SUMMIT ENGINEERING L.L.C.

Presents

# Preliminary Stormwater Analysis

for

New building at Sherwood
Commercial Center - Lot 3
20737 SW Olds Pl
Sherwood, OR 97140

Client:

Ink:Built Architects
2808 NE MLK JR BLVD. STE G
Portland, OR 97212

Project No. 20-026

Date: November 18, 2021

Summit Engineering LLC
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Designer's Certification and Statement:

"I hereby certify that this Preliminary Stormwater Analysis for a New building at Sherwood Commercial Center - Lot 3 in Sherwood, OR has been prepared by me or under my supervision and meets minimum standards of Clean Water Services and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me."

# Table of Contents

## Project Description

The project site lies at 20737 SW Olds Place in Sherwood, OR (Lot 3 of Sherwood Commercial Center), bounded by industrial sites on all sides. The site lies in an industrial subdivision and the lots within the subdivision have been cleared and mass graded in preparation for development. The subdivision contains several developed sites, and has primary vehicle access on SW Olds Place.

The site lies in the north central portion of the Rock Creek subwatershed of the Tualatin River. This subwatershed includes portions of Sherwood and rural, unincorporated Washington County that drain into the Tualatin River and its tributaries. Much of this subwatershed is highly urbanized and modified from its historic form. The upper reaches of Rock Creek include farmland and secondary forests. Rock Creek eventually reaches the Tualatin River, which meanders east and south eventually to enter the Willamette River.

The project consists of the construction of a new building, parking and landscaping. The building will be used for office, equipment storage and warehouse space.

| | Existing | New | Replaced |
|---|---|---|---|
| Impervious surface (on site) | 0 sf | 33,162 sf | 0 sf |
| Roof top | 0 sf | 11,972 sf | 0 sf |
| Asphalt | 0 sf | 17,578 sf | 0 sf |
| Sidewalks | 0 sf | 2,748 sf | 0 sf |
| Impervious surface (off site) | 0 sf | 0 sf | 500 sf |
| Driveways | 0 sf | 0 sf | 250 sf |
| Sidewalks | 0 sf | 0 sf | 0 sf |
| Total land disturbance (off and on site) | | 40,570 sf | |

- References to CWS R&O 19-05 Section 2.04.2.m

  *Requirement:*

1. Maps showing the following information:

A) Upstream basin flowing through the site with contours.

*Refer to Exhibit 1 and 2:* basin overview and proposed conditions with contours. The extent of the upstream basin can be considered as the western edge of Lot 3 and to the west; the upstream basin shall constitute its own drainage area.

The project area of Lot 3 consists of approximately 238 feet of mass graded earth at 2% slope from west to east for most of the site. Since mass grading, the site has not been developed.

B) Downstream basin to the point where analysis is required in the downstream analysis detailed in subsection (3) and (4) below, with contours.

*Refer to Exhibit 1:* basin overview. As noted in the summary of requirements of Section 2.04.2.m.3 below, the downstream basin continues to the point of discharge to open waterway as noted on Exhibit 1.

C) Site plan showing development layout with contours.

*Refer to Exhibit 2:* proposed conditions for the proposed development.

D) Existing stormwater facilities on and adjacent to the site.

*Refer to Exhibit 1:* the basin overview indicates an existing engineered swale on the east boundary of the Sherwood Commercial Center subdivision. This swale provides treatment for all impervious surfaces of the developed subdivision. No other known above-ground stormwater facilities existing on site or on adjacent properties.

E) Stormwater facilities proposed to be constructed by the project.

*Refer to Exhibit 2:* proposed conditions for the proposed development. No stormwater treatment are proposed for this development. The impervious areas of the building roof and hard surfaces will be routed to a proposed private underground pipe storage system and then to the existing storm stub on site, that flows to the public storm sewer in SW Olds Place. This storm sewer drains to the existing swale along the eastern boundary of the Sherwood Commerical Center subdivision.

2. Calculations for:

A) Sizing of water quality and quantity facilities.

*Refer to:* no stormwater treatment systems are proposed for this development. Refer to the Methodology section for calculations and summary results of the proposed private underground pipe storage system.

B) Sizing of conveyance system, including calculations showing portions of existing conveyance system that are not proposed to be altered have adequate capacity according to the criteria in

these rules.

*Refer to:* pipe sizing worksheet for conveyance sizing. (included with permit submittal)

3. Review of Downstream Conveyance System:

A) For each development constructing new impervious surface of greater than 5,280 square feet, or collecting and discharging greater than 5,280 square feet of impervious area, except for the construction of a detached single family dwelling or duplex, the design Engineer shall perform a capacity and condition analysis of existing downstream storm facilities and conveyance elements receiving flow from the proposed development.

