3J CONSULTING

CIVIL ENGINEERING | WATER RESOURCES | COMMUNITY PLANNING

STORMWATER MANAGEMENT REPORT

RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT

Rhododendron Dr & 35th Ave
Florence, OR

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DESIGNER'S CERTIFICATION & STATEMENT

I hereby certify that this Stormwater Management Report for the Rhododendron Arbor Planned Unit Development project has been prepared by me and meets minimum standards of the City of Florence and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me.

EXECUTIVE SUMMARY

The project site is approximately 9.28 acres with 0.34 acres of frontage improvements and is located at 35th Street and Rhododendron Drive in Florence, Oregon and consists of tax lots 18121534 3800, 18121533 700, & 18122221 1900. The existing site is currently undeveloped and covered with trees and vegetation. There is a conveyance ditch onsite, that carries stormwater from the east side of the site to the west and discharges to the drainage system in Rhododendron Drive.

The proposed project will consist of a subdivision, creating 82-lots (80 single-family homes and 2 multi-family buildings). The multi-family lots will be developed at a later date under a separate review process. The subdivision will include streets, sidewalks, utilities, and Rhododendron Drive frontage improvements. A 24" pipe will be installed to replace the existing conveyance ditch, bypassing all stormwater BMPs and discharge directly to the existing drainage system in Rhododendron Drive.

The proposed BMPs are designed in accordance with the City of Florence standards. The proposed biofiltration pond is designed to treat up to the water quality storm shown in Table 4.1 of the City of Florence Stormwater Design Manual (24-hour rainfall depth of 0.83 inches). Manufactured treatment technologies are required to treat runoff from a rainfall intensity of 0.19 inches per hour. Projects subject to flow control are required to utilize onsite retention (infiltration) to the maximum extent feasible. Runoff discharging offsite shall not exceed predeveloped peak runoff rates for the 2-year, 10-year, and 25-year design storm. All stormwater conveyance is designed to convey runoff from the 25-year design storm with no out of system flooding.

The proposed site will treat runoff from all streets and sidewalks in a proposed biofiltration pond and four (4) ADS StreamFilter Catch Basins (containing BayFilter cartridges). Runoff treated in the biofiltration pond will be retained and infiltrated in the drain rock of the facility and runoff treated in the ADS StreamFilter Catch Basins will be conveyed to proposed infiltration basins. In accordance with the City of Florence Stormwater Management Design Manual, roof runoff from residential roof area (including the multi-family buildings) does not require pretreatment; therefore, runoff from roofs will be conveyed directly to the proposed infiltration facilities. Installation of these facilities will be deferred to home construction.

No deficiencies were identified downstream of the proposed project.

The proposed BMPs are designed in accordance with the City of Florence Stormwater Management Design Manual, last revised September 2011.

PROJECT OVERVIEW & DESCRIPTION

The project site is approximately 9.28 acres with 0.34 acres of frontage improvements and is located at 35th Street and Rhododendron Drive in Florence, Oregon and consists of tax lots 18121534 3800, 18121533 700, & 18122221 1900. The project falls within the jurisdiction of the City of Florence and will comply with the City's Stormwater Design Manual, revised September 2011.

The existing site is currently undeveloped and covered with trees and vegetation. There is a conveyance ditch onsite, that carries stormwater from the east side of the site to the west and discharges to the drainage system in Rhododendron Drive. The site typically slopes from the northeast to the southwest.

The proposed project will consist of a subdivision, creating 82-lots (80 single-family homes and 2 multi-family buildings). The multi-family lots will be developed at a later date under a separate review process. The subdivision will include streets, sidewalks, utilities, and Rhododendron Drive frontage improvements. A 24" pipe will be installed to replace the existing conveyance ditch, bypassing all stormwater BMPs and discharge directly to the existing drainage system in Rhododendron Drive.

Runoff from the proposed project will be managed and infiltrated onsite; no runoff is expected leave the site up to the 100-year design storm. If the proposed BMPs fail, runoff will overflow to the existing drainage system in Rhododendron Drive. Runoff from most streets and sidewalks will be treated, retained, and infiltrated in a biofiltration pond. Due to utility conflicts, not all runoff from the proposed site can be conveyed to the biofiltration pond for treatment. Basins 10, 12, 14, and 16 will sheet flow to ADS StreamFilter Catch Basins to be treated and then conveyed to infiltration basins. In accordance with the City of Florence Stormwater Management Design Manual, runoff from residential roof area does not require pretreatment; therefore, runoff from the proposed roofs will be conveyed directly to the proposed infiltration facilities. Installation of these facilities will be deferred to home construction.

Portions of this Stormwater Management Report has been revised to address comments provided by Civil West Engineering Services on November 19, 2021 on behalf of the City.

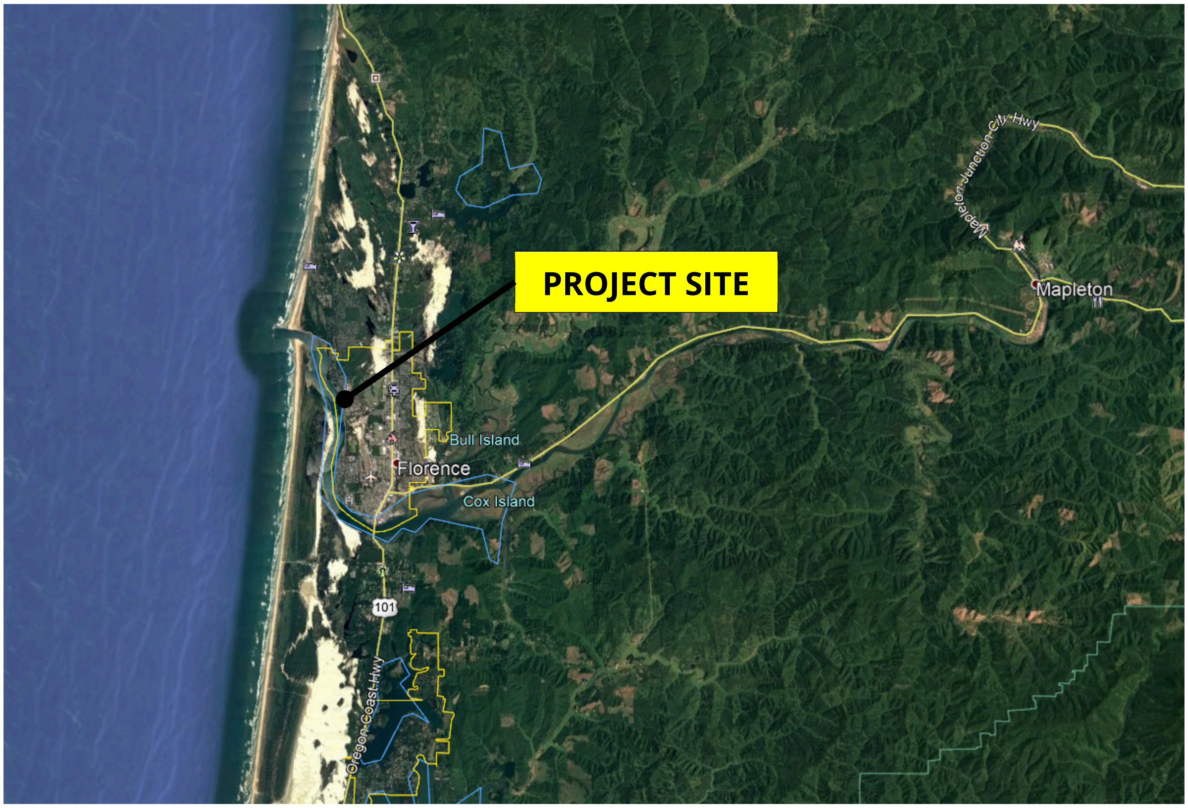


Figure 1 - Vicinity Map

Figure 2 - Site Location

METHODOLOGY

Existing Conditions

Existing Basins

The existing site is located on the east side of Rhododendron Drive between 35th Street and Coast Guard Road in Florence, Oregon (See Technical Appendix: Exhibits – Existing Conditions). The site is currently undeveloped and covered in trees and vegetation. Table 1 outlines the onsite impervious and pervious areas in the existing conditions.

Existing Basin	sf	ac
Impervious Area	1,674	0.04
Pervious Area	402,351	9.24
Total Area	*404,025*	*9.28*

Table 1 – Existing Basin Areas

Existing Drainage

The existing site generally drains from the northeast to the southwest. Currently, the precipitation infiltrates into the soil while excess runoff is conveyed through sheet flow or via an existing ditch. Both forms of conveyance outfall into Rhododendron Drive, Bud's Ravine and ultimately the Siuslaw River.

Flood Map

The site is located within Zone X (un-shaded) per flood Insurance Rate Map (FIRM) community panel numbers 41039C0938F & 41039C1426F. FEMA's definition of Zone X (un-shaded) is an area of minimal flood hazard.

Hydrologic Soil Group

The soil types as classified by the United States Department of Agriculture Soil Survey of Lane County, Oregon are identified in Table 2 (See Technical Appendix: Exhibits – Hydrologic Soils Group – Lane County Area, Oregon).

Soil Type	Hydrologic Group	Percent Coverage (%)
Waldport Fine Sand	A	91.3
*Yaquina Loamy Fine Sand	A/D	8.7

*Modeled as Hydrologic Soils group D

Table 2 – Hydrologic Soils Group

Geotechnical Investigation

A geotechnical investigation performed by Branch Engineering on January 28, 2020 (See Technical Appendix: Geotechnical Report) evaluated onsite infiltration rates using the encased falling head infiltration test at 3 locations; testing was performed at 54 & 56 inches below ground surface (BGS). The infiltration rates were evaluated to be 92, 49, & 80 in/hr.

No groundwater was observed in the exploratory test pits which were advanced to a maximum of 10 ft BGS. Well logs from nearby sites were obtained from the Oregon Water Resources Department by the Geotechnical Engineer. The well logs list static water levels at 6.2 ft and 21 feet BGS. Variations in the depth to water is typical in stabilized dune environments with raised dunal areas and deflation zones with water close to the surface. The Geotechnical Engineer expects that ground water levels will fluctuate with the season and should be expected to be highest during the late winter and spring months. The presence of ground water is not expected to impact the proposed development, provided the recommendations of the Geotechnical Report are implemented in the design and construction of the project.

Due to concerns with groundwater mounding associated with the proposed infiltration facilities, studies were conducted by Branch Engineering, Inc and GSI Water Solutions, Inc. Both studies found that ground water mounding will be negligible (See Technical Appendix: Other Studied – Geotechnical Evaluation of Groundwater Hydraulics and Technical Review of a Groundwater Mounding Analysis for a proposed Development at 35th Street and Rhododendron Drive, Florence, OR).

Proposed Conditions

Proposed Basins

The project consists of a subdivision, creating 82-lots (80 single-family homes and 2 multi-family buildings) (See Technical Appendix: Exhibits - Post-Construction Conditions-Full Build Out). The subdivision will include streets, sidewalks, utilities and Rhododendron Drive improvements. Table 3 outlines the onsite impervious and pervious areas for the proposed project.

Proposed Basin	**sf**	**ac**
Impervious Area	167,272	3.84
Pervious Area	236,753	5.44
Total Area	*404,025*	*9.28*

Table 3 – Proposed Basin Areas

Additionally, the project will construct a new sidewalk along the frontage of the site. Table 4 below shows the total impervious area constructed for the sidewalks.

Proposed Basin	**sf**	**ac**
Impervious Area	14,759	0.34

Table 4 – Proposed Frontage Improvements

Impervious area (including full build) draining to the onsite stormwater management systems will be approximately 3.52 acres. The future roofs from Lot 1 (Basin 22) will not drain to the onsite stormwater management system and will drain to drywells which will be constructed under a separate permit. The frontage improvements cannot be conveyed to the onsite system due to grading constraints. The City has indicated that the existing system in Rhododendron Drive should be able to accommodate the increase in impervious area.

Design Review & Building Permits

Stormwater runoff from the roofs of 80 single-family homes will be managed through the installation of infiltration trenches. The two apartment complexes proposed for the site will be managed through the use of drywells. All stormwater facilities will be required to be reanalyzed during the design phase of future projects.

Proposed Drainage

In proposed conditions, all runoff from the site will be managed and infiltrated onsite. Runoff from the proposed streets and sidewalks will be treated in a biofiltration pond and four (4) ADS StreamFilter Catch Basins with BayFilter cartridges. After treatment, runoff will then be infiltrated in the drain rock of the biofiltration pond or conveyed to four (4) infiltration basins onsite.

Stormwater Management

The City of Florence requires that new developments infiltrate runoff to the maximum extent feasible. All runoff from onsite is designed to be managed, retained, and infiltrated onsite; no runoff is expected to leave the site. In the event that the proposed infiltration BMPs fail and runoff exceeds the capacity, then water will overflow to the existing drainage system in Rhododendron Drive.

Runoff from the majority of the proposed streets and sidewalks will be treated in a biofiltration pond located on the west side of the site (See Basins 1 through 9, 11, 13, 15, and 17 through 21 in the Post-Construction Conditions Exhibit). After treatment, runoff will be retained in the drain rock of the biofiltration pond and allowed to infiltrate.

Due to utility conflicts, not all impervious area onsite can be conveyed to the proposed biofiltration pond (See Basins 10, 12, 14, and 16 in the Post-Construction Conditions Exhibit). The impervious area that cannot be conveyed to the biofiltration pond will be treated in ADS StreamFilter Catch Basins and infiltrated in infiltration basins.

The existing conveyance ditch onsite will be replaced with a 24" bypass pipe. The bypass pipe will discharge water directly to the existing drainage system in Rhododendron Drive.

Conveyance Design Criteria

The existing ditch onsite will be piped and conveyed to the stormwater system in Rhododendron Drive. The proposed 24" pipe will bypass all onsite BMPs and be conveyed directly to the existing drainage system in Rhododendron Drive. The proposed pipe is designed to convey the 25-year design storm with no out of system flooding. Two 48" open grated manholes (SDMH19 and SDMH07) will be installed to intercept sheet flow from the basin. Although the survey did not pick up an existing pipe in the easement, a connection will be provided for a pipe, should it be found during construction. Also, a low point on the east side of Lot 63 will contain a 24" pipe which will connect to SDMH07. The entrance of the pipe will contain at grade grate.

Underground injection Control Registration

All proposed underground injection control (UIC) structures must be registered with the Oregon Department of Environmental Quality (ODEQ) at least 90 days prior to construction. Below is a list of all BMPs that are required to be registered as UIC's with the ODEQ.

- Biofiltration Pond
- Infiltration Basin #1
- Infiltration Basin #2
- Infiltration Basin #3
- Infiltration Basin #4

ANALYSIS

Design Assumptions

Design Storms

Per Section 4.5 of the City's Stormwater Management Design Manual Florence has unique rainfall distributions where instead of a "quick buildup with heavy intensity precipitation, rainfall tends to have broad peaks with several continuous hours of heavy rainfall." Due to this, a SCS Type 1a hyetographs is the most appropriate rainfall distribution for the area. Table 5 below shows the Design Storms used to design the proposed stormwater system.

Recurrence Interval (yr)	24-hr Depth (in)
WQ	0.83
2	3.46
10	4.48
25	5.06
100	5.95

Table 5 – 24-hr Rainfall Depths

Per the City of Florence Stormwater Management Design Manual, all manufactured treatment technologies and other flow rate based treatment facilities shall be designed using the rational method. The rainfall intensity used to design the ADS StreamFilter Catch Basins is shown in Table 6.

Time of Concentration (min)	Rainfall Intensity (in/hr)
5	0.19

Table 6 – Water Quality Rainfall Intensity

Computation Methods & Software

In conformance with the City's Stormwater Management Design Manual, the Santa Barbara Urban Hydrograph (SBUH) Method via XPSTORM was used to evaluate stormwater runoff volume to size the proposed infiltration basins. Additionally, XPSTORM was utilized to model the proposed drainage system, size the biofiltration pond and analyze the downstream system.

Per section 4.5 of the City's Stormwater Management Design Manual, all manufacture treatment technologies were designed using the rational method. The following equation was used to determine the flow rate required to treat.

$Q = CIA$

C = Runoff Coefficient (0.90 for impervious surfaces)
I = Rainfall Intensity (shown in Table 6)
A = Impervious Area (acres)

Time of Concentration

A time of concentration of 5 minutes was assumed for proposed conditions.

Curve Numbers

Per Table A-2 of the SWMM, the runoff curve numbers (CN) by the Natural Resources Conservation Service (NRCS) for impervious (CN=98) and pervious areas (open space, fair condition) 49 and 84 based on percent coverage of each Hydrologic Soils Group, (see Table 2), respectively, for the proposed conditions.

Pollution Reduction

Per the SWMM, pollution reduction facilities must perform at the required efficiency as follows: 70 percent total suspended solids (TSS) removal from 90 percent of the average annual runoff. Pollution reduction BMPs are required for all impervious area, except for roof area. Runoff from all roads, sidewalks and paths will be conveyed to a proposed biofiltration pond or StreamFilter Catch Basins to be treated. Roof runoff will be conveyed directly to infiltration BMPs.

Stormwater Quantity

Per Section 3.1 of the City of Florence Stormwater Management Design Manual, onsite infiltration is required to the maximum extent feasible. Post-Construction peak release rates shall not exceed the pre-developed peak runoff rates for the 2 through 25-year design storms.

Biofiltration Pond Sizing

Runoff from the majority of the roads and hardscaping onsite will be conveyed to a Biofiltration Pond to be treated (approximately 100,000 sf). The biofiltration pond is sized in accordance with section 5.11 of the City of Florence Stormwater Management Design Manual to capture and infiltrate all runoff from the WQ storm event through the growing medium (18" depth). The pond is split between 3 cells; a forebay is provided at each outfall. The forebays provide a total of 0.5' of dead storage.

The proposed biofiltration pond was sized using the performance approach and the software XPSTORM. Runoff was modeled using the SBUH method. The proposed biofiltration pond will have the following dimensions:

Bottom Area = 695 sf
Bottom Width = 4 ft
Side Slopes = 3:1
Growing Medium Depth = 18 in
Drain Rock Depth = 36 in
Top Area = 2,678 sf
Elevation of Overflow to Drain Rock = 53.18 ft
Elevation of Emergency Overflow (Top of Pond) = 54.67 ft
Maximum Ponded Water Duration = less than 18 hours after each storm event

Storm events that exceed the WQ depth will overflow and be injected directly to the drain rock under the growing medium. Runoff will be retained in the biofiltration pond and be infiltrated onsite. Table 7 shows the stage and freeboard in the proposed biofiltration pond (See Technical Appendix: Hydrographs – Biofiltration Pond Stage and Storage). An emergency overflow will be installed to provide a minimum 1 foot of freeboard above the 25-year storm event.

Recurrence Interval	Stage (ft)	Freeboard (ft)
WQ	53.18	1.49
2-Year	53.49	1.18
10-Year	53.56	1.11
25-Year	53.59	1.08
100-Year	54.37	0.30

Table 7 – Biofiltration Pond Stage & Storage

StreamFilter Catch Basin Sizing

Runoff from the concrete and asphalt surfaces in basins 10, 12, 14, and 16 will be treated using ADS StreamFilter Catch Basins (roof runoff will be conveyed directly to each infiltration basin). Each facility has been designed to treat runoff from all proposed impervious area draining to it, as well as any impervious area that will be constructed in future phases. The required water quality flow rate and number of cartridges required to treat each basin is presented in Table 8 (See Technical Appendix: Calculations – ADS BayFilter Configurator). The StreamFilter Catch Basins contain BayFilter cartridges; ADS differentiates their catch basins from their manholes and vaults containing the BayFilter cartridges with the name "StreamFilter" (See Construction Drawing Sheet C933).

WQ Facility I.D.	Infiltration Facility	Impervious Area Treated (sf)	Water Quality Flow (cfs)	Type of Cartridge	Number of Cartridges
StreamFilter #1	Infiltration Basin #1	9,831	0.04	BayFilter 522	1
StreamFilter #2	Infiltration Basin #2	1,934	0.01	BayFilter 522	1
StreamFilter #3	Infiltration Basin #3	5,260	0.02	BayFilter 522	1
StreamFilter #4	Infiltration Basin #4	10,584	0.04	BayFilter 522	1

Table 8 – StreamFilter Calculations

Infiltration Basin Sizing

A total of four (4) infiltration basins will be constructed to infiltrate runoff from impervious area that cannot be conveyed to the proposed Biofiltration Pond. Each infiltration basin is designed to accommodate the proposed impervious area and future construction phases. In accordance with the City's Stormwater Management Design Manual, each facility is design to have a drawdown time of 10 hours, a design infiltration rate of 6.0 in/hr, and sized to fully infiltrate the 25-year design storm. Additionally, each infiltration basin has a depth of 3 ft and a porosity of 0.3 (see Technical Appendix: Calculations – Infiltration Basin Design). The required area of all infiltration basins are presented in Table 9.

Infiltration Facility	Impervious Area Draining to Facility (sf)	[1]Future Phase Impervious Area (sf)	Runoff Volume (cf)	Required Area (sf)
Infiltration Basin #1	1,410	13,221	6,091	1,025
Infiltration Basin #2	934	4,000	1,925	326
Infiltration Basin #3	3,760	10,500	5,776	979
Infiltration Basin #4	3,084	16,500	7,876	1,335

[1] Includes future roof area and concrete/ac.

Table 9 – Infiltration Basin Details

Stormwater Escape Route

All runoff from the proposed project will be managed, retained and infiltrated onsite up to the 100-year storm event. In the event that a proposed BMP fails, runoff from the site will overflow to the existing drainage system in Rhododendron Drive.

Conveyance Performance

In accordance with section 9-5-3 of the City of Florence Stormwater Management Design Manual, the proposed drainage systems and bypass line are design for the 25-year storm event. The proposed stormwater management system was also modeled up to the 100-year storm event.

The proposed stormwater conveyance system for the biofiltration pond and infiltration basins will safely convey runoff up to the 100-year storm event with no out of system flooding. Table 10 shows the peak water elevation and minimum freeboard in each system for the 25-year and 100-year storm events. All runoff will be retained and infiltrated onsite; no runoff is expected to overflow to the emergency overflow or exceed the capacity of the infiltration basins.

The proposed 24" bypass pipe will safely convey runoff up to the 100-year storm event with no out of system flooding. Table 10 shows the peak water elevation and minimum freeboard in the proposed bypass line.

Stormwater Management Facility	25-Year Minimum Freeboard (ft)	100-Year Minimum Freeboard (ft)
Biofiltration Pond	2.41	1.63
Infiltration Basin #1	2.54	2.21
Infiltration Basin #2	4.36	4.00
Infiltration Basin #3	2.23	0.54
Infiltration Basin #4	2.98	1.17
Bypass	1.55	1.33

Table 10 – Conveyance Performance

Outfall Protection

Each proposed outfall to the biofiltration pond will be protected from erosion and scouring with riprap. Each outfall protection will be sized in accordance with the City of Portland SWMM (See Table B-2 in the SWMM). Below are the required dimensions of riprap at each outfall:

- Average Stone Size = 6 in
- Depth = 12 in
- Width = 7 ft
- Length = 8 ft
- Height above crown = 1 ft

DOWNSTREAM ANALYSIS

The City of Florence requires any development requiring a Drainage Plan onsite and offsite drainage concerns, both up gradient and down gradient (minimum of 1/4 mile) of the proposed site. The analysis shall determine if:

1. Modification to the existing onsite stormwater drainage and management facilities and drainage patterns shall not restrict or redirect flows creating backwater or direct discharge onto offsite property to levels greater that the existing conditions unless approved by the affected offsite property owners and the City.

2. Stormwater facilities shall be designed and constructed to accommodate all flows generated from the project's property in accordance with the land use zoning as shown in the most recent approved City Code.
3. Capacity of the downstream drainage system to determine if increase in peak flow rates resulting from the proposed development can be accommodated.

City of Florence, Oregon Stormwater Master Plan Update by Civil West Engineering Services, Inc

In December of 2018, Civil West Engineering Services completed a Stormwater Master Plan (SWMP) Update which addressed the drainage upstream and downstream of this proposed development. The SWMP was developed as an update to the City's 2000 Storm Water Management Plan "intended to supplement the information and analyses provided in SWMP 2000, and establish a more current and relevant list of recommended priority capital improvement projects". (page 12)

According to the SWMP, infiltration of stormwater runoff is relied upon as the primary method for disposal in the northern portion of the City since there is very little underground stormwater infrastructure throughout this area. As such, the most common cause for flooding in the City occurs when large amounts of surface water has infiltrated into the ground, and, in combination with increased wet weather, can result in a rise in the water table causing ground water to surcharge back out onto the surface. The SWMP has identified locations where this condition has been observed. Section 4.4 of the SWMP specifically discusses the area north of the proposed development, which does not contribute stormwater runoff to the proposed site but could add to the existing storm in Rhododendron Drive in the future due to flooding.

Stormwater from Mariner's Village and contributing basins northeast is piped underground through the subdivision where it discharges into Tax Lot 4600, forming a natural water body during the wet season. According to the SWMP, stormwater infiltrates here until summer months when the ground water recedes. Flooding recently occurred in the wet season of 2016-2017 where the ground water could not be contained in Tax Lot 4600 and surcharged out of catch basins in the subdivision as well as spilled into Common Area C (See Technical Appendix: Downstream Analysis – Figure 4-12-Surface & Ground Water Movement Near Mariners Village).

Fairway Estates east and south of Mariner's Village has drainage infrastructure providing detention to pre-developed conditions that include storm pipes as large as 60-inch and a 4-inch orifice controlling release rates. The development planned to connect a 15-inch pipe into the City's storm line in Rhododendron Drive and for this downstream analysis, it has been assumed that the pipe has been connected. There is no stormwater connection between Mariner's Village and Fairway Estates; however, discussion was provided in the SWMP which mentioned a solution to Mariner's Village flooding issues by installing an emergency overflow weir from that neighborhood into the Fairway Estates system. Our analysis does not include the basin area from Mariner's Village or an overflow discharging into Fairway Estates.

The 15-inch pipe on Rhododendron Drive conveys stormwater south before discharging into "Bud's Ravine" via a 36" pipe in Rhododendron Drive installed in 2015. The storm network is represented in the maps provided in the SWMP labeled Region 6 Map and Region 3 Map (See Technical Appendix: Downstream Analysis – Region 6 & 3 Maps). The 36" pipe also conveys water from the proposed project site and upstream along with a basin south of the site to Bud's Ravine (See Technical Appendix: Downstream Analysis – Downstream Basins).

Design Report by Branch Engineering

A design report dated May 12, 2004 by Branch Engineering discussed proposed improvements to alleviate flooding issues north of the site which would, in part, upgrade the storm line on Rhododendron Drive discharging to Bud's Ravine. Three improvements were discussed which are shown on Figure 3 from the same report (See Technical Appendix: Downstream Analysis – Drainage Improvements Rhododendron Drive and 35th Street Vicinity Figure 3). Of major significance to the proposed project site was to have a 60" storm line installed through the southern portion of the site which would convey flows from Mariner's Village, Fairway Estates, Sandpines Golf Course and all contributing basins. The 60" pipe would continue on Rhododendron Drive and intercept a new 24" coming from the east. The design report discusses the option of either replacing Bud's Ravine with a new 60" pipe or constructing a concrete lined open channel. Either option would discharge to Siuslaw River. Additionally, the report recommended armoring the outfall of the pipe at the river for erosion prevention.

According to the SWMP by Civil West Engineering, none of the improvements discussed in the drainage report were implemented, including erosion control measures or scour prevention improvements. However, the SWMP does state the following:

> *"Bud's Ravine has not been piped, but it has been subjected to increased flows. Visual inspection of Bud's Ravine revealed that the ravine is so densely vegetated that it is mostly unnavigable by foot. Plants and trees in this area are very well established, and their presence provides natural slope stabilization and scour prevention." (page 55)*

Additionally, per the SWMP, Bud's Ravine is a stable conveyance channel and eligible to receive additional flows.

Downstream Storm Description

According to the survey by S&F Land Services on September 19, 2019, near the northwestern corner of Tax Lot 1900, a manhole intercepts a 14" storm pipe from the north on Rhododendron Drive, and a 36" storm line from the proposed project site (Tax Lot 3800). The manhole discharges stormwater through a 36" storm pipe south on Rhododendron Drive for approximately 30' to another manhole which also has a 12" pipe from the south discharging into it. This manhole discharges stormwater west through Rhododendron Drive through a 42" pipe to the west side of the road into Bud's Ravine which is approximately 660' upstream of the Siuslaw River.

The downstream system was modeled using the SBUH method and the computer software XPSTORM. Although efforts to gather as-builts for the upstream and downstream basins were pursued by the City of Florence and EGR & Associated, Inc (Consultants that previously worked on site located upstream of the proposed project site), no as-builts were acquired. Pipe inverts and lengths surveyed by S&F Land Services were utilized, as well as as-builts provided by the City for the pipe upgrades on Rhododendron Drive. Where discrepancies between the survey and as-built occurred, the as-builts were used. LIDAR data (from publicly available LIDAR Data online DOGAMI Lidar Viewer) was used to delineate contributing basins as well as estimate cross sections for Bud's Ravine. The Manning's Coefficient (n) of 0.013 was used for the pipes and 0.048 for Bud's Ravine. The downstream system was analyzed up to the Siuslaw River.

All runoff from onsite will be managed and infiltrated onsite; however, for the downstream analysis, the worst-case scenario was modeled assuming zero infiltration. It should be noted that groundwater modeling was not considered in the downstream analysis since each groundwater event cannot be quantified due to variables associated with characteristics such as initial soil storage (saturation), previous events, groundwater elevations, etc. The new sidewalk constructed along Rhododendron Drive was assumed to increase the runoff as well to the 36” pipe and Bud’s Ravine.

Each sub basin’s time of concentrations was assumed based on the slope of the land and cover type. The CN of each sub basins was determined by the type of cover for each basin and weighted by the Hydrologic Soils Group Type present for each sub basin.

The model shows that the downstream system has capacity to handle the increased flow from the proposed development. The downstream system has capacity to convey the 25-year design storm without surcharging any pipes and maintaining a minimum freeboard of 3.00’ (See Technical Appendix: Downstream Analysis – XPSTORM Conveyance Data). Additionally, the system can convey the 100-year design storm without surcharging any pipes and maintaining a minimum freeboard of 2.88’. Given that the existing downstream system has capacity for the entire site plus the frontage improvements, the increase in runoff from the proposed sidewalk will not have an adverse effect on the downstream system.

ENGINEERING CONCLUSIONS

This report demonstrates that the proposed stormwater management system for the Florence Master Plan follows the City’s Stormwater Design Manual. The proposed site takes advantage of infiltration and all runoff will be managed and infiltrated onsite. Additionally, pollution reduction in accordance with the City’s Stormwater Design Manual were used to provide treatment from all concrete and asphalt.

An Operations & Maintenance Plan for the stormwater facilities is provided in the Technical Appendix.

TECHNICAL APPENDIX

Exhibits

National Flood Hazard Layer FIRMette
Hydrologic Soils Group – Lane County Area, Oregon
Post-Construction Conditions – Hydrologic Soils Group
Table A-2 – Runoff Curve Numbers for Urban Areas
Existing Conditions
Post-Construction Conditions

Calculations

BayFilter Configurator
Infiltration Basin Design

Hydrographs

Biofiltration Pond Stage & Freeboard

XPSTORM Output

XPSTORM Hydraulic Layout - Onsite
XPSTORM Runoff Data (Biofiltration Pond, Infiltration Basin #1-4)
XPSTORM Conveyance Data (Biofiltration Pond, Infiltration Basin #1-4)
XPSTORM Hydraulic Layout - Bypass
XPSTORM Runoff Data (Bypass Line)
XPSTORM Conveyance Data (Bypass Line)

Downstream Analysis

Figure 4-12-Surface & Ground Water Movement Near Mariners Village
Region 6 & 3 Maps
Drainage Improvements Rhododendron Drive and 35th Street Vicinity Figure 3
Downstream Basins
Hydraulic Soil Group (Basin 2-5)
Downstream As-Builts
XPSTORM Hydraulic Layout
XPSTORM Runoff Data
XPSTORM Conveyance Data

Geotechnical Report

Geotechnical Engineering Recommendations and Site Evaluation, Branch Engineering, Inc., January 28, 2020

Other Studies

Geotechnical Evaluation of Groundwater Hydraulics, Florence Housing Development – Site A, Rhododendron Drive and 35th Street, Florence, OR, Branch Engineering Inc., July 6, 2021
Technical Review of a Groundwater Mounding Analysis for a Proposed Development at 35th Street and Rhododendron Dr, Florence, Oregon, GSI Water Solutions, Inc., July 21, 2021

Operations & Maintenance

REFERENCES

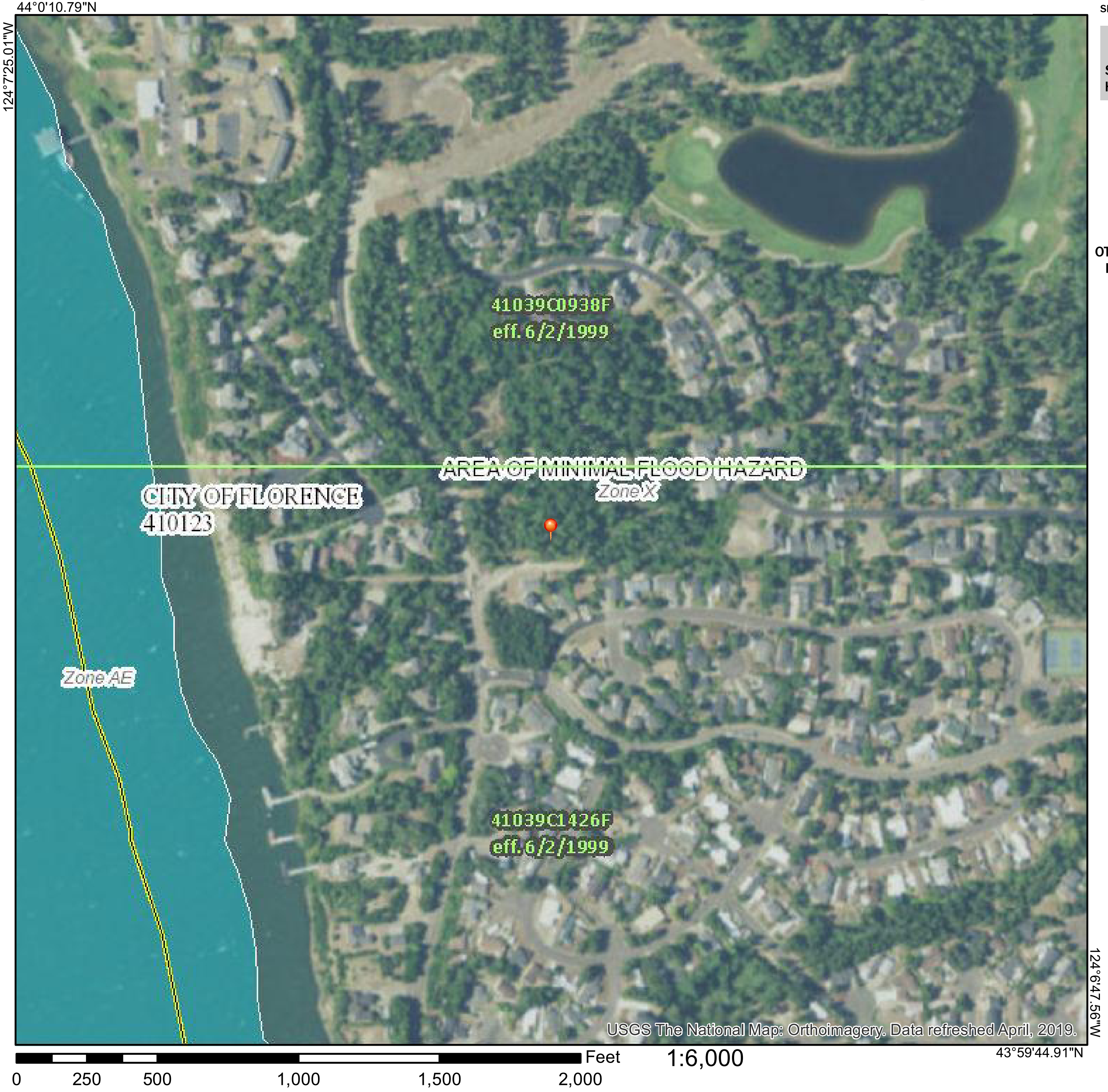
Stormwater Design Manual issued September 2011 – City of Florence

City of Florence Stormwater Master Plan Update issued December 2018 – Civil West Engineering Services, Inc

