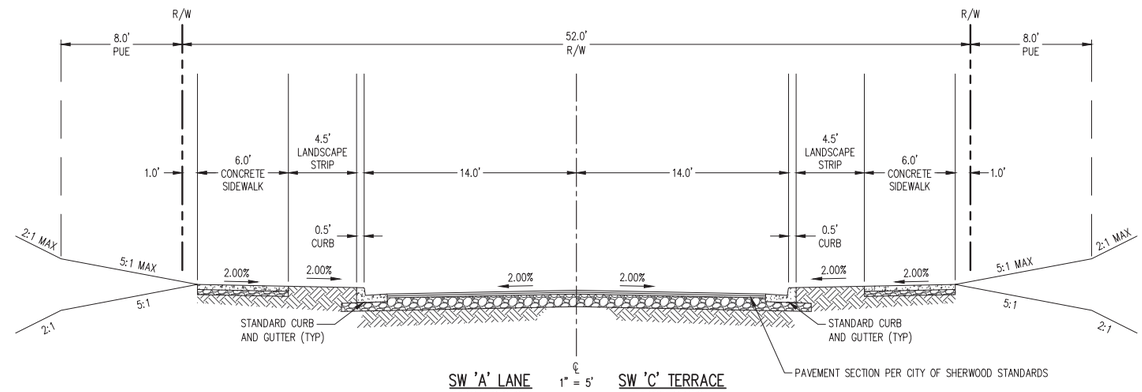
REVISIONS

JOB NUMBER
4570

SHEET
P14

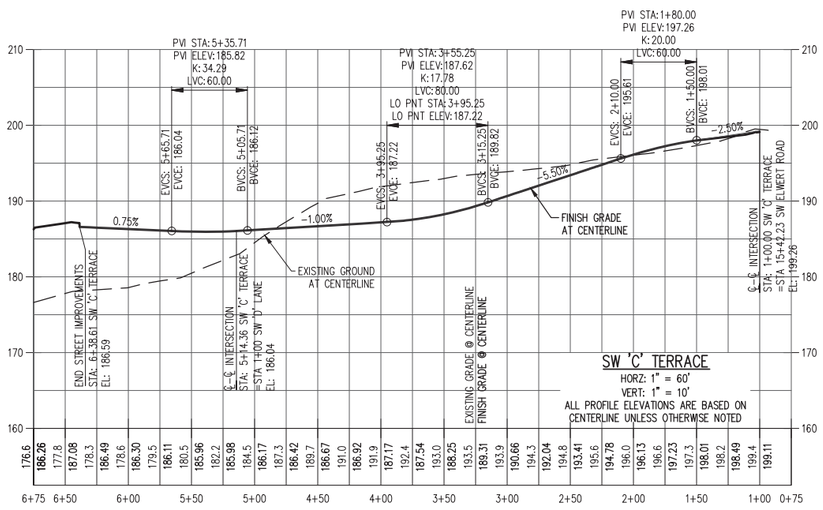
AKS DRAWING FILE: P09 STREET.DWG | LAYOUT: P12

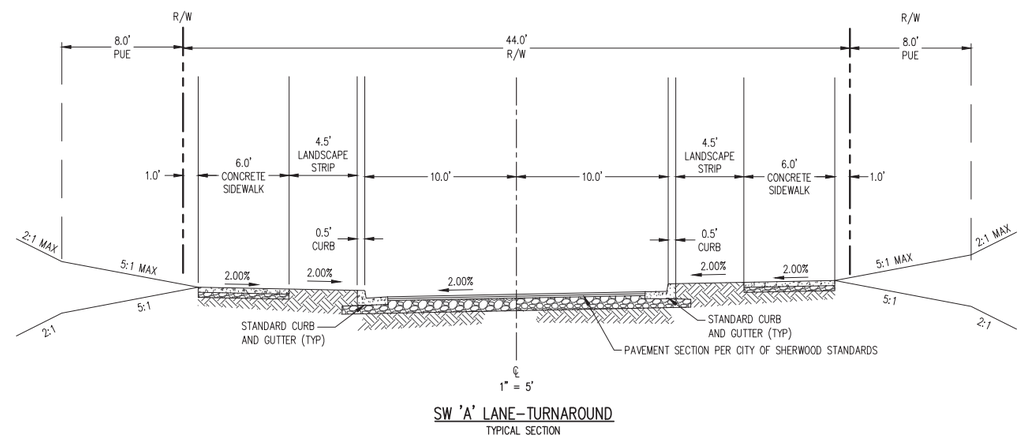




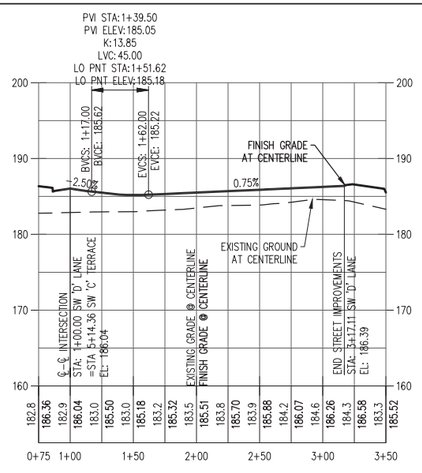
SW 'A' LANE
TYPICAL SECTION
(STA 1+49.61 – STA 6+10.40)

SW 'C' TERRACE
TYPICAL SECTION
(STA 1+50.00 – STA 6+38.61)

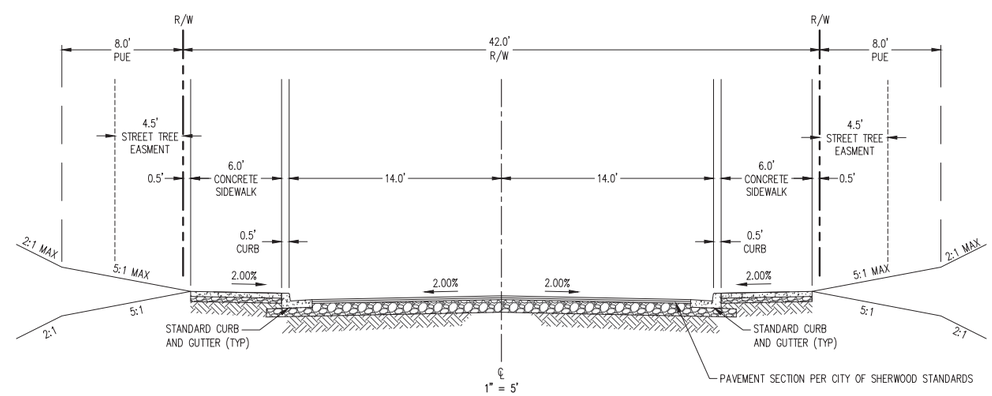




SW 'A' LANE–TURNAROUND
TYPICAL SECTION



SW 'D' LANE
HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED



SW 'D' LANE
TYPICAL SECTION
(STA 1+39.00 – STA 3+35.61)

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SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01–08–2016

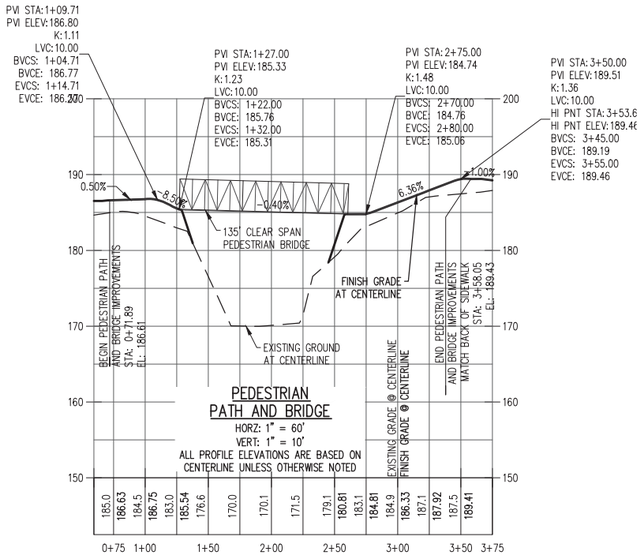
REGISTERED PROFESSIONAL ENGINEER
OREGON JANUARY 8, 2002
PAUL A. SELLKE
PRELIMINARY NOT FOR CONSTRUCTION
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

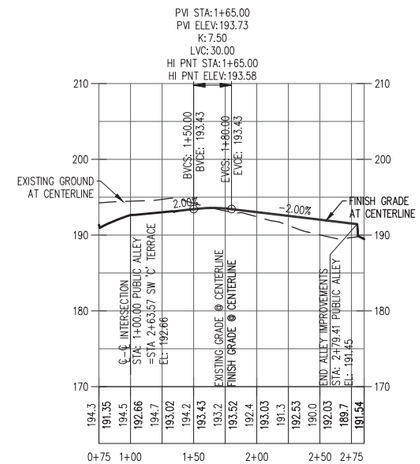
SHEET
P15

AKS DRAWING FILE: P09 STREETLOWG | LAYOUT: P13



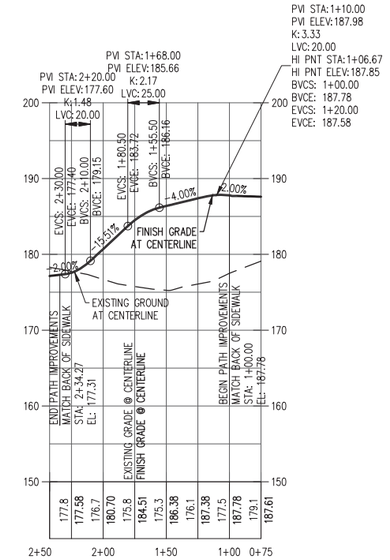
PEDESTRIAN PATH AND BRIDGE

HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED



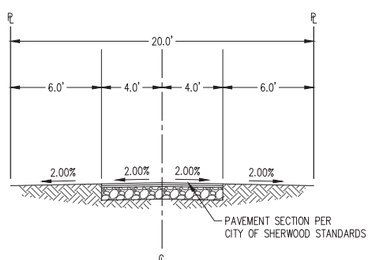
PUBLIC ALLEY

HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED



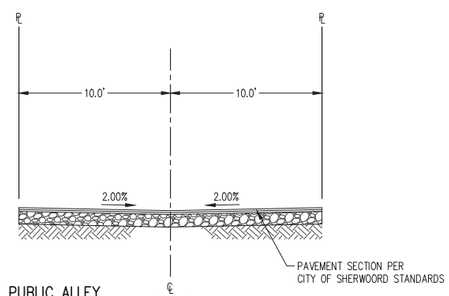
EDY ROAD PEDESTRIAN PATH

HORZ: 1" = 60'
VERT: 1" = 10'
ALL PROFILE ELEVATIONS ARE BASED ON CENTERLINE UNLESS OTHERWISE NOTED



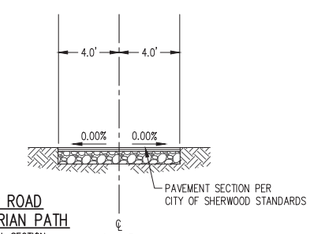
PEDESTRIAN PATH

TYPICAL SECTION
(STA 1+06.00 – STA 4+63.90)
1" = 5'



PUBLIC ALLEY

TYPICAL SECTION
(STA 1+47.00 – STA 2+72.91)
1" = 5'



EDY ROAD PEDESTRIAN PATH

TYPICAL SECTION
(STA 1+00.00 – STA 3+13.76)
1" = 5'

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY STREET PROFILES AND CROSS-SECTIONS (CONT.)

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

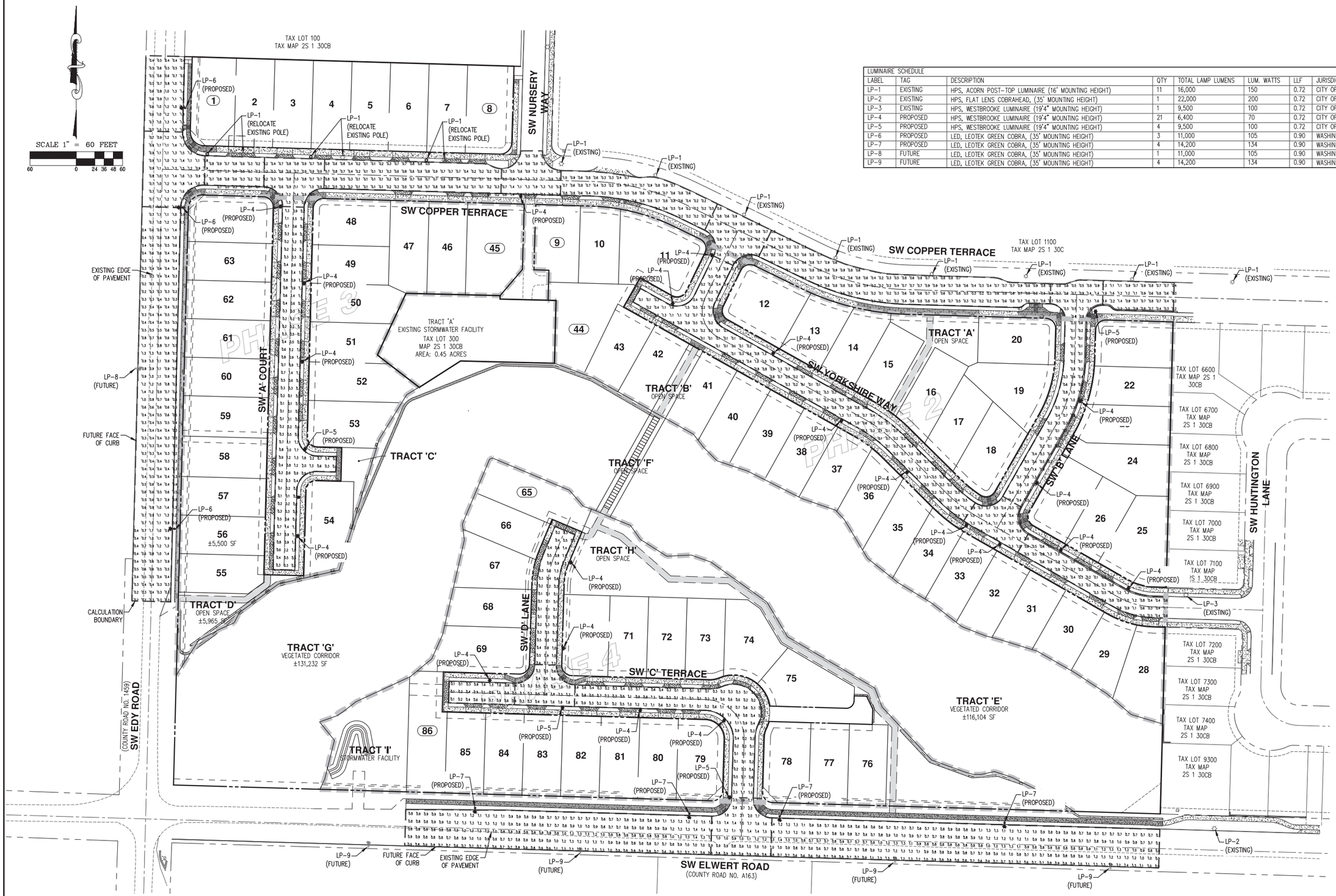
REGISTERED PROFESSIONAL ENGINEER
OREGON
JANUARY 26, 2001
PAUL A. SELLAE
PRELIMINARY NOT FOR CONSTRUCTION
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

SHEET
P16

AKS DRAWING FILE: P09 STREET.DWG | LAYOUT: P14



LUMINAIRE SCHEDULE							
LABEL	TAG	DESCRIPTION	QTY	TOTAL LAMP LUMENS	LUM. WATTS	LLF	JURISDICTION
LP-1	EXISTING	HPS, ACORN POST-TOP LUMINAIRE (16' MOUNTING HEIGHT)	11	16,000	150	0.72	CITY OF SHERWOOD
LP-2	EXISTING	HPS, FLAT LENS COBRAHEAD, (35' MOUNTING HEIGHT)	1	22,000	200	0.72	CITY OF SHERWOOD
LP-3	EXISTING	HPS, WESTBROOKE LUMINAIRE (19'4" MOUNTING HEIGHT)	1	9,500	100	0.72	CITY OF SHERWOOD
LP-4	PROPOSED	HPS, WESTBROOKE LUMINAIRE (19'4" MOUNTING HEIGHT)	21	6,400	70	0.72	CITY OF SHERWOOD
LP-5	PROPOSED	HPS, WESTBROOKE LUMINAIRE (19'4" MOUNTING HEIGHT)	4	9,500	100	0.72	CITY OF SHERWOOD
LP-6	PROPOSED	LED, LEOTEK GREEN COBRA, (35' MOUNTING HEIGHT)	3	11,000	105	0.90	WASHINGTON COUNTY
LP-7	PROPOSED	LED, LEOTEK GREEN COBRA, (35' MOUNTING HEIGHT)	4	14,200	134	0.90	WASHINGTON COUNTY
LP-8	FUTURE	LED, LEOTEK GREEN COBRA, (35' MOUNTING HEIGHT)	1	11,000	105	0.90	WASHINGTON COUNTY
LP-9	FUTURE	LED, LEOTEK GREEN COBRA, (35' MOUNTING HEIGHT)	4	14,200	134	0.90	WASHINGTON COUNTY

AKS ENGINEERING & FORESTRY, LLC
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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY PHOTOMETRIC PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JANUARY 8, 2008
JOHN CHRISTIANSEN

RENEWAL DATE: 12/31/17

REVISIONS

JOB NUMBER
4570

SHEET
P17

AKS DRAWING FILE: P20 LIGHTING.DWG | LAYOUT: P15

CALCULATION SUMMARY (CITY OF SHERWOOD)								
LABEL	CLASSIFICATION	CALCTYPE	UNITS	AVG	MAX	MIN	AVG/MIN	MAX/MIN
SW COPPER TERRACE	NEIGHBORHOOD ROUTE	Illuminance	Fc	0.6	2.2	0.1	6	22
SW YORKSHIRE WAY	LOCAL	Illuminance	Fc	0.6	1.6	0.1	6	16
SW 'A' LANE	LOCAL	Illuminance	Fc	0.6	2.2	0.1	6	22
SW 'B' LANE	LOCAL	Illuminance	Fc	0.5	1.4	0.1	5	14
SW 'C' TERRACE	LOCAL	Illuminance	Fc	0.6	2.3	0.1	6	23
SW 'D' LANE	LOCAL	Illuminance	Fc	0.5	1.4	0.1	5	14
SW COPPER TERRACE – SW 'A' COURT	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION	Illuminance	Fc	0.8	1.4	0.3	3	5
SW COPPER TERRACE – SW NURSERY WAY	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION	Illuminance	Fc	1.0	1.9	0.3	3	6
SW COPPER TERRACE – SW YORKSHIRE WAY	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION	Illuminance	Fc	0.9	1.7	0.5	2	3
SW COPPER TERRACE – SW 'B' LANE	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION	Illuminance	Fc	1.0	2.1	0.3	3	7
SW YORKSHIRE WAY – SW 'B' LANE	LOCAL/LOCAL INTERSECTION	Illuminance	Fc	0.9	1.6	0.3	3	5
SW 'C' TERRACE – SW 'D' LANE	LOCAL/LOCAL INTERSECTION	Illuminance	Fc	0.8	1.9	0.3	3	6

LIGHT LEVEL SUMMARY (CITY OF SHERWOOD)				
ROADWAY	CLASSIFICATION (PEDESTRIAN CONFLICT)		LIGHT LEVEL	UNIFORMITY
SW COPPER TERRACE	NEIGHBORHOOD ROUTE (LOW)	TARGET	≥ 0.4 FC AVE	≤ 6:1 AVE/MIN
		ACHIEVED	0.6 FC	6:1
SW YORKSHIRE WAY	LOCAL (LOW)	TARGET	≥ 0.4 FC AVE	≤ 6:1 AVE/MIN
		ACHIEVED	0.6 FC	6:1
SW 'A' COURT	LOCAL (LOW)	TARGET	≥ 0.4 FC AVE	≤ 6:1 AVE/MIN
		ACHIEVED	0.6 FC	6:1
SW 'B' LANE	LOCAL (LOW)	TARGET	≥ 0.4 FC AVE	≤ 6:1 AVE/MIN
		ACHIEVED	0.5 FC	5:1
SW 'C' TERRACE	LOCAL (LOW)	TARGET	≥ 0.4 FC AVE	≤ 6:1 AVE/MIN
		ACHIEVED	0.6 FC	6:1
SW 'D' LANE	LOCAL (LOW)	TARGET	≥ 0.4 FC AVE	≤ 6:1 AVE/MIN
		ACHIEVED	0.5 FC	5:1
SW COPPER TERRACE – SW 'A' LANE	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION (LOW)	TARGET	≥ 0.8 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	0.8 FC	3:1
SW COPPER TERRACE – SW NURSERY WAY	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION (LOW)	TARGET	≥ 0.8 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	1.0 FC	3:1
SW COPPER TERRACE – SW YORKSHIRE WAY	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION (LOW)	TARGET	≥ 0.8 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	0.9 FC	2:1
SW COPPER TERRACE – SW 'B' LANE	NEIGHBORHOOD ROUTE/LOCAL INTERSECTION (LOW)	TARGET	≥ 0.8 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	1.0 FC	3:1
SW YORKSHIRE WAY – SW 'B' LANE	LOCAL/LOCAL INTERSECTION (LOW)	TARGET	≥ 0.8 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	0.9 FC	3:1
SW 'C' TERRACE – SW 'D' LANE	LOCAL/LOCAL INTERSECTION (LOW)	TARGET	≥ 0.8 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	0.8 FC	3:1

NOTE:
TARGET = CODE REQUIRED PER WASHINGTON COUNTY STANDARDS FOR ROADWAY ILLUMINATION
ACHIEVED = DESIGN VALUE

CALCULATION SUMMARY (WASHINGTON COUNTY)								
LABEL	CLASSIFICATION	CALCTYPE	UNITS	AVG	MAX	MIN	AVG/MIN	MAX/MIN
SW EDY ROAD	COLLECTOR	Illuminance	Fc	0.6	1.9	0.2	3	10
SW ELWERT ROAD	ARTERIAL	Illuminance	Fc	0.9	1.5	0.6	2	3
SW EDY ROAD – SW COPPER TERRACE	COLLECTOR/NEIGHBORHOOD ROUTE INTERSECTION	Illuminance	Fc	1.1	1.9	0.7	2	3
SW ELWERT ROAD – SW 'C' TERRACE	ARTERIAL/LOCAL INTERSECTION	Illuminance	Fc	1.4	2.9	0.8	2	4

LIGHT LEVEL SUMMARY (WASHINGTON COUNTY)				
ROADWAY	CLASSIFICATION (PEDESTRIAN CONFLICT)		LIGHT LEVEL	UNIFORMITY
SW EDY ROAD	COLLECTOR (LOW)	TARGET	≥ 0.6 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	0.6 FC	3:1
SW ELWERT ROAD	ARTERIAL (LOW)	TARGET	≥ 0.9 FC AVE	≤ 3:1 AVE/MIN
		ACHIEVED	0.9 FC	2:1
SW COPPER TERRACE – SW EDY ROAD	COLLECTOR/NEIGHBORHOOD ROUTE INTERSECTION (LOW)	TARGET	≥ 1.0 FC AVE	≤ 4:1 AVE/MIN
		ACHIEVED	1.1 FC	2:1
SW ELWERT ROAD – SW 'C' TERRACE	ARTERIAL/LOCAL INTERSECTION (LOW)	TARGET	≥ 1.3 FC AVE	≤ 3:1 AVE/MIN
		ACHIEVED	1.4 FC	2:1

NOTE:
TARGET = CODE REQUIRED PER WASHINGTON COUNTY STANDARDS FOR ROADWAY ILLUMINATION
ACHIEVED = DESIGN VALUE

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY PHOTOMETRIC CALCULATION SUMMARY

DESIGNED BY: PAS/DS
DRAWN BY: DS
CHECKED BY: PAS
SCALE: AS NOTED
DATE: 01-08-2016

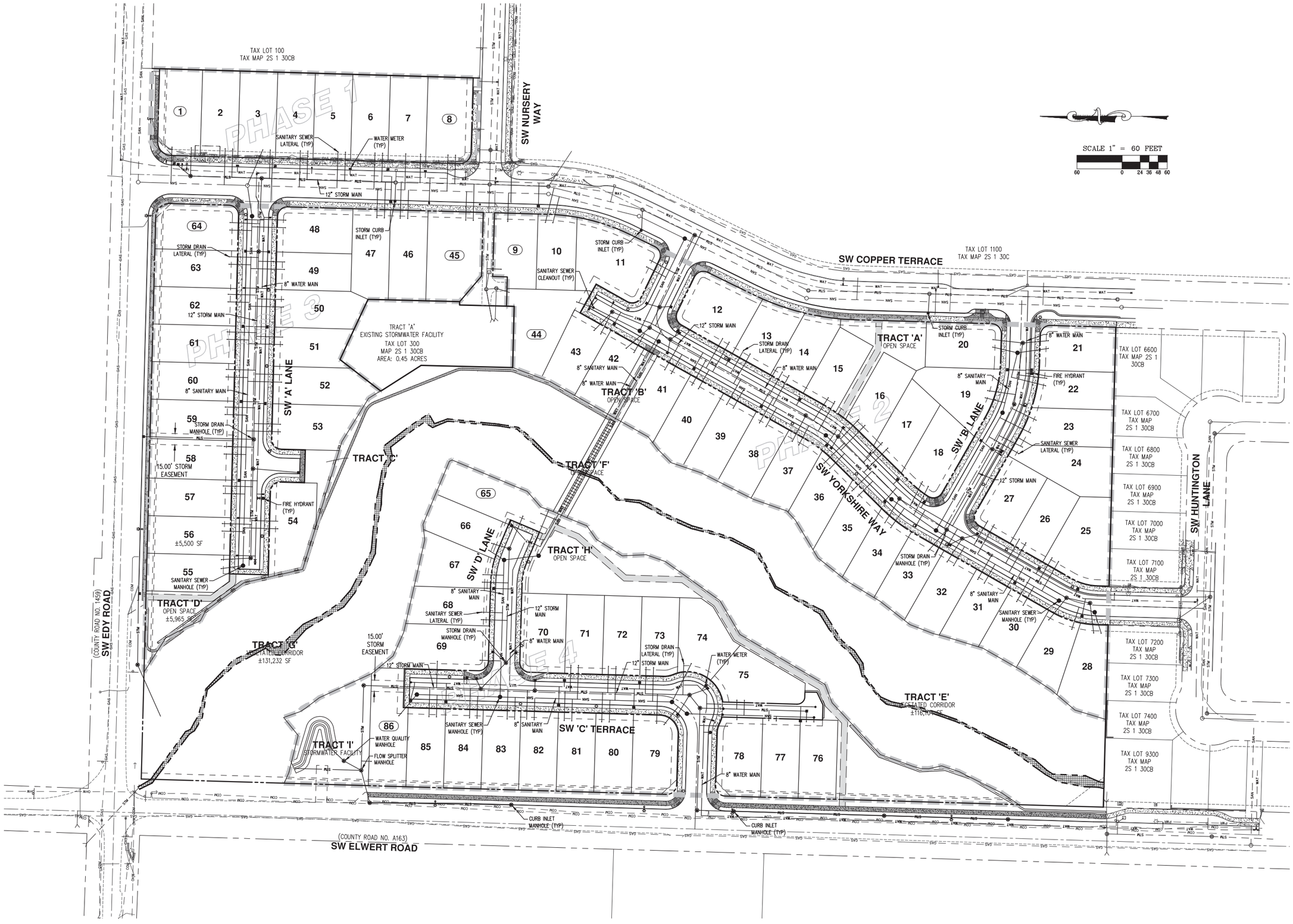
REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
JANUARY 8, 2002
JOHN P. CHRISTIANSEN
RENEWAL DATE: 12/31/17

REVISIONS

JOB NUMBER
4570

SHEET
P18

AKS DRAWING FILE: P20 LIGHTING.DWG | LAYOUT: P16



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY COMPOSITE UTILITY PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED
DATE: 01-08-2016	

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

SHEET
P19

AKS DRAWING FILE: P13 COMP UTLDWG | LAYOUT: 18

AERIAL PHOTOGRAPH DATED JULY 7, 2012 AND OBTAINED FROM METRO.

SCALE 1" = 100 FEET

100 0 40 60 80 100

LEGEND

- 530 FOOT BOUNDARY FROM SUBJECT PROPERTY
- EXISTING STREETS
- STREET IMPROVEMENTS INCLUDED IN PROJECT
- EXISTING PEDESTRIAN CONNECTIONS
- PROPOSED PEDESTRIAN IMPROVEMENTS INCLUDED IN PROJECT
- FUTURE STREET IMPROVEMENTS

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON

TAX LOTS 250 AND 251

WASHINGTON COUNTY TAX MAP 2S 1 30CB

CONCEPTUAL FUTURE CONNECTIVITY PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-08-2016

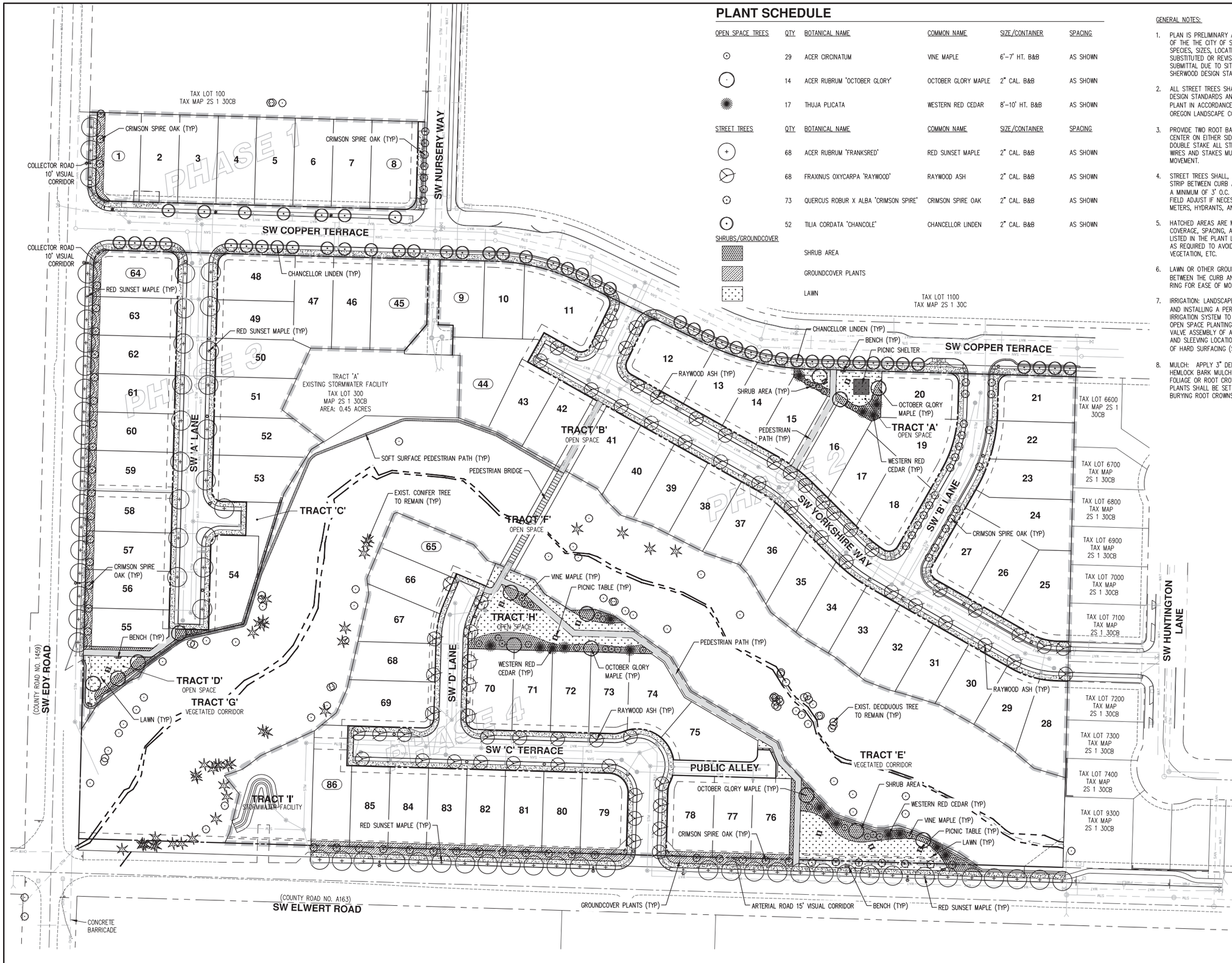
REGISTERED PROFESSIONAL ENGINEER
OREGON
JANUARY 19, 2011
PAUL A. SELLNE
PRELIMINARY NOT FOR CONSTRUCTION
RENEWAL DATE: 6/30/16

REVISIONS

JOB NUMBER
4570

SHEET
P20

AKS DRAWING FILE: P19 CIRC.DWG | LAYOUT: P19



PLANT SCHEDULE

OPEN SPACE TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	29	ACER CIRCINATUM	VINE MAPLE	6'-7' HT. B&B	AS SHOWN
	14	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY MAPLE	2" CAL. B&B	AS SHOWN
	17	THUJA PLICATA	WESTERN RED CEDAR	8'-10' HT. B&B	AS SHOWN
STREET TREES	**QTY**	**BOTANICAL NAME**	**COMMON NAME**	**SIZE/CONTAINER**	**SPACING**
	68	ACER RUBRUM 'FRANKSRED'	RED SUNSET MAPLE	2" CAL. B&B	AS SHOWN
	68	FRAXINUS OXYCARPA 'RAYWOOD'	RAYWOOD ASH	2" CAL. B&B	AS SHOWN
	73	QUERCUS ROBUR X ALBA 'CRIMSON SPIRE'	CRIMSON SPIRE OAK	2" CAL. B&B	AS SHOWN
	52	TILIA CORDATA 'CHANCOLE'	CHANCELLOR LINDEN	2" CAL. B&B	AS SHOWN
SHRUBS/GROUNDCOVER					
		SHRUB AREA			
		GROUNDCOVER PLANTS			
		LAWN			

GENERAL NOTES:

1. PLAN IS PRELIMINARY AND INTENDED TO SHOW THAT APPLICABLE STANDARDS OF THE THE CITY OF SHERWOOD DEVELOPMENT CODE CAN BE MET. PLANT SPECIES, SIZES, LOCATIONS, QUANTITIES, AND OTHER PLAN CHANGES MAY BE SUBSTITUTED OR REVISED BY THE LANDSCAPE ARCHITECT PRIOR TO FINAL SUBMITTAL DUE TO SITE CONDITIONS AND AVAILABILITY WHERE ALLOWED BY SHERWOOD DESIGN STANDARDS.
2. ALL STREET TREES SHALL CONFORM TO APPLICABLE CITY OF SHERWOOD DESIGN STANDARDS AND TO THE AMERICAN NURSERY STANDARDS ANSI Z60.1. PLANT IN ACCORDANCE WITH 'BEST-PRACTICE' STANDARDS ADOPTED BY THE OREGON LANDSCAPE CONTRACTORS BOARD (OLCB).
3. PROVIDE TWO ROOT BARRIERS 18" DEEP X 10' LONG FOR ALL STREET TREES. CENTER ON EITHER SIDE OF TREE TRUNK ALONG SIDEWALK AND CURB. DOUBLE STAKE ALL STREET TREES PARALLEL TO STREET AND SIDEWALK. GUY WIRES AND STAKES MUST NOT INTERFERE WITH VEHICULAR OR PEDESTRIAN MOVEMENT.
4. STREET TREES SHALL, WHERE APPLICABLE, BE CENTERED IN THE PLANTING STRIP BETWEEN CURB AND SIDEWALK. ALL OTHER TREES SHALL BE PLANTED A MINIMUM OF 3' O.C. FROM BACK OF SIDEWALK OR OTHER HARDSCAPING. FIELD ADJUST IF NECESSARY TO AVOID CONFLICTS WITH STREET LIGHTS, WATER METERS, HYDRANTS, AND OTHER UTILITIES.
5. HATCHED AREAS ARE MEANT TO CONVEY GENERAL PLANT LOCATION. PLANT COVERAGE, SPACING, AND LAYOUT SHALL BE CONSISTENT WITH THE SPACING LISTED IN THE PLANT LEGEND FOR FULL COVERAGE. FIELD ADJUST PLANTING AS REQUIRED TO AVOID CONFLICTS WITH UTILITIES, LIGHTS, VAULTS, EXISTING VEGETATION, ETC.
6. LAWN OR OTHER GROUNDCOVER PLANTS SHALL BE PLANTED IN ALL AREAS BETWEEN THE CURB AND SIDEWALK. MAINTAIN A MINIMUM 3' DIAMETER MULCH RING FOR EASE OF MOWING AROUND EACH STREET TREE.
7. IRRIGATION: LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING AND INSTALLING A PERMANENT, UNDERGROUND 'DESIGN-BUILD' AUTOMATIC IRRIGATION SYSTEM TO WATER ALL STREET TREES AND PLANTING BEDS AND OPEN SPACE PLANTINGS. COORDINATE POINT OF CONNECTION, DOUBLE CHECK VALVE ASSEMBLY OF A TYPE APPROVED BY LOCAL AND STATE JURISDICTIONS, AND SLEEVING LOCATIONS WITH GENERAL CONTRACTOR PRIOR TO INSTALLATION OF HARD SURFACING (SIDEWALKS, DRIVEWAYS, ETC.).
8. MULCH: APPLY 3" DEEP WELL-AGED MEDIUM GRIND OR SHREDDED DARK HEMLOCK BARK MULCH UNDER AND AROUND ALL PLANTINGS. DO NOT COVER FOLIAGE OR ROOT CROWNS OF PLANTS WITH BARK MULCH. TREES AND OTHER PLANTS SHALL BE SET TO ACCOMMODATE MULCH APPLICATION WITHOUT BURYING ROOT CROWNS.

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY STREET TREE & OPEN SPACE PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED
DATE: 01-08-2016	

REGISTERED LANDSCAPE ARCHITECT
PRELIMINARY NOT FOR CONSTRUCTION
KIRK S. MAUSBALD
OREGON
06-05-13

REVISIONS

JOB NUMBER
4570

SHEET
P21

AKS DRAWING FILE: P16 STREET TREE.DWG | LAYOUT: P21

PLANT SCHEDULE

OPEN SPACE TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	29	ACER CIRCINATUM	VINE MAPLE	6'-7' HT. B&B	AS SHOWN
	14	ACER RUBRUM 'OCTOBER GLORY'	OCTOBER GLORY MAPLE	2" CAL. B&B	AS SHOWN
	17	THUJA PLICATA	WESTERN RED CEDAR	8'-10' HT. B&B	AS SHOWN

STREET TREES	QTY	BOTANICAL NAME	COMMON NAME	SIZE/CONTAINER	SPACING
	68	ACER RUBRUM 'FRANKSRED'	RED SUNSET MAPLE	2" CAL. B&B	AS SHOWN
	68	FRAXINUS OXYCARPA 'RAYWOOD'	RAYWOOD ASH	2" CAL. B&B	AS SHOWN
	73	QUERCUS ROBUR X ALBA 'CRIMSON SPIRE'	CRIMSON SPIRE OAK	2" CAL. B&B	AS SHOWN
	52	TILIA CORDATA 'CHANCOLE'	CHANCELLOR LINDEN	2" CAL. B&B	AS SHOWN

NET SITE DEVELOPMENT AREA: 557,943 SF ±
REQUIRED CANOPY COVERAGE MINIMUM: 40% (223,178 SF)
PROPOSED TOTAL CANOPY COVERAGE (PLANTED AND EXISTING): 327,734 SF (59%)

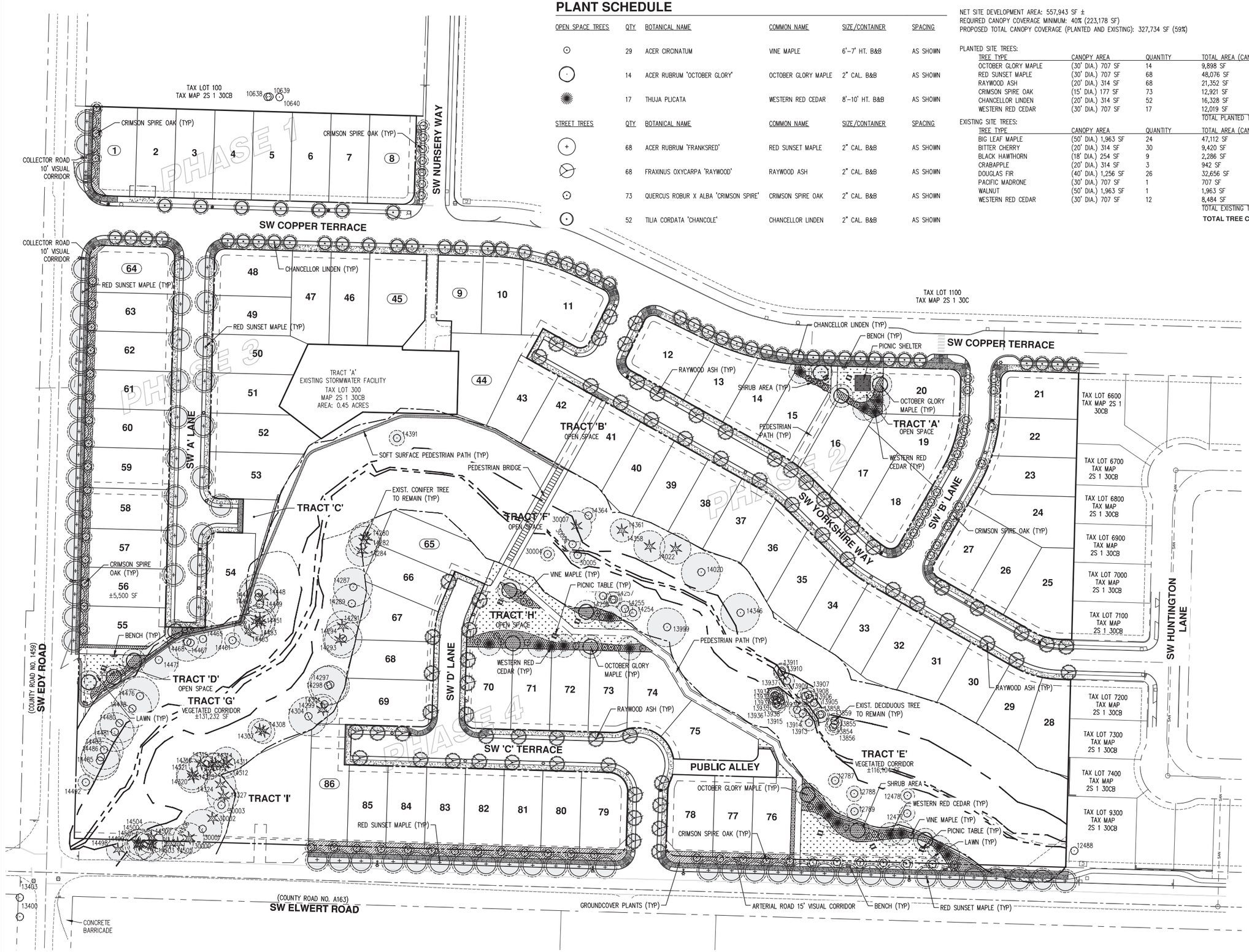
PLANTED SITE TREES:

TREE TYPE	CANOPY AREA	QUANTITY	TOTAL AREA (CANOPY AREA X QUANTITY)
OCTOBER GLORY MAPLE	(30' DIA.) 707 SF	14	9,898 SF
RED SUNSET MAPLE	(30' DIA.) 707 SF	68	48,076 SF
RAYWOOD ASH	(20' DIA.) 314 SF	68	21,352 SF
CRIMSON SPIRE OAK	(15' DIA.) 177 SF	73	12,921 SF
CHANCELLOR LINDEN	(20' DIA.) 314 SF	52	16,328 SF
WESTERN RED CEDAR	(30' DIA.) 707 SF	17	12,019 SF
			TOTAL PLANTED TREE CANOPY AREA: 120,594 SF

EXISTING SITE TREES:

TREE TYPE	CANOPY AREA	QUANTITY	TOTAL AREA (CANOPY AREA X QUANTITY X 2 EXISTING TREE CREDIT)
BIG LEAF MAPLE	(50' DIA.) 1,963 SF	24	47,112 SF
BITTER CHERRY	(20' DIA.) 314 SF	30	9,420 SF
BLACK HAWTHORN	(18' DIA.) 254 SF	9	2,286 SF
CRABAPPLE	(20' DIA.) 314 SF	3	942 SF
DOUGLAS FIR	(40' DIA.) 1,256 SF	26	32,656 SF
PACIFIC MADRONE	(30' DIA.) 707 SF	1	707 SF
WALNUT	(50' DIA.) 1,963 SF	1	1,963 SF
WESTERN RED CEDAR	(30' DIA.) 707 SF	12	8,484 SF
			TOTAL EXISTING TREE CANOPY AREA: 207,140 SF

TOTAL TREE CANOPY AREA: 327,734 SF (59%)



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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY TREE CANOPY PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED
DATE: 01-08-2016	

REGISTERED PROFESSIONAL LANDSCAPE ARCHITECT
KIRK W. MUSSELMAN
OREGON
05/07/13

REVISIONS

JOB NUMBER
4570

SHEET
P22

AKS DRAWING FILE: P21 TREE CANOPY.DWG | LAYOUT: P22

SCALE 1" = 60 FEET

60 0 24 36 48 60

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON

TAX LOTS 250 AND 251 WASHINGTON COUNTY TAX MAP 2S 1 30CB

CONCEPTUAL OPEN SPACE PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 01-06-2016

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P23

Exhibit B: Open Space Plan

SCALE 1" = 60 FEET

60 0 24 36 48 60

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON

TAX LOTS 250 AND 251 WASHINGTON COUNTY TAX MAP 2S 1 30CB

CONCEPTUAL OPEN SPACE PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

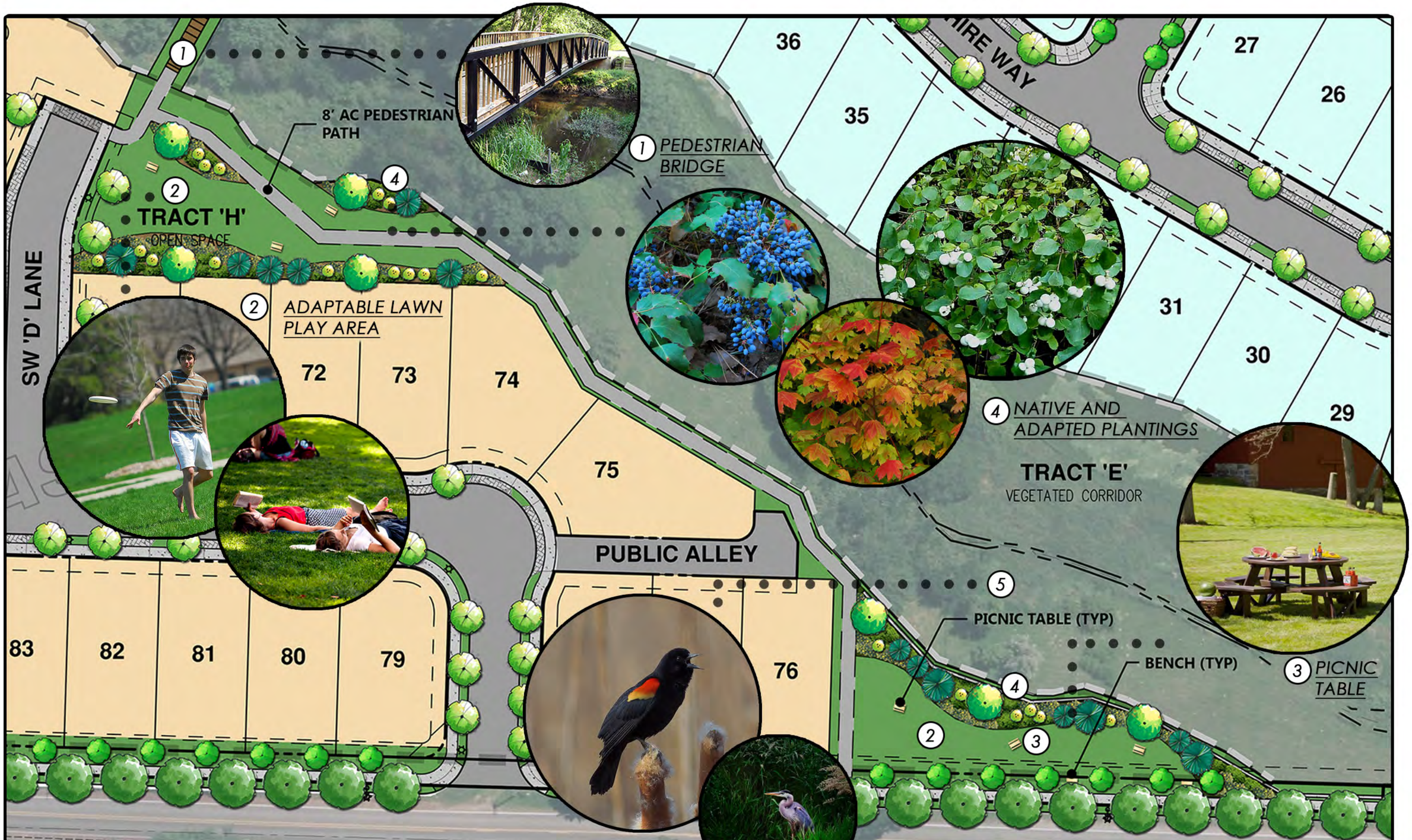
DATE: 01-06-2016

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

SHEET
P23



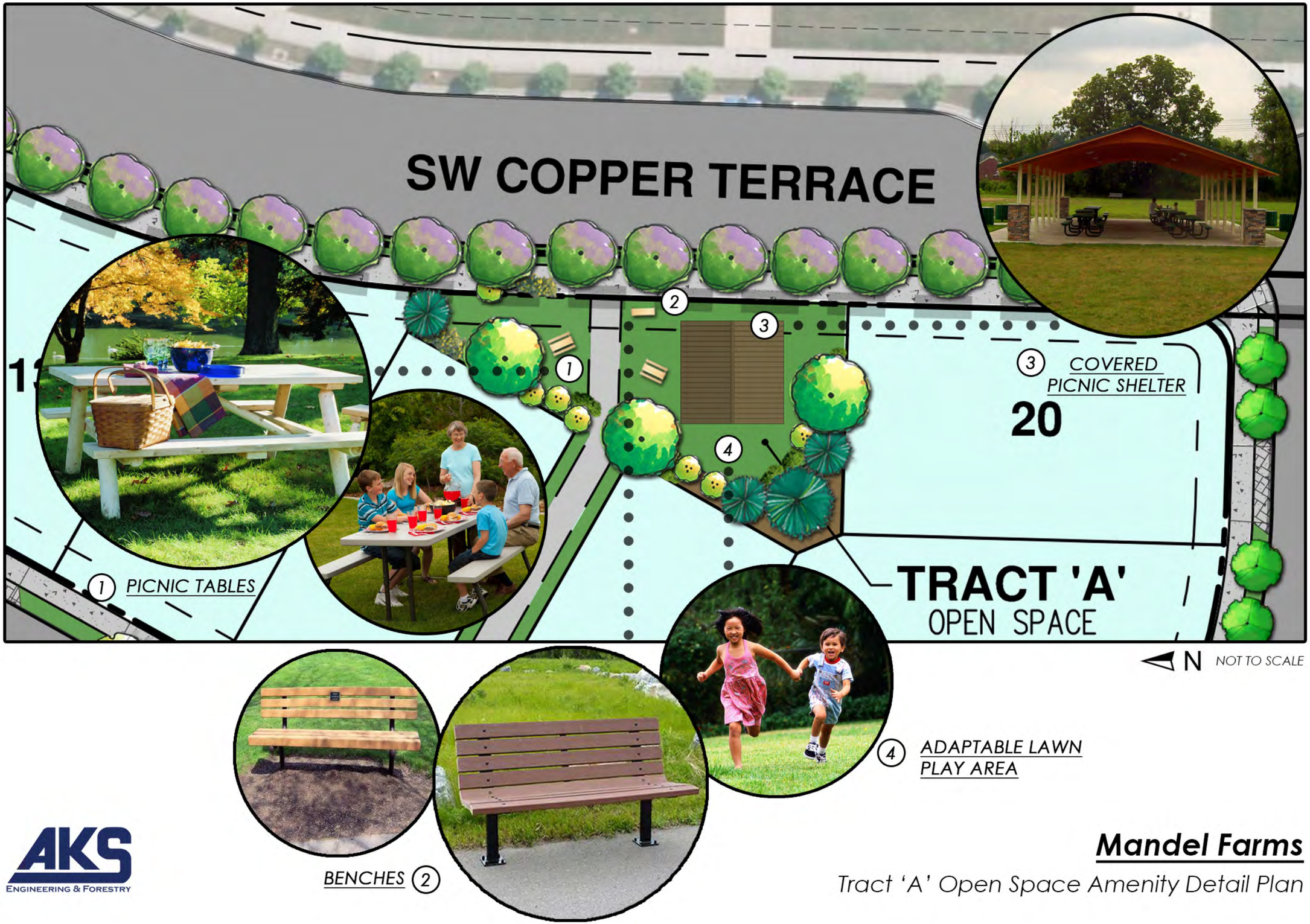
AKS ENGINEERING & FORESTRY

N NOT TO SCALE

5 VEGETATION AND WILDLIFE HABITAT ENHANCEMENT

Mandel Farms

Tract 'H' Open Space Amenity Detail Plan



AKS ENGINEERING & FORESTRY

Mandel Farms

Tract 'A' Open Space Amenity Detail Plan

1 PICNIC TABLE

AKS ENGINEERING & FORESTRY

N NOT TO SCALE

Mandel Farms

Tract 'D' Open Space Amenity Detail Plan

Exhibit C: Application Form

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 _____)
- ☐ Variance(list standard(s) to be varied in description
- ☐ Site Plan (Sq. footage of building and parking area)
- ☐ Planned Unit Development
- ☐ Conditional Use
- ☐ Partition (# of lots _____)
- ☑ Subdivision (# of lots 76)
- ☐ 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 Departments/Planning/Fee Schedule.

Owner/Applicant Information:

Applicant: Kelly Ritz
Phone: 503-387-7602
Applicant Address: 4230 SW Galewood St., Suite 100, Lake Oswego, OR 97035
Email: kelly@ventureprop.com
Owner: 2007 Mandel Family Trust/David Mandel/Randy Kieling
Phone: _____
Owner Address: 16990 SW Richen Park Circle, Sherwood, OR 97140
Email: _____
Contact for Additional Information: _____

Property Information:

Street Location: 21340 SW Elwert Road, Sherwood, OR 97140; no site address for lot 251
Tax Lot and Map No: 2S130CB lots 00250 and 00251
Existing Structures/Use: Single-family dwelling and outbuilding/agricultural; vacant/agricultural
Existing Plan/Zone Designation: MDRH, NC, Open Space; MDRL
Size of Property(ies) 21.28 acres and 1.19 acres

Proposed Action:

Purpose and Description of Proposed Action: Subdivide parcels into 76 single-family residential lots and one commercial tract. Construct internal streets and related public improvements, including pedestrian connections to and through new public open space and pedestrian bridge spanning the natural resource area.

Proposed Use: Single-family residential

Proposed No. of Phases (one year each): Four

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	Date
David Mandel	Oct 19, 2015
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.

☑ **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 * sets** 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)

☑ **Signed checklist** verifying submittal includes specific materials necessary for the application process

* **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.

LAND USE APPLICATION FORM

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	Date
Randy L. Kieling	10/15/15
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.

☐ **3 * copies of Application Form** completely filled out and signed by the property owner (or person with authority to make decisions on the property.

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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 _____ Date 10-19-15

Owner's Signature _____ Date _____

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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 _____)
- ☐ Variance(list standard(s) to be varied in description
- ☐ Site Plan (Sq. footage of building and parking area)
- ☐ Planned Unit Development
- ☐ Conditional Use
- ☐ Partition (# of lots _____)
- ☑ Subdivision (# of lots 76)
- ☐ 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 Departments/Planning/Fee Schedule.

Owner/Applicant Information:

Applicant: Kelly Ritz — Phone: 503-387-7602
Applicant Address: 4230 SW Galewood St., Suite 100, Lake Oswego, OR 97035 — Email: kelly@ventureprop.com
Owner: 2007 Mandel Family Trust/David Mandel/Randy Kieling — Phone: _____
Owner Address: ~~16990 SW Richen Park Circle, Sherwood, OR 97140~~ — Email: _____
Contact for Additional Information: 13990 SW Hall Blvd., Tigard 97223

Property Information:

Street Location: 21340 SW Elwert Road, Sherwood, OR 97140; no site address for lot 251
Tax Lot and Map No: 2S130CB lots 00250 and 00251
Existing Structures/Use: Single-family dwelling and outbuilding/agricultural; vacant/agricultural
Existing Plan/Zone Designation: MDRH, NC, Open Space; MDRL
Size of Property(ies) 21.28 acres and 1.19 acres

Proposed Action:

Purpose and Description of Proposed Action: Subdivide parcels into 76 single-family residential lots and one commercial tract. Construct internal streets and related public improvements, including pedestrian connections to and through new public open space and pedestrian bridge spanning the natural resource area.

Proposed Use: Single-family residential

Proposed No. of Phases (one year each): Four

Continued on Reverse

LAND USE APPLICATION FORM

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	Date
Jane Q. Mandel	10/19/15
Owner's Signature	Date
Marc P Mandel	10/19/15

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☐ **At least 3 * folded** sets of plans

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TUALATIN · VANCOUVER · SALEM-KEIZER
AKS ENGINEERING & FORESTRY
WWW.AKS-ENG.COM
12965 SW HERMAN RD., SUITE 100 · TUALATIN, OR 97062
P: (503) 563-6151 F: (503) 563-6152

October 14, 2015

Brad Kilby
Planning Manager
City of Sherwood
22560 SW Pine St.
Sherwood, OR 97140

RE: Fee Calculations for Mandel Farms Subdivision Application

Dear Mr. Kilby,

Please find below, our calculations for determining the appropriate planning-related fees for the Mandel Farms Subdivision.

City of Sherwood Master Fees and Charges: Section 9 – Planning Charges for Service

	Item	Fee	Calculation	Total
D.	Subdivision	$6,220 plus $20/lot	$6,220 + ($20 x 76 lots)	$7,742
E.	Publication/distribution Type III/IV notice	$466		$466
Total				**$8,208**

City of Sherwood Resolution 2015-055, June 2015

Based on these calculations, a check in the amount of $8,208 is enclosed with our subdivision application. Please do not hesitate to call or email with questions regarding these, or other items related to our submittal.

Sincerely,
AKS ENGINEERING & FORESTRY, LLC

Mimi Doukas, AICP, RLA

SECTION 9: PLANNING CHARGES FOR SERVICE

A) Annexations:

- Deposit (Applicant pays 100% of actual expenses including staff time) $7,500

Any balance owing is due within 30 days from the final annexation invoice date.

B) Appeals:

- Type I or II actions (ORS 227.175) 10 (b) $250
- Type III or IV actions 50% of original fee(s)

C) Conditional Use Permit:

- Conditional use permit without concurrent type III or IV application $4,145
- Conditional use permit with concurrent type III or IV application $2,072

D) Land Divisions/Adjustments:

- Lot line adjustment $743
- Minor land partition $2,488
- Expedited minor partition $550
- Final plat processing (minor land partition) $550
- Subdivision $6,222 plus$20 per lot
- Expedited subdivision *(Added to the cost of the subdivision application)* $2,205
- Final plat processing (Subdivision) $1,102

E) Other Fees:

- Consultant as needed actual costs
- Community Development Code Plan Check *(payable at time of building permit submittal*
  1) Residential permits $105
  2) ADUs Accessory Dwelling Units $105
  3) Commercial, Industrial, Multi-Family Permits $661
  (Final Site Plan Review fee, if a final site plan review is not required this fee is not charged)
- Design review team consultations/recommendations staff time (see section 1)
- Detailed site analysis letter $150
- Interpretive decisions by the Director $330
- Medical Marijuana Facility $276, plus notification fee
- Non-conforming use modification $1,000
- Modification to application in review $500

(If modified after the application is deemed complete and the modification is needed to adequately review the app.)

- Other land use action
  1) Administrative $276
  2) Hearing required and/or use of Hearings Officer $2,425
- Planning Re-inspection fee $60 each after 1st
- Postponement/continuance hearings $300

(If applicant request is after notice has been published and/or staff report prepared)

- Pre-application conference $400
- Publication/distribution of Notice Type 2 $284
- Publication/distribution of Notice Type 3 & 4 $466
- Home Occupation Review of initial application (Class A) $50
- Home Occupation Review of renewal application (Class A) $25
- Zone verification letter $50

F) Trees:

- Tree mitigation inspection — $60 each after 1st
- Street Tree Removal Permit — $25 - 1st tree, $10 each additional tree
- Removal of more than 6 trees or 10% on private property — $107

G) Planned Unit Development (PUD):

- Planned Unit Development (PUD) Preliminary — $2,205
- Planned Unit Development (PUD) - Final — See Site Plan Review Fee

(Plus appropriate application fees (i.e. subdivisions, site plan, town-homes, etc.)

H) Refunds:

- 75% refund if application is withdrawn prior to 30 day completeness
- 50% refund if withdrawn prior to public notice
- 25% refund if withdrawn prior to staff report

I) Signage:

- Permanent signs on private property - *(First 32 sq. ft. plus $1 each additional sq. ft, of sign face) (Excludes Home Occupation Signage)* — $150
- Banner signs – Consecutive one month period — $150
- Temporary portable sign violation
  1) First offense — No fine; collected and marked
  2) Second offense — $50 per sign
  3) Third offense — $100 per sign

J) Site Plan Review:

- Type III and IV - *(Additional $100 for every 10,000 sq. ft. or portion thereof over the first 15,000 sq. ft.)(Including Town-Homes, excluding projects in Old Town)* — $6,222
- Final site plan review (Type III and IV) (Due at the time of Building Permit Submittal) — $661
- Fast track site plan review (Type II) — $2,025
- Minor modification to approved Site Plan — $276
- Major modification to approved Site Plan, Type II — $1,010
- Major modification to approved Site Plan, Type III or IV — $2,425
- Old Town overlay review — $250 added to application

(All uses excluding Single-Family detached dwellings) (Application fee for Old Town projects is the application fee based on size of the project plus the Old Town Overlay review fee.)

K) Temporary Uses:

- Administrative — $335

L) Time Extension to Approval:

- No hearing required — $150

M) Variance:

- Adjustment - *(Per lot and per standard to be varied)* — $50
- Class A Variance - *(Per lot and per standard to be varied)* — $4,145
- Class B Variance - *(Per lot and per standard to be varied)* — $1,102

N) Zone Amendments:

- Text amendment — $5,330
- Map amendment — $5,330

APPLICATION MATERIALS REQUIRED FOR

SUBDIVISION PLAT

Submit the following to the City of Sherwood Planning Department, 22560 SW Pine St., Sherwood, OR 97140: (503) 925-2308.

It is strongly suggested that you have a pre-application meeting with the City prior to submitting for a Subdivision. (See *Pre-application Process* form for information.)

Note: The Clean Water Services (CWS) requires a pre-screening to determine if water quality sensitive areas exist on the property. If these sensitive areas exist, a Site Assessment and Service Provider Letter is required prior to submitting for a subdivision or minor land partition or undertaking any development. **This application will not be accepted without a completed Pre-Screening Form and if required a Service Provider Letter.** Please contact CWS at (503) 681-3600.

If the proposal is next to a Washington County roadway, the applicant must submit an Access Report (Traffic Study) to Washington County Department of Land Use and Transportation (503) 846-8761. **This application will not be accepted until an Access Report (Traffic Study) is submitted to Washington County and the Access Report is deemed complete by the County; or written verification from Washington County that an Access Report is not required is provided.**

I. **Fee -** See City of Sherwood current Fee Schedule, which includes the "Publication/Distribution of Notice" fee, at **www.sherwoodoregon.gov.** Click on Departments/Planning/ Fee Schedule.

Note: The above fee is required at the time you submit for a subdivision. Additional fees will be charged for building permit, system development charges, impact fees and other fees applicable to the development. These fees will be charged when you make application for building permit. Building permit application will not be accepted until the final plat is recorded.

II. **BACKGROUND INFORMATION** (all materials collated and folded (not rolled) to create fifteen (15) sets)

*****Note that the *final* application must contain fifteen (15) folded sets of the above, however, upon initial submittal of the application and prior to completeness review, the applicant may submit three (3) complete folded sets with the application in lieu of fifteen (15), with the understanding that fifteen (15) complete sets of the application materials will be required before the application is deemed complete and scheduled for review.

☑ **Application Form –** One original and fourteen (14) copies of a completed **City of Sherwood Application for Land Use Action** form. Original signatures from all owners must be on the application form.

☑ **Documentation of Neighborhood Meeting** - Affidavits of mailing, sign-in sheets and a summary of the meeting notes shall be included with the application.

☑ **Tax Map** - Fifteen (15) copies of the latest Tax Map available from the Washington County Assessor's Office showing property within at least 300 feet with scale (1"=100' or 1"= 200') north point, date and legend.

☑ **Mailing Labels –** Two (2) sets of mailing labels for property owners within 1,000 feet of the subject site, including a map of the area showing the properties to receive notice. Mailing labels are available from the Washington County Assessors office or a private title insurance company. . Ownership records shall be based on the most current available information from the Tax Assessor's office. *It is the applicant's responsibility to provide mailing labels that accurately reflect all property owners that reside within 1,000 feet of the subject site.*

☑ **Vicinity Map –** Fifteen (15) copies of a vicinity map. A photocopy of the Thomas Guide is adequate, showing the City limits and the Urban Growth Boundary.

☑ **Narrative –** Fifteen (15) copies and **an electronic copy** of a narrative explaining the proposal in detail and a response to the Required Findings for Subdivision, located in Chapter 16 of the Municipal Code/Zoning & Development, Section 16.120. The Municipal Code/Zoning & Development is available online at www.sherwoodoregon.gov, City Government/Records.

☑ **Electronic Copy –** An electronic copy of the entire application packet. This should include all submittal materials (narrative, vicinity map, mailing labels, site plan, preliminary plat, etc.).

III. REQUIRED PLANS

Submit fifteen (15) sets of the following folded full-size plans and **an electronic copy in PDF format**. Plans must have:

1) The proposed name of the development. If a proposed project name is the same as or similar to other existing projects in the City of Sherwood, the applicant may be required to modify the project name.
2) The name, address and phone of the owner, developer, applicant and plan producer.
3) North arrow,
4) Legend,
5) Date plans were prepared and date of any revisions
6) Scale clearly shown. Other than architectural elevations, all plans must be drawn to an engineer scale.
7) All dimensions clearly shown.

☑ **Existing Conditions Plan** - Existing conditions plan drawn to scale showing: property lines and dimensions, existing structures and other improvements such as streets and utilities, existing vegetation including trees, any floodplains or wetlands and any easements on the property. The existing conditions plan shall also include the slope of the site at 5-foot contour intervals

☑ **Preliminary Development Plans-** Plans must be sufficient for the Hearing Authority to determine compliance with applicable standards. The following information is typically needed for adequate review:

1. The subject parcel(s), its dimensions and area and the buildable area of each lot.

2. The location and dimensions of proposed development, including the following:

Transportation

a. Public and private streets with proposed frontage improvements including curb, gutters, sidewalks, planter strip, street lighting, distances to street centerline, pavement width, right-of-way width, bike lanes and driveway drops.
b. Public and private access easements, width and location.
c. General circulation plan showing location, widths and direction of existing and proposed streets, bicycle and pedestrian ways and transit routes and facilities.
d. Show the location and distance to neighboring driveways and the width and locations of driveways located across the street.
e. The location and size of accesses, sight distance and any fixed objects on collectors or arterial streets.
f. Emergency accesses.

Grading and Erosion Control

g. Indicate the proposed grade at two (2)-foot contour intervals.
h. Indicate the proposed erosion control measures to CWS standards (refer to CWS R&O 07-20).
i. Show areas of cut and fill with areas of structural fill.
j. Show the location of all retaining walls, the type of material to be used, the height of the retaining wall from the bottom of the footing to the top of the wall and the exposed height of the wall.

Utilities

k. Utilities must be shown after proposed grade with 2-foot contour intervals.
l. Map location, purpose, dimensions and ownership of easements.
m. Fire hydrant locations and fire flows.
n. Water, sewer and stormwater line locations, types and sizes.
o. Clearly indicate the private and public portions of the system.
p. Above-ground utilities and manhole locations

Preliminary Stormwater Plan

q. Show location, size and slope of water quality facility.
r. Preliminary calculations justifying size of facility.
s. The total square footage of the new and existing impervious area.
t. Indicate a stormwater facility to CWS standards (CWS R&O 07-20).

Sensitive Areas

u. Show any and all streams, ponds, wetlands and drainage ways.
v. Indicate the vegetative corridor for sensitive areas to CWS standards. (R&O 07-20).
w. Indicate measures to avoid environmental degradation that meet CWS, DSL and Army Corp requirements.
x. Flood elevation.
y. Wetland delineation and buffering proposed.

Land Use

z. The square footage of each building and a break down of square footage by use. (i.e. retail, office, industrial, residential, etc.).
aa. Net buildable acres. (The land remaining after unbuildable areas are taken out, such as the floodplain and wetland areas.)
bb. Net density calculation for residential use.
cc. Existing trees proposed to remain and trees to be removed and the drip-lines of trees proposed to remain.
dd. Street tree location, size and type. (refer to Ch. 8, Section 8.304.06 of the Community Development Code).
ee. Location, size and height of proposed free-standing signs.
ff. Location, height and type of fencing and walls.
gg. For each lot indicated the building envelope.

☑ **Reduced - Proposed Development Plans –** One (1) reduced copy of the Proposed Development Plans on 8 1/2" by 11" sheets and fifteen (15) reduced copies on 11" by 17" sheets.

☑ **Lighting Plan** – Photometric lighting plan indicating foot candle power on and along the perimeter of the site. Proposed locations, height and size of lights. (If outdoor lighting is proposed).

☑ **Surrounding Land Uses –** Existing land use including nature, size and location of existing structures within 300 feet. .

IV. DOCUMENTS REQUIRED

☑ **Title Report** – Two (2) copies of a current preliminary title report available from a private title insurance company.

☐ **CWS Service Provider Letter** – Four (4) copies of the CWS service provider letter.

☑ **Soils Analysis and/or Geotechnical Report** – Four (4) copies completed by a registered Soils Engineer or Geologist including measures to protect natural hazards. (If required by the City Engineer).

☑ **Traffic Study –** Four (4) copies of a traffic study. (If required by the City Engineer

V. ADDITIONAL DOCUMENTS THAT MAY BE REQUIRED

☐ **Army Corps and DSL wetland applications and/or permits –** Four (4) copies of required Divisions of State Lands and/or Army Corp of Engineers permits and/or permit applications if applicable.

☐ **Trip Analysis** - verifying compliance with the Capacity Allocation Program, if required per 16.108.070.

☑ **Tree Report –** Two (2) copies of a tree report prepared by an arborist, forester, landscape architect, botanist or other qualified professional. (If trees are on-site).

☑ **Natural Resource Assessment** – If required by Clean Water Services (CWS). The CWS Pre-Screening indicates as to whether this report is required or not.

☐ **Wetland Delineation Study** – if required by Oregon Division of State Lands (DSL) or the Army Corps of Engineers.

☐ **Other Special Studies and/or Reports** – if required by the Planning Director or the City Engineer to address issues identified in the pre-application meeting or during project review.

☐ Verification of compliance with other agency standards such as CWS, DSL, Army Corps of Engineers, ODOT, PGE, BPA, Washington County

Signature

10/20/2015
Date

Zach Pelz, AICP
Print Name

Exhibit D: County Tax Map and TRIO

First American Title Company of Oregon

Customer Service Department
121 SW Morrison Street Suite 300 - Portland, OR 97204
Phone: 503.219.TRIO (8746) Fax: 503.790.7872
Email: cs.portland@firstam.com
Today's Date : 10/14/2015

OWNERSHIP INFORMATION

Owner : **2007 Mandel Family**
CoOwner : **Mandel David**
Site Address : 21340 SW Elwert Rd Sherwood 97140
Mail Address : 16990 SW Richen Park Cir Sherwood Or 97140
Telephone :

Bldg # 1 Of 1
Ref Parcel Number : 2S130CB 00250
Parcel Number : R0548642
T: 02S R: 01W S: 30 Q: SW QQ: NW
County : Washington (OR)

PROPERTY DESCRIPTION

Map Page Grid :
Census Tract : 322.00 Block: 1
Neighborhood : 4TL0
Subdivision/Plat :
School District : Sherwood
Building Use : Single Family Res
Land Use : 5414 Agr,Farm Unzoned,Improved
Legal : ACRES 21.28, UNZONED FARMLAND-
: POTENTIAL ADDITIONAL TAX LIABILITY,
: LAND HOOK

ASSESSMENT AND TAX INFORMATION

Mkt Land : $1,812,520
Mkt Structure : $63,260
Mkt Total : $1,888,090
%Improved : 3
M50AssdTotal : $163,240
Levy Code : 08810
14-15 Taxes : $3,076.81
Millage Rate : 18.8485
Zoning : MDRH

PROPERTY CHARACTERISTICS

Bedrooms	: 4	Year Built	: 1936	Patio SqFt	:
Bathrooms	: 1.00	EffYearBlt	: 1936	Deck SqFt	:
Heat Method	: Stove	BsmFin SF	:	ExtFinish	: Wood Std Shtg
Foundation	: Concrete Ftg	BsmUnfinSF	: 1,146	Const Type	: Wd Stud\shtg
Lot Acres	: 21.28	BldgSqFt	: 2,877	Roof Shape	: Gable
Lot SqFt	: 926,957	1stFlrSF	: 1,146	Roof Matl	: Comp Shingle
Garage Type	:	UpperFlSF	:	Porch SqFt	: 288
Garage SF	:	Attic SqFt	: 585	Paving Matl	:

TRANSFER INFORMATION

Owner Name(s)	Sale Date	Doc#	Sale Price	Deed Type	Loan Amount	Loan Type
:2007 Mandel Family	:02/12/2008	11973	:$7,000	:Bargain &	:	:
:Mandel Family Living 2007	:04/30/2007	48408	:	:Bargain &	:	:
:Mandel Marvin	:07/20/2001	71926	:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:

This title information has been furnished, without charge, in conformance with the guidelines approved by the State of Oregon Insurance Commissioner. The Insurance Division cautions intermediaries that this service is designed to benefit the ultimate insureds. Indiscriminate use only benefiting intermediaries will not be permitted. Said services may be discontinued. No liability is assumed for any errors in this report.

First American Title Company of Oregon

Customer Service Department
121 SW Morrison Street Suite 300 - Portland, OR 97204
Phone: 503.219.TRIO (8746) Fax: 503.790.7872
Email: cs.portland@firstam.com
Today's Date : 10/14/2015

OWNERSHIP INFORMATION

Owner : **2007 Mandel Family**
CoOwner : **Mandel David**
Site Address : *no Site Address* Sherwood 97140
Mail Address : 16990 SW Richen Park Cir Sherwood Or 97140
Telephone :

Bldg # Of
Ref Parcel Number : 2S130CB 00251
Parcel Number : R2162860
T: 02S R: 01W S: 30 Q: SW QQ: NW
County : Washington (OR)

PROPERTY DESCRIPTION

Map Page Grid :
Census Tract : 321.03 Block:
Neighborhood : 4TL0
Subdivision/Plat :
School District : Sherwood
Building Use :
Land Use : 5414 Agr,Farm Unzoned,Improved
Legal : ACRES 1.19, UNZONED FARMLAND-
: POTENTIAL ADDITIONAL TAX LIABILITY,
: LAND HOOK

ASSESSMENT AND TAX INFORMATION

Mkt Land : $119,950
Mkt Structure :
Mkt Total : $121,010
%Improved :
M50AssdTotal : $1,060
Levy Code : 08810
14-15 Taxes : $19.98
Millage Rate : 18.8485
Zoning : MDRL

PROPERTY CHARACTERISTICS

Bedrooms	:	Year Built	:	Patio SqFt	:
Bathrooms	:	EffYearBlt	:	Deck SqFt	:
Heat Method	:	BsmFin SF	:	ExtFinish	:
Foundation	:	BsmUnfinSF	:	Const Type	:
Lot Acres	: 1.19	BldgSqFt	:	Roof Shape	:
Lot SqFt	: 51,836	1stFlrSF	:	Roof Matl	:
Garage Type	:	UpperFlSF	:	Porch SqFt	:
Garage SF	:	Attic SqFt	:	Paving Matl	:

TRANSFER INFORMATION

Owner Name(s)	Sale Date	Doc#	Sale Price	Deed Type	Loan Amount	Loan Type
:2007 Mandel Family	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:

This title information has been furnished, without charge, in conformance with the guidelines approved by the State of Oregon Insurance Commissioner. The Insurance Division cautions intermediaries that this service is designed to benefit the ultimate insureds. Indiscriminate use only benefiting intermediaries will not be permitted. Said services may be discontinued. No liability is assumed for any errors in this report.

2S 1 30CB

WASHINGTON COUNTY OREGON
NW1/4 SW1/4 SECTION 30 T2S R1W W.M.
SCALE 1" = 100'

36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6
12	7	8	9	10	11	12	7
13	18	17	16	15	14	13	18
24	19	20	21	22	23	24	19
25	30	29	28	27	26	25	30
36	31	32	33	34	35	36	31
1	6	5	4	3	2	1	6

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.washington.or.us

BB	BA	AB	AA
BC	BD	AC	AD
CB	CA	DB	DA
CC	CD	DC	DD

SECTION 30

Cancelled Taxlots For: 2S130CB
200,101,201,

SCALE 1" = 100'
0 50 100 200 300

Assessment
CARTOGRAPHY
Taxation

PLOT DATE: January 09, 2014
FOR ASSESSMENT PURPOSES ONLY - DO NOT RELY ON FOR OTHER USE

Map areas delineated by either gray shading or a cross-hatched pattern are for reference only and may not indicate the most current property boundaries. Please consult the appropriate map for the most current information.

SHERWOOD
2S 1 30CB

dig2s1w30

Washington County, Oregon
04/30/2007 04:10:26 PM
D-DBS Cnt=1 Stn=11 C WHITE
$15.00 $6.00 $11.00 - Total = $32.00

2007-048408

01108754200700484080030034

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

After Recording, Return to:

Reco

MARVIN P. MANDEL
JANE Q. MANDEL
Co-Trustees of the
2007 Mandel Family Trust
21340 SW Elwert Road
Sherwood, Oregon 97140

Until a change is requested,
all tax statements shall be sent
to the following address:

SAME AS ABOVE

BARGAIN AND SALE DEED

MARVIN P. MANDEL, ("Grantor"), conveys to MARVIN P. MANDEL and JANE Q. MANDEL, Co-Trustees of the 2007 MANDEL FAMILY REVOCABLE LIVING TRUST ("Grantees"), the following described real property located in Washington County, Oregon, free of encumbrances except those of public record:

DESCRIPTION OF PROPERTIES:

PLEASE SEE ATTACHED EXHIBIT A.

The true consideration for this conveyance is the transfer of the property to Grantees for estate planning purposes and is valued at $0.00.

THE LIABILITY AND OBLIGATIONS OF THE GRANTOR TO GRANTEES AND GRANTEES' HEIRS AND ASSIGNS UNDER THE WARRANTIES AND COVENANTS CONTAINED HEREIN OR PROVIDED BY LAW SHALL BE LIMITED TO THE EXTENT OF COVERAGE THAT WOULD BE AVAILABLE TO GRANTORS UNDER A STANDARD POLICY OF TITLE INSURANCE CONTAINING EXCEPTIONS FOR MATTERS OF PUBLIC RECORD EXTENDED. IT IS THE INTENTION OF THE GRANTOR TO PRESERVE ANY EXISTING TITLE INSURANCE COVERAGE. THE LIMITATIONS

JOHN A. RANKIN, LLC.
Attorney at Law
26715 S.W. Baker Road
Sherwood, Oregon 97140
(503) 625-9710 / Fax (503) 625-9709

CONTAINED HEREIN EXPRESSLY DO NOT RELIEVE GRANTORS OF ANY LIABILITY OR OBLIGATIONS UNDER THIS INSTRUMENT, BUT MERELY DEFINE THE SCOPE, NATURE, AND AMOUNT OF SUCH LIABILITY OR OBLIGATIONS.

THIS INSTRUMENT WILL NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES AND TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930.

DATED: February 27, 2007.

MARVIN P. MANDEL
Grantor

STATE OF OREGON)
) ss.
County of Washington)

Personally appeared the above named MARVIN P. MANDEL, Grantor, and acknowledged the foregoing to be his voluntary act and deed.

BEFORE ME:

Notary Public for Oregon
My commission expires: 6-2-07

OFFICIAL SEAL
JOHN A. RANKIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 368750
MY COMMISSION EXPIRES JUNE 2, 2007

JOHN A. RANKIN, LLC.
Attorney at Law
26715 S.W. Baker Road
Sherwood, Oregon 97140
(503) 625-9710 / Fax (503) 625-9709

EXHIBIT "A"

Beginning at the one-quarter corner on the West line of Section 30, Township 2 South, Range 1 West, Willamette Meridian, in the County of Washington and State of Oregon, being also the Northwest corner of the Southwest one-quarter of said Section 30; thence East along the centerline of said Section 15 chains, more less, to the Northwest corner of the Mandel tract described in deed recorded December 8, 1900 in Book 56 at Page 141, Deed Records; thence South parallel to the West line of said Section 30, 20 chains, more or less, to the Southeast corner of the Mandel tract described in deed recorded March 14, 1914 Book 101 at page 413, Deed Records; thence West parallel to the North line of said Southwest one-quarter of Section 30 to the West line of said Section 30 at the centerline of Elwert Road; thence North along the West line of said Section 30, 20 chains, more or less, to the point of beginning.

Commonly known as 21340 SW Elwert Road, Sherwood, Oregon 97140

First American Title Company of Oregon

Customer Service Department
121 SW Morrison Street Suite 300 - Portland, OR 97204
Phone: 503.219.TRIO (8746) Fax: 503.790.7872
Email: cs.portland@firstam.com
Today's Date : 10/15/2015

OWNERSHIP INFORMATION

Owner : **2007 Mandel Family**
CoOwner : **Mandel David**
Site Address : *no Site Address* Sherwood 97140
Mail Address : 16990 SW Richen Park Cir Sherwood Or 97140
County : Washington (OR)

Bldg # Of
Ref Parcel Number : 2S130CB 00251
Parcel Number : R2162860
T: 02S R: 01W S: 30 Q: SW QQ: NW

PROPERTY DESCRIPTION

Map Page Grid :
Census Tract : 321.03 Block:
Neighborhood : 4TL0
School District : Sherwood
Subdivision/Plat :
Building Use :
Land Use : 5414 Agr,Farm Unzoned,Improved
Legal : ACRES 1.19, UNZONED FARMLAND-
: POTENTIAL ADDITIONAL TAX LIABILITY,
: LAND HOOK

ASSESSMENT AND TAX INFORMATION

Mkt Land : $119,950
Mkt Structure :
Mkt Total : $121,010
%Improved :
M50AssdTotal : $1,060
Levy Code : 08810
14-15 Taxes : $19.98
Millage Rate : 18.8485
Zoning : MDRL

PROPERTY CHARACTERISTICS

Bedrooms	:	Year Built	:	Patio SqFt	:
Bathrooms	:	EffYearBlt	:	Deck SqFt	:
Heat Method	:	BsmFin SF	:	ExtFinish	:
Foundation	:	BsmUnfinSF	:	Const Type	:
Lot Acres	: 1.19	BldgSqFt	:	Roof Shape	:
Lot SqFt	: 51,836	1stFlrSF	:	Roof Matl	:
Garage Type	:	UpperFlSF	:	Porch SqFt	:
Garage SF	:	Attic SqFt	:	Paving Matl	:

TRANSFER INFORMATION

Owner Name(s)	Sale Date	Doc#	Sale Price	Deed Type	Loan Amount	Loan Type
:2007 Mandel Family	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:
:	:		:	:	:	:

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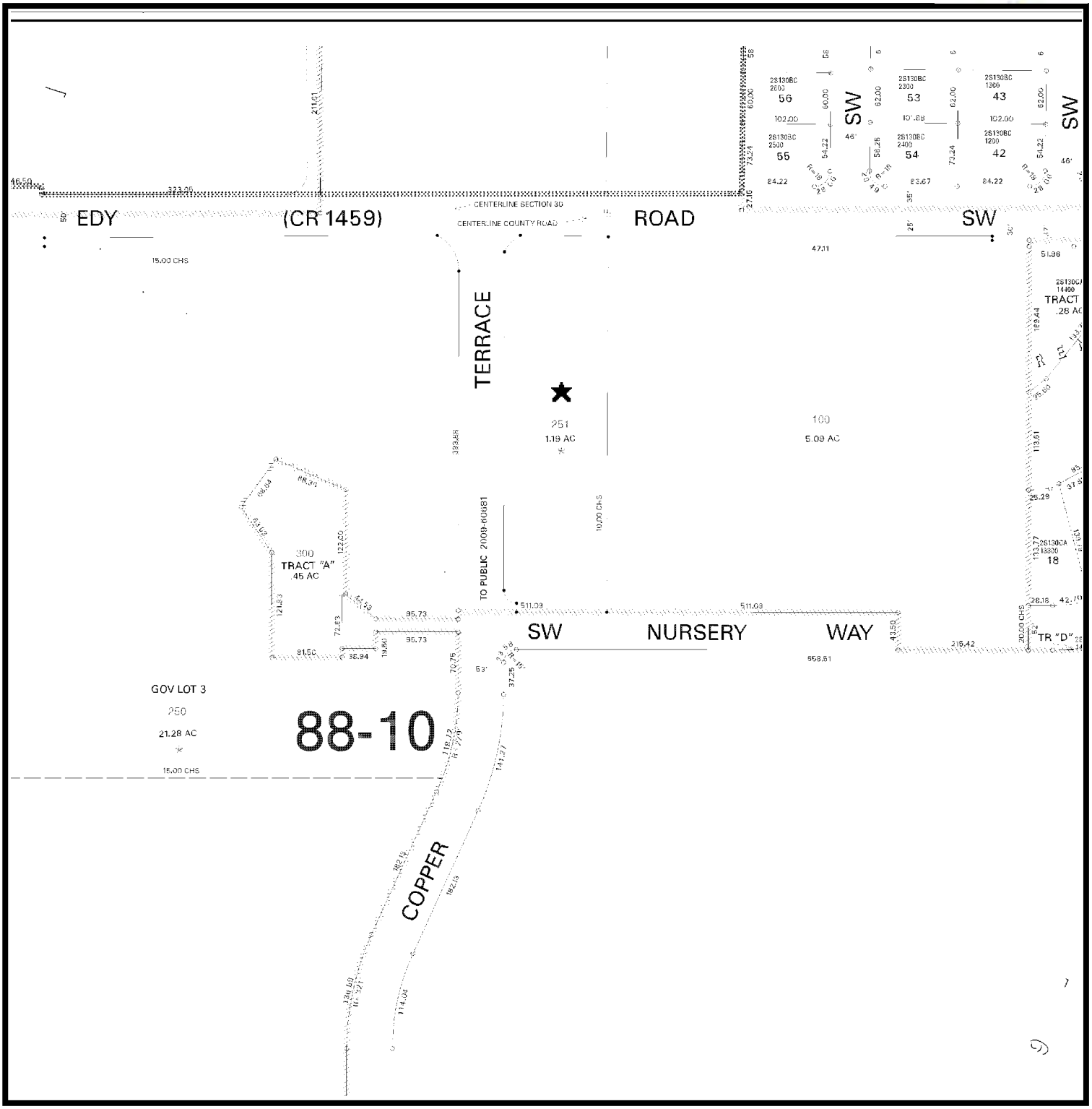
Reference Parcel #: 2S130CB 00251

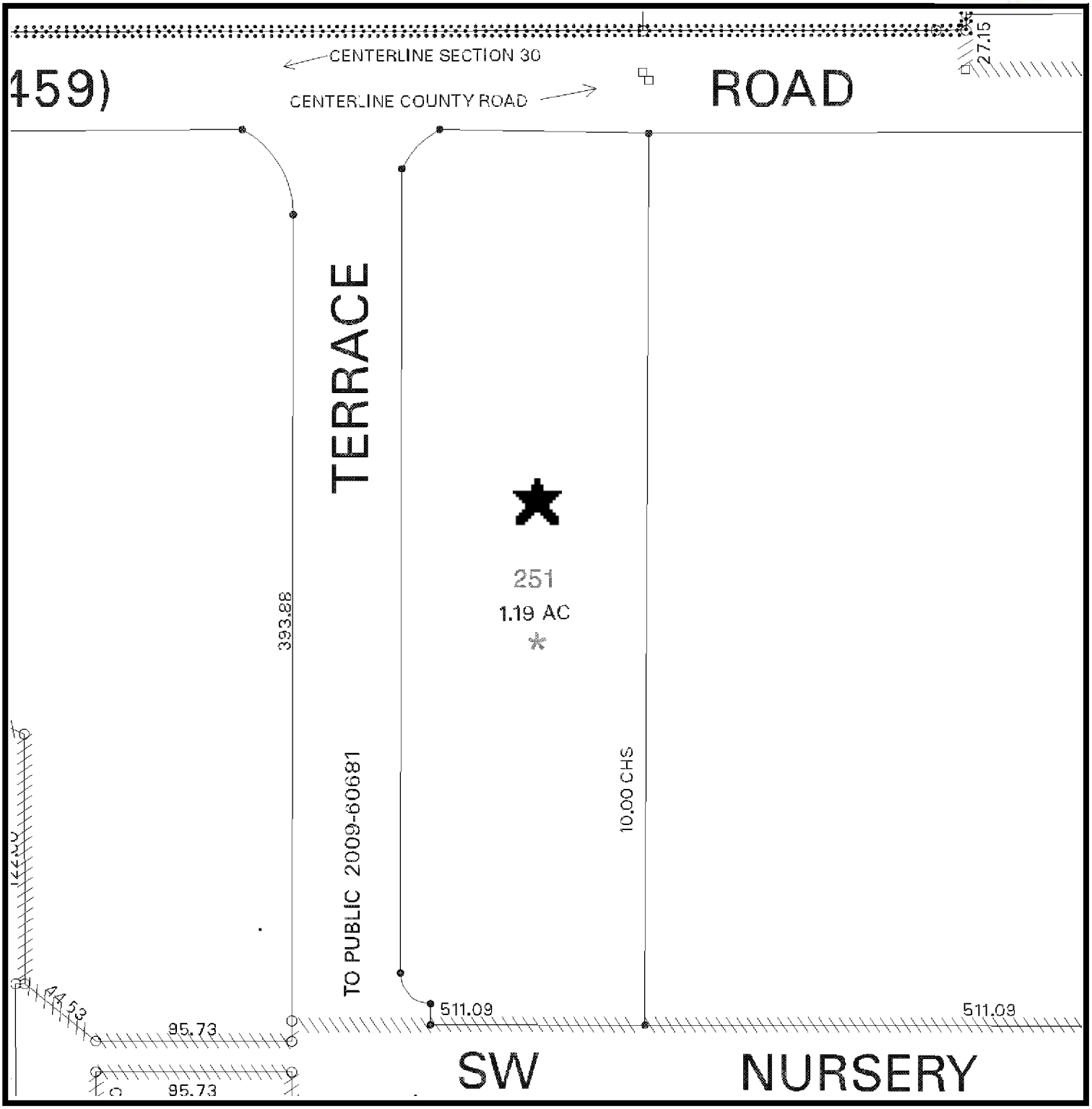


First American Title Company of Oregon

Customer Service Department
121 SW Morrison Street Suite 300 Portland, OR 97204
Phone: 503.219.TRIO (8746) Fax: 503.790.7872
Email: cs.portland@firstam.com

THIS MAP IS PROVIDED AS A CONVENIENCE IN LOCATING PROPERTY. FIRST AMERICAN TITLE COMPANY OF OREGON ASSUMES NO LIABILITY FOR ANY VARIATIONS AS MAY BE DISCLOSED BY AN ACTUAL SURVEY

Reference Parcel #: 2S130CB 00251



First American Title Company of Oregon

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Washington County, Oregon
08/23/2013 11:46:00 AM
D-DD Cnt=1 Stn=29 RECORDS1
$30.00 $5.00 $11.00 $15.00 - Total =$61.00

2013-077318

01871723201300773180060062

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

After recording, please return to:
Washington County Surveyor's Office
1400 SW Walnut Street, MS-17
Hillsboro, Oregon 97123

DEDICATION DEED

David Mandel, Marvin P. Mandel and Jane Q. Mandel, Co-Trustees of the 2007 Mandel Revocable Living Trust, and Randy Louis Kieling, Grantors, grant to WASHINGTON COUNTY, a political subdivision of the State of Oregon, Grantee, on behalf of the public, for the use of the public forever, the following easements in that certain real property situated in the County of Washington and State of Oregon, described on the attached Exhibit "A," and shown on the attached Exhibit "B."

The true consideration for this conveyance is **$ NONE**.

PARCEL 1 - DEDICATION OF RIGHT-OF-WAY
Including the right to construct, operate, and maintain a public road, all customary associated uses, and appurtenant facilities.

PARCEL 2 - SLOPE EASEMENT
Including the right to construct and maintain slopes necessitated by the construction, operation, and maintenance of the public road, all public facilities, and improvements in the adjacent right-of-way. Grantee shall never be required to remove the slope materials placed by it on said property, nor shall Grantee be subject to any damages to Grantors by reasons of any change of grade of the roadway abutting on said property.

AND - DRAINAGE EASEMENT
Including the right to construct, operate, and maintain facilities for storm and surface drainage purposes over, under, and across said property, together with the right to enter upon said easement area for the purpose of planting, digging, cleaning, and to perform other activities that enhance and preserve the drainage function of the easement area.

This document is intended to grant easements on the property described, not to convey fee title or any interest in the underlying property except as expressly stated herein. The easements granted shall not prevent Grantors from the use of said property provided, however, that such use shall not be permitted to interfere with the rights herein granted. Grantor shall not be permitted to endanger the lateral support of any facilities constructed within the easements granted herein.

Grantors hereby covenant to and with Grantee that they are the owners of said property, which is free from all encumbrances, except for easements, conditions and restrictions of record, and will warrant and defend the easement rights herein granted from all lawful claims whatsoever, except as stated herein.

IN WITNESS WHEREOF, the above named Grantors, have caused this instrument to be signed.

DATED this 14th day of August, 2013.

David Mandel

David Mandel

STATE OF OREGON)
) ss.
County of Washington)

This instrument was acknowledged before me on this 14th day of August, 2013 by David Mandel

OFFICIAL SEAL
JOHN A RANKIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 458661
MY COMMISSION EXPIRES JUNE 02, 2015

Notary Public for Oregon
My Commission Expires: 6-2-15

DATED this 14th day of AUGUST, 2013.

2007 Mandel Family Revocable Living Trust

Marvin P. Mandel, Co-Trustee

2007 Mandel Family Revocable Living Trust

Jane Q. Mandel, Co-Trustee

STATE OF OREGON)
) ss.
County of Washington)

This instrument was acknowledged before me on this 14th day of AUGUST, 2013 by Marvin P. Mandel and Jane Q. Mandel, Co-Trustees of the 2007 Mandel Family Revocable Living Trust.

OFFICIAL SEAL
JOHN A RANKIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 458661
MY COMMISSION EXPIRES JUNE 02, 2015

Notary Public for Oregon
My Commission Expires: 6-2-15

DATED this 14th day of AUGUST, 2013.

Randy Louis Kieling

Randy Louis Kieling

STATE OF OREGON)
) ss.
County of Washington)

This instrument was acknowledged before me on this 14th day of AUGUST, 2013 by Randy Louis Kieling.

OFFICIAL SEAL
JOHN A RANKIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 458661
MY COMMISSION EXPIRES JUNE 02, 2015

Notary Public for Oregon
My Commission Expires: 6-2-15

Accepted on behalf of Washington County, Oregon.

Dated this 23rd day of Aug, 2013

By:
James H. Elam, County Surveyor

Approved as to form:

Loretta S. Skurdahl,
Senior Assistant County Counsel

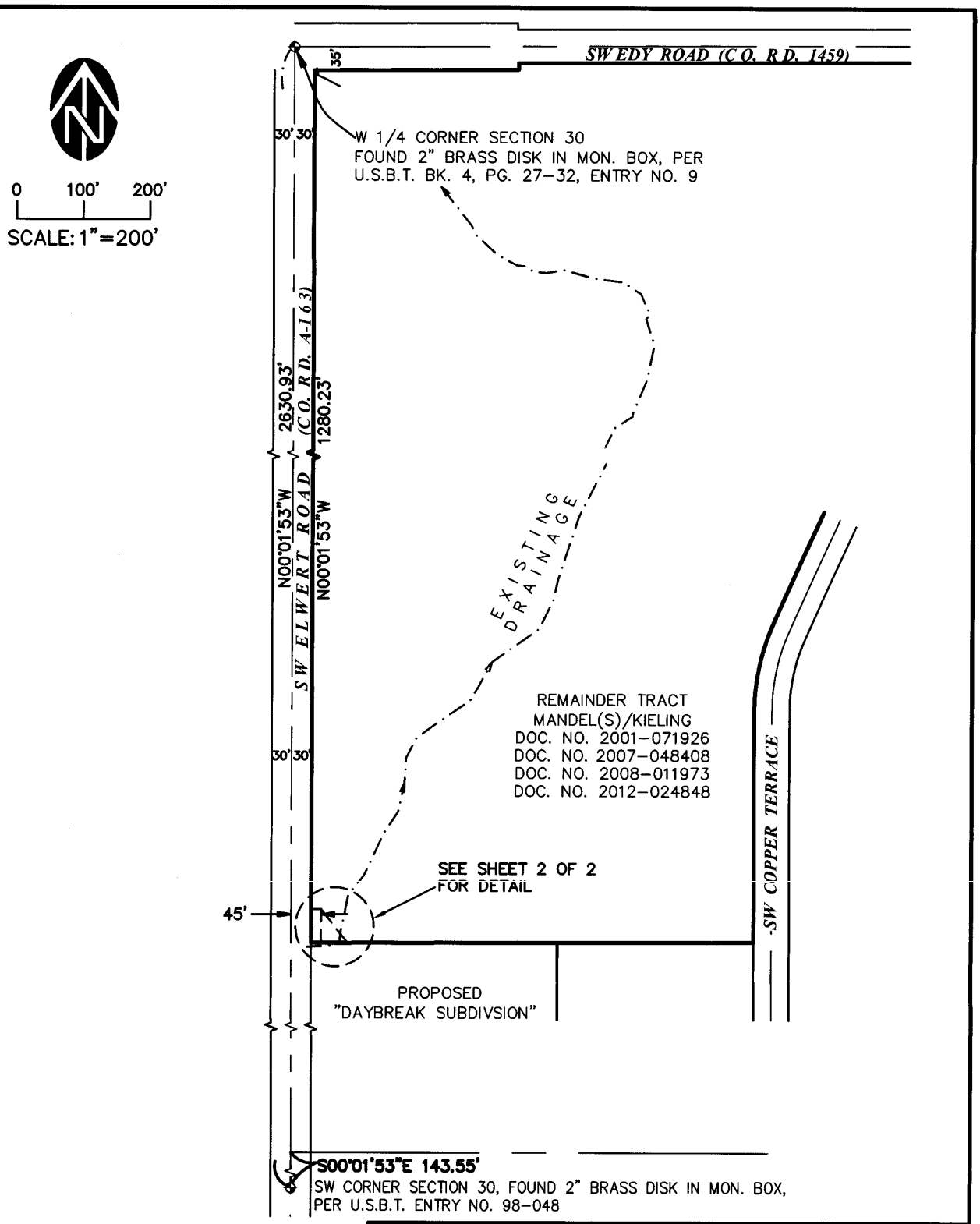


EXHIBIT B

PAGE 1 OF 2

LOCATED IN THE SW. 1/4 OF SECTION 30
TOWNSHIP 2 SOUTH, RANGE 1 WEST, W.M.
WASHINGTON COUNTY, OREGON

DATE	19JUNE13
DRAWN BY	DPR
CHECKED BY	GRA
REVISION	1
JOB NO.	1377-006

WESTLAKE CONSULTANTS INC.
ENGINEERING ◆ SURVEYING ◆ PLANNING
PACIFIC CORPORATE CENTER
15115 S.W. SEQUOIA PARKWAY, SUITE 150
TIGARD, OREGON 97224
(503) 684-0652
FAX (503) 624-0157

Drawing Name: J:\1377-006.13\Survey\CAD\DWG\137706Ex_v2013.dwg Jun 19, 2013 - 12:57pm - dpr

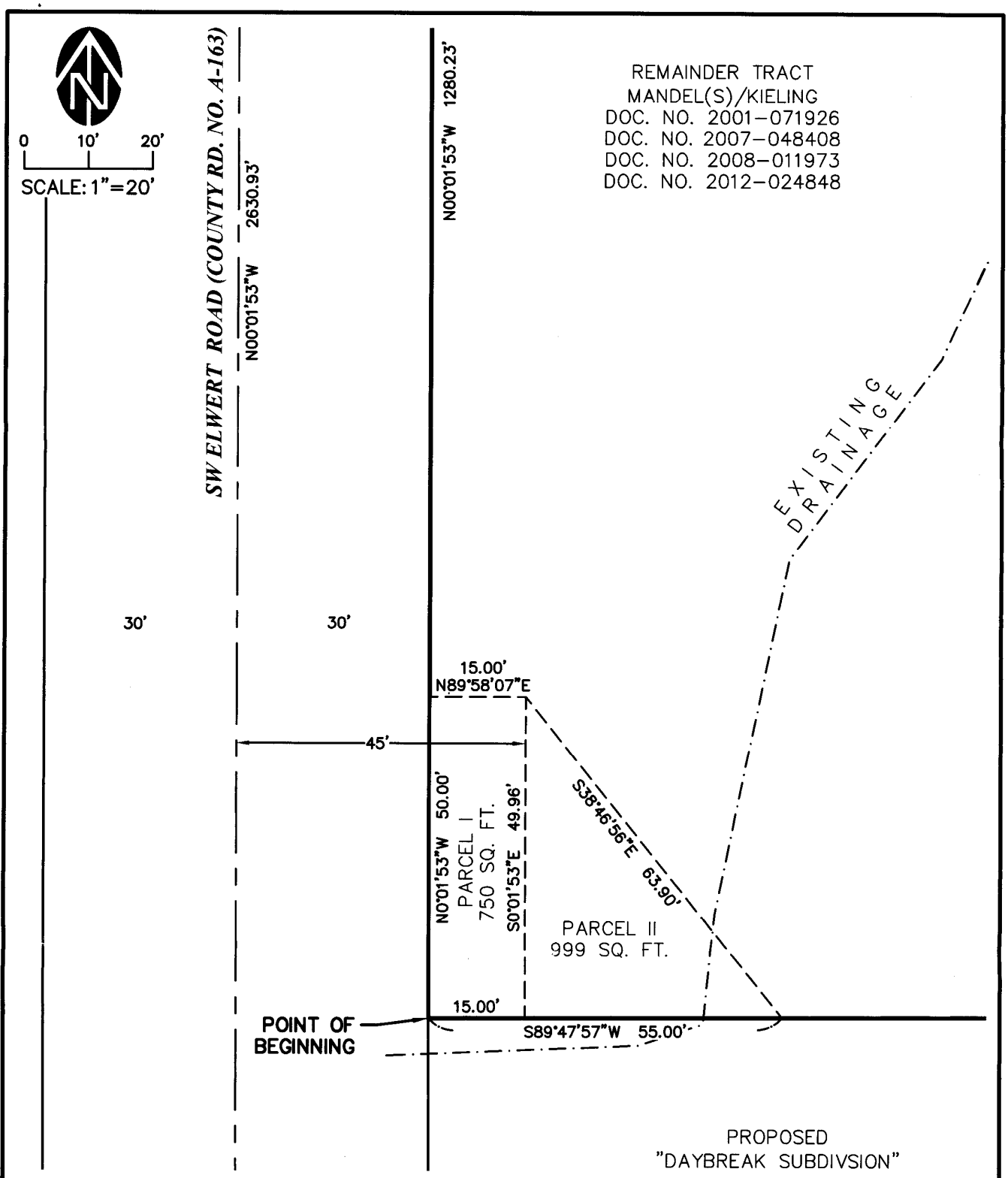


EXHIBIT B

PAGE 2 OF 2

LOCATED IN THE SW. 1/4 OF SECTION 30
TOWNSHIP 2 SOUTH, RANGE 1 WEST, W.M.
WASHINGTON COUNTY, OREGON

DATE	19JUNE13
DRAWN BY	DPR
CHECKED BY	GRA
REVISION	1
JOB NO.	1377-006

WESTLAKE CONSULTANTS INC.
ENGINEERING ◆ SURVEYING ◆ PLANNING
PACIFIC CORPORATE CENTER
15115 S.W. SEQUOIA PARKWAY, SUITE 150
TIGARD, OREGON 97224
(503) 684-0652
FAX (503) 624-0157

Drawing Name: J:\1377-006.13\Survey\CAD\DWG\137706Ex_v2013.dwg Jun 19, 2013 - 12:57pm - dpr

EXHIBIT A

Daybreak Subdivision
Mandel(s)/Kieling Tract
Project No. 1377-006
June 19, 2013

PROPERTY DESCRIPTION

Two Parcels of land located in the Southwest 1/4 of Section 30, Township 2 South, Range 1 West, Willamette Meridian, Washington County, Oregon; being portions of that property conveyed by Documents No. 90-66876 and No. 2001-71926, and being more particularly described as follows:

PARCEL I –Dedication of Right-of-Way:

Beginning at the southwest corner of the subject property, being the intersection of the south line of said property conveyed by Documents No. 90-66876 & No. 2001-71926 and the east right-of-way line of S.W. Elwert Road, 30-foot east of the centerline thereof; thence, along said east right-of-way line, North 00°01'53" West 50.00 feet; thence North 89°58'07" East 15.00 feet; thence, parallel with said east right-of-way line, South 00°01'53" East 49.96 feet, more or less, to said south line; thence, along said south line, South 89°47'57" West 15.00 feet to the point of beginning.

"Parcel I" contains 750 square feet, more or less.

PARCEL II – Public Slope and Drainage Easement:

Beginning at the southwest corner of the subject property, being the intersection of the south line of said property conveyed by Documents No. 90-66876 & No. 2001-71926 and the east right-of-way line of S.W. Elwert Road, 30-foot east of the centerline thereof; thence, along said east right-of-way line, North 00°01'53" West 50.00 feet; thence North 89°58'07" East 15.00 feet; thence South 38°46'56" East 63.90 feet, more or less, to said south line; thence, along said south line, South 89°47'57" West 55.00 feet to the point of beginning.

EXCEPTING THEREFROM "Parcel I" as described hereinabove.

"Parcel II" contains 999 square feet, more or less.

Bearings are based on Partition Plat No. 2009-035.

REGISTERED
PROFESSIONAL
LAND SURVEYOR
OREGON
JULY 25, 1990
GARY R. ANDERSON
#2434

Renewal 12/31/13

J:\1377-006.13\Survey\CAD\WORK\PD-20130607_Mandel-Kieling dedication 01.docx

Washington County, Oregon
04/30/2007 04:10:26 PM
D-DBS Cnt=1 Stn=11 C WHITE
$15.00 $6.00 $11.00 - Total = $32.00

2007-048408

01108754200700484080030034

I, Richard Hobernicht, Director of Assessment and Taxation and Ex-Officio County Clerk for Washington County, Oregon, do hereby certify that the within instrument of writing was received and recorded in the book of records of said county.

Richard Hobernicht, Director of Assessment and Taxation, Ex-Officio County Clerk

After Recording, Return to:

Reco

MARVIN P. MANDEL
JANE Q. MANDEL
Co-Trustees of the
2007 Mandel Family Trust
21340 SW Elwert Road
Sherwood, Oregon 97140

Until a change is requested,
all tax statements shall be sent
to the following address:

SAME AS ABOVE

BARGAIN AND SALE DEED

MARVIN P. MANDEL, ("Grantor"), conveys to MARVIN P. MANDEL and JANE Q. MANDEL, Co-Trustees of the 2007 MANDEL FAMILY REVOCABLE LIVING TRUST ("Grantees"), the following described real property located in Washington County, Oregon, free of encumbrances except those of public record:

DESCRIPTION OF PROPERTIES:

PLEASE SEE ATTACHED EXHIBIT A.

The true consideration for this conveyance is the transfer of the property to Grantees for estate planning purposes and is valued at $0.00.

THE LIABILITY AND OBLIGATIONS OF THE GRANTOR TO GRANTEES AND GRANTEES' HEIRS AND ASSIGNS UNDER THE WARRANTIES AND COVENANTS CONTAINED HEREIN OR PROVIDED BY LAW SHALL BE LIMITED TO THE EXTENT OF COVERAGE THAT WOULD BE AVAILABLE TO GRANTORS UNDER A STANDARD POLICY OF TITLE INSURANCE CONTAINING EXCEPTIONS FOR MATTERS OF PUBLIC RECORD EXTENDED. IT IS THE INTENTION OF THE GRANTOR TO PRESERVE ANY EXISTING TITLE INSURANCE COVERAGE. THE LIMITATIONS

JOHN A. RANKIN, LLC.
Attorney at Law
26715 S.W. Baker Road
Sherwood, Oregon 97140
(503) 625-9710 / Fax (503) 625-9709

CONTAINED HEREIN EXPRESSLY DO NOT RELIEVE GRANTORS OF ANY LIABILITY OR OBLIGATIONS UNDER THIS INSTRUMENT, BUT MERELY DEFINE THE SCOPE, NATURE, AND AMOUNT OF SUCH LIABILITY OR OBLIGATIONS.

THIS INSTRUMENT WILL NOT ALLOW USE OF THE PROPERTY DESCRIBED IN THIS INSTRUMENT IN VIOLATION OF APPLICABLE LAND USE LAWS AND REGULATIONS. BEFORE SIGNING OR ACCEPTING THIS INSTRUMENT, THE PERSON ACQUIRING FEE TITLE TO THE PROPERTY SHOULD CHECK WITH THE APPROPRIATE CITY OR COUNTY PLANNING DEPARTMENT TO VERIFY APPROVED USES AND TO DETERMINE ANY LIMITS ON LAWSUITS AGAINST FARMING OR FOREST PRACTICES AS DEFINED IN ORS 30.930.

DATED: February 27, 2007.

MARVIN P. MANDEL
Grantor

STATE OF OREGON)
) ss.
County of Washington)

Personally appeared the above named MARVIN P. MANDEL, Grantor, and acknowledged the foregoing to be his voluntary act and deed.

BEFORE ME:

Notary Public for Oregon
My commission expires: 6-2-07

OFFICIAL SEAL
JOHN A. RANKIN
NOTARY PUBLIC-OREGON
COMMISSION NO. 368750
MY COMMISSION EXPIRES JUNE 2, 2007

JOHN A. RANKIN, LLC.
Attorney at Law
26715 S.W. Baker Road
Sherwood, Oregon 97140
(503) 625-9710 / Fax (503) 625-9709

EXHIBIT "A"

Beginning at the one-quarter corner on the West line of Section 30, Township 2 South, Range 1 West, Willamette Meridian, in the County of Washington and State of Oregon, being also the Northwest corner of the Southwest one-quarter of said Section 30; thence East along the centerline of said Section 15 chains, more less, to the Northwest corner of the Mandel tract described in deed recorded December 8, 1900 in Book 56 at Page 141, Deed Records; thence South parallel to the West line of said Section 30, 20 chains, more or less, to the Southeast corner of the Mandel tract described in deed recorded March 14, 1914 Book 101 at page 413, Deed Records; thence West parallel to the North line of said Southwest one-quarter of Section 30 to the West line of said Section 30 at the centerline of Elwert Road; thence North along the West line of said Section 30, 20 chains, more or less, to the point of beginning.

Commonly known as 21340 SW Elwert Road, Sherwood, Oregon 97140

Exhibit E: Pre-Application Meeting Notes

City of Sherwood Oregon

Home of the Tualatin River National Wildlife Refuge

Pre-Application Conference Notes

PAC 15-06

Meeting Date: July 6, 2015

Meeting Time: 2:30PM

Planning Staff Contact: Brad Kilby

503-625-4206

Kilbyb@sherwoodoregon.gov

Residential Subdivision/Rezone

PLEASE NOTE: The conference and notes cannot cover all Code requirements and aspects related to site planning that should apply to the development of your property. Failure of the staff to provide information required by the Code shall not constitute a waiver of the applicable standards or requirements. It is recommended that a prospective applicant either obtain and read the Community Development Code or ask any questions of City staff relative to Code requirements prior to submitting an application.

Proposed project name: Mandel Property

PROPOSAL DESCRIPTION: Proposal to complete a sequence of land use applications including a partition to divide a 21.28 acres site two, then, a concurrent subdivision application on one of the parcels, and a rezone on the second parcel to remove the Neighborhood Commercial designation on the portion of the property that is south of SW Edy Road, and immediately east of SW Elwert Road. There is a single-family residence with accessory buildings on the portion of the site that is located west of a drainage that bisects the property, and a regional stormwater facility on the east side of the same resource. The property is also divided by SW Copper Terrace Road.

APPLICANT: Venture Properties
Attn: Kelly Ritz
4230 Galewood Street, Suite 100
Sherwood, OR 97140 (503)625-9710

APPLICANT'S REPRESENTATIVE:
AKS Engineering and Forestry
Attn: Mimi Doukas
12965 SW Herman Road
Tualatin, OR 97062

OWNER: Marvin and Jane Mandel

PROPERTY LOCATION: WCTM 2S130CB00250 Southeast corner of the intersection of SW Edy Road and SW Elwert

Identified potential constraints/issues: Regional Stormwater Facility, Vegetated Corridor, Intervening

Right-of-way, Cul-de-sac length, connectivity and circulation
Based on the information provided, NECESSARY APPLICATION: The Partition is a Type II process, The Rezone and Subdivision would be considered by Planning Commission with a recommendation to the City Council for their own consideration, and ultimately a decision.