B) The analysis shall extend downstream to a point in the drainage system where the additional flow from the proposed development site constitutes 10 percent or less of the total tributary drainage flow.

C) Where the additional flow from the proposed development drops to less than 10 percent of the total tributary drainage flow, then the analysis will continue for the lesser of:
i. One-quarter (1/4) of a mile; or
ii. Until the additional flow constitutes less than 5 percent of the total tributary drainage flow.

D) When the downstream analysis does not continue for at least one-quarter (1/4) mile, the design engineer shall provide a stamped Certification of Investigation that states the design Engineer has visually investigated the downstream system for at least one-quarter (1/4) mile downstream and is aware of no observable downstream impacts to structures.

*Results:*

A brief summary of the downstream storm system is as follows. The peak flows listed below are taken from models using the SBUH methodology and 25-year storm event.

Part A and B:

- This site is located at the intersection of SW Olds Place and SW Arrow St. Lot 3 is the property at the northwest corner of this intersection.

- The point of discharge of the new building roof, asphalt, and sidewalk impervious areas is into an existing storm sewer stub as shown on Exhibit 2 labeled "site discharge." The subdivision has been built with a storm sewer system to collect stormwater runoff from all lots in the subdivision. This storm system does not accept flows from any other source outside of the subdivision. The storm sewer system flows to a swale at the eastern boundary of the subdivision that has been sized to treat runoff from all of the impervious area of the subdivision.

- The storm sewer system of the subdivision has been sized to convey tribuary runoff from each of the lots of the subdivision and convey them to the swale at the eastern boundary of the

subdivision. Since no flow is proposed to enter the storm sewer from the proposed development site other than what the storm sewer was designed to accommodate from this lot, the storm sewer has adequate capacity to convey flows to the swale.

- At the point of discharge into the swale, the runoff from the proposed development site is 5% of the runoff of the total tributary drainage flow of the subdivision. From an SBUH model, the runoff quantities are:

Discharge runoff from proposed development = 0.716 cfs at 25-year peak undetained flow
Discharge runoff from subdivision = 13.865 cfs at 25-year peak undetained flow

Part C:

- The proposed development contributes 5% of the total tributary drainage flow. Proceed to part D.

Part D:

- The point of discharge of the swale is to an open waterway within a vegetated and wooded area that borders an open agricultural area, and is not well defined. This agricultural area is part of a local drainage basin that contributes flow to Rock Creek. Rock Creek is a mostly perennial stream that conveys stormwater runoff out of the eastern portion of the City of Sherwood, and originates 2-3 miles to the south off of the eastern flanks of Parrett Mountain, a local high point at the southern end of the Chehalem Mountains. The stream bed of Rock Creek adjacent to and downstream of the Sherwood Commercial Center subdivision lies within the city limits and nearby agricultural areas. The stream bed has been highly modified from its original form, and in its present form serves to convey municipal stormwater runoff north to the Tualatin River. The channel of Rock Creek has been straightened from its historic form as it flows north through agricultural areas away from the Sherwood Commercial Center subdivision.

- Rock Creek flows north from the Sherwood Commercial Center subdivision through approximately 0.85 miles of agricultural areas before crossing under Highway 99W.

- When the downstream capacity analysis has not continued 1/4 mile downstream of the where the contributing flow drops to less than 10 percent of total tributary drainage flow, the design engineer shall provide a stamped Certification of Investigation that states the design engineer has visually investigated the downstream system for at least one-quarter (1/4) mile downstream and is aware of no observable downstream impacts to structures.

- This analysis and report shall serve as Certification of Investigation that signifies the design engineer has visually investigated the downstream system for at least one-quarter (1/4) mile downstream and is aware of no observable downstream impacts to structures.

- This concludes the downstream analysis.

- References to CWS R&O 19-05 Section 4.08.1.d.1. Quality.

*Requirement:*

All new impervious surfaces and three times the modified impervious surface, up to the total existing impervious surface on the site.

*Results:*

The existing swale along the eastern boundary of the Sherwood Commerical Center subdivision provides water quality treatment for all properties with the subdivision. Therefore, no stormwater quality facilities are proposed with this development.

- References to CWS R&O 19-05 Section 4.08.1.d.2. Quantity.

*Requirement:*

Quantity required for conveyance capacity or hydromodification: All new and modified impervious area created by the development.

*Results:*

For this project, only new impervious area on site will be detained in proposed underground pipe storage. New impervious area on site will be detained for hydromodification standards only since no downstream deficiencies have been identified in the downstream analysis.

Area on site = 33,162 sf

- References to CWS R&O 19-05 Section 4.03.2. Hydromodification Assessment Required.