Stormwater Management Manual issued 2016 – City of Portland

EXHIBITS

National Flood Hazard Layer FIRMette



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS	■	Without Base Flood Elevation (BFE) *Zone A, V, A99*
		With BFE or Depth *Zone AE, AO, AH, VE, AR*
	▨	Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD	■	0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
	▨	Future Conditions 1% Annual Chance Flood Hazard *Zone X*
	▨	Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
	▨	Area with Flood Risk due to Levee *Zone D*
OTHER AREAS	NO SCREEN	Area of Minimal Flood Hazard *Zone X*
	☐	Effective LOMRs
	■	Area of Undetermined Flood Hazard *Zone D*
GENERAL STRUCTURES	— — —	Channel, Culvert, or Storm Sewer
	IIIIIII	Levee, Dike, or Floodwall
OTHER FEATURES	B 20.2 17.5	Cross Sections with 1% Annual Chance Water Surface Elevation
	8 — —	Coastal Transect
	~~513~~	Base Flood Elevation Line (BFE)
	—	Limit of Study
	—	Jurisdiction Boundary
	--- ---	Coastal Transect Baseline
	- —	Profile Baseline
	—	Hydrographic Feature
MAP PANELS	☐	Digital Data Available
	☐	No Digital Data Available
	☒	Unmapped

N

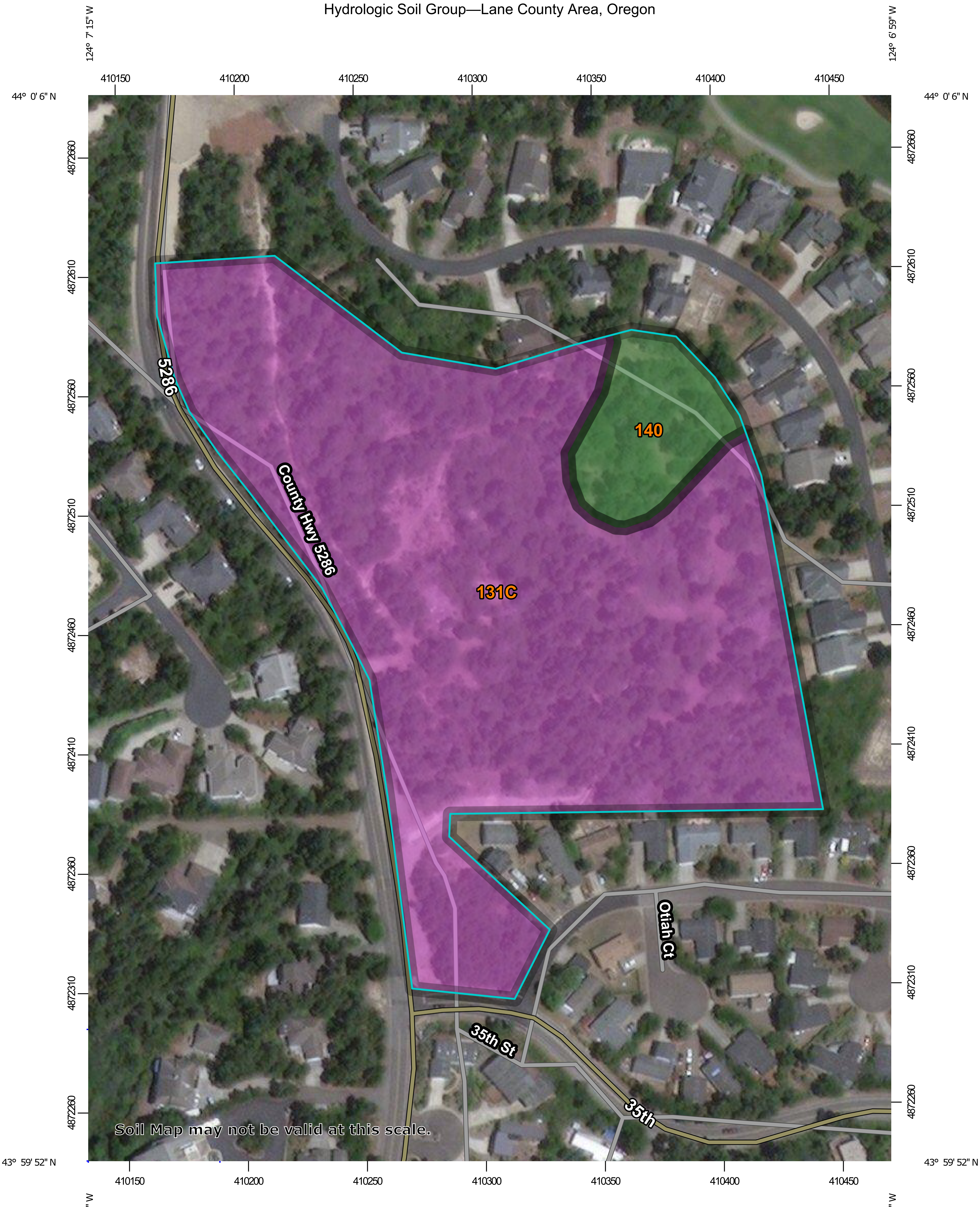
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

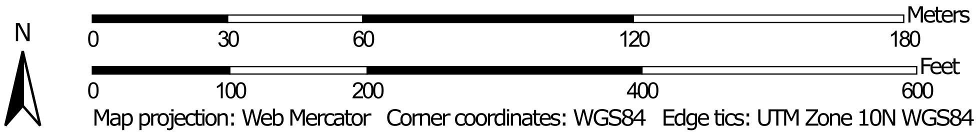
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/15/2020 at 4:43:03 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Hydrologic Soil Group—Lane County Area, Oregon



Map Scale: 1:2,170 if printed on A portrait (8.5" x 11") sheet.



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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
131C	Waldport fine sand, 0 to 12 percent slopes	A	10.2	91.3%
140	Yaquina loamy fine sand	A/D	1.0	8.7%
Totals for Area of Interest			**11.2**	**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.

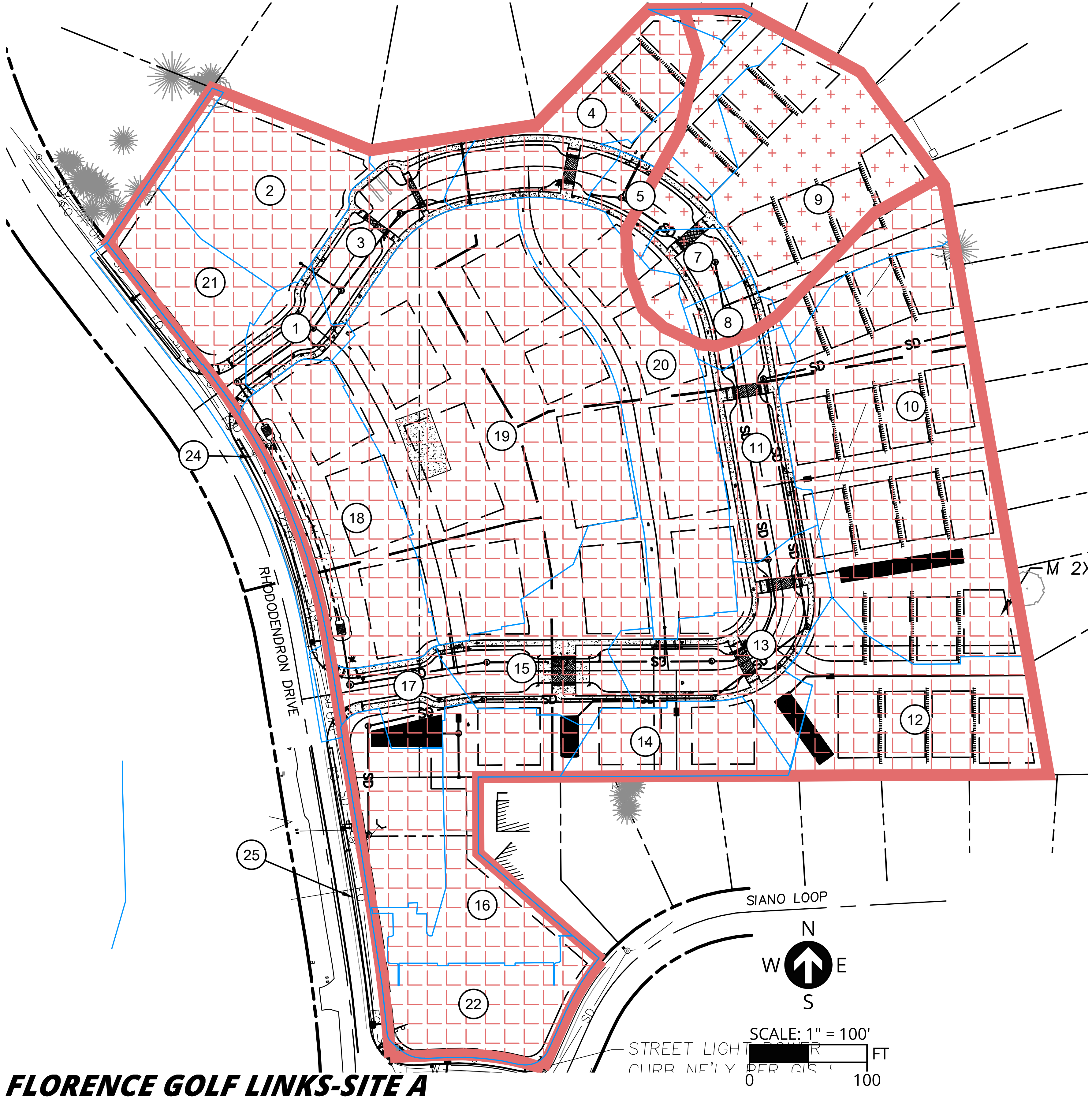
Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

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



LEGEND

▦ HYDROLOGIC 'A' SOIL GROUP: WALDPORT FINE SAND

✚ HYDROLOGIC 'D' SOIL GROUP: YAQUINA LOAMY FINE SAND

FLORENCE GOLF LINKS-SITE A

DECEMBER 2021

APIC FLORENCE HOLDINGS, LLC

POST-CONSTRUCTION CONDITIONS - HYDROLOGIC SOIL GROUP

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

Table A-2. Curve Numbers for Urban Areas

Cover type and hydrological condition	Average percent impervious area	Curve Numbers by Hydrologic Soil Group			
		A	B	C	D
Open Space (lawns, parks, golf courses, cemeteries, etc.):					
Poor condition (grass cover <50%)		68	79	86	89
Fair condition (grass cover 50-75%)		49	69	79	84
Good condition (grass cover >75%)		39	61	74	80
Impervious Area:					
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	93
Urban Districts:					
Commercial and business	85	85	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	82
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

Soil Conservation Service, Urban Hydrology for Small Watersheds, Technical Release 55, pp. 2.5-2.8, June 1986.

LENGEND

🟥 CONCRETE / ASPHALT

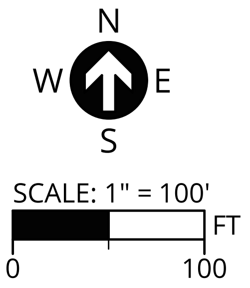
⇨ SURFACE RUN-OFF FLOW ARROW

- - - -200- - - - EXISTING MAJOR CONTOUR

·······201········ EXISTING MINOR CONTOUR

TOTAL SITE = 404,025 SF = 9.28 ACRES
IMPERVIOUS AREA = 1,674 SF = 0.04 ACRES
PERVIOUS AREA = 402,351 SF = 9.24 ACRES

CN = 39.7 (WOODS FAIR CONDITIONS, WEIGHTED BASED OF HSG)



RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT

09/16/2021

APIC FLORENCE HOLDINGS, LLC

EXISTING CONDITIONS

3J CONSULTING
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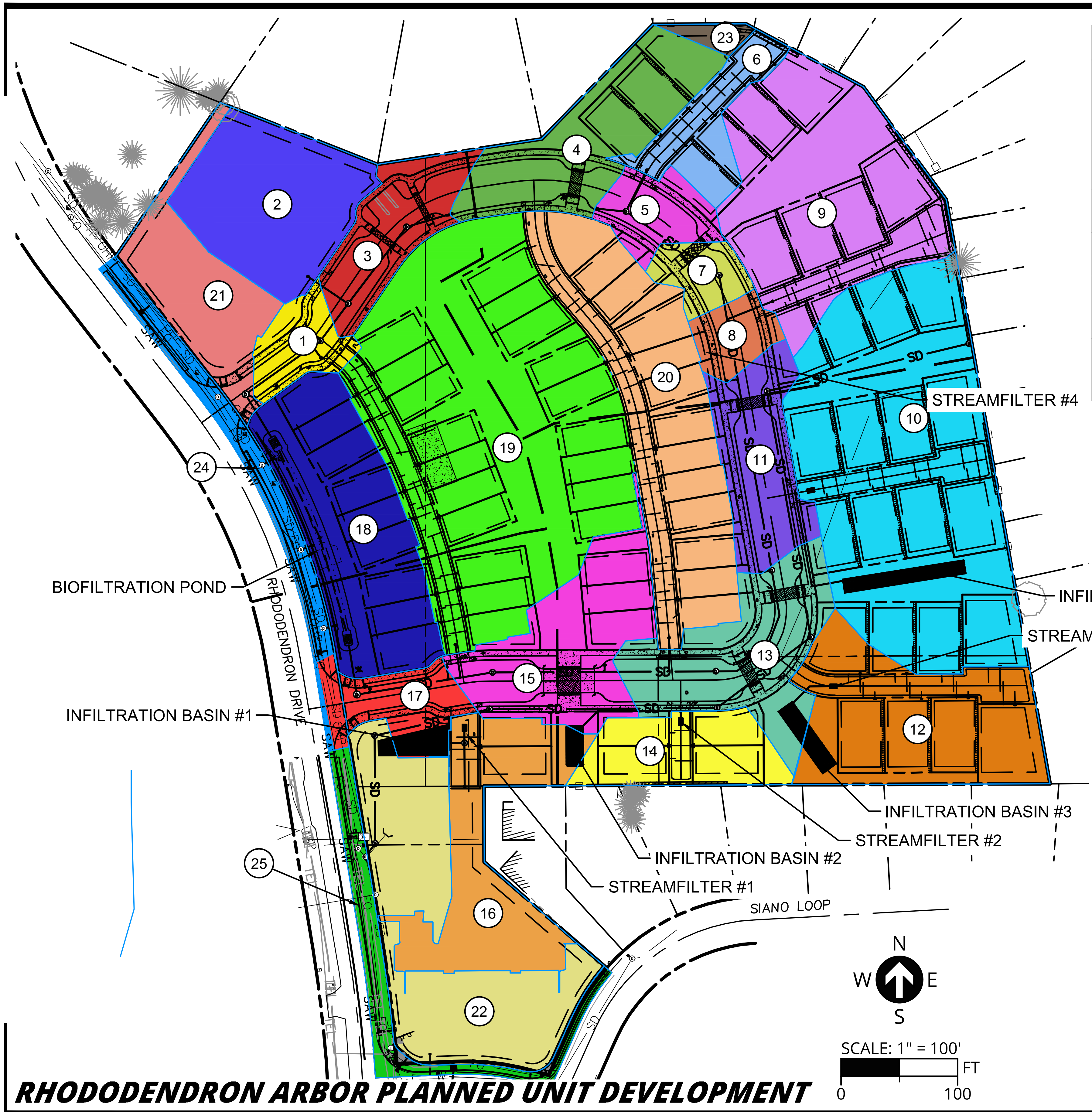

PROPOSED INFILTRATION FACILITIES

FACILITY	2,3CONCRETE / AC (SF)	2,3FUTURE CONCRETE / AC (SF)	1,3FUTURE ROOF AREA (SF)	RUNOFF VOLUME (CF)	REQUIRED AREA (SF)
BIOFILTRATION POND	73,922	26,000	0	42,134	2,410
INFILTRATION BASIN #1	1,410	8,421	4800	6,091	1,187
INFILTRATION BASIN #2	934	1,000	3,000	1,925	326
INFILTRATION BASIN #3	3,760	1,500	9,000	5,776	979
INFILTRATION BASIN #4	3,084	7,500	9,000	7,876	1,335

[1] DOES NOT REQUIRE TREATMENT.

[2] RUNOFF FROM CONCRETE AND AC WILL BE TREATED BEFORE BEING CONVEYED TO INFILTRATION BASINS.

[3] APPROXIMATE FUTURE BUILD OUT. FACILITIES SHALL BE ANALYZED PRIOR TO FUTURE CONSTRUCTION.

TOTAL SITE = 404,025 SF + 14,759 SF OFFSITE = 418,784 SF (9.62 AC)

IMPERVIOUS AREA DRAINING TO ONSITE BMPS	= 153,331 SF = 3.52 AC
IMPERVIOUS AREA DRAINING OFFSITE	= 14,759 SF = 0.34 AC
IMPERVIOUS AREA DRAINING TO FUTURE DRYWELLS	= 13,941 SF = 0.32 AC
PERVIOUS AREA	= 236,753 SF = 5.44 ACRES

RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT

DECEMBER 2021

APIC FLORENCE HOLDINGS, LLC

POST-CONSTRUCTION CONDITIONS

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RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT

APIC FLORENCE HOLDINGS, LLC

POST-CONSTRUCTION BASIN AREAS - FULL BUILD OUT

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09/16/2021

BASIN	TOTAL AREA (ACRES)	[1]IMPERVIOUS AREA (ACRES)	PERVIOUS AREA (ACRES)	[4]CN	TIME OF CONCENTRATION (MIN)	DRAINS TO	TREATMENT FACILITY	INFILTRATION FACILITY
①	0.12	0.09	0.03	49	5	SDCB-12	BIOFILTRATION POND	BIOFILTRATION POND
②	0.41	0.10	0.31	49	5	SDCB-14	BIOFILTRATION POND	BIOFILTRATION POND
③	0.22	0.18	0.04	49	5	SDCB-13	BIOFILTRATION POND	BIOFILTRATION POND
④	0.37	0.16	0.21	66.5	5	SDCB-15	BIOFILTRATION POND	BIOFILTRATION POND
⑤	0.13	0.10	0.03	84	5	SDCB-11	BIOFILTRATION POND	BIOFILTRATION POND
⑥	0.17	0.08	0.09	84	5	SDCB-10	BIOFILTRATION POND	BIOFILTRATION POND
⑦	0.09	0.07	0.02	84	5	SDCB-09	BIOFILTRATION POND	BIOFILTRATION POND
⑧	0.09	0.08	0.01	84	5	SDCB-07	BIOFILTRATION POND	BIOFILTRATION POND
⑨	0.71	0.19	0.52	84	5	SDCB-08	BIOFILTRATION POND	BIOFILTRATION POND
⑩	1.13	0.45	0.68	49	5	SDCB-19	STORMFILTER #4	INFILTRATION BASIN #4
⑪	0.26	0.19	0.07	49	5	SDCB-06	BIOFILTRATION POND	BIOFILTRATION POND
⑫	0.51	0.33	0.18	49	5	SDCB-18	STORMFILTER #3	INFILTRATION BASIN #3
⑬	0.39	0.24	0.15	49	5	SDCB-04	BIOFILTRATION POND	BIOFILTRATION POND
⑭	0.23	0.11	0.12	49	5	SDCB-17	STORMFILTER #2	INFILTRATION BASIN #2
⑮	0.40	0.12	0.28	49	5	SDCB-02	BIOFILTRATION POND	BIOFILTRATION POND
⑯	0.40	0.34	0.07	49	5	SDCB-16	STORMFILTER #1	INFILTRATION BASIN #1
⑰	0.17	0.12	0.05	49	5	SDCB-01	BIOFILTRATION POND	BIOFILTRATION POND
⑱	0.54	0.06	0.48	49	5	WQ BASIN #1	BIOFILTRATION POND	BIOFILTRATION POND
⑲	1.38	0.32	1.06	49	5	SDCB-03	BIOFILTRATION POND	BIOFILTRATION POND
⑳	0.66	0.17	0.49	49	5	SDCB-05	BIOFILTRATION POND	BIOFILTRATION POND
㉑	0.29	0.02	0.27	49	5	SDAD-02	BIOFILTRATION POND	BIOFILTRATION POND
㉒	0.57	0.32	0.25	49	5	[2]DRYWELLS	-	-
㉓	0.03	0.00	0.03	49	5	OFFSITE	OFFSITE	OFFSITE
㉔	0.17	0.17	0.00	49	5	[3]OFFSITE	-	-
㉕	0.17	0.17	0.00	49	5	[3]OFFSITE	-	-
[5]TOTAL	9.62	4.18	5.42	-	-		-	-

[1] IMPERVIOUS AREA INCLUDES ESTIMATED FUTURE IMPERVIOUS AREA.

[2] BASIN 22 IMPERVIOUS AREA IS ROOF DRAIN ONLY AND WILL DRAIN TO DRYWELLS TO BE CONSTRUCTED IN THE FUTURE.

[3] RUNOFF FROM BASINS WILL BE INTERCEPTED BY THE STORM SYSTEM IN ROW. PER THE CITY, THE ADDITIONAL IMPERVIOUS AREA SHOULD BE ACCOMMODATED IN THE EXISTING SYSTEM.

[4] REPRESENTS PERVIOUS CURVE NUMBER. IMPERVIOUS CURVE NUMBER = 98. THE AREAS WERE MODELED SEPARATELY WITHOUT UTILIZING A COMPOSITE CURVE NUMBER. BASIN 5 CN 50% 'A' SOILS & 50% 'D' SOILS.

[5] TOTALS MAY VARY SLIGHTLY DUE TO ROUNDING.

CALCULATIONS

BayFilter™ Configurator

StreamFilter #1

Easily configure custom BayFilter™ designs with a few simple clicks.

Structure

Type
○ Precast Vault
○ Manhole w/ External Bypass
StreamFilter Catch Basin

Design Method

Measurement System: Imperial

Design Parameter: Flow Rate

Treatment Flow: 0.04 cfs

System Elevations

Rim Elevation: 67.08 ft.

Outlet Elevation: 63.58 ft.

Drop from Inlet to Outlet: 42 in.

Is there a storage system upstream?
No
○ Yes

Sediment Load Check (optional)

Expand ⊞

Recommendation

Choose your BayFilter™ Series

Series 500
Series 500 is for Total Suspended Solids (TSS) and Phosphorus and utilizes EMC media.

Series 600
Series 600 is for enhanced metals treatment.

Recommended Model Type: BayFilter™ 522

Recommended filter based on largest filter to meet recommended drop without a weir.

Filter Model: BayFilter™ 522

Flow Rate: 22.5 gpm

✓ Minimum headwater depth achieved

Recommended Model	**CBF-3** View Drawing Email Results
# of Cartridges	1
Recommended Design Head	20 in.
Minimum Structure Height	28 in.
Dimensions	32 in. x 58.25 in.

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BaySaver Technologies
1030 Deer Hollow Drive
Mount Airy MD, 21771

info@baysaver.com
1-800-BAYSAVER (229-7283)

BayFilter™ Configurator

StreamFilter #2

Easily configure custom BayFilter™ designs with a few simple clicks.

Structure

Type	○ Precast Vault ○ Manhole w/ External Bypass StreamFilter Catch Basin

Design Method

Measurement System	Imperial
Design Parameter	Flow Rate
Treatment Flow	0.02 cfs

System Elevations

Rim Elevation	63.93 ft.
Outlet Elevation	60.43 ft.
Drop from Inlet to Outlet	42 in.

Is there a storage system upstream?

No

○ Yes

Sediment Load Check (optional)

Expand ⊞

Recommendation

Choose your BayFilter™ Series

Series 500

Series 500 is for Total Suspended Solids (TSS) and Phosphorus and utilizes EMC media.

Series 600

Series 600 is for enhanced metals treatment.

Recommended Model Type	BayFilter™ 522

Recommended filter based on largest filter to meet recommended drop without a weir.

Filter Model	BayFilter™ 522
Flow Rate	22.5 gpm

✓ Minimum headwater depth achieved

Recommended Model	**CBF-1** View Drawing Email Results
# of Cartridges	1
Recommended Design Head	20 in.
Minimum Structure Height	28 in.
Dimensions	32 in. x 58.25 in.

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BayFilter™ Configurator

StreamFilter #3

Easily configure custom BayFilter™ designs with a few simple clicks.

Structure

Type
- ○ Precast Vault
- ○ Manhole w/ External Bypass
- StreamFilter Catch Basin

Design Method

Measurement System	Imperial
Design Parameter	Flow Rate
Treatment Flow	0.01 cfs

System Elevations

Rim Elevation	62.57 ft.
Outlet Elevation	58.08 ft.
Drop from Inlet to Outlet	54 in.

Is there a storage system upstream?
- No
- ○ Yes

Sediment Load Check (optional)

Expand ⊞

Recommendation

Choose your BayFilter™ Series

Series 500

Series 500 is for Total Suspended Solids (TSS) and Phosphorus and utilizes EMC media.

Series 600

Series 600 is for enhanced metals treatment.

Recommended Model Type BayFilter™ 522

Recommended filter based on largest filter to meet recommended drop without a weir.

Filter Model	BayFilter™ 522
Flow Rate	22.5 gpm

✓ Minimum headwater depth achieved

Recommended Model	**CBF-1** View Drawing Email Results
# of Cartridges	1
Recommended Design Head	20 in.
Minimum Structure Height	28 in.
Dimensions	32 in. x 58.25 in.

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BayFilter™ Configurator

StreamFilter #4

Easily configure custom BayFilter™ designs with a few simple clicks.

Structure

Type
- ○ Precast Vault
- ○ Manhole w/ External Bypass
- StreamFilter Catch Basin

Design Method

Measurement System	Imperial
Design Parameter	Flow Rate
Treatment Flow	0.02 cfs

System Elevations

Rim Elevation	58.77 ft.
Outlet Elevation	56.13 ft.
Drop from Inlet to Outlet	32 in.

Is there a storage system upstream?
- No
- ○ Yes

Sediment Load Check (optional)

Expand ⊞

Recommendation

Choose your BayFilter™ Series

Series 500

Series 500 is for Total Suspended Solids (TSS) and Phosphorus and utilizes EMC media.

Series 600

Series 600 is for enhanced metals treatment.

Recommended Model Type	BayFilter™ 522

Recommended filter based on largest filter to meet recommended drop without a weir.

Filter Model	BayFilter™ 522
Flow Rate	22.5 gpm

✓ Minimum headwater depth achieved

Recommended Model	**CBF-1** View Drawing Email Results
# of Cartridges	1
Recommended Design Head	20 in.
Minimum Structure Height	28 in.
Dimensions	32 in. x 58.25 in.

ADS
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INFILTRATION BASIN DESIGN

PROJECT NAME	Florence Site A	**BY** KEF	**DATE** 12/10/2021
PROJECT NUMBER	19555	**FACILITY** Infiltration Basin #1	

Impervious Catchment Area

Impervious Area 14,631 sq ft

Volume from storm (V_s) 6,049 ft^3

Infiltration Calculation

Measured Infiltration Rate *i* 73.67 in/hr

Design Infiltration Rate I_D (SF=2) 6.00 in/hr

Drawdown Time (T) 10 hours

Storm Event Information

Return Period (yr)	25	Santa Barbara Unit Hydrograph (See 25-Year Runoff Rate Hydrograph)
24-hr precip. (in)	5.06	
Location	Florence	
Hydrologic Soil Group	A	

Infiltration Trench

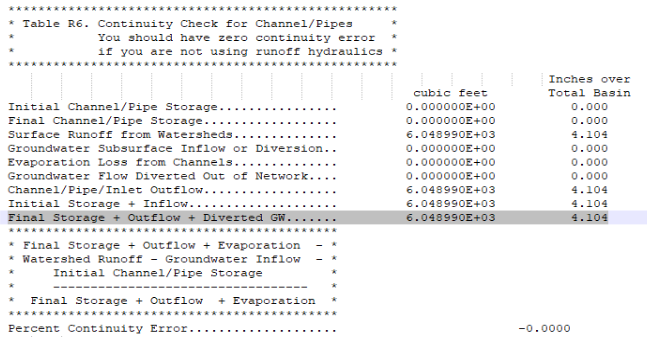
Length (L)	**100.0 ft**	
Width (W)	**10 ft**	$W = A_t/L$
Area (A_t)	See Calculation below	
Porosity (n)	0.3	
Depth (D)	3.0 **ft**	

Infiltration Volume (V_i) $V_i=V_s$

$$V_i = A_t * i * T * (1/12)$$

$$A_t = \frac{V_i}{((n*D)+I_D*T/12)} =$$ **1025 sq ft** **Bottom surface area required to infiltrate within required drawdown time.**

Volume of runoff computed in XPSTORM:



```
****************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
****************************************************
                                                          Inches over
                                           cubic feet     Total Basin
Initial Channel/Pipe Storage...............  0.000000E+00      0.000
Final Channel/Pipe Storage.................  0.000000E+00      0.000
Surface Runoff from Watersheds.............  6.048990E+03      4.104
Groundwater Subsurface Inflow or Diversion..  0.000000E+00      0.000
Evaporation Loss from Channels.............  0.000000E+00      0.000
Groundwater Flow Diverted Out of Network....  0.000000E+00      0.000
Channel/Pipe/Inlet Outflow.................  6.048990E+03      4.104
Initial Storage + Inflow...................  6.048990E+03      4.104
Final Storage + Outflow + Diverted GW.......  6.048990E+03      4.104
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ---------------------------------    *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error....................                -0.0000
```

INFILTRATION BASIN DESIGN

PROJECT NAME Florence Site A **BY** JBC **DATE** 12/10/2021
PROJECT NUMBER 19555 **FACILITY** Infiltration Basin #2

Impervious Catchment Area

Impervious Area 4,934 sq ft
Volume from storm (V_s) 1,925 ft^3

Infiltration Calculation

Measured Infiltration Rate *i* 73.67 in/hr
Design Infiltration Rate I_D (SF=2) 6.00 in/hr
Drawdown Time (T) 10 hours

Storm Event Information

Return Period (yr) 25 Santa Barbara Unit Hydrograph (See 25-Year Runoff Rate Hydrograph)
24-hr precip. (in) 5.06
Location Florence
Hydrologic Soil Group A

Infiltration Trench

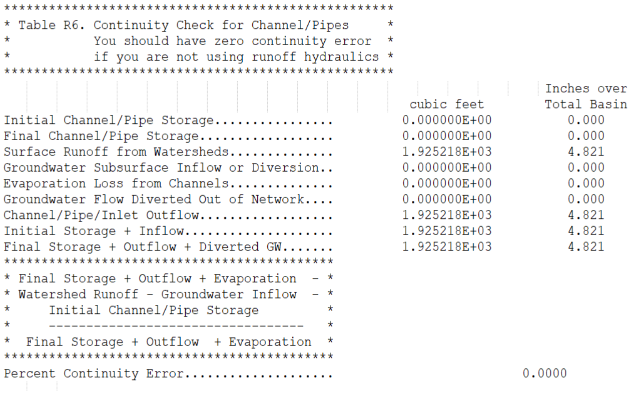
Length (L) **100.0 ft**
Width (W) **3 ft** $W = A_t/L$
Area (A_t) See Calculation below
Porosity (n) 0.3
Depth (D) 3.0 **ft**

Infiltration Volume (V_i) **$V_i=V_s$**

$$V_i = A_t * i * T * (1/12)$$

$$A_t = \frac{V_i}{((n*D)+I_D*T/12)} =$$ **326 sq ft** **Bottom surface area required to infiltrate within required drawdown time.**

Volume of runoff computed in XPSTORM:



```
****************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
****************************************************
                                                       Inches over
                                           cubic feet  Total Basin
Initial Channel/Pipe Storage................   0.000000E+00    0.000
Final Channel/Pipe Storage..................   0.000000E+00    0.000
Surface Runoff from Watersheds..............   1.925218E+03    4.821
Groundwater Subsurface Inflow or Diversion..   0.000000E+00    0.000
Evaporation Loss from Channels..............   0.000000E+00    0.000
Groundwater Flow Diverted Out of Network....   0.000000E+00    0.000
Channel/Pipe/Inlet Outflow..................   1.925218E+03    4.821
Initial Storage + Inflow....................   1.925218E+03    4.821
Final Storage + Outflow + Diverted GW.......   1.925218E+03    4.821
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ----------------------------------   *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error....................                0.0000
```

3J CONSULTING
CIVIL ENGINEERING | WATER RESOURCES | COMMUNITY PLANNING

INFILTRATION BASIN DESIGN

PROJECT NAME	Florence Site A	**BY** JBC	**DATE** 12/10/2021
PROJECT NUMBER	19555	**FACILITY** Infiltration Basin #3	

Impervious Catchment Area

Impervious Area	14,260 sq ft
Volume from storm (V_s)	5,776 ft^3

Infiltration Calculation

Measured Infiltration Rate *i*	73.67 in/hr
Design Infiltration Rate I_D (SF=2)	6.00 in/hr
Drawdown Time (T)	10 hours

Storm Event Information

Return Period (yr)	25	Santa Barbara Unit Hydrograph (See 25-Year Runoff Rate Hydrograph)
24-hr precip. (in)	5.06	
Location	Florence	
Hydrologic Soil Group	A	

Infiltration Trench

Length (L)	**50.0 ft**	
Width (W)	**20 ft**	$W = A_t/L$
Area (A_t)	See Calculation below	
Porosity (n)	0.3	
Depth (D)	3.0 **ft**	

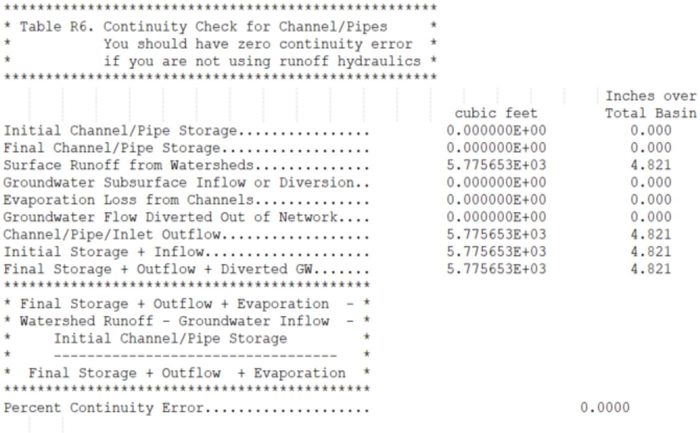
Infiltration Volume (V_i) $V_i=V_s$

$$V_i = A_t * i * T * (1/12)$$

$$A_t = \frac{V_i}{((n*D)+I_D*T/12)} = \quad 979 \text{ sq ft}$$

Bottom surface area required to infiltrate within required drawdown time.

Volume of runoff computed in XPSTORM:



```
*****************************************************
* Table R6. Continuity Check for Channel/Pipes      *
*           You should have zero continuity error   *
*           if you are not using runoff hydraulics  *
*****************************************************
                                                          Inches over
                                           cubic feet     Total Basin
Initial Channel/Pipe Storage...............  0.000000E+00     0.000
Final Channel/Pipe Storage.................  0.000000E+00     0.000
Surface Runoff from Watersheds.............  5.775653E+03     4.821
Groundwater Subsurface Inflow or Diversion..  0.000000E+00     0.000
Evaporation Loss from Channels.............  0.000000E+00     0.000
Groundwater Flow Diverted Out of Network....  0.000000E+00     0.000
Channel/Pipe/Inlet Outflow.................  5.775653E+03     4.821
Initial Storage + Inflow...................  5.775653E+03     4.821
Final Storage + Outflow + Diverted GW.......  5.775653E+03     4.821
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     ----------------------------------   *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error...................                0.0000
```

INFILTRATION BASIN DESIGN

PROJECT NAME Florence Site A **BY** JBC **DATE** 12/10/2021
PROJECT NUMBER 19555 **FACILITY** Infiltration Basin #4

Impervious Catchment Area

Impervious Area 19,584 sq ft
Volume from storm (V_s) 7,876 ft^3

Infiltration Calculation

Measured Infiltration Rate *i* 73.67 in/hr
Design Infiltration Rate I_D (SF=2) 6.00 in/hr
Drawdown Time (T) 10 hours

Storm Event Information

Return Period (yr)	25	Santa Barbara Unit Hydrograph (See 25-Year Runoff Rate Hydrograph)
24-hr precip. (in)	5.06	
Location	Florence	
Hydrologic Soil Group	A	

Infiltration Trench

Length (L)	**50.0 ft**	
Width (W)	**27 ft**	$W = A_t/L$
Area (A_t)	See Calculation below	
Porosity (n)	0.3	
Depth (D)	3.0 **ft**	

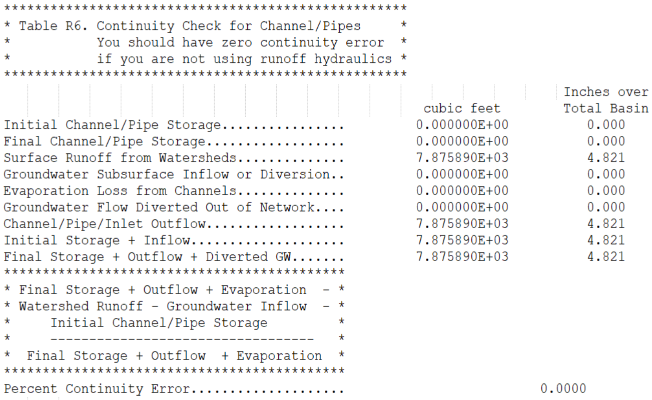
Infiltration Volume (V_i) **$V_i=V_s$**

$$V_i = A_t * i * T * (1/12)$$

$$A_t = \frac{V_i}{((n*D)+I_D*T/12)} =$$ **1335 sq ft**

Bottom surface area required to infiltrate within required drawdown time.

