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Planning Division
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Preliminary Storm Drainage Report

Beech Pointe

Beaverton, Oregon

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VALID THROUGH 12-31-25

Date: September 2024
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PDG Job No. 390-004a

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1.0 INTRODUCTION

This report represents the **preliminary** storm drainage and stormwater analysis for the Beach Pointe project. The basis of this report is to comply with City of Beaverton, Clean Water Services (CWS), and the State of Oregon's regulations and engineering standards as well as the latest edition of the Oregon Plumbing Specialty Code (OSPC). Compiled in this report are the design criteria for the site, the hydrologic methodology, and the **preliminary** drainage analysis.

2.0 SITE DESCRIPTION AND LOCATION

The proposed development is a 6-lot subdivision with no proposed internal streets nor street widening. The property is identified as tax lots 1100, 1200, 1300, and 1400 of Tax Map 1S115AC and is approximately 0.99 acres. The site is addressed as 4670, 4680, 4690, and 4700 SW Beech Drive, Beaverton and is located on the north side of Beech Drive between SW Beaverton Hillsdale Highway, SW Maple Avenue, and SW Beech Drive. The property is zoned RMC – Residential Mixed C Density.

3.0 EXISTING CONDITIONS

Each of the 4 tax lots making up the site currently supports a single detached dwelling accessed from SW Beech Drive, with the northern portion of Tax Lots 1200 and 1300 also utilized as overflow parking for businesses located to the north of the site along SW Beaverton-Hillsdale Highway. All existing structures and parking on the site, with the exception of the dwelling on Tax Lot 1100, will be removed as part of this application.

The site fronts SW Beech Drive to the south. To the north and east of the project site are developed commercial properties, zoned CS (Community Service). To the east of the project site is a developed single-family home, zoned RMC (Residential Mixed C).

There are no designated Significant Natural Resources on the property. There are also no identified natural hazards, wetlands, or floodplains associated with this site.

3.1 Site Topography

The property generally slopes from northeast to southwest. The high point of the site is at the northeast corner of the property at an approximate elevation of 198.3 feet, with a relative low point at the southwest corner at an elevation of 192.6 feet. Existing grades range between 1 and 7.5% with a typical grade of 4%.

Stormwater from the site sheds south to SW Beech Drive. There is a high point along the project frontage on SW Beech Drive which splits the flow to drain west and south. In both directions, stormwater drains along the existing curbline where it is collected in existing catch basins and drains south to the mainline in SW Larch Lane. These flows are then discharged to the west in the existing wetlands at Little People Park, west of SW Maple Avenue. This stormwater eventually enters Beaverton Creek.

3.2 Soil Type

The predominant soil type found on the site is Aloha Silt Loam (1) with a corresponding hydrologic soil group (HSG) 'C/D' respectively, as shown on the attached Natural Resources Conservation Service (NRCS) soil survey for Washington County.

Table 3-2: Hydrologic Soil Group Ratings

NRCS Map Unit Symbol	NRCS Map Unit Name	Hydrologic Soil Group Rating
1	Aloha Silt Loam	C/D

As recommended by the Natural Resources Conservation Service (NRCS), soils with dual hydrologic groups ('C/D') will be assumed to be type 'D' for undrained areas, and type 'C' for drained areas. The site has positive drainage throughout the site in both the existing and developed condition, so a hydrologic group 'C' will be used in the analysis.

3.3 Runoff Curve Numbers

Predeveloped and developed pervious areas will use a Runoff Curve Number (RCN) of 74 corresponding to "Open Space" cover type (HSG designation 'C') in good condition. A runoff curve number of 98 will be used for existing, permanently removed impervious and new, proposed impervious areas. For existing impervious surfaces that will be redeveloped as part of the project, a runoff curve number of 75 will be used for the existing condition (refer to the *SCS Runoff Curve Numbers* Exhibit).

Table 3-3: Runoff Curve Numbers

Land Description	Existing RCN	Proposed RCN
Open Space, Good Condition	74	74
Impervious (Redeveloped)	75	98
Impervious (New or Permanently Removed)	98	98

4.0 PROPOSED IMPROVEMENTS

As part of this development, the existing on-site improvements will be removed, the site will be regraded, and public utilities will be installed on the project site. In addition, off site utility improvements will be installed on the properties to the east (identified as Tax Lots 1800 and 1900 of Tax Map 1S115AD). A new public storm connection will be made to an existing catch basin on Tax Lot 1900 and a new public mainline will be extended to the proposed off-site stormwater facility constructed on Tax Lot 1800. A storm main will be extended along the west edge of Tax Lot 1800 (offsite) to a point of connection at the northeast corner of the project site. A number of offsite easements will be required to be obtained prior to site development permit issuance. Please note that the existing frontage street is fully built out in the existing condition and will not be conveyed to the proposed pond.

A new on-site public storm main will then be extended along the rear of the property, through a new public storm easement, and will serve the project site as well as the properties to the north (Tax Lots 100, 200, 300, 400, and 500) as well as Tax Lot 1800, which contains the proposed storm pond. Runoff from the site will be collected and conveyed to the new off-site pond, which will provide both water quality and detention, including a hydromodification approach.

At this time, the proposed pond is being designed to provide treatment for the project site as well as Tax Lots 400, 500, and 1800. Conveyance is being designed to the project site as well as Tax Lots 100, 200, 300, 400, 500, and 1800. See the *Basin Map* within this report for more information.

4.1 Hydrology / Hydraulic Methodology

Using the Santa Barbara Urban Hydrograph (SBUH) method based on a Type 1A rainfall distribution, the site has been analyzed to determine the proposed peak runoff rates for ½ of the 2, 2, 5, 10, and 25-year 24-hour storm event. The SBUH method uses runoff curve numbers in conjunction with the property's hydrologic soil group to model the site's permeability. Stormwater analysis and facility design was provided using "Hydraflow Hydrographs by Intelisolve" modeling software.

A predeveloped time of concentration of 15.31 minutes and a developed time of concentration of 7.66 minutes were calculated using the methodology outlined in the TR-55 technical manual *(refer to the Time of Concentration Calculations and Exhibits)*.

Rainfall depths for all storm events used in the calculations and design of the proposed storm drainage system are found in the latest edition of Clean Water Services' *Design and Construction Standard's for Sanitary and Storm Water Management* (R&O 19-5) and as shown below.

Table 4-1: 24-Hour Rainfall Depths (CWS)					
Recurrence Interval, years	2	5	10	25	100
24-Hour Depths, Inches	2.50	3.10	3.45	3.90	4.50

4.2 Water Quality

As required by the City of Beaverton, runoff will be treated from any new impervious surfaces created as a result of the proposed development. The water quality facilities will follow City of Beaverton's standards and shall be designed to treat storm water generated by 0.36 inches of precipitation falling in 3 hours with an average storm return period of 96 hours. The water quality facilities will remove a minimum of 65% of the Total Phosphorous (TP) from the stormwater runoff.

Water quality will be satisfied through a combination of pretreatment, with a sumped water quality manhole, and a vegetated detention pond.

The proposed pond meets water quality requirements by providing the water quality volume outlined by Clean Water Services, copied below.

$$\text{Water Quality Volume (cu.ft.)} = \frac{0.36\ (in.)\, x\ Area\ (sq.ft.)}{12\ (in./ft.)}$$

The area requiring treatment has been calculated in the *Impervious Area Calculations*, contained within this report. Both this required water quality volume and the Intelisolve printout showing volume provided are shown in the *Water Quality Pond Calculations* within this report.

4.3 Water Quantity / Hydromodification

The stormwater discharge location has been evaluated using Clean Water Service's Hydromodification Map. The receiving reach is identified as Beaverton Creek, with a mapped Risk Level of Low (refer to *Appendix A – Clean Water Services' Maps and Hydromodification Map*). The project is creating between 12,000 sf and 80,000 sf impervious and therefore falls under the Medium Project Size Category. With the Low Risk Level and Medium Project Size Category, the project is classified as a Category 2 Hydromodification Approach. Therefore, peak-flow matching detention has been chosen to satisfy the hydromodification requirement.

It should be noted that the proposed pond is designed to manage more than 80,000 sf impervious, though not all that area is being constructed under this project. Should that be considered a reason to bump the project into a Large Project Size Category, that would not create any additional requirements – it would still be considered a Category 2 Hydromodification Approach.

In order to satisfy Clean Water Services' hydromodification approach and water quantity control requirements, stormwater quantity facilities shall be designed to capture runoff so the post-development runoff rates from the site do not exceed the predevelopment runoff rates from the site, based on 24-hour storm events. Specifically, the 2, 5, 10, and 25-year post-development runoff rates will not exceed their respective ½ of the 2, 5, 10, and 25-year pre-development runoff rates.

A flow control manhole with one orifice and an overflow weir wall will attenuate the post-developed peak runoff as required above and as shown below.

Table 4.3: Detention Pond Outflows

Storm Event (yr)	Pre-Developed (cfs)	Developed (cfs)	Released Outflow (cfs)
2	0.27	1.02	0.13
5	0.53	1.41	0.32
10	0.70	1.65	0.48
25	0.95	1.95	0.80

4.4 Conveyance

The proposed conveyance system consists of an underground pipe system with manholes. A new public storm connection will be made to an existing catch basin on Tax Lot 1900 and a new public mainline will be extended to the north and west to a proposed stormwater facility constructed on Tax Lot 1800 (offsite). A storm main will be extended along the west edge of Tax Lot 1800 (offsite) to a point of connection at the northeast corner of the project site. A new on-site public storm main will then be extended along the rear of the property, through a new public storm easement, and will serve the project site as well as the properties to the north (Tax Lots 100, 200, 300, 400, and 500) as well as Tax Lot 1800, which contains the proposed storm pond.

The drainage system for the public improvements has been designed to convey the 25-year storm event without surcharging the proposed underground pipe network. Using a Manning's 'n' value of 0.013, the minimum pipe size and slope required to convey the 25-year storm event and maintain a minimum velocity of 2.5 feet per second when flowing full is a 12" pipe at 0.0040 ft./ft. at the upper reaches of the mainline and 15" pipe at 0.0030 ft./ft. at the lower reaches (refer to the *Conveyance Calculations*).

5.0 DOWNSTREAM ANALYSIS

Runoff from the site is proposed to discharge the existing public storm main located on Tax Lot 1900. This mainline flows south through Tax Lot 1900, then to the southwest to

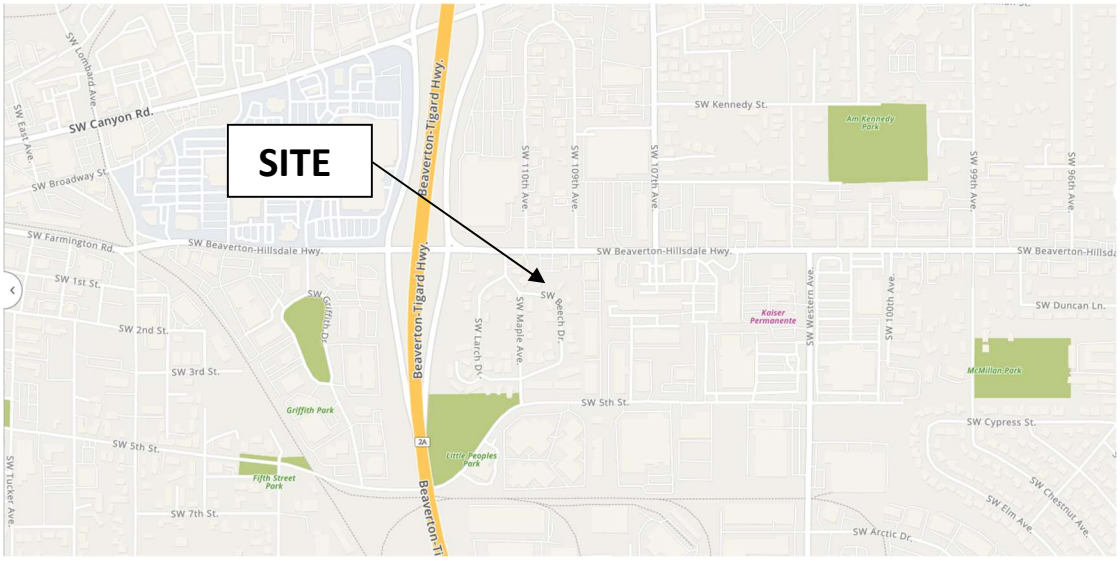
SW Larch Lane, across SW Maple Avenue, and discharges to the existing wetland at Little Peoples Park.

Because stormwater from the site currently drains to SW Beech Drive and SW Maple Avenue, rather than the storm main on Tax Lot 1900, stormwater has been additionally detained as to not increase the amount of stormwater entering the existing Tax Lot 1900 storm system. In the existing condition, Tax Lot 1800 drains to the Tax Lot 1900 storm system undetained. Tax Lot 1800 is currently developed with approximately 83% impervious coverage. The post-developed 25-year release rate from the pond, which treats and detains our project site as well as Tax Lots 400, 500, and 1800 (and their future redevelopment), is less than the existing 25-year release rate of Tax Lot 1800. See the calculations in the Appendices for more information. Therefore, the proposed development will not increase stormwater in the downstream system and no further downstream analysis is required. All stormwater from the site will end up in the SW Larch Lane storm system and will outfall to the wetlands as in the pre-developed condition.