ZONING DISTRICT DIMENSIONAL REQUIREMENTS (Refer to Code Section 16. 12)

The property is located within the Area 59 Concept Plan area and is split zoned with Medium Density Residential Low (MDRL), Medium Density Residential High (MDRH), and Neighborhood Commercial, this proposal is for the development of the MDRH and MDRL zoned portions of the site. The Neighborhood Commercial portion of the site is not being developed at this time.

MINIMUM LOT SIZE: 5,000 sq. ft. LOT WIDTH AT FRONT PROPERTY LINE: 25 ft.

LOT WIDTH AT BUILDING LINE: 50 ft. MAXIMUM HEIGHT: 30 ft. or 2-stories for the MDRL zoned property, and 35 ft. or 2 ½ stories for the MDRH zoned property.

Setbacks: Front: 20 ft. Side 5 ft. Rear 20 ft. Corner 15 ft. from street* Keep this in mind for all corner lots in that the width of the lot is decreased by up to 20-feet with setbacks.

☒ **NARRATIVE**
The applicant shall submit a narrative which provides findings based on the applicable approval standards. Failure to provide a narrative or adequately address criteria would be reason to consider an application incomplete and delay review of the proposal. The applicant should review the code for applicable criteria.

☒ **CLEAN WATER SERVICES SERVICE PROVIDER LETTER**

The applicant shall submit a CWS Service Provider Letter at time of application submittal. An application will not be deemed complete without a CWS Service Provider Letter or a CWS prescreening noting that a Service Provider Letter is not required.

☒ **PLAN AMENDMENTS (16.80)**

A. Text Amendment

An amendment to the text of the Comprehensive Plan or the Zoning and Community Development Code must be based upon a need for such an amendment as identified by the Council or the Commission. Such an amendment must be consistent with the intent of the adopted Sherwood Comprehensive Plan, and with all other provisions of the Plan, the Transportation System Plan and this Code, and with any applicable State or City statutes and regulations, including this Section.

B. Map Amendment

An amendment to the City Zoning Map may be granted, provided that the proposal satisfies all applicable requirements of the adopted Sherwood Comprehensive Plan, the Transportation System Plan and this Code, and that:

1. The proposed amendment is consistent with the goals and policies of the Comprehensive Plan and the Transportation System Plan.
2. There is an existing and demonstrable need for the particular uses and zoning proposed, taking into account the importance of such uses to the economy of the City, the existing market demand for any goods or services which such uses will provide, the presence or absence and location of other such uses or similar uses in the area, and the general public good.
3. The proposed amendment is timely, considering the pattern of development in the area, surrounding land uses, any changes which may have occurred in the neighborhood or community to warrant the proposed amendment, and the availability of utilities and services to serve all potential uses in the proposed zoning district.
4. Other lands in the City already zoned for the proposed uses are either unavailable or unsuitable for immediate development due to location, size or other factors.

C. Transportation Planning Rule Consistency

1. The applicant shall demonstrate consistency with the Transportation Planning Rule, specifically by addressing whether the proposed amendment creates a significant effect on the transportation system pursuant to OAR 660-012-0060. If required, a Traffic Impact Analysis (TIA) shall be prepared pursuant to Section 16.106.080.

☒ **PUBLIC INFRASTRUCTURE (16.104)**

All public improvements shall conform to City standards and specifications found in the **Engineering Design Manual** and installed in accordance with Chapter 108. The Council may establish additional specifications to supplement the standard of this Code and other applicable ordinances.

☒ **TRANSPORTATION FACILITIES (16.106)**

16.106.020 All developments containing or abutting an existing or proposed street that is unimproved or substandard in ROW or improvement, shall dedicate the necessary right of way prior to issuance of building permits or occupancy.

16.106.020.C.1. When development includes or abuts a proposed street in no event shall the required improvement exceed 40 ft.

2. Half Streets: When a half street is created, a minimum of 22 feet of driving surface shall be provided by the developer.

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.

16.106.030: Location: Street Connectivity and Future Street Systems

16.106.040 C. Future Extension: Where necessary to access or permit future subdivision or development of adjoining land, streets shall extend to the boundary of the proposed development and provide the required roadway width. Dead-end streets less than 100' in length shall comply with the Engineering Design Manual.

☒ **SANITARY SEWER (16.110)**

Sanitary sewers shall be installed to serve all new developments and shall connect to existing sanitary sewer mains. **NOTE: (This property is subject to a reimbursement district)**

☒ **WATER (16.112)**

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 this Code, the Water System Master Plan, the City 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. **NOTE: (This property is subject to a reimbursement district)**

☒ **STORM WATER (16.114)**

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 04-0, or its replacement. **NOTE: (This property is subject to a reimbursement district)**

☒ **FIRE (16.116)**

All developments are required to comply with the regulations of Tualatin Valley Fire & Rescue. TVF&R regulations can be found on their website at: www.tvfr.com/Dept/fm/const/index.html.

☒ **OVERHEAD UTILITIES (16.118)**

All existing and proposed utilities must 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 Commission.

☒ **SUBDIVISIONS (16.120)**

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.

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.

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).

D. Adequate water, sanitary sewer, and other public facilities exist to support the use of land proposed in the plat.

E. **Development of additional, contiguous property under the same ownership can be accomplished in accordance with this Code.**

F. Adjoining land can either be developed independently or is provided access that will allow development in accordance with this Code.

G. Tree and woodland inventories have been submitted and approved as per Section 16.142.060.

H. The plat clearly shows the proposed lot numbers, setbacks, dedications and easements.

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.

☒ **LAND PARTITIONS (16.122)**

If a partition exceeds two (2) acres and within one (1) year is re-partitioned into more than two (2) parcels, and any single parcel is less than one (1) acre in size, full compliance with the subdivision regulations of this Code may be required.

☒ **LAND DIVISION DESIGN STANDARDS (16.128)**

Block Length, Pedestrian and Bicycle ways, and Lot standards.

☒ **ENVIRONMENTAL RESOURCES (16.144 Wetlands, Habitat, and Natural Areas)**

There is an existing vegetated corridor that will require protection and enhancement consistent with CWS standards. Applicant must provide a Service Provider Letter from CWS, and delineate any wetlands on-site. ***THE PROPOSAL FOR SEWER SERVICE AND/OR PEDESTRIAN CROSSING SHOULD BE INITIALLY PROPOSED AND SHARED TO CONSOLIDATE CROSSINGS AND PERMITTING***

☒ **LANDSCAPED VISUAL CORRIDOR (16.142.040)**

A landscaped visual corridor is required along all collectors and arterials (as designated by the Transportation System Plan) as well as Highway 99W. The required width of the corridor for collectors is ten (10) feet, arterials is fifteen (15) feet and Highway 99W is twenty-five (25) feet. **This development is required to provide a 15 foot landscaped visual corridor along SW Elwert**

Road as an arterial, and a 10 foot landscaped visual corridor along SW Edy Road as a collector on the TSP. (May use portions of the lot to achieve the visual corridor with limitations on fence placement)

The required visual corridor shall be planted as specified by the review authority to provide a continuous visual buffer between major streets and developed uses.

☒ **STREET TREES (16.142.060)**

Trees are required to be planted along public streets abutting any new development. Spacing is based on the maximum canopy spread identified in the recommended street tree list with the intent of providing a continuous canopy without an opening. For example, 30 canopy spread = 30 ft. spacing between trees. Root barriers will be required with new street trees.

☒ **TREES ON PRIVATE PROPERTY (16.142.070)**

All applications shall be required to preserve trees to the maximum extent feasible.

Each net development site shall provide a variety of trees to achieve a minimum total tree canopy of 40 %. The canopy percentage is based on the expected mature canopy of each tree regardless of spacing. Arborists provide the estimate.

☒ APPLICABLE CODE CRITERIA
(These sections ***must*** be addressed in the narrative submitted with the land use application)

X 16.12 (Residential Land Use Districts)
X 16.58 (Clear Vision and Fence Standards)
x 16.92 (Landscaping)
x 16.106 (Transportation Facilities)
X 16.108 (Improvement Plan Review
X 16.110 (Sanitary Sewers)
X 16.112 (Water Supply)
X 16.114 (Storm Water)
X 16.116 (Fire Protection)
X 16.118 (Public and Private Utilities)
x 16.120 (Subdivisions)
X 16.128 (Land Division Design Standards)
X 16.142 (Parks, Trees and Open Space)- Visual Corridor, Street trees and Trees
X 16.156 (Energy Conservation)

ADDITIONAL CONCERNS OR COMMENTS:

PROCEDURE

____ Type II - Administrative Staff Review, Planning Commission for any appeals.
____ Type III- Public hearing before the Hearings Officer, Planning Commission for any appeals.
____ Type IV- Public hearing before the Planning Commission, City Council for any appeals.
X Type V- Public hearing before the Planning Commission with the Commission making a recommendation on the proposal to the City Council. An additional public hearing shall be held by the City Council. Any appeals shall be heard by the Land Use Board of Appeals (LUBA).

APPLICATION SUBMITTAL PROCESS

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.

☒ **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 * sets** of narrative addressing application criteria

☒ **Fee** (along with calculations utilized to determine fee if applicable) **CHECK WITH STAFF PRIOR TO SUBMITALL OF APPLICATION TO CONFIRM FEES DUE.**

☒ **Signed checklist** verifying submittal includes specific materials necessary for the application process

* **Note** that the required number of copies must be submitted for completeness; however, upon initial submittal applicants are encouraged to submit only 3 copies for completeness review. Prior to completeness, required number of copies and one full electronic copy will be required to be submitted.

The Planning Department will perform a preliminary review of the application and will determine whether an application is complete within 30 days of the counter submittal. Staff will notify the applicant if additional information or additional copies of the submitted materials are required.

The administrative decision or public hearing will typically occur approximately 45 to 60 days after an application is deemed complete by the Planning Department. Applications involving difficult or protracted issues or requiring review by other jurisdictions may take additional time to review. Written recommendations from the Planning staff are issued seven (7) days prior to the public hearing. A 14-day public appeal period follows all land use decisions.

Information/Handouts provided at Pre-app:

☒ Application form
☐ CWS pre-screen form
☐ Copy of fee schedule
☐ Copy of maps including: ___ Aerial, __Wetlands, __Floodplain, __Sanitary lines, __Storm lines
☒ Other Area 59 Concept Plan Maps
☒ Neighborhood Meeting Packet

Response to Questions from Applicant

1. This seems feasible, however, the CWS vegetated corridor will be required to be set aside in a tract and enhanced in accordance with CWS design standards. the Code states, "If a partition exceeds two (2) acres and within one (1) year is re-partitioned into more than two (2) parcels, and

any single parcel is less than one (1) acre in size, full compliance with the subdivision regulations of this Code may be required. This means that you would be required to meet the subdivision requirements, but does not preclude you from asking for a partition first.

2. The City review type will depend on the application type. Type II, Type V. Consider a Planned Unit Development? Partition (Type II), Subdivision (Type IV), Rezone or PUD (Type V). Road Modifications.
3. Studies required for the rezone will require an analysis to justify the rezone, and a traffic study to ensure compliance with the Transportation Planning Rule. Traffic study will be required for the subdivision based on traffic generation alone. Wetland Delineation and resource survey.
4. Aside from this standard, single-family developments are required to provide a minimum of 5% of the net buildable site is required for usable open space aside from environmentally constrained areas, yards or setbacks, visual corridors, and buffers.
5. Check with Building and Engineering.

SEE ENGINEERING COMMENTS FOR RESPONSES TO REMAINDER OF QUESTIONS.

ADDITIONAL COMMENTS

6. The road is part of the concept plan, but that plan does not necessarily dictate the location of the connection. Without the connection, the project would not meet block length standards. A connection will ultimately need to be provided and stubbed to the undeveloped tract along with all public utilities. (The connection could potentially be bonded for as opposed to constructed provided it was approved by the City Engineer, and it was demonstrated by the applicant that the connection is proposed in a location that is feasible.
7. There is the potential that usable open space created over and above the 5% required above could be eligible for park SDC credits since there is a need for 14 acres identified in the concept plan.
8. Neighborhood Meeting is required
9. A reimbursement district is in place for this property

End of pre-application conference comments

Exhibit F: Neighborhood Meeting Documentation

TUALATIN · VANCOUVER · SALEM-KEIZER
AKS ENGINEERING & FORESTRY
WWW.AKS-ENG.COM
12965 SW HERMAN RD., SUITE 100 · TUALATIN, OR 97062
P: (503) 563-6151 F: (503) 563-6152

July 7, 2015

Ref: Notice of Neighborhood Meeting
Development of an approximately 85 lot subdivision at 21340 SW Elwert Road (Washington County Assessor's Map 2S130CB Tax Lots 250 & 251)

Dear Property Owner/Neighbor:

AKS Engineering & Forestry, LLC is holding a neighborhood meeting regarding the +/- 22.5 acre property located at 21340 SW Elwert Road, Washington County Assessor's Map 2S130CB Tax Lots 250 and 251, zoned MDRH (Medium Density Residential High), MDRL (Medium Density Residential Low), NC (Neighborhood Commercial), and Open Space. The project involves subdividing the property to create approximately 85 lots for future detached single-family homes. The applicant is also proposing a Comprehensive Plan Amendment/Zone Change to change the NC (Neighborhood Commercial) Zoning to MDRL (Medium Density Residential Low). Prior to applying to the City of Sherwood Planning Department we would like to take the opportunity to discuss the project in more detail with you.

The purpose of this meeting is to provide a forum for the applicant and surrounding property owners/residents to review and discuss the project before an application is submitted to the City. This meeting gives you the opportunity to share with us any special information you know about the property involved. We will attempt to answer questions, which may be relevant to meeting development standards consistent with City of Sherwood's Zoning and Development Code.

Meeting Information:

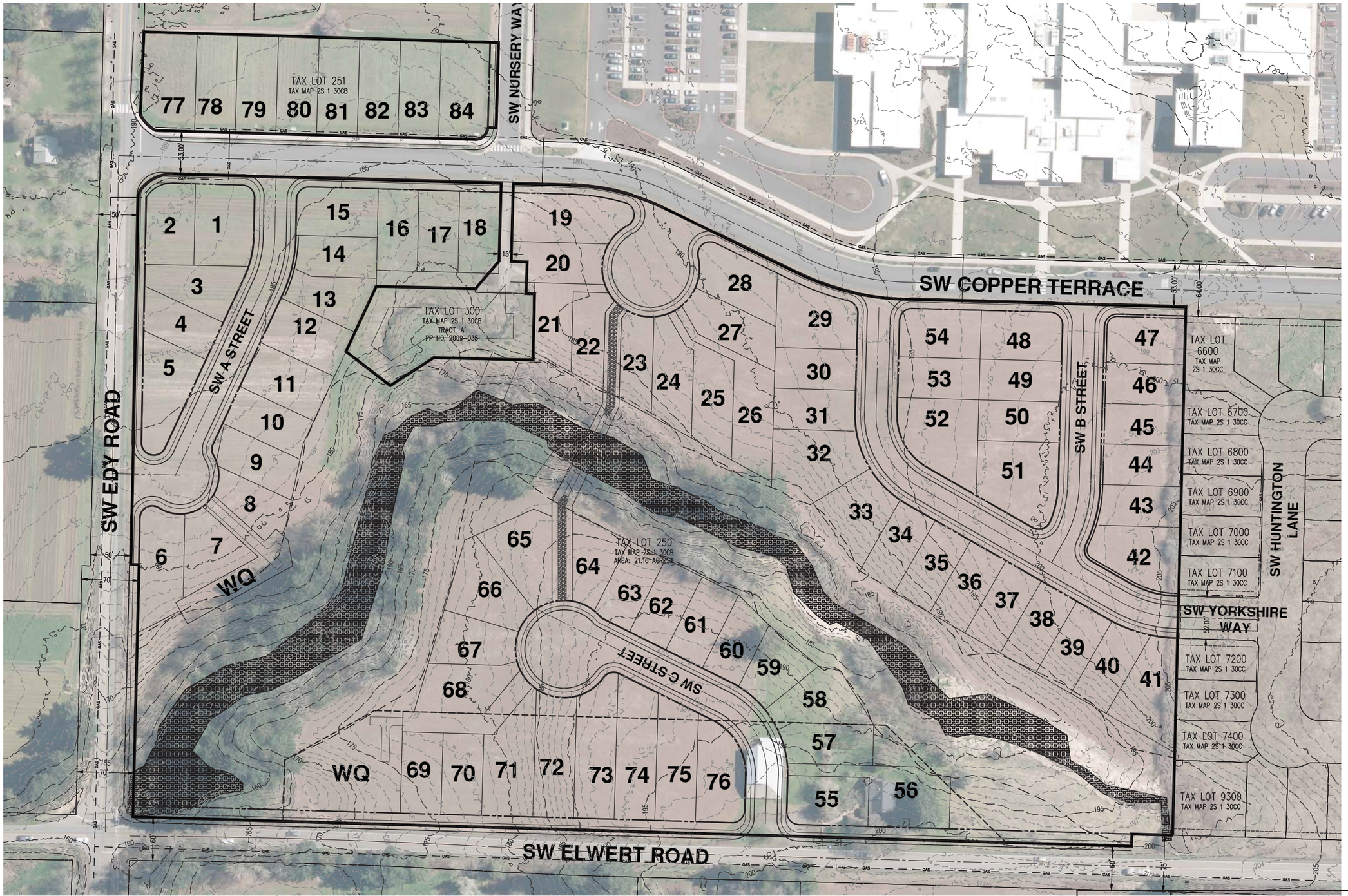
Tuesday, July 21, 2015 at 6:00 p.m.
at Edy Ridge Elementary School
21472 SW Copper Terrace, Sherwood, Oregon 97140

Please note this meeting will be an informational meeting to discuss preliminary plans. These plans may be altered prior to submittal of an application to the City. Depending upon the type of land use action required, you may receive official notice from City of Sherwood for you to either participate with written comments and/or an opportunity to attend a public hearing.

I look forward to discussing this project with you. If you have questions, but will be unable to attend, please feel free to call me at 503-563-6151.

Sincerely,
AKS ENGINEERING & FORESTRY, LLC

Mimi Doukas, AICP, RLA
Planning Project Manager



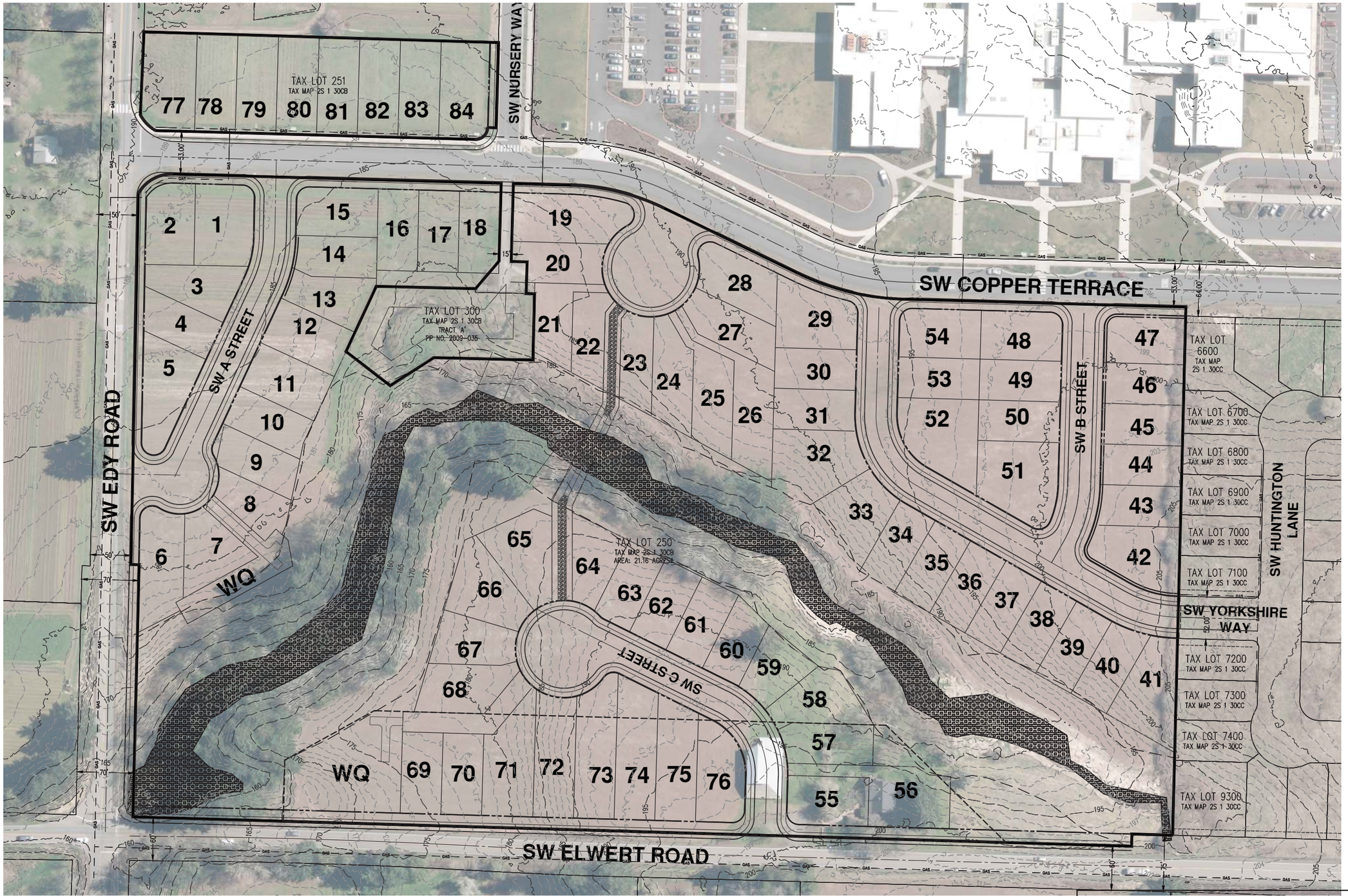
DATE: 7/20/2015

LAYOUT 3

MANDEL PROPERTY

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

EXHIBIT A	A
DRWN:	MD
CHKD:	
AKS JOB:	4570



DATE: 7/20/2015

LAYOUT 3

MANDEL PROPERTY

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

EXHIBIT A

A

DRWN: MD
CHKD:
AKS JOB: 4570

DWG: 4570 20150717 LAY4 – RENDERING NEIGH MEETING | LAY1

TUALATIN · VANCOUVER · SALEM
12965 SW HERMAN RD., SUITE 100 · TUALATIN, OR 97062
AKS ENGINEERING & FORESTRY
WWW.AKS-ENG.COM
P: (503) 563-6151 F: (503) 563-6152

July 23, 2015

Neighborhood Meeting Summary: 21340 SW Elwert Road
Assessor's Map: 2S130CB Tax Lots 250 & 251
Sherwood, Oregon 97006

Meeting Date: July 21, 2015
Time: 6:00 PM
Location: Edy Ridge Elementary School, 21472 SW Copper Terrace, Sherwood, Oregon 97140

The following serves as a summary of the primary subjects covered at the Neighborhood Meeting. Mimi Doukas from AKS Engineering & Forestry facilitated the meeting. A brief presentation about the project with a rendered site plan was made, followed by questions and answers. The project involves subdividing the property to create approximately 85 lots for future detached single-family homes. The applicant is also proposing a Comprehensive Plan Amendment/Zone Change to change the NC (Neighborhood Commercial) Zoning to MDRL (Medium Density Residential Low). Business cards with contact information were provided, as well as an attendance sheet for attendees to sign.

Major discussion questions:

1. **When Area 59 was first proposed there wasn't going to be any access to Elwert Road and now things have changed and there is so much traffic – how will the County allow this?**
   - They will review the application but the access spacing on Elwert Road is an arterial with Washington County and they allow access points at 600 feet away from intersections, which this is.
   - In addtion, there not any lots fronting onto Elwert, and only 20 lots proposed on the cul-de-sac-de-sac connecting to Elwert.
2. **The homes on Elwert Road wouldn't access their homes on Elwert Road?**
   - No, they would access it internally through the cul-de-sac. All of the lots would front on the cul-de-sac. Elwert Road and Edy Road are both visual corridors so Elwert Road must have a 15-foot landscape space and Edy Road requires a 10-foot landscape space. A few lots access on Copper Terrace which is permitted. The design minimizes the number of lots with direct access onto Copper Terrace.
3. **What is happening with existing home and is it historical?**
   - We are not sure at this time, though it is located essentially on lot 56. There has been no discussion about the home. Not familiar with the home and whether it is historical or not.
4. **With the initial design of the area part of the requirement was that there would be this commercial area, with all of the time and effort put forth to make that designation why is it so easy to ignore it?**
   - It is definitely not easy to change the designation; we have to go through public hearings with both the planning commission and then the city council. Also, there has been an economical

analysis of land inventory done of the viability of this as a commercial business location. Commercial development needs a certain level of population to provide enough customers to achieve the proper rents. The City has a shortage of residential lands, particularly if the Brookman annexation does not move forward. The strong need for residential land outweighed the limited commercial need.

5. **Are you planning to move forward with this even though the roads aren't ready for it/aren't taken care of?**
   - We will need to do a Traffic Study to show that this project will not make things worse. Most of the traffic study is about the impacts to intersections so it will look at how intersections in the area will react and whether any mitigation is needed. It may show that a stop sign or turn lane or something like that may be needed to ensure that the project does not make any intersections fall below performance standards.
6. **What is the projected completion date of the Traffic Study?**
   - It will have to be part of the Land Use Application for the subdivision.
7. **What about environmental Impact?**
   - We have to go through Clean Water Services for stormwater review and for the protection of the drainageway and wetlands. This will require wetland delineation and service provider letters. The wetland delineation to show what regulatory buffers are supposed to be and the impacts we are proposing like the bridge crossing.
8. **100 year flood plain?**
   - It is not within the 100 year flood plain.
9. **Estimated target date for first build?**
   - The first stage (namely infrastructure) consisting of when the pipes go into the ground is expected to begin next summer and then homes will follow that – all expected to be done in one phase.
10. **Is the developer (Venture) associated with a builder?**
    - Venture Properties is primarily associated with Stone Bridge Homes and anticipate them as the builder again. Locally owned builder.
11. **Where is all of the traffic going to go?**
    - Not too many options – they will have to go either Elwert Road or Edy Road.
12. **Value of commercial – convenience store or coffee shop?**
    - Originally, there was a thought to put something like that in but with the traffic issues on Elwert Road you would be putting even more traffic on Elwert Road. It does not benefit the community as much as it was thought. Elwert Road is not designed to be a pedestrian street.
13. **The people that come through the area are using it already as a bypass from Hillsboro, isn't there something that could be added (commercially like a McDonald's or something) that would benefit the people who actually live in the area without creating more traffic then there already is?**
    - Commercial developers cannot make it work – it isn't a viable option for them. Drive by commercial is more appropriate on Highway 99W. That type of use would make Elwert worse and not provide much of a neighborhood benefit.
14. **Is there any concern about access off of Copper Terrace?**
    - Yes, we are trying to minimize the number of lots that are accessed from or front onto Copper Terrace because it is less than ideal. There is an existing water quality facility that will prevent certain lots from being accessed on internal streets/cul-de-sacs. It creates a pinch point.
15. **Is there street parking on Copper Terrace or the internal streets?**

- There is on-street parking on the internal streets on one side and parking on the non-school side of Copper Terrace.

16. **Why do you need off-street parking?**
    - It is just good for a community to have lots of parking options for visitors, etc.
17. **How many homes are proposed?**
    - Currently proposed at 85. This may go up or down by a lot, but should be close.
18. **Is there a standard rule for the number of homes and maximum capacity in the school?**
    - Oregon Land Use does not tie school capacity and land use review together.
19. **This is in the City limits?**
    - Yes
20. **What are the next steps?**
    - We are proposing two applications – in the next couple of weeks we will submit the zone change/comprehensive plan amendment application which will request a change from commercial to residential. After submitting that application we will submit a subdivision application. They will overlap, but the zone change will go first. The subdivision will show the commercial land at tracts for future re-platting.

Sincerely,
AKS ENGINEERING & FORESTRY, LLC

Mimi Doukas, AICP, RLA
Planning Project Manager

NEIGHBORHOOD MEETING SIGN IN SHEET

Proposed Project: Mandel Property - 85 lot Subdivision

Proposed Project Location: 21340 SW Elwert Rd - SE Corner of Edy & Elwert

Project Contact: Wm. Doukas - AKS 503-563-6151

Meeting Location: Edy Ridge Elementary School

Meeting Date: 7/21/15

Name	Address	E-Mail	Please identify yourself (check all that apply)			
			Resident	Property owner	Business owner	Other
PAUL CHRISTEN	18201 S.W. EDY RD SHERWOOD			X		
MARGARETA UMLAND	18605 S.W. Edy Sherwood			X		
ROB FAGLIANO	SHERWOOD SD (20250 SW CIPOLE RD, TUALATIN, OR)	rfagliano@sherwood.k12.or.us				X
Ron/Barbara Bennirk	21615 SW Elwert Rd Sherwood	rnbbenn@msn.com		X		
JEFF HILL	21644 SW OXFORD TERRACE	nutmegsrus@msn.com		✓		
Verena Schmidt	18107 S.W. Edy Rd 97140	sgarden1@frontier.com		✓		
DENNIS CHRISTEN	18201 SW EDY RD, SHERWOOD	ARTERZT@MSN		X		

Updated October 2010

NEIGHBORHOOD MEETING SIGN IN SHEET

Proposed Project: Mandel Property - 85 lot Subdivision

Proposed Project Location: 21340 SW Elwert Rd - SE Corner of Edy & Elwert

Project Contact: Wm. Doukas - AKS 503-563-6151

Meeting Location: Edy Ridge Elementary School

Meeting Date: 7/21/15

Name	Address	E-Mail	Please identify yourself (check all that apply)			
			Resident	Property owner	Business owner	Other
Mary Lowe	21660 SW Oxford Terrace.	mccarthy23@gmail.com		X		
Steve Reynolds	21880 SW Elwert	SREYNOLD@CH2M.com		X		
Joan Reynolds	21880 SW ELWERT	SBR323@AOL.COM		✓		
Joy Dickover	16541 SW Daylily St	team-jd@kw.com		✓	✓	
Kimberly Merrill	21591 SW Derby Terr.	kimberly.merrill72@gmail.com		✓		
Jeff Roberts	15373 SW Sunset Blvd	jeff@crandallgroup.com	X			
James Bryant & Jennifer Ballard	20762 SW Trails End	James1Bryant@frontier.com	X	X		

Updated October 2010

NEIGHBORHOOD MEETING SIGN IN SHEET

Proposed Project: Mandel Property - 85 lot Subdivision

Proposed Project Location: 21340 SW Elwert Rd - SE Corner of Edy & Elwert

Project Contact: Wm. Doukas - AKS 503-563-6151

Meeting Location: Edy Ridge Elementary School

Meeting Date: 7/21/15

Name	Address	E-Mail	Please identify yourself (check all that apply)			
			Resident	Property owner	Business owner	Other
Leonard Bolen	21588 SW Oxford Terrace	jr_bolen@hotmail.com	✓			
Margo Weinberger	20885 SW Trails End Dr. Sherwood		✓	✓		

Updated October 2010

SHERWOOD SCHOOL DISTRICT FACILITY USE AGREEMENT

Office Use Only	*Event Schedule #*
Invoice #	

Submit application to Maintenance Dept **AT LEAST TWO WEEKS** prior to use.

ACTIVITY/EVENT: Neighborhood Meeting SCHOOL REQUESTED: Edy Ridge Elementary

ORGANIZATION: AKS Engineering & Forestry [X] ONE TIME USE [ ] RECURRING EVENT

Start Date:	07/21/15	S M [T] W Th F S	PM 5:30 AM	to	PM 8:00 AM	[ ] Weekly
End Date:	07/21/15	S M [T] W Th F S				[ ] Monthly

Responsible Party (**Must be present at event**): Mimi Doukas - AKS Eng. SSD Employee? **Yes** [**No**]

Address: 12965 SW Herman Road, Suite 100 Phone: 503-563-6151

Alternate Contact: Matt Scheidegger Phone: 503-563-6151

E-Mail: Mimi Doukas (MimiD@aks-eng.com) Matt Scheidegger (scheideggerm@aks-eng.com)

	Elementary School *(circle one)* **Archer Glen Edy Ridge Hopkins Middleton**		**Middle School** *(circle one)* **Laurel Ridge Sherwood Middle School**		**Sherwood High School**
X	Cafeteria		Cafeteria		Commons
	M.P.R. (Hopkins)		Commons (S.M.S.)		Classroom(s) #
	Stage		Classroom(s) #		Media Center
	Classroom(s) #		Media Center		Kitchen **
	Pod #		Kitchen **		Instrumental Music Room
	Media Center		Upper Gym/Auditorium (S.M.S.)		Vocal Music Room
	Kitchen **		Stage		Performing Arts Center
	Covered Play Area		Gym		Main Gym
	Gym		Gym 2 (S.M.S.)		Auxiliary Gym
	Small Gym (Hopkins)		Staff Room		Upper Gym
	Staff Room		Front Lawn		Dance Room
	Front Lawn		Track		Staff Room
	P.E. Field		Baseball Field		Stadium/Track
	Baseball Complex		Football Field		Upper Baseball Field
	Community Room (Ridge Campus)		Community Room (Ridge Campus)		Upper Soccer Field
	Other:		Front Entrance Lobby		Lower Baseball/Practice Field
			Tennis Courts		Softball Complex
			Other:		Community Room
					Other:

****NOTE:** All Kitchen use must be approved in advance by the Food Service Director. A District kitchen staff member ***must*** be present and will be paid their current hourly rate.

For special arrangements (i.e.: A/V equipment use, tables and chairs) **contact school office** for assistance.

INSURANCE REQUIRED PRIOR TO USE: [X] Insurance Certificate Attached [ ] On File at SSD

- We agree to be responsible for safeguarding the facilities used for this activity and for payment of all charges. We understand that facility fees (other than key deposits) are NON-REFUNDABLE, except at the Superintendent's discretion. We further agree that the school property will be used in accordance with the policies and regulations of Sherwood School District 88J.

Revised Mar 2013

- If the premises are to be used outside the District's regular custodial work hours, we agree that a District employee, approved by the District, will be on duty for security and clean up. If a kitchen is used, the head cook or designee will be hired to supervise and secure the equipment and facility.
- We understand that smoking is prohibited and that alcoholic beverages are not permitted on school property. Further, anyone participating in activities in a gymnasium must wear gym shoes with non-marking soles. We agree that if any of these policies or regulations are violated, we will be prohibited from further use of the District's facilities.
- We will be responsible for the conduct of the individuals associated with our activity while using the school facilities. We will assume the cost of repairing any damage to the premises or equipment. As the lessee, we agree to indemnify and save harmless the District from all liability, expense, cost or damage which may be claimed against or incurred or suffered by the District as a result of negligence of the lessee, its members, officers, agents, employees or invitees, resulting in bodily injury to any person or persons or property damage to their personal property or damage to District property and occurring in connection with lessee's use of the facility.
- All users of District facilities shall comply with all federal, state and municipal equal opportunity laws and regulations prohibiting discrimination. We agree to not discriminate against a qualified individual with a disability. We agree to provide a qualified individual with a disability an opportunity to participate in or benefit from the aid, benefit, or service that is equal to that afforded others involved in our program or activity.

ASBESTOS HAZARD EMERGENCY RESPONSIBLE ACT of 1987 – PUBLIC LAW #99-519

Sherwood School District 88J buildings have been inspected for asbestos and all were found to be in excellent condition. The District is required by the AHERA agencies to insure the safety of the students, staff and the general public. Periodic surveillance takes place every six months to ensure that those areas containing ACM's (asbestos-containing materials) are safe and non-friable. An initial investigation indicated very small amounts of asbestos located in non-teaching areas of Hopkins Elementary, Sherwood middle School and Sherwood High School. Those areas are not readily accessible, except to District Custodial and Maintenance personnel who receive on-going special training in asbestos handling. More information is available at each school and at SSD Maintenance.

WE (THE UNDERSIGNED) HEARBY ACKNOWLEDGE THAT WE HAVE READ, UNDERSTAND AND AGREE TO THE TERMS AND PROVISIONS OF THIS FACILITY USE AGREEMENT. WE HAVE ATTACHED THE APPROPRIATE PAYMENT & INSURANCE INFORMATION.

_____ 7/15/15

Signature of Authorized User Date

_____ _____

Building Coordinator – Facilities Use

I acknowledge I have reviewed this application and any attachments, for compliance & accuracy, and arranged for Custodial assistance.

PARTICIPANT INFORMATION:

Estimated # Participants 10-20 # of Adult Sherwood Residents _____ # Sherwood Students _____

Estimated # Spectators _____ Admission Charges _____ Tuition per Student _____

****INCLUDE FEES WITH APPLICATION** – see fee schedule here:

https://docs.google.com/spreadsheet/pub?key=0Ak3V9kft7p3pdHItSmtZQ3gzUlE4c2F6VGJWd3FTaHc&output=html

Principal _____ Date _____

Maintenance Coordinator _____ Date _____

In case of emergency or lock out on day of event please call: 1st (971)570-9484 or 2nd (971)563-1099

Please PRINT a copy of this form for your records.

Office Use Only:

E-mail & Emergency Number Confirmation: _____ *Custodian Assigned:* _____ *Invoice to Finance:* _____

Revised Mar 2013

OP ID: NP

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY) 07/14/2015

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER
Leonard Adams Insurance, Inc.
5201 SW Westgate Dr, Suite 300
Portland, OR 97221
Joe Riter

CONTACT NAME:
PHONE (A/C, No, Ext):
FAX (A/C, No):
E-MAIL ADDRESS:
PRODUCER CUSTOMER ID #: AKSEN-1

INSURED
AKS Engineering & Forestry, LLC;AKS Engineering & Forestry Salem-Keizer LLC;AKS Engineeri & Forestry Vancouver LLC
12965 SW Herman Rd STE 100
Tualatin, OR 97062

INSURER(S) AFFORDING COVERAGE	NAIC #
INSURER A : American Fire & Casualty Compa	24066
INSURER B : Ohio Casualty Insurance Co	24074
INSURER C :	
INSURER D :	
INSURER E :	
INSURER F :	

COVERAGES CERTIFICATE NUMBER: REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
	GENERAL LIABILITY						EACH OCCURRENCE	$ 1,000,000
A	X COMMERCIAL GENERAL LIABILITY			BKA55413848	01/25/2015	01/25/2016	DAMAGE TO RENTED PREMISES (Ea occurrence)	$ 1,000,000
	CLAIMS-MADE X OCCUR						MED EXP (Any one person)	$ 15,000
A	X Stop Gap $1mill						PERSONAL & ADV INJURY	$ 1,000,000
A	X EPL $100,000						GENERAL AGGREGATE	$ 2,000,000
	GEN'L AGGREGATE LIMIT APPLIES PER:						PRODUCTS - COMP/OP AGG	$ 2,000,000
	POLICY X PRO-JECT LOC						Emp Ben.	$ 1,000,000
	AUTOMOBILE LIABILITY						COMBINED SINGLE LIMIT (Ea accident)	$ 1,000,000
A	X ANY AUTO			BAA55413848	01/25/2015	01/25/2016	BODILY INJURY (Per person)	$
	ALL OWNED AUTOS						BODILY INJURY (Per accident)	$
	SCHEDULED AUTOS						PROPERTY DAMAGE (PER ACCIDENT)	$
A	X HIRED AUTOS			BAA55413848	01/25/2015	01/25/2016		$
A	X NON-OWNED AUTOS			BAA55413848	01/25/2015	01/25/2016		$
								$
	X UMBRELLA LIAB X OCCUR						EACH OCCURRENCE	$ 5,000,000
B	EXCESS LIAB CLAIMS-MADE			USO55413848	01/25/2015	01/25/2016	AGGREGATE	$ 5,000,000
	DEDUCTIBLE							$
	X RETENTION $ 10,000							$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N						WC STATU-TORY LIMITS OTH-ER	
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH)	N / A					E.L. EACH ACCIDENT	$
	If yes, describe under DESCRIPTION OF OPERATIONS below						E.L. DISEASE - EA EMPLOYEE	$
							E.L. DISEASE - POLICY LIMIT	$
A	Equipment Floater			BMO55413848	01/25/2015	01/25/2016	Equip TIV	351,132

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER

SHERWO1

Sherwood School District
20250 SW Cipole Rd
Tualatin, OR 97062

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Joe Riter

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SHERWOOD SCHOOL DISTRICT FACILITY USE AGREEMENT

Office Use Only	*Event Schedule #*
Invoice #	

Submit application to Maintenance Dept AT LEAST TWO WEEKS prior to use.

ACTIVITY/EVENT: Neighborhood Meeting SCHOOL REQUESTED: Edy Ridge Elementary

ORGANIZATION: AKS Engineering & Forestry [X] ONE TIME USE [ ] RECURRING EVENT

Start Date:	07/21/15	S M [T] W Th F S	PM 5:30 AM	to	PM 8:00 AM	[ ] Weekly
End Date:	07/21/15	S M [T] W Th F S				[ ] Monthly

Responsible Party (Must be present at event): Mimi Doukas - AKS Eng. SSD Employee? Yes [No]

Address: 12965 SW Herman Road, Suite 100 Phone: 503-563-6151

Alternate Contact: Matt Scheidegger Phone: 503-563-6151

E-Mail: Mimi Doukas (MimiD@aks-eng.com) Matt Scheidegger (scheideggerm@aks-eng.com)

	Elementary School *(circle one)* Archer Glen Edy Ridge Hopkins Middleton		Middle School *(circle one)* Laurel Ridge Sherwood Middle School		Sherwood High School
X	Cafeteria		Cafeteria		Commons
	M.P.R. (Hopkins)		Commons (S.M.S.)		Classroom(s) #
	Stage		Classroom(s) #		Media Center
	Classroom(s) #		Media Center		Kitchen **
	Pod #		Kitchen **		Instrumental Music Room
	Media Center		Upper Gym/Auditorium (S.M.S.)		Vocal Music Room
	Kitchen **		Stage		Performing Arts Center
	Covered Play Area		Gym		Main Gym
	Gym		Gym 2 (S.M.S.)		Auxiliary Gym
	Small Gym (Hopkins)		Staff Room		Upper Gym
	Staff Room		Front Lawn		Dance Room
	Front Lawn		Track		Staff Room
	P.E. Field		Baseball Field		Stadium/Track
	Baseball Complex		Football Field		Upper Baseball Field
	Community Room (Ridge Campus)		Community Room (Ridge Campus)		Upper Soccer Field
	Other:		Front Entrance Lobby		Lower Baseball/Practice Field
			Tennis Courts		Softball Complex
			Other:		Community Room
					Other:

**NOTE: All Kitchen use must be approved in advance by the Food Service Director. A District kitchen staff member *must* be present and will be paid their current hourly rate.

For special arrangements (i.e.: A/V equipment use, tables and chairs) contact school office for assistance.

INSURANCE REQUIRED PRIOR TO USE: [X] Insurance Certificate Attached [ ] On File at SSD

- We agree to be responsible for safeguarding the facilities used for this activity and for payment of all charges. We understand that facility fees (other than key deposits) are NON-REFUNDABLE, except at the Superintendent's discretion. We further agree that the school property will be used in accordance with the policies and regulations of Sherwood School District 88J.

Revised Mar 2013

- If the premises are to be used outside the District's regular custodial work hours, we agree that a District employee, approved by the District, will be on duty for security and clean up. If a kitchen is used, the head cook or designee will be hired to supervise and secure the equipment and facility.
- We understand that smoking is prohibited and that alcoholic beverages are not permitted on school property. Further, anyone participating in activities in a gymnasium must wear gym shoes with non-marking soles. We agree that if any of these policies or regulations are violated, we will be prohibited from further use of the District's facilities.
- We will be responsible for the conduct of the individuals associated with our activity while using the school facilities. We will assume the cost of repairing any damage to the premises or equipment. As the lessee, we agree to indemnify and save harmless the District from all liability, expense, cost or damage which may be claimed against or incurred or suffered by the District as a result of negligence of the lessee, its members, officers, agents, employees or invitees, resulting in bodily injury to any person or persons or property damage to their personal property or damage to District property and occurring in connection with lessee's use of the facility.
- All users of District facilities shall comply with all federal, state and municipal equal opportunity laws and regulations prohibiting discrimination. We agree to not discriminate against a qualified individual with a disability. We agree to provide a qualified individual with a disability an opportunity to participate in or benefit from the aid, benefit, or service that is equal to that afforded others involved in our program or activity.

ASBESTOS HAZARD EMERGENCY RESPONSIBLE ACT of 1987 – PUBLIC LAW #99-519

Sherwood School District 88J buildings have been inspected for asbestos and all were found to be in excellent condition. The District is required by the AHERA agencies to insure the safety of the students, staff and the general public. Periodic surveillance takes place every six months to ensure that those areas containing ACM's (asbestos-containing materials) are safe and non-friable. An initial investigation indicated very small amounts of asbestos located in non-teaching areas of Hopkins Elementary, Sherwood middle School and Sherwood High School. Those areas are not readily accessible, except to District Custodial and Maintenance personnel who receive on-going special training in asbestos handling. More information is available at each school and at SSD Maintenance.

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_____ _____

Signature of Authorized User Date

_____ _____

Building Coordinator – Facilities Use

I acknowledge I have reviewed this application and any attachments, for compliance & accuracy, and arranged for Custodial assistance.

PARTICIPANT INFORMATION:

Estimated # Participants ___10-20___ # of Adult Sherwood Residents _____ # Sherwood Students _____

Estimated # Spectators _____ Admission Charges _____ Tuition per Student _____

**INCLUDE FEES WITH APPLICATION – see fee schedule here:

https://docs.google.com/spreadsheet/pub?key=0Ak3V9kft7p3pdHItSmtZQ3gzUlE4c2F6VGJWd3FTaHc&output=html

Principal _____ Date _____

Maintenance Coordinator _____ Date _____

In case of emergency or lock out on day of event please call: 1st (971)570-9484 or 2nd (971)563-1099

Please PRINT a copy of this form for your records.

Office Use Only:

E-mail & Emergency Number Confirmation: _____ *Custodian Assigned:* _____ *Invoice to Finance:* _____

Revised Mar 2013

Affidavit of Mailing

DATE: 07-07-15

STATE OF OREGON)
)
Washington County)

I, Connor Huske, representative for the Mandel Subdivision proposed development project do hereby certify that the attached notice to adjacent property owners and recognized neighborhood organizations that are within 1,000 feet of the subject project, was placed in a U.S. Postal receptacle on 07-07-15.

Representatives Name: Connor Huske
Name of the Organization: AKS Engineering and Forestry

Exhibit G: Natural Resources Assessment

TUALATIN · VANCOUVER · SALEM
12965 SW HERMAN RD., SUITE 100 · TUALATIN, OR 97062
AKS ENGINEERING & FORESTRY
WWW.AKS-ENG.COM
P: (503) 563-6151 F: (503) 563-6152

Natural Resource Assessment

To: Clean Water Services Environmental Plan Review

From: Lindsey Obermiller, Natural Resource Specialist and Stacey Reed, Senior Wetland Scientist

CC: Kelly Ritz, Venture Properties

Date: 10/12/2015

Re: Mandel Property Sensitive Area and Vegetation Corridor
SW Elwert Road and SW Edy Road, Washington County, Oregon
Tax Map 2S 1S 30CB, Tax Lot 250

Introduction and Background

AKS Engineering and Forestry, LLC (AKS) was contracted by Venture Properties to conduct a wetland and waters delineation and natural resource assessment on Tax Lot 250 of Tax Map 2S 1W 30CB, located in Sherwood, Washington County, Oregon (attached Figures 1 and 2). The study area, referred to as the Mandel Farm Subdivision, is approximately 21.21 acres in size. The boundary of a 1.34-acre palustrine emergent wetland (PEM) and 0.20-acre of a perennial tributary to Chicken Creek were delineated on the site. The slopes adjacent to the wetland and/or perennial tributary (whichever is the outer resource) are greater than 25% in the northern portion of the site, requiring the vegetated corridor to extend 35 feet past the break in slope to less than 25%. The slopes adjacent to the wetland in the southern portion of the site are less than 25%, requiring a 50-foot wide vegetated corridor.

The project includes a residential subdivision. Site development will result in permanent vegetated corridor encroachment for a pedestrian crossing, surface stormwater infrastructure, and retaining walls, requiring a Tier 1 Alternatives Analysis review. On-site replacement vegetated corridor mitigation is proposed to offset the permanent vegetated corridor encroachment. This memo has been prepared to meet Clean Water Services' (CWS') natural resource assessment requirements listed under Chapter 3 of the June 2007 (amended in 2008) R&O Design and Construction Standards.

Existing Conditions

The wetlands associated with the perennial tributary to Chicken Creek flow in a northerly direction through the center of the site. A home and barn exist in the southern portion of the site. Agricultural wheat fields were present throughout the majority of the site. A narrow forested riparian upland area was present adjacent to the tributary in the northern portion of the site. The forested community is generally dominated by big leaf maple (*Acer macrophyllum*), western red cedar (*Thuja plicata*), and Douglas fir (*Pseudotsuga menziesii*). A culvert exists on the northwest corner of the intersection of SW Elwert Road and SW Edy Road.

According to the Natural Resources Conservation Service's (NRCS') soil survey map for Washington County, Oregon, the following soil units are mapped within the study area (Figure 3):

- Unit 22-Huberly silt loam, hydric;
- Unit 45A – Woodburn silt loam, 0% to 3% slopes, non-hydric; with 1% hydric Dayton inclusions in terraces;
- Unit 45B- Woodburn silt loam, 3% to 7% slopes, non-hydric; with 1% hydric Dayton inclusions in terraces;
- Unit 45C – Woodburn silt loam, 7% to 12% slopes, non-hydric;
- Unit 46F-Xerochrepts and Hapioxerolis, very steep, non-hydric; and
- Unit 43-Wapato silty clay loam, hydric.

The study area is not included on the City of Sherwood Local Wetland Inventory (LWI) map.

Topography on the site consists of a gradual slope toward the on-site tributary and wetland in the central portion of the site. Neighboring land use consists of rural residential, agriculture, and Laurel Ridge Middle School to the east of the property.

Water Quality Sensitive areas

Senior Wetland Scientist Stacey Reed and Natural Resource Specialist Lindsey Obermiller conducted site visits on July 28, 2015 to delineate current site conditions. The methodology used for determining the presence of wetlands and for delineating wetland boundaries followed the U.S. Army Corps of Engineers' (Corps') *Wetlands Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0).* Soils, vegetation, and indicators of hydrology were recorded at six paired plots for a total of 12 sample plot locations (see Attachment A). Wetland, water boundaries, and Plots 1-12 were flagged in the field and their locations were professionally land surveyed and mapped by AKS, as shown on Existing Conditions Figures 4 and 5. The investigation determined that a total of 1.54 acres of resources were present on the site (1.34 acres of wetland and 0.20 acres of perennial waters).

A Department of Land Services (DSL) concurred wetland delineation is on record for this site (DSL File #WD-2007-0180; Attachment B). This delineation was completed in 2007 for the development of Laurel Ridge Middle School to the east of the project site, and expired in 2012. The 2007 wetland delineation determined 1.49 acres of wetland and waters were present on the site. AKS' site visit determined wetland conditions were very similar to conditions delineated in 2007.

Wetlands

The wetlands on the site are floodplain wetlands associated with the perennial tributary to Chicken Creek and therefore belong to the Riverine Flow-Through hydrogeomorphic (HGM) subclass. The dominant vegetation community found within the wetland included Pacific ninebark (*Physocarups capitatus*, FACW), Western red cedar (*T. plicata*, FAC), willow (*Salix* species, FAC), reed canary grass (*Phalaris arundinacea*, FACW), lady fern (*Athyrium angustum*, FAC), and yellow skunk cabbage (*Lysichiton americanus*, OBL), as represented by data observed in Plots 2, 3, 5, 7, 9, and 11. English Ivy (*Hendera helix*, FACU) and Himalayan blackberry (*Rubus armeniacus*, FACU) encroachment was also present in many wetland plots, due to established invasive populations in the adjacent upland areas.

Soil saturation was present in the surface 12-inches during our summer 2015 site visits at Plots 3, 5, 9, and 11. Plots 2 and 7 had oxidized rhizospheres associated with living roots and was located on the floodplain bench associated with the tributary. Hydric Redox Dark Surface (F6) indicator was present at all wetland plots, as well as one plot (Plot 9) that met the hydric Depleted Matrix (F3) indicator.

The wetland boundary was delineated based on a change in the plant community from a hydrophytic-dominated vegetation community in wetland to a non-hydrophytic-dominated vegetation community in upland (reed canarygrass in wetland to wheat fields in upland in the southern portion of the site; skunk cabbage/lady fern in wetland to bigleaf maple/sword fern/English ivy in upland in the northern portion of the site). The change in the vegetation community coincided with a distinct change in the landform from floodplain wetland to a convex hillslope landform in upland. Additionally, the adjacent upland lacked hydrology and hydric soils indicators, validating the delineated wetland boundaries.

Waters

An unnamed perennial tributary to Chicken Creek (which is a tributary to the Tualatin River) flows northeasterly through the wetland area delineated on the site. The creek exits the site in the northwest through a culvert located under the SW Edy Road and SW Elwert Road intersection. Within the southern upstream portions, the tributary is ditched (approximately 2-foot wide channel bed with 3-foot tall incised banks) and flows through reed canarygrass dominated wetland adjacent to a wheat field. The channel develops a more natural bed and bank in the central portion of the site (approximately 4-foot wide channel bed with 1-foot tall banks). No flow was present in the upstream portions of the channel during the July and August 2015 site visits. An average of approximately 4-inch deep continuous flow was present in the downstream portions of the channel on July 28, 2015. The dominant substrate consisted of silt loam with pockets of gravels in the downstream portions of the channel bed.

The ordinary high water mark (OHWM) was delineated based on physical field indicators observed during the July 2015 site visit. Heading northwest from the southern point of the tributary, much of the OHWM was indicated by a distinct top of bank, where the soils and vegetation would grow right up to the edge of the ditched creek. Heading towards the more meandering natural features of the creek in the center of the site, indicators of OHWM were observed along the top of the stream bank. The vegetation above the top of stream bank was dominated by wetland vegetation species.

Vegetated Corridor

Extent of On-Site Vegetative Corridor

The slopes adjacent to wetland in the southern portion of the site are less than 25%, requiring a 50-foot wide vegetated corridor. The slopes adjacent to wetland in the northern portion of the site are greater than 25%, requiring the vegetated corridor to extend beyond the break in slope to less than 25%. A stamped geotechnical report prepared by GeoPacific determined slope stability could be adequately maintained with a reduced 15-foot setback from the break in slope (see Attachment C). Approximately 183,164 square feet (4.20 acres) of vegetated corridor exists on the site.

Existing Condition of the Vegetated Corridor

Existing conditions of the vegetated corridor on site was observed and analyzed according to vegetated corridor standards of CWS, which are based on the presence of tree canopy and percent cover of native trees, shrubs, and groundcovers. The site visit to document the existing condition of on-site vegetated corridor was conducted on August 17, 2015.

Seven VECO plots were documented to describe the existing condition of on-site vegetated corridor. VECO Plots A-E were located west of wetland and VECO Plots F and G were located on the eastern side of the tributary/wetland.

The vegetation community within VECO Plot A consisted of the non-native cultivated wheat (*Tritcum aestivum*) with no canopy or shrub community. This community was generally present throughout vegetated

corridor in the southern portion of the site. VECO Plot A was determined to be in *degraded* condition, because it lacked a native community and tree canopy.

The vegetation community within VECO Plot B consisted of non-native and invasive Himalayan blackberry (*R. armeniacus*) thickets with no tree canopy or native shrub community and was also determined to be in *degraded* condition because it lacked a native community and tree canopy. This community was present adjacent to the eastern wetland boundary in the central portion of the site.

VECO Plot C documented the conditions of the corridor located in the central portion of the site, east of the tributary. This community was generally dominated by Douglas-fir (*P. menziesii*) and Himalayan blackberry (*R. armeniacus*). VECO plot C was determined to be in *degraded* condition, due to the understory being dominated by an invasive vegetation species and the site only 25% canopy cover.

VECO Plot D documents a non-native weedy forb and Himalayan blackberry community present adjacent to the northeastern wetland boundary, in the vicinity of the stormwater facility on tax lot 300. This community was dominated by common velvet grass (*Holcus lanatus*), Himalayan blackberry (*Rubus armeniacus*), Canadian thistle (*Cirsium arvense*), and orchard grass (*Dactylis glomerata*), with no canopy or native woody vegetation. Therefore, this community was determined to be in *degraded* condition.

The vegetation community within VECO Plot E (also upland Plot 12) consisted of a canopy dominated by big-leaf maple (*A. macrophyllum*) with lesser amounts of western red cedar (*T. plicata*) and red alder (*Alnus rubra*). The understory was dominated by a dense layer of English Ivy (*H. helix*). According to CWS standards, VECO Plot E was determined to be in *marginal* condition, due to only having 80% cover by native vegetation species (greater than 80% cover by native vegetation species is required for *good* condition corridor).

The vegetation community within VECO Plot F was located adjacent to wetland in the northern portion of the site, southwest of the tributary. This community was dominated by Douglas-fir (*P. menziesii*) overstory with mostly Pacific poison oak (*Toxicodendron diversilobum*) dominant throughout the understory. Holly-leaf Oregon grape (*Mahonia aquifolium*), California dewberry (*Rubus ursinus*), and sword fern (*Polystichum munitum*) were less dominant in the understory. According to CWS standards, this community would be determined to be in *good* condition, due to having greater than 50% tree canopy and greater than 80% cover by native vegetation species. However, AKS determined this community to be in *marginal* condition, as only 31% native vegetation community was present in the understory. The understory was also dominated by poison oak (a non-native species), which requires removal and replanting with native vegetation. This community was generally present throughout the majority of the vegetated corridor adjacent to the western side of the wetland in the northern portion of the site.

The vegetation community within VECO Plot G consisted of a non-native grass and herb community dominated by colonial bent (*Agrostis capillaris*), large sweet vernal grass (*Anthoxanthum odoratum*), Queen Anne's-lace (*Daucus carota*), and English plantain (*Plantago lanceolata*). This community was determined to be in *degraded* condition, because it lacked woody and native vegetation.

The location of vegetated corridor plots are shown in Figures 4 and 5. The VECO data sheets are included in Attachment D. Photos representing the existing condition of the vegetated corridors are included in Attachment E.

Project

Project Overview

A residential subdivision is proposed for the site that will include a total of 86 single-family lots. The project avoids impacts to wetlands and waters. Minimal unavoidable vegetated corridor encroachment is proposed. The site plan includes partial frontage improvements along the southern side of SW Edy Road and the eastern side of SW Elwert Road. The site plan is included as Figures 6 and 7.

Vegetated Corridor Impacts

The proposed site plan will result in a total of 8,387 square feet of permanent encroachment to vegetated corridor. Vegetated corridor encroachment is either an allowed use or does not exceed 30% of the corridor depth or 40% of the length, requiring a Tier 1 Alternatives Analysis. Permanent vegetated corridor impacts are described below:

1. A total of 1,369 square feet of permanent vegetated corridor impact is proposed for a pedestrian bridge crossing. An 8-foot wide by 120-foot long bridge will span the wetland and tributary to provide access across the sensitive areas. Bridge footings will not be placed in wetland. An 8-foot wide paved trail with 2-foot wide gravel shoulders will lead up to the bridge crossing. According to section 3.05.7 of CWS Design and Construction Standards R&O 07-20, pedestrian paths crossing a vegetated corridor from one side to the other to provide access across a sensitive area is allowed if impacts to the vegetated corridor are minimized through choice of mode, sizing, and placement, and replacement mitigation is provided in accordance with Section 3.08. The bridge will span an area where the width of the wetland, tributary, and vegetated corridor are narrowest. On-site replacement mitigation is proposed to mitigate for the bridge and paved trail impacts (total impacts will be mitigated, including full width of the path). Therefore, the permanent vegetated corridor impact associated with the pedestrian crossing is an allowed use.

2. Approximately 1,393 square feet of permanent vegetated corridor impact in the outer 5 feet of the vegetated corridor for the development of a cul-de-sac and a pedestrian trail is proposed. Retaining walls will be used to minimize vegetated corridor encroachment. On-site replacement mitigation is proposed.

3. Approximately 630 square feet of impact is proposed for grading within the outer 16% of vegetated corridor for construction of a stormwater facility. Grading will occur in *marginal* condition corridor and will result in a permanent change to existing contours. Therefore, the grading cannot be considered an allowed use. On-site replacement mitigation is proposed.

4. Approximately 130 square feet of permanent impact is proposed in the outer edges of vegetated corridor for partial frontage improvements along SW Edy Road. On-site replacement mitigation will offset the vegetated corridor impacts to occur in right-of-way.

5. Approximately 1,146 square feet of impact is proposed within the outer 30% of the 50-foot wide vegetated corridor in the southeast portion of the site for sidewalk improvements along SW Elwert Road. There are no alternatives to the location of development for the sidewalk. Vegetated corridor impacts will be minimized by the use of a retaining wall. On-site replacement mitigation is proposed. Therefore, the encroachment meets the criteria for acceptance listed under Section 3.07.3 of CWS Design and Construction Standards.

6. A total of approximately 156 square feet of permanent vegetated corridor impact is proposed for two riprap stormwater outfalls. Each outfall will not exceed 100 square feet. Therefore, according to Section

3.05.5, the outfalls in vegetated corridor are considered an allowed use and do not require replacement mitigation.

7. A total of approximately 3,704 square feet of permanent impact is proposed for a 3-foot wide soft foot path that will span the outer edge of the vegetated corridor in two locations from the pedestrian bridge crossing. One foot path starts on the east side of the pedestrian bridge crossing and extends along the vegetated corridor heading north and ends just before SW Eddy Road. The other foot path starts on the west side of the pedestrian bridge crossing and extends along the vegetated corridor heading south ending approximately 200-feet from the southwest corner of SW Elwert Road. According to Section 3.05.8, this encroachment is consider an allowed use since the pathway width does not exceed 12-feet, will not require the removal of native trees with greater than 6-inch diameter breast height (dbh), and is located in the outermost 40% of the vegetated corridor. No grading is proposed for the path. The path width will not extend beyond 3-feet; therefore, permanent encroachment does not require replacement mitigation.

The project will also result in a total of 5,330 square feet of temporary vegetated corridor impact. All temporarily impacted areas will be replanted to *good* condition, per the attached Planting Specification Tables (Attachment F).

Mitigation

Vegetated Corridor Mitigation

The project will result in an approximate total of 4,668 square feet of permanent vegetated corridor impact that requires mitigation. Therefore, 4,668 square feet of replacement vegetated corridor is planned to offset the permanent vegetated corridor encroachment. The proposed vegetated corridor replacement mitigation areas are broken up into several small areas adjacent to and continuous with existing vegetated corridor. The vegetated corridor replacement mitigation areas are shown on attached Figures 6 and 7. Vegetated corridor replacement mitigation areas are currently in *degraded* condition, requiring enhancement to *good* condition, per attached Mandel Farms Subdivision Planting Specification Tables (Attachment F).

Vegetated Corridor Enhancement

The site will have approximately 174,082 square feet of remaining on-site *degraded* and *marginal* condition vegetated corridor. The remaining 174,082 square feet of vegetated corridor and the 4,668 square feet of replacement mitigation area will be enhanced to *good* condition, per CWS standards.

The attached Mandel Farms Subdivision Planting Specification Tables (Attachment F) lists the recommended plant species and quantities. The planting table divides the 179,412 total square foot planting areas into "zones." Zone 1 represents approximately 114,382 square feet of areas that generally lacked tree canopy (e.g. areas dominated by Himalayan blackberry or wheat fields). Therefore, the vegetation species prescribed in Zone 1 are sun tolerant.

Zone 2 represents approximately 59,700 square feet of areas that generally contained some tree canopy. Therefore, the vegetation species prescribed for Zone 2 are more shade-tolerant species. Since the majority of Zone 2 contained existing mature trees, only a portion of the required number of tree plantings are proposed for Zone 2.

Zone 3 represents approximately 5,330 square feet of temporary impacted area due to construction of development. The vegetation species prescribed for Zone 3 are partial-tolerant species. Maps showing all three Zones can be found on attached Figures 8 and 9.

A protective easement will be required over Tracts F and D, which contain all wetlands, waters, remaining vegetated corridor, and vegetated corridor mitigation areas.

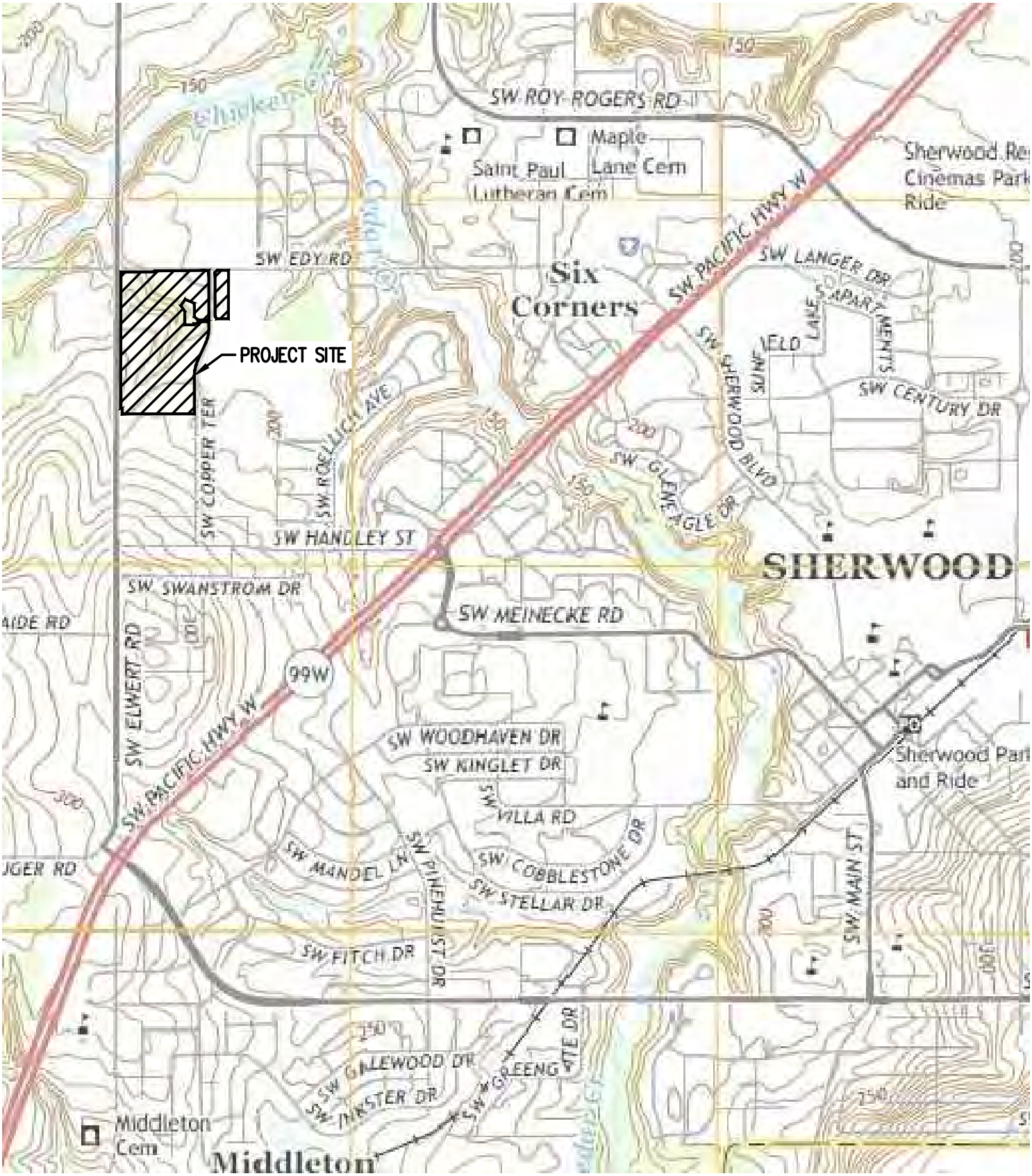
Please do not hesitate to contact us with any questions concerning this project.

Stacey Reed, PWS
Senior Wetland Scientist
Fieldwork and Report Review

Lindsey Obermiller
Natural Resource Specialist
Fieldwork and Report Preparation

List of Attached Figures
Figure 1. Vicinity Map
Figure 2. Tax Lot Map
Figure 3. Soils Map
Figures 4-5. Existing Conditions Plan
Figures 6-7. Site Plan
Figures 8-9. Vegetated Corridor Mitigation and Enhancement Planting by Zone Map

List of Attachments
Attachment A: Wetland Determination Data Sheets
Attachment B: WD#2007-0180 Wetland Delineation Concurrence Letter
Attachment C: Geotech Report from GeoPacific
Attachment D: VECO Data Sheets (VECO Plots A-F).
Attachment E: Representative Site Photographs
Attachment F: Mandel Farm Vegetated Corridor Mitigation and Enhancement Planting Specification Tables



PROJECT SITE

SCALE 1" = 1200 FEET

1200 0 480 720 960 1200

DATE: 10-08-2015

MANDEL FARM - NATURAL RESOURCE ASSESSMENT
VICINITY MAP

FIGURE 1

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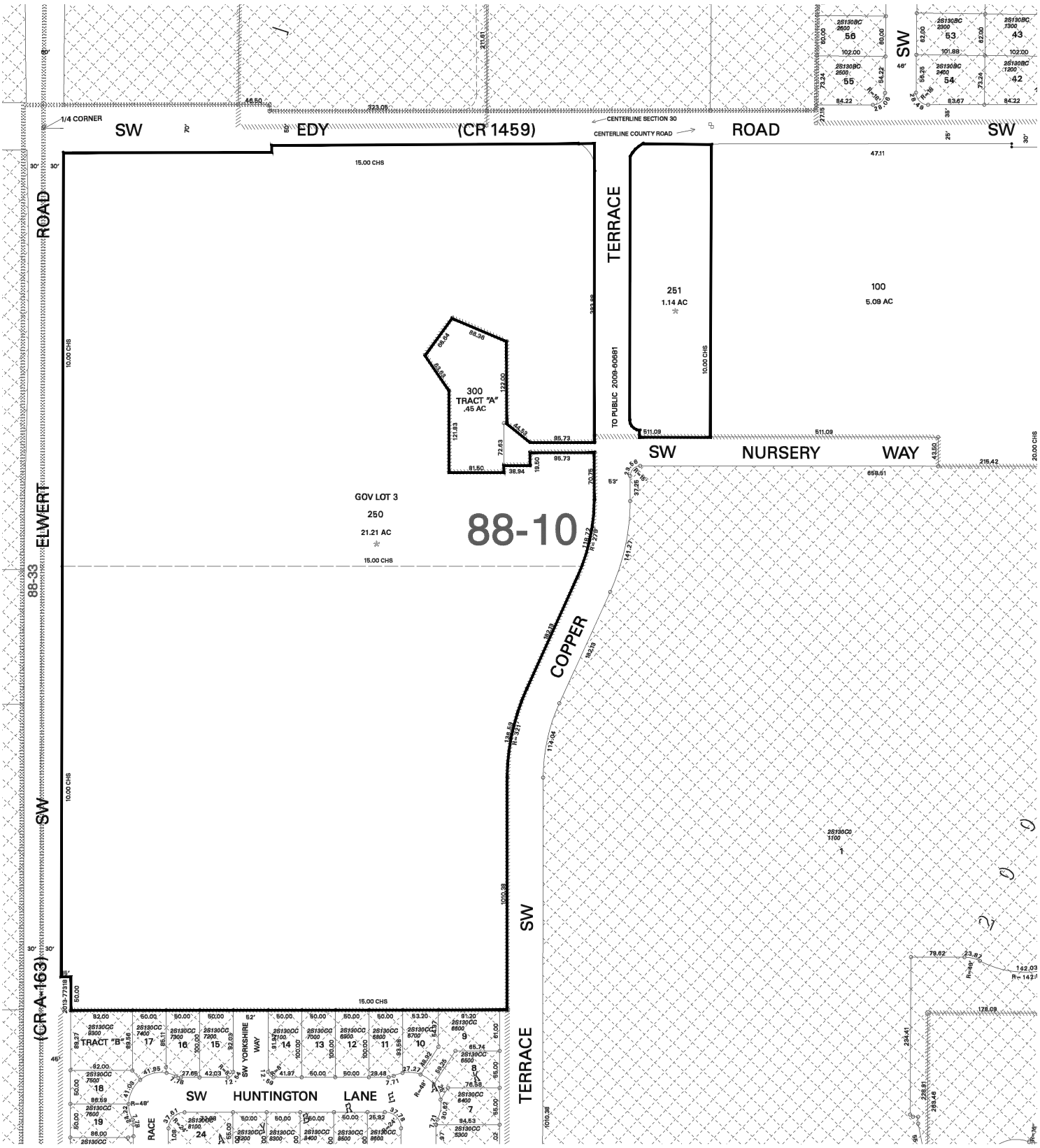
DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: 20150928 SPL MAPS | VICINITY



PROJECT SITE

SCALE 1" = 200 FEET

200 0 80 120 160 200

DATE: 10-08-2015

MANDEL FARM - NATURAL RESOURCE ASSESSMENT
TAX LOT MAP

FIGURE **2**

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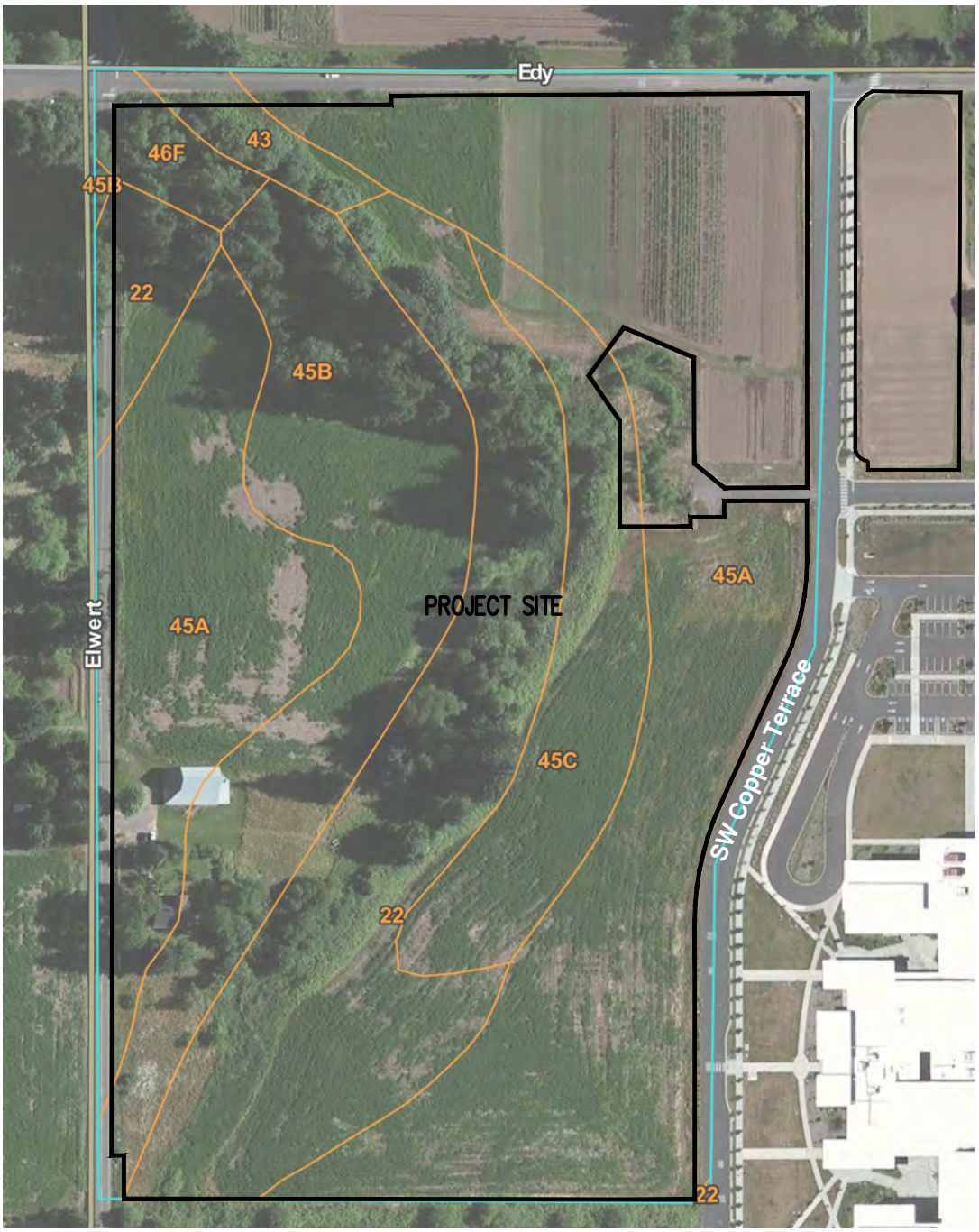
DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: 20150928 SPL MAPS | TAXLOT



NRCS WEB SOIL SURVEY FOR WASHINGTON COUNTY

MAP UNIT SYMBOL	MAP UNIT NAME
22	HUBERLY SILT LOAM (HYDRIC)
43	WAPATO SILTY CLAY LOAM (HYDRIC)
45A	WOODBURN SILT LOAM, 0%–3% SLOPES (NON–HYDRIC)
45B	WOODBURN SILT LOAM, 3%–7% SLOPES (NON–HYDRIC)
45C	WOODBURN SILT LOAM, 7%–12% SLOPES (NON–HYDRIC)
46F	XEROCHREPTS AND HAPLOXEROLLS (NON–HYDRIC)

DATE: 10–08–2015

PROJECT SITE

SCALE 1" = 200 FEET

200 0 80 120 160 200

MANDEL FARM - NATURAL RESOURCE ASSESSMENT
SOILS MAP

FIGURE **3**

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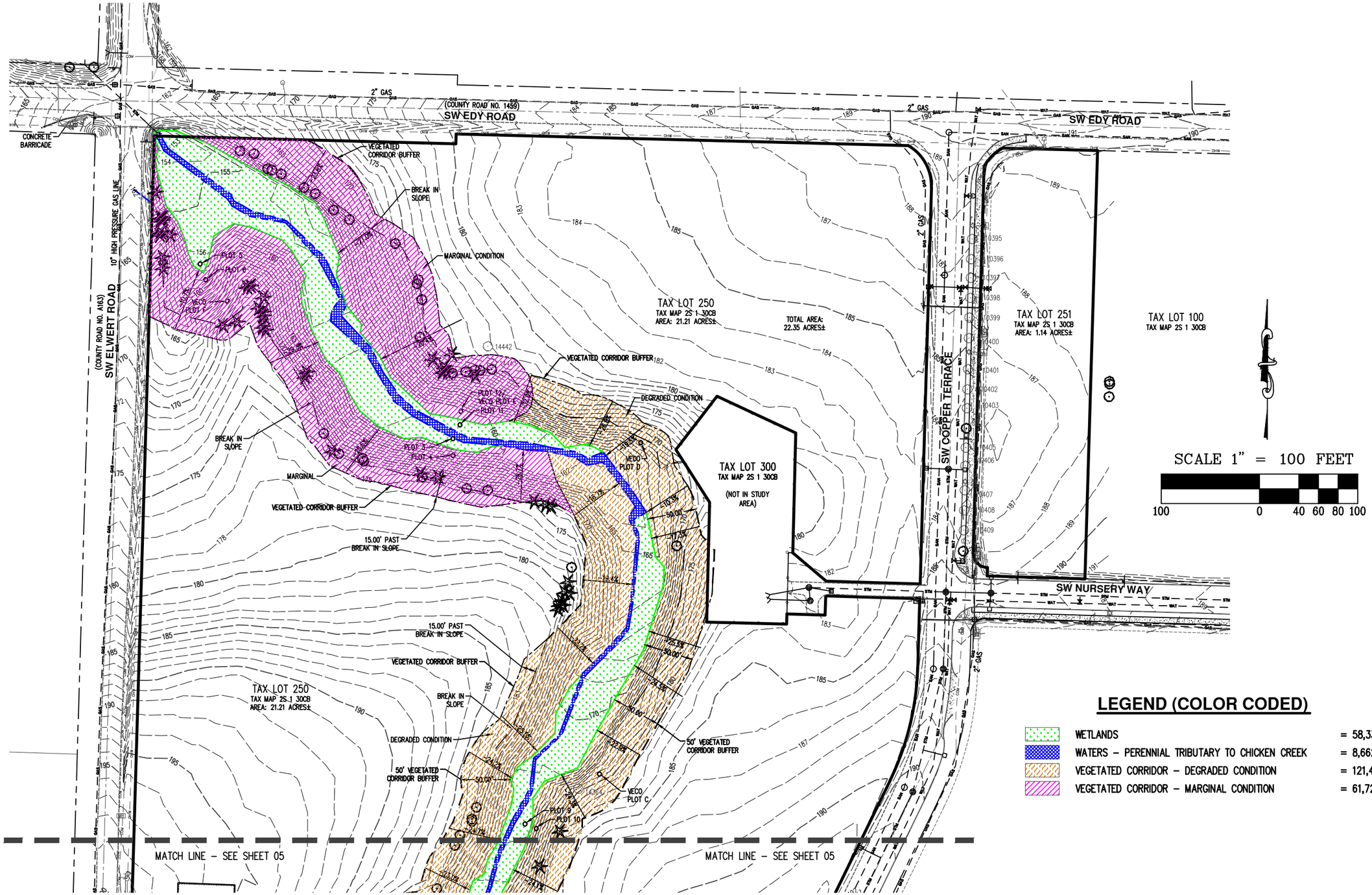
DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: 20150928 SPL MAPS | SOILS



LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS - PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±
VEGETATED CORRIDOR - DEGRADED CONDITION	= 121,436 SF±
VEGETATED CORRIDOR - MARGINAL CONDITION	= 61,728 SF±

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON
WASHINGTON COUNTY TAX MAP 2S 1 30CB
TAX LOTS 250 AND 251

VEGETATED CORRIDOR EXISTING CONDITIONS - NORTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 10-08-2015	

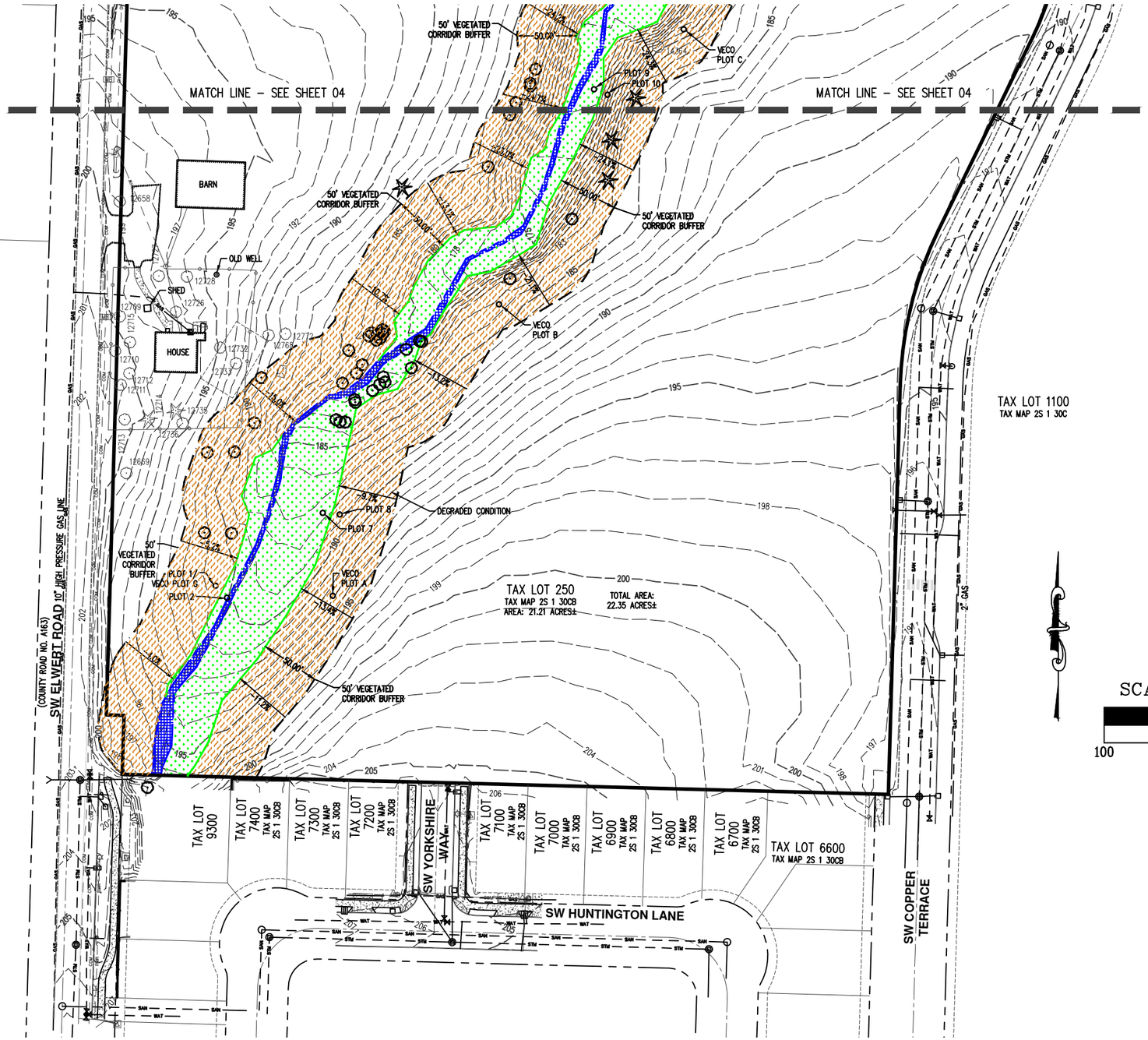
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
04

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC EXISTING CONDITIONS.DWG | LAYOUT: CWS 04



SCALE 1" = 100 FEET

100 0 40 60 80 100

LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS - PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±
VEGETATED CORRIDOR - DEGRADED CONDITION	= 121,436 SF±
VEGETATED CORRIDOR - MARGINAL CONDITION	= 61,728 SF±

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SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

VEGETATED CORRIDOR EXISTING CONDITIONS - SOUTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 10-08-2015	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

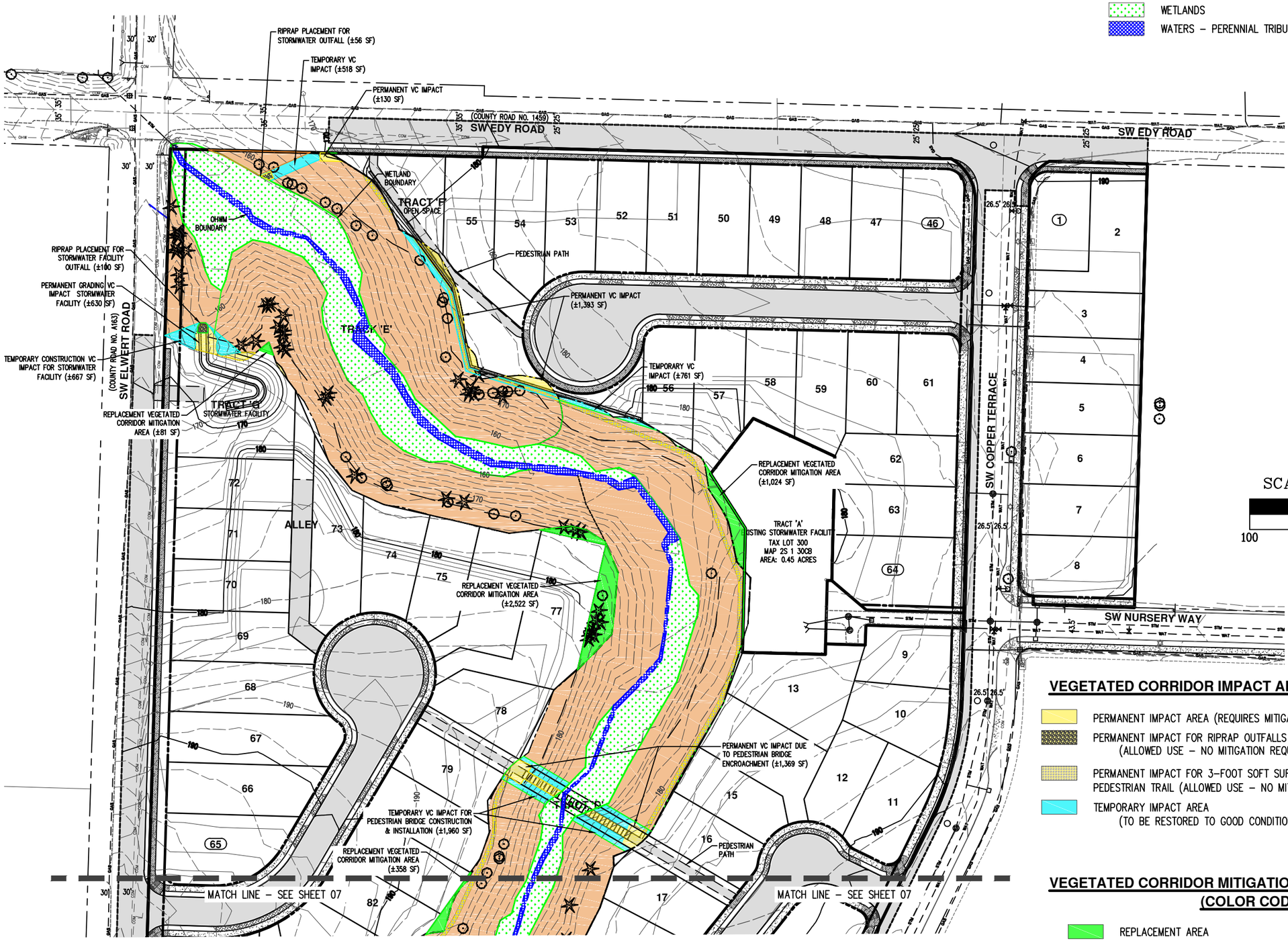
JOB NUMBER
4570

FIGURE
05

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC EXISTING CONDITIONS.DWG | LAYOUT: CMS 05

LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±



SCALE 1" = 100 FEET

100 0 40 60 80 100

VEGETATED CORRIDOR IMPACT AREAS (COLOR CODED)

PERMANENT IMPACT AREA (REQUIRES MITIGATION)	= 4,668 SF±
PERMANENT IMPACT FOR RIPRAP OUTFALLS – 2 LOCATIONS (ALLOWED USE – NO MITIGATION REQUIRED)	= 156 SF±
PERMANENT IMPACT FOR 3-FOOT SOFT SURFACE PEDESTRIAN TRAIL (ALLOWED USE – NO MITIGATION REQUIRED)	= 3,704 SF±
TEMPORARY IMPACT AREA (TO BE RESTORED TO GOOD CONDITION)	= 5,330 SF±

VEGETATED CORRIDOR MITIGATION/ENHANCEMENT AREAS (COLOR CODED)

REPLACEMENT AREA	= 4,668 SF±
ENHANCED AREA	= 169,414 SF±

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PROPOSED VC IMPACT & MITIGATION PLAN - NORTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 10-08-2015	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
06

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC MITIGATION PLAN.DWG | LAYOUT: CMS 06

LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±

SCALE 1" = 100 FEET

100 0 40 60 80 100

VEGETATED CORRIDOR IMPACT AREAS (COLOR CODED)

PERMANENT IMPACT AREA (REQUIRES MITIGATION)	= 4,668 SF±
PERMANENT IMPACT FOR RIPRAP OUTFALLS – 2 LOCATIONS (ALLOWED USE – NO MITIGATION REQUIRED)	= 156 SF±
PERMANENT IMPACT FOR 3-FOOT SOFT SURFACE PEDESTRIAN TRAIL (ALLOWED USE – NO MITIGATION REQUIRED)	= 3,704 SF±
TEMPORARY IMPACT AREA (TO BE RESTORED TO GOOD CONDITION)	= 5,330 SF±

VEGETATED CORRIDOR MITIGATION/ENHANCEMENT AREAS (COLOR CODED)

REPLACEMENT AREA	= 4,668 SF±
ENHANCED AREA	= 169,414 SF±

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30DB

PROPOSED VC IMPACT & MITIGATION PLAN - SOUTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 10-08-2015	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

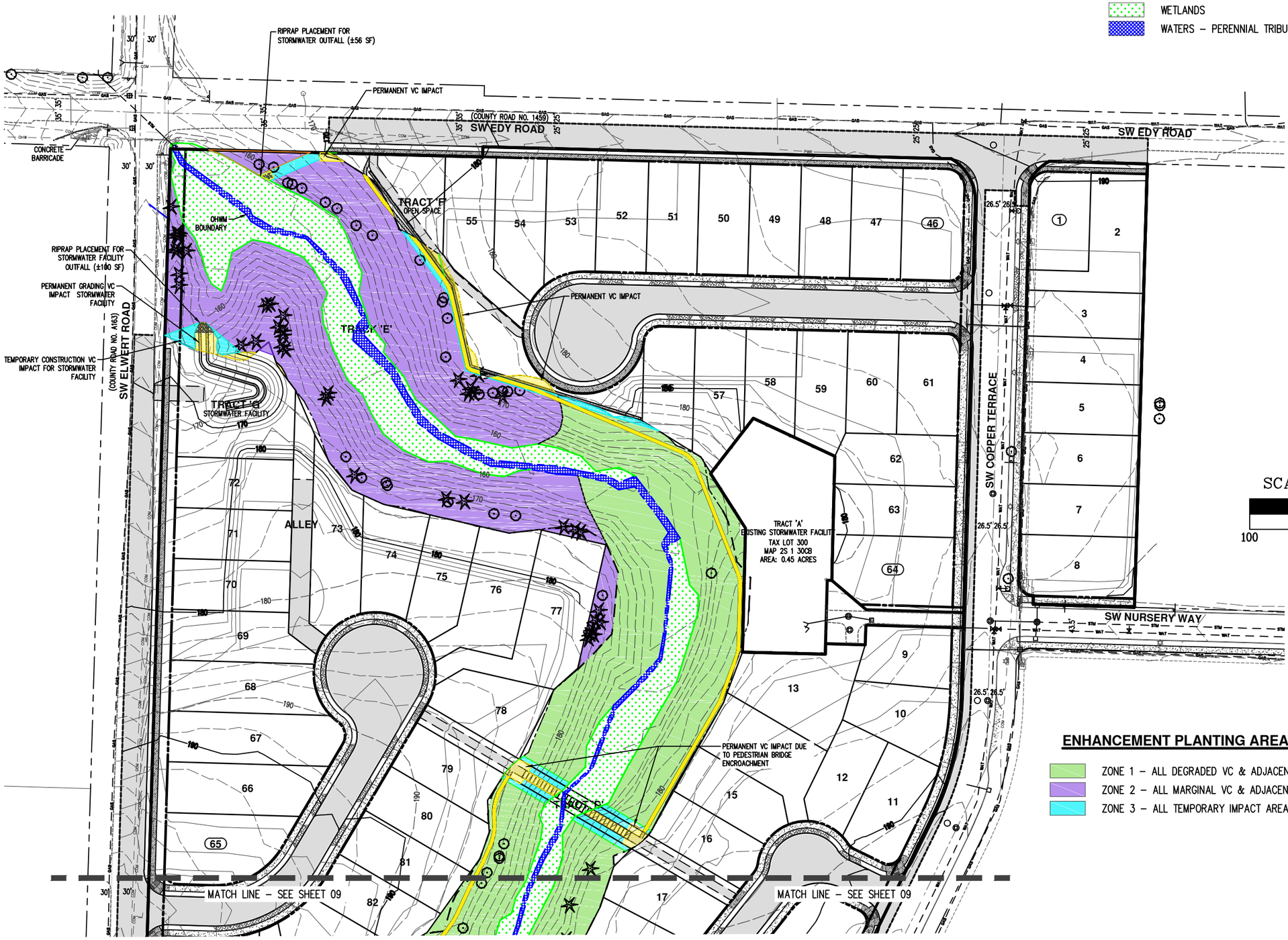
JOB NUMBER
4570

FIGURE
07

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC MITIGATION PLAN.DWG | LAYOUT: CWS 07

LEGEND (COLOR CODED)

- WETLANDS
- WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK



SCALE 1" = 100 FEET

100 0 40 60 80 100

ENHANCEMENT PLANTING AREAS (COLOR CODED)

ZONE 1 – ALL DEGRADED VC & ADJACENT VC REPLACEMENT AREAS	= 114,382 SF±
ZONE 2 – ALL MARGINAL VC & ADJACENT REPLACEMENT VC AREAS	= 59,700 SF±
ZONE 3 – ALL TEMPORARY IMPACT AREAS	= 5,330 SF±

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON

TAX LOTS 250 AND 251

WASHINGTON COUNTY TAX MAP 2S 1 30CB

VC ENHANCEMENT PLANTING LOCATIONS - NORTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 10-08-2015	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
08

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC PLANTING ENHANCE PLAN.DWG | LAYOUT: CWS 08

LEGEND (COLOR CODED)

- WETLANDS
- WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK

SCALE 1" = 100 FEET

100 0 40 60 80 100

ENHANCEMENT PLANTING AREAS (COLOR CODED)

ZONE 1 – ALL DEGRADED VC & ADJACENT VC REPLACEMENT AREAS	= 114,382 SF±
ZONE 2 – ALL MARGINAL VC & ADJACENT REPLACEMENT VC AREAS	= 59,700 SF±
ZONE 3 – ALL TEMPORARY IMPACT AREAS	= 5,330 SF±

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON

TAX LOTS 250 AND 251 WASHINGTON COUNTY TAX MAP 2S 1 30DB

VC ENHANCEMENT PLANTING LOCATIONS - SOUTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED

DATE: 10-08-2015

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
09

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC PLANTING ENHANCE PLAN.DWG | LAYOUT: CMS 09

Attachment A

Wetland Determination Data Sheets (Plots 1-12)

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: 1

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): <3%

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification:

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	X
Hydric Soil Present?	Yes	No	X
Wetland Hydrology Present?	Yes	No	X

Is the Sampled Area within a Wetland? **Yes** **No** X

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, OR.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Plantago lanceolata*	20%	Yes	FACU
2. *Daucus carota*	20%	Yes	FACU
3. *Agrostis capillaris*	20%	Yes	FAC
4. *Anthoxanthum odoratum*	20%	Yes	FACU
5. *Schedonorus arundinaceus*	5%	No	FAC
6. *Prunella vulgaris*	5%	No	FACU
7. *Dactylis glomerata*	5%	No	FACU
8. *Holcus lanatus*	5%	No	FAC
9.			
10.			
11.			
	100%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0%	= Total Cover	

% Bare Ground in Herb Stratum 0%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	30	x 3 =	90
FACU species	70	x 4 =	280
UPL species	0	x 5 =	0
Column Totals:	100 (A)		370 (B)

Prevalence Index = B/A = 3.70

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.

Hydrophytic Vegetation Present? **Yes** **No** X

Remarks:

SOIL

Sampling Point: **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 Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12+	10YR 3/2	100					SiL	

[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 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 x	Depth (inches): _____	
Water Table Present?	Yes _____	No x	Depth (inches): >12	**Wetland Hydrology Present?**
Saturation Present? (includes capillary fringe)	Yes _____	No x	Depth (inches): >12	**Yes** _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soils very dry and compacted making it hard to dig.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: 2

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Floodplain Terrace Local relief (concave, convex, none): Concave Slope (%): <3%

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification:

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 X	No	**Is the Sampled Area within a Wetland?** **Yes X** **No**
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, OR.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	100%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

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	0	x 1 =	0
FACW species	100	x 2 =	200
FAC species	0	x 3 =	0
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	100 (A)		200 (B)

Prevalence Index = B/A = 2.00

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.

Hydrophytic Vegetation Present? **Yes X** **No**

Remarks:

SOIL

Sampling Point: **2**

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
0-5	10YR 3/2	100					SiL	
5-14+	10YR 3/2	80	7.5YR 4/4	20	C	M	SiL	

[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: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

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 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)
- 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 ___	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:
Geomorphic Position (D2) related to floodplain terrace.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **3**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Floodplain terrace Local relief (concave, convex, none): Concave Slope (%): <3

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (45B) Woodburn Silt Loam, 3-7% slopes NWI classification:

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 **X**	No	**Is the Sampled Area within a Wetland?** **Yes X** **No**
Hydric Soil Present?	Yes **X**	No	
Wetland Hydrology Present?	Yes **X**	No	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, OR.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Physocarpus capitatus*	5%	Yes	FACW
2.			
3.			
4.			
5.			
	5% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Athyrium angustum*	50%	Yes	FAC
2. *Lysichiton americanus*	20%	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	70% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 30%

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	20	x 1 =	20
FACW species	5	x 2 =	10
FAC species	50	x 3 =	150
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	75 (A)		180 (B)

Prevalence Index = B/A = 2.40

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.

Hydrophytic Vegetation Present? **Yes X** **No**

Remarks:

SOIL

Sampling Point: **3**

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
0-5	10YR 3/2	90	10YR 4/4	10	C	M	SiL	
5-16+	10YR 4/1	95	10YR 4/6	5	C	M	SiCL	

[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 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 X	Depth (inches): ___		
Water Table Present?	Yes X	No ___	Depth (inches): 10	**Wetland Hydrology Present?**	
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 5	**Yes** X	**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: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: 4

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (45B) Woodburn Silt Loam, 3-7% slopes NWI classification:

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	X
Hydric Soil Present?	Yes	No	X
Wetland Hydrology Present?	Yes	No	X

Is the Sampled Area within a Wetland? **Yes** **No** X

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to N

Plot 4 is approximately 4' higher in elevation than Plot 3.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Pseudotsuga menziesii*	30%	Yes	FACU
2. *Alnus rubra*	10%	Yes	FAC
3. *Acer macrophyllum*	10%	Yes	FACU
4.			
	50%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Thuja plicata*	15%	Yes	FAC
2. *Acer macrophyllum*	10%	Yes	FACU
3. *Ilex aquifolium*	5%	No	FACU
4.			
5.			
	30%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Hedera helix*	80%	Yes	FACU
2. *Polystichum munitum*	5%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	85%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1. *Rubus ursinus*	10%	Yes	FACU
2.			
	10%	= Total Cover	

% Bare Ground in Herb Stratum 15%

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	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	25	x 3 =	75
FACU species	120	x 4 =	480
UPL species	0	x 5 =	0
Column Totals:	145 (A)		555 (B)

Prevalence Index = B/A = 3.83

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.

Hydrophytic Vegetation Present? **Yes** **No** X

Remarks:

SOIL

Sampling Point: **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
0-14+	10YR 3/2	100					SiL	

[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: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

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 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:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **5**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Floodplain Terrace/Toe Slope Local relief (concave, convex, none): Concave Slope (%): <3

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification:

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 **X**	No	**Is the Sampled Area within a Wetland?** **Yes X** **No**
Hydric Soil Present?	Yes **X**	No	
Wetland Hydrology Present?	Yes **X**	No	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, O

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Physocarpus capitatus*	5%	Yes	FACW
2. *Thuja plicata*	5%	Yes	FAC
3.			
4.			
5.			
	10% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Lysichiton americanus*	25%	Yes	OBL
2. *Athyrium angustum*	15%	Yes	FAC
3. *Hedera helix*	10%	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	50% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 50%

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	25	x 1 =	25
FACW species	5	x 2 =	10
FAC species	20	x 3 =	60
FACU species	10	x 4 =	40
UPL species	0	x 5 =	0
Column Totals:	60 (A)		135 (B)

Prevalence Index = B/A = 2.25

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.

Hydrophytic Vegetation Present? **Yes X** **No**

Remarks:

SOIL

Sampling Point: **5**

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
0-6	10YR 3/2	90	10YR 4/6	10	C	M	SiL	
6-16+	2.5Y 3/1	90	10YR 4/4	10	C	M	SiCL	

[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 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 x	Depth (inches): ___		
Water Table Present?	Yes X	No ___	Depth (inches): 10	**Wetland Hydrology Present?**	
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): 4	**Yes** X	**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: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **6**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification:

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 **X**	**Is the Sampled Area within a Wetland?** **Yes** **No X**
Hydric Soil Present?	Yes	No **X**	
Wetland Hydrology Present?	Yes	No **X**	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, O

Plot located approximately 2 feet higher than Plot 5.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Thuja plicata*	30%	Yes	FAC
2. *Pseudotsuga menziesii*	10%	Yes	FACU
3. *Acer macrophyllum*	10%	Yes	FACU
4.			
	50%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Thuja plicata*	15%	Yes	FAC
2.			
3.			
4.			
5.			
	15%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Hedera helix*	55%	Yes	FACU
2. *Polystichum munitum*	10%	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	65%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0%	= Total Cover	

% Bare Ground in Herb Stratum 35%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 40% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	45	x 3 =	135
FACU species	85	x 4 =	340
UPL species	0	x 5 =	0
Column Totals:	130 (A)		475 (B)

Prevalence Index = B/A = 3.65

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.

Hydrophytic Vegetation Present? **Yes** **No X**

Remarks:

SOIL

Sampling Point: **6**

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
0-14+	10YR 3/2	100					SiL	

[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: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

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 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:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: 7

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Floodplain terrace Local relief (concave, convex, none): Concave Slope (%): <3%

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification:

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 X	No	**Is the Sampled Area within a Wetland?** **Yes X** **No**
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, OR.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Phalaris arundinacea*	100%	Yes	FACW
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	100% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 0%

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	0	x 1 = 0
FACW species	100	x 2 = 200
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	0	x 5 = 0
Column Totals:	100 (A)	200 (B)

Prevalence Index = B/A = 2.00

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.

Hydrophytic Vegetation Present? **Yes X** **No**

Remarks:

SOIL

Sampling Point: **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
0-8	10YR 3/2						SiL	
8-16+	10YR 3/2	85	7.5YR 4/6	15	C	PL	SiL	

[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 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)
- 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 ___	No X	Depth (inches): >16"
Saturation Present? (includes capillary fringe)	Yes ___	No X	Depth (inches): >16"

Wetland Hydrology Present? **Yes** X **No** ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Oxidized Rhizospheres along Living Roots (C3) were found below 8". Soils were very dry throughout. Drought year-Chpt.5 problem hydrology-meets soils and vegetation; therefore, primary wetland hydrology assumed present during the early growing season during a normal rainfall year.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **8**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): <3%

Subregion (LRR): A, Northwest Forests and Coast Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification: _____

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 **X**	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** **X**
Hydric Soil Present?	Yes _____	No **X**	
Wetland Hydrology Present?	Yes _____	No **X**	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, O

Plot is approximately 1 ft higher in elevation from wetland Plot 7.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Triticum aestivum*	95%	Yes	NOL
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	95% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 5%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0% (A/B)

Prevalence Index worksheet:

	Total % Cover of:	Multiply by:
OBL species	0	x 1 = 0
FACW species	0	x 2 = 0
FAC species	0	x 3 = 0
FACU species	0	x 4 = 0
UPL species	95	x 5 = 475
Column Totals:	95 (A)	475 (B)

Prevalence Index = B/A = 5.00

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.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Remarks:

SOIL

Sampling Point: **8**

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
0-16+	10YR 3/2	100					SiL	

[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: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

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 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:

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: 9

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Toe slope/Floodplain bench Local relief (concave, convex, none): Concave Slope (%): <3%

Subregion (LRR): A, Northwest Forests and Coast Lat: Long: Datum:

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification:

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 X	No	**Is the Sampled Area within a Wetland?** **Yes X** **No**
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, O

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0% = Total Cover		
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Rubus armeniacus*	10%	Yes	FACU
2.			
3.			
4.			
5.			
	10% = Total Cover		
Herb Stratum (Plot size: 5' r)			
1. *Athyrium angustum*	40%	Yes	FAC
2. *Epelobium watsonii*	10%	Yes	FACW
3. *Scirpus tabernaemontanii*	10%	Yes	OBL
4. *Polystichum munitum*	5%	No	FACU
5. *Equisetum arvense*	5%	No	FAC
6. *Phalaris arundinacea*	5%	No	FACW
7. *Leersia oryzoides*	5%	No	OBL
8.			
9.			
10.			
11.			
	80% = Total Cover		
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0% = Total Cover		

% Bare Ground in Herb Stratum 20%

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	15	x 1 =	15
FACW species	15	x 2 =	30
FAC species	45	x 3 =	135
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	90 (A)		240 (B)

Prevalence Index = B/A = 2.67

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.

Hydrophytic Vegetation Present? **Yes X** **No**

Remarks:

SOIL

Sampling Point: **9**

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
0-6	10YF 3/2	95	10YR 4/4	5	C	M	SiCL	
6-16+	10YR 4/1	90	7.5YR 3/3	10	C	M	SiCL	

[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)
- X 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)
- X 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 X	Depth (inches): ___		
Water Table Present?	Yes X	No ___	Depth (inches): 12"	**Wetland Hydrology Present?**	
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): Surface	**Yes** X	**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: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 7/28/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **10**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5-10%

Subregion (LRR): A, Northwest Forests and Coast Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification: _____

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 **X**	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** **X**
Hydric Soil Present?	Yes _____	No **X**	
Wetland Hydrology Present?	Yes _____	No **X**	

Remarks:

Plot approximately 4ft higher in elevation than paired wetland Plot 9.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Arbutus menziesii*	10%	Yes	NOL
2. *Thuja plicata*	5%	Yes	FAC
3.			
4.			
	15%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Corylus cornuta*	70%	Yes	FACU
2. *Rubus armeniacus*	20%	Yes	FACU
3.			
4.			
5.			
	90%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Polystichum munitum*	20%	Yes	FACU
2. *Carex leptopoda*	5%	Yes	FAC
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	25%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1.			
2.			
	0%	= Total Cover	

% Bare Ground in Herb Stratum 75%

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 33% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	110	x 4 =	440
UPL species	10	x 5 =	50
Column Totals:	130 (A)		520 (B)

Prevalence Index = B/A = 4.00

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.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Remarks:

SOIL

Sampling Point: **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
0-13+	10YR 3/2	100					SiL	

[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: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)

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 x	Depth (inches): _____
Water Table Present?	Yes _____	No x	Depth (inches): >13"
Saturation Present? (includes capillary fringe)	Yes _____	No x	Depth (inches): >13"

Wetland Hydrology Present? **Yes** _____ **No** **X**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Soils were very dry and crumbly throughout.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys and Coast Region

Project/Site: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 8/17/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **11**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Toe slope/Floodplain bench Local relief (concave, convex, none): Concave Slope (%): 3%

Subregion (LRR): A, Northwest Forests and Coast Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification: _____

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 **X**	No _____	**Is the Sampled Area within a Wetland?** **Yes X** **No** _____
Hydric Soil Present?	Yes **X**	No _____	
Wetland Hydrology Present?	Yes **X**	No _____	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, O

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	15%	Yes	FACU
2. *Alnus rubra*	15%	Yes	FAC
3.			
4.			
	30%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1.			
2.			
3.			
4.			
5.			
	0%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Athyrium angustum*	40%	Yes	FAC
2. *Lysichiton americanus*	20%	Yes	OBL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	60%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1. *Hedera helix*	80%	Yes	FACU
2. *Rubus ursinus*	5%	No	FACU
	85%	= Total Cover	

% Bare Ground in Herb Stratum 40%

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	20	x 1 = 20
FACW species	0	x 2 = 0
FAC species	55	x 3 = 165
FACU species	85	x 4 = 340
UPL species	0	x 5 = 0
Column Totals:	160 (A)	525 (B)

Prevalence Index = B/A = 3.28

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.

Hydrophytic Vegetation Present? **Yes X** **No** _____

Remarks:

SOIL

Sampling Point: **11**

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
0-6	10YR 3/2	90	7.5YR 3/4	10	C	M	SiCL	
6-16+	10GY 3/1	100					SiC	

[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)
- X 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)
- 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)
- X 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 X	Depth (inches): ___		
Water Table Present?	Yes X	No ___	Depth (inches): 14"	**Wetland Hydrology Present?**	
Saturation Present? (includes capillary fringe)	Yes X	No ___	Depth (inches): Surface	**Yes** X	**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: Mandel Farms Subdivision City/County: Sherwood/Washington Sampling Date: 8/17/2015

Applicant/Owner: Venture Properties State: OR Sampling Point: **12**

Investigator(s): Stacey Reed & Lindsey Obermiller Section, Township, Range: 2S 1W 30CB

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 5-10%

Subregion (LRR): A, Northwest Forests and Coast Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: (22) Huberly Silt Loam NWI classification: _____

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 **X**	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** **X**
Hydric Soil Present?	Yes _____	No **X**	
Wetland Hydrology Present?	Yes _____	No **X**	

Remarks: Precipitation: No recorded rainfall for the day of site visite. 0.34 inches of rainfall during the two weeks prior according to NWS Portland, OR.

VEGETATION

Tree Stratum (Plot size: 30' r)	Absolute % Cover	Dominant Species?	Indicator Status
1. *Acer macrophyllum*	45%	Yes	FACU
2. *Thuja plicata*	5%	No	FAC
3. *Alnus rubra*	5%	No	FAC
4.			
	55%	= Total Cover	
Sapling/Shrub Stratum (Plot size: 10' r)			
1. *Thuja plicata*	5%	Yes	FAC
2.			
3.			
4.			
5.			
	5%	= Total Cover	
Herb Stratum (Plot size: 5' r)			
1. *Polystichum munitum*	10%	Yes	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	10%	= Total Cover	
Woody Vine Stratum (Plot size: 10' r)			
1. *Hedera helix*	50%	Yes	FACU
2. *Rubus ursinus*	10%	No	FACU
	60%	= 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: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	15	x 3 =	45
FACU species	70	x 4 =	280
UPL species	0	x 5 =	0
Column Totals:	85 (A)		325 (B)

Prevalence Index = B/A = 3.82

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.

