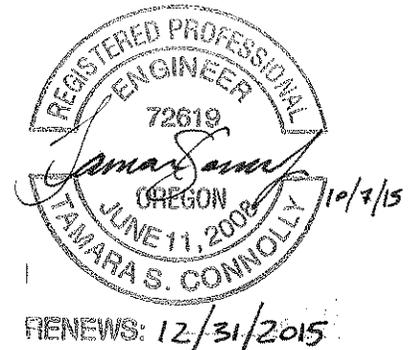


Technical Memorandum



808 SW 3rd Avenue
Suite 300
Portland, OR 97204
Phone (503) 287-6825
Fax (503) 415-2304

To: Mike Peebles, PE
From: Tammi Connolly, PE
Francesca White, EIT
Jeremy Tamargo, EIT
Copies: File
Date: June 11, 2015
Subject: South Cooper Mountain Heights
Preliminary Drainage Report
Project No.: 16985



Introduction

The South Cooper Mountain Heights subdivision project is a proposed residential development in the City of Beaverton, with stormwater jurisdiction through Clean Water Services (CWS). The development will consist of 1 multi-family lot, 101 attached single-family lots, and 274 detached single-family lots. The development also includes sidewalks, public roadways, private driveways, utilities and a stormwater management system. The stormwater management system will include a conveyance system, Low Impact Development Approach (LIDA) water quality facilities, and 10 regional stormwater management facilities.

The purpose of this memorandum is to outline compliances of the South Cooper Mountain Heights stormwater management system with the City of Beaverton (COB) Engineering Design Manual (COB, 2007) and the Clean Water Services Design and Construction Standards (CWS, 2007). Descriptions of the existing and proposed hydrologic conditions, as well as preliminary documentation showing the onsite stormwater management system's compliance with COB standards for water quality and quantity are included in this report.

Design Criteria

Design of the proposed stormwater system will meet the following design criteria:

- Design and Construction Standards for Sanitary Sewer and Surface Water Management (CWS, 2007)
- Engineering Design Manual (COB, 2007)
- Low Impact Development Approaches Handbook (CWS, 2009)

The City of Beaverton has adopted the CWS *Design and Construction Standards for Sanitary Sewer and Surface Water Management*. All City standards in the *Engineering Design Manual* meet or exceed the CWS stormwater requirements. Additionally, the City of Beaverton is in the process of updating their *Engineering Design Manual*, and any changes to the *Engineering Design Manual* will apply to the South Cooper Mountain Heights subdivision project. The City of Beaverton's anticipated design standards will meet or exceed the current COB standards, and therefore, were used in this stormwater analysis.

Project Phasing

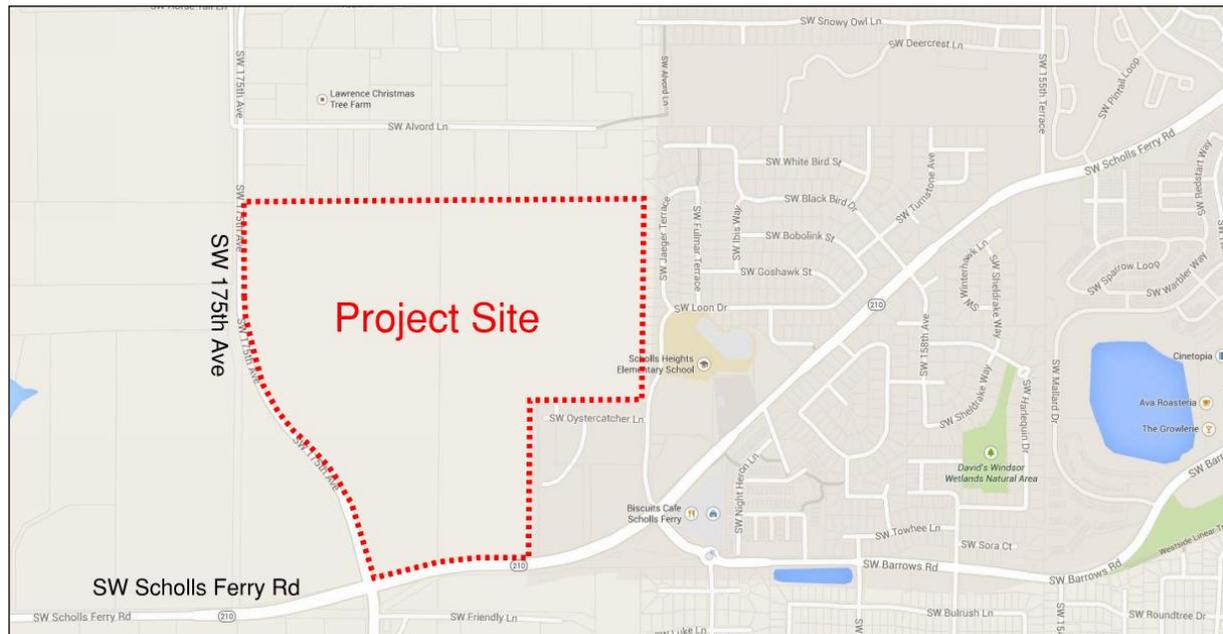
The South Cooper Mountain Heights subdivision project will be constructed in five phases, as shown in Figures 2A through 2D. Water quality and detention facilities for Phase 1 and the improvements along SW 175th Avenue were sized using the current COB standards, as this phase is anticipated to be developed prior to the release of the City's updated standards.

Phases 2 through 5 are anticipated to be developed after the City's adoption of updated stormwater standards, thus triggering the need to use different sizing methodology. Combined water quality and quantity facilities within Phases 2 through 5 were sized using current COB standards. The required volume of these facilities was then multiplied by of a factor of 2.5 to estimate pond sizes in anticipation of future, more stringent standards. This increased volume factor was based on Otak internal discussions regarding preliminary results from facility sizing using the Tualatin River Urban Stormwater Tool (TRUST) software to aid in the design of water quantity control facilities based on a continuous flow duration model. Preliminary results from use of the TRUST software on the River Terrace subdivision, which is located directly south of the South Cooper Mountain Heights subdivision, required detention ponds with approximately 2.5 times the volume of detention ponds sized using the current COB peak matching methodology. It is anticipated that the City of Beaverton will adopt a continuous flow duration model for sizing of stormwater facilities, therefore, the factor of 2.5 was used to estimate the volume needed for the ponds in Phases 2 through 5 of the development.

Site Description

Location

The proposed South Cooper Mountain Heights development is located in the City of Beaverton, Oregon. The development site is bordered to the south by SW Scholls Ferry Road and to the west by SW 175th Avenue (see Vicinity Map). The western portion of the site is currently being used for agriculture, while the eastern portion of the site is an undeveloped mixture of grass and wooded areas.



Vicinity Map

Topography

The South Cooper Mountain Heights project will be constructed on land with slopes ranging from 1.5 to 14 percent. An unnamed drainage ditch intersects the property in the northeast corner. There is also another unnamed drainage ditch that runs from north to south across the property with significant wetland area located in the southern portion of the project site, as shown Figure 1B. Existing elevations on the property vary between approximately 310 feet in the southeast corner to 460 feet on the northern property boundary.

Soils

Soils are categorized by the National Resource Conservation Service (NRCS) as hydrologic soil group types C and D, which consist of silt loams (See Appendix A). These soils generally exhibit moderate to low infiltration rates and relatively high runoff rates. Type C soils are located generally within the areas of proposed development, while Type D soils are shown to be located in stream and wetland corridors.

Drainage Basins

Existing Conditions

Stormwater runoff generally drains from the northwest to the southeast toward SW Scholls Ferry Road. See Figures 1A and 1B for onsite drainage basins under existing conditions. The 107.7 acre South Cooper Mountain Heights project is located within the Fanno Creek Subbasin, which is within the Tualatin River Basin.

Proposed Conditions

The proposed development will consist of 1 multi-family lot, 101 attached single-family lots, and 274 detached single-family lots. Per COB and CWS standards, a maximum impervious area of 2,640 square feet was assumed for each detached single-family residential lot within the project limits. For attached single-family residential lots and multi-family buildings, impervious rooftop areas were calculated using building footprints. The project will add approximately 50.84 acres of new impervious area, including rooftops, roadways, sidewalks and driveways.

Under proposed conditions, the site was divided into ten drainage basins, one of which includes public right of way. See Figures 2A through 2D for onsite drainage basins under proposed conditions. Stormwater runoff within each onsite basin (Basins M, N, O1, O2, O3, P1, P2, P3, P4, P5, and Q1) will have a dry detention facility to meet water quality and water quantity requirements. Runoff generated by a portion of SW 175th Avenue (Basin Q2) will be treated by LIDA facilities and detained in a detention basin located within the property limits of the South Cooper Mountain Heights subdivision. See Table 1 for a summary of the basin areas under existing and proposed conditions.

Table 1: Basin Areas							
Basin	Phase	Existing Conditions			Proposed Conditions		
		Impervious Area (ac)	Pervious Area (ac)	Total Area (ac)	Pervious Area (ac)	Impervious Area (ac)	Total Area (ac)
M	Phase 2	0.00	32.14	32.14	14.53	17.61	32.14
N	Phase 2	0.00	2.74	2.74	0.62	2.12	2.74
O1	Phase 3	0.00	1.73	1.73	0.52	1.20	1.73
O2	Phase 3	0.00	3.81	3.81	1.36	2.45	3.81
P1	Phase 1	0.00	5.82	5.82	2.04	3.78	5.82
P2	Phase 1	0.00	0.93	0.93	0.21	0.72	0.93
P3	Phase 1	0.00	8.64	8.64	2.25	6.38	8.64
P4	Phase 1	0.00	4.07	4.07	0.80	3.27	4.07
P5	Phase 4	0.00	5.29	5.29	1.12	4.17	5.29
Q1	Phase 5	0.00	10.23	10.23	4.50	5.73	10.23
Q2	Phase 1	0.00	3.40	3.40	0.00	3.40	3.40
Total		0.00	78.79	78.79	27.95	50.84	78.79

Hydrology

For this preliminary analysis, the proposed development was divided into pervious and impervious areas within each drainage basin, as shown above in Table 1. Peak runoff rates generated from each development phase were calculated using the Santa Barbara Urban Hydrograph (SBUH) method in

HydroCAD v10.0. Precipitation depths for this project site, listed in Table 2, were obtained from the COB *Engineering Design Manual*. These depths were determined to be more conservative than those listed in the CWS design standards, and were therefore used to calculate site rainfall and runoff rates based on the NRCS Type 1A rainfall distribution.

Table 2: City of Beaverton Precipitation Depths	
Recurrence Interval	Precipitation Depth (in)
2-Year	2.50
10-Year	3.50
25-Year	4.00
100-Year	4.50

Curve Number

Per COB standards, Curve Numbers (CN) for impervious and pervious areas during existing and proposed conditions were selected using Table 2-2a – Runoff Curve Numbers for Urban Areas from Technical Release 55: Urban Hydrology for Small Watersheds (TR-55) (See Appendix A). Table 3 provides a summary of the runoff curve numbers under existing and proposed conditions.

Table 3: Runoff Curve Numbers			
Category	Cover Type	Hydrologic Soil Group	Curve Number
Impervious Area	Pavement, roofs, sidewalks	C	98
Pervious Area, Existing Conditions	Woods/grass combination - Good Condition	C	72
Pervious Area, Existing Conditions	Pasture, grassland or range - Good Condition	C	74
Pervious Area, Proposed Conditions	50-75% Grass cover - Fair Condition	C	79

Time of Concentration

The time of concentration (Tc) represents the maximum time needed for all areas of the basin to contribute to the outflow hydrograph. Time of concentration values for each contributing drainage basin during existing and proposed conditions were calculated using the method provided by the SCS Technical Release 55 (SCS, 1986). The time of concentration for existing conditions was calculated directly using the HydroCAD v10.0 software. A time of concentration of five minutes, the minimum allowable, was assumed for all proposed conditions as a conservative design approach.

Water Quality

COB standards require water quality treatment for runoff from contributing impervious areas generated by 0.36 inches of precipitation falling in a 4-hour period. For all onsite basins (M, N, O1, O2, O3, P1, P2, P3, P4, P5, and Q1), water quality treatment will be provided by the regional stormwater management facilities. The regional extended dry basins have been sized to provide water quality treatment in addition to meeting COB detention requirements. Each facility has an orifice sized to detain the water quality volume and release it over a 48-hour period. See Appendix B for water quality treatment sizing calculations for the onsite extended dry detention basins.

Basin Q2 consists of the contributing impervious area from SW 175th Avenue. Water quality treatment for runoff within Basin Q2 will be provided by LIDA swales in the planter strip. A simplified approach method was used to size the LIDA facilities in Basin Q2, with each LIDA facility required to have a minimum treatment area equal to six percent of the contributing impervious area, per COB standards. LIDA sizing will be included in the design of the 175th Street public improvements.

Water Quantity

The City of Beaverton *Engineering Design Manual* requires that detention be provided for all development on sites greater than or equal to one-half acre in size. The mitigated peak discharge rate released by each regional stormwater management facility must be less than or equal to the peak flow rate from the respective existing conditions 2-year, 10-year and 25-year recurrence interval storm events generated by the corresponding contributing basin, per COB standards. Detention requirements will be fulfilled onsite by ten regional extended dry detention basins. These facilities were sized using HydroCAD v10.0 software (See Appendix C). Because the site will be developed in multiple phases, the stormwater management facilities for Phases 2 through 5 were upsized to manage a storage volume 2.5 times greater than a facility designed using current COB standards in anticipation of future COB stormwater management standards.

Table 4 provides existing peak runoff rates and detained peak discharge rates under proposed conditions for each basin within the South Cooper Mountain Heights project site. Table 5 contains the sizing parameters for the ten proposed extended dry detention basins.