*Requirement:*

Unless specifically waived in writing by the District, a Hydromodification Assessment is required of all activities described in Section 4.03.1, unless the activity meets any of the following criteria:

a. The project results in the addition and/or modification of less than 12,000 square feet of impervious surface.

b. The project is located in an area with a District approved subbasin strategy with an identified regional stormwater management approach for hydromodification.

*Results:*

1. Risk level identified on the district's website as "low."
2. Development class identified as "developed" (pre-2002).
3. Project size category identified as "medium."

- References to CWS R&O 19-05 Section 4.03.7.a. Criteria for Requiring Implementation of a Hydromodification Approach.

*Requirement:*

A Hydromodification Approach shall be implemented on-site unless any of the following conditions exist:

1. The result of Section 4.03.5 is that the project is Category 1 and the applicant selects Fee-In-Lieu; or

2. The project is located within a District-approved stormwater management strategy area, and implementation of an approach is not a requirement of the development; or

3. In the judgment of the District, implementation of an on-site hydromodification approach is impracticable or ineffective due to topography, soils, landslide risk, high water table, or other site conditions. The District may require a site-specific analysis (e.g., infiltration testing, geotechnical evaluation) to support such a determination; or

4. In the judgment of the District, on-site implementation results in the inefficient use of District or City resources for long-term operations and maintenance;

5. In the judgment of the District, the proposed development is likely to have a negligible impact and on-site implementation of a hydromodification approach will result in little or no benefit to the Receiving Reach,...

*Results:*

1. Since the project is more than 12,000 sf, it does not qualify for Sec. 4.03.7.a.1, and since the project is more than 25,000 sf it does not qualify for 4.03.7.a.5.

2. The flows from the proposed development site represent 5% of the flows from the subdivision. The subdivision was constructed without a system to detain flows from entering the adjacent wooded area, agricultural area, or Rock Creek complying with Sec. 4.03, as these areas and the reach along Rock Creek have sufficient capacity to convey additional flow from the subdivision as noted in the Downstream Analysis.

For this project, in discussions with city staff it has been determined that this project will provide hydromodification detention on site due to the fact that the existing public stormwater quality facility on the eastern boundary of the Sherwood Commercial Center subdivision that treats runoff from the subdivision lacks a high-flow bypass and is potentially subject to high flows from the build-out of lots within the subdivision, flows which may cause erosion; and further, hydromodification detention will be provided because this project does not qualify for any of the exemptions listed in 4.03.7.a. In addition, a lack of access to the existing stormwater facility prohibits installing a high-flow bypass or other adjustments or improvements to the facility that protect it from erosion.

New impervious area on site will be detained in proposed, privately maintained underground pipe storage. New private underground pipe storage on site will detain flows according to Section 4.03.5.a.3, which references Category 2 (Section 4.03.5.b) and Category 3 (Section 4.03.5.c).

This project selects Category 2 per Section 4.03.5.b.2: Peak-Flow Matching Detention according to Section 4.08.6. All proposed on-site impervious area will be detained according to peak-flow matching detention per Section 4.08.6.a, with hydrologic routing calculations using the SBUH methodology to support the design of the detained flow within the private underground pipe storage. The private underground pipe storage is sized for detaining storm events such that the peak runoff of Section 4.08.6.c is met. Refer to the Hydromodification Detention section in the Methodology section for details on sizing.

## Methodology

Existing site conditions within the site consist of a mass-graded lot with scattered vegetation, undeveloped since the time of construction of the public infrastructure within the Sherwood Commercial Center subdivision. Public infrastructure within the subdivision conssist of public street, sidewalks and utilities. The ground slopes are low, mostly 2-10%, with existing site runoff either infiltrating in landscape areas or exiting the site by overland flow into adjacent properties or the right-of-way.

Proposed impervious surfaces include new roof area, private sidewalks, and asphalt drive area. All roof downspouts and catch basins within paved areas will be connected directly to a hard storm pipe and conveyed to pre-treatment water quality manholes. The outlet of these manholes will be hard piped to private underground pipe storage. The outlet of the underground pipe storage is connected by hard pipe to a manhole fitted with a multiple orifice flow control structure. This flow control structure will restrict flows exiting the manhole. An overflow equal to the diameter of the riser structure pipe (12 inches) is set at the top of the detention pipe storage elevation. The outlet of the flow control manhole will connect by hard pipe to an existing stormwater only stub on site, that connects to an existing public storm pipe in SW Olds Place that flows to the existing public stormwater quality facility on the eastern boundary of the subdivision. Refer to Exhibit 2 and the plan sheets for location and sizes of the

proposed stormwater improvements on site.

With development of the site, new or redeveloped impervious surfaces must be treated and/or detained to the requirements set forth by Clean Water Services (CWS).