Hydrophytic Vegetation Present? **Yes** _____ **No** **X**

Remarks:

SOIL

Sampling Point: **12**

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
0-13+	10YR 3/2	100					SiL	

[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: S = sand; Si = silt; C = clay; L = loam or loamy; co = coarse; f = fine; vf = very fine; + = heavy (more clay); - = light (less clay)
Soils very dry.

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 x	Depth (inches): _____
Water Table Present?	Yes _____	No x	Depth (inches): >13"
Saturation Present? (includes capillary fringe)	Yes _____	No x	Depth (inches): >13"

Wetland Hydrology Present? Yes _____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Attachment B

2007 Wetland Delineation DSL File WD-2007-0180

Oregon
Theodore R. Kulongoski, Governor

Department of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279
(503) 378-3805
FAX (503) 378-4844
www.oregonstatelands.us.

State Land Board

Theodore R. Kulongoski
Governor

Bill Bradbury
Secretary of State

Randall Edwards
State Treasurer

July 18, 2007

Dan Jamison
Sherwood School District, 88J
23295 SW Main Street
Sherwood, OR 97140

Re: Wetland Delineation Report for the New Sherwood Elementary and Middle Schools, Washington County; T 2S, R 1W, Sec. 30CA, Portion of Tax Lot 100; Sec. 30CB, Tax Lot 200 and Portion of 100; Sec. 30CC, Tax Lot 100 and Portions of 200, 300, and 700; Sec. 30CD, Tax Lot 12800; WD #07-0180; App. #38523

Dear Mr. Jamison:

The Department of State Lands has reviewed the wetland delineation report prepared by Environmental Science & Assessment, LLC for the site referenced above. Based on the information presented in the report and my site visit on July 17th, 2007, we concur with their delineation and conclusions. Within the study area, 4 wetlands and an unnamed tributary to Chicken Creek were identified, totaling 3.82 acres. These wetlands and the tributary are subject to the permit requirements of the state Removal-Fill Law. A state permit is required for fill or excavation of 50 cubic yards or more in a wetland area or below the ordinary high water line of a waterway (the 2 year recurrence interval flood elevation, if OHWL cannot be determined).

This concurrence is for purposes of the state Removal-Fill Law only. Federal or local permit requirements may apply as well. 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 and procedures for renewal of an expired determination are found in OAR 141-090-0045 (available on our web site or upon request). The applicant, landowner, or agent may submit a request for reconsideration of this determination in writing within 60 calendar days of the date of this letter.

Thank you for having the site evaluated. Please phone me at extension 232 if you have any questions.

Sincerely,

Peter Ryan, PWS
Wetland Specialist

Approved by Janet C. Morlan
Janet C. Morlan, PWS
Wetlands Program Manager

cc: Kim Reavis, Environmental Science & Assessment, LLC
City of Sherwood Planning Department (Maps enclosed for updating LWI)
Tina Teed, Corps of Engineers
Damon Reische, Clean Water Services (for Washington County Sites)
Carrie Landrum, DSL

WETLAND DELINEATION / DETERMINATION REPORT COVER FORM

This form constitutes a request for a jurisdictional determination by the Department of State Lands and must be attached to the front of reports submitted to the Department for review and approval.

Wetlands Program Manager/Oregon Division of State Lands
775 Summer Street NE, Suite 100
Salem, OR 97301-1279

RECEIVED STATE LANDS 2007 APR -2 P 1:10

X Applicant _ Owner Name, Firm and Address: Sherwood School District, 88J (Dan Jamison) 23295 SW Main Street Sherwood, OR 97140	Business phone # (503) 625-8100 Home phone # (optional) FAX # (503) 205-2332 E-mail: djamison@ci.sherwood.or.us
X Authorized Legal Agent: Kelly S. Hossaini Name and Address: Miller Nash, LLP 3400 U.S. Bankcorp Tower Portland, OR 97204-3699	Business phone # 503-205-2332 FAX # 503-224-0155 E-mail: kellyhossaini@millernash.com

I either own the property described below or I have legal authority to allow access to the property. I authorize the Division to access the property for the purpose of confirming the information in the report, after prior notification to the primary contact.
Typed/Printed Name: _____ Signature: _____
Date:_____ Special instructions regarding site access:

Project and Site Information (for latitude & longitude, use centroid of site or start & end points of linear project)

Project Name: New Elementary/Middle School	Latitude: 45°21'57" N	Longitude: 122°51'48" W
Proposed Use: School facility and sport fields	Tax Map # 2S 1 30CA, CB, & CC	
Project Street Address (or other descriptive location): the undeveloped area southeast of the intersection of SW Elwert Road and SW Edy Road City: Sherwood County: Washington	Township 2 South Range 1 West Section 30 QQ SW 1/4 Tax Lot (s) CA –100; CB-200, 100; CC-300, 100, 700, 200 Waterway: N/A River Mile: N/A NWI Quad(s): Sherwood	

Wetland Delineation Information

Wetland Consultant Name, Firm and Address: Environmental Science & Assessment (Kim Reavis) or (Jack Dalton) 838 SW First Avenue, Portland, OR 97204	Phone # (503) 478-0424 FAX # 503-478-0422 E-mail address: kim@esapdx.com

The information and conclusions on this form and in the attached report are true and correct to the best of my knowledge.
Consultant's Signature [redacted] Date: 3/29/07

Primary Contact for report review and site access is X Consultant _ Applicant/Owner _Authorized Agent

Wetland/Waters Present? X Yes _ No	Total Wetland Acreage: 3.82

Delineation Purpose

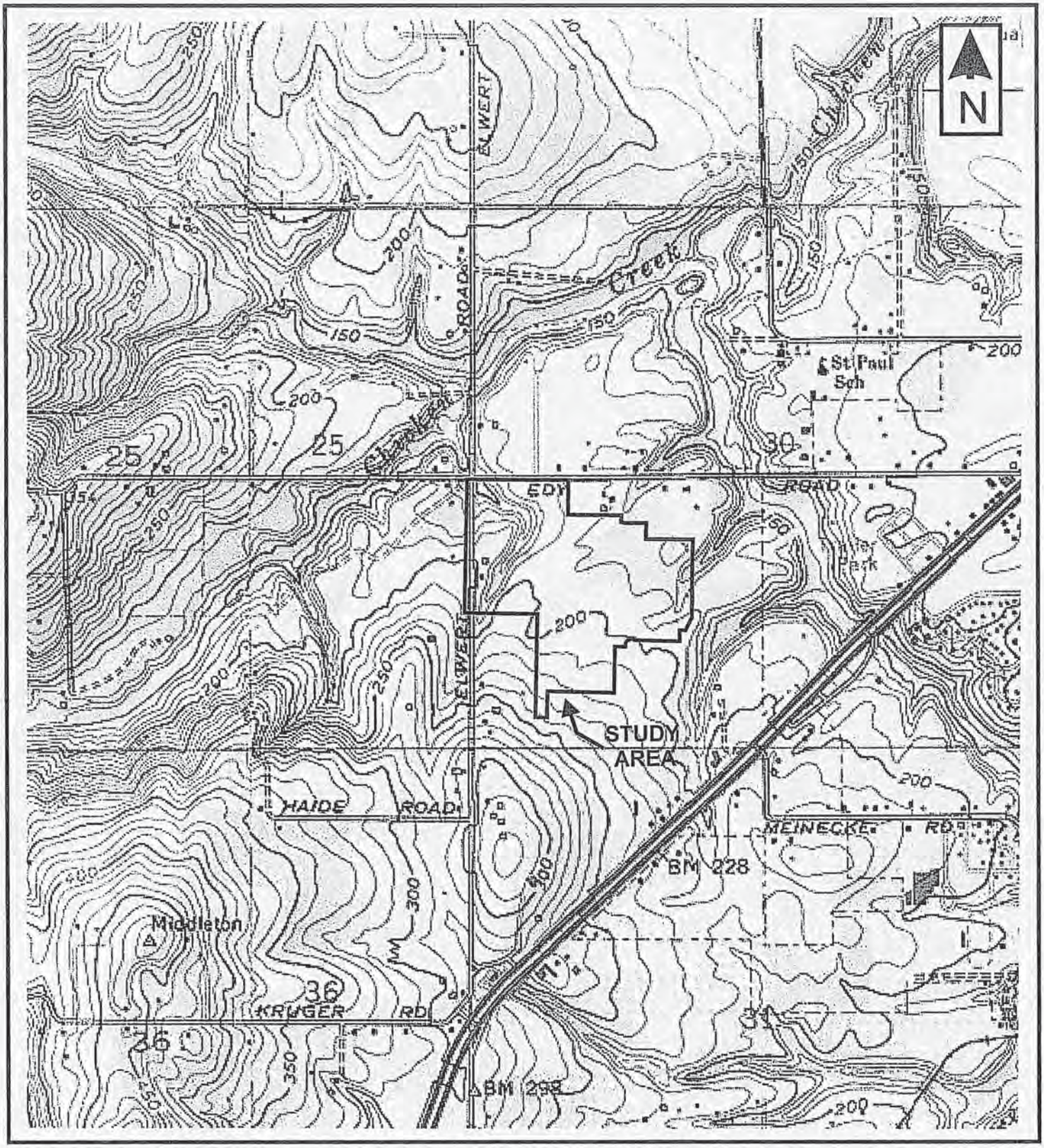
__ R-F permit application submitted with delineation	__ Sale, purchase, lease etc.
__ Mitigation bank site	__ Partition, re-plat, lot line adjustment
__ Industrial Land Certification Program site	__ Habitat restoration project
_X_ R-F application will be submitted within 90 days	__ Other:

Other Information:

Has previous delineation/application been made on parcel? No	If known, previous DSL#
Does LWI, if any, show wetland on parcel? Yes	LWI wetland code: Sherwood, OR

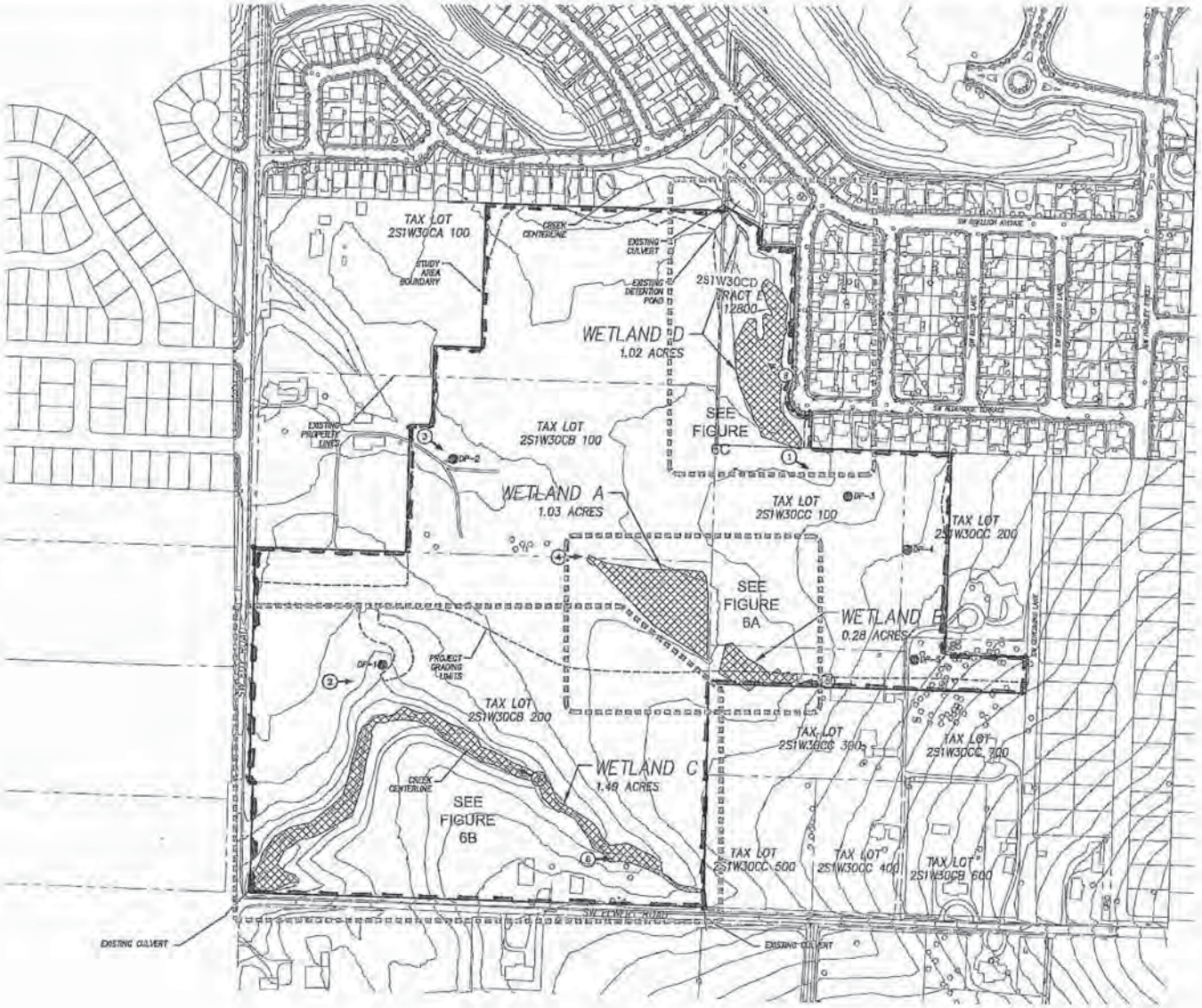
For Office Use Only

DSL Reviewer: PR	Report Tier: X 1 __2 __3	DSL WD # 2007-0180
Date Delineation Received: 4 / 2 / 07	DSL Project # _____	DSL Site #_____
Scanned___ Final Scan___	DSL WN#_____	DSL App.#_____



Source: USGS 7.5-Minute Sherwood, OR Quadrangle, 1961, Photorevised 1985.

Environmental Science & Assessment, LLC	Vicinity Map New Elementary and Middle School Sherwood, Oregon	Figure 1 Approx. Scale: 1in. = 2000 ft.



SCALE: 1" = 300'

LEGEND

- DP-X DATA POINT
- PHOTO POINT (PHOTO TAKEN IN DIRECTION OF ARROW)
- GRADING LIMITS
- STUDY AREA BOUNDARY
- EXISTING PROPERTY LINE
- 5' COUNTOURS

DSL WD # 07-0180

Approval Issued 7/18/2007

Approval Expires 7/18/2012

SURVEY BY WESTLAKE CONSULTANTS, INC. AND HARPER HOUF PETERSON RIGHELLIS, INC., FIELD MEASUREMENTS BY ES&A, ACCURACY ±2 TO 4 FEET

FIGURE 3

WETLAND MAP

NEW ELEMENTARY AND MIDDLE SCHOOL

SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.

DESIGNED ESA

DRAWN HHPR

CHECKED JKG

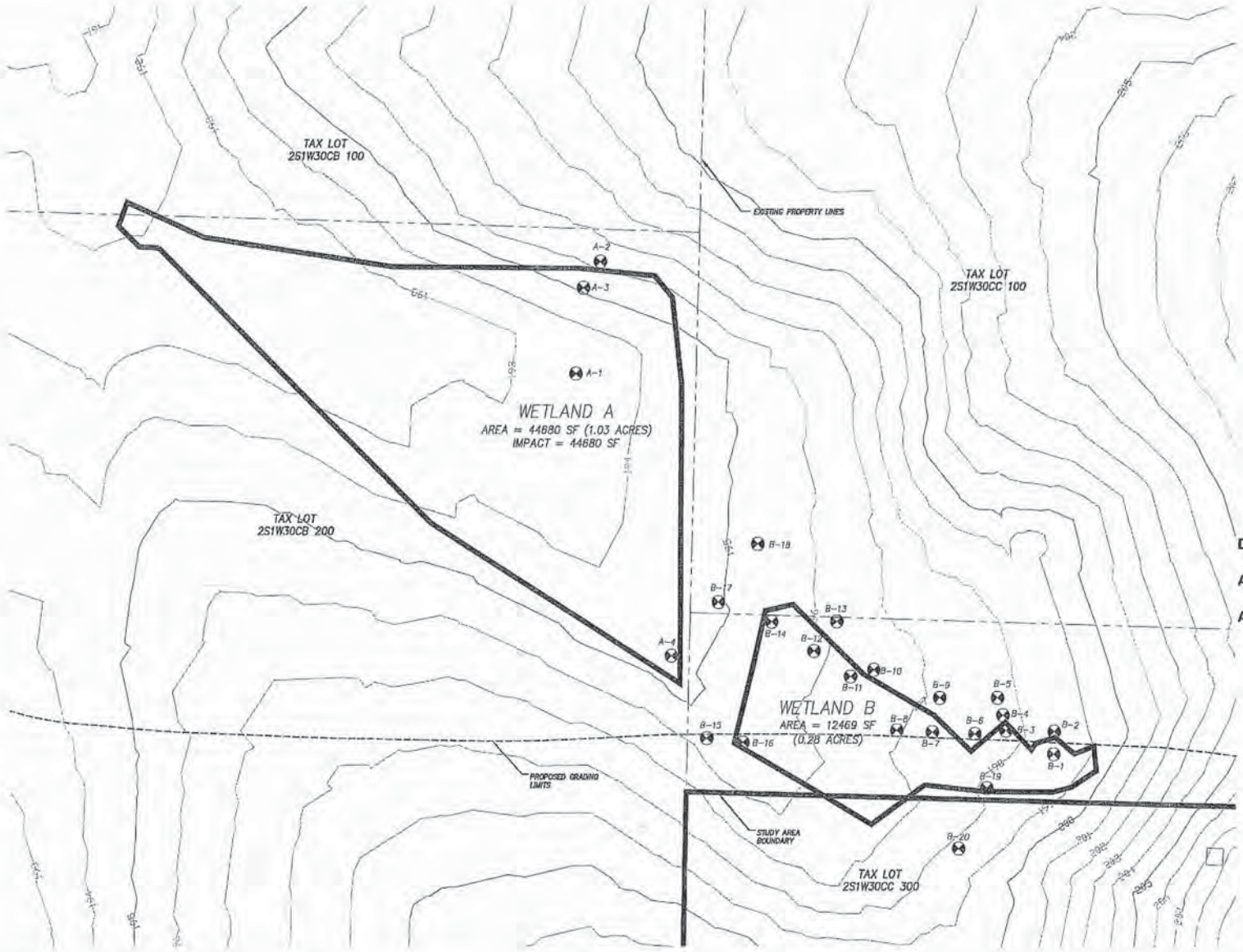
DATE MARCH 2007

REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO. 1 OF 1

JOB NO. SHD-06



DSL WD # 07-0180

Approval Issued 7/18/2007

Approval Expires 7/18/2012

SURVEY BY WESTLAKE CONSULTANTS, INC.

FIGURE 7a

WETLANDS A AND B

NEW ELEMENTARY AND MIDDLE SCHOOL

SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.

ENGINEERS • SURVEYORS • PLANNERS
5205 SW MEADOWS ROAD, LAKE OSWEGO, OR 97035
TEL: 503.221.1131 www.hhpr.com FAX: 503.221.1171

DESIGNED	ZDM
DRAWN	HHPR
CHECKED	KAS
DATE	MARCH 2007

REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO. 1 OF 1

JOB NO. SHD-05

P:\HOPR-PROJ\SHD-OAKS\SWETLANDS\EXHIB-WETLAND MAP.dwg

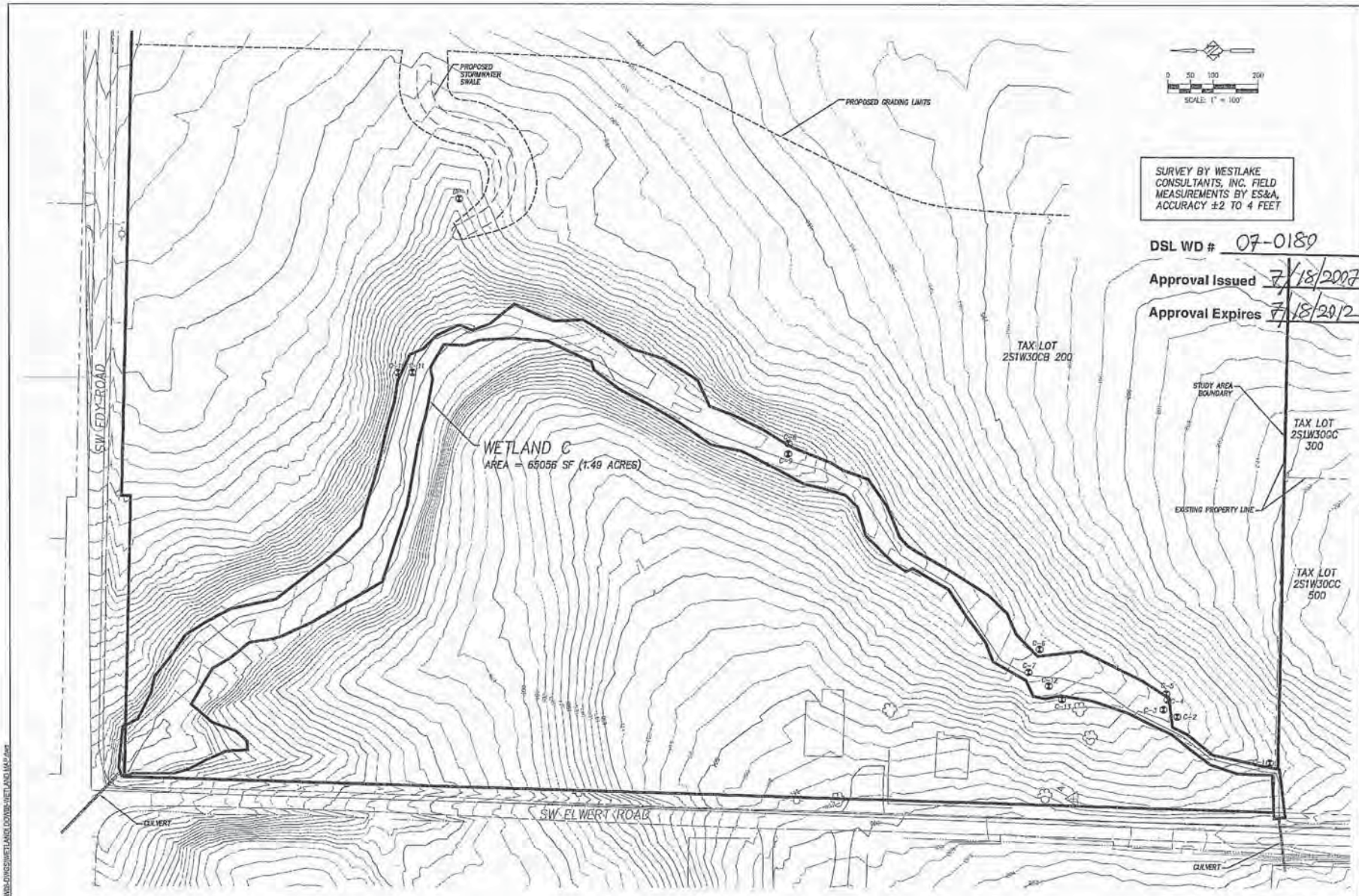


FIGURE 7b

WETLAND C
NEW ELEMENTARY AND MIDDLE SCHOOL
SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
5000 SW Meadows Road, Suite 300, Portland, OR 97035
TEL 503.221.1131 www.hhpr.com FAX 503.221.1171

DESIGNED	ESMA
DRAWN	HHPR
CHECKED	KAS
DATE	MARCH 2007

DATE	NO.	DESCRIPTION
REVISIONS		

SHEET NO. 1 OF 1

JOB NO. SHD-05

P:\HOME\BRIGHWD\-FINDS\WETLAND\DOWN\WETLAND MAP.dwg

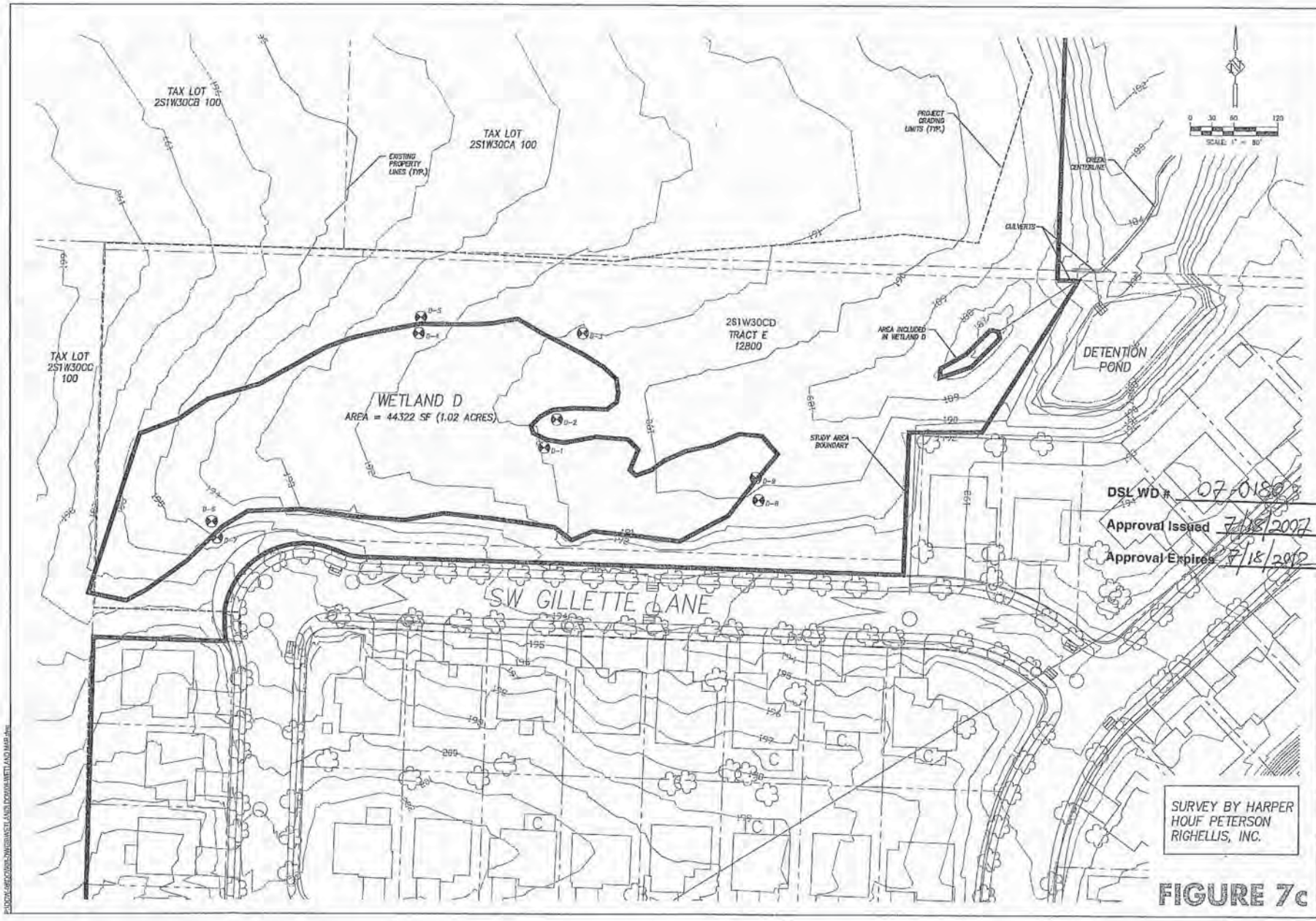


FIGURE 7c

WETLAND D
NEW ELEMENTARY AND MIDDLE SCHOOL
SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS • SURVEYORS
5300 SW Meadows Road, Lake Oswego, OR 97035
Tel. 503.221.1131 www.hhpr.com Fax 503.221.1171

DESIGNED	ESM
DRAWN	HHPR
CHECKED	KAS
DATE	MARCH 2007

REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO. 1 OF 1

JOB NO. SHD-05

P:\DOCS\-SHD\07005-SW\SHD\WETLANDS\DCW\WETLAND MAP.dwg

Attachment C

GeoTech Report Mandel Farm

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

October 6, 2015
Project No. 15-3938

Kelly Ritz
Venture Properties
4230 SW Galewood Street, Suite 100
Lake Oswego, Oregon 97035
Via email: kelly@stonebridgehomesnw.com

CC: Paul Sellke, AKS Engineering & Forestry pauls@aks-eng.com

SUBJECT: CLEAN WATER SERVICES SLOPE SETBACKS
MANDEL PROPERTY SUBDIVISION
SW EDY ROAD & SW ELWERT ROAD
SHERWOOD, OREGON

This letter report presents our review of on-site natural slopes pertaining to Clean Water Services (CWS) slope setbacks. Natural site grades within the limits of proposed development generally range between about 5 and 15 percent. Steeper slopes are present immediately adjacent to a tributary drainage to Chicken Creek, which bisects the site. Based on the site topographic mapping, maximum slopes adjacent to the drainage range from 5 to 17 feet and are on the order of 20 to 55 percent grade with slopes up to 80 percent grade in limited areas.

Clean Water Services (CWS) allows a reduction of the 35-foot setback from the break in slope to 15 feet with a geotechnical engineer's review. GeoPacific's evaluation of the slope stability setback was based on geologic reconnaissance, test pit exploration, site specific topographic survey, and published geologic mapping. Visual criterion considered by the geologist when evaluating slope stability included topographic grade and smoothness or regularity; degree of creep; age, density, condition and degree on deformity of native trees; and evidence of erosion and past fill placement.

Our reconnaissance of the steeply sloping portion of the site (immediately adjacent to the tributary drainage to Chicken Creek) indicates slopes are generally stable with some minor slope creep immediately adjacent to the drainage. No springs or seeps were observed. Based on our reconnaissance and information available at present, a 15 foot offset from the break in slope is adequate to maintain slope stability along the vegetated corridor.

Construction of the northern cul-de-sac will require encroaching into the 15 foot setback from the break in slope. Retaining walls up to 11 feet in height are planned at the top of the slope leaving an approximate 5 foot offset from the break in slope. The proposed retaining wall location will require a site-specific engineered design which incorporates geotechnical design parameters and recommendations to maintain slope stability in this area.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.

REGISTERED PROFESSIONAL ENGINEER
14743PE
OREGON
JAN. 23, 1990
JAMES D. IMBRIE

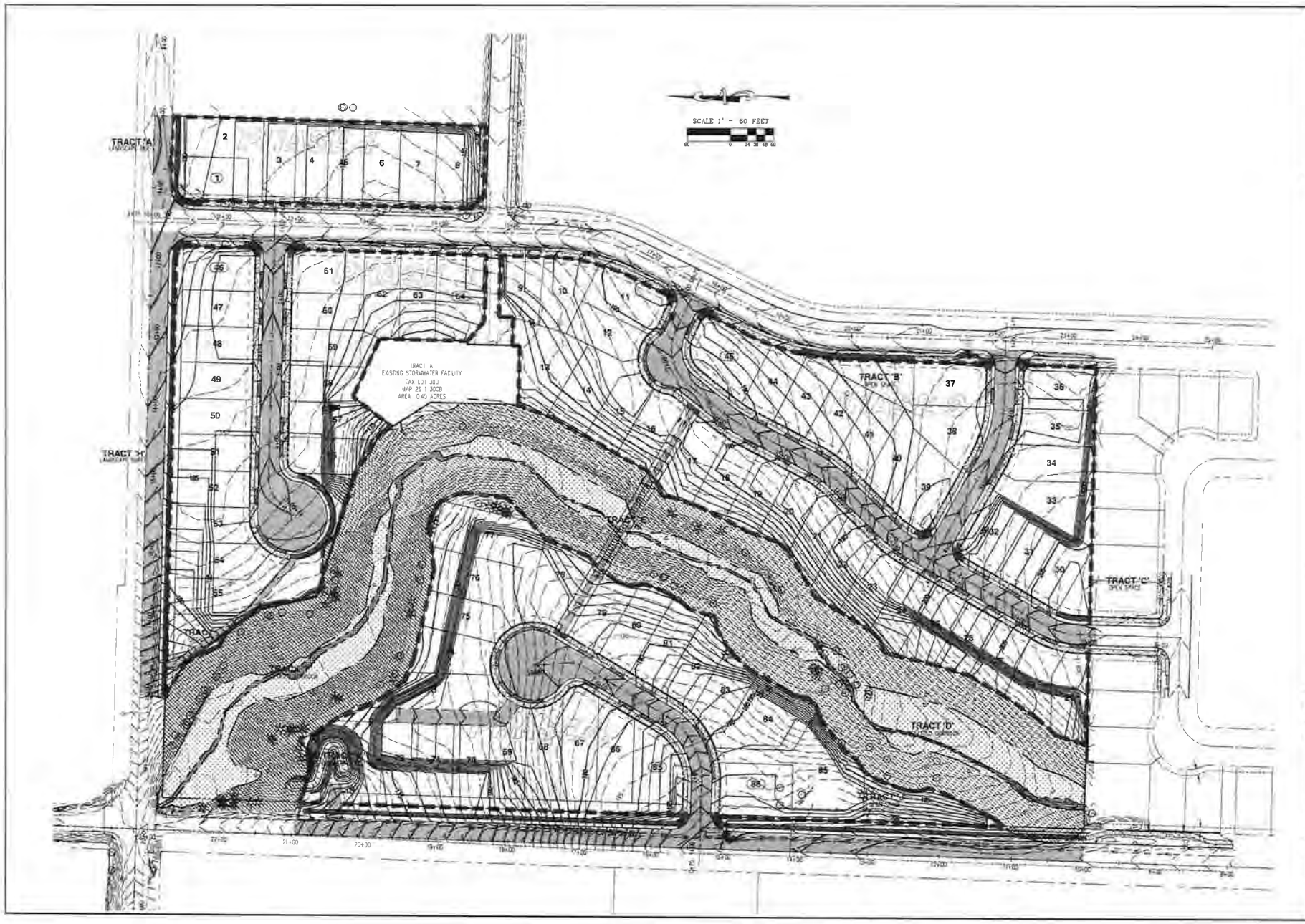
CERTIFIED
OREGON
JAMES D. IMBRIE
E1734
ENGINEERING GEOLOGIST

EXPIRES: 06/30/2017

EXPS-31-16

James D. Imbrie, G.E., C.E.G
Principal Geotechnical Engineer

Attachments: Mandel Property Subdivision Layout



AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN ROAD, STE 100
TUALATIN, OR 97062
P: 503.563.6151
www.aksfirm.com

AKS

ENGINEERING · SURVEYING · NATURAL RESOURCES
FORESTRY · PLANNING · LANDSCAPE ARCHITECTURE

MANDEL FARM SUBDIVISION

SHERWOOD OREGON

WASHINGTON COUNTY, 1S1 MAP 2S 1 3CCB

PRELIMINARY GRADING PLAN

DESIGNED BY: FAS/CS
DRAWN BY: JS
CHECKED BY: FAS
SCALE: AS NOTED
DATE: 11-21-2019

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS:

JOB NUMBER
4570

SHEET
P07

Attachment D

VECO Plot Data Sheets

Vegetated Corridor (VECO) Condition Assessment for CWS Natural Resource Assessment

Site:	Mandel Farms Subdivision
Job Number:	4570
Investigators:	Stacey Reed & Lindsey
Date:	August 17, 2015
Community:	Wheat fields
Location:	Southeast Corner / adjacent to wetland
Plot ID:	VECO A

Tree species, % Cover, Native, Invasive - 30 foot radius, >5% cover: 0%

Shrub species, % Cover, Native, Invasive - 30 foot radius, >5% cover: 0%

Herb Species, % Cover, Native, Invasive - 10 foot radius, >5% cover: 95%

* *Triticum aestivum*	cultivated wheat	non-native	95%

* Dominant

Total Cover 95%

	Absolute areal cover
% Tree canopy:	**0%**
% Cover by natives:	0%
% Invasive:	0%
% Non-native:	95%
	95%

Corridor Condition: Degraded

Vegetated Corridor (VECO) Condition Assessment for CWS Natural Resource Assessment

Site: Mandel Farms Subdivision
Job Number: 4570
Investigators: Stacey Reed & Lindsey
Date: August 17, 2015

Community: Himalayan blackberry
Location: Eastern side of wetland
Plot ID: VECO B

Tree species, % Cover, Native, Invasive - 30 foot radius, >5% cover: 0%

Shrub species, % Cover, Native, Invasive - 30 foot radius, >5% cover: 100%

* *Rubus armeniacus*	Himalayan blackberry	invasive, noxious	100%

Herb Species, % Cover, Native, Invasive - 10 foot radius, >5% cover: 0%

* Dominant

Total Cover 100%

	Absolute areal cover
% Tree canopy:	**0%**
% Cover by natives:	0%
% Invasive:	100%
% Non-native:	0%
	100%

Corridor Condition: Degraded

Vegetated Corridor (VECO) Condition Assessment for CWS Natural Resource Assessment

Site: Mandel Farms Subdivision
Job Number: 4570
Investigators: Stacey Reed & Lindsey
Date: August 17, 2015

Community: Conifer/deciduous mix
Location: East of wetland and tributary / central portion of site
Plot ID: VECO C

Tree species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			25%
* *Pseudotsuga menziesii*	Douglas-fir	native	25%

Shrub species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			120%
* *Rubus armeniacus*	Himalayan blackberry	invasive, noxious	95%
Acer macrophyllum	big-leaf maple	native	15%
Corylus cornuta	beaked hazelnut	native	10%

Herb Species, % Cover, Native, Invasive - 10 foot radius, >5% cover:			0%

* Dominant

Total Cover 145%

	Absolute areal cover
% Tree canopy:	**25%**
% Cover by natives:	50%
% Invasive:	95%
% Non-native:	0%
	145%

Corridor Condition: Degraded

Vegetated Corridor (VECO) Condition Assessment for CWS Natural Resource Assessment

Site:	Mandel Farms Subdivision		
Job Number:	4570		
Investigators:	Stacey Reed & Lindsey		
Date:	August 17, 2015		
Community:	Non-native weedy forb		
Location:	Northeastern portion of site / north side of tributary		
Plot ID:	VECO D		
Tree species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			0%
Shrub species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			40%
* *Rubus armeniacus*	Himalayan blackberry	invasive, noxious	40%
Herb Species, % Cover, Native, Invasive - 10 foot radius, >5% cover:			100%
* *Holcus lanatus*	common velvet grass	non-native	40%
* *Dactylis glomerata*	orchard grass	non-native	20%
* *Cirsium arvense*	Canadian thistle	invasive, noxious	20%
Plantago lanceolata	English plantain	non-native	5%
Agrostis capillaris	colonial bent	non-native	5%
Taraxacum officinale	common dandelion	non-native	5%
Equisetum arvense	field horsetail	native	5%
		non-native	
* Dominant			
		Total Cover	140%

	Absolute areal cover
% Tree canopy:	**0%**
% Cover by natives:	5%
% Invasive:	60%
% Non-native:	75%
	140%

Corridor Condition: Degraded

Vegetated Corridor (VECO) Condition Assessment for CWS Natural Resource Assessment

Site: Mandel Farms Subdivision
Job Number: 4570
Investigators: Stacey Reed & Lindsey
Date: August 17, 2015

Community: Bigleaf maple forest
Location: Northeast of wetland and tributary in northern portion of site
Plot ID: VECO E (Upland plot 12)

Tree species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			55%
* *Acer macrophyllum*	big-leaf maple	native	45%
* *Thuja plicata*	western arborvitae (western red cedar)	native	5%
* *Alnus rubra*	red alder	native	5%

Shrub species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			5%
* *Thuja plicata*	western arborvitae (western red cedar)	native	5%

Herb Species, % Cover, Native, Invasive - 10 foot radius, >5% cover:			100%
* *Hedera helix*	English ivy	invasive, noxious	85%
Rubus ursinus	California dewberry	native	10%
Polystichum munitum	pineland sword fern	native	5%

* Dominant

Total Cover 160%

	Absolute areal cover
% Tree canopy:	**55%**
% Cover by natives:	75%
% Invasive:	85%
% Non-native:	0%
	160%

Corridor Condition: Marginal

Vegetated Corridor (VECO) Condition Assessment for CWS Natural Resource Assessment

Site:	Mandel Farms Subdivision		
Job Number:	4570		
Investigators:	Stacey Reed & Lindsey		
Date:	August 17, 2015		
Community:	Douglas-Fir/Poison Oak		
Location:	West of tributary in northern portion of site		
Plot ID:	VECO F		
Tree species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			80%
* *Pseudotsuga menziesii*	Douglas-fir	native	80%
Shrub species, % Cover, Native, Invasive - 30 foot radius, >5% cover:			71%
* *Toxicodendron diversilobun*	Pacific poison-oak	non-native	50%
* *Mahonia aquifolium*	holly-leaf Oregon-grape	native	10%
Thuja plicata	western arborvitae (western red cedar)	native	5%
Acer macrophyllum	big-leaf maple	native	2%
Symphoricarpos albus	common snowberry	native	2%
Oemleria cerasiformis	oso-berry	native	2%
Herb Species, % Cover, Native, Invasive - 10 foot radius, >5% cover:			10%
* *Rubus ursinus*	California dewberry	native	5%
* *Polystichum munitum*	pineland sword fern	native	5%

* Dominant

		Total Cover	161%

	Absolute areal cover
% Tree canopy:	**80%**
% Cover by natives:	111%
% Invasive:	0%
% Non-native:	50%
	161%

Corridor Condition: Changed to Marginal

Attachment E

Representative Site Photographs

Photos taken by Lindsey Obermiller on August 17, 2015

Photo A. View southwest of *degraded* condition vegetated corridor (VECO Plot A).

Photo B. View northeast of *degraded* condition vegetated corridor (VECO B).

Photo C. View west of *degraded* condition vegetated corridor, north of central wetland (VECO C).

Photo D. View south of *degraded* condition vegetated corridor adjacent to wetland (VECO D).

Photos taken by Lindsey Obermiller on August 17, 2015

Photo E. View south from central wetland of *marginal* condition vegetated corridor (VECO E).

Photo F. View north from northwest corner of *marginal* condition vegetated corridor (VECO F).

Photo G. View northwest of *degraded* condition vegetated corridor (VECO G).

Photo H. View southwest of VECO Plot E.

Attachment F

Mandel Farms Vegetated Corridor Enhancement
Planting Specification Tables

Mandel Farm Subdivision
Vegetated Corridor Mitigation and Enhancement Planting Specifications
October 2, 2015

Planting Specifications for the enhancement of Zone 1 (sun tolerant zone) =**117,258 square feet**

Scientific Name	Common Name	Size*	Spacing/Seeding Rate	Quantity
Trees (total 1,173)				
Acer macrophyllum	big leaf maple	2 gallon	10 feet on center	391
Pseudotsuga menziesiii	Douglas fir	2 gallon	10 feet on center	391
Alnus rubra	red alder	1 gallon	10 feet on center	391
Shrubs (total 5,863)				
Holodiscus discolor	oceanspray	1 gallon	4-5 feet on center	1172
Mahonia aquafolium	Tall Oregon grape	1 gallon	4-5 feet on center	1172
Ribes sanguineum	red flowering current	1 gallon	4-5 feet on center	1173
Rosa gymnocarpa	baldhip rose	1 gallon	4-5 feet on center	1172
Symphoricarpos albus	snowberry	1 gallon	4-5 feet on center	1172
Seed Mix				
Agrostis exarata	Spike bentgrass	seed	1 lb pls/acre	As needed for bare soil areas >25 square feet
Bromus carinatus	Native California brome	seed	1 lbs pls/acre	

**Bare root plants may be substituted for container plants, based on availability. If bare root plants are used, they must be planted during the late winter/early spring dormancy period.*

Planting Specifications for the enhancement of Zone 2 (shade tolerant zone) = **59,925 square feet**

Scientific Name	Common Name	Size*	Spacing/Seeding Rate	Quantity
Trees (total 400)				
Thuja plicata	Western red cedar	2 gallon	10 feet on center	400
Shrubs (total 2,996)				
Acer circinatum	vine maple	1 gallon	4-5 feet on center	596
Gaultheria shallon	salal	1 gallon	4-5 feet on center	599
Mahonia nervosa	Cascade Oregon grape	1 gallon	4-5 feet on center	599
Polystichum munitum	sword fern	1 gallon	4-5 feet on center	599
Sambucus racemosa	red elderberry	1 gallon	4-5 feet on center	599
Seed Mix				
Agrostis exarata	Spike bentgrass	seed	1 lb pls/acre	As needed for bare soil areas >25 square feet
Agrostis scabra	Hair bentgrass	seed	2 lbs pls/acre	

**Bare root plants may be substituted for container plants, based on availability. If bare root plants are used, they must be planted during the late winter/early spring dormancy period.*

Planting Specifications for Zone 3 (temporarily impacted areas) = **5,825 square feet**

Scientific Name	Common Name	Size*	Spacing/Seeding Rate	Quantity
Trees (total 58)				
Acer macrophyllum	big leaf maple	2 gallon	10 feet on center	29
Pseudotsuga menziesiii	Douglas fir	2 gallon	10 feet on center	29
Shrubs (total 291)				
Holodiscus discolor	oceanspray	1 gallon	4-5 feet on center	58
Mahonia aquafolium	Tall Oregon grape	1 gallon	4-5 feet on center	58
Ribes sanguineum	red flowering current	1 gallon	4-5 feet on center	58
Rosa gymnocarpa	baldhip rose	1 gallon	4-5 feet on center	58
Symphoricarpos albus	snowberry	1 gallon	4-5 feet on center	59

Seed Mix				
Agrostis exarata	Spike bentgrass	seed	1 lb pls/acre	As needed for bare soil areas >25 square feet
Bromus carinatus	Native California brome	seed	1 lbs pls/acre	

**Bare root plants may be substituted for container plants, based on availability. If bare root plants are used, they must be planted during the late winter/early spring dormancy period.*

Planting Notes (per CWS Design & Construction Standards, Appendix A Planting Requirements, June 2007):

1) Plantings should preferably be installed between February 1 and May 1 for bare roots and seeds, and between October 1 and November 15 for containers. Plants may be installed at other times of the year; however, additional measures may be necessary to ensure plant survival during the two-year maintenance period, such as irrigation or other water practices (e.g. polymer plus watering). Bare root plants must be installed during the late winter/early spring dormancy period.

2) Non-native invasive species observed on the site include Himalayan blackberry, reed canarygrass, thistle, and English ivy. Invasive species control within proposed planting areas consistent with Clean Water Services' *Integrated Vegetation and Animal Management Guide* is required prior to installing new enhancement plantings.

3) Plantings shall be mulched a minimum of three inches in depth and 18 inches in diameter to retain moisture and discourage weed growth around newly installed plant material.

4) Tree plantings shall be protected from wildlife damage (e.g. beaver, nutria) by installing tree-protector tubes or wire mesh cylinders around newly installed plantings.

Maintenance Plan:

1) Clean Water Services requires a two-year maintenance period for vegetated corridor mitigation. The enhanced vegetated corridor is to be inspected annually and a minimum of two times during the growing season, by June 1 and September 30.

2) Plant survival: Clean Water Services' success criterion for vegetated corridor enhancement is 80% survival of tree and shrub plantings during the two years following planting. If any mortality is noted on the site, the factor likely to have caused mortality of plantings is to be determined and corrected if possible. If survival falls below 80% at any time during the two-year maintenance period, the plantings shall be replaced and other corrective measures, such as mulching or irrigation, may need to be implemented. If replanting is necessary, the maintenance period will be extended for two years from the date of replanting.

3) Invasive species control is to be conducted as needed based on site inspections. Invasive species include Himalayan blackberry (*Rubus armeniacus*), reed canarygrass (*Phalaris arundinacea*), teasel (*Dipsacus fullonum*), Canada and bull thistle (*Cirsium arvense* and *C. vulgare*), Scotch broom (*Cytisus scoparius*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed (*Polygonium cuspidatum*), morning glory (*Convolvulus* species), giant hogweed (*Heracleum mantegazzianum*), English ivy (*Hedera helix*), nightshade (*Solanum* species), and clematis (*Clematis ligusticifolia* and *C. vitalba*).

Exhibit H: Clean Water Services Service Provider Letter

Clean Water Services
Our commitment is clear.

CWS File Number
15-003302

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 07-20).

Jurisdiction:	Sherwood	**Review Type:**	Tier 1 Analysis
Site Address / Location:	21340 SW Elwert Rd Sherwood, OR 97140	**SPL Issue Date:**	November 24, 2015
		SPL Expiration Date:	November 23, 2017

Applicant Information:		**Owner Information:**	
Name	KELLY RITZ	Name	2007 MANDEL FAMILY TRUST
Company	VENTURE PROPERTIES	Company	
Address	4230 GALEWOOD ST, SUITE 100 PORTLAND OR 97225	Address	16990 SW RICHEN PARK CIR SHERWOOD OR 97140
Phone/Fax	(503) 387-7600	Phone/Fax	
E-mail:	kelly@stonebridgehomesnw.com	E-mail:	

Tax lot ID	**Development Activity**
2S130CB00250, 251	Mandel Farm Subdivision

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:	Marginal/Degraded		

Enhancement of Remaining Vegetated Corridor Required: [X]

Square Footage to be enhanced: 170,438

Encroachments into Pre-Development Vegetated Corridor:

Type and location of Encroachment:	Square Footage:
Road Improvements, Pedestrian Bridge & 10-foot Wide Trail, Stormwater Facility (Permanent Encroachment; Mitigation Required)	4,149
Stormwater Facility Outfalls (Permanent Encroachment; No Mitigation Required)	81
3-foot Wide Trail (Permanent Encroachment; No Mitigation Required)	3,704
Utilities, Bridge, Retaining Wall, Stomwater Facility (Temporary Encroachment; Restoration Planting In-place Required	4,896

Mitigation Requirements:

Type/Location	Sq. Ft./Ratio/Cost
On-site Replacement (2S130CB00250)	4,149

[X] Conditions Attached [X] Development Figures Attached (8) [ ] 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.

Alternatives Analysis

Washington County is requiring frontage improvements to SW Elwert Road. Frontage improvements include extending the existing sidewalk, which results in unavoidable vegetated corridor impact. The improvements to SW Elwert Road will result in impact within the outer 30% of the vegetated corridor. The project will meet the Tier 1 alternatives analysis criteria as described below. There are no alternatives to the location of the sidewalk extension that would result in less encroachment.

1. The proposed encroachment area is mitigated in accordance with Section 3.08.
The project will result in a total of 4,149 square feet of permanent vegetated corridor impact that requires mitigation. Therefore, 4,149 square feet of replacement vegetated corridor is planned to offset the permanent vegetated corridor encroachment. The proposed vegetated corridor replacement mitigation areas are broken up into several small areas adjacent to and continuous with existing vegetated corridor. The project will also result in a total of 4,896 square feet of temporary vegetated corridor impact. All temporarily impacted areas will be replanted to good condition.

2. Enhancement of the replacement area, if not already in good 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.
The 4,149 square feet of vegetated corridor replacement mitigation areas are currently in degraded condition, and will be enhanced to good condition. The site will have approximately 170,438 square feet of remaining on-site degraded and marginal condition vegetated corridor. The remaining 170,438 square feet of vegetated corridor will be enhanced to good condition, per CWS standards.

3. 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.

4. Location of development and site planning minimizes incursion into the Vegetated corridor.
Retaining walls have been incorporated into the project design to minimize vegetated corridor encroachment due to road improvements, the cul-de-sac, and the pedestrian trail. The bridge footings will be placed outside wetland areas to avoid impacts to the sensitive area.

5. No practicable alternative to the location of development exists that will not disturb the Vegetated Corridor.
No practical alternatives exist that would avoid vegetated corridor encroachment associated with the construction of the sidewalk along SW Elwert Road. Due to the existing sidewalk alignment and street improvements, the sidewalk cannot be re-aligned to avoid vegetated corridor encroachment.

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 07-20, Chapter 3.
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 07-20, Section 3.06.1 and per approved plans.
3. **If there will be 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.**

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 disturbance 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 07-20, Section 5.10.
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 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 07-20, Section 3.14.2, Table 3-3.
14. For Vegetated Corridors up to 50 feet wide, the applicant shall enhance the entire Vegetated Corridor to meet or exceed good corridor condition as defined in R&O 07-20, Section 3.14.2, Table 3-3.
15. 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.
16. 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 07-20, Appendix A, and shall include planting specifications for all Vegetated Corridor, including any cleared areas larger than 25 square feet in Vegetated Corridor rated ""good.""
17. Prior to installation of plant materials, all invasive vegetation within the Vegetated Corridor shall be removed per methods described in Clean Water Services' Integrated Vegetation and Animal Management Guidance, 2003. During removal of invasive vegetation care shall be taken to minimize impacts to existing native tree and shrub species.
18. Clean Water Services 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 Landscape Requirements (R&0 07-20, Appendix A).
19. **Maintenance and monitoring requirements shall comply with R&O 07-20, Section 2.11.2. 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.**
20. **Performance assurances for the Vegetated Corridor shall comply with R&O 07-20, Section 2.06.2, Table 2-1 and Section 2.10, Table 2-2.**
21. **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.

22. **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.**
23. 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.
24. 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).
25. 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.
26. 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.

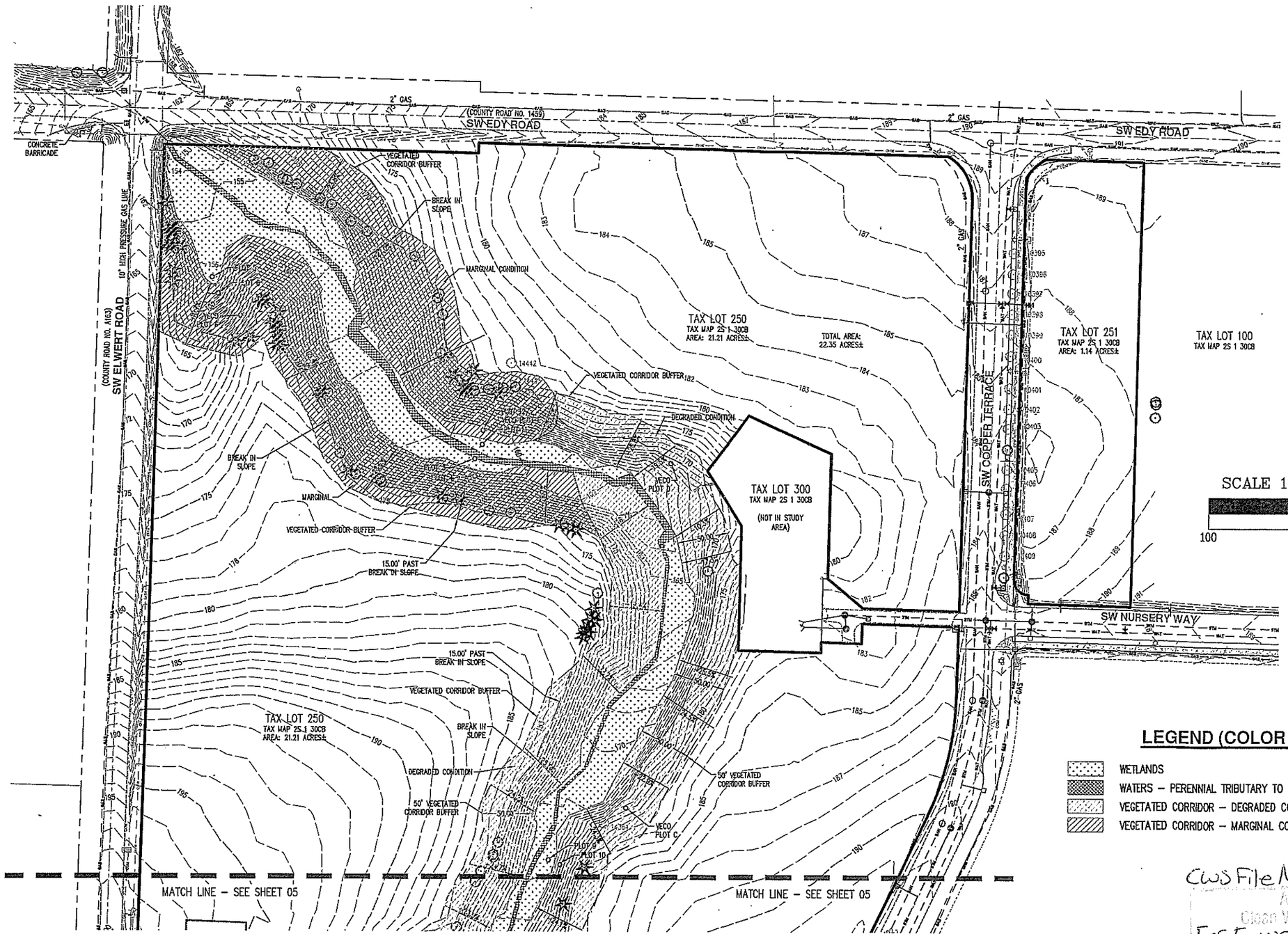
This Service Provider Letter is not valid unless CWS-approved site plan is attached.

Please call (503) 681-3667 with any questions.

Stacy Benjamin

Stacy Benjamin
Environmental Plan Review

Attachments (8)



LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±
VEGETATED CORRIDOR – DEGRADED CONDITION	= 121,436 SF±
VEGETATED CORRIDOR – MARGINAL CONDITION	= 61,728 SF±

CWS File No. 15-003302
Approved
Clean Water Services
For Environmental Review
By SUB Date 11/29/15
SPL Attachment 1 of 8

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

VEGETATED CORRIDOR EXISTING CONDITIONS - NORTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 10-08-2015	

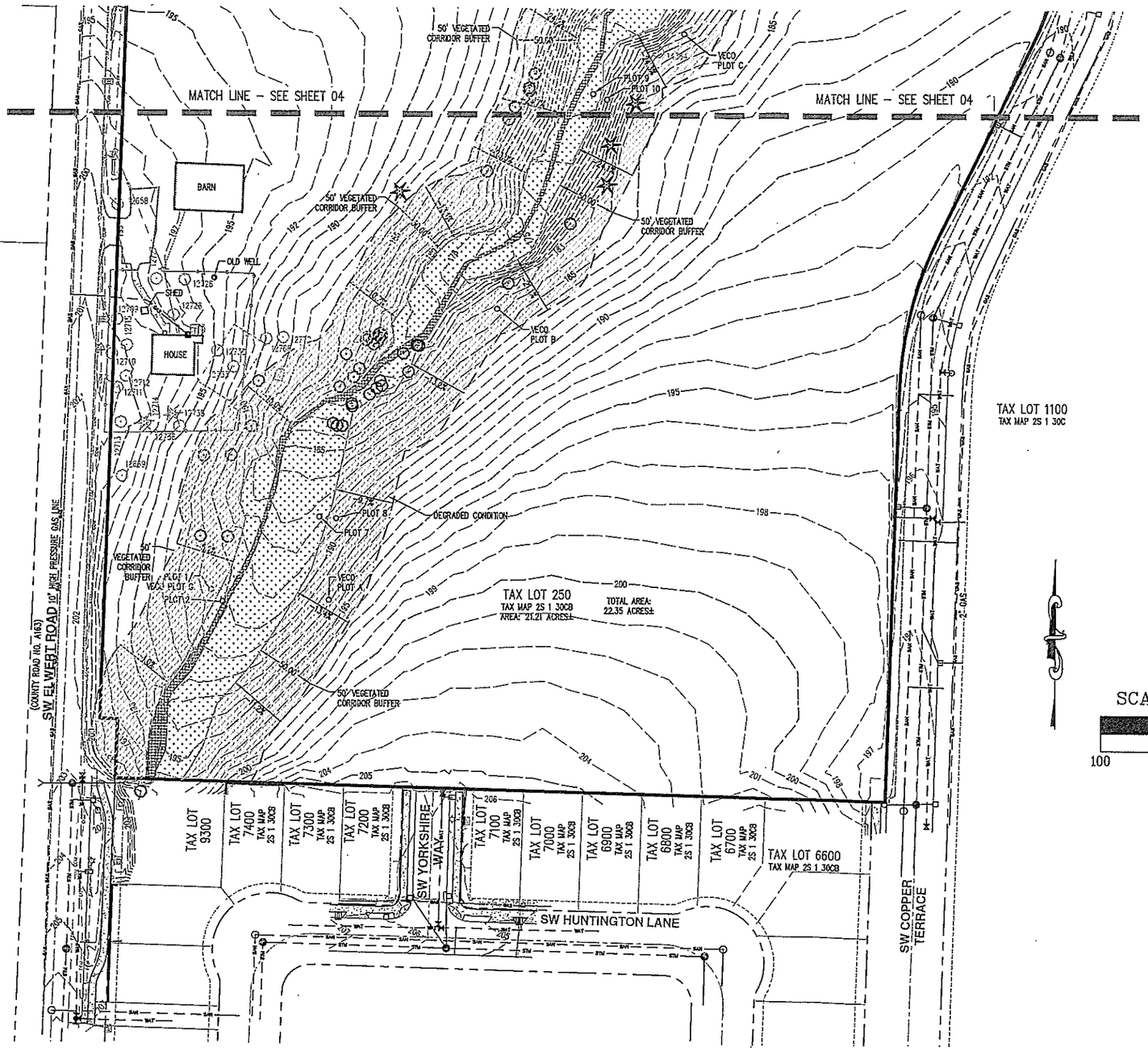
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
04

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC EXISTING CONDITIONS | LAYOUT: CWS 04



SCALE 1" = 100 FEET

100 0 40 60 80 100

LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±
VEGETATED CORRIDOR – DEGRADED CONDITION	= 121,436 SF±
VEGETATED CORRIDOR – MARGINAL CONDITION	= 61,728 SF±

CWS File No. 15-003302
Approved
Clean Water Services
FO Environmental Review
By SWB 11/24/15
SPL Attachment 2 of 8

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MANDEL FARM SUBDIVISION

SHERWOOD OREGON

TAX LOTS 250 AND 251 WASHINGTON COUNTY TAX MAP 2S 1 30CB

VEGETATED CORRIDOR EXISTING CONDITIONS - SOUTH HALF

DESIGNED BY: PAS/DS
DRAWN BY: PAS
CHECKED BY: SR
SCALE: AS NOTED
DATE: 10-08-2015

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

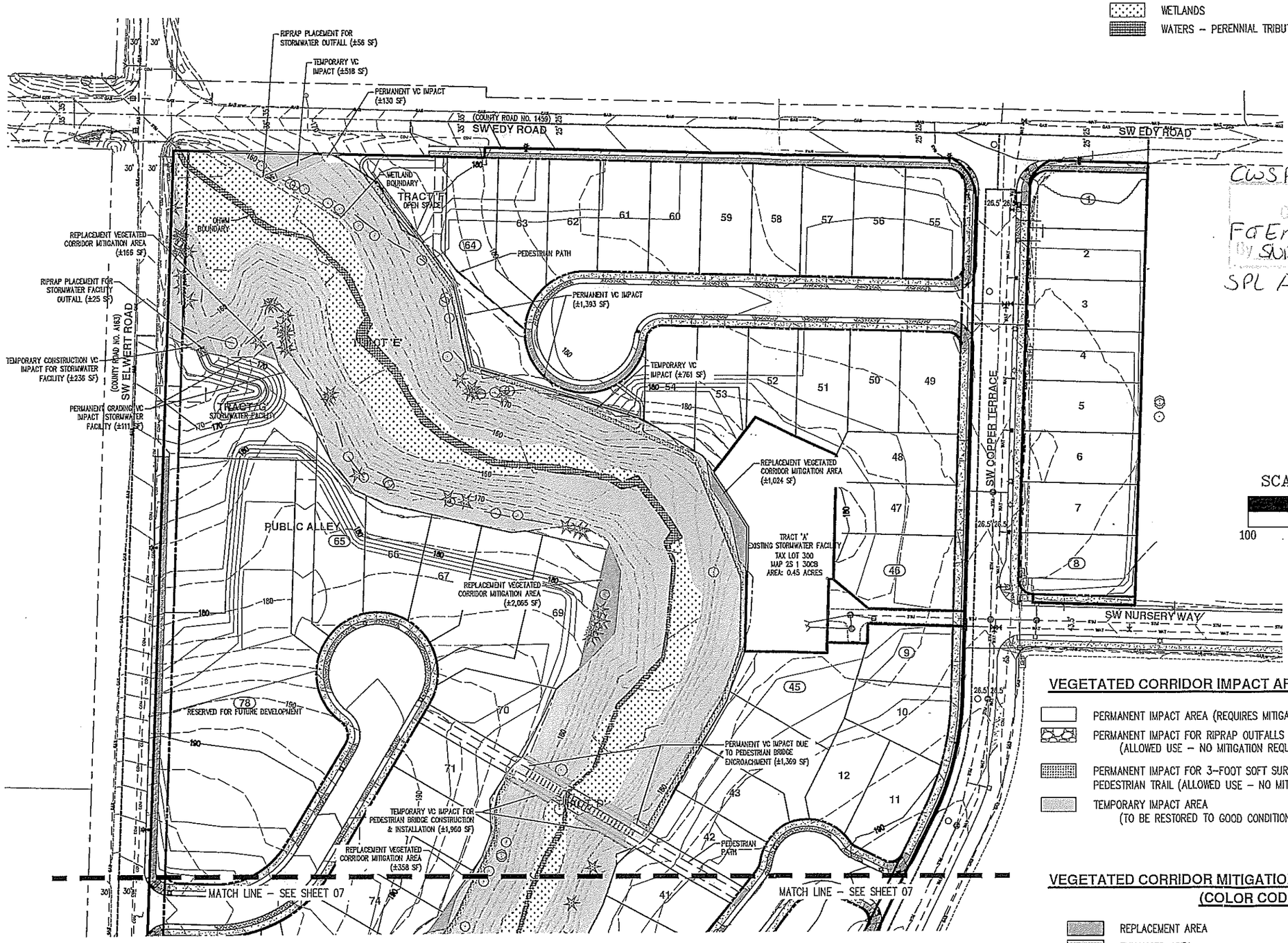
JOB NUMBER 4570

FIGURE 05

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC EXISTING CONDITIONS.DWG | LAYOUT: CWS 05

LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±



CWS File No. 15-003302
Agenda Item
Clean Water Services
FG Environmental Review
By SUB 11/29/15
SPL Attachment 3 of 8

SCALE 1" = 100 FEET

100 0 40 60 80 100

VEGETATED CORRIDOR IMPACT AREAS (COLOR CODED)

PERMANENT IMPACT AREA (REQUIRES MITIGATION)	= 4,149 SF±
PERMANENT IMPACT FOR RIPRAP OUTFALLS – 2 LOCATIONS (ALLOWED USE – NO MITIGATION REQUIRED)	= 81 SF±
PERMANENT IMPACT FOR 3-FOOT SOFT SURFACE PEDESTRIAN TRAIL (ALLOWED USE – NO MITIGATION REQUIRED)	= 3,704 SF±
TEMPORARY IMPACT AREA (TO BE RESTORED TO GOOD CONDITION)	= 4,896 SF±

VEGETATED CORRIDOR MITIGATION/ENHANCEMENT AREAS (COLOR CODED)

REPLACEMENT AREA	= 4,149 SF±
ENHANCED AREA	= 170,438 SF±

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
WASHINGTON COUNTY TAX MAP 2S 1 30CB
TAX LOTS 250 AND 251

PROPOSED VC IMPACT & MITIGATION PLAN - NORTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 11-05-2015	

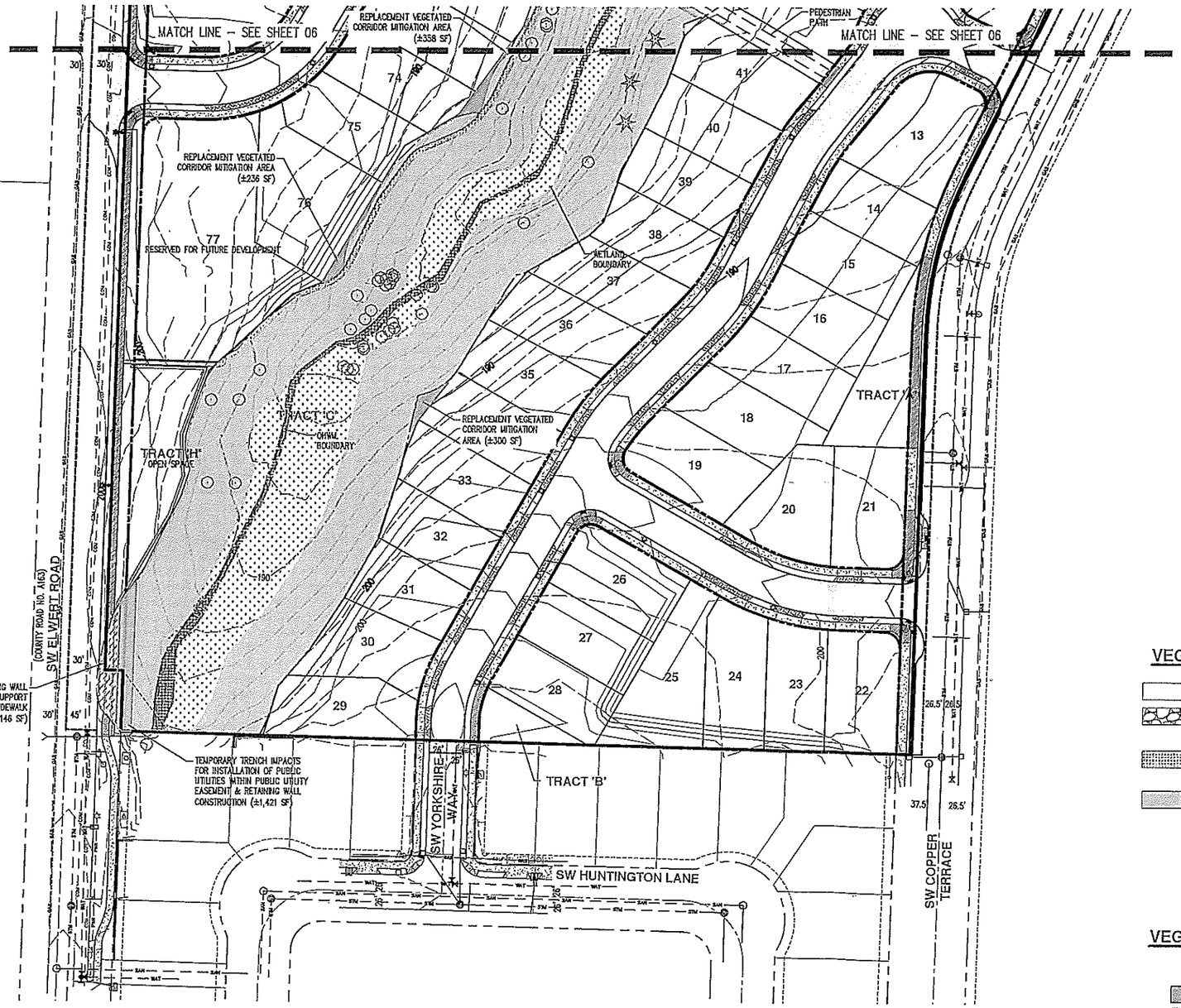
PRELIMINARY, NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
06

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC MITIGATION PLAN.DWG | LAYOUT: CBS 06



LEGEND (COLOR CODED)

WETLANDS	= 58,334 SF±
WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK	= 8,662 SF±

CWS File No. 15-003302

For Environmental Review
SNB 11/24/15
SPL Attachment 4 of 8

SCALE 1" = 100 FEET

100 0 40 60 80 100

VEGETATED CORRIDOR IMPACT AREAS (COLOR CODED)

PERMANENT IMPACT AREA (REQUIRES MITIGATION)	= 4,149 SF±
PERMANENT IMPACT FOR RIPRAP OUTFALLS – 2 LOCATIONS (ALLOWED USE – NO MITIGATION REQUIRED)	= 81 SF±
PERMANENT IMPACT FOR 3-FOOT SOFT SURFACE PEDESTRIAN TRAIL (ALLOWED USE – NO MITIGATION REQUIRED)	= 3,704 SF±
TEMPORARY IMPACT AREA (TO BE RESTORED TO GOOD CONDITION)	= 4,896 SF±

VEGETATED CORRIDOR MITIGATION/ENHANCEMENT AREAS (COLOR CODED)

REPLACEMENT AREA	= 4,149 SF±
ENHANCED AREA	= 170,438 SF±

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SHERWOOD OREGON
WASHINGTON COUNTY TAX MAP 2S 1 30CB
TAX LOTS 250 AND 251

PROPOSED VC IMPACT & MITIGATION PLAN - SOUTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 11-05-2015	

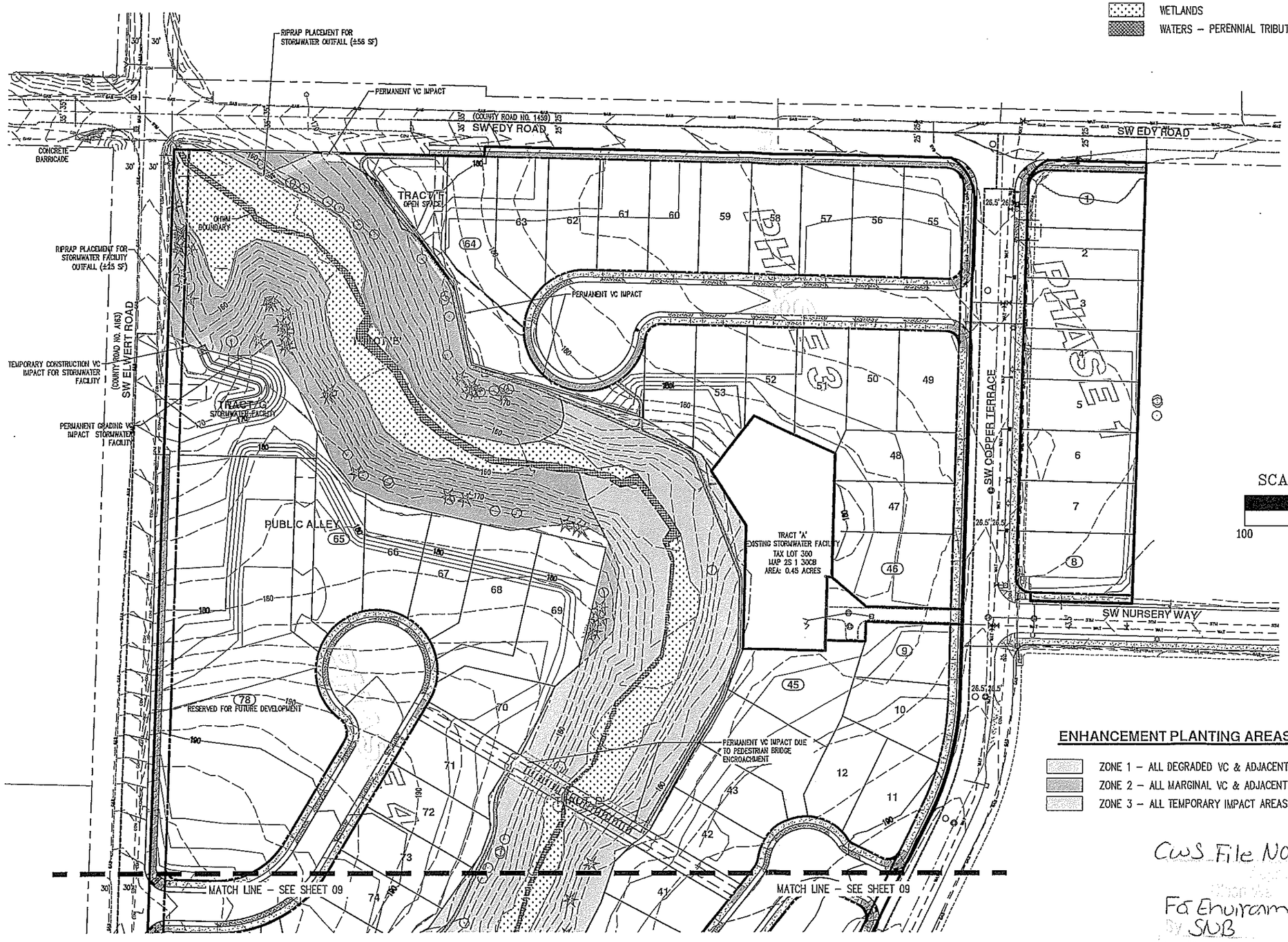
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER
4570

FIGURE
07

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC MITIGATION PLAN.DWG | LAYOUT: CWS 07



LEGEND (COLOR CODED)

- WETLANDS
- WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK

SCALE 1" = 100 FEET

100 0 40 60 80 100

ENHANCEMENT PLANTING AREAS (COLOR CODED)

ZONE 1 – ALL DEGRADED VC & ADJACENT VC REPLACEMENT AREAS	= 114,136 SF±
ZONE 2 – ALL MARGINAL VC & ADJACENT REPLACEMENT VC AREAS	= 60,451 SF±
ZONE 3 – ALL TEMPORARY IMPACT AREAS	= 4,896 SF±

CWS File No. 15-003302

For Environmental Review
By SNB 11/24/15

SPL Attachment 5 of 8

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SHERWOOD OREGON

TAX LOTS 250 AND 251 WASHINGTON COUNTY TAX MAP 2S 1 30CB

VC ENHANCEMENT PLANTING LOCATIONS - NORTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 11-05-2015	

PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER 4570

FIGURE 08

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC PLANTING ENHANCE PLANLOWG | LAYOUT: CVG 08

LEGEND (COLOR CODED)

- WETLANDS
- WATERS – PERENNIAL TRIBUTARY TO CHICKEN CREEK

SCALE 1" = 100 FEET

100 0 40 60 80 100

ENHANCEMENT PLANTING AREAS (COLOR CODED)

ZONE 1	– ALL DEGRADED VC & ADJACENT VC REPLACEMENT AREAS	= 114,136 SF±
ZONE 2	– ALL MARGINAL VC & ADJACENT REPLACEMENT VC AREAS	= 60,451 SF±
ZONE 3	– ALL TEMPORARY IMPACT AREAS	= 4,896 SF±

CWS File No. 15-003302

Clerk
For Environmental Review
By SNB 11/24/15

SPL Attachment 6 of 8

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SHERWOOD OREGON

TAX LOTS 250 AND 251 WASHINGTON COUNTY TAX MAP 2S 1 30CB

VC ENHANCEMENT PLANTING LOCATIONS - SOUTH HALF

DESIGNED BY:	PAS/DS
DRAWN BY:	PAS
CHECKED BY:	SR
SCALE:	AS NOTED
DATE: 11-05-2015	

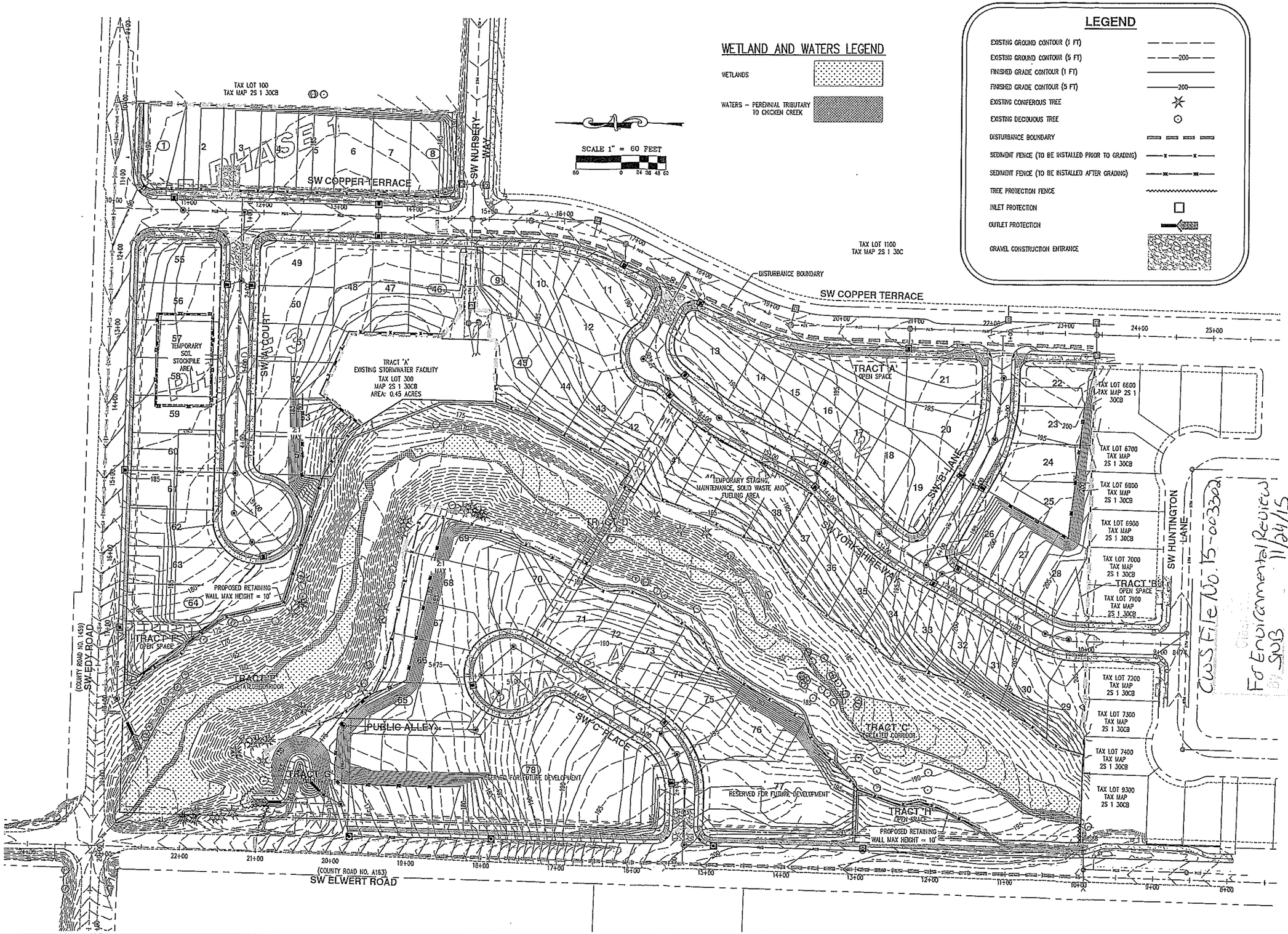
PRELIMINARY NOT FOR CONSTRUCTION

REVISIONS

JOB NUMBER 4570

FIGURE 09

AKS DRAWING FILE: 4570 MANDEL FARM SUB, VC PLANTING ENHANCE PLANTING | LAYOUT: CHS 09



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SHERWOOD, OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY GRADING AND EROSION AND SEDIMENT CONTROL PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED

DATE: 10-20-2015

REGISTERED PROFESSIONAL ENGINEER
PRELIMINARY NOT FOR CONSTRUCTION
OREGON
ALEXANDER H. HURLEY
RENEWAL DATE: 6/30/17

REVISIONS

JOB NUMBER
4570

SHEET
P09

AKS DRAWING FILE: P09 GRADING.DWG | LAYOUT: P09

REQUIRED SETBACKS

FRONT YARD:	14 FT
FRONT GARAGE:	20 FT
SIDE YARD:	5 FT
CORNER LOT SIDE YARD:	15 FT
*REAR YARD:	20 FT

*14' REAR YARD SETBACK PROPOSED ADJACENT TO VEGETATED CORRIDOR

DENSITY CALCULATIONS

GROSS SITE AREA:	±973,600 SF (±22.35 AC)
PUBLIC R.O.W. DEDICATION:	±155,382 SF (±3.57 AC)
SENSITIVE LANDS TRACTS (VEGETATED CORRIDOR & WETLANDS):	±246,994 SF (±5.67 AC)
FUTURE DEVELOPMENT TRACTS:	±74,615 SF (±1.71 AC)
NET DEVELOPABLE AREA:	±496,609 SF (±11.40 AC)

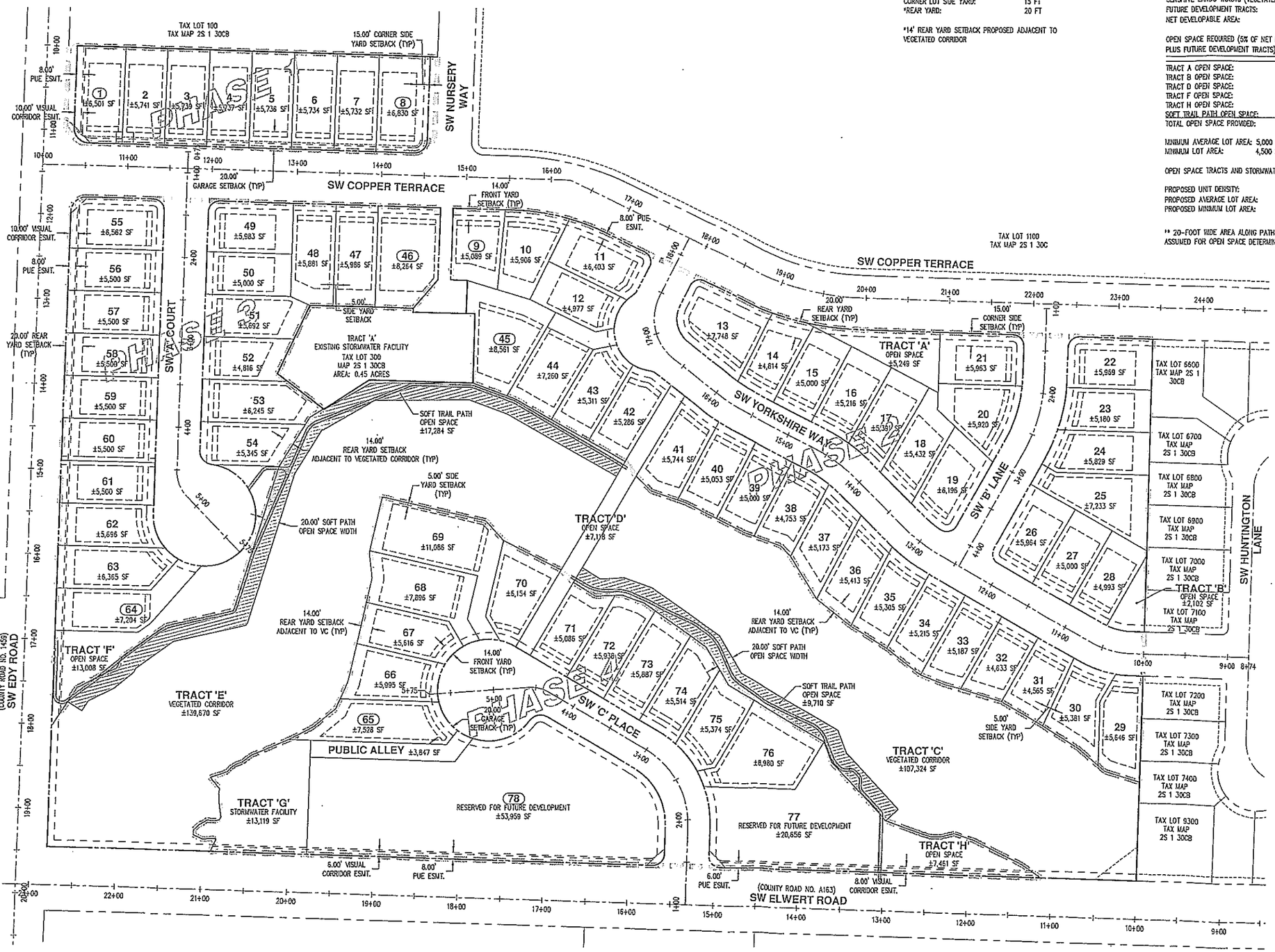
OPEN SPACE REQUIRED (5% OF NET DEVELOPABLE PLUS FUTURE DEVELOPMENT TRACTS):	±28,517 SF
TRACT A OPEN SPACE:	±5,249 SF
TRACT B OPEN SPACE:	±2,102 SF
TRACT D OPEN SPACE:	±7,118 SF**
TRACT F OPEN SPACE:	±13,008 SF
TRACT H OPEN SPACE:	±7,461 SF
SOFT TRAIL PATH OPEN SPACE:	±26,994 SF**
TOTAL OPEN SPACE PROVIDED:	±61,932 SF

MINIMUM AVERAGE LOT AREA: 5,000 SF
MINIMUM LOT AREA: 4,500 SF

OPEN SPACE TRACTS AND STORMWATER FACILITY:	±48,057 SF (±1.10 AC)

PROPOSED UNIT DENSITY:	76 UNITS
PROPOSED AVERAGE LOT AREA:	(448,552/76 LOTS) = 5,902 SF
PROPOSED MINIMUM LOT AREA:	4,565 SF

** 20-FOOT WIDE AREA ALONG PATHS ASSUMED FOR OPEN SPACE DETERMINATIONS.



City File No. 15-00382
For Environmental Review
11/24/15
SPL Attachment 8 of 8

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MANDEL FARMS SUBDIVISION

SHERWOOD OREGON
TAX LOTS 250 AND 251
WASHINGTON COUNTY TAX MAP 2S 1 30CB

PRELIMINARY BUILDING SETBACKS PLAN

DESIGNED BY:	PAS/DS
DRAWN BY:	DS
CHECKED BY:	PAS
SCALE:	AS NOTED
DATE: 10-20-2015	

REGISTERED PROFESSIONAL LAND SURVEYOR
PRELIMINARY NOT FOR CONSTRUCTION
OREGON JULY 20, 2003 ALEXANDER H. HURLEY 55391LS
RENEWS: 6/30/17

REVISIONS

JOB NUMBER
4570

SHEET
P04

AKS DRAWING FILE: P04 SETBACKS.DWG | LAYOUT: P04

Exhibit I: October 28, 2015 City of Sherwood Engineering Memo

Engineering Land Use Application Comments

To:	Connie Randall, Associate Planner
From:	Craig Christensen, P.E., Engineering Department
Project:	Mandel Property Zone Change (PA 15-04)
Date:	October 28, 2015

Engineering staff has reviewed the information provided for the above cited project. Final construction plans will need to meet the standards established by the City of Sherwood Engineering Department and Public Works Department, Clean Water Services (CWS) and Tualatin Valley Fire & Rescue in addition to requirements established by other jurisdictional agencies providing land use comments. City of Sherwood Engineering Department comments are as follows:

Sanitary Sewer
Currently there is no sanitary sewer available for servicing of the subject zone change property along SW Elwert Road. It is anticipated that future sanitary service will come from a 15-inch diameter sanitary sewer within SW Copper Terrace. Since the amount of area of the zone change is relatively small in respect to the overall basin that will be served by the 15-inch diameter sanitary sewer, any changes in zoning will not have a significant effect on the sanitary sewer system.

Water
Currently there is no public water service available for servicing of the subject zone change property along SW Elwert Road. It is anticipated that future water service will be looped through the subject zone change property providing adequate service for the new zoning classification.

Storm Sewer
Currently there is no storm sewer available for servicing of the subject zone change property along SW Elwert Road. It is anticipated that the subject zone change property will discharge storm runoff into the existing tributary. The new zoning will likely have less impervious area than the existing. Therefore, the proposed zone change will slightly reduce the future flows at the culvert crossing beneath the SW Elwert Road/SW Edy Road intersection.

Transportation
The subject zone change property is adjacent to SW Elwert Road and would likely get sole access from SW Elwert Road due to a tributary around the other 3 sides of the property. A Trip Analysis by Lancaster Engineering has concluded that the proposed

zone change from Neighborhood Commercial to Medium Density Residential High would result in less traffic than the current zone designation. Therefore the new zoning will reduce the future traffic impacts to SW Elwert Road from development of the subject property.

Since the proposed zone change reduces the number of trips to and from the subject zone change property, the change in zoning does not significantly affect an existing or planned transportation facility therefore not requiring any additional measures per OAR 660-012-0060.

The City of Sherwood Transportation System Plan (TSP) shows a future neighborhood route connecting SW Elwert Road and SW Copper Terrace through the subject zone change property. This future street is identified in the TSP under Section E (Aspirational Project List) as project D35. Even though the TSP shows the neighborhood route through the subject zone change property, exact locations of future streets within the TSP are graphical in nature and are not intended to designate exact locations. In the case of this connector street between SW Elwert Road and SW Copper Terrace locating it within the subject zone change property would be very expensive on both monetary and environmental levels since it would require crossing a tributary that is significantly lower than the surrounding property. The cost of bridging the tributary in this area would likely exceed $2,000,000 for a 700-foot section of roadway. During the design of the subdivision south of the subject zone change property (Daybreak Subdivision) a future street plan was submitted identifying an interconnect between SW Copper Terrace and SW Elwert Road where a new local street would intersect with SW Elwert Road approximately 730 north of SW Handley Street. This new interconnect will be fully funded by the development of the property in which it lies (no city funding).

Due to the above data, no street crossing of the tributary will be required of the subject property during the land use review process. This should be taken into account when considering the acceptability of a zone change.

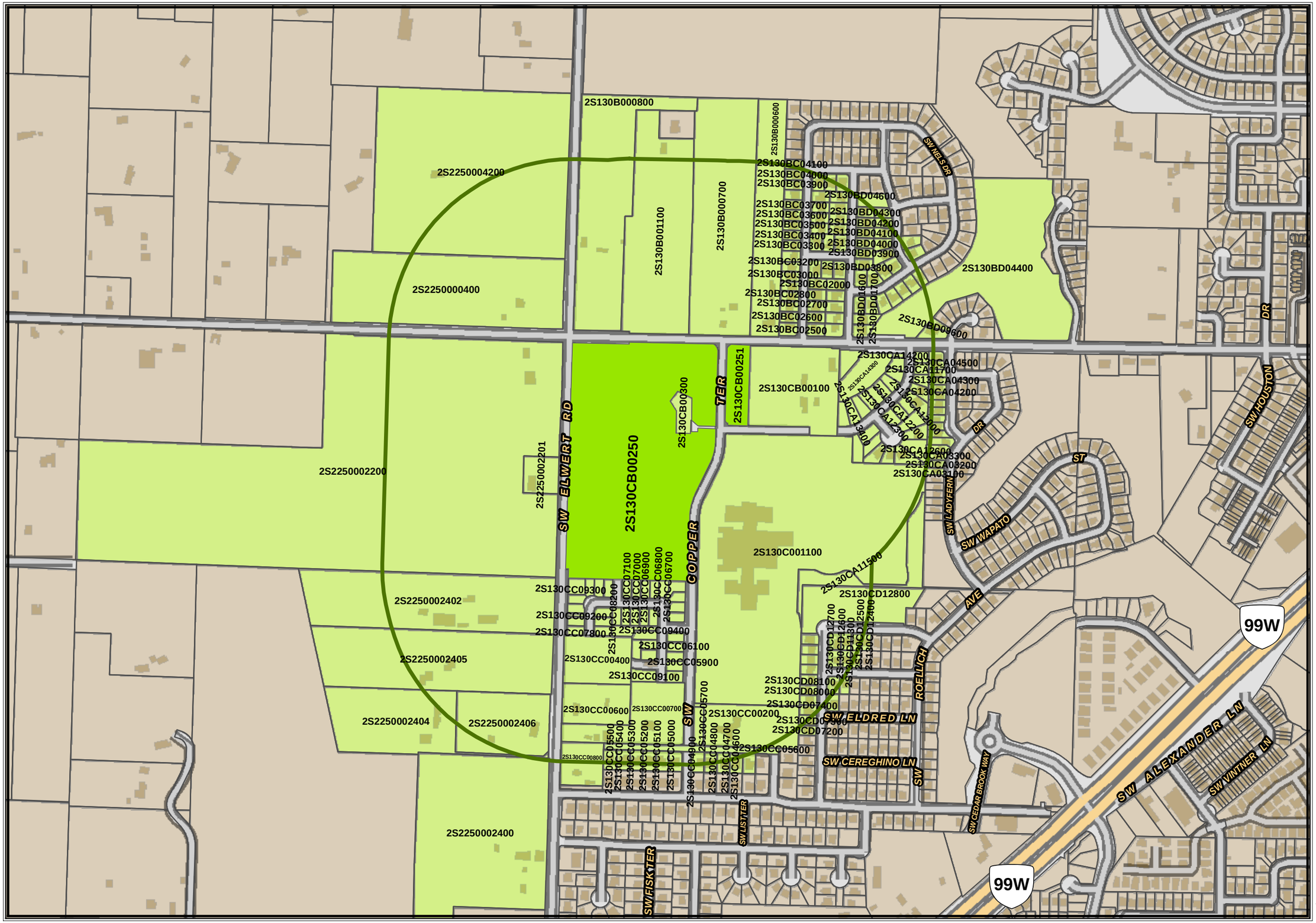
Final Analysis

From a public improvement standpoint, the proposed zone change for the western portion of the subject property will not have a significant effect on public facilities.

Engineering conditions for the subject property will be made at the time of development of the subject property. Therefore there are no engineering conditions at this time.

END OF COMMENTS

Exhibit J: Mailing Labels



Prepared By:

First American

Date: 10/14/2015

1000 Foot Radius
21340 SW Elwert Rd

- Subject Parcels
- Notification Area
- Radius
- Taxlots

This information is deemed reliable but is not guaranteed.

2S130B0 00600
Christ Schmidt
18107 SW Edy Rd
Sherwood, OR 97140

2S130B0 00700
Louis Christen
1719 SE 161st Pl
Vancouver, WA 98683

2S130B0 00800
Ida Wilks
20812 SW Elwert Rd
Sherwood, OR 97140

2S130B0 01100
Lowal Labahn
18283 SW Edy Rd
Sherwood, OR 97140

2S130BC 00100
Kknw LLC
1800 NW 167th Pl #150
Beaverton, OR 97006

2S130BC 00200
Thomas Ogle
20723 SW Settlement Dr
Sherwood, OR 97140

2S130BC 00300
Aaron Hutchens
20739 SW Settlement Dr
Sherwood, OR 97140

2S130BC 00400
Barrie Malcolm
20755 SW Settlement Dr
Sherwood, OR 97140

2S130BC 00500
Carol Carr
13410 NE 80th St
Redmond, WA 98052

2S130BC 00600
Paul & Sarah Billeci
17961 SW Bridger Ln
Sherwood, OR 97140

2S130BC 00700
Steve Traffas
17993 SW Bridger Ln
Sherwood, OR 97140

2S130BC 00800
James Bryant
20762 SW Trails End Dr
Sherwood, OR 97140

2S130BC 00900
Alan Schechla
Po Box 1201
Sherwood, OR 97140

2S130BC 01000
Derek Conrow
22500 SW Fairoaks Ct
Sherwood, OR 97140

2S130BC 01100
Czmowski
20714 SW Trails End Dr
Sherwood, OR 97140

2S130BC 01200
Natalie Thompson
20983 SW Settlement Dr
Sherwood, OR 97140

2S130BC 01300
Phillip Jackson
20959 SW Settlement Dr
Sherwood, OR 97140

2S130BC 01400
Charilyn Crooks
20933 SW Settlement Dr
Sherwood, OR 97140

2S130BC 01500
Kenneth Judy
20905 SW Settlement Dr
Sherwood, OR 97140

2S130BC 01600
Bradley Albert
20877 SW Settlement Dr
Sherwood, OR 97140

2S130BC 01700
Bruce Hall
17924 SW Bridger Ln
Sherwood, OR 97140

2S130BC 01800
Peter Morin
17956 SW Bridger Ln
Sherwood, OR 97140

2S130BC 01900
Terry Melzer
17988 SW Bridger Ln
Sherwood, OR 97140

2S130BC 02000
Teresa Parfet
20872 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02100
James Lee
20906 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02200
Dennis Richards
20932 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02300
Linda Ager
20958 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02400
Brooks Eilertson
20982 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02500
John Randolph Lacy
20987 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02600
Tod Kringelhede
20963 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02700
Carolyn McBee
20937 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02800
Mark Sullivan
20911 SW Trails End Dr
Sherwood, OR 97140

2S130BC 02900
David Weinberger
20885 SW Trails End Dr
Sherwood, OR 97140

2S130BC 03000
James Krauel
20859 SW Trails End Dr
Sherwood, OR 97140

2S130BC 03100
Kknw LLC
1800 NW 167th Pl #150
Beaverton, OR 97006

2S130BC 03200
Aaron Avon
20805 SW Trails End Dr
Sherwood, OR 97140

2S130BC 03300
Stephen Marriott
20789 SW Trails End Dr
Sherwood, OR 97140

2S130BC 03400
Lindsay Layne Jones Kubin
181 Link Ct
Newberg, OR 97132

2S130BC 03500
Kevin Call
20757 SW Trails End Dr
Sherwood, OR 97140

2S130BC 03600
Julie Vincent
20741 SW Trails End Dr
Sherwood, OR 97140

2S130BC 03700
Christopher Katsuda
10954 SW Marilyn St
Tualatin, OR 97062

2S130BC 03800
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2870 Driscoll Rd
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2S130BC 03900
Brian Petty
20697 SW Trails End Dr
Sherwood, OR 97140

2S130BC 04000
David Gilmore
20685 SW Trails End Dr
Sherwood, OR 97140

2S130BC 04100
Lowell Serfling
20673 SW Trails End Dr
Sherwood, OR 97140

2S130BC 06300
Jacques Tardy
17982 SW Farwest Ln
Sherwood, OR 97140

2S130BC 06400
Peter Glazer Sr.
4500 Kruse Way #390
Lake Oswego, OR 97035

2S130BC 06500
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2108 SE 131st Ave
Vancouver, WA 98683

2S130BD 01400
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20990 SW Settlement Dr
Sherwood, OR 97140

2S130BD 01500
Betty Winkelman
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Sherwood, OR 97140

2S130BD 01600
Rose Wilson
17898 SW Nels Dr
Sherwood, OR 97140

2S130BD 01700
Lsf9 Master Participation
511 SW 10th Ave #400
Portland, OR 97205

2S130BD 01800
Nicholas Thomas Chester
17870 SW Nels Dr
Sherwood, OR 97140

2S130BD 01900
Linda Conder
17854 SW Nels Dr
Sherwood, OR 97140

2S130BD 02000
Randy Freeman
17830 SW Nels Dr
Sherwood, OR 97140

2S130BD 02100
Kenneth Sonner
17808 SW Nels Dr
Sherwood, OR 97140

2S130BD 02200
William Haffner
17796 SW Nels Dr
Sherwood, OR 97140

2S130BD 02400
Tracey Stadick
20786 SW Santa Fe Ter
Sherwood, OR 97140

2S130BD 02500
Mark Normo
20764 SW Santa Fe Ter
Sherwood, OR 97140

2S130BD 02900
Paula Standring Investment Compa
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2S130BD 03000
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Sherwood, OR 97140

2S130BD 03100
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2S130BD 03200
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Sherwood, OR 97140

2S130BD 03300
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Sherwood, OR 97140

2S130BD 03400
Judy Malena Winner
17815 SW Nels Dr
Sherwood, OR 97140

2S130BD 03500
Jose Castelan
17841 SW Nels Dr
Sherwood, OR 97140

2S130BD 03600
Michael Conrow
21030 SW Finnigan Hill Rd
Hillsboro, OR 97123

2S130BD 03700
Michael Conrow
21030 SW Finnigan Hill Rd
Hillsboro, OR 97123

2S130BD 03800
Carol Jean Westbrook
20820 SW Settlement Dr
Sherwood, OR 97140

2S130BD 03900
Eloise Hanable
20794 SW Settlement Dr
Sherwood, OR 97140

2S130BD 04000
Mohammed Al-Sheikhly
20778 SW Settlement Dr
Sherwood, OR 97140

2S130BD 04100
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2S130BD 04200
Benjamin Coffman
20746 SW Settlement Dr
Sherwood, OR 97140

2S130BD 04300
Christopher Farthing
20730 SW Settlement Dr
Sherwood, OR 97140

2S130BD 04400
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22560 SW Pine St
Sherwood, OR 97140

2S130BD 04600
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130BD 09500
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Sherwood, OR 97140

2S130BD 09600
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1 Home Campus
Des Moines, IA 50328

2S130C0 01100
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2S130CA 03100
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21267 SW Ladyfern Dr
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2S130CA 03200
Yi De Wu
21251 SW Ladyfern Dr
Sherwood, OR 97140

2S130CA 03300
Michael Fletcher
21235 SW Ladyfern Dr
Sherwood, OR 97140

2S130CA 03400
Phillip Riggs
21219 SW Ladyfern Dr
Sherwood, OR 97140

2S130CA 03500
David Mandaro
21203 SW Ladyfern Dr
Sherwood, OR 97140

2S130CA 03600
Carlos Bejarano
21171 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 03700
Brandon Smith
21155 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 03800
Joseph Keebler
21139 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 03900
Scott White
21123 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 04000
Jody Cook
21107 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 04100
Valladares
21091 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 04200
Bonnie Denise Schmidlin
21075 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 04300
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21059 SW Bedstraw Ter
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2S130CA 04400
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1849 Sichel St #B
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2S130CA 04500
Jennifer Benthin
21027 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 04600
Erica Vaness
21011 SW Bedstraw Ter
Sherwood, OR 97140

2S130CA 11500
Sherwood School Dist 88j
23295 SW Main St
Sherwood, OR 97140

2S130CA 11600
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Lake Oswego, OR 97035

2S130CA 11700
Joshua Davis
21046 SW Nursery Way
Sherwood, OR 97140

2S130CA 11800
Tony Knox
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2S130CA 11900
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21088 SW Nursery Way
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2S130CA 12000
Cowan
Po Box 460
Sherwood, OR 97140

2S130CA 12100
David Morgan Sr.
21114 SW Nursery Way
Sherwood, OR 97140

2S130CA 12200
Joseph Hendrickson
21120 SW Nursery Way
Sherwood, OR 97140

2S130CA 12300
Kevin Hoffman
21136 SW Nursery Way
Sherwood, OR 97140

2S130CA 12400
Weston Lahr
17871 SW Nursery Ct
Sherwood, OR 97140

2S130CA 12500
Mark Oliver
17855 SW Nursery Ct
Sherwood, OR 97140

2S130CA 12600
Brian Daniel Gill
17843 SW Nursery Ct
Sherwood, OR 97140

2S130CA 12700
Samuel Brewer
17860 SW Nursery Ct
Sherwood, OR 97140

2S130CA 12800
Darbey Budd
17892 SW Nursery Ct
Sherwood, OR 97140

2S130CA 12900
Timothy Miller
17914 SW Nursery Ct
Sherwood, OR 97140

2S130CA 13000
David Adam Wilcox
17928 SW Nursery Ct
Sherwood, OR 97140

2S130CA 13100
Thomas Ponnuswamy
17940 SW Nursery Ct
Sherwood, OR 97140

2S130CA 13200
Josh Kliever
21214 SW Nursery Way
Sherwood, OR 97140

2S130CA 13300
Scott Douglas Petersen
21163 SW Nursery Way
Sherwood, OR 97140

2S130CA 13400
William Deborde
21151 SW Nursery Way
Sherwood, OR 97140

2S130CA 13500
August Mazenko
21149 SW Nursery Way
Sherwood, OR 97140

2S130CA 13600
David Yang
21137 SW Nursery Way
Sherwood, OR 97140

2S130CA 13700
Robert James Eckstein
21123 SW Nursery Way
Sherwood, OR 97140

2S130CA 13800
Charles Gregory
21115 SW Nursery Way
Sherwood, OR 97140

2S130CA 13900
Luis Milera Jr.
21093 SW Nursery Way
Sherwood, OR 97140

2S130CA 14000
David Amparan
21067 SW Nursery Way
Sherwood, OR 97140

2S130CA 14100
Renaissance Custom Homes LLC
16771 Boones Ferry Rd
Lake Oswego, OR 97035

2S130CA 14200
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CA 14300
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CA 14400
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CA 14500
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CB 00100
18022 Edy LLC
18022 SW Edy Rd
Sherwood, OR 97140

2S130CB 00300
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CC 00200
Fillmore
21750 SW Copper Ter
Sherwood, OR 97140

2S130CC 00400
Alexander
11401 SW 107th Pl
Tigard, OR 97223

2S130CC 00600
Alan Schendel
12599 SW Bridgeview Ct
Tigard, OR 97223

2S130CC 00700
Alexander
11401 SW 107th Pl
Tigard, OR 97223

2S130CC 00800
Reynolds
21880 SW Elwert Rd
Sherwood, OR 97140

2S130CC 04500
Donya Roth
18068 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 04600
Brian Tharp
18094 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 04700
Gower Talley
18120 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 04800
Matthew Thomsen
18134 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 04900
Yvette Elledge
18160 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 05000
Corwin Nordstrom
18202 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 05100
Alan Belyea
18228 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 05200
Matthew Sheetz
18256 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 05300
David Timmer
Po Box 995
Sherwood, OR 97140

2S130CC 05400
Bryan Pennington
18324 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 05500
Justin Branco
11865 SW Tualatin Rd #66
Tualatin, OR 97062

2S130CC 05600
Copper Meadows Owners
18324 SW Cereghino Ln
Sherwood, OR 97140

2S130CC 05700
Sherwood School Dist 88j
23295 SW Main St
Sherwood, OR 97140

2S130CC 05800
Charles Kunert
21718 SW Oxford Ter
Sherwood, OR 97140

2S130CC 05900
Dolly Jolene Langford
21698 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06000
Jeff Lowe
21660 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06100
Jeffrey Hill
21644 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06200
Lawrence Mucha
21622 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06300
Leonard Bolen Jr.
21588 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06400
Charles Macdonald
21562 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06500
Matthew Zaniewski
21546 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06600
Zhen Li
21524 SW Oxford Ter
Sherwood, OR 97140

2S130CC 06700
Richard Anderson
18355 SW Huntington Ln
Sherwood, OR 97140

2S130CC 06800
Michael Phillips
18371 SW Huntington Ln
Sherwood, OR 97140

2S130CC 06900
Brandy Budd
18393 SW Huntington Ln
Sherwood, OR 97140

2S130CC 07000
Henan Zhang
18419 SW Huntington Ln
Sherwood, OR 97140

2S130CC 07100
Chichang Zhang
18435 SW Huntington Ln
Sherwood, OR 97140

2S130CC 07200
Derek Hann
18463 SW Huntington Ln
Sherwood, OR 97140

2S130CC 07300
Michael Panson
18481 SW Huntington Ln
Sherwood, OR 97140

2S130CC 07400
Nicholas Babcock
18505 SW Huntington Ln
Sherwood, OR 97140

2S130CC 07500
Erin Anderson
21557 SW Derby Ter
Sherwood, OR 97140

2S130CC 07600
Gregory Folk
21573 SW Derby Ter
Sherwood, OR 97140

2S130CC 07700
Kimberly Merrill
21591 SW Derby Ter
Sherwood, OR 97140

2S130CC 07800
Andrew Collins
21615 SW Derby Ter
Sherwood, OR 97140

2S130CC 07900
Johanna Knight
Po Box 1538
Sherwood, OR 97140

2S130CC 08000
Richard Powers
21598 SW Derby Ter
Sherwood, OR 97140

2S130CC 08100
Deborah Martin
21576 SW Derby Ter
Sherwood, OR 97140

2S130CC 08200
Christopher Burke
18454 SW Huntington Ln
Sherwood, OR 97140

2S130CC 08300
Stephanie Austermann
18432 SW Huntington Ln
Sherwood, OR 97140

2S130CC 08400
Matthew Griffin
18410 SW Huntington Ln
Sherwood, OR 97140

2S130CC 08500
Ryan Williams
18396 SW Huntington Ln
Sherwood, OR 97140

2S130CC 08600
Norman Helsham
18378 SW Huntington Ln
Sherwood, OR 97140

2S130CC 08700
Mark Steger
21623 SW Oxford Ter
Sherwood, OR 97140

2S130CC 08800
Nathaniel Coston
21635 SW Oxford Ter
Sherwood, OR 97140

2S130CC 08900
Sean Potter
21657 SW Oxford Ter
Sherwood, OR 97140

2S130CC 09000
Kevin Flower
18409 SW Locksley Ln
Sherwood, OR 97140

2S130CC 09100
Paul Baxter
21715 SW Oxford Ter
Sherwood, OR 97140

2S130CC 09200
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CC 09300
Sherwood City
22560 SW Pine St
Sherwood, OR 97140

2S130CC 09400
Daybreak Homeowners Association
21621 SW Oxford Ter
Sherwood, OR 97140

2S130CD 03300
Kyle Russell
17983 SW Eldred Ln
Sherwood, OR 97140

2S130CD 07200
Jason Tyler
21839 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 07300
Michael Whisenhunt
21811 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 07400
Edward Dillon
21783 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 07500
Diane Stark
21759 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 08000
Eva Morris
17918 SW Vandolah Ln
Sherwood, OR 97140

2S130CD 08100
Brynn Buswell
21715 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 08200
Eric Vandenberg
21683 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 08300
Lori Heironimus
21661 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 08400
Robert Rettig
21639 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 08500
Timothy Breslin
21617 SW Aldridge Ter
Sherwood, OR 97140

2S130CD 11000
Colin Bishop
17962 SW Reisner Ln
Sherwood, OR 97140

2S130CD 11100
Vantage Homes LLC
1761 3rd St #103
Norco, CA 92860

2S130CD 11200
Joseph Young
17993 SW Reisner Ln
Sherwood, OR 97140

2S130CD 11300
Frank Heckendorn
17967 SW Reisner Ln
Sherwood, OR 97140

2S130CD 11400
Alexander Salisbury
17943 SW Reisner Ln
Sherwood, OR 97140

2S130CD 12400
Stanley Stobie
17912 SW Gillette Ln
Sherwood, OR 97140

2S130CD 12500
Mark Finerson
17936 SW Gillette Ln
Sherwood, OR 97140

2S130CD 12600
Cashman
23311 SW Redfern Pl
Sherwood, OR 97140

2S130CD 12700
Danny Tam
17984 SW Gillette Ln
Sherwood, OR 97140

2S130CD 12800
Sherwood City
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Sherwood, OR 97140

2S22500 00400
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Portland, OR 97268

2S22500 02201
Rodney Hill
21285 SW Elwert Rd
Sherwood, OR 97140

2S22500 02400
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15265 SW Beef Bend Rd
Tigard, OR 97224

2S22500 02402
Ronald Edwin Bennink
21615 SW Elwert Rd
Sherwood, OR 97140

2S22500 02402
Ronald Edwin Bennink
21615 SW Elwert Rd
Sherwood, OR 97140

2S22500 02404
Scott Jeffrey Thiel
21875 SW Elwert Rd
Sherwood, OR 97140

2S22500 02405
Patricia Te Ottoman
Po Box 1569
Sherwood, OR 97140

2S22500 02406
Thomas Samples
21839 SW Elwert Rd
Sherwood, OR 97140

2S22500 04200
Tom Lt Pettijohn
Po Box 341
Sherwood, OR 97140

Exhibit K: Traffic Impact Analysis

MANDEL PROPERTY SUBDIVISION
TRAFFIC IMPACT STUDY

SHERWOOD, OREGON

DATE:
January 5, 2016

PREPARED FOR:
Venture Properties, Inc.