6.0 CONCLUSION

Based on the supporting stormwater calculations and attached analysis, it is the opinion of Pioneer Design Group that the development of Beech Pointe will not adversely affect the existing downstream drainage system nor adjacent property owners. We have provided water quality and quantity treatment with the proposed pretreatment manhole, detention pond, and attenuated flow control manhole. For conveyance purposes, we have also detained stormwater to release at lower rates than those received currently by the existing storm system. Therefore, all the requirements associated with Clean Water Services' design and construction standards and the City of Beaverton have been met for this project.

7.0 VICINITY MAP



ENGINEERING CALCULATIONS & SPREADSHEETS

Map Scale: 1:533 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 23, Sep 7, 2023

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Sep 26, 2022—Oct 11, 2022

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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Aloha silt loam	C/D	1.1	100.0%
Totals for Area of Interest			**1.1**	**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.

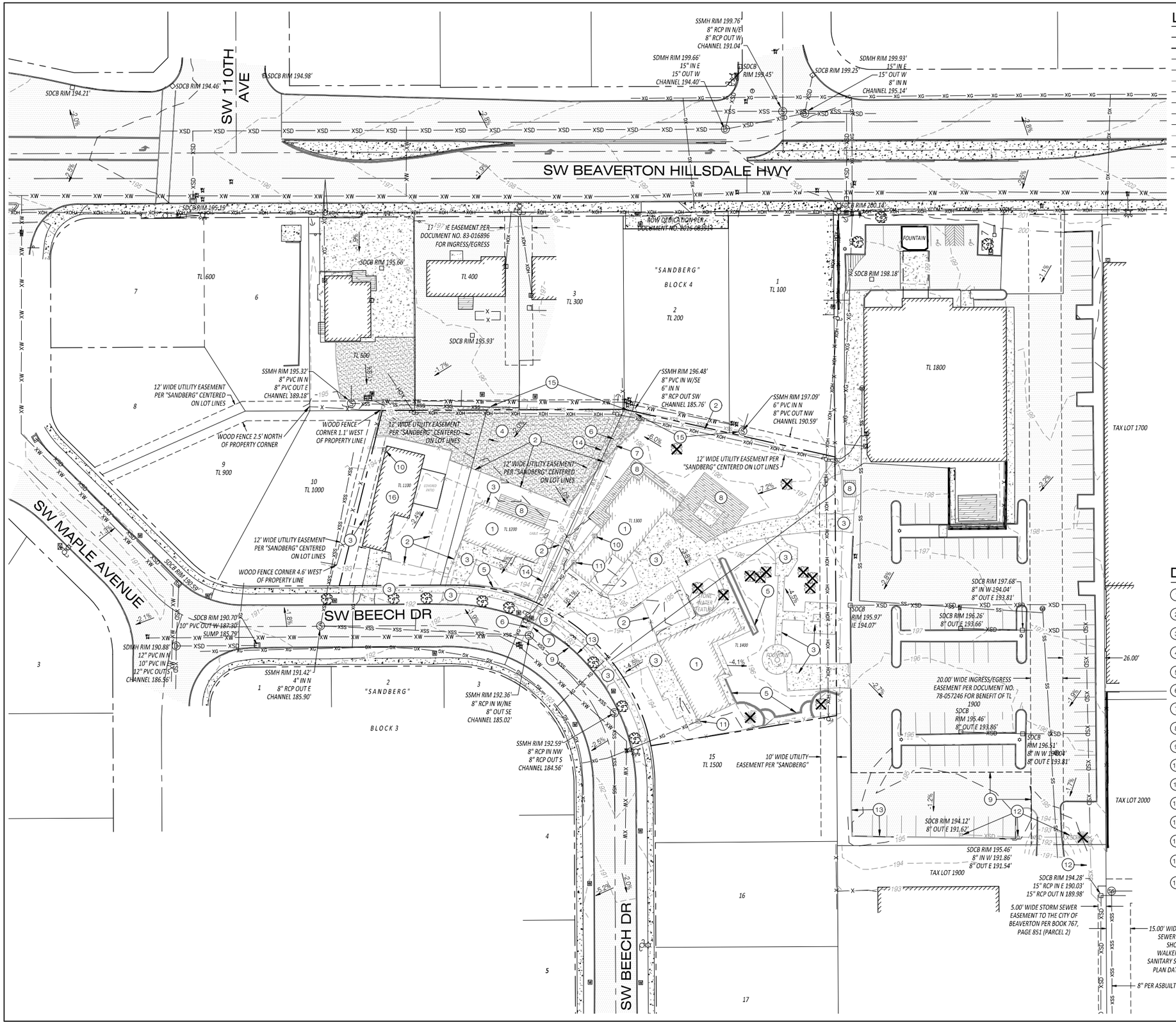
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher



LEGEND

- RIGHT-OF-WAY LINE
- BOUNDARY LINE
- EXISTING LOT LINE
- CENTER LINE
- STORM DRAINAGE LINE
- SANITARY SEWER LINE
- WATER LINE
- GAS LINE
- COMMUNICATION LINE
- UNDERGROUND POWER LINE
- OVERHEAD WIRE
- WOOD FENCE (AS NOTED)
- EXISTING 2' CONTOUR
- EXISTING 10' CONTOUR
- CONIFEROUS TREE (DBH)
- DECIDUOUS TREE (DBH)
- CATCH BASIN/DRAIN INLET
- STORM DITCH INLET
- STORM MANHOLE
- SANITARY MANHOLE
- WATER VALVE
- FIRE HYDRANT ASSEMBLY
- WATER METER
- GAS VALVE
- GAS METER
- STREET SIGN
- MAILBOX
- ELECTRIC PEDESTAL
- LIGHT POLE
- POWER POLE
- COMMUNICATION VAULT
- TELECOMMUNICATION PEDESTAL
- UTILITY EXTENSION
- FOUND SURVEY MONUMENT AS NOTED
- EXISTING CONCRETE
- EXISTING ASPHALT PAVEMENT
- EXISTING GRAVEL SURFACE
- EXISTING BUILDING FOOTPRINT
- EXISTING TREE TO BE REMOVED
- EXISTING SLOPE DIRECTION

DEMOLITION NOTES

1. EXISTING BUILDING TO BE REMOVED.
2. EXISTING FENCE TO BE REMOVED.
3. EXISTING CONCRETE TO BE REMOVED.
4. EXISTING GRAVEL TO BE REMOVED.
5. EXISTING WALL TO BE REMOVED.
6. EXISTING WATER MAIN TO BE REMOVED AND RELOCATED.
7. EXISTING SANITARY SEWER MAIN TO BE REMOVED AND RELOCATED.
8. EXISTING DECK TO BE REMOVED.
9. SAWCUT & REMOVE EXISTING AC PAVEMENT.
10. EXISTING ELECTRIC METER TO BE REMOVED.
11. EXISTING GAS METER TO BE REMOVED.
12. EXISTING CATCH BASINS & STORM LINE TO BE REMOVED.
13. EXISTING CURB TO BE REMOVED.
14. EXISTING OVERHEAD WIRE TO BE REMOVED.
15. EXISTING SANITARY SEWER MAIN TO BE REMOVED AND RELAYED IN THE SAME LOCATION.
16. EXISTING BUILDING TO REMAIN THROUGH PLAT RECORDATION.

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MAR. 08, 2022
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PRELIMINARY
NOT FOR CONSTRUCTION

VALID THROUGH 12-31-25

EXISTING CONDITIONS, TREE REMOVAL, & DEMOLITION PLAN

BEECH POINTE
BEAVERTON, OREGON

Designed by	WJD	Date	09/2024
Drawn by	WJD	Date	09/2024
Reviewed by	MLS	Date	09/2024
Project No.	390-004a	REF.	
Horiz. Scale:			
Vert. Scale:			

No.	Date	Revision	By

Project
BEECH POINTE
No.
390-004a
Type
PLANNING
Sheet
P3.0

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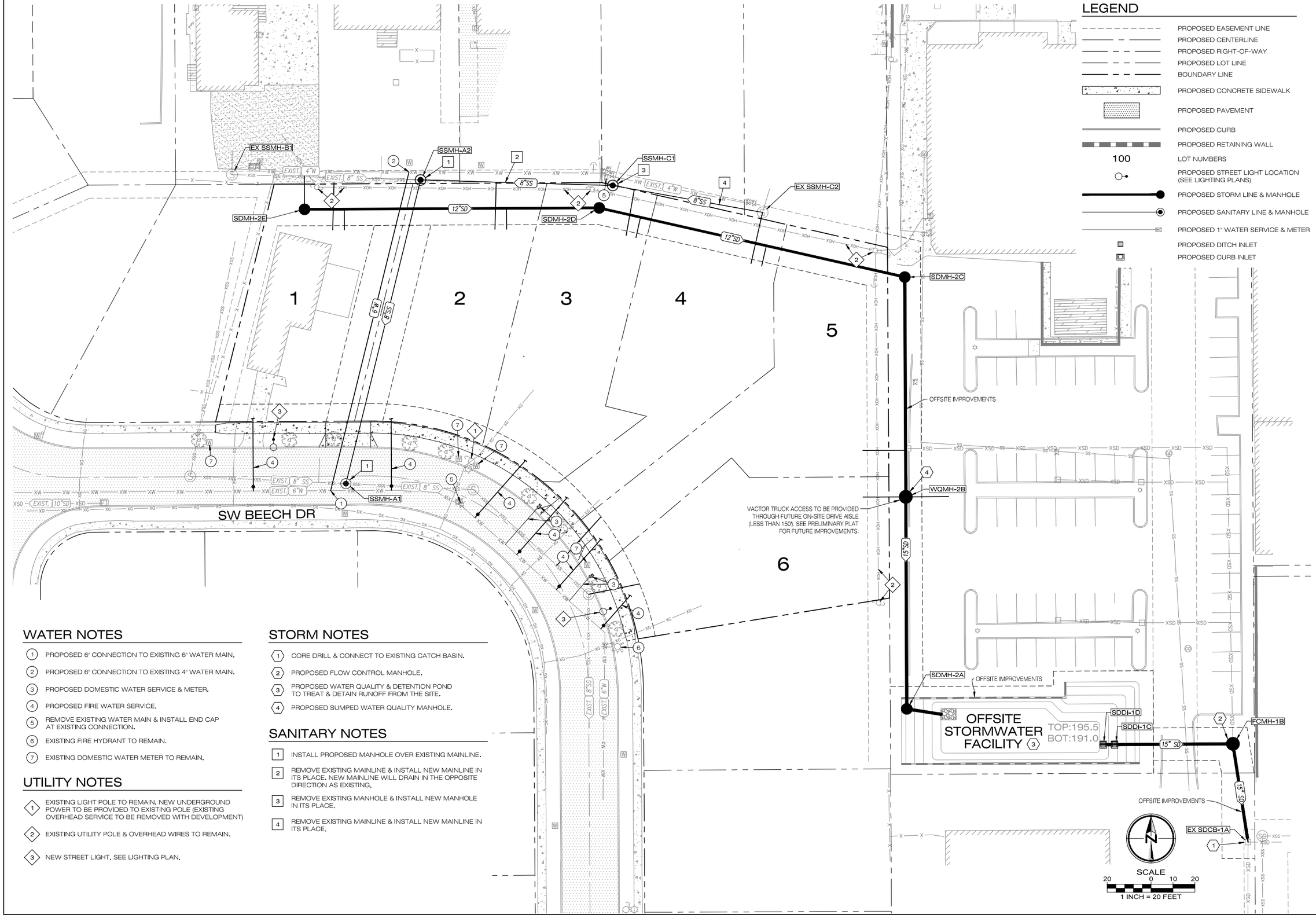

LEGEND

- PROPOSED EASEMENT LINE
- PROPOSED CENTERLINE
- PROPOSED RIGHT-OF-WAY
- PROPOSED LOT LINE
- BOUNDARY LINE
- PROPOSED CONCRETE SIDEWALK
- PROPOSED PAVEMENT
- PROPOSED CURB
- PROPOSED RETAINING WALL
- 100 LOT NUMBERS
- PROPOSED STREET LIGHT LOCATION (SEE LIGHTING PLANS)
- PROPOSED STORM LINE & MANHOLE
- PROPOSED SANITARY LINE & MANHOLE
- PROPOSED 1" WATER SERVICE & METER
- PROPOSED DITCH INLET
- PROPOSED CURB INLET

WATER NOTES

1. PROPOSED 6" CONNECTION TO EXISTING 6" WATER MAIN.
2. PROPOSED 6" CONNECTION TO EXISTING 4" WATER MAIN.
3. PROPOSED DOMESTIC WATER SERVICE & METER.
4. PROPOSED FIRE WATER SERVICE.
5. REMOVE EXISTING WATER MAIN & INSTALL END CAP AT EXISTING CONNECTION.
6. EXISTING FIRE HYDRANT TO REMAIN.
7. EXISTING DOMESTIC WATER METER TO REMAIN.