Table 4: Facility Flow Control Summary						
Catchment/Facility ID	Peak Flow Rate (cfs)					
	2-year		10-year		25-year	
	Existing	Proposed (Detained)	Existing	Proposed (Detained)	Existing	Proposed (Detained)
Basin M	1.37	1.36	4.90	4.03	7.12	5.96
Basin N	0.12	0.11	0.43	0.38	0.62	0.57
Basin O1 + O2	0.22	0.22	0.72	0.71	1.05	1.05
Basin P1	0.35	0.33	1.06	0.99	1.48	1.28
Basin P2	0.08	0.07	0.22	0.18	0.31	0.30
Basin P3	0.55	0.54	1.68	1.42	2.35	2.32
Basin P4	0.24	0.23	0.75	0.69	1.05	0.92
Basin P5	0.33	0.32	1.02	0.97	1.42	1.24
Basin Q1	0.56	0.53	1.67	1.46	2.35	2.33
Basin Q2	0.19	0.19	0.59	0.53	0.83	0.82

Table 5: Extended Dry Detention Basin Design Parameters							
Basin	Phase	COB Standards			Anticipated Future COB Standards		
		Top Surface Area (sf)	Treatment Volume (cf)	Total Depth (ft)	Top Surface Area (sf)	Treatment Volume (cf)	Total Depth (ft)
M	Phase 2	41,148	138,732	5	65,100	346,284	7
N	Phase 2	6,327	16,428	5	9,360	41,022	7
O1 + O2	Phase 3	9,936	28,164	5	15,075	70,538	7
P1	Phase 1	9,108	25,392	5	N/A	N/A	N/A
P2	Phase 1	2,583	5,292	5	N/A	N/A	N/A
P3	Phase 1	13,572	40,368	5	N/A	N/A	N/A
P4	Phase 1	8,127	22,188	5	N/A	N/A	N/A
P5	Phase 4	9,792	27,648	5	14,850	69,363	7
Q1	Phase 5	13,983	41,772	5	21,500	104,669	7
Q2	Phase 1	7,812	21,170	5	N/A	N/A	N/A

Conveyance

Preliminary pipe layouts are shown in the construction plan sets (to be provided in final Stormwater Management Plan document). Inlets, manholes and pipes were located based on COB design criteria and the proposed layout of parking lots, roadways, and buildings. During final design, the

stormwater conveyance network will be sized using the 25-year, 24-hour storm event with the condition that the hydraulic grade line remains at least 1 foot below the rim elevations at manholes and catch basins. Storm outfalls will be armored to protect channel banks.

Conclusions

The proposed South Cooper Mountain Heights development project will include a stormwater management system designed to follow the standards of the City of Beaverton. The development will create approximately 50.84 acres of new impervious area. Combined water quality and water quantity facilities designed for Phase 1 will meet COB standards. For Phases 2 through 5, the stormwater management facility volumes calculated using current COB standards and then were upsized in anticipation of future stormwater management standards. For the public right-of-way, LIDA facilities will be designed to provide water quality treatment for runoff generated by SW 175th Avenue. Water quantity requirements will be met by a detention basin located within the project limits of the South Cooper Mountain Heights site. The onsite conveyance system will be sized during the final design phase using standards set by the City of Beaverton.

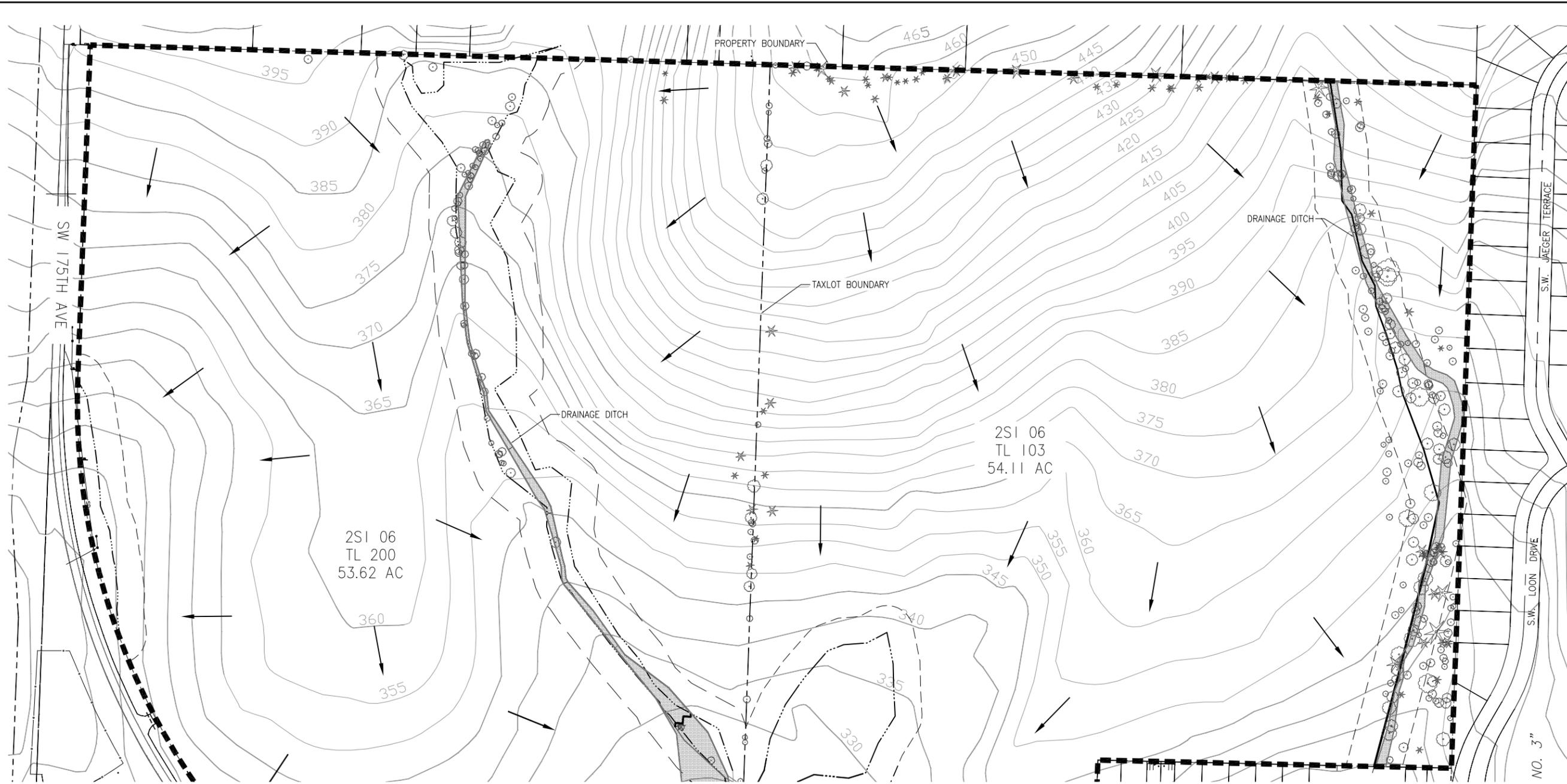
References

- COB, 2007. City of Beaverton Engineering Design Manual and Standard Drawings, City of Beaverton, January 2007.
- CWS, 2007. Design and Construction Standards for Sanitary Sewer and Surface Water Management, Clean Water Services, June 2007.
- CWS, 2009. Low Impact Development Approaches Handbook, Clean Water Services, July 2009.
- SCS, 1986. Technical Release 55: Urban Hydrology for Small Watersheds, United States Department of Agriculture Soil Conservation Service, June 1986.

Figures

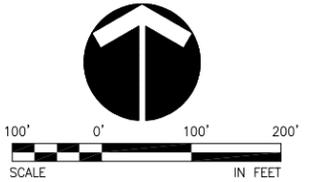
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- STORM DRAIN MANHOLE
- CONTOUR LINE
- WETLAND LIMIT
- CWS VEGETATED CORRIDOR
- 100 YEAR FLOOD PLAIN
- DRAINAGE ARROW
- TREE



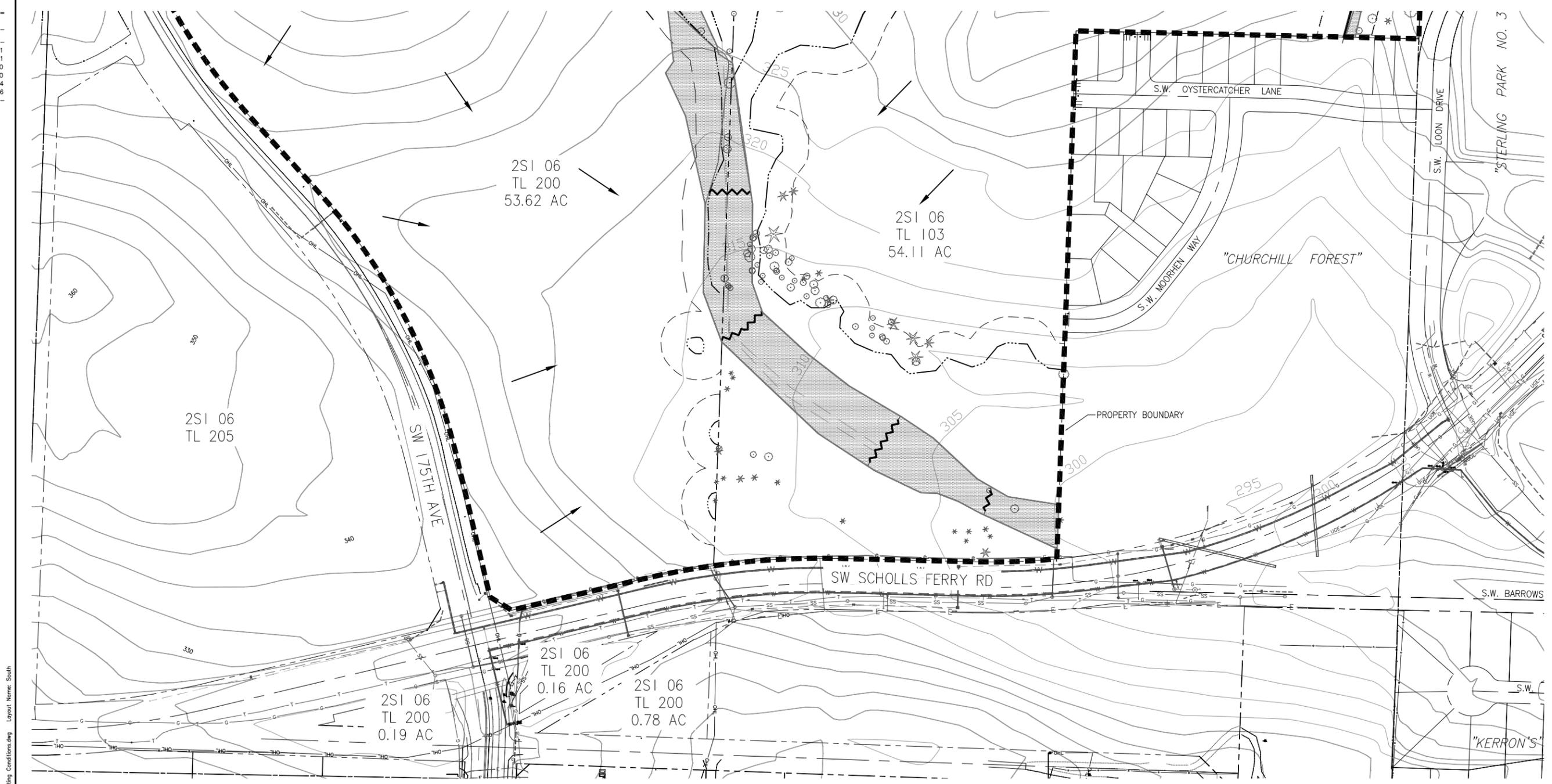
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 BEAVERTON, OR 97006

SOUTH COOPER MOUNTAIN HEIGHTS
 BEAVERTON, OREGON
 EXISTING CONDITIONS
 NORTH

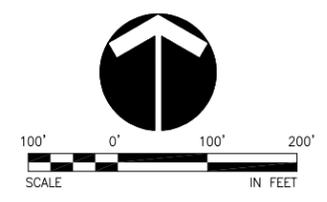
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 808 SW 3rd Ave., Ste. 300
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 S17531X360
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LEGEND

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- CONTOUR LINE
- WETLAND LIMIT
- CWS VEGETATED CORRIDOR
- 100 YEAR FLOOD PLAIN
- DRAINAGE ARROW
- TREE



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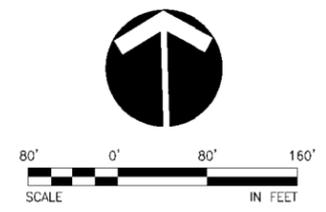
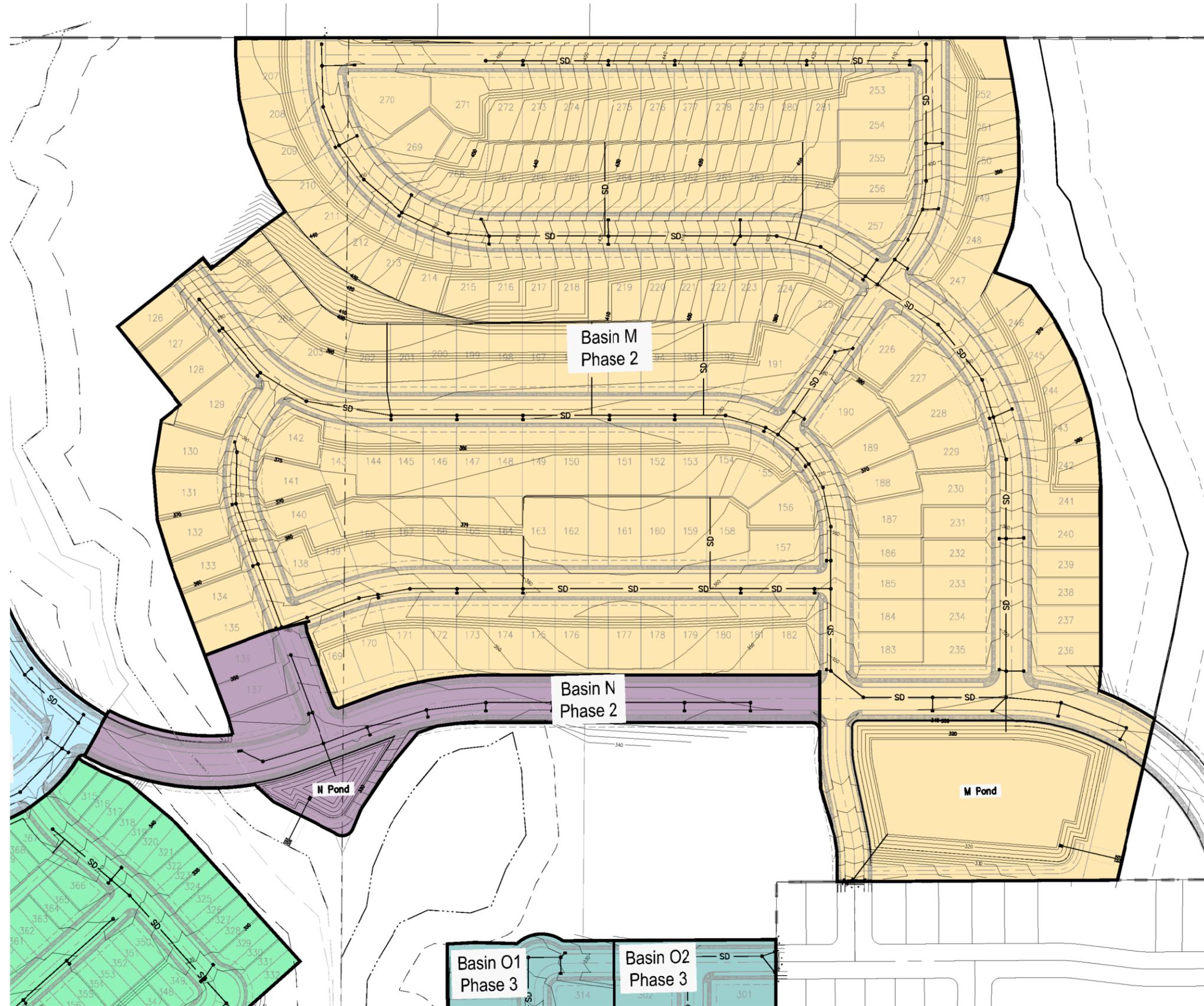
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 SOUTH