*Pre-treatment*

Trapped catch basins and water quality manholes are proposed pre-treatment for stormwater upstream of the private underground pipe storage to meet the requirement of pre-treatment per Section CWS R&O 19-5 Section 4.07.1. Pre-treatment sizing is as follows:

*Requirement:*
- Section 4.07.1 refers users to Section 4.09 for sizing criteria.
- Section 4.09.c.5: Volume of sump: 20 cubic feet/ 1.0 cfs of flow into the water quality manhole, up to the 25-year flow. Flow calculations shall include the effect of an upstream flow splitter.
- *Results:*
  - Final sizing to be determined at permit submittal.

*Quality*

No stormwater quality treatment is proposed for this project due to the existing downstream public stormwater facility (swale) along the eastern boundary of the Sherwood Commerical Center subdivision that treats all runoff from the Sherwood Commerical Center subdivision.

*Detention*

No stormwater quantity detention is proposed for this project since no downstream deficiencies were identified in the downstream analysis.

*Hydromodification Detention*

Hydromodification detention is proposed for this project meeting Section 4.08.6.c. Section 4.08.6.c indicates:

the post-development runoff rates from the site do not exceed the pre-development runoff rates in the table below.

| Post-Developed Peak Runoff Rate | Pre-Developed Peak Runoff Target Rate |
|---|---|
| 2-year, 24-hour | 50% of 2-year, 24-hour |
| 5-year, 24-hour | 5-year, 24-hour |
| 10-year, 24-hour | 10-year, 24-hour |

In order to fulfill the requirement of on-site hydromodification detention, the private underground pipe storage will detain all site-generated stormwater runoff from proposed impervious surfaces. The private underground pipe storage was sized by routing a design storm through Hydrocad, which utilizes SBUH methodology at the prescribed rates in the table above. A summary of the model output is shown in the tables below. Flow rates are to meet the requirements of Section 4.08.6.c.

| | Post-Developed Peak Runoff Rate | | Pre-Developed Peak Runoff Target Rate |
|---|---|---|---|
| 2-year, 24-hour | 0.035 cfs | 50% of 2-year, 24-hour | 0.037 cfs |
| 5-year, 24-hour | 0.076 cfs | 5-year, 24-hour | 0.128 cfs |
| 10-year, 24-hour | 0.136 cfs | 10-year, 24-hour | 0.189 cfs |

Pre-developed site and post-developed site (detained) flow rates.

Therefore, the hydromodification requirement has been met.