UTILITY NOTES

1. EXISTING LIGHT POLE TO REMAIN. NEW UNDERGROUND POWER TO BE PROVIDED TO EXISTING POLE (EXISTING OVERHEAD SERVICE TO BE REMOVED WITH DEVELOPMENT)
2. EXISTING UTILITY POLE & OVERHEAD WIRES TO REMAIN.
3. NEW STREET LIGHT. SEE LIGHTING PLAN.

STORM NOTES

1. CORE DRILL & CONNECT TO EXISTING CATCH BASIN.
2. PROPOSED FLOW CONTROL MANHOLE.
3. PROPOSED WATER QUALITY & DETENTION POND TO TREAT & DETAIN RUNOFF FROM THE SITE.
4. PROPOSED SUMPED WATER QUALITY MANHOLE.

SANITARY NOTES

1. INSTALL PROPOSED MANHOLE OVER EXISTING MAINLINE.
2. REMOVE EXISTING MAINLINE & INSTALL NEW MAINLINE IN ITS PLACE. NEW MAINLINE WILL DRAIN IN THE OPPOSITE DIRECTION AS EXISTING.
3. REMOVE EXISTING MANHOLE & INSTALL NEW MANHOLE IN ITS PLACE.
4. REMOVE EXISTING MAINLINE & INSTALL NEW MAINLINE IN ITS PLACE.

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WILLIAM J.
PRELIMINARY
NOT FOR CONSTRUCTION
VALID THROUGH 12-31-25

PRELIMINARY COMPOSITE UTILITY PLAN

BEECH POINTE
BEAVERTON, OREGON

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Reviewed by	MLS	Date	09/2024
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Project: BEECH POINTE
No. 390-004a
Type: PLANNING
Sheet: **P6.0**

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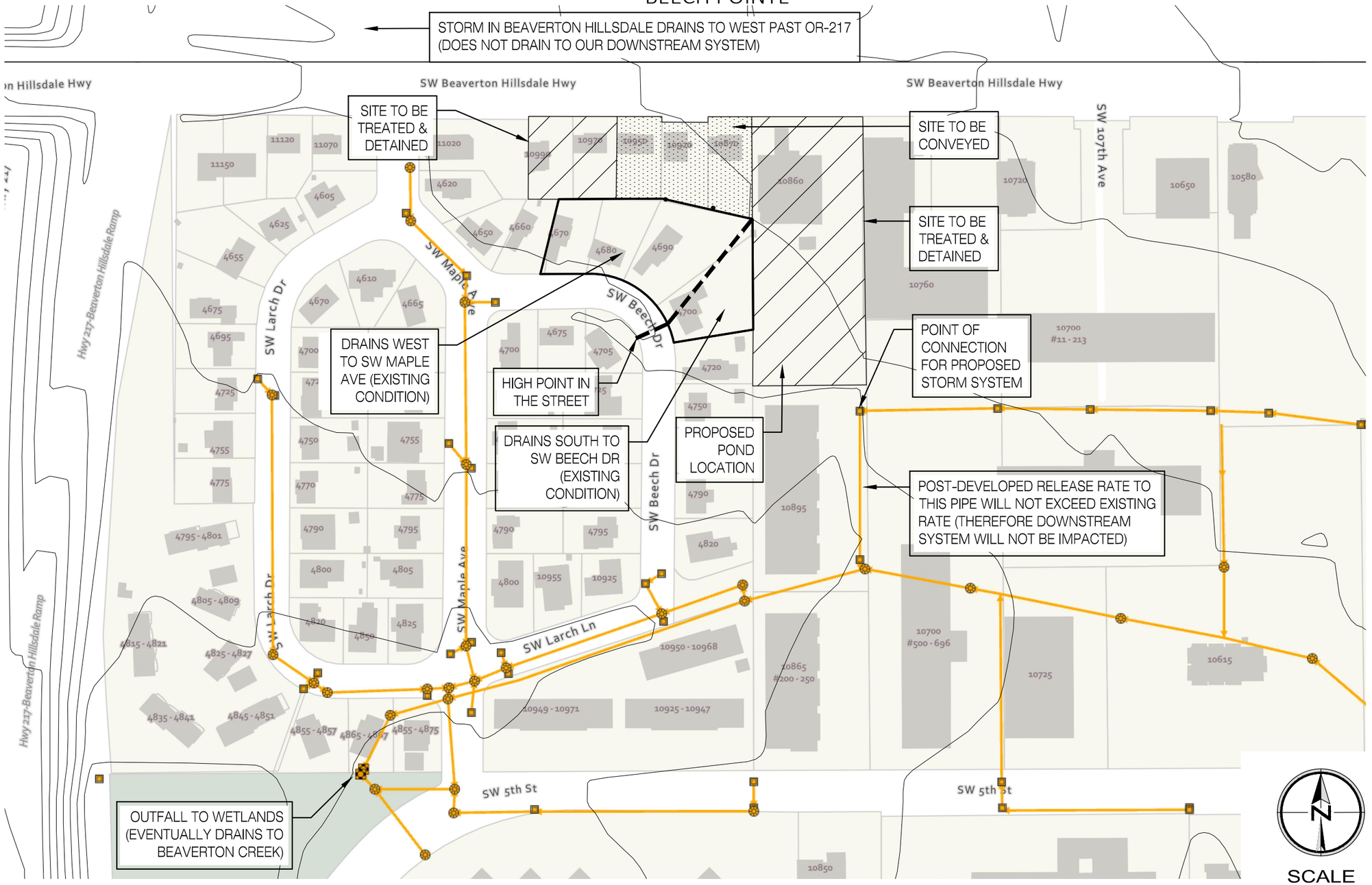
BASIN MAP

BEECH POINTE



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390-004a BASIN MAP.DWG

Project
BEECH POINTE

No.
390-004a

Type
PLANNING

Sheet
1 of 1

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RUNOFF CURVE NUMBERS (TR55)

Table 2-2a: Runoff curve numbers for urban areas [1]

Cover description		CN for hydrologic soil group			
Cover type and hydrologic condition	Average percent impervious area[2]	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 (CNs 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 hava 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.

MANNING'S "n" VALUES

SHEET FLOW EQUATION MANNING'S VALUES	n_s
Smooth Surfaces (concrete, asphault, gravel, or bare hand packed soil)	0.011
Fallow Fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover (≤ 20%)	0.06
Cultivated soil with residue cover (> 20%)	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grasses	0.41
Range (natural)	0.13
Woods or forrest with light underbrush	0.40
Woods or forrest with dense underbrush	0.80

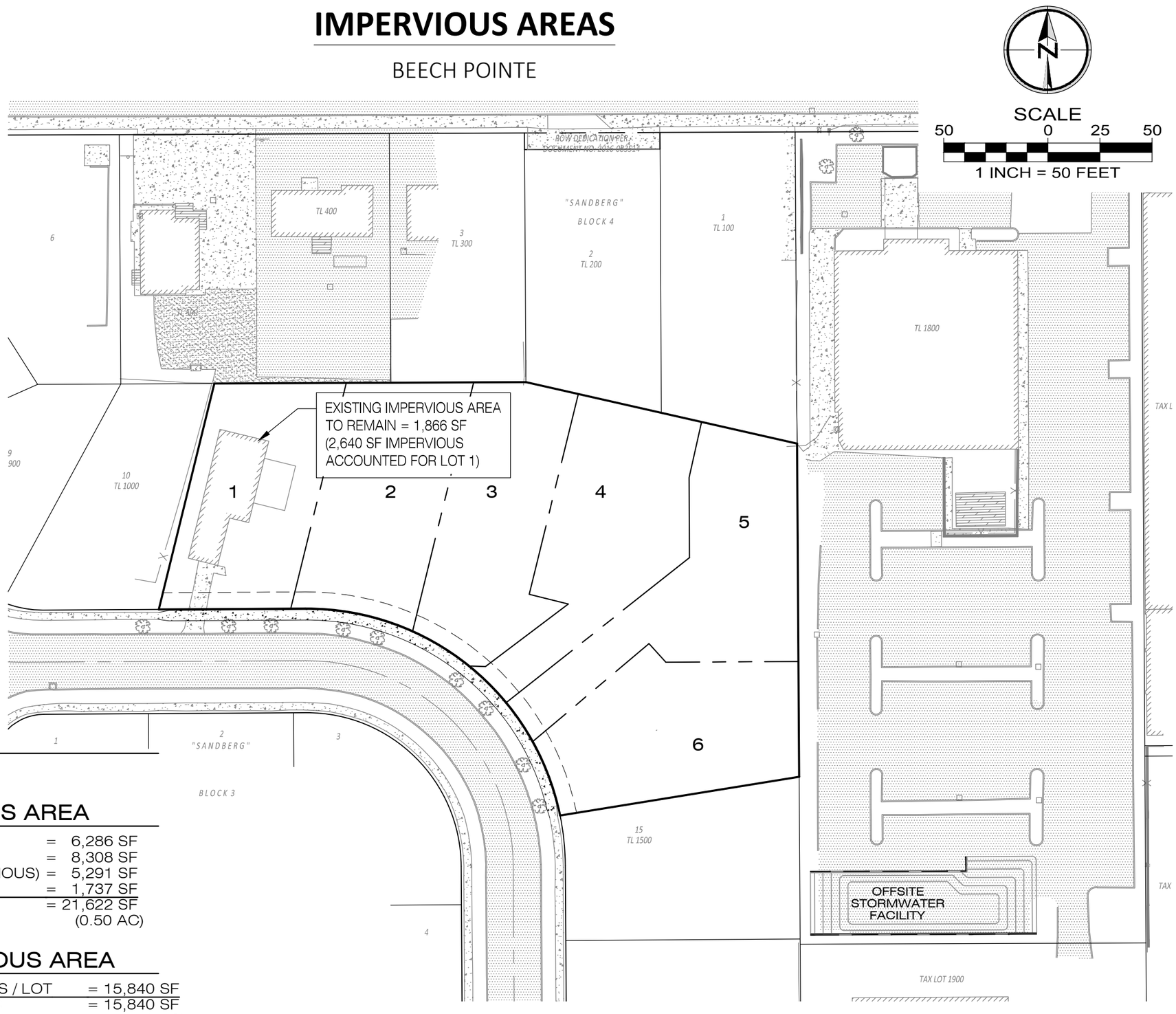
SHALLOW CONCENTRATED FLOW (after initial 300 ft of sheet flow, R = 0.1)	k_s
Forrest with heavy ground litter and meadows (n = 0.010)	3
Brushy ground with some trees (n = 0.060)	5
Fallow or minimum tillage cultivation (n = 0.040)	8
High grass (n = 0.035)	9
Short grass, pasture and lawns (n = 0.030)	11
Nearly bare ground (n = 0.25)	13
Paved and gravel areas (n = 0.012)	27

CHANNEL FLOW (Intermittent) (At the beginning of all visible channels, R = 0.2)	k_c
Forested swale with heavy ground cover (n = 0.10)	5
Forested drainage course/ravine with defined channel bed (n = 0.050)	10
Rock-lined waterway (n = 0.035)	15
Grassed waterway (n = 0.030)	17
Earth-lined waterway (n = 0.025)	20
CMP pipe (n = 0.024)	21
Concrete pipe (n = 0.012)	42
Other waterways and pipe 0.508/n	

CHANNEL FLOW (continuous stream, R = 0.4)	k_c
Meandering stream (n = 0.040)	20
Rock-lined stream (n = 0.035)	23
Grass-lined stream (n = 0.030)	27
Other streams, man-made channels and pipe (n = 0.807/n)	

IMPERVIOUS AREAS

BEECH POINTE



SITE AREA

43,256 SF = 0.99 AC

EXISTING IMPERVIOUS AREA

EXISTING BUILDINGS	=	6,286 SF
EXISTING CONCRETE	=	8,308 SF
EXISTING GRAVEL (60% IMPERVIOUS)	=	5,291 SF
EXISTING DECKS	=	1,737 SF
TOTAL EXISTING IMPERVIOUS	=	21,622 SF (0.50 AC)

PROPOSED IMPERVIOUS AREA

6 LOTS AT 2,640 SF IMPERVIOUS / LOT	=	15,840 SF
TOTAL PROPOSED IMPERVIOUS	=	15,840 SF (0.36 AC)

PIONEER DESIGN GROUP
CIVIL ENGINEERING • LAND USE PLANNING • LAND SURVEYING • LANDSCAPE ARCHITECTURE
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Designed by	WJD	Date 09/2024
Drawn by	WJD	Date 09/2024
Reviewed by	BEF	Date 09/2024
Project No.	390-004a	REF.
Horiz. Scale:		
Vert. Scale:		