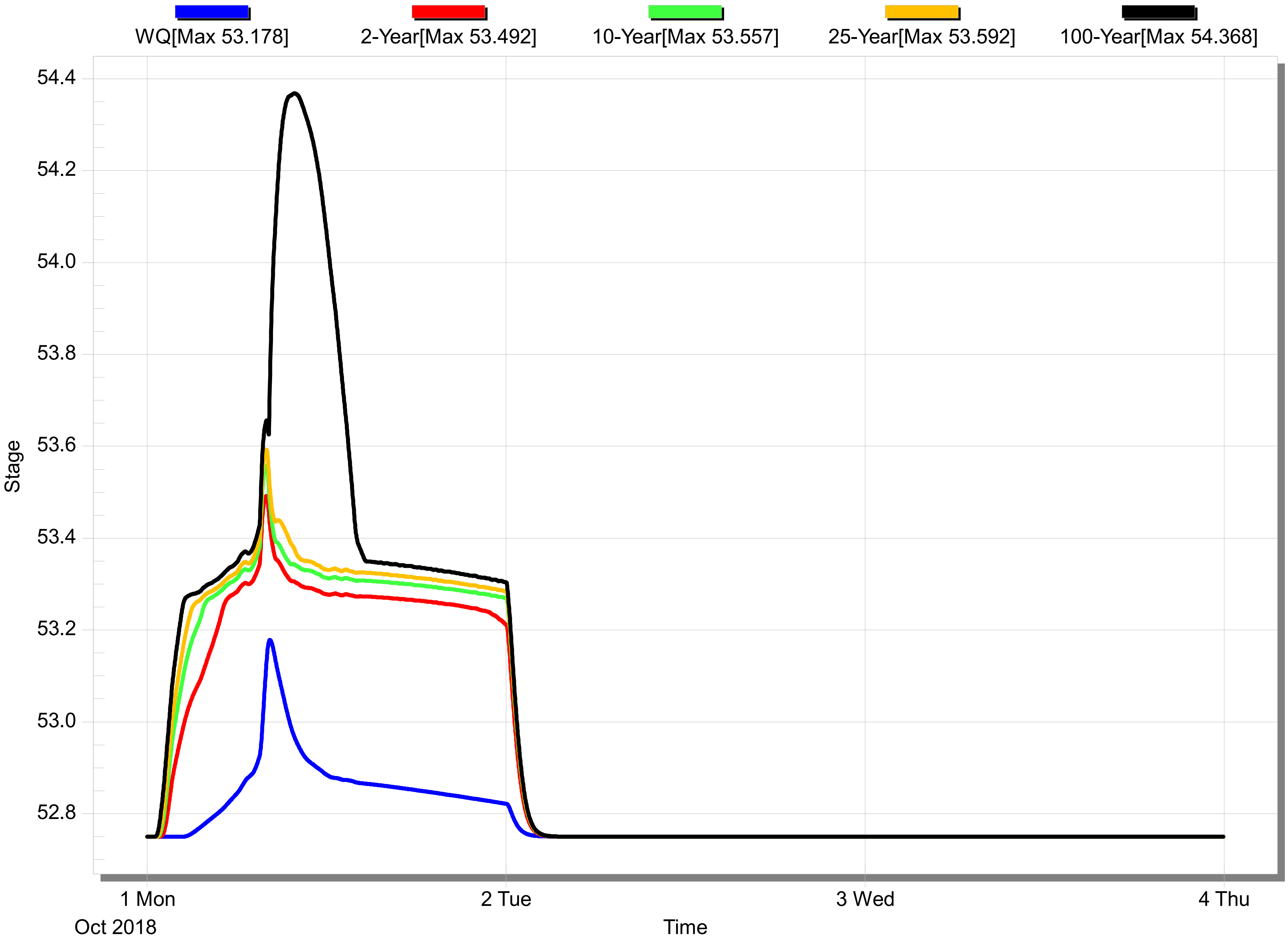
Volume of runoff computed in XPSTORM:



```
****************************************************
* Table R6. Continuity Check for Channel/Pipes     *
*           You should have zero continuity error  *
*           if you are not using runoff hydraulics *
****************************************************
                                                                        Inches over
                                                      cubic feet        Total Basin
Initial Channel/Pipe Storage................         0.000000E+00          0.000
Final Channel/Pipe Storage..................         0.000000E+00          0.000
Surface Runoff from Watersheds..............         7.875890E+03          4.821
Groundwater Subsurface Inflow or Diversion..         0.000000E+00          0.000
Evaporation Loss from Channels..............         0.000000E+00          0.000
Groundwater Flow Diverted Out of Network....         0.000000E+00          0.000
Channel/Pipe/Inlet Outflow..................         7.875890E+03          4.821
Initial Storage + Inflow....................         7.875890E+03          4.821
Final Storage + Outflow + Diverted GW.......         7.875890E+03          4.821
********************************************
* Final Storage + Outflow + Evaporation  - *
* Watershed Runoff - Groundwater Inflow  - *
*     Initial Channel/Pipe Storage         *
*     -----------------------------------  *
*  Final Storage + Outflow  + Evaporation  *
********************************************
Percent Continuity Error....................                         0.0000
```

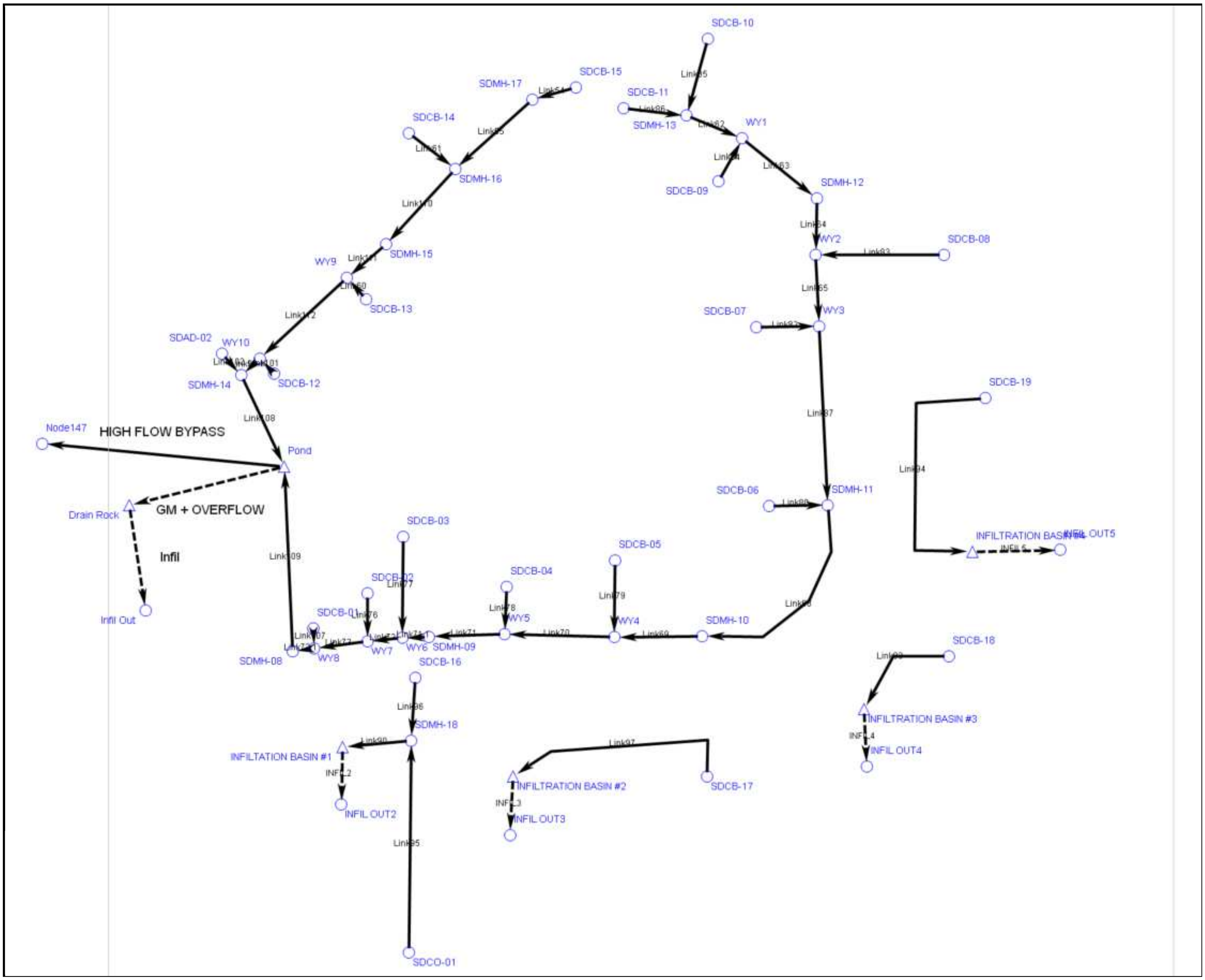
HYDROGRAPHS

BIOFILTRATION POND
STAGE AND STORAGE



XPSTORM OUTPUT

XPSTORM HYDRAULIC LAYOUT - ONSITE



XPSTORM-RUNOFF DATA PROPOSED - WQ - STORM EVENT

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-15	0.16	100	98	5	0.83	0.83	0.00	0.03
	0.21	0	67	5				
SDCB-12	0.09	100	98	5	0.83	0.83	0.00	0.02
	0.03	0	49	5				
SDCB-13	0.18	100	98	5	0.83	0.83	0.00	0.03
	0.04	0	49	5				
SDCB-14	0.1	100	98	5	0.83	0.83	0.00	0.02
	0.31	0	49	5				
SDCB-02	0.12	100	98	5	0.83	0.83	0.00	0.02
	0.28	0	49	5				
SDCB-03	0.27	100	98	5	0.83	0.83	0.00	0.04
	1.11	0	49	5				
SDCB-04	0.24	100	98	5	0.83	0.83	0.00	0.04
	0.15	0	49	5				
SDCB-05	0.17	100	98	5	0.83	0.83	0.00	0.03
	0.49	0	49	5				
SDCB-06	0.19	100	98	5	0.83	0.83	0.00	0.03
	0.07	0	49	5				
SDCB-07	0.08	100	98	5	0.83	0.744	0.09	0.01
	0.01	0	84	5				
SDCB-08	0.19	100	98	5	0.83	0.744	0.09	0.03
	0.52	0	84	5				
SDCB-09	0.07	100	98	5	0.83	0.744	0.09	0.01
	0.02	0	84	5				
SDCB-10	0.08	100	98	5	0.83	0.744	0.09	0.01
	0.09	0	84	5				
SDCB-11	0.1	100	98	5	0.83	0.744	0.09	0.02
	0.03	0	84	5				
WQ BASIN 1	0.06	100	98	5	0.83	0.83	0.00	0.01
	0.48	0	49	5				
SDAD-02	0.02	100	98	5	0.83	0.83	0.00	0.00
	0.27	0	49	5				
SDCB-01	0.12	100	98	5	0.83	0.83	0.00	0.02
	0.05	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 2 YR - STORM EVENT

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-15	0.16	100	98	5	3.46	2.657	0.80	0.15
	0.21	0	67	5				
SDCB-12	0.09	100	98	5	3.46	3.299	0.16	0.07
	0.03	0	49	5				
SDCB-13	0.18	100	98	5	3.46	3.299	0.16	0.15
	0.04	0	49	5				
SDCB-14	0.1	100	98	5	3.46	3.299	0.16	0.08
	0.31	0	49	5				
SDCB-02	0.12	100	98	5	3.46	3.299	0.16	0.10
	0.28	0	49	5				
SDCB-03	0.27	100	98	5	3.46	3.299	0.16	0.22
	1.11	0	49	5				
SDCB-04	0.24	100	98	5	3.46	3.299	0.16	0.19
	0.15	0	49	5				
SDCB-05	0.17	100	98	5	3.46	3.299	0.16	0.14
	0.49	0	49	5				
SDCB-06	0.19	100	98	5	3.46	3.299	0.16	0.15
	0.07	0	49	5				
SDCB-07	0.08	100	98	5	3.46	1.558	1.90	0.07
	0.01	0	84	5				
SDCB-08	0.19	100	98	5	3.46	1.558	1.90	0.39
	0.52	0	84	5				
SDCB-09	0.07	100	98	5	3.46	1.558	1.90	0.07
	0.02	0	84	5				
SDCB-10	0.08	100	98	5	3.46	1.558	1.90	0.11
	0.09	0	84	5				
SDCB-11	0.1	100	98	5	3.46	1.558	1.90	0.10
	0.03	0	84	5				
WQ BASIN 1	0.06	100	98	5	3.46	3.299	0.16	0.05
	0.48	0	49	5				
SDAD-02	0.02	100	98	5	3.46	3.299	0.16	0.02
	0.27	0	49	5				
SDCB-01	0.12	100	98	5	3.46	3.299	0.16	0.10
	0.05	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 10 YR - STORM EVENT

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-15	0.16	100	98	5	4.48	3.064	1.42	0.22
	0.21	0	67	5				
SDCB-12	0.09	100	98	5	4.48	4.031	0.45	0.10
	0.03	0	49	5				
SDCB-13	0.18	100	98	5	4.48	4.031	0.45	0.19
	0.04	0	49	5				
SDCB-14	0.1	100	98	5	4.48	4.031	0.45	0.11
	0.31	0	49	5				
SDCB-02	0.12	100	98	5	4.48	4.031	0.45	0.13
	0.28	0	49	5				
SDCB-03	0.27	100	98	5	4.48	4.031	0.45	0.29
	1.11	0	49	5				
SDCB-04	0.24	100	98	5	4.48	4.031	0.45	0.25
	0.15	0	49	5				
SDCB-05	0.17	100	98	5	4.48	4.031	0.45	0.18
	0.49	0	49	5				
SDCB-06	0.19	100	98	5	4.48	4.031	0.45	0.20
	0.07	0	49	5				
SDCB-07	0.08	100	98	5	4.48	1.682	2.80	0.09
	0.01	0	84	5				
SDCB-08	0.19	100	98	5	4.48	1.682	2.80	0.56
	0.52	0	84	5				
SDCB-09	0.07	100	98	5	4.48	1.682	2.80	0.09
	0.02	0	84	5				
SDCB-10	0.08	100	98	5	4.48	1.682	2.80	0.15
	0.09	0	84	5				
SDCB-11	0.1	100	98	5	4.48	1.682	2.80	0.13
	0.03	0	84	5				
WQ BASIN 1	0.06	100	98	5	4.48	4.031	0.45	0.06
	0.48	0	49	5				
SDAD-02	0.02	100	98	5	4.48	4.031	0.45	0.02
	0.27	0	49	5				
SDCB-01	0.12	100	98	5	4.48	4.031	0.45	0.13
	0.05	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-15	0.16	100	98	5	5.06	3.254	1.81	0.26
	0.21	0	67	5				
SDCB-12	0.09	100	98	5	5.06	4.398	0.66	0.11
	0.03	0	49	5				
SDCB-13	0.18	100	98	5	5.06	4.398	0.66	0.22
	0.04	0	49	5				
SDCB-14	0.1	100	98	5	5.06	4.398	0.66	0.12
	0.31	0	49	5				
SDCB-02	0.12	100	98	5	5.06	4.398	0.66	0.14
	0.28	0	49	5				
SDCB-03	0.27	100	98	5	5.06	4.398	0.66	0.32
	1.11	0	49	5				
SDCB-04	0.24	100	98	5	5.06	4.398	0.66	0.29
	0.15	0	49	5				
SDCB-05	0.17	100	98	5	5.06	4.398	0.66	0.20
	0.49	0	49	5				
SDCB-06	0.19	100	98	5	5.06	4.398	0.66	0.23
	0.07	0	49	5				
SDCB-07	0.08	100	98	5	5.06	1.736	3.32	0.10
	0.01	0	84	5				
SDCB-08	0.19	100	98	5	5.06	1.736	3.32	0.66
	0.52	0	84	5				
SDCB-09	0.07	100	98	5	5.06	1.736	3.32	0.10
	0.02	0	84	5				
SDCB-10	0.08	100	98	5	5.06	1.736	3.32	0.17
	0.09	0	84	5				
SDCB-11	0.1	100	98	5	5.06	1.736	3.32	0.15
	0.03	0	84	5				
WQ BASIN 1	0.06	100	98	5	5.06	4.398	0.66	0.07
	0.48	0	49	5				
SDAD-02	0.02	100	98	5	5.06	4.398	0.66	0.02
	0.27	0	49	5				
SDCB-01	0.12	100	98	5	5.06	4.398	0.66	0.14
	0.05	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-15	0.16	100	98	5	5.95	3.503	2.45	0.33
	0.21	0	67	5				
SDCB-12	0.09	100	98	5	5.95	4.902	1.05	0.13
	0.03	0	49	5				
SDCB-13	0.18	100	98	5	5.95	4.902	1.05	0.26
	0.04	0	49	5				
SDCB-14	0.1	100	98	5	5.95	4.902	1.05	0.16
	0.31	0	49	5				
SDCB-02	0.12	100	98	5	5.95	4.902	1.05	0.19
	0.28	0	49	5				
SDCB-03	0.27	100	98	5	5.95	4.902	1.05	0.46
	1.11	0	49	5				
SDCB-04	0.24	100	98	5	5.95	4.902	1.05	0.35
	0.15	0	49	5				
SDCB-05	0.17	100	98	5	5.95	4.902	1.05	0.27
	0.49	0	49	5				
SDCB-06	0.19	100	98	5	5.95	4.902	1.05	0.27
	0.07	0	49	5				
SDCB-07	0.08	100	98	5	5.95	1.802	4.15	0.12
	0.01	0	84	5				
SDCB-08	0.19	100	98	5	5.95	1.802	4.15	0.82
	0.52	0	84	5				
SDCB-09	0.07	100	98	5	5.95	1.802	4.15	0.12
	0.02	0	84	5				
SDCB-10	0.08	100	98	5	5.95	1.802	4.15	0.21
	0.09	0	84	5				
SDCB-11	0.1	100	98	5	5.95	1.802	4.15	0.17
	0.03	0	84	5				
WQ BASIN 1	0.06	100	98	5	5.95	4.902	1.05	0.12
	0.48	0	49	5				
SDAD-02	0.02	100	98	5	5.95	4.902	1.05	0.05
	0.27	0	49	5				
SDCB-01	0.12	100	98	5	5.95	4.902	1.05	0.17
	0.05	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - WQ - STORM EVENT

INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCO-01	0.11	100	98	5	0.83	0	0.63	0.02
SDCB-16	0.226	100	98	5	0.83	0.83	0.00	0.04
	0.07	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 2 YR - STORM EVENT

INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCO-01	0.11	100	98	5	3.46	0	3.23	0.09
SDCB-16	0.226	100	98	5	3.46	3.30	0.16	0.18
	0.07	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 10 YR - STORM EVENT

INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCO-01	0.11	100	98	5	4.48	0	4.24	0.12
SDCB-16	0.226	100	98	5	4.48	4.03	0.45	0.24
	0.07	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCO-01	0.11	100	98	5	5.06	0	4.82	0.13
SDCB-16	0.226	100	98	5	5.06	4.40	0.66	0.27
	0.07	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCO-01	0.11	100	98	5	5.95	0	5.71	0.16
SDCB-16	0.226	100	98	5	5.95	4.90	1.05	0.32
	0.07	0	49	5				

XPSTORM-RUNOFF DATA PROPOSED - WQ - STORM EVENT

INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-17	0.04	100	98	5	0.83	0.83	0.00	0.01
	0.11	0	49	5				
INFILTRATION BASIN #2	0.07	100	98	5	0.83	0	0.63	0.01

XPSTORM-RUNOFF DATA PROPOSED - 10 YR - STORM EVENT

INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-17	0.04	100	98	5	4.48	4.031	0.45	0.05
	0.11	0	49	5				
INFILTRATION BASIN #2	0.07	100	98	5	4.48	0	4.24	0.07

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-17	0.04	100	98	5	5.95	4.902	1.05	0.06
	0.11	0	49	5				
INFILTRATION BASIN #2	0.07	100	98	5	5.95	0	5.71	0.10

XPSTORM-RUNOFF DATA PROPOSED - 2 YR - STORM EVENT

INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-17	0.04	100	98	5	`	3.299	0.16	0.04
	0.11	0	49	5				
INFILTRATION BASIN #2	0.07	100	98	5	3.46	0	3.23	0.06

XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-17	0.04	100	98	5	5.06	4.398	0.66	0.05
	0.11	0	49	5				
INFILTRATION BASIN #2	0.07	100	98	5	5.06	0	4.82	0.08

XPSTORM-RUNOFF DATA PROPOSED - WQ - STORM EVENT

INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-18	0.12	100	98	5	0.83	0.83	0.00	0.02
	0.19	0	49	5				
INFILTRATION BASIN #3	0.21	100	98	5	0.83	0	0.63	0.03

XPSTORM-RUNOFF DATA PROPOSED - 2 YR - STORM EVENT

INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-18	0.12	100	98	5	3.46	3.30	0.16	0.10
	0.19	0	49	5				
INFILTRATION BASIN #3	0.21	100	98	5	3.46	0	3.23	0.17

XPSTORM-RUNOFF DATA PROPOSED - 10 YR - STORM EVENT

INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-18	0.12	100	98	5	4.48	4.03	0.45	0.13
	0.19	0	49	5				
INFILTRATION BASIN #3	0.21	100	98	5	4.48	0	4.24	0.22

XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-18	0.12	100	98	5	5.06	4.40	0.66	0.14
	0.19	0	49	5				
INFILTRATION BASIN #3	0.21	100	98	5	5.06	0	4.82	0.25

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-18	0.12	100	98	5	5.95	4.90	1.05	0.18
	0.19	0	49	5				
INFILTRATION BASIN #3	0.21	100	98	5	5.95	0	5.71	0.29

XPSTORM-RUNOFF DATA PROPOSED - WQ - STORM EVENT

INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-19	0.24	100	98	5	0.83	0.83	0.00	0.04
	0.68	0	49	5				
INFILTRATION BASIN #4	0.21	100	98	5	0.83	0	0.63	0.03

XPSTORM-RUNOFF DATA PROPOSED - 2 YR - STORM EVENT

INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-19	0.24	100	98	5	3.46	3.299	0.16	0.20
	0.68	0	49	5				
INFILTRATION BASIN #4	0.21	100	98	5	3.46	0	3.23	0.17

XPSTORM-RUNOFF DATA PROPOSED - 10 YR - STORM EVENT

INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-19	0.24	100	98	5	4.48	4.031	0.45	0.26
	0.68	0	49	5				
INFILTRATION BASIN #4	0.21	100	98	5	4.48	0	4.24	0.22

XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-19	0.24	100	98	5	5.06	4.398	0.66	0.29
	0.68	0	49	5				
INFILTRATION BASIN #4	0.21	100	98	5	5.06	0	4.82	0.25

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDCB-19	0.24	100	98	5	5.95	4.902	1.05	0.39
	0.68	0	49	5				
INFILTRATION BASIN #4	0.21	100	98	5	5.95	0	5.71	0.29

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (WQ STORM EVENT)

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link54	SDCB-15	SDMH-17	1.00	39.36	4.6	7.81	0.00	0.03	2.25	0.05	0.05	64.13	63.74	60.63	58.74	3.46	4.95	60.67	58.79
Link55	SDMH-17	SDMH-16	1.00	82.73	3.0	6.19	0.00	0.03	1.92	0.05	0.05	63.74	62.14	58.74	56.14	4.95	5.93	58.79	56.21
Link110	SDMH-16	SDMH-15	1.00	39.91	1.9	4.88	0.01	0.04	7.31	0.07	0.07	62.14	61.29	56.14	55.29	5.93	5.92	56.21	55.37
Link112	WY9	WY10	1.00	64.79	0.7	3.00	0.02	0.07	1.49	0.12	0.12	61.15	59.73	55.23	54.77	5.81	4.84	55.34	54.89
Link101	SDCB-12	WY10	1.00	5.36	25.0	17.81	0.00	0.02	5.02	0.12	0.12	59.61	59.73	56.11	54.77	3.48	4.84	56.13	54.89
Link60	SDCB-13	WY9	1.00	13.08	16.4	14.41	0.00	0.03	1.18	0.11	0.11	60.87	61.15	57.37	55.23	3.47	5.81	57.40	55.34
Link61	SDCB-14	SDMH-16	1.00	41.50	0.5	2.53	0.01	0.02	0.90	0.06	0.06	63.27	62.14	56.45	56.14	6.76	5.93	56.51	56.21
Link62	SDMH-13	WY1	1.00	40.00	0.5	2.58	0.01	0.03	1.04	0.09	0.09	67.59	68.46	62.59	62.38	4.94	5.99	62.65	62.47
Link63	WY1	SDMH-12	1.00	54.00	0.5	2.52	0.02	0.04	1.75	0.09	0.09	68.46	69.78	62.38	62.01	5.99	7.69	62.47	62.09
Link64	SDMH-12	WY2	1.00	38.10	0.6	2.83	0.01	0.04	2.20	0.10	0.10	69.78	69.63	62.01	61.77	7.69	7.76	62.09	61.87
Link65	WY2	WY3	1.00	52.38	0.6	2.83	0.03	0.07	2.83	0.12	0.12	69.63	68.63	61.77	61.44	7.76	7.07	61.87	61.56
Link87	WY3	SDMH-11	1.00	165.08	0.6	2.83	0.03	0.08	2.20	0.12	0.12	68.63	65.30	61.44	60.30	7.07	4.90	61.56	60.40
Link68	SDMH-11	SDMH-10	1.00	120.00	2.1	5.16	0.02	0.11	2.67	0.10	0.10	65.30	62.68	60.30	57.68	4.90	4.89	60.40	57.79
Link69	SDMH-10	WY4	1.00	39.89	1.8	4.82	0.02	0.11	3.39	0.12	0.12	62.68	61.88	57.68	56.95	4.89	4.81	57.79	57.07
Link70	WY4	WY5	1.00	47.54	1.8	4.82	0.03	0.14	2.50	0.13	0.13	61.88	60.94	56.95	56.08	4.81	4.73	57.07	56.21
Link71	WY5	SDMH-09	1.00	104.37	1.8	4.82	0.04	0.18	2.92	0.13	0.13	60.94	59.07	56.08	54.07	4.73	4.84	56.21	54.23
Link72	WY6	WY7	1.00	9.30	0.9	3.30	0.07	0.22	2.33	0.18	0.18	58.58	58.39	53.83	53.75	4.57	4.46	54.01	53.93
Link73	WY7	WY8	1.00	68.61	0.9	3.30	0.07	0.24	3.47	0.19	0.19	58.39	57.22	53.75	53.16	4.46	3.87	53.93	53.35
Link109	SDMH-08	WQ BASIN 1	1.00	52.00	0.5	2.52	0.10	0.26	2.58	0.43	0.43	57.22	56.00	53.01	52.75	3.99	2.82	53.23	53.18
Link76	SDCB-02	WY7	1.00	12.64	7.0	9.45	0.00	0.02	0.66	0.18	0.18	58.14	58.39	54.64	53.75	3.47	4.46	54.67	53.93
Link77	SDCB-03	WY6	1.00	28.00	4.5	7.65	0.01	0.04	11.24	0.18	0.18	58.62	58.58	55.12	53.83	3.45	4.57	55.17	54.01
Link78	SDCB-04	WY5	1.00	10.55	10.7	11.66	0.00	0.04	25.12	0.13	0.13	60.71	60.94	57.21	56.08	3.46	4.73	57.25	56.21
Link79	SDCB-05	WY4	1.00	29.00	4.8	7.77	0.00	0.03	0.94	0.12	0.12	61.83	61.88	58.33	56.95	3.46	4.81	58.37	57.07
Link80	SDCB-06	SDMH-11	1.00	10.55	11.1	11.86	0.00	0.03	5.48	0.04	0.04	65.07	65.30	61.57	60.30	3.46	4.90	61.61	60.40
Link82	SDCB-07	WY3	1.00	10.55	32.8	20.40	0.00	0.01	11.14	0.12	0.12	68.40	68.63	64.90	61.44	3.49	7.07	64.92	61.56
Link83	SDCB-08	WY2	1.00	42.00	11.5	12.04	0.00	0.03	1.26	0.10	0.10	70.07	69.63	66.57	61.77	3.46	7.76	66.61	61.87
Link84	SDCB-09	WY1	1.00	7.82	31.6	20.02	0.00	0.01	3.36	0.09	0.09	68.35	68.46	64.85	62.38	3.49	5.99	64.86	62.47
Link85	SDCB-10	SDMH-13	1.00	40.00	5.8	8.58	0.00	0.01	3.98	0.03	0.03	68.51	67.59	65.01	62.59	3.47	4.94	65.04	62.65
Link86	SDCB-11	SDMH-13	1.00	26.27	2.7	6.22	0.00	0.02	1.11	0.06	0.06	66.89	67.59	63.39	62.59	3.46	4.94	63.43	62.65
HIGH FLOW BYPASS	WQ BASIN 1	Node147	1.00	11.06	3.3	6.52	0.00	0.00	0.00	0.00	0.00	56.00	59.64	52.75	54.27	2.82	5.37	53.18	54.27
Link108	SDMH-14	WQ BASIN 1	1.00	48.00	2.8	5.95	0.02	0.09	2.74	0.09	0.09	59.59	56.00	54.59	52.75	4.91	2.82	54.68	53.18
Link98.1	WY10	SDMH-14	1.00	11.27	0.7	3.00	0.03	0.09	1.68	0.12	0.12	59.73	59.59	54.77	54.59	4.84	4.91	54.89	54.68
Link102	SDAD-02	SDMH-14	1.00	30.00	5.5	8.38	0.00	0.00	3.45	0.02	0.02	59.85	59.59	56.35	54.59	3.48	4.91	56.37	54.68
Link71.1	SDMH-09	WY6	1.00	27.91	0.9	3.30	0.05	0.18	2.09	0.18	0.18	59.07	58.58	54.07	53.83	4.84	4.57	54.23	54.01
Link73.1	WY8	SDMH-08	1.00	11.63	0.9	3.30	0.08	0.26	3.00	0.19	0.19	57.22	57.22	53.16	53.01	3.87	3.99	53.35	53.23
Link107	SDCB-01	WY8	1.00	4.61	10.9	10.45	0.00	0.02	0.69	0.19	0.19	57.12	57.22	53.62	53.16	3.47	3.87	53.65	53.35
Link111	SDMH-15	WY9	1.00	8.45	0.7	3.00	0.01	0.04	1.13	0.11	0.11	61.29	61.15	55.29	55.23	5.92	5.81	55.37	55.34

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (2-YR STORM EVENT)

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link54	SDCB-15	SDMH-17	1.00	39.36	4.6	7.81	0.02	0.15	3.55	0.11	0.11	64.13	63.74	60.63	58.74	3.40	4.89	60.73	58.85
Link55	SDMH-17	SDMH-16	1.00	82.73	3.0	6.19	0.02	0.15	3.29	0.11	0.11	63.74	62.14	58.74	56.14	4.89	5.85	58.85	56.29
Link110	SDMH-16	SDMH-15	1.00	39.91	1.9	4.88	0.05	0.23	3.18	0.15	0.15	62.14	61.29	56.14	55.29	5.85	5.80	56.29	55.49
Link112	WY9	WY10	1.00	64.79	0.7	3.00	0.13	0.38	2.46	0.26	0.26	61.15	59.73	55.23	54.77	5.68	4.70	55.47	55.03
Link101	SDCB-12	WY10	1.00	5.36	25.0	17.81	0.00	0.07	4.11	0.26	0.26	59.61	59.73	56.11	54.77	3.45	4.70	56.16	55.03
Link60	SDCB-13	WY9	1.00	13.08	16.4	14.41	0.01	0.15	9.21	0.24	0.24	60.87	61.15	57.37	55.23	3.43	5.68	57.44	55.47
Link61	SDCB-14	SDMH-16	1.00	41.50	0.5	2.53	0.03	0.08	1.48	0.13	0.13	63.27	62.14	56.45	56.14	6.69	5.85	56.58	56.29
Link62	SDMH-13	WY1	1.00	40.00	0.5	2.58	0.08	0.20	3.40	0.22	0.22	67.59	68.46	62.59	62.38	4.81	5.86	62.78	62.60
Link63	WY1	SDMH-12	1.00	54.00	0.5	2.52	0.11	0.27	2.10	0.22	0.22	68.46	69.78	62.38	62.01	5.86	7.56	62.60	62.22
Link64	SDMH-12	WY2	1.00	38.10	0.6	2.83	0.09	0.27	2.64	0.33	0.33	69.78	69.63	62.01	61.77	7.56	7.53	62.22	62.10
Link65	WY2	WY3	1.00	52.38	0.6	2.83	0.23	0.66	2.83	0.35	0.35	69.63	68.63	61.77	61.44	7.53	6.84	62.10	61.79
Link87	WY3	SDMH-11	1.00	165.08	0.6	2.83	0.26	0.72	3.01	0.35	0.35	68.63	65.30	61.44	60.30	6.84	4.72	61.79	60.58
Link68	SDMH-11	SDMH-10	1.00	120.00	2.1	5.16	0.17	0.88	4.90	0.28	0.28	65.30	62.68	60.30	57.68	4.72	4.71	60.58	57.97
Link69	SDMH-10	WY4	1.00	39.89	1.8	4.82	0.18	0.88	4.91	0.31	0.31	62.68	61.88	57.68	56.95	4.71	4.62	57.97	57.26
Link70	WY4	WY5	1.00	47.54	1.8	4.82	0.21	1.01	4.58	0.34	0.34	61.88	60.94	56.95	56.08	4.62	4.52	57.26	56.42
Link71	WY5	SDMH-09	1.00	104.37	1.8	4.82	0.25	1.21	5.10	0.34	0.34	60.94	59.07	56.08	54.07	4.52	4.58	56.42	54.49
Link72	WY6	WY7	1.00	9.30	0.9	3.30	0.43	1.42	3.90	0.48	0.48	58.58	58.39	53.83	53.75	4.28	4.16	54.30	54.23
Link73	WY7	WY8	1.00	68.61	0.9	3.30	0.46	1.52	3.87	0.53	0.53	58.39	57.22	53.75	53.16	4.16	3.53	54.23	53.69
Link109	SDMH-08	WQ BASIN 1	1.00	52.00	0.5	2.52	0.64	1.61	2.87	0.74	0.74	57.22	56.00	53.01	52.75	3.59	2.51	53.63	53.49
Link76	SDCB-02	WY7	1.00	12.64	7.0	9.45	0.01	0.10	0.89	0.48	0.48	58.14	58.39	54.64	53.75	3.43	4.16	54.71	54.23
Link77	SDCB-03	WY6	1.00	28.00	4.5	7.65	0.03	0.22	11.25	0.47	0.47	58.62	58.58	55.12	53.83	3.38	4.28	55.24	54.30
Link78	SDCB-04	WY5	1.00	10.55	10.7	11.66	0.02	0.19	25.26	0.34	0.34	60.71	60.94	57.21	56.08	3.41	4.52	57.30	56.42
Link79	SDCB-05	WY4	1.00	29.00	4.8	7.77	0.02	0.14	1.22	0.31	0.31	61.83	61.88	58.33	56.95	3.41	4.62	58.42	57.26
Link80	SDCB-06	SDMH-11	1.00	10.55	11.1	11.86	0.01	0.15	5.49	0.18	0.18	65.07	65.30	61.57	60.30	3.42	4.72	61.65	60.58
Link82	SDCB-07	WY3	1.00	10.55	32.8	20.40	0.00	0.07	1.53	0.35	0.35	68.40	68.63	64.90	61.44	3.46	6.84	64.94	61.79
Link83	SDCB-08	WY2	1.00	42.00	11.5	12.04	0.03	0.39	27.46	0.33	0.33	70.07	69.63	66.57	61.77	3.38	7.53	66.69	62.10
Link84	SDCB-09	WY1	1.00	7.82	31.6	20.02	0.00	0.07	1.38	0.22	0.22	68.35	68.46	64.85	62.38	3.46	5.86	64.89	62.60
Link85	SDCB-10	SDMH-13	1.00	40.00	5.8	8.58	0.01	0.11	3.51	0.09	0.09	68.51	67.59	65.01	62.59	3.42	4.81	65.09	62.78
Link86	SDCB-11	SDMH-13	1.00	26.27	2.7	6.22	0.02	0.10	1.47	0.19	0.19	66.89	67.59	63.39	62.59	3.41	4.81	63.48	62.78
HIGH FLOW BYPASS	WQ BASIN 1	Node147	1.00	11.06	3.3	6.52	0.00	0.00	0.00	0.00	0.00	56.00	59.64	52.75	54.27	2.51	5.37	53.49	54.27
Link108	SDMH-14	WQ BASIN 1	1.00	48.00	2.8	5.95	0.08	0.46	4.22	0.24	0.24	59.59	56.00	54.59	52.75	4.81	2.51	54.78	53.49
Link98.1	WY10	SDMH-14	1.00	11.27	0.7	3.00	0.15	0.45	2.75	0.26	0.26	59.73	59.59	54.77	54.59	4.70	4.81	55.03	54.78
Link102	SDAD-02	SDMH-14	1.00	30.00	5.5	8.38	0.00	0.02	1.46	0.09	0.09	59.85	59.59	56.35	54.59	3.47	4.81	56.38	54.78
Link71.1	SDMH-09	WY6	1.00	27.91	0.9	3.30	0.37	1.21	3.61	0.47	0.47	59.07	58.58	54.07	53.83	4.58	4.28	54.49	54.30
Link73.1	WY8	SDMH-08	1.00	11.63	0.9	3.30	0.49	1.62	3.68	0.57	0.57	57.22	57.22	53.16	53.01	3.53	3.59	53.69	53.63
Link107	SDCB-01	WY8	1.00	4.61	10.9	10.45	0.01	0.10	0.88	0.53	0.53	57.12	57.22	53.62	53.16	3.43	3.53	53.69	53.69
Link111	SDMH-15	WY9	1.00	8.45	0.7	3.00	0.08	0.23	1.84	0.24	0.24	61.29	61.15	55.29	55.23	5.80	5.68	55.49	55.47