PREPARED BY:
Daniel Stumpf, EI
Michael Ard, PE

REGISTERED PROFESSIONAL ENGINEER
54983PE
OREGON
JULY 10, 2002
MICHAEL T. ARD

EXPIRES: 12/31/17

LANCASTER ENGINEERING

321 SW 4th Ave., Suite 400 | Portland, OR 97204 | 503.248.0313 | lancasterengineering.com

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EXECUTIVE SUMMARY

1. An 86-lot subdivision is proposed for property located in the southeast quadrant of the intersection of SW Elwert Road at SE Edy Road in Sherwood, Oregon. The site will take access via new roadways intersecting SW Elwert Road and SW Copper Terrace.

2. The trip generation calculations show that the proposed subdivision is projected to generate a total of 65 trips during the morning peak hour and 86 trips during the evening peak hour.

3. Each of the study intersections is projected to operate within the performance standards established by the City of Sherwood through the year 2017, either with or without the addition of site trips from the proposed development. No operational mitigations are necessary or recommended.

4. It is anticipated that adequate sight distance will be available for each of the proposed site access intersections. No sight distance mitigations are necessary or recommended.

5. Based on the detailed review of all of the crash data, no significant patterns and no contributing design concerns were identified at the study intersections. Accordingly, no safety mitigations are recommended.

6. The proposed site access intersections on SW Elwert Road and SW Copper Terrace are projected to have adequate sight distance to maintain safe and efficient traffic flow in the site vicinity.

7. Based on the warrant analyses, no new traffic signals or turn lanes are projected to be warranted upon completion of the proposed development.

8. The proposed development was also evaluated to determine whether any mitigation is necessary to address interaction of the existing schools in the site vicinity with the proposed new development. Considerations included queuing and congestion in the vicinity of the schools during peak arrival and departure times as well as operations and safety for motorized and non-motorized travel in the site vicinity. Based on the detailed analysis, no significant operational or safety concerns were identified and no mitigation is recommended.

PROJECT DESCRIPTION & LOCATION

INTRODUCTION

An 86-lot subdivision is proposed for property located in the southeast quadrant of the intersection of SW Elwert Road at SW Edy Road in Sherwood, Oregon. The development will take access via connections to SW Copper Terrace and SW Elwert Road.

This report addresses the impacts of the proposed development on the surrounding street system. The report includes safety and capacity/level-of-service analyses at the following intersections:

1. SW Edy Road at SW Elwert Road
2. SW Edy Road at SW Copper Terrace
3. SW Elwert Road at the west site access
4. SW Copper Terrace at SW Nursery Way
5. SW Elwert Road at SW Handley Street
6. SW Handley Street at SW Copper Terrace

Additionally, an operational analysis of the primary access points along SW Copper Terrace will be provided.

The purpose of the study is to determine whether the transportation system in the vicinity of the site is capable of safely and efficiently supporting the existing and proposed uses, and to determine any mitigation that might be necessary to do so.

LOCATION

The project site is bounded by SW Edy Road to the north, SW Elwert Road to the west, SW Copper Terrace to the east, and the existing residential development fronting SW Huntington Lane to the south. A wetland area divides the subject property. The western portion of the proposed development will take access via a new street intersecting SW Elwert Road, while the eastern portion of the development will take access via connections to SW Copper Terrace.

The subject site is surrounded by existing residential development to the south, Laurel Ridge Middle School and Edy Ridge Elementary School to the east, and a mix of agricultural, forested lands and undeveloped property to the west and north.

VICINITY STREETS

SW Edy Road is classified by the City of Sherwood as a Collector. It has a two-lane cross-section with a posted speed limit of 40 mph in the site vicinity. A 20-mph school speed zone applies in the vicinity of SW Copper Terrace, as signaled by flasher signs at the start and end of the school day. The roadway is striped to prohibit passing. Curbs, sidewalks, bike lanes and on-street parking are generally not available on either side of the roadway within the site frontage, although sidewalks are in place along the north side of the roadway east of SW Copper Terrace.

SW Elwert Road is classified by the City of Sherwood as an Arterial. It has a two-lane cross-section with a posted 45 mph speed limit. Curbs, sidewalks, bike lanes and on-street parking are generally not available on either side of the roadway within the site frontage. However, intermittent sidewalks are available to the south of the property adjacent to existing residential subdivisions.

SW Copper Terrace is classified by the City of Sherwood as a Neighborhood Route. It has one through lane in each direction, with no centerline striping and a statutory residential speed limit of 25 mph. It also has a 20 mph school speed limit between SW Cereghino Lane and SW Edy Road from 7:00 AM to 5:00 PM on school days. Continuous curbs and sidewalks are in place along the east side of the roadway, and partial curbs and sidewalks are in place along the west side of the roadway adjacent to existing residential subdivisions. On-street parking is available along the east side of the roadway, but is restricted to loading and unloading only on school days from 7:00 AM to 5:00 PM adjacent to the elementary and middle schools.

SW Nursery Way is classified by the City of Sherwood as a Local Street. It has a two-lane cross-section without centerline striping. Opposite the subject property, the roadway currently extends from SW Copper Terrace to a north/south access drive that serves Laurel Ridge Middle School; however, it will be extended in the future to connect through to SW Edy Road. Curbs are in place along both sides of the roadway, and sidewalks are provided along the south side of the roadway adjacent to Laurel Ridge Middle School. Both curbs and sidewalks are in place along the east segment of the roadway that connects to SW Edy Road. It has a statutory residential speed limit of 25 mph.

SW Handley Street is classified by the City of Sherwood as a Collector. It has a two-lane cross-section without centerline striping and has a statutory residential speed limit of 25 mph. Curbs, sidewalks and on-street parking are in place along both sides of the roadway.

STUDY INTERSECTIONS

The intersection of SW Edy Road at SW Elwert Road is a four-way intersection operating under all-way stop control. Each of the four approaches has a single, shared travel lane for all turning movements; however, the westbound approach widens sufficiently to provide a de-facto right-turn lane that can serve one vehicle.

The intersection of SW Edy Road at SW Copper Terrace is a T-intersection controlled by a stop sign on the northbound Copper Terrace approach. Through traffic traveling along SW Edy Road does not stop. Each of the three intersection approaches has a single, shared lane for all turning movements. A marked crosswalk is in place crossing the east leg of the intersection. All other crosswalks are unmarked.

The intersection of SW Copper Terrace at SW Nursery Way is a T-intersection controlled by a stop sign on the westbound Nursery Way approach. Through traffic traveling along SW Cooper Terrace does not stop. Each of the three intersection approaches has a single, shared travel land for all turning movements. A marked crosswalk is in place crossing the east leg of the intersection. All other crosswalks are unmarked.

The intersection of SW Elwert Road at SW Handley Street is a T-intersection controlled by a stop sign on the westbound Handley Street approach. Through traffic traveling along SW Elwert Road does not stop. Each of the three intersection approaches has a single, shared travel land for all turning movements.

The intersection of SW Copper Terrace at SW Handley Street is a T-intersection operating under all-way stop control. Bulb-outs are in place, narrowing the roadway to encourage reduced vehicle travel speeds and shorten pedestrian crossings at the intersection. The east leg of the intersection has a marked crosswalk. All other crosswalks are unmarked.

A vicinity map displaying the project site, vicinity streets, and the study area intersections with their associated lane configurations is shown in Figure 1 on page 7.

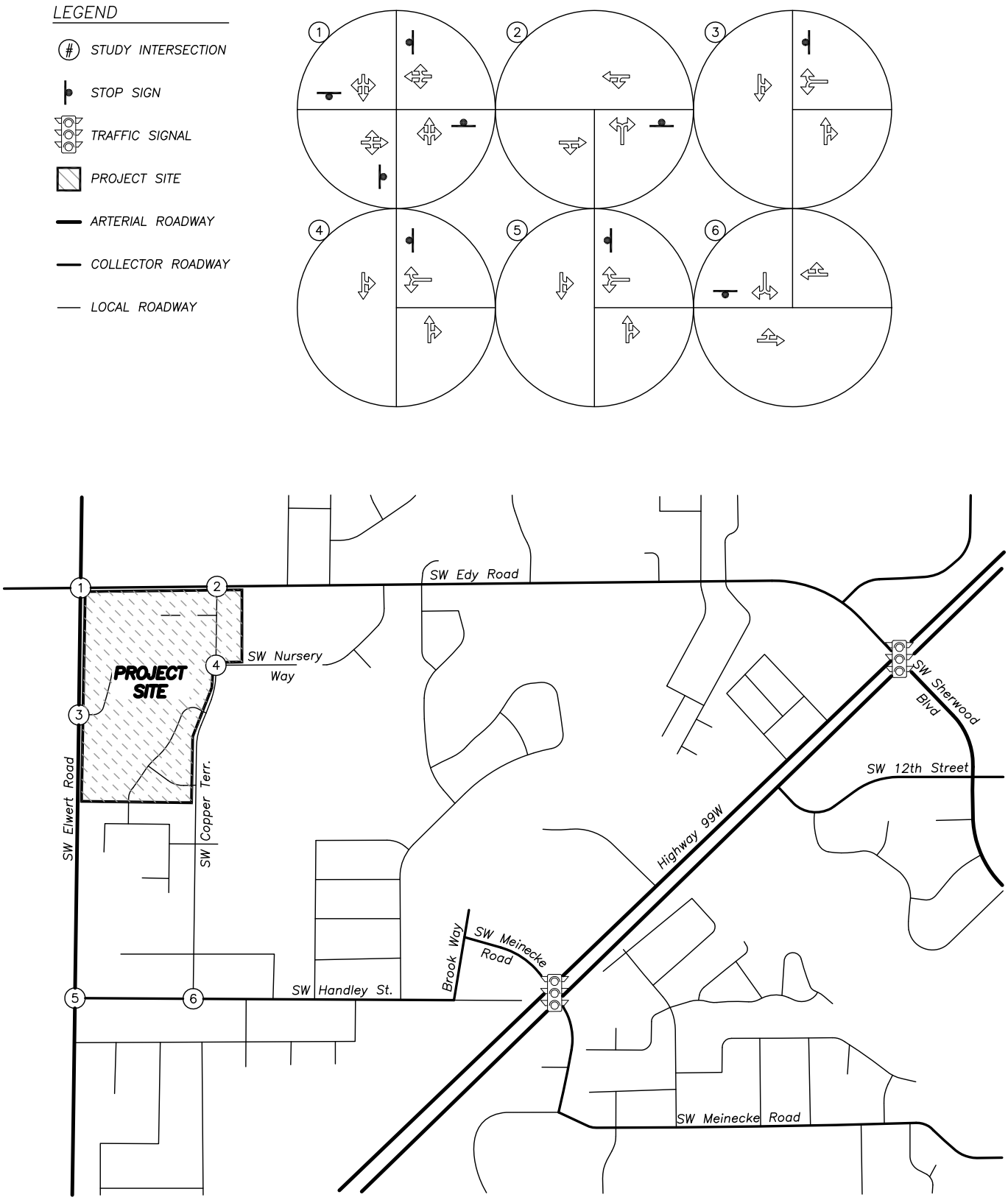
TRAFFIC COUNTS

Traffic counts were conducted at the study area intersections during 2015 from 7:00 AM to 9:00 AM and from 4:00 PM to 6:00 PM. Data from each intersection peak hour was used for analysis.

Figure 2 on page 8 shows the existing AM and PM peak hour traffic volumes for the study area intersections.

VICINITY SCHOOLS

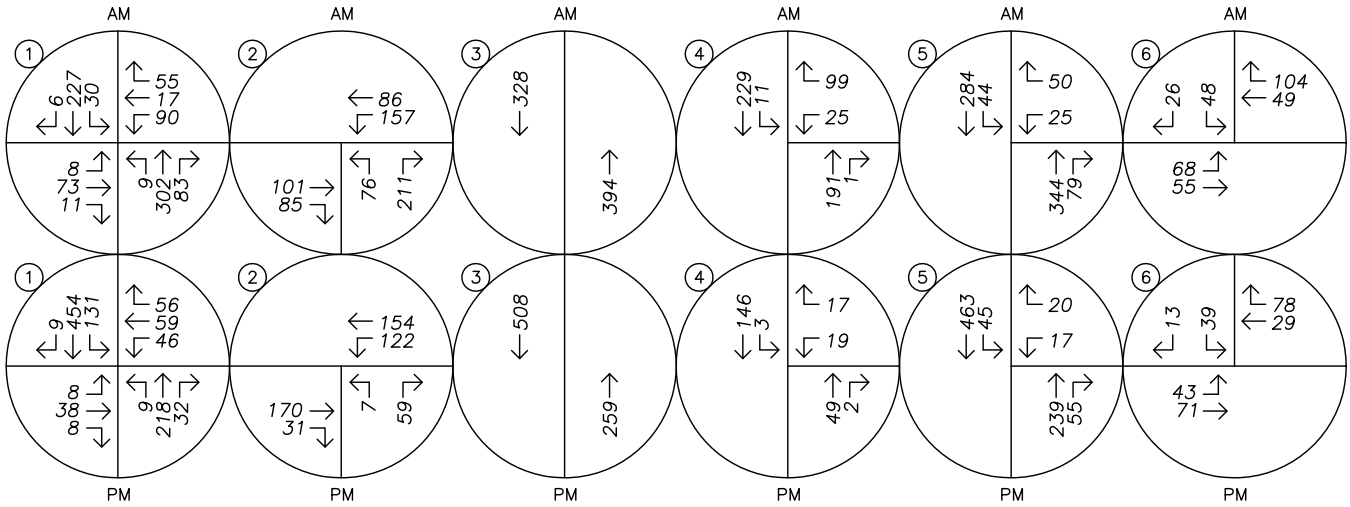
Laurel Ridge Middle School and Edy Ridge Elementary School are located on the east side of SW Copper Terrace between SW Nursery Way and SW Cereghino Lane. Laurel Ridge Middle School operates between 8:00 AM and 2:50 PM and serves approximately 490 students in grades 6 through 8. Edy Ridge Elementary School operates between 7:55 AM and 2:15 PM and serves approximately 540 students in grades K through 5.

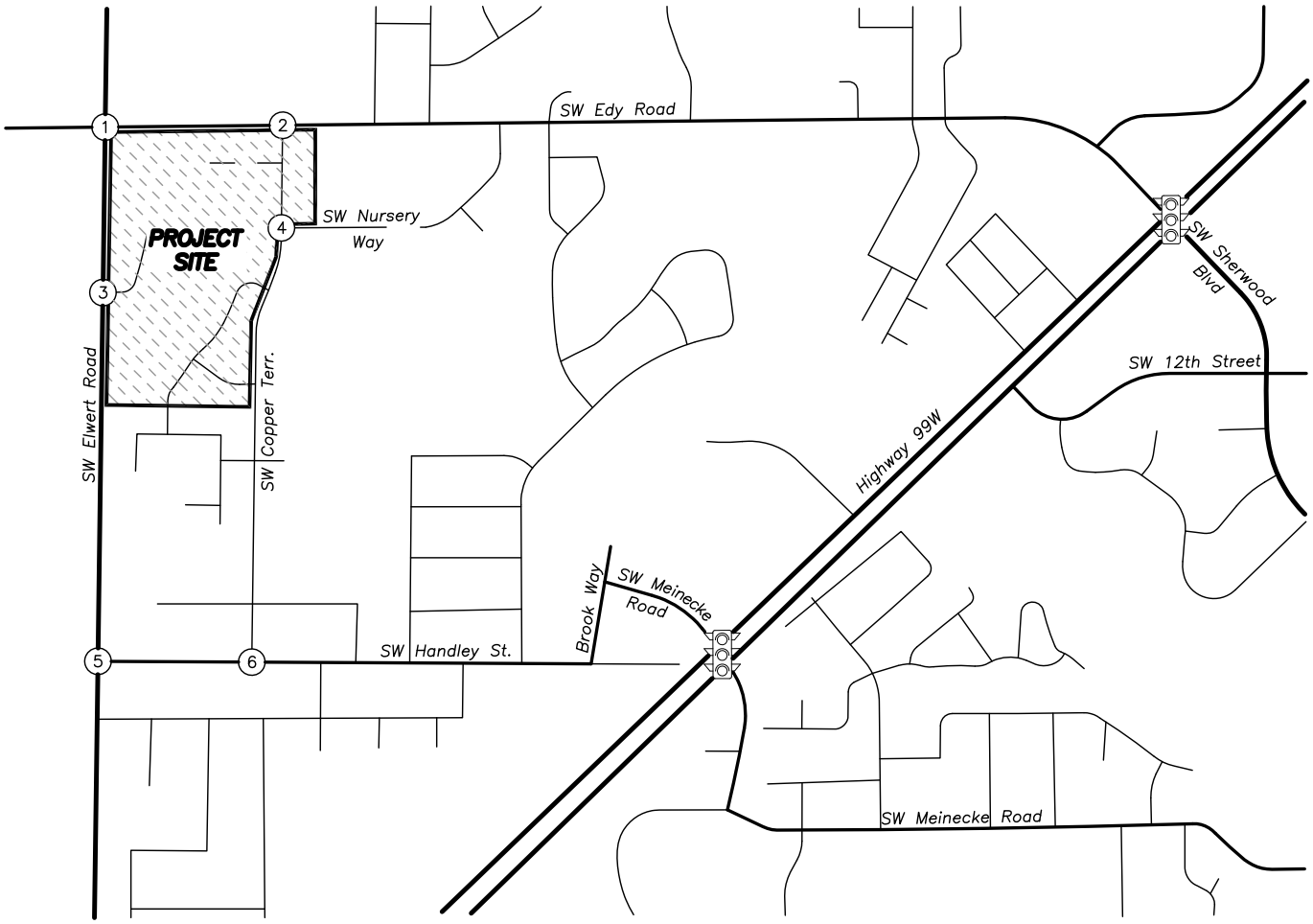


VICINITY MAP

no scale

FIGURE 1





TRAFFIC VOLUMES
Existing Conditions
AM and PM Peak Hours

no scale

FIGURE 2

SITE TRIPS

TRIP GENERATION

The proposed subdivision will construct 86 single-family detached homes. To estimate the number of trips that will be generated by the proposed subdivision, trip rates from the *TRIP GENERATION MANUAL*[1] were used. Data from land-use code 210, *Single-Family Detached Housing*, was used to estimate the proposed development's trip generation based on the number of dwelling units.

The trip generation calculations show that the proposed subdivision is projected to generate a net increase of 65 trips during the morning peak hour and 86 trips during the evening peak hour. The trip generation estimates are summarized in Table 1. Detailed trip generation calculations are included in the technical appendix to this report.

Table 1 - Trip Generation Summary

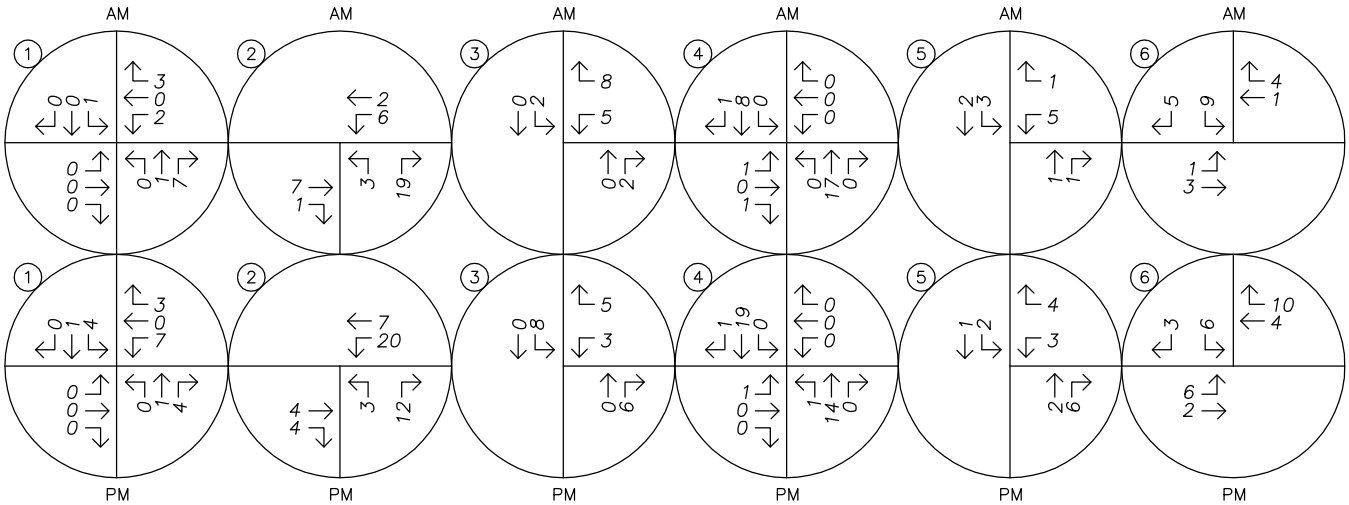
	ITE Code	Size	Morning Peak Hour			Evening Peak Hour			Weekday
			In	Out	Total	In	Out	Total	Total
Single-Family Detached Housing									
Proposed Development	210	86 units	16	49	65	54	32	86	818

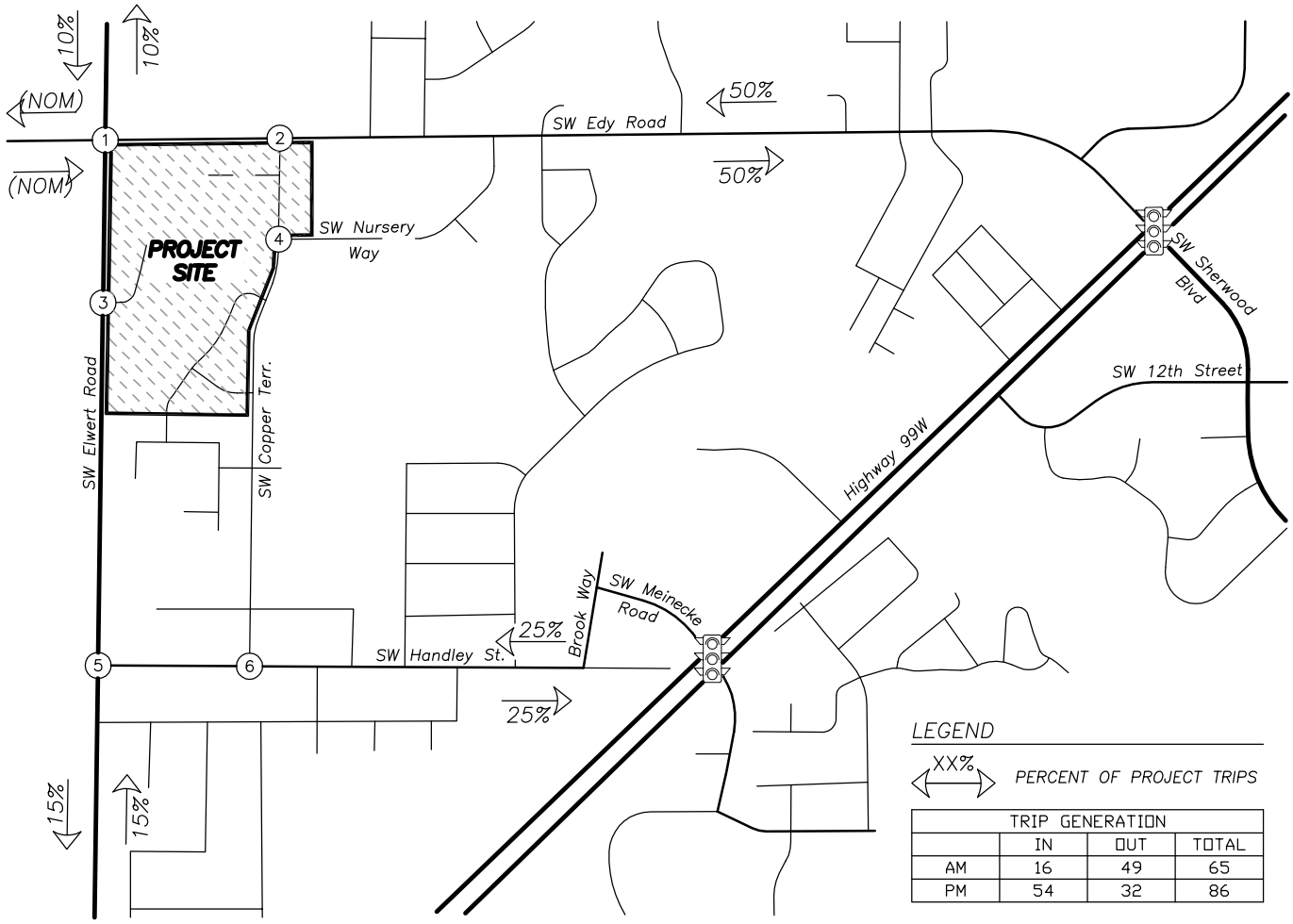
TRIP DISTRIBUTION

The directional distribution of site trips to and from the proposed development was estimated based on locations of likely trip destinations, locations of major transportation facilities in the site vicinity, and existing travel patterns at the study area intersections.

Diagrams showing the trip distribution and assignment for the site trips generated by the proposed development during the AM and PM peak hours are shown in Figure 3 on page 10.

[1] Institute of Transportation Engineers (ITE), *TRIP GENERATION MANUAL, 9th Edition*, 2012





TRIP GENERATION			
	IN	OUT	TOTAL
AM	16	49	65
PM	54	32	86

SITE TRIP DISTRIBUTION & ASSIGNMENT
Proposed Development Plan – Site Trips
AM and PM Peak Hours

no scale

FIGURE 3

OPERATIONAL ANALYSIS

BACKGROUND TRAFFIC

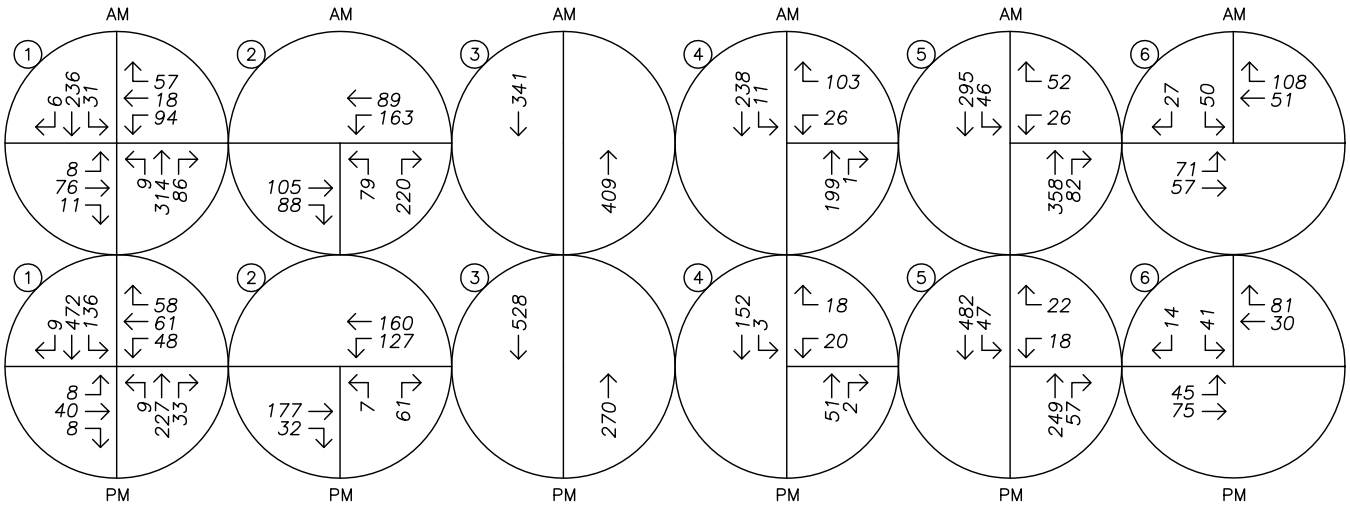
To provide analysis of the impact of the proposed development on the nearby transportation facilities, an estimate of future traffic volumes is required. In order to calculate the future traffic volumes, a compounded growth rate of two percent per year was applied over a period of two years to approximate year 2017 background conditions.

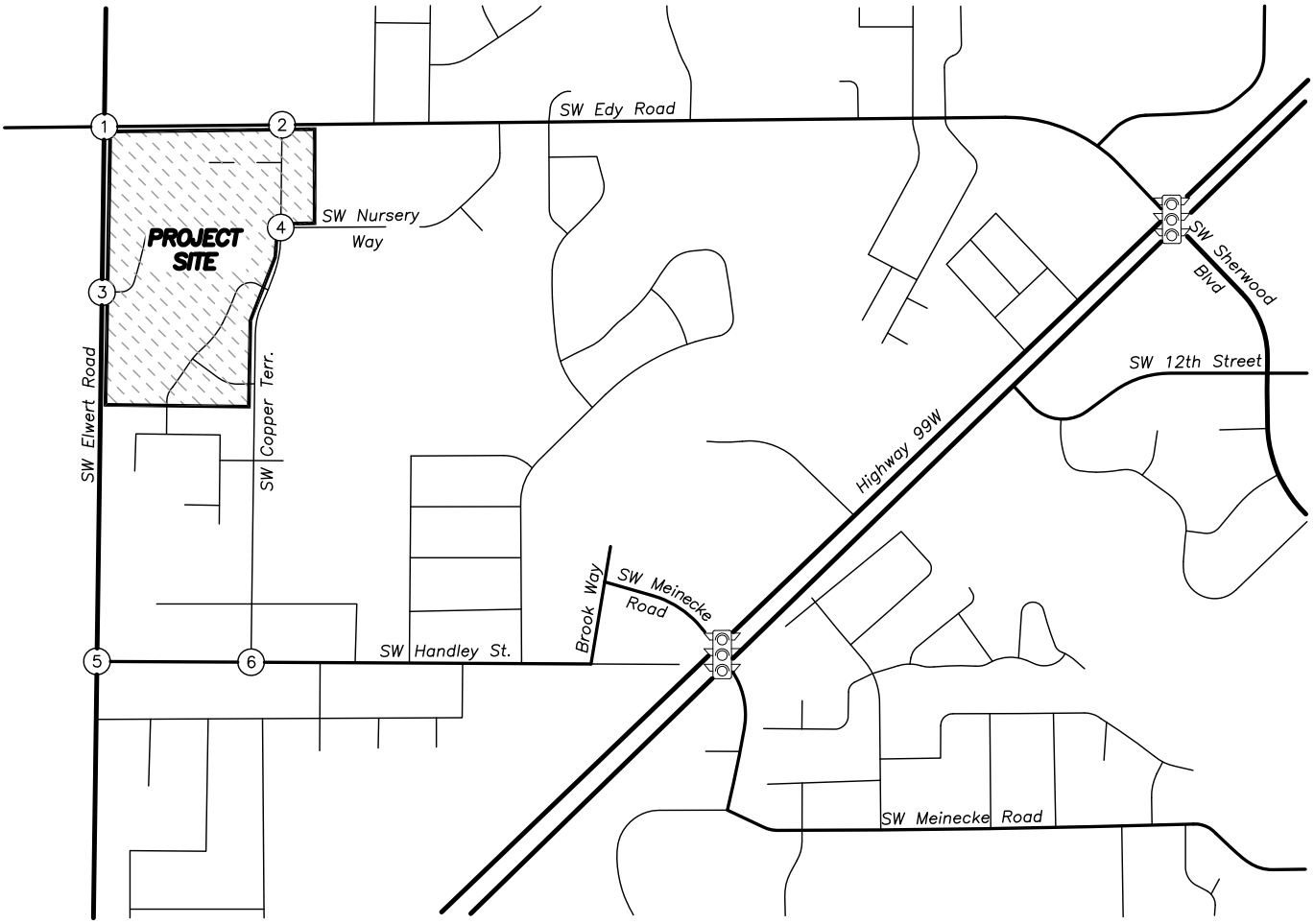
Figure 4 on page 12 shows the projected year 2017 background volumes for the AM and PM peak hour traffic volumes of the study area intersections.

BACKGROUND TRAFFIC PLUS SITE TRIPS

Peak hour trips calculated to be generated by the proposed development, as described earlier within the Trip Generation section, were added to the projected year 2017 background traffic volumes to obtain the expected 2017 background plus site trips.

Figure 5 on page 13 shows the projected year 2017 peak hour traffic volumes with the addition of site trips from the proposed development.

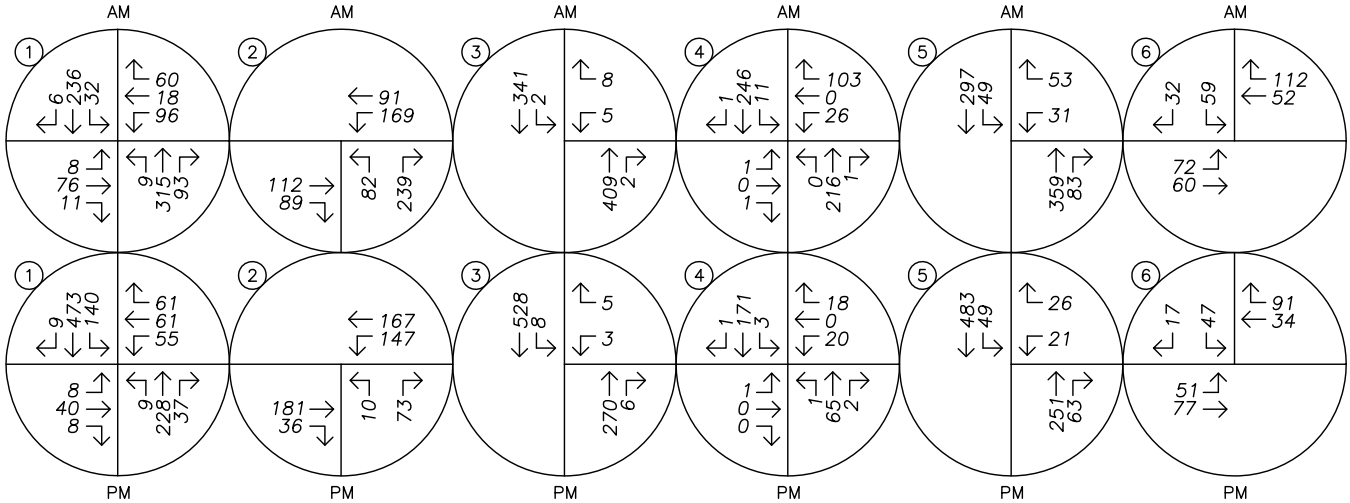


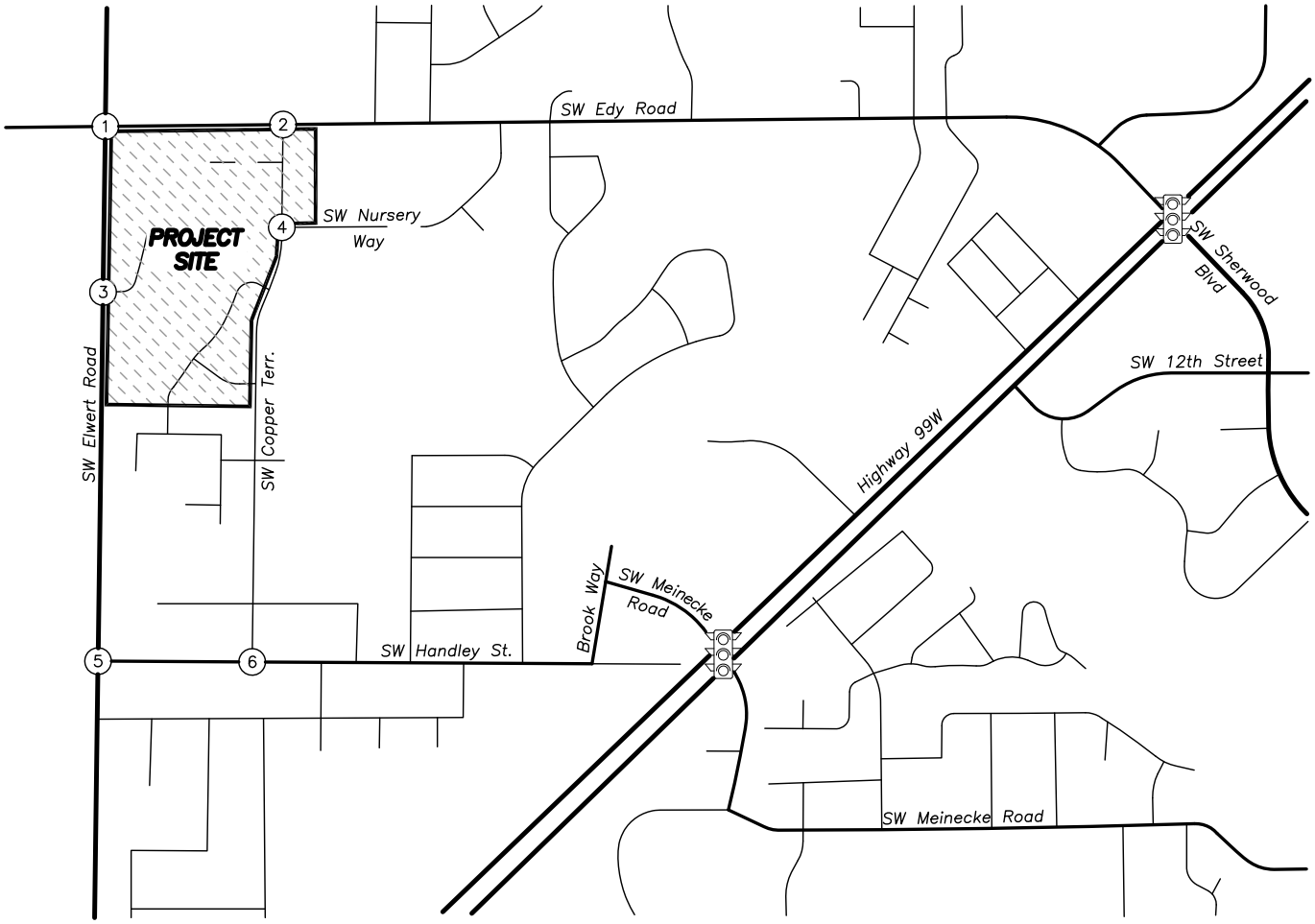


TRAFFIC VOLUMES
2017 Background Conditions
AM and PM Peak Hours

no scale

FIGURE 4





TRAFFIC VOLUMES
2017 Background Plus Site Trips
AM and PM Peak Hours

no scale

FIGURE 5

INTERSECTION CAPACITY AND LEVEL-OF-SERVICE ANALYSIS

To determine the performance of the study intersections, a capacity analysis was conducted for the morning and evening peak hours for existing conditions, year 2017 background conditions, and year 2017 background plus site trips from the proposed development. The analysis was conducted according to the unsignalized and signalized intersection analysis methodologies given in the *HIGHWAY CAPACITY MANUAL* (HCM), published by the Transportation Research Board.

Washington County requires that intersections on SW Edy Road and on SW Elwert Road operate with a volume to capacity ratio (v/c) of 0.99 or less during the peak hours. The v/c ratio is a measure of the portion of intersection capacity that is utilized. An intersection operating with a v/c ratio of 1.0 would be operating at capacity. Since v/c ratios are not defined for all-way stop-controlled intersections, the degree of utilization was used as a proxy for evaluating individual movements and intersection capacity utilization was used as a proxy for the overall intersection operation.

The City of Sherwood requires that all-way stop-controlled intersections operate at level of service D or better and with a v/c of 0.85 or less. It also requires that two-way stop-controlled intersections operate at level of service E or better and with a v/c of 0.90 or less. Levels of service can range from LOS A, which indicates very little or no delay experience by vehicles, to LOS F, which indicates a high degree of congestion and delay.

The intersection of SW Elwert Road at SW Edy Road currently operates at with a v/c ratio of 0.66 during the morning peak hour 0.90 during the evening peak hour. Under year 2017 background conditions, the intersection is projected to operate with a v/c ratio of 0.69 during the morning peak hour and 0.93 during the evening peak hour. With the addition of site trips from the proposed development, the intersection is projected to operate with a v/c ratio of 0.72 during the morning peak hour and 0.96 during the evening peak hour. Intersection operation is acceptable per Washington County standards and no mitigation is recommended. It should be noted that the above descriptions refer to the critical movements at the intersections, per Washington County requirements. If City of Sherwood evaluations standards are also applied at this intersection, they would apply on an overall intersection basis, in accordance with the requirements detailed in the city's Transportation System Plan. Since the overall intersection is projected to operate at level of service D and with a v/c ratio of 0.71, intersection operation is also projected to meet City of Sherwood standards following completion of the proposed development.

The intersection of SW Edy Road at SW Copper Terrace currently operates with a v/c ratio of 0.76 during the morning peak hour and 0.12 during the evening peak hour. Under year 2017 background conditions, the intersection is projected to operate with a v/c ratio of 0.82 during the morning peak hour and 0.12 during the evening peak hour. With the addition of site trips from the proposed development, the intersection is projected to operate with a v/c ratio of 0.86 during the morning peak hour and 0.16 during the evening peak hour. Intersection operation is acceptable per Washington County standards and no mitigation is recommended.

The proposed intersection of SW Elwert Road at the west site access is projected to operate with a v/c ratio of 0.28 during the morning peak hour and 0.17 during the evening peak hour. Intersection operation is acceptable per Washington County standards and no mitigation is recommended.

The intersection of SW Copper Terrace at SW Nursery Way currently operates at LOS C with a v/c ratio of 0.45 during the morning peak hour and at LOS A with a v/c ratio of 0.06 during the evening peak hour. Under year 2017 background conditions, the intersection is projected to operate at LOS C during the morning peak hour with a v/c ratio of 0.48 and at LOS A during the evening peak hour with a v/c ratio of 0.07. Upon completion of the proposed subdivision, the intersection is projected to operate at LOS C with a v/c ratio of 0.58 during the morning peak hour and at LOS B with a v/c ratio of 0.07 during the evening peak hour. Intersection operation is acceptable per City of Sherwood standards and no mitigation is recommended.

The intersection of SW Elwert Road at SW Handley Street currently operates with a v/c ratio of 0.18 during the morning peak hour and 0.08 during the evening peak hour. Under year 2017 background conditions, the intersection is projected to operate with a v/c ratio of 0.20 during the morning peak hour and 0.09 during the evening peak hour. With the addition of site trips from the proposed development, the intersection is projected to operate with a v/c ratio of 0.25 during the morning peak hour and 0.16 during the evening peak hour. Intersection operation is acceptable per Washington County standards and no mitigation is recommended.

The intersection of SW Copper Terrace at SW Handley Street currently operates at LOS A with a v/c ratio of 0.33 during the morning peak hour and at LOS A with a v/c ratio of 0.16 during the evening peak hour. Under year 2017 background conditions, the intersection is projected to operate at LOS A during the morning peak hour with a v/c ratio of 0.35 and at LOS A during the evening peak hour with a v/c ratio of 0.17. Upon completion of the proposed subdivision, the intersection is projected to operate at LOS B with a v/c ratio of 0.37 during the morning peak hour and at LOS A with a v/c ratio of 0.18 during the evening peak hour. Intersection operation is acceptable per City of Sherwood standards and no mitigation is recommended.

The proposed site accesses to SW Copper Terrace were also evaluated to verify whether they will operate acceptably upon completion of the proposed development. The northernmost site access intersection is projected to accommodate the highest volumes of traffic on both SW Copper Terrace and on the side-street approach. Accordingly, it represents a worst-case analysis for the proposed site access intersections. Based on the analysis, this intersection is projected to operate at level of service C and with a v/c ratio of 0.29 during the morning peak hour, and at level of service B with a v/c ratio of 0.15 during the evening peak hour. Accordingly all site access intersections on SW Copper Terrace are projected to operate acceptably per City of Sherwood standards.

The results of the capacity analysis, along with the levels of service, delay, and v/c ratios are shown in Table 2. Detailed calculations, as well as tables showing the relationships between delay and level of service are included in the appendix to this report.

It should be noted that upon completion of the SW Nursery Way alignment, a portion of the school traffic traveling to and from the east on SW Edy Road will be expected to utilize the new connection, since it will provide a more direct route to the Laurel Ridge Middle School campus. Currently all school traffic coming from or destined for SW Edy Road uses SW Copper Terrace for access. Since operation of this intersection is favorable when carrying the full demands of this traffic and with single-lane approaches on all legs of the intersection, providing a second connection to SW Edy Road can only result in reduced volume-to-capacity ratios and reduced overall delays for the intersections. Accordingly, the study intersections and the intersection of SW Edy Road at SW

Nursery Way are projected to continue to operate acceptably either with or without completion of this roadway connection.

Table 2 - Capacity and LOS Analysis Summary

	Morning Peak Hour			Evening Peak Hour		
	LOS	Delay (s)	v/c	LOS	Delay (s)	v/c
SW Elwert Road at SW Edy Road*						
2015 Existing Conditions	C	18	0.66	E	37	0.90
2017 Background Conditions	C	20	0.69	E	43	0.93
2017 Background + Site Conditions	C	21	0.72	E	47	0.96
SW Edy Road at SW Copper Terrace						
2015 Existing Conditions	D	27	0.76	A	9	0.12
2017 Background Conditions	D	33	0.82	A	9	0.12
2017 Background + Site Conditions	E	37	0.86	B	12	0.16
SW Elwert Road at West Site Access						
2017 Background + Site Conditions	B	14	0.28	B	12	0.17
SW Copper Terrace at SW Nursery Way						
2015 Existing Conditions	C	17	0.45	A	10	0.06
2017 Background Conditions	C	18	0.48	A	10	0.07
2017 Background + Site Conditions	C	25	0.58	B	11	0.07
SW Elwert Road at SW Handley Street						
2015 Existing Conditions	B	14	0.18	B	13	0.08
2017 Background Conditions	B	15	0.20	B	14	0.09
2017 Background + Site Conditions	C	15	0.25	B	14	0.16
SW Copper Terrace at SW Handley Street*						
2015 Existing Conditions	A	10	0.33	A	8	0.16
2017 Background Conditions	A	10	0.35	A	8	0.17
2017 Background + Site Conditions	B	10	0.37	A	8	0.18

***All-way stop controlled intersection**

Based on the results of the operational analysis, all study area intersections are currently operating acceptably per the applicable jurisdiction standards, and are projected to continue operating acceptably through 2017 either with or without the addition of site trips from the proposed development. No operational mitigations are necessary or recommended.

SAFETY ANALYSIS

CRASH DATA ANALYSIS

Using data obtained from ODOT's Crash Data Analysis and Reporting Unit, a review of the most recent available five years of crash history (2010 – 2014) at the study area intersections was performed. The crash data was evaluated based on the number of crashes, the type of collisions, the severity of the collisions, and the resulting crash rate for the intersection. Crash rates provide the ability to compare relative safety risks at different intersections by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated using the common assumption that traffic counted during the evening peak hour represents 10% of the average annual daily traffic (AADT) at the intersection. Crash rates in excess of 1.0 crashes per million entering vehicles (CMEV) may be indicative of safety hazards that should be further investigated and mitigated.

The intersection of SW Elwert Road at SW Edy Road had two reported crashes during the five-year analysis period. Both were angle collisions. They resulted in a total of one non-incapacitating injury and two reports of a "possible injury/complaint of pain". The crash rate for the intersection was calculated to be 0.10 crashes per million entering vehicles.

The intersections of SW Edy Road at SW Copper Terrace, SW Copper Terrace at SW Nursery Way, SW Elwert Road at SW Handley Street and SW Copper Terrace at SW Handley Street had no reported crashes during the five-year analysis period.

Based on the detailed review of all of the crash data, no significant patterns and no contributing design concerns were identified at the study intersections. Accordingly, no safety mitigations are recommended.

INTERSECTION SIGHT DISTANCE

Intersection sight distance was examined for the proposed site access on SW Elwert Road. Intersection sight distance was measured and evaluated in accordance with the standards established by Washington County. The driver's eye is assumed to be 15 feet from the near edge of the roadway and at a height of 3.5 feet above the approach street pavement, with an oncoming vehicle height of 4.25 feet above the approaching travel lanes.

Based on the posted speed of 45 mph on SW Elwert Road, the minimum required intersection sight distance for the proposed site access is 450 feet in each direction.

Intersection sight distance was measured from the proposed site access location on SW Elwert Road approximately 780 feet south of the centerline of SW Edy Road. Intersection sight distance was measured to be continuous to SW Edy Road to the north (780 feet) and 510 feet to the south. Based on detailed analysis, adequate sight distance is projected to be available for the proposed site access on SW Elwert Road for safe operation of the proposed access.

Intersection sight distance was also examined for the proposed site access locations along SW Copper Terrace. Based on the statutory residential speed limit of 25 mph, a minimum of 280 feet of

intersection sight distance is required in each direction. SW Copper Terrace has a relatively flat grade within the site vicinity. Sight lines from the proposed points of access extend to SW Edy Road to the north, and in excess of 280 feet to the south. Accordingly, adequate sight distance can be provided for the proposed site access intersections along SW Copper Terrace.

TRAFFIC SIGNAL WARRANT ANALYSIS

Traffic signal warrants were examined for the intersections of SW Edy Road at SW Elwert Road, SW Edy Road at SW Copper Terrace, and SW Elwert Road at SW Handley Street. Based on the analysis, no new traffic signals are projected to be warranted through 2017 either with or without the addition of site trips from the proposed development. No new traffic signals are recommended.

TURN-LANE WARRANT ANALYSIS

Left-turn lane warrants were examined for the intersections of SW Edy Road at SW Copper Terrace and SW Elwert Road at SW Handley Street. Consideration of major-street left-turn lanes at two-way stop-controlled intersections is primarily a safety concern. Left-turn lanes are provided in order to allow turning vehicles to pull out of the through travel lane while waiting for a gap in the opposing traffic stream.

Based on the analysis, the intersection of SW Edy Road at SW Copper Terrace is projected to meet warrants for a westbound left-turn lane under year 2017 traffic conditions either with or without the addition of site trips from the proposed development.

However, when SW Nursery Way is completed it is anticipated that approximately 460 daily trips will divert to this new street connection. In total, SW Nursery Way is projected to accommodate less than 1,000 vehicles per day including both residential and school-related traffic upon completion of the street connection. This volume of traffic can be safely accommodated while maintaining the livability of SW Nursery Way.

The diversion of school trips to the new street connection will also result in westbound left turn lane warrants not being met at the intersection of SW Edy Road at SW Copper Terrace or at SW Edy Road and SW Nursery Way. Since the proposed development does not create the need for a left-turn lane and completion of the SW Nursery Way street connection will make the turn lane unnecessary, no mitigation is recommended in conjunction with the proposed development.

The intersection of SW Elwert Road at SW Handley Street meets warrants for a southbound left-turn lane under existing conditions and is projected to continue to warrant installation of this treatment either with or without the addition of site trips from the proposed development. The proposed development is projected to add one to two vehicles to the southbound left-turn movement at the intersection of SW Elwert Road and SW Handley Street. Accordingly, a requirement to construct this improvement would be disproportionate to the impact of the proposed development.

VICINITY SCHOOLS AND PROPOSED DEVELOPMENT INTERACTION

The proposed development will include the construction of three new public streets on the west side of SW Copper Terrace and is expected at add vehicle trips along this existing roadway. A detailed analysis was conducted in order to determine whether the proposed development will require any operational or safety mitigations to address concerns that arise as a result of interaction between the new development and the nearby schools, Edy Ridge Elementary School and Laurel Ridge Middle School.

As outlined in the Intersection Capacity and Level-of-Service section of this report, all proposed site access intersections along SW Copper Terrace are projected to operate acceptably per City of Sherwood standards. All other existing intersections along the roadway are also projected to operate acceptably per City of Sherwood and Washington County standards with the addition of site trips. Accordingly, no operational concerns are anticipated in association with motorized vehicle traffic.

Some queuing and congestion currently occur with the school campuses and along SW Copper Terrace immediately prior to the start of the school day and at the end of the school day. These conditions are primarily associated with parents dropping off and picking up students at the schools. Although the queues and congestion inhibit the free flow of traffic along SW Copper Terrace, these conditions are limited to periods of approximately 15 minutes on school days and occur precisely when student/pedestrian activities are at their peak. Such congestion reduces the speed of through traffic along the adjacent roadway and thereby improves safety at the most appropriate possible times. Since the queuing and congestion are transient conditions that improve safety at the appropriate times and since SW Copper Terrace is not needed to serve a vital connectivity function during these times, such interruptions to the flow of through traffic are beneficial overall and therefore acceptable. Although these interruptions will result in minor negative impacts to the travel times and levels of service experienced by drivers entering and exiting the proposed development, no mitigations are recommended.

Based on the evaluation of crash history in the site vicinity, no existing design deficiencies were identified with respect to safety in the site vicinity. Accordingly, the primary factor that merits additional evaluation concerns safety for non-motorized travel in the site vicinity.

There are four marked crosswalks that cross SW Copper Terrace; one located on the south side of SW Cereghino Lane, two located on the north and south legs of the intersection at Lionheart Lane, and one located approximately 430 feet north of Lionheart Lane. The crosswalk 430 feet north of Lionheart Lane is located within the frontage of the proposed subdivision. Since this crossing is roughly centered between the two schools, it is reasonable to expect that it may serve the majority of pedestrians traveling between the proposed development and the schools. The crosswalk is aligned approximately 40 feet north of the north edge of the proposed “B” Lane alignment. A pedestrian landing is included in the proposed site plan, connecting to continuous sidewalks that will be provided along the west side of SW Copper Terrace over the full length of the proposed development.

Since the exiting crosswalk will connect to a new sidewalk network on the west side of the roadway as well as the existing sidewalk network on the east side of the roadway, the proposed development will meaningfully enhance pedestrian connectivity in the site vicinity.

CONCLUSIONS

Each of the study intersections is projected to operate within the performance standards established by the City of Sherwood through the year 2017, either with or without the addition of site trips from the proposed development. No operational mitigations are necessary or recommended.

It is anticipated that adequate sight distance will be available for each of the proposed site access intersections. No sight distance mitigations are necessary or recommended.

Based on the detailed review of all of the crash data, no significant patterns and no contributing design concerns were identified at the study intersections. Accordingly, no safety mitigations are recommended.

The proposed site access intersections on SW Elwert Road and SW Copper Terrace are projected to have adequate sight distance to maintain safe and efficient traffic flow in the site vicinity.

Based on the warrant analyses, no new traffic signals or turn lanes are projected to be warranted upon completion of the proposed development.

The proposed development was also evaluated to determine whether any mitigation is necessary to address interaction of the existing schools in the site vicinity with the proposed new development. Considerations included queuing and congestion in the vicinity of the schools during peak arrival and departure times as well as operations and safety for motorized and non-motorized travel in the site vicinity. Based on the detailed analysis, no significant operational or safety concerns were identified and no mitigation is recommended.

APPENDIX

LEVEL OF SERVICE

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

Level of service A: Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.

Level of service B: Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.

Level of service C: Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.

Level of service D: Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.

Level of service E: Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.

Level of service F: Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.

1e

LEVEL OF SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS

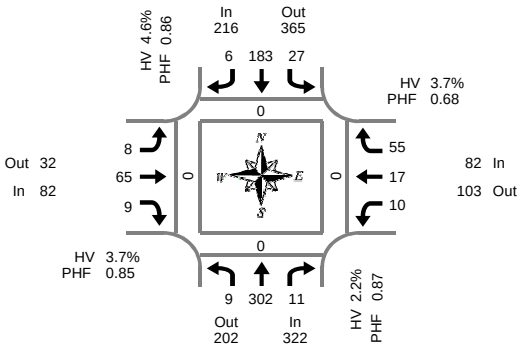
LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	<10
B	10-20
C	20-35
D	35-55
E	55-80
F	>80

LEVEL OF SERVICE CRITERIA
FOR UNSIGNALIZED INTERSECTIONS

LEVEL OF SERVICE	CONTROL DELAY PER VEHICLE (Seconds)
A	<10
B	10-15
C	15-25
D	25-35
E	35-50
F	>50

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:05 AM to 8:05 AM

SW Elwert Rd & SW Edy Rd

Wednesday, July 08, 2015
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	0	21	1	0	3	11	0	0	1	5	0	0	0	1	0	0	43	0	0	0	0
7:05 AM	0	18	3	0	0	10	1	0	1	8	0	0	1	3	1	0	46	0	0	0	0
7:10 AM	1	26	0	0	3	13	0	0	0	7	0	0	1	0	6	0	57	0	0	0	0
7:15 AM	0	29	1	0	1	22	0	0	1	6	1	0	0	3	5	0	69	0	0	0	0
7:20 AM	0	34	0	0	1	20	1	0	1	5	0	0	0	0	4	0	66	0	0	0	0
7:25 AM	0	23	0	0	3	12	3	0	0	4	1	0	1	2	4	0	53	0	0	0	0
7:30 AM	3	21	1	0	2	15	0	0	1	8	0	0	1	0	6	0	58	0	0	0	0
7:35 AM	1	36	0	0	3	18	0	0	1	5	0	0	0	3	3	0	70	0	0	0	0
7:40 AM	0	30	1	0	1	16	0	0	1	7	0	0	1	1	5	0	63	0	0	0	0
7:45 AM	2	21	0	0	6	19	0	0	2	4	1	0	3	2	9	0	69	0	0	0	0
7:50 AM	0	23	2	0	1	16	0	0	0	5	0	0	1	0	8	0	56	0	0	0	0
7:55 AM	0	18	2	0	3	14	0	0	0	3	4	0	1	3	1	0	49	0	0	0	0
8:00 AM	2	23	1	0	3	8	1	0	0	3	2	0	0	0	3	0	46	0	0	0	0
8:05 AM	0	14	0	0	1	16	0	0	0	4	1	0	0	0	5	0	41	0	0	0	0
8:10 AM	1	32	1	0	4	13	0	0	0	5	0	0	2	0	4	0	62	0	0	0	0
8:15 AM	0	24	1	0	4	17	0	0	1	2	1	0	0	2	4	0	56	0	0	0	0
8:20 AM	1	19	0	0	3	18	0	0	1	7	1	0	0	1	1	0	52	0	0	0	0
8:25 AM	0	18	2	0	5	8	0	0	1	5	0	0	0	3	1	0	43	0	0	0	0
8:30 AM	1	35	1	0	5	10	0	0	1	2	0	0	0	0	1	0	56	0	0	0	0
8:35 AM	0	14	2	0	2	12	0	0	1	3	0	0	1	0	3	0	38	0	0	0	0
8:40 AM	0	20	3	0	1	17	0	0	1	2	0	0	0	0	1	0	45	0	0	0	0
8:45 AM	0	14	2	0	2	17	0	0	0	2	1	0	0	2	3	0	43	0	0	0	0
8:50 AM	0	14	2	0	4	12	0	0	1	4	1	0	1	3	2	0	44	0	0	0	0
8:55 AM	2	11	3	0	1	10	0	0	1	5	1	0	3	3	3	0	43	0	0	0	0
Total Survey	14	538	29	0	62	344	6	0	17	111	15	0	17	32	83	0	1,268	0	0	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	1	65	4	0	6	34	1	0	2	20	0	0	2	4	7	0	146	0	0	0	0
7:15 AM	0	86	1	0	5	54	4	0	2	15	2	0	1	5	13	0	188	0	0	0	0
7:30 AM	4	87	2	0	6	49	0	0	3	20	0	0	2	4	14	0	191	0	0	0	0
7:45 AM	2	62	4	0	10	49	0	0	2	12	5	0	5	5	18	0	174	0	0	0	0
8:00 AM	3	69	2	0	8	37	1	0	0	12	3	0	2	0	12	0	149	0	0	0	0
8:15 AM	1	61	3	0	12	43	0	0	3	14	2	0	0	6	6	0	151	0	0	0	0
8:30 AM	1	69	6	0	8	39	0	0	3	7	0	0	1	0	5	0	139	0	0	0	0
8:45 AM	2	39	7	0	7	39	0	0	2	11	3	0	4	8	8	0	130	0	0	0	0
Total Survey	14	538	29	0	62	344	6	0	17	111	15	0	17	32	83	0	1,268	0	0	0	0

Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	322	202	524	0	216	365	581	0	82	32	114	0	82	103	185	0	702
%HV	2.2%				4.6%				3.7%				3.7%				3.3%
PHF	0.87				0.86				0.85				0.68				0.87

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

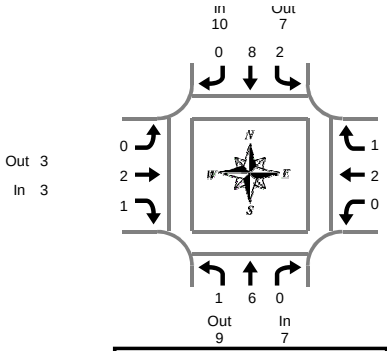
By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	9	302	11	322	27	183	6	216	8	65	9	82	10	17	55	82	702
%HV	11.1%	2.0%	0.0%	2.2%	7.4%	4.4%	0.0%	4.6%	0.0%	3.1%	11.1%	3.7%	0.0%	11.8%	1.8%	3.7%	3.3%
PHF	0.56	0.85	0.55	0.87	0.68	0.83	0.38	0.86	0.50	0.77	0.38	0.85	0.50	0.71	0.63	0.68	0.87

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
7:00 AM	7	300	11	0	27	186	5	0	9	67	7	0	10	18	52	0	699	0	0	0	0
7:15 AM	9	304	9	0	29	189	5	0	7	59	10	0	10	14	57	0	702	0	0	0	0
7:30 AM	10	279	11	0	36	178	1	0	8	58	10	0	9	15	50	0	665	0	0	0	0
7:45 AM	7	261	15	0	38	168	1	0	8	45	10	0	8	11	41	0	613	0	0	0	0
8:00 AM	7	238	18	0	35	158	1	0	8	44	8	0	7	14	31	0	569	0	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:05 AM to 8:05 AM

SW Elwert Rd & SW Edy Rd

Wednesday, July 08, 2015
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
7:05 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
7:10 AM	1	0	0	1	0	1	0	1	0	1	0	1	0	0	0	0	3
7:15 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	1	0	1	3
7:20 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
7:25 AM	0	1	0	1	1	0	0	1	0	0	1	1	0	0	1	1	4
7:30 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	0	0	3
7:35 AM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
7:40 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
7:50 AM	0	0	0	0	0	2	0	2	0	1	0	1	0	0	0	0	3
7:55 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
8:05 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
8:10 AM	0	1	0	1	0	0	0	0	0	2	0	2	0	0	0	0	3
8:15 AM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
8:20 AM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	2
8:25 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1
8:30 AM	0	2	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
8:35 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
8:40 AM	0	3	0	3	0	1	0	1	1	0	0	1	0	0	0	0	5
8:45 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
8:50 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:55 AM	0	0	0	0	0	1	0	1	0	0	0	0	0	1	0	1	2
Total Survey	1	14	0	15	3	13	0	16	1	5	1	7	0	3	2	5	43

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	1	1	0	2	1	1	0	2	0	1	0	1	0	0	0	0	5
7:15 AM	0	3	0	3	1	2	0	3	0	0	1	1	0	1	1	2	9
7:30 AM	0	2	0	2	1	2	0	3	0	0	0	0	0	0	0	0	5
7:45 AM	0	0	0	0	0	2	0	2	0	1	0	1	0	1	0	1	4
8:00 AM	0	1	0	1	0	2	0	2	0	2	0	2	0	0	0	0	5
8:15 AM	0	2	0	2	0	1	0	1	0	0	0	0	0	0	1	1	4
8:30 AM	0	5	0	5	0	1	0	1	1	1	0	2	0	0	0	0	8
8:45 AM	0	0	0	0	0	2	0	2	0	0	0	0	0	1	0	1	3
Total Survey	1	14	0	15	3	13	0	16	1	5	1	7	0	3	2	5	43

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SW Elwert Rd			Southbound SW Elwert Rd			Eastbound SW Edy Rd			Westbound SW Edy Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	7	9	16	10	7	17	3	3	6	3	4	7	23
PHF	0.44			0.83			0.75			0.38			0.64

By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	1	6	0	7	2	8	0	10	0	2	1	3	0	2	1	3	23
PHF	0.25	0.38	0.00	0.44	0.25	0.67	0.00	0.83	0.00	0.50	0.25	0.75	0.00	0.50	0.25	0.38	0.64

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

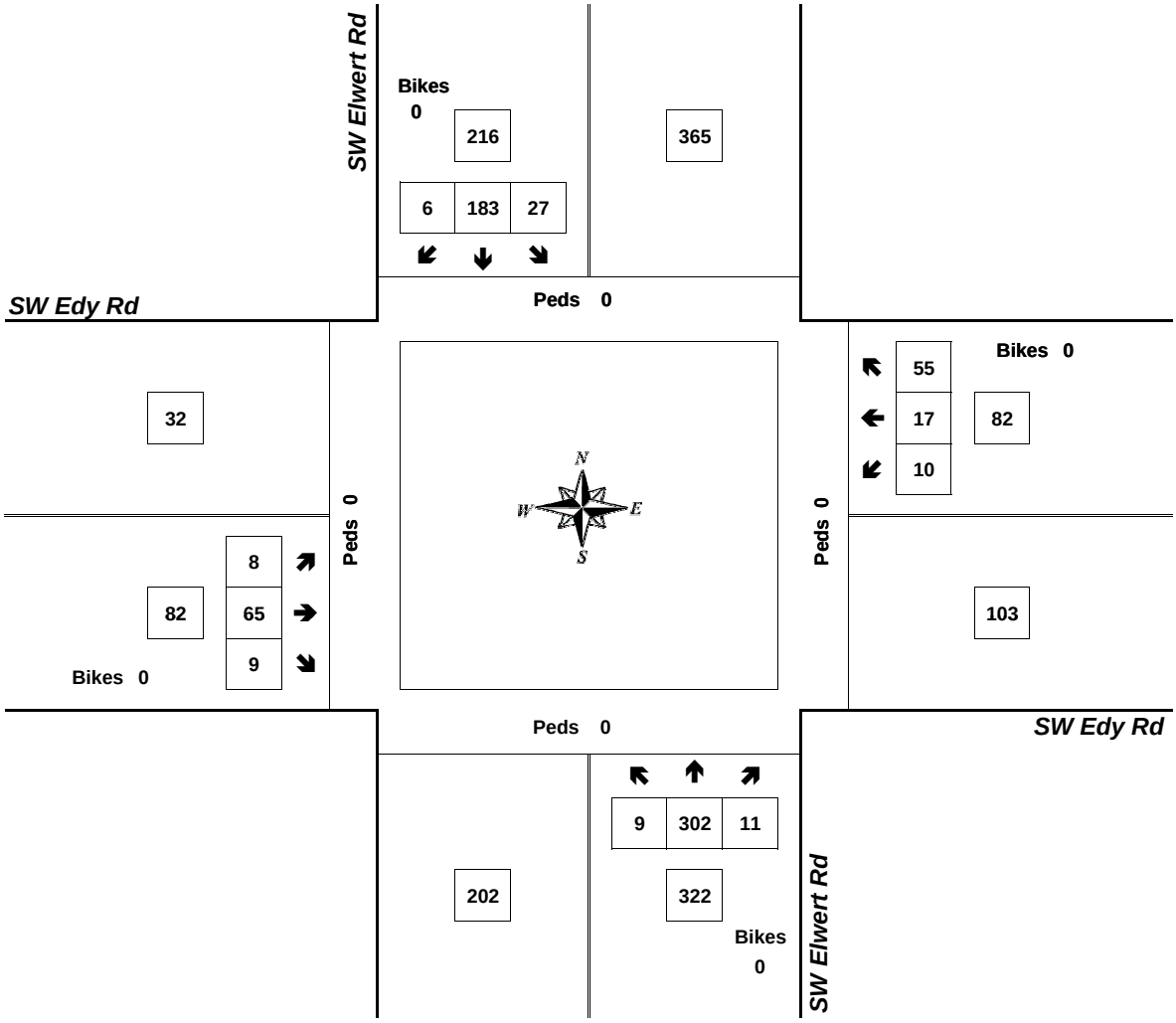
Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
7:00 AM	1	6	0	7	3	7	0	10	0	2	1	3	0	2	1	3	23
7:15 AM	0	6	0	6	2	8	0	10	0	3	1	4	0	2	1	3	23
7:30 AM	0	5	0	5	1	7	0	8	0	3	0	3	0	1	1	2	18
7:45 AM	0	8	0	8	0	6	0	6	1	4	0	5	0	1	1	2	21
8:00 AM	0	8	0	8	0	6	0	6	1	3	0	4	0	1	1	2	20

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Elwert Rd & SW Edy Rd

7:05 AM to 8:05 AM
Wednesday, July 08, 2015

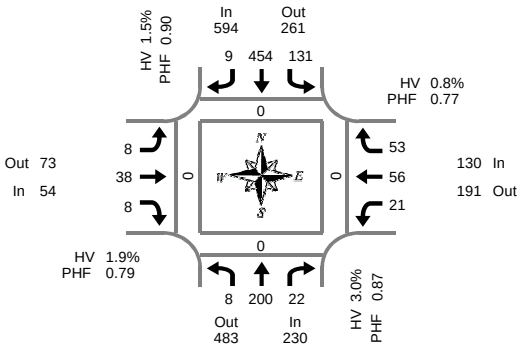


Approach	PHF	HV%	Volume
EB	0.85	3.7%	82
WB	0.68	3.7%	82
NB	0.87	2.2%	322
SB	0.86	4.6%	216
Intersection	0.87	3.3%	702

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Elwert Rd & SW Edy Rd

Wednesday, July 08, 2015
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	0	16	3	0	6	39	0	0	0	1	0	0	1	3	4	0	73	0	0	0	0
4:05 PM	1	14	2	0	3	19	1	0	0	3	0	0	1	5	2	0	51	0	0	0	0
4:10 PM	1	12	3	0	3	24	1	0	1	2	3	0	2	5	0	0	57	0	0	0	0
4:15 PM	1	24	1	0	6	30	0	0	2	3	2	0	3	3	4	0	79	0	0	0	0
4:20 PM	1	19	5	0	11	28	0	0	0	4	3	0	2	5	7	0	85	0	0	0	0
4:25 PM	0	15	6	0	7	33	1	0	1	3	2	0	4	4	3	0	79	0	0	0	0
4:30 PM	0	15	2	0	8	38	1	0	1	1	2	0	1	6	6	0	81	0	0	0	0
4:35 PM	0	9	1	0	4	25	0	0	0	2	0	0	0	3	8	0	52	0	0	0	0
4:40 PM	0	26	0	0	5	40	0	0	0	2	1	0	1	4	4	0	83	0	0	0	0
4:45 PM	1	17	0	0	11	44	0	0	0	4	1	0	0	6	3	0	87	0	0	0	0
4:50 PM	1	18	0	0	7	43	1	0	1	3	0	0	2	3	4	0	83	0	0	0	0
4:55 PM	1	8	5	0	12	29	0	0	0	4	1	0	3	3	1	0	67	0	0	0	0
5:00 PM	0	19	1	0	12	40	1	0	1	7	0	0	2	3	7	0	93	0	0	0	0
5:05 PM	0	14	1	0	9	27	1	0	0	4	0	0	4	7	2	0	69	0	0	0	0
5:10 PM	1	19	1	0	10	27	0	0	0	2	2	0	2	7	8	0	79	0	0	0	0
5:15 PM	1	18	3	0	7	44	1	0	1	3	0	0	2	5	3	0	88	0	0	0	0
5:20 PM	0	21	2	0	15	32	2	0	1	1	0	0	2	5	7	0	88	0	0	0	0
5:25 PM	0	17	1	0	9	47	0	0	1	0	0	1	1	3	7	0	86	0	0	0	0
5:30 PM	3	19	1	0	15	37	0	0	0	3	1	0	2	7	3	0	91	0	0	0	0
5:35 PM	0	11	2	0	17	39	1	0	2	4	3	0	0	5	4	0	88	0	0	0	0
5:40 PM	0	19	5	0	7	45	2	0	1	3	0	0	1	2	4	0	89	0	0	0	0
5:45 PM	1	22	1	0	3	27	0	0	0	1	1	0	2	7	2	0	67	0	0	0	0
5:50 PM	1	23	2	0	9	22	1	0	1	2	3	0	2	3	1	0	70	0	0	0	0
5:55 PM	1	15	3	0	10	37	3	0	0	3	1	0	0	2	4	0	79	0	0	0	0
Total Survey	15	410	51	0	206	816	17	0	14	65	26	1	40	106	98	0	1,864	0	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	2	42	8	0	12	82	2	0	1	6	3	0	4	13	6	0	181	0	0	0	0
4:15 PM	2	58	12	0	24	91	1	0	3	10	7	0	9	12	14	0	243	0	0	0	0
4:30 PM	0	50	3	0	17	103	1	0	1	5	3	0	2	13	18	0	216	0	0	0	0
4:45 PM	3	43	5	0	30	116	1	0	1	11	2	0	5	12	8	0	237	0	0	0	0
5:00 PM	1	52	3	0	31	94	2	0	1	13	2	0	8	17	17	0	241	0	0	0	0
5:15 PM	1	56	6	0	31	123	3	0	3	4	0	1	5	13	17	0	262	0	0	0	0
5:30 PM	3	49	8	0	39	121	3	0	3	10	4	0	3	14	11	0	268	0	0	0	0
5:45 PM	3	60	6	0	22	86	4	0	1	6	5	0	4	12	7	0	216	0	0	0	0
Total Survey	15	410	51	0	206	816	17	0	14	65	26	1	40	106	98	0	1,864	0	0	0	0

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	230	483	713	0	594	261	855	0	54	73	127	1	130	191	321	0	1,008	0	0	0	0
%HV	3.0%				1.5%				1.9%				0.8%				1.8%				
PHF	0.87				0.90				0.79				0.77				0.94				

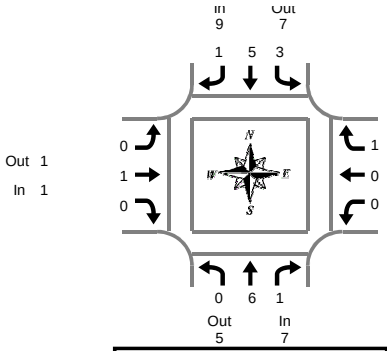
By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	8	200	22	230	131	454	9	594	8	38	8	54	21	56	53	130	1,008
%HV	0.0%	3.0%	4.5%	3.0%	2.3%	1.1%	11.1%	1.5%	0.0%	2.6%	0.0%	1.9%	0.0%	0.0%	1.9%	0.8%	1.8%
PHF	0.67	0.86	0.69	0.87	0.80	0.92	0.75	0.90	0.67	0.63	0.50	0.79	0.58	0.74	0.74	0.77	0.94

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes	L	T	R	Bikes		North	South	East	West
4:00 PM	7	193	28	0	83	392	5	0	6	32	15	0	20	50	46	0	877	0	0	0	0
4:15 PM	6	203	23	0	102	404	5	0	6	39	14	0	24	54	57	0	937	0	0	0	0
4:30 PM	5	201	17	0	109	436	7	0	6	33	7	1	20	55	60	0	956	0	0	0	0
4:45 PM	8	200	22	0	131	454	9	0	8	38	8	1	21	56	53	0	1,008	0	0	0	0
5:00 PM	8	217	23	0	123	424	12	0	8	33	11	1	20	56	52	0	987	0	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Elwert Rd & SW Edy Rd

Wednesday, July 08, 2015
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	1	1	0	2	0	0	0	0	0	0	1	1	3
4:05 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:10 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:20 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:25 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
4:30 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
4:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:40 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4:50 PM	0	3	0	3	0	2	0	2	0	0	0	0	0	0	0	0	5
4:55 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
5:00 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:05 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:10 PM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	1
5:15 PM	0	0	1	1	0	1	0	1	0	0	0	0	0	0	1	1	3
5:20 PM	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1
5:25 PM	0	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0	2
5:30 PM	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1
5:35 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5:40 PM	0	1	0	1	0	1	1	2	0	0	0	0	0	0	0	0	3
5:45 PM	0	1	0	1	0	2	0	2	0	0	0	0	0	0	0	0	3
5:50 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
5:55 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Survey	0	10	1	11	4	10	1	15	0	1	0	1	0	0	4	4	31

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	0	0	0	1	2	0	3	0	0	0	0	0	0	1	1	4
4:15 PM	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1	2
4:30 PM	0	1	0	1	0	1	0	1	0	0	0	0	0	0	1	1	3
4:45 PM	0	3	0	3	1	2	0	3	0	0	0	0	0	0	0	0	6
5:00 PM	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2
5:15 PM	0	1	1	2	2	1	0	3	0	0	0	0	0	0	1	1	6
5:30 PM	0	1	0	1	0	2	1	3	0	0	0	0	0	0	0	0	4
5:45 PM	0	2	0	2	0	2	0	2	0	0	0	0	0	0	0	0	4
Total Survey	0	10	1	11	4	10	1	15	0	1	0	1	0	0	4	4	31

Heavy Vehicle Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Elwert Rd			Southbound SW Elwert Rd			Eastbound SW Edy Rd			Westbound SW Edy Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	7	5	12	9	7	16	1	1	2	1	5	6	18
PHF	0.44			0.75			0.25			0.25			0.64

By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
Volume	0	6	1	7	3	5	1	9	0	1	0	1	0	0	1	1	18
PHF	0.00	0.38	0.25	0.44	0.38	0.63	0.25	0.75	0.00	0.25	0.00	0.25	0.00	0.00	0.25	0.25	0.64

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

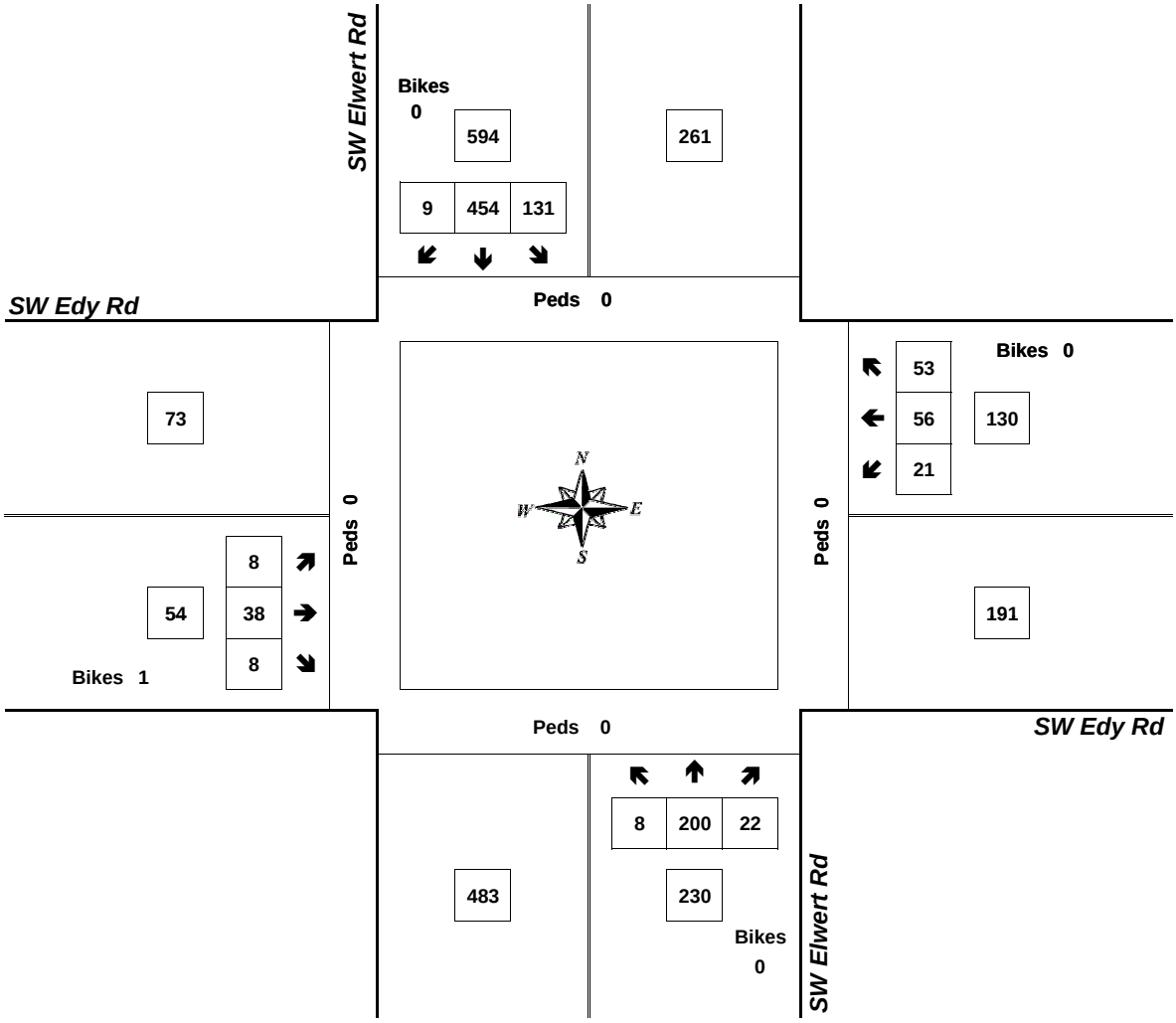
Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L	T	R	Total	L	T	R	Total	L	T	R	Total	L	T	R	Total	
4:00 PM	0	5	0	5	2	5	0	7	0	0	0	0	0	0	3	3	15
4:15 PM	0	6	0	6	1	3	0	4	0	1	0	1	0	0	2	2	13
4:30 PM	0	6	1	7	3	4	0	7	0	1	0	1	0	0	2	2	17
4:45 PM	0	6	1	7	3	5	1	9	0	1	0	1	0	0	1	1	18
5:00 PM	0	5	1	6	2	5	1	8	0	1	0	1	0	0	1	1	16

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Elwert Rd & SW Edy Rd

4:45 PM to 5:45 PM
Wednesday, July 08, 2015

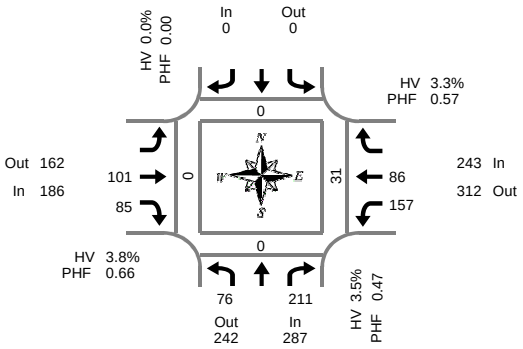


Approach	PHF	HV%	Volume
EB	0.79	1.9%	54
WB	0.77	0.8%	130
NB	0.87	3.0%	230
SB	0.90	1.5%	594
Intersection	0.94	1.8%	1,008

Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:10 AM to 8:10 AM

SW Copper Terrace & SW Edy Rd

Wednesday, September 16, 2015
7:00 AM to 9:00 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	0		1	0				0		8	0	0	1	5		0	15	0	0	0	0
7:05 AM	0		1	0				0		9	1	0	0	7		0	18	0	0	0	0
7:10 AM	1		3	0				0		11	1	0	6	3		0	25	0	0	0	0
7:15 AM	2		4	0				0		7	4	0	6	5		0	28	0	0	0	0
7:20 AM	5		8	0				0		7	7	0	10	11		0	48	0	0	0	0
7:25 AM	4		13	0				0		6	7	0	12	5		0	47	0	0	0	0
7:30 AM	6		8	0				0		14	14	0	21	8		0	71	0	0	1	0
7:35 AM	10		20	0				0		3	8	0	33	7		0	81	0	0	3	0
7:40 AM	9		20	0				0		12	15	0	24	3		0	83	0	0	20	0
7:45 AM	8		44	0				0		6	21	0	29	11		0	119	0	0	1	0
7:50 AM	18		46	0				0		10	6	0	6	7		0	93	0	0	2	0
7:55 AM	9		27	0				0		10	2	0	5	7		0	60	0	0	3	0
8:00 AM	4		12	0				0		10	0	0	3	9		0	38	0	0	0	0
8:05 AM	0		6	0				0		5	0	0	2	10		0	23	0	0	1	0
8:10 AM	1		6	0				0		4	1	0	3	7		0	22	0	0	1	0
8:15 AM	0		3	0				0		8	0	0	0	2		0	13	0	0	0	0
8:20 AM	0		3	0				0		7	1	0	0	3		0	14	0	0	0	0
8:25 AM	0		0	0				0		10	0	0	0	6		0	16	0	0	0	0
8:30 AM	0		0	0				0		4	1	0	1	7		0	13	0	0	1	0
8:35 AM	1		0	0				0		8	1	0	0	6		0	16	0	0	1	0
8:40 AM	2		1	0				0		8	0	0	2	6		0	19	0	1	4	0
8:45 AM	0		5	0				0		6	0	0	0	3		0	14	0	0	0	0
8:50 AM	0		1	0				0		7	0	0	2	5		0	15	0	0	1	0
8:55 AM	0		1	0				0		4	0	0	3	2		0	10	0	0	0	0
Total Survey	80		233	0				0		184	90	0	169	145		0	901	0	1	39	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	1		5	0				0		28	2	0	7	15		0	58	0	0	0	0
7:15 AM	11		25	0				0		20	18	0	28	21		0	123	0	0	0	0
7:30 AM	25		48	0				0		29	37	0	78	18		0	235	0	0	24	0
7:45 AM	35		117	0				0		26	29	0	40	25		0	272	0	0	6	0
8:00 AM	5		24	0				0		19	1	0	8	26		0	83	0	0	2	0
8:15 AM	0		6	0				0		25	1	0	0	11		0	43	0	0	0	0
8:30 AM	3		1	0				0		20	2	0	3	19		0	48	0	1	6	0
8:45 AM	0		7	0				0		17	0	0	5	10		0	39	0	0	1	0
Total Survey	80		233	0				0		184	90	0	169	145		0	901	0	1	39	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	287	242	529	0	0	0	0	0	186	162	348	0	243	312	555	0	716
%HV	3.5%				0.0%				3.8%				3.3%				3.5%
PHF	0.47				0.00				0.66				0.57				0.61

Pedestrians Crosswalk			
North	South	East	West
0	0	31	0

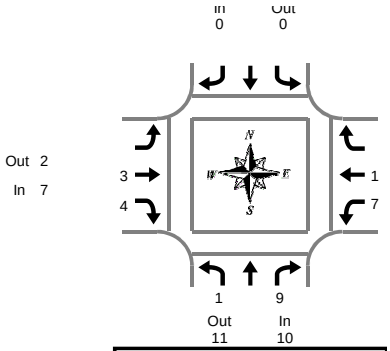
By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	76		211	287				0		101	85	186	157	86		243	716
%HV	1.3%	NA	4.3%	3.5%	NA	NA	NA	0.0%	NA	3.0%	4.7%	3.8%	4.5%	1.2%	NA	3.3%	3.5%
PHF	0.54		0.45	0.47				0.00		0.84	0.48	0.66	0.46	0.83		0.57	0.61

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
7:00 AM	72		195	0				0		103	86	0	153	79		0	688	0	0	30	0
7:15 AM	76		214	0				0		94	85	0	154	90		0	713	0	0	32	0
7:30 AM	65		195	0				0		99	68	0	126	80		0	633	0	0	32	0
7:45 AM	43		148	0				0		90	33	0	51	81		0	446	0	1	14	0
8:00 AM	8		38	0				0		81	4	0	16	66		0	213	0	1	9	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:10 AM to 8:10 AM

SW Copper Terrace & SW Edy Rd

Wednesday, September 16, 2015
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L		R	Total				Total		T	R	Total	L	T		Total	
7:00 AM	0		0	0				0		0	0	0	0	1		1	1
7:05 AM	0		0	0				0		0	0	0	0	1		1	1
7:10 AM	0		0	0				0		1	0	1	0	0		0	1
7:15 AM	0		0	0				0		1	0	1	1	0		1	2
7:20 AM	0		0	0				0		0	0	0	0	0		0	0
7:25 AM	0		0	0				0		0	0	0	0	0		0	0
7:30 AM	0		0	0				0		0	2	2	2	0		2	4
7:35 AM	0		1	1				0		0	0	0	2	0		2	3
7:40 AM	0		1	1				0		0	1	1	0	0		0	2
7:45 AM	0		3	3				0		0	0	0	0	0		0	3
7:50 AM	1		1	2				0		0	1	1	0	0		0	3
7:55 AM	0		0	0				0		0	0	0	1	0		1	1
8:00 AM	0		1	1				0		1	0	1	1	0		1	3
8:05 AM	0		2	2				0		0	0	0	0	1		1	3
8:10 AM	0		0	0				0		0	0	0	1	0		1	1
8:15 AM	0		0	0				0		0	0	0	0	0		0	0
8:20 AM	0		0	0				0		1	0	1	0	0		0	1
8:25 AM	0		0	0				0		1	0	1	0	0		0	1
8:30 AM	0		0	0				0		0	0	0	0	1		1	1
8:35 AM	0		0	0				0		1	0	1	0	0		0	1
8:40 AM	0		0	0				0		0	0	0	0	0		0	0
8:45 AM	0		1	1				0		0	0	0	0	0		0	1
8:50 AM	0		0	0				0		0	0	0	0	0		0	0
8:55 AM	0		0	0				0		0	0	0	2	0		2	2
Total Survey	1		10	11				0		6	4	10	10	4		14	35

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L		R	Total				Total		T	R	Total	L	T		Total	
7:00 AM	0		0	0				0		1	0	1	0	2		2	3
7:15 AM	0		0	0				0		1	0	1	1	0		1	2
7:30 AM	0		2	2				0		0	3	3	4	0		4	9
7:45 AM	1		4	5				0		0	1	1	1	0		1	7
8:00 AM	0		3	3				0		1	0	1	2	1		3	7
8:15 AM	0		0	0				0		2	0	2	0	0		0	2
8:30 AM	0		0	0				0		1	0	1	0	1		1	2
8:45 AM	0		1	1				0		0	0	0	2	0		2	3
Total Survey	1		10	11				0		6	4	10	10	4		14	35

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Copper Terrace			Southbound SW Copper Terrace			Eastbound SW Edy Rd			Westbound SW Edy Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	10	11	21	0	0	0	7	2	9	8	12	20	25
PHF	0.42			0.00			0.58			0.50			0.69

By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	1		9	10				0		3	4	7	7	1		8	25
PHF	0.25		0.45	0.42				0.00		0.38	0.33	0.58	0.44	0.25		0.50	0.69

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

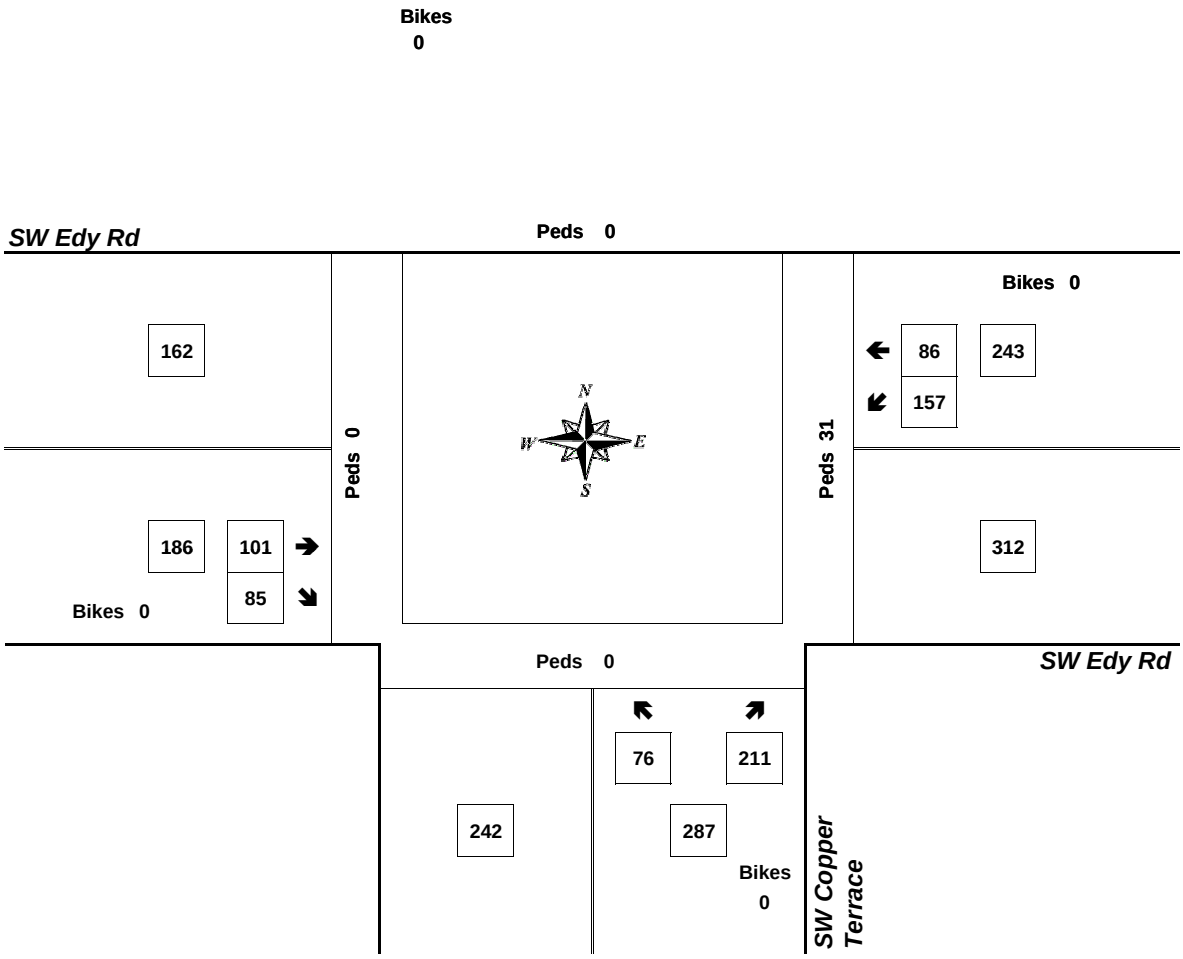
Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L		R	Total				Total		T	R	Total	L	T		Total	
7:00 AM	1		6	7				0		2	4	6	6	2		8	21
7:15 AM	1		9	10				0		2	4	6	8	1		9	25
7:30 AM	1		9	10				0		3	4	7	7	1		8	25
7:45 AM	1		7	8				0		4	1	5	3	2		5	18
8:00 AM	0		4	4				0		4	0	4	4	2		6	14

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Copper Terrace & SW Edy Rd

7:10 AM to 8:10 AM
Wednesday, September 16, 2015

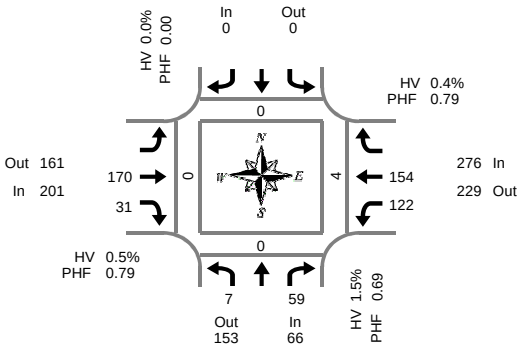


Approach	PHF	HV%	Volume
EB	0.66	3.8%	186
WB	0.57	3.3%	243
NB	0.47	3.5%	287
SB	0.00	0.0%	0
Intersection	0.61	3.5%	716

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
5:00 PM to 6:00 PM

SW Copper Terrace & SW Edy Rd

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	2		1	0				0		6	0	0	1	5		0	15	0	0	0	0
4:05 PM	1		5	0				0		4	1	0	3	10		0	24	0	0	0	0
4:10 PM	1		4	0				0		14	0	0	0	6		0	25	0	0	0	0
4:15 PM	0		2	0				0		11	1	0	0	13		0	27	0	0	0	0
4:20 PM	1		2	0				0		16	1	0	2	10		0	32	0	0	0	0
4:25 PM	3		3	0				0		17	2	0	0	13		0	38	0	0	0	0
4:30 PM	2		1	0				0		14	1	0	1	10		0	29	0	0	0	0
4:35 PM	0		1	0				0		12	0	0	6	13		0	32	0	0	0	0
4:40 PM	1		1	0				0		9	1	0	3	4		0	19	0	0	0	0
4:45 PM	1		3	0				0		17	1	0	6	13		0	41	0	0	0	0
4:50 PM	1		4	0				0		12	1	0	7	14		0	39	0	0	0	0
4:55 PM	1		5	0				0		9	1	0	4	12		0	32	0	0	2	0
5:00 PM	0		7	0				0		13	1	0	8	14		0	43	0	0	0	0
5:05 PM	1		4	0				0		15	1	0	14	12		0	47	0	0	0	0
5:10 PM	0		6	0				0		13	3	0	9	11		0	42	0	0	1	0
5:15 PM	0		10	0				0		14	3	0	13	20		0	60	0	0	0	0
5:20 PM	0		8	0				0		15	6	0	17	14		0	60	0	0	0	0
5:25 PM	2		2	0				0		22	2	0	6	17		0	51	0	0	0	0
5:30 PM	0		2	0				0		16	3	0	9	14		0	44	0	0	0	0
5:35 PM	1		2	0				0		16	3	0	12	8		0	42	0	0	1	0
5:40 PM	0		4	0				0		13	3	0	8	13		0	41	0	0	0	0
5:45 PM	2		6	0				0		4	2	0	12	10		0	36	0	0	1	0
5:50 PM	1		3	0				0		16	3	0	5	12		0	40	0	0	0	0
5:55 PM	0		5	0				0		13	1	0	9	9		0	37	0	0	1	0
Total Survey	21		91	0				0		311	41	0	155	277		0	896	0	0	6	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	4		10	0				0		24	1	0	4	21		0	64	0	0	0	0
4:15 PM	4		7	0				0		44	4	0	2	36		0	97	0	0	0	0
4:30 PM	3		3	0				0		35	2	0	10	27		0	80	0	0	0	0
4:45 PM	3		12	0				0		38	3	0	17	39		0	112	0	0	2	0
5:00 PM	1		17	0				0		41	5	0	31	37		0	132	0	0	1	0
5:15 PM	2		20	0				0		51	11	0	36	51		0	171	0	0	0	0
5:30 PM	1		8	0				0		45	9	0	29	35		0	127	0	0	1	0
5:45 PM	3		14	0				0		33	6	0	26	31		0	113	0	0	2	0
Total Survey	21		91	0				0		311	41	0	155	277		0	896	0	0	6	0

Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	66	153	219	0	0	0	0	0	201	161	362	0	276	229	505	0	543
%HV	1.5%				0.0%				0.5%				0.4%				0.6%
PHF	0.69				0.00				0.79				0.79				0.79

Pedestrians Crosswalk			
North	South	East	West
0	0	4	0

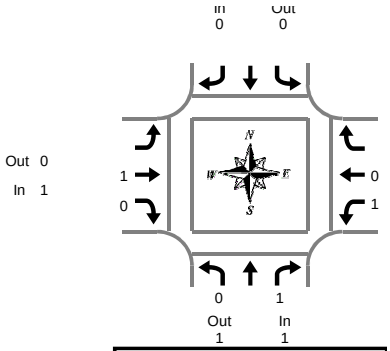
By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	7		59	66				0		170	31	201	122	154		276	543
%HV	0.0%	NA	1.7%	1.5%	NA	NA	NA	0.0%	NA	0.6%	0.0%	0.5%	0.8%	0.0%	NA	0.4%	0.6%
PHF	0.58		0.61	0.69				0.00		0.79	0.65	0.79	0.78	0.75		0.79	0.79

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total	Pedestrians Crosswalk			
	L		R	Bikes				Bikes		T	R	Bikes	L	T		Bikes		North	South	East	West
4:00 PM	14		32	0				0		141	10	0	33	123		0	353	0	0	2	0
4:15 PM	11		39	0				0		158	14	0	60	139		0	421	0	0	3	0
4:30 PM	9		52	0				0		165	21	0	94	154		0	495	0	0	3	0
4:45 PM	7		57	0				0		175	28	0	113	162		0	542	0	0	4	0
5:00 PM	7		59	0				0		170	31	0	122	154		0	543	0	0	4	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW Copper Terrace & SW Edy Rd

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

Peak Hour Summary
5:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L		R	Total				Total		T	R	Total	L	T		Total	
4:00 PM	0		0	0				0		1	0	1	0	0		0	1
4:05 PM	0		0	0				0		1	0	1	0	0		0	1
4:10 PM	0		0	0				0		0	0	0	0	0		0	0
4:15 PM	0		0	0				0		0	0	0	0	0		0	0
4:20 PM	0		0	0				0		0	0	0	0	0		0	0
4:25 PM	0		0	0				0		0	0	0	0	0		0	0
4:30 PM	0		0	0				0		1	0	1	0	0		0	1
4:35 PM	0		0	0				0		0	0	0	0	0		0	0
4:40 PM	0		0	0				0		0	0	0	0	0		0	0
4:45 PM	0		0	0				0		0	0	0	0	0		0	0
4:50 PM	0		0	0				0		0	0	0	0	0		0	0
4:55 PM	0		0	0				0		0	0	0	0	0		0	0
5:00 PM	0		0	0				0		0	0	0	0	0		0	0
5:05 PM	0		0	0				0		0	0	0	0	0		0	0
5:10 PM	0		0	0				0		0	0	0	0	0		0	0
5:15 PM	0		0	0				0		0	0	0	0	0		0	0
5:20 PM	0		0	0				0		0	0	0	0	0		0	0
5:25 PM	0		0	0				0		1	0	1	0	0		0	1
5:30 PM	0		0	0				0		0	0	0	0	0		0	0
5:35 PM	0		0	0				0		0	0	0	0	0		0	0
5:40 PM	0		0	0				0		0	0	0	0	0		0	0
5:45 PM	0		0	0				0		0	0	0	0	0		0	0
5:50 PM	0		0	0				0		0	0	0	0	0		0	0
5:55 PM	0		1	1				0		0	0	0	1	0		1	2
Total Survey	0		1	1				0		4	0	4	1	0		1	6

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L		R	Total				Total		T	R	Total	L	T		Total	
4:00 PM	0		0	0				0		2	0	2	0	0		0	2
4:15 PM	0		0	0				0		0	0	0	0	0		0	0
4:30 PM	0		0	0				0		1	0	1	0	0		0	1
4:45 PM	0		0	0				0		0	0	0	0	0		0	0
5:00 PM	0		0	0				0		0	0	0	0	0		0	0
5:15 PM	0		0	0				0		1	0	1	0	0		0	1
5:30 PM	0		0	0				0		0	0	0	0	0		0	0
5:45 PM	0		1	1				0		0	0	0	1	0		1	2
Total Survey	0		1	1				0		4	0	4	1	0		1	6

Heavy Vehicle Peak Hour Summary
5:00 PM to 6:00 PM

By Approach	Northbound SW Copper Terrace			Southbound SW Copper Terrace			Eastbound SW Edy Rd			Westbound SW Edy Rd			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	1	1	2	0	0	0	1	0	1	1	2	3	3
PHF	0.25			0.00			0.25			0.25			0.38

By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Total
	L		R	Total				Total		T	R	Total	L	T		Total	
Volume	0		1	1				0		1	0	1	1	0		1	3
PHF	0.00		0.25	0.25				0.00		0.25	0.00	0.25	0.25	0.00		0.25	0.38

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

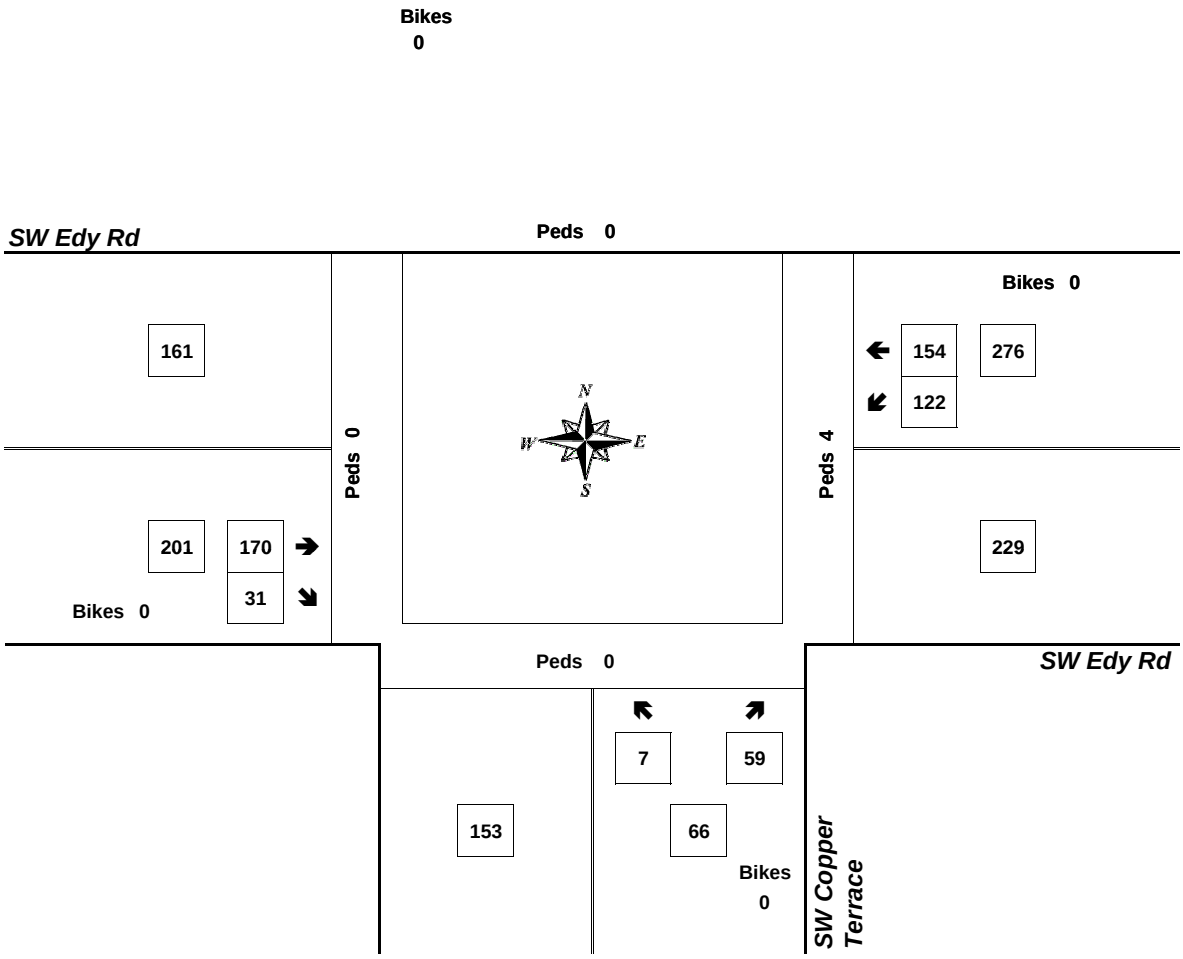
Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Edy Rd				Westbound SW Edy Rd				Interval Total
	L		R	Total				Total		T	R	Total	L	T		Total	
4:00 PM	0		0	0				0		3	0	3	0	0		0	3
4:15 PM	0		0	0				0		1	0	1	0	0		0	1
4:30 PM	0		0	0				0		2	0	2	0	0		0	2
4:45 PM	0		0	0				0		1	0	1	0	0		0	1
5:00 PM	0		1	1				0		1	0	1	1	0		1	3

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Copper Terrace & SW Edy Rd

5:00 PM to 6:00 PM
Tuesday, September 15, 2015



Approach	PHF	HV%	Volume
EB	0.79	0.5%	201
WB	0.79	0.4%	276
NB	0.69	1.5%	66
SB	0.00	0.0%	0
Intersection	0.79	0.6%	543

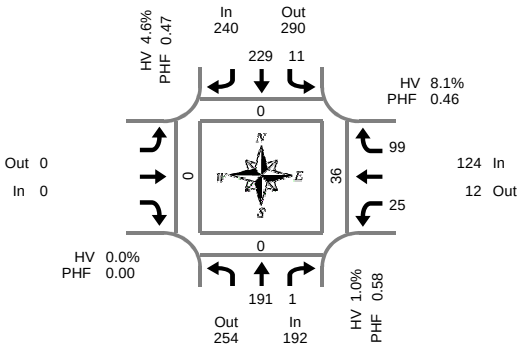
Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740

SW Copper Terrace & SW Nursery Way

Wednesday, September 16, 2015
7:00 AM to 9:00 AM



Peak Hour Summary
7:10 AM to 8:10 AM

5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		0	0	0	0	1		0				0	1		0	0	2	0	0	0	0
7:05 AM		2	0	0	0	5		0				0	0		0	0	7	0	0	0	0
7:10 AM		6	0	0	1	8		0				0	0		0	0	15	0	0	0	0
7:15 AM		7	0	0	0	10		0				0	1		1	0	19	0	0	0	0
7:20 AM		12	0	0	0	26		0				0	5		8	0	51	0	0	0	0
7:25 AM		13	0	0	2	16		0				0	3		3	0	37	0	0	0	0
7:30 AM		15	0	0	3	35		0				0	3		9	0	65	0	0	3	0
7:35 AM		29	0	0	2	39		0				0	5		12	0	87	0	0	3	0
7:40 AM		26	0	0	1	47		0				0	3		13	0	90	0	0	22	0
7:45 AM		22	0	0	0	33		0				0	1		33	0	89	0	0	2	0
7:50 AM		34	1	0	1	9		0				0	2		13	0	60	0	0	3	0
7:55 AM		17	0	0	1	1		0				0	0		1	0	20	0	0	2	0
8:00 AM		6	0	0	0	2		0				0	0		5	0	13	0	0	1	0
8:05 AM		4	0	0	0	3		0				0	2		1	0	10	0	0	0	0
8:10 AM		5	0	0	0	3		0				0	0		0	0	8	0	0	2	0
8:15 AM		3	0	0	0	1		0				0	0		0	0	4	0	0	2	0
8:20 AM		0	0	0	0	0		0				0	0		1	0	1	0	0	0	0
8:25 AM		0	0	0	0	1		0				0	0		0	0	1	0	0	2	0
8:30 AM		0	0	0	0	1		0				0	1		1	0	3	0	0	0	0
8:35 AM		1	0	0	0	3		0				0	0		1	0	5	0	0	4	0
8:40 AM		2	0	0	0	0		0				0	0		1	0	3	0	0	0	0
8:45 AM		3	0	0	0	1		0				0	0		1	0	5	0	0	0	0
8:50 AM		0	1	0	0	3		0				0	0		0	0	4	0	0	0	0
8:55 AM		1	0	0	0	1		0				0	0		0	0	2	0	0	1	0
Total Survey		208	2	0	11	249		0				0	27		104	0	601	0	0	47	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		8	0	0	1	14		0				0	1		0	0	24	0	0	0	0
7:15 AM		32	0	0	2	52		0				0	9		12	0	107	0	0	0	0
7:30 AM		70	0	0	6	121		0				0	11		34	0	242	0	0	28	0
7:45 AM		73	1	0	2	43		0				0	3		47	0	169	0	0	7	0
8:00 AM		15	0	0	0	8		0				0	2		6	0	31	0	0	3	0
8:15 AM		3	0	0	0	2		0				0	0		1	0	6	0	0	4	0
8:30 AM		3	0	0	0	4		0				0	1		3	0	11	0	0	4	0
8:45 AM		4	1	0	0	5		0				0	0		1	0	11	0	0	1	0
Total Survey		208	2	0	11	249		0				0	27		104	0	601	0	0	47	0

Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	192	254	446	0	240	290	530	0	0	0	0	0	124	12	136	0	556
%HV	1.0%				4.6%				0.0%				8.1%				4.1%
PHF	0.58				0.47				0.00				0.46				0.52

Pedestrians Crosswalk			
North	South	East	West
0	0	36	0

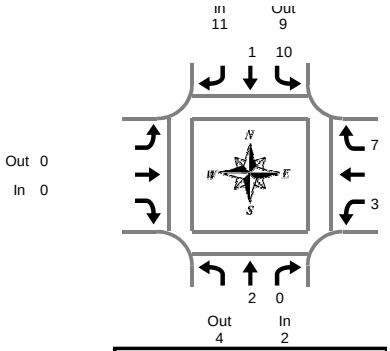
By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		191	1	192	11	229		240				0	25		99	124	556
%HV	NA	1.0%	0.0%	1.0%	90.9%	0.4%	NA	4.6%	NA	NA	NA	0.0%	12.0%	NA	7.1%	8.1%	4.1%
PHF		0.58	0.25	0.58	0.39	0.47		0.47				0.00	0.57		0.42	0.46	0.52

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		183	1	0	11	230		0				0	24		93	0	542	0	0	35	0
7:15 AM		190	1	0	10	224		0				0	25		99	0	549	0	0	38	0
7:30 AM		161	1	0	8	174		0				0	16		88	0	448	0	0	42	0
7:45 AM		94	1	0	2	57		0				0	6		57	0	217	0	0	18	0
8:00 AM		25	1	0	0	19		0				0	3		11	0	59	0	0	12	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW Copper Terrace & SW Nursery Way