390-004a IMPERVIOUS AREAS.DWG

Project
BEECH POINTE

No.
390-004a

Type
PLANNING

Sheet
1 of 1

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PIONEER DESIGN GROUP

IMPERVIOUS AREA CALCULATIONS

JOB NUMBER: 390-004a
PROJECT: Beech Pointe
FILE: 390004a_Prelim Hydro.xls

NEW IMPERVIOUS AREA

6 LOTS AT 2,640-SF IMPERVIOUS AREA / LOT	15,840.00 ft^2	
	15,840.00 ft^2	**0.36 ac**

EXISTING IMPERVIOUS AREA

BUILDINGS	6,286.00 ft^2	
CONCRETE	8,308.00 ft^2	
GRAVEL AT 60% IMPERVIOUS	5,291.00 ft^2	
DECK	1,737.00 ft^2	
	21,622.00 ft^2	**0.50 ac**

Total Shed Area	**43,256.00 ft^2**	**0.99 ac**
Existing Impervious Area	**21,622.00 ft^2**	**0.50 ac**
% Impervious		**50.0 %**
Proposed Impervious Area	**15,840.00 ft^2**	**0.36 ac**
% Impervious		**36.6 %**

PIONEER DESIGN GROUP

IMPERVIOUS AREA CALCULATIONS
POND SIZING + FULL BUILD OUT OF TL'S 400, 500, 1800

JOB NUMBER: 390-004a
PROJECT: Beech Pointe
FILE: 390004a_Prelim Hydro.xls

NEW IMPERVIOUS AREA

PROJECT SITE (TL 1100, 1200, 1300, 1400)	15,840.00 ft^2	
TL 400 & 500*	14,207.00 ft^2	
TL 1800*	50,695.00 ft^2	
*Areas based on preliminary designs for redevelopment projects	**80,742.00 ft^2**	**1.85 ac**

EXISTING IMPERVIOUS AREA

PROJECT SITE -> Assume CN = 75 (Redevelopment)	21,622.00 ft^2	
TL 400 & 500 -> Assume CN = 75 (Redevelopment)	14,064.00 ft^2	
TL 1800 -> Assume CN = 75 (Redevelopment)	53,702.00 ft^2	
	89,388.00 ft^2	**2.05 ac**

Total Shed Area	**123,474.00 ft^2**	**2.83 ac**
Existing Impervious Area	**89,388.00 ft^2**	**2.05 ac**
% Impervious		**72.4 %**
Redeveloped Impervious -> Assume CN = 75	**89,388.00 ft^2**	**2.05 ac**
Proposed Impervious Area	**80,742.00 ft^2**	**1.85 ac**
% Impervious		**65.4 %**

PIONEER DESIGN GROUP

WATER QUALITY POND CALCULATIONS

JOB NUMBER: 390-004a
PROJECT: Beech Pointe
FILE: 390004a_Prelim Hydro.xls

REFERENCES:
1. Clean Water Services R&O 07-20.
2. City of Beaverton Engineering Design Manual (2019).

REQUIRED WATER QUALITY TREATMENT: 65% Phosphorus Removal.

PROPOSED TREATMENT METHODS:

1. Sumped Catch Basins	15%
2. Water quality Pond	50%
total	65%

DESIGN STORM

Precipitation:	0.36	inches
Storm Duration:	3	hours
Storm Return Period:	96	hours
Storm Window:	2	weeks

IMPERVIOUS AREA:
Impervious Area*: 1.85 acres
*Areas based on preliminary designs for redevelopment projects on Tax Lots 400, 500, & 1800

Design Inflow = (1.85 ac)*(43560 ft^2/ac)*(0.36 in / 3.0 hrs) = **0.22 cfs**

VOLUME CALCULATION:
POND VOLUME = (1.85 acres)(43560 sqft/acre)(0.36 inch)/(12 in/ft) = **2,418 ft^3**

WQ VOLUME PROVIDED (SEE BELOW): **2756 ft^3**
FROM ELEVATION 191.0 TO 192.5

Stage / Storage / Discharge

Row 0 — (●) Ave end area ( ) Conic

	Stage (ft)	Elevation (ft)	Contour Area (sqft)	Incremental Storage (cuft)	Total Storage (cuft)	Discharge (cfs)
▶	0.00	191.00	1338	0	0	0.000
	1.00	192.00	1995	1667	1667	0.015
	1.50	192.50	2364	1090	2756	0.022
	2.00	193.00	2530	1224	3980	0.076
	3.00	194.00	2867	2699	6678	0.123
	3.50	194.50	3045	1478	8156	1.108
	4.00	195.00	3232	1569	9726	8.845

POND OUTLET ORIFICE CALCULATIONS:

Q = (2,418 ft3)/(48 hrs)/(60 min/hrs)/(60 s/min)= 0.014 cfs

h = average hydraulic head = 12 inches below high flow

A = 0.00 ft^2

$A = \pi r^2$

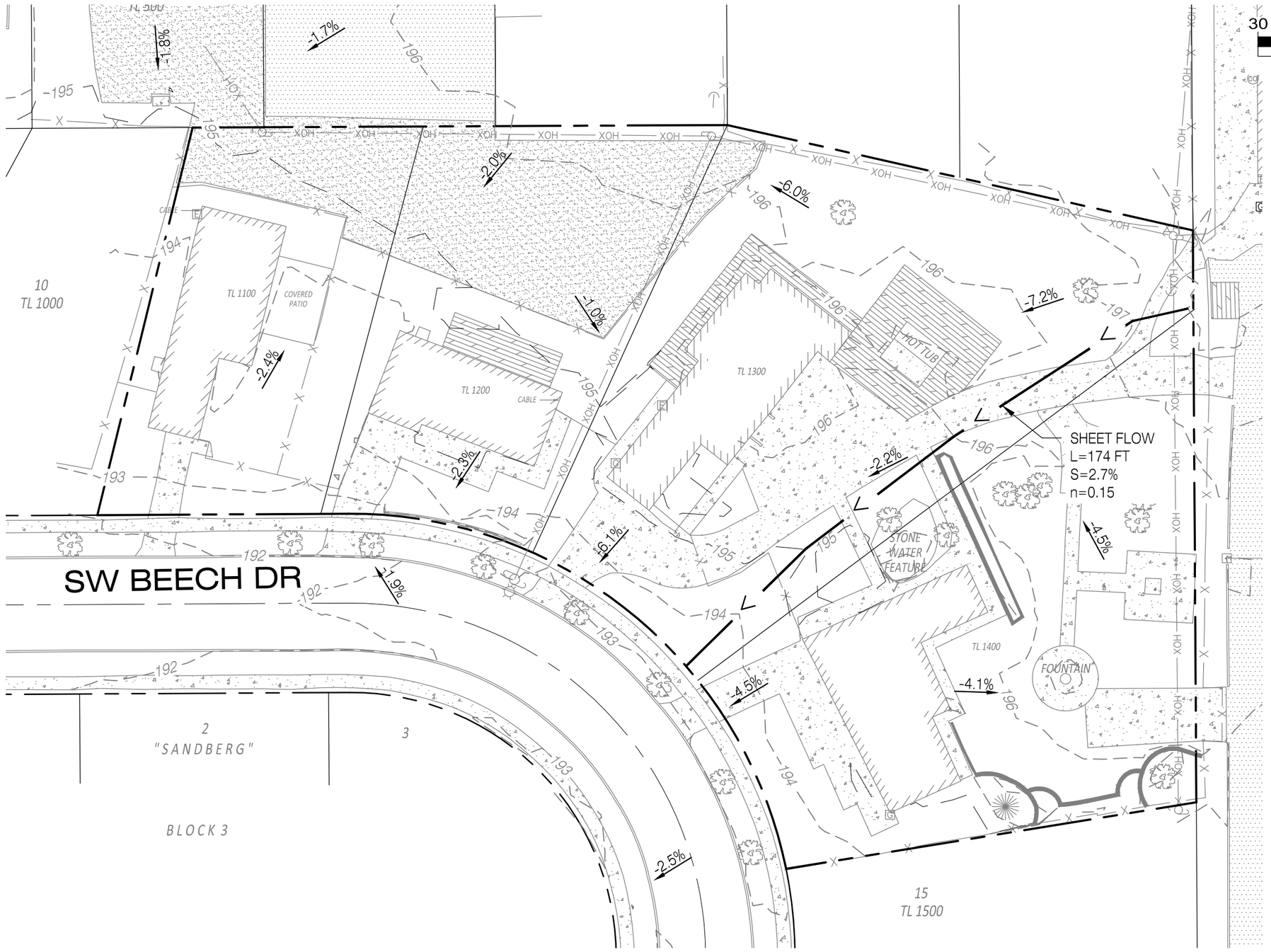
r = 0.03 ft. radius

d = 2r

d = 0.72 in. diameter, use **6/8 " orifice**

PRE-DEVELOPED TIME OF CONCENTRATION

BEECH POINTE



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390-004a IMPERVIOUS AREAS.DWG

Project
BEECH POINTE

No.
390-004a

Type
PLANNING

Sheet
1 of 1

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PIONEER DESIGN GROUP

PREDEVELOPED TIME OF CONCENTRATION

JOB NUMBER: 390-004a
PROJECT: Beech Pointe
FILE: 390004a_Prelim Hydro.xls

			Accum. Tc
LAG ONE: SHEET FLOW (FIRST 174 FEET)			
Tt = Travel time			
Manning's "n " =	0.15		
Flow Length, L =	174 ft	(300 ft. max.)	
P = 2-year, 24hr storm =	2.5 in		
Slope, S_0 =	0.027 ft/ft		
$T_T = \frac{(0.42)(n * L)^{0.8}}{(P)^{0.5}(S_0)^{0.4}}$	15.31 min.		15.31 min.

TOTAL PREDEVELOPED TIME OF CONCENTRATION (Tc) = 15.31 min.

PIONEER DESIGN GROUP

DEVELOPED TIME OF CONCENTRATION

JOB NUMBER: 390-004a
PROJECT: Beech Pointe
FILE: 390004a_Prelim Hydro.xls

Catchment Time	5	min.
Longest Run of Pipe	478	ft
Velocity of Flow	3	ft/s
Time in Pipe = (478 ft)/(3.00 ft/s) =	159	s
TOTAL DEVELOPED Tc =	**7.66**	**min.**