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (10-YR STORM EVENT)
BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link54	SDCB-15	SDMH-17	1.00	39.36	4.6	7.81	0.03	0.22	4.02	0.13	0.13	64.13	63.74	60.63	58.74	3.38	4.87	60.75	58.87
Link55	SDMH-17	SDMH-16	1.00	82.73	3.0	6.19	0.04	0.22	3.70	0.13	0.13	63.74	62.14	58.74	56.14	4.87	5.82	58.87	56.32
Link110	SDMH-16	SDMH-15	1.00	39.91	1.9	4.88	0.07	0.33	3.53	0.18	0.18	62.14	61.29	56.14	55.29	5.82	5.76	56.32	55.53
Link112	WY9	WY10	1.00	64.79	0.7	3.00	0.17	0.52	2.70	0.31	0.31	61.15	59.73	55.23	54.77	5.64	4.65	55.51	55.08
Link101	SDCB-12	WY10	1.00	5.36	25.0	17.81	0.01	0.10	1.24	0.31	0.31	59.61	59.73	56.11	54.77	3.45	4.65	56.16	55.08
Link60	SDCB-13	WY9	1.00	13.08	16.4	14.41	0.01	0.19	5.74	0.28	0.28	60.87	61.15	57.37	55.23	3.42	5.64	57.45	55.51
Link61	SDCB-14	SDMH-16	1.00	41.50	0.5	2.53	0.04	0.11	1.60	0.14	0.14	63.27	62.14	56.45	56.14	6.68	5.82	56.59	56.32
Link62	SDMH-13	WY1	1.00	40.00	0.5	2.58	0.11	0.27	1.91	0.26	0.26	67.59	68.46	62.59	62.38	4.78	5.82	62.81	62.64
Link63	WY1	SDMH-12	1.00	54.00	0.5	2.52	0.14	0.36	2.29	0.26	0.26	68.46	69.78	62.38	62.01	5.82	7.53	62.64	62.25
Link64	SDMH-12	WY2	1.00	38.10	0.6	2.83	0.13	0.36	1.72	0.39	0.39	69.78	69.63	62.01	61.77	7.53	7.47	62.25	62.16
Link65	WY2	WY3	1.00	52.38	0.6	2.83	0.33	0.92	3.12	0.41	0.41	69.63	68.63	61.77	61.44	7.47	6.78	62.16	61.85
Link87	WY3	SDMH-11	1.00	165.08	0.6	2.83	0.36	1.01	3.30	0.41	0.41	68.63	65.30	61.44	60.30	6.78	4.67	61.85	60.63
Link68	SDMH-11	SDMH-10	1.00	120.00	2.1	5.16	0.24	1.21	5.37	0.33	0.33	65.30	62.68	60.30	57.68	4.67	4.66	60.63	58.02
Link69	SDMH-10	WY4	1.00	39.89	1.8	4.82	0.25	1.21	4.88	0.37	0.37	62.68	61.88	57.68	56.95	4.66	4.56	58.02	57.32
Link70	WY4	WY5	1.00	47.54	1.8	4.82	0.29	1.39	5.02	0.40	0.40	61.88	60.94	56.95	56.08	4.56	4.46	57.32	56.48
Link71	WY5	SDMH-09	1.00	104.37	1.8	4.82	0.34	1.64	5.53	0.41	0.41	60.94	59.07	56.08	54.07	4.46	4.50	56.48	54.58
Link72	WY6	WY7	1.00	9.30	0.9	3.30	0.58	1.93	4.20	0.57	0.57	58.58	58.39	53.83	53.75	4.19	4.07	54.39	54.32
Link73	WY7	WY8	1.00	68.61	0.9	3.30	0.62	2.05	4.18	0.68	0.68	58.39	57.22	53.75	53.16	4.07	3.39	54.32	53.83
Link109	SDMH-08	WQ BASIN 1	1.00	52.00	0.5	2.52	0.87	2.19	3.35	0.81	0.81	57.22	56.00	53.01	52.75	3.45	2.44	53.77	53.56
Link76	SDCB-02	WY7	1.00	12.64	7.0	9.45	0.01	0.13	0.96	0.57	0.57	58.14	58.39	54.64	53.75	3.42	4.07	54.72	54.32
Link77	SDCB-03	WY6	1.00	28.00	4.5	7.65	0.04	0.29	10.98	0.56	0.56	58.62	58.58	55.12	53.83	3.37	4.19	55.25	54.39
Link78	SDCB-04	WY5	1.00	10.55	10.7	11.66	0.02	0.25	19.46	0.40	0.40	60.71	60.94	57.21	56.08	3.40	4.46	57.31	56.48
Link79	SDCB-05	WY4	1.00	29.00	4.8	7.77	0.02	0.18	11.73	0.37	0.37	61.83	61.88	58.33	56.95	3.40	4.56	58.43	57.32
Link80	SDCB-06	SDMH-11	1.00	10.55	11.1	11.86	0.02	0.20	5.39	0.23	0.23	65.07	65.30	61.57	60.30	3.41	4.67	61.66	60.63
Link82	SDCB-07	WY3	1.00	10.55	32.8	20.40	0.00	0.09	1.59	0.41	0.41	68.40	68.63	64.90	61.44	3.45	6.78	64.95	61.85
Link83	SDCB-08	WY2	1.00	42.00	11.5	12.04	0.05	0.56	7.40	0.39	0.39	70.07	69.63	66.57	61.77	3.35	7.47	66.72	62.16
Link84	SDCB-09	WY1	1.00	7.82	31.6	20.02	0.00	0.09	1.43	0.26	0.26	68.35	68.46	64.85	62.38	3.45	5.82	64.90	62.64
Link85	SDCB-10	SDMH-13	1.00	40.00	5.8	8.58	0.02	0.15	3.70	0.12	0.12	68.51	67.59	65.01	62.59	3.41	4.78	65.10	62.81
Link86	SDCB-11	SDMH-13	1.00	26.27	2.7	6.22	0.02	0.13	1.58	0.22	0.22	66.89	67.59	63.39	62.59	3.40	4.78	63.49	62.81
HIGH FLOW BYPASS	WQ BASIN 1	Node147	1.00	11.06	3.3	6.52	0.00	0.00	0.00	0.00	0.00	56.00	59.64	52.75	54.27	2.44	5.37	53.56	54.27
Link108	SDMH-14	WQ BASIN 1	1.00	48.00	2.8	5.95	0.11	0.63	4.45	0.31	0.31	59.59	56.00	54.59	52.75	4.78	2.44	54.81	53.56
Link98.1	WY10	SDMH-14	1.00	11.27	0.7	3.00	0.20	0.61	3.00	0.31	0.31	59.73	59.59	54.77	54.59	4.65	4.78	55.08	54.81
Link102	SDAD-02	SDMH-14	1.00	30.00	5.5	8.38	0.00	0.02	4.09	0.12	0.12	59.85	59.59	56.35	54.59	3.46	4.78	56.39	54.81
Link71.1	SDMH-09	WY6	1.00	27.91	0.9	3.30	0.50	1.64	3.88	0.56	0.56	59.07	58.58	54.07	53.83	4.50	4.19	54.58	54.39
Link73.1	WY8	SDMH-08	1.00	11.63	0.9	3.30	0.69	2.26	3.97	0.71	0.71	57.22	57.22	53.16	53.01	3.39	3.45	53.83	53.77
Link107	SDCB-01	WY8	1.00	4.61	10.9	10.45	0.06	0.54	24.25	0.68	0.68	57.12	57.22	53.62	53.16	3.26	3.39	53.86	53.83
Link111	SDMH-15	WY9	1.00	8.45	0.7	3.00	0.11	0.33	2.03	0.28	0.28	61.29	61.15	55.29	55.23	5.76	5.64	55.53	55.51

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YR STORM EVENT)
BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link54	SDCB-15	SDMH-17	1.00	39.36	4.6	7.81	0.03	0.26	11.70	0.14	0.14	64.13	63.74	60.63	58.74	3.37	4.86	60.76	58.88
Link55	SDMH-17	SDMH-16	1.00	82.73	3.0	6.19	0.04	0.26	3.90	0.14	0.14	63.74	62.14	58.74	56.14	4.86	5.81	58.88	56.33
Link110	SDMH-16	SDMH-15	1.00	39.91	1.9	4.88	0.08	0.38	3.70	0.19	0.19	62.14	61.29	56.14	55.29	5.81	5.74	56.33	55.55
Link112	WY9	WY10	1.00	64.79	0.7	3.00	0.20	0.60	2.82	0.33	0.33	61.15	59.73	55.23	54.77	5.62	4.63	55.53	55.10
Link101	SDCB-12	WY10	1.00	5.36	25.0	17.81	0.01	0.11	1.28	0.33	0.33	59.61	59.73	56.11	54.77	3.45	4.63	56.17	55.10
Link60	SDCB-13	WY9	1.00	13.08	16.4	14.41	0.02	0.22	2.00	0.30	0.30	60.87	61.15	57.37	55.23	3.41	5.62	57.46	55.53
Link61	SDCB-14	SDMH-16	1.00	41.50	0.5	2.53	0.05	0.12	1.66	0.15	0.15	63.27	62.14	56.45	56.14	6.67	5.81	56.60	56.33
Link62	SDMH-13	WY1	1.00	40.00	0.5	2.58	0.12	0.32	1.99	0.28	0.28	67.59	68.46	62.59	62.38	4.76	5.80	62.83	62.66
Link63	WY1	SDMH-12	1.00	54.00	0.5	2.52	0.17	0.42	2.39	0.28	0.28	68.46	69.78	62.38	62.01	5.80	7.51	62.66	62.27
Link64	SDMH-12	WY2	1.00	38.10	0.6	2.83	0.15	0.42	1.78	0.43	0.43	69.78	69.63	62.01	61.77	7.51	7.43	62.27	62.20
Link65	WY2	WY3	1.00	52.38	0.6	2.83	0.38	1.08	3.25	0.45	0.45	69.63	68.63	61.77	61.44	7.43	6.74	62.20	61.89
Link87	WY3	SDMH-11	1.00	165.08	0.6	2.83	0.42	1.18	3.44	0.45	0.45	68.63	65.30	61.44	60.30	6.74	4.64	61.89	60.66
Link68	SDMH-11	SDMH-10	1.00	120.00	2.1	5.16	0.27	1.41	5.60	0.36	0.36	65.30	62.68	60.30	57.68	4.64	4.63	60.66	58.05
Link69	SDMH-10	WY4	1.00	39.89	1.8	4.82	0.29	1.41	5.09	0.40	0.40	62.68	61.88	57.68	56.95	4.63	4.53	58.05	57.35
Link70	WY4	WY5	1.00	47.54	1.8	4.82	0.33	1.61	5.54	0.44	0.44	61.88	60.94	56.95	56.08	4.53	4.42	57.35	56.52
Link71	WY5	SDMH-09	1.00	104.37	1.8	4.82	0.39	1.89	5.63	0.45	0.45	60.94	59.07	56.08	54.07	4.42	4.45	56.52	54.62
Link72	WY6	WY7	1.00	9.30	0.9	3.30	0.67	2.21	4.33	0.63	0.63	58.58	58.39	53.83	53.75	4.13	4.02	54.45	54.38
Link73	WY7	WY8	1.00	68.61	0.9	3.30	0.71	2.36	4.29	0.77	0.77	58.39	57.22	53.75	53.16	4.02	3.30	54.38	53.92
Link109	SDMH-08	WQ BASIN 1	1.00	52.00	0.5	2.52	1.00	2.51	3.60	0.84	0.84	57.22	56.00	53.01	52.75	3.37	2.41	53.85	53.59
Link76	SDCB-02	WY7	1.00	12.64	7.0	9.45	0.02	0.14	1.00	0.63	0.63	58.14	58.39	54.64	53.75	3.41	4.02	54.73	54.38
Link77	SDCB-03	WY6	1.00	28.00	4.5	7.65	0.04	0.32	1.24	0.62	0.62	58.62	58.58	55.12	53.83	3.36	4.13	55.26	54.45
Link78	SDCB-04	WY5	1.00	10.55	10.7	11.66	0.03	0.29	1.67	0.44	0.44	60.71	60.94	57.21	56.08	3.39	4.42	57.32	56.52
Link79	SDCB-05	WY4	1.00	29.00	4.8	7.77	0.03	0.20	1.30	0.40	0.40	61.83	61.88	58.33	56.95	3.39	4.53	58.44	57.35
Link80	SDCB-06	SDMH-11	1.00	10.55	11.1	11.86	0.02	0.23	3.76	0.26	0.26	65.07	65.30	61.57	60.30	3.40	4.64	61.67	60.66
Link82	SDCB-07	WY3	1.00	10.55	32.8	20.40	0.01	0.10	1.64	0.45	0.45	68.40	68.63	64.90	61.44	3.45	6.74	64.95	61.89
Link83	SDCB-08	WY2	1.00	42.00	11.5	12.04	0.06	0.66	3.51	0.43	0.43	70.07	69.63	66.57	61.77	3.34	7.43	66.73	62.20
Link84	SDCB-09	WY1	1.00	7.82	31.6	20.02	0.01	0.10	1.92	0.28	0.28	68.35	68.46	64.85	62.38	3.45	5.80	64.90	62.66
Link85	SDCB-10	SDMH-13	1.00	40.00	5.8	8.58	0.02	0.17	3.60	0.14	0.14	68.51	67.59	65.01	62.59	3.40	4.76	65.11	62.83
Link86	SDCB-11	SDMH-13	1.00	26.27	2.7	6.22	0.02	0.15	1.64	0.24	0.24	66.89	67.59	63.39	62.59	3.40	4.76	63.50	62.83
HIGH FLOW BYPASS	WQ BASIN 1	Node147	1.00	11.06	3.3	6.52	0.00	0.00	0.00	0.00	0.00	56.00	59.64	52.75	54.27	2.41	5.37	53.59	54.27
Link108	SDMH-14	WQ BASIN 1	1.00	48.00	2.8	5.95	0.12	0.73	4.53	0.34	0.34	59.59	56.00	54.59	52.75	4.76	2.41	54.83	53.59
Link98.1	WY10	SDMH-14	1.00	11.27	0.7	3.00	0.24	0.70	3.12	0.33	0.33	59.73	59.59	54.77	54.59	4.63	4.76	55.10	54.83
Link102	SDAD-02	SDMH-14	1.00	30.00	5.5	8.38	0.00	0.02	3.70	0.14	0.14	59.85	59.59	56.35	54.59	3.46	4.76	56.39	54.83
Link71.1	SDMH-09	WY6	1.00	27.91	0.9	3.30	0.57	1.89	4.00	0.62	0.62	59.07	58.58	54.07	53.83	4.45	4.13	54.62	54.45
Link73.1	WY8	SDMH-08	1.00	11.63	0.9	3.30	0.80	2.64	4.13	0.79	0.79	57.22	57.22	53.16	53.01	3.30	3.37	53.92	53.85
Link107	SDCB-01	WY8	1.00	4.61	10.9	10.45	0.07	0.74	2.10	0.77	0.77	57.12	57.22	53.62	53.16	3.18	3.30	53.94	53.92
Link111	SDMH-15	WY9	1.00	8.45	0.7	3.00	0.13	0.38	2.13	0.30	0.30	61.29	61.15	55.29	55.23	5.74	5.62	55.55	55.53

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YR STORM EVENT)

BIOFILTRATION POND - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link54	SDCB-15	SDMH-17	1.00	39.36	4.6	7.81	0.04	0.33	11.66	0.16	0.16	64.13	63.74	60.63	58.74	3.36	4.84	60.77	58.90
Link55	SDMH-17	SDMH-16	1.00	82.73	3.0	6.19	0.05	0.33	4.20	0.16	0.16	63.74	62.14	58.74	56.14	4.84	5.79	58.90	56.35
Link110	SDMH-16	SDMH-15	1.00	39.91	1.9	4.88	0.10	0.49	3.98	0.21	0.21	62.14	61.29	56.14	55.29	5.79	5.70	56.35	55.59
Link112	WY9	WY10	1.00	64.79	0.7	3.00	0.25	0.74	3.00	0.37	0.37	61.15	59.73	55.23	54.77	5.58	4.59	55.57	55.14
Link101	SDCB-12	WY10	1.00	5.36	25.0	17.81	0.01	0.13	1.36	0.37	0.37	59.61	59.73	56.11	54.77	3.44	4.59	56.17	55.14
Link60	SDCB-13	WY9	1.00	13.08	16.4	14.41	0.02	0.26	2.06	0.34	0.34	60.87	61.15	57.37	55.23	3.41	5.58	57.46	55.57
Link61	SDCB-14	SDMH-16	1.00	41.50	0.5	2.53	0.06	0.16	1.82	0.17	0.17	63.27	62.14	56.45	56.14	6.65	5.79	56.62	56.35
Link62	SDMH-13	WY1	1.00	40.00	0.5	2.58	0.15	0.38	2.10	0.31	0.31	67.59	68.46	62.59	62.38	4.74	5.77	62.85	62.69
Link63	WY1	SDMH-12	1.00	54.00	0.5	2.52	0.20	0.50	2.52	0.31	0.31	68.46	69.78	62.38	62.01	5.77	7.49	62.69	62.30
Link64	SDMH-12	WY2	1.00	38.10	0.6	2.83	0.18	0.50	1.86	0.48	0.48	69.78	69.63	62.01	61.77	7.49	7.38	62.30	62.25
Link65	WY2	WY3	1.00	52.38	0.6	2.83	0.47	1.32	3.43	0.51	0.51	69.63	68.63	61.77	61.44	7.38	6.68	62.25	61.95
Link87	WY3	SDMH-11	1.00	165.08	0.6	2.83	0.51	1.44	3.62	0.51	0.51	68.63	65.30	61.44	60.30	6.68	4.60	61.95	60.70
Link68	SDMH-11	SDMH-10	1.00	120.00	2.1	5.16	0.33	1.71	5.90	0.40	0.40	65.30	62.68	60.30	57.68	4.60	4.59	60.70	58.09
Link69	SDMH-10	WY4	1.00	39.89	1.8	4.82	0.36	1.71	5.34	0.45	0.45	62.68	61.88	57.68	56.95	4.59	4.48	58.09	57.40
Link70	WY4	WY5	1.00	47.54	1.8	4.82	0.41	1.98	5.52	0.49	0.49	61.88	60.94	56.95	56.08	4.48	4.37	57.40	56.57
Link71	WY5	SDMH-09	1.00	104.37	1.8	4.82	0.48	2.32	5.70	0.56	0.56	60.94	59.07	56.08	54.07	4.37	4.34	56.57	54.73
Link72	WY6	WY7	1.00	9.30	0.9	3.30	0.84	2.76	4.45	0.78	0.78	58.58	58.39	53.83	53.75	3.99	3.86	54.59	54.53
Link73	WY7	WY8	1.00	68.61	0.9	3.30	0.89	2.94	4.33	1.25	1.25	58.39	57.22	53.75	53.16	3.86	2.81	54.53	54.41
Link109	SDMH-08	WQ BASIN 1	1.00	52.00	0.5	2.52	1.24	3.11	4.03	1.62	1.62	57.22	56.00	53.01	52.75	2.82	1.63	54.40	54.37
Link76	SDCB-02	WY7	1.00	12.64	7.0	9.45	0.02	0.19	1.00	0.78	0.78	58.14	58.39	54.64	53.75	3.40	3.86	54.74	54.53
Link77	SDCB-03	WY6	1.00	28.00	4.5	7.65	0.06	0.46	1.37	0.76	0.76	58.62	58.58	55.12	53.83	3.33	3.99	55.29	54.59
Link78	SDCB-04	WY5	1.00	10.55	10.7	11.66	0.03	0.35	1.73	0.49	0.49	60.71	60.94	57.21	56.08	3.38	4.37	57.33	56.57
Link79	SDCB-05	WY4	1.00	29.00	4.8	7.77	0.04	0.27	1.48	0.45	0.45	61.83	61.88	58.33	56.95	3.37	4.48	58.46	57.40
Link80	SDCB-06	SDMH-11	1.00	10.55	11.1	11.86	0.02	0.27	3.74	0.30	0.30	65.07	65.30	61.57	60.30	3.40	4.60	61.67	60.70
Link82	SDCB-07	WY3	1.00	10.55	32.8	20.40	0.01	0.12	1.73	0.51	0.51	68.40	68.63	64.90	61.44	3.45	6.68	64.96	61.95
Link83	SDCB-08	WY2	1.00	42.00	11.5	12.04	0.07	0.82	3.74	0.48	0.48	70.07	69.63	66.57	61.77	3.32	7.38	66.75	62.25
Link84	SDCB-09	WY1	1.00	7.82	31.6	20.02	0.01	0.12	22.45	0.31	0.31	68.35	68.46	64.85	62.38	3.45	5.77	64.90	62.69
Link85	SDCB-10	SDMH-13	1.00	40.00	5.8	8.58	0.02	0.21	3.61	0.16	0.16	68.51	67.59	65.01	62.59	3.39	4.74	65.12	62.85
Link86	SDCB-11	SDMH-13	1.00	26.27	2.7	6.22	0.03	0.17	1.72	0.26	0.26	66.89	67.59	63.39	62.59	3.39	4.74	63.50	62.85
HIGH FLOW BYPASS	WQ BASIN 1	Node147	1.00	11.06	3.3	6.52	0.00	0.00	0.00	0.00	0.00	56.00	59.64	52.75	54.27	1.63	5.37	54.37	54.27
Link108	SDMH-14	WQ BASIN 1	1.00	48.00	2.8	5.95	0.15	0.92	4.60	1.12	1.12	59.59	56.00	54.59	52.75	4.73	1.63	54.86	54.37
Link98.1	WY10	SDMH-14	1.00	11.27	0.7	3.00	0.29	0.87	3.31	0.37	0.37	59.73	59.59	54.77	54.59	4.59	4.73	55.14	54.86
Link102	SDAD-02	SDMH-14	1.00	30.00	5.5	8.38	0.01	0.05	3.71	0.17	0.17	59.85	59.59	56.35	54.59	3.45	4.73	56.40	54.86
Link71.1	SDMH-09	WY6	1.00	27.91	0.9	3.30	0.70	2.32	4.08	0.76	0.76	59.07	58.58	54.07	53.83	4.34	3.99	54.73	54.59
Link73.1	WY8	SDMH-08	1.00	11.63	0.9	3.30	0.94	3.11	4.14	1.34	1.34	57.22	57.22	53.16	53.01	2.81	2.82	54.41	54.40
Link107	SDCB-01	WY8	1.00	4.61	10.9	10.45	0.07	0.75	2.18	1.25	1.25	57.12	57.22	53.62	53.16	2.71	2.81	54.41	54.41
Link111	SDMH-15	WY9	1.00	8.45	0.7	3.00	0.16	0.49	2.30	0.34	0.34	61.29	61.15	55.29	55.23	5.70	5.58	55.59	55.57

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (WQ STORM EVENT)
INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link90	SDMH-18	INFILTATION BASIN #1	1.00	22.00	0.5	2.52	0.02	0.05	1.54	0.12	0.12	58.79	58.69	53.80	53.69	4.87	4.96	53.92	53.73
Link95	SDCO-01	SDMH-18	1.00	36.00	0.5	2.52	0.01	0.02	0.94	0.06	0.06	59.16	58.79	54.08	53.80	5.02	4.87	54.14	53.92
Link96	SDCB-16	SDMH-18	1.00	14.18	15.7	14.13	0.00	0.04	6.39	0.04	0.04	58.77	58.79	56.13	53.80	2.60	4.87	56.17	53.92

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (2-YR STORM EVENT)
INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link90	SDMH-18	INFILTATION BASIN #1	1.00	22.00	0.5	2.52	0.10	0.26	2.30	0.81	0.81	58.79	58.69	53.80	53.69	4.29	4.19	54.50	54.50
Link95	SDCO-01	SDMH-18	1.00	36.00	0.5	2.52	0.04	0.09	1.49	0.60	0.60	59.16	58.79	54.08	53.80	4.66	4.29	54.50	54.50
Link96	SDCB-16	SDMH-18	1.00	14.18	15.7	14.13	0.01	0.18	6.38	0.60	0.60	58.77	58.79	56.13	53.80	2.56	4.29	56.21	54.50

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (10-YR STORM EVENT)
INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link90	SDMH-18	INFILTATION BASIN #1	1.00	22.00	0.5	2.52	0.13	0.32	2.34	1.40	1.40	58.79	58.69	53.80	53.69	3.70	3.60	55.09	55.09
Link95	SDCO-01	SDMH-18	1.00	36.00	0.5	2.52	0.04	0.11	1.55	1.19	1.19	59.16	58.79	54.08	53.80	4.07	3.70	55.09	55.09
Link96	SDCB-16	SDMH-18	1.00	14.18	15.7	14.13	0.02	0.24	5.96	1.19	1.19	58.77	58.79	56.13	53.80	2.55	3.70	56.22	55.09

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YR STORM EVENT)
INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link90	SDMH-18	INFILTATION BASIN #1	1.00	22.00	0.5	2.52	0.14	0.35	3.08	1.89	1.89	58.79	58.69	53.80	53.69	3.21	3.11	55.58	55.58
Link95	SDCO-01	SDMH-18	1.00	36.00	0.5	2.52	0.05	0.12	1.56	1.68	1.68	59.16	58.79	54.08	53.80	3.58	3.21	55.58	55.58
Link96	SDCB-16	SDMH-18	1.00	14.18	15.7	14.13	0.02	0.27	4.53	1.68	1.68	58.77	58.79	56.13	53.80	2.54	3.21	56.23	55.58

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YR STORM EVENT)
INFILTRATION BASIN 1 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link90	SDMH-18	INFILTATION BASIN #1	1.00	22.00	0.5	2.52	0.17	0.44	3.10	2.79	2.79	58.79	58.69	53.80	53.69	2.31	2.21	56.48	56.48
Link95	SDCO-01	SDMH-18	1.00	36.00	0.5	2.52	0.05	0.14	1.51	2.58	2.58	59.16	58.79	54.08	53.80	2.68	2.31	56.48	56.48
Link96	SDCB-16	SDMH-18	1.00	14.18	15.7	14.13	0.02	0.32	4.93	2.58	2.58	58.77	58.79	56.13	53.80	2.29	2.31	56.48	56.48

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (WQ STORM EVENT)
INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link97	SDCB-17	INFILTRATION BASIN #2	1.00	100.00	3.8	6.95	0.00	0.01	14.37	###########	########	62.57	59.28	58.08	54.28	4.45	5.00	58.12	54.28

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (2-YR STORM EVENT)
INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link97	SDCB-17	INFILTRATION BASIN #2	1.00	100.00	3.8	6.95	0.01	0.04	12.29	0.14	0.14	62.57	59.28	58.08	54.28	4.42	4.86	58.15	54.42

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (10-YR STORM EVENT)
INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link97	SDCB-17	INFILTRATION BASIN #2	1.00	100.00	3.8	6.95	0.01	0.05	2.48	0.44	0.44	62.57	59.28	58.08	54.28	4.41	4.56	58.16	54.72

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YR STORM EVENT)
INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link97	SDCB-17	INFILTRATION BASIN #2	1.00	100.00	3.8	6.95	0.01	0.05	12.24	0.64	0.64	62.57	59.28	58.08	54.28	4.41	4.36	58.16	54.92

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YR STORM EVENT)
INFILTRATION BASIN 2 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link97	SDCB-17	INFILTRATION BASIN #2	1.00	100.00	3.8	6.95	0.01	0.06	12.10	1.00	1.00	62.57	59.28	58.08	54.28	4.41	4.00	58.16	55.28

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (WQ STORM EVENT)
INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link93	SDCB-18	INFILTRATION BASIN #3	1.00	39.40	11.2	11.95	0.00	0.02	24.08	0.05	0.05	63.93	61.50	60.43	56.00	3.47	5.45	60.46	56.05

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (2-YR STORM EVENT)
INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link93	SDCB-18	INFILTRATION BASIN #3	1.00	39.40	11.2	11.95	0.01	0.10	26.76	1.37	1.37	63.93	61.50	60.43	56.00	3.44	4.13	60.49	57.37

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (10-YR STORM EVENT)
INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link93	SDCB-18	INFILTRATION BASIN #3	1.00	39.40	11.2	11.95	0.01	0.13	20.42	2.45	2.45	63.93	61.50	60.43	56.00	3.43	3.05	60.50	58.45

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YR STORM EVENT)
INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link93	SDCB-18	INFILTRATION BASIN #3	1.00	39.40	11.2	11.95	0.01	0.14	28.04	3.28	3.28	63.93	61.50	60.43	56.00	3.42	2.23	60.51	59.28

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YR STORM EVENT)
INFILTRATION BASIN 3 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link93	SDCB-18	INFILTRATION BASIN #3	1.00	39.40	11.2	11.95	0.02	0.18	27.80	4.96	4.96	63.93	61.50	60.43	56.00	2.97	0.54	60.96	60.96

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (WQ STORM EVENT)
INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link94	SDCB-19	INFILTRATION BASIN #4	1.00	120.79	5.4	8.32	0.01	0.04	2.68	0.06	0.06	67.08	62.65	63.58	57.00	3.44	5.61	63.64	57.04

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (2-YR STORM EVENT)
INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link94	SDCB-19	INFILTRATION BASIN #4	1.00	120.79	5.4	8.32	0.02	0.20	3.33	1.06	1.06	67.08	62.65	63.58	57.00	3.39	4.59	63.69	58.06

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (10-YR STORM EVENT)
INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link94	SDCB-19	INFILTRATION BASIN #4	1.00	120.79	5.4	8.32	0.03	0.26	3.06	1.90	1.90	67.08	62.65	63.58	57.00	3.38	3.75	63.70	58.90

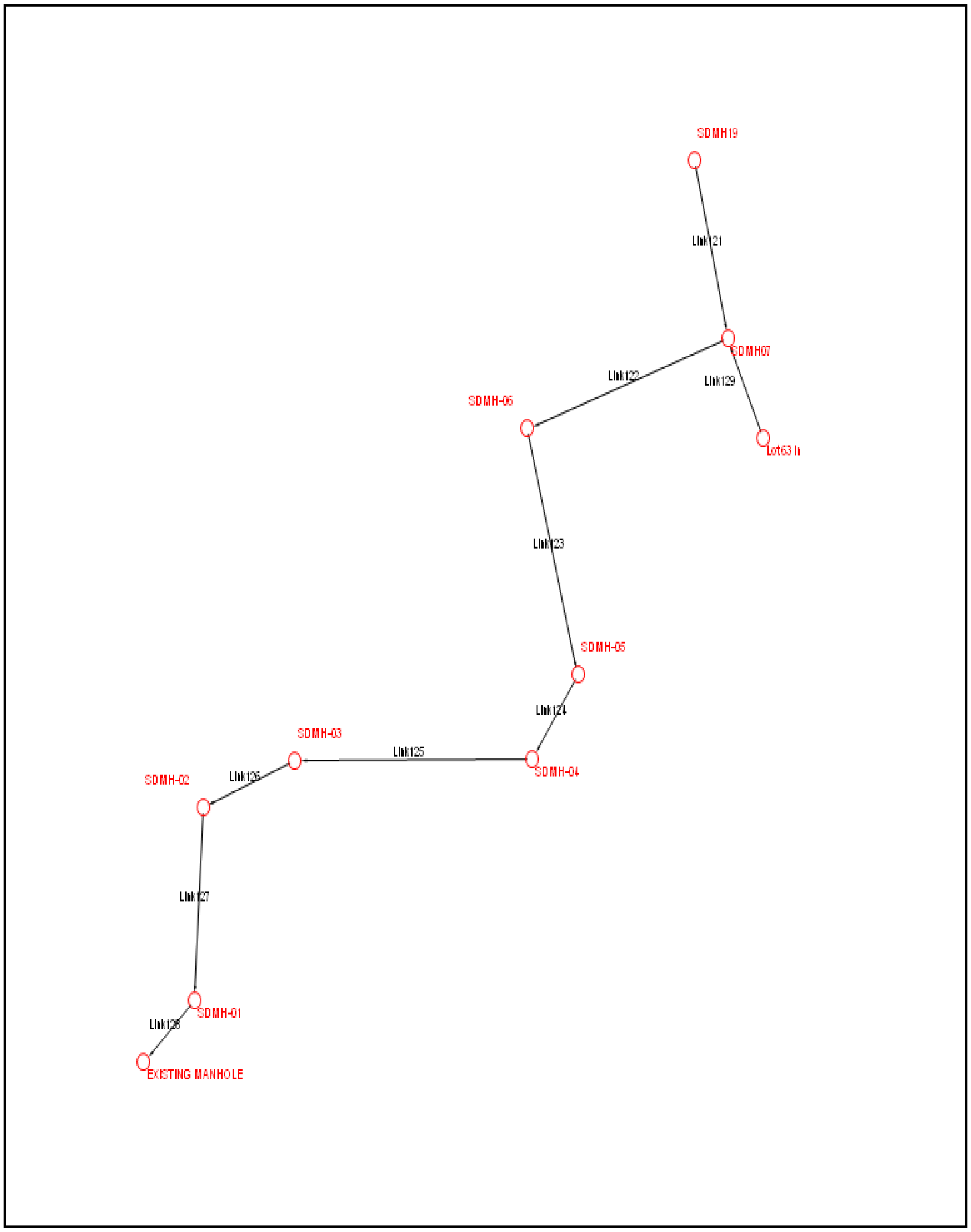
XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YR STORM EVENT)
INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link94	SDCB-19	INFILTRATION BASIN #4	1.00	120.79	5.4	8.32	0.04	0.29	17.57	2.67	2.67	67.08	62.65	63.58	57.00	3.37	2.98	63.71	59.67

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YR STORM EVENT)
INFILTRATION BASIN 4 - PLANNED UNIT DEVELOPMENT

Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link94	SDCB-19	INFILTRATION BASIN #4	1.00	120.79	5.4	8.32	0.05	0.39	17.52	4.48	4.48	67.08	62.65	63.58	57.00	3.35	1.17	63.73	61.48