Wednesday, September 16, 2015
7:00 AM to 9:00 AM

Peak Hour Summary
7:10 AM to 8:10 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		0	0	0	0	0		0				0	0		0	0	0
7:05 AM		0	0	0	0	0		0				0	0		0	0	0
7:10 AM		0	0	0	1	0		1				0	0		0	0	1
7:15 AM		0	0	0	0	0		0				0	1		0	1	1
7:20 AM		0	0	0	0	0		0				0	0		0	0	0
7:25 AM		0	0	0	2	0		2				0	0		0	0	2
7:30 AM		0	0	0	3	0		3				0	0		0	0	3
7:35 AM		0	0	0	1	0		1				0	1		2	3	4
7:40 AM		1	0	1	1	0		1				0	1		2	3	5
7:45 AM		0	0	0	0	1		1				0	0		0	0	1
7:50 AM		1	0	1	1	0		1				0	0		1	1	3
7:55 AM		0	0	0	1	0		1				0	0		1	1	2
8:00 AM		0	0	0	0	0		0				0	0		1	1	1
8:05 AM		0	0	0	0	0		0				0	0		0	0	0
8:10 AM		0	0	0	0	1		1				0	0		0	0	1
8:15 AM		0	0	0	0	0		0				0	0		0	0	0
8:20 AM		0	0	0	0	0		0				0	0		0	0	0
8:25 AM		0	0	0	0	0		0				0	0		0	0	0
8:30 AM		0	0	0	0	0		0				0	0		0	0	0
8:35 AM		0	0	0	0	0		0				0	0		0	0	0
8:40 AM		1	0	1	0	0		0				0	0		0	0	1
8:45 AM		0	0	0	0	0		0				0	0		0	0	0
8:50 AM		0	1	1	0	1		1				0	0		0	0	2
8:55 AM		0	0	0	0	1		1				0	0		0	0	1
Total Survey		3	1	4	10	4		14				0	3		7	10	28

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		0	0	0	1	0		1				0	0		0	0	1
7:15 AM		0	0	0	2	0		2				0	1		0	1	3
7:30 AM		1	0	1	5	0		5				0	2		4	6	12
7:45 AM		1	0	1	2	1		3				0	0		2	2	6
8:00 AM		0	0	0	0	1		1				0	0		1	1	2
8:15 AM		0	0	0	0	0		0				0	0		0	0	0
8:30 AM		1	0	1	0	0		0				0	0		0	0	1
8:45 AM		0	1	1	0	2		2				0	0		0	0	3
Total Survey		3	1	4	10	4		14				0	3		7	10	28

Heavy Vehicle Peak Hour Summary
7:10 AM to 8:10 AM

By Approach	Northbound SW Copper Terrace			Southbound SW Copper Terrace			Eastbound SW Nursery Way			Westbound SW Nursery Way			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	2	4	6	11	9	20	0	0	0	10	10	20	23
PHF	0.25			0.46			0.00			0.42			0.48

By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		2	0	2	10	1		11				0	3		7	10	23
PHF		0.25	0.00	0.25	0.42	0.25		0.46				0.00	0.38		0.44	0.42	0.48

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

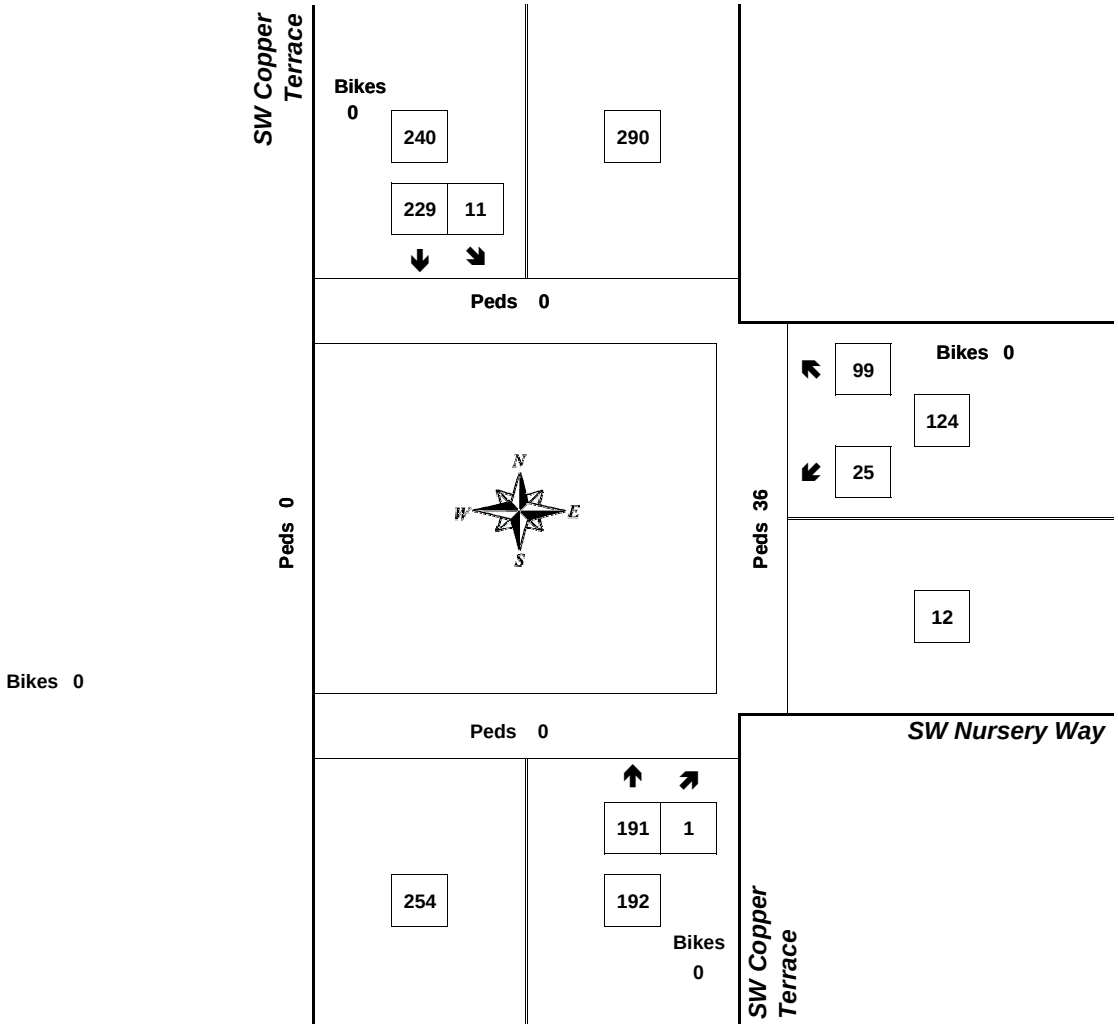
Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		2	0	2	10	1		11				0	3		6	9	22
7:15 AM		2	0	2	9	2		11				0	3		7	10	23
7:30 AM		2	0	2	7	2		9				0	2		7	9	20
7:45 AM		2	0	2	2	2		4				0	0		3	3	9
8:00 AM		1	1	2	0	3		3				0	0		1	1	6

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Copper Terrace & SW Nursery Way

7:10 AM to 8:10 AM
Wednesday, September 16, 2015



Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.46	8.1%	124
NB	0.58	1.0%	192
SB	0.47	4.6%	240
Intersection	0.52	4.1%	556

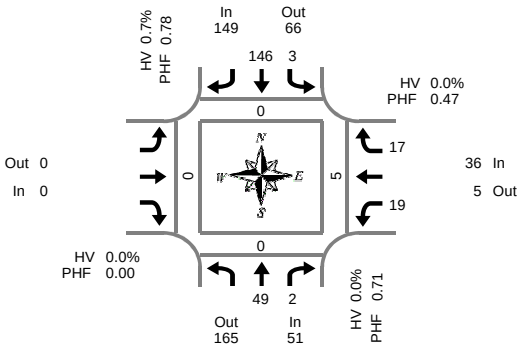
Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740

SW Copper Terrace & SW Nursery Way

Tuesday, September 15, 2015
4:00 PM to 6:00 PM



Peak Hour Summary
4:55 PM to 5:55 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		5	0	0	0	3		0				0	0		3	0	11	0	0	0	0
4:05 PM		2	0	0	0	2		0				0	1		0	0	5	0	0	0	0
4:10 PM		4	1	0	0	0		0				0	0		1	0	6	0	0	0	0
4:15 PM		2	0	0	1	2		0				0	0		0	0	5	0	0	0	0
4:20 PM		3	0	0	0	1		0				0	0		2	0	6	0	0	0	0
4:25 PM		3	0	0	0	4		0				0	0		2	0	9	0	0	0	0
4:30 PM		1	0	0	0	1		0				0	0		0	0	2	0	0	0	0
4:35 PM		2	0	0	0	6		0				0	0		0	0	8	0	0	0	0
4:40 PM		1	0	0	0	5		0				0	0		0	0	6	0	0	0	0
4:45 PM		4	0	0	0	9		0				0	0		1	0	14	0	0	0	0
4:50 PM		5	0	0	1	6		0				0	0		1	0	13	0	0	0	0
4:55 PM		5	0	0	0	6		0				0	0		0	0	11	0	0	2	0
5:00 PM		8	0	0	0	14		0				0	2		1	0	25	0	0	0	0
5:05 PM		4	1	0	0	12		0				0	1		0	0	18	0	0	0	0
5:10 PM		3	0	0	0	15		0				0	2		5	0	25	0	0	1	0
5:15 PM		6	0	0	0	19		0				0	5		1	0	31	0	0	0	0
5:20 PM		6	0	0	1	13		0				0	4		2	0	26	0	0	0	0
5:25 PM		1	0	0	0	9		0				0	1		1	0	12	0	0	0	0
5:30 PM		2	0	0	0	14		0				0	1		2	0	19	0	0	0	0
5:35 PM		2	1	0	1	12		0				0	0		1	0	17	0	0	1	0
5:40 PM		6	0	0	1	14		0				0	1		1	0	23	0	0	1	0
5:45 PM		3	0	0	0	8		0				0	0		2	0	13	0	0	0	0
5:50 PM		3	0	0	0	10		0				0	2		1	0	16	0	0	0	0
5:55 PM		1	0	0	0	6		0				0	1		2	0	10	0	0	3	0
Total Survey		82	3	0	5	191		0				0	21		29	0	331	0	0	8	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		11	1	0	0	5		0				0	1		4	0	22	0	0	0	0
4:15 PM		8	0	0	1	7		0				0	0		4	0	20	0	0	0	0
4:30 PM		4	0	0	0	12		0				0	0		0	0	16	0	0	0	0
4:45 PM		14	0	0	1	21		0				0	0		2	0	38	0	0	2	0
5:00 PM		15	1	0	0	41		0				0	5		6	0	68	0	0	1	0
5:15 PM		13	0	0	1	41		0				0	10		4	0	69	0	0	0	0
5:30 PM		10	1	0	2	40		0				0	2		4	0	59	0	0	2	0
5:45 PM		7	0	0	0	24		0				0	3		5	0	39	0	0	3	0
Total Survey		82	3	0	5	191		0				0	21		29	0	331	0	0	8	0

Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	51	165	216	0	149	66	215	0	0	0	0	0	36	5	41	0	236
%HV	0.0%				0.7%				0.0%				0.0%				0.4%
PHF	0.71				0.78				0.00				0.47				0.72

Pedestrians Crosswalk			
North	South	East	West
0	0	5	0

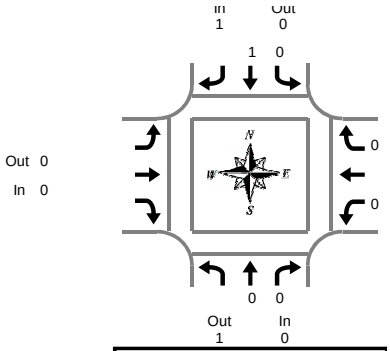
By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		49	2	51	3	146		149				0	19		17	36	236
%HV	NA	0.0%	0.0%	0.0%	0.0%	0.7%	NA	0.7%	NA	NA	NA	0.0%	0.0%	NA	0.0%	0.0%	0.4%
PHF		0.72	0.50	0.71	0.38	0.78		0.78				0.00	0.43		0.53	0.47	0.72

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		37	1	0	2	45		0				0	1		10	0	96	0	0	2	0
4:15 PM		41	1	0	2	81		0				0	5		12	0	142	0	0	3	0
4:30 PM		46	1	0	2	115		0				0	15		12	0	191	0	0	3	0
4:45 PM		52	2	0	4	143		0				0	17		16	0	234	0	0	5	0
5:00 PM		45	2	0	3	146		0				0	20		19	0	235	0	0	6	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



SW Copper Terrace & SW Nursery Way

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

Peak Hour Summary
4:55 PM to 5:55 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	0	0	0	0		0				0	0		0	0	0
4:05 PM		0	0	0	0	0		0				0	0		0	0	0
4:10 PM		0	0	0	0	0		0				0	0		0	0	0
4:15 PM		0	0	0	0	0		0				0	0		0	0	0
4:20 PM		0	0	0	0	0		0				0	0		0	0	0
4:25 PM		0	0	0	0	0		0				0	0		0	0	0
4:30 PM		0	0	0	0	0		0				0	0		0	0	0
4:35 PM		0	0	0	0	0		0				0	0		0	0	0
4:40 PM		0	0	0	0	0		0				0	0		0	0	0
4:45 PM		0	0	0	0	0		0				0	0		0	0	0
4:50 PM		0	0	0	0	0		0				0	0		0	0	0
4:55 PM		0	0	0	0	0		0				0	0		0	0	0
5:00 PM		0	0	0	0	0		0				0	0		0	0	0
5:05 PM		0	0	0	0	0		0				0	0		0	0	0
5:10 PM		0	0	0	0	0		0				0	0		0	0	0
5:15 PM		0	0	0	0	0		0				0	0		0	0	0
5:20 PM		0	0	0	0	0		0				0	0		0	0	0
5:25 PM		0	0	0	0	0		0				0	0		0	0	0
5:30 PM		0	0	0	0	0		0				0	0		0	0	0
5:35 PM		0	0	0	0	0		0				0	0		0	0	0
5:40 PM		0	0	0	0	0		0				0	0		0	0	0
5:45 PM		0	0	0	0	0		0				0	0		0	0	0
5:50 PM		0	0	0	0	1		1				0	0		0	0	1
5:55 PM		1	0	1	0	0		0				0	0		0	0	1
Total Survey		1	0	1	0	1		1				0	0		0	0	2

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	0	0	0	0		0				0	0		0	0	0
4:15 PM		0	0	0	0	0		0				0	0		0	0	0
4:30 PM		0	0	0	0	0		0				0	0		0	0	0
4:45 PM		0	0	0	0	0		0				0	0		0	0	0
5:00 PM		0	0	0	0	0		0				0	0		0	0	0
5:15 PM		0	0	0	0	0		0				0	0		0	0	0
5:30 PM		0	0	0	0	0		0				0	0		0	0	0
5:45 PM		1	0	1	0	1		1				0	0		0	0	2
Total Survey		1	0	1	0	1		1				0	0		0	0	2

Heavy Vehicle Peak Hour Summary
4:55 PM to 5:55 PM

By Approach	Northbound SW Copper Terrace			Southbound SW Copper Terrace			Eastbound SW Nursery Way			Westbound SW Nursery Way			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	1	1	1	0	1	0	0	0	0	0	0	1
PHF	0.00			0.25			0.00			0.00			0.25

By Movement	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		0	0	0	0	1		1				0	0		0	0	1
PHF		0.00	0.00	0.00	0.00	0.25		0.25				0.00	0.00		0.00	0.00	0.25

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

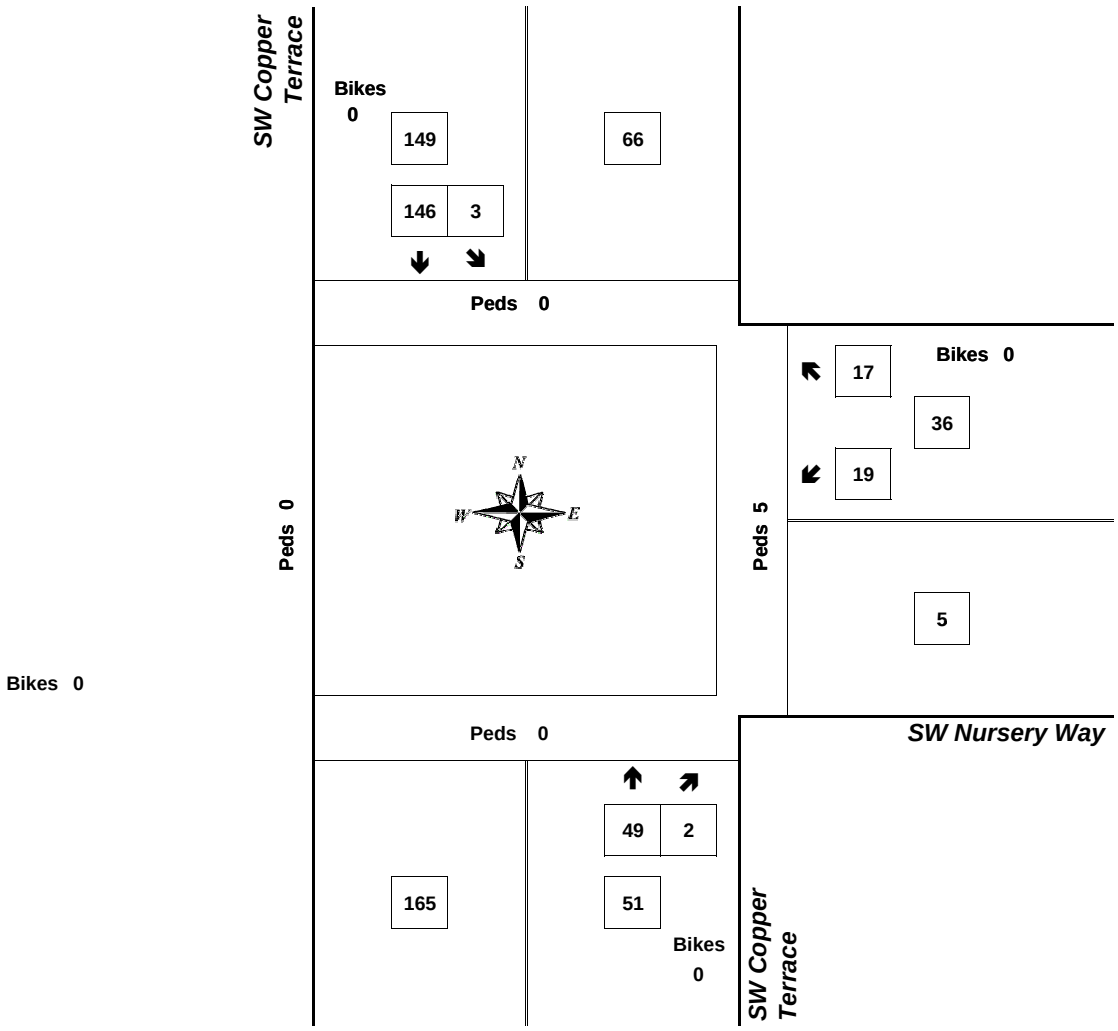
Interval Start Time	Northbound SW Copper Terrace				Southbound SW Copper Terrace				Eastbound SW Nursery Way				Westbound SW Nursery Way				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	0	0	0	0		0				0	0		0	0	0
4:15 PM		0	0	0	0	0		0				0	0		0	0	0
4:30 PM		0	0	0	0	0		0				0	0		0	0	0
4:45 PM		0	0	0	0	0		0				0	0		0	0	0
5:00 PM		1	0	1	0	1		1				0	0		0	0	2

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Copper Terrace & SW Nursery Way

4:55 PM to 5:55 PM
Tuesday, September 15, 2015



Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.47	0.0%	36
NB	0.71	0.0%	51
SB	0.78	0.7%	149
Intersection	0.72	0.4%	236

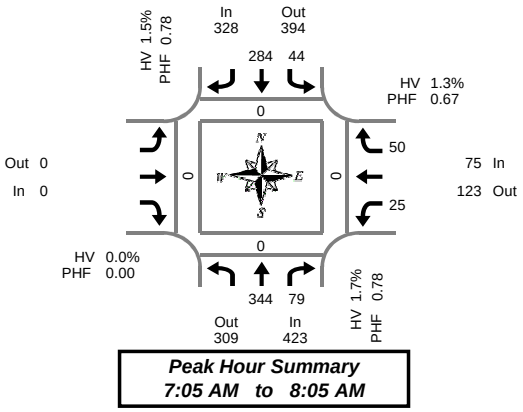
Count Period: 4:00 PM to 6:00 PM

Total Vehicle Summary

Clay Carney
(503) 833-2740

SW Elwert Rd & SW Handley St

Wednesday, September 16, 2015
7:00 AM to 9:00 AM



5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		25	3	0	0	11		0				0	0		1	0	40	0	0	0	0
7:05 AM		37	1	0	4	16		0				0	1		3	0	62	0	0	0	0
7:10 AM		23	2	0	2	20		0				0	1		2	0	50	0	0	0	0
7:15 AM		28	5	0	4	21		0				0	0		4	0	62	0	0	0	0
7:20 AM		25	9	0	3	21		0				0	1		3	0	62	0	0	0	0
7:25 AM		32	14	0	6	27		0				0	3		2	0	84	0	0	0	0
7:30 AM		39	8	0	2	22		0				0	5		4	0	80	0	0	0	0
7:35 AM		28	14	0	4	17		0				0	3		5	0	71	0	0	0	0
7:40 AM		31	14	0	8	24		0				0	3		3	0	83	0	0	0	0
7:45 AM		25	5	0	4	38		0				0	1		10	0	83	0	0	0	0
7:50 AM		30	4	0	4	27		0				0	4		7	0	76	0	0	0	0
7:55 AM		26	1	0	2	30		0				0	2		2	0	63	0	0	0	0
8:00 AM		20	2	0	1	21		0				0	1		5	0	50	0	0	0	0
8:05 AM		18	2	0	0	17		0				0	2		2	0	41	0	0	0	0
8:10 AM		17	1	0	0	10		0				0	2		1	0	31	0	0	0	0
8:15 AM		31	1	0	0	28		0				0	2		1	0	63	0	0	0	0
8:20 AM		27	0	0	0	19		0				0	2		1	0	49	0	0	0	0
8:25 AM		17	0	0	0	17		0				0	1		2	0	37	0	0	0	0
8:30 AM		13	1	0	2	13		0				0	1		2	0	32	0	0	0	0
8:35 AM		16	2	0	1	14		0				0	0		2	0	35	0	0	0	0
8:40 AM		22	2	0	0	15		0				0	0		3	0	42	0	0	0	0
8:45 AM		19	1	0	1	13		0				0	1		2	0	37	0	0	0	0
8:50 AM		16	1	0	0	14		0				0	0		1	0	32	0	0	0	0
8:55 AM		10	1	0	1	20		0				0	1		0	0	33	0	0	0	0
Total Survey		575	94	0	49	475		0				0	37		68	0	1,298	0	0	0	0

15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		85	6	0	6	47		0				0	2		6	0	152	0	0	0	0
7:15 AM		85	28	0	13	69		0				0	4		9	0	208	0	0	0	0
7:30 AM		98	36	0	14	63		0				0	11		12	0	234	0	0	0	0
7:45 AM		81	10	0	10	95		0				0	7		19	0	222	0	0	0	0
8:00 AM		55	5	0	1	48		0				0	5		8	0	122	0	0	0	0
8:15 AM		75	1	0	0	64		0				0	5		4	0	149	0	0	0	0
8:30 AM		51	5	0	3	42		0				0	1		7	0	109	0	0	0	0
8:45 AM		45	3	0	2	47		0				0	2		3	0	102	0	0	0	0
Total Survey		575	94	0	49	475		0				0	37		68	0	1,298	0	0	0	0

Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Total
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	
Volume	423	309	732	0	328	394	722	0	0	0	0	0	75	123	198	0	826
%HV	1.7%				1.5%				0.0%				1.3%				1.6%
PHF	0.78				0.78				0.00				0.67				0.85

Pedestrians Crosswalk			
North	South	East	West
0	0	0	0

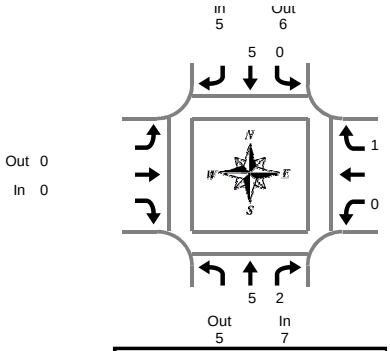
By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		344	79	423	44	284		328				0	25		50	75	826
%HV	NA	1.5%	2.5%	1.7%	0.0%	1.8%	NA	1.5%	NA	NA	NA	0.0%	0.0%	NA	2.0%	1.3%	1.6%
PHF		0.87	0.55	0.78	0.69	0.75		0.78				0.00	0.57		0.63	0.67	0.85

Rolling Hour Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
7:00 AM		349	80	0	43	274		0				0	24		46	0	816	0	0	0	0
7:15 AM		319	79	0	38	275		0				0	27		48	0	786	0	0	0	0
7:30 AM		309	52	0	25	270		0				0	28		43	0	727	0	0	0	0
7:45 AM		262	21	0	14	249		0				0	18		38	0	602	0	0	0	0
8:00 AM		226	14	0	6	201		0				0	13		22	0	482	0	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
7:05 AM to 8:05 AM

SW Elwert Rd & SW Handley St

Wednesday, September 16, 2015
7:00 AM to 9:00 AM

Heavy Vehicle 5-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		0	0	0	0	0		0				0	0		0	0	0
7:05 AM		1	0	1	0	1		1				0	0		0	0	2
7:10 AM		2	0	2	0	0		0				0	0		0	0	2
7:15 AM		0	0	0	0	1		1				0	0		0	0	1
7:20 AM		0	0	0	0	0		0				0	0		0	0	0
7:25 AM		0	0	0	0	1		1				0	0		0	0	1
7:30 AM		1	0	1	0	0		0				0	0		0	0	1
7:35 AM		0	1	1	0	0		0				0	0		0	0	1
7:40 AM		0	0	0	0	0		0				0	0		1	1	1
7:45 AM		0	0	0	0	1		1				0	0		0	0	1
7:50 AM		0	0	0	0	1		1				0	0		0	0	1
7:55 AM		1	0	1	0	0		0				0	0		0	0	1
8:00 AM		0	1	1	0	0		0				0	0		0	0	1
8:05 AM		1	0	1	0	2		2				0	0		0	0	3
8:10 AM		0	0	0	0	0		0				0	0		0	0	0
8:15 AM		1	0	1	0	1		1				0	0		0	0	2
8:20 AM		3	0	3	0	0		0				0	0		0	0	3
8:25 AM		0	0	0	0	1		1				0	0		0	0	1
8:30 AM		0	0	0	0	0		0				0	0		0	0	0
8:35 AM		1	0	1	0	0		0				0	0		0	0	1
8:40 AM		0	0	0	0	0		0				0	0		0	0	0
8:45 AM		1	0	1	0	0		0				0	0		0	0	1
8:50 AM		0	0	0	0	1		1				0	0		0	0	1
8:55 AM		1	0	1	0	1		1				0	0		0	0	2
Total Survey		13	2	15	0	11		11				0	0		1	1	27

Heavy Vehicle 15-Minute Interval Summary
7:00 AM to 9:00 AM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		3	0	3	0	1		1				0	0		0	0	4
7:15 AM		0	0	0	0	2		2				0	0		0	0	2
7:30 AM		1	1	2	0	0		0				0	0		1	1	3
7:45 AM		1	0	1	0	2		2				0	0		0	0	3
8:00 AM		1	1	2	0	2		2				0	0		0	0	4
8:15 AM		4	0	4	0	2		2				0	0		0	0	6
8:30 AM		1	0	1	0	0		0				0	0		0	0	1
8:45 AM		2	0	2	0	2		2				0	0		0	0	4
Total Survey		13	2	15	0	11		11				0	0		1	1	27

Heavy Vehicle Peak Hour Summary
7:05 AM to 8:05 AM

By Approach	Northbound SW Elwert Rd			Southbound SW Elwert Rd			Eastbound SW Handley St			Westbound SW Handley St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	7	5	12	5	6	11	0	0	0	1	2	3	13
PHF	0.58			0.63			0.00			0.25			0.65

By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		5	2	7	0	5		5				0	0		1	1	13
PHF		0.42	0.50	0.58	0.00	0.63		0.63				0.00	0.00		0.25	0.25	0.65

Heavy Vehicle Rolling Hour Summary
7:00 AM to 9:00 AM

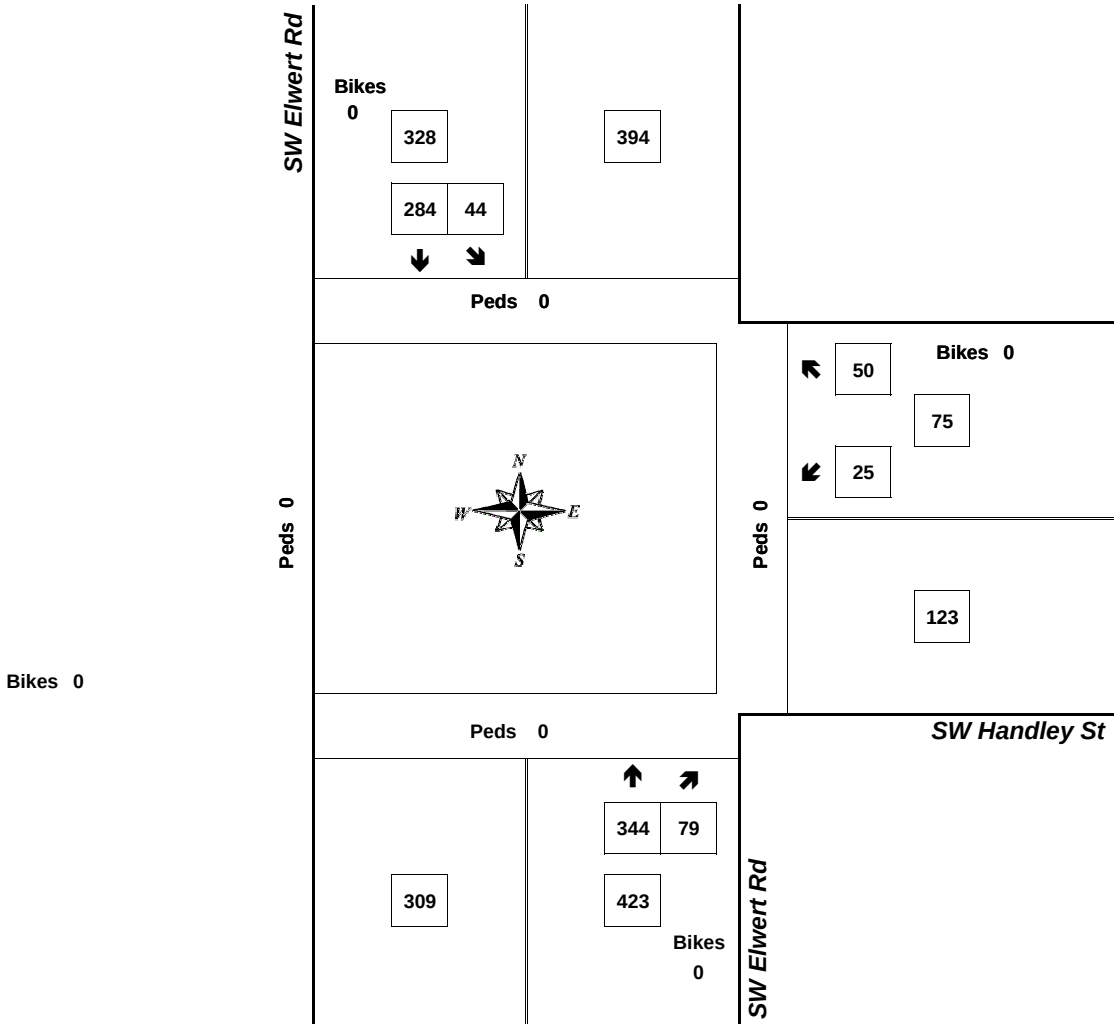
Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
7:00 AM		5	1	6	0	5		5				0	0		1	1	12
7:15 AM		3	2	5	0	6		6				0	0		1	1	12
7:30 AM		7	2	9	0	6		6				0	0		1	1	16
7:45 AM		7	1	8	0	6		6				0	0		0	0	14
8:00 AM		8	1	9	0	6		6				0	0		0	0	15

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Elwert Rd & SW Handley St

7:05 AM to 8:05 AM
Wednesday, September 16, 2015

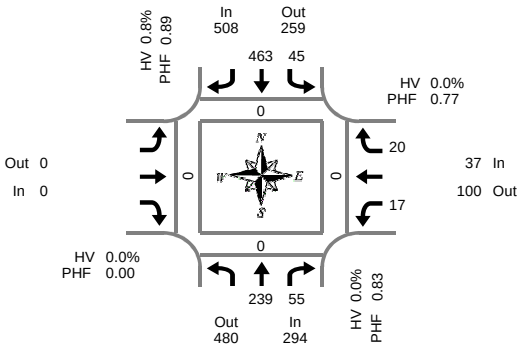


Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.67	1.3%	75
NB	0.78	1.7%	423
SB	0.78	1.5%	328
Intersection	0.85	1.6%	826

Count Period: 7:00 AM to 9:00 AM

Total Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Elwert Rd & SW Handley St

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		16	0	0	1	21		0				0	2		0	0	40	0	0	0	0
4:05 PM		8	1	0	2	22		0				0	0		1	0	34	0	0	0	0
4:10 PM		10	0	0	1	34		0				0	0		2	0	47	0	0	0	0
4:15 PM		25	0	0	3	33		0				0	0		4	0	65	2	0	0	0
4:20 PM		25	0	0	1	38		0				0	0		1	0	65	0	0	0	0
4:25 PM		24	1	0	1	30		0				0	1		0	0	57	0	0	0	0
4:30 PM		17	2	0	2	47		0				0	0		0	0	68	0	0	0	0
4:35 PM		17	3	0	6	40		0				0	1		1	0	68	0	0	0	0
4:40 PM		15	0	0	0	34		0				0	1		0	0	50	0	0	0	0
4:45 PM		15	2	0	1	46		0				0	0		1	0	65	0	0	0	0
4:50 PM		17	6	0	3	47		0				0	0		4	0	77	0	0	0	0
4:55 PM		22	6	0	4	41		0				0	4		1	0	78	0	0	0	0
5:00 PM		18	4	0	4	40		0				0	2		1	0	69	0	0	0	0
5:05 PM		20	2	0	10	38		0				0	2		2	0	74	0	0	0	0
5:10 PM		18	3	0	1	33		0				0	3		2	0	60	0	0	0	0
5:15 PM		20	6	0	2	33		0				0	1		1	0	63	0	0	0	0
5:20 PM		20	9	0	4	35		0				0	2		3	0	73	0	0	0	0
5:25 PM		27	1	0	2	38		0				0	2		0	0	70	0	0	0	0
5:30 PM		29	3	0	2	34		0				0	0		1	0	69	0	0	0	0
5:35 PM		15	6	0	5	39		0				0	0		2	0	67	0	0	0	0
5:40 PM		18	7	0	7	39		0				0	1		2	0	74	0	0	0	0
5:45 PM		21	2	0	3	28		0				0	1		1	0	56	0	0	0	0
5:50 PM		18	8	0	2	31		0				0	1		0	0	60	0	0	0	0
5:55 PM		20	5	0	2	38		0				0	2		0	0	67	0	0	0	0
Total Survey		455	77	0	69	859		0				0	26		30	0	1,516	2	0	0	0

15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		34	1	0	4	77		0				0	2		3	0	121	0	0	0	0
4:15 PM		74	1	0	5	101		0				0	1		5	0	187	2	0	0	0
4:30 PM		49	5	0	8	121		0				0	2		1	0	186	0	0	0	0
4:45 PM		54	14	0	8	134		0				0	4		6	0	220	0	0	0	0
5:00 PM		56	9	0	15	111		0				0	7		5	0	203	0	0	0	0
5:15 PM		67	16	0	8	106		0				0	5		4	0	206	0	0	0	0
5:30 PM		62	16	0	14	112		0				0	1		5	0	210	0	0	0	0
5:45 PM		59	15	0	7	97		0				0	4		1	0	183	0	0	0	0
Total Survey		455	77	0	69	859		0				0	26		30	0	1,516	2	0	0	0

Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Total	Pedestrians Crosswalk			
	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes	In	Out	Total	Bikes		North	South	East	West
Volume	294	480	774	0	508	259	767	0	0	0	0	0	37	100	137	0	839	0	0	0	0
%HV	0.0%				0.8%				0.0%				0.0%				0.5%				
PHF	0.83				0.89				0.00				0.77				0.94				

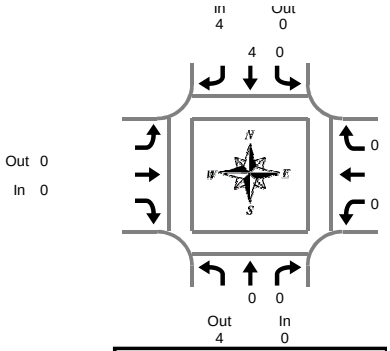
By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		239	55	294	45	463		508				0	17		20	37	839
%HV	NA	0.0%	0.0%	0.0%	0.0%	0.9%	NA	0.8%	NA	NA	NA	0.0%	0.0%	NA	0.0%	0.0%	0.5%
PHF		0.79	0.76	0.83	0.63	0.86		0.89				0.00	0.53		0.83	0.77	0.94

Rolling Hour Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total	Pedestrians Crosswalk			
		T	R	Bikes	L	T		Bikes				Bikes	L		R	Bikes		North	South	East	West
4:00 PM		211	21	0	25	433		0				0	9		15	0	714	2	0	0	0
4:15 PM		233	29	0	36	467		0				0	14		17	0	796	2	0	0	0
4:30 PM		226	44	0	39	472		0				0	18		16	0	815	0	0	0	0
4:45 PM		239	55	0	45	463		0				0	17		20	0	839	0	0	0	0
5:00 PM		244	56	0	44	426		0				0	17		15	0	802	0	0	0	0

Heavy Vehicle Summary

Clay Carney
(503) 833-2740



Peak Hour Summary
4:45 PM to 5:45 PM

SW Elwert Rd & SW Handley St

Tuesday, September 15, 2015
4:00 PM to 6:00 PM

Heavy Vehicle 5-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	0	0	0	0		0				0	0		0	0	0
4:05 PM		0	0	0	0	1		1				0	0		0	0	1
4:10 PM		0	0	0	0	0		0				0	0		0	0	0
4:15 PM		1	0	1	0	2		2				0	0		0	0	3
4:20 PM		1	0	1	0	0		0				0	0		0	0	1
4:25 PM		0	0	0	0	0		0				0	1		0	1	1
4:30 PM		0	0	0	0	0		0				0	0		0	0	0
4:35 PM		0	0	0	0	0		0				0	0		0	0	0
4:40 PM		0	0	0	0	1		1				0	0		0	0	1
4:45 PM		0	0	0	0	1		1				0	0		0	0	1
4:50 PM		0	0	0	0	0		0				0	0		0	0	0
4:55 PM		0	0	0	0	1		1				0	0		0	0	1
5:00 PM		0	0	0	0	1		1				0	0		0	0	1
5:05 PM		0	0	0	0	0		0				0	0		0	0	0
5:10 PM		0	0	0	0	0		0				0	0		0	0	0
5:15 PM		0	0	0	0	0		0				0	0		0	0	0
5:20 PM		0	0	0	0	0		0				0	0		0	0	0
5:25 PM		0	0	0	0	0		0				0	0		0	0	0
5:30 PM		0	0	0	0	0		0				0	0		0	0	0
5:35 PM		0	0	0	0	1		1				0	0		0	0	1
5:40 PM		0	0	0	0	0		0				0	0		0	0	0
5:45 PM		0	0	0	0	0		0				0	0		0	0	0
5:50 PM		0	0	0	0	0		0				0	0		0	0	0
5:55 PM		0	0	0	0	0		0				0	0		0	0	0
Total Survey		2	0	2	0	8		8				0	1		0	1	11

Heavy Vehicle 15-Minute Interval Summary
4:00 PM to 6:00 PM

Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		0	0	0	0	1		1				0	0		0	0	1
4:15 PM		2	0	2	0	2		2				0	1		0	1	5
4:30 PM		0	0	0	0	1		1				0	0		0	0	1
4:45 PM		0	0	0	0	2		2				0	0		0	0	2
5:00 PM		0	0	0	0	1		1				0	0		0	0	1
5:15 PM		0	0	0	0	0		0				0	0		0	0	0
5:30 PM		0	0	0	0	1		1				0	0		0	0	1
5:45 PM		0	0	0	0	0		0				0	0		0	0	0
Total Survey		2	0	2	0	8		8				0	1		0	1	11

Heavy Vehicle Peak Hour Summary
4:45 PM to 5:45 PM

By Approach	Northbound SW Elwert Rd			Southbound SW Elwert Rd			Eastbound SW Handley St			Westbound SW Handley St			Total
	In	Out	Total	In	Out	Total	In	Out	Total	In	Out	Total	
Volume	0	4	4	4	0	4	0	0	0	0	0	0	4
PHF	0.00			0.50			0.00			0.00			0.50

By Movement	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Total
		T	R	Total	L	T		Total				Total	L		R	Total	
Volume		0	0	0	0	4		4				0	0		0	0	4
PHF		0.00	0.00	0.00	0.00	0.50		0.50				0.00	0.00		0.00	0.00	0.50

Heavy Vehicle Rolling Hour Summary
4:00 PM to 6:00 PM

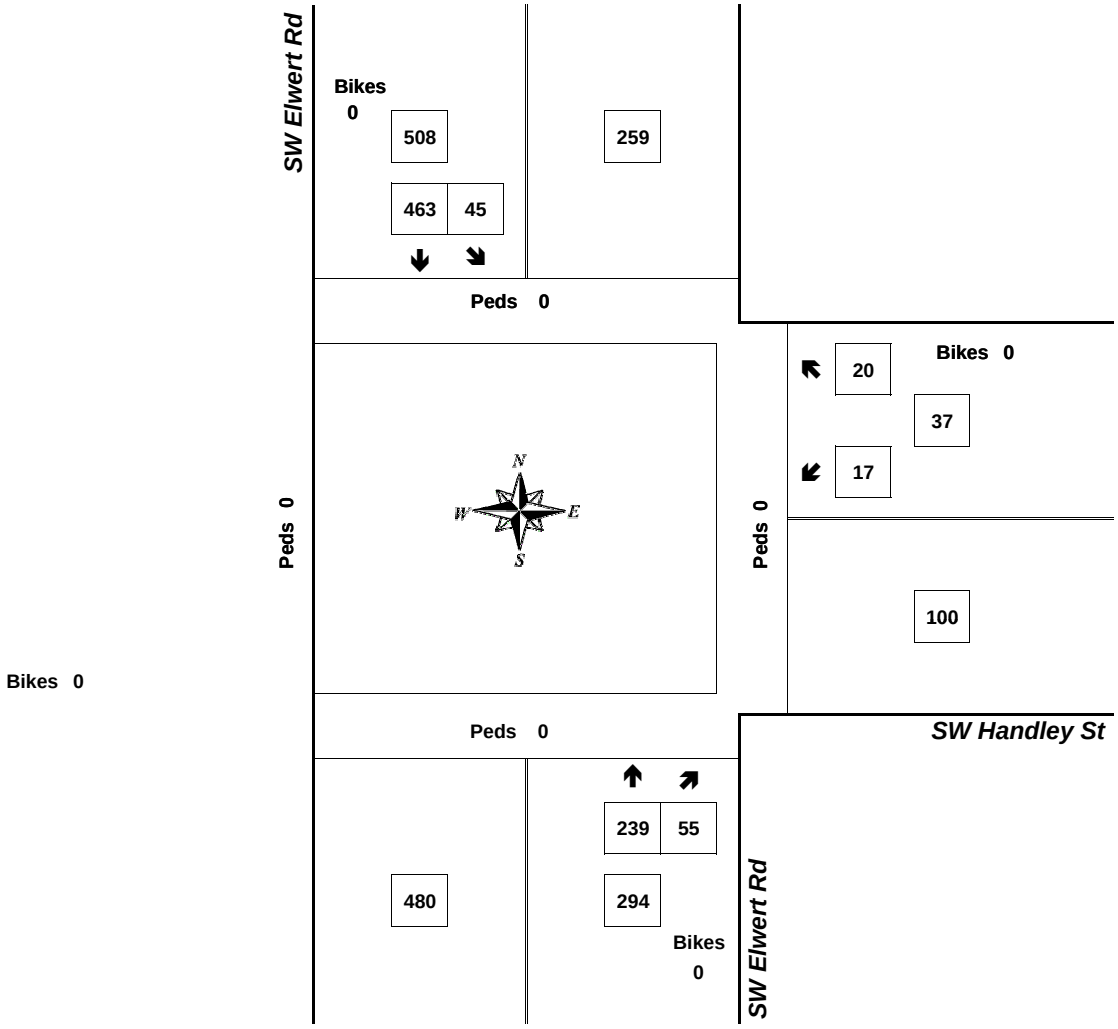
Interval Start Time	Northbound SW Elwert Rd				Southbound SW Elwert Rd				Eastbound SW Handley St				Westbound SW Handley St				Interval Total
		T	R	Total	L	T		Total				Total	L		R	Total	
4:00 PM		2	0	2	0	6		6				0	1		0	1	9
4:15 PM		2	0	2	0	6		6				0	1		0	1	9
4:30 PM		0	0	0	0	4		4				0	0		0	0	4
4:45 PM		0	0	0	0	4		4				0	0		0	0	4
5:00 PM		0	0	0	0	2		2				0	0		0	0	2

Peak Hour Summary

Clay Carney
(503) 833-2740

SW Elwert Rd & SW Handley St

4:45 PM to 5:45 PM
Tuesday, September 15, 2015



Approach	PHF	HV%	Volume
EB	0.00	0.0%	0
WB	0.77	0.0%	37
NB	0.83	0.0%	294
SB	0.89	0.8%	508
Intersection	0.94	0.5%	839

Count Period: 4:00 PM to 6:00 PM

Turning Movement Count Report

Report Generated Using Turning Movement Count for Android by PortableStudies.com

Study Information

Study Summary

Count Name
SW Handley Street at SW Copper Terrace
Location
SW Handley Street at SW Copper Terrace, Sherwood, OR
Performed By
MTA
Date
Thursday, October 15, 2015

Notes

U = U Turn L = Left Turn T = Thru R = Right Turn
P1 = Pedestrian Direction 1 P2 = Pedestrian Direction 2
Veh = Total Vehicles for Approach

Vehicle Volume	
346	
% Bank 1	**% Bank 2**
98.3%	1.7%
% Bank 3	**% Bank 4**
0.0%	0.0%
Pedestrians Volume	
62	

Count Data

Time Period	Eastbound Approach							Westbound Approach							Northbound Approach							Southbound Approach							Total Vehicles	Total Pedestrians
	U	L	T	R	P1	P2	Veh	U	L	T	R	P1	P2	Veh	U	L	T	R	P1	P2	Veh	U	L	T	R	P1	P2	Veh		
7:05 AM	0	1	1	0	0	0	2	0	0	3	1	0	0	4	0	0	0	0	0	0	0	0	0	0	1	0	0	1	7	0
7:10 AM	0	0	2	0	0	0	2	0	0	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	0
7:15 AM	0	5	2	0	0	0	7	0	0	2	5	4	1	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	5
7:20 AM	0	9	4	0	1	0	13	0	0	1	5	2	0	6	0	0	0	0	0	0	0	0	3	0	1	0	0	4	23	3
7:25 AM	0	6	3	0	0	0	9	0	0	3	12	6	0	15	0	0	0	0	0	0	0	0	2	0	3	0	0	5	29	6
7:30 AM	0	11	6	0	0	0	17	0	0	7	21	2	0	28	0	0	0	0	0	0	0	0	11	0	0	0	1	11	56	3
7:35 AM	0	12	6	0	0	0	18	0	0	5	24	7	2	29	0	0	0	0	0	0	0	0	2	0	5	0	0	7	54	9
7:40 AM	0	12	9	0	0	0	21	0	0	4	17	18	1	21	0	0	0	0	0	0	0	0	8	0	2	0	0	10	52	19
7:45 AM	0	6	5	0	0	0	11	0	0	7	13	9	0	20	0	0	0	0	0	0	0	0	5	0	2	0	3	7	38	12
7:50 AM	0	0	14	0	0	0	14	0	0	4	4	0	2	8	0	0	0	0	0	0	0	0	9	0	4	0	0	13	35	2
7:55 AM	0	4	3	0	0	0	7	0	0	4	2	0	2	6	0	0	0	0	0	0	0	0	7	0	4	0	0	11	24	2
8:00 AM	0	2	0	0	0	0	2	0	0	3	0	0	1	3	0	0	0	0	0	0	0	0	1	0	3	0	0	4	9	1

Vehicle Summary

	Eastbound Approach							Westbound Approach							Northbound Approach							Southbound Approach						
Total	123				1		*	150				57		*	0				0		*	73				4		*
Subtotals	0	68	55	0	1	0	*	0	0	46	104	48	9	*	0	0	0	0	0	0	*	0	48	0	25	0	4	*
% Bank 1	0.0%	97.1%	100.0%	0.0%	*	*	*	0.0%	0.0%	97.8%	99.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	97.9%	0.0%	96.0%	*	*	*
% Bank 2	0.0%	2.9%	0.0%	0.0%	*	*	*	0.0%	0.0%	2.2%	1.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	2.1%	0.0%	4.0%	*	*	*
% Bank 3	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*
% Bank 4	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*

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Turning Movement Count Report

Report Generated Using Turning Movement Count for Android by PortableStudies.com

Study Information

Study Summary

Count Name
SW Handley Street at SW Copper Terrace
Location
SW Handley Street at SW Copper Terrace, Sherwood, Oregon
Performed By
MA
Date
Thursday, September 24, 2015

Notes

U = U Turn L = Left Turn T = Thru R = Right Turn
P1 = Pedestrian Direction 1 P2 = Pedestrian Direction 2
Veh = Total Vehicles for Approach

Vehicle Volume	
273	
% Bank 1	**% Bank 2**
97.4%	2.6%
% Bank 3	**% Bank 4**
0.0%	0.0%
Pedestrians Volume	
4	

Count Data

Time Period	Eastbound Approach							Westbound Approach							Northbound Approach							Southbound Approach							Total Vehicles	Total Pedestrians
	U	L	T	R	P1	P2	Veh	U	L	T	R	P1	P2	Veh	U	L	T	R	P1	P2	Veh	U	L	T	R	P1	P2	Veh		
4:55 PM	0	4	7	0	0	0	11	0	0	1	13	0	0	14	0	0	0	0	0	0	0	0	3	0	3	0	0	6	31	0
5:00 PM	0	3	9	0	0	0	12	0	0	6	2	0	0	8	0	0	0	0	0	0	0	0	6	0	0	0	0	6	26	0
5:05 PM	0	3	4	0	0	0	7	0	0	5	4	0	0	9	0	0	0	0	0	0	0	0	5	0	1	0	0	6	22	0
5:10 PM	0	5	2	0	0	0	7	0	0	2	4	0	0	6	0	0	0	0	0	0	0	0	2	0	2	0	0	4	17	0
5:15 PM	0	3	7	0	0	0	10	0	0	3	6	0	0	9	0	0	0	0	0	0	0	0	4	0	0	0	0	4	23	0
5:20 PM	0	4	6	0	0	0	10	0	0	1	4	0	0	5	0	0	0	0	0	0	0	0	4	0	0	0	0	4	19	0
5:25 PM	0	4	10	0	0	0	14	0	0	2	9	0	0	11	0	0	0	0	0	0	0	0	3	0	2	0	0	5	30	0
5:30 PM	0	2	4	0	0	0	6	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	4	0	1	0	0	5	13	0
5:35 PM	0	2	6	0	0	0	8	0	0	4	0	0	0	4	0	0	0	0	0	0	0	0	4	0	0	0	0	4	16	0
5:40 PM	0	5	3	0	0	0	8	0	0	2	10	2	0	12	0	0	0	0	0	0	0	0	3	0	0	0	0	3	23	2
5:45 PM	0	4	5	0	0	0	9	0	0	2	13	1	0	15	0	0	0	0	0	0	0	0	1	0	2	0	0	3	27	1
5:50 PM	0	4	7	1	0	0	12	0	0	1	11	1	0	12	0	0	0	0	0	0	0	0	0	0	2	0	0	2	26	1

Vehicle Summary

	Eastbound Approach							Westbound Approach							Northbound Approach							Southbound Approach						
Total	114				0		*	107				4		*	0				0		*	52				0		*
Subtotals	0	43	70	1	0	0	*	0	0	29	78	4	0	*	0	0	0	0	0	0	*	0	39	0	13	0	0	*
% Bank 1	0.0%	97.7%	97.1%	100.0%	*	*	*	0.0%	0.0%	96.6%	100.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	92.3%	0.0%	100.0%	*	*	*
% Bank 2	0.0%	2.3%	2.9%	0.0%	*	*	*	0.0%	0.0%	3.4%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	7.7%	0.0%	0.0%	*	*	*
% Bank 3	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*
% Bank 4	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*	0.0%	0.0%	0.0%	0.0%	*	*	*

Questions?

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TRIP GENERATION CALCULATIONS

Land Use: Single-Family Detached Housing
Land Use Code: 210
Variable: Dwelling Units
Variable Value: 76

AM PEAK HOUR

Trip Rate: 0.75

	Enter	Exit	Total
Directional Distribution	25%	75%	
Trip Ends	**14**	**43**	**57**

PM PEAK HOUR

Trip Rate: 1.00

	Enter	Exit	Total
Directional Distribution	63%	37%	
Trip Ends	**48**	**28**	**76**

WEEKDAY

Trip Rate: 9.52

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**362**	**362**	**724**

SATURDAY

Trip Rate: 9.91

	Enter	Exit	Total
Directional Distribution	50%	50%	
Trip Ends	**377**	**377**	**754**

Source: TRIP GENERATION, Ninth Edition

Intersection	
Intersection Delay, s/veh	14.9
Intersection LOS	B

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	8	73	11	0	90	17	55	0	9	302	83
Peak Hour Factor	0.92	0.87	0.87	0.87	0.92	0.87	0.87	0.87	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	4	4	4	2	4	4	4	2	2	2	2
Mvmt Flow	0	9	84	13	0	103	20	63	0	10	347	95
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	10.9	12	17.8
HCM LOS	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	9%	56%	11%
Vol Thru, %	77%	79%	10%	86%
Vol Right, %	21%	12%	34%	2%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	394	92	162	263
LT Vol	9	8	90	30
Through Vol	302	73	17	227
RT Vol	83	11	55	6
Lane Flow Rate	453	106	186	302
Geometry Grp	1	1	1	1
Degree of Util (X)	0.657	0.186	0.315	0.47
Departure Headway (Hd)	5.219	6.335	6.097	5.602
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	688	563	587	641
Service Time	3.273	4.42	4.172	3.665
HCM Lane V/C Ratio	0.658	0.188	0.317	0.471
HCM Control Delay	17.8	10.9	12	13.6
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	4.9	0.7	1.3	2.5

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	30	227	6
Peak Hour Factor	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	5	5	5
Mvmt Flow	0	34	261	7
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	13.6
HCM LOS	B

Lane

Intersection	
Int Delay, s/veh	12.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	101	85	157	86	76	211
Conflicting Peds, #/hr	0	0	0	0	0	31
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	61	61	61	61	61	61
Heavy Vehicles, %	4	4	3	3	4	4
Mvmt Flow	166	139	257	141	125	346

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	336	0	922	266
Stage 1	-	-	-	-	266	-
Stage 2	-	-	-	-	656	-
Critical Hdwy	-	-	4.13	-	6.1	6.1
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	-	-	2.227	-	2.5	2.5
Pot Cap-1 Maneuver	-	-	1218	-	409	1005
Stage 1	-	-	-	-	1055	-
Stage 2	-	-	-	-	665	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1218	-	306	975
Mov Cap-2 Maneuver	-	-	-	-	306	-
Stage 1	-	-	-	-	1024	-
Stage 2	-	-	-	-	513	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.7	27
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	618	-	-	1218	-
HCM Lane V/C Ratio	0.761	-	-	0.211	-
HCM Control Delay (s)	27	-	-	8.7	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	7	-	-	0.8	-

Intersection	
Int Delay, s/veh	4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	25	99	191	1	11	229
Conflicting Peds, #/hr	0	0	0	36	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	52	52	52	52	52	52
Heavy Vehicles, %	8	8	1	1	5	5
Mvmt Flow	48	190	367	2	21	440

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	851	368	0	0	369	0
Stage 1	368	-	-	-	-	-
Stage 2	483	-	-	-	-	-
Critical Hdwy	6.48	6.28	-	-	4.15	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.372	-	-	2.245	-
Pot Cap-1 Maneuver	323	664	-	-	1173	-
Stage 1	687	-	-	-	-	-
Stage 2	608	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	304	664	-	-	1173	-
Mov Cap-2 Maneuver	304	-	-	-	-	-
Stage 1	687	-	-	-	-	-
Stage 2	573	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	17	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	536	1173	-
HCM Lane V/C Ratio	-	-	0.445	0.018	-
HCM Control Delay (s)	-	-	17	8.1	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.3	0.1	-

Intersection	
Int Delay, s/veh	1.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	25	50	344	79	44	284
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	29	59	405	93	52	334

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	843	405	0	0	405	0
Stage 1	405	-	-	-	-	-
Stage 2	438	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	335	648	-	-	1154	-
Stage 1	676	-	-	-	-	-
Stage 2	653	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	317	648	-	-	1154	-
Mov Cap-2 Maneuver	317	-	-	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	617	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.2	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	481	1154	-
HCM Lane V/C Ratio	-	-	0.183	0.045	-
HCM Control Delay (s)	-	-	14.2	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.1	-

Intersection	
Intersection Delay, s/veh	9.5
Intersection LOS	A

Movement	EBU	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Vol, veh/h	0	68	55	0	49	104	0	48	26
Peak Hour Factor	0.92	0.53	0.53	0.92	0.53	0.53	0.92	0.53	0.53
Heavy Vehicles, %	2	3	3	2	2	2	2	4	4
Mvmt Flow	0	128	104	0	92	196	0	91	49
Number of Lanes	0	0	1	0	1	0	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	9.8	9.3	9.3
HCM LOS	A	A	A

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	55%	0%	65%
Vol Thru, %	45%	32%	0%
Vol Right, %	0%	68%	35%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	123	153	74
LT Vol	68	0	48
Through Vol	55	49	0
RT Vol	0	104	26
Lane Flow Rate	232	289	140
Geometry Grp	1	1	1
Degree of Util (X)	0.304	0.333	0.194
Departure Headway (Hd)	4.714	4.153	5.013
Convergence, Y/N	Yes	Yes	Yes
Cap	761	866	713
Service Time	2.75	2.184	3.062
HCM Lane V/C Ratio	0.305	0.334	0.196
HCM Control Delay	9.8	9.3	9.3
HCM Lane LOS	A	A	A
HCM 95th-tile Q	1.3	1.5	0.7

Intersection	
Intersection Delay, s/veh	26.1
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	8	38	8	0	46	59	56	0	9	218	32
Peak Hour Factor	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	2	2	2	2	1	1	1	2	3	3	3
Mvmt Flow	0	9	40	9	0	49	63	60	0	10	232	34
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	2
HCM Control Delay	10.7	11.2	12.7
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	3%	15%	44%	0%	22%
Vol Thru, %	84%	70%	56%	0%	76%
Vol Right, %	12%	15%	0%	100%	2%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	259	54	105	56	594
LT Vol	9	8	46	0	131
Through Vol	218	38	59	0	454
RT Vol	32	8	0	56	9
Lane Flow Rate	276	57	112	60	632
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.425	0.108	0.223	0.104	0.904
Departure Headway (Hd)	5.554	6.788	7.198	6.257	5.15
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	645	524	497	570	701
Service Time	3.61	4.874	4.965	4.024	3.193
HCM Lane V/C Ratio	0.428	0.109	0.225	0.105	0.902
HCM Control Delay	12.7	10.7	12	9.8	37.4
HCM Lane LOS	B	B	B	A	E
HCM 95th-tile Q	2.1	0.4	0.8	0.3	11.7

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	131	454	9
Peak Hour Factor	0.92	0.94	0.94	0.94
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	139	483	10
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	37.4
HCM LOS	E

Lane

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	170	31	122	154	7	59
Conflicting Peds, #/hr	0	0	0	0	0	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	215	39	154	195	9	75

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	258	0	743	239
Stage 1	-	-	-	-	239	-
Stage 2	-	-	-	-	504	-
Critical Hdwy	-	-	4.11	-	6.1	6.1
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.209	-	2.5	2.5
Pot Cap-1 Maneuver	-	-	1313	-	523	1042
Stage 1	-	-	-	-	1091	-
Stage 2	-	-	-	-	799	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1313	-	452	1038
Mov Cap-2 Maneuver	-	-	-	-	452	-
Stage 1	-	-	-	-	1087	-
Stage 2	-	-	-	-	694	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	9.3
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	913	-	-	1313	-
HCM Lane V/C Ratio	0.092	-	-	0.118	-
HCM Control Delay (s)	9.3	-	-	8.1	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	1.5

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	19	17	49	2	3	146
Conflicting Peds, #/hr	0	0	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	26	24	68	3	4	203

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	280	74	0	0	71	0
Stage 1	69	-	-	-	-	-
Stage 2	211	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	712	990	-	-	1536	-
Stage 1	956	-	-	-	-	-
Stage 2	827	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	706	985	-	-	1529	-
Mov Cap-2 Maneuver	706	-	-	-	-	-
Stage 1	956	-	-	-	-	-
Stage 2	821	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.7	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	815	1529	-
HCM Lane V/C Ratio	-	-	0.061	0.003	-
HCM Control Delay (s)	-	-	9.7	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	17	20	239	55	45	463
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	18	21	254	59	48	493

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	842	254	0	0	254	0
Stage 1	254	-	-	-	-	-
Stage 2	588	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	336	787	-	-	1317	-
Stage 1	791	-	-	-	-	-
Stage 2	557	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	319	787	-	-	1317	-
Mov Cap-2 Maneuver	319	-	-	-	-	-
Stage 1	791	-	-	-	-	-
Stage 2	529	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.4	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	470	1317	-
HCM Lane V/C Ratio	-	-	0.084	0.036	-
HCM Control Delay (s)	-	-	13.4	7.8	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBU	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Vol, veh/h	0	43	71	0	29	78	0	39	13
Peak Hour Factor	0.92	0.86	0.86	0.92	0.86	0.86	0.92	0.86	0.86
Heavy Vehicles, %	2	3	3	2	3	3	2	8	8
Mvmt Flow	0	50	83	0	34	91	0	45	15
Number of Lanes	0	0	1	0	1	0	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	8.1	7.4	8
HCM LOS	A	A	A

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	0%	75%
Vol Thru, %	62%	27%	0%
Vol Right, %	0%	73%	25%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	114	107	52
LT Vol	43	0	39
Through Vol	71	29	0
RT Vol	0	78	13
Lane Flow Rate	133	124	60
Geometry Grp	1	1	1
Degree of Util (X)	0.156	0.129	0.077
Departure Headway (Hd)	4.228	3.72	4.579
Convergence, Y/N	Yes	Yes	Yes
Cap	842	949	787
Service Time	2.29	1.799	2.579
HCM Lane V/C Ratio	0.158	0.131	0.076
HCM Control Delay	8.1	7.4	8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.6	0.4	0.2

Intersection	
Intersection Delay, s/veh	15.9
Intersection LOS	C

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	8	76	11	0	94	18	57	0	9	314	86
Peak Hour Factor	0.92	0.87	0.87	0.87	0.92	0.87	0.87	0.87	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	4	4	4	2	4	4	4	2	2	2	2
Mvmt Flow	0	9	87	13	0	108	21	66	0	10	361	99
Number of Lanes	0	0	1	0	0	0	1	0	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	1	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	1
HCM Control Delay	11.2	12.4	19.5
HCM LOS	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	8%	56%	11%
Vol Thru, %	77%	80%	11%	86%
Vol Right, %	21%	12%	34%	2%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	409	95	169	273
LT Vol	9	8	94	31
Through Vol	314	76	18	236
RT Vol	86	11	57	6
Lane Flow Rate	470	109	194	314
Geometry Grp	1	1	1	1
Degree of Util (X)	0.692	0.199	0.335	0.497
Departure Headway (Hd)	5.301	6.572	6.21	5.698
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	677	549	573	628
Service Time	3.373	4.572	4.304	3.779
HCM Lane V/C Ratio	0.694	0.199	0.339	0.5
HCM Control Delay	19.5	11.2	12.4	14.4
HCM Lane LOS	C	B	B	B
HCM 95th-tile Q	5.5	0.7	1.5	2.8

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	31	236	6
Peak Hour Factor	0.92	0.87	0.87	0.87
Heavy Vehicles, %	2	5	5	5
Mvmt Flow	0	36	271	7
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	1
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	14.4
HCM LOS	B

Lane

Intersection	
Int Delay, s/veh	15.3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	105	88	163	89	79	220
Conflicting Peds, #/hr	0	0	0	0	0	31
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	61	61	61	61	61	61
Heavy Vehicles, %	4	4	3	3	4	4
Mvmt Flow	172	144	267	146	130	361

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	347	0	955	275
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	680	-
Critical Hdwy	-	-	4.13	-	6.1	6.1
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	-	-	2.227	-	2.5	2.5
Pot Cap-1 Maneuver	-	-	1206	-	391	993
Stage 1	-	-	-	-	1044	-
Stage 2	-	-	-	-	647	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1206	-	288	964
Mov Cap-2 Maneuver	-	-	-	-	288	-
Stage 1	-	-	-	-	1013	-
Stage 2	-	-	-	-	491	-

Approach	EB	WB	NB
HCM Control Delay, s	0	5.7	33.2
HCM LOS			D

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	595	-	-	1206	-
HCM Lane V/C Ratio	0.824	-	-	0.222	-
HCM Control Delay (s)	33.2	-	-	8.8	0
HCM Lane LOS	D	-	-	A	A
HCM 95th %tile Q(veh)	8.5	-	-	0.8	-

Intersection	
Int Delay, s/veh	4.2

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	26	103	199	1	11	238
Conflicting Peds, #/hr	0	0	0	36	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	52	52	52	52	52	52
Heavy Vehicles, %	8	8	1	1	5	5
Mvmt Flow	50	198	383	2	21	458

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	884	384	0	0	385	0
Stage 1	384	-	-	-	-	-
Stage 2	500	-	-	-	-	-
Critical Hdwy	6.48	6.28	-	-	4.15	-
Critical Hdwy Stg 1	5.48	-	-	-	-	-
Critical Hdwy Stg 2	5.48	-	-	-	-	-
Follow-up Hdwy	3.572	3.372	-	-	2.245	-
Pot Cap-1 Maneuver	308	651	-	-	1157	-
Stage 1	676	-	-	-	-	-
Stage 2	597	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	290	651	-	-	1157	-
Mov Cap-2 Maneuver	290	-	-	-	-	-
Stage 1	676	-	-	-	-	-
Stage 2	563	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	18.1	0	0.4
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	520	1157	-
HCM Lane V/C Ratio	-	-	0.477	0.018	-
HCM Control Delay (s)	-	-	18.1	8.2	0
HCM Lane LOS	-	-	C	A	A
HCM 95th %tile Q(veh)	-	-	2.5	0.1	-

Intersection	
Int Delay, s/veh	1.8

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	26	52	358	82	46	295
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	0	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	1	1	2	2	2	2
Mvmt Flow	31	61	421	96	54	347

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	876	421	0	0	421	0
Stage 1	421	-	-	-	-	-
Stage 2	455	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.12	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.218	-
Pot Cap-1 Maneuver	321	635	-	-	1138	-
Stage 1	664	-	-	-	-	-
Stage 2	641	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	302	635	-	-	1138	-
Mov Cap-2 Maneuver	302	-	-	-	-	-
Stage 1	664	-	-	-	-	-
Stage 2	603	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	14.7	0	1.1
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	464	1138	-
HCM Lane V/C Ratio	-	-	0.198	0.048	-
HCM Control Delay (s)	-	-	14.7	8.3	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.7	0.2	-

Intersection	
Intersection Delay, s/veh	9.7
Intersection LOS	A

Movement	EBU	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Vol, veh/h	0	71	57	0	51	108	0	50	27
Peak Hour Factor	0.92	0.53	0.53	0.92	0.53	0.53	0.92	0.53	0.53
Heavy Vehicles, %	2	3	3	2	2	2	2	4	4
Mvmt Flow	0	134	108	0	96	204	0	94	51
Number of Lanes	0	0	1	0	1	0	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	10	9.5	9.4
HCM LOS	A	A	A

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	55%	0%	65%
Vol Thru, %	45%	32%	0%
Vol Right, %	0%	68%	35%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	128	159	77
LT Vol	71	0	50
Through Vol	57	51	0
RT Vol	0	108	27
Lane Flow Rate	242	300	145
Geometry Grp	1	1	1
Degree of Util (X)	0.318	0.349	0.204
Departure Headway (Hd)	4.746	4.185	5.062
Convergence, Y/N	Yes	Yes	Yes
Cap	756	858	706
Service Time	2.786	2.219	3.114
HCM Lane V/C Ratio	0.32	0.35	0.205
HCM Control Delay	10	9.5	9.4
HCM Lane LOS	A	A	A
HCM 95th-tile Q	1.4	1.6	0.8

Intersection	
Intersection Delay, s/veh	29.3
Intersection LOS	D

Movement	EBU	EBL	EBT	EBR	WBU	WBL	WBT	WBR	NBU	NBL	NBT	NBR
Vol, veh/h	0	8	40	8	0	46	61	58	0	9	227	33
Peak Hour Factor	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95	0.92	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2	2	1	1	1	2	3	3	3
Mvmt Flow	0	8	42	8	0	48	64	61	0	9	239	35
Number of Lanes	0	0	1	0	0	0	1	1	0	0	1	0

Approach	EB	WB	NB
Opposing Approach	WB	EB	SB
Opposing Lanes	2	1	1
Conflicting Approach Left	SB	NB	EB
Conflicting Lanes Left	1	1	1
Conflicting Approach Right	NB	SB	WB
Conflicting Lanes Right	1	1	2
HCM Control Delay	10.9	11.4	13.1
HCM LOS	B	B	B

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	3%	14%	43%	0%	22%
Vol Thru, %	84%	71%	57%	0%	76%
Vol Right, %	12%	14%	0%	100%	1%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	269	56	107	58	617
LT Vol	9	8	46	0	136
Through Vol	227	40	61	0	472
RT Vol	33	8	0	58	9
Lane Flow Rate	283	59	113	61	649
Geometry Grp	2	5	7	7	2
Degree of Util (X)	0.441	0.113	0.228	0.107	0.936
Departure Headway (Hd)	5.609	6.883	7.273	6.336	5.187
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	640	517	491	562	695
Service Time	3.673	4.978	5.048	4.111	3.234
HCM Lane V/C Ratio	0.442	0.114	0.23	0.109	0.934
HCM Control Delay	13.1	10.9	12.2	9.9	42.9
HCM Lane LOS	B	B	B	A	E
HCM 95th-tile Q	2.3	0.4	0.9	0.4	13

Intersection	
Intersection Delay, s/veh	
Intersection LOS	

Movement	SBU	SBL	SBT	SBR
Vol, veh/h	0	136	472	9
Peak Hour Factor	0.92	0.95	0.95	0.95
Heavy Vehicles, %	2	2	2	2
Mvmt Flow	0	143	497	9
Number of Lanes	0	0	1	0

Approach	SB
Opposing Approach	NB
Opposing Lanes	1
Conflicting Approach Left	WB
Conflicting Lanes Left	2
Conflicting Approach Right	EB
Conflicting Lanes Right	1
HCM Control Delay	42.9
HCM LOS	E

Lane

Intersection	
Int Delay, s/veh	3

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Vol, veh/h	177	32	127	160	7	61
Conflicting Peds, #/hr	0	0	0	0	0	4
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	79	79	79	79	79	79
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	224	41	161	203	9	77

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	269	0	772	248
Stage 1	-	-	-	-	248	-
Stage 2	-	-	-	-	524	-
Critical Hdwy	-	-	4.11	-	6.1	6.1
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.209	-	2.5	2.5
Pot Cap-1 Maneuver	-	-	1300	-	503	1030
Stage 1	-	-	-	-	1079	-
Stage 2	-	-	-	-	780	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1300	-	431	1026
Mov Cap-2 Maneuver	-	-	-	-	431	-
Stage 1	-	-	-	-	1075	-
Stage 2	-	-	-	-	671	-

Approach	EB	WB	NB
HCM Control Delay, s	0	3.6	9.4
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	898	-	-	1300	-
HCM Lane V/C Ratio	0.096	-	-	0.124	-
HCM Control Delay (s)	9.4	-	-	8.2	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	0.3	-	-	0.4	-

Intersection	
Int Delay, s/veh	1.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	20	18	51	2	3	152
Conflicting Peds, #/hr	0	0	0	5	5	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	72	72	72	72	72	72
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	28	25	71	3	4	211

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	291	77	0	0	74	0
Stage 1	72	-	-	-	-	-
Stage 2	219	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	702	987	-	-	1532	-
Stage 1	953	-	-	-	-	-
Stage 2	820	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	697	982	-	-	1525	-
Mov Cap-2 Maneuver	697	-	-	-	-	-
Stage 1	953	-	-	-	-	-
Stage 2	814	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	0.1
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	808	1525	-
HCM Lane V/C Ratio	-	-	0.065	0.003	-
HCM Control Delay (s)	-	-	9.8	7.4	0
HCM Lane LOS	-	-	A	A	A
HCM 95th %tile Q(veh)	-	-	0.2	0	-

Intersection	
Int Delay, s/veh	1

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Vol, veh/h	18	22	249	57	47	482
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	100	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	94	94	94	94	94	94
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	19	23	265	61	50	513

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	878	265	0	0	265	0
Stage 1	265	-	-	-	-	-
Stage 2	613	-	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11	-
Critical Hdwy Stg 1	5.41	-	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209	-
Pot Cap-1 Maneuver	320	776	-	-	1305	-
Stage 1	782	-	-	-	-	-
Stage 2	542	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	303	776	-	-	1305	-
Mov Cap-2 Maneuver	303	-	-	-	-	-
Stage 1	782	-	-	-	-	-
Stage 2	513	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	0.7
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	SBL	SBT
Capacity (veh/h)	-	-	456	1305	-
HCM Lane V/C Ratio	-	-	0.093	0.038	-
HCM Control Delay (s)	-	-	13.7	7.9	0
HCM Lane LOS	-	-	B	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.1	-

Intersection	
Intersection Delay, s/veh	7.8
Intersection LOS	A

Movement	EBU	EBL	EBT	WBU	WBT	WBR	SBU	SBL	SBR
Vol, veh/h	0	45	75	0	30	81	0	41	14
Peak Hour Factor	0.92	0.86	0.86	0.92	0.86	0.86	0.92	0.86	0.86
Heavy Vehicles, %	2	3	3	2	3	3	2	8	8
Mvmt Flow	0	52	87	0	35	94	0	48	16
Number of Lanes	0	0	1	0	1	0	0	1	0

Approach	EB	WB	SB
Opposing Approach	WB	EB	
Opposing Lanes	1	1	0
Conflicting Approach Left	SB		WB
Conflicting Lanes Left	1	0	1
Conflicting Approach Right		SB	EB
Conflicting Lanes Right	0	1	1
HCM Control Delay	8.1	7.4	8
HCM LOS	A	A	A

Lane	EBLn1	WBLn1	SBLn1
Vol Left, %	38%	0%	75%
Vol Thru, %	62%	27%	0%
Vol Right, %	0%	73%	25%
Sign Control	Stop	Stop	Stop
Traffic Vol by Lane	120	111	55
LT Vol	45	0	41
Through Vol	75	30	0
RT Vol	0	81	14
Lane Flow Rate	140	129	64
Geometry Grp	1	1	1
Degree of Util (X)	0.164	0.134	0.082
Departure Headway (Hd)	4.237	3.731	4.6
Convergence, Y/N	Yes	Yes	Yes
Cap	839	945	783
Service Time	2.304	1.816	2.6
HCM Lane V/C Ratio	0.167	0.137	0.082
HCM Control Delay	8.1	7.4	8
HCM Lane LOS	A	A	A
HCM 95th-tile Q	0.6	0.5	0.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	76	11	96	18	60	9	315	93	32	236	6
Future Volume (vph)	8	76	11	96	18	60	9	315	93	32	236	6
Peak Hour Factor	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.87
Hourly flow rate (vph)	9	87	13	110	21	69	10	362	107	37	271	7

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	109	200	479	315
Volume Left (vph)	9	110	10	37
Volume Right (vph)	13	69	107	7
Hadj (s)	0.01	-0.03	-0.10	0.10
Departure Headway (s)	6.7	6.4	5.4	5.8
Degree Utilization, x	0.20	0.35	0.72	0.51
Capacity (veh/h)	461	500	643	573
Control Delay (s)	11.3	12.8	21.0	14.8
Approach Delay (s)	11.3	12.8	21.0	14.8
Approach LOS	B	B	C	B

Intersection Summary			
Delay	16.8		
Level of Service	C		
Intersection Capacity Utilization	53.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	112	89	169	91	82	239
Future Volume (Veh/h)	112	89	169	91	82	239
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.61	0.61	0.61	0.61	0.61
Hourly flow rate (vph)	184	146	277	149	134	392
Pedestrians				31		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				3.5		
Percent Blockage				3		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			330		960	288
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			330		960	288
tC, single (s)			4.1		*6.1	*6.1
tC, 2 stage (s)						
tF (s)			2.2		*2.5	*2.5
p0 queue free %			77		55	59
cM capacity (veh/h)			1224		300	946

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	330	426	526
Volume Left	0	277	134
Volume Right	146	0	392
cSH	1700	1224	611
Volume to Capacity	0.19	0.23	0.86
Queue Length 95th (ft)	0	22	242
Control Delay (s)	0.0	6.5	36.7
Lane LOS		A	E
Approach Delay (s)	0.0	6.5	36.7
Approach LOS			E

Intersection Summary			
Average Delay	17.2		
Intersection Capacity Utilization	56.8%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	8	409	2	2	341
Future Volume (Veh/h)	5	8	409	2	2	341
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	9	481	2	2	401
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	887	482			483	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	887	482			483	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	98			100	
cM capacity (veh/h)	314	584			1080	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	15	483	403
Volume Left	6	0	2
Volume Right	9	2	0
cSH	435	1700	1080
Volume to Capacity	0.03	0.28	0.00
Queue Length 95th (ft)	3	0	0
Control Delay (s)	13.6	0.0	0.1
Lane LOS	B		A
Approach Delay (s)	13.6	0.0	0.1
Approach LOS	B		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	31.6%	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 (veh/h)	1	0	1	26	0	103	0	216	1	11	246	1
Future Volume (Veh/h)	1	0	1	26	0	103	0	216	1	11	246	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52	0.52
Hourly flow rate (vph)	2	0	2	50	0	198	0	415	2	21	473	2
Pedestrians					36							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					3							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1130	969	474	970	969	452	475			453		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1130	969	474	970	969	452	475			453		
tC, single (s)	7.1	6.5	6.2	7.2	6.5	6.3	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.6	4.0	3.4	2.2			2.2		
p0 queue free %	98	100	100	76	100	66	100			98		
cM capacity (veh/h)	115	242	595	209	242	575	1098			1054		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	4	248	417	496
Volume Left	2	50	0	21
Volume Right	2	198	2	2
cSH	192	425	1098	1054
Volume to Capacity	0.02	0.58	0.00	0.02
Queue Length 95th (ft)	2	90	0	2
Control Delay (s)	24.1	24.7	0.0	0.6
Lane LOS	C	C		A
Approach Delay (s)	24.1	24.7	0.0	0.6
Approach LOS	C	C		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	36.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	31	53	359	83	49	297
Future Volume (Veh/h)	31	53	359	83	49	297
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	36	62	422	98	58	349
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	887	422			520	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	887	422			520	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	88	90			94	
cM capacity (veh/h)	298	634			1046	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	98	422	98	407
Volume Left	36	0	0	58
Volume Right	62	0	98	0
cSH	449	1700	1700	1046
Volume to Capacity	0.22	0.25	0.06	0.06
Queue Length 95th (ft)	21	0	0	4
Control Delay (s)	15.3	0.0	0.0	1.7
Lane LOS	C			A
Approach Delay (s)	15.3	0.0		1.7
Approach LOS	C			

Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	52.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	72	60	52	112	59	32
Future Volume (vph)	72	60	52	112	59	32
Peak Hour Factor	0.53	0.53	0.53	0.53	0.53	0.53
Hourly flow rate (vph)	136	113	98	211	111	60

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	249	309	171
Volume Left (vph)	136	0	111
Volume Right (vph)	0	211	60
Hadj (s)	0.16	-0.38	-0.01
Departure Headway (s)	4.9	4.3	5.2
Degree Utilization, x	0.34	0.37	0.24
Capacity (veh/h)	700	797	631
Control Delay (s)	10.3	9.8	9.8
Approach Delay (s)	10.3	9.8	9.8
Approach LOS	B	A	A

Intersection Summary			
Delay	10.0		
Level of Service	A		
Intersection Capacity Utilization	37.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	4	1	316	256	2
Future Volume (Veh/h)	5	4	1	316	256	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.52	0.52	0.52	0.52	0.52	0.52
Hourly flow rate (vph)	10	8	2	608	492	4
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	1106	494	496			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1106	494	496			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	96	99	100			
cM capacity (veh/h)	232	575	1073			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	18	610	496
Volume Left	10	2	0
Volume Right	8	0	4
cSH	316	1073	1700
Volume to Capacity	0.06	0.00	0.29
Queue Length 95th (ft)	5	0	0
Control Delay (s)	17.1	0.1	0.0
Lane LOS	C	A	
Approach Delay (s)	17.1	0.1	0.0
Approach LOS	C		

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	27.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	8	40	8	55	61	61	9	228	37	140	473	9
Future Volume (vph)	8	40	8	55	61	61	9	228	37	140	473	9
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Hourly flow rate (vph)	8	42	8	58	64	64	9	240	39	147	498	9

Direction, Lane #	EB 1	WB 1	WB 2	NB 1	SB 1
Volume Total (vph)	58	122	64	288	654
Volume Left (vph)	8	58	0	9	147
Volume Right (vph)	8	0	64	39	9
Hadj (s)	-0.02	0.25	-0.68	-0.02	0.07
Departure Headway (s)	7.1	7.4	6.4	5.7	5.3
Degree Utilization, x	0.11	0.25	0.11	0.46	0.96
Capacity (veh/h)	479	469	538	617	654
Control Delay (s)	11.0	11.6	9.1	13.4	47.2
Approach Delay (s)	11.0	10.8		13.4	47.2
Approach LOS	B	B		B	E

Intersection Summary			
Delay	31.5		
Level of Service	D		
Intersection Capacity Utilization	70.8%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	181	36	147	167	10	73
Future Volume (Veh/h)	181	36	147	167	10	73
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.79	0.79	0.79	0.79	0.79	0.79
Hourly flow rate (vph)	229	46	186	211	13	92
Pedestrians				4		
Lane Width (ft)				12.0		
Walking Speed (ft/s)				3.5		
Percent Blockage				0		
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			275		835	256
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			275		835	256
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			86		96	88
cM capacity (veh/h)			1294		289	780

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	275	397	105
Volume Left	0	186	13
Volume Right	46	0	92
cSH	1700	1294	644
Volume to Capacity	0.16	0.14	0.16
Queue Length 95th (ft)	0	13	14
Control Delay (s)	0.0	4.6	11.7
Lane LOS		A	B
Approach Delay (s)	0.0	4.6	11.7
Approach LOS			B

Intersection Summary			
Average Delay	3.9		
Intersection Capacity Utilization	45.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	3	5	270	6	8	528
Future Volume (Veh/h)	3	5	270	6	8	528
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	3	5	287	6	9	562
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	870	290			293	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	870	290			293	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	321	752			1274	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	8	293	571
Volume Left	3	0	9
Volume Right	5	6	0
cSH	500	1700	1274
Volume to Capacity	0.02	0.17	0.01
Queue Length 95th (ft)	1	0	1
Control Delay (s)	12.3	0.0	0.2
Lane LOS	B		A
Approach Delay (s)	12.3	0.0	0.2
Approach LOS	B		

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	44.2%	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 (veh/h)	1	0	0	20	0	18	1	65	2	3	171	1
Future Volume (Veh/h)	1	0	0	20	0	18	1	65	2	3	171	1
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	1	0	0	28	0	25	1	90	3	4	238	1
Pedestrians					5							
Lane Width (ft)					12.0							
Walking Speed (ft/s)					3.5							
Percent Blockage					0							
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	365	346	238	345	346	96	239			98		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	365	346	238	345	346	96	239			98		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	100	100	100	95	100	97	100			100		
cM capacity (veh/h)	572	572	800	604	573	958	1328			1494		

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	1	53	94	243
Volume Left	1	28	1	4
Volume Right	0	25	3	1
cSH	572	732	1328	1494
Volume to Capacity	0.00	0.07	0.00	0.00
Queue Length 95th (ft)	0	6	0	0
Control Delay (s)	11.3	10.3	0.1	0.1
Lane LOS	B	B	A	A
Approach Delay (s)	11.3	10.3	0.1	0.1
Approach LOS	B	B		

Intersection Summary			
Average Delay	1.5		
Intersection Capacity Utilization	20.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	21	26	251	63	49	483
Future Volume (Veh/h)	21	26	251	63	49	483
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94
Hourly flow rate (vph)	22	28	267	67	52	514
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	885	267			334	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	885	267			334	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	93	96			96	
cM capacity (veh/h)	303	774			1231	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1
Volume Total	50	267	67	566
Volume Left	22	0	0	52
Volume Right	28	0	67	0
cSH	460	1700	1700	1231
Volume to Capacity	0.11	0.16	0.04	0.04
Queue Length 95th (ft)	9	0	0	3
Control Delay (s)	13.8	0.0	0.0	1.2
Lane LOS	B			A
Approach Delay (s)	13.8	0.0		1.2
Approach LOS	B			

Intersection Summary			
Average Delay	1.4		
Intersection Capacity Utilization	54.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Traffic Volume (vph)	51	77	34	91	47	17
Future Volume (vph)	51	77	34	91	47	17
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	59	90	40	106	55	20

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	149	146	75
Volume Left (vph)	59	0	55
Volume Right (vph)	0	106	20
Hadj (s)	0.13	-0.38	0.12
Departure Headway (s)	4.4	3.9	4.7
Degree Utilization, x	0.18	0.16	0.10
Capacity (veh/h)	806	908	725
Control Delay (s)	8.3	7.6	8.1
Approach Delay (s)	8.3	7.6	8.1
Approach LOS	A	A	A

Intersection Summary			
Delay	8.0		
Level of Service	A		
Intersection Capacity Utilization	30.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	2	4	79	177	6
Future Volume (Veh/h)	4	2	4	79	177	6
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.72	0.72	0.72	0.72	0.72	0.72
Hourly flow rate (vph)	6	3	6	110	246	8
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	372	250	254			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	372	250	254			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	100	100			
cM capacity (veh/h)	626	789	1311			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	9	116	254
Volume Left	6	6	0
Volume Right	3	0	8
cSH	672	1311	1700
Volume to Capacity	0.01	0.00	0.15
Queue Length 95th (ft)	1	0	0
Control Delay (s)	10.4	0.4	0.0
Lane LOS	B	A	
Approach Delay (s)	10.4	0.4	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	19.7%	ICU Level of Service	A
Analysis Period (min)	15		

OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION
TRANSPORTATION DATA SECTION - CRASH ANAYLYSIS AND REPORTING UNIT
URBAN NON-SYSTEM CRASH LISTING

CITY OF SHERWOOD, WASHINGTON COUNTY

ELWERT RD at EDY RD, City of Sherwood, Washington County, 01/01/2010 to 12/31/2014

Total crash records: 2

SER# INVEST	S P E D	A	U C	R S G L	C O H K	W R	DATE DAY TIME	CLASS DIST FROM	CITY STREET FIRST STREET SECOND STREET	RD CHAR DIRECT LOCTN	INT-TYPE (MEDIAN) LEGS (#LANES)	INT-REL TRAF-CONTL	OFFRD RNDBT DRVWY	WTHR SURF LIGHT	CRASH COLL SVRTY	V#	SPCL USE TRLR QTY OWNER TYPE	MOVE FROM TO	P#	PRTC TYPE	INJ SVRTY	A G E	S E X	LICNS RES	PED LOC	ERROR	ACT	EVENT	CAUSE
02740	N	N	N				05/15/2014	16	SW EDY RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
COUNTY							TH	0	SW ELWERT RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE	E -W									015		00
							10A			02	0		N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	67	F	OTH-Y		028	000		02
																								N-RES					
																02	NONE 0	STRGHT											
																	PRVTE	S -N									015		00
																	PSNGR CAR		01	DRVR	NONE	20	F	OR-Y		000	000		00
																								OR>25					
05033	N	N	N	N	N		09/01/2014	16	SW EDY RD	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE 0	STRGHT											02
CITY							MO	0	SW ELWERT RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE	S -N									000		00
							4P			04	0		N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	35	F	OTH-Y		000	000		00
																								N-RES					
																01	NONE 0	STRGHT											
																	PRVTE	S -N									000		00
																	PSNGR CAR		02	PSNG	INJC	36	F			000	000		00
																02	NONE 0	STRGHT											
																	PRVTE	W -E									000		00
																	PSNGR CAR		01	DRVR	INJB	71	M	OR-Y		000	000		00
																								OR<25					

Disclaimer: The information contained in this report is compiled from individual driver and police crash reports submitted to the Oregon Department of Transportation as required in ORS 811.720. The Crash Analysis and Reporting Unit is committed to providing the highest quality crash data to customers. However, because submittal of crash report forms is the responsibility of the individual driver, the Crash Analysis and Reporting Unit can not guarantee that all qualifying crashes are represented nor can assurances be made that all details pertaining to a single crash are accurate. Note: Legislative changes to DMV's vehicle crash reporting requirement, effective 01/01/2004, may result in fewer property damage only crashes being eligible for inclusion in the Statewide Crash Data File.

Traffic Signal Warrant Analysis

Project: Mandel Subdivision
Date: 1/5/2016
Scenario: 2017 Bkgd plus Site

Major Street:	SW Elwert Road	Minor Street:	SW Edy Road
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	896	PM Peak Hour Volumes:	162

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	8,960	8,850	
Minor Street*	1,620	2,650	**No**
Condition B: Interruption of Continuous Traffic			
Major Street	8,960	13,300	
Minor Street*	1,620	1,350	**No**
Combination Warrant			
Major Street	8,960	10,640	
Minor Street*	1,620	2,120	**No**

* Minor street right-turning traffic volumes reduced by 25%

Traffic Signal Warrant Analysis

Project: Mandel Subdivision
Date: 1/5/2016
Scenario: 2017 Bkgd plus Site

Major Street:	SW Edy Road	Minor Street:	SW Copper Terrace
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	531	PM Peak Hour Volumes:	261

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	5,310	8,850	
Minor Street*	2,610	2,650	**No**
Condition B: Interruption of Continuous Traffic			
Major Street	5,310	13,300	
Minor Street*	2,610	1,350	**No**
Combination Warrant			
Major Street	5,310	10,640	
Minor Street*	2,610	2,120	**No**

* Minor street right-turning traffic volumes reduced by 25%

Traffic Signal Warrant Analysis

Project: Mandel Subdivision
Date: 1/5/2016
Scenario: 2017 Bkgd plus Site

Major Street:	SW Elwert Road	Minor Street:	SW Handley Street
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	846	Peak Hour Volumes:	71

Warrant Used:

X 100 percent of standard warrants used

_____ 70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
WARRANT 1, CONDITION A		100%	70%	100%	70%
Major St.	Minor St.	Warrants	Warrants	Warrants	Warrants
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
WARRANT 1, CONDITION B					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
Warrant 1			
Condition A: Minimum Vehicular Volume			
Major Street	8,460	8,850	
Minor Street*	710	2,650	**No**
Condition B: Interruption of Continuous Traffic			
Major Street	8,460	13,300	
Minor Street*	710	1,350	**No**
Combination Warrant			
Major Street	8,460	10,640	
Minor Street*	710	2,120	**No**

* Minor street right-turning traffic volumes reduced by 25%

Left-Turn Lane Warrant Analysis

Project: Mandel Subdivision
Intersection: SW Edy Road at SW Copper Terrace
Date: 1/5/2016
Scenario: 2015 Existing

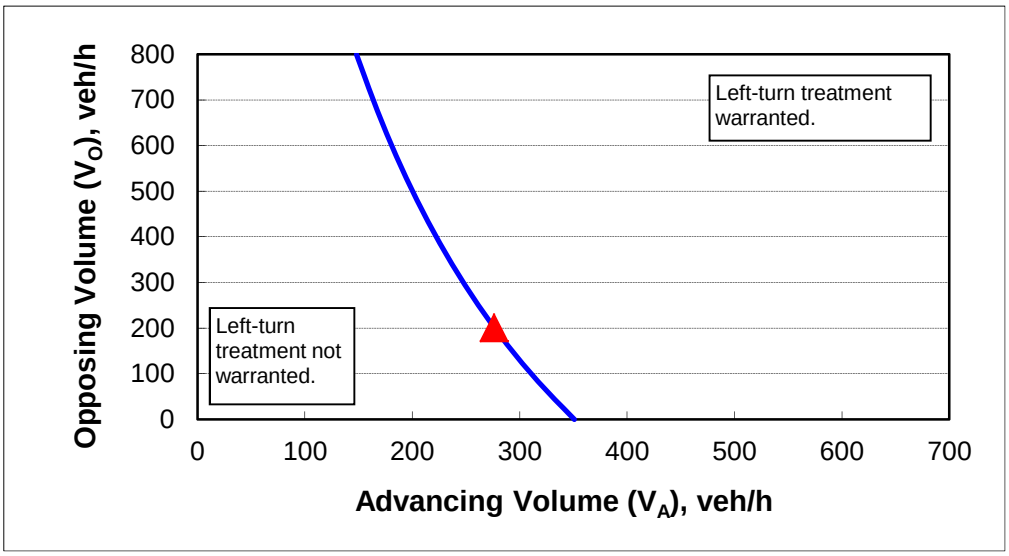
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	40
Percent of left-turns in advancing volume (V_A), %:	44%
Advancing volume (V_A), veh/h:	276
Opposing volume (V_O), veh/h:	201

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	276
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment NOT warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: Mandel Subdivision
Intersection: SW Edy Road at SW Copper Terrace
Date: 1/5/2016
Scenario: 2017 Background

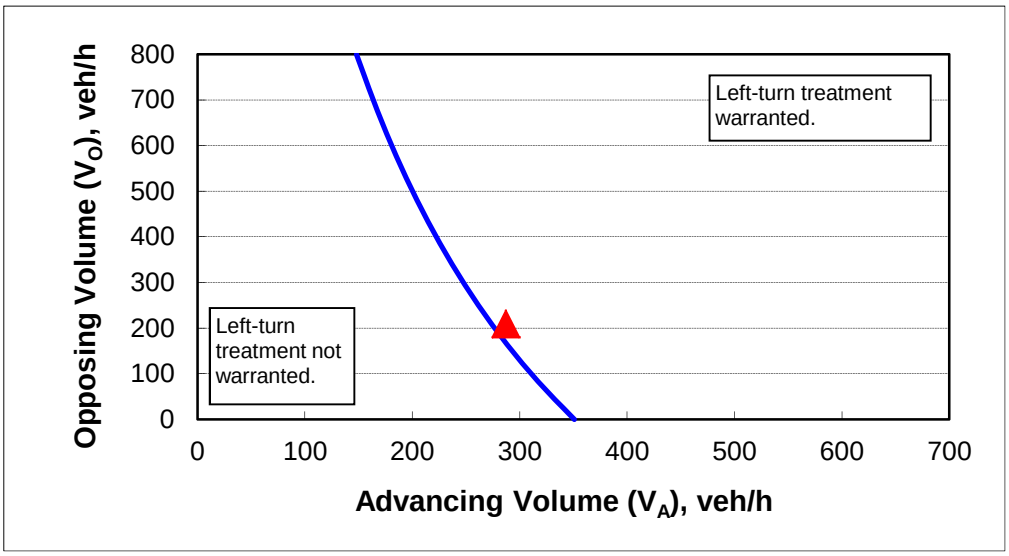
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	40
Percent of left-turns in advancing volume (V_A), %:	44%
Advancing volume (V_A), veh/h:	287
Opposing volume (V_O), veh/h:	209

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	274
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: Mandel Subdivision
Intersection: SW Edy Road at SW Copper Terrace
Date: 1/5/2016
Scenario: 2017 Background Plus Site

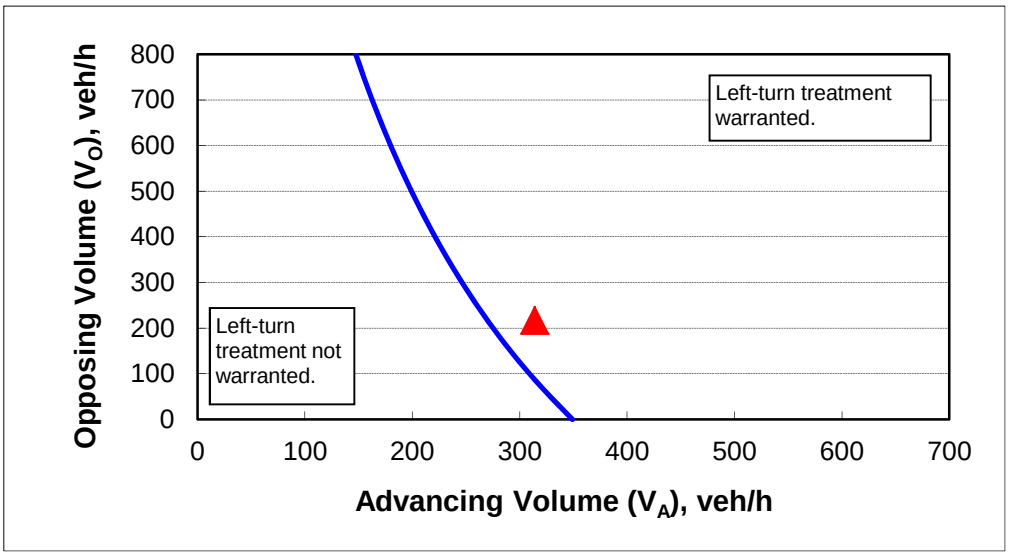
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	40
Percent of left-turns in advancing volume (V_A), %:	47%
Advancing volume (V_A), veh/h:	314
Opposing volume (V_O), veh/h:	217

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	270
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: Mandel Subdivision
Intersection: SW Elwert Road at SW Handley Street
Date: 1/5/2016
Scenario: 2015 Existing

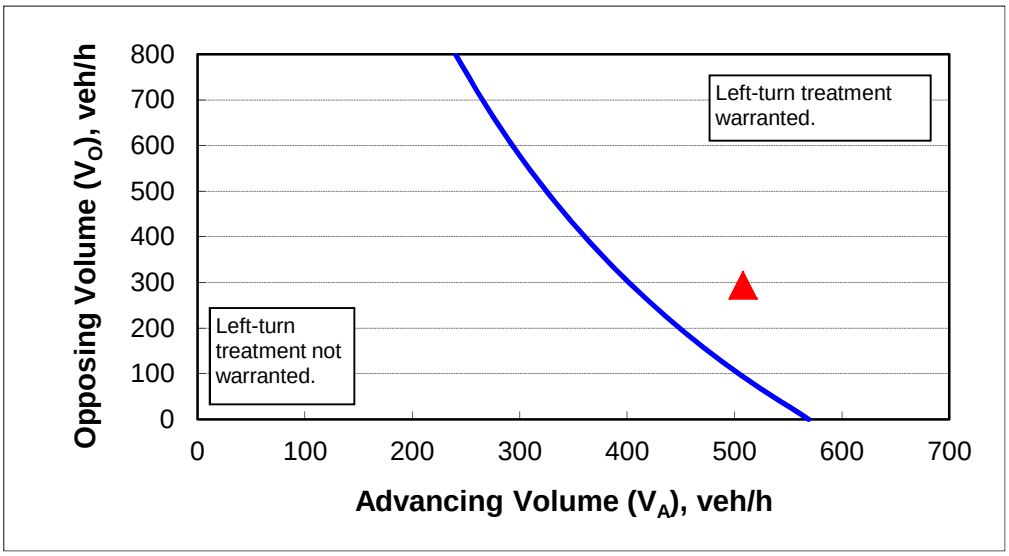
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	508
Opposing volume (V_O), veh/h:	294

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	404
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: Mandel Subdivision
Intersection: SW Elwert Road at SW Handley Street
Date: 1/5/2016
Scenario: 2017 Background

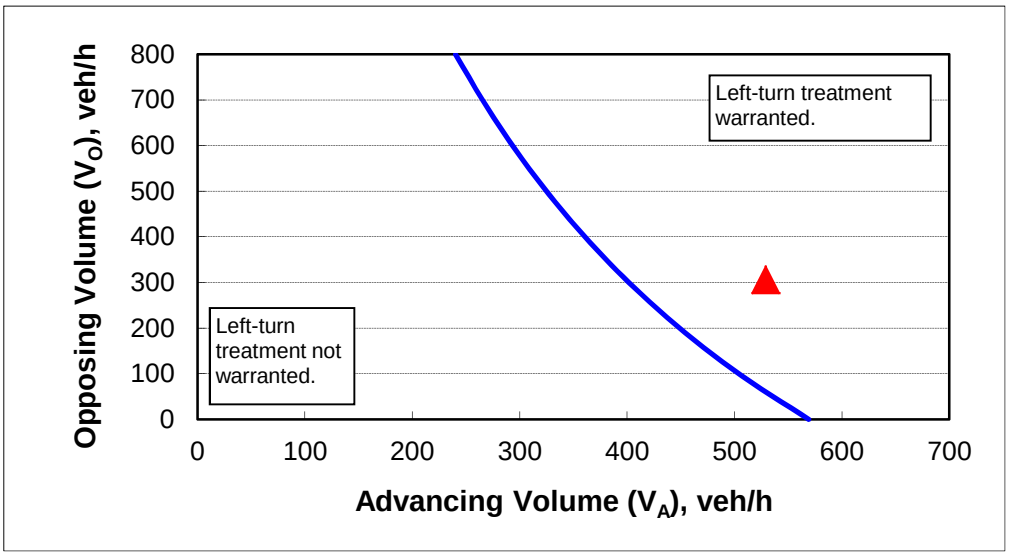
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	529
Opposing volume (V_O), veh/h:	306

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	399
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Left-Turn Lane Warrant Analysis

Project: Mandel Subdivision
Intersection: SW Elwert Road at SW Handley Street
Date: 1/5/2016
Scenario: 2017 Background Plus Site

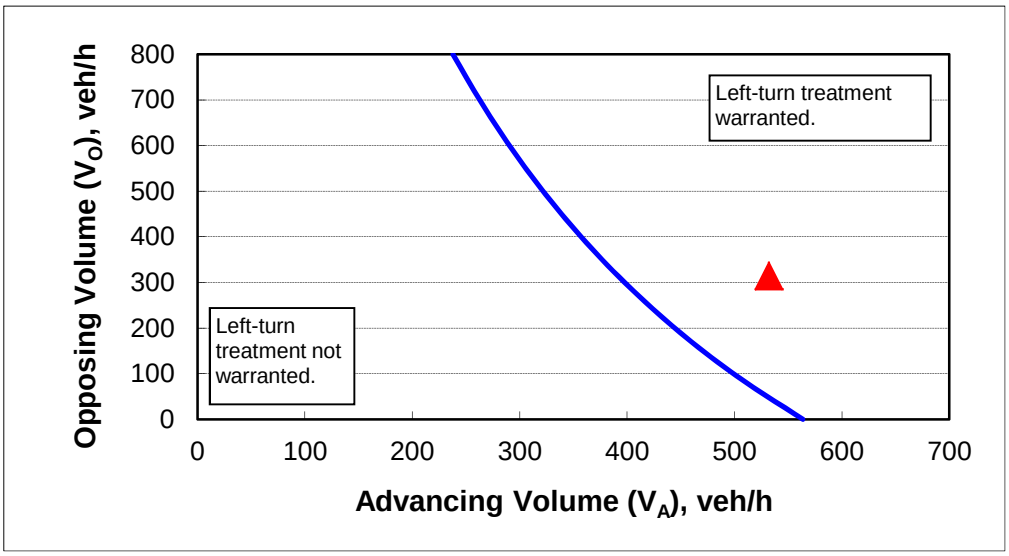
2-lane roadway (English)

INPUT

Variable	Value
85th percentile speed, mph:	45
Percent of left-turns in advancing volume (V_A), %:	9%
Advancing volume (V_A), veh/h:	532
Opposing volume (V_O), veh/h:	314

OUTPUT

Variable	Value
Limiting advancing volume (V_A), veh/h:	392
Guidance for determining the need for a major-road left-turn bay:	
Left-turn treatment warranted.	



CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

Exhibit J: Preliminary Stormwater Report

MANDEL FARMS SUBDIVISION
SHERWOOD, OREGON

PRELIMINARY STORMWATER REPORT

DATE: January 2016

CLIENT: Venture Properties, LLC.
4230 SW Galewood Street, Suite 100
Lake Oswego, OR 97035

ENGINEERING CONTACT: Paul Sellke, PE, GE
PaulS@aks-eng.com

ENGINEERING FIRM: AKS Engineering & Forestry, LLC.

AKS ENGINEERING & FORESTRY
12965 SW Herman Road, Suite 100
Tualatin, OR 97062
P: (503) 563-6151
www.aks-eng.com

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APPENDICES

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APPENDIX E USDA-NRCS SOIL RESOURCE REPORT
APPENDIX F TR55 RUNOFF CURVE NUMBERS

Preliminary Stormwater Report
Mandel Farms Subdivision
Sherwood, Oregon

1.0 PURPOSE OF REPORT

The purpose of this report is to analyze the effects the proposed development will have on the existing stormwater conveyance system, document the criteria, methodology, and informational sources by which the proposed stormwater system will be designed, and present the results of the preliminary hydraulic analysis.

2.0 PROJECT LOCATION/DESCRIPTION

The proposed residential subdivision will be located west and north of The Laurel Ridge Elementary and Middle Schools in Sherwood, Oregon. The parcels encompassing 22.35 acres (Tax Lot 250 and 251 2S 1 30CB) are located southeast of the intersection of SW Elwert Road and SW Edy Road in Sherwood, Oregon.

The proposed project, divided into four (4) phases, consists of an 86 lot residential subdivision for single-family detached homes. The site improvements include the construction of public streets, underground utilities and a stormwater facility. Site improvements also include vegetated corridor mitigation and enhancement.

3.0 REGULATORY DESIGN CRITERIA

3.1 STORMWATER QUANTITY

Per *Clean Water Services (CWS) Design and Construction Standards Manual for Sanitary Sewer and Surface Water Management (R&O 07-20), Section 4.03 Water Quantity Control Requirements*, *on-site detention is required when any of the following conditions exist*:

1. There is an identified downstream deficiency and the District or City determines that detention rather than conveyance system enlargement is the more effective solution.

2. There is an identified regional detention site within the boundary of the development.

3. Water quantity facilities are required by District-adopted watershed management plans or adopted subbasin master plans.

A downstream analysis incorporating the New Elementary and Middle School (Laurel Ridge Elementary and Middle School) Final Stormwater report, dated August 2007 by Harper Hour Peterson Righellis (HHRP) Inc and the subject site has been completed as part of this report.

The downstream analysis, performed per Clean Water Service's standards, determined stormwater detention for the subject site is not required.

3.2 STORMWATER QUALITY

Stormwater quality for the subdivision areas east of the unnamed tributary to Chicken Creek (Phases 1-3) will be provided by the existing regional stormwater facility located on Tax Lot 300. This regional facility has been sized to treat the runoff from the subject site per the HHRP stormwater report.

For areas west of the unnamed tributary (Phase 4), water quality treatment will be provided by a proposed vegetated swale designed and constructed per the requirements of the Clean Water Services *Design and Construction Standards for Sanitary Sewer and Surface Water Management (R&O 07-20).*

4.0 DESIGN METHODOLOGY

The Santa Barbara Urban Hydrograph (SBUH) Method was used to analyze stormwater runoff from the site. This method utilizes the SCS Type 1A 24-hour design storm. HydroCAD 8.5 computer software aided in the analysis. Representative CN numbers are obtained from the *Technical Release 55* and are included in an Appendix.

5.0 DESIGN PARAMETERS

5.1 DESIGN STORMS

Per CWS requirements, the stormwater analysis utilizes the 24-hour storm for the evaluation and design of the existing and proposed stormwater facilities. The following 24-hour rainfall intensity was utilized as the design storm for the recurrence interval.

Table 5.1

Recurrence Interval (Years)	Total Precipitation Depth (Inches)
25	3.90

5.2 PRE-DEVELOPED SITE CONDITIONS

5.2.1 Site Topography

Existing on-site grades generally vary from ±5% to ±25% and drain towards the unnamed tributary of Chicken Creek, flowing through the site from the southwest to the northwest corner of the site. The site has a high point at ±206 feet located against the south property line (near SW Yorkshire Way) and a low point of ±154 feet near the northwestern property corner near the intersection of SW Edy Road and SW Elwert Road.

5.2.2 Land Use

The existing site consist of a residential property with gravel driveway, house, associated buildings, landscape areas and farm fields.

5.3 Soil Type

The soils beneath the project site and the associated drainage basins are classified as Woodburn Silt Loam according to the USDA Soil Survey for Washington County. The following table outlines the Hydrologic Soil Group rating for each soil type:

Table 5.3

NRCS Map Unit Identification	NRCS Soil Classification	Hydrologic Soil Group Rating
45 B/C/D	Woodburn Silt Loam	C

Further information on this soil type is included in the NRCS Soil Resource Report located on the appendix of this report.

5.4 POST DEVELOPED SITE CONDITIONS

5.4.1 Site Topography

The onsite slopes will be modified with cuts and fills to accommodate the construction of the public streets and a stormwater quality facility for the western portion (Phase 4) of the site. Additionally, sloped residential building pads will be constructed adjacent to the public right-of-way.

5.4.2 Land Use

The site land-use will consist of 86-lot single-family residential subdivision with associated streets, sidewalks and underground utilities.

5.4.3 Post-Developed Input Parameters

See HydroCAD Analysis in the attached appendices.

5.4.4 Description of Off-Site Contributing Basins

North and west of the subject site are residential properties and farms which do not direct stormwater runoff towards the subject site. Properties to the east and south of the subject site direct stormwater runoff towards the unnamed tributary creek located through the subject site. These contributing basins are identified and analyzed as part of the New Elementary and Middle School Final Stormwater report by HHRP, dated August 2007.

6.0 DESIGN METHODOLOGY

6.1 PROPOSED STORMWATER CONDUIT SIZING AND INLET SPACING

The proposed onsite curb inlets will be spaced per CWS requirements to properly convey stormwater runoff. The proposed storm system pipes will be sized using Manning's equation to convey the peak flows from the 25-year storm event.

Inlet spacing on SW Edy Road and SW Elwert Road will be designed, and addressed within the final stormwater report, to meet the ODOT requirement of stormwater runoff being contained within the gutter and below the allowable depth.

6.2 PROPOSED STORMWATER QUALITY CONTROL FACILTY

6.2.1 East Basin (Phases 1-3)

Water quality treatment for Phases 1-3 of the project will be provided by the regional stormwater facility located on Tax Lot 300. The drainage subbasins for Phases 1-3 within the Mandel Farm subdivision have been accounted for within the regional stormwater facility design as Basins A2 and A6 per the New Elementary and Middle School Stormwater Report by HHRP. Per the HHRP stormwater report, approximately 300,808 sf of impervious area treatment was provided for the full build-out of Phases 1-3. Per the currently proposed subdivision plan, Phases 1-3 requires approximately 274,473 sf of impervious area for treatment within the regional facility (See Figure 3).

As part of this report, the existing regional stormwater facility has been evaluated including the development of the proposed Mandel Farms subdivision. With the development of the Phases 1 through 3 of Mandel Farms subdivision, it is anticipated stormwater runoff during the water quality event will have a peak flow depth of 0.49 feet and a minimum residence time of 9 minutes within the existing regional facility (see attached Appendix D for further detail). Therefore, the existing regional stormwater facility has sufficient capacity to provide water quality treatment for Phases 1-3 of the subdivision. Based on the preliminary stormwater analysis, the flow splitter manhole will require some modifications to the existing 11-inch orifice to discharge the water quality flow to water quality manhole. This will be refined during final engineering.

A small portion of sidewalk and roadway area from SW Edy Road is unable to be conveyed to the regional stormwater facility. Instead this area will be collected and conveyed to the existing unnamed tributary creek (see Figure 3, Phase 1-3 Treatment Map, for further detail). This untreatable area will be offset by providing stormwater treatment to existing untreated impervious areas of SW Edy Road and SW Elwert Road.

6.2.2 West Basin (Phase 4)

Water quality treatment for the proposed Phase 4 of the subject site will be provided by a vegetated swale designed and constructed per *Clean Water Services Design and Construction*

Standards for Sanitary Sewer and Surface Water Management (R&O 07-20). Stormwater runoff from Phase 4 will be routed through a 2-foot wide (bottom width), 119-foot long vegetated swale located on Tract G. The proposed water quality swale will be designed to provide a minimum residence time of 9 minutes. Detailed calculations and checks against CWS criteria are included in Appendix C.

A portion of the existing untreated SW Elwert Road impervious area will be routed to the vegetated swale. This area will offset the existing untreatable areas along SW Edy Road, SW Elwert Road and additional onsite impervious pedestrian trail areas which are proposed within the subdivision. Please see Figure 4, Phase 4 Treatment Map, for additional detail and information regarding the areas obtaining water quality treatment.