PIONEER DESIGN GROUP

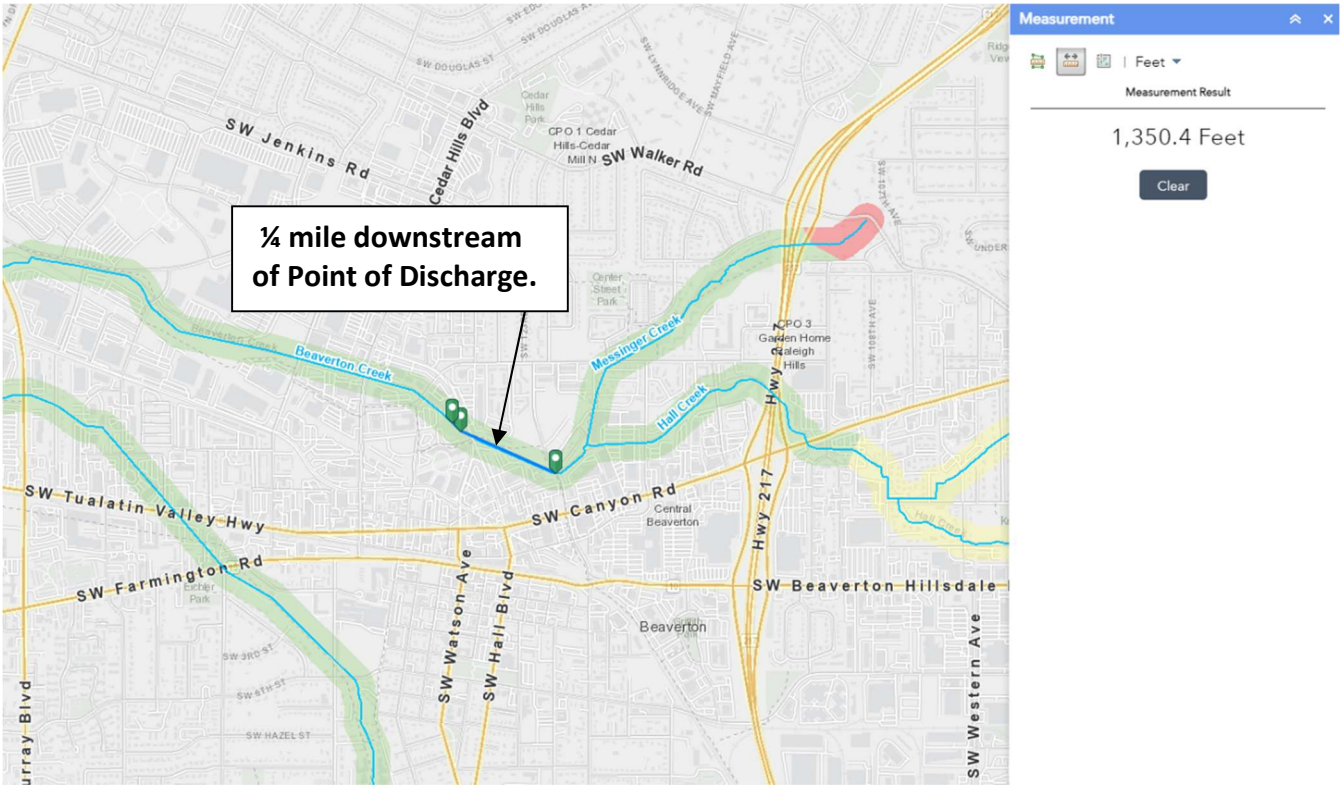
STORMWATER CONVEYANCE CALCULATIONS

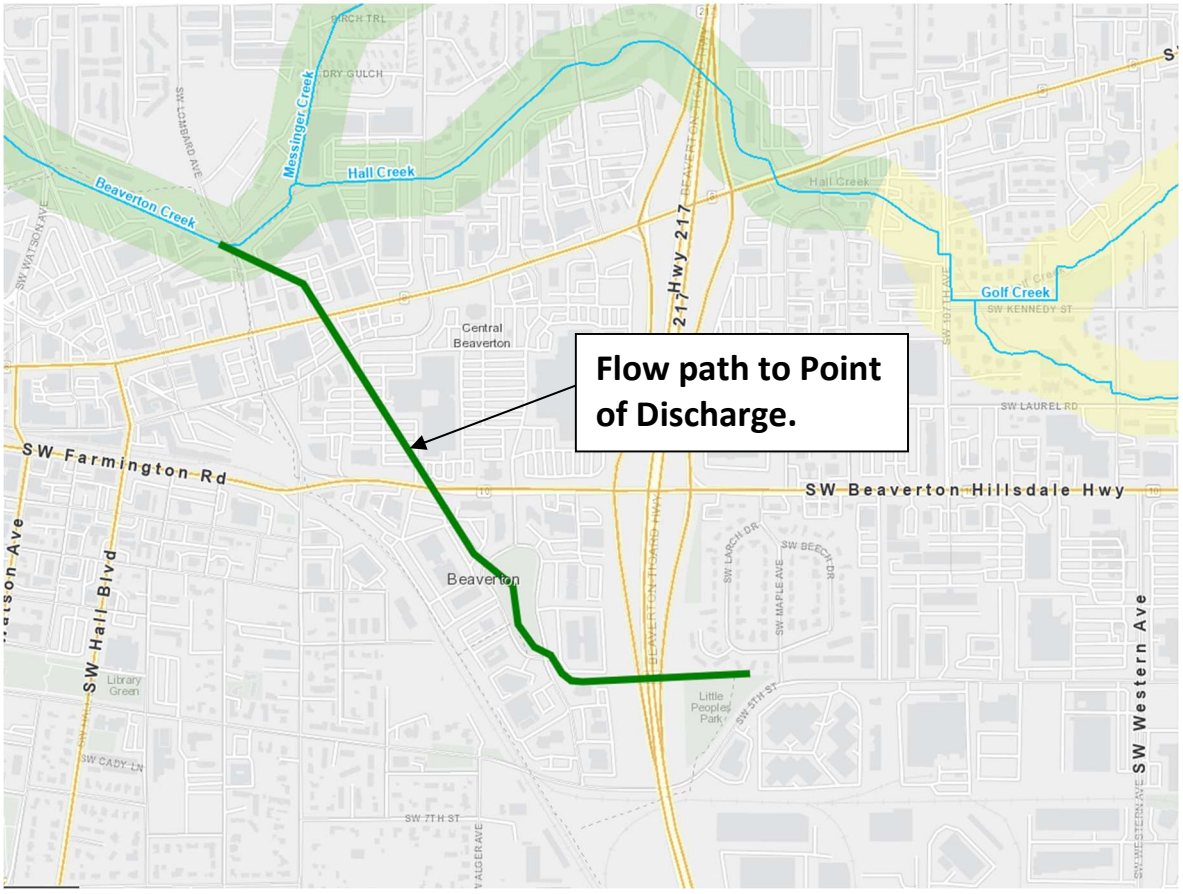
JOB NUMBER: 390-004a
PROJECT: Beech Pointe

FILE: 390004a_Prelim Hydro.xls
Design Storm: 25 YR
Storm Duration: 24 HRS
Precipitation: 3.9 IN
Manning's "n" 0.013

LINE	INC. AREA (AC)	AREA TOTAL (AC)	% IMP.	AREA PERV. (AC)	CN PER.	AREA IMP. (AC)	CN IMP.	TIME (MIN)	Q (CFS)	PIPE SIZE (IN)	SLOPE (FT/FT)	Qf (CFS)	Q/Qf (%)	Vf (FPS)	V/Vf (%)	ACTUAL V (FPS)
PROJECT SITE (to be conveyed & treated)	0.99	0.99	36.6	0.63	79	0.36	98	5.00	0.67							
TL 400 & 500 (to be conveyed & treated)	0.36	0.36	90.6	0.03	79	0.33	98	5.00	0.35							
TL 100, 200, 300 (to be conveyed)	0.58	0.58	80.0	0.12	79	0.46	98	5.00	0.53							
TL 1800 (to be conveyed & treated)	1.49	1.49	78.3	0.32	79	1.16	98	5.00	1.34							
UPPER REACH	1.93	1.93	59.7	0.78	79	1.15	98	5.00	1.54	12	0.0040	2.26	0.68	2.88	1.11	3.18
LOWER REACH	3.42	3.42	67.8	1.10	79	2.32	98	5.00	2.88	15	0.0030	3.55	0.81	2.89	1.15	3.31

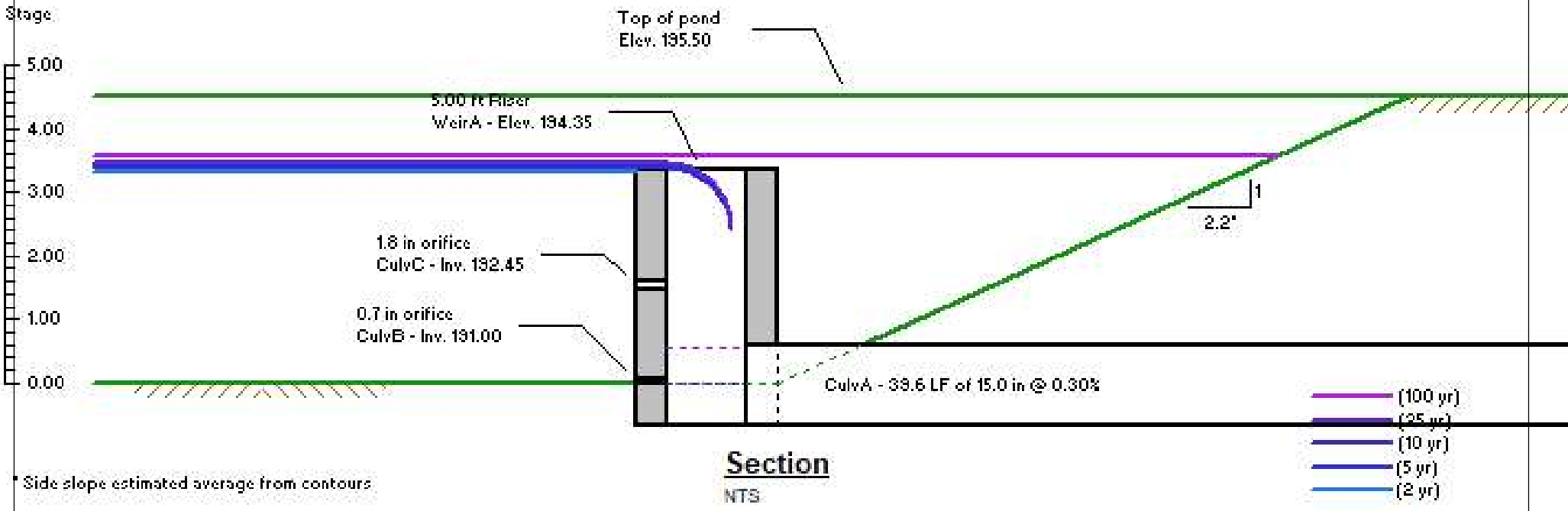
APPENDIX A –
CWS HYDROMODIFCATION MAPS


¼ mile downstream of Point of Discharge.
Measurement
Feet
Measurement Result
1,350.4 Feet
Clear
SW Jenkins Rd
Cedar Hills Blvd
SW Walker Rd
Beaverton Creek
Messinger Creek
Hall Creek
Hwy 217
SW Tualatin Valley Hwy
SW Canyon Rd
SW Farmington Rd
SW Watson Ave
SW Hall Blvd
SW Beaverton Hillsdale
Beaverton
SW Western Ave


Flow path to Point of Discharge.
Beaverton Creek
Messinger Creek
Hall Creek
Golf Creek
Central Beaverton
Hwy 217
SW Farmington Rd
SW Beaverton Hillsdale Hwy
SW Hall Blvd
Beaverton
SW Western Ave

APPENDIX B – INTELISOLVE CALCULATIONS & POND REPORT

Pond



Section

NTS

* Side slope estimated average from contours

Schematic only. Not for construction.

Table of Contents

Hydrograph Return Period Recap

Hyd. No.	Hydrograph type (origin)	Inflow Hyd(s)	Peak Outflow (cfs)								Hydrograph description
			1-Yr	2-Yr	3-Yr	5-Yr	10-Yr	25-Yr	50-Yr	100-Yr	
1	SCS Runoff	-------	-------	0.27	-------	0.53	0.70	0.95	-------	1.29	Existing Condition
2	SCS Runoff	-------	-------	1.02	-------	1.41	1.65	1.95	-------	2.36	Developed Condition
3	Reservoir	2	-------	0.13	-------	0.32	0.48	0.80	-------	1.86	Pond

Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.27	3	486	6,892	----	------	------	Existing Condition
2	SCS Runoff	1.02	3	477	14,744	----	------	------	Developed Condition
3	Reservoir	0.13	3	1290	14,700	2	194.34	7,669	Pond

Hydrograph Plot

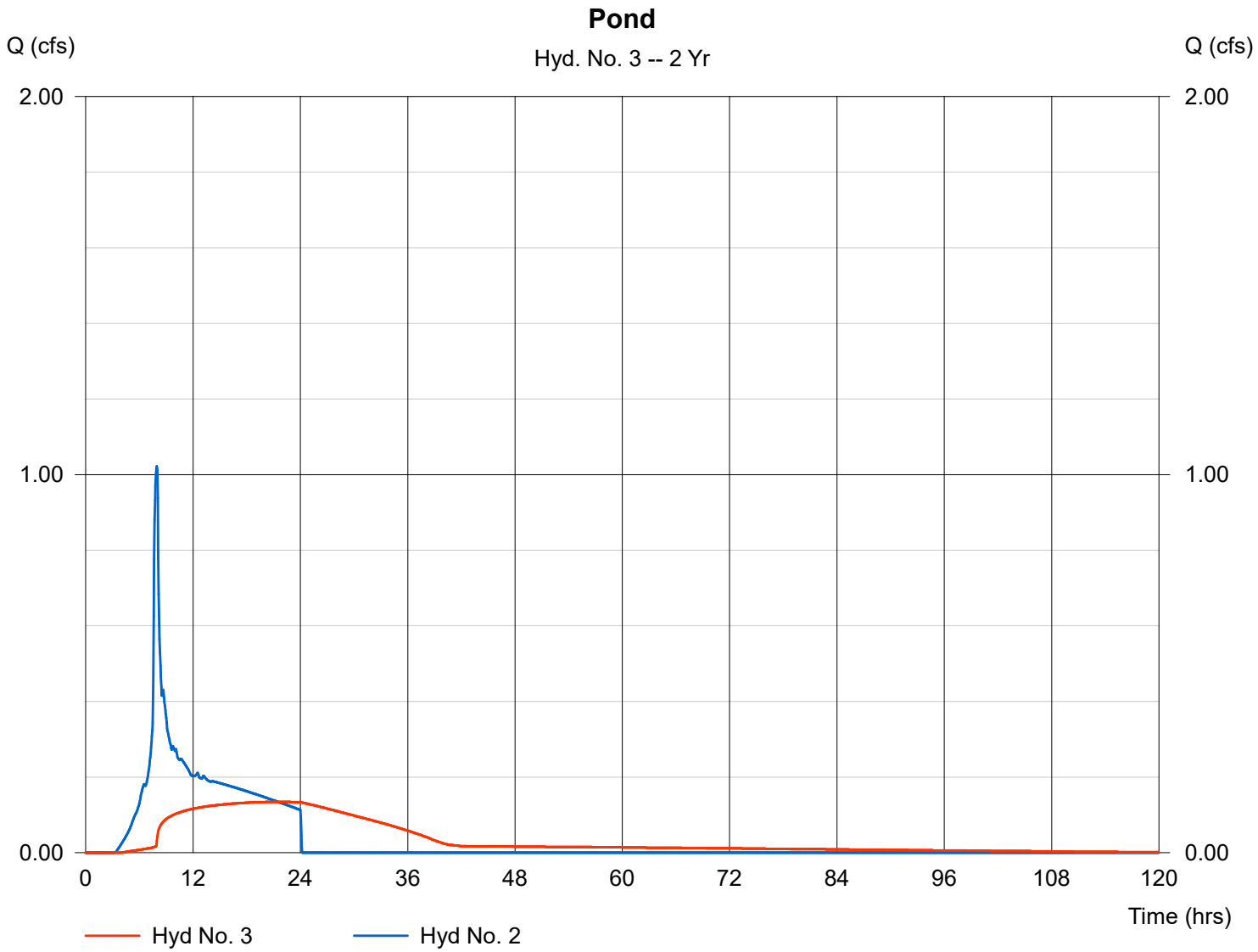
Hydraflow Hydrographs by Intelisolve | Thursday, Sep 12 2024, 12:29 PM