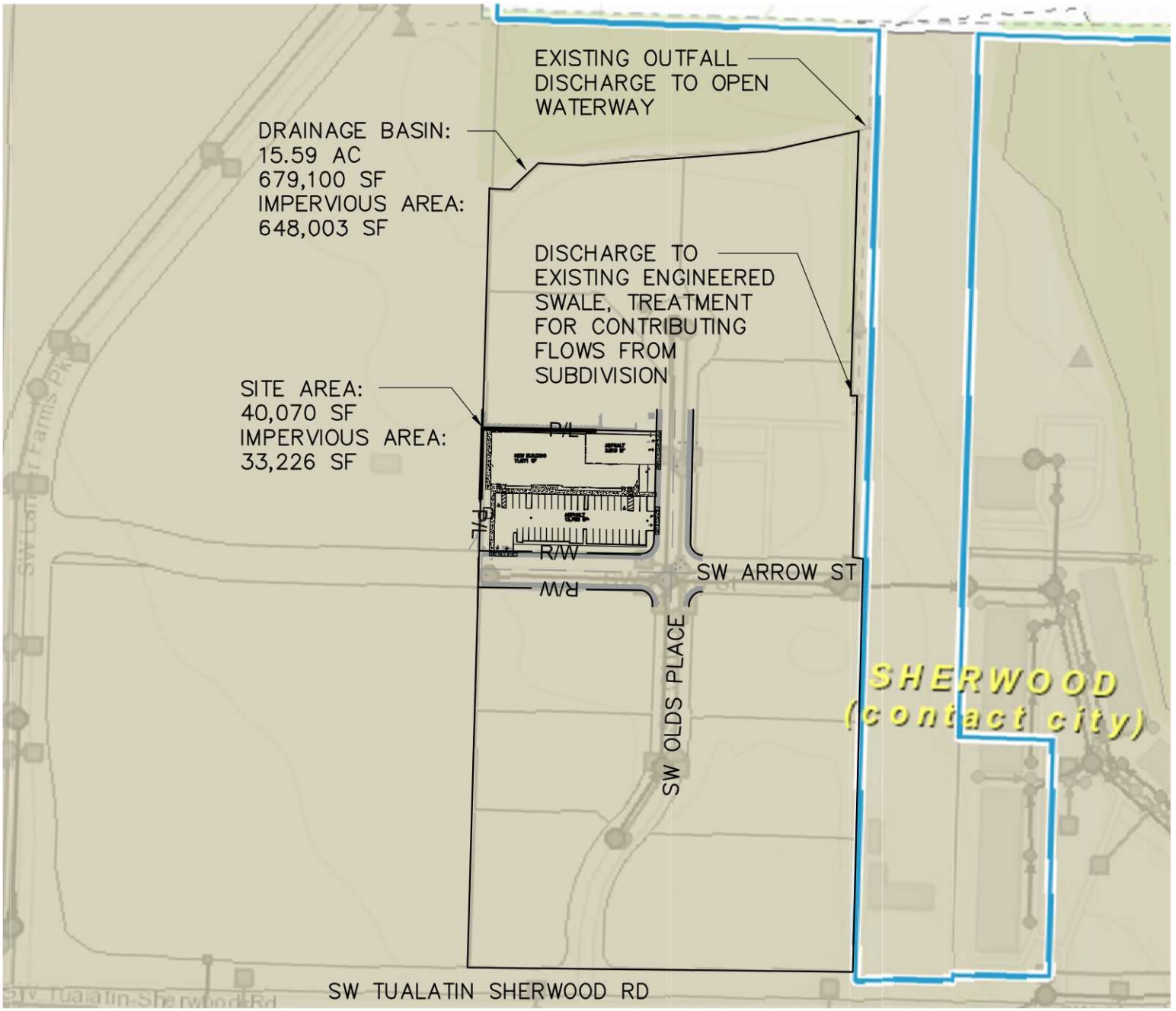
## Analysis

On-site pipe conveyance calculations have been included, using the SBUH methodology and the 25-year storm (3.9 inches in 24 hours) using Hydrocad. (Pipe conveyance calculations provided at permit submittal).

Refer to the following pages for routing of the proposed private (provided at permit submittal).

## Engineering Conclusions

The site meets all requirements of the Clean Water Services 2019 Design and Construction Standards. Impervious surface runoff is treated in an existing off-site public stormwater facility and on-site flows are detained in private underground pipe storage.