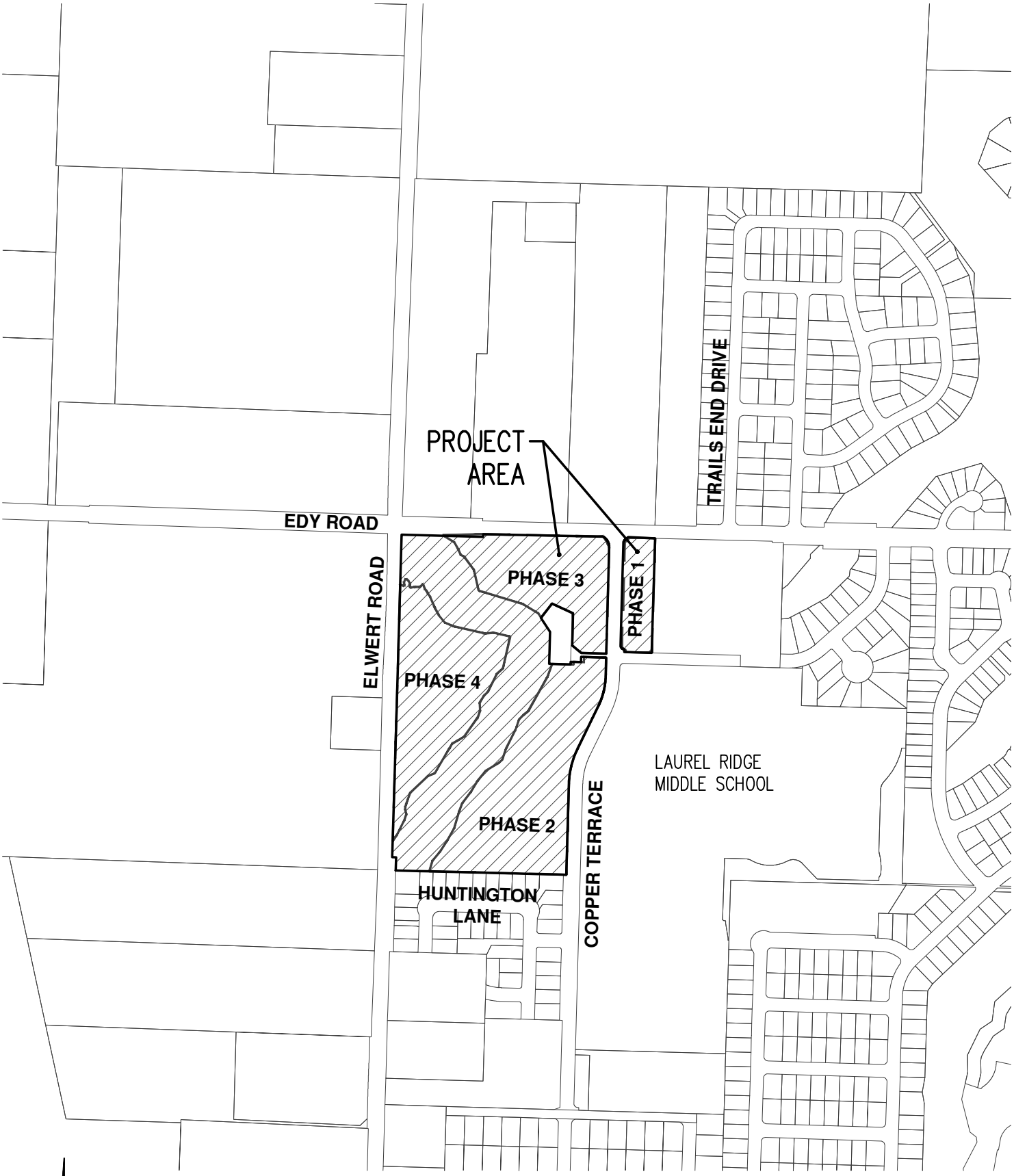
6.3 WATER QUANTITY AND DOWNSTREAM ANALYSIS

A downstream analysis was conducted by AKS which incorporates the New Elementary and Middle School Final Stormwater report by HHRP. Based on our downstream analysis modeling (which utilizes offsite flows and subbasins from the HHRP stormwater report), stormwater detention for the subject site is not required at this time.

The HHRP stormwater analysis determined stormwater detention for the subject site is not required until the drainage basin approaches full build-out conditions which results in less than 1-foot of freeboard at the existing 24-inch culvert, located beneath the intersection of SW Edy and SW Elwert Road.

The downstream analysis of the existing 24-inch culvert incorporated the subbasin drainage areas established in the HHRP stormwater report and evaluated the overall drainage basin with the full development of the Mandel Farms subdivision. See Figure 5, Site Overlay on HHRP Basin Map, at the end of this report for an overlay of the Mandel Farms subdivision on the drainage basin map provided in the HHRP stormwater report. It is anticipated that subbasins 2, 6, A4 and portions of 7 and 9 will remain undeveloped after the development of the Mandel Farms subdivision. With the development of the Mandel Farms subdivision, the 24-inch culvert beneath the SW Edy Road and SW Elwert Road intersection has sufficient capacity to convey the upstream stormwater runoff during the 25-year storm event while maintaining a minimum of 1 foot of freeboard. See Appendix A for additional detail regarding the downstream analysis.

The downstream analysis also identified that an existing 12-inch storm main (Reach 8R) conveying stormwater flow from the west of the intersection of SW Copper Terrace and SW Nursery Way is currently undersized to accommodate the additional stormwater flow from the proposed developments of Phase 1 and 3. Therefore, based on the preliminary stormwater analysis, the proposed subdivision project will be required to upsize the existing 12-inch storm main to an 18-inch main. Additional refinement of the stormwater analysis will be conducted during final engineering to confirm the required stormwater improvements to the existing storm mains.



SCALE 1" = 500 FEET

500 0 200 300 400 500

DATE: 01-08-2016

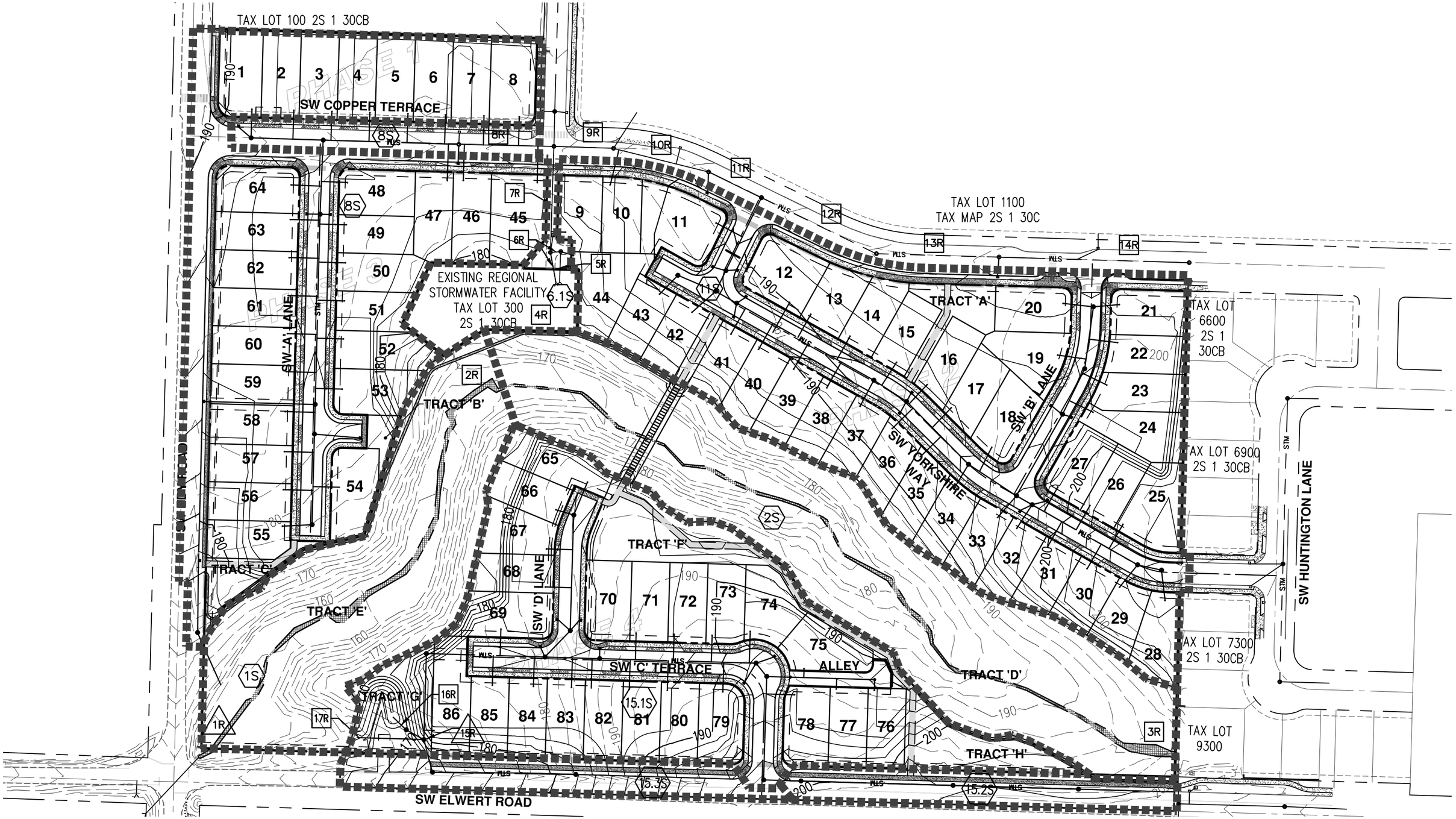
VICINITY MAP
MANDEL FARMS SUBDIVISION

FIGURE 1

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: VICINITY MAP | LAYOUT1



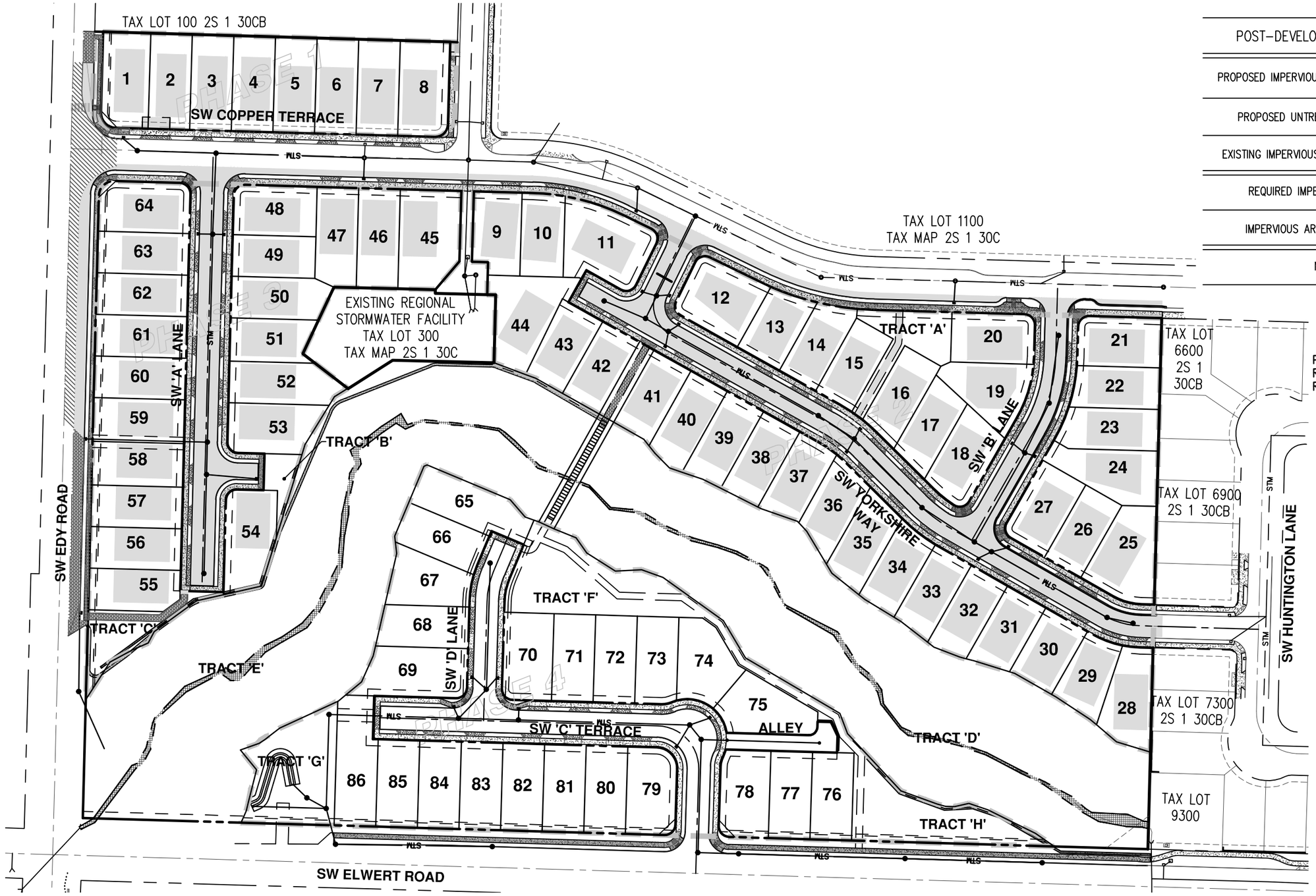
DATE: 01-08-2016

SCALE 1" = 120 FEET

120 0 48 72 96 120

POST-DEVELOPED BASIN DELINEATION	FIGURE
MANDEL FARMS SUBDIVISION	2
AKS ENGINEERING & FORESTRY, LLC 12965 SW HERMAN RD, STE 100 TUALATIN, OR 97062 P: 503.563.6151 F: 503.563.6152 aks-eng.com	DRWN: DS CHKD: PAS AKS JOB: 4570

DWG: POST-DEVELOPED | LAYOUT1



POST-DEVELOPED IMPERVIOUS AREA TABLE (PHASE 1-3)	
PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT	266,736 SF
PROPOSED UNTREATABLE IMPERVIOUS AREA	7,047 SF
EXISTING IMPERVIOUS AREA RECEIVING TREATMENT	7,737 SF
REQUIRED IMPERVIOUS AREA TO TREAT	273,783 SF
IMPERVIOUS AREA TREATMENT PROVIDED	274,473 SF
NET TOTAL	+690 SF

PROPOSED IMPERVIOUS AREAS FROM PHASES 1, 2, AND 3 WILL RECEIVE WATER QUALITY TREATMENT WITHIN THE EXISTING REGIONAL STORMWATER FACILITY LOCATED ON TAX LOT 300

— INDICATES PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT
*AN IMPERVIOUS AREA OF 2,640 SQ. FT. PER LOT WAS ASSUMED

— INDICATES PROPOSED UNTREATABLE IMPERVIOUS AREA

— INDICATES EXISTING IMPERVIOUS AREA RECEIVING TREATMENT

SCALE 1" = 120 FEET

120 0 48 72 96 120

DATE: 01-08-2016

PHASES 1-3 TREATMENT MAP

FIGURE 3

MANDEL FARMS SUBDIVISION

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
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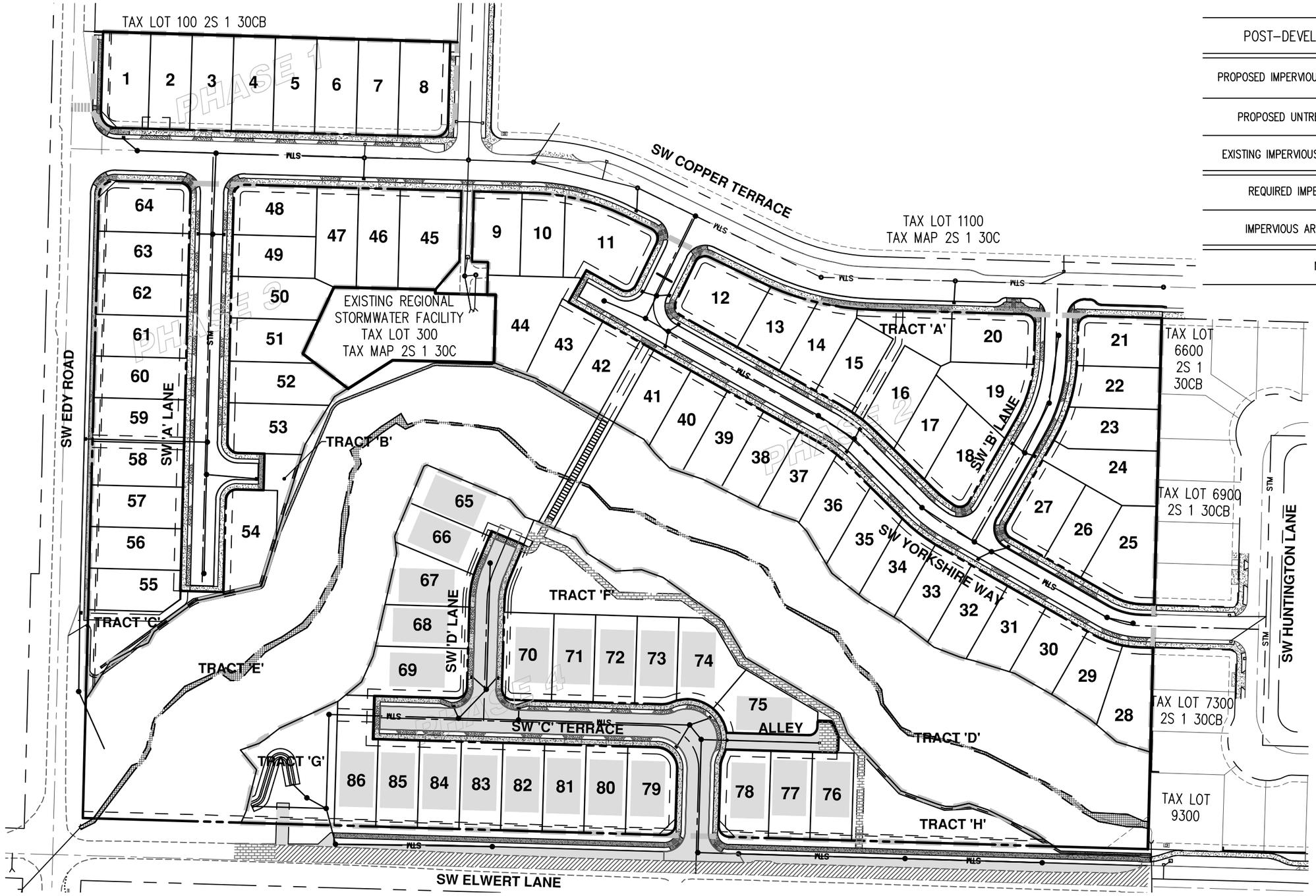
DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: TREATMENT MAP PHASE 1-3 | LAYOUT1



POST-DEVELOPED IMPERVIOUS AREA TABLE (PHASE 4)	
PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT	109,097 SF
PROPOSED UNTREATABLE IMPERVIOUS AREA	7.024 SF
EXISTING IMPERVIOUS AREA RECEIVING TREATMENT	16,334 SF
REQUIRED IMPERVIOUS AREA TO TREAT	116,121 SF
IMPERVIOUS AREA TREATMENT PROVIDED	125,131 SF
NET TOTAL	+9,310 SF

INDICATES PROPOSED IMPERVIOUS AREA RECEIVING TREATMENT
*AN IMPERVIOUS AREA OF 2,640 SQ. FT. PER LOT WAS ASSUMED

INDICATES PROPOSED UNTREATABLE IMPERVIOUS AREA

INDICATES EXISTING IMPERVIOUS AREA RECEIVING TREATMENT

SCALE 1" = 120 FEET

120 0 48 72 96 120

DATE: 01-08-2016

PHASE 4 TREATMENT MAP

FIGURE 4

MANDEL FARMS SUBDIVISION

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: TREATMENT MAP - PHASE 4 | LAYOUT1

REGIONAL WQ & STORM SEWER SERVICE BASIN
NEW ELEMENTARY AND MIDDLE SCHOOL
SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
ENGINEERS • PLANNERS
LANDSCAPE ARCHITECTS • SURVEYORS
5200 SW Meadows Avenue, Suite 150, Portland, OR 97239
phone: 503.221.1131 www.hhpr.com fax: 503.221.1171

DESIGNED: HHPR
DRAWN: HHPR
CHECKED: KAS
DATE: 5-25-07

DATE	NO.	DESCRIPTION

REVISIONS

SHEET NO. 1.0

JOB NO. DOW-08

P:\DOW-08\DOW08-DWGS\STORM\WATER\Omaha Storm\ DOW08-SUB BASIN AREAS.dwg

DATE: 01-08-2016

SCALE 1" = 250 FEET

250 0 100 150 200 250

PROPOSED SITE OVERLAY ON HHRP BASIN MAP

MANDEL FARMS SUBDIVISION

AKS ENGINEERING & FORESTRY, LLC
12965 SW HERMAN RD, STE 100
TUALATIN, OR 97062
P: 503.563.6151 F: 503.563.6152 aks-eng.com

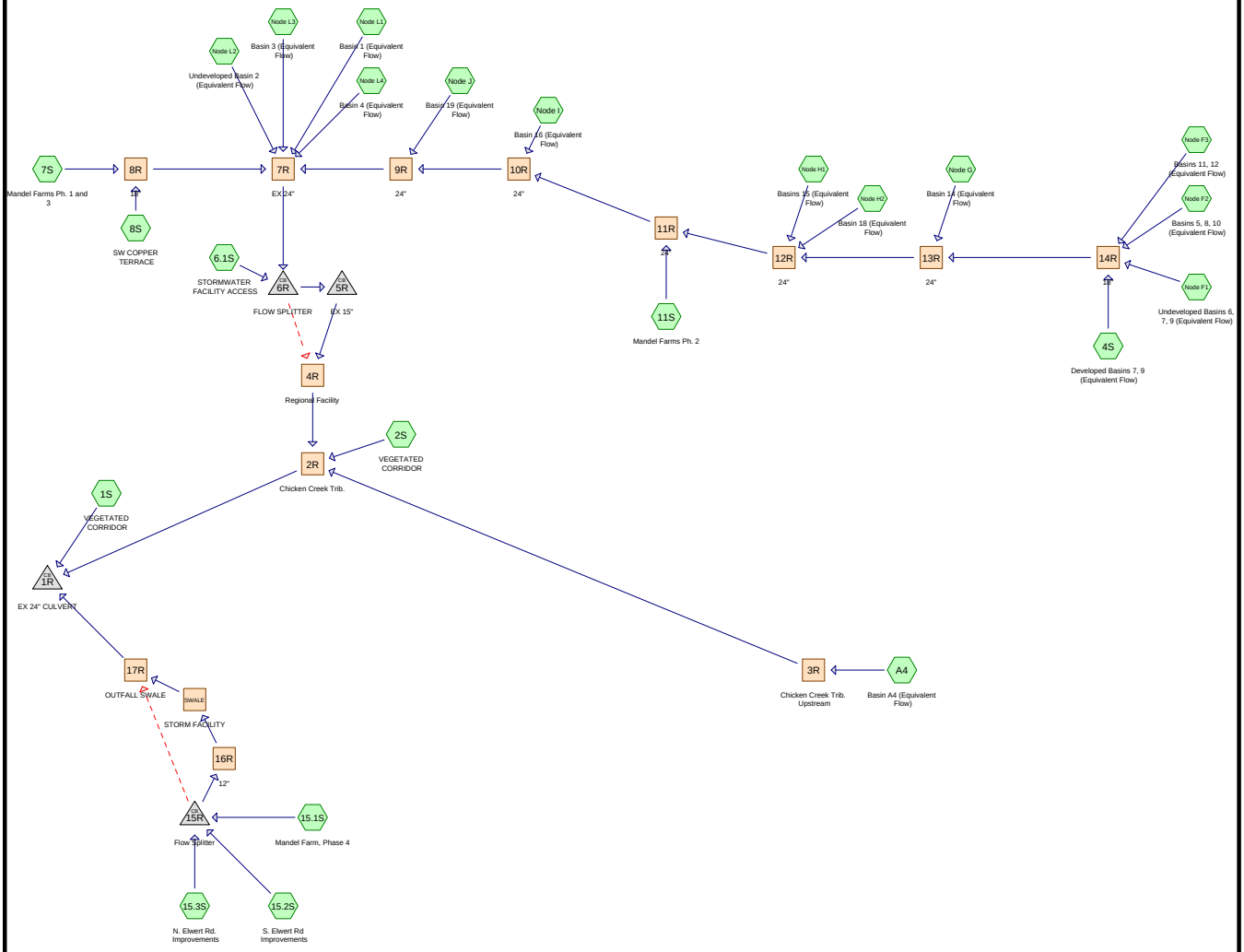
FIGURE 5

DRWN: DS
CHKD: PAS
AKS JOB: 4570

DWG: POST-DEVELOPED | LAYOUT1 (2)

APPENDIX A

POST-DEVELOPED SITE AND DOWNSTREAM 25-YEAR YEAR STORM EVENT ANALYSIS



Subcat Reach Pond Link

Drainage Diagram for 4570 POST-DEVELOPED

Prepared by AKS Engineering & Forestry (PAS), Printed 1/8/2016

HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: VEGETATED Runoff Area=103,387 sf 0.00% Impervious Runoff Depth>1.37"
Flow Length=650' Tc=18.1 min CN=72/0 Runoff=0.52 cfs 0.272 af

Subcatchment 2S: VEGETATED Runoff Area=146,909 sf 0.00% Impervious Runoff Depth>1.37"
Flow Length=1,144' Tc=18.8 min CN=72/0 Runoff=0.72 cfs 0.386 af

Subcatchment 4S: Developed Basins 7, 9 Runoff Area=4.550 ac 60.88% Impervious Runoff Depth>2.96"
Tc=10.0 min CN=79/98 Runoff=3.14 cfs 1.121 af

Subcatchment 6.1S: STORMWATER Runoff Area=3,225 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.023 af

Subcatchment 7S: Mandel Farms Ph. 1 Runoff Area=255,702 sf 46.62% Impervious Runoff Depth>2.52"
Tc=5.0 min CN=74/98 Runoff=3.47 cfs 1.231 af

Subcatchment 8S: SW COPPER TERRACE Runoff Area=16,815 sf 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.35 cfs 0.118 af

Subcatchment 11S: Mandel Farms Ph. 2 Runoff Area=292,501 sf 53.08% Impervious Runoff Depth>2.65"
Tc=5.0 min CN=74/98 Runoff=4.23 cfs 1.486 af

Subcatchment 15.1S: Mandel Farm, Runoff Area=211,396 sf 47.67% Impervious Runoff Depth>2.54"
Tc=5.0 min CN=74/98 Runoff=2.90 cfs 1.027 af

Subcatchment 15.2S: S. Elwert Rd Runoff Area=22,513 sf 72.97% Impervious Runoff Depth>3.08"
Tc=5.0 min CN=74/98 Runoff=0.39 cfs 0.133 af

Subcatchment 15.3S: N. Elwert Rd. Runoff Area=24,582 sf 67.89% Impervious Runoff Depth>2.97"
Tc=5.0 min CN=74/98 Runoff=0.41 cfs 0.140 af

Subcatchment A4: Basin A4 (Equivalent Runoff Area=83.000 ac 9.64% Impervious Runoff Depth>1.99"
Tc=55.5 min CN=79/98 Runoff=20.96 cfs 13.797 af

Subcatchment Node F1: Undeveloped Runoff Area=7.070 ac 0.00% Impervious Runoff Depth>1.85"
Flow Length=525' Slope=0.0500 '/' Tc=29.3 min CN=79/0 Runoff=2.10 cfs 1.092 af

Subcatchment Node F2: Basins 5, 8, 10 Runoff Area=0.670 ac 88.06% Impervious Runoff Depth>3.45"
Tc=5.0 min CN=79/98 Runoff=0.57 cfs 0.192 af

Subcatchment Node F3: Basins 11, 12 Runoff Area=4.020 ac 66.17% Impervious Runoff Depth>3.05"
Tc=10.0 min CN=79/98 Runoff=2.87 cfs 1.022 af

Subcatchment Node G: Basin 14 Runoff Area=1.810 ac 49.72% Impervious Runoff Depth>2.76"
Tc=10.0 min CN=79/98 Runoff=1.15 cfs 0.416 af

Subcatchment Node H1: Basins 15 Runoff Area=0.170 ac 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.16 cfs 0.052 af

Subcatchment Node H2: Basin 18 Runoff Area=3.160 ac 68.04% Impervious Runoff Depth>3.08"
Tc=10.0 min CN=79/98 Runoff=2.28 cfs 0.812 af

Subcatchment Node I: Basin 16 Runoff Area=0.180 ac 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.16 cfs 0.055 af

Subcatchment Node J: Basin 19 Runoff Area=0.100 ac 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.09 cfs 0.030 af

Subcatchment Node L1: Basin 1 Runoff Area=5.310 ac 56.87% Impervious Runoff Depth>2.89"
Tc=10.0 min CN=79/98 Runoff=3.56 cfs 1.277 af

Subcatchment Node L2: Undeveloped Basin Runoff Area=2.960 ac 0.00% Impervious Runoff Depth>1.83"
Flow Length=410' Slope=0.0050 '/' Tc=48.2 min CN=79/0 Runoff=0.71 cfs 0.452 af

Subcatchment Node L3: Basin 3 Runoff Area=0.250 ac 100.00% Impervious Runoff Depth>3.66"
Tc=5.0 min CN=0/98 Runoff=0.23 cfs 0.076 af

Subcatchment Node L4: Basin 4 Runoff Area=0.680 ac 51.47% Impervious Runoff Depth>2.79"
Tc=5.0 min CN=79/98 Runoff=0.46 cfs 0.158 af

Reach 2R: Chicken Creek Trib. Avg. Depth=1.50' Max Vel=5.72 fps Inflow=45.35 cfs 23.713 af
n=0.030 L=620.0' S=0.0177 '/' Capacity=78.30 cfs Outflow=44.14 cfs 23.678 af

Reach 3R: Chicken Creek Trib. Upstream Avg. Depth=0.83' Max Vel=5.54 fps Inflow=20.96 cfs 13.797 af
n=0.030 L=1,114.0' S=0.0294 '/' Capacity=100.90 cfs Outflow=20.93 cfs 13.758 af

Reach 4R: Regional Facility Avg. Depth=1.75' Max Vel=0.91 fps Inflow=25.34 cfs 9.604 af
n=0.240 L=230.0' S=0.0150 '/' Capacity=69.35 cfs Outflow=25.04 cfs 9.569 af

Reach 7R: EX 24" Avg. Depth=1.37' Max Vel=11.04 fps Inflow=25.29 cfs 9.583 af
D=24.0" n=0.013 L=139.4' S=0.0189 '/' Capacity=31.13 cfs Outflow=25.27 cfs 9.581 af

Reach 8R: 18" Avg. Depth=0.93' Max Vel=3.31 fps Inflow=3.83 cfs 1.349 af
D=18.0" n=0.013 L=125.1' S=0.0026 '/' Capacity=5.40 cfs Outflow=3.83 cfs 1.348 af

Reach 9R: 24" Avg. Depth=1.19' Max Vel=8.52 fps Inflow=16.58 cfs 6.272 af
D=24.0" n=0.013 L=78.3' S=0.0123 '/' Capacity=25.05 cfs Outflow=16.57 cfs 6.271 af

Reach 10R: 24" Avg. Depth=1.27' Max Vel=7.81 fps Inflow=16.50 cfs 6.243 af
D=24.0" n=0.013 L=128.8' S=0.0099 '/' Capacity=22.46 cfs Outflow=16.49 cfs 6.241 af

Reach 11R: 24" Avg. Depth=1.22' Max Vel=8.16 fps Inflow=16.35 cfs 6.189 af
D=24.0" n=0.013 L=92.2' S=0.0111 '/' Capacity=23.79 cfs Outflow=16.34 cfs 6.188 af

Reach 12R: 24" Avg. Depth=1.01' Max Vel=7.61 fps Inflow=12.15 cfs 4.704 af
D=24.0" n=0.013 L=153.1' S=0.0110 '/' Capacity=23.77 cfs Outflow=12.14 cfs 4.703 af

Reach 13R: 24" Avg. Depth=0.97' Max Vel=6.45 fps Inflow=9.73 cfs 3.842 af
D=24.0" n=0.013 L=161.2' S=0.0083 '/' Capacity=20.55 cfs Outflow=9.72 cfs 3.840 af

Reach 14R: 18" Avg. Depth=0.87' Max Vel=8.06 fps Inflow=8.60 cfs 3.427 af
D=18.0" n=0.013 L=250.2' S=0.0163 '/' Capacity=13.43 cfs Outflow=8.58 cfs 3.426 af

Reach 16R: 12" Avg. Depth=0.61' Max Vel=4.90 fps Inflow=2.47 cfs 1.160 af
D=12.0" n=0.013 L=23.9' S=0.0100 '/' Capacity=3.57 cfs Outflow=2.47 cfs 1.160 af

Reach 17R: OUTFALL SWALE Avg. Depth=1.28' Max Vel=0.38 fps Inflow=3.66 cfs 1.294 af
n=0.240 L=35.0' S=0.0049 '/' Capacity=14.86 cfs Outflow=3.65 cfs 1.292 af

Reach SWALE: STORM FACILITY Avg. Depth=1.15' Max Vel=0.35 fps Inflow=2.47 cfs 1.160 af
n=0.240 L=119.0' S=0.0050 '/' Capacity=13.22 cfs Outflow=2.44 cfs 1.155 af

Pond 1R: EX 24" CULVERT Peak Elev=159.59' Inflow=47.68 cfs 25.243 af
24.0" x 100.6' Culvert Outflow=47.68 cfs 25.243 af

Pond 5R: EX 15" Peak Elev=177.08' Inflow=6.90 cfs 6.955 af
15.0" x 39.9' Culvert Outflow=6.90 cfs 6.955 af

Pond 6R: FLOW SPLITTER Peak Elev=178.40' Inflow=25.34 cfs 9.604 af
Primary=6.90 cfs 6.955 af Secondary=18.45 cfs 2.648 af Outflow=25.34 cfs 9.604 af

Pond 15R: Flow Splitter Peak Elev=163.42' Inflow=3.70 cfs 1.299 af
Primary=2.47 cfs 1.160 af Secondary=1.23 cfs 0.139 af Outflow=3.70 cfs 1.299 af

Total Runoff Area = 138.655 ac Runoff Volume = 25.367 af Average Runoff Depth = 2.20"
77.66% Pervious = 107.681 ac 22.34% Impervious = 30.975 ac

Summary for Subcatchment 1S: VEGETATED CORRIDOR

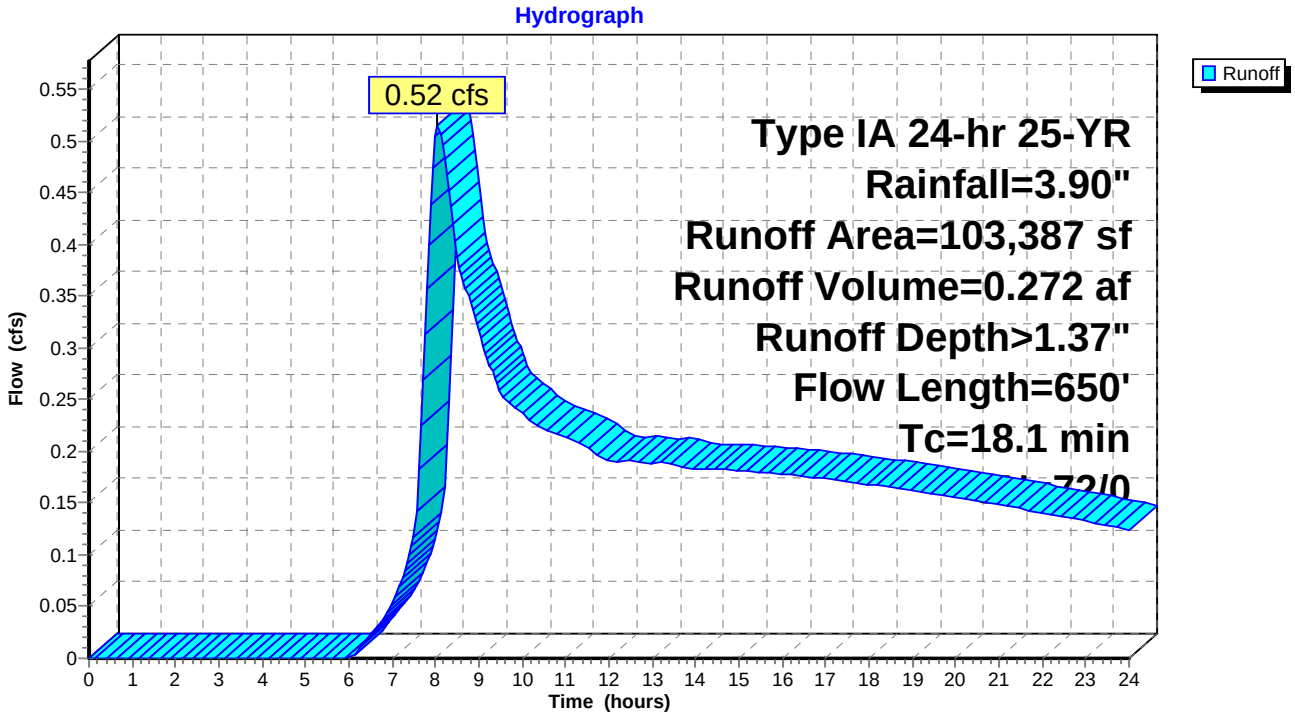
Runoff = 0.52 cfs @ 8.05 hrs, Volume= 0.272 af, Depth> 1.37"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

Area (sf)	CN	Description
103,387	72	Woods/grass comb., Good, HSG C
103,387	72	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	30	0.0050	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
2.0	620	0.0178	5.26	71.04	**Channel Flow,** Area= 13.5 sf Perim= 19.0' r= 0.71' n= 0.030
18.1	650	Total			

Subcatchment 1S: VEGETATED CORRIDOR



Summary for Subcatchment 2S: VEGETATED CORRIDOR

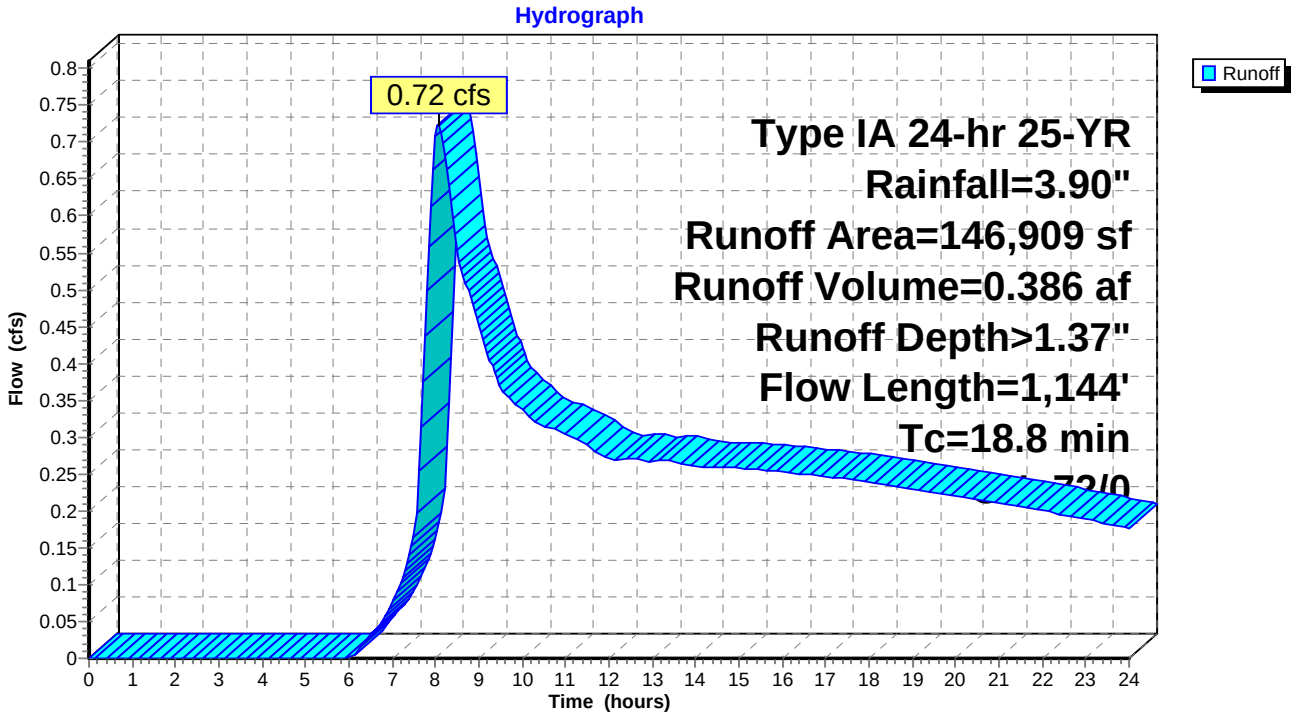
Runoff = 0.72 cfs @ 8.06 hrs, Volume= 0.386 af, Depth> 1.37"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

Area (sf)	CN	Description
146,909	72	Woods/grass comb., Good, HSG C
146,909	72	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.1	30	0.0050	0.03		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 2.50"
2.7	1,114	0.0294	6.76	91.30	**Channel Flow,** Area= 13.5 sf Perim= 19.0' r= 0.71' n= 0.030
18.8	1,144	Total			

Subcatchment 2S: VEGETATED CORRIDOR



Summary for Subcatchment 4S: Developed Basins 7, 9 (Equivalent Flow)

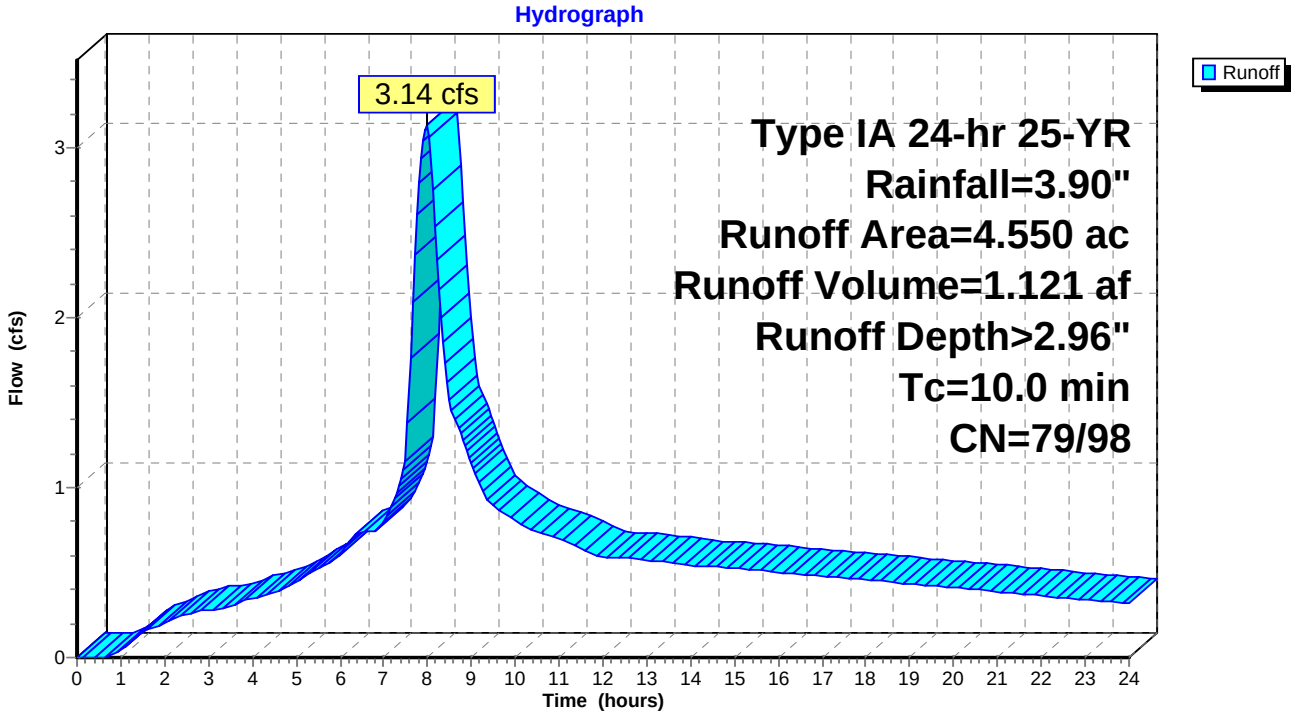
Runoff = 3.14 cfs @ 7.98 hrs, Volume= 1.121 af, Depth> 2.96"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	2.770	98	Impervious Area according to HHPR report (Basin 7 and 9 are 40% developed)
*	1.780	79	Pervious Area according to HHPR report (Basin 7 and 9 are 40% developed)
	4.550	91	Weighted Average
	1.780	79	Pervious Area
	2.770	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4S: Developed Basins 7, 9 (Equivalent Flow)



Summary for Subcatchment 6.1S: STORMWATER FACILITY ACCESS

[49] Hint: Tc<2dt may require smaller dt

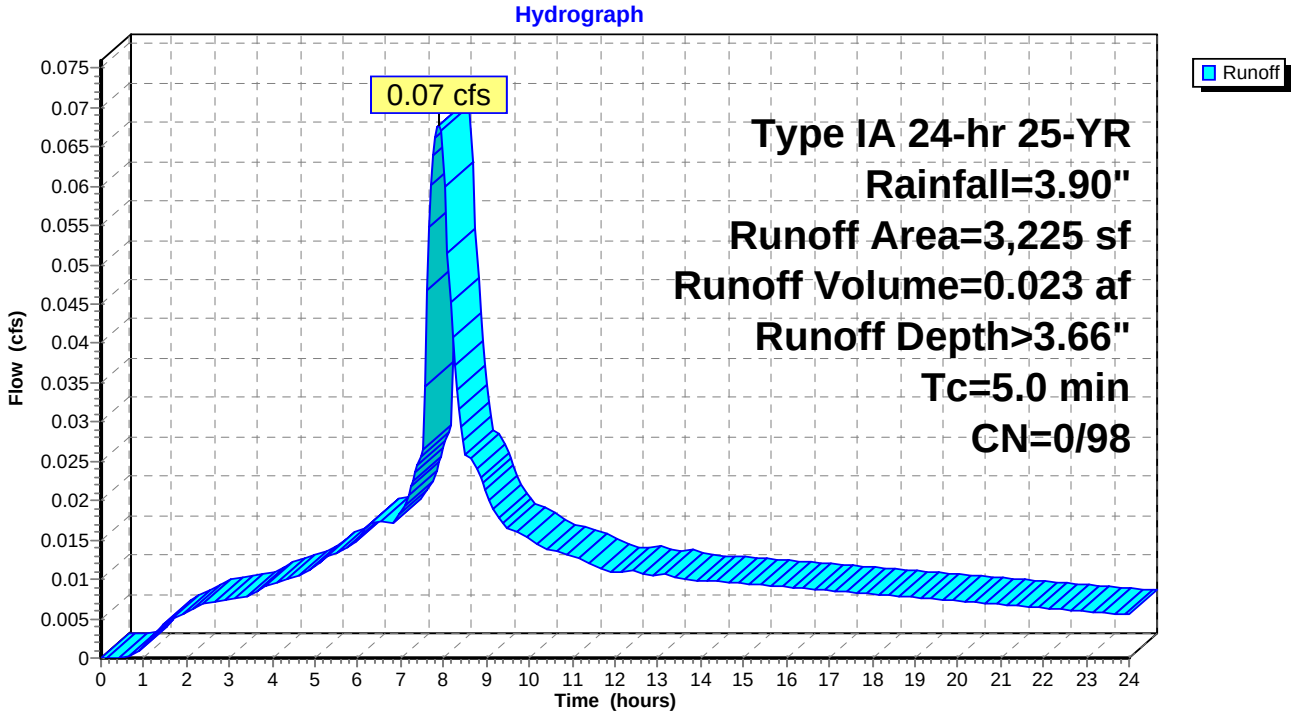
Runoff = 0.07 cfs @ 7.90 hrs, Volume= 0.023 af, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	3,225	98	Impervious Area on Access Road
	3,225	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.1S: STORMWATER FACILITY ACCESS



Summary for Subcatchment 7S: Mandel Farms Ph. 1 and 3

[49] Hint: Tc<2dt may require smaller dt

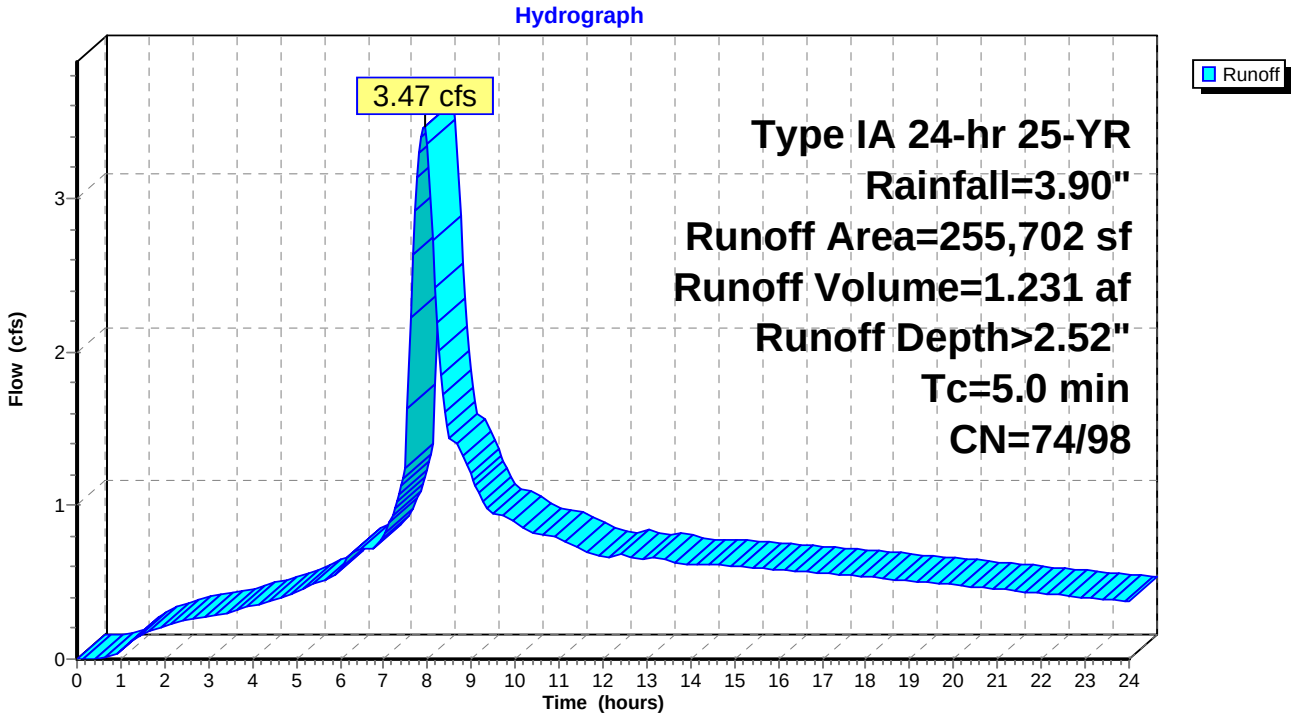
Runoff = 3.47 cfs @ 7.94 hrs, Volume= 1.231 af, Depth> 2.52"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	73,920	98	28 lots @ 2640 sf
*	45,298	98	Road pavements, curbs & sidewalks
	136,484	74	>75% Grass cover, Good, HSG C
	255,702	85	Weighted Average
	136,484	74	Pervious Area
	119,218	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: Mandel Farms Ph. 1 and 3



Summary for Subcatchment 8S: SW COPPER TERRACE

[49] Hint: Tc<2dt may require smaller dt

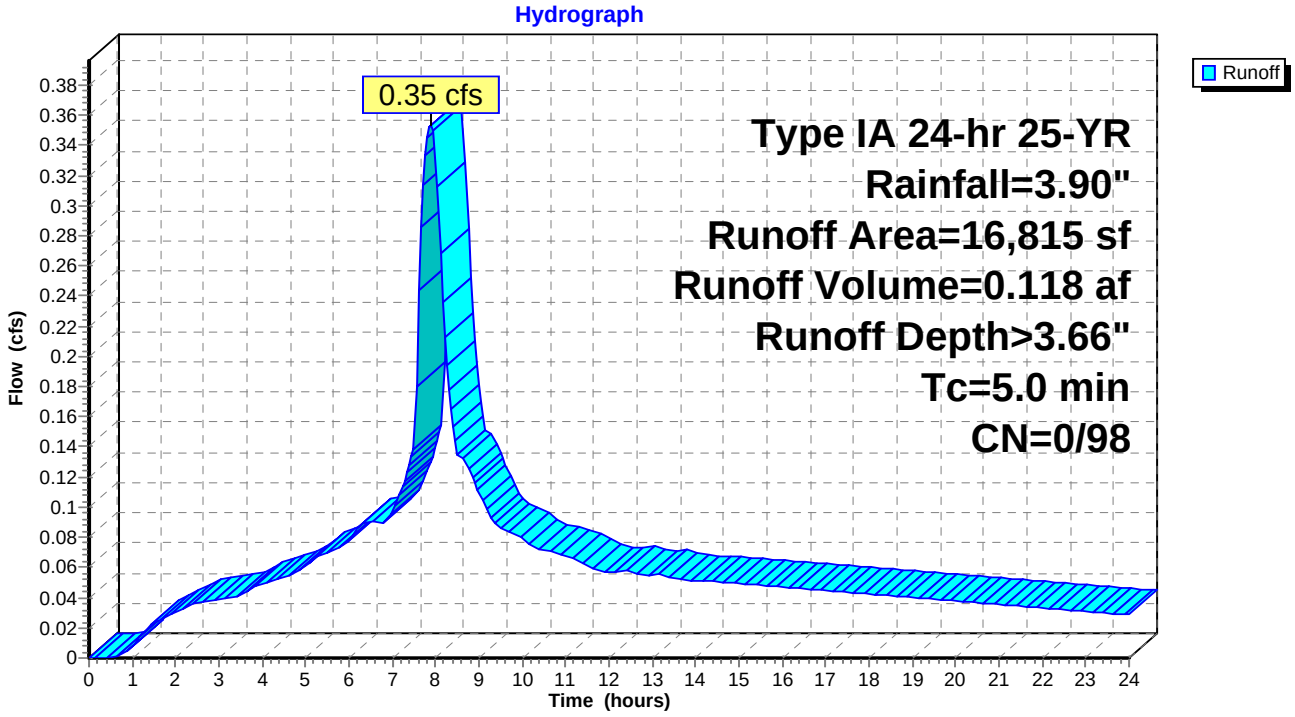
Runoff = 0.35 cfs @ 7.90 hrs, Volume= 0.118 af, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	16,815	98	Impervious Roadway and Sidewalk
	16,815	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S: SW COPPER TERRACE



Summary for Subcatchment 11S: Mandel Farms Ph. 2

[49] Hint: Tc<2dt may require smaller dt

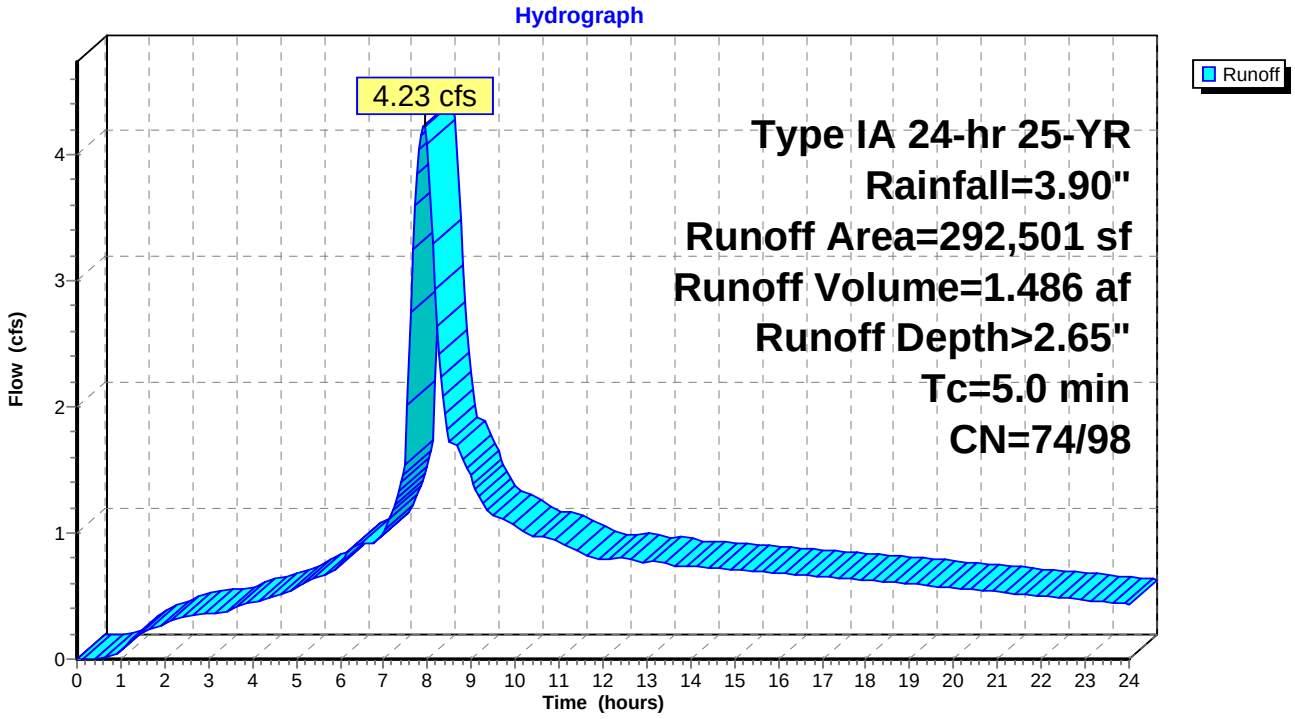
Runoff = 4.23 cfs @ 7.93 hrs, Volume= 1.486 af, Depth> 2.65"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	95,040	98	36 lots @ 2640 sf
*	60,215	98	Road pavements, curbs & sidewalks
	137,246	74	>75% Grass cover, Good, HSG C
	292,501	87	Weighted Average
	137,246	74	Pervious Area
	155,255	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: Mandel Farms Ph. 2



Summary for Subcatchment 15.1S: Mandel Farm, Phase 4

[49] Hint: Tc<2dt may require smaller dt

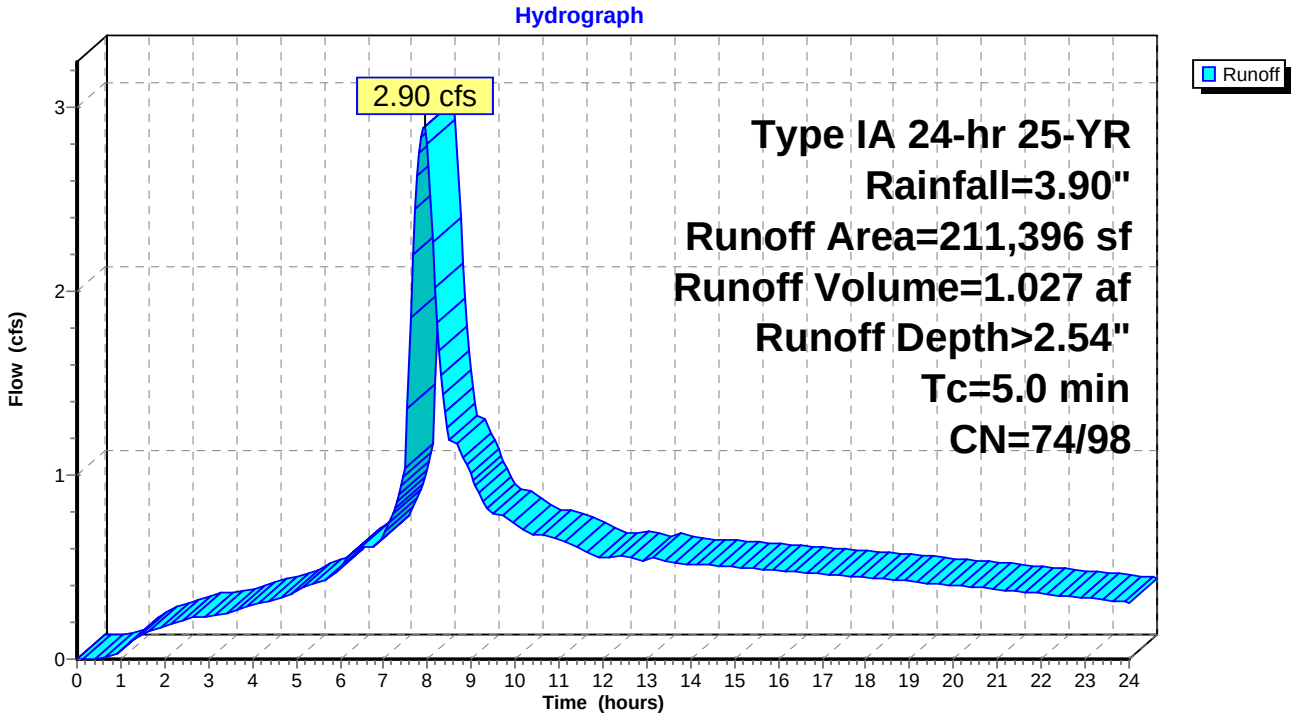
Runoff = 2.90 cfs @ 7.94 hrs, Volume= 1.027 af, Depth> 2.54"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	58,080	98	22 lots @ 2640 sf
*	42,683	98	Road pavements, curbs & sidewalks
	110,633	74	>75% Grass cover, Good, HSG C
	211,396	85	Weighted Average
	110,633	74	Pervious Area
	100,763	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15.1S: Mandel Farm, Phase 4



Summary for Subcatchment 15.2S: S. Elwert Rd Improvements

[49] Hint: Tc<2dt may require smaller dt

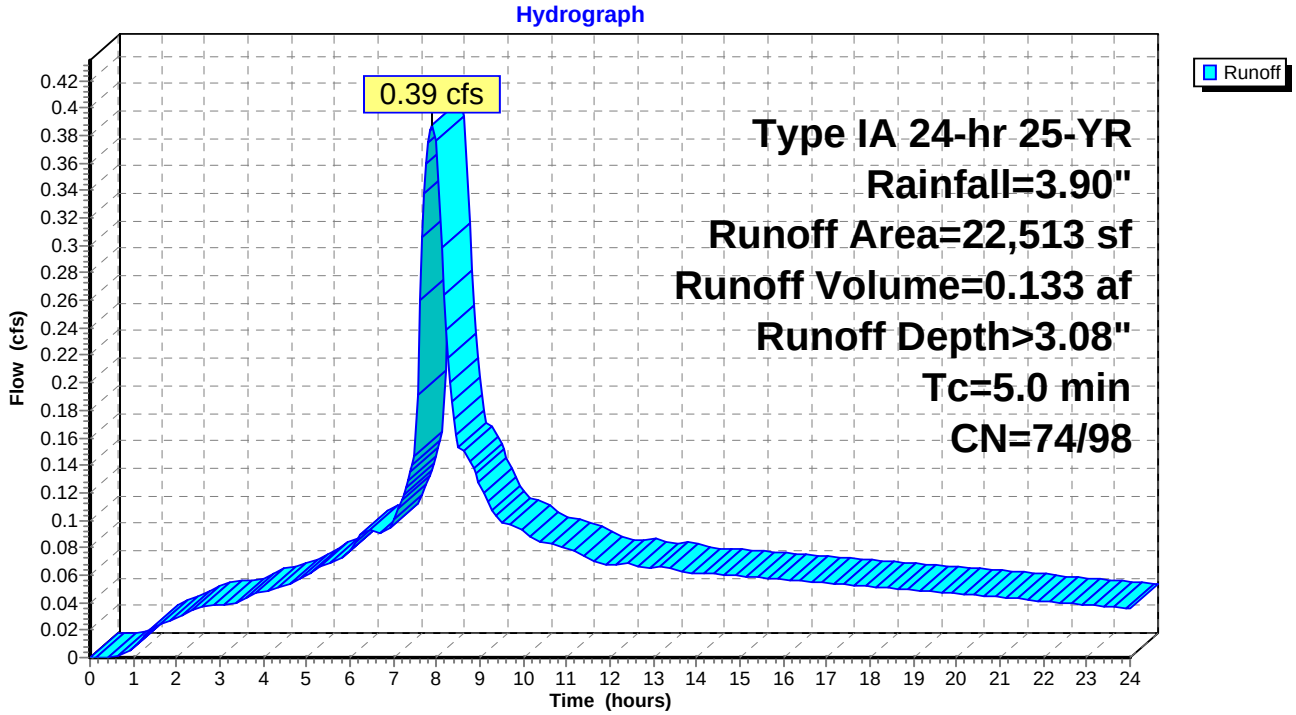
Runoff = 0.39 cfs @ 7.91 hrs, Volume= 0.133 af, Depth> 3.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	16,428	98	Road pavement, curb & sidewalks
	6,085	74	>75% Grass cover, Good, HSG C
	22,513	92	Weighted Average
	6,085	74	Pervious Area
	16,428	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15.2S: S. Elwert Rd Improvements



Summary for Subcatchment 15.3S: N. Elwert Rd. Improvements

[49] Hint: Tc<2dt may require smaller dt

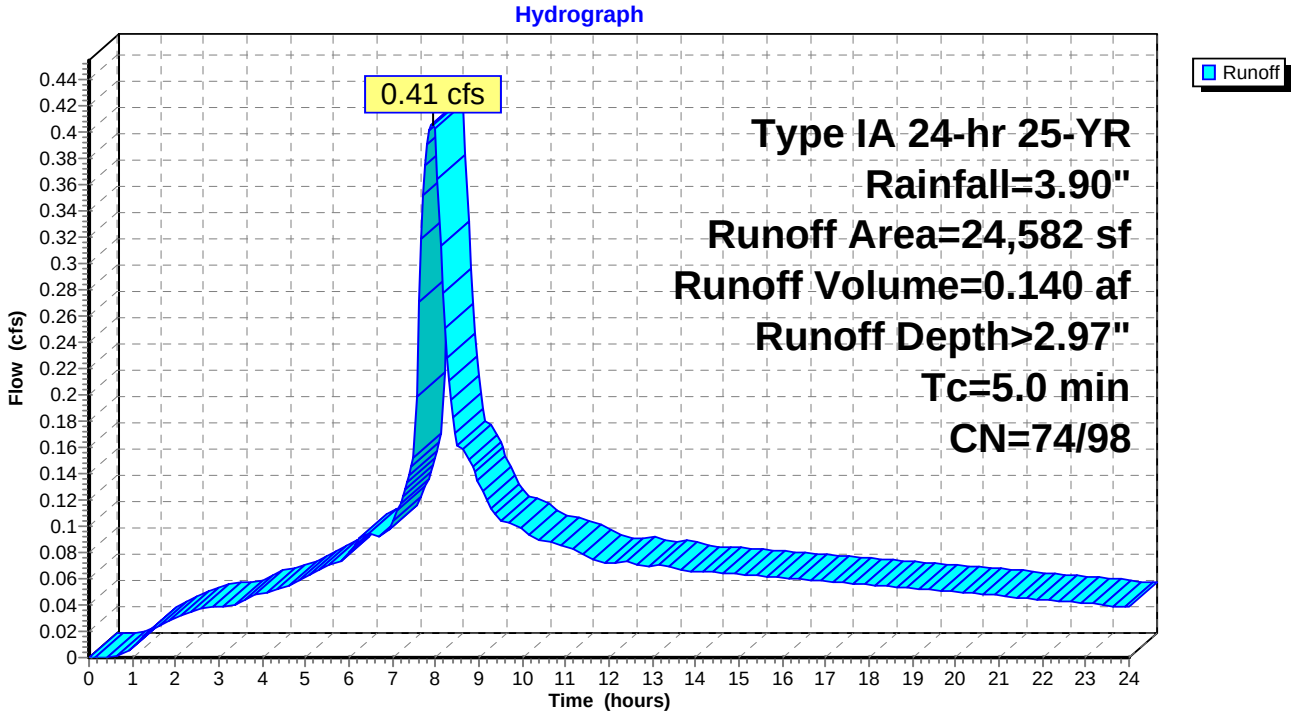
Runoff = 0.41 cfs @ 7.92 hrs, Volume= 0.140 af, Depth> 2.97"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (sf)	CN	Description
*	16,689	98	Road pavement, curb & sidewalks
	7,893	74	>75% Grass cover, Good, HSG C
	24,582	90	Weighted Average
	7,893	74	Pervious Area
	16,689	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 15.3S: N. Elwert Rd. Improvements



Summary for Subcatchment A4: Basin A4 (Equivalent Flow)

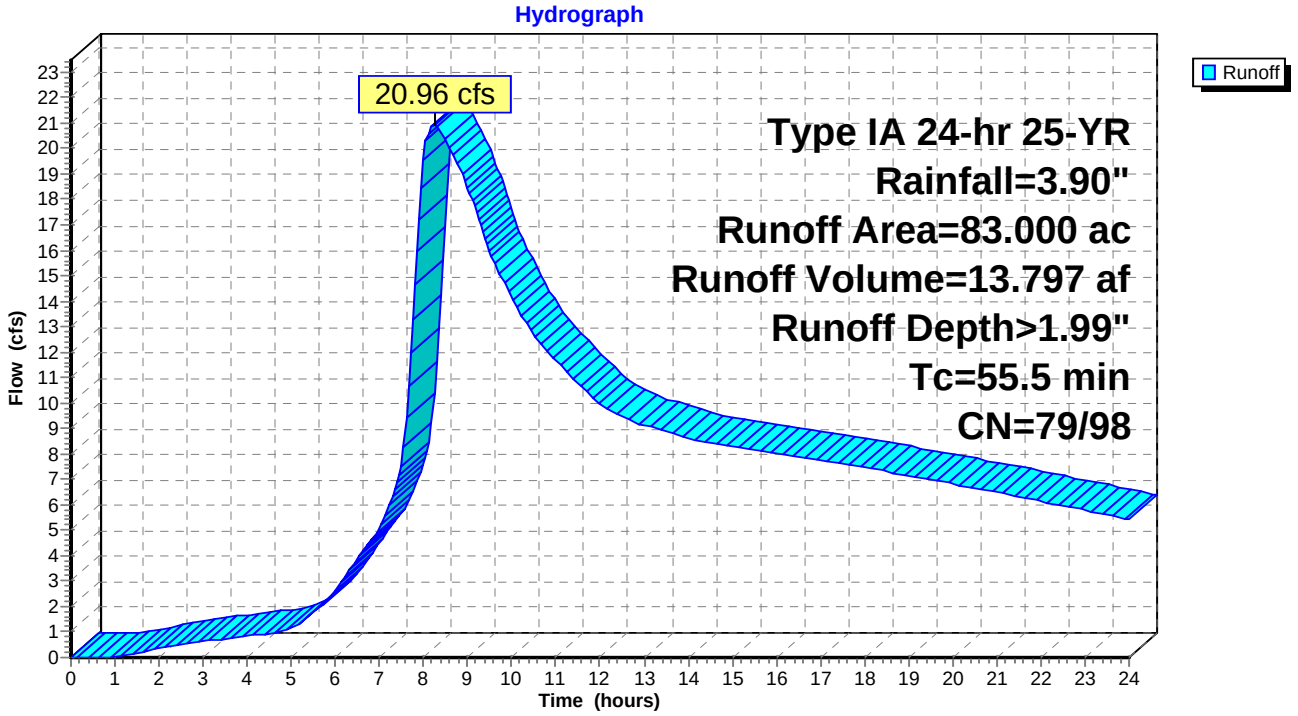
Runoff = 20.96 cfs @ 8.25 hrs, Volume= 13.797 af, Depth> 1.99"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	8.000	98	Impervious Area according to HHPR report
*	75.000	79	Pervious Area according to HHPR report
	83.000	81	Weighted Average
	75.000	79	Pervious Area
	8.000	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
55.5					**Direct Entry,**

Subcatchment A4: Basin A4 (Equivalent Flow)



Summary for Subcatchment Node F1: Undeveloped Basins 6, 7, 9 (Equivalent Flow)

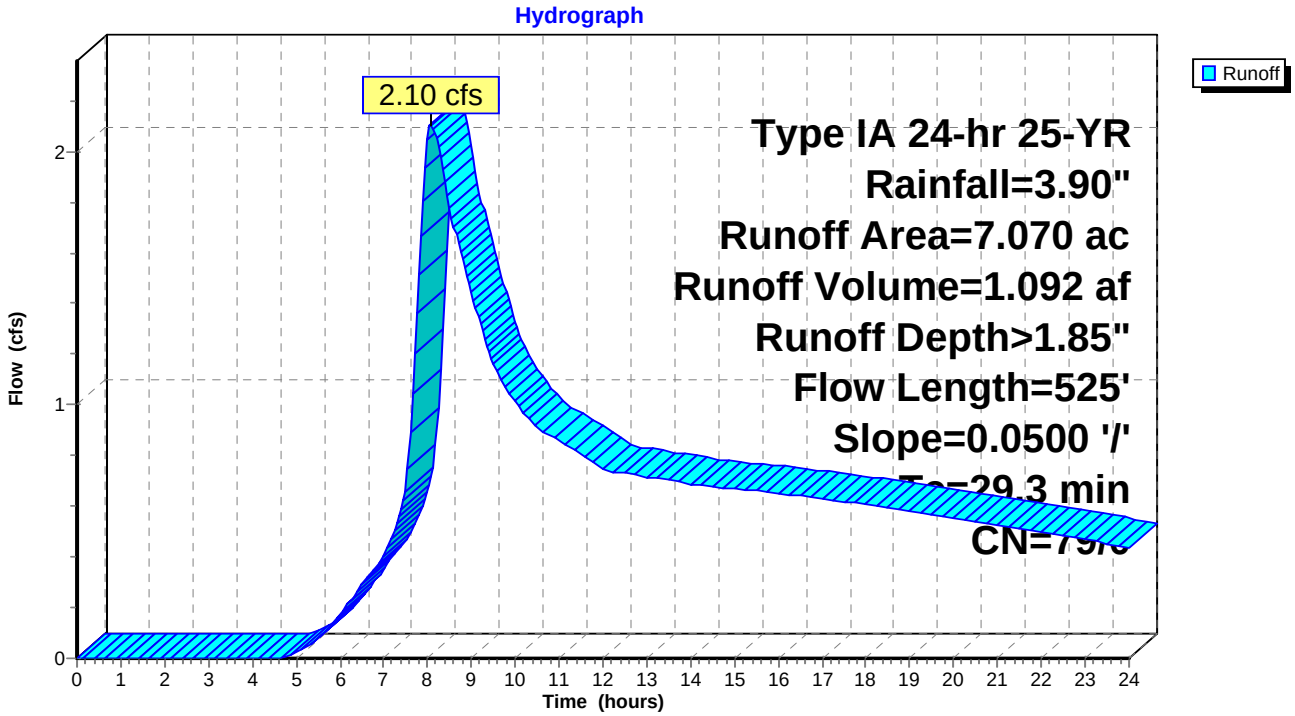
Runoff = 2.10 cfs @ 8.07 hrs, Volume= 1.092 af, Depth> 1.85"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	7.070	79	Pervious Area according to HHPR report (Basins 7 and 9 are 60% undeveloped)
	7.070	79	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.9	300	0.0500	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.50"
2.4	225	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.3	525	Total			

Subcatchment Node F1: Undeveloped Basins 6, 7, 9 (Equivalent Flow)



Summary for Subcatchment Node F2: Basins 5, 8, 10 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

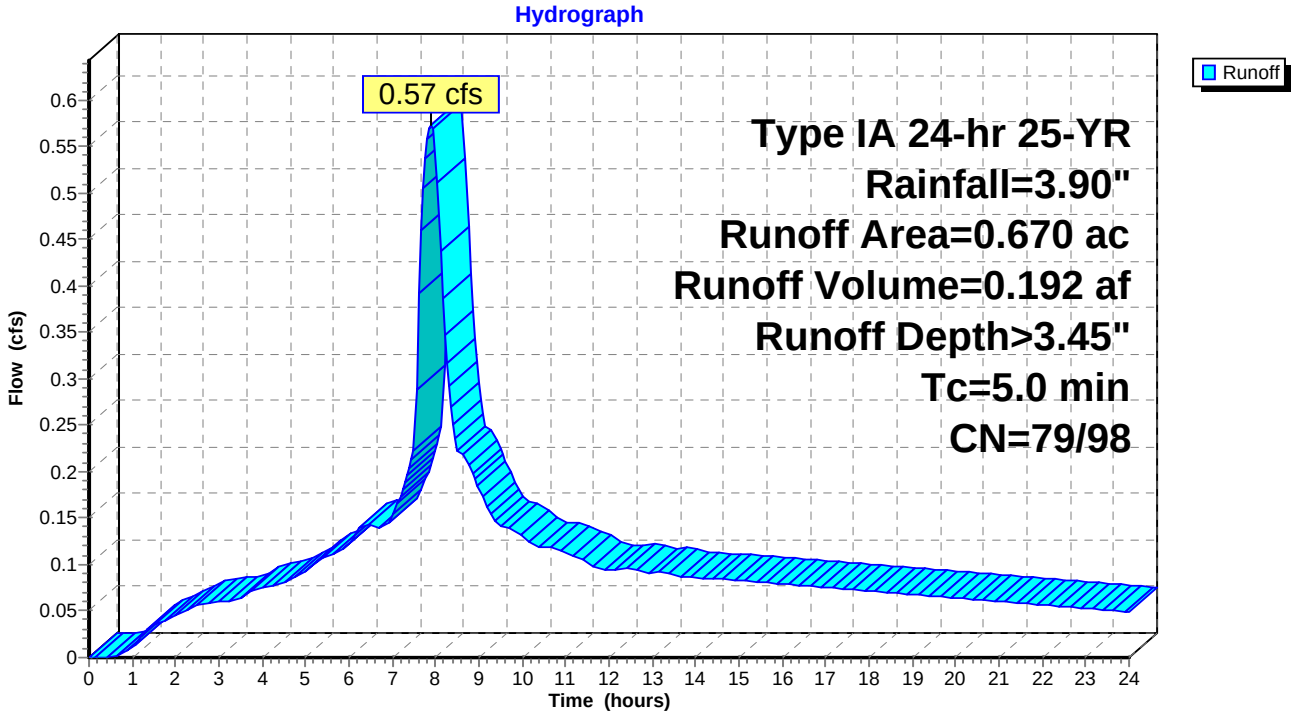
Runoff = 0.57 cfs @ 7.90 hrs, Volume= 0.192 af, Depth> 3.45"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.590	98	Impervious Area according to HHPR report
*	0.080	79	Pervious Area according to HHPR report
	0.670	96	Weighted Average
	0.080	79	Pervious Area
	0.590	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node F2: Basins 5, 8, 10 (Equivalent Flow)



Summary for Subcatchment Node F3: Basins 11, 12 (Equivalent Flow)

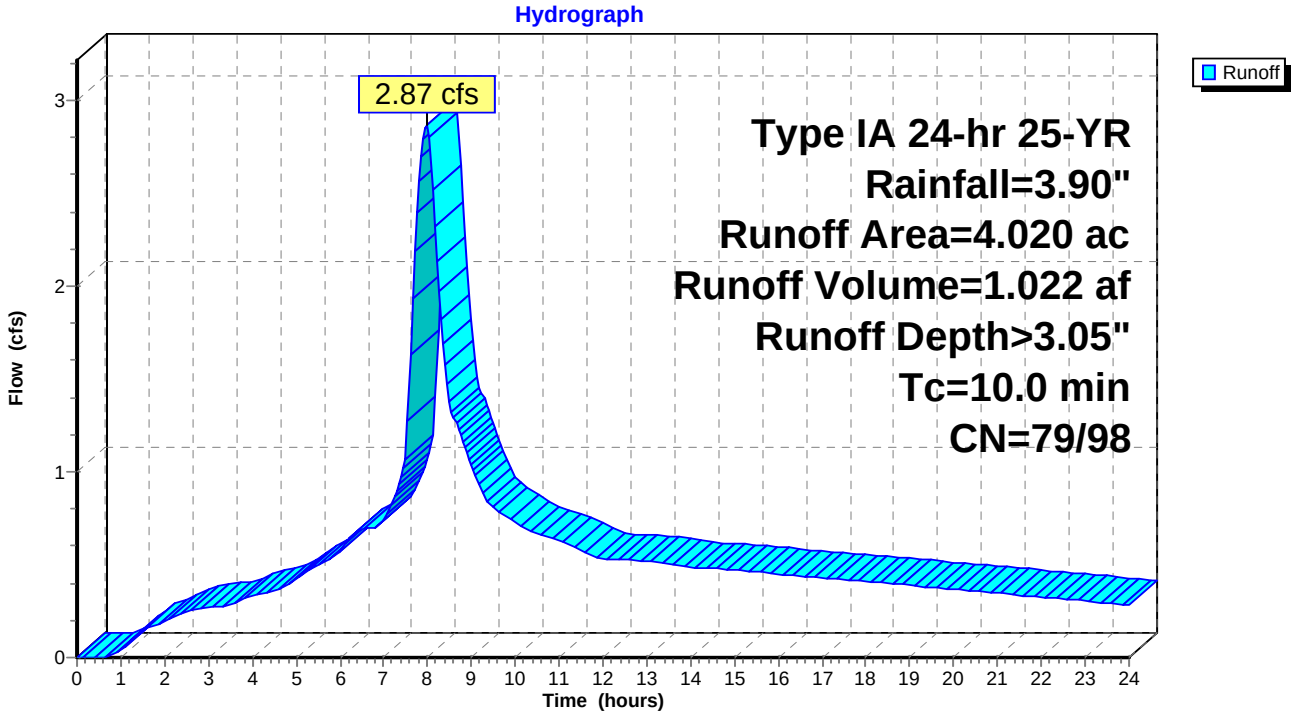
Runoff = 2.87 cfs @ 7.98 hrs, Volume= 1.022 af, Depth> 3.05"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	2.660	98	Impervious Area according to HHPR report (53% of Basin 12 incorporates proposed site)
*	1.360	79	Pervious Area according to HHPR report (53% of Basin 12 incorporates proposed site)
	4.020	92	Weighted Average
	1.360	79	Pervious Area
	2.660	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node F3: Basins 11, 12 (Equivalent Flow)



Summary for Subcatchment Node G: Basin 14 (Equivalent Flow)

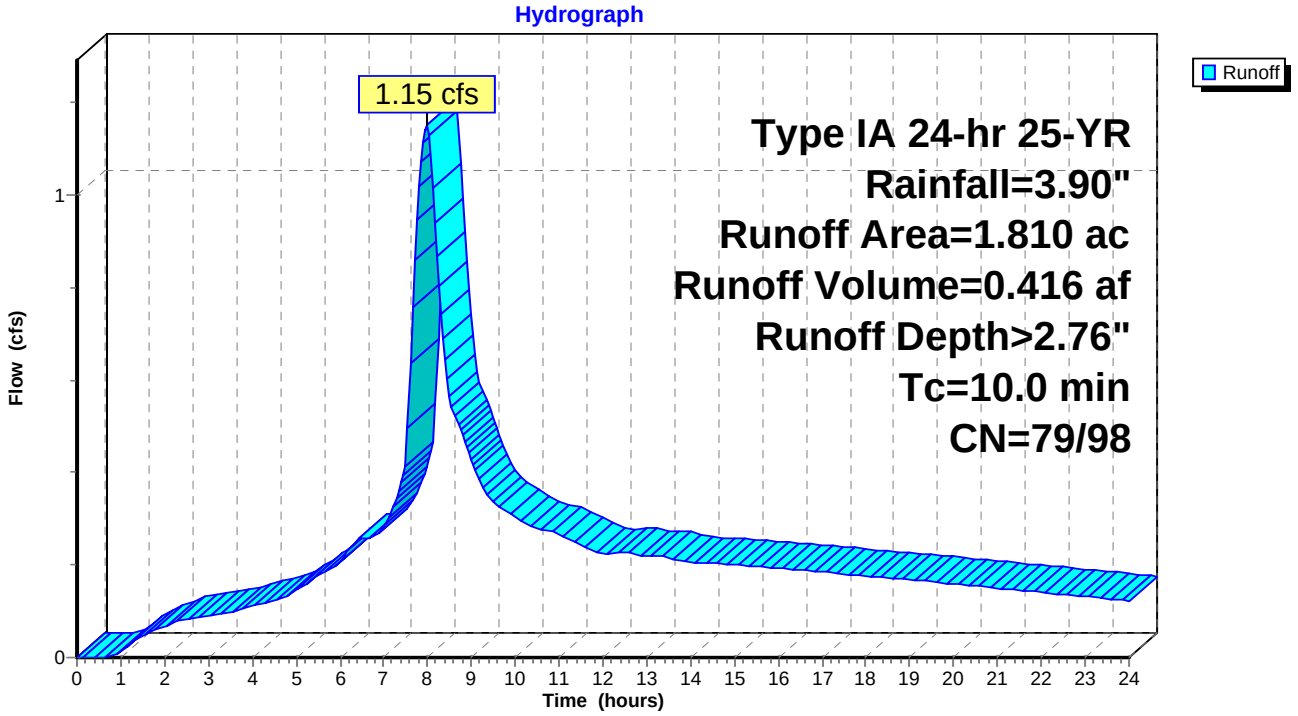
Runoff = 1.15 cfs @ 7.98 hrs, Volume= 0.416 af, Depth> 2.76"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.900	98	Impervious Area according to HHPR report
*	0.910	79	Pervious Area according to HHPR report
	1.810	88	Weighted Average
	0.910	79	Pervious Area
	0.900	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node G: Basin 14 (Equivalent Flow)



Summary for Subcatchment Node H1: Basins 15 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

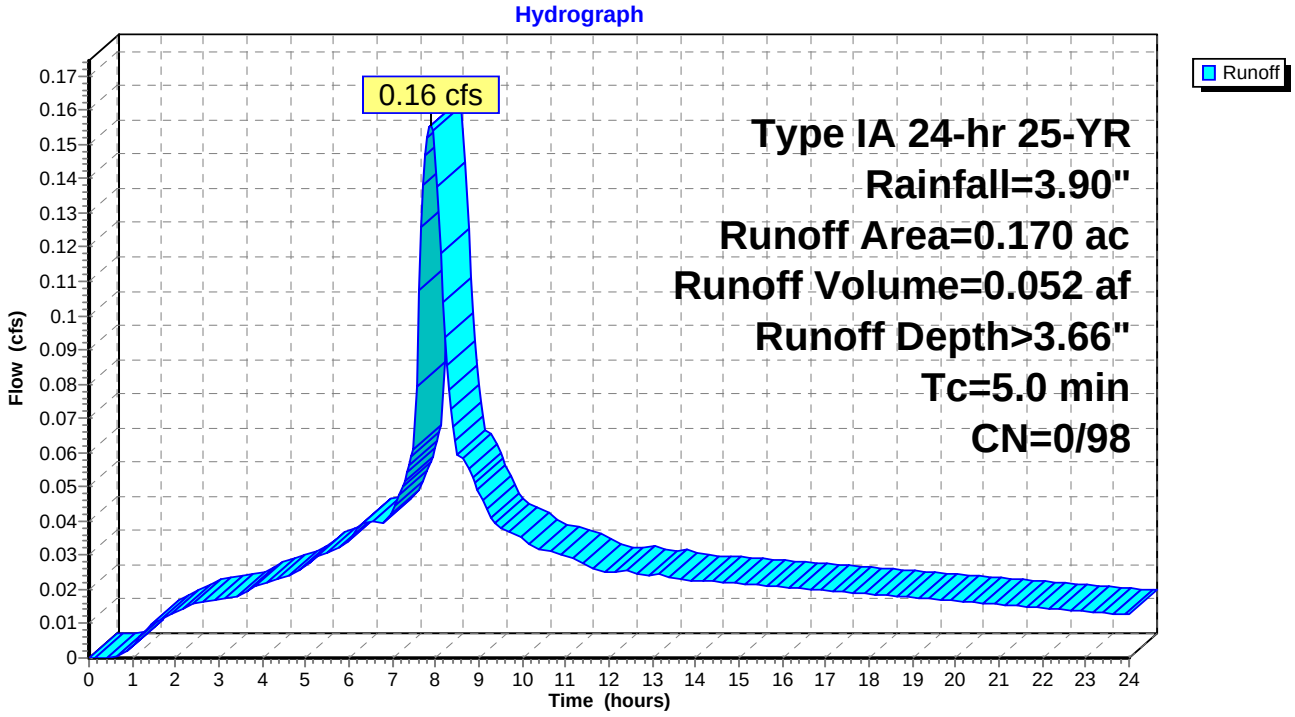
Runoff = 0.16 cfs @ 7.90 hrs, Volume= 0.052 af, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.170	98	Impervious Area according to HHPR report
	0.170	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node H1: Basins 15 (Equivalent Flow)



Summary for Subcatchment Node H2: Basin 18 (Equivalent Flow)

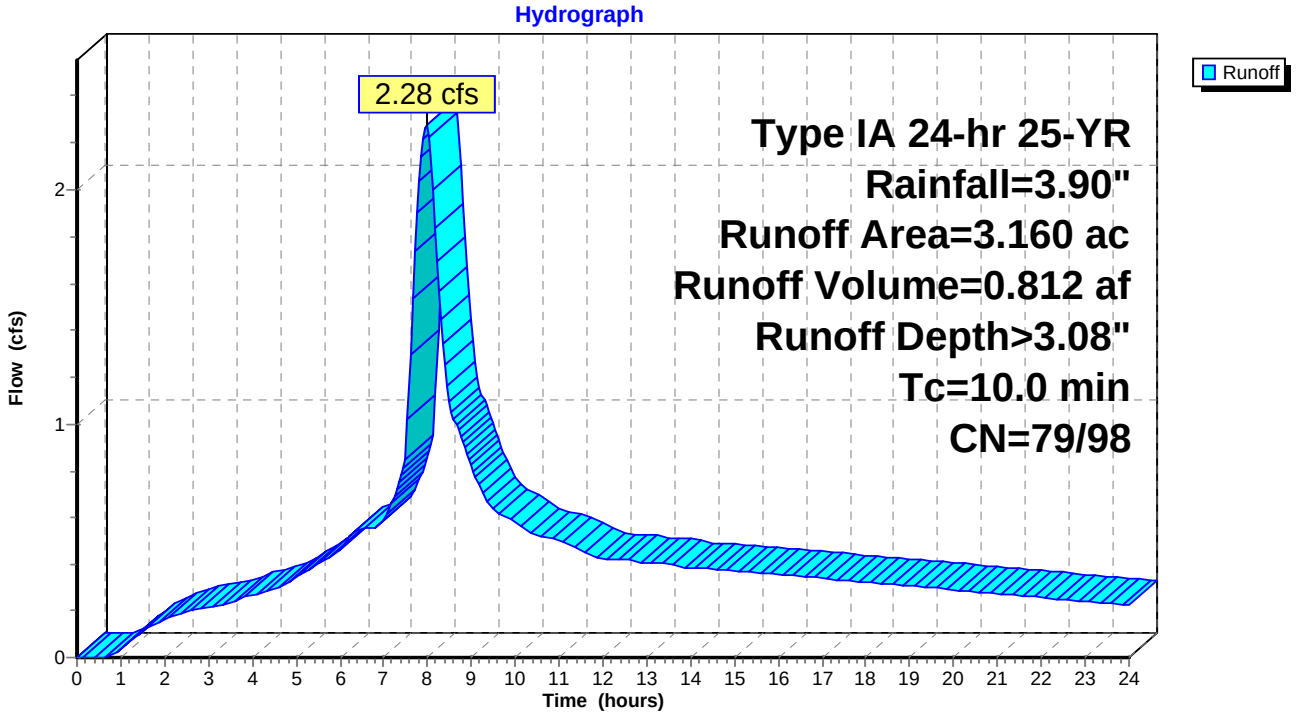
Runoff = 2.28 cfs @ 7.98 hrs, Volume= 0.812 af, Depth> 3.08"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	2.150	98	Impervious Area according to HHPR report
*	1.010	79	Pervious Area according to HHPR report
	3.160	92	Weighted Average
	1.010	79	Pervious Area
	2.150	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node H2: Basin 18 (Equivalent Flow)



Summary for Subcatchment Node I: Basin 16 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

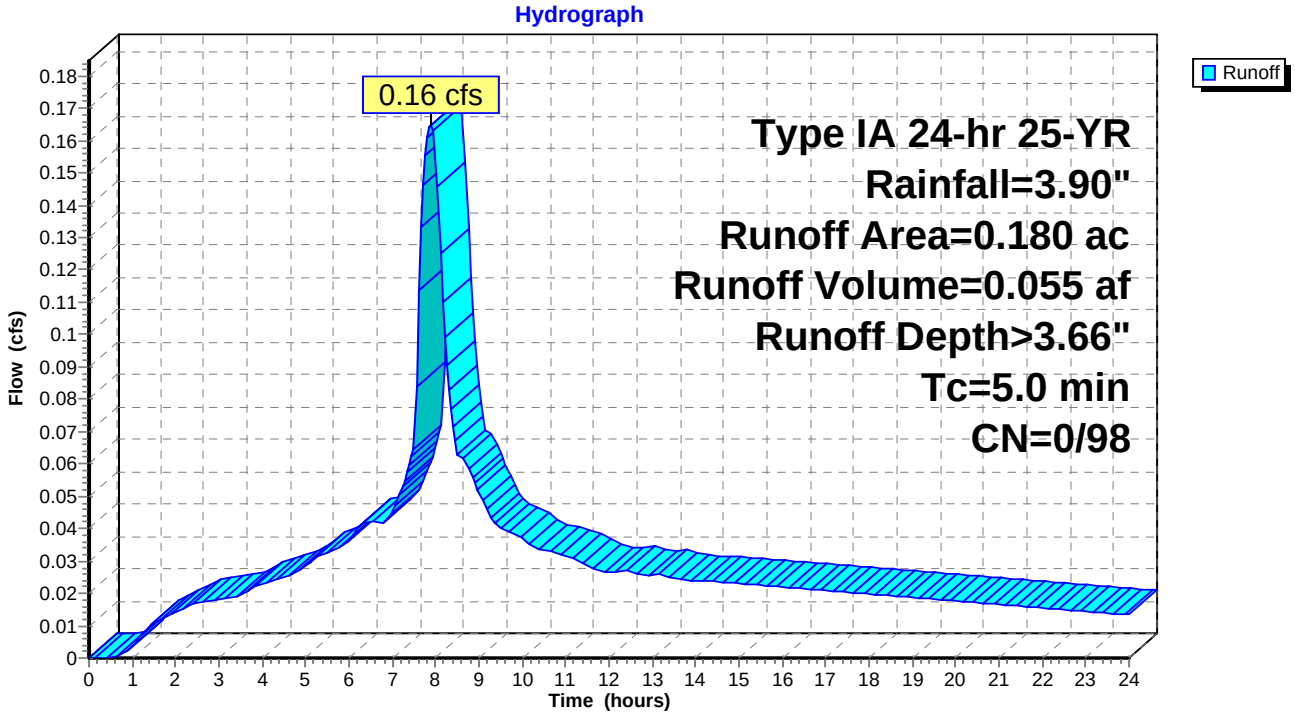
Runoff = 0.16 cfs @ 7.90 hrs, Volume= 0.055 af, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.180	98	Impervious Area according to HHPR report
	0.180	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node I: Basin 16 (Equivalent Flow)



Summary for Subcatchment Node J: Basin 19 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

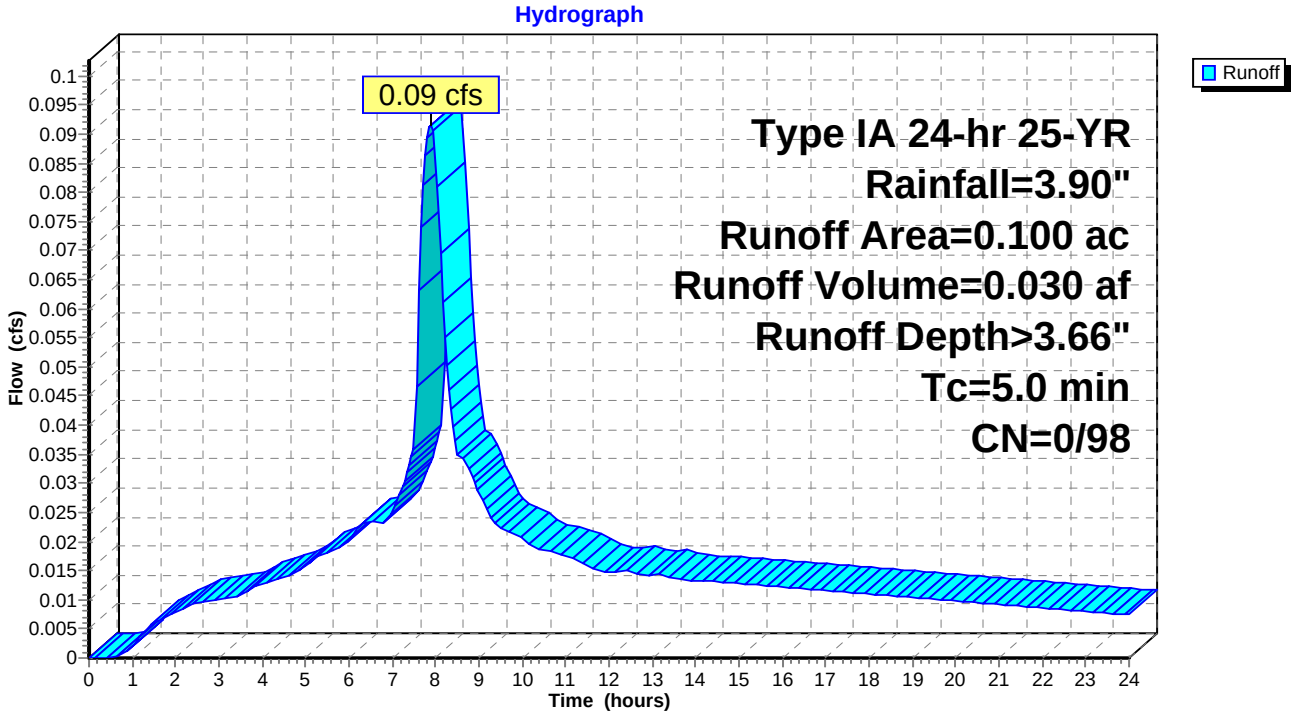
Runoff = 0.09 cfs @ 7.90 hrs, Volume= 0.030 af, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.100	98	Impervious Area according to HHPR report
	0.100	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node J: Basin 19 (Equivalent Flow)



Summary for Subcatchment Node L1: Basin 1 (Equivalent Flow)

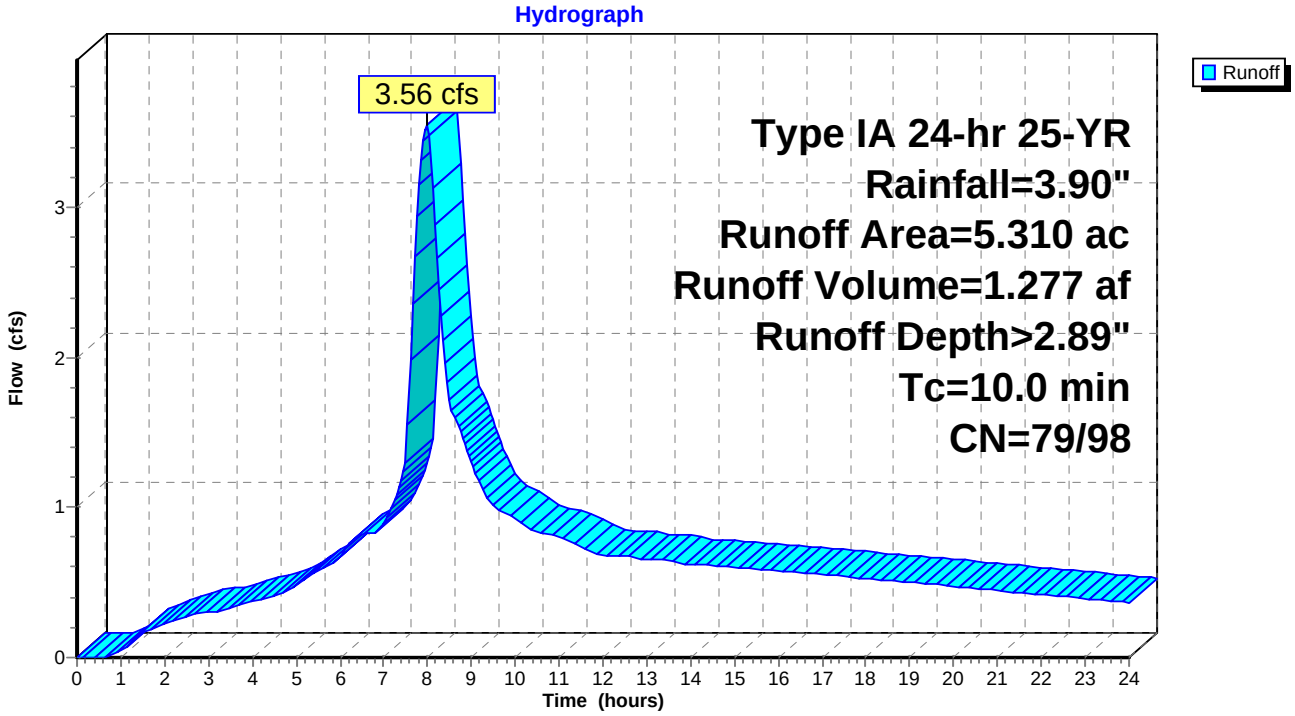
Runoff = 3.56 cfs @ 7.98 hrs, Volume= 1.277 af, Depth> 2.89"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	3.020	98	Impervious Area according to HHPR report
*	2.290	79	Pervious Area according to HHPR report
	5.310	90	Weighted Average
	2.290	79	Pervious Area
	3.020	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node L1: Basin 1 (Equivalent Flow)



Summary for Subcatchment Node L2: Undeveloped Basin 2 (Equivalent Flow)

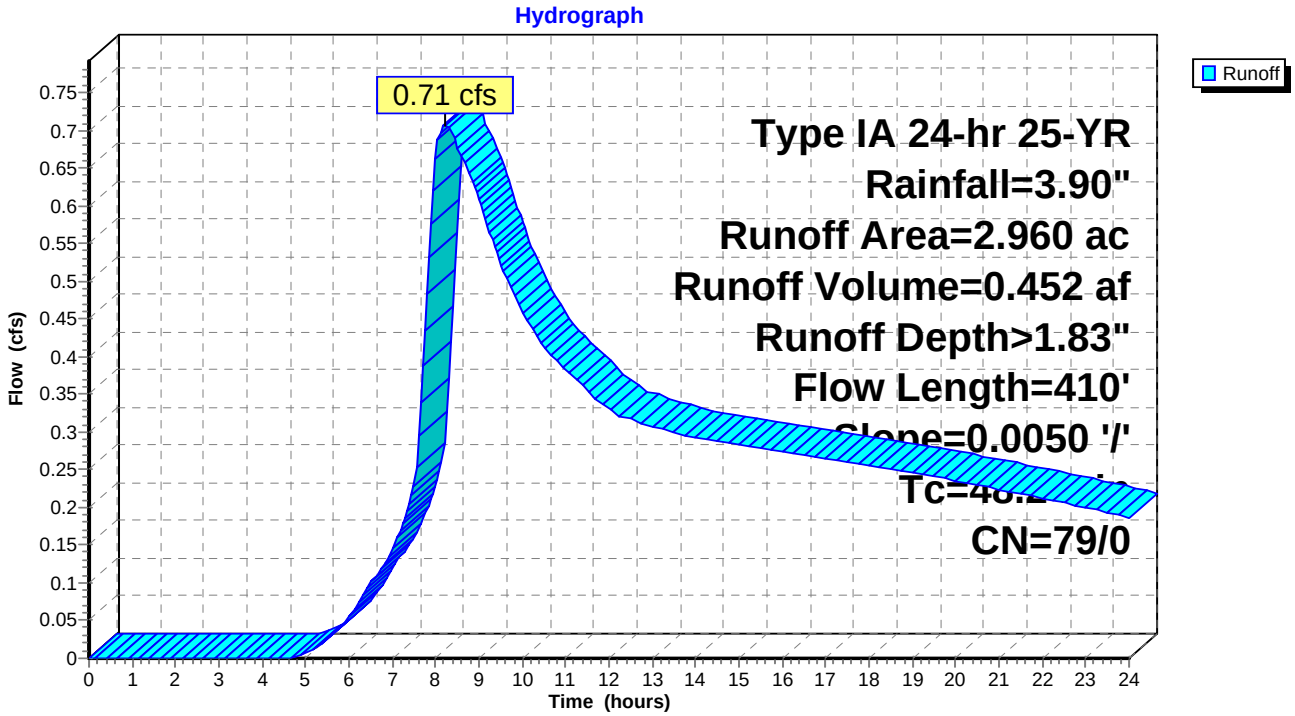
Runoff = 0.71 cfs @ 8.23 hrs, Volume= 0.452 af, Depth> 1.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	2.960	79	Pervious Area according to HHPR report
	2.960	79	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.5	300	0.0050	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
1.7	110	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
48.2	410	Total			

Subcatchment Node L2: Undeveloped Basin 2 (Equivalent Flow)



Summary for Subcatchment Node L3: Basin 3 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

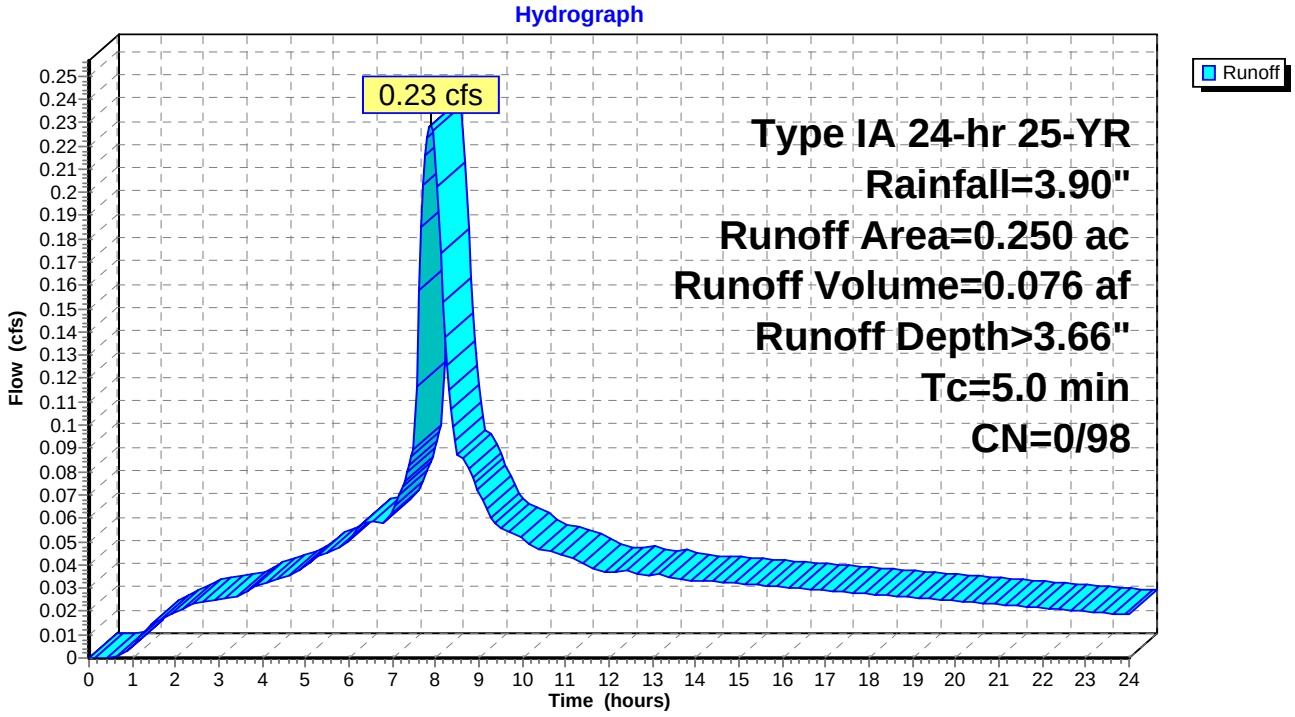
Runoff = 0.23 cfs @ 7.90 hrs, Volume= 0.076 af, Depth> 3.66"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.250	98	Impervious Area according to HHPR report
	0.250	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node L3: Basin 3 (Equivalent Flow)



Summary for Subcatchment Node L4: Basin 4 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

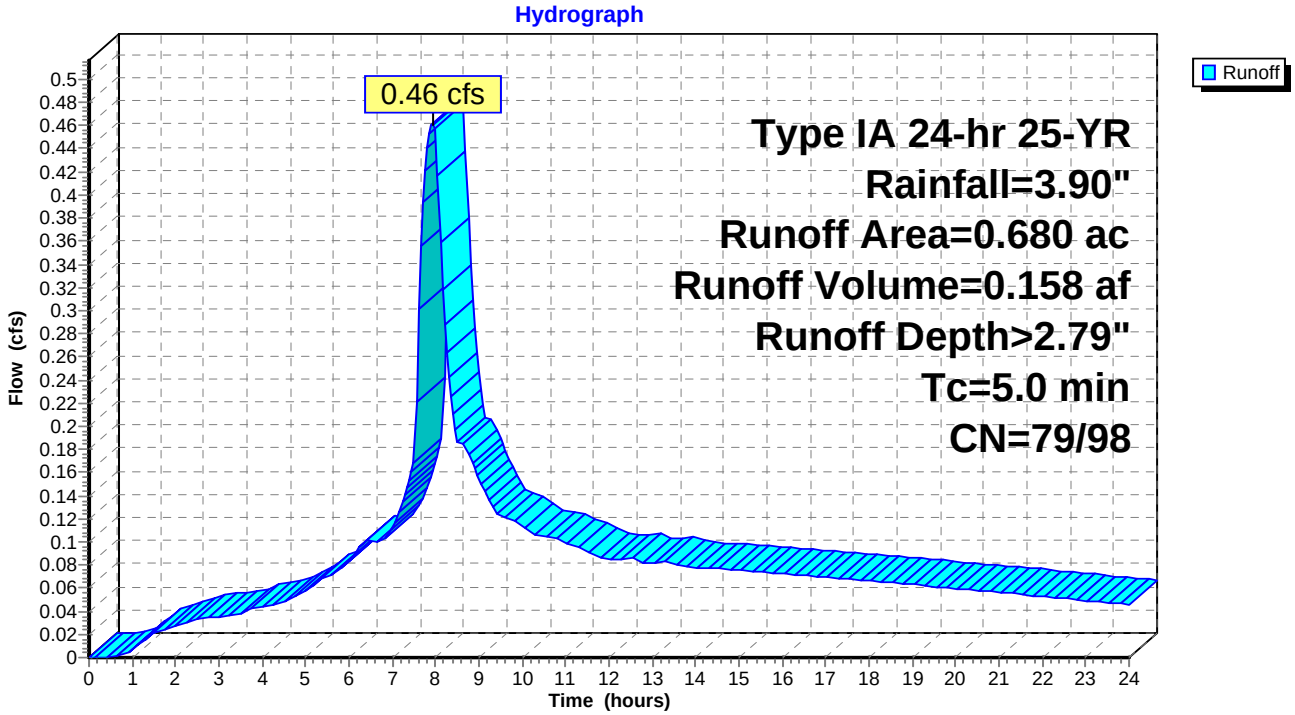
Runoff = 0.46 cfs @ 7.93 hrs, Volume= 0.158 af, Depth> 2.79"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.90"

	Area (ac)	CN	Description
*	0.350	98	Impervious Area according to HHPR report
*	0.330	79	Pervious Area according to HHPR report
	0.680	89	Weighted Average
	0.330	79	Pervious Area
	0.350	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node L4: Basin 4 (Equivalent Flow)



Summary for Reach 2R: Chicken Creek Trib.

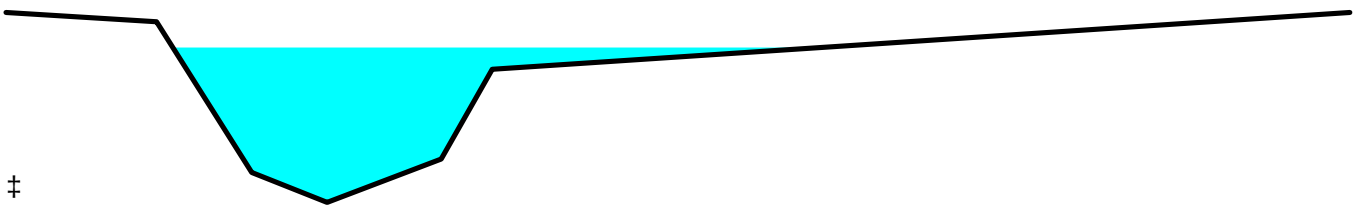
[87] Warning: Oscillations may require Finer Routing or smaller dt
[62] Warning: Exceeded Reach 3R OUTLET depth by 0.67' @ 8.15 hrs

Inflow Area = 130.348 ac, 21.41% Impervious, Inflow Depth > 2.18" for 25-YR event
Inflow = 45.35 cfs @ 8.06 hrs, Volume= 23.713 af
Outflow = 44.14 cfs @ 8.14 hrs, Volume= 23.678 af, Atten= 3%, Lag= 4.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.72 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 3.66 fps, Avg. Travel Time= 2.8 min

Peak Storage= 6,233 cf @ 8.14 hrs, Average Depth at Peak Storage= 1.50'
Bank-Full Depth= 1.84', Capacity at Bank-Full= 78.30 cfs

Custom cross-section, Length= 620.0' Slope= 0.0177 '/'
Constant n= 0.030
Inlet Invert= 162.00', Outlet Invert= 151.04'

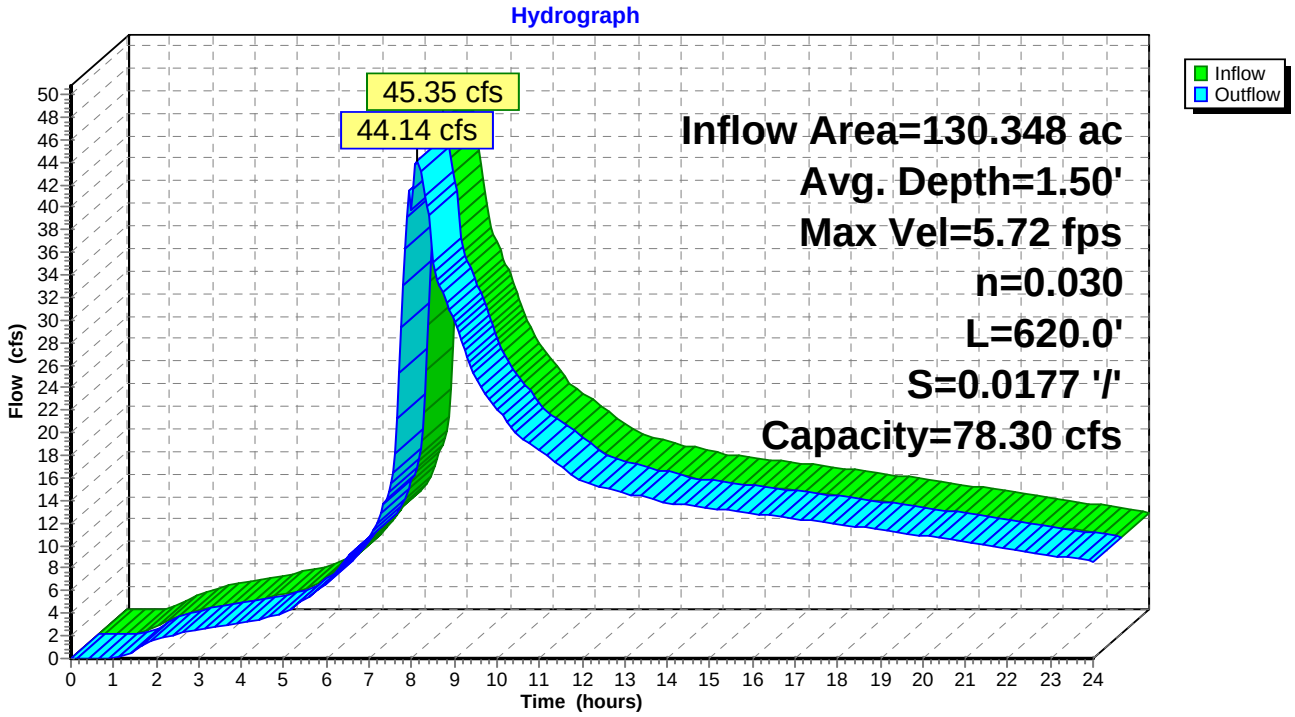


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-8.85	1.84	0.00
-4.70	1.75	0.09
-2.08	0.29	1.55
0.00	0.00	1.84
3.14	0.42	1.42
4.55	1.29	0.55
28.18	1.84	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.29	0.6	4.3	382	1.12
0.42	1.2	5.5	773	3.05
1.29	7.3	9.0	4,516	41.51
1.75	15.9	29.7	9,855	68.90
1.84	18.9	37.7	11,697	78.30

Reach 2R: Chicken Creek Trib.