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STORM MANHOLE	●
PUBLIC UTILITY EASEMENT	- - - - -
DRAINAGE BASIN	— (thick line) —
WETLAND LIMIT	- · - · - · -
CWS VEGETATED CORRIDOR	- - - - -

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SOUTH COOPER MOUNTAIN HEIGHTS
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 PROPOSED CONDITIONS
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otak
 HanmiGlobal Partner
 806 SW 3rd Ave., Ste. 300
 Portland, OR 97204
 Phone: (503) 267-6825
 Fax: (503) 45-2304
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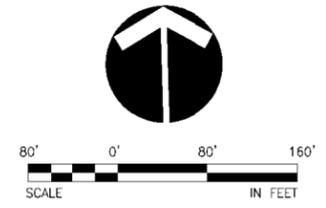
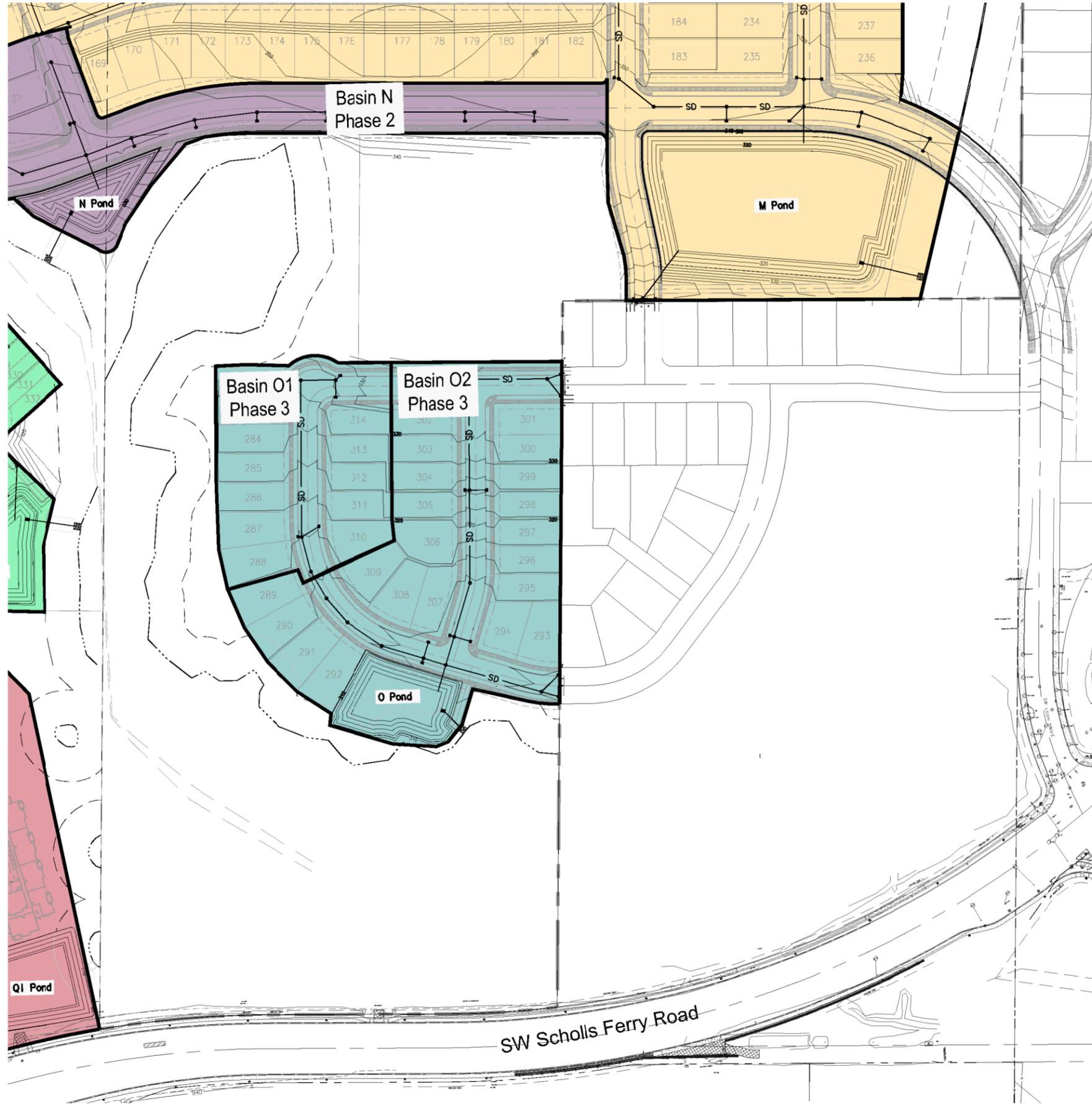
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Design Drawn Checked Date Initial Issue Date:



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LEGEND

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- STORM CURB INLET/CATCH BASIN
- STORM MANHOLE
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- DRAINAGE BASIN
- WETLAND LIMIT
- CWS VEGETATED CORRIDOR

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 jerryf

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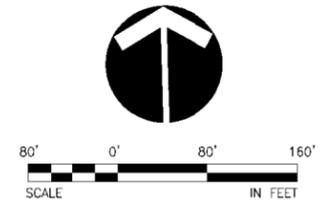
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LEGEND

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- STORM MANHOLE ●
- PUBLIC UTILITY EASEMENT - - - - -
- DRAINAGE BASIN [—————]
- WETLAND LIMIT [· · · · ·]
- CWS VEGETATED CORRIDOR [—————]

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Hanmi Global Partner
 806 SW 3rd Ave., Ste. 300
 Portland, OR 97204
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 Fax: (503) 45-2304
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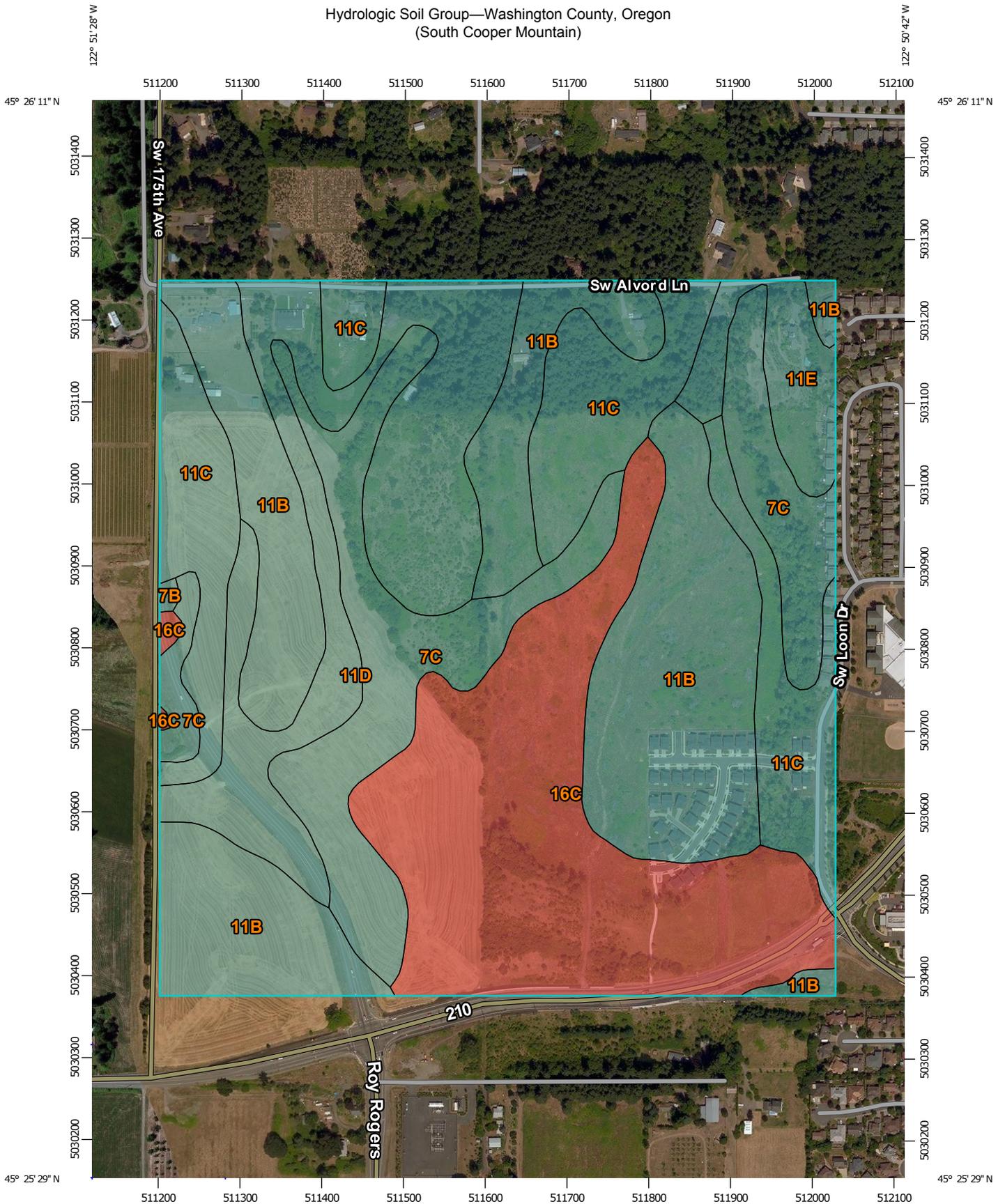


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Appendix A—Site Hydrologic Information

Hydrologic Soil Group—Washington County, Oregon
(South Cooper Mountain)



Map Scale: 1:6,400 if printed on A portrait (8.5" x 11") sheet.

0 50 100 200 300 Meters

0 300 600 1200 1800 Feet

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

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 12, Sep 19, 2014

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

Date(s) aerial images were photographed: Jul 8, 2010—Aug 23, 2014

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Washington County, Oregon (OR067)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
7B	Cascade silt loam, 3 to 7 percent slopes	C	0.2	0.1%
7C	Cascade silt loam, 7 to 12 percent slopes	C	27.4	15.3%
11B	Cornelius and Kinton silt loams, 2 to 7 percent slopes	C	50.3	28.1%
11C	Cornelius and Kinton silt loams, 7 to 12 percent slopes	C	27.8	15.5%
11D	Cornelius and Kinton silt loams, 12 to 20 percent slopes	C	26.9	15.0%
11E	Cornelius and Kinton silt loams, 20 to 30 percent slopes	C	6.1	3.4%
16C	Delena silt loam, 3 to 12 percent slopes	D	40.3	22.5%
Totals for Area of Interest			179.0	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Table 2-2c Runoff curve numbers for other agricultural lands ^{1/}

Cover type	Cover description	Hydrologic condition	Curve numbers for hydrologic soil group			
			A	B	C	D
Pasture, grassland, or range—continuous forage for grazing. ^{2/}		Poor	68	79	86	89
		Fair	49	69	79	84
		Good	39	61	74 ←	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.		—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element. ^{3/}		Poor	48	67	77	83
		Fair	35	56	70	77
		Good	30 ^{4/}	48	65	73
Woods—grass combination (orchard or tree farm). ^{5/}		Poor	57	73	82	86
		Fair	43	65	76	82
		Good	32	58	72 ←	79
Woods. ^{6/}		Poor	45	66	77	83
		Fair	36	60	73	79
		Good	30 ^{4/}	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.		—	59	74	82	86

¹ Average runoff condition, and $I_a = 0.2S$.

² **Poor:** <50% ground cover or heavily grazed with no mulch.

Fair: 50 to 75% ground cover and not heavily grazed.

Good: >75% ground cover and lightly or only occasionally grazed.

³ **Poor:** <50% ground cover.

Fair: 50 to 75% ground cover.

Good: >75% ground cover.

⁴ Actual curve number is less than 30; use CN = 30 for runoff computations.

⁵ CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

⁶ **Poor:** Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.

Fair: Woods are grazed but not burned, and some forest litter covers the soil.

Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

Table 2-2a Runoff curve numbers for urban areas ^{1/}

Cover description	Average percent impervious area ^{2/}	Curve numbers for hydrologic soil group			
		A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
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
<i>Developing urban areas</i>					
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.