XPSTORM HYDRAULIC LAYOUT - BYPASS



XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

BYPASS LINE - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDMH19	19.911	45	66.3	60	5.06	2.153	2.91	7.58
SDMH07	2.348	45	66.3	60	5.06	2.153	2.91	0.89
Lot 63 In	2.528	45	66.3	60	5.06	2.153	2.91	0.96

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

BYPASS LINE - PLANNED UNIT DEVELOPMENT

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDMH19	19.911	45	66.3	60	5.95	2.267	3.68	9.90
SDMH07	2.348	45	66.3	60	5.95	2.267	3.68	1.17
Lot 63 In	2.528	45	66.3	60	5.95	2.267	3.68	1.26

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YEAR STORM EVENT)

BYPASS LINE - PLANNED UNIT DEVELOPMENT

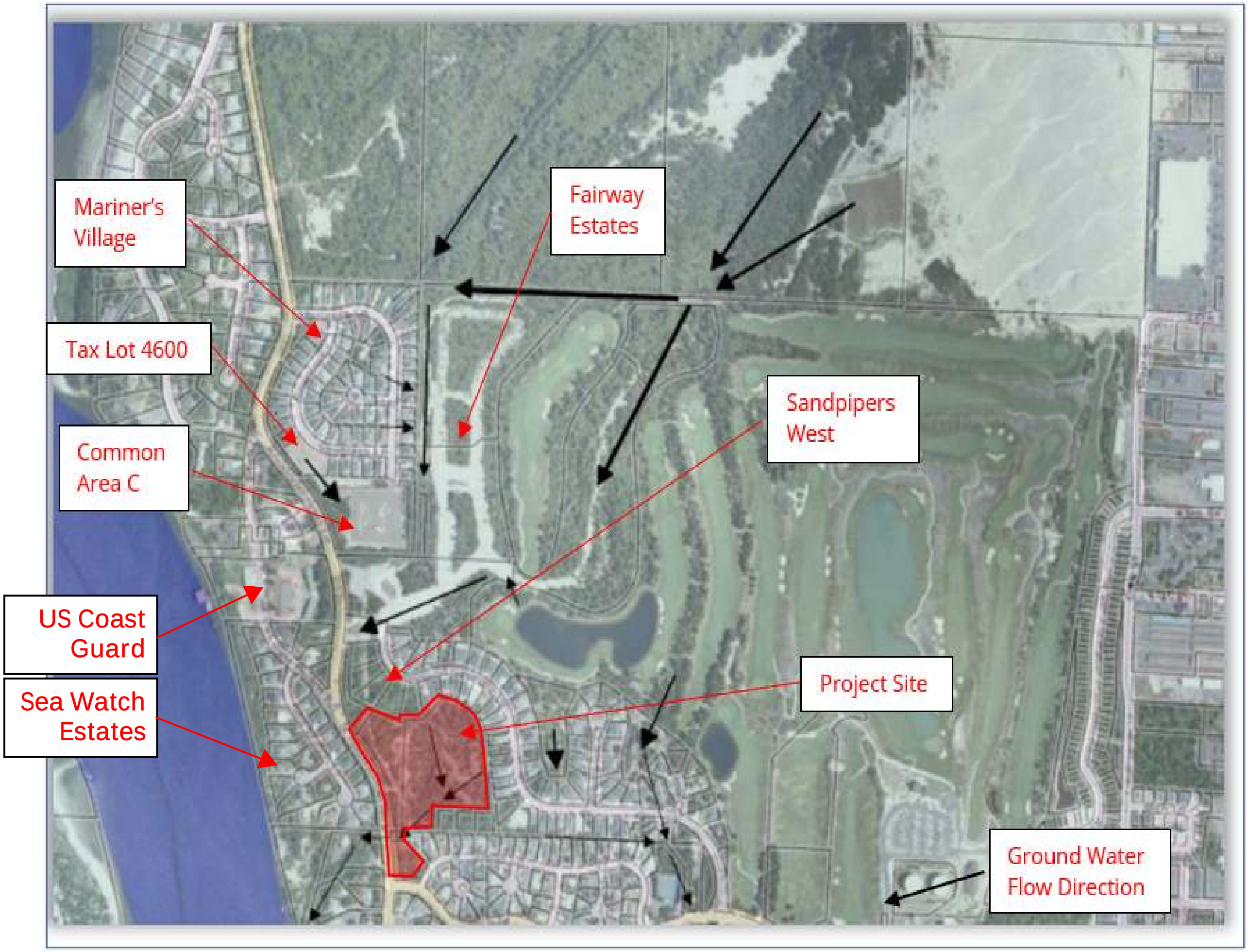
Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link121	SDMH19	SDMH07	2.00	61.80	1.0	22.66	0.34	7.59	5.60	1.01	0.51	65.69	64.95	63.01	62.29	1.88	1.55	63.81	63.40
Link122	SDMH07	SDMH-06	2.00	177.77	0.5	16.01	0.59	9.46	5.32	1.11	0.56	64.95	68.80	62.29	61.30	1.55	6.39	63.40	62.41
Link123	SDMH-06	SDMH-05	2.00	214.14	0.5	15.99	0.59	9.44	5.31	1.11	0.56	68.80	65.34	61.30	60.13	6.39	4.10	62.41	61.24
Link124	SDMH-05	SDMH-04	2.00	100.91	0.5	15.92	0.59	9.44	5.31	1.11	0.55	65.34	63.79	60.13	59.53	4.10	3.46	61.24	60.34
Link125	SDMH-04	SDMH-03	2.00	195.09	1.5	27.72	0.34	9.44	7.98	0.81	0.40	63.79	60.11	59.53	56.50	3.46	2.89	60.34	57.22
Link126	SDMH-03	SDMH-02	2.00	100.97	2.3	34.14	0.28	9.44	7.42	1.01	0.50	60.11	57.97	56.50	54.10	2.89	2.76	57.22	55.21
Link127	SDMH-02	SDMH-01	2.00	92.51	0.5	15.95	0.59	9.44	5.32	1.11	0.55	57.97	57.79	54.10	53.54	2.76	3.47	55.21	54.32
Link128	SDMH-01	EXISTING MANHOLE	2.00	14.39	1.7	29.22	0.32	9.44	8.30	0.78	0.39	57.79	57.71	53.54	53.30	3.47	3.63	54.32	54.08
Link129	Lot 63 In	SDMH07	2.00	34.67	1.8	30.01	0.04	1.32	7.13	1.01	0.51	65.02	64.95	63.00	62.29	1.61	1.55	63.41	63.40

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YEAR STORM EVENT)

BYPASS LINE - PLANNED UNIT DEVELOPMENT

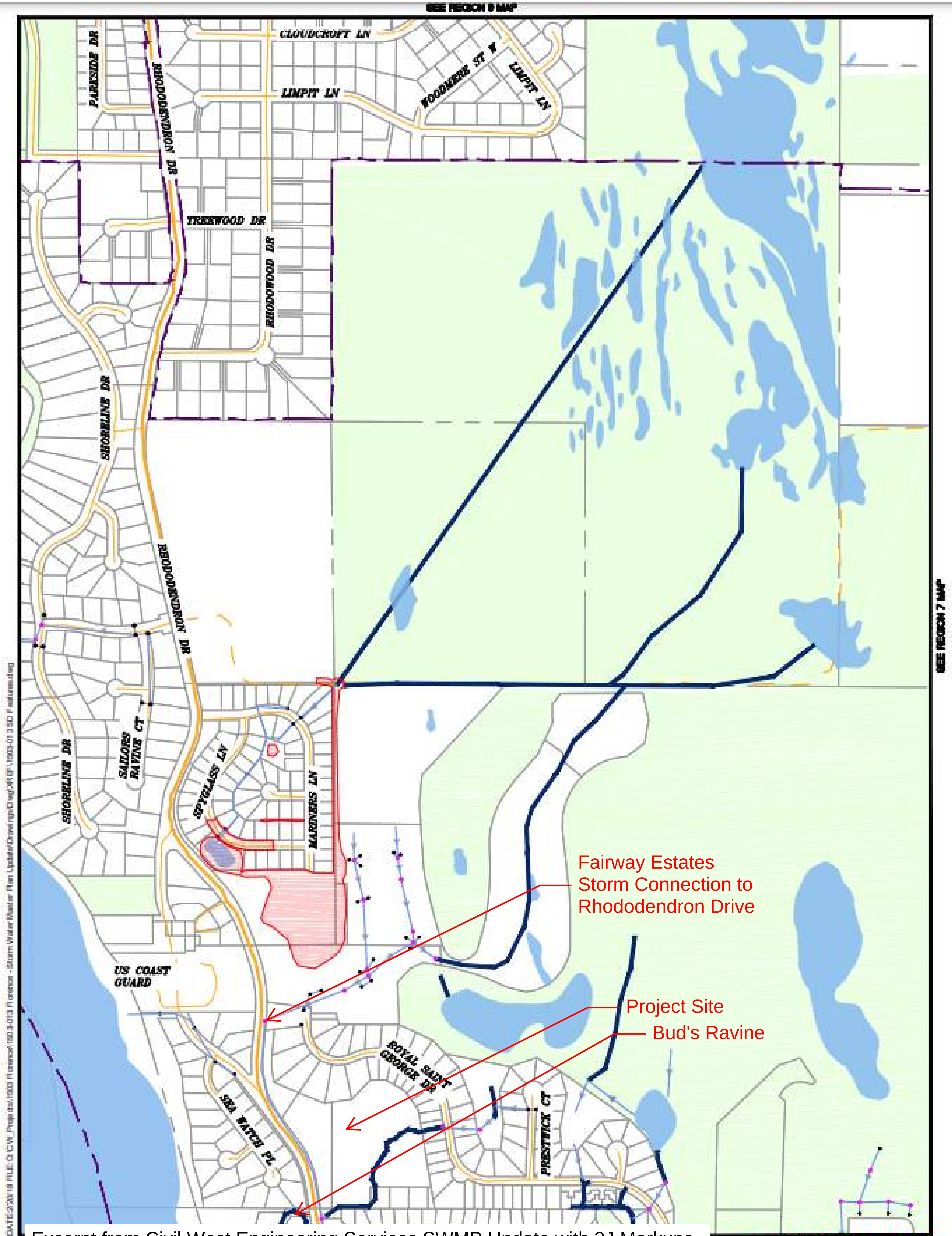
Location			Conduit Properties			Conduit Results						Conduit Profile							
	Station																		
Link	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link121	SDMH19	SDMH07	2.00	61.80	1.0	22.66	0.44	9.90	5.70	1.23	0.61	65.69	64.95	63.01	62.29	1.71	1.33	63.98	63.62
Link122	SDMH07	SDMH-06	2.00	177.77	0.5	16.01	0.77	12.33	5.72	1.33	0.66	64.95	68.80	62.29	61.30	1.33	6.17	63.62	62.63
Link123	SDMH-06	SDMH-05	2.00	214.14	0.5	15.99	0.77	12.33	5.71	1.33	0.67	68.80	65.34	61.30	60.13	6.17	3.90	62.63	61.44
Link124	SDMH-05	SDMH-04	2.00	100.91	0.5	15.92	0.77	12.33	5.75	1.31	0.66	65.34	63.79	60.13	59.53	3.90	3.33	61.44	60.47
Link125	SDMH-04	SDMH-03	2.00	195.09	1.5	27.72	0.45	12.33	8.56	0.94	0.47	63.79	60.11	59.53	56.50	3.33	2.78	60.47	57.33
Link126	SDMH-03	SDMH-02	2.00	100.97	2.3	34.14	0.36	12.33	7.83	1.21	0.61	60.11	57.97	56.50	54.10	2.78	2.56	57.33	55.41
Link127	SDMH-02	SDMH-01	2.00	92.51	0.5	15.95	0.77	12.33	5.76	1.31	0.66	57.97	57.79	54.10	53.54	2.56	3.34	55.41	54.45
Link128	SDMH-01	EXISTING MANHOLE	2.00	14.39	1.7	29.22	0.42	12.33	8.91	0.91	0.45	57.79	57.71	53.54	53.30	3.34	3.50	54.45	54.21
Link129	Lot 63 In	SDMH07	2.00	34.67	1.8	30.01	0.05	1.34	7.18	1.23	0.61	65.02	64.95	63.00	62.29	1.41	1.33	63.61	63.62

DOWNSTREAM ANALYSIS



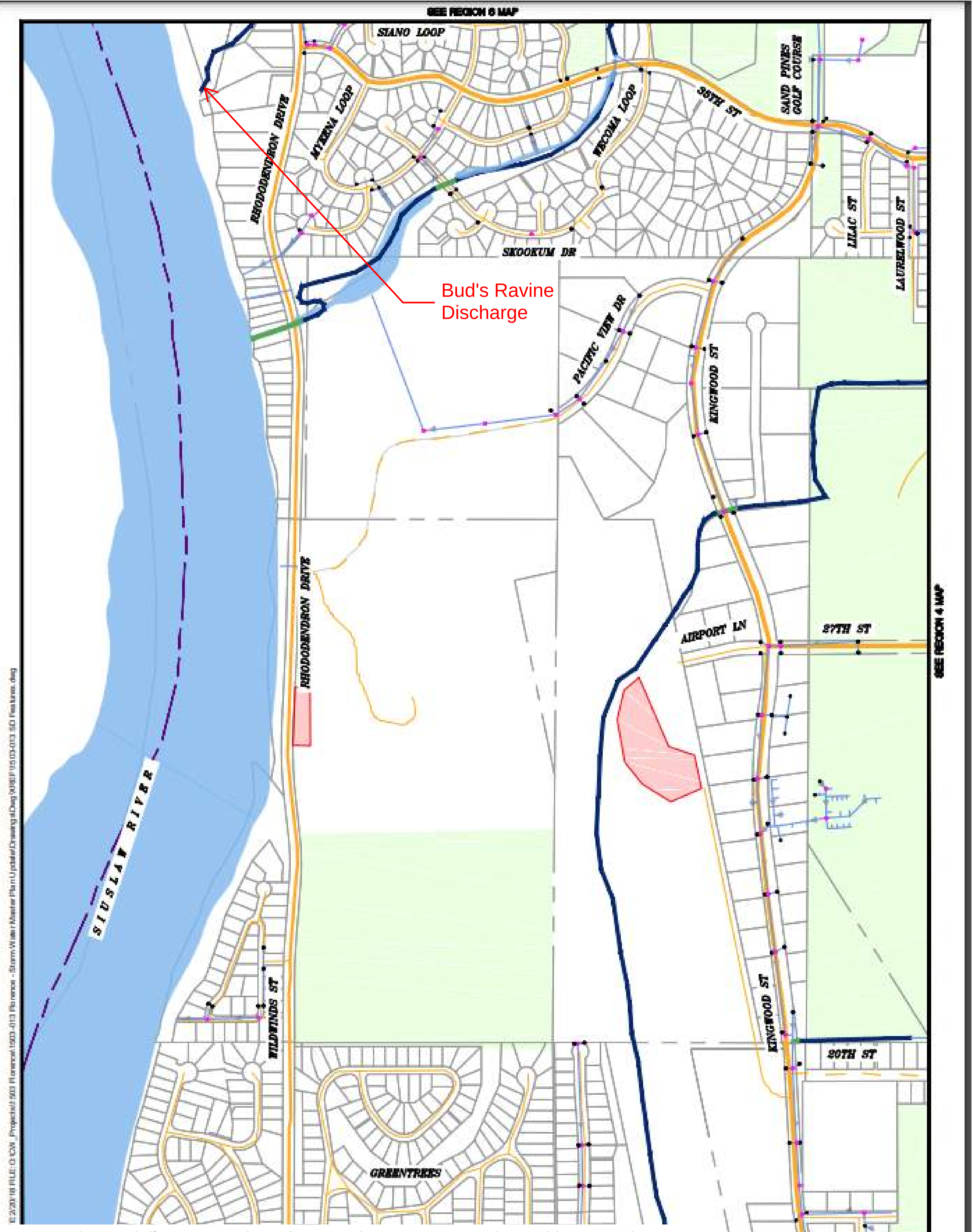
Excerpt from Civil West Engineering Services SWMP Update with 3J Markups

Figure 4-12 - Surface & Ground Water Movement Near Mariner's Village



Excerpt from Civil West Engineering Services SWMP Update with 3J Markups

REGION 6 MAP

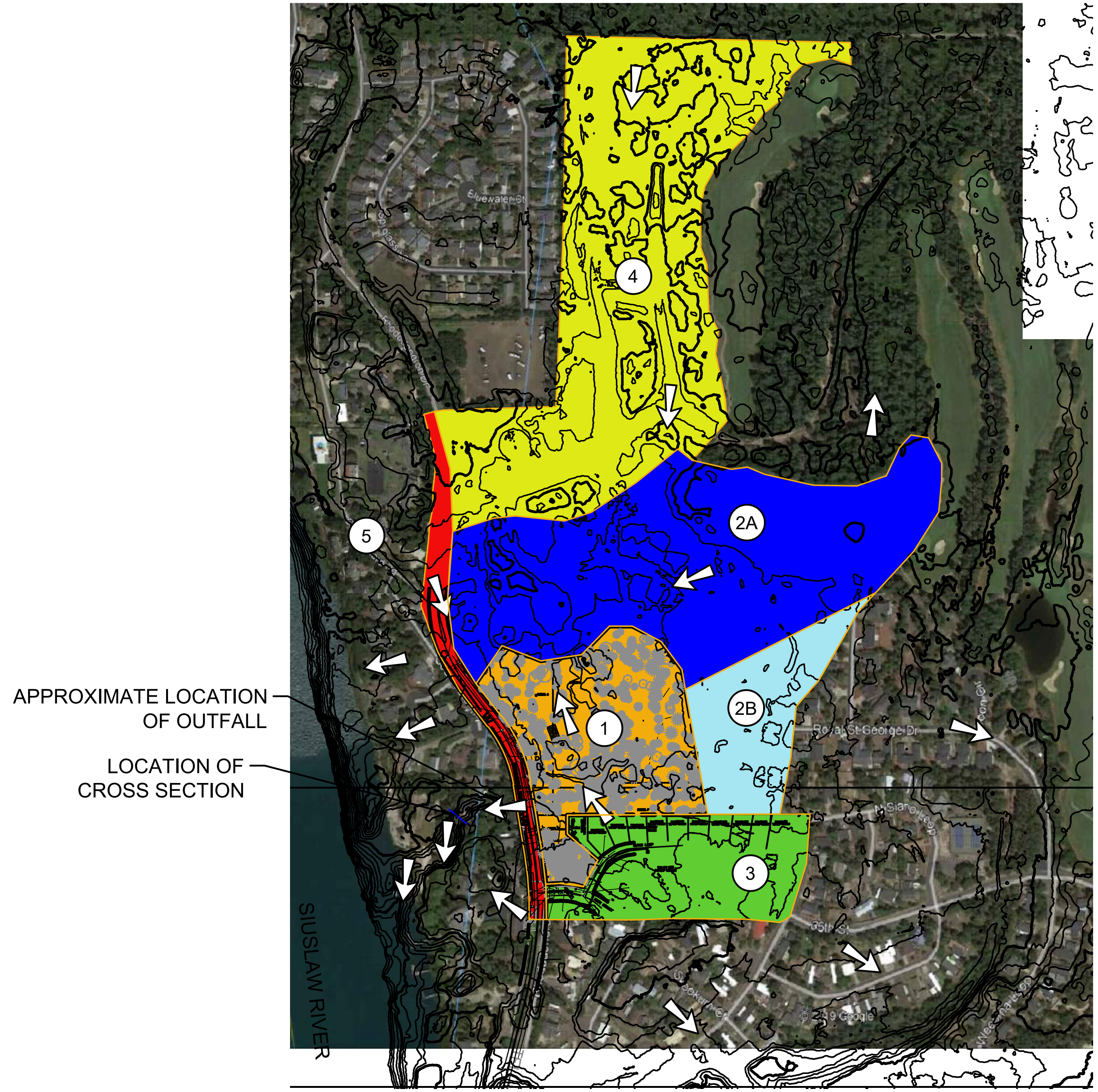


Excerpt from Civil West Engineering Services SWMP Update with 3J Markups

REGION 3 MAP

Figure 6-7 - Approximate path of Bud's Ravine

Excerpt from Civil West Engineering Services SWMP Update with 3J Markups



LEGEND

⇨	SURFACE RUN-OFF FLOW ARROW

BASIN	TOTAL AREA (AC)	% IMPERVIOUS	CN	TIME OF CONCENTRATION (MIN)	DRAINS TO
①	PROPOSED SITE (SEE EXHIBIT)				INLET
(2A)	19.911	45	66.3	60	[1]SDMH19
(2B)	4.876	45	66.3	60	[1]SDMH07
* ③	6.710	65	49.0	20	SDMH2
④	24.070	65	49.0	20	SDMH1
⑤	2.670	100	98.0	5	SDMH1

*ASSUMED FULL BUILD.

1MANHOLES SDMH19 & SDMH 07 WILL BE OPEN 48" OPEN GRATED STRUCTURES

N
W E
S

SCALE: 1" = 500'
FT
0 500

DECEMBER 2021

PLANNED UNIT DEVELOPEMENT

LRS ARCHITECTS, INC.

DOWNSTREAM BASINS

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

Hydrologic Soil Group—Lane County Area, Oregon
(BASIN 2)

Map Scale: 1:3,620 if printed on A landscape (11" x 8.5") sheet.

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
44	Dune land		11.3	27.7%
131C	Waldport fine sand, 0 to 12 percent slopes	A	9.4	23.0%
140	Yaquina loamy fine sand	A/D	20.2	49.3%
Totals for Area of Interest			**41.0**	**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.

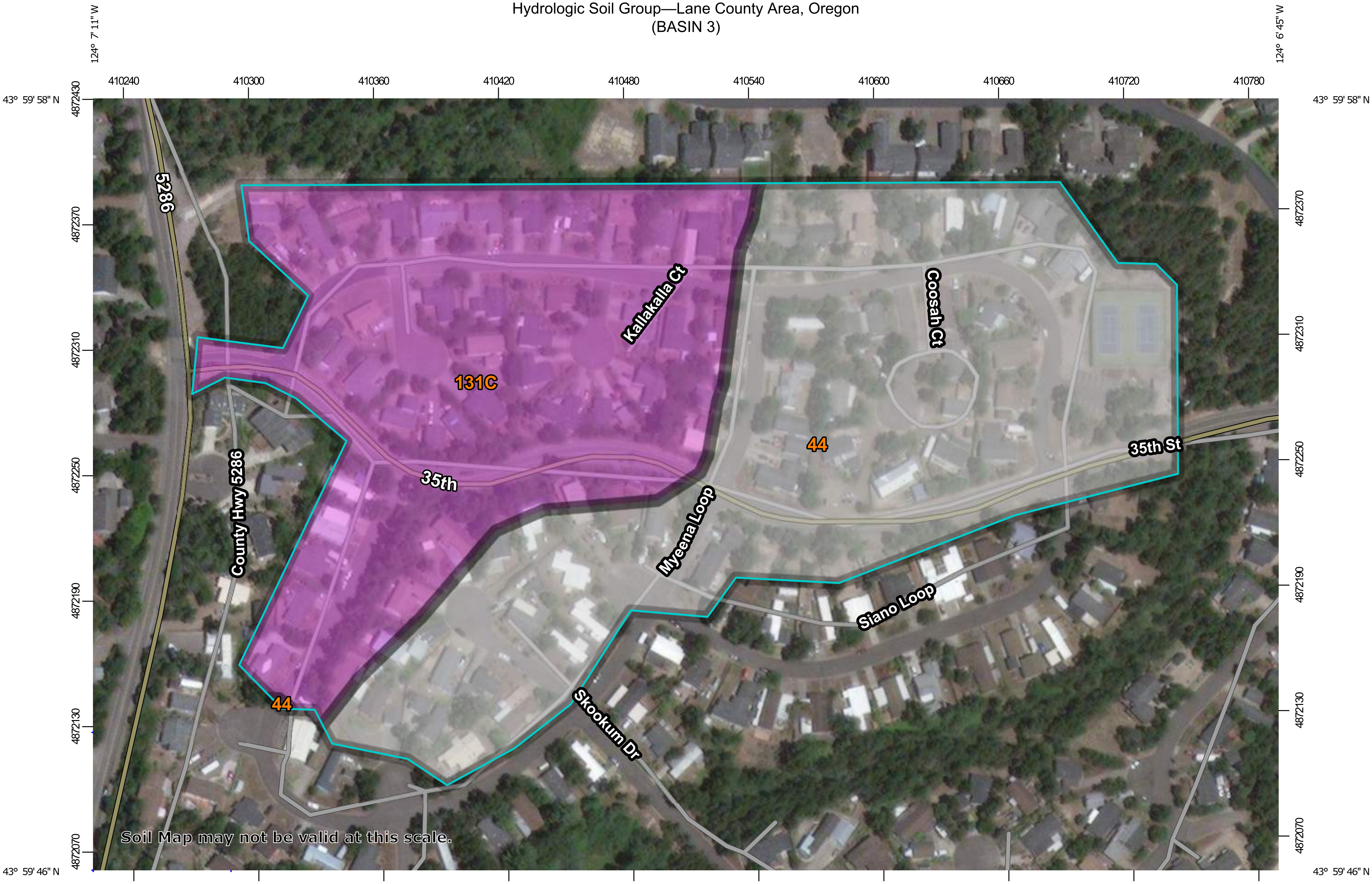
Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

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.

Hydrologic Soil Group—Lane County Area, Oregon
(BASIN 3)



Map Scale: 1:2,600 if printed on A landscape (11" x 8.5") sheet.

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
44	Dune land		12.1	54.9%
131C	Waldport fine sand, 0 to 12 percent slopes	A	9.9	45.1%
Totals for Area of Interest			**22.0**	**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.

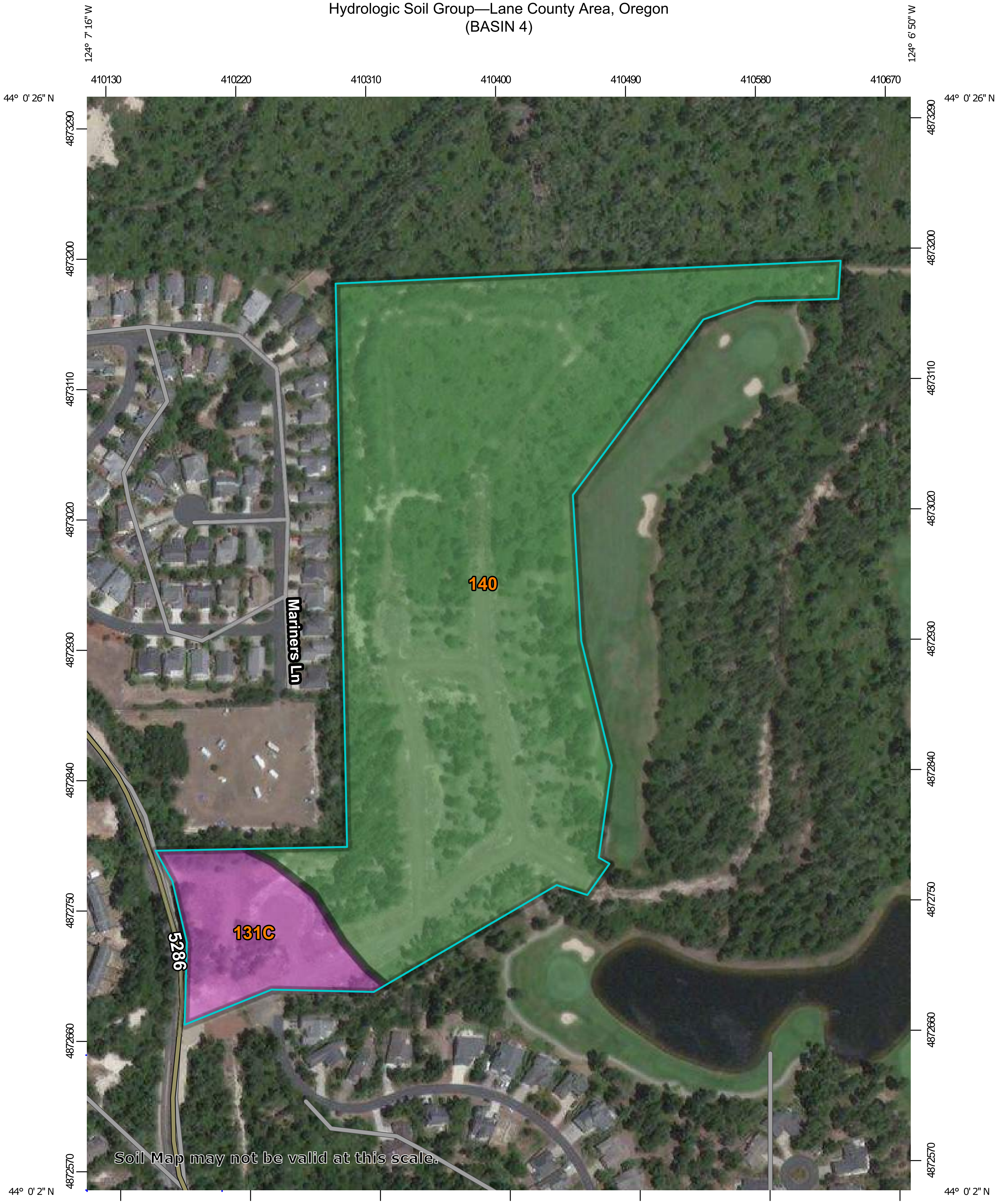
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over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

Hydrologic Soil Group—Lane County Area, Oregon
(BASIN 4)



Map Scale: 1:3,680 if printed on A portrait (8.5" x 11") sheet.

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
131C	Waldport fine sand, 0 to 12 percent slopes	A	2.7	10.7%
140	Yaquina loamy fine sand	A/D	22.2	89.3%
Totals for Area of Interest			**24.8**	**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.

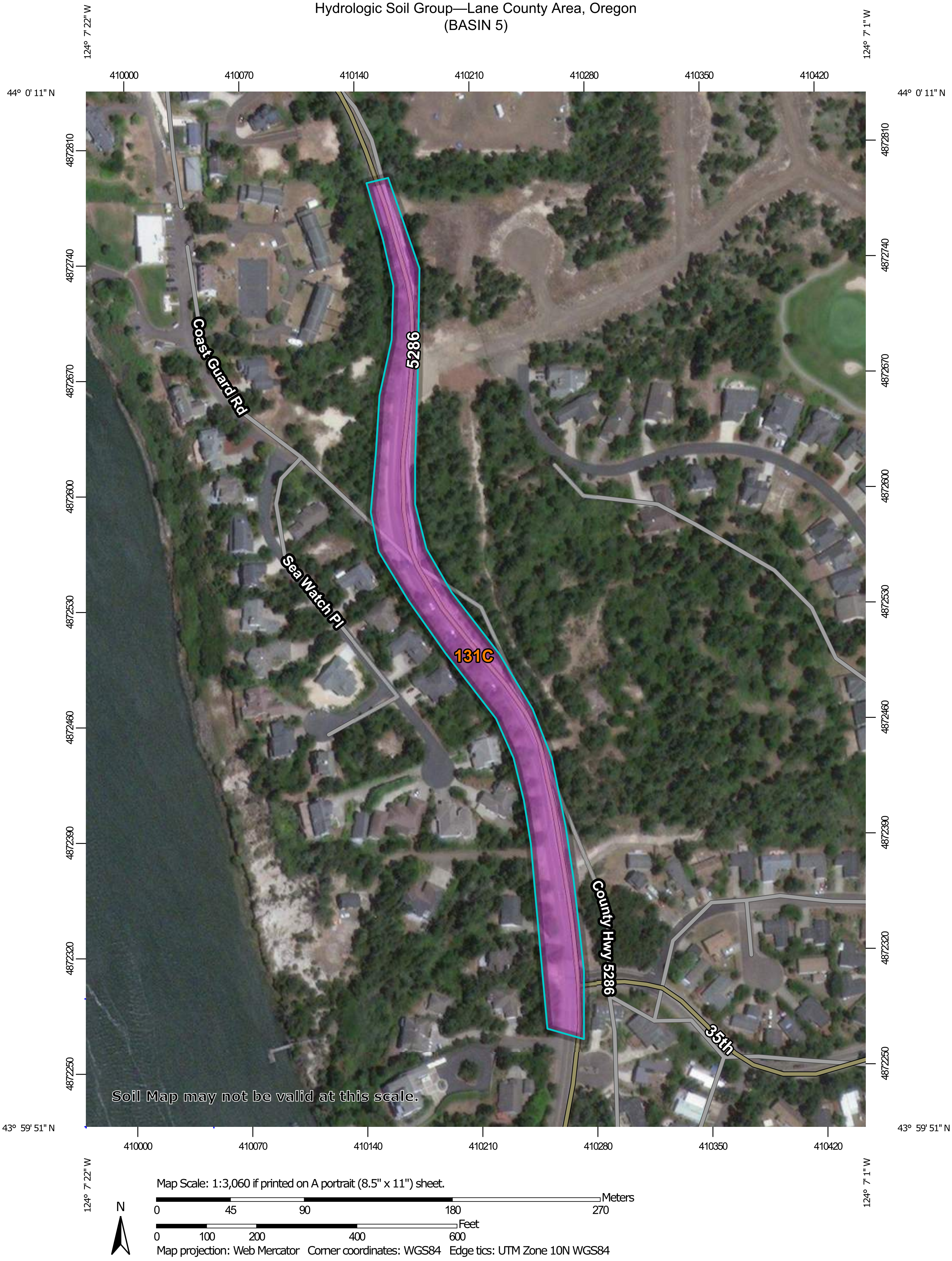
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over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

Hydrologic Soil Group—Lane County Area, Oregon
(BASIN 5)



Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
131C	Waldport fine sand, 0 to 12 percent slopes	A	3.0	100.0%
Totals for Area of Interest			**3.0**	**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.