Hyd. No. 3

Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.13 cfs
Storm frequency	=	2 yrs	Time interval	=	3 min
Inflow hyd. No.	=	2	Max. Elevation	=	194.34 ft
Reservoir name	=	Pond	Max. Storage	=	7,669 cuft

Storage Indication method used. | Hydrograph Volume = 14,700 cuft



Pond Report

Pond No. 1 - Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	191.00	1,338	0	0
1.00	192.00	1,995	1,667	1,667
1.50	192.50	2,364	1,090	2,756
2.00	193.00	2,530	1,224	3,980
3.00	194.00	2,867	2,699	6,678
3.50	194.50	3,045	1,478	8,156
4.00	195.00	3,232	1,569	9,726
4.50	195.50	3,427	1,665	11,390

Culvert / Orifice Structures

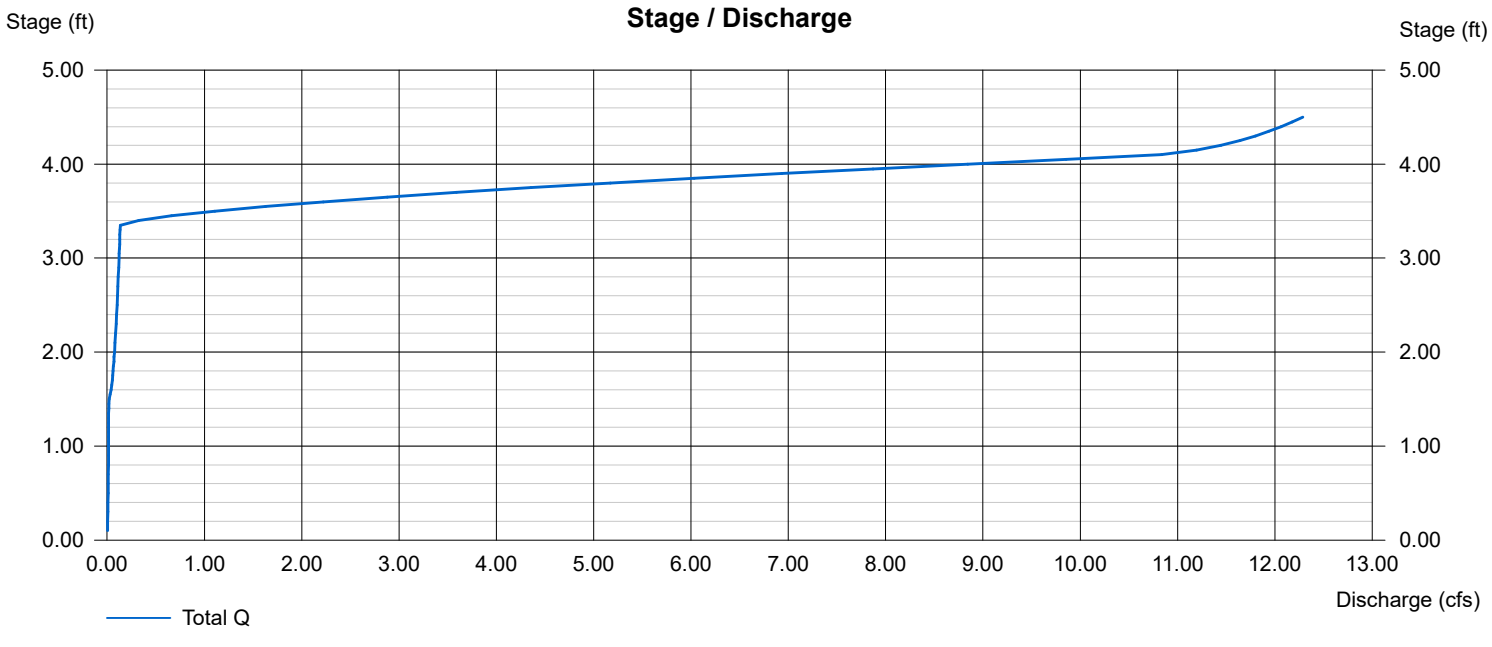
	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	0.74	1.75	0.00
Span (in)	= 15.00	0.74	1.75	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 190.34	191.00	192.45	0.00
Length (ft)	= 39.60	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 194.35	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.53	3	486	10,878	----	------	------	Existing Condition
2	SCS Runoff	1.41	3	477	19,995	----	------	------	Developed Condition
3	Reservoir	0.32	3	651	19,951	2	194.40	7,858	Pond

Hydrograph Plot

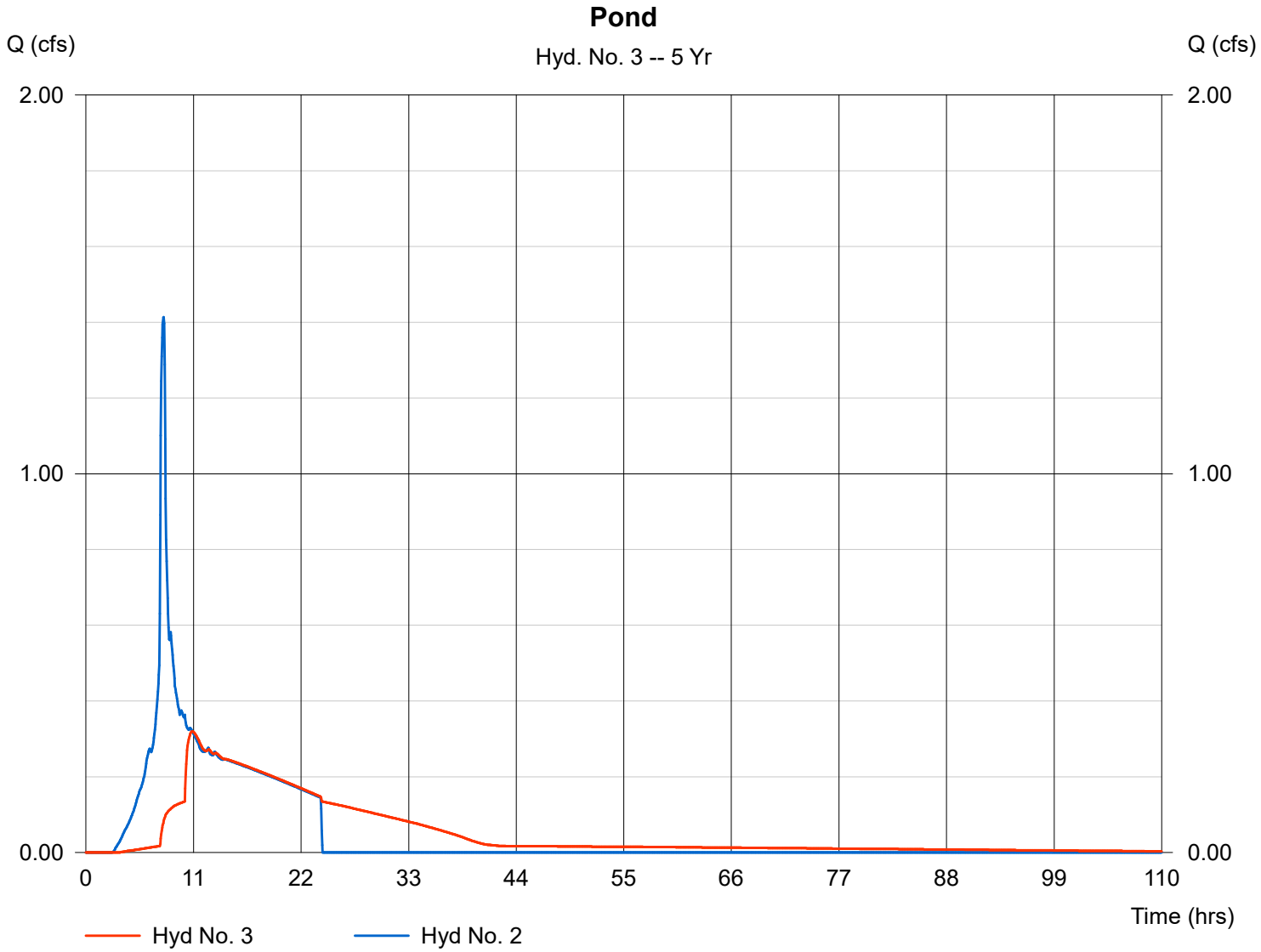
Hydraflow Hydrographs by Intelisolve | Thursday, Sep 12 2024, 12:29 PM

Hyd. No. 3

Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.32 cfs
Storm frequency	=	5 yrs	Time interval	=	3 min
Inflow hyd. No.	=	2	Max. Elevation	=	194.40 ft
Reservoir name	=	Pond	Max. Storage	=	7,858 cuft

Storage Indication method used. | Hydrograph Volume = 19,951 cuft



Pond Report

Pond No. 1 - Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	191.00	1,338	0	0
1.00	192.00	1,995	1,667	1,667
1.50	192.50	2,364	1,090	2,756
2.00	193.00	2,530	1,224	3,980
3.00	194.00	2,867	2,699	6,678
3.50	194.50	3,045	1,478	8,156
4.00	195.00	3,232	1,569	9,726
4.50	195.50	3,427	1,665	11,390

Culvert / Orifice Structures

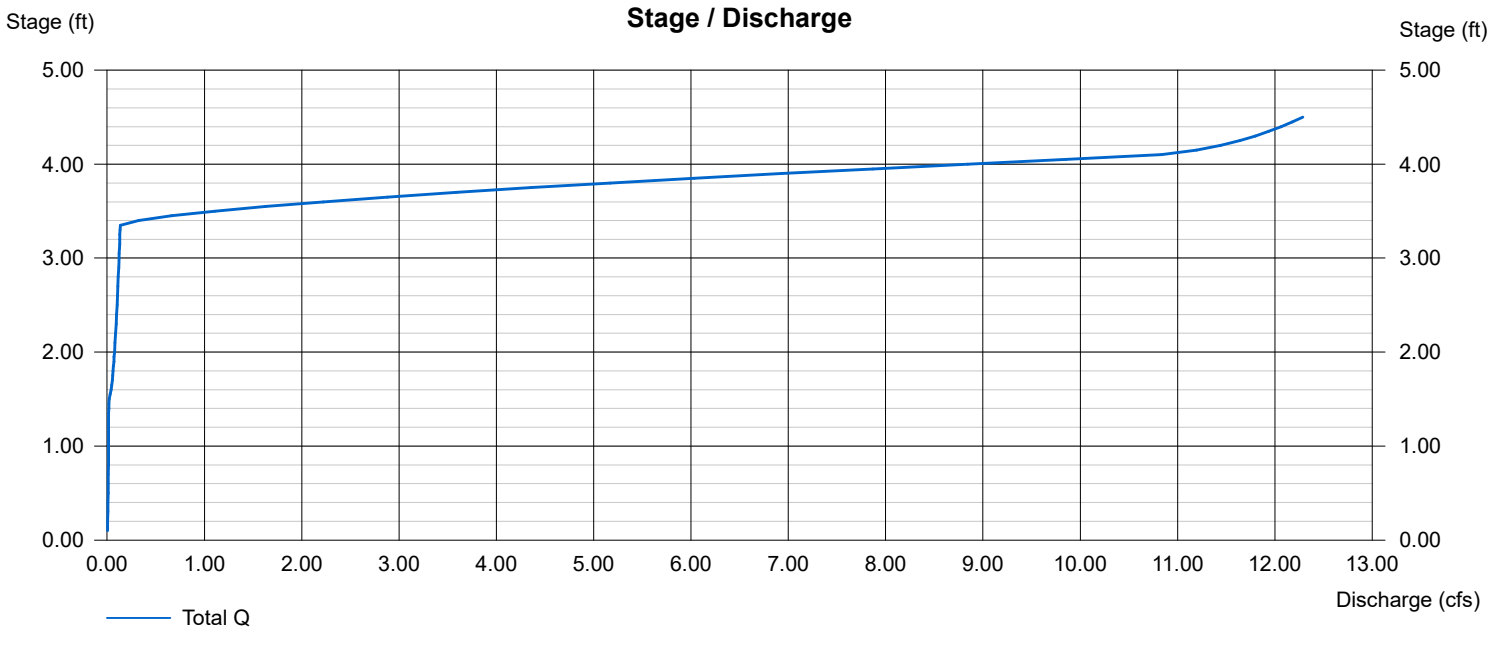
	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	0.74	1.75	0.00
Span (in)	= 15.00	0.74	1.75	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 190.34	191.00	192.45	0.00
Length (ft)	= 39.60	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 194.35	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.70	3	483	13,418	----	------	------	Existing Condition
2	SCS Runoff	1.65	3	474	23,126	----	------	------	Developed Condition
3	Reservoir	0.48	3	555	23,081	2	194.42	7,928	Pond