Basin Areas - Proposed Conditions

16985 South Cooper Mountain

Basin Name	No. of Housing Units	Basin Area (sf)	Basin Area (ac)	Proposed Roadway and Sidewalks (sf)	Proposed Roof (sf)	Contributing Impervious Area (sf)	Contributing Impervious Area (ac)	Pervious area (sf)	Pervious area (ac)
M	154	1,399,815	32.14	360,473	406,560	767,033	17.61	632,782	14.53
N	2	119,395	2.74	86,908	5,280	92,188	2.12	27,207	0.62
O1	12	75,176	1.73	20,772	31,680	52,452	1.20	22,724	0.52
O2	21	165,752	3.81	51,212	55,440	106,652	2.45	59,100	1.36
P1	34	253,559	5.82	75,062	89,760	164,822	3.78	88,737	2.04
P2	0	40,508	0.93	31,334	0	31,334	0.72	9,174	0.21
P3	69	376,200	8.64	109,799	168,238	278,037	6.38	98,163	2.25
P4	22	177,436	4.07	101,473	41,003	142,476	3.27	34,960	0.80
P5	60	230,420	5.29	72,830	108,775	181,605	4.17	48,815	1.12
Q1	10	445,777	10.23	126,446	123,364	249,810	5.73	195,967	4.50
Q2	0	148,057	3.40	148,057	0	148,057	3.40	0	0.00
Total to Onsite Storm	384	3,432,095	78.79	1,184,366	1,030,100	2,214,466	50.84	1,217,629	27.95

Appendix B—Water Quality Calculations

Water Quality Calculations

16985 South Cooper Mountain Basin N

Impervious Area: 2.12 ac Proposed Impervious
 IA 92,188 ft²

COB/CWS Standards

Water Quality Volume and Flow: (CWS, 4.05.06)
 WQV = 0.36 in x IA / 12 in/ft (4 hours)
 WQF = WQV/14400 (CWS, 4.05.06)

WQV 2,766 ft³ Water Quality Volume
 WQF 0.19 ft³/s Water Quality Flow

Current Pond:	27 ft	Bottom Area	2,187
Bottom Width	81 ft	Total Depth	5 ft
Bottom Length	3 : 1	Top Area	6,327 sf
Side Slopes		Total Volume	20,390 cf

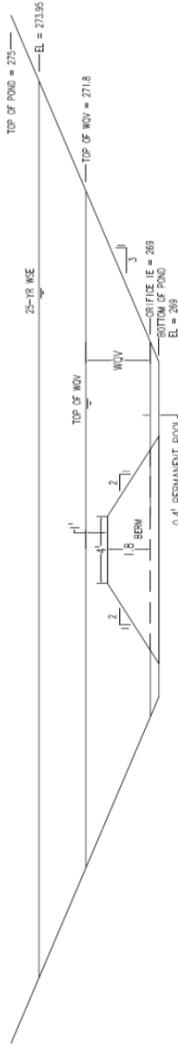
Elevation (ft)	Depth (ft)	Area (sf)	Area (ac)	Volume (cf)	WQ Orifice Invert IE
98.67	0.0	5.1984	0.0001	0	WQ Orifice Invert IE
99.99	1.32	5.1984	0.0001	0	
100	1.33	2,187	0.0502	0	Bottom of Pond
100.01	1.34	2,193	0.0504	22	
101.1	2.43	2,943	0.0676	2,821	WQV
102	3.33	3,627	0.0833	5,778	
103	4.33	4,455	0.1023	9,819	
104	5.33	5,355	0.1229	14,724	
105	6.33	6,327	0.1452	20,565	

WQ Orifice Sizing:

$$D = 24 * [(Q/C)/(2gH)]^{0.5} / 3.14^{0.5}$$

Q	0.02	ft ³ /s	Water Quality Orifice Flow
C	0.62		Constant
g	32.2	ft/s ²	Gravitational acceleration
WQ OR depth	2.43	ft	From pond table above
H	1.62	ft	Head

D 0.66 in Water Quality Orifice Diameter



Existing Conditions Peak Flowrates (cfs)

2-year	0.12
10-year	0.43
25-year	0.62
100-year	0.83

Proposed Conditions Peak Flowrates (cfs)

2-year	0.11
10-year	0.38
25-year	0.57
100-year	0.91

Water Quality Calculations

16985 South Cooper Mountain Basin P1

Impervious Area: 3.78 ac Proposed Impervious
 IA 164,822 ft²

COB/CWS Standards

Water Quality Volume and Flow: (CWS, 4.05.06)
 WQV = 0.36 in x IA / 12 in/ft (4 hours)
 WQF = WQV/14400 (CWS, 4.05.06)

WQV 4,945 ft³ Water Quality Volume
 WQF 0.34 ft³/s Water Quality Flow

Current Pond:			
Bottom Width	36 ft	Bottom Area	3,888
Bottom Length	108 ft	Total Depth	5 ft
Side Slopes	3 : 1	Top Area	9,108 sf
		Total Volume	31,578 cf

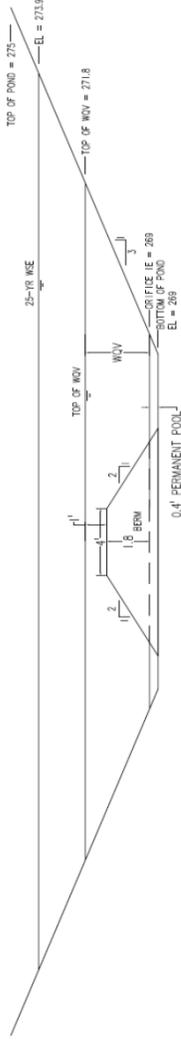
Elevation (ft)	Depth (ft)	Area (sf)	Area (ac)	Volume (cf)	WQ Orifice Invert IE
98.67	0.0	5.1984	0.0001	0	WQ Orifice Invert IE
99.99	1.32	5.1984	0.0001	0	
100	1.33	3,888	0.0893	0	Bottom of Pond
100.01	1.34	3,897	0.0895	39	
101.15	2.48	4,929	0.1132	5,079	WQV
102	3.33	5,760	0.1322	9,613	
103	4.33	6,804	0.1562	15,895	
104	5.33	7,920	0.1818	23,257	
105	6.33	9,108	0.2091	31,771	

WQ Orifice Sizing:

$$D = 24 * [(Q/C)/(2gH)]^{0.5} / 3.14^{0.5}$$

Q	0.03	ft ³ /s	Water Quality Orifice Flow
C	0.62		Constant
g	32.2	ft/s ²	Gravitational acceleration
WQ OR depth	2.48	ft	From pond table above
H	1.65	ft	Head

D 0.93 in Water Quality Orifice Diameter



2-year	0.35
10-year	1.06
25-year	1.48
100-year	1.94

2-year	0.33
10-year	0.99
25-year	1.28
100-year	2.15

Water Quality Calculations

16985 South Cooper Mountain Basin P2

Impervious Area: 0.72 ac Proposed Impervious
 IA 31,334 ft²

COB/CWS Standards

Water Quality Volume and Flow: (CWS, 4.05.06)
 WQV = 0.36 in x IA / 12 in/ft (4 hours)
 WQF = WQV/14400 (CWS, 4.05.06)

WQV 940 ft³ Water Quality Volume
 WQF 0.07 ft³/s Water Quality Flow

Current Pond:	11 ft	Bottom Area	363
Bottom Width	33 ft	Total Depth	5 ft
Side Slopes	3 : 1	Top Area	2,583 sf
		Total Volume	6,524 cf

Elevation (ft)	Depth (ft)	Area (sf)	Area (ac)	Volume (cf)	WQ Orifice Invert IE
98.67	0.0	5.1984	0.0001	0	WQ Orifice Invert IE
99.99	1.32	5.1984	0.0001	0	Bottom of Pond
100	1.33	363	0.0083	0	
100.01	1.34	366	0.0084	4	
101.6	2.93	878	0.0201	992	WQV
102	3.33	1,035	0.0238	1,375	
103	4.33	1,479	0.0340	2,632	
104	5.33	1,995	0.0458	4,369	
105	6.33	2,583	0.0593	6,658	

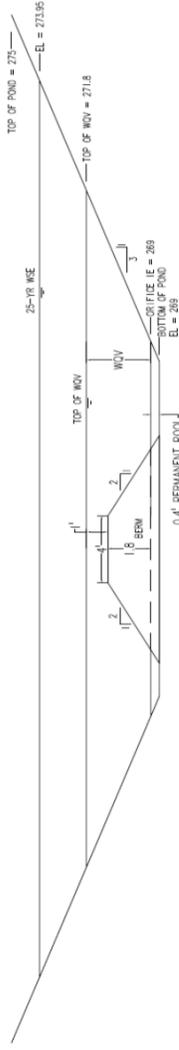
WQ Orifice Sizing:

$$D = 24 * [(Q/C)/(2gH)]^{0.5} / 3.14^{0.5}$$

Q	0.01	ft ³ /s	Water Quality Orifice Flow
C	0.62		Constant
g	32.2	ft/s ²	Gravitational acceleration
WQ OR depth	2.93	ft	From pond table above
H	1.95	ft	Head

D 0.38 in Water Quality Orifice Diameter

*Minimum Orifice Diameter = 0.5 in



Existing Conditions Peak Flowrates (cfs)

2-year	0.08
10-year	0.22
25-year	0.31
100-year	0.40

Proposed Conditions Peak Flowrates (cfs)

2-year	0.07
10-year	0.18
25-year	0.30
100-year	0.54

Water Quality Calculations

16985 South Cooper Mountain Basin P3

Impervious Area: 6.38 ac Proposed Impervious
 IA 278,037 ft²

COB/CWS Standards

Water Quality Volume and Flow: (CWS, 4.05.06)
 WQV = WQV/14400 (CWS, 4.05.06) (4 hours)

WQV 8,341 ft³ Water Quality Volume
 WQF 0.58 ft³/s Water Quality Flow

Current Pond:	48 ft	Bottom Area	6,912
Bottom Width	144 ft	Total Depth	5 ft
Side Slopes	3 : 1	Top Area	13,572 sf
		Total Volume	50,283 cf

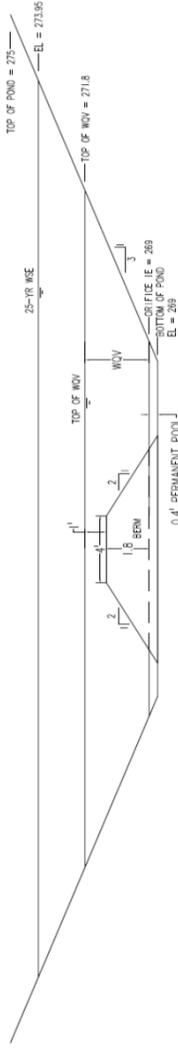
Elevation (ft)	Depth (ft)	Area (sf)	Area (ac)	Volume (cf)	WQ Orifice Invert IE
98.67	0.0	5.1984	0.0001	0	WQ Orifice Invert IE
99.99	1.32	5.1984	0.0001	0	
100	1.33	6,912	0.1587	0	Bottom of Pond
100.01	1.34	6,924	0.1589	69	
101.15	2.48	8,284	0.1902	8,738	WQV
102	3.33	9,360	0.2149	16,237	
103	4.33	10,692	0.2455	26,263	
104	5.33	12,096	0.2777	37,657	
105	6.33	13,572	0.3116	50,491	

WQ Orifice Sizing:

$$D = 24 * [(Q/C)/(2gH)]^{0.5} / 3.14^{0.5}$$

Q	0.05	ft ³ /s	Water Quality Orifice Flow
C	0.62		Constant
g	32.2	ft/s ²	Gravitational acceleration
WQ OR depth	2.48	ft	From pond table above
H	1.65	ft	Head

D 1.18 in Water Quality Orifice Diameter



Existing Conditions Peak Flowrates (cfs)

2-year	0.55
10-year	1.68
25-year	2.35
100-year	3.07

Proposed Conditions Peak Flowrates (cfs)

2-year	0.54
10-year	1.42
25-year	2.32
100-year	3.55

Water Quality Calculations

16985 South Cooper Mountain Basin P4

Impervious Area: 3.27 ac Proposed Impervious
 IA 142,476 ft²

COB/CWS Standards

Water Quality Volume and Flow: (CWS, 4.05.06)
 WQV = 0.36 in x IA / 12 in/ft (4 hours)
 WQF = WQV/14400 (CWS, 4.05.06)

WQV 4,274 ft³ Water Quality Volume
 WQF 0.30 ft³/s Water Quality Flow

Current Pond:	
Bottom Width	33 ft
Bottom Length	99 ft
Side Slopes	3 : 1
	Bottom Area
	Total Depth
	Top Area
	Total Volume
	5 ft
	8,127 sf
	27,578 cf

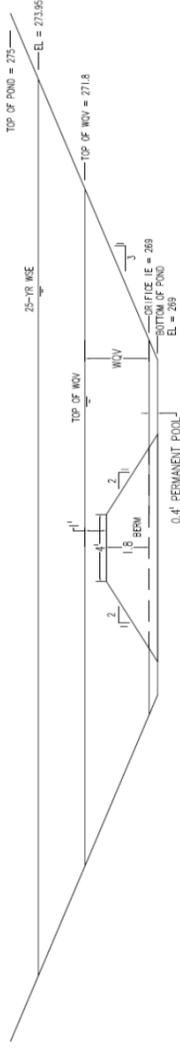
Elevation (ft)	Depth (ft)	Area (sf)	Area (ac)	Volume (cf)	WQ Orifice Invert IE
98.67	0.0	5.1984	0.0001	0	WQ Orifice Invert IE
99.99	1.32	5.1984	0.0001	0	
100	1.33	3,267	0.0750	0	Bottom of Pond
100.01	1.34	3,275	0.0752	33	
101.15	2.48	4,225	0.0970	4,308	WQV
102	3.33	4,995	0.1147	8,227	
103	4.33	5,967	0.1370	13,708	
104	5.33	7,011	0.1610	20,197	
105	6.33	8,127	0.1866	27,766	

WQ Orifice Sizing:

$$D = 24 * [(Q/C)/(2gH)]^{0.5} / 3.14^{0.5}$$

Q	0.02 ft ³ /s	Water Quality Orifice Flow
C	0.62	Constant
g	32.2 ft/s ²	Gravitational acceleration
WQ OR depth	2.48 ft	From pond table above
H	1.65 ft	Head

D 0.84 in Water Quality Orifice Diameter



Existing Conditions Peak Flowrates (cfs)

2-year	0.24
10-year	0.75
25-year	1.05
100-year	1.37

Proposed Conditions Peak Flowrates (cfs)

2-year	0.23
10-year	0.69
25-year	0.92
100-year	1.35

Water Quality Calculations

16985 South Cooper Mountain Basin P5

Impervious Area: 5.29 ac Proposed Impervious
 IA 230,420 ft²

COB/CWS Standards

Water Quality Volume and Flow: (CWS, 4.05.06)
 WQV = 0.36 in x IA / 12 in/ft (4 hours)
 WQF = WQV/14400 (CWS, 4.05.06)

WQV 6,913 ft³ Water Quality Volume
 WQF 0.48 ft³/s Water Quality Flow

Current Pond:	Bottom Area	4,332
Bottom Width	Total Depth	5 ft
Bottom Length	Top Area	9,792 sf
Side Slopes	Total Volume	34,395 cf