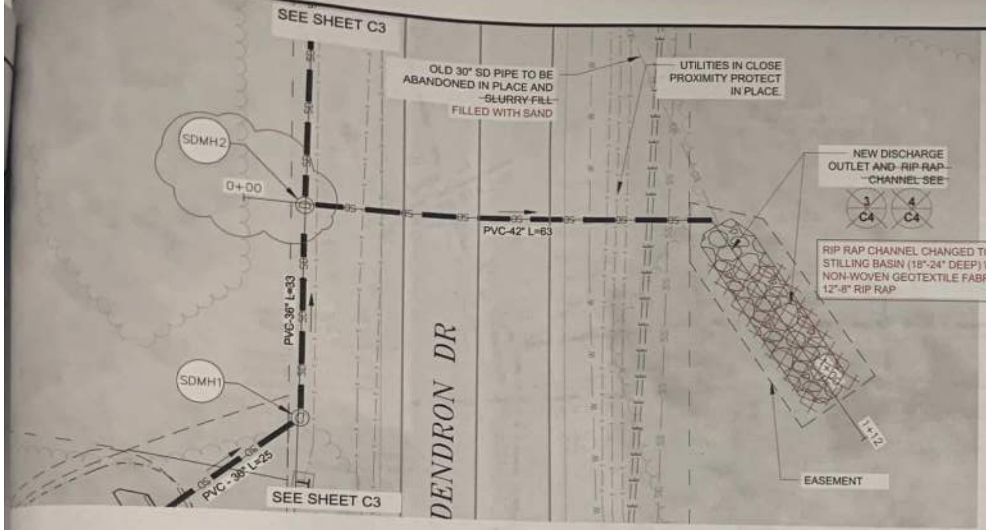
Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over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

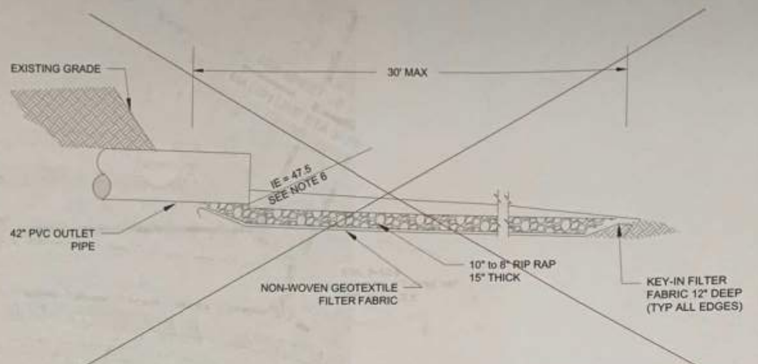
Component Percent Cutoff: None Specified



N

1 / C4 SD IMPROVEMENT- ROAD CROSSING PLAN STA 0+00 TO END

SCALE: 1" = 10'



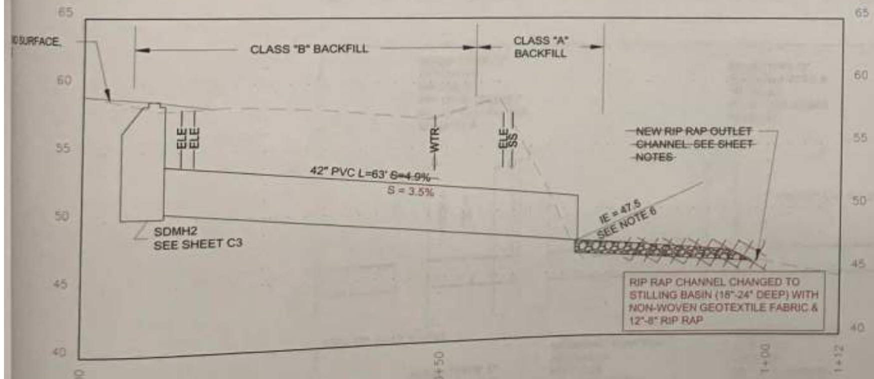
3 / C4 SD OUTLET

NOT TO SCALE

RIP RAP CHANNEL CHANGED TO STILLING BASIN (18"-24" DEEP) WITH NON-WOVEN GEOTEXTILE FABRIC & 12"-8" RIP RAP

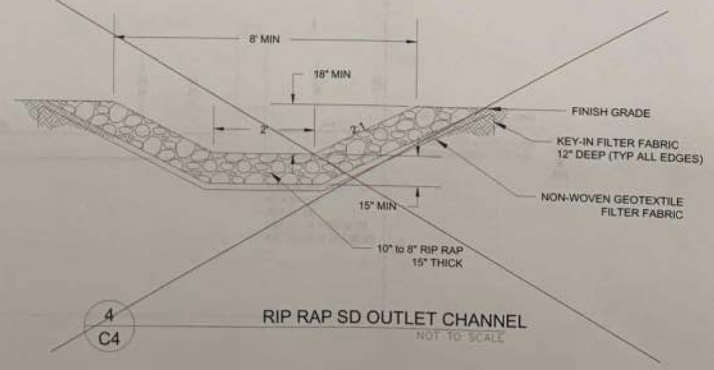
SHEET NOTES:

1) CONTRACTOR SHALL CONTACT "ONE CALL" FOR UTILITY LOCATES PRIOR TO THE START OF ANY EXCAVATION.
2) CONTRACTOR SHALL POTHOLE EXIST'G UTILITIES AND STORM DRAIN PIPING PRIOR TO CONSTRUCTION TO CONFIRM DEPTH, LOCATION AND SIZE OF NEW STORM DRAIN.
3) INSTALL NEW STORM DRAIN PER CITY OF FLORENCE DETAIL F-301.
4) INSTALL NEW SD MANHOLES PER CITY OF FLORENCE DETAILS F-315 AND F-315A.
5) DESIGNATED PORTIONS OF THE EXISTING STORM DRAIN PIPING ARE TO BE ABANDONED IN PLACE. PIPE SHALL BE SLURRY FILLED IN ITS ENTIRETY. PROVIDE CONCRETE END PLUGS AS REQUIRED.
6) VERIFY INVERT ELEVATION IN FIELD, ~~GRADE RIP RAP CHANNEL TO DRAIN. RIP RAP CHANNEL TO DAYLIGHT WITH EXISTING SURFACE.~~



2 / C4 SD IMPROVEMENT- ROAD CROSSING PROFILE STA 0+00 TO END

SCALE HORZ 1"=10'
VERT 1"=2.5'



4 / C4 RIP RAP SD OUTLET CHANNEL

NOT TO SCALE

This record drawing has been prepared, in part, based upon information furnished by others. While this information is believed to be reliable, the Engineer assumes no responsibility for the accuracy of this record drawing or for any errors or omissions that may have been incorporated into it as a result of incorrect information provided to the Engineer.

MARK E HAMPTON

Civil West
Engineering Services, Inc.
486 E Street
Coos Bay, Oregon 97420
541-266-8601
www.civilwest.com

REV.	DATE	DESCRIPTION	BY

Designed By: MEH | Drawn By: JJL | Checked By: MLG
Project No: 1502-002

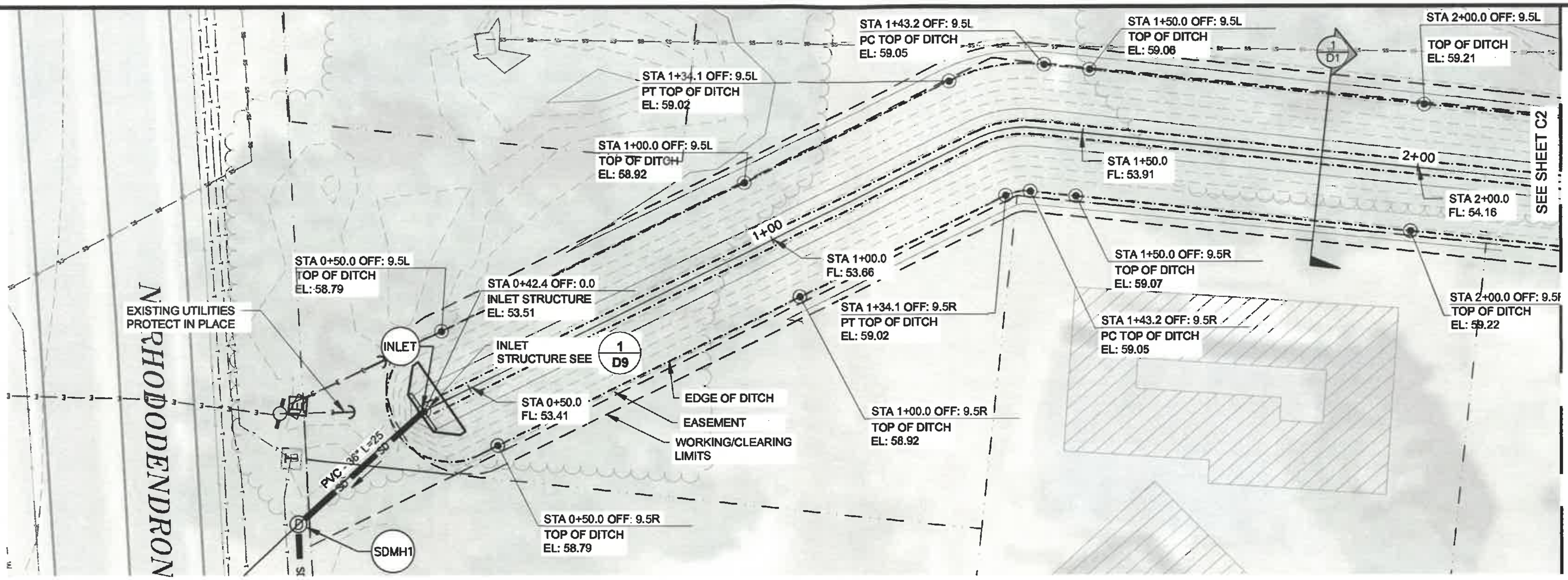
RECORD DRAWING
DATE: 05/03/2016

CITY OF FLORENCE
LANE COUNTY, OREGON

SIANO LOOP DRAINAGE AND SANITARY SEWER IMPROVEMENTS

SD IMPROVEMENT- ROAD CROSSING

Sheet No. C4
Date JULY 2015



PLAN SCALE
10 0 5 10 20
1"=20'

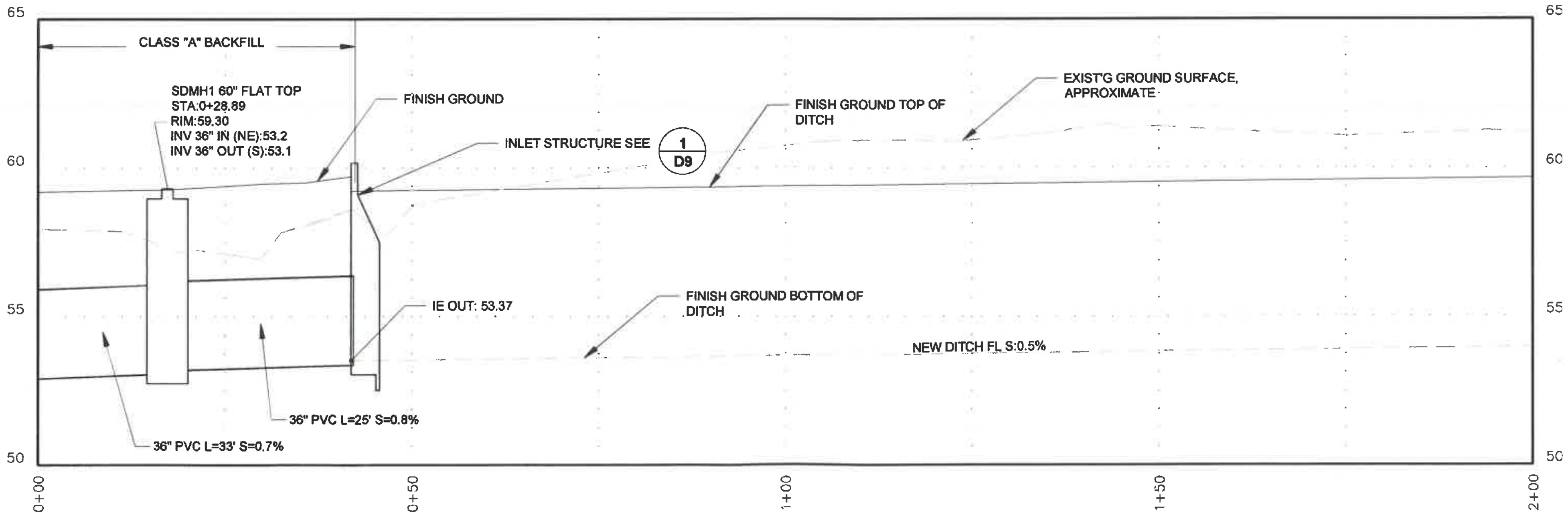
N

1
C1

NEW SD DITCH PLAN STA 0+00 TO 2+00

SHEET NOTES:

1) CONTRACTOR SHALL CONTACT "ONE CALL" FOR UTILITY LOCATES PRIOR TO THE START OF ANY EXCAVATION.
2) NEW DITCH SHALL HAVE MIN SLOPE OF 0.5%
3) FOR STORM DRAIN DITCH DETAIL SEE 1/D1



2
C1

NEW SD DITCH PROFILE STA 0+00 TO 2+00

SCALE HORZ 1"=20'
VERT 1"=5'

REGISTERED PROFESSIONAL ENGINEER
63164PE
Mark E Hampton
OREGON
JAN 11 2005
MARK E HAMPTON

RENEWAL DATE: 06/30/17

Civil West
Engineering Services, Inc.

486 E Street
Coos Bay, Oregon 97420

541-266-8601
www.civilwest.com

REV.	DATE	DESCRIPTION	BY

Designed By: MEH
Drawn By: JJL
Checked By: MLG
Project No: 1502-002

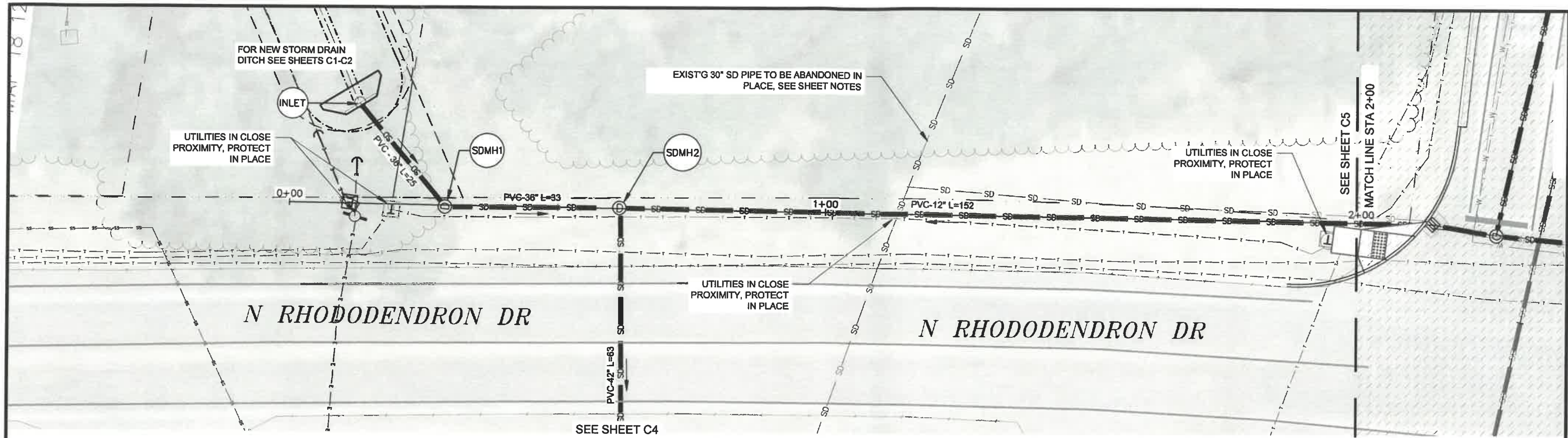
CITY OF FLORENCE
LANE COUNTY, OREGON

SIANO LOOP DRAINAGE AND SANITARY SEWER IMPROVEMENTS

NEW SD DITCH STA 0+00 TO 2+00

Sheet No. C1
Date JULY 2015

DATE:7/28/15 FILE:Z:\CW_Projects\1503 Florence\1503-002 Florence Siano Loop Drainage Improvements\Drawings\Dwg\Siano Loop - Working JJL.dwg



SHEET NOTES:

1) CONTRACTOR SHALL CONTACT "ONE CALL" FOR UTILITY LOCATES PRIOR TO THE START OF ANY EXCAVATION.
2) CONTRACTOR SHALL POTHOLE EXIST'G UTILITIES AND STORM DRAIN PIPING PRIOR TO CONSTRUCTION TO CONFIRM DEPTH, LOCATION AND SIZE OF NEW STORM DRAIN.
3) INSTALL NEW STORM DRAIN PER CITY OF FLORENCE DETAIL F-301.
4) INSTALL NEW SD MANHOLES PER CITY OF FLORENCE DETAILS F-315 AND F-315A.
5) DESIGNATED PORTIONS OF THE EXISTING STORM DRAIN PIPING ARE TO BE ABANDONED IN PLACE. PIPE SHALL BE SLURRY FILLED IN ITS ENTIRETY. PROVIDE CONCRETE END PLUGS AS REQUIRED.

1
C3

SD IMPROVEMENTS PLAN STA 0+00 TO 2+00

PLAN SCALE
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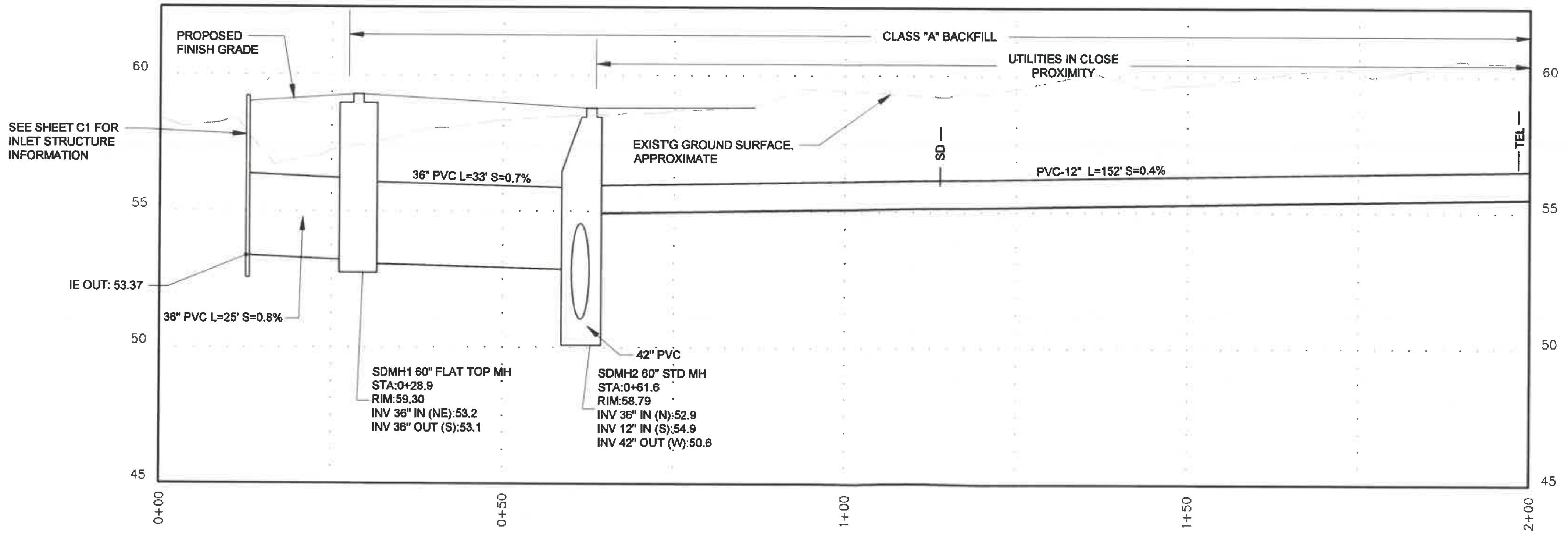

2
C3

SD IMPROVEMENTS PROFILE STA 0+00 TO 2+00

SCALE HORZ 1"=20'
VERT 1"=5'

DATE:7/28/15 FILE:Z:\CW_Projects\1503 Florence\1503-002 Florence Siano Loop Drainage Improvements\Drawings\Dwg\Siano Loop - Working JJL.dwg

REGISTERED PROFESSIONAL ENGINEER
63164PE
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OREGON
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RENEWAL DATE: 06/30/17

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REV.	DATE	DESCRIPTION	BY

Designed By: MEH
Drawn By: JJL
Checked By: MLG
Project No: 1502-002

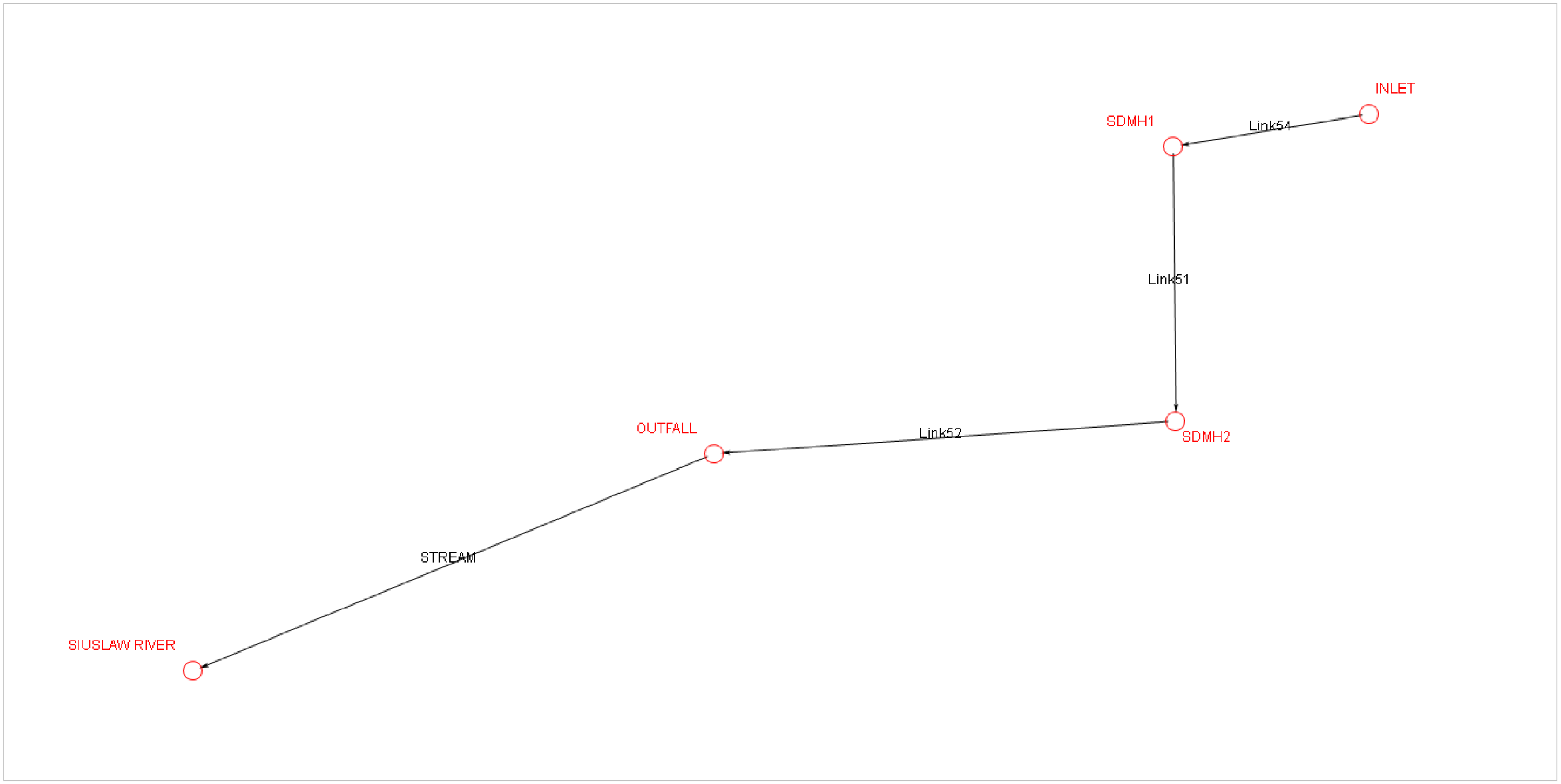
CITY OF FLORENCE
LANE COUNTY, OREGON

SIANO LOOP DRAINAGE AND SANITARY SEWER IMPROVEMENTS

SD IMPROVEMENTS STA 0+00 TO 2+00

Sheet No. C3
Date JULY 2015

Downstream Analysis – XPSTORM Hydraulic Layout



XPSTORM-RUNOFF DATA PROPOSED - 25 YR - STORM EVENT

DOWNSTREAM ANALYSIS - FLORENCE MASTER PLAN

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDMH1	24.067	65	49.0	20	5.06	0	4.81	17.63
	2.667	100	98.0	5				
SDMH2	20.882	65	49.0	20	5.06	2.065	3.00	12.63
INLET	40.43	45	66.3	45	5.06	1.26	3.80	26.08
	9.275	80	52.0	5				

XPSTORM-RUNOFF DATA PROPOSED - 100 YR - STORM EVENT

DOWNSTREAM ANALYSIS - FLORENCE MASTER PLAN

Node Information					Runoff Information			
Node Name	Area	Impervious	Curve Number	Tc	Rainfall	Infiltration	Surface Runoff	
	acre	%		min.	in	in	in	cfs
SDMH1	24.067	65	49.0	20	5.95	0	5.70	22.47
	2.667	100	98.0	5				
SDMH2	20.882	65	49.0	20	5.95	2.163	3.79	16.35
INLET	40.43	45	66.3	45	5.95	1.296	4.65	33.39
	9.275	80	52.0	5				

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (25-YEAR STORM EVENT)

DOWNSTREAM ANALYSIS - FLORENCE MASTER PLAN

Location			Conduit Properties			Conduit Results						Conduit Profile							
Link	Station																		
	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link51	SDMH1	SDMH2	3.00	33.00	0.7	51.92	0.84	43.70	8.23	2.11	0.70	59.30	58.79	53.10	49.71	4.09	7.77	55.21	51.02
Link52	SDMH2	OUTFALL	3.50	63.00	3.5	188.22	0.30	56.35	17.10	1.31	0.38	58.79	54.00	49.71	33.77	7.77	18.60	51.02	35.40
STREAM	OUTFALL	SIUSLAW RIVER	0.00	620.00	5.1	22303.77	0.00	56.00	6.56	1.63	0.08	54.00	35.00	33.77	0.00	18.60	33.38	35.40	1.62
Link54	INLET	SDMH1	3.00	25.00	0.8	55.00	0.47	26.08	5.65	2.01	0.67	58.50	59.30	53.37	53.10	3.26	4.09	55.24	55.21

XPSTORM CONVEYANCE DATA - PROPOSED CONDITIONS (100-YEAR STORM EVENT)

DOWNSTREAM ANALYSIS - FLORENCE MASTER PLAN

Location			Conduit Properties			Conduit Results						Conduit Profile							
Link	Station																		
	From	To	Diameter	Length	Slope	Design Capacity	Qmax/ Qdesign	Max Flow	Max Velocity	Max Flow Depth	y/d0	US Ground Elev.	DS Ground Elev.	US IE	DS IE	US Freeboard	DS Freeboard	US HGL	DS HGL
			ft	ft	%	cfs		cfs	ft/s	ft		ft	ft	ft	ft	ft	ft	ft	ft
Link51	SDMH1	SDMH2	3.00	33.00	0.7	51.92	1.08	55.86	9.07	2.46	0.82	59.30	58.79	53.10	49.71	3.74	7.58	55.56	51.21
Link52	SDMH2	OUTFALL	3.50	63.00	3.5	188.22	0.38	72.24	18.28	1.51	0.43	58.79	54.00	49.71	33.77	7.58	18.41	51.21	35.59
STREAM	OUTFALL	SIUSLAW RIVER	0.00	620.00	5.1	22303.77	0.00	71.79	6.98	1.82	0.09	54.00	35.00	33.77	0.00	18.41	33.23	35.59	1.77
Link54	INLET	SDMH1	3.00	25.00	0.8	55.00	0.61	33.39	5.86	2.36	0.79	58.50	59.30	53.37	53.10	2.90	3.74	55.60	55.56

GEOTECHNICAL REPORT

Branch
ENGINEERING inc
Since 1977
civil · transportation
structural · geotechnical
SURVEYING

January 28, 2020

Ashlee Sorber
American Pacific International Capital
Via Email: asorber@apicincus.com

RE: **GEOTECHNICAL ENGINEERING RECOMMENDATIONS AND SITE EVALUATION
FLORENCE HOUSING DEVELOPMENT – SITE A
RHODODENDRON DRIVE AND 35TH STREET
FLORENCE, OREGON
BRANCH ENGINEERING INC. PROJECT NO. 19-510**

Pursuant to your authorization Branch Engineering Inc. (BEI) performed a geotechnical engineering investigation at the subject site for the proposed development of a multi-family residential apartment complex.

On December 17, 2019 ten (10) exploratory test pits were advanced using a metal tracked excavator to a maximum depth of 10-feet below ground surface (BGS). The subsurface soil conditions in the test pits were logged in accordance the USCS (Unified Soil Classification System) ASTM D2488 and field tests consisting of portable dynamic cone penetrometer (DCP) tests, and falling head infiltration tests were performed. The accompanying report presents the results of our site research, field exploration and testing, data analysis, our conclusions and geotechnical engineering recommendations for the project. The site is suitable for the planned development, provided the recommendations of this report are implemented in the design and construction of the project.

Sincerely,
Branch Engineering Inc.

REGISTERED PROFESSIONAL ENGINEER
#16,170
OREGON
SEPT 15, 1992
RONALD J. DERRICK
EXPIRES: 12/31/2021

Ronald J. Derrick, P.E., G.E.
Principal Geotechnical Engineer

EUGENE–SPRINGFIELD ALBANY–SALEM–CORVALLIS

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FIGURE 1 – Site Map

APPENDIX A – Test Pit Logs & Field Test Summaries, Infiltration Testing Data, Well Logs, USDA NRCS Soil Mapping

APPENDIX B – Geotechnical Specifications

1.0 INTRODUCTION

The subject site is located along and east of Rhododendron Drive in Florence, Oregon at latitude 44.000000° north and longitude 124.118365° west. The site consists of vacant land with 7 separate parcels totaling approximately 9.2-acres in size.

This report presents the results and findings of Branch Engineering, Inc. (BEI) field observations, testing, and research for the subject site. Our investigation included the evaluation of the subsurface conditions at the site to provide geotechnical recommendations for the design and construction of proposed residential buildings and site improvements for access and parking.

1.1 Project and Site Description

Our understanding of the project is a residential development consisting of multi-unit and detached housing units with associated site improvements such as utility installation, paved access roads, and parking is proposed. Access to the site is expected to be taken from Rhododendron Drive.

The site is surrounded by single-family residential development with Rhododendron Drive running roughly north-south along the western perimeter of the site and the Florence Golf Links golf course present behind adjacent single-family residences.

At the time of our visit, the site surface was covered with vegetation consisting of scattered shore pines, manzanita, salal, rhododendrons, and other vegetation typical of the Oregon Coast dune ecology. Several partially overgrown former driveways, or pathways were used to access the interior of the site. Review of historical photos available from Google Earth ™ indicate that in the 1990's the site was used as an RV park/campground. During our site visit we observed several areas of debris indicating the site had been used for dumping household waste items, and in other areas trash from unauthorized camp sites was observed. Water and wastewater pipes from the former RV park were observed in various locations on the site and there is potential for slabs or septic tanks to remain buried on the property. Areas of undocumented sand fill are also likely to be encountered during site clearing activities.

The site topography is relatively flat, with elevations ranging from 58-feet to 67-feet above sea level. Several swales, or drainage ditches were observed on the southeastern portion of the site and the northwestern portion of the site, north of an existing driveway from Rhododendron Drive. The southeastern drainage features appear to be part of an existing surface drainage pattern transporting surface runoff from the adjacent Wisteria at Sandpines development across the southern portion of the site to a recently (2015 +/-) constructed drainage swale and box culvert crossing Rhododendron Drive to the west.

1.2 Scope of Work

Our scope of work included a site reconnaissance and subsurface investigation on December 17, 2019. Ten (10) exploratory test pits were advanced at the locations shown on the attached Figure-1 Site Exploration Map with the observed soil stratigraphy classified in accordance with the American Society of Testing and Materials (ASTM) Method D-2488.

A portable dynamic cone penetrometer which consists of graduated steel rods driven into the soil by dropping a 35-lb slide hammer a vertical distance of 18-inches was used to assess the consistency of the site soil at select locations and depths in the test pits.

In addition to the exploratory test pits, three (3) Falling Head Infiltration Tests were performed at the locations shown on the attached Figure-1 with results summarized below and field data attached.

Field log summaries of the site exploratory test pits, including field test results, are presented in Appendix A. Also included in Appendix A are copies of nearby well logs from the Oregon Department of Water Resources on-line database, and the soil survey mapping of the site. Field and laboratory test results are summarized on the test pit log summaries.

1.3 Site Information Resources

The following site investigation activities were performed and literature resources were reviewed for pertinent site information:

- Review of the United States Department of the Interior Geological Survey (USGS) 2017 Mercer Lake, Oregon Quadrangle Map and the 2017 Florence, OR Quadrangle Map.
- Ten exploratory test pits were advanced to a maximum depth of 10-feet below ground surface (BGS), and three Falling Head Infiltration Tests were performed on the site at the approximate locations shown on Figure-1.
- Review of the Lane County area Web Soil Survey, United States Department of Agricultural (USDA) Natural Resources Conservation Service (NRCS), see Appendix A.
- Review of the USGS Geologic Map of Oregon, (USGS 1991, Walker & MacLeod).
- Review of Oregon Department of Water Resources Well Logs from nearby locations, see Appendix A.
- Review of DOGAMI online hazard view for the subject site vicinity.

2.0 SITE SUBSURFACE CONDITIONS

The analyses, conclusions and recommendations contained in this report are based on site conditions as they presently exist and assume the exploratory test pit excavations, presented in Appendix A, are representative of the subsurface conditions throughout the site. If, during construction, subsurface conditions differ from those encountered in the exploratory test pits; BEI requests that we be informed to review the site conditions and adjust our recommendations, if necessary.

2.1 Site Soils

The NRCS Web Soil Survey maps two soil units across the site area; Waldport fine sand, 0 to 12 percent slopes and Waldport fine sand is mapped across the majority of the site area with Yaquina loamy fine sand mapped across the northeast portion of the site. Both soil units are described as well drained fine grain eolian sand.

In the exploratory test pits, medium dense, tan, moist, fine grain sand was observed underlying existing topsoil, or root zones. In several test pits, clayey gravel fill was observed near the ground surface which we attribute to previous development on the site. Sidewall caving was observed as excavation depths increased below approximately 3-feet to 5-feet BGS.

Blow counts recorded during DCP testing at depths from 3-feet to 4-feet BGS indicate a loose consistency of the sand which becomes medium dense with depth.

2.2 Ground Water

No groundwater was observed in the exploratory test pits which were advanced to a maximum of 10-feet BGS or to about a bottom elevation of 50-feet (mean sea level) MSL. Well logs from nearby sites were obtained from the Oregon Water Resources Department and list static water levels at 6.2-feet and 21-feet BGS, see attached logs. Variations in the depth to water is typical in stabilized dune environments with raised dunal areas and deflation zones with water closer to the surface. Historically the subject site had received more surface and near surface water flow before up slope development to the north and west have collected and diverted stormwater away from the site. Ponds remain on the golf course property that also retain water.

We expect that ground water levels (from the regional water table or perched lenses) will fluctuate with the seasons and should be expected to be highest during the late winter and spring months when rainstorms are more intense and frequent, and soils are near saturation. Due to the presence of relatively clean sand on the site, it is likely well drained with remnants of surface water channels in the southeast are of the site.

The presence of ground water is not expected to impact the proposed development, provided the recommendations of this report are implemented in the design and construction of the project. Perched lenses of water may be encountered but impacts can be mitigated by the recommendations within this report. If excavations do encounter the static water table dewatering measures will be required for work such as utility installation below the water table elevation.

3.0 GEOLOGIC SETTING

The 1991 Geologic map of Oregon by Walker and MacLeod maps the site geology as dune sand. The subject site is located near the northern extent of the longest coastal strip of dunes on the Oregon Coast. The dunes in the area were likely formed post ice-age during the Holocene epoch by eolian processes associated with the activity of wind. The typical pattern seen in the area is transverse dunes (running parallel to the ocean) caused by the varying on, and off shore winds. The area is mapped as sedimentary deposits of the Holocene and or Pleistocene, unconsolidated to poorly consolidated eolian sands. The subject site is underlain by Holocene-aged sedimentary deposits of unconsolidated to poorly consolidated fine-grained sands.

The site is located on the Oregon Coast, the entire Oregon Coast is located near the Cascadia Subduction Zone, which is a zone of converging tectonic plates that historically produces major earthquake events, a depiction of the historical Subduction Zone earthquake events is shown below.

Occurrence and Relative Size of Cascadia Subduction Zone Megathrust Earthquakes

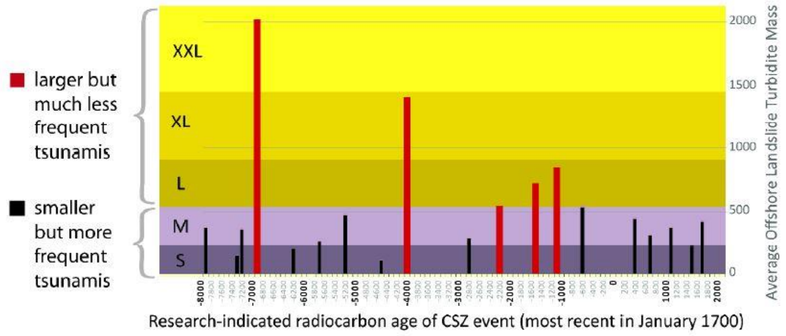


Figure 3: This chart depicts the timing, frequency, and magnitude of the last 19 great Cascadia Subduction Zone events over the past 10,000 years. The most recent event occurred on January 26, 1700. The 1700 event is considered to be a "medium sized" event. The data used to create this chart came from research that examined the many submarine landslides, known as "turbidites," that are triggered only by these great earthquakes (Witter and others, 2011). The loose correlation is "the bigger the turbidite, the bigger the earthquake."

3.1 Seismic Site Classification

Based on the soil properties encountered in our site pits and on-site well log information, Site Class D (Table 20.1-1 ASCE 7) is recommended for the medium dense sand encountered in the test pits. Pursuant to the 2019 Oregon Structural Specialty Code the following potential geologic and seismic hazards are addressed.

- Slope Instability: The site topography is relatively flat with isolated high and low areas typical of stabilized dune topography. Our review of the online Department of Geologic and Mining Industries (DOGAMI) hazard viewer does not map any areas of high landslide hazard risk, or existing landslides in the vicinity of the site, or in a location that may affect the site. Provided the earthwork recommendations in this report are incorporated into design and construction of the project the risk of landslides impacting the site is low.