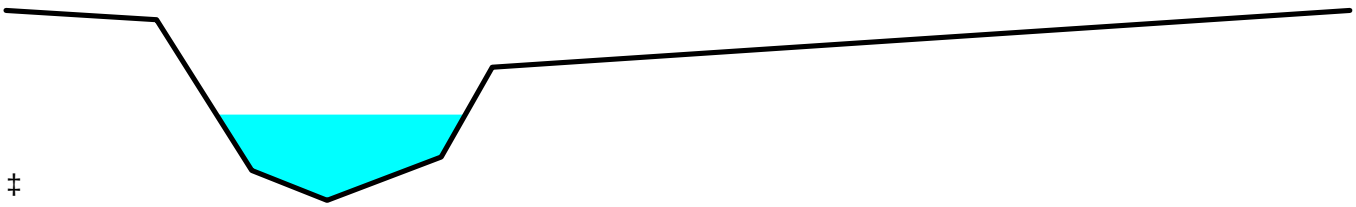
Summary for Reach 3R: Chicken Creek Trib. Upstream

Inflow Area = 83.000 ac, 9.64% Impervious, Inflow Depth > 1.99" for 25-YR event
Inflow = 20.96 cfs @ 8.25 hrs, Volume= 13.797 af
Outflow = 20.93 cfs @ 8.29 hrs, Volume= 13.758 af, Atten= 0%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.54 fps, Min. Travel Time= 3.4 min
Avg. Velocity = 3.58 fps, Avg. Travel Time= 5.2 min

Peak Storage= 4,209 cf @ 8.29 hrs, Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 1.84', Capacity at Bank-Full= 100.90 cfs

Custom cross-section, Length= 1,114.0' Slope= 0.0294 '/'
Constant n= 0.030
Inlet Invert= 194.70', Outlet Invert= 162.00'

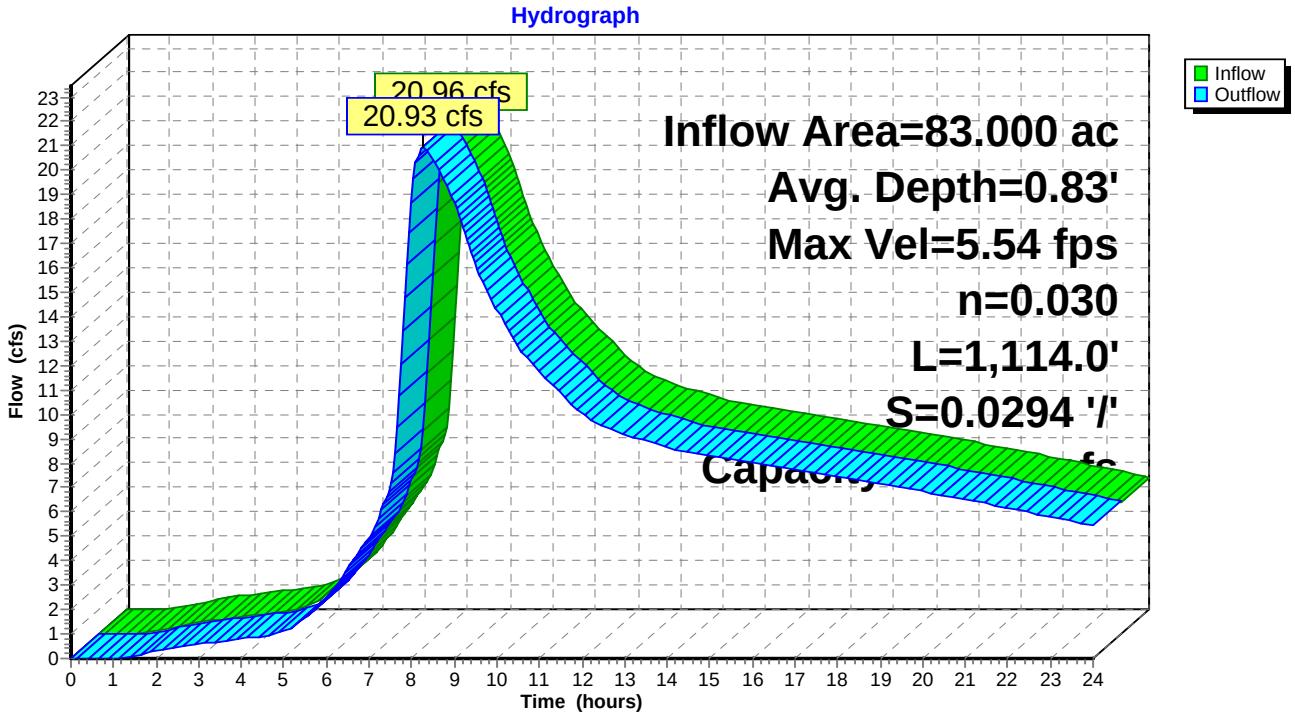


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-8.85	1.84	0.00
-4.70	1.75	0.09
-2.08	0.29	1.55
0.00	0.00	1.84
3.14	0.42	1.42
4.55	1.29	0.55
28.18	1.84	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.29	0.6	4.3	687	1.44
0.42	1.2	5.5	1,389	3.92
1.29	7.3	9.0	8,114	53.49
1.75	15.9	29.7	17,708	88.78
1.84	18.9	37.7	21,017	100.90

Reach 3R: Chicken Creek Trib. Upstream



Summary for Reach 4R: Regional Facility

Inflow Area = 43.975 ac, 45.26% Impervious, Inflow Depth > 2.62" for 25-YR event
Inflow = 25.34 cfs @ 7.99 hrs, Volume= 9.604 af
Outflow = 25.04 cfs @ 8.03 hrs, Volume= 9.569 af, Atten= 1%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.91 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 7.5 min

Peak Storage= 6,323 cf @ 8.03 hrs, Average Depth at Peak Storage= 1.75'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 69.35 cfs

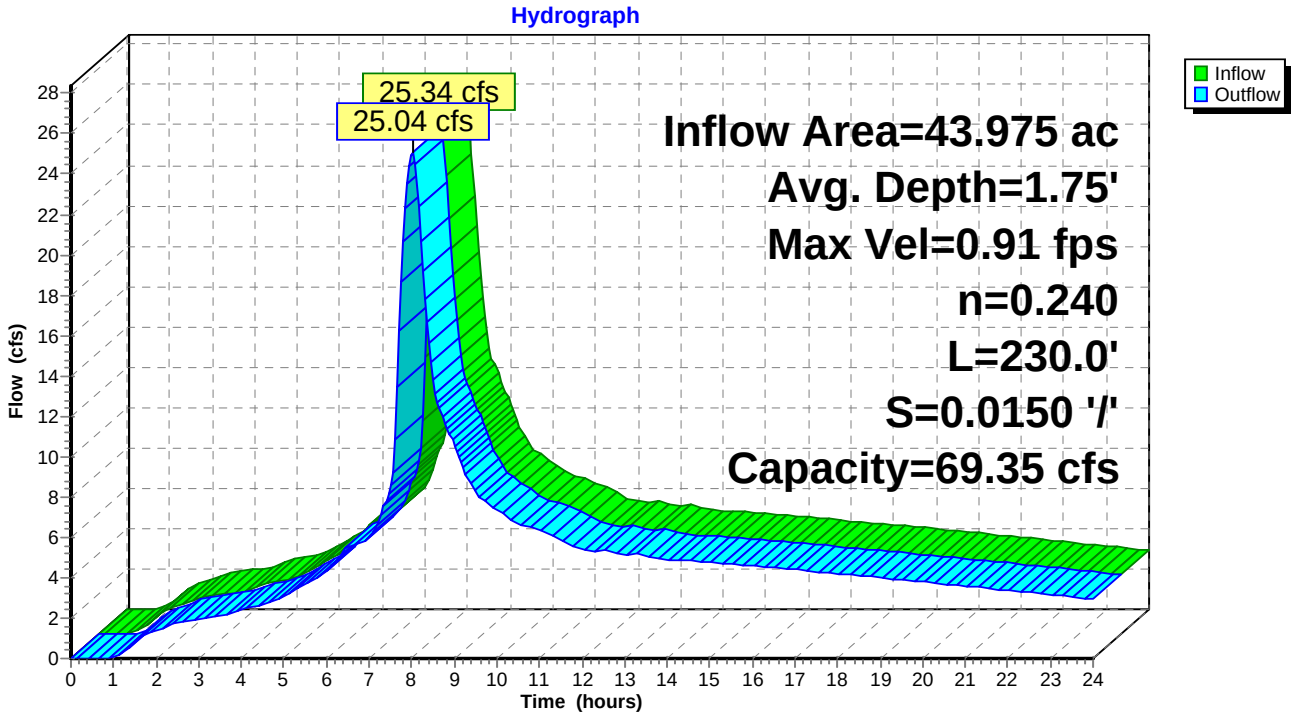
Custom cross-section, Length= 230.0' Slope= 0.0150 '/' (101 Elevation Intervals)
Constant n= 0.240
Inlet Invert= 174.00', Outlet Invert= 170.55'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-13.25	3.00	0.00
-7.00	0.50	2.50
-5.00	0.00	3.00
5.00	0.00	3.00
7.00	0.50	2.50
13.25	3.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	10.0	0	0.00
0.50	6.0	14.1	1,380	2.57
3.00	56.6	27.6	13,024	69.35

Reach 4R: Regional Facility



Summary for Reach 7R: EX 24"

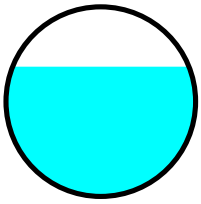
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Warning: Exceeded Reach 8R OUTLET depth by 0.29' @ 8.05 hrs
[62] Warning: Exceeded Reach 9R OUTLET depth by 0.14' @ 8.00 hrs

Inflow Area = 43.901 ac, 45.16% Impervious, Inflow Depth > 2.62" for 25-YR event
Inflow = 25.29 cfs @ 7.99 hrs, Volume= 9.583 af
Outflow = 25.27 cfs @ 7.99 hrs, Volume= 9.581 af, Atten= 0%, Lag= 0.1 min

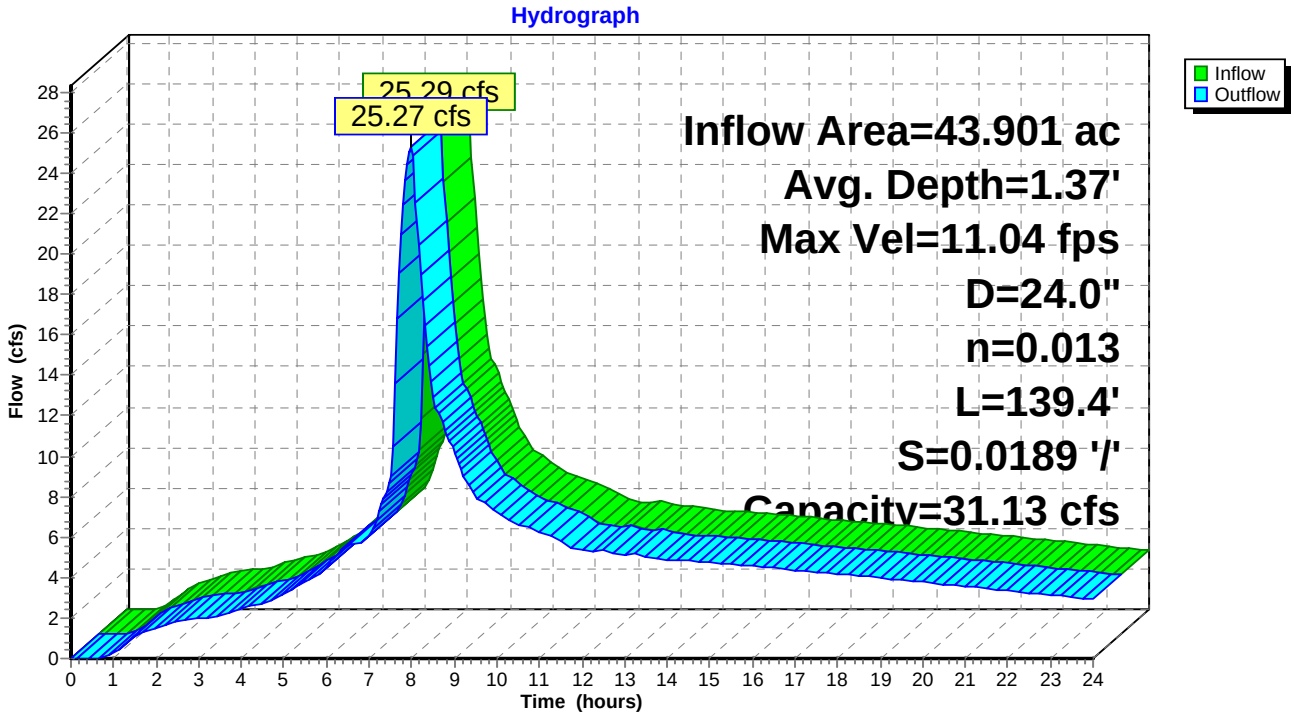
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 11.04 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 6.91 fps, Avg. Travel Time= 0.3 min

Peak Storage= 319 cf @ 7.99 hrs, Average Depth at Peak Storage= 1.37'
Defined Flood Depth= 185.68', Capacity at Flood Depth= -11,966.43 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 31.13 cfs

24.0" Diameter Pipe, n= 0.013
Length= 139.4' Slope= 0.0189 '/'
Inlet Invert= 178.45', Outlet Invert= 175.81'



Reach 7R: EX 24"



Summary for Reach 8R: 18"

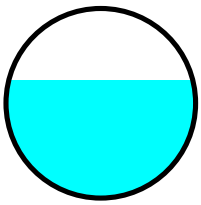
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 6.256 ac, 49.92% Impervious, Inflow Depth > 2.59" for 25-YR event
Inflow = 3.83 cfs @ 7.94 hrs, Volume= 1.349 af
Outflow = 3.83 cfs @ 7.95 hrs, Volume= 1.348 af, Atten= 0%, Lag= 0.5 min

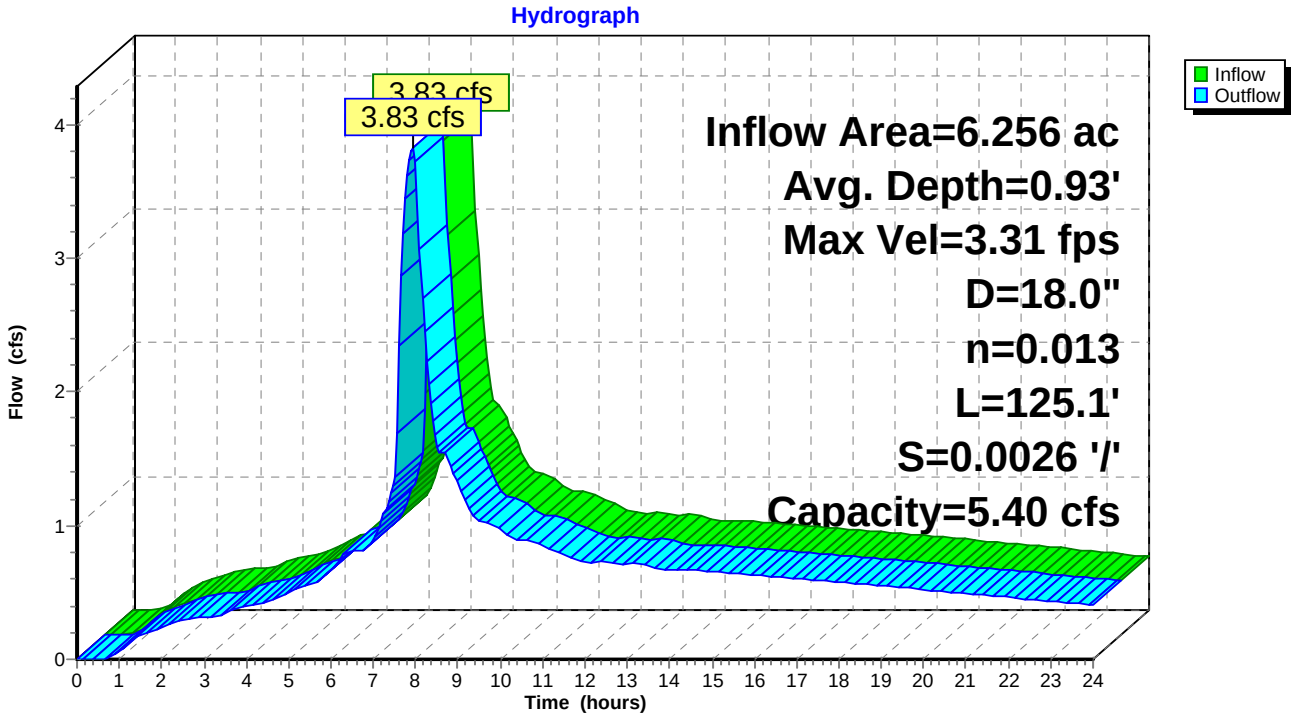
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.31 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.01 fps, Avg. Travel Time= 1.0 min

Peak Storage= 144 cf @ 7.95 hrs, Average Depth at Peak Storage= 0.93'
Defined Flood Depth= 183.79', Capacity at Flood Depth= -2,745.79 cfs
Bank-Full Depth= 1.50', Capacity at Bank-Full= 5.40 cfs

18.0" Diameter Pipe, n= 0.013
Length= 125.1' Slope= 0.0026 '/'
Inlet Invert= 178.94', Outlet Invert= 178.61'



Reach 8R: 18"



Summary for Reach 9R: 24"

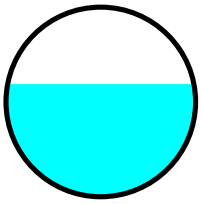
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 10R outlet invert by 1.01' @ 8.00 hrs

Inflow Area =	28.445 ac,	46.00% Impervious,	Inflow Depth >	2.65"	for 25-YR event
Inflow =	16.58 cfs @	7.99 hrs,	Volume=	6.272 af	
Outflow =	16.57 cfs @	7.99 hrs,	Volume=	6.271 af,	Atten= 0%, Lag= 0.1 min

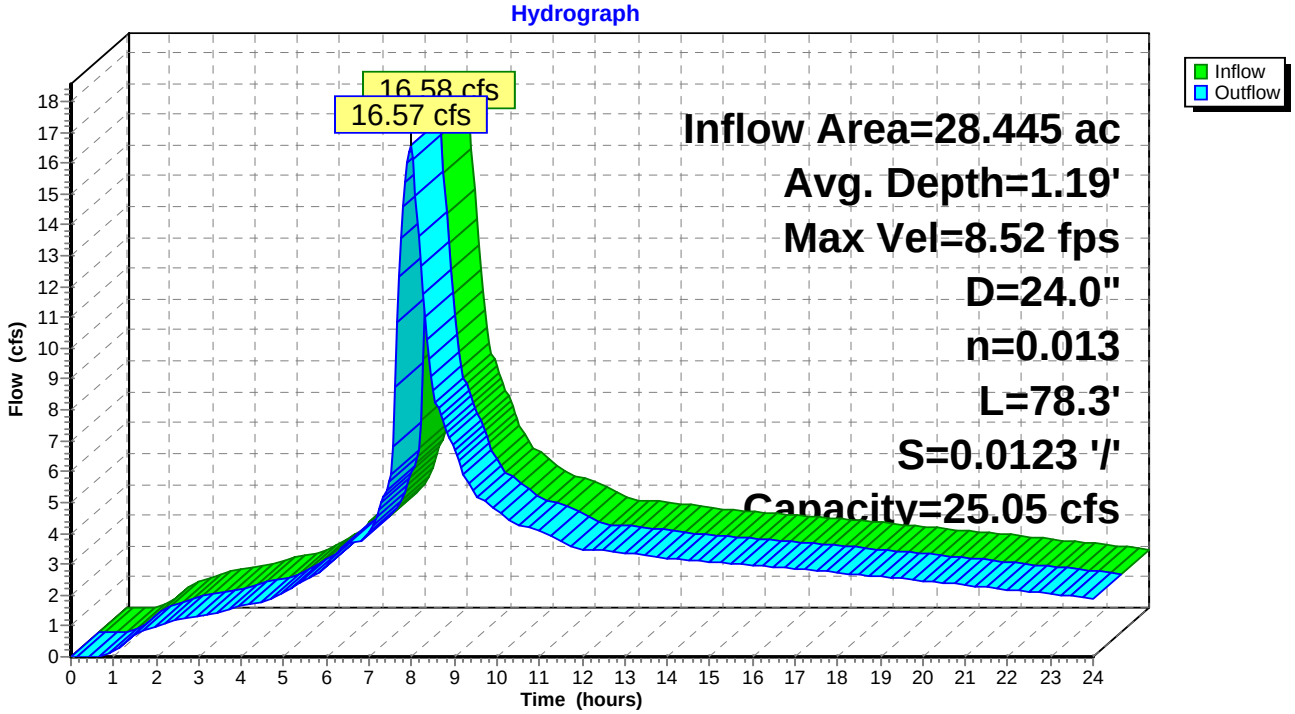
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.52 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.24 fps, Avg. Travel Time= 0.2 min

Peak Storage= 152 cf @ 7.99 hrs, Average Depth at Peak Storage= 1.19'
Defined Flood Depth= 188.25', Capacity at Flood Depth= -9,763.35 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 25.05 cfs

24.0" Diameter Pipe, n= 0.013
Length= 78.3' Slope= 0.0123 '/'
Inlet Invert= 179.45', Outlet Invert= 178.49'



Reach 9R: 24"



Summary for Reach 10R: 24"

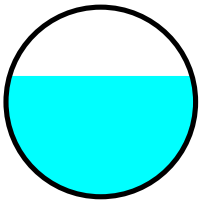
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 11R outlet invert by 1.07' @ 8.00 hrs

Inflow Area = 28.345 ac, 45.81% Impervious, Inflow Depth > 2.64" for 25-YR event
Inflow = 16.50 cfs @ 7.99 hrs, Volume= 6.243 af
Outflow = 16.49 cfs @ 7.99 hrs, Volume= 6.241 af, Atten= 0%, Lag= 0.1 min

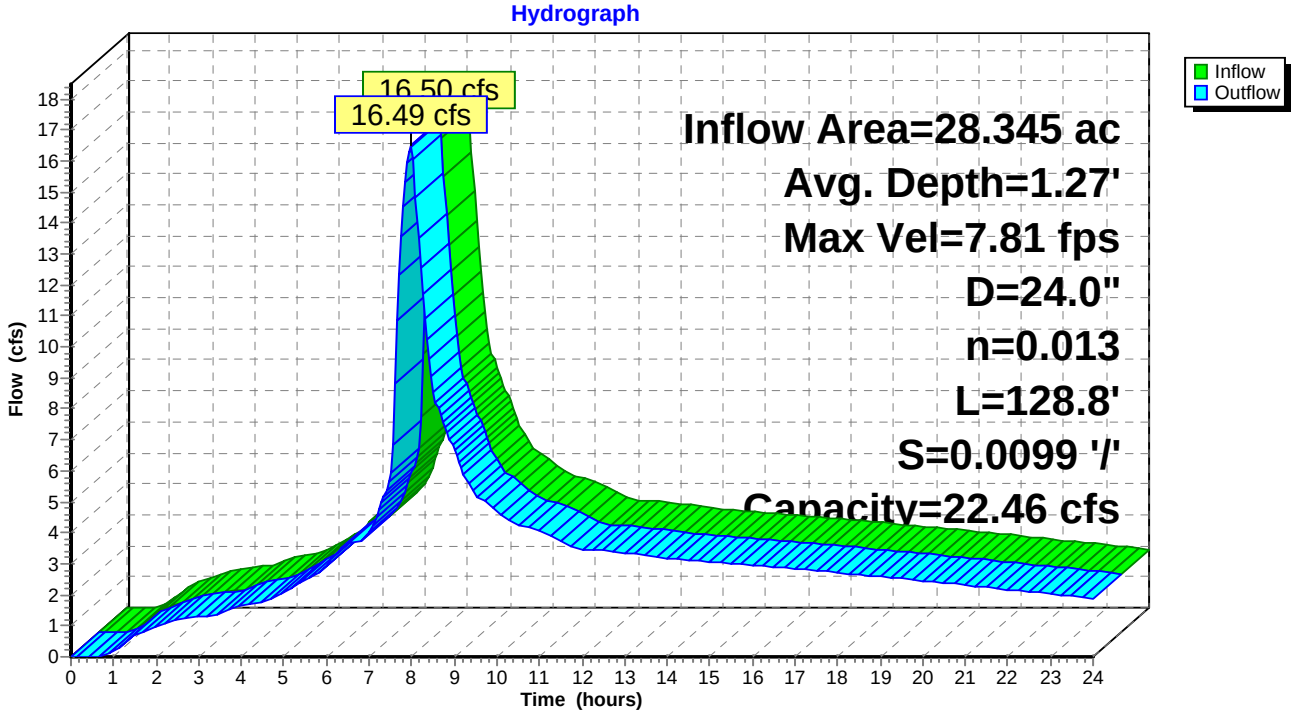
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.81 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.84 fps, Avg. Travel Time= 0.4 min

Peak Storage= 272 cf @ 7.99 hrs, Average Depth at Peak Storage= 1.27'
Defined Flood Depth= 191.00', Capacity at Flood Depth= -8,885.25 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 22.46 cfs

24.0" Diameter Pipe, n= 0.013
Length= 128.8' Slope= 0.0099 '/'
Inlet Invert= 180.90', Outlet Invert= 179.63'



Reach 10R: 24"



Summary for Reach 11R: 24"

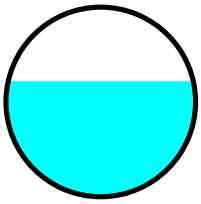
[52] Hint: Inlet/Outlet conditions not evaluated
[62] Warning: Exceeded Reach 12R OUTLET depth by 0.21' @ 7.95 hrs

Inflow Area = 28.165 ac, 45.46% Impervious, Inflow Depth > 2.64" for 25-YR event
Inflow = 16.35 cfs @ 7.99 hrs, Volume= 6.189 af
Outflow = 16.34 cfs @ 7.99 hrs, Volume= 6.188 af, Atten= 0%, Lag= 0.1 min

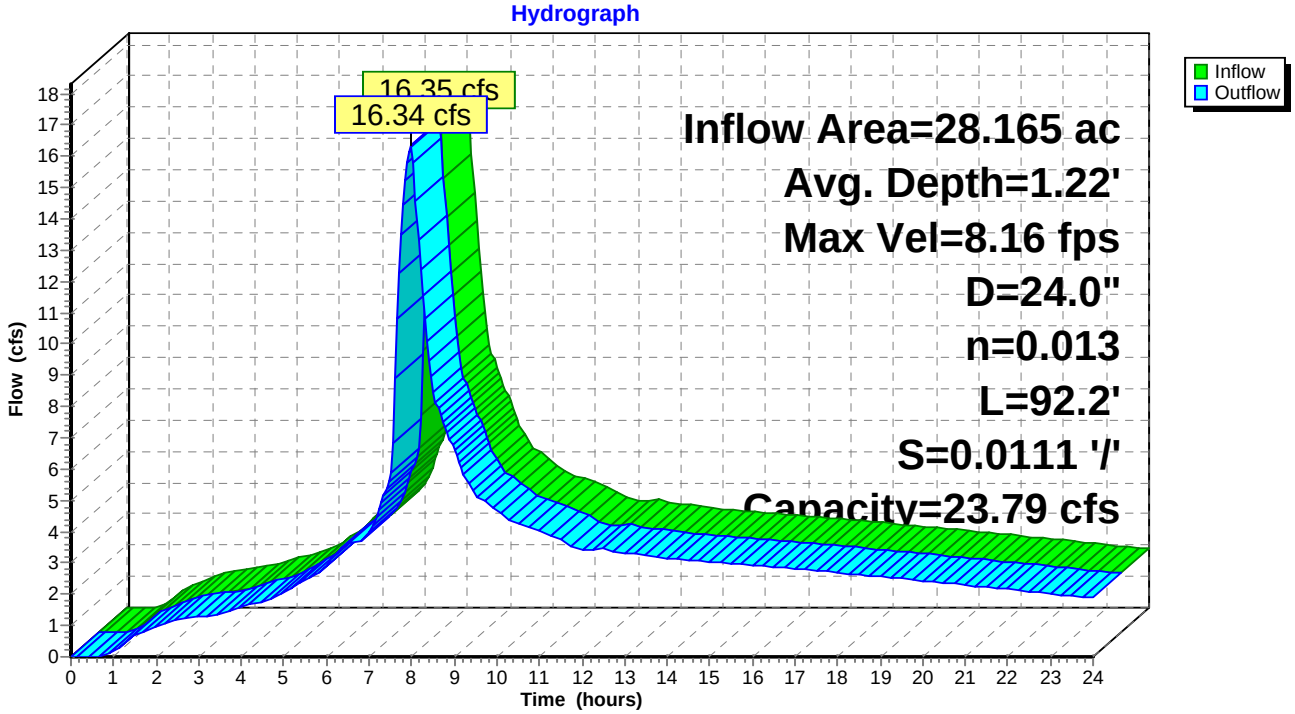
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.16 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 5.02 fps, Avg. Travel Time= 0.3 min

Peak Storage= 185 cf @ 7.99 hrs, Average Depth at Peak Storage= 1.22'
Defined Flood Depth= 184.68', Capacity at Flood Depth= -9,096.02 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 23.79 cfs

24.0" Diameter Pipe, n= 0.013
Length= 92.2' Slope= 0.0111 '/'
Inlet Invert= 182.12', Outlet Invert= 181.10'



Reach 11R: 24"



Summary for Reach 12R: 24"

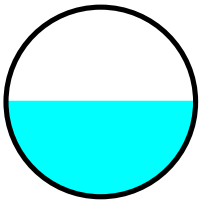
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 13R outlet invert by 0.91' @ 8.00 hrs

Inflow Area = 21.450 ac, 43.08% Impervious, Inflow Depth > 2.63" for 25-YR event
Inflow = 12.15 cfs @ 8.00 hrs, Volume= 4.704 af
Outflow = 12.14 cfs @ 8.00 hrs, Volume= 4.703 af, Atten= 0%, Lag= 0.2 min

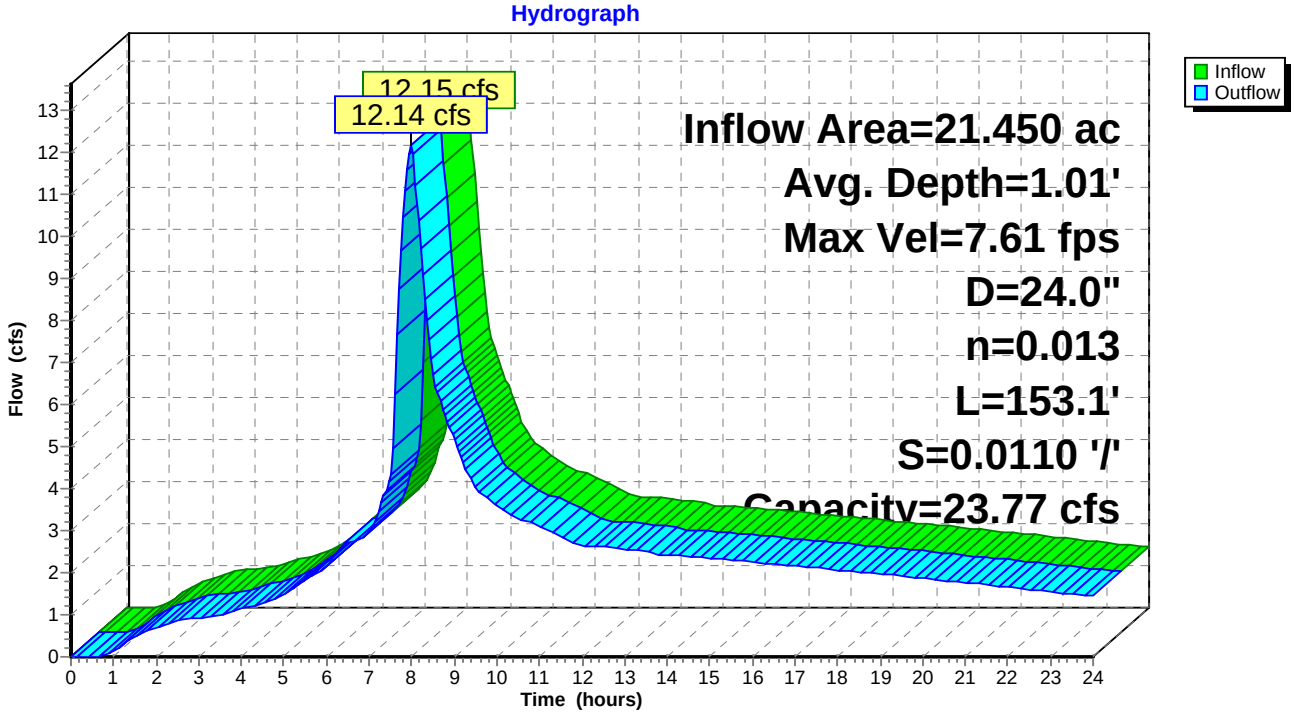
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.61 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.64 fps, Avg. Travel Time= 0.6 min

Peak Storage= 244 cf @ 8.00 hrs, Average Depth at Peak Storage= 1.01'
Defined Flood Depth= 193.90', Capacity at Flood Depth= -9,545.78 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 23.77 cfs

24.0" Diameter Pipe, n= 0.013
Length= 153.1' Slope= 0.0110 '/'
Inlet Invert= 183.81', Outlet Invert= 182.12'



Reach 12R: 24"



Summary for Reach 13R: 24"

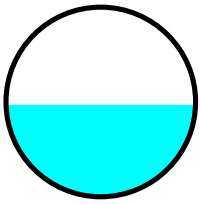
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 14R outlet invert by 0.61' @ 8.00 hrs

Inflow Area =	18.120 ac,	38.19% Impervious,	Inflow Depth >	2.54"	for 25-YR event
Inflow =	9.73 cfs @	8.00 hrs,	Volume=	3.842 af	
Outflow =	9.72 cfs @	8.00 hrs,	Volume=	3.840 af,	Atten= 0%, Lag= 0.3 min

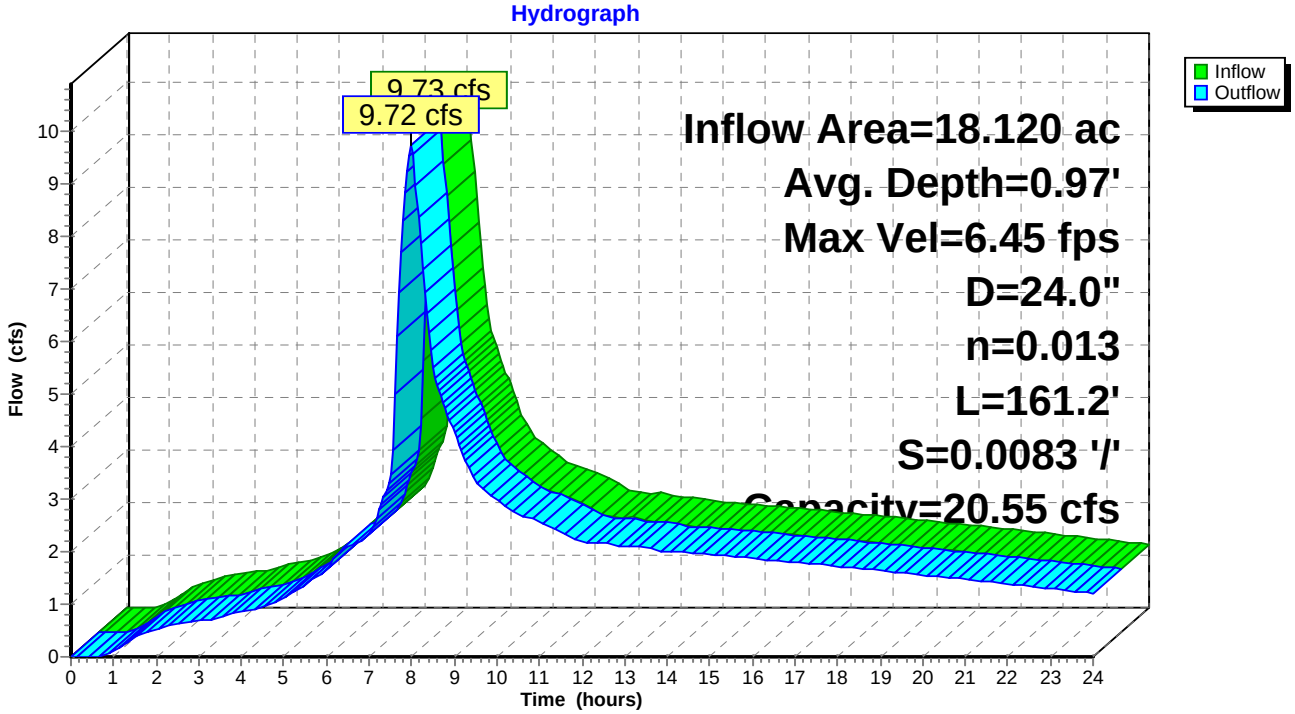
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.45 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.94 fps, Avg. Travel Time= 0.7 min

Peak Storage= 243 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.97'
Defined Flood Depth= 196.28', Capacity at Flood Depth= -8,355.36 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 20.55 cfs

24.0" Diameter Pipe, n= 0.013
Length= 161.2' Slope= 0.0083 '/'
Inlet Invert= 185.24', Outlet Invert= 183.91'



Reach 13R: 24"



Summary for Reach 14R: 18"

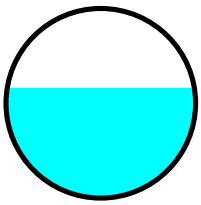
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 16.310 ac, 36.91% Impervious, Inflow Depth > 2.52" for 25-YR event
Inflow = 8.60 cfs @ 7.99 hrs, Volume= 3.427 af
Outflow = 8.58 cfs @ 8.00 hrs, Volume= 3.426 af, Atten= 0%, Lag= 0.3 min

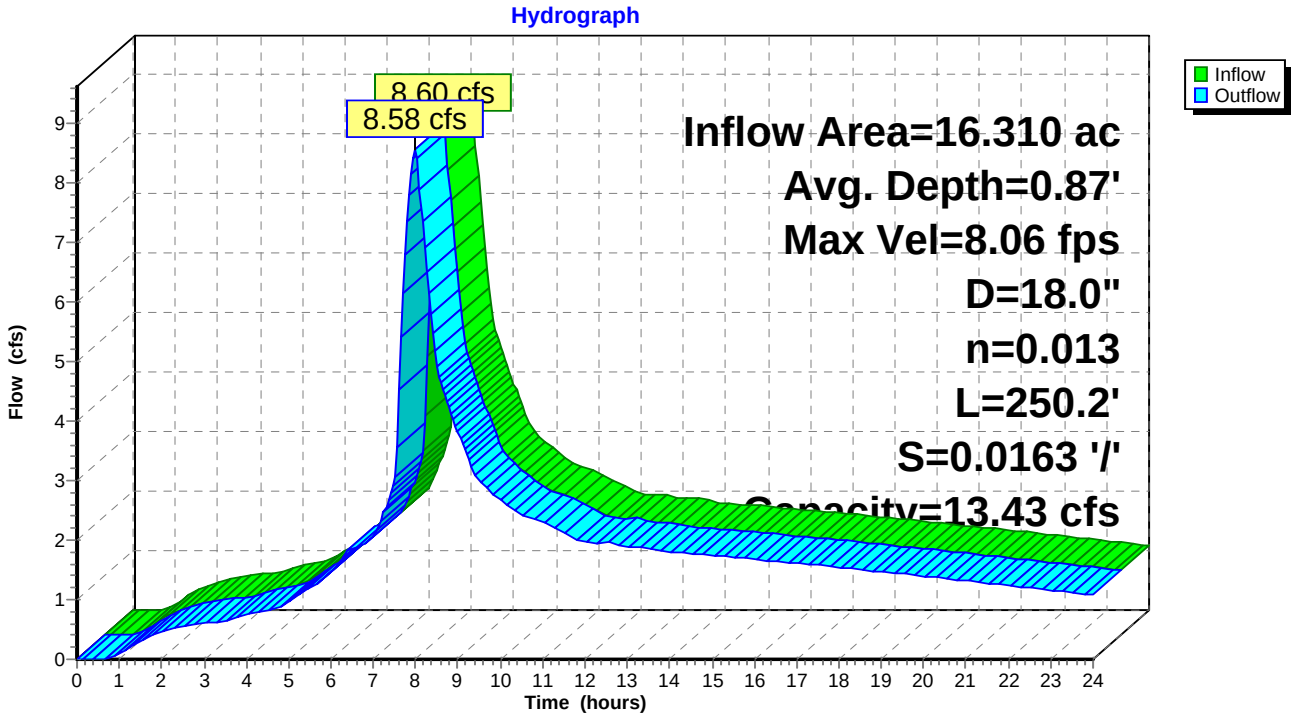
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.06 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 5.01 fps, Avg. Travel Time= 0.8 min

Peak Storage= 266 cf @ 8.00 hrs, Average Depth at Peak Storage= 0.87'
Defined Flood Depth= 191.72', Capacity at Flood Depth= -7,133.24 cfs
Bank-Full Depth= 1.50', Capacity at Bank-Full= 13.43 cfs

18.0" Diameter Pipe, n= 0.013
Length= 250.2' Slope= 0.0163 '/'
Inlet Invert= 189.69', Outlet Invert= 185.60'



Reach 14R: 18"



Summary for Reach 16R: 12"

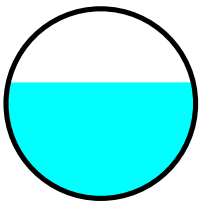
[52] Hint: Inlet/Outlet conditions not evaluated

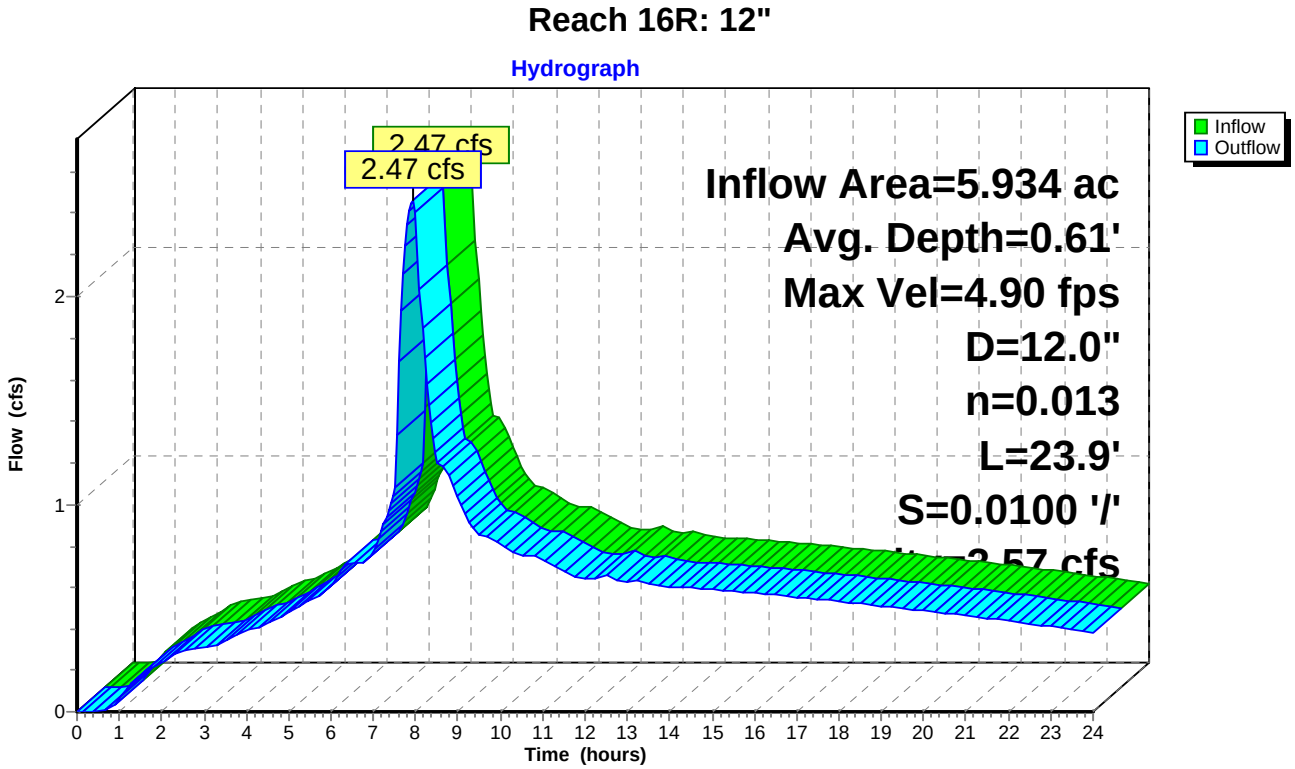
Inflow Area = 5.934 ac, 51.79% Impervious, Inflow Depth > 2.35" for 25-YR event
Inflow = 2.47 cfs @ 7.95 hrs, Volume= 1.160 af
Outflow = 2.47 cfs @ 7.95 hrs, Volume= 1.160 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.90 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.26 fps, Avg. Travel Time= 0.1 min

Peak Storage= 12 cf @ 7.95 hrs, Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.00', Capacity at Bank-Full= 3.57 cfs

12.0" Diameter Pipe, n= 0.013
Length= 23.9' Slope= 0.0100 '/'
Inlet Invert= 162.28', Outlet Invert= 162.04'





Summary for Reach 17R: OUTFALL SWALE

[62] Warning: Exceeded Reach SWALE OUTLET depth by 0.13' @ 7.90 hrs

Inflow Area = 5.934 ac, 51.79% Impervious, Inflow Depth > 2.62" for 25-YR event
Inflow = 3.66 cfs @ 7.98 hrs, Volume= 1.294 af
Outflow = 3.65 cfs @ 7.98 hrs, Volume= 1.292 af, Atten= 0%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.38 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 2.7 min

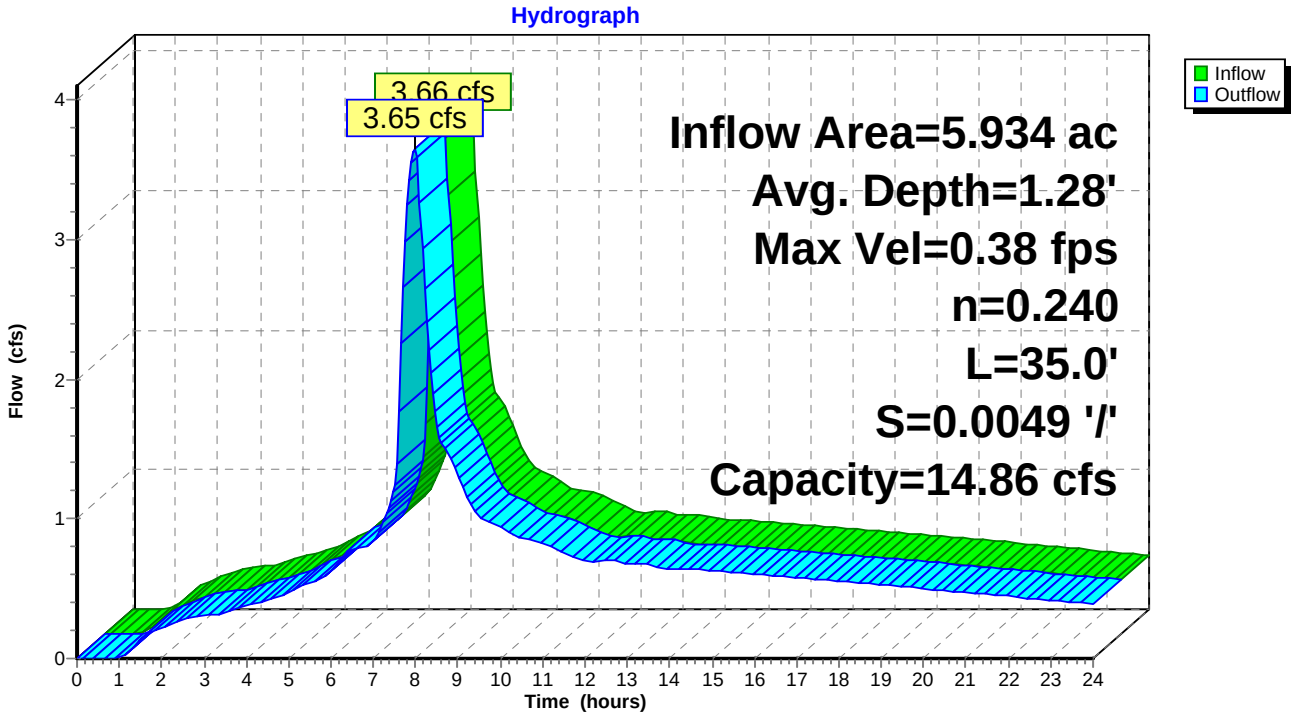
Peak Storage= 333 cf @ 7.98 hrs, Average Depth at Peak Storage= 1.28'
Bank-Full Depth= 2.50', Capacity at Bank-Full= 14.86 cfs

Custom cross-section, Length= 35.0' Slope= 0.0049 '/'
Constant n= 0.240
Inlet Invert= 161.44', Outlet Invert= 161.27'

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-8.50	2.50	0.00
-3.50	0.50	2.00
-1.50	0.00	2.50
0.00	0.00	2.50
1.50	0.00	2.50
3.50	0.50	2.00
8.50	2.50	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	3.0	0	0.00
0.50	2.5	7.1	88	0.54
2.50	26.5	17.9	928	14.86

Reach 17R: OUTFALL SWALE



Summary for Reach SWALE: STORM FACILITY

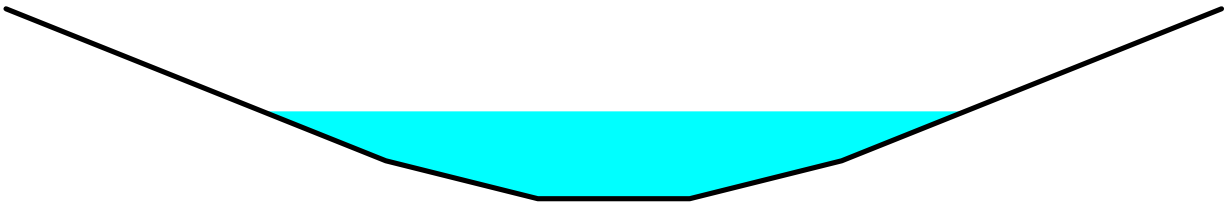
[63] Warning: Exceeded Reach 16R INLET depth by 0.33' @ 8.10 hrs

Inflow Area = 5.934 ac, 51.79% Impervious, Inflow Depth > 2.35" for 25-YR event
Inflow = 2.47 cfs @ 7.95 hrs, Volume= 1.160 af
Outflow = 2.44 cfs @ 8.00 hrs, Volume= 1.155 af, Atten= 1%, Lag= 2.8 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.35 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.22 fps, Avg. Travel Time= 8.8 min

Peak Storage= 827 cf @ 8.00 hrs, Average Depth at Peak Storage= 1.15'
Bank-Full Depth= 2.50', Capacity at Bank-Full= 13.22 cfs

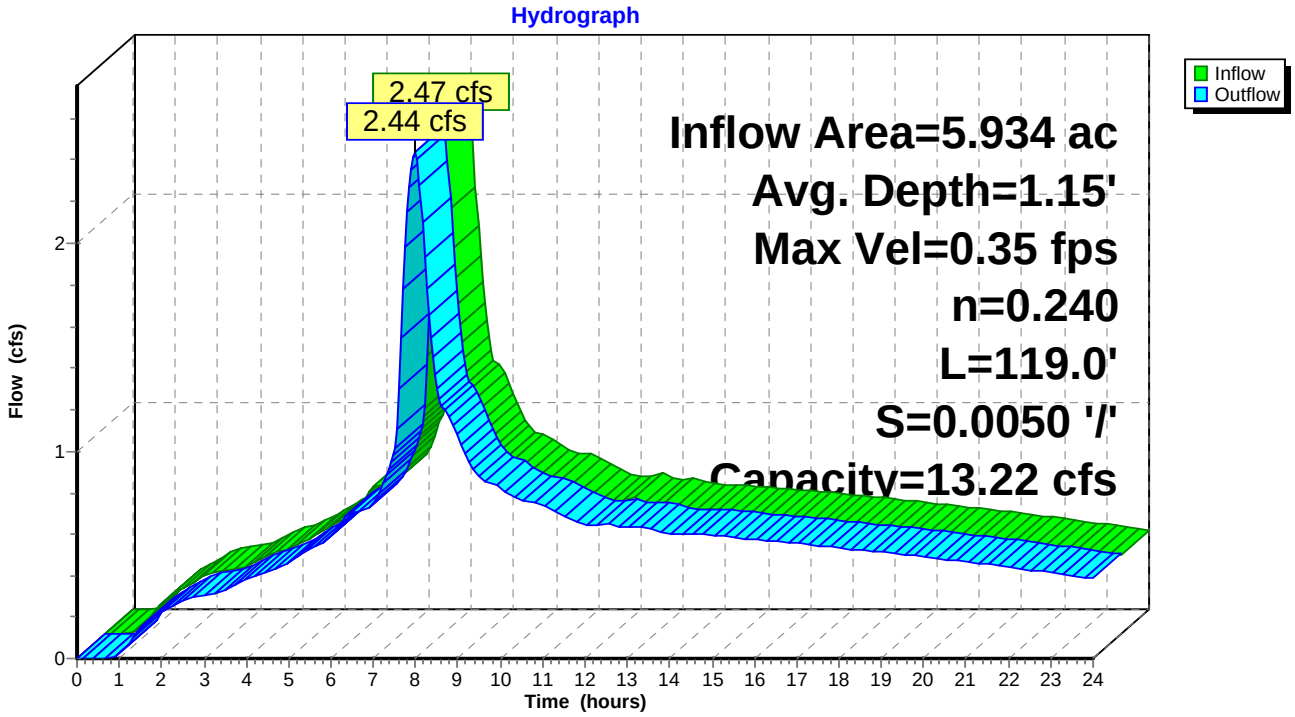
Custom cross-section, Length= 119.0' Slope= 0.0050 '/'
Constant n= 0.240
Inlet Invert= 162.04', Outlet Invert= 161.45'



Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-8.00	2.50	0.00
-3.00	0.50	2.00
-1.00	0.00	2.50
0.00	0.00	2.50
1.00	0.00	2.50
3.00	0.50	2.00
8.00	2.50	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	2.0	0	0.00
0.50	2.0	6.1	238	0.41
2.50	24.0	16.9	2,856	13.22

Reach SWALE: STORM FACILITY



Summary for Pond 1R: EX 24" CULVERT

[62] Warning: Exceeded Reach 2R OUTLET depth by 7.01' @ 8.15 hrs

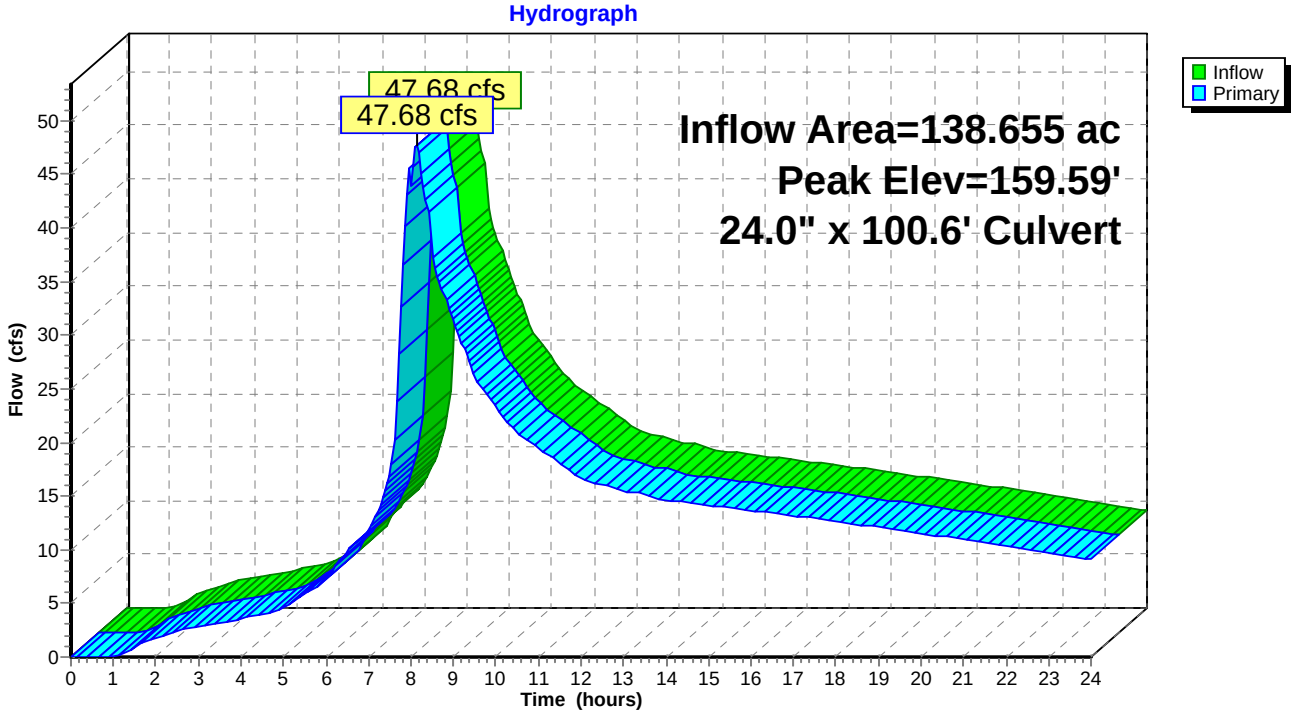
Inflow Area =	138.655 ac,	22.34% Impervious,	Inflow Depth >	2.18"	for 25-YR event
Inflow =	47.68 cfs @	8.13 hrs,	Volume=	25.243 af	
Outflow =	47.68 cfs @	8.13 hrs,	Volume=	25.243 af,	Atten= 0%, Lag= 0.0 min
Primary =	47.68 cfs @	8.13 hrs,	Volume=	25.243 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 159.59' @ 8.13 hrs
Flood Elev= 161.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	151.04'	**24.0" x 100.6' long Culvert** RCP, groove end projecting, Ke= 0.200 Outlet Invert= 148.82' S= 0.0221 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=47.54 cfs @ 8.13 hrs HW=159.54' (Free Discharge)
└**1=Culvert** (Barrel Controls 47.54 cfs @ 15.13 fps)

Pond 1R: EX 24" CULVERT



Summary for Pond 5R: EX 15"

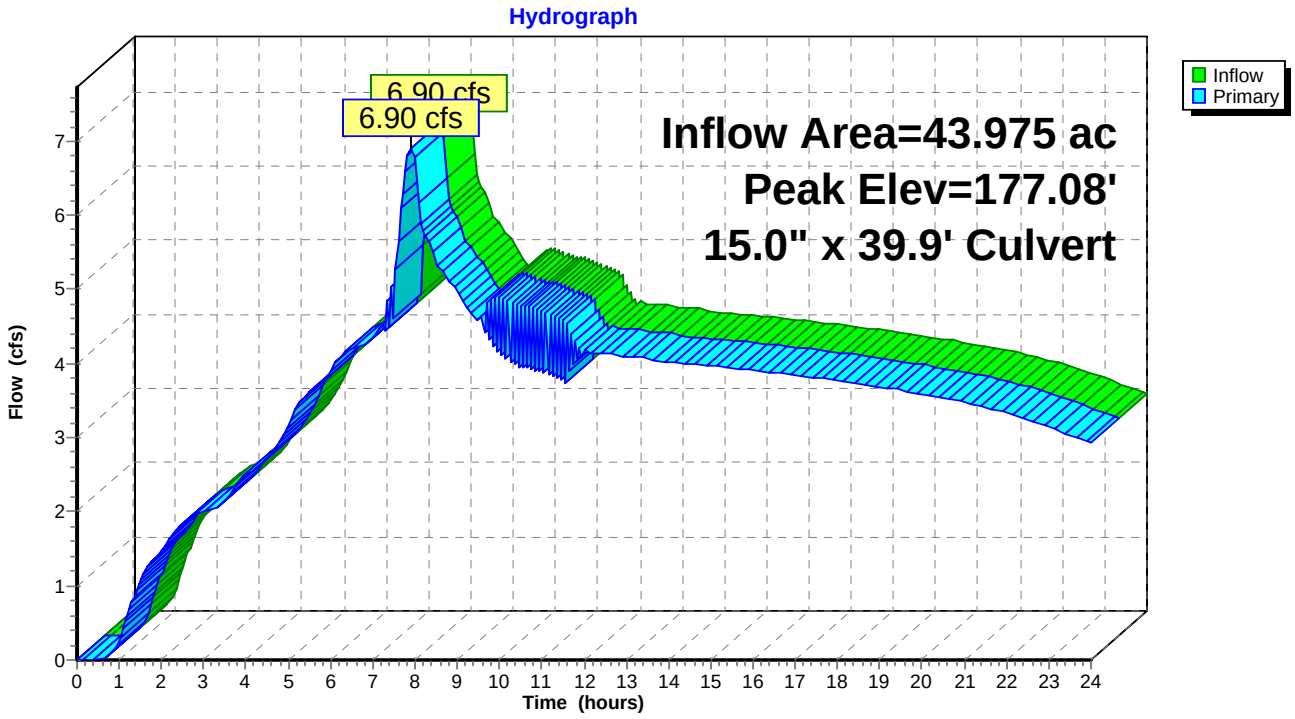
Inflow Area = 43.975 ac, 45.26% Impervious, Inflow Depth > 1.90" for 25-YR event
Inflow = 6.90 cfs @ 7.91 hrs, Volume= 6.955 af
Outflow = 6.90 cfs @ 7.91 hrs, Volume= 6.955 af, Atten= 0%, Lag= 0.0 min
Primary = 6.90 cfs @ 7.91 hrs, Volume= 6.955 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 177.08' @ 7.99 hrs
Flood Elev= 182.77'

Device	Routing	Invert	Outlet Devices
#1	Primary	174.42'	**15.0" x 39.9' long Culvert** Square-edged headwall, Ke= 0.500 Outlet Invert= 174.32' S= 0.0025 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=6.77 cfs @ 7.91 hrs HW=177.02' TW=175.70' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 6.77 cfs @ 5.52 fps)

Pond 5R: EX 15"



Summary for Pond 6R: FLOW SPLITTER

[62] Warning: Exceeded Reach 7R OUTLET depth by 1.22' @ 8.00 hrs

Inflow Area =	43.975 ac,	45.26% Impervious,	Inflow Depth >	2.62"	for 25-YR event
Inflow =	25.34 cfs @	7.99 hrs,	Volume=	9.604 af	
Outflow =	25.34 cfs @	7.99 hrs,	Volume=	9.604 af,	Atten= 0%, Lag= 0.0 min
Primary =	6.90 cfs @	7.91 hrs,	Volume=	6.955 af	
Secondary =	18.45 cfs @	7.99 hrs,	Volume=	2.648 af	

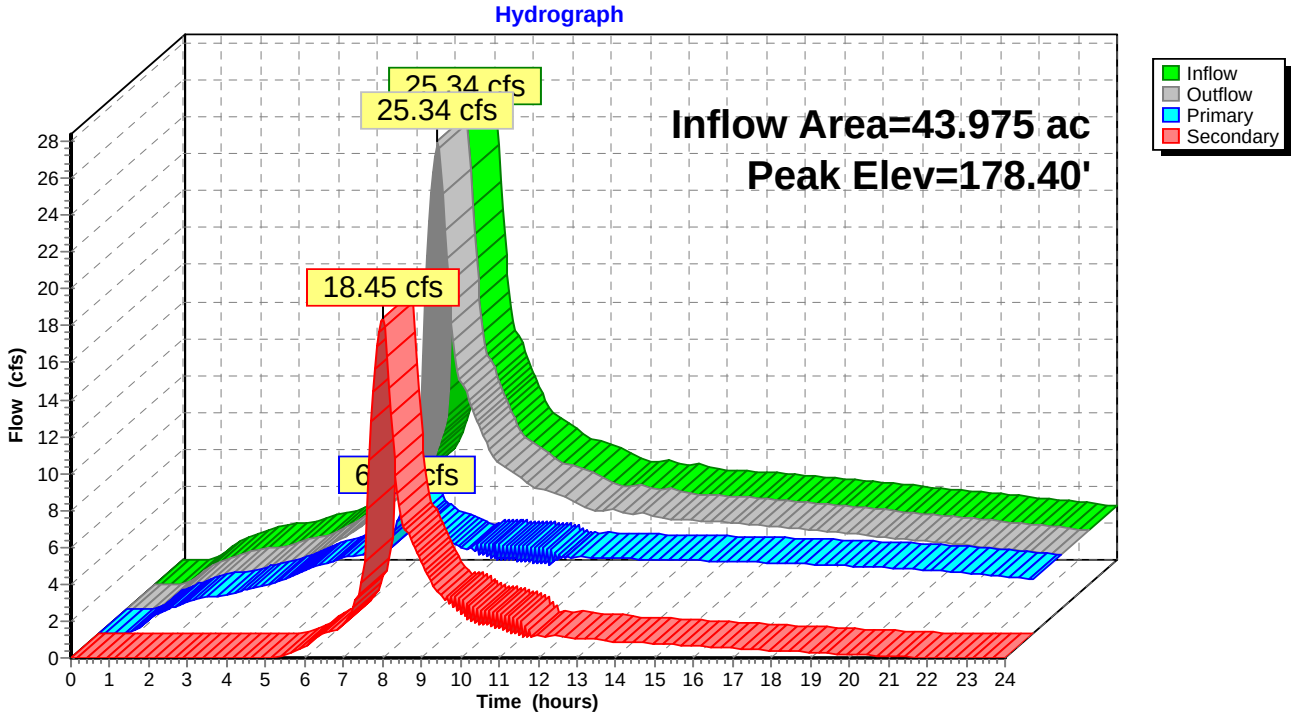
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 178.40' @ 7.99 hrs
Flood Elev= 182.51'

Device	Routing	Invert	Outlet Devices
#1	Secondary	175.91'	**24.0" x 40.2' long Culvert** Ke= 0.500 Outlet Invert= 174.23' S= 0.0418 '/' Cc= 0.900 n= 0.013
#2	Primary	174.76'	**15.0" x 13.5' long Culvert** Ke= 0.500 Outlet Invert= 174.72' S= 0.0030 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=6.68 cfs @ 7.91 hrs HW=178.30' TW=177.02' (Dynamic Tailwater)
└─**2=Culvert** (Inlet Controls 6.68 cfs @ 5.44 fps)

Secondary OutFlow Max=18.40 cfs @ 7.99 hrs HW=178.39' TW=175.75' (Dynamic Tailwater)
└─**1=Culvert** (Inlet Controls 18.40 cfs @ 5.86 fps)

Pond 6R: FLOW SPLITTER



Summary for Pond 15R: Flow Splitter

[57] Hint: Peaked at 163.42' (Flood elevation advised)

Inflow Area =	5.934 ac, 51.79% Impervious, Inflow Depth > 2.63" for 25-YR event				
Inflow =	3.70 cfs @	7.93 hrs,	Volume=	1.299 af	
Outflow =	3.70 cfs @	7.93 hrs,	Volume=	1.299 af,	Atten= 0%, Lag= 0.0 min
Primary =	2.47 cfs @	7.95 hrs,	Volume=	1.160 af	
Secondary =	1.23 cfs @	7.92 hrs,	Volume=	0.139 af	

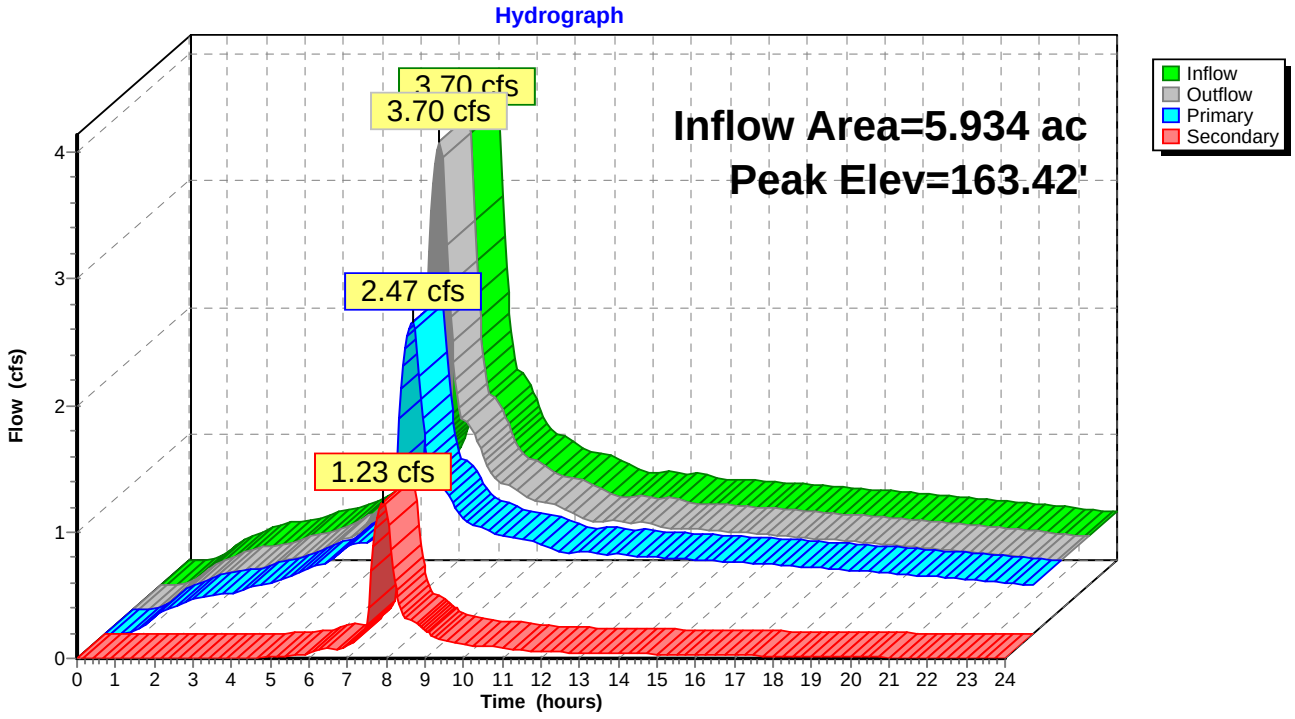
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 163.42' @ 7.95 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	162.42'	**12.0" x 26.4' long Culvert** Ke= 0.500 Outlet Invert= 162.16' S= 0.0098 '/' Cc= 0.900 n= 0.013
#2	Secondary	162.76'	**12.0" x 95.9' long Culvert** Ke= 0.500 Outlet Invert= 161.44' S= 0.0138 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=2.47 cfs @ 7.95 hrs HW=163.42' TW=162.89' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 2.47 cfs @ 3.91 fps)

Secondary OutFlow Max=1.21 cfs @ 7.92 hrs HW=163.42' TW=162.71' (Dynamic Tailwater)
└**2=Culvert** (Outlet Controls 1.21 cfs @ 3.16 fps)

Pond 15R: Flow Splitter



APPENDIX B

SELECTED PAGES FROM HHPR NEW ELEMENTARY AND MIDDLE SCHOOL FINAL STORMWATER REPORT, DATED AUG. 2007

Final Stormwater Management Report For:

New Elementary and Middle School
Sherwood, Oregon

Prepared For:
Sherwood School District

Prepared By:

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August, 2007

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Cleanwater Services Healthy Streams Plan – Supporting Information

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Photo Log

Introduction

Project Description

The site is a proposed elementary school and middle school on approximately 30-acres. The site is part of a larger area known as Study Area 59 (approximately 85 acres), which is part of a recent City of Sherwood urban growth boundary expansion area.

Existing Conditions

The existing site consists of farm and orchard land and some marshy wetland areas. The site has four drainage basins which all drain to the north, one drains to the northwest corner of the site to Chicken Creek (basin A) and the other three (basins B, C, and D) to the north and northeast corner of the site to Cedar Creek. An existing basin map is provided in Appendix A.

The Natural Resource Conservation Service (NRCS) Soil Survey of Washington County, Oregon describes the soils within the school site as Hydrologic Soil Type C. Soils within the tributary boundary are classified as Hydrologic Soil Type D. Hydrologic soil groups are basin 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 within the school site have a slow infiltration rate when thoroughly wet. Type C classification consists chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. The soil in this area is Woodburn silt loam, having a slow rate of water transmission.

Soils within the Chicken Creek and Cedar Creek tributaries are classified as having very slow infiltration rates, resulting in very high runoff potential when soils are thoroughly wet. These soils consist mostly of clays that have a high shrink-swell potential and a high water table. Type D soils have a very slow rate of water transmission. Soils in this area include Huberly silt loam and Wapato silty clay loam. A soils map and additional information is included in Appendix B.

Proposed Conditions

The storm runoff from the proposed onsite private impervious area (the school building and parking lots) will drain to the northwest corner of the site. The runoff from the ball fields will drain to the wetlands and existing drainage channel at the east side of the site. In order to develop the proposed school site two public roads are proposed; an extension of Copper Terrace from Cereghino Lane to Edy Road and another road along the north side of the school property. Stormwater from the road improvements will drain to the basin in the northwest corner of the site. Proposed Basins A2, A5, and A6 were analyzed for future development based on zoning established with the Area 59 Concept Plan. A map showing proposed full build out drainage basins is included in Appendix A.

As stated above, the hydrologic soil classification for the school site is Type C. The associated composite curve number (CN) used in runoff calculations for undeveloped pervious areas is 81. A CN of 79 was used for analyzing the developed pervious area and 98 for paved parking lots, roofs, driveways and streets for both undeveloped and developed conditions. Supporting tables are included in Appendix B.

Water Quantity and Downstream Analysis

The proposed school and surrounding developments will reroute the majority of Area 59 to a proposed regional water quality facility in the northwest drainage basin. The improvements will partially maintain runoff to the existing northeast and east drainage systems, which converge further north of the site in Cedar Creek. A thorough analysis was completed on the mentioned drainage basins.

The NRCS Technical Release 55 (TR55) method and equations were used to calculate the time of concentration for sheet flow, shallow concentrate flow, channel flow, and pipe flow. These equations and time of concentration calculations are included in Appendix C for reference. The Santa Barbara Urban Hydrograph (SBUH) method was used along with the rainfall distribution listed in the CWS Design and Construction Standards dated June 2007. Hydrographs were generated for all identified sub-basins contributing to the three major drainage basins within Area 59 using the NRCS Type 1A, 24 hour storm parameters. Flow outputs sorted by development scenarios and a FEMA map are located in Appendix C.

Northwest Drainage Basin:

A conveyance analysis was conducted for the unnamed tributary to Chicken Creek which winds through the northwest quadrant of Area 59. The tributary was evaluated during three scenarios including existing conditions, proposed school development while maintaining existing (undeveloped) conditions for the remaining contributing basin, and proposed full build out conditions including all contributing areas within Area 59. Basin maps which represent each scenario are included in Appendix C along with developed flows.

The northwest drainage basin will significantly increase in size with the construction of the new school and associated roadways and utilities. The development will redirect the majority of existing basin B to proposed full build out basins A1 and A2. Refer to existing and proposed basin maps in appendix C.

25-year flows were generated for areas contributing to the northwest basin for the three scenarios and were used to analyze the existing culvert located at the intersection of SW Elwert Road and SW Edy Road. The purpose of the analysis was to determine any backwater effects due to existing downstream deficiencies which would potentially cause areas of inundation during the 25-year storm event. Nomographs were used to determine the existing capacity of the 24" culvert and the elevation head for each scenario, this information is located in Appendix C. The 25-year flows were also applied to cross section model of the tributary at the upstream end (Section A-A) of the existing 24-inch culvert. Refer to Appendix C for exhibits which depict the given data as well as the analysis results. The existing culvert has the following characteristics:

Existing Culvert Characteristics

Size	24"
Type	Circular concrete
Length	102 ft
Slope	1.85%
Inlet Configuration	Projecting barrel

Table 1.1

The following table outlines the depth, spread of flow, and water surface elevation for the three development scenarios.

Flow Characteristics

Development Scenario	25-Year Flow	Depth of Flow	Spread of Flow	Water Surface Elev.	Freeboard to Road (Elev. = 161.0')
Existing Conditions (Scenario 1)	27 cfs	3.6 ft	18 ft	154.4	6.6 ft
School Development (Scenario 2)	43 cfs	7.0 ft	32 ft	157.8	3.2 ft
Full Build Out (Scenario 3)	52 cfs	9.8 ft	N/A	160.6	0.4 ft

Table 1.2

As indicated in Table 1.2, full build out conditions exceed the minimum requirement of maintaining at least 1-foot of freeboard from a permanent structure to the free surface. Therefore, under full build out conditions, the culvert will have to be upsized to a minimum diameter of 30-inches. This is assuming the existing culvert will be replaced with the same type of circular concrete culvert, but this type of culvert would not meet fish passage requirements. The Clean Water Services Healthy Streams Plan identifies the Chicken Creek culvert at Elwert Road further downstream of the Edy and Elwert intersection as having a fish barrier due to depth. The plan ranks this culvert as a high priority for replacement because it has both conveyance and fish passage deficiencies. Upon replacement, the culvert would most likely be required to meet fish passage design standards. Therefore, the culvert located upstream at the Elwert and Edy intersection would also be required to meet fish passage requirements. It is anticipated that this culvert will be replaced with intersection improvements which will be required with future development of the adjacent property. Appendix F includes relevant information from CWS' Healthy Streams Plan.

The existing 24" culvert has an existing capacity of 49 cfs while maintaining 1 foot of freeboard below the roadway. The proposed school development and public roadway improvements will increase the 25 year flow from 27 cfs to 43 cfs which is still within the existing capacity of the downstream culvert; therefore onsite detention is not required.

Northeast Drainage Basin:
As indicated on the existing conditions map in Appendix C, basins B and D (38 acres) contribute to the northeast drainage basin. Upon development the proposed drainage basin will be reduced from 38 acres to 7 acres, with five or the seven acres being developable. Because the development will decrease the contributing area, runoff will also be reduced; therefore downstream capacity is not a concern.

East Drainage Basin:
30 acres currently drain to the east drainage basin, including portions of the school site and a portion of the existing development to the south. The east drainage basin flows

towards the existing Miller Landing Subdivision. In 2000 this development constructed a 112" x 75" arched CMP to maintain upstream flow conditions. The culvert collects runoff from the existing 30 acre basin and discharges it into an existing wetland, a tributary to Cedar Creek. Design calculations for this culvert were not included in the Miller's Landing Stormwater Management Report provided by the City of Sherwood. Upon full build out of Area 59, approximately 32 acres will generate a total of 13.4 cfs routed to this culvert. A conveyance analysis determined that the existing culvert has adequate capacity to convey proposed and future improvements.

Water Quality

Clean Water Services requires that storm water quality facilities shall be designed to remove 65 percent of the total phosphorous from the runoff of 100 percent of the newly constructed impervious surfaces during a dry weather storm event totaling 0.36 inches of precipitation falling in 4-hours with an average storm return period of 96 hours. A regional water quality facility will treat the majority of proposed impervious surfaces created with the school construction as well as 100 percent of the impervious areas generated by surrounding developments. This regional water quality facility will be located in the northwest corner of Area 59 and will discharge into the unnamed tributary to Chicken Creek also noted as the northwest drainage basin. Treatment facility characteristics are listed in Table 1.3.

Proposed Swale Characteristics

Impervious Area Treated	27.54 ac
Treatment Flow Rate	2.50 cfs
Swale Length	230 LF
Bottom Width	10 ft
Side Slope	4:1
Water Quality Depth	0.5 ft
Velocity	0.43 fps
Longitudinal Slope	1.50 %

Table 1.3

The water quality (WQ) facility is sized to treat runoff from future development on the adjacent parcels within Study Area 59. The approximate treatment basin boundary of the regional water quality facility is shown on the "Regional WQ & Storm Sewer Service Basin" Drawing in Appendix E. A contributing basin breakdown as well as supporting data for the regional water quality facility sizing can be found in Appendix D. The impervious area for the future development is based on the zoning adopted as part of the Study Area 59 Concept Plan. 2640 square feet of impervious area was used per single family dwelling unit within proposed residential areas.

A water quality manhole will be located upstream of the proposed swale which will provide pretreatment for the entire water quality basin. The WQ flow associated with full build out conditions is 2.50 cfs. CWS requires 20 cubic feet of storage per 1.0 cfs of inflow up to the 25-year event. The upstream flow splitter allows 5.64 cfs to pass during the 25-year event while the remaining flow bypasses the water quality manhole. As a result, the proposed WQ manhole will have a 48-inch sump and a 72-inch diameter, providing 113 cubic feet of storage. This volume can treat 5.65 cfs of flow which exceeds

the proposed release rate to the WQ manhole and the water quality flow rate of 2.50 cfs for full build out conditions. Upon future private development, each property will not be required to provide an additional pretreatment method prior to connecting into the public storm line.

As shown on the proposed basin map, the proposed track and ball fields (basin C1) contribute to the east drainage system without flowing through a water quality facility. Because this basin consists only of open fields and a pervious pavement foot track, water quality is not necessary. No permanent structures are currently proposed within this basin. If in the future modular buildings or tennis courts are constructed, low impact development approaches can be implemented to treat the near negligible runoff associated with the impervious area. Vehicular traffic will not have access to this basin therefore contaminates are minimal.

Conveyance

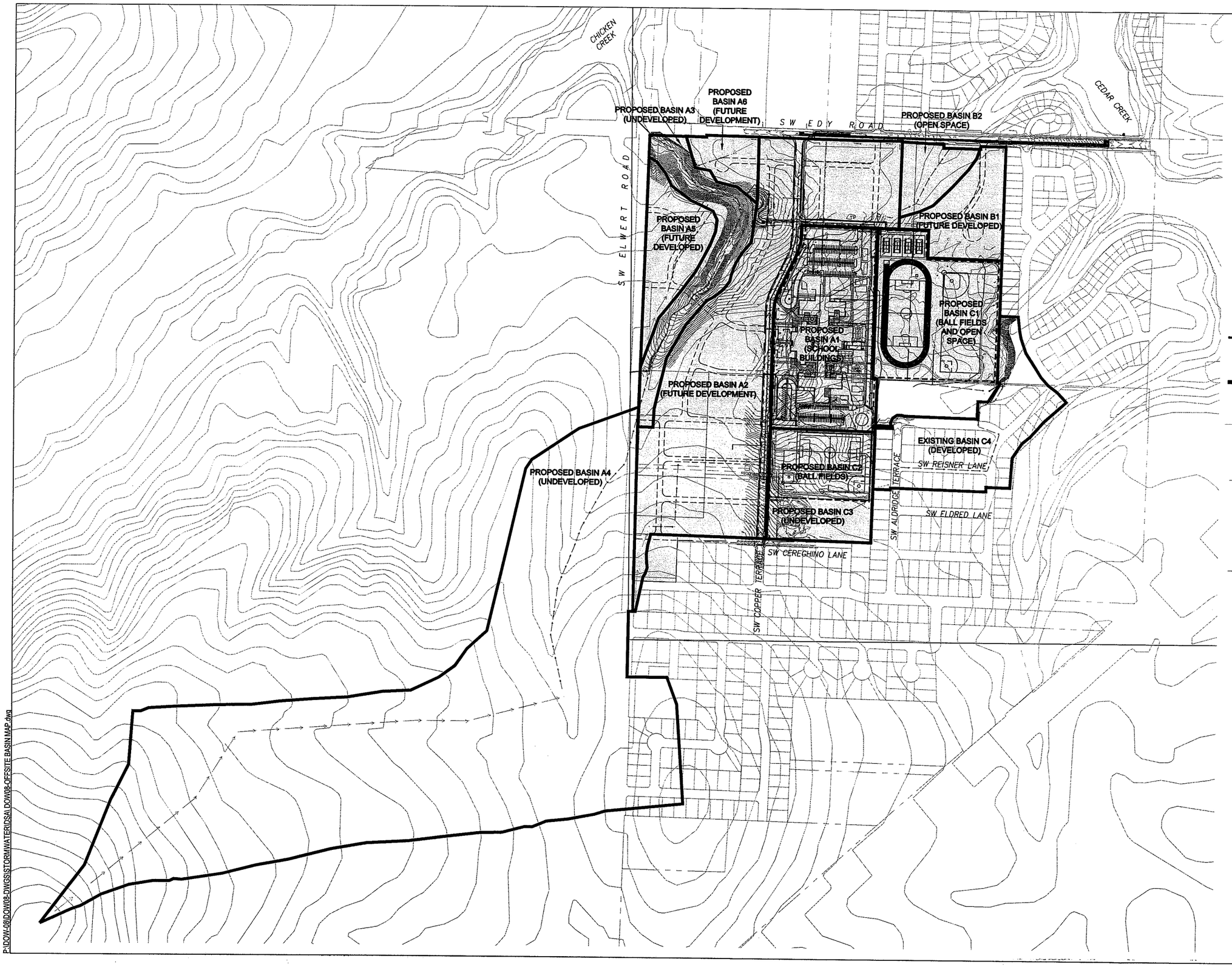
The proposed on-site and public storm sewer was sized using the 25-year Santa Barbara Urban Hydrograph method. The public systems are sized to convey the runoff from the future development of adjacent parcels within Study Area 59. A Manning's Coefficient "n" of 0.013 was used in the Manning's Equation to determine pipe capacity and velocity. The public storm lines were designed to maintain a minimum 2.5 fps velocity while maintaining 1 foot freeboard between the hydraulic grade line and the top of structure or finish grade above the pipe for the 25-year post developed peak rate of runoff. A flow splitter manhole is proposed upstream of the water quality manhole. The flow splitter manhole will divert the water quality flows produced from the total contributing basin to the water quality manhole while allowing the remaining 25-year flow to bypass directly into the proposed water quality swale. Supporting data including a basin map breakdown, conveyance spreadsheet, flow splitter data, and a flow summary associated with each basin are located in Appendix E.

The on-site private storm system is currently designed (elevation and conveyance) such that all future modular buildings and additions are able to connect into the system leading to the northwest drainage basin.

A 60" flow splitter is proposed upstream of the water quality swale. The structure directs the water quality storm to an offline water quality manhole for pretreatment. A 15" pipe with an 10" orifice is located at the base of the manhole leading to the water quality manhole. This orifice is sized to pass the water quality flow of 2.50 cfs. High flows enter a 24" diameter pipe located at an elevation at which the water quality treatment requirements have been met. This line directly discharges into the proposed water quality swale. An increase in elevation head on the orifice allows flows in excess of the required water quality treatment flow to enter the pretreatment manhole; therefore the structure is sized accordingly.

The water quality facility was checked for open channel conveyance capacity during the 25-year storm event. The velocity in the swale is 1.0 fps which is less than the maximum allowed of 2 fps per CWS. An 8' wide, 12' long, 2.5' thick class 200 riprap pad will be constructed at the pipe outfall into the swale, this will provide velocity reduction prior to discharging into the treatment area. Detailed calculations for the pretreatment structure and swale are located in Appendix D while supporting information for the proposed flow splitter is in Appendix E.

Appendix E includes an open channel conveyance analysis of the Copper Terrace west roadside ditch. Upon the school development Copper Terrace will be extended from Cereghino Lane to Edy Road. An exhibit of the contributing basins and typical section of the proposed roadway is also included in Appendix E. A public storm line will be constructed with the school development which will have the capacity to convey future build out flows. The temporary roadside ditch was analyzed for flooding assuming flows from the west half of Copper Terrace and the existing upstream basin contribute to the open channel system. Temporary ditch inlet structures will tie into the public system with permanent inlet laterals that are designed with adequate conveyance capacity during full build out conditions as well as providing enough depth to serve the limits of the future development. The runoff will be collected and routed through the proposed public storm system including the regional water quality facilities. The ditch maintains a velocity between 0-5 fps; therefore the proposed road side ditch shall be lined with vegetation to prevent erosion from occurring per CWS standards.



0 125 250 500
SCALE: 1" = 500'

AREA 59

SCHOOL BOUNDARY

BASIN LINE

TIME OF CONCENTRATION SHEET FLOW

TIME OF CONCENTRATION SHALLOW CONCENTRATED FLOW

TIME OF CONCENTRATION CHANNEL OR PIPE FLOW

PROPOSED BASIN MAP

NEW ELEMENTARY AND MIDDLE SCHOOL

SHERWOOD, OREGON

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CHECKED: KAS
DATE: 5-25-07

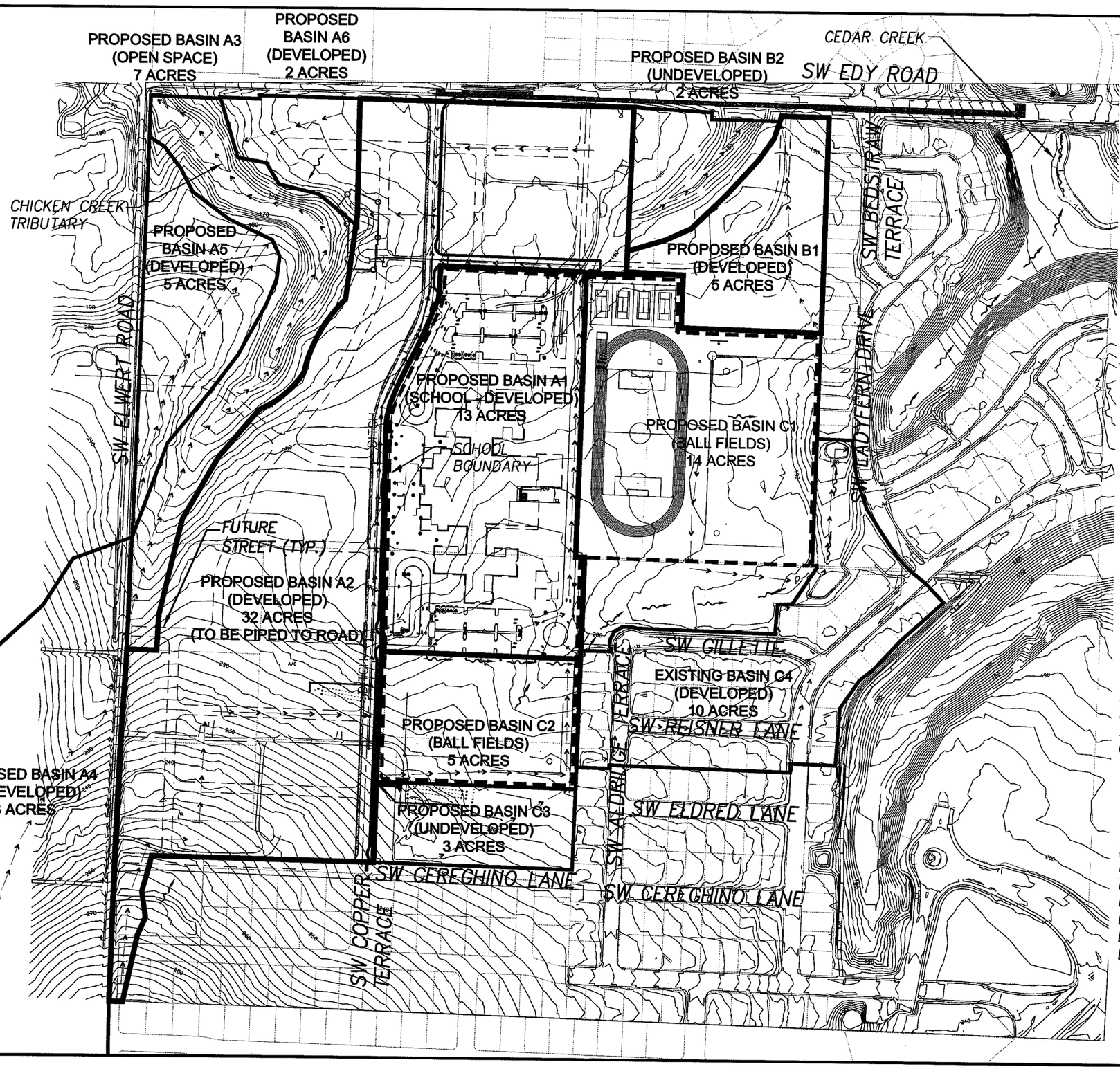
REVISIONS

DATE	NO.	DESCRIPTION

SHEET NO. 2.0

JOB NO. DOW-08

P:\DOW-08\DOW08-DWGS\STORM\WATERIDS\ALDOW08-OFFSITE BASIN MAP.dwg



SEE PROPOSED BASIN MAP IN APPENDIX A FOR UPSTREAM BASIN BOUNDARIES AND Tc FLOW PATTERNS

NOTE:
FUTURE STREETS SHOWN ARE FROM AREA 59 CONCEPT PLAN

PROPOSED CONDITIONS
NW DRAINAGE BASIN = BASINS A1–A6
NE DRAINAGE BASIN = BASINS B1 & B2
EAST DRAINAGE BASIN = BASINS C1–C4

SCENARIO 3 - FULL BUILD OUT BASIN MAP

NEW ELEMENTARY AND MIDDLE SCHOOL

SHERWOOD, OREGON

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DESIGNED: HHPR
DRAWN: HHPR
CHECKED: KAS
DATE: 5-25-07

DATE	NO.	DESCRIPTION

REVISIONS

SHEET NO. 3.0

JOB NO. DOW-08

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DOW-08
New Sherwood Elementary and Middle School

Time of Concentration Summary

Existing Conditions

Northwest Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
A	81	114	63.06	27.37

Northeast Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
B	81	36	32.79	11.47
D	81	2	45.39	0.55
			Total	12.02

East Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
C	87	30	34.55	12.82

Proposed School Development Conditions

Northwest Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
A1	89	13	29.94	6.43
A2	81	2	15.12	0.82
A3	98	5	10.94	4.28
A4	81	14	37.65	4.20
A5	81	11	26.59	3.81
A6	81	11	38.34	3.27
A7	81	83	55.50	20.97
			Total	42.90

Northeast Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
B1	81	3	15.12	1.22
B2	81	7	39.14	2.07
			Total	3.28

East Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
C1	80	14	30.38	4.34
C2	79	5	32.35	1.42
C3	81	3	20.32	1.14
C4	92	10	17.28	6.57
			Total	13.38

DOW-08
New Sherwood Elementary and Middle School

Time of Concentration Summary

Proposed Full Build Out Conditions

Northwest Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
A1	89	13	29.94	6.43
A2	92	32	27.67	18.35
A3	81	7	7.61	3.27
A4	81	83	55.50	20.97
A5	92	5	33.93	2.67
A6	92	2	17.47	1.31
			Total	52.16

Northeast Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
B1	92	5	39.14	2.53
B2	81	2	3.08	0.97
			Total	3.40

East Drainage Basin

Basin	Composite CN	Area (ac)	t_c (min)	Q_{25} (cfs)
C1	80	14	30.38	4.34
C2	79	5	32.35	1.42
C3	81	3	20.32	1.14
C4	92	10	17.28	6.57
			Total	13.37

Flow Summary

Drainage Basin 25-Year Flow (cfs) for each Scenario			
Drainage Basin	Existing	School Development	Full Build Out
Northwest	27.37	42.90	52.16
Northeast	12.02	3.28	3.40
East	12.82	13.38	13.37

Study Area 59
SCS Curve Number Analysis
Scenario 3 *- Future Zoning Build-out*

Total Basin Area = **43** acres

Hydrologic Group C

SCS Base Curve Numbers	
Meadow, pasture or grasses	79
Impervious	98

SCS Curve Numbers used:
Ref.: (SCS TR-55, USDA, June 1986)

		Pervious CN	% Impervious	Composite CN
1	MDRL (8 DUA Max.)	79	68%	92
2	MDRH (11 DUA Max.)	79	87%	96

Notes:
1. One DUA is assumed to contribute 2640 sq. ft.
2. DUA is defined per net acres, less 20% for roads.

Sub-Basin	Total Area	ST Imp.	Lot Imp. MDRL	Lot Imp. MDRH	Site Imp. School	Total Impervious Area (AC)	Total Pervious Area (AC)	Comp. CN	Time of Conc (min)	Q_{25} (CFS)
1	5.32	n/a	n/a	n/a	3.02	3.02	2.29	90	10	3.65
2	5.04	1.01	1.95	n/a	n/a	2.96	2.08	90	10	3.46
3	0.25	0.25	n/a	n/a	n/a	0.25	0.00	98	5	0.23
4	0.68	n/a	n/a	n/a	0.35	0.35	0.33	89	5	0.47
5	0.24	0.24	n/a	n/a	n/a	0.24	0.00	98	5	0.22
6	4.83	0.97	1.87	n/a	n/a	2.84	1.99	90	10	3.31
7	3.52	0.70	1.37	n/a	n/a	2.07	1.45	90	10	2.41
8	0.18	0.18	n/a	n/a	n/a	0.18	0.00	98	5	0.17
9	3.27	0.65	n/a	1.75	n/a	2.40	0.87	93	10	2.50
10	0.25	n/a	n/a	n/a	0.17	0.17	0.08	92	5	0.19
11	2.54	n/a	n/a	n/a	1.60	1.60	0.94	91	10	1.81
12	3.15	0.63	0.69	0.95	n/a	2.26	0.89	93	10	2.41
13	2.86	0.57	n/a	1.52	n/a	2.10	0.76	93	10	2.19
14	1.81	n/a	n/a	n/a	0.90	0.90	0.90	88	10	1.14
15	0.17	0.17	n/a	n/a	n/a	0.17	0.00	98	5	0.16
16	0.18	0.18	n/a	n/a	n/a	0.18	0.00	98	5	0.15
17	2.71	0.54	n/a	1.44	n/a	1.98	0.72	93	10	2.07
18	3.16	n/a	n/a	n/a	2.15	2.15	1.01	92	10	2.33
19	0.10	0.10	n/a	n/a	n/a	0.10	0.00	98	5	0.09
20	0.42	0.42	n/a	n/a	n/a	0.42	0.00	98	5	0.38
21	2.01	0.40	0.78	n/a	n/a	1.18	0.83	90	10	1.38

TOTAL IMPERVIOUS AREA TO WQ FACILITY =	**27.54**

SCHOOL SITE INCLUDES BASINS 1, 3, 4, 5, 8, 10, 11, 14–16, 18, 19 AND 20.