Hydrograph Plot

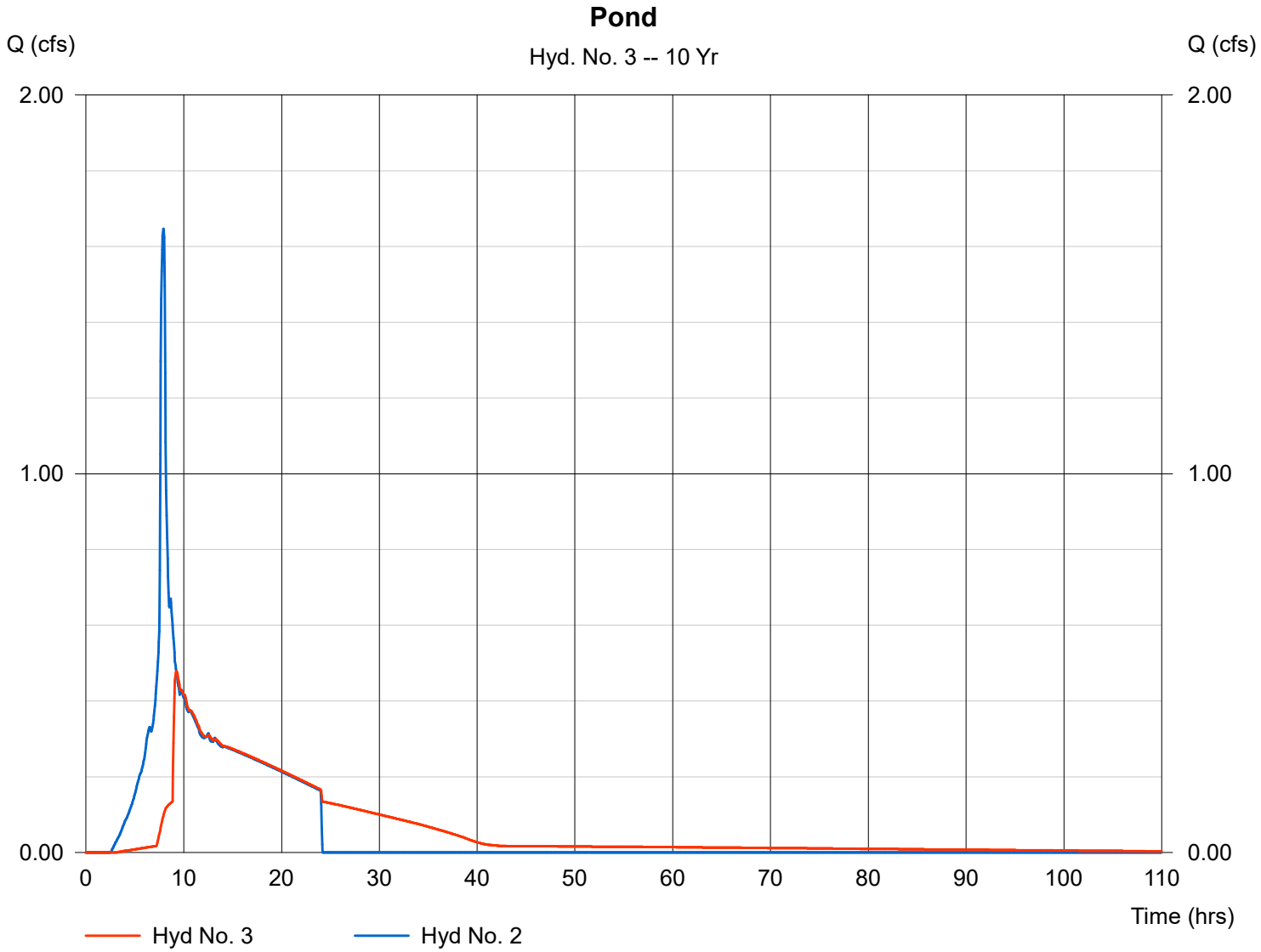
Hydraflow Hydrographs by Intelisolve | Thursday, Sep 12 2024, 12:29 PM

Hyd. No. 3

Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.48 cfs
Storm frequency	=	10 yrs	Time interval	=	3 min
Inflow hyd. No.	=	2	Max. Elevation	=	194.42 ft
Reservoir name	=	Pond	Max. Storage	=	7,928 cuft

Storage Indication method used. | Hydrograph Volume = 23,081 cuft



Pond Report

Pond No. 1 - Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	191.00	1,338	0	0
1.00	192.00	1,995	1,667	1,667
1.50	192.50	2,364	1,090	2,756
2.00	193.00	2,530	1,224	3,980
3.00	194.00	2,867	2,699	6,678
3.50	194.50	3,045	1,478	8,156
4.00	195.00	3,232	1,569	9,726
4.50	195.50	3,427	1,665	11,390

Culvert / Orifice Structures

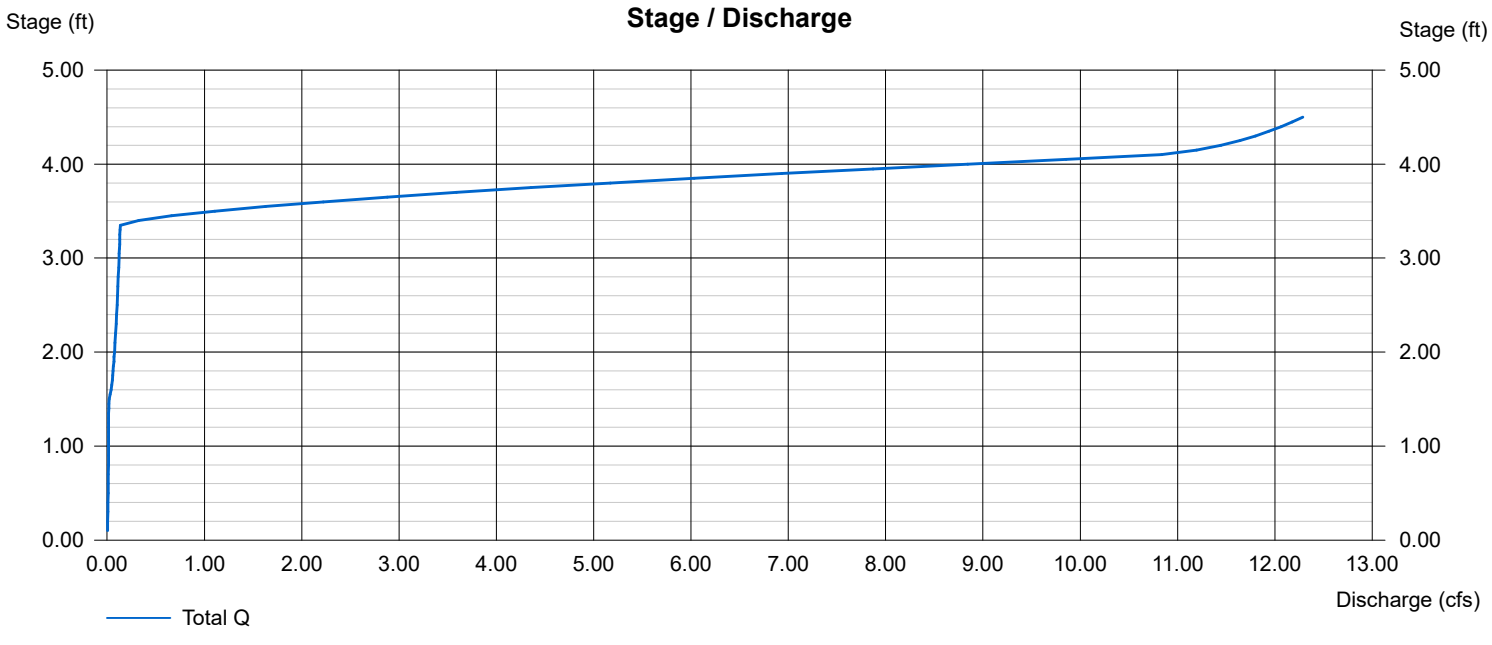
	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	0.74	1.75	0.00
Span (in)	= 15.00	0.74	1.75	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 190.34	191.00	192.45	0.00
Length (ft)	= 39.60	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 194.35	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	0.95	3	483	16,866	----	------	------	Existing Condition
2	SCS Runoff	1.95	3	474	27,202	----	------	------	Developed Condition
3	Reservoir	0.80	3	507	27,158	2	194.47	8,054	Pond

Hydrograph Plot

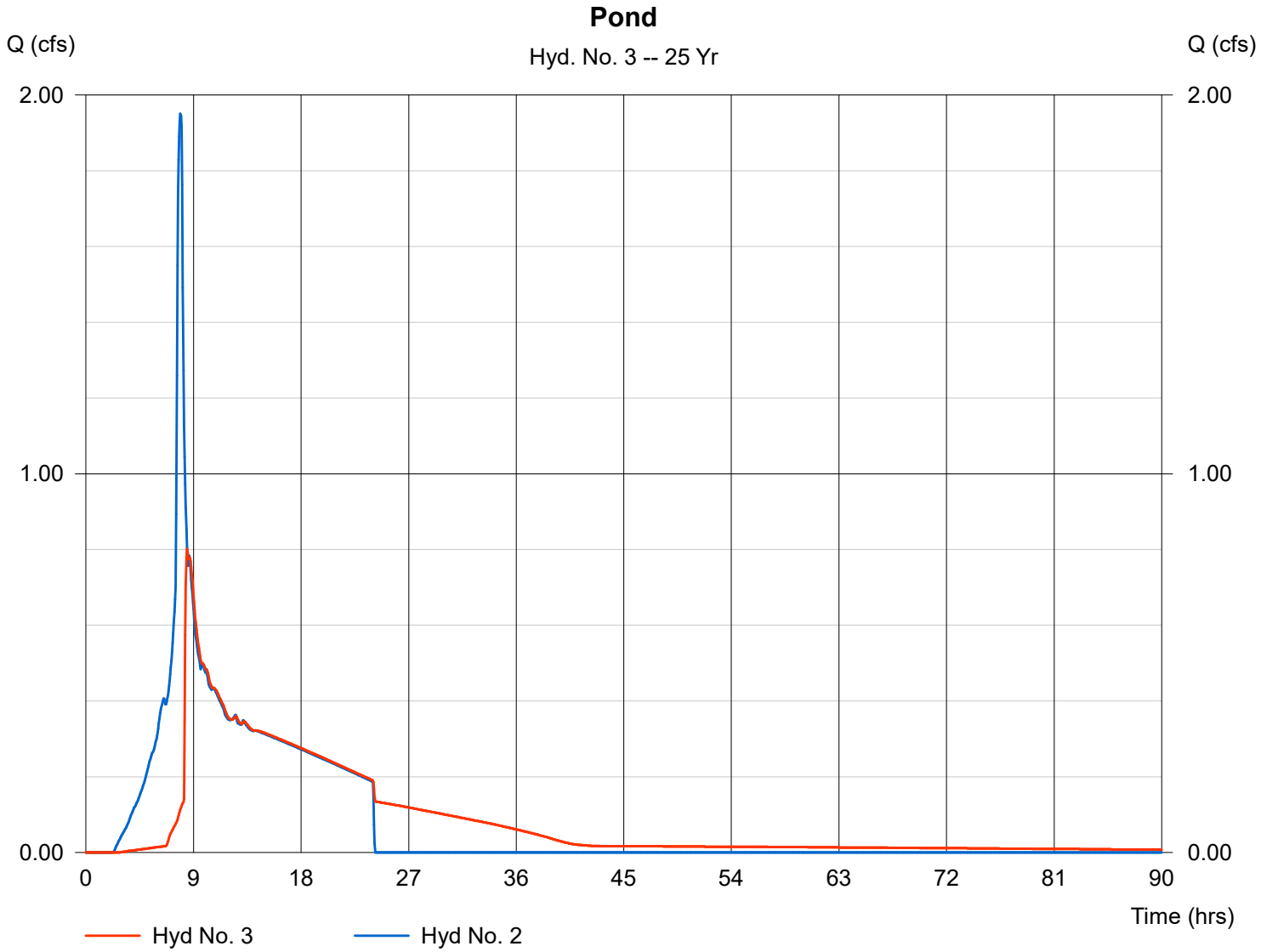
Hydraflow Hydrographs by Intelisolve | Thursday, Sep 12 2024, 12:29 PM

Hyd. No. 3

Pond

Hydrograph type	=	Reservoir	Peak discharge	=	0.80 cfs
Storm frequency	=	25 yrs	Time interval	=	3 min
Inflow hyd. No.	=	2	Max. Elevation	=	194.47 ft
Reservoir name	=	Pond	Max. Storage	=	8,054 cuft