- Liquefaction: Near surface sands are loose and susceptible to liquefaction and settlement if saturated at the time of a seismic event; however, based on our investigation findings and review of area well logs, it appears that the high ground water level is at least 10-feet below most areas of the site, at or below an elevation of 50-feet MSL. The sand at this depth becomes a medium dense consistency. Based on an anticipated lateral acceleration of 0.4g in the event of CSZ earthquake resulting in a cyclic stress ratio of 0.26 the sands within 20-feet BGS, liquefaction may occur (Boulanger & Idriss, University of California, Davis 2014) in saturated conditions; however, the risk of ground surface effects due to liquefaction are considered to be low. The potential from tsunami and ground shaking at the site in the event of a CSZ earthquake are considered to be the primary potential site impacts.

- There are no known active faults on the site, other normal faults are mapped in the hills in the site vicinity, however, these faults are not known to be active. The risk of surface rupture is low.

- There are no abrupt changes in ground elevation on or near the site that would present a potential for lateral spreading to occur during a seismic event; the risk for lateral spread on the site is low, provided any embanked fill on the site is constructed per the recommendations in this report.

4.0 CONCLUSIONS

Based on our field observations, subsurface explorations, and data analyses, we conclude that the site is geologic and geotechnically suitable for the proposed development provided that the recommendations of this report are incorporated into the design and construction of the project. Our investigation did not reveal any specific site features or subsurface conditions that would impede the proposed design and construction of the project. We conclude that no further geotechnical analysis is required on the subject site for the proposed site improvements.

5.0 RECOMMENDATIONS

The following sections present site-specific recommendations and design parameters for site preparation, drainage, foundations, utility excavations, and slab/pavement design. General material and construction specifications for the items discussed herein are provided in Appendix B.

The subsurface conditions observed in our site investigation are consistent; however, our field explorations only represent a very small portion of the site. Should loose or unsuitable soils extend to a depth greater than that described herein, or areas of distinct soil variation be discovered, this office shall be notified to perform site observation and additional excavation may be required.

5.1 Site Preparation and Foundation Subgrade Requirements

The following recommendations are for earthwork in the building foundation areas, roadways, and parking areas. Earthwork shall be performed in general accordance with the standard of practice as described in Appendix J of the 2019 Oregon Structural Specialty Code and as specified in this report.

All areas intended to directly or laterally support structures or roadways shall be stripped of vegetation, organic soil, unsuitable fill, and/or other deleterious material. These stripping’s shall be removed from the site or reserved for use in landscaping or non-structural areas. Once subgrade is exposed, expected to be loose to medium dense sand, the recommended subgrade preparation is as follows:

Foundation Subgrade Preparation
In areas of foundation footings, organic topsoil and loose sand shall be removed to consistently medium dense sand either for the placement of foundation forms or structural fill. Upon excavation to suitable subgrade, the subgrade shall be wetted and rolled with a vibratory smooth drum roller until no additional visual settlement of the subgrade is detected. Conventional strip and spread footings may be used for the foundation system of the proposed structures.

Foundation footings shall be placed at least 5-feet from the competent face of downward slopes below footings.

If footings are not constructed immediately upon subgrade preparation, we recommend that the subgrade be covered with a minimum of 3-inches of compacted aggregate to mitigate wind and water erosion. After construction of footings, the perimeter of the footings shall be protected from erosion to mitigate undermining of footings. If structural fill is required to raise subgrade elevations, the fill shall conform to the recommendations in Sections 5.2 below.

Pavement Subgrade Preparation
In areas of pavement for vehicle access or parking, we recommend that the existing vegetation, topsoil, and areas of loose soil be removed to consistent subgrade material as described above. The expected depth of excavation to the subgrade material described above is approximately 10- to 16-inches. Upon excavation to suitable subgrade, the subgrade shall be wetted and rolled with a vibratory smooth drum roller until no additional visual settlement of the subgrade is detected. Fill placed to raise pavement subgrade elevations shall be placed on suitable subgrade, and conform to the recommendations below. We recommend that a minimum of 6-inches of compacted aggregate be placed on the subgrade in light vehicle pavement areas. Heavy construction traffic will require additional aggregate thickness, a minimum of 12-inches, to mitigate rutting of the subgrade.

During subgrade excavation in foundation and pavement areas we recommend the Geotechnical Engineer of Record, or designated representative visit the site to observe the subgrade material prior to placement of structural fill or aggregate.

5.2 Engineered Fill Recommendations

All engineered fill placed on the site shall consist of homogenous material and shall meet the following recommendations. Clean, native sand is suitable for use as structural fill material.

- Areas of structural fill placement shall be stripped of organic material, loose soil, and subgrade approved by the Geotechnical Engineer prior to the placement of fill materials. Sloped areas in excess of 20% shall be properly keyed and benched horizontally into competent material as the fill height progresses. Proof-rolling or hand-probing of the subgrade may be required to assess competence.

- Prior to placement, fill material shall be approved by the Geotechnical Engineer. Acceptable fill shall be free of organics or other deleterious materials. The sand present on the site is acceptable for use as engineered fill upon removal of any organic material.

- The fill shall be moisture conditioned within 2% +/- of optimum moisture content and compacted in lifts with loose lift thickness not exceeding 8- inches with appropriate equipment for the fill material.

- Periodic visits to the site to verify lift thickness, source material, and compaction efforts shall be conducted by the Geotechnical Engineer or designated representative and documented.

- The recommended compaction level for engineered fill is 90% of ASHTO T-180/ASTM 1557-D (modified Proctor) unless otherwise specified. Compaction shall be measured by testing with nuclear densometer ASTM D-6938, or D-1556 sand cone method. If compaction testing by nuclear densometer is not possible due to the nature of the approved fill material, proof rolling with a fully loaded 10 CY dump truck observed by the Geotechnical Engineer or designated representative shall be conducted.

5.3 Cut/Fill Slopes

Fill slopes may be constructed up to a slope of 2:1 (H:V) and should be protected from erosion. See the attached Figure 2, Fill Slope Detail, for benching and drainage details. Fill shall be placed on subgrade consisting of level benches excavated through near surface topsoil or other unsuitable subgrade materials. All fill slopes in excess of 5 feet in height shall contain a keyway as shown on Figure 2. Temporary cut slopes may be excavated up to 1.5:1 (H:V) in steepness. but permanent slopes shall not exceed 2:1. All slopes shall be protected from erosion by timely placement of vegetation, or other means, and runoff should not be allowed to flow down the face of slopes.

Cut and/or fill slopes shall be no steeper than 2:1 and shall be compacted to their outer edge by either back rolling or being over built and cut to grade. All slopes shall be protected with erosion control measures and surface water shall not be allowed to drain over the top of a slope. Foundations shall be placed such that there is at least 5 lateral feet from the face of slope or outside a 1:1 plane projected from the toe of slope; whichever is greater.

5.4 Lateral Earth Pressures and Friction Coefficient

The following equivalent fluid pressure parameters can be used for design of site retaining structures that are free draining with no hydrostatic pressures.

Table-1 Lateral Earth Pressures

Material	Passive Earth Pressure (Kp)*1	Active Earth Pressure (Ka)*3	At-Rest Earth Pressure (Ko)*2
Sand (Level Backfill)	250 pcf	30 pcf	45 pcf
Sand (2:1 Backfill Slope)	250 pcf	40 pcf	55 pcf

*1 – Neglect upper foot of material unless covered by footing or pavement.
*2 – For walls restrained at the top from movement
*3 – For seismic design increase Ka by 0.7 of the peak ground acceleration (PGA) and apply at 0.4H above the base of the wall, where H is the wall height.

The coefficient of friction for concrete poured neat against undisturbed or compacted sand subgrade is 0.45 and 0.5 may be used for concrete poured on a minimum of 12-inches of compacted aggregate.

5.5 Drainage & Infiltration Testing

An on-site storm drainage system is expected to be engineered for this project. Three encased falling head infiltration tests were performed on December 17, 2019. Infiltration tests were conducted with 6-inch diameter pipes set and sealed in native soil. Infiltration test locations are shown on the attached Figures 1. The recorded field test measurements are provided in Appendix A. No factor of safety has been applied to the measured rates of vertical hydraulic conductivity.

Test Location	*Test Depth (Inches)*	*Measured Hydraulic Conductivity, k (in/hr)*
IT-1	54	92
IT-2	54	49
IT-3	56	80

Alteration of existing grades for this project will likely change drainage patterns but should not adversely affect adjacent properties. We recommend that areas of structural fill be evaluated to ensure proper drainage away from structures is maintained. Accumulation of drainage near structural fills may result in saturation and softening of material. Final perimeter landscape grades shall slope away from the foundation and surface water shall not be allowed to pond adjacent to foundations.

5.6 Soil Bearing Capacity

Based on our site observations and review of proposed building plans, conventional spread footings or continuous strip footings are suitable for the proposed site development provided the building pad area preparation is in conformance with the recommendations described above in Section 5.1. The allowable bearing capacity for foundation elements placed on undisturbed sand subgrade or prepared structural fill is 1,500 psf. The allowable bearing capacity may be increased by 1/3 for short-term loading such as wind and seismic.

Additionally, structural fill should extend laterally, from all foundation edges, a minimum distance or 5-feet or within a 1:1 plane from at least 1-foot outside the edge of footing. Perimeter landscape grades shall be sloped away from all foundations and water should not be allowed to pond within 10-feet of footings.

The following recommendations shall be implemented in the design and construction of the project. Periodic site observations by a geotechnical representative of Branch Engineering, Inc. are recommended during the construction of the project. The specific phases of construction that should be observed are:

Table 3:

Recommended Construction Phases to be Observed by the Geotechnical Engineer	
Phase	*Observation*
At completion of street excavation	Subgrade observation by the geotechnical engineer before fabric and aggregate placement.
Imported fill material	Observation of material or information on material type and source.
Placement or compaction of fill material	Observation by geotechnical engineer or test results by qualified testing agency.

5.7 Settlement

The maximum building foundation loads are estimated to be less than 1.5 kip/linear foot for wall loads and/or 3 kips for column loads. Site-specific consolidation testing was not performed; however, based on soil observations and test results in similar soil conditions, the estimated total settlement at the site is not expected to exceed 0.75-inches with a differential settlement up to 0.5-inches over a span of 20 feet. The settlement estimates are based on the building load effects and area expected to occur over a short-term, generally by the time construction is completed. These settlement estimates do not account for seismic induced settlement, which may be as much as 2+ inches, but is expected to be relatively uniform across a building footprint. Foundations should be placed a minimum distance from each other to prevent overlapping of stress distributions defined as a 1:1 (H:V) slope projection from all foundation edges to a minimum depth of two (2) times the foundation width of the largest footing.

5.8 Slabs-On-Grade

After site preparation to expose suitable subgrade prepared in accordance with Section 5.1, load bearing concrete slabs shall be underlain by a compacted sand subgrade or leveling course of compacted, crushed aggregate, if necessary. A modulus of subgrade reaction of 150 pci may be used for design of slabs on approved native subgrade material or structural fill. Non-load bearing slabs or pavements do not require geotechnical design criteria; however, BEI recommends a stable subgrade to mitigate un-controlled cracks. The edges of slabs shall be protected from erosion and undermining of the slab; a vapor barrier system shall be selected by the project architect and may be dependent on slab cover materials.

5.9 Pavement Design Recommendations

The estimated California Bearing Raito (CBR) for the near surface loose sand is 3 based on blow count correlations; however, once the pavement section subgrade is exposed and compacted, the consistency of the sand can typically be increased to at least medium dense to depths of at least 3-feet thereby increasing the CBR of 8, which is a “Fair” classification. Our recommendations used the guidance of the 1993 AASHTO Guide for Design of Pavement Structures, the 2003 revised Asphalt Pavement Design Guide, published by the Asphalt Pavement Association of Oregon, and the 2019 ODOT Pavement Design Guide as well as results from engineered structural pavement sections developed for sites with similar soils and anticipated traffic loads. Based on an estimated equivalent 18-kip single axle loading (ESAL) of 50,000 over 20-years, a subgrade resilient modulus of 5000 psi, and 90% reliability, a Structural Number of 3.0 has been used for design of the pavement sections for the driveway portions of the site. Pavement may consist of 4-inches of Asphalt Concrete (AC) over 12-inches of base aggregate. The above section is recommended for areas of anticipated heavy traffic, including refuse, delivery, and furniture moving trucks. In areas that will be restricted to light passenger vehicle travel or parking, the recommended pavement section can be reduced to 3-inches of AC pavement over 8-inches of base aggregate. A geotextile separation fabric is recommended in wet areas where pumping of the sand may cause intrusion into the base aggregate.

A bi-axial geogrid system may be used to reduce base aggregate thicknesses, if necessary, for design grades. The surface must then be smooth and free of obstructions, depressions, and debris. Geogrid placement must be in accordance with 2018 ODOT Standard Specifications 00331.41. The aggregate size atop the geogrid shall not exceed 1.5-inches.

The above recommended structural pavement sections are designed for the type of vehicle use on the site after construction completion, not for construction vehicle traffic which is generally heavier, occurs over a short time, and impacts the site before full pavement sections are constructed. The construction traffic may cause subgrade failures and the site contractor should consider over-building designated haul routes through the site to mitigate soft areas at the time of final paving.

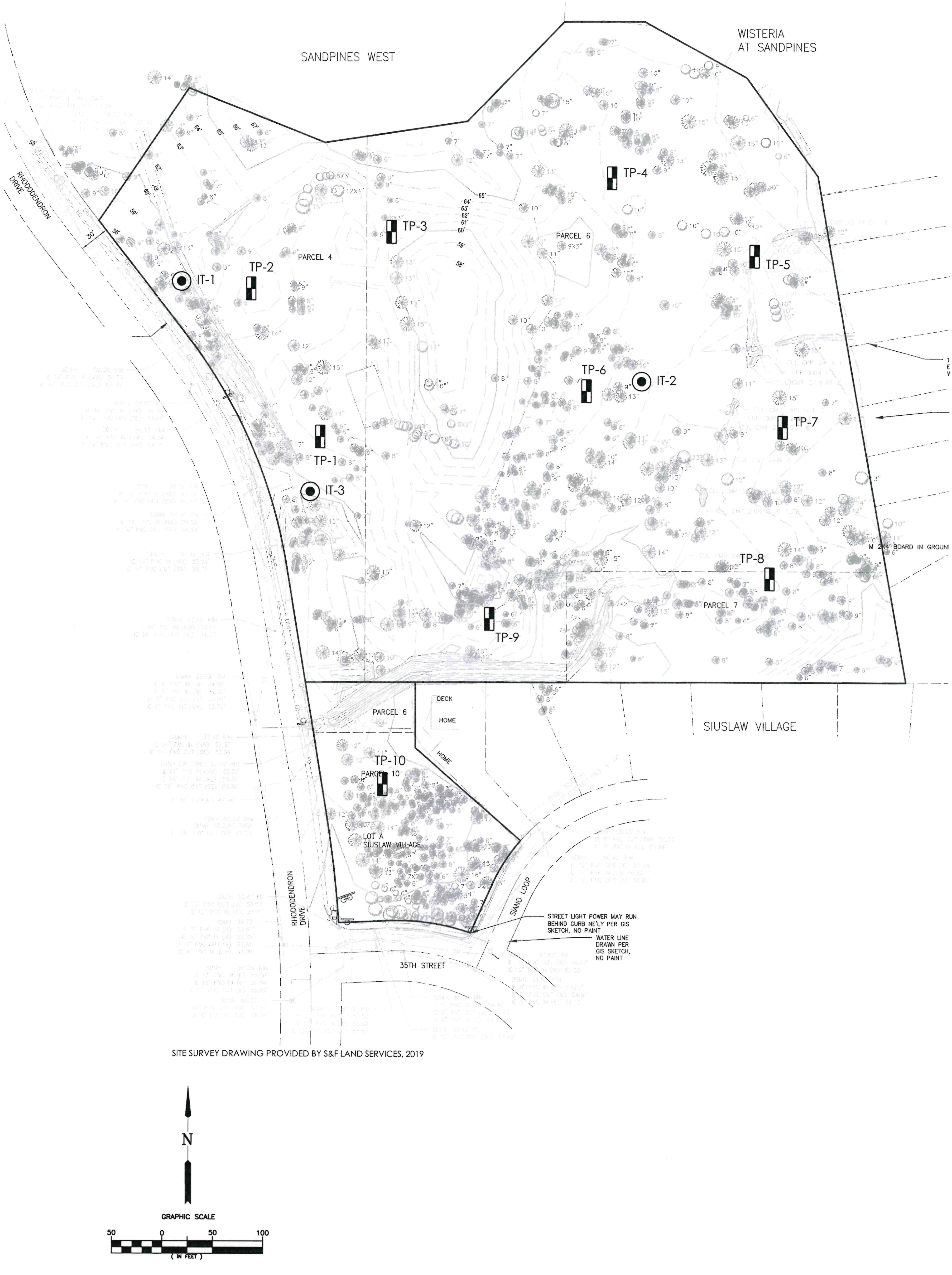
5.10 Wet Weather/Dry Weather Construction Practices

The site material is sand to depths over 70-feet and is relatively free-draining. Precipitation will not adversely impact site earthwork; however, high groundwater levels during the wet season may impact site trenching activities and cause “pumping” of the subgrade with repeated heavy vehicle traffic. Dewatering and/or shoring of excavation sidewalls may be required during construction. Construction traffic routes should have a minimum of 12-inches of aggregate, with preferably 3-inch minus angular aggregate in the lower 8-inches of the temporary road section to mitigate subgrade degradation during wet weather conditions. Final design pavement sections and foundation subgrade recommendations do not account for repeated heavy truck traffic associated with construction.

6.0 REPORT LIMITATIONS

This report has presented BEI’s site observations and research, subsurface explorations, geotechnical engineering analyses, and recommendations for the proposed site development. The conclusions in this report are based on the conditions described in this report and are intended for the exclusive use of American Pacific International Capital and their representatives for use in design and construction of the development described herein. The analysis and recommendations may not be suitable for other structures or purposes.

Services performed by the geotechnical engineer for this project have been conducted with the level of care and skill exercised by other current geotechnical professionals in this area. No warranty is herein expressed or implied. The conclusions in this report are based on the site conditions as they currently exist and it is assumed that the limited site locations that were physically investigated generally represent the subsurface conditions at the site. Should site development or site conditions change, or if a substantial amount of time goes by between our site investigation and site development, we reserve the right to review this report for its applicability. If you have any questions regarding the contents of this report please contact our office.



SITE SURVEY DRAWING PROVIDED BY S&F LAND SERVICES, 2019

LEGEND

▨ TP-4 INDICATES APPROXIMATE LOCATION OF EXPLORATORY TEST PIT EXCAVATION

◉ IT-1 INDICATES APPROXIMATE LOCATION OF INFILTRATION TEST

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SCALE: 1:100 (11"x17")

SITE EXPLORATION MAP - APIC - FLORENCE SITE A

FLORENCE, OREGON

FIGURE-1

12-17-2019

PROJECT NO. 19-510

APPENDIX A:

- TEST PIT SUMMARIES
- DCP TEST LOGS
- INFILTRATION TESTING RESULTS
- OWRD WELL LOGS
- USDA SOIL SURVEY

RELATIVE DENSITY - COARSE GRAINED SOILS

RELATIVE DENSITY	SPT N-VALUE	D&M SAMPLER (140 lbs hammer)	D&M SAMPLER (300 lbs hammer)
VERY LOOSE	< 4	< 11	< 4
LOOSE	4 - 10	11 - 26	4 - 10
MEDIUM DENSE	10 - 30	26 - 74	10 - 30
DENSE	30 - 50	74 - 120	30 - 47
VERY DENSE	> 50	> 120	> 47

USCS GRAIN SIZE

FINES		< #200 (.075 mm)
SAND	Fine	#200 - #40 (.425 mm)
	Medium	#40 - #10 (2 mm)
	Coarse	#10 - #4 (4.75 mm)
GRAVEL	Fine	#4 - 0.75 inch
	Coarse	0.75 - 3 inch
COBBLES		3 - 12 inches

CONSISTENCY - FINE GRAINED SOILS

CONSISTENCY	SPT N-VALUE	D&M SAMPLER (140 lbs hammer)	D&M SAMPLER (300 lbs hammer)	POCKET PEN. / UNCONFINED (TSF)	MANUAL PENETRATION TEST
VERY SOFT	< 2	< 3	< 2	< 0.25	Easy several inches by fist
SOFT	2 - 4	3 - 6	2 - 5	0.25 - 0.50	Easy several inches by thumb
MEDIUM STIFF	4 - 8	6 - 12	5 - 9	0.50 - 1.00	Moderate several inches by thumb
STIFF	8 - 15	12 - 25	9 - 19	1.00 - 2.00	Readily indented by thumb
VERY STIFF	15 - 30	25 - 65	19 - 31	2.00 - 4.00	Readily indented by thumbnail
HARD	> 30	> 65	> 31	> 4.00	Difficult by thumbnail

UNIFIED SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			GROUP SYMBOLS AND TYPICAL NAMES	
COARSE-GRAINED SOILS: More than 50% retained on No. 200 sieve	GRAVELS: 50% or more *retained* on the No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP	Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures.
			GC	Clayey gravels, gravel-sand-clay mixtures.
	SANDS: 50% or more *passing* the No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines.
			SP	Poorly-graded sands and gravelly sands, little or no fines.
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures.
			SC	Clayey sands, sand-clay mixtures.
FINE-GRAINED SOILS: Less than 50% retained on No. 200 sieve	SILT AND CLAY	LIQUID LIMIT LESS THAN 50	ML	Inorganic silts, rock flour, clayey silts.
			CL	Inorganic clays of low to medium plasticity, lean clays.
			OL	Organic silt and organic silty clays of low plasticity.
		LIQUID LIMIT 50 OR GREATER	MH	Inorganic silts, clayey silts.
			CH	Inorganic clays of high plasticity, fat clays.
			OH	Organic clays of medium to high plasticity.
HIGHLY ORGANIC SOILS			PT	Peat, muck, and other highly organic soil.

MOISTURE CONTENT

DRY: Absence of moisture, dusty, dry to the touch
DAMP: Some moisture but leaves no moisture on hand
MOIST: Leaves moisture on hand
WET: Visble free water, usually saturated

	PLASTICITY	DRY STRENGTH	DILATANCY	TOUGHNESS
ML	Non to Low	Non to Low	Slow to Rapid	Low, can't roll
CL	Low to Med.	Med. to High	None to Slow	Medium
MH	Med. to High	Low to Med.	None to Slow	Low to Med.
CH	Med. to High	High to V.High	None	High

STRUCTURE

STRATIFIED: Alternating layers of material or color > 6mm thick.
LAMINATED: Alternating layers < 6mm thick.
FISSURED: Breaks along definate fracture planes.
SLICKENSIDED: Striated, polished, or glossy fracture planes.
BLOCKY: Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
LENSES: Has small pockets of different soils, note thickness.
HOMOGENEOUS: Same color and appearance throughout.

LIST OF ABBREVIATION & EXPLANATIONS

SPT	Standard Penetration Test split barrel sampler
D&M	Dames and Moore sampler
LL	Atterberg Liquid Limit
PL	Atterberg Plastic Limit
PP	Pocket Penetrometer
VS	Vane Shear
G	Grab sample
MC	Moisture Content
MD	Moisture Density
UC	Unconfined Compressive Strength

TABLE A-1

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GEOTECHNICAL SITE INVESTIGATION EXPLORATORY KEY

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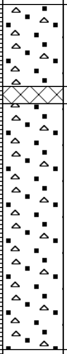
Borehole ID: TP-1

Sheet 1 of 1

Client: American Pacific International Capital
Project Name: Florence Housing Development - Site A
Project Number: 19-510
Project Location: 35th Street and Rhododendron Drive, Florence, Oregon
Date Started: Dec 17 2019 **Completed:** Dec 17 2019
Logged By: RJD **Checked By:** RJD
Drilling Contractor: Ray Wells Inc.
Latitude: **Longitude:** **Elevation:**
Drilling Method: Test Pit Excavation
Ground Water Levels
Equipment: Metal Tracked Excavator
▽
Hammer Type:
▼
Notes:
▽



Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
1		(Fill) Loose, light brown, Sand with fine roots, slightly moist					
2		(Fill) Dark brown, Clayey Gravel, former road bed					
3		(SW) Medium dense, slightly moist, light tan, fine grain Sand, laminated structure, former dune					
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Borehole ID: TP-2

Sheet 1 of 1

Client: American Pacific International Capital
Project Name: Florence Housing Development - Site A
Project Number: 19-510
Project Location: 35th Street and Rhododendron Drive, Florence, Oregon
Date Started: Dec 17 2019 **Completed:** Dec 17 2019
Logged By: RJD **Checked By:** RJD
Drilling Contractor: Ray Wells Inc.
Latitude: **Longitude:** **Elevation:**
Drilling Method: Test Pit Excavation
Ground Water Levels
Equipment: Metal Tracked Excavator ▽
Hammer Type: 35 lb Slide Hammer ▼
Notes: ◮

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
	▨	(Fill) Compacted clayey crushed rock Aggregate over organic soil					
1	⁘	(SW) Tan, slightly moist, medium dense fine grain Sand, some sidewall caving					
2							
3							
4							
5			BAG	0			
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Borehole ID: TP-3

Sheet 1 of 1

Client: American Pacific International Capital
Project Name: Florence Housing Development - Site A
Project Number: 19-510
Project Location: 35th Street and Rhododendron Drive, Florence, Oregon
Date Started: Dec 17 2019 **Completed:** Dec 17 2019
Logged By: RJD **Checked By:** RJD
Drilling Contractor: Ray Wells Inc.
Latitude: **Longitude:** **Elevation:**
Drilling Method: Test Pit Excavation
Ground Water Levels
Equipment: Metal Tracked Excavator ▽
Hammer Type: ▼
Notes: ▽

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
		(OL-SC) Organic Topsoil with roots to 3' below surface					
1		(SW) Light reddish brown, slightly moist, medium dense, fine grain Sand					
2							
3							
4							
5		(SW) Fine grain Sand grades to tan color with sidewall caving					
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Borehole ID: TP-4

Sheet 1 of 1

Client: American Pacific International Capital
Project Name: Florence Housing Development - Site A
Project Number: 19-510
Project Location: 35th Street and Rhododendron Drive, Florence, Oregon
Date Started: Dec 17 2019 **Completed:** Dec 17 2019
Logged By: RJD **Checked By:** RJD
Drilling Contractor: Ray Wells Inc.
Latitude: **Longitude:** **Elevation:**
Drilling Method: Test Pit Excavation
Ground Water Levels
Equipment: Metal Tracked Excavator ▽
Hammer Type: 35 lb Slide Hammer ▼
Notes: ▽

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
1		(Fill) Dark Brown Silt and crushed rock Aggregate					
2		(Fill) Reddish brown, Silty Clay and crushed rock Aggregate					
3		(SW) Tan, slightly moist, medium dense, fine grain Sand, root zone at 48"					
4							
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Borehole ID: TP-5

Sheet 1 of 1

Client: American Pacific International Capital

Project Name: Florence Housing Development - Site A

Project Number: 19-510

Project Location: 35th Street and Rhododendron Drive, Florence, Oregon

Date Started: Dec 17 2019 **Completed:** Dec 17 2019

Logged By: RJD **Checked By:** RJD

Drilling Contractor: Ray Wells Inc.

Latitude: **Longitude:** **Elevation:**

Drilling Method: Test Pit Excavation

Ground Water Levels

Equipment: Metal Tracked Excavator

Hammer Type:

Notes:

Depth	**Graphic**	**Material Description**	**Sample**	**Recovery % RQD**	**Blow Counts (N Value)**	**Pocket Pen. (tsf)**	**SPT N-Value PL MC LL Fines Content** 10 20 30 40 50 60 70 80 90
		(Fill) Silty Clay with crushed rock Aggregate and roots					
1		(OL/OH Significant root zone					
2		(SW) Tan, slightly moist, medium dense, fine grain Sand					
3							
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Borehole ID: TP-6

Sheet 1 of 1

Client: American Pacific International Capital
Project Name: Florence Housing Development - Site A
Project Number: 19-510
Project Location: 35th Street and Rhododendron Drive, Florence, Oregon
Date Started: Dec 17 2019 **Completed:** Dec 17 2019
Logged By: RJD **Checked By:** RJD
Drilling Contractor: Ray Wells Inc.
Latitude: **Longitude:** **Elevation:**
Drilling Method: Test Pit Excavation
Ground Water Levels
Equipment: Metal Tracked Excavator
▽
Hammer Type:
▼
Notes:
▽

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
		(OL-OH) Organic duff and leaf litter					
1		(SW) Reddish brown to tan, slightly moist, medium dense, fine grain Sand, roots extending to 24" below surface					
2							
3							
4							
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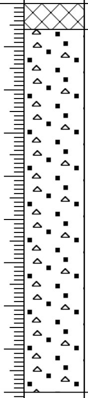
Borehole ID: TP-7

Sheet 1 of 1

Client: American Pacific International Capital
Project Name: Florence Housing Development - Site A
Project Number: 19-510
Project Location: 35th Street and Rhododendron Drive, Florence, Oregon
Date Started: Dec 17 2019 **Completed:** Dec 17 2019
Logged By: RJD **Checked By:** RJD
Drilling Contractor: Ray Wells Inc.
Latitude: **Longitude:** **Elevation:**
Drilling Method: Test Pit Excavation
Ground Water Levels
Equipment: Metal Tracked Excavator ▽
Hammer Type: ▼
Notes: ▽

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
		(Fill) Dark brown Silty Clay and crushed rock Aggregate, trace roots					
1		(SW) Tan, slightly moist, medium dense, fine grain Sand, caving sidewalls at 24"					
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3							
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Borehole ID: TP-8

Sheet 1 of 1

Client: American Pacific International Capital		**Project Name:** Florence Housing Development - Site A	
Project Number: 19-510		**Project Location:** 35th Street and Rhododendron Drive, Florence, Oregon	
Date Started: Dec 17 2019	**Completed:** Dec 17 2019	**Logged By:** RJD	**Checked By:** RJD
Drilling Contractor: Ray Wells Inc.		**Latitude:** **Longitude:**	**Elevation:**
Drilling Method: Test Pit Excavation		**Ground Water Levels**	
Equipment: Metal Tracked Excavator		▽	
Hammer Type:		▼	
Notes:		▽	

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
		(Ol-OH) Organic duff and leaf litter					
1		(SW) Tan, slightly moist, medium dense, fine grain Sand, sidewall caving at 24" and roots to 48"					
2							
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Borehole ID: TP-9

Sheet 1 of 1

Client: American Pacific International Capital

Project Name: Florence Housing Development - Site A

Project Number: 19-510

Project Location: 35th Street and Rhododendron Drive, Florence, Oregon

Date Started: Dec 17 2019 **Completed:** Dec 17 2019

Logged By: RJD **Checked By:** RJD

Drilling Contractor: Ray Wells Inc.

Latitude: **Longitude:** **Elevation:**

Drilling Method: Test Pit Excavation

Ground Water Levels

Equipment: Metal Tracked Excavator

Hammer Type:

Notes:

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
		(OL-OH) Organic duff and roots					
1		(SW) Tan, slightly moist, medium dense, fine grain Sand, roots to 24" below surface					
2							
3							
4							
5			BAG	0			
6							
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Borehole ID: TP-10

Sheet 1 of 1

Client: American Pacific International Capital

Project Name: Florence Housing Development - Site A

Project Number: 19-510

Project Location: 35th Street and Rhododendron Drive, Florence, Oregon

Date Started: Dec 17 2019 **Completed:** Dec 17 2019

Logged By: RJD **Checked By:** RJD

Drilling Contractor: Ray Wells Inc.

Latitude: **Longitude:** **Elevation:**

Drilling Method: Test Pit Excavation

Ground Water Levels

Equipment: Metal Tracked Excavator ▽

Hammer Type: ▼

Notes: ▽

Depth	Graphic	Material Description	Sample	Recovery % RQD	Blow Counts (N Value)	Pocket Pen. (tsf)	SPT N-Value PL MC LL Fines Content 10 20 30 40 50 60 70 80 90
		(OL-OH) Topsoil and roots					
1		(SW) Light brown, slightly moist, loose, fine grain Sand					
2		(SW) Tan, slightly moist, medium dense, fine grain Sand					
3							
4							
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DYNAMIC CONE LOG

PROJECT NUMBER: 19-510
DATE STARTED: 12-17-2019
DATE COMPLETED: 12-17-2019

HOLE #: TP-2
CREW: RJD
PROJECT: APIC Florence Site A
ADDRESS: Rhododendron Drive
LOCATION: Florence, Oregon

SURFACE ELEVATION: 64'
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

DEPTH	BLOWS PER 10 cm	RESISTANCE Kg/cm²	GRAPH OF CONE RESISTANCE 0 50 100 150	N'	TESTED CONSISTENCY NON-COHESIVE	COHESIVE
-						
-						
- 1 ft						
-						
-						
- 2 ft						
-						
-						
- 3 ft	5	22.2	••••••	6	LOOSE	MEDIUM STIFF
- 1 m	6	26.6	•••••••	7	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 4 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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DYNAMIC CONE LOG

PROJECT NUMBER: 19-510
DATE STARTED: 12-17-2019
DATE COMPLETED: 12-17-2019

HOLE #: TP-4
CREW: RJD
PROJECT: APIC Florence Site A
ADDRESS: Rhododendron Drive
LOCATION: Florence, Oregon

SURFACE ELEVATION: 63'
WATER ON COMPLETION: No
HAMMER WEIGHT: 35 lbs.
CONE AREA: 10 sq. cm

	BLOWS	RESISTANCE	GRAPH OF CONE RESISTANCE		TESTED CONSISTENCY	
DEPTH	PER 10 cm	Kg/cm^2	0 50 100 150	N'	NON-COHESIVE	COHESIVE
-						
-						
- 1 ft						
-						
-						
- 2 ft						
-						
-						
- 3 ft						
- 1 m	4	17.8	•••••	5	LOOSE	MEDIUM STIFF
-	5	19.3	•••••	5	LOOSE	MEDIUM STIFF
- 4 ft	6	23.2	••••••	6	LOOSE	MEDIUM STIFF
-						
-						
- 5 ft						
-						
-						
- 6 ft						
-						
- 2 m						
- 7 ft						
-						
-						
- 8 ft						
-						
-						
- 9 ft						
-						
-						
- 3 m 10 ft						
-						
-						
-						
- 11 ft						
-						
-						
- 12 ft						
-						
-						
- 4 m 13 ft						

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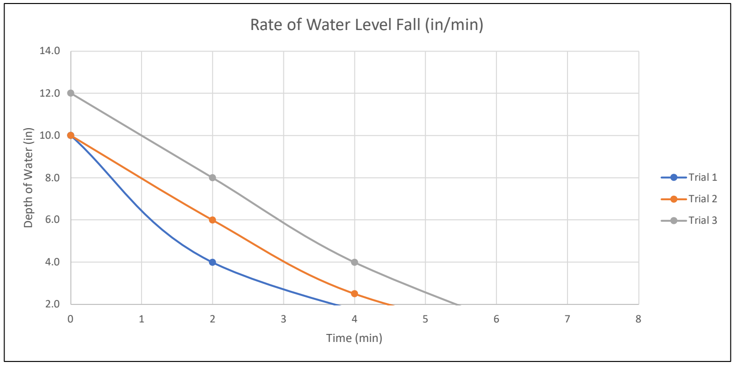
Infiltration Test Results

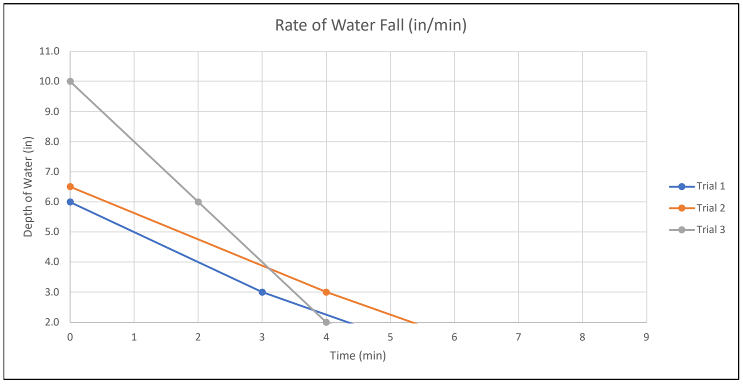
Project: American Pacific International Capital - Florence Site
Testing Date: December 17, 2019
BEI Project Number: 19-510
Test Type: Encased Falling Head Infiltration
Time = 0 at addition of H2O

Infiltration Test 1 Trial 1			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-1 (in/hr)**
Standpipe Diameter (in)	6		0	44.0	10.0			
Standpipe Height AGS (in)	0		2	50.0	4.0	3.00	180.0	
Test Depth BGS (in)	54		6	54.0	0.0	1.00	60.0	120.0
Volume of Water Added (gal)	1							
Clocktime at Start	12:08							
ASTM Soil Type	(SW)							
Infiltration Test 1 Trial 2			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-2 (in/hr)**
Volume of Water Added (gal)	1		0	44.0	10.0			
Clocktime	12:16		2	48.0	6.0	2.00	120.0	
			4	51.5	2.5	1.75	105.0	
			7	54.0	0.0	0.83	50.0	91.7
Infiltration Test 1 Trial 3			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-3 (in/hr)**
Volume of Water Added (gal)	1		0	42.0	12.0			
Clocktime	12:24		2	46.0	8.0	2.00	120.0	
			4	50.0	4.0	2.00	120	
			7	54.0	0.0	1.33	80.0	106.7



Reccomended Rate (in/hr)
92.0

Infiltration Test 2 Trial 1			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-1**
Standpipe Diameter (in)	6		0	48.0	6.0			
Standpipe Height AGS (in)	0		3	51.0	3.0	1.00	60.0	
Test Depth BGS (in)	54		7	54.0	0.0	0.75	45.0	52.5
Volume of Water Added (gal)	1							
Clocktime	13:09							
ASTM Soil Type	(SW)							
Infiltration Test 2 Trial 2			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**AVG Rate of Fall T-2**
Volume of Water Added (gal)	0.75		0	47.5	6.5			
Clocktime	13:17		4	51.0	3.0	0.88	52.5	
			8	54.0	0.0	0.75	45.0	48.8
Infiltration Test 2 Trial 3			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**AVG Rate of Fall T-2**
Volume of Water Added (gal)	1		0	44.0	10.0			
Clocktime	13:33		2	48.0	6.0	2.00	120.0	
			4	52.0	2.0	2.00	120.0	
			7	54.0	0.0	0.67	40.0	120.0



Reccomended Rate (in/hr)
49.0

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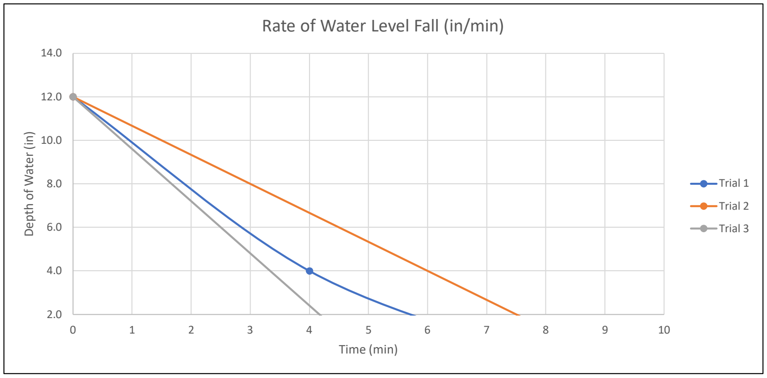
Infiltration Test Results

Project: American Pacific International Capital - Florence Site
Testing Date: December 17, 2019
BEI Project Number: 19-510
Test Type: Encased Falling Head Infiltration
Time = 0 at addition of H2O

Infiltration Test 3 Trial 1			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-1 (in/hr)**
Standpipe Diameter (in)	6		0	44.0	12.0			
Standpipe Height AGS (in)	0		4	52.0	4.0	2.00	120.0	
Test Depth BGS (in)	56		8	56.0	0.0	1.00	60.0	90.0
Volume of Water Added (gal)	1							
Clocktime at Start	13:52							
ASTM Soil Type	(SW)							
Infiltration Test 3 Trial 2			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-2 (in/hr)**
Volume of Water Added (gal)	1		0	44.0	12.0			
Clocktime	14:01		9	56.0	0.0	1.33	80.0	80.0
Infiltration Test 3 Trial 3			**Elapsed Time (min)**	**Depth to Water Surface (in)**	**Depth of Water (in)**	**Rate of Fall (in/min)**	**Rate of Fall (in/hr)**	**Avg Rate of Fall T-3 (in/hr)**
Volume of Water Added (gal)	1		0	44.0	12.0			
Clocktime	14:11		5	56.0	0.0	2.40	144.0	144.0



Reccomended Rate (in/hr)
80.0

Replacement Log

RECEIVED
DEC 11 1995

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

LANE
50937

(START CARD) # 41065

Instructions for completing this report are on the last page of this form.