Elevation (ft)	Depth (ft)	Area (sf)	Area (ac)	Volume (cf)	WQ Orifice Invert IE
98.67	0.0	5.1984	0.0001	0	WQ Orifice Invert IE
99.99	1.32	5.1984	0.0001	0	
100	1.33	4,332	0.0994	0	Bottom of Pond
100.01	1.34	4,341	0.0997	43	
101.3	2.63	5,378	0.1281	6,441	WQV
102	3.33	6,300	0.1446	10,599	
103	4.33	7,392	0.1697	17,445	
104	5.33	8,556	0.1964	25,419	
105	6.33	9,792	0.2248	34,593	

WQ Orifice Sizing:

$$D = 24 * [(Q/C)/(2gH)]^{0.5} / 3.14^{0.5}$$

Q	0.04 ft ³ /s	Water Quality Orifice Flow
C	0.62	Constant
g	32.2 ft/s ²	Gravitational acceleration
WQ OR depth	2.63 ft	From pond table above
H	1.75 ft	Head

D 1.06 in Water Quality Orifice Diameter



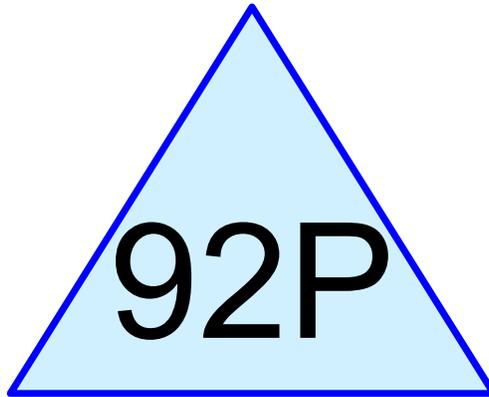
Existing Conditions Peak Flowrates (cfs)

2-year	0.33
10-year	1.02
25-year	1.42
100-year	1.86

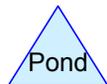
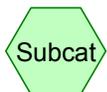
Proposed Conditions Peak Flowrates (cfs)

2-year	0.32
10-year	0.97
25-year	1.24
100-year	1.76

Appendix C—HydroCAD Output



P - M Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

Prepared by Otak, Inc.

Printed 5/28/2015

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Summary for Pond 92P: P - M Pond

Inflow Area = 32.140 ac, 54.79% Impervious, Inflow Depth = 1.62" for 2-year Storm event
 Inflow = 12.36 cfs @ 7.94 hrs, Volume= 4.346 af
 Outflow = 1.36 cfs @ 23.44 hrs, Volume= 4.059 af, Atten= 89%, Lag= 930.1 min
 Primary = 1.36 cfs @ 23.44 hrs, Volume= 4.059 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.48' @ 23.44 hrs Surf.Area= 0.852 ac Storage= 2.612 af

Plug-Flow detention time= 1,127.3 min calculated for 4.059 af (93% of inflow)
 Center-of-Mass det. time= 1,081.0 min (1,798.3 - 717.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	3.981 af	97.00'W x 294.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Vert. WQ Orifice/Grate C= 0.600
#3	Device 1	100.80'	5.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.36 cfs @ 23.44 hrs HW=103.48' (Free Discharge)

1=Culvert (Passes 1.36 cfs of 21.00 cfs potential flow)
 2=WQ Orifice/Grate (Orifice Controls 0.20 cfs @ 8.98 fps)
 3=2-yr Orifice/Grate (Orifice Controls 1.16 cfs @ 7.88 fps)
 4=10/25-yr BCR Weir (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

Prepared by Otak, Inc.

Printed 5/28/2015

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Summary for Pond 92P: P - M Pond

Inflow Area = 32.140 ac, 54.79% Impervious, Inflow Depth = 2.50" for 10-year Storm event
 Inflow = 19.39 cfs @ 7.93 hrs, Volume= 6.690 af
 Outflow = 4.03 cfs @ 11.22 hrs, Volume= 6.397 af, Atten= 79%, Lag= 197.5 min
 Primary = 4.03 cfs @ 11.22 hrs, Volume= 6.397 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.79' @ 11.22 hrs Surf.Area= 0.870 ac Storage= 2.879 af

Plug-Flow detention time= 821.7 min calculated for 6.397 af (96% of inflow)
 Center-of-Mass det. time= 790.4 min (1,498.3 - 707.9)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	3.981 af	97.00'W x 294.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Vert. WQ Orifice/Grate C= 0.600
#3	Device 1	100.80'	5.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=4.03 cfs @ 11.22 hrs HW=103.79' (Free Discharge)

1=Culvert (Passes 4.03 cfs of 22.27 cfs potential flow)
 2=WQ Orifice/Grate (Orifice Controls 0.20 cfs @ 9.37 fps)
 3=2-yr Orifice/Grate (Orifice Controls 1.23 cfs @ 8.32 fps)
 4=10/25-yr BCR Weir (Weir Controls 2.60 cfs @ 1.52 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 92P: P - M Pond

Inflow Area = 32.140 ac, 54.79% Impervious, Inflow Depth = 2.95" for 25-year Storm event
 Inflow = 23.05 cfs @ 7.93 hrs, Volume= 7.903 af
 Outflow = 5.96 cfs @ 9.71 hrs, Volume= 7.609 af, Atten= 74%, Lag= 106.9 min
 Primary = 5.96 cfs @ 9.71 hrs, Volume= 7.609 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.90' @ 9.71 hrs Surf.Area= 0.878 ac Storage= 2.983 af

Plug-Flow detention time= 707.5 min calculated for 7.605 af (96% of inflow)
 Center-of-Mass det. time= 682.6 min (1,386.6 - 704.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	3.981 af	97.00'W x 294.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Vert. WQ Orifice/Grate C= 0.600
#3	Device 1	100.80'	5.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=5.96 cfs @ 9.71 hrs HW=103.90' (Free Discharge)

1=Culvert (Passes 5.96 cfs of 22.74 cfs potential flow)
 2=WQ Orifice/Grate (Orifice Controls 0.21 cfs @ 9.51 fps)
 3=2-yr Orifice/Grate (Orifice Controls 1.25 cfs @ 8.48 fps)
 4=10/25-yr BCR Weir (Weir Controls 4.50 cfs @ 1.86 fps)

Summary for Pond 92P: P - M Pond

Inflow Area = 32.140 ac, 54.79% Impervious, Inflow Depth = 3.41" for 100-year Storm event
 Inflow = 26.78 cfs @ 7.92 hrs, Volume= 9.135 af
 Outflow = 9.11 cfs @ 8.96 hrs, Volume= 8.841 af, Atten= 66%, Lag= 61.9 min
 Primary = 9.11 cfs @ 8.96 hrs, Volume= 8.841 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.06' @ 8.96 hrs Surf.Area= 0.887 ac Storage= 3.119 af

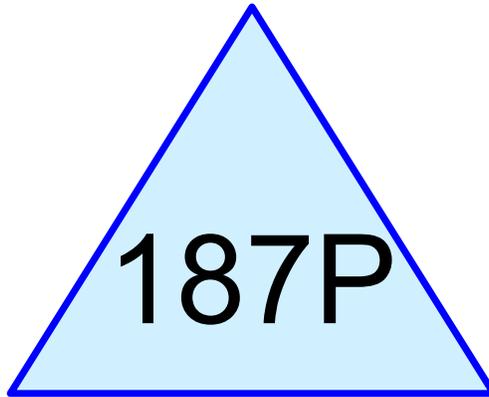
Plug-Flow detention time= 621.7 min calculated for 8.836 af (97% of inflow)
 Center-of-Mass det. time= 600.2 min (1,300.8 - 700.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	3.981 af	97.00'W x 294.00'L x 5.00'H Prismatic Z=3.0

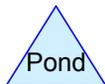
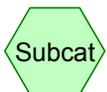
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Vert. WQ Orifice/Grate C= 0.600
#3	Device 1	100.80'	5.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=9.11 cfs @ 8.96 hrs HW=104.06' (Free Discharge)

- 1=Culvert (Passes 9.11 cfs of 23.34 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.21 cfs @ 9.70 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 1.28 cfs @ 8.69 fps)
- 4=10/25-yr BCR Weir (Weir Controls 7.62 cfs @ 2.28 fps)



P - Q2 Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

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Summary for Pond 187P: P - Q2 Pond

Inflow Area = 3.400 ac, 100.00% Impervious, Inflow Depth = 2.27" for 2-year Storm event
 Inflow = 1.96 cfs @ 7.90 hrs, Volume= 0.643 af
 Outflow = 0.19 cfs @ 21.45 hrs, Volume= 0.643 af, Atten= 90%, Lag= 813.0 min
 Primary = 0.19 cfs @ 21.45 hrs, Volume= 0.643 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.43' @ 21.45 hrs Surf.Area= 0.141 ac Storage= 0.356 af

Plug-Flow detention time= 973.1 min calculated for 0.643 af (100% of inflow)
 Center-of-Mass det. time= 972.5 min (1,646.3 - 673.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.607 af	32.00'W x 96.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	103.75'	2.5' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.19 cfs @ 21.45 hrs HW=103.43' (Free Discharge)

- 1=Culvert (Passes 0.19 cfs of 20.79 cfs potential flow)
- 2=2-yr Orifice/Grate (Orifice Controls 0.19 cfs @ 8.91 fps)
- 3=10/25-yr BCR Weir (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 187P: P - Q2 Pond

Inflow Area = 3.400 ac, 100.00% Impervious, Inflow Depth = 3.27" for 10-year Storm event
 Inflow = 2.79 cfs @ 7.90 hrs, Volume= 0.926 af
 Outflow = 0.53 cfs @ 11.05 hrs, Volume= 0.925 af, Atten= 81%, Lag= 189.2 min
 Primary = 0.53 cfs @ 11.05 hrs, Volume= 0.925 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.88' @ 11.05 hrs Surf.Area= 0.151 ac Storage= 0.422 af

Plug-Flow detention time= 860.9 min calculated for 0.925 af (100% of inflow)
 Center-of-Mass det. time= 860.5 min (1,524.5 - 664.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.607 af	32.00'W x 96.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	103.75'	2.5' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.53 cfs @ 11.05 hrs HW=103.88' (Free Discharge)

1=Culvert (Passes 0.53 cfs of 22.65 cfs potential flow)
 2=2-yr Orifice/Grate (Orifice Controls 0.21 cfs @ 9.48 fps)
 3=10/25-yr BCR Weir (Weir Controls 0.32 cfs @ 1.00 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 187P: P - Q2 Pond

Inflow Area = 3.400 ac, 100.00% Impervious, Inflow Depth = 3.77" for 25-year Storm event
 Inflow = 3.20 cfs @ 7.90 hrs, Volume= 1.067 af
 Outflow = 0.82 cfs @ 9.33 hrs, Volume= 1.066 af, Atten= 74%, Lag= 86.2 min
 Primary = 0.82 cfs @ 9.33 hrs, Volume= 1.066 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.95' @ 9.33 hrs Surf.Area= 0.153 ac Storage= 0.433 af

Plug-Flow detention time= 762.1 min calculated for 1.066 af (100% of inflow)
 Center-of-Mass det. time= 763.2 min (1,423.9 - 660.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.607 af	32.00'W x 96.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	103.75'	2.5' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.82 cfs @ 9.33 hrs HW=103.95' (Free Discharge)

1=Culvert (Passes 0.82 cfs of 22.91 cfs potential flow)
 2=2-yr Orifice/Grate (Orifice Controls 0.21 cfs @ 9.57 fps)
 3=10/25-yr BCR Weir (Weir Controls 0.61 cfs @ 1.24 fps)

16985 PrelimDetention

Type IA 24-hr 100-year Storm Rainfall=4.50"

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Summary for Pond 187P: P - Q2 Pond

Inflow Area = 3.400 ac, 100.00% Impervious, Inflow Depth = 4.26" for 100-year Storm event
 Inflow = 3.61 cfs @ 7.90 hrs, Volume= 1.208 af
 Outflow = 1.27 cfs @ 8.79 hrs, Volume= 1.208 af, Atten= 65%, Lag= 53.4 min
 Primary = 1.27 cfs @ 8.79 hrs, Volume= 1.208 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.03' @ 8.79 hrs Surf.Area= 0.155 ac Storage= 0.446 af

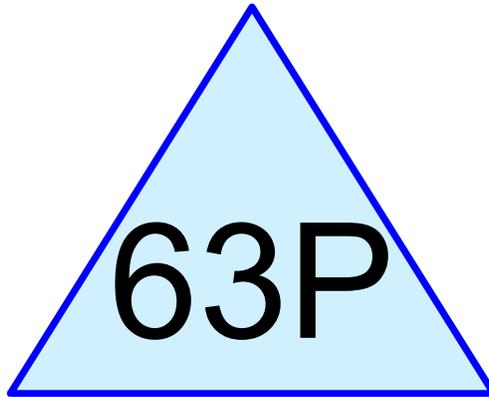
Plug-Flow detention time= 684.4 min calculated for 1.207 af (100% of inflow)
 Center-of-Mass det. time= 685.5 min (1,343.6 - 658.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.607 af	32.00'W x 96.00'L x 5.00'H Prismatic Z=3.0

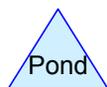
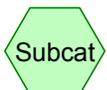
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100'/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	103.75'	2.5' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.27 cfs @ 8.79 hrs HW=104.03' (Free Discharge)

1=Culvert (Passes 1.27 cfs of 23.24 cfs potential flow)
 2=2-yr Orifice/Grate (Orifice Controls 0.21 cfs @ 9.67 fps)
 3=10/25-yr BCR Weir (Weir Controls 1.06 cfs @ 1.51 fps)



P - N Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

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Summary for Pond 63P: P - N Pond

Inflow Area = 2.740 ac, 77.37% Impervious, Inflow Depth = 1.95" for 2-year Storm event
 Inflow = 1.31 cfs @ 7.91 hrs, Volume= 0.444 af
 Outflow = 0.11 cfs @ 24.02 hrs, Volume= 0.409 af, Atten= 92%, Lag= 966.3 min
 Primary = 0.11 cfs @ 24.02 hrs, Volume= 0.409 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.72' @ 24.02 hrs Surf.Area= 0.117 ac Storage= 0.303 af