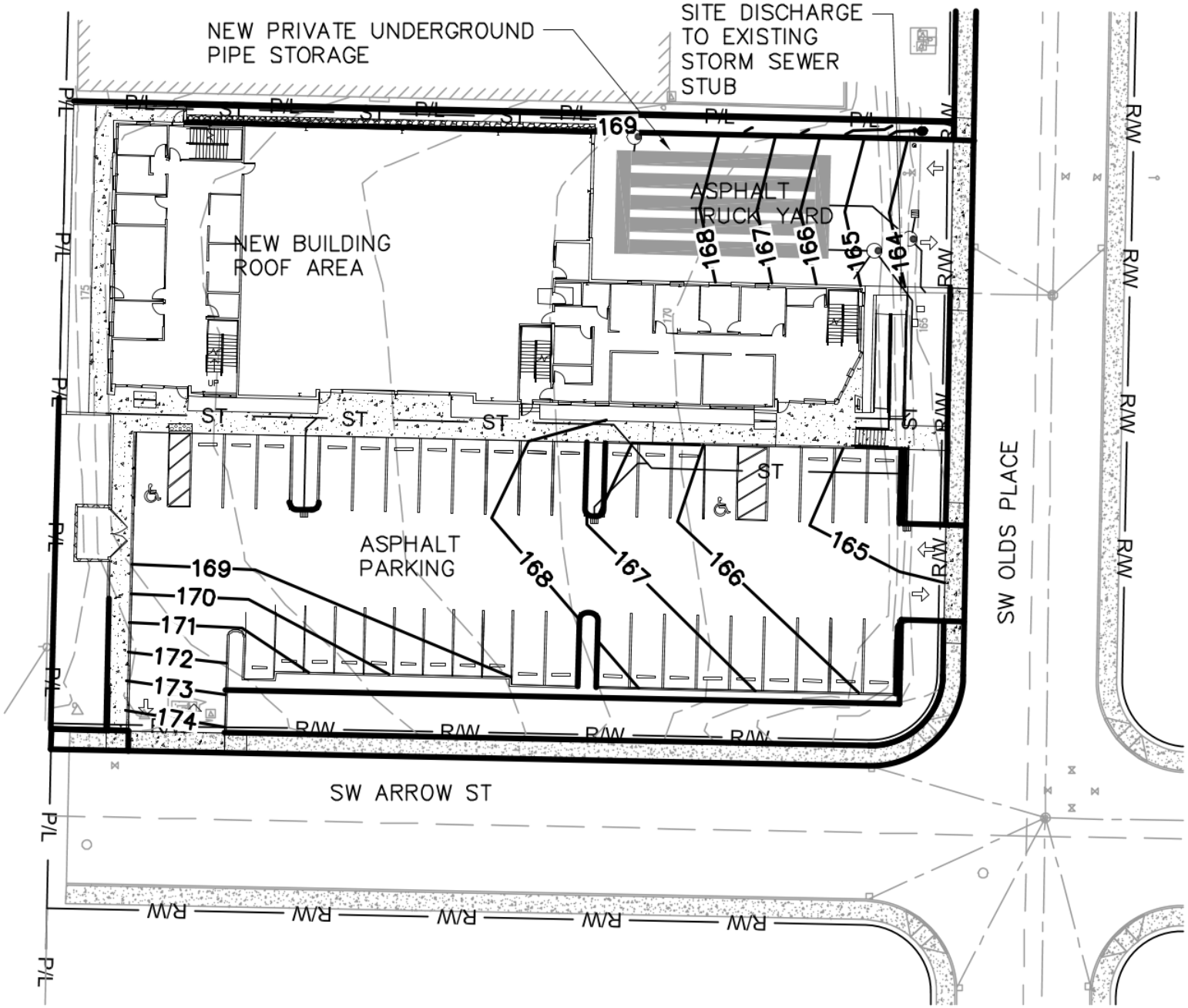

1

BASIN OVERVIEW

1" = 200'

200 0 100 200 400

(IN FEET)