0 50 100 200
SCALE: 1" = 200'

LEGEND

- EXISTING PROPERTY LINE
- PROPOSED PROPERTY LINE
- PROPOSED SERVICE BOUNDARY
- PROPOSED STORM SEWER
- PROPOSED SUB-BASINS
- C — DENOTES PROPOSED NODE
- 6 — DENOTES PROPOSED BASIN

REGIONAL WQ & STORM SEWER SERVICE BASIN
NEW ELEMENTARY AND MIDDLE SCHOOL
SHERWOOD, OREGON

Harper Houf Peterson Righellis Inc.
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Study Area 59
Phased Development
Scenario 3 *- Future Zoning Build-out*

School Property Contributing to Conveyance and Water Quality

Sub-Basin	Total Area	ST Imp.	Lot Imp. MDRL	Lot Imp. MDRH	Site Imp. School	Total Impervious Area (AC)	Total Pervious Area (AC)	Comp. CN	Time of Conc (min)	Q_{25} (CFS)
1	5.32	n/a	n/a	n/a	3.02	3.02	2.29	90	10	3.65
3	0.25	0.25	n/a	n/a	n/a	0.25	0.00	98	5	0.23
4	0.68	n/a	n/a	n/a	0.35	0.35	0.33	89	5	0.47
5	0.24	0.24	n/a	n/a	n/a	0.24	0.00	98	5	0.22
8	0.18	0.18	n/a	n/a	n/a	0.18	0.00	98	5	0.17
10	0.25	n/a	n/a	n/a	0.17	0.17	0.08	92	5	0.19
11	2.54	n/a	n/a	n/a	1.60	1.60	0.94	91	10	1.81
14	1.81	n/a	n/a	n/a	0.90	0.90	0.90	88	10	1.14
15	0.17	0.17	n/a	n/a	n/a	0.17	0.00	98	5	0.16
16	0.18	0.18	n/a	n/a	n/a	0.18	0.00	98	5	0.15
18	3.16	n/a	n/a	n/a	2.15	2.15	1.01	92	10	2.33
19	0.10	0.10	n/a	n/a	n/a	0.10	0.00	98	5	0.09
20	0.42	0.42	n/a	n/a	n/a	0.42	0.00	98	5	0.38
Total	15.29						Composite CN	94		

Future Development Property Contributing to Conveyance and Water Quality

Sub-Basin	Total Area	ST Imp.	Lot Imp. MDRL	Lot Imp. MDRH	Site Imp. School	Total Imp. Area (AC)	Total Perv. Area (AC)	Comp. CN	Time of Conc (min)	Q_{25} (CFS)
2	5.04	1.01	1.95	n/a	n/a	2.96	2.08	90	10	3.46
6	4.83	0.97	1.87	n/a	n/a	2.84	1.99	90	10	3.31
7	3.52	0.70	1.37	n/a	n/a	2.07	1.45	90	10	2.41
9	3.27	0.65	n/a	1.75	n/a	2.40	0.87	93	10	2.50
12	3.15	0.63	0.69	0.95	n/a	2.26	0.89	93	10	2.41
13	2.86	0.57	n/a	1.52	n/a	2.10	0.76	93	10	2.19
17	2.71	0.54	n/a	1.44	n/a	1.98	0.72	93	10	2.07
21	2.01	0.40	0.78	n/a	n/a	1.18	0.83	90	10	1.38
Total	27.39						Composite CN	92		

APPENDIX C

TRACT G STORMWATER QUALITY CALCULATIONS

STORMWATER QUALITY CALCULATIONS

Client:	Venture Properties, LLC
Project:	Mandel Farms Subdivison
AKS Job No.:	4570
Date:	January 8, 2016
Done By:	DS
Checked By:	PAS

IMPERVIOUS AREA

Total Site Area:	5.92	acres
Total Site Area:	257,979	square feet (sf)
Number of Lots:	22	
Impervious Area Per Lot:	2,640	sf
Total Impervious Lot Area:	58,080	sf
Road & Sidewalk Impervious Area:	75,051	sf
Total Impervious Area:	133,131	sf

WATER QUALITY VOLUME (WQV)

(Per CWS 4.05.6b - R&O 07-20)

$$WQV = \frac{0.36'' \text{ X Area (ft)}}{12'' \text{ per ft}} = \mathbf{3994} \ \textbf{cubic feet}$$

WATER QUALITY FLOW (WQF)

(Per CWS 4.05.6b - R&O 07-20)

$$WQF = \frac{\text{WQV (sf)}}{14{,}400 \text{ seconds}} = \mathbf{0.28} \ \textbf{cfs}$$

WATER QUALITY MANHOLE SUMP VOLUME CALCULATIONS

(Per CWS 4.06.1b - R&O 07-20)

CWS Criteria: Sump Volume = 20 cubic feet per 1.0 cfs of flow

Calculated 25-year Flow through WQ Manhole =	**2.47**	**cfs**	
Calculated Manhole Sump Volume =	**49.4**	**cubic feet**	
Calculated Manhole Sump Depth (60" Dia. Manhole) =	**2.5**	**ft**	< 5 feet maximum

VEGETATED SWALE, WATER QUALITY FLOW DESIGN & CALCULATIONS

Hydraulic Design Criteria (Per CWS 4.06.2 - R&O 07-20)

Design Flow: Water Quality Flow
Minimum Hydraulic Residence Time: 9 minutes
Maximum Water Design Depth: 0.5-ft
Minimum Freeboard: 1.0 foot (for facilities not protected from high flows)
Manning's "n" Value: 0.24
Maximum Velocity: 2.0 fps based on the 25-YR flow

Swale Sizing Assumptions:

Slope	Bottom Width	Manning's #	Side Slope	Depth of Swale	Length
(ft/ft)	(ft)	"n"	H:V	(ft)	(ft)
0.005	2	0.24	4	2.5	100

Water Quality Flow Hydraulic Calculations:

Q	Flow Depth	Flow Area	Wp	R	Velocity
(cfs)	(ft)	(sf)	(ft)	(ft)	(fps)
0.28	0.42	1.55	5.46	0.28	0.18

25-Year Flow Hydraulic Calculations (See HydroCAD Printouts):

Q	Flow Depth	Velocity
(cfs)	(ft)	(fps)
2.47	1.15	0.35

Check Against Design Criteria:

	Calculated			CWS Criteria		Meet CWS Criteria?
Minimum Hydraulic Residence Time:	**9.3**	**minutes**	>	9	minutes	Yes
Maximum Water Quality Design Depth:	**0.42**	**feet**	<	0.5	feet	Yes
Minimum Freeboard:	**1.35**	**feet**	>	1	feet	Yes
Maximum Velocity:	**0.35**	**fps**	<	2	fps	Yes
Minimum Length:	**100**	**feet**	≥	100	feet	Yes

Channel Report

Hydraflow Express Extension for Autodesk® AutoCAD® Civil 3D® by Autodesk, Inc. Friday, Jan 8 2016

Water Quality Flow

Trapezoidal

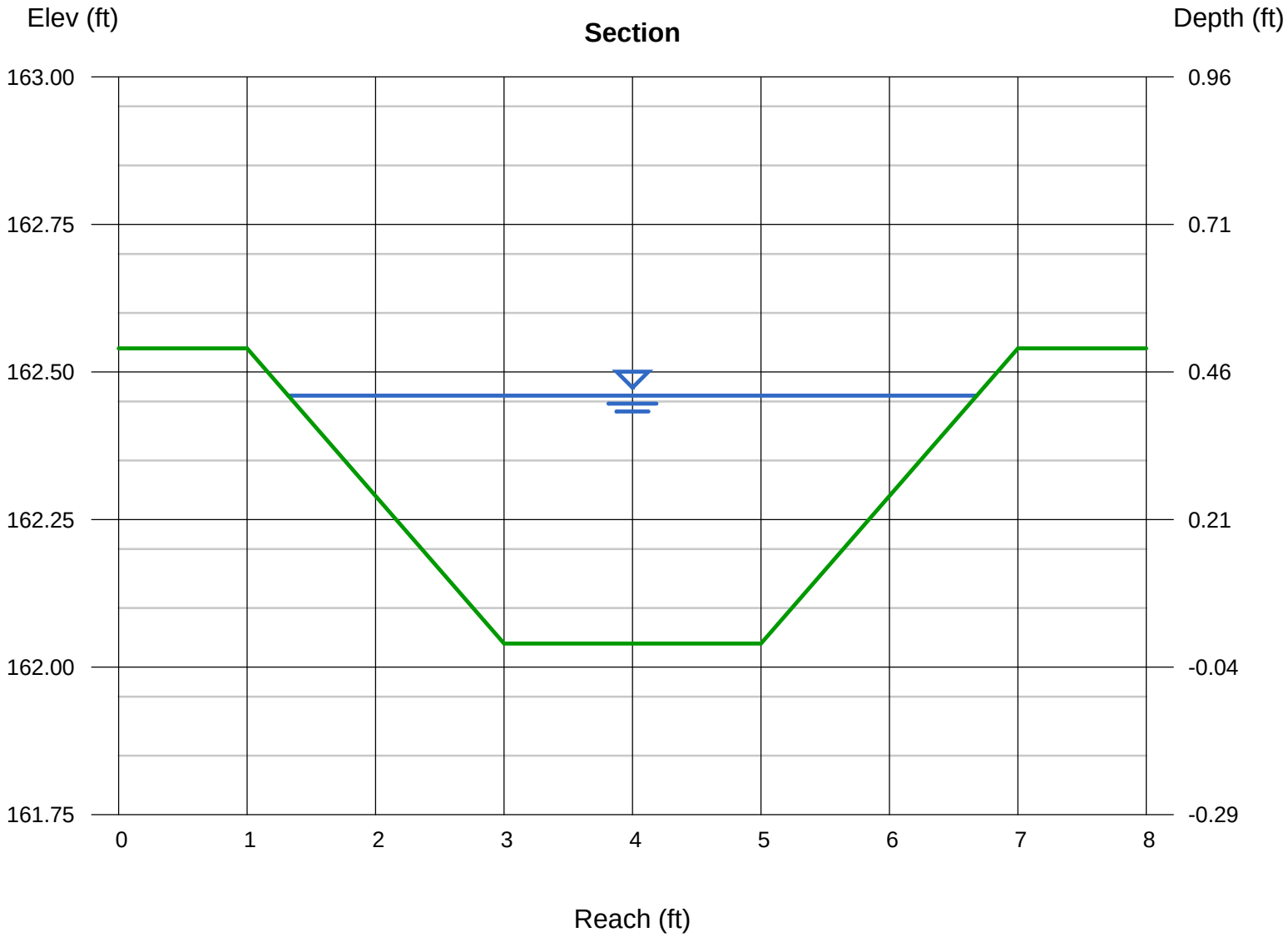
Bottom Width (ft)	=	2.00
Side Slopes (z:1)	=	4.00, 4.00
Total Depth (ft)	=	0.50
Invert Elev (ft)	=	162.04
Slope (%)	=	0.50
N-Value	=	0.240

Calculations

Compute by:		Known Q
Known Q (cfs)	=	0.28

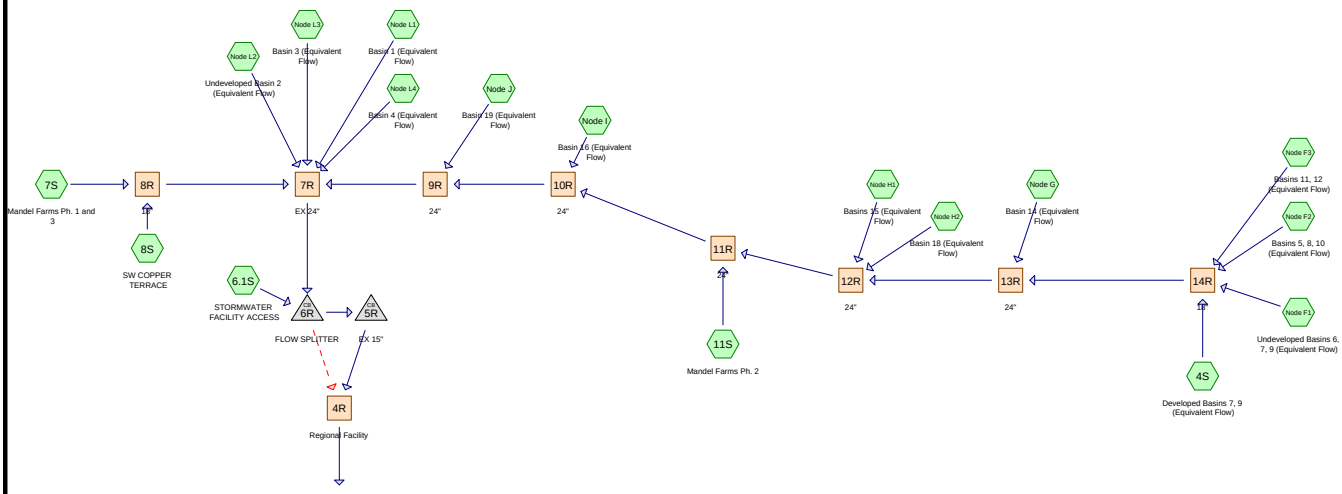
Highlighted

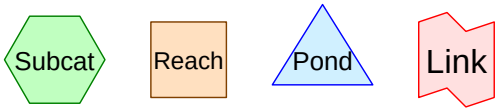
Depth (ft)	=	0.42
Q (cfs)	=	0.280
Area (sqft)	=	1.55
Velocity (ft/s)	=	0.18
Wetted Perim (ft)	=	5.46
Crit Depth, Yc (ft)	=	0.09
Top Width (ft)	=	5.36
EGL (ft)	=	0.42



APPENDIX D

EXISTING REGIONAL STORMWATER FACILITY WATER QUALITY STORM EVENT ANALYSIS





Drainage Diagram for 4570 POST-DEVELOPED

Prepared by AKS Engineering & Forestry (PAS), Printed 1/8/2016

HydroCAD® 8.50 s/n 005096 © 2007 HydroCAD Software Solutions LLC

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 4S: Developed Basins 7, 9 Runoff Area=4.550 ac 60.88% Impervious Runoff Depth=0.12"
Tc=10.0 min CN=79/98 Runoff=0.40 cfs 0.045 af

Subcatchment 6.1S: STORMWATER Runoff Area=3,225 sf 100.00% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=0/98 Runoff=0.01 cfs 0.001 af

Subcatchment 7S: Mandel Farms Ph. 1 Runoff Area=255,702 sf 46.62% Impervious Runoff Depth=0.09"
Tc=5.0 min CN=74/98 Runoff=0.50 cfs 0.044 af

Subcatchment 8S: SW COPPER TERRACE Runoff Area=16,815 sf 100.00% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=0/98 Runoff=0.07 cfs 0.006 af

Subcatchment 11S: Mandel Farms Ph. 2 Runoff Area=292,501 sf 53.08% Impervious Runoff Depth=0.10"
Tc=5.0 min CN=74/98 Runoff=0.66 cfs 0.058 af

Subcatchment Node F1: Undeveloped Runoff Area=7.070 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=525' Slope=0.0500 '/' Tc=29.3 min CN=79/0 Runoff=0.00 cfs 0.000 af

Subcatchment Node F2: Basins 5, 8, 10 Runoff Area=0.670 ac 88.06% Impervious Runoff Depth=0.17"
Tc=5.0 min CN=79/98 Runoff=0.11 cfs 0.010 af

Subcatchment Node F3: Basins 11, 12 Runoff Area=4.020 ac 66.17% Impervious Runoff Depth=0.13"
Tc=10.0 min CN=79/98 Runoff=0.38 cfs 0.043 af

Subcatchment Node G: Basin 14 Runoff Area=1.810 ac 49.72% Impervious Runoff Depth=0.10"
Tc=10.0 min CN=79/98 Runoff=0.13 cfs 0.015 af

Subcatchment Node H1: Basins 15 Runoff Area=0.170 ac 100.00% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 0.003 af

Subcatchment Node H2: Basin 18 Runoff Area=3.160 ac 68.04% Impervious Runoff Depth=0.13"
Tc=10.0 min CN=79/98 Runoff=0.31 cfs 0.035 af

Subcatchment Node I: Basin 16 Runoff Area=0.180 ac 100.00% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=0/98 Runoff=0.03 cfs 0.003 af

Subcatchment Node J: Basin 19 Runoff Area=0.100 ac 100.00% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=0/98 Runoff=0.02 cfs 0.002 af

Subcatchment Node L1: Basin 1 Runoff Area=5.310 ac 56.87% Impervious Runoff Depth=0.11"
Tc=10.0 min CN=79/98 Runoff=0.43 cfs 0.049 af

Subcatchment Node L2: Undeveloped Basin Runoff Area=2.960 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=410' Slope=0.0050 '/' Tc=48.2 min CN=79/0 Runoff=0.00 cfs 0.000 af

Subcatchment Node L3: Basin 3 Runoff Area=0.250 ac 100.00% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=0/98 Runoff=0.05 cfs 0.004 af

Subcatchment Node L4: Basin 4 Runoff Area=0.680 ac 51.47% Impervious Runoff Depth=0.10"
Tc=5.0 min CN=79/98 Runoff=0.06 cfs 0.006 af

Reach 4R: Regional Facility Avg. Depth=0.49' Max Vel=0.42 fps Inflow=3.08 cfs 0.323 af
n=0.240 L=230.0' S=0.0150 '/' Capacity=69.35 cfs Outflow=2.51 cfs 0.323 af

Reach 7R: EX 24" Avg. Depth=0.42' Max Vel=6.30 fps Inflow=3.12 cfs 0.322 af
D=24.0" n=0.013 L=139.4' S=0.0189 '/' Capacity=31.13 cfs Outflow=3.07 cfs 0.322 af

Reach 8R: 18" Avg. Depth=0.33' Max Vel=1.99 fps Inflow=0.58 cfs 0.051 af
D=18.0" n=0.013 L=125.1' S=0.0026 '/' Capacity=5.40 cfs Outflow=0.58 cfs 0.051 af

Reach 9R: 24" Avg. Depth=0.38' Max Vel=4.76 fps Inflow=1.99 cfs 0.212 af
D=24.0" n=0.013 L=78.3' S=0.0123 '/' Capacity=25.05 cfs Outflow=1.99 cfs 0.212 af

Reach 10R: 24" Avg. Depth=0.40' Max Vel=4.39 fps Inflow=2.00 cfs 0.211 af
D=24.0" n=0.013 L=128.8' S=0.0099 '/' Capacity=22.46 cfs Outflow=1.97 cfs 0.211 af

Reach 11R: 24" Avg. Depth=0.39' Max Vel=4.55 fps Inflow=1.97 cfs 0.208 af
D=24.0" n=0.013 L=92.2' S=0.0111 '/' Capacity=23.79 cfs Outflow=1.97 cfs 0.208 af

Reach 12R: 24" Avg. Depth=0.32' Max Vel=4.08 fps Inflow=1.33 cfs 0.150 af
D=24.0" n=0.013 L=153.1' S=0.0110 '/' Capacity=23.77 cfs Outflow=1.33 cfs 0.150 af

Reach 13R: 24" Avg. Depth=0.30' Max Vel=3.38 fps Inflow=1.01 cfs 0.112 af
D=24.0" n=0.013 L=161.2' S=0.0083 '/' Capacity=20.55 cfs Outflow=1.00 cfs 0.112 af

Reach 14R: 18" Avg. Depth=0.26' Max Vel=4.27 fps Inflow=0.88 cfs 0.098 af
D=18.0" n=0.013 L=250.2' S=0.0163 '/' Capacity=13.43 cfs Outflow=0.89 cfs 0.098 af

Pond 5R: EX 15" Peak Elev=175.59' Inflow=3.08 cfs 0.323 af
15.0" x 39.9' Culvert Outflow=3.08 cfs 0.323 af

Pond 6R: FLOW SPLITTER Peak Elev=175.90' Inflow=3.08 cfs 0.323 af
Primary=3.08 cfs 0.323 af Secondary=0.00 cfs 0.000 af Outflow=3.08 cfs 0.323 af

Total Runoff Area = 43.975 ac Runoff Volume = 0.323 af Average Runoff Depth = 0.09"
54.74% Pervious = 24.074 ac 45.26% Impervious = 19.901 ac

Summary for Subcatchment 4S: Developed Basins 7, 9 (Equivalent Flow)

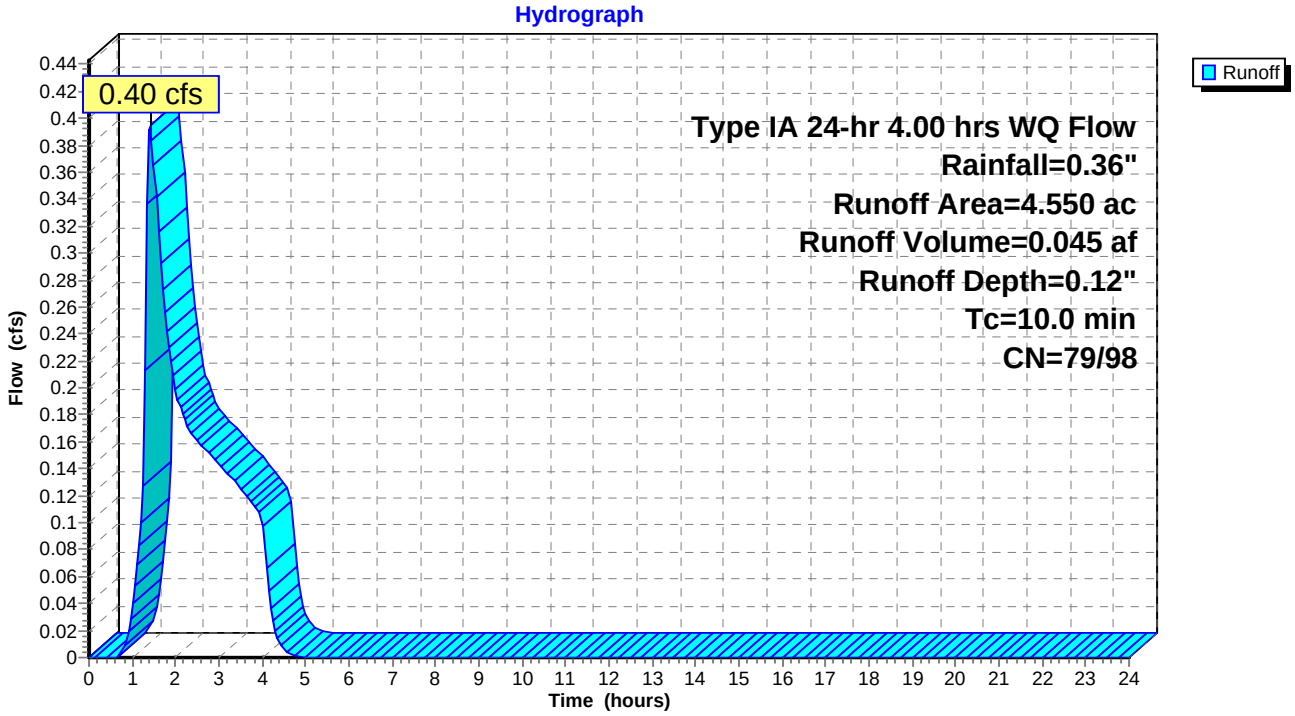
Runoff = 0.40 cfs @ 1.42 hrs, Volume= 0.045 af, Depth= 0.12"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	2.770	98	Impervious Area according to HHPR report (Basin 7 and 9 are 40% developed)
*	1.780	79	Pervious Area according to HHPR report (Basin 7 and 9 are 40% developed)
	4.550	91	Weighted Average
	1.780	79	Pervious Area
	2.770	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment 4S: Developed Basins 7, 9 (Equivalent Flow)



Summary for Subcatchment 6.1S: STORMWATER FACILITY ACCESS

[49] Hint: Tc<2dt may require smaller dt

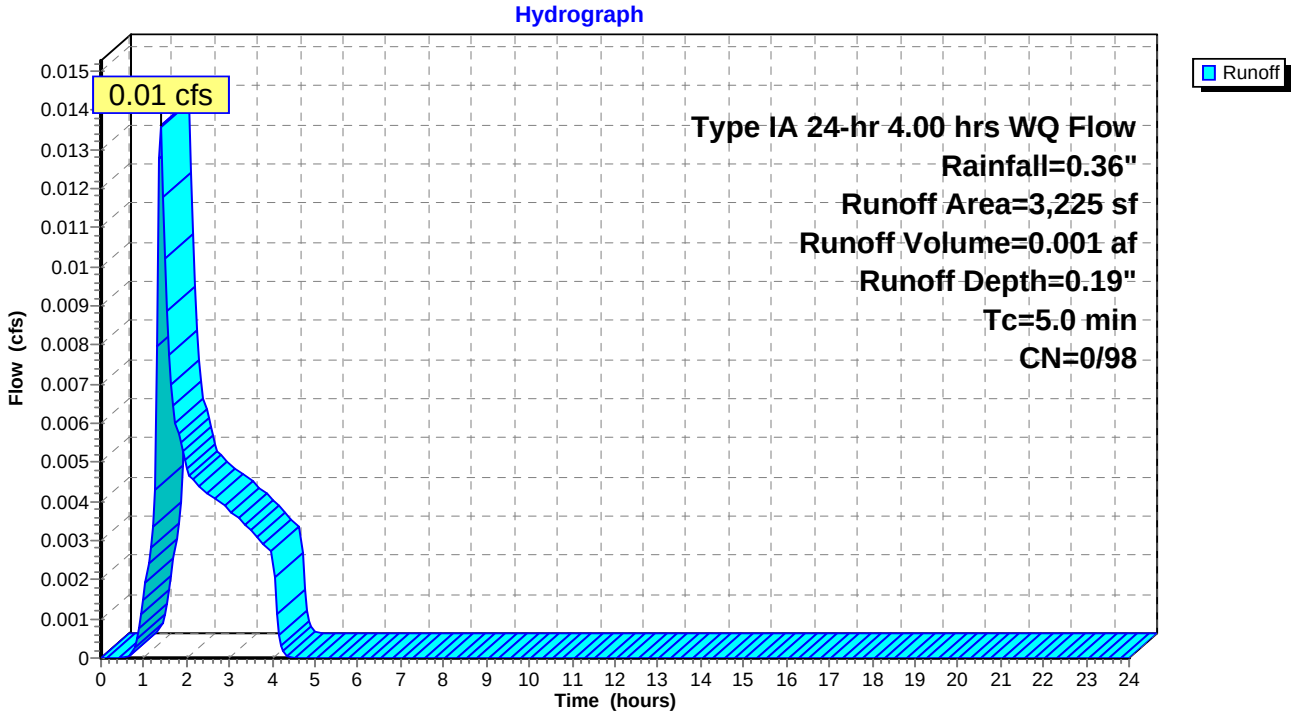
Runoff = 0.01 cfs @ 1.39 hrs, Volume= 0.001 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (sf)	CN	Description
*	3,225	98	Impervious Area on Access Road
	3,225	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 6.1S: STORMWATER FACILITY ACCESS



Summary for Subcatchment 7S: Mandel Farms Ph. 1 and 3

[49] Hint: Tc<2dt may require smaller dt

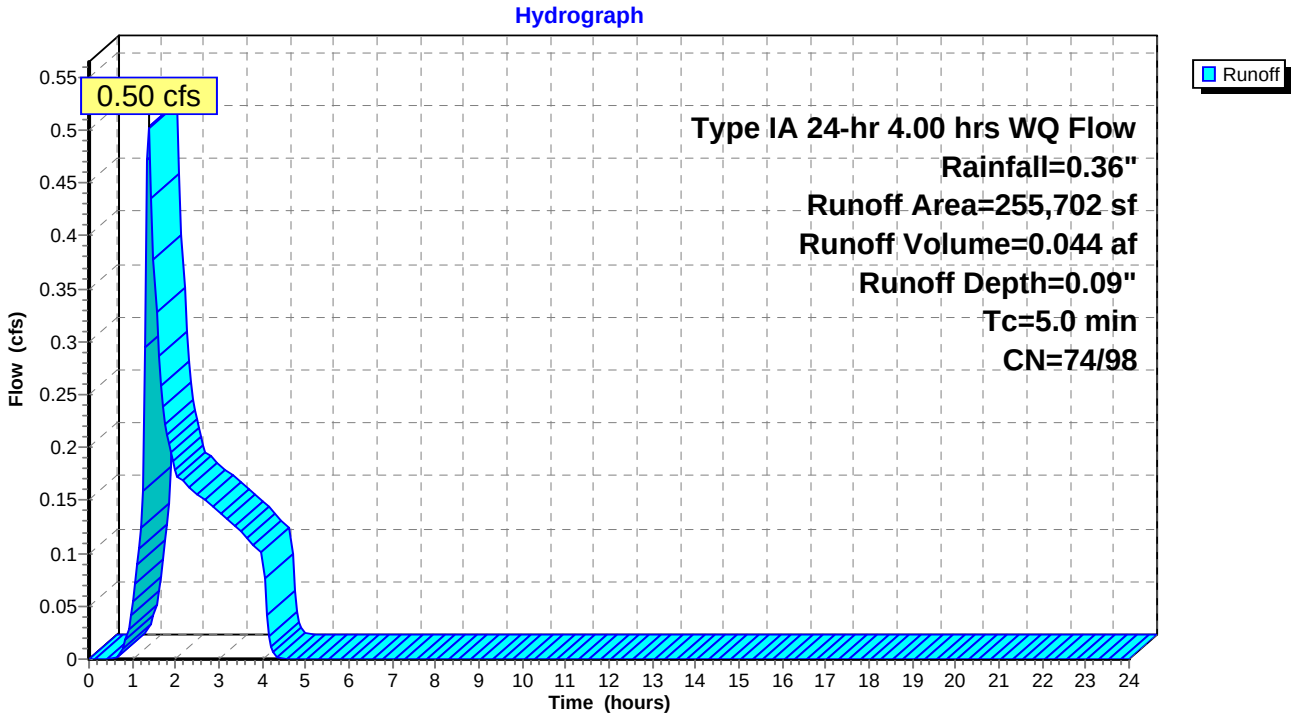
Runoff = 0.50 cfs @ 1.39 hrs, Volume= 0.044 af, Depth= 0.09"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (sf)	CN	Description
*	73,920	98	28 lots @ 2640 sf
*	45,298	98	Road pavements, curbs & sidewalks
	136,484	74	>75% Grass cover, Good, HSG C
	255,702	85	Weighted Average
	136,484	74	Pervious Area
	119,218	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 7S: Mandel Farms Ph. 1 and 3



Summary for Subcatchment 8S: SW COPPER TERRACE

[49] Hint: Tc<2dt may require smaller dt

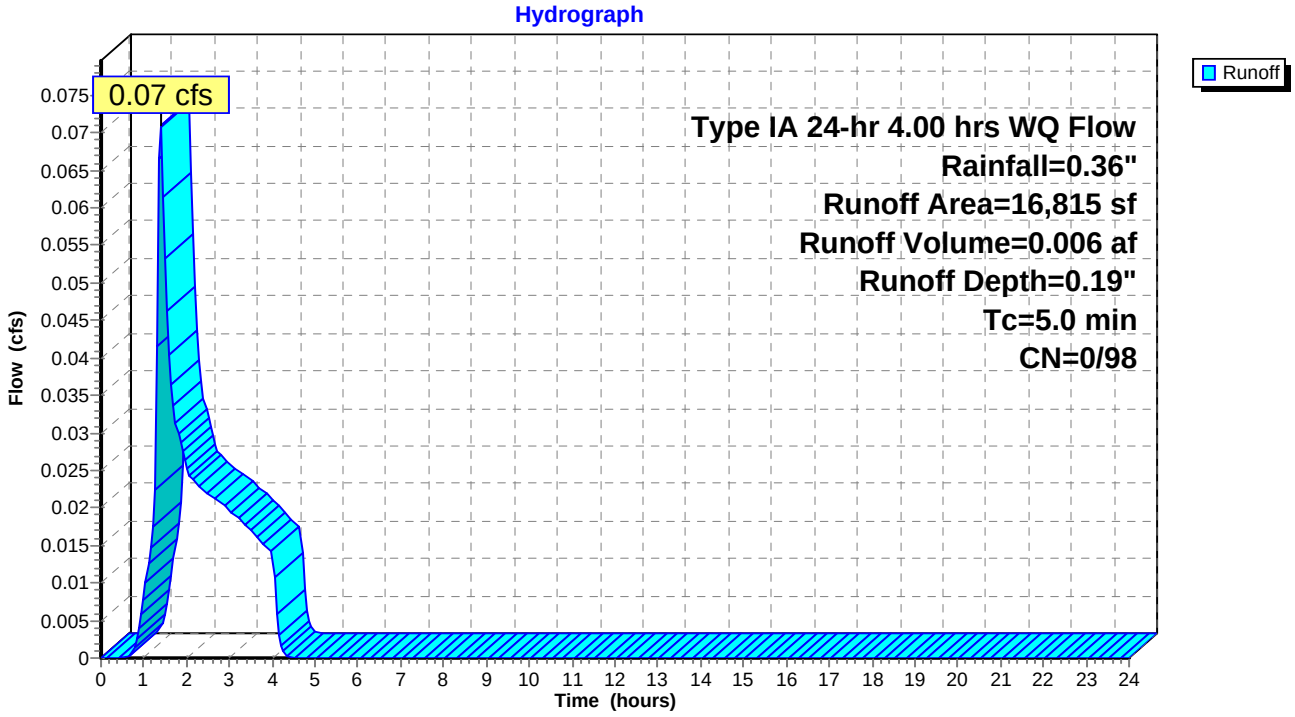
Runoff = 0.07 cfs @ 1.39 hrs, Volume= 0.006 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (sf)	CN	Description
*	16,815	98	Impervious Roadway and Sidewalk
	16,815	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 8S: SW COPPER TERRACE



Summary for Subcatchment 11S: Mandel Farms Ph. 2

[49] Hint: Tc<2dt may require smaller dt

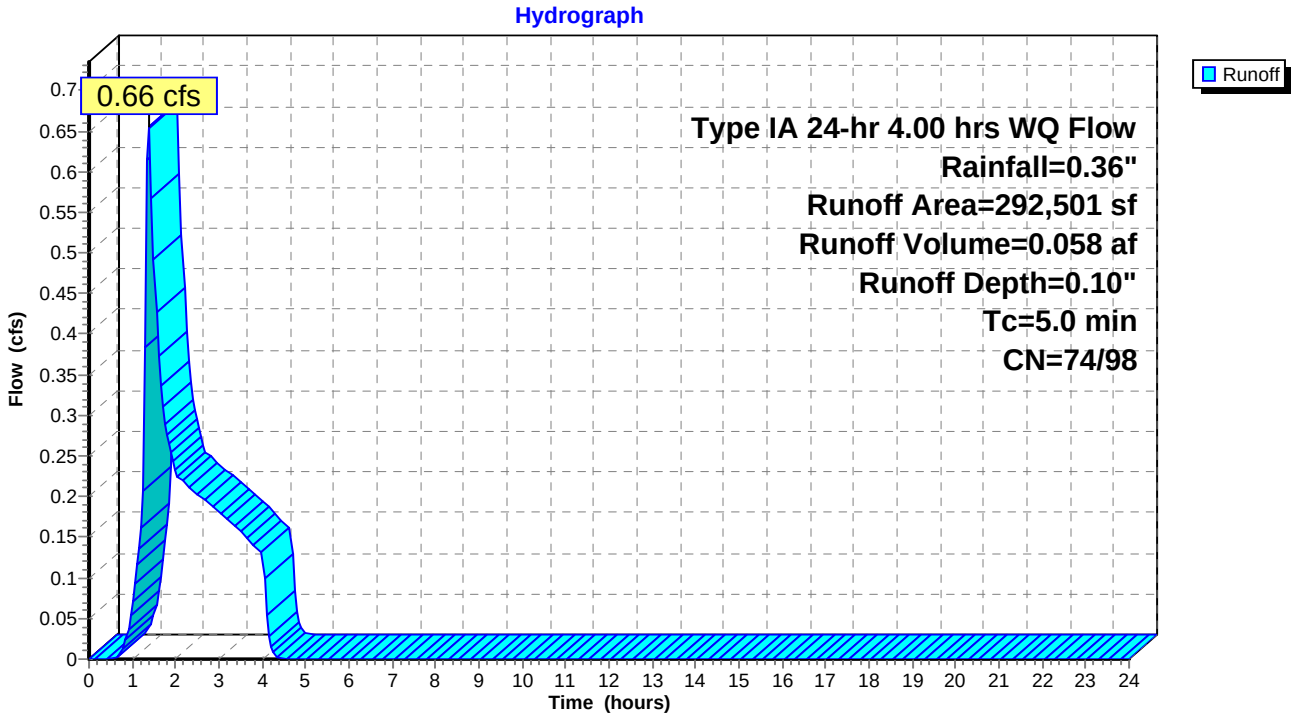
Runoff = 0.66 cfs @ 1.39 hrs, Volume= 0.058 af, Depth= 0.10"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (sf)	CN	Description
*	95,040	98	36 lots @ 2640 sf
*	60,215	98	Road pavements, curbs & sidewalks
	137,246	74	>75% Grass cover, Good, HSG C
	292,501	87	Weighted Average
	137,246	74	Pervious Area
	155,255	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 11S: Mandel Farms Ph. 2



Summary for Subcatchment Node F1: Undeveloped Basins 6, 7, 9 (Equivalent Flow)

[45] Hint: Runoff=Zero

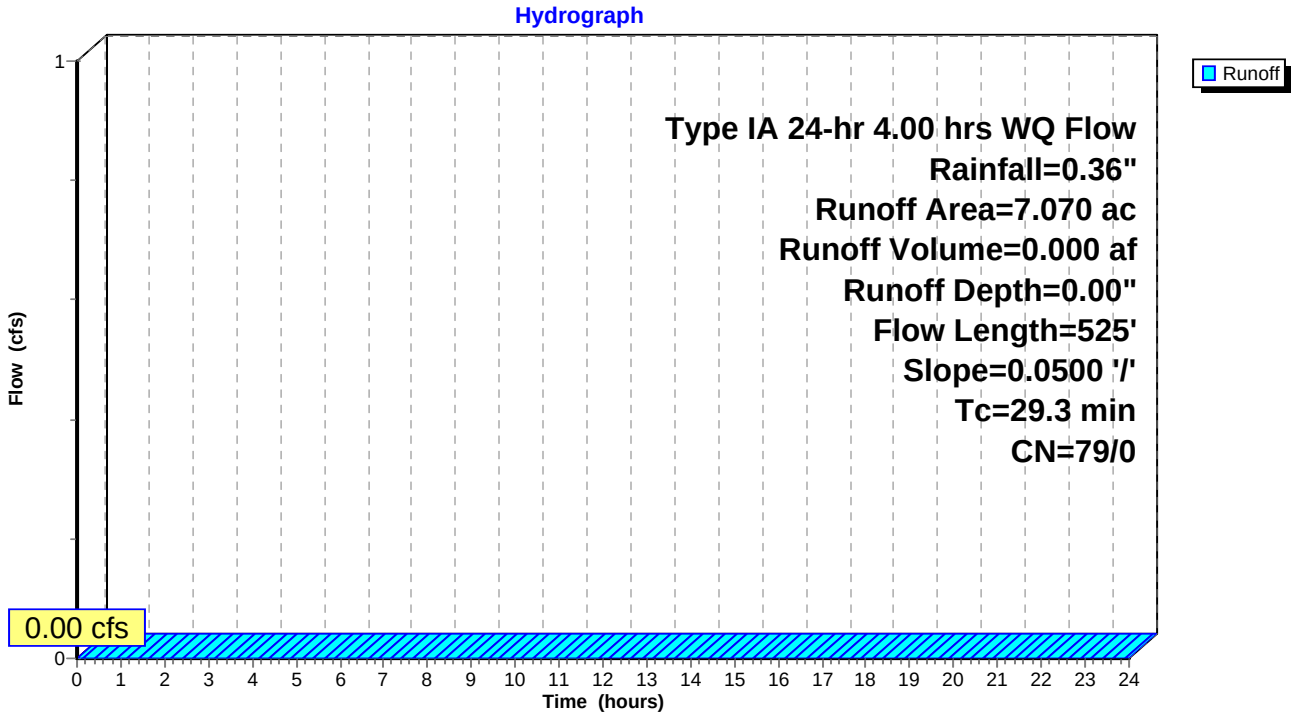
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	7.070	79	Pervious Area according to HHPR report (Basins 7 and 9 are 60% undeveloped)
	7.070	79	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.9	300	0.0500	0.19		**Sheet Flow,** Grass: Dense n= 0.240 P2= 2.50"
2.4	225	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
29.3	525	Total			

Subcatchment Node F1: Undeveloped Basins 6, 7, 9 (Equivalent Flow)



Summary for Subcatchment Node F2: Basins 5, 8, 10 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

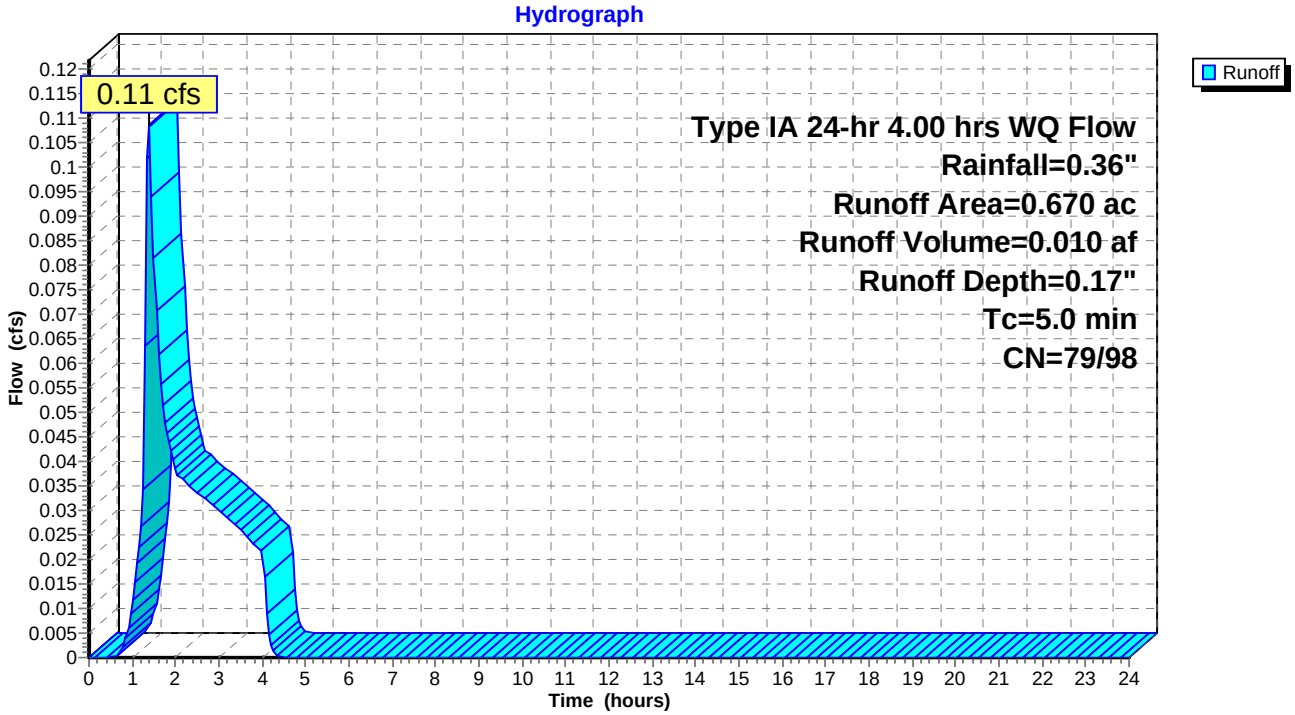
Runoff = 0.11 cfs @ 1.39 hrs, Volume= 0.010 af, Depth= 0.17"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.590	98	Impervious Area according to HHPR report
*	0.080	79	Pervious Area according to HHPR report
	0.670	96	Weighted Average
	0.080	79	Pervious Area
	0.590	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node F2: Basins 5, 8, 10 (Equivalent Flow)



Summary for Subcatchment Node F3: Basins 11, 12 (Equivalent Flow)

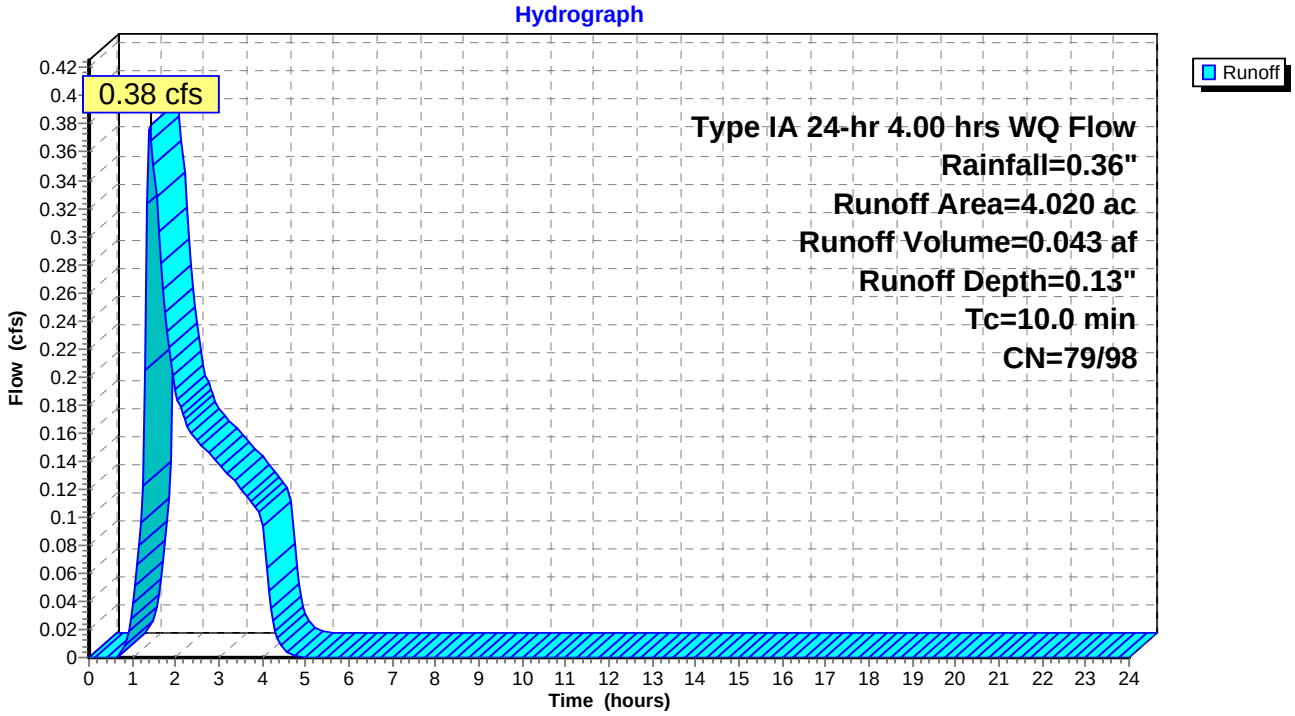
Runoff = 0.38 cfs @ 1.42 hrs, Volume= 0.043 af, Depth= 0.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	2.660	98	Impervious Area according to HHPR report (53% of Basin 12 incorporates proposed site)
*	1.360	79	Pervious Area according to HHPR report (53% of Basin 12 incorporates proposed site)
	4.020	92	Weighted Average
	1.360	79	Pervious Area
	2.660	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node F3: Basins 11, 12 (Equivalent Flow)



Summary for Subcatchment Node G: Basin 14 (Equivalent Flow)

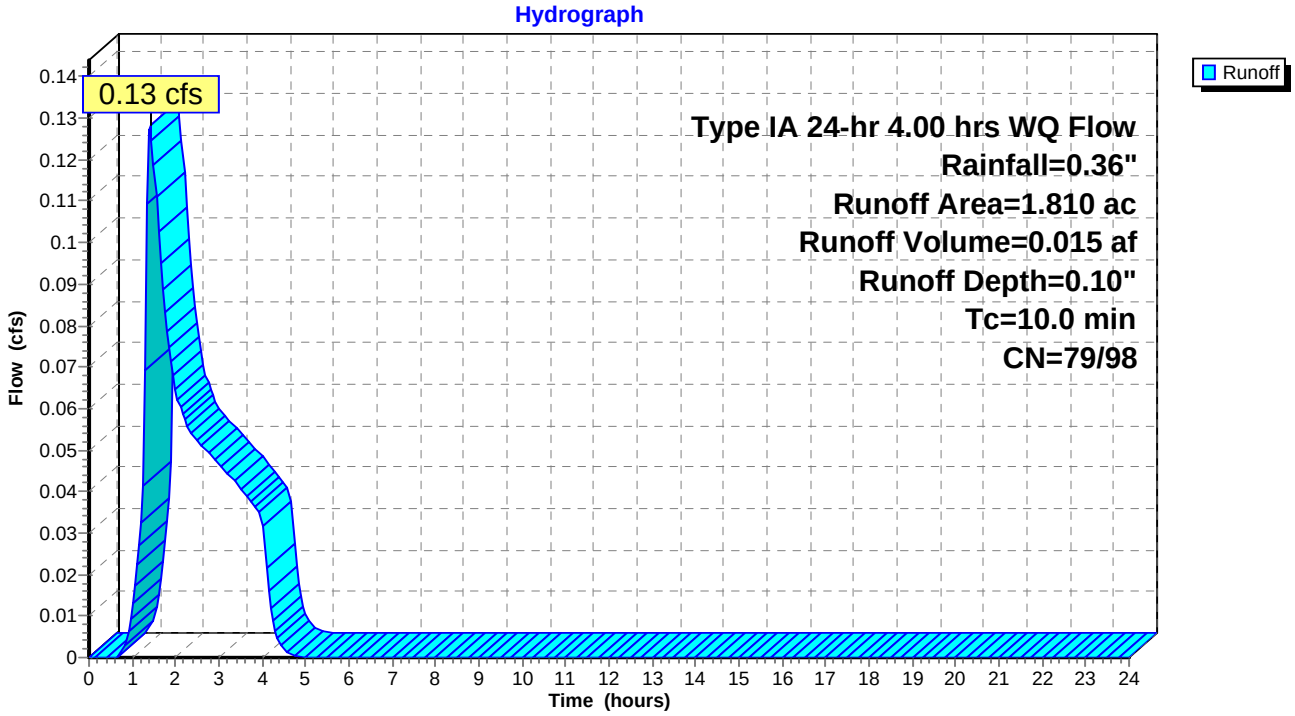
Runoff = 0.13 cfs @ 1.42 hrs, Volume= 0.015 af, Depth= 0.10"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.900	98	Impervious Area according to HHPR report
*	0.910	79	Pervious Area according to HHPR report
	1.810	88	Weighted Average
	0.910	79	Pervious Area
	0.900	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node G: Basin 14 (Equivalent Flow)



Summary for Subcatchment Node H1: Basins 15 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

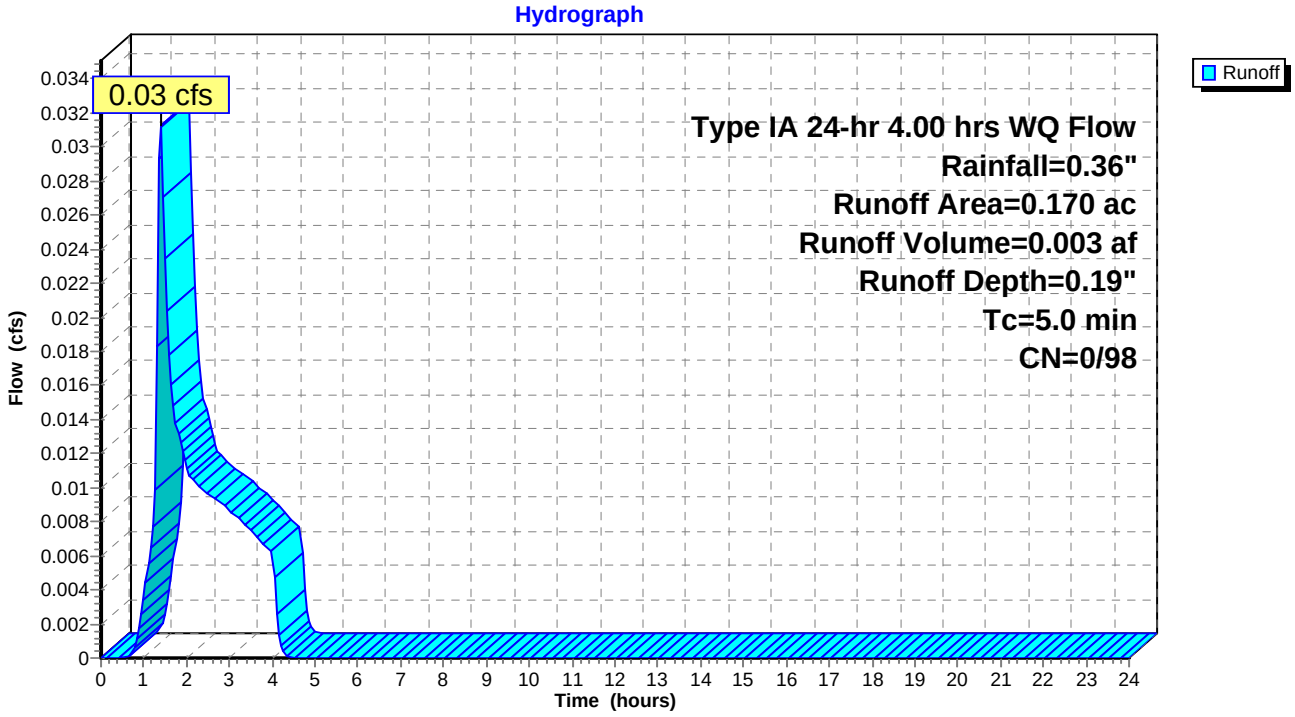
Runoff = 0.03 cfs @ 1.39 hrs, Volume= 0.003 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.170	98	Impervious Area according to HHPR report
	0.170	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node H1: Basins 15 (Equivalent Flow)



Summary for Subcatchment Node H2: Basin 18 (Equivalent Flow)

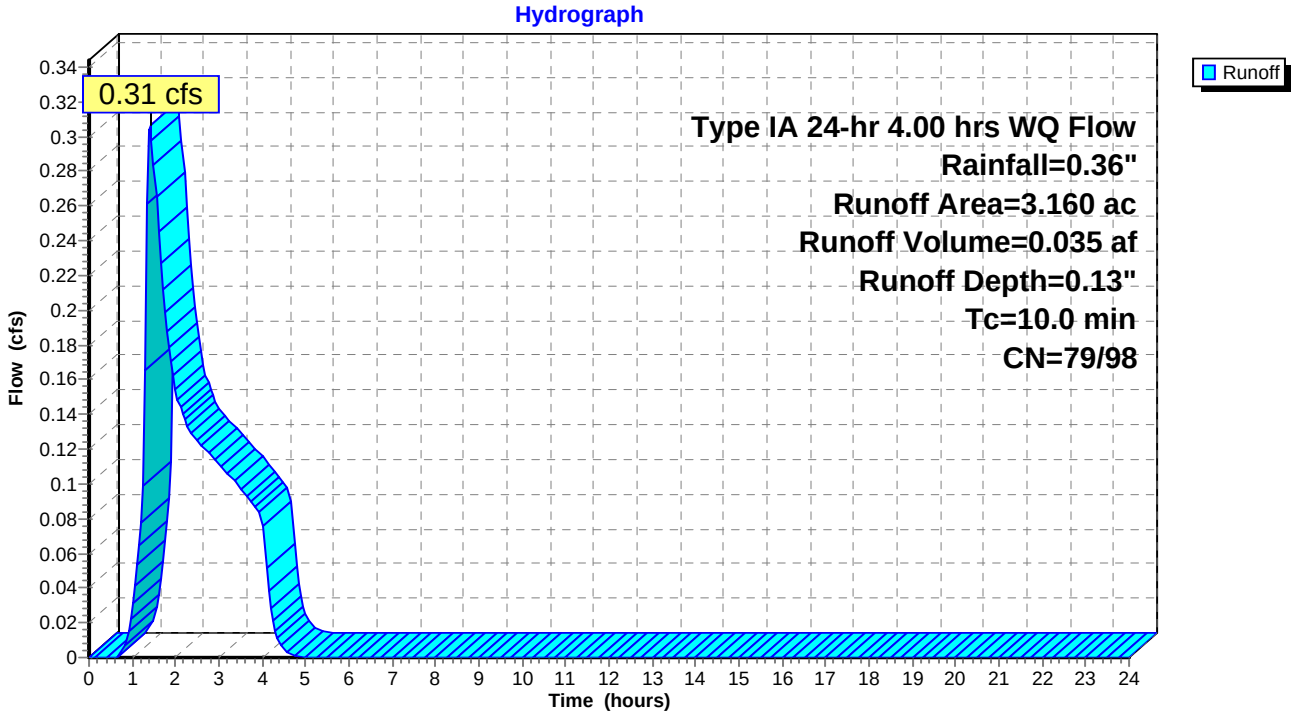
Runoff = 0.31 cfs @ 1.42 hrs, Volume= 0.035 af, Depth= 0.13"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	2.150	98	Impervious Area according to HHPR report
*	1.010	79	Pervious Area according to HHPR report
	3.160	92	Weighted Average
	1.010	79	Pervious Area
	2.150	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node H2: Basin 18 (Equivalent Flow)



Summary for Subcatchment Node I: Basin 16 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

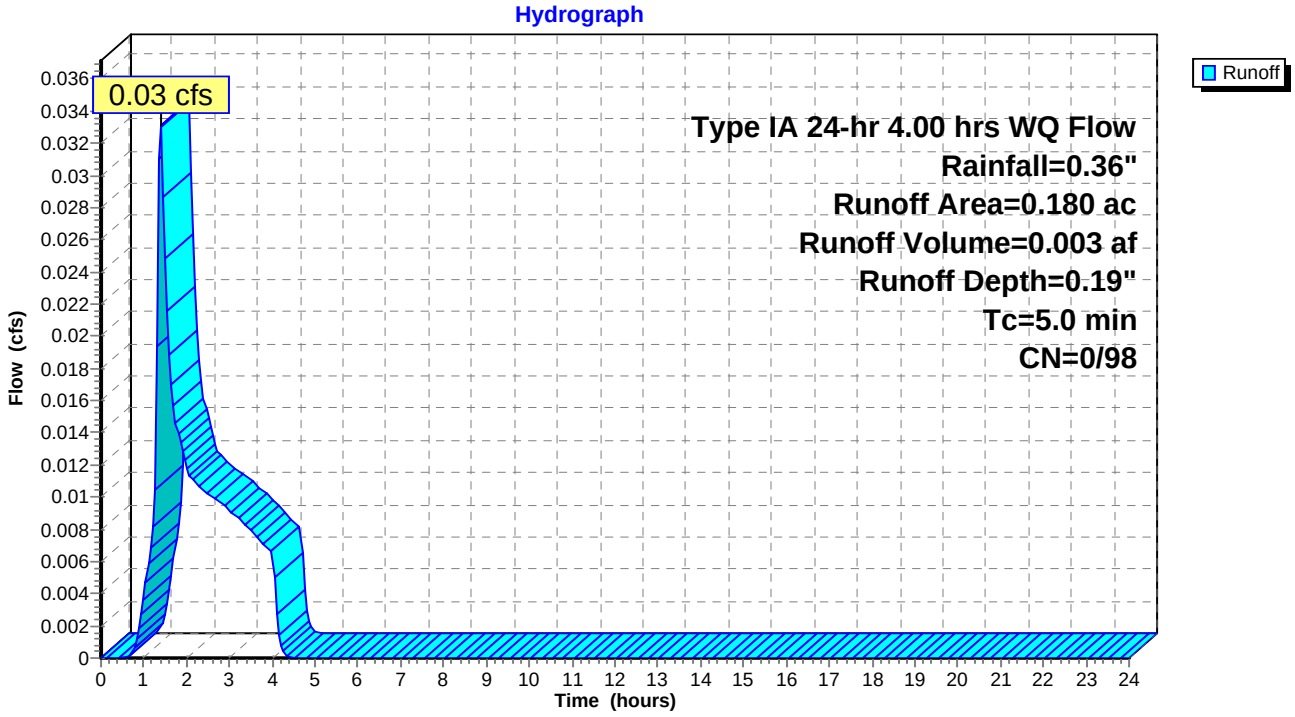
Runoff = 0.03 cfs @ 1.39 hrs, Volume= 0.003 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.180	98	Impervious Area according to HHPR report
	0.180	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node I: Basin 16 (Equivalent Flow)



Summary for Subcatchment Node J: Basin 19 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

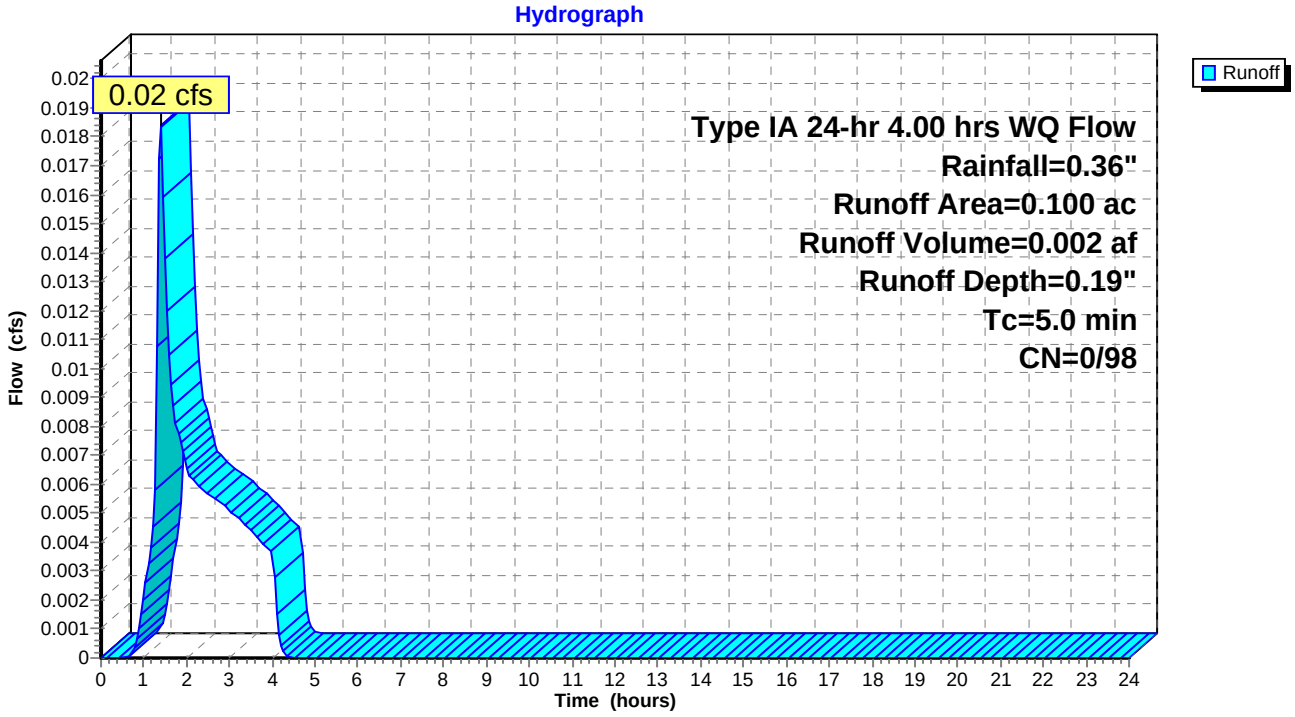
Runoff = 0.02 cfs @ 1.39 hrs, Volume= 0.002 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.100	98	Impervious Area according to HHPR report
	0.100	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node J: Basin 19 (Equivalent Flow)



Summary for Subcatchment Node L1: Basin 1 (Equivalent Flow)

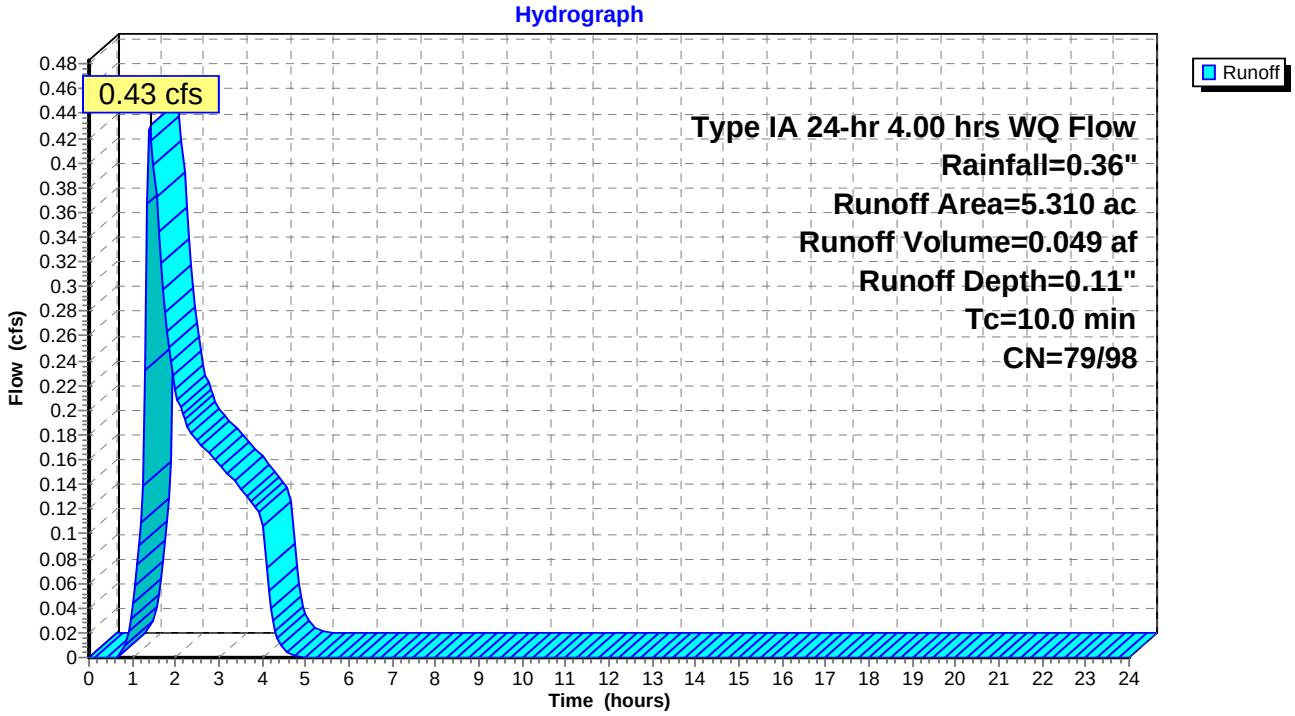
Runoff = 0.43 cfs @ 1.42 hrs, Volume= 0.049 af, Depth= 0.11"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	3.020	98	Impervious Area according to HHPR report
*	2.290	79	Pervious Area according to HHPR report
	5.310	90	Weighted Average
	2.290	79	Pervious Area
	3.020	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0					**Direct Entry,**

Subcatchment Node L1: Basin 1 (Equivalent Flow)



Summary for Subcatchment Node L2: Undeveloped Basin 2 (Equivalent Flow)

[45] Hint: Runoff=Zero

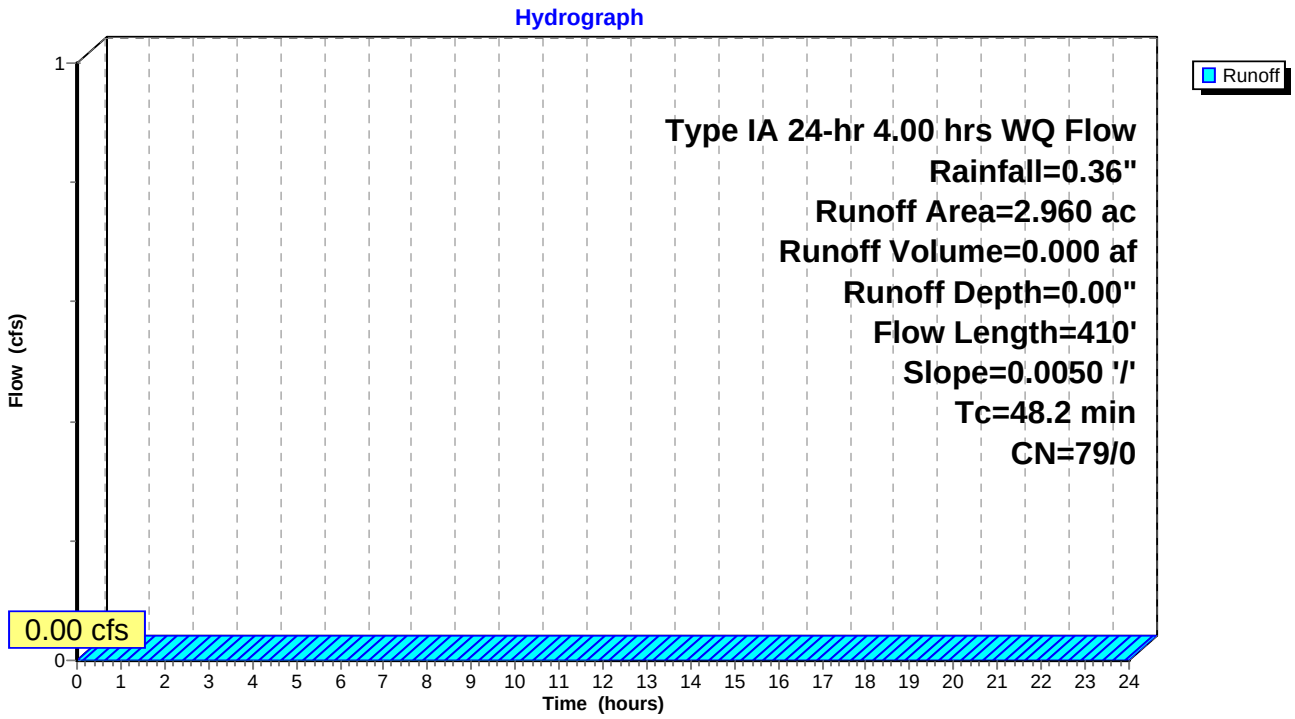
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	2.960	79	Pervious Area according to HHPR report
	2.960	79	Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.5	300	0.0050	0.11		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.50"
1.7	110	0.0050	1.06		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
48.2	410	Total			

Subcatchment Node L2: Undeveloped Basin 2 (Equivalent Flow)



Summary for Subcatchment Node L3: Basin 3 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

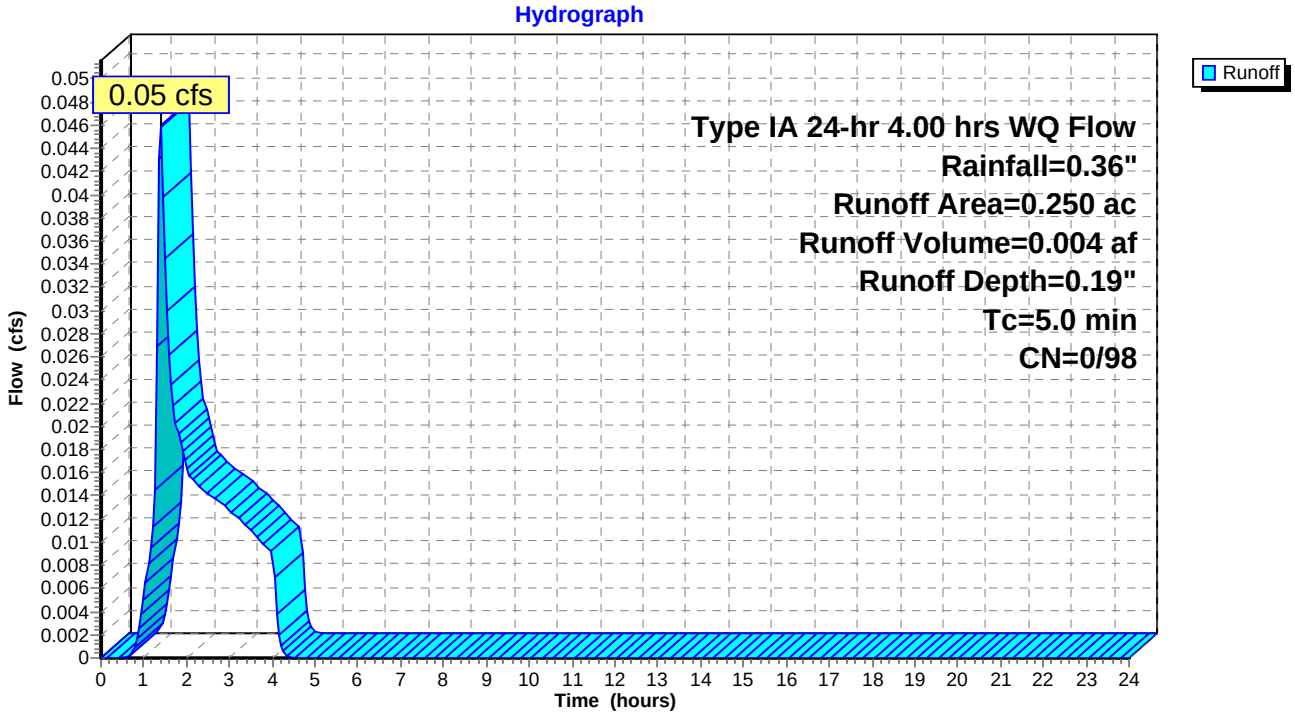
Runoff = 0.05 cfs @ 1.39 hrs, Volume= 0.004 af, Depth= 0.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.250	98	Impervious Area according to HHPR report
	0.250	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node L3: Basin 3 (Equivalent Flow)



Summary for Subcatchment Node L4: Basin 4 (Equivalent Flow)

[49] Hint: Tc<2dt may require smaller dt

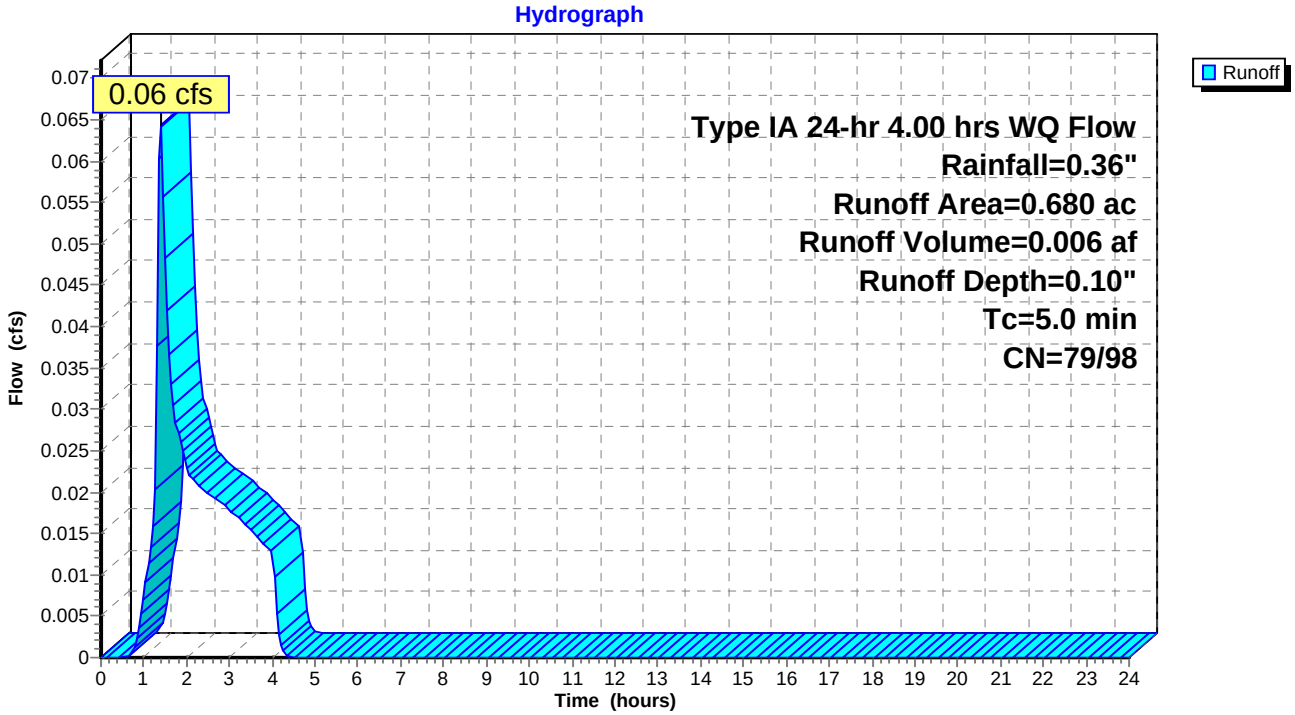
Runoff = 0.06 cfs @ 1.39 hrs, Volume= 0.006 af, Depth= 0.10"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 4.00 hrs WQ Flow Rainfall=0.36"

	Area (ac)	CN	Description
*	0.350	98	Impervious Area according to HHPR report
*	0.330	79	Pervious Area according to HHPR report
	0.680	89	Weighted Average
	0.330	79	Pervious Area
	0.350	98	Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment Node L4: Basin 4 (Equivalent Flow)



Summary for Reach 4R: Regional Facility

Inflow Area = 43.975 ac, 45.26% Impervious, Inflow Depth = 0.09" for WQ Flow event
Inflow = 3.08 cfs @ 1.43 hrs, Volume= 0.323 af
Outflow = 2.51 cfs @ 1.56 hrs, Volume= 0.323 af, Atten= 19%, Lag= 8.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 26.4 min

Peak Storage= 1,356 cf @ 1.56 hrs, Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 69.35 cfs

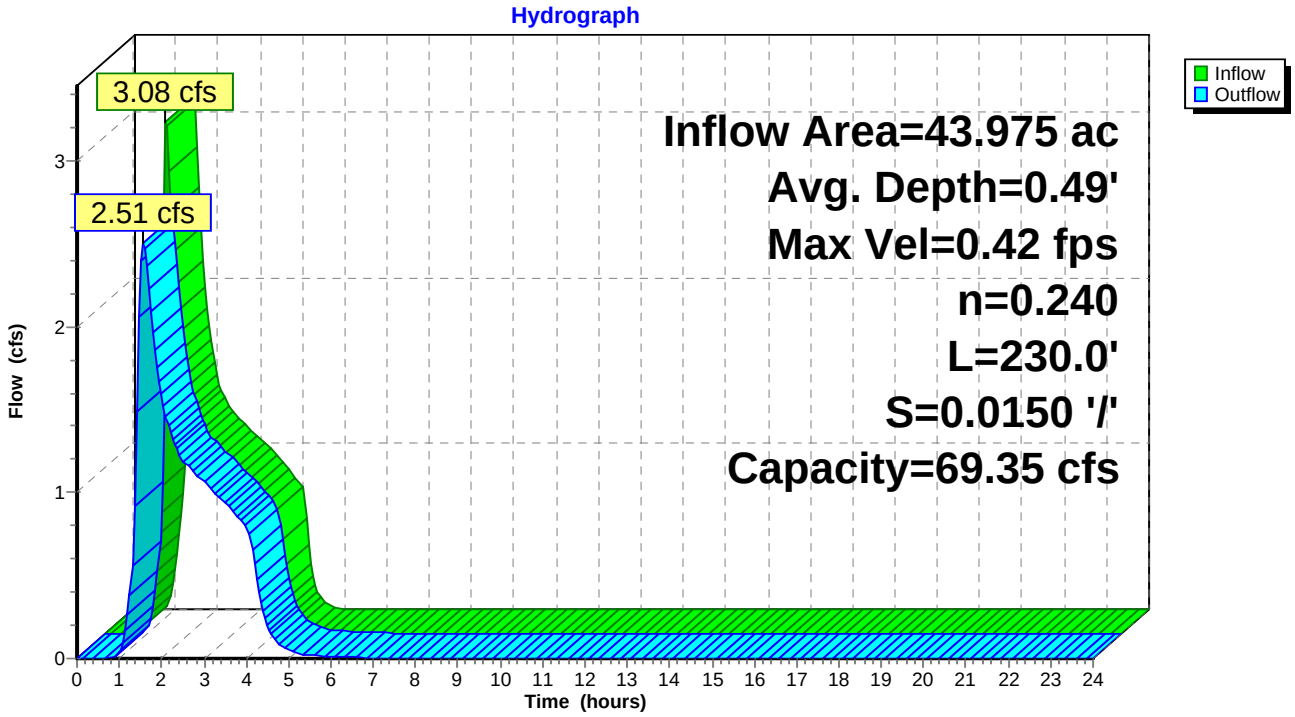
Custom cross-section, Length= 230.0' Slope= 0.0150 '/' (101 Elevation Intervals)
Constant n= 0.240
Inlet Invert= 174.00', Outlet Invert= 170.55'

‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
-13.25	3.00	0.00
-7.00	0.50	2.50
-5.00	0.00	3.00
5.00	0.00	3.00
7.00	0.50	2.50
13.25	3.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	10.0	0	0.00
0.50	6.0	14.1	1,380	2.57
3.00	56.6	27.6	13,024	69.35

Reach 4R: Regional Facility



Summary for Reach 7R: EX 24"

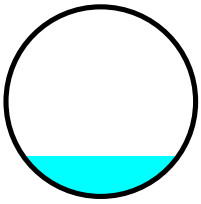
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 8R outlet invert by 0.26' @ 1.45 hrs
[62] Warning: Exceeded Reach 9R OUTLET depth by 0.01' @ 1.40 hrs

Inflow Area = 43.901 ac, 45.16% Impervious, Inflow Depth = 0.09" for WQ Flow event
Inflow = 3.12 cfs @ 1.42 hrs, Volume= 0.322 af
Outflow = 3.07 cfs @ 1.43 hrs, Volume= 0.322 af, Atten= 2%, Lag= 0.4 min

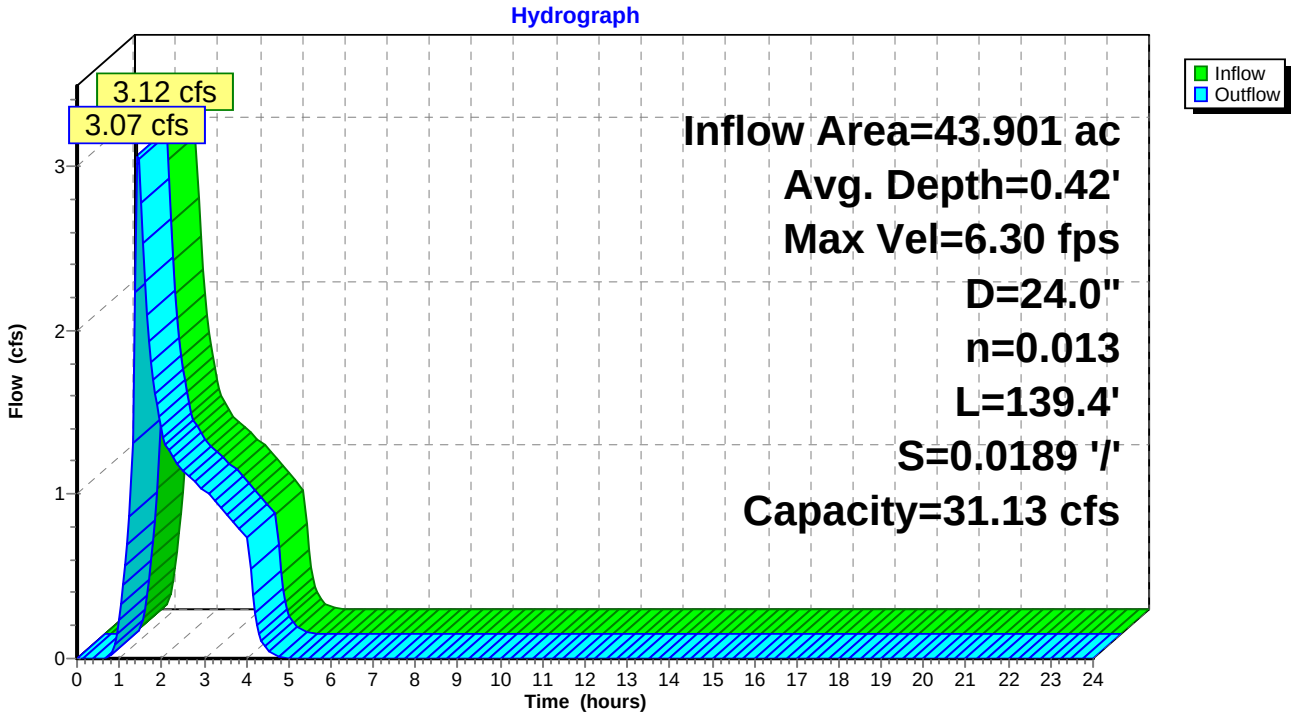
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.30 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 3.38 fps, Avg. Travel Time= 0.7 min

Peak Storage= 68 cf @ 1.43 hrs, Average Depth at Peak Storage= 0.42'
Defined Flood Depth= 185.68', Capacity at Flood Depth= -11,966.43 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 31.13 cfs

24.0" Diameter Pipe, n= 0.013
Length= 139.4' Slope= 0.0189 '/'
Inlet Invert= 178.45', Outlet Invert= 175.81'



Reach 7R: EX 24"



Summary for Reach 8R: 18"

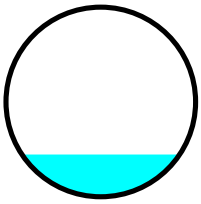
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 6.256 ac, 49.92% Impervious, Inflow Depth = 0.10" for WQ Flow event
Inflow = 0.58 cfs @ 1.39 hrs, Volume= 0.051 af
Outflow = 0.58 cfs @ 1.41 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.9 min

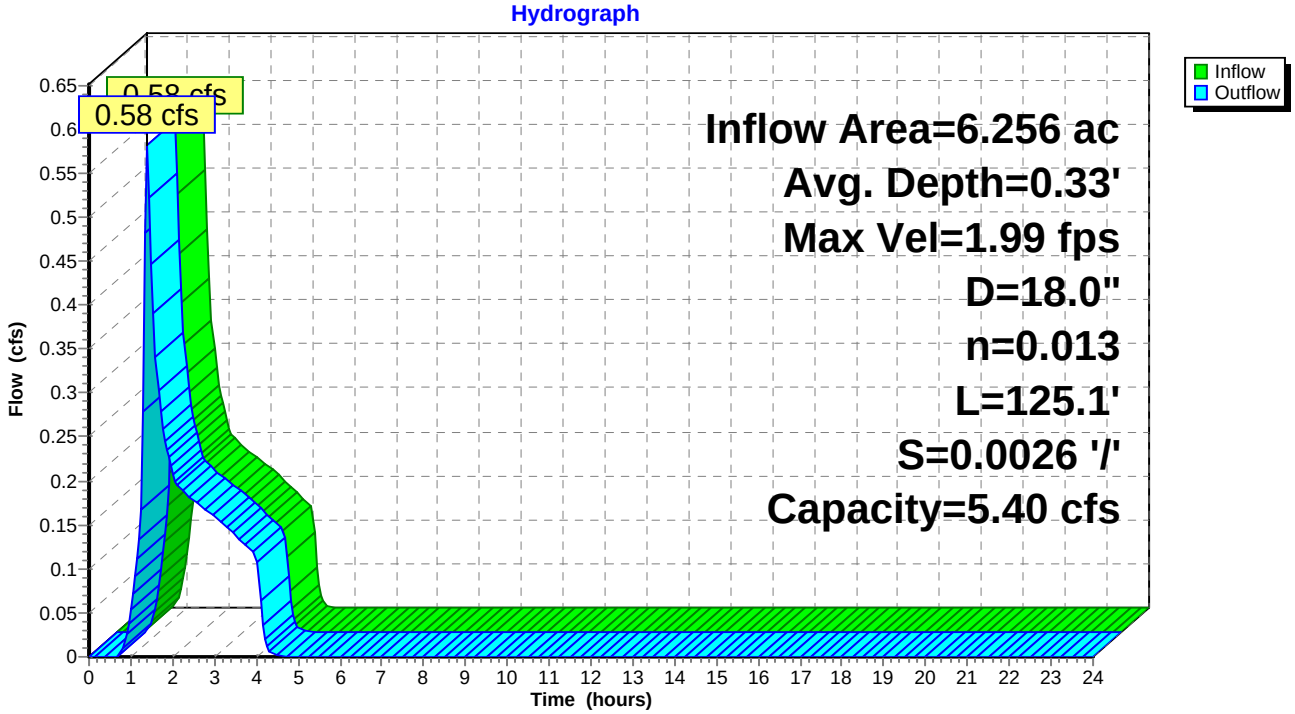
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.99 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.14 fps, Avg. Travel Time= 1.8 min

Peak Storage= 36 cf @ 1.41 hrs, Average Depth at Peak Storage= 0.33'
Defined Flood Depth= 183.79', Capacity at Flood Depth= -2,745.79 cfs
Bank-Full Depth= 1.50', Capacity at Bank-Full= 5.40 cfs

18.0" Diameter Pipe, n= 0.013
Length= 125.1' Slope= 0.0026 '/'
Inlet Invert= 178.94', Outlet Invert= 178.61'



Reach 8R: 18"



Summary for Reach 9R: 24"

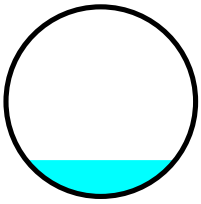
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt
[61] Hint: Exceeded Reach 10R outlet invert by 0.20' @ 1.45 hrs

Inflow Area = 28.445 ac, 46.00% Impervious, Inflow Depth = 0.09" for WQ Flow event
Inflow = 1.99 cfs @ 1.43 hrs, Volume= 0.212 af
Outflow = 1.99 cfs @ 1.44 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.3 min

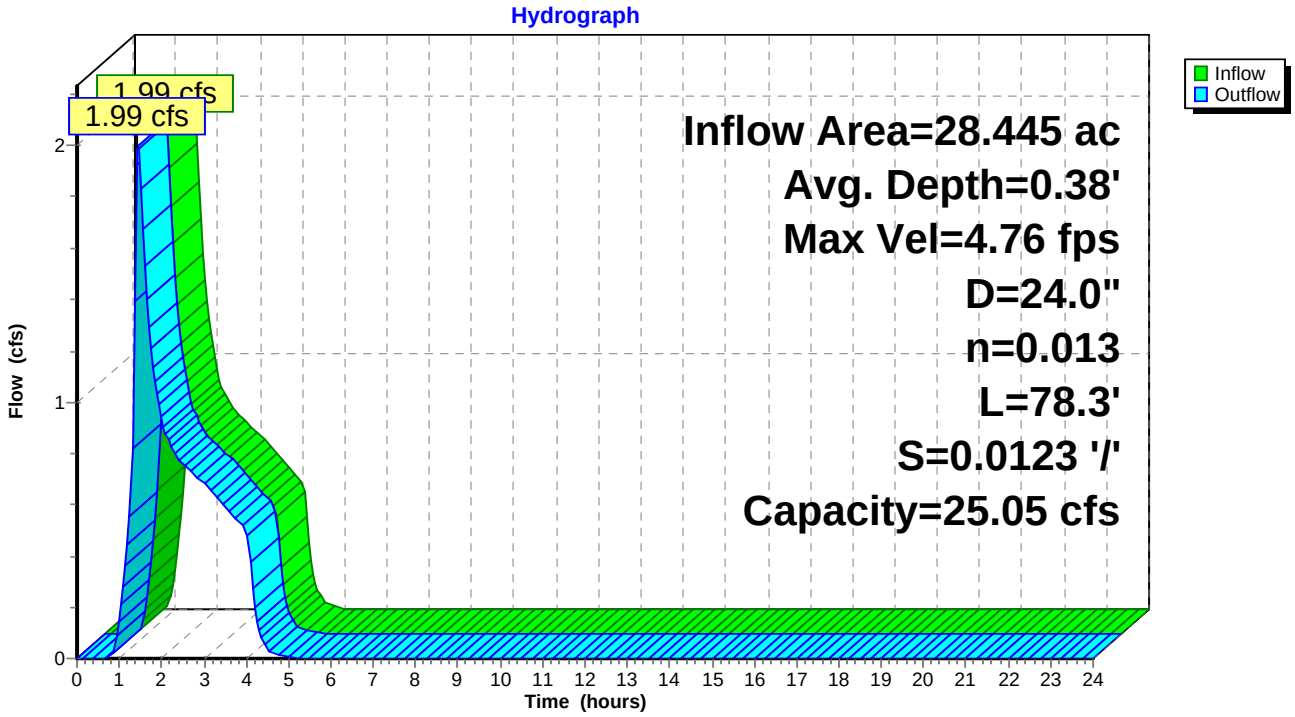
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.76 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.59 fps, Avg. Travel Time= 0.5 min

Peak Storage= 33 cf @ 1.44 hrs, Average Depth at Peak Storage= 0.38'
Defined Flood Depth= 188.25', Capacity at Flood Depth= -9,763.35 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 25.05 cfs

24.0" Diameter Pipe, n= 0.013
Length= 78.3' Slope= 0.0123 '/'
Inlet Invert= 179.45', Outlet Invert= 178.49'



Reach 9R: 24"


Hydrograph
1.99 cfs
1.99 cfs
Inflow
Outflow
Inflow Area=28.445 ac
Avg. Depth=0.38'
Max Vel=4.76 fps
D=24.0"
n=0.013
L=78.3'
S=0.0123 '/'
Capacity=25.05 cfs
Flow (cfs)
Time (hours)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Reach 10R: 24"

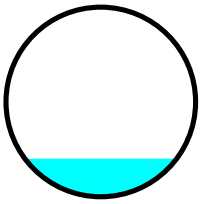
[52] Hint: Inlet/Outlet conditions not evaluated
[61] Hint: Exceeded Reach 11R outlet invert by 0.20' @ 1.45 hrs

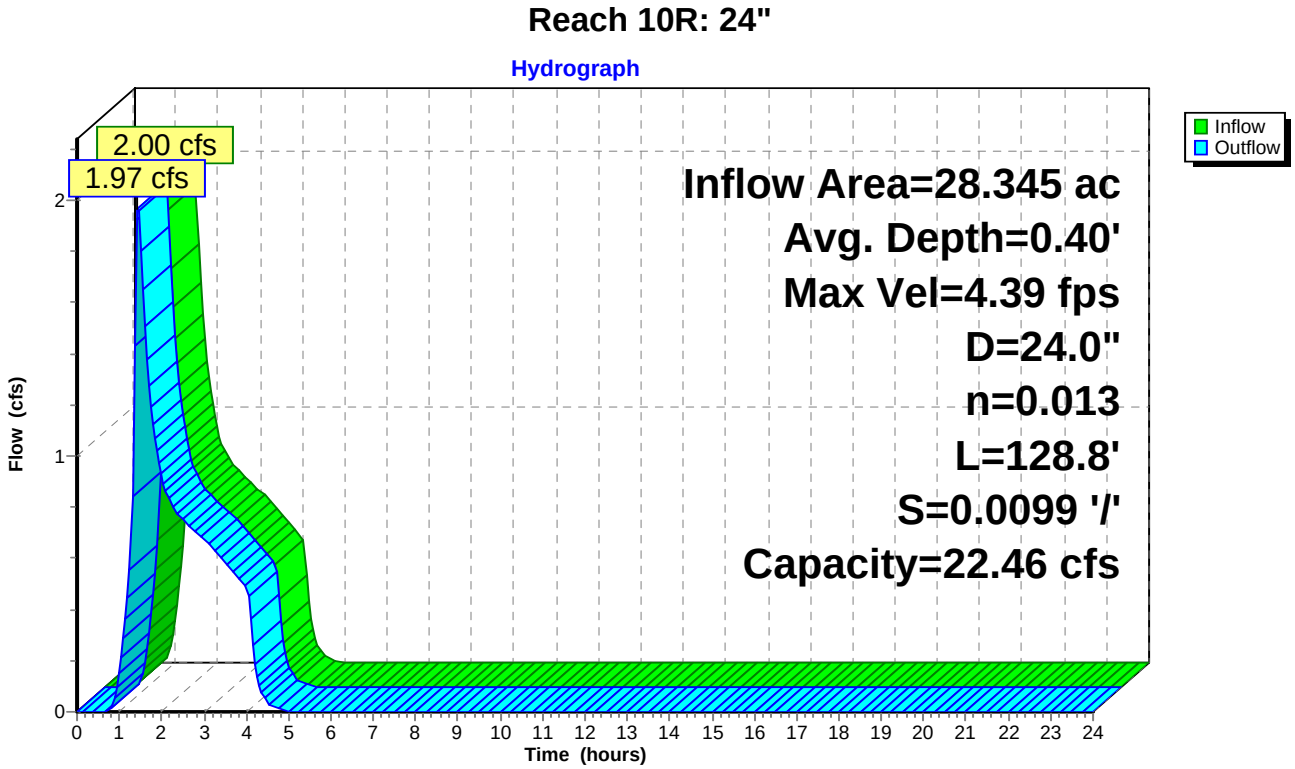
Inflow Area = 28.345 ac, 45.81% Impervious, Inflow Depth = 0.09" for WQ Flow event
Inflow = 2.00 cfs @ 1.42 hrs, Volume= 0.211 af
Outflow = 1.97 cfs @ 1.43 hrs, Volume= 0.211 af, Atten= 2%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.39 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 2.40 fps, Avg. Travel Time= 0.9 min

Peak Storage= 58 cf @ 1.43 hrs, Average Depth at Peak Storage= 0.40'
Defined Flood Depth= 191.00', Capacity at Flood Depth= -8,885.25 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 22.46 cfs

24.0" Diameter Pipe, n= 0.013
Length= 128.8' Slope= 0.0099 '/'
Inlet Invert= 180.90', Outlet Invert= 179.63'





Summary for Reach 11R: 24"

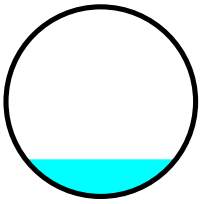
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt
[62] Warning: Exceeded Reach 12R OUTLET depth by 0.07' @ 1.40 hrs

Inflow Area = 28.165 ac, 45.46% Impervious, Inflow Depth = 0.09" for WQ Flow event
Inflow = 1.97 cfs @ 1.42 hrs, Volume= 0.208 af
Outflow = 1.97 cfs @ 1.42 hrs, Volume= 0.208 af, Atten= 0%, Lag= 0.2 min

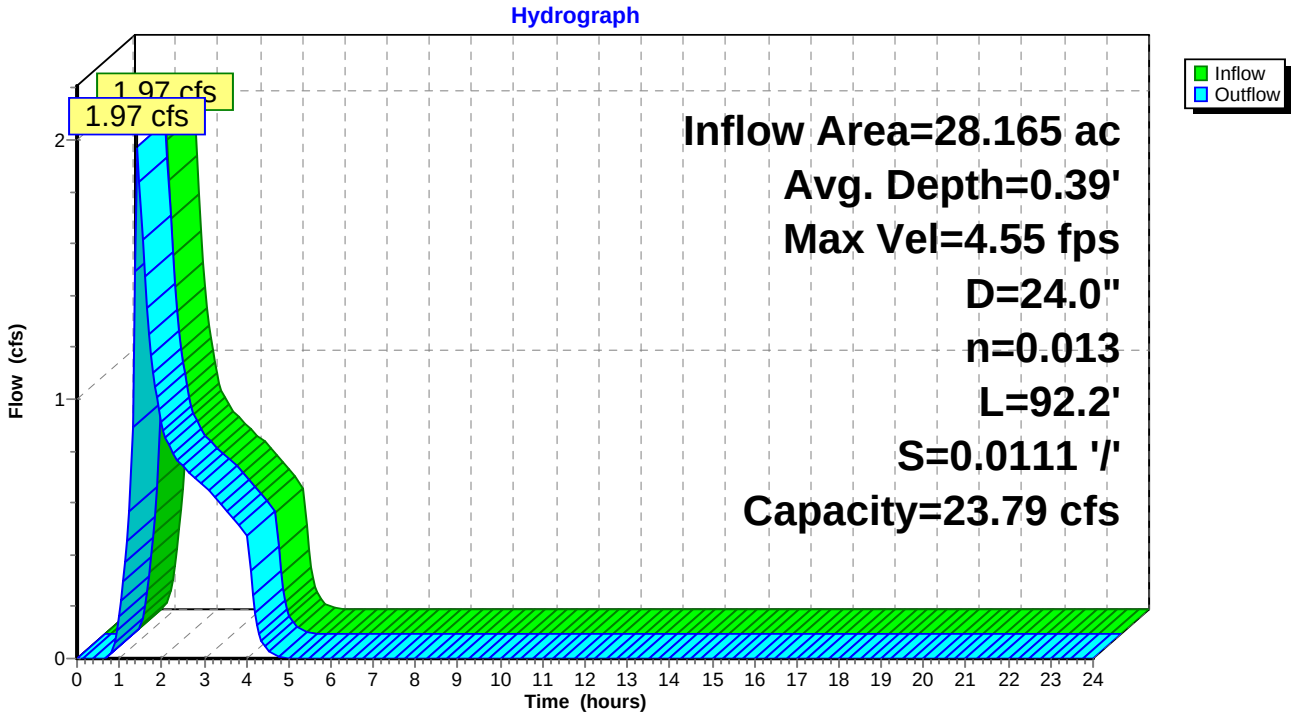
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.55 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.52 fps, Avg. Travel Time= 0.6 min

Peak Storage= 40 cf @ 1.42 hrs, Average Depth at Peak Storage= 0.39'
Defined Flood Depth= 184.68', Capacity at Flood Depth= -9,096.02 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 23.79 cfs

24.0" Diameter Pipe, n= 0.013
Length= 92.2' Slope= 0.0111 '/'
Inlet Invert= 182.12', Outlet Invert= 181.10'



Reach 11R: 24"


Hydrograph
Inflow
Outflow
1.97 cfs
1.97 cfs
Inflow Area=28.165 ac
Avg. Depth=0.39'
Max Vel=4.55 fps
D=24.0"
n=0.013
L=92.2'
S=0.0111 '/'
Capacity=23.79 cfs
Flow (cfs)
Time (hours)

Summary for Reach 12R: 24"

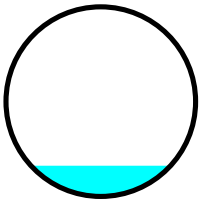
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt
[61] Hint: Exceeded Reach 13R outlet invert by 0.22' @ 1.45 hrs

Inflow Area = 21.450 ac, 43.08% Impervious, Inflow Depth = 0.08" for WQ Flow event
Inflow = 1.33 cfs @ 1.43 hrs, Volume= 0.150 af
Outflow = 1.33 cfs @ 1.45 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.8 min

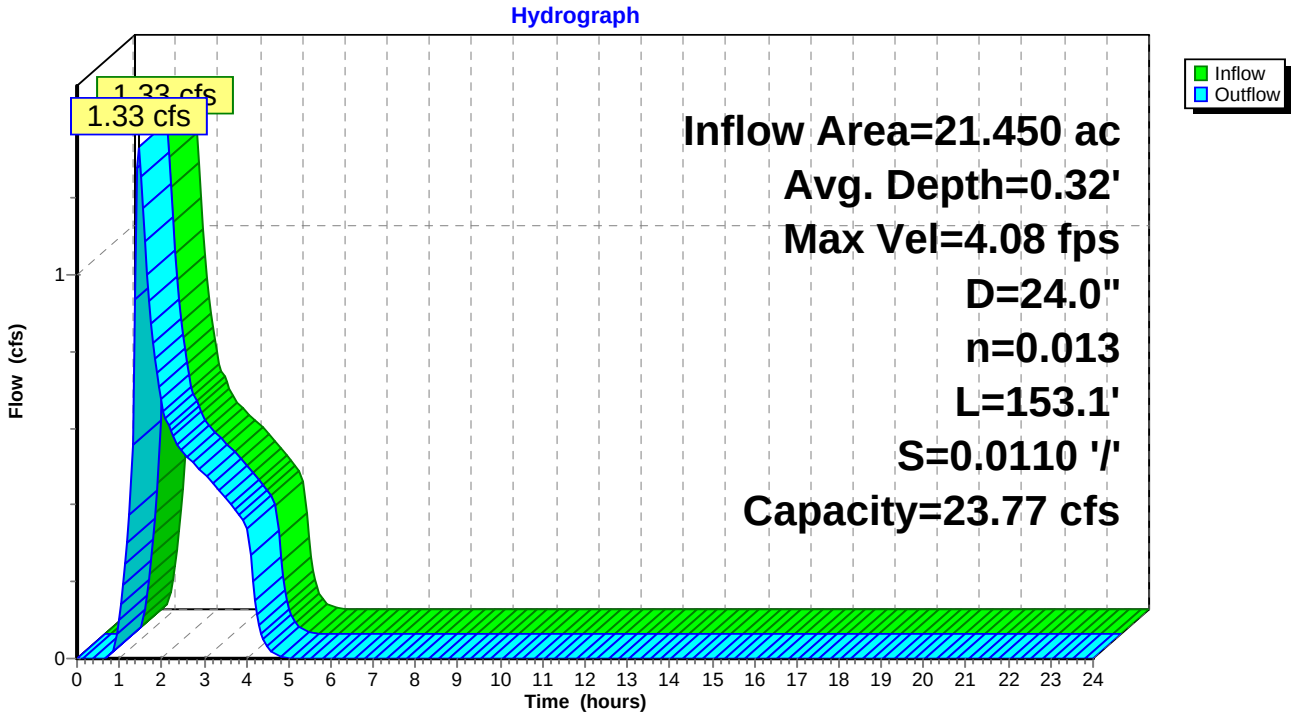
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.08 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.30 fps, Avg. Travel Time= 1.1 min

Peak Storage= 50 cf @ 1.45 hrs, Average Depth at Peak Storage= 0.32'
Defined Flood Depth= 193.90', Capacity at Flood Depth= -9,545.78 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 23.77 cfs

24.0" Diameter Pipe, n= 0.013
Length= 153.1' Slope= 0.0110 '/'
Inlet Invert= 183.81', Outlet Invert= 182.12'



Reach 12R: 24"


Hydrograph
Inflow
Outflow
1.33 cfs
1.33 cfs
Inflow Area=21.450 ac
Avg. Depth=0.32'
Max Vel=4.08 fps
D=24.0"
n=0.013
L=153.1'
S=0.0110 '/'
Capacity=23.77 cfs
Flow (cfs)
Time (hours)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Summary for Reach 13R: 24"

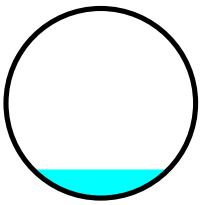
[52] Hint: Inlet/Outlet conditions not evaluated

Inflow Area = 18.120 ac, 38.19% Impervious, Inflow Depth = 0.07" for WQ Flow event
Inflow = 1.01 cfs @ 1.42 hrs, Volume= 0.112 af
Outflow = 1.00 cfs @ 1.44 hrs, Volume= 0.112 af, Atten= 2%, Lag= 1.0 min

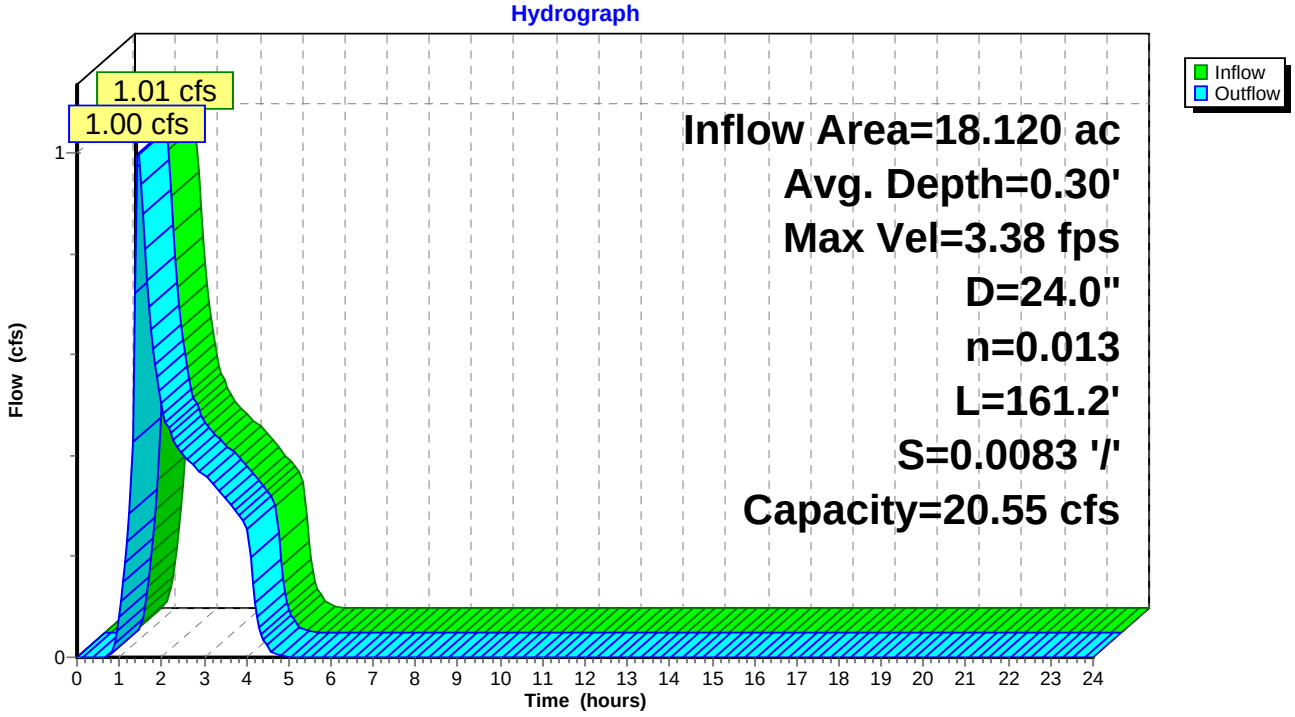
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.38 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 1.4 min

Peak Storage= 48 cf @ 1.44 hrs, Average Depth at Peak Storage= 0.30'
Defined Flood Depth= 196.28', Capacity at Flood Depth= -8,355.36 cfs
Bank-Full Depth= 2.00', Capacity at Bank-Full= 20.55 cfs

24.0" Diameter Pipe, n= 0.013
Length= 161.2' Slope= 0.0083 '/'
Inlet Invert= 185.24', Outlet Invert= 183.91'



Reach 13R: 24"



Summary for Reach 14R: 18"

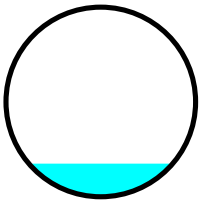
[52] Hint: Inlet/Outlet conditions not evaluated
[90] Warning: Qout>Qin may require Finer Routing or smaller dt

Inflow Area = 16.310 ac, 36.91% Impervious, Inflow Depth = 0.07" for WQ Flow event
Inflow = 0.88 cfs @ 1.41 hrs, Volume= 0.098 af
Outflow = 0.89 cfs @ 1.42 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.5 min

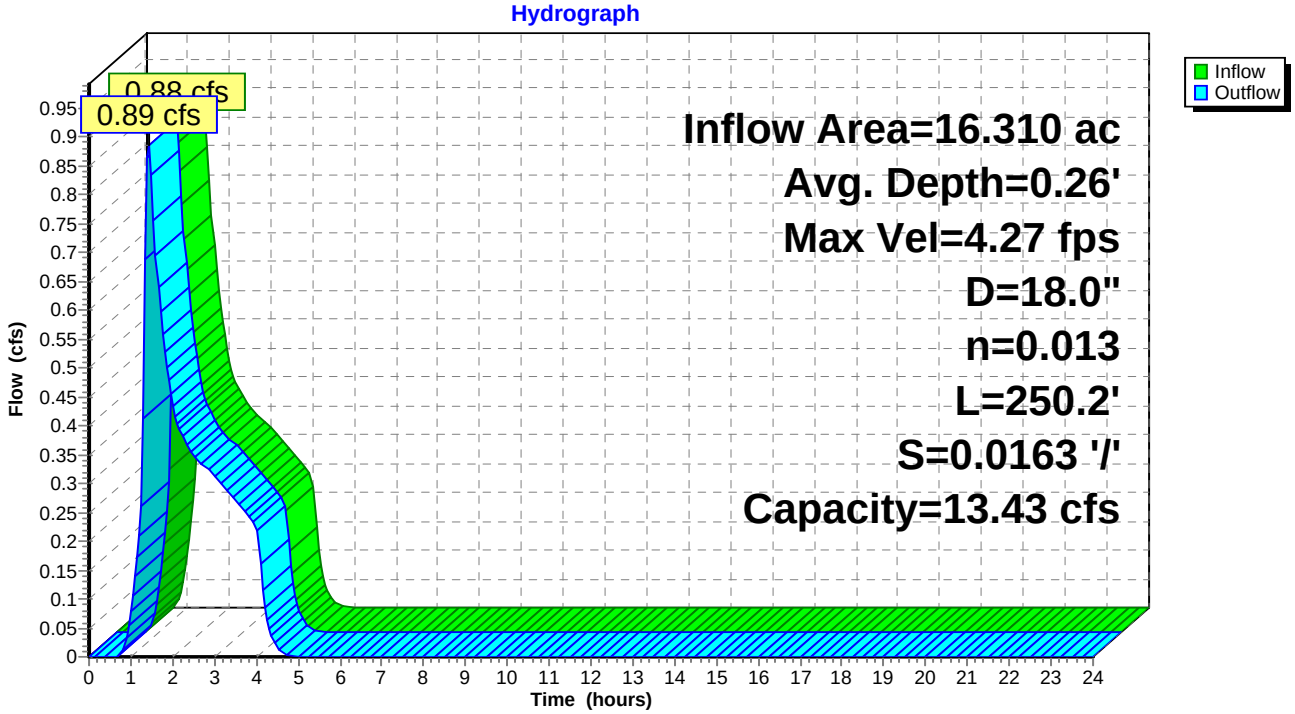
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.27 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 2.48 fps, Avg. Travel Time= 1.7 min

Peak Storage= 52 cf @ 1.42 hrs, Average Depth at Peak Storage= 0.26'
Defined Flood Depth= 191.72', Capacity at Flood Depth= -7,133.24 cfs
Bank-Full Depth= 1.50', Capacity at Bank-Full= 13.43 cfs

18.0" Diameter Pipe, n= 0.013
Length= 250.2' Slope= 0.0163 '/'
Inlet Invert= 189.69', Outlet Invert= 185.60'



Reach 14R: 18"



Summary for Pond 5R: EX 15"

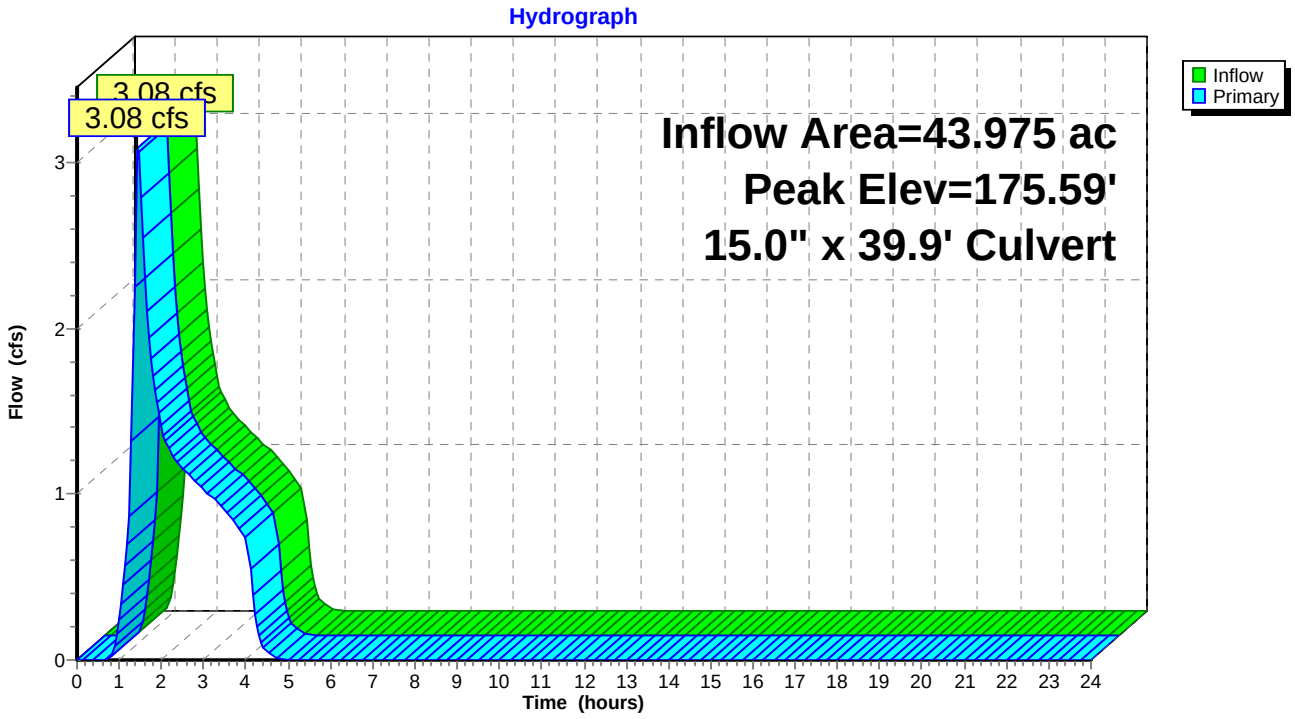
Inflow Area =	43.975 ac, 45.26% Impervious, Inflow Depth = 0.09" for WQ Flow event				
Inflow =	3.08 cfs @	1.43 hrs, Volume=	0.323 af		
Outflow =	3.08 cfs @	1.43 hrs, Volume=	0.323 af, Atten= 0%, Lag= 0.0 min		
Primary =	3.08 cfs @	1.43 hrs, Volume=	0.323 af		

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 175.59' @ 1.43 hrs
Flood Elev= 182.77'

Device	Routing	Invert	Outlet Devices
#1	Primary	174.42'	**15.0" x 39.9' long Culvert** Square-edged headwall, Ke= 0.500 Outlet Invert= 174.32' S= 0.0025 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.05 cfs @ 1.43 hrs HW=175.58' TW=174.41' (Dynamic Tailwater)
└─**1=Culvert** (Barrel Controls 3.05 cfs @ 3.34 fps)

Pond 5R: EX 15"



Summary for Pond 6R: FLOW SPLITTER

[61] Hint: Exceeded Reach 7R outlet invert by 0.09' @ 1.45 hrs

Inflow Area =	43.975 ac, 45.26% Impervious, Inflow Depth = 0.09" for WQ Flow event				
Inflow =	3.08 cfs @	1.43 hrs,	Volume=	0.323 af	
Outflow =	3.08 cfs @	1.43 hrs,	Volume=	0.323 af,	Atten= 0%, Lag= 0.0 min
Primary =	3.08 cfs @	1.43 hrs,	Volume=	0.323 af	
Secondary =	0.00 cfs @	0.00 hrs,	Volume=	0.000 af	

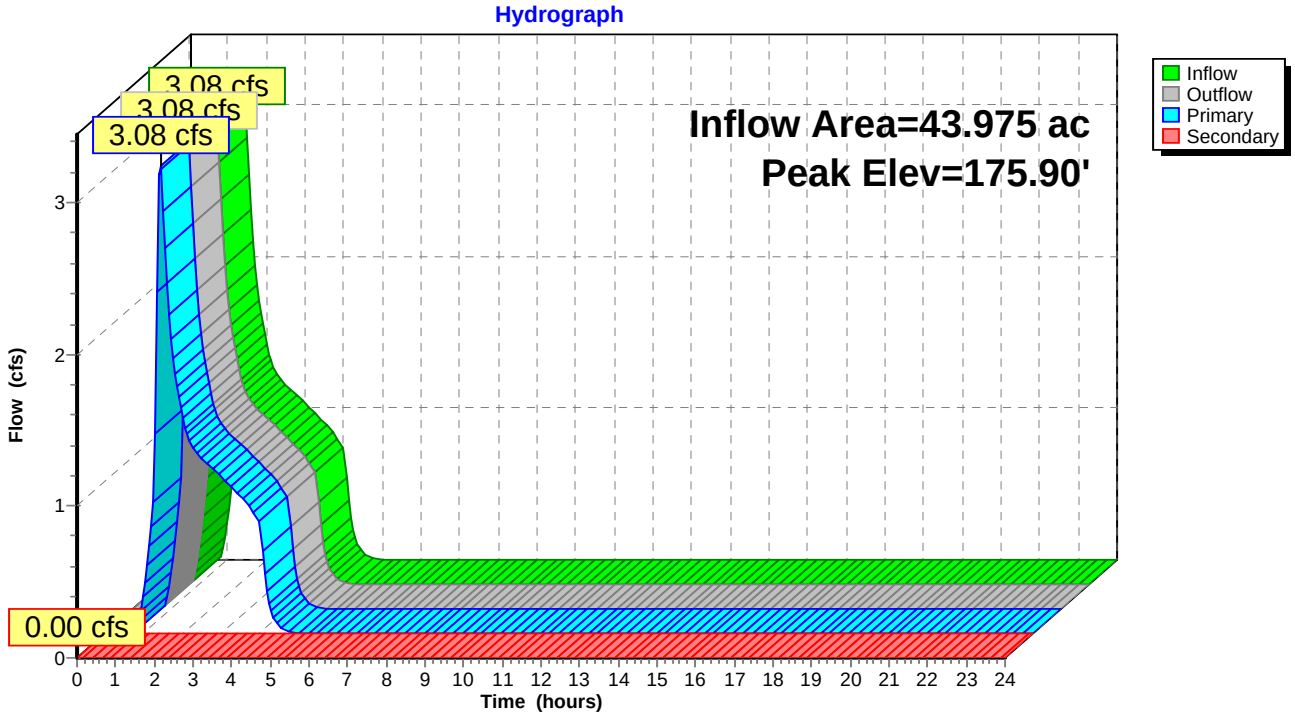
Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 175.90' @ 1.44 hrs
Flood Elev= 182.51'

Device	Routing	Invert	Outlet Devices
#1	Secondary	175.91'	**24.0" x 40.2' long Culvert** Ke= 0.500 Outlet Invert= 174.23' S= 0.0418 '/' Cc= 0.900 n= 0.013
#2	Primary	174.76'	**15.0" x 13.5' long Culvert** Ke= 0.500 Outlet Invert= 174.72' S= 0.0030 '/' Cc= 0.900 n= 0.013

Primary OutFlow Max=3.00 cfs @ 1.43 hrs HW=175.89' TW=175.58' (Dynamic Tailwater)
└─**2=Culvert** (Outlet Controls 3.00 cfs @ 3.39 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=174.76' TW=174.00' (Dynamic Tailwater)
└─**1=Culvert** (Controls 0.00 cfs)

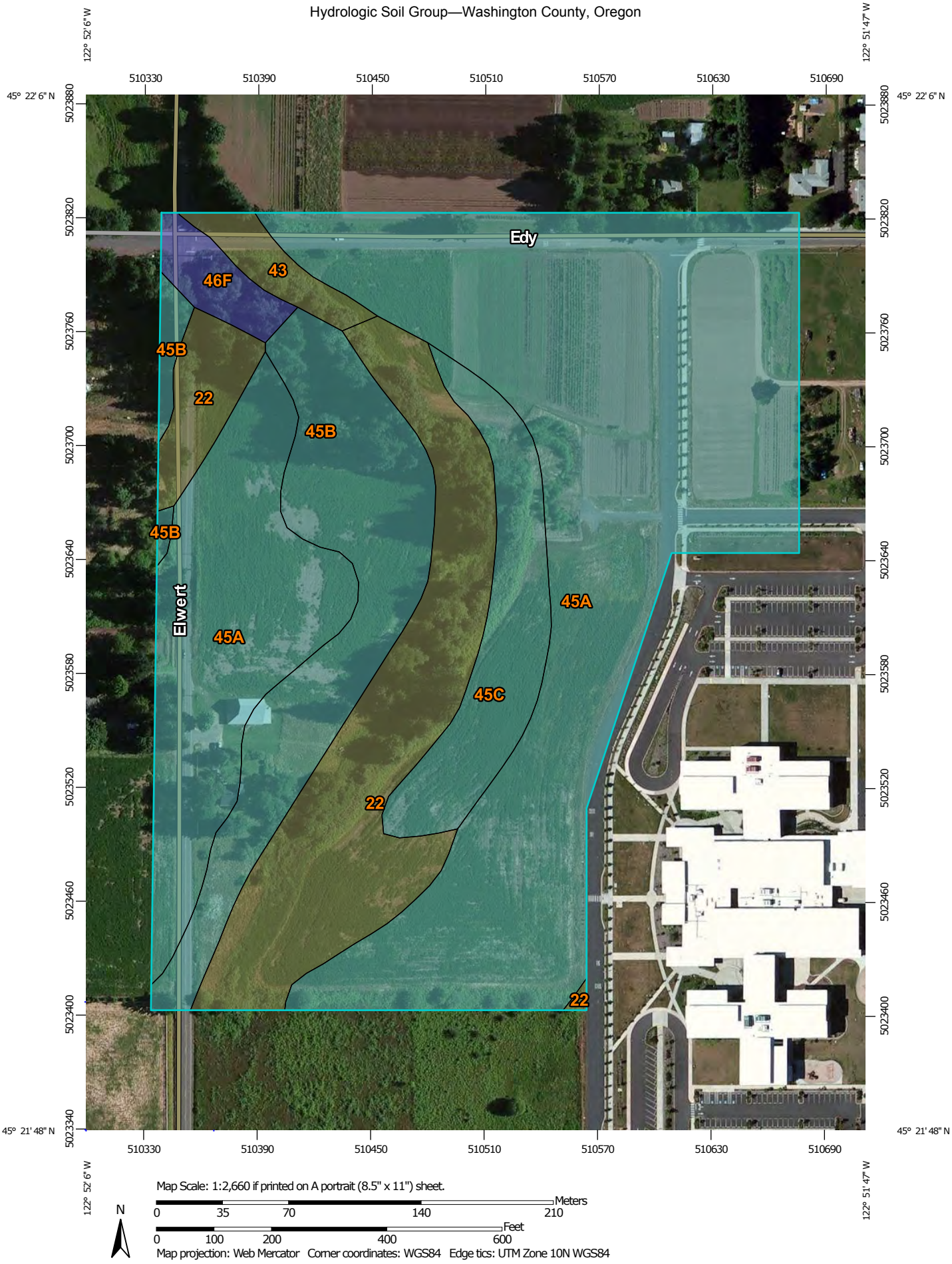
Pond 6R: FLOW SPLITTER



APPENDIX E

USDA-NRCS SOIL RESOURCE REPORT

Hydrologic Soil Group—Washington County, Oregon



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: http://websoilsurvey.nrcs.usda.gov
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 13, Sep 18, 2015

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—Sep 4, 2011

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**
22	Huberly silt loam	C/D	5.4	18.2%
43	Wapato silty clay loam	C/D	0.5	1.7%
45A	Woodburn silt loam, 0 to 3 percent slopes	C	16.8	57.2%
45B	Woodburn silt loam, 3 to 7 percent slopes	C	4.1	14.0%
45C	Woodburn silt loam, 7 to 12 percent slopes	C	2.1	7.0%
46F	Xerochrepts and Haploxerolls, very steep	B	0.5	1.9%
Totals for Area of Interest			**29.5**	**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

APPENDIX F

TR55 RUNOFF CURVE NUMBERS

TR55 RUNOFF CURVE NUMBERS

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	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	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.

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.