Plug-Flow detention time= 1,459.2 min calculated for 0.409 af (92% of inflow)
 Center-of-Mass det. time= 1,403.0 min (2,094.9 - 691.9)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.471 af	27.00'W x 81.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.7" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.10'	1.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.75'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.11 cfs @ 24.02 hrs HW=103.72' (Free Discharge)

↑ **1=Culvert** (Passes 0.11 cfs of 22.00 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.02 cfs @ 9.28 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.08 cfs @ 7.79 fps)
 ↑ **4=10/25-yr BCR Weir** (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 63P: P - N Pond

Inflow Area = 2.740 ac, 77.37% Impervious, Inflow Depth = 2.88" for 10-year Storm event
 Inflow = 1.95 cfs @ 7.91 hrs, Volume= 0.658 af
 Outflow = 0.38 cfs @ 11.17 hrs, Volume= 0.622 af, Atten= 80%, Lag= 195.5 min
 Primary = 0.38 cfs @ 11.17 hrs, Volume= 0.622 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.85' @ 11.17 hrs Surf.Area= 0.120 ac Storage= 0.319 af

Plug-Flow detention time= 1,073.1 min calculated for 0.622 af (95% of inflow)
 Center-of-Mass det. time= 1,035.0 min (1,718.1 - 683.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.471 af	27.00'W x 81.00'L x 5.00'H Prismaoid Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.7" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.10'	1.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.75'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.38 cfs @ 11.17 hrs HW=103.85' (Free Discharge)

↑ **1=Culvert** (Passes 0.38 cfs of 22.54 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.45 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.09 cfs @ 7.99 fps)
 ↑ **4=10/25-yr BCR Weir** (Weir Controls 0.27 cfs @ 0.89 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 63P: P - N Pond

Inflow Area = 2.740 ac, 77.37% Impervious, Inflow Depth = 3.36" for 25-year Storm event
 Inflow = 2.27 cfs @ 7.91 hrs, Volume= 0.767 af
 Outflow = 0.57 cfs @ 9.47 hrs, Volume= 0.731 af, Atten= 75%, Lag= 93.9 min
 Primary = 0.57 cfs @ 9.47 hrs, Volume= 0.731 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.89' @ 9.47 hrs Surf.Area= 0.121 ac Storage= 0.325 af

Plug-Flow detention time= 930.0 min calculated for 0.730 af (95% of inflow)
 Center-of-Mass det. time= 897.3 min (1,577.1 - 679.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.471 af	27.00'W x 81.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.7" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.10'	1.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.75'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.57 cfs @ 9.47 hrs HW=103.89' (Free Discharge)

↑ **1=Culvert** (Passes 0.57 cfs of 22.71 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.50 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.09 cfs @ 8.05 fps)
 ↑ **4=10/25-yr BCR Weir** (Weir Controls 0.46 cfs @ 1.06 fps)

Summary for Pond 63P: P - N Pond

Inflow Area = 2.740 ac, 77.37% Impervious, Inflow Depth = 3.84" for 100-year Storm event
 Inflow = 2.59 cfs @ 7.91 hrs, Volume= 0.876 af
 Outflow = 0.91 cfs @ 8.84 hrs, Volume= 0.840 af, Atten= 65%, Lag= 55.8 min
 Primary = 0.91 cfs @ 8.84 hrs, Volume= 0.840 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.96' @ 8.84 hrs Surf.Area= 0.122 ac Storage= 0.332 af

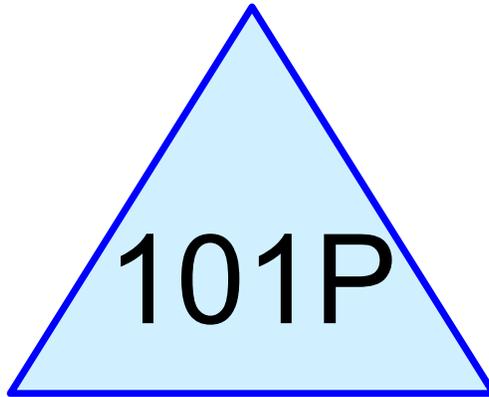
Plug-Flow detention time= 819.7 min calculated for 0.840 af (96% of inflow)
 Center-of-Mass det. time= 791.1 min (1,468.1 - 677.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.471 af	27.00'W x 81.00'L x 5.00'H Prismaoid Z=3.0

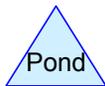
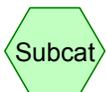
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.7" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.10'	1.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.75'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.91 cfs @ 8.84 hrs HW=103.96' (Free Discharge)

- 1=Culvert (Passes 0.91 cfs of 22.96 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.03 cfs @ 9.58 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.09 cfs @ 8.14 fps)
- 4=10/25-yr BCR Weir (Weir Controls 0.80 cfs @ 1.28 fps)



P - 01 Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

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Summary for Pond 101P: P - O1 Pond

Inflow Area = 5.530 ac, 66.00% Impervious, Inflow Depth = 1.78" for 2-year Storm event
 Inflow = 2.39 cfs @ 7.92 hrs, Volume= 0.822 af
 Outflow = 0.22 cfs @ 24.01 hrs, Volume= 0.763 af, Atten= 91%, Lag= 965.0 min
 Primary = 0.22 cfs @ 24.01 hrs, Volume= 0.763 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.73' @ 24.01 hrs Surf.Area= 0.193 ac Storage= 0.543 af

Plug-Flow detention time= 1,344.3 min calculated for 0.763 af (93% of inflow)
 Center-of-Mass det. time= 1,293.7 min (1,997.2 - 703.5)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.812 af	38.00'W x 117.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	100.95'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.73'	2.3' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.22 cfs @ 24.01 hrs HW=103.73' (Free Discharge)

↑ **1=Culvert** (Passes 0.22 cfs of 22.03 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.04 cfs @ 9.29 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.17 cfs @ 8.02 fps)
 ↑ **4=10/25-yr BCR Weir** (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 101P: P - O1 Pond

Inflow Area = 5.530 ac, 66.00% Impervious, Inflow Depth = 2.69" for 10-year Storm event
 Inflow = 3.63 cfs @ 7.92 hrs, Volume= 1.239 af
 Outflow = 0.71 cfs @ 11.37 hrs, Volume= 1.179 af, Atten= 80%, Lag= 206.8 min
 Primary = 0.71 cfs @ 11.37 hrs, Volume= 1.179 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.91' @ 11.37 hrs Surf.Area= 0.198 ac Storage= 0.579 af

Plug-Flow detention time= 979.7 min calculated for 1.179 af (95% of inflow)
 Center-of-Mass det. time= 944.7 min (1,639.4 - 694.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.812 af	38.00'W x 117.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	100.95'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.73'	2.3' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.71 cfs @ 11.37 hrs HW=103.91' (Free Discharge)

↑ **1=Culvert** (Passes 0.71 cfs of 22.76 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.04 cfs @ 9.52 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.18 cfs @ 8.28 fps)
 ↑ **4=10/25-yr BCR Weir** (Weir Controls 0.49 cfs @ 1.18 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 101P: P - O1 Pond

Inflow Area = 5.530 ac, 66.00% Impervious, Inflow Depth = 3.15" for 25-year Storm event
 Inflow = 4.27 cfs @ 7.92 hrs, Volume= 1.453 af
 Outflow = 1.05 cfs @ 9.84 hrs, Volume= 1.393 af, Atten= 75%, Lag= 115.4 min
 Primary = 1.05 cfs @ 9.84 hrs, Volume= 1.393 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.98' @ 9.84 hrs Surf.Area= 0.200 ac Storage= 0.593 af

Plug-Flow detention time= 845.8 min calculated for 1.392 af (96% of inflow)
 Center-of-Mass det. time= 817.4 min (1,508.7 - 691.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.812 af	38.00'W x 117.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	100.95'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.73'	2.3' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.05 cfs @ 9.84 hrs HW=103.98' (Free Discharge)

- 1=Culvert (Passes 1.05 cfs of 23.05 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.61 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.18 cfs @ 8.38 fps)
- 4=10/25-yr BCR Weir (Weir Controls 0.83 cfs @ 1.42 fps)

Summary for Pond 101P: P - O1 Pond

Inflow Area = 5.530 ac, 66.00% Impervious, Inflow Depth = 3.62" for 100-year Storm event
 Inflow = 4.92 cfs @ 7.92 hrs, Volume= 1.669 af
 Outflow = 1.62 cfs @ 8.97 hrs, Volume= 1.609 af, Atten= 67%, Lag= 63.5 min
 Primary = 1.62 cfs @ 8.97 hrs, Volume= 1.609 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.08' @ 8.97 hrs Surf.Area= 0.203 ac Storage= 0.613 af

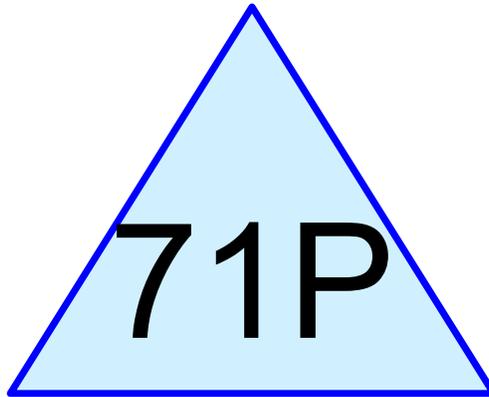
Plug-Flow detention time= 746.2 min calculated for 1.609 af (96% of inflow)
 Center-of-Mass det. time= 719.7 min (1,407.9 - 688.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.812 af	38.00'W x 117.00'L x 5.00'H Prismatic Z=3.0

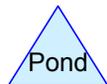
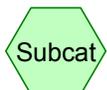
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	100.95'	2.0" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.73'	2.3' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.62 cfs @ 8.97 hrs HW=104.08' (Free Discharge)

- 1=Culvert (Passes 1.62 cfs of 23.44 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.73 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.19 cfs @ 8.52 fps)
- 4=10/25-yr BCR Weir (Weir Controls 1.39 cfs @ 1.72 fps)



P - P1 Pond



Summary for Pond 71P: P - P1 Pond

Inflow Area = 5.820 ac, 64.95% Impervious, Inflow Depth = 1.77" for 2-year Storm event
 Inflow = 2.49 cfs @ 7.93 hrs, Volume= 0.858 af
 Outflow = 0.33 cfs @ 19.47 hrs, Volume= 0.820 af, Atten= 87%, Lag= 692.8 min
 Primary = 0.33 cfs @ 19.47 hrs, Volume= 0.820 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.43' @ 19.47 hrs Surf.Area= 0.167 ac Storage= 0.433 af

Plug-Flow detention time= 913.9 min calculated for 0.820 af (96% of inflow)
 Center-of-Mass det. time= 884.3 min (1,589.0 - 704.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.729 af	36.00'W x 108.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.45'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.33 cfs @ 19.47 hrs HW=103.43' (Free Discharge)

- 1=Culvert (Passes 0.33 cfs of 20.79 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 8.91 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.29 cfs @ 7.26 fps)
- 4=10/25-yr Orifice/Grate (Controls 0.00 cfs)
- 5=BCR Weir (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 71P: P - P1 Pond

Inflow Area = 5.820 ac, 64.95% Impervious, Inflow Depth = 2.67" for 10-year Storm event
 Inflow = 3.79 cfs @ 7.92 hrs, Volume= 1.295 af
 Outflow = 0.99 cfs @ 9.45 hrs, Volume= 1.257 af, Atten= 74%, Lag= 91.9 min
 Primary = 0.99 cfs @ 9.45 hrs, Volume= 1.257 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.70' @ 9.45 hrs Surf.Area= 0.174 ac Storage= 0.480 af

Plug-Flow detention time= 665.1 min calculated for 1.256 af (97% of inflow)
 Center-of-Mass det. time= 645.2 min (1,341.1 - 695.9)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.729 af	36.00'W x 108.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.45'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.99 cfs @ 9.45 hrs HW=103.70' (Free Discharge)

↑ **1=Culvert** (Passes 0.99 cfs of 21.94 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.04 cfs @ 9.26 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.31 cfs @ 7.69 fps)
 ↑ **4=10/25-yr Orifice/Grate** (Orifice Controls 0.65 cfs @ 2.42 fps)
 ↑ **5=BCR Weir** (Controls 0.00 cfs)

Summary for Pond 71P: P - P1 Pond

Inflow Area = 5.820 ac, 64.95% Impervious, Inflow Depth = 3.13" for 25-year Storm event
 Inflow = 4.46 cfs @ 7.92 hrs, Volume= 1.520 af
 Outflow = 1.28 cfs @ 9.22 hrs, Volume= 1.481 af, Atten= 71%, Lag= 78.2 min
 Primary = 1.28 cfs @ 9.22 hrs, Volume= 1.481 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.96' @ 9.22 hrs Surf.Area= 0.181 ac Storage= 0.526 af

Plug-Flow detention time= 580.9 min calculated for 1.480 af (97% of inflow)
 Center-of-Mass det. time= 564.0 min (1,256.4 - 692.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.729 af	36.00'W x 108.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.45'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.28 cfs @ 9.22 hrs HW=103.96' (Free Discharge)

- 1=Culvert (Passes 1.28 cfs of 22.97 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.58 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.32 cfs @ 8.07 fps)
- 4=10/25-yr Orifice/Grate (Orifice Controls 0.92 cfs @ 3.44 fps)
- 5=BCR Weir (Controls 0.00 cfs)

Summary for Pond 71P: P - P1 Pond

Inflow Area = 5.820 ac, 64.95% Impervious, Inflow Depth = 3.60" for 100-year Storm event
 Inflow = 5.15 cfs @ 7.92 hrs, Volume= 1.747 af
 Outflow = 2.15 cfs @ 8.46 hrs, Volume= 1.708 af, Atten= 58%, Lag= 32.5 min
 Primary = 2.15 cfs @ 8.46 hrs, Volume= 1.708 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.12' @ 8.46 hrs Surf.Area= 0.185 ac Storage= 0.556 af

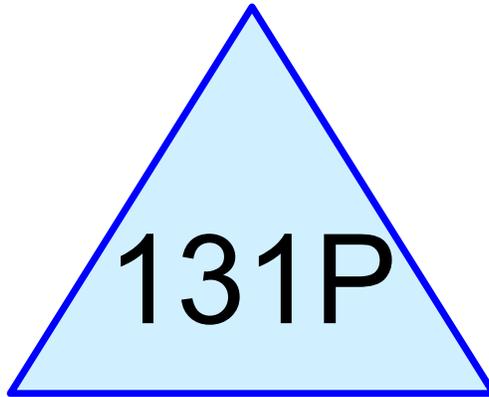
Plug-Flow detention time= 516.0 min calculated for 1.707 af (98% of inflow)
 Center-of-Mass det. time= 501.5 min (1,190.8 - 689.3)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.729 af	36.00'W x 108.00'L x 5.00'H Prismatic Z=3.0