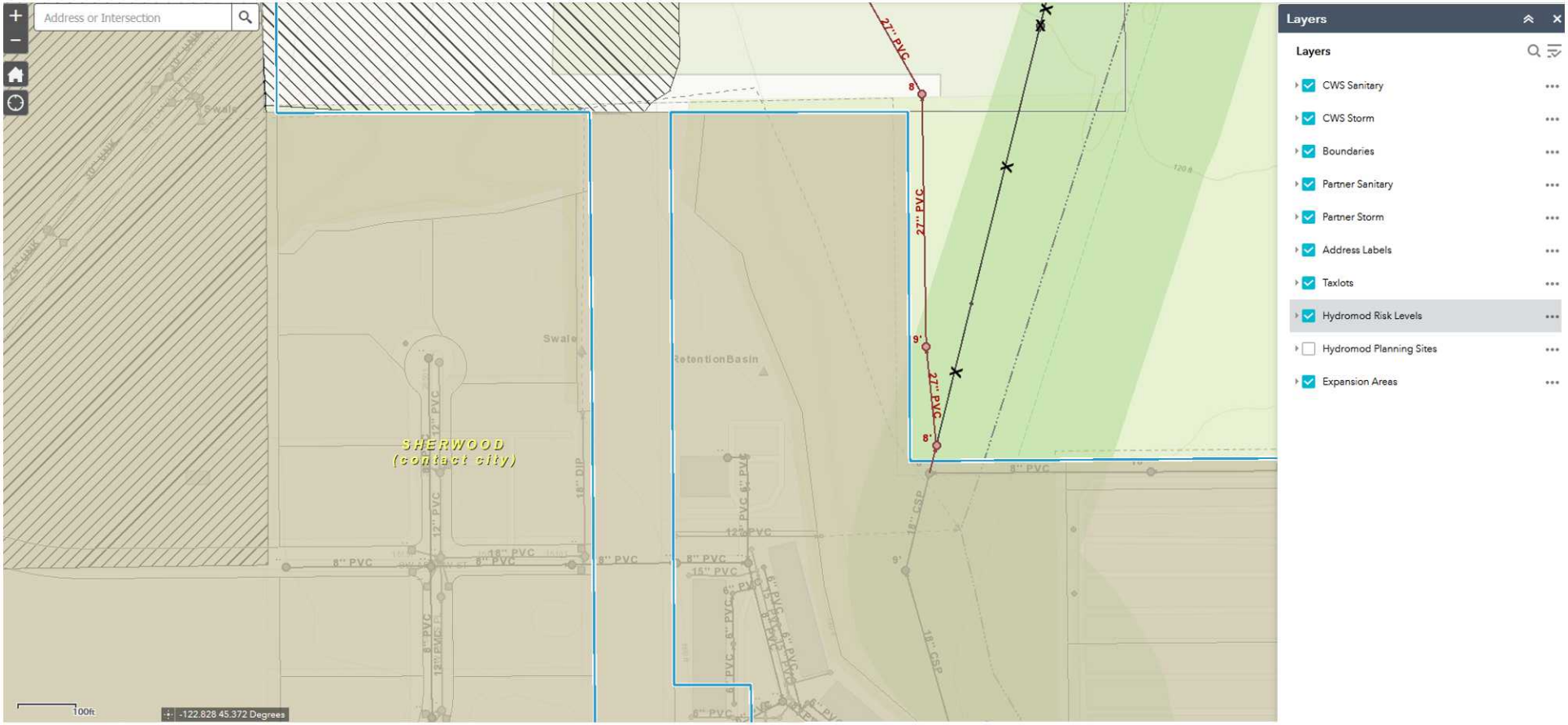

2

# PROPOSED CONDITIONS

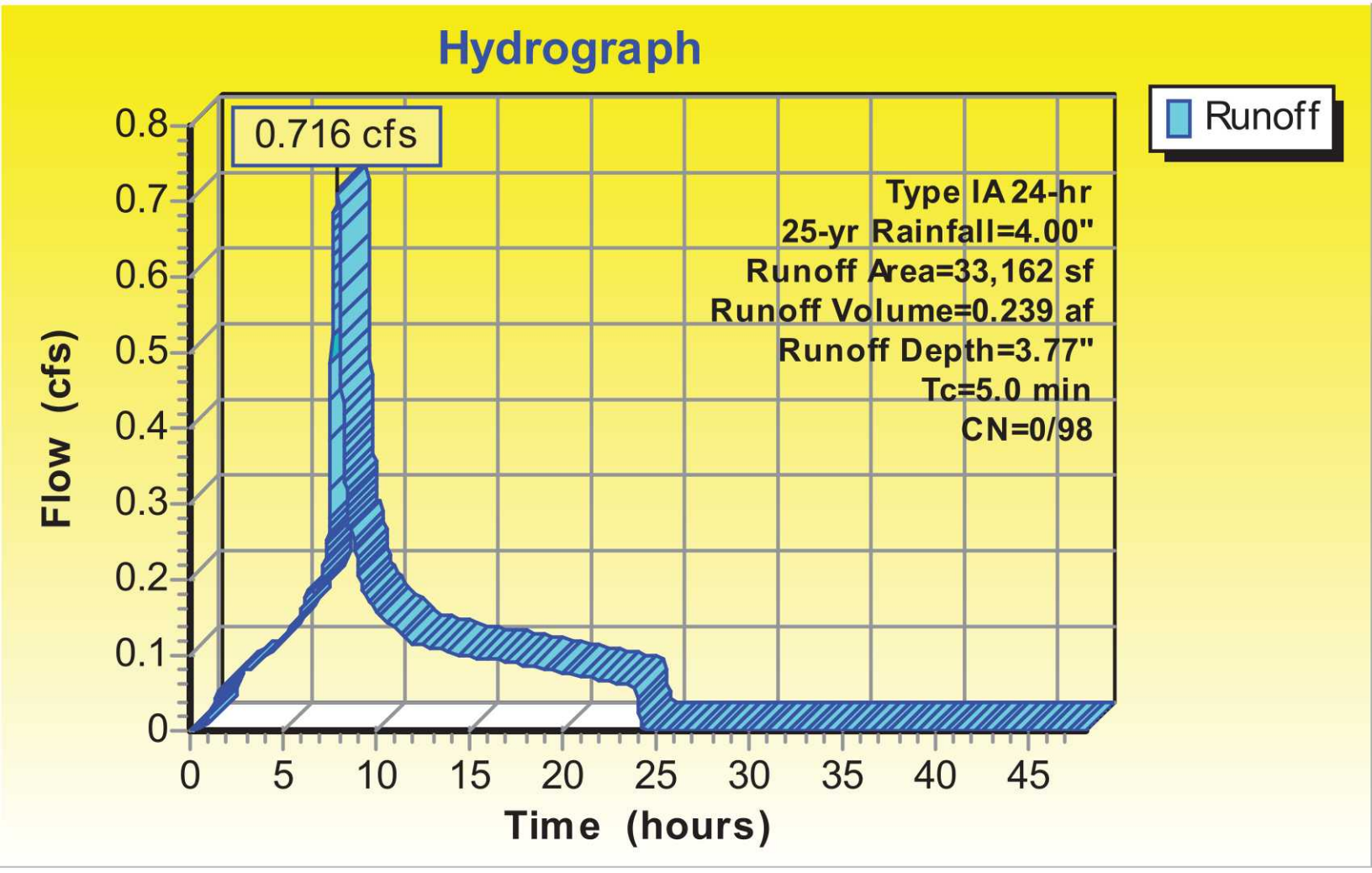
1" = 40'