Storage Indication method used. | Hydrograph Volume = 27,158 cuft



Pond Report

Pond No. 1 - Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	191.00	1,338	0	0
1.00	192.00	1,995	1,667	1,667
1.50	192.50	2,364	1,090	2,756
2.00	193.00	2,530	1,224	3,980
3.00	194.00	2,867	2,699	6,678
3.50	194.50	3,045	1,478	8,156
4.00	195.00	3,232	1,569	9,726
4.50	195.50	3,427	1,665	11,390

Culvert / Orifice Structures

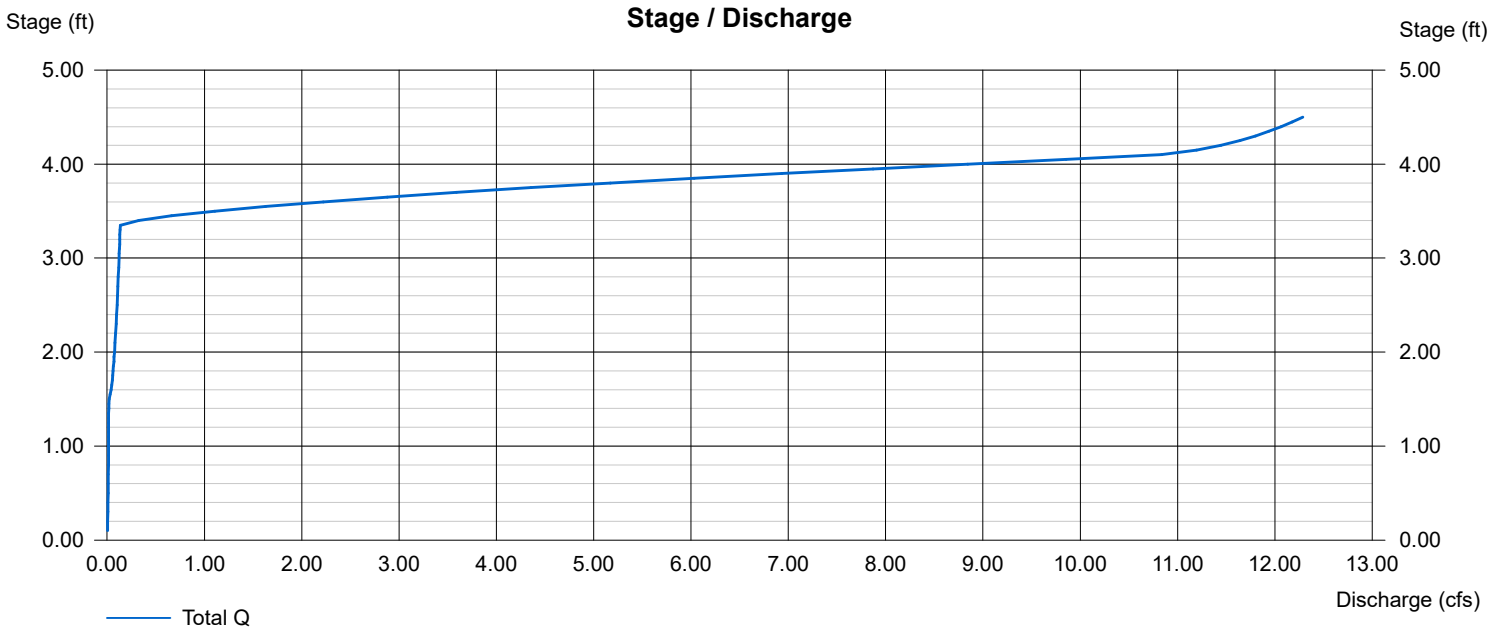
	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	0.74	1.75	0.00
Span (in)	= 15.00	0.74	1.75	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 190.34	191.00	192.45	0.00
Length (ft)	= 39.60	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 194.35	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



Hydrograph Summary Report

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Maximum storage (cuft)	Hydrograph description
1	SCS Runoff	1.29	3	483	21,722	----	------	------	Existing Condition
2	SCS Runoff	2.36	3	474	32,704	----	------	------	Developed Condition
3	Reservoir	1.86	3	486	32,660	2	194.57	8,374	Pond

Hydrograph Plot

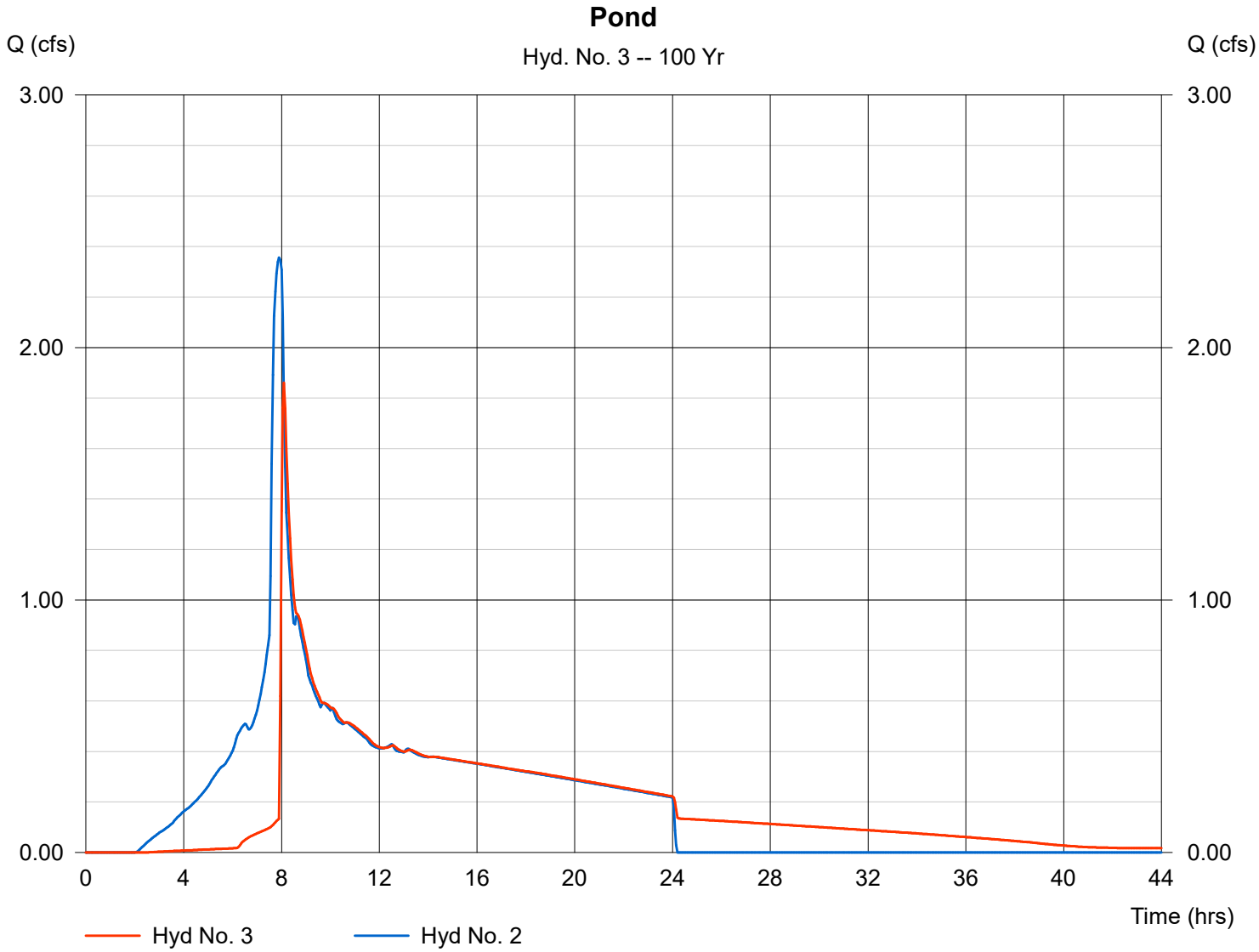
Hydraflow Hydrographs by Intelisolve | Thursday, Sep 12 2024, 12:30 PM

Hyd. No. 3

Pond

Hydrograph type	=	Reservoir	Peak discharge	=	1.86 cfs
Storm frequency	=	100 yrs	Time interval	=	3 min
Inflow hyd. No.	=	2	Max. Elevation	=	194.57 ft
Reservoir name	=	Pond	Max. Storage	=	8,374 cuft

Storage Indication method used. | Hydrograph Volume = 32,660 cuft



Pond Report

Pond No. 1 - Pond

Pond Data

Pond storage is based on known contour areas. Average end area method used.

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	191.00	1,338	0	0
1.00	192.00	1,995	1,667	1,667
1.50	192.50	2,364	1,090	2,756
2.00	193.00	2,530	1,224	3,980
3.00	194.00	2,867	2,699	6,678
3.50	194.50	3,045	1,478	8,156
4.00	195.00	3,232	1,569	9,726
4.50	195.50	3,427	1,665	11,390

Culvert / Orifice Structures

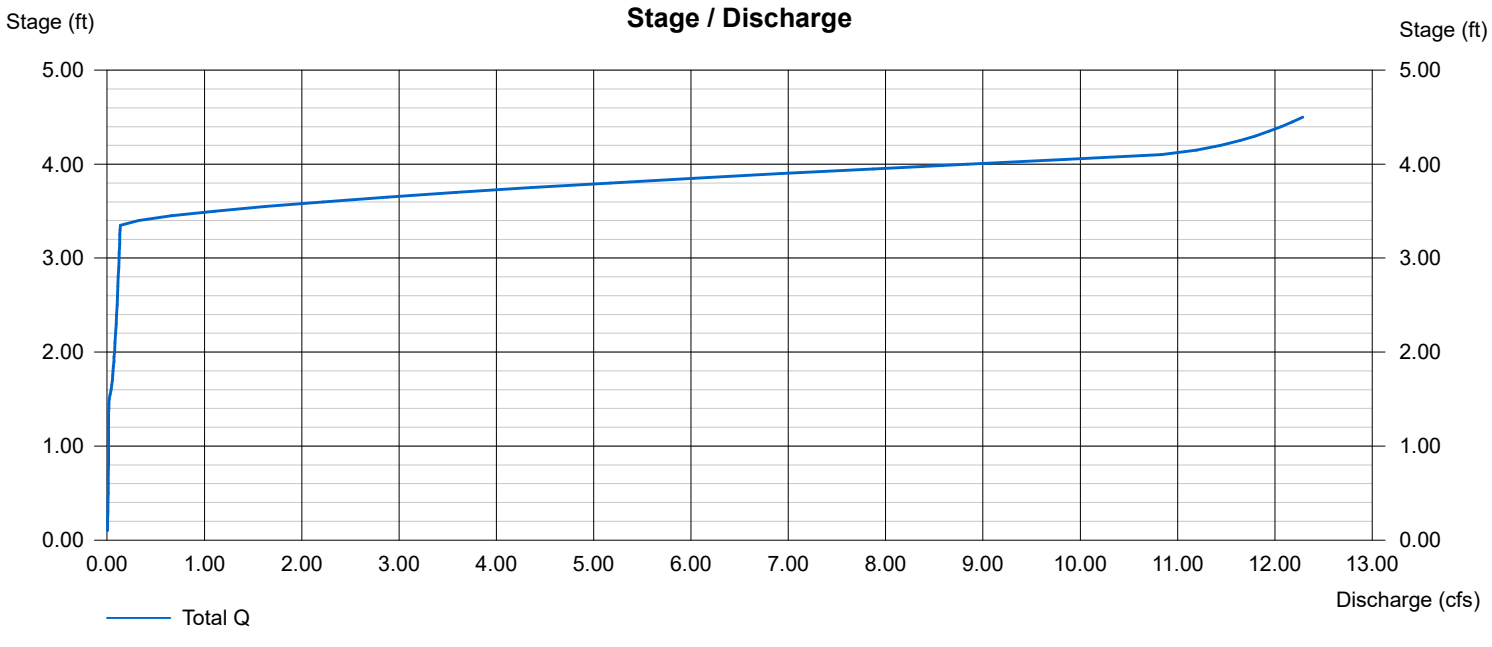
	[A]	[B]	[C]	[D]
Rise (in)	= 15.00	0.74	1.75	0.00
Span (in)	= 15.00	0.74	1.75	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 190.34	191.00	192.45	0.00
Length (ft)	= 39.60	0.00	0.00	0.00
Slope (%)	= 0.30	0.00	0.00	0.00
N-Value	= .013	.013	.013	.013
Orif. Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 194.35	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.00	0.00	0.00
Weir Type	= Riser	---	---	---
Multi-Stage	= Yes	No	No	No

Exfiltration = 0.000 in/hr (Contour) Tailwater Elev. = 0.00 ft

Note: Culvert/Orifice outflows have been analyzed under inlet and outlet control.



APPENDIX C –
EXISTING RUNOFF CALCULATIONS FOR TAX LOT 1800

Hydrograph Plot

Hyd. No. 1

Exist. TL 1800 (For Conveyance)

Hydrograph type	= SCS Runoff	Peak discharge	= 1.18 cfs
Storm frequency	= 25 yrs	Time interval	= 3 min
Drainage area	= 1.490 ac	Curve number	= 94
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 5.00 min
Total precip.	= 3.90 in	Distribution	= Type IA
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Volume = 16,360 cuft