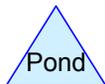
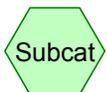
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.45'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.15 cfs @ 8.46 hrs HW=104.12' (Free Discharge)

- 1=Culvert (Passes 2.15 cfs of 23.58 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.78 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.33 cfs @ 8.30 fps)
- 4=10/25-yr Orifice/Grate (Orifice Controls 1.06 cfs @ 3.95 fps)
- 5=BCR Weir (Weir Controls 0.72 cfs @ 0.98 fps)



P - P2 Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

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Summary for Pond 131P: P - P2 Pond

Inflow Area = 0.930 ac, 77.42% Impervious, Inflow Depth = 1.95" for 2-year Storm event
 Inflow = 0.45 cfs @ 7.91 hrs, Volume= 0.151 af
 Outflow = 0.07 cfs @ 15.30 hrs, Volume= 0.151 af, Atten= 85%, Lag= 443.0 min
 Primary = 0.07 cfs @ 15.30 hrs, Volume= 0.151 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.19' @ 15.30 hrs Surf.Area= 0.036 ac Storage= 0.066 af

Plug-Flow detention time= 763.4 min calculated for 0.151 af (100% of inflow)
 Center-of-Mass det. time= 764.9 min (1,456.8 - 691.9)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.152 af	11.00'W x 33.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.5" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.60'	1.3" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	2.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.07 cfs @ 15.30 hrs HW=103.19' (Free Discharge)

↑ 1=Culvert (Passes 0.07 cfs of 19.74 cfs potential flow)
 ↑ 2=WQ Orifice/Grate (Orifice Controls 0.01 cfs @ 8.60 fps)
 ↑ 3=2-yr Orifice/Grate (Orifice Controls 0.06 cfs @ 6.07 fps)
 ↑ 4=10/25-yr BCR Weir (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 131P: P - P2 Pond

Inflow Area = 0.930 ac, 77.42% Impervious, Inflow Depth = 2.88" for 10-year Storm event
 Inflow = 0.66 cfs @ 7.91 hrs, Volume= 0.223 af
 Outflow = 0.18 cfs @ 9.36 hrs, Volume= 0.223 af, Atten= 74%, Lag= 86.7 min
 Primary = 0.18 cfs @ 9.36 hrs, Volume= 0.223 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.67' @ 9.36 hrs Surf.Area= 0.042 ac Storage= 0.085 af

Plug-Flow detention time= 685.1 min calculated for 0.223 af (100% of inflow)
 Center-of-Mass det. time= 686.7 min (1,369.7 - 683.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.152 af	11.00'W x 33.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.5" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.60'	1.3" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	2.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.18 cfs @ 9.36 hrs HW=103.67' (Free Discharge)

1=Culvert (Passes 0.18 cfs of 21.80 cfs potential flow)
 2=WQ Orifice/Grate (Orifice Controls 0.01 cfs @ 9.22 fps)
 3=2-yr Orifice/Grate (Orifice Controls 0.06 cfs @ 6.92 fps)
 4=10/25-yr BCR Weir (Weir Controls 0.10 cfs @ 0.73 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 131P: P - P2 Pond

Inflow Area = 0.930 ac, 77.42% Impervious, Inflow Depth = 3.36" for 25-year Storm event
 Inflow = 0.77 cfs @ 7.91 hrs, Volume= 0.260 af
 Outflow = 0.30 cfs @ 8.50 hrs, Volume= 0.260 af, Atten= 61%, Lag= 35.4 min
 Primary = 0.30 cfs @ 8.50 hrs, Volume= 0.260 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.72' @ 8.50 hrs Surf.Area= 0.042 ac Storage= 0.087 af

Plug-Flow detention time= 603.5 min calculated for 0.260 af (100% of inflow)
 Center-of-Mass det. time= 605.2 min (1,285.0 - 679.8)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.152 af	11.00'W x 33.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.5" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.60'	1.3" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	2.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.30 cfs @ 8.50 hrs HW=103.72' (Free Discharge)

↑ 1=Culvert (Passes 0.30 cfs of 22.00 cfs potential flow)
 ↑ 2=WQ Orifice/Grate (Orifice Controls 0.01 cfs @ 9.28 fps)
 ↑ 3=2-yr Orifice/Grate (Orifice Controls 0.06 cfs @ 7.00 fps)
 ↑ 4=10/25-yr BCR Weir (Weir Controls 0.22 cfs @ 0.96 fps)

Summary for Pond 131P: P - P2 Pond

Inflow Area = 0.930 ac, 77.42% Impervious, Inflow Depth = 3.84" for 100-year Storm event
 Inflow = 0.88 cfs @ 7.91 hrs, Volume= 0.297 af
 Outflow = 0.54 cfs @ 8.20 hrs, Volume= 0.297 af, Atten= 39%, Lag= 17.7 min
 Primary = 0.54 cfs @ 8.20 hrs, Volume= 0.297 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.79' @ 8.20 hrs Surf.Area= 0.043 ac Storage= 0.090 af

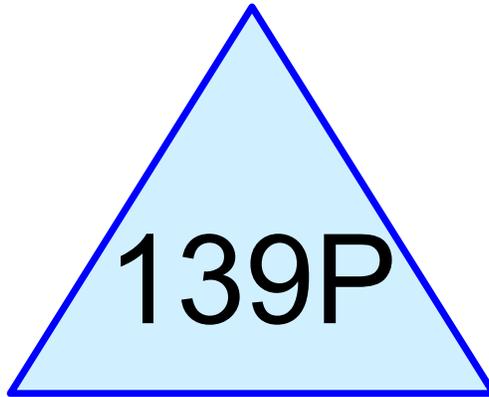
Plug-Flow detention time= 538.5 min calculated for 0.297 af (100% of inflow)
 Center-of-Mass det. time= 538.4 min (1,215.3 - 677.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.152 af	11.00'W x 33.00'L x 5.00'H Prismatic Z=3.0

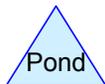
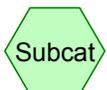
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.5" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.60'	1.3" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	2.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.54 cfs @ 8.20 hrs HW=103.79' (Free Discharge)

- 1=Culvert (Passes 0.54 cfs of 22.29 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.01 cfs @ 9.37 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.07 cfs @ 7.12 fps)
- 4=10/25-yr BCR Weir (Weir Controls 0.46 cfs @ 1.22 fps)



P - P3 Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

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Summary for Pond 139P: P - P3 Pond

Inflow Area = 8.630 ac, 73.93% Impervious, Inflow Depth = 1.90" for 2-year Storm event
 Inflow = 4.02 cfs @ 7.92 hrs, Volume= 1.364 af
 Outflow = 0.54 cfs @ 18.23 hrs, Volume= 1.305 af, Atten= 87%, Lag= 618.8 min
 Primary = 0.54 cfs @ 18.23 hrs, Volume= 1.305 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.29' @ 18.23 hrs Surf.Area= 0.255 ac Storage= 0.675 af

Plug-Flow detention time= 910.6 min calculated for 1.305 af (96% of inflow)
 Center-of-Mass det. time= 879.2 min (1,574.4 - 695.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.158 af	48.00'W x 144.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	3.5" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.54 cfs @ 18.23 hrs HW=103.29' (Free Discharge)

↑ **1=Culvert** (Passes 0.54 cfs of 20.20 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.07 cfs @ 8.74 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.47 cfs @ 7.05 fps)
 ↑ **4=10/25-yr BCR Weir** (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 139P: P - P3 Pond

Inflow Area = 8.630 ac, 73.93% Impervious, Inflow Depth = 2.82" for 10-year Storm event
 Inflow = 5.99 cfs @ 7.91 hrs, Volume= 2.030 af
 Outflow = 1.42 cfs @ 9.97 hrs, Volume= 1.966 af, Atten= 76%, Lag= 123.4 min
 Primary = 1.42 cfs @ 9.97 hrs, Volume= 1.966 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.81' @ 9.97 hrs Surf.Area= 0.271 ac Storage= 0.812 af

Plug-Flow detention time= 728.4 min calculated for 1.965 af (97% of inflow)
 Center-of-Mass det. time= 707.0 min (1,393.4 - 686.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.158 af	48.00'W x 144.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	3.5" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.42 cfs @ 9.97 hrs HW=103.81' (Free Discharge)

- 1=Culvert (Passes 1.42 cfs of 22.38 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.07 cfs @ 9.40 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.52 cfs @ 7.86 fps)
- 4=10/25-yr BCR Weir (Weir Controls 0.82 cfs @ 1.29 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 139P: P - P3 Pond

Inflow Area = 8.630 ac, 73.93% Impervious, Inflow Depth = 3.30" for 25-year Storm event
 Inflow = 7.00 cfs @ 7.91 hrs, Volume= 2.370 af
 Outflow = 2.32 cfs @ 8.96 hrs, Volume= 2.306 af, Atten= 67%, Lag= 62.7 min
 Primary = 2.32 cfs @ 8.96 hrs, Volume= 2.306 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.94' @ 8.96 hrs Surf.Area= 0.276 ac Storage= 0.847 af

Plug-Flow detention time= 638.0 min calculated for 2.306 af (97% of inflow)
 Center-of-Mass det. time= 617.7 min (1,300.8 - 683.1)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.158 af	48.00'W x 144.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	3.5" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.32 cfs @ 8.96 hrs HW=103.94' (Free Discharge)

↑ **1=Culvert** (Passes 2.32 cfs of 22.88 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.08 cfs @ 9.56 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.54 cfs @ 8.04 fps)
 ↑ **4=10/25-yr BCR Weir** (Weir Controls 1.70 cfs @ 1.68 fps)

Summary for Pond 139P: P - P3 Pond

Inflow Area = 8.630 ac, 73.93% Impervious, Inflow Depth = 3.77" for 100-year Storm event
 Inflow = 8.02 cfs @ 7.91 hrs, Volume= 2.713 af
 Outflow = 3.55 cfs @ 8.41 hrs, Volume= 2.648 af, Atten= 56%, Lag= 29.7 min
 Primary = 3.55 cfs @ 8.41 hrs, Volume= 2.648 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.07' @ 8.41 hrs Surf.Area= 0.280 ac Storage= 0.885 af

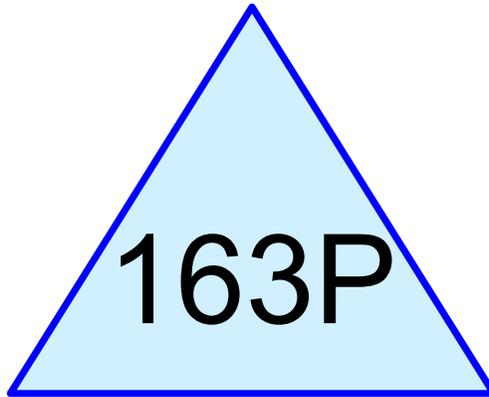
Plug-Flow detention time= 566.5 min calculated for 2.648 af (98% of inflow)
 Center-of-Mass det. time= 548.6 min (1,228.9 - 680.3)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.158 af	48.00'W x 144.00'L x 5.00'H Prismatic Z=3.0

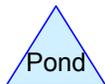
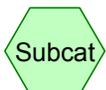
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	3.5" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.60'	3.0' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.54 cfs @ 8.41 hrs HW=104.07' (Free Discharge)

- 1=Culvert (Passes 3.54 cfs of 23.40 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.08 cfs @ 9.72 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.55 cfs @ 8.23 fps)
- 4=10/25-yr BCR Weir (Weir Controls 2.92 cfs @ 2.05 fps)



P - P4 Pond



Summary for Pond 163P: P - P4 Pond

Inflow Area = 4.070 ac, 80.34% Impervious, Inflow Depth = 1.99" for 2-year Storm event
 Inflow = 2.00 cfs @ 7.91 hrs, Volume= 0.675 af
 Outflow = 0.23 cfs @ 20.49 hrs, Volume= 0.648 af, Atten= 89%, Lag= 754.8 min
 Primary = 0.23 cfs @ 20.49 hrs, Volume= 0.648 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.41' @ 20.49 hrs Surf.Area= 0.147 ac Storage= 0.372 af

Plug-Flow detention time= 1,063.1 min calculated for 0.647 af (96% of inflow)
 Center-of-Mass det. time= 1,035.4 min (1,724.6 - 689.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.637 af	33.00'W x 99.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.5" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.23 cfs @ 20.49 hrs HW=103.41' (Free Discharge)

- 1=Culvert (Passes 0.23 cfs of 20.71 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 8.89 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.19 cfs @ 7.24 fps)
- 4=10/25-yr Orifice/Grate (Controls 0.00 cfs)
- 5=BCR Weir (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

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Summary for Pond 163P: P - P4 Pond

Inflow Area = 4.070 ac, 80.34% Impervious, Inflow Depth = 2.93" for 10-year Storm event
 Inflow = 2.95 cfs @ 7.91 hrs, Volume= 0.995 af
 Outflow = 0.69 cfs @ 9.97 hrs, Volume= 0.966 af, Atten= 77%, Lag= 123.8 min
 Primary = 0.69 cfs @ 9.97 hrs, Volume= 0.966 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.69' @ 9.97 hrs Surf.Area= 0.153 ac Storage= 0.414 af

Plug-Flow detention time= 806.0 min calculated for 0.966 af (97% of inflow)
 Center-of-Mass det. time= 786.4 min (1,466.6 - 680.3)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.637 af	33.00'W x 99.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.5" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.69 cfs @ 9.97 hrs HW=103.69' (Free Discharge)

1=Culvert (Passes 0.69 cfs of 21.87 cfs potential flow)
 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.24 fps)
 3=2-yr Orifice/Grate (Orifice Controls 0.20 cfs @ 7.67 fps)
 4=10/25-yr Orifice/Grate (Weir Controls 0.45 cfs @ 1.41 fps)
 5=BCR Weir (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 163P: P - P4 Pond