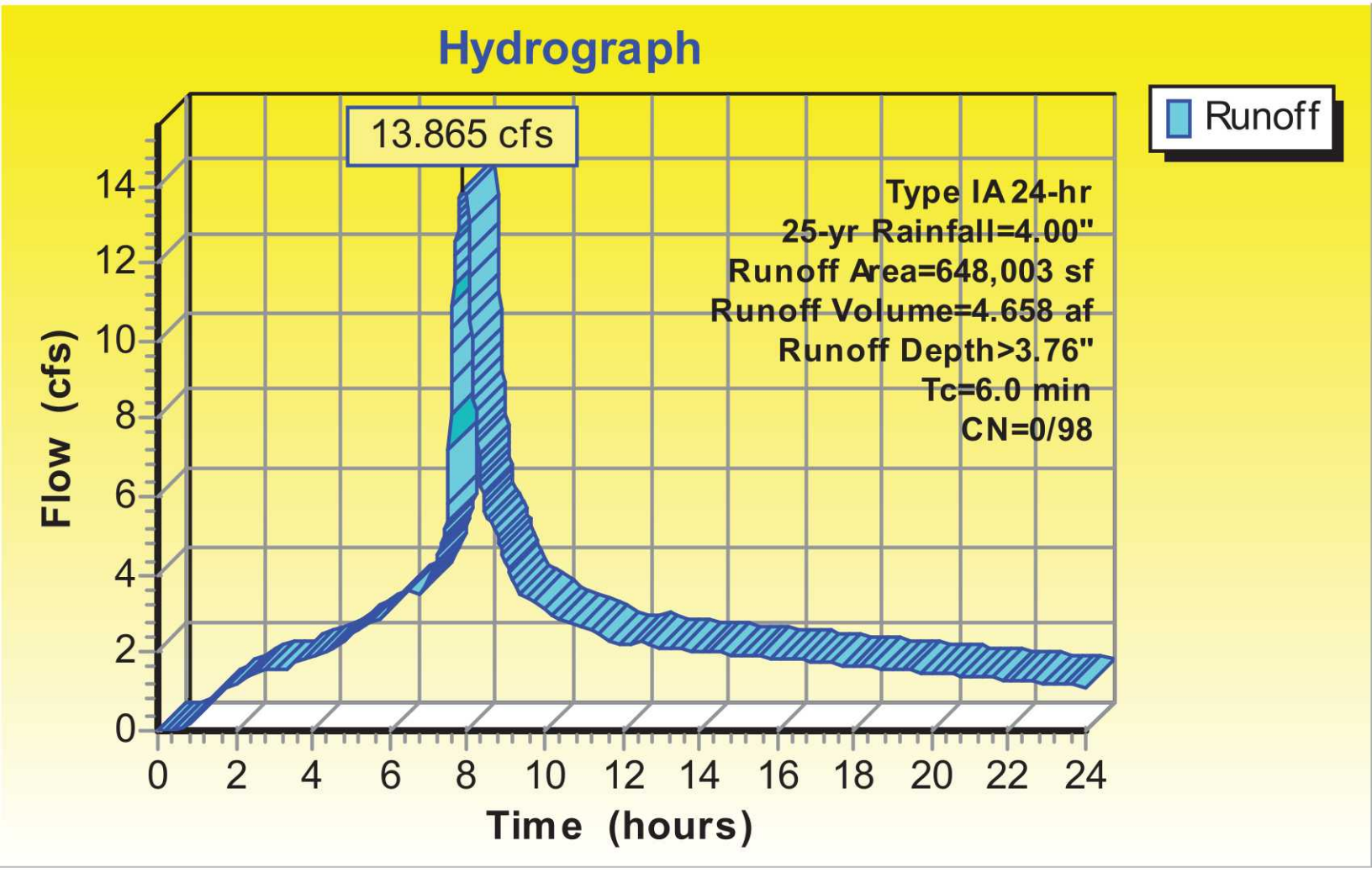
40 0 20 40 80

(IN FEET)


Address or Intersection
Layers
Layers
CWS Sanitary
CWS Storm
Boundaries
Partner Sanitary
Partner Storm
Address Labels
Taxlots
Hydromod Risk Levels
Hydromod Planning Sites
Expansion Areas
SHERWOOD
(contact city)
Swale
RetentionBasin
27" PVC
8" PVC
18" DIP
18" CSP
12" PVC
15" PVC
100ft
-122.828 45.372 Degrees

IMPERVIOUS AREA ON SITE - 25-YR




Hydrograph
13.865 cfs
Runoff
Type IA 24-hr
25-yr Rainfall=4.00"
Runoff Area=648,003 sf
Runoff Volume=4.658 af
Runoff Depth>3.76"
Tc=6.0 min
CN=0/98
Flow (cfs)
0
2
4
6
8
10
12
14
0
2
4
6
8
10
12
14
16
18
20
22
24
Time (hours)