Inflow Area = 4.070 ac, 80.34% Impervious, Inflow Depth = 3.41" for 25-year Storm event
 Inflow = 3.43 cfs @ 7.91 hrs, Volume= 1.157 af
 Outflow = 0.92 cfs @ 9.32 hrs, Volume= 1.128 af, Atten= 73%, Lag= 84.6 min
 Primary = 0.92 cfs @ 9.32 hrs, Volume= 1.128 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.86' @ 9.32 hrs Surf.Area= 0.157 ac Storage= 0.441 af

Plug-Flow detention time= 708.2 min calculated for 1.128 af (98% of inflow)
 Center-of-Mass det. time= 689.5 min (1,366.5 - 677.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.637 af	33.00'W x 99.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.5" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.92 cfs @ 9.32 hrs HW=103.86' (Free Discharge)

1=Culvert (Passes 0.92 cfs of 22.57 cfs potential flow)
 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.46 fps)
 3=2-yr Orifice/Grate (Orifice Controls 0.21 cfs @ 7.92 fps)
 4=10/25-yr Orifice/Grate (Orifice Controls 0.66 cfs @ 2.88 fps)
 5=BCR Weir (Controls 0.00 cfs)

Summary for Pond 163P: P - P4 Pond

Inflow Area = 4.070 ac, 80.34% Impervious, Inflow Depth = 3.89" for 100-year Storm event
 Inflow = 3.91 cfs @ 7.91 hrs, Volume= 1.320 af
 Outflow = 1.35 cfs @ 8.87 hrs, Volume= 1.292 af, Atten= 66%, Lag= 57.6 min
 Primary = 1.35 cfs @ 8.87 hrs, Volume= 1.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.06' @ 8.87 hrs Surf.Area= 0.162 ac Storage= 0.473 af

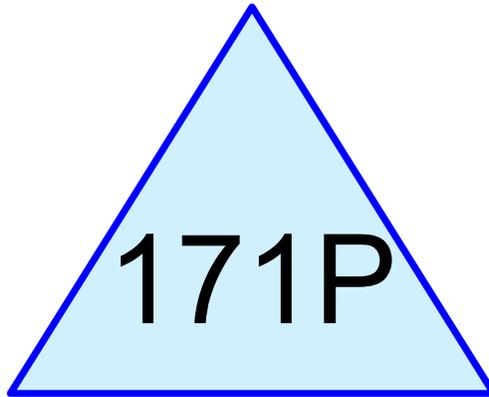
Plug-Flow detention time= 633.3 min calculated for 1.292 af (98% of inflow)
 Center-of-Mass det. time= 616.8 min (1,291.1 - 674.3)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.637 af	33.00'W x 99.00'L x 5.00'H Prismaoid Z=3.0

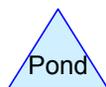
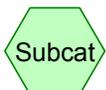
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	0.9" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.15'	2.2" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	6.5" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.35 cfs @ 8.87 hrs HW=104.06' (Free Discharge)

- 1=Culvert (Passes 1.35 cfs of 23.35 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.04 cfs @ 9.70 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.22 cfs @ 8.22 fps)
- 4=10/25-yr Orifice/Grate (Orifice Controls 0.83 cfs @ 3.61 fps)
- 5=BCR Weir (Weir Controls 0.26 cfs @ 0.70 fps)



P - P5 Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

Prepared by Otak, Inc.

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Summary for Pond 171P: P - P5 Pond

Inflow Area = 5.290 ac, 78.83% Impervious, Inflow Depth = 1.97" for 2-year Storm event
 Inflow = 2.57 cfs @ 7.91 hrs, Volume= 0.867 af
 Outflow = 0.32 cfs @ 19.21 hrs, Volume= 0.823 af, Atten= 88%, Lag= 677.7 min
 Primary = 0.32 cfs @ 19.21 hrs, Volume= 0.823 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.33' @ 19.21 hrs Surf.Area= 0.178 ac Storage= 0.457 af

Plug-Flow detention time= 1,010.1 min calculated for 0.823 af (95% of inflow)
 Center-of-Mass det. time= 974.8 min (1,665.4 - 690.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.793 af	38.00'W x 114.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100' /' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.0" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.30'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.35'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.32 cfs @ 19.21 hrs HW=103.33' (Free Discharge)

↑ **1=Culvert** (Passes 0.32 cfs of 20.35 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.05 cfs @ 8.78 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.27 cfs @ 6.85 fps)
 ↑ **4=10/25-yr Orifice/Grate** (Controls 0.00 cfs)
 ↑ **5=BCR Weir** (Controls 0.00 cfs)

Summary for Pond 171P: P - P5 Pond

Inflow Area = 5.290 ac, 78.83% Impervious, Inflow Depth = 2.91" for 10-year Storm event
 Inflow = 3.80 cfs @ 7.91 hrs, Volume= 1.281 af
 Outflow = 0.97 cfs @ 9.44 hrs, Volume= 1.236 af, Atten= 74%, Lag= 91.9 min
 Primary = 0.97 cfs @ 9.44 hrs, Volume= 1.236 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.59' @ 9.44 hrs Surf.Area= 0.185 ac Storage= 0.505 af

Plug-Flow detention time= 746.5 min calculated for 1.236 af (96% of inflow)
 Center-of-Mass det. time= 720.1 min (1,401.8 - 681.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.793 af	38.00'W x 114.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.0" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.30'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.35'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.97 cfs @ 9.44 hrs HW=103.59' (Free Discharge)

- 1=Culvert (Passes 0.97 cfs of 21.48 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.05 cfs @ 9.12 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.29 cfs @ 7.29 fps)
- 4=10/25-yr Orifice/Grate (Orifice Controls 0.63 cfs @ 2.36 fps)
- 5=BCR Weir (Controls 0.00 cfs)

Summary for Pond 171P: P - P5 Pond

Inflow Area = 5.290 ac, 78.83% Impervious, Inflow Depth = 3.38" for 25-year Storm event
 Inflow = 4.42 cfs @ 7.91 hrs, Volume= 1.492 af
 Outflow = 1.24 cfs @ 9.21 hrs, Volume= 1.446 af, Atten= 72%, Lag= 78.3 min
 Primary = 1.24 cfs @ 9.21 hrs, Volume= 1.446 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.83' @ 9.21 hrs Surf.Area= 0.192 ac Storage= 0.549 af

Plug-Flow detention time= 655.6 min calculated for 1.446 af (97% of inflow)
 Center-of-Mass det. time= 632.6 min (1,311.0 - 678.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.793 af	38.00'W x 114.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.0" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.30'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.35'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.24 cfs @ 9.21 hrs HW=103.83' (Free Discharge)

- 1=Culvert (Passes 1.24 cfs of 22.44 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.05 cfs @ 9.42 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.30 cfs @ 7.65 fps)
- 4=10/25-yr Orifice/Grate (Orifice Controls 0.89 cfs @ 3.32 fps)
- 5=BCR Weir (Controls 0.00 cfs)

Summary for Pond 171P: P - P5 Pond

Inflow Area = 5.290 ac, 78.83% Impervious, Inflow Depth = 3.86" for 100-year Storm event
 Inflow = 5.05 cfs @ 7.91 hrs, Volume= 1.704 af
 Outflow = 1.76 cfs @ 8.85 hrs, Volume= 1.658 af, Atten= 65%, Lag= 56.3 min
 Primary = 1.76 cfs @ 8.85 hrs, Volume= 1.658 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.07' @ 8.85 hrs Surf.Area= 0.198 ac Storage= 0.596 af

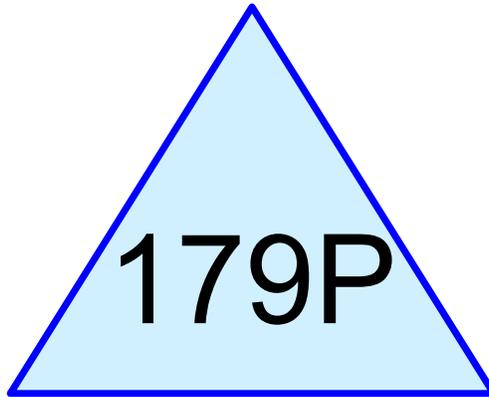
Plug-Flow detention time= 585.7 min calculated for 1.657 af (97% of inflow)
 Center-of-Mass det. time= 567.4 min (1,243.1 - 675.7)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.793 af	38.00'W x 114.00'L x 5.00'H Prismatic Z=3.0

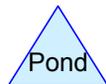
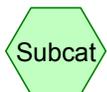
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.0" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.30'	2.7" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.35'	7.0" Horiz. 10/25-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#5	Device 1	104.00'	6.0' long x 0.5' breadth BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.76 cfs @ 8.85 hrs HW=104.07' (Free Discharge)

- 1=Culvert (Passes 1.76 cfs of 23.38 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.05 cfs @ 9.71 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.32 cfs @ 8.01 fps)
- 4=10/25-yr Orifice/Grate (Orifice Controls 1.09 cfs @ 4.08 fps)
- 5=BCR Weir (Weir Controls 0.30 cfs @ 0.73 fps)



P - Q1 Pond



16985 PrelimDetention

Type IA 24-hr 2-year Storm Rainfall=2.50"

Prepared by Otak, Inc.

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Summary for Pond 179P: P - Q1 Pond

Inflow Area = 10.230 ac, 56.01% Impervious, Inflow Depth = 1.64" for 2-year Storm event
 Inflow = 3.99 cfs @ 7.94 hrs, Volume= 1.398 af
 Outflow = 0.53 cfs @ 20.33 hrs, Volume= 1.339 af, Atten= 87%, Lag= 743.8 min
 Primary = 0.53 cfs @ 20.33 hrs, Volume= 1.339 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.35' @ 20.33 hrs Surf.Area= 0.265 ac Storage= 0.716 af

Plug-Flow detention time= 931.9 min calculated for 1.339 af (96% of inflow)
 Center-of-Mass det. time= 901.6 min (1,617.3 - 715.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.199 af	49.00'W x 147.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.05'	3.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	2.2' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.53 cfs @ 20.33 hrs HW=103.35' (Free Discharge)

↑ **1=Culvert** (Passes 0.53 cfs of 20.47 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.07 cfs @ 8.82 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.46 cfs @ 7.31 fps)
 ↑ **4=10/25-yr BCR Weir** (Controls 0.00 cfs)

16985 PrelimDetention

Type IA 24-hr 10-year Storm Rainfall=3.50"

Prepared by Otak, Inc.

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Summary for Pond 179P: P - Q1 Pond

Inflow Area = 10.230 ac, 56.01% Impervious, Inflow Depth = 2.52" for 10-year Storm event
 Inflow = 6.23 cfs @ 7.93 hrs, Volume= 2.147 af
 Outflow = 1.46 cfs @ 10.18 hrs, Volume= 2.084 af, Atten= 77%, Lag= 135.4 min
 Primary = 1.46 cfs @ 10.18 hrs, Volume= 2.084 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.77' @ 10.18 hrs Surf.Area= 0.279 ac Storage= 0.831 af

Plug-Flow detention time= 699.6 min calculated for 2.083 af (97% of inflow)
 Center-of-Mass det. time= 680.4 min (1,386.8 - 706.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.199 af	49.00'W x 147.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.05'	3.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	2.2' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=1.46 cfs @ 10.18 hrs HW=103.77' (Free Discharge)

↑ **1=Culvert** (Passes 1.46 cfs of 22.22 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.35 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.50 cfs @ 7.94 fps)
 ↑ **4=10/25-yr BCR Weir** (Weir Controls 0.89 cfs @ 1.48 fps)

16985 PrelimDetention

Type IA 24-hr 25-year Storm Rainfall=4.00"

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Summary for Pond 179P: P - Q1 Pond

Inflow Area = 10.230 ac, 56.01% Impervious, Inflow Depth = 2.97" for 25-year Storm event
 Inflow = 7.40 cfs @ 7.93 hrs, Volume= 2.534 af
 Outflow = 2.33 cfs @ 9.09 hrs, Volume= 2.471 af, Atten= 69%, Lag= 70.0 min
 Primary = 2.33 cfs @ 9.09 hrs, Volume= 2.471 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 103.92' @ 9.09 hrs Surf.Area= 0.284 ac Storage= 0.871 af

Plug-Flow detention time= 607.5 min calculated for 2.471 af (98% of inflow)
 Center-of-Mass det. time= 589.4 min (1,292.0 - 702.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.199 af	49.00'W x 147.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.05'	3.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	2.2' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.33 cfs @ 9.09 hrs HW=103.92' (Free Discharge)

↑ **1=Culvert** (Passes 2.33 cfs of 22.80 cfs potential flow)
 ↑ **2=WQ Orifice/Grate** (Orifice Controls 0.07 cfs @ 9.53 fps)
 ↑ **3=2-yr Orifice/Grate** (Orifice Controls 0.51 cfs @ 8.15 fps)
 ↑ **4=10/25-yr BCR Weir** (Weir Controls 1.74 cfs @ 1.89 fps)

Summary for Pond 179P: P - Q1 Pond

Inflow Area = 10.230 ac, 56.01% Impervious, Inflow Depth = 3.43" for 100-year Storm event
 Inflow = 8.59 cfs @ 7.92 hrs, Volume= 2.927 af
 Outflow = 3.44 cfs @ 8.51 hrs, Volume= 2.864 af, Atten= 60%, Lag= 35.5 min
 Primary = 3.44 cfs @ 8.51 hrs, Volume= 2.864 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 3
 Peak Elev= 104.06' @ 8.51 hrs Surf.Area= 0.289 ac Storage= 0.913 af

Plug-Flow detention time= 535.7 min calculated for 2.864 af (98% of inflow)
 Center-of-Mass det. time= 519.9 min (1,219.1 - 699.2)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	1.199 af	49.00'W x 147.00'L x 5.00'H Prismatic Z=3.0

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	24.0" Round Culvert L= 100.0' RCP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 100.00' / 99.00' S= 0.0100 '/ Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	98.67'	1.2" Horiz. WQ Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Device 1	101.05'	3.4" Horiz. 2-yr Orifice/Grate C= 0.600 Limited to weir flow at low heads
#4	Device 1	103.50'	2.2' long x 0.5' breadth 10/25-yr BCR Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=3.44 cfs @ 8.51 hrs HW=104.06' (Free Discharge)

- 1=Culvert (Passes 3.44 cfs of 23.36 cfs potential flow)
- 2=WQ Orifice/Grate (Orifice Controls 0.08 cfs @ 9.71 fps)
- 3=2-yr Orifice/Grate (Orifice Controls 0.53 cfs @ 8.36 fps)
- 4=10/25-yr BCR Weir (Weir Controls 2.84 cfs @ 2.29 fps)