(1) OWNER: Well Number 2

Name Florence Resort Community

Address 1050 35th St.

City Florence State OR Zip 97439

(2) TYPE OF WORK

☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:

☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger

☐ Other

(4) PROPOSED USE:

☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation

☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:

Special Construction approval ☒ Yes ☐ No Depth of Completed Well 105 ft.

Explosives used ☐ Yes ☒ No Type Amount

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
16"	0'	20'	Bentonite	0'	20'	24 sacks
12"	20'	108'				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E

☒ Other

Backfill placed from ft. to ft. Material

Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2'	33'	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	10"	25'	45'	.250	☒	☐	☒	☐
	10"	95'	105'	.250	☒	☐	☒	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:

☐ Perforations Method

☒ Screens Type V-Wire Material Stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
45'	95'	.008		12"	Tele	☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour

well output may fluctuate

☒ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
430	62		10.5 hrs.

Temperature of water 51° Depth Artesian Flow Found

Was a water analysis done? ☐ Yes By whom

Did any strata contain water not suitable for intended use? ☐ Too little

☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other

Depth of strata:

(9) LOCATION OF WELL by legal description:

County Lane Latitude Longitude

Township 18 S N or S Range 12 W E or W. WM.

Section 15 SW 1/4 SE 1/4

Tax Lot 800 Lot Block Subdivision

Street Address of Well (or nearest address) 1050 35th St.
Florence OR

(10) STATIC WATER LEVEL:

21 ft. below land surface. Date 9/23/92

Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found

From	To	Estimated Flow Rate	SWL
21	105	430	21

(12) WELL LOG:

Ground Elevation

Material	From	To	SWL
sand brown	0	64	21
sand lt blue	64	105	21
sand + blue clay	105	108	21

Date started 5/9/92 Completed 9/22/92

(unbonded) Water Well Constructor Certification:

I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.

WWC Number

Signed Date

(bonded) Water Well Constructor Certification:

I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.

WWC Number 97

Signed Mark Armstrong Date 9/29/92

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

Replacement Log

RECEIVED

DEC 1 1 1995

WATER RESOURCES DEPT.
SALEM, OREGON

LANE
50936

STATE OF OREGON
WATER SUPPLY WELL REPORT
(as required by ORS 537.765)

Instructions for completing this report are on the last page of this form.

(START CARD) # 41058

(1) OWNER: Well Number 1
Name Florence Resort Community
Address 1050 35th St.
City Florence State OR Zip 97439

(2) TYPE OF WORK
☒ New Well ☐ Deepening ☐ Alteration (repair/recondition) ☐ Abandonment

(3) DRILL METHOD:
☐ Rotary Air ☐ Rotary Mud ☒ Cable ☐ Auger
☐ Other

(4) PROPOSED USE:
☒ Domestic ☐ Community ☐ Industrial ☐ Irrigation
☐ Thermal ☐ Injection ☐ Livestock ☐ Other

(5) BORE HOLE CONSTRUCTION:
Special Construction approval ☒ Yes ☐ No Depth of Completed Well 70.5 ft.
Explosives used ☐ Yes ☒ No Type Amount

HOLE			SEAL			
Diameter	From	To	Material	From	To	Sacks or pounds
16"	0'	9'	Bentonite	0	9'	12 Sacks
12"	9'	70.5'				

How was seal placed: Method ☐ A ☐ B ☐ C ☐ D ☐ E
☒ Other
Backfill placed from ft. to ft. Material
Gravel placed from ft. to ft. Size of gravel

(6) CASING/LINER:

	Diameter	From	To	Gauge	Steel	Plastic	Welded	Threaded
Casing:	12"	+2'	26'	.250	☒	☐	☒	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
					☐	☐	☐	☐
Liner:	10"	20.5'	25.5'	.250	☒	☐	☒	☐
	10"	65.5'	70.5'	.250	☒	☐	☒	☐

Final location of shoe(s)

(7) PERFORATIONS/SCREENS:
☐ Perforations Method
☒ Screens Type V. Wire Material Stainless

From	To	Slot size	Number	Diameter	Tele/pipe size	Casing	Liner
25.5	65.5	.008		12"	Tele	☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

(8) WELL TESTS: Minimum testing time is 1 hour
well output may fluctuate
☑ Pump ☐ Bailer ☐ Air ☐ Flowing Artesian

Yield gal/min	Drawdown	Drill stem at	Time
175	42'	—	12+ hr.

Temperature of water 51° Depth Artesian Flow Found
Was a water analysis done? ☐ Yes By whom
Did any strata contain water not suitable for intended use? ☐ Too little
☐ Salty ☐ Muddy ☐ Odor ☐ Colored ☐ Other
Depth of strata:

(9) LOCATION OF WELL by legal description:
County Lane Latitude Longitude
Township 18 S N or S Range 12 W E or W. WM.
Section 15 SW 1/4 SE 1/4
Tax Lot 800 Lot Block Subdivision
Street Address of Well (or nearest address) 1050 35th St
Florence, OR

(10) STATIC WATER LEVEL:
6.2 ft. below land surface. Date 7/30/92
Artesian pressure lb. per square inch. Date

(11) WATER BEARING ZONES:

Depth at which water was first found

From	To	Estimated Flow Rate	SWL
12	70	175	6.2

(12) WELL LOG:
Ground Elevation

Material	From	To	SWL
Sand	0	41	6.2
Sand w/ peat	41	47	6.2
Sand lt blue	47	72	6.2
Steel plate welded on bottom			

Date started 4/26/92 Completed 9/22/92

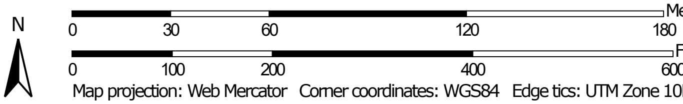
(unbonded) Water Well Constructor Certification:
I certify that the work I performed on the construction, alteration, or abandonment of this well is in compliance with Oregon water supply well construction standards. Materials used and information reported above are true to the best of my knowledge and belief.
WWC Number
Signed Date

(bonded) Water Well Constructor Certification:
I accept responsibility for the construction, alteration, or abandonment work performed on this well during the construction dates reported above. All work performed during this time is in compliance with Oregon water supply well construction standards. This report is true to the best of my knowledge and belief.
WWC Number 97
Signed Date 9/29/92

ORIGINAL & FIRST COPY-WATER RESOURCES DEPARTMENT SECOND COPY-CONSTRUCTOR THIRD COPY-CUSTOMER

Soil Map—Lane County Area, Oregon

Map Scale: 1:2,300 if printed on A landscape (11" x 8.5") sheet.



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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Lane County Area, Oregon
Survey Area Data: Version 16, Sep 10, 2019

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

Date(s) aerial images were photographed: Aug 27, 2007—Sep 15, 2016

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
131C	Waldport fine sand, 0 to 12 percent slopes	10.4	92.5%
140	Yaquina loamy fine sand	0.8	7.5%
Totals for Area of Interest		**11.2**	**100.0%**

Lane County Area, Oregon

131C—Waldport fine sand, 0 to 12 percent slopes

Map Unit Setting

National map unit symbol: 234r
Elevation: 0 to 150 feet
Mean annual precipitation: 60 to 100 inches
Mean annual air temperature: 48 to 54 degrees F
Frost-free period: 165 to 300 days
Farmland classification: Not prime farmland

Map Unit Composition

Waldport and similar soils: 85 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waldport

Setting

Landform: Dunes
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
Oe - 1 to 3 inches: moderately decomposed plant material
H1 - 3 to 8 inches: fine sand
H2 - 8 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 12 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Heceta

Percent of map unit: 4 percent

Landform: Interdunes
Hydric soil rating: Yes

Yaquina

Percent of map unit: 4 percent
Landform: Marine terraces
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Lane County Area, Oregon
Survey Area Data: Version 16, Sep 10, 2019

Lane County Area, Oregon

140—Yaquina loamy fine sand

Map Unit Setting

National map unit symbol: 2359
Elevation: 20 to 130 feet
Mean annual precipitation: 70 to 80 inches
Mean annual air temperature: 50 to 52 degrees F
Frost-free period: 180 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Yaquina and similar soils: 85 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Yaquina

Setting

Landform: Dune slacks
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Eolian sand of mixed origin

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 9 inches: loamy fine sand
H2 - 9 to 30 inches: fine sand
H3 - 30 to 60 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: About 0 to 24 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Low (about 4.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: A/D
Forage suitability group: Somewhat Poorly Drained (G004AY017OR)

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Lane County Area, Oregon
Survey Area Data: Version 16, Sep 10, 2019

APPENDIX B:

Recommended Earthwork Specifications

GEOTECHNICAL SPECIFICATIONS

General Earthwork

1. All areas where structural fills, fill slopes, structures, or roadways are to be constructed shall be stripped of organic topsoil and cleared of surface and subsurface deleterious material, including but limited to vegetation, roots, or other organic material, undocumented fill, construction debris, soft or unsuitable soils as directed by the Geotechnical Engineer of Record. These materials shall be removed from the site or stockpiled in a designated location for reuse in landscape areas if suitable for that purpose. Existing utilities and structures that are not to be used as part of the project design or by neighboring facilities, shall be removed or properly abandoned, and the associated debris removed from the site.

2. Upon completion of site stripping and clearing, the exposed soil and/or rock shall be observed by the Geotechnical Engineer of Record or a designated representative to assess the subgrade condition for the intended overlying use. Pits, depressions, or holes created by the removal of root wads, utilities, structures, or deleterious material shall be properly cleared of loose material, benched and backfilled with fill material approved by the Geotechnical Engineer of Record compacted to the project specifications.

3. In structural fill areas, the subgrade soil shall be scarified to a depth of 4-inches, if soil fill is used, moisture conditioned to within 2% of the materials optimum moisture for compaction, and blended with the first lift of fill material. The fill placement and compaction equipment shall be appropriate for fill material type, required degree of blending, and uncompacted lift thickness. Assuming proper equipment selection, the total uncompacted thickness of the scarified subgrade and first fill lift shall not exceed 8-inches, subsequent lifts of uncompacted fill shall not exceed 8-inches unless otherwise approved by the Geotechnical Engineer of Record. The uncompacted lift thickness shall be assessed based on the type of compaction equipment used and the results of initial compaction testing. Fine-grain soil fill is generally most effectively compacted using a kneading style compactor, such as a sheeps-foot roller; granular materials are more effectively compacted using a smooth, vibratory roller or impact style compactor.

4. All structural soil fill shall be well blended, moisture conditioned to within 2% of the material's optimum moisture content for compaction and compacted to at least 90% of the material's maximum dry density as determined by ASTM Method D-1557, or an equivalent method. Soil fill shall not contain more than 10% rock material and no solid material over 3-inches in diameter unless approved by the Geotechnical Engineer of Record. Rocks shall be evenly distributed throughout each lift of fill that they are contained within and shall not be clumped together in such a way that voids can occur.

5. All structural granular fill shall be well blended, moisture conditioned at or up to 3% above of the material's optimum moisture content for compaction and compacted to at least 90% of the material's maximum dry density as determined by ASTM Method D-1557, or an equivalent method. 95% relative compaction may be required for pavement base rock or in upper lifts of the granular structural fill where a sufficient thickness of the fill section allows for higher compaction percentages to be achieved. The granular fill shall not contain solid particles over 2-inches in diameter unless special density testing methods or proof-rolling is approved by the Geotechnical Engineer of Record. Granular fill is generally considered to be a crushed aggregate with a fracture surface of at least 70% and a maximum size not exceeding 1.5-inches in diameter, well-graded with less than 10%, by weight, passing the No. 200 Sieve.

6. Structural fill shall be field tested for compliance with project specifications for every 2-feet in vertical rise or 500 cy placed, whichever is less. In-place field density testing shall be performed by a competent individual, trained in the testing and placement of soil and aggregate fill placement, using either ASTM Method D-1556/4959/4944 (Sand Cone), D-6938 (Nuclear Densometer), or D-2937/4959/4944 (Drive Cylinder). Should the fill materials not be suitable for testing by the above methods, then observation of placement, compaction and proof-rolling with a loaded 10 cy dump-truck, or equivalent ground pressure equipment, by a trained individual may be used to assess and document the compliance with structural fill specifications.

Utility Excavations

1. Utility excavations are to be excavated to the design depth for bedding and placement and shall not be over-excavated. Trench widths shall only be of sufficient width to allow placement and proper construction of the utility and backfill of the trench.
2. Backfilling of a utility trench will be dependent on its location, use, depth, and utility line material type. Trenches that are required to meet structural fill specifications, such as those under or near buildings, or within pavement areas, shall have granular material strategically compacted to at least the spring-line of the utility conduit to mitigate pipeline movement and deformation. The initial lift thickness of backfill overlying the pipeline will be dependent on the pipeline material, type of backfill, and the compaction equipment, so as not to cause deflection or deformation of the pipeline. Trench backfill shall conform to the General Earthwork specifications for placement, compaction, and testing of structural fill.

Geotextiles

1. All geotextiles shall be resistant to ultraviolet degradation, and to biological and chemical environments normally found in soils. Geotextiles shall be stored so that they are not in direct sunlight or exposed to chemical products. The use of a geotextile shall be specified and shall meet the following specification for each use.

<u>Subgrade/Aggregate Separation</u>

Woven or nonwoven fabric conforming to the following physical properties:

• Minimum grab tensile strength	ASTM Method D-4632	180 lb
• Minimum puncture strength (CBR)	ASTM Method D-6241	371 lb
• Elongation	ASTM Method D-4632	15%
• Maximum apparent opening size	ASTM Method D-4751	No. 40
• Minimum permittivity	ASTM Method D-4491	0.05 s^{-1}

<u>Drainage Filtration</u>

Woven fabric conforming to the following physical properties:

• Minimum grab tensile strength	ASTM Method D-4632	110 lb
• Minimum puncture strength (CBR)	ASTM Method D-6241	220 lb
• Elongation	ASTM Method D-4632	50%
• Maximum apparent opening size	ASTM Method D-4751	No. 40
• Minimum permittivity	ASTM Method D-4491	0.5 s^{-1}

<u>Geogrid Base Reinforcement</u>

Extruded biaxially or triaxially oriented polypropylene conforming to the following physical properties:

• Peak tensile strength lb/ft	ASTM Method D-6637	925
• Tensile strength at 2% strain lb/ft	ASTM Method D-6637	300
• Tensile strength at 5% strain lb/ft	ASTM Method D-6637	600
• Flexural Rigidity	ASTM Method D-1388	250,000 mg-cm
• Effective Opening Size rock size	ASTM Method D-4751	1.5x

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July 6, 2021

Ashlee Sorber
American Pacific International Capital
Via Email: asorber@apicincus.com

RE: GEOTECHNICAL EVALUATION OF GROUNDWATER HYDRAULICS
FLORENCE HOUSING DEVELOPMENT – SITE A
RHODODENDRON DRIVE AND 35TH STREET
FLORENCE, OREGON
BRANCH ENGINEERING INC. PROJECT NO. 19-510

Pursuant to your request, Branch Engineering Inc. (BEI) geotechnical engineering staff has collected information regarding the historic surface and subsurface flow of stormwater on and in the vicinity of the subject site (Site). The information contained herein is based on our geologic knowledge of the area, discussions with a long-time local excavation contractor, review of the December 2018 Stormwater Master Plan Update for the City of Florence, and discussions with City of Florence Public Works staff.

The Site, formerly a KOA campground prior to the year 2000, lies on the southern end of a north to south drainage path that begins in the open dune area north of Heceta Beach Road creating a series of shallow lakes between these open dunes and those located behind the Fred Meyer store on the north end of the Sand Pines Golf Course at which point the flow of water bends west towards the Siusalw River with various surface water outlets to the river and groundwater flow atop a cemented sand lense near low tide river level. It is our understanding the lakes within the golf course are lined manmade reservoirs.

Findings

Historically, several areas of Florence have experienced extended periods of standing surface water during times of heavily, sustained rainfall as is evidenced by conditions documented in 1996/1997 and 2016/2017. Continued improvements over the years by the City of Florence and developers have mitigated some of the high-water conditions, but it is our understanding that Federal agency oversight has limited the number of direct outfalls and flow volumes to the Siuslaw River requiring the implementation of detention/retention and infiltration systems to be employed.

Recent stormwater system improvements in the vicinity of the Site include:

- Construction of retention facilities in the Mariners Village development north of the Site;
- Installation of detention and flow control structures for stormwater in the Fairway Estates subdivision directly north of the Site; and

- Construction of the Siano Ditch and enhancement of Bud's Ravine on the south end of the Site to mitigate surface water that was directed onto the Site by development of the Sand Pines and Sand Pines West subdivision.

Our geotechnical site investigation in December 2019 did not encounter any groundwater the test pits that were excavated to a maximum depth of 10-feet below the surface grade nor was there oxidation staining of the sand that would indicate a fluctuating water level observed. No flowing surface water was present, although surface soil on the east side of the site, adjacent to the Sand Pines development, had a noticeably elevated moisture content and is believed to be yard and roof drain runoff from the adjacent houses.

The Site is currently forested with some remaining remnants of the former campground; since it appears that a majority of the surface water that had originally been diverted towards the Site has been mitigated, and the amount of precipitation falling on the Site cannot be controlled, we researched factors that may contribute to the pre- and post-development stormwater conditions. These factors include changes in vegetation cover and concentrated infiltration of stormwater from impervious surface areas. A United States Department of Agriculture[1] (USDA) study indicates tree canopies detain an average of 20% to 30% of the rainfall and that vegetation provides a reduction in water through transpiration. Modeling by the United States Geological Survey[2] (USGS) of groundwater mounding effects from concentrated infiltration basins indicates that mounding is most sensitive to the vertical hydraulic conductivity of the soil. Higher rates of infiltration show less mounding of groundwater levels in aquifers but increased lateral spread of the mounding effect.

In our initial July 24, 2020 report, the groundwater mounding was estimated using a hypothetical stormwater infiltration basin for a 10-acre site, for which the USGS had conducted numerous simulations using the finite difference model MODFLOW. The results of this modeling effort were presented in accordance with Reference 2, from which BEI chose the model simulation results with conditions of 40% impervious cover, a design storm of 1.25-inches, basin depth of 2-feet, with a square basin area of 9,075 square feet, aquifer thickness of 20-feet, and soil permeability of 5-inches/hour and a specific yield of 8.5%. This model simulation produced a maximum mounding height of 1.85-feet with a maximum extent of 185 feet for a mounding of 0.25-feet. For comparison, a simulation was run using the Hantush spreadsheet analysis provided as a link in Reference 2 with the similar input parameters as used in the MODFLOW model with an unrealistic mounding effect.

BEI has subsequently used the Hantush analysis using the following input parameters provided by 3J Consulting and BEI's site specific research:

Infiltration rate (ft/day)	12
Specific Yield	0.3
Hydraulic Conductivity (ft/Day)	12 (conservative est.)
Half basin length (ft)	2
Half basin width (ft)	87.5
Duration of Infiltration Period (day)	1
Aquifer thickness (ft)	50

The attached results show a mounding of 1.9-feet at the source with an attenuation to 0.25 at 80-feet away and 0.06-feet at 120-feet from the source. These results are comparable to our initial results presented from the USGS MODFLOW analysis.

In addition to above considerations associated with groundwater, in the unlikely event where groundwater extends all the way to the surface, mounding would be non-existent, and all infiltration facilities will surcharge. Similarly, during an intense rainfall event that produces surface water flow, the water will be conveyed to the designated flow path routes that includes driveways, alleys and roads where stormwater catch basins and inlets reside. Should the site stormwater system become overloaded, the alleys and roads will become the conveyance routes to Bud's Ravine, which is identified as the conveyance path to the Siuslaw River.

Conclusions

Based on our research of the hydraulics of the Site and general vicinity we conclude the following:

- Recent stormwater improvements in the area of the Site have reduced the flow of surface water onto the site.
- Groundwater mounding may occur as a result of concentrated infiltration of stormwater; however, the degree of mounding is expected to be negligible.

The proposed design for infiltration of Site stormwater is consistent with the area and local regulations, and does not appear it will have an adverse impact on the current subsurface flow of water on, or offsite, of the property.

Sincerely,
Branch Engineering Inc.

Ronald J. Derrick, P.E., G.E.
Principal Geotechnical Engineer

1: USDA Forest Service 1146, Urban Forest Systems and Green Stormwater Infrastructure, February 2020.

2: USGS, Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins, Scientific Investigations Report 2010-5102.

GSI
Water Solutions, Inc.

TECHNICAL MEMORANDUM

Technical Review of a Groundwater Mounding Analysis for a Proposed Development at 35th Street and Rhododendron Drive, Florence, Oregon

To: Mike Miller / City of Florence Public Works

From: Matt Kohlbecker, RG / GSI Water Solutions, Inc.
Ellen Svadlenak, GIT / GSI Water Solutions, Inc.
Kathy Roush / GSI Water Solutions, Inc.

Date: July 21, 2021

MATTHEW V. KOHLBECKER
Matthew Kohlbecker
G2248
RENEWS: 5/1/22

This Technical Memorandum (TM) summarizes a review of the Branch Engineering, Inc. (BEI) report titled *Geotechnical Evaluation of Groundwater Hydraulics, Florence Housing Development—Site A*, dated July 6, 2021. The purpose of the BEI report is to evaluate the potential for stormwater infiltration at a proposed development northeast of 35th Street and Rhododendron Drive in Florence, Oregon, to exacerbate erosion of a nearby bluff at the Sea Watch Subdivision.

1. Background

APIC Florence Holdings, LLC (APIC), has proposed a 120 planned unit development on a parcel located northeast of the intersection of 35th Street and Rhododendron Drive in Florence, Oregon (City of Florence, 2021). Currently, the site is undeveloped, and precipitation infiltrates into site soils or is conveyed offsite through a drainage ditch into the drainage system on Rhododendron Drive. Development of the site will create 231,733 square feet of impervious area, and all stormwater runoff from impervious surfaces will be infiltrated using 13 soakage trenches, 3 drywells, and 1 infiltration basin (3J Consulting, 2020; 3J Consulting and LRS Architects, 2020).

The proposed development is located near the Sea Watch Subdivision, which is located on a sand bluff bordering the Siuslaw River about 500 feet west of Rhododendron Drive. In the past, homeowners have raised concerns about erosion of the bluff. One geotechnical evaluation concluded that erosion is due to internal erosion of bluff sand by springs along the toe of the bluff, which are created by daylighting groundwater (Foundation Engineers, 1997). Another geotechnical evaluation additionally identified the preexisting steepness of the slope, wind erosion, and water erosion as contributing factors (GeoDesign, 2005).

Hypothetically, stormwater infiltration has the potential to increase the flow of springs at the toe of the bluff because infiltration from a constructed basin causes the groundwater level in an aquifer to rise into a mound-like shape. As infiltration continues, the groundwater mound spreads further away from the infiltration site. If the groundwater mound were to reach the springs at the toe of the bluff, spring flow could increase, potentially exacerbating bluff erosion. Specifically, the spring flow could increase because, according to Darcy's Law, a higher hydraulic gradient associated with the groundwater mound increases the groundwater discharge rate at the springs [see Equation (2.4) in Freeze and Cherry (1979)]. If the groundwater mound does not reach the springs at the toe of the bluff, then spring flow would not increase, and bluff erosion due to the springs would not be exacerbated by the stormwater infiltration.

The City of Florence (City) requested that APIC provide technical information demonstrating that stormwater infiltration at the proposed development would not exacerbate erosion of the Sea Watch Subdivision bluff, and retained GSI Water Solutions, Inc. (GSI) to conduct a third party review of the technical information. On July 6, 2021, APIC provided the City with a *Geotechnical Evaluation of Groundwater Hydraulics, Florence Housing Development—Site A*, prepared by BEI (BEI, 2021). On July 15, 2021, 3J Consulting provided GSI with additional information about the locations of soakage trenches at the proposed development (3J Consulting, 2021). The remainder of this TM presents GSI's technical review of the evaluation of groundwater mounding and potential impacts on springs documented in the BEI report, and is organized as follows:

- **Section 1: Background.**
- **Section 2: Technical Review.** Presents GSI's review of BEI's modeling approach to evaluating groundwater mounding and the parameters (e.g., aquifer properties) used in the evaluation.
- **Section 3: Re-Run of the Hantush (1967) Equation to Calculate Mounding from Soakage Trenches and Drywells.** Presents a re-run of the model used by BEI to evaluate whether including infiltration from soakage trenches and drywells changes the overall conclusion of BEI (2021).
- **Section 4: Conclusions.** Presents GSI's conclusion about BEI's modeling analysis.

2. Technical Review

BEI used the Hantush (1967) equation to calculate the groundwater mounding that occurs when stormwater is infiltrated into the infiltration basin at the proposed development. BEI calculated that the groundwater mound would be 0.06 feet at 120 feet west of the infiltration basin. Based on this result, BEI concluded that ". . . the degree of mounding (from stormwater infiltration) is expected to be negligible" (BEI, pg. 3, 2021).

The following sections present GSI's review of the approach that BEI used to evaluate mounding (Section 2.1) and the input parameters BEI used to calculate mounding (Section 2.2).

2.1 Technical Review of BEI Approach

Originally published in the scientific journal *Water Resources Research*, the Hantush (1967) equation is a peer-reviewed, widely-accepted method for estimating groundwater mounding beneath an infiltration basin under steady-state conditions (Carleton, 2010). Moreover, BEI performed the mounding calculations using a spreadsheet model developed by the U.S. Geological Survey (Carleton, 2010), so the implementation of the equation was performed using a peer-reviewed tool. However, BEI's evaluation only addressed groundwater mounding from the infiltration basin (i.e., BEI did not address groundwater mounding from the 13 soakage trenches or 3 drywells).

GSI concludes that the approach to evaluating groundwater mounding used acceptable equations, and that the equations were implemented correctly using a U.S. Geological Survey spreadsheet. However, GSI notes that the approach did not include the effects of mounding from soakage trenches and drywells.

2.2 Technical Review of BEI's Input Parameters

In order to calculate groundwater mounding, the Hantush (1967) equation requires that the user specify physical properties of the infiltration basin, aquifer properties, the infiltration rate, and the infiltration duration (called "input parameters" in this TM). The aquifer properties should be representative of the sandy sediments of the Dune Sand, which is the unit into which stormwater will be infiltrated, and from which spring discharges occur at the toe of the Sea Watch Subdivision (Hampton, 1963). GSI reviewed the input parameters used by BEI to determine if they were: (1) representative, as compared to published values for the Florence area and/or proposed development, and (2) conservative, meaning that the input parameter would over-predict mounding. The following bullets summarize GSI's review of the input parameters used in the Hantush (1967) equation:

- **Physical Properties of the Infiltration Basin.** According to 3J Consulting (2020) and personal communication (2021a, 2021b), the infiltration basin system is comprised of a 700 square foot water quality treatment basin (dimensions of 4 feet by 175 feet) and an approximately 1,430 square foot infiltration basin (dimensions of 13 feet by 110 feet). Stormwater is treated in the water quality treatment basin, and then overflows into the infiltration basin where it is infiltrated. In the Hantush (1967) mounding calculations, BEI (2021) uses the dimensions of the water quality treatment basin, which is smaller than the infiltration basin. The dimensions used by BEI (2021) are not representative of the infiltration basin; however, the dimensions used by BEI (2021) are conservative (because using a smaller basin area results in higher mounding).

- **Specific Yield.** A property of unconfined aquifers, specific yield is a dimensionless value that describes the volume of water stored in aquifer pores that is released per unit surface area of aquifer per unit decline in the water table (Freeze and Cherry, 1979). BEI used a value of 0.30 for specific yield, which is slightly lower than lab-measured values for the Dune Sand reported in Table 3 of Hampton (1963) (values range from 0.323 to 0.334). BEI's value for specific yield is representative of the Dune Sand and is conservative (because using a lower specific yield results in higher mounding).

- **Horizontal Hydraulic Conductivity.** Hydraulic conductivity is a measure of the permeability of porous media, and in groundwater systems is the flow rate per unit area of aquifer per unit hydraulic gradient (Freeze and Cherry, 1979). BEI used a value of 12 feet per day (ft/day) for hydraulic conductivity, which is lower than the average hydraulic conductivity of 62.8 ft/day for the Dune Sand in Table 3 of Hampton (1963)[1] and the calculated hydraulic conductivity of 62 ft/day based on a 4-hour aquifer test at the City of Florence Well No. 12[2] (OWRD, 2007). BEI's value for hydraulic conductivity does not appear to be representative of the Dune Sand; however, the hydraulic conductivity used by BEI (2021) is conservative (because using a lower hydraulic conductivity results in additional mounding).

- **Saturated Zone Thickness.** The saturated zone is the portion of subsurface soils that are saturated with groundwater (i.e., the aquifer) (Freeze and Cherry, 1979). BEI used a value of 50 feet for saturated zone thickness, which is thicker than the unsaturated zone thickness of 15 feet reported in a test borehole at the Sea Watch Subdivision by Foundation Engineers (1997). BEI's value for saturated zone thickness does not appear to be representative of the Dune Sand at nearby properties, and is not conservative (because a thicker saturated zone results in less mounding).

- **Infiltration Rate and Duration.** Infiltration rate is the amount of water that infiltrates into the basin per unit area per unit time (i.e., units of feet per day) (Carleton, 2010). BEI used an infiltration rate of 12 feet/day and a duration of one day, but did not provide an explanation of the method that was used to develop the infiltration rate. In order to evaluate the infiltration rate of 12 feet/day, GSI estimated an infiltration rate based on the following criteria:

---

[1] Hampton (1963) presents values of 270 gpd/ft^2 (36.1 ft/day), 600 gpd/ft^2 (80.2 ft/day), 600 gpd/ft^2 (80.2 ft/day), and 410 gpd/ft^2 (54.8 ft/day). The average of these values is 470 gpd/ft^2 (62.8 ft/day).

[2] LANE 63365. Calculation is based on a transmissivity of 23,925 gpd/ft and an aquifer thickness of 51.6 feet (the length of the Well 12 screen).

- The 25-year storm is infiltrated into the infiltration basin. According to the *City of Florence Stormwater Design Manual* (City of Florence, 2011), the 25-year storm is 5.06 inches of precipitation in a 24 hour period.
- All precipitation runoff is conveyed to the infiltration basin, which drains 111,908 square feet of impervious area (3J Consulting, 2020).
- The infiltration basin is 13 feet long (*x*-direction) and 110 feet wide (*y*-direction) (i.e., 1,430 square foot recharge basin).
- Stormwater runoff volume is calculated by the following equation:

$$V = (p)(A) \tag{1}$$

Where:

V is the volume of stormwater runoff (cubic feet),
p is the precipitation during the 25-year storm (feet per day), and
A is the impervious area (square feet).

According to Equation (1), the resulting volume of stormwater runoff to the infiltration basin is 47,188 cubic feet. Assuming this runoff is infiltrated into a 1,430 square feet infiltration basin, the infiltration rate is 33 feet per day [which is significantly higher than the 12 feet per day used by BEI (2021)]. We do not comment in this TM on whether the BEI (2021) infiltration rate is representative or conservative, in recognition of the fact that the method used by BEI (2021) to calculate stormwater runoff from the 25-year storm may be more sophisticated than Equation (1). <u>However, we do note the difference between the BEI (2021) infiltration rate and the infiltration rate calculated by Equation (1), and will evaluate the effect that this difference has on the model results in the following section.</u>

3. Re-Run of the Hantush (1967) Equation to Calculate Mounding from Soakage Trenches and Drywells

As discussed in Section 2.1, BEI (2021) did not include infiltration from soakage trenches and drywells in the groundwater mounding analysis. Therefore, GSI re-ran the Hantush (1967) calculations to include the soakage trenches and drywells. GSI also updated some of the aquifer parameters in the Hantush (1967) equation so that they are representative of the Dune Sands and/or conservative, as shown in Table 1.

Table 1. Aquifer Parameters Used in the GSI Re-Run of the Hantush (1967) Equation.

Parameter	Value	Units	Comments
Specific Yield	0.30	dimensionless	Same as BEI (2021)
Horizontal Hydraulic Conductivity	62.8	feet/day	The average of hydraulic conductivities from Hampton (1963).
Initial Thickness of Saturated Zone	15	feet	From Foundation Engineers (1997).

The properties of the infiltration basin and soakage trenches, which were used to calculate the infiltration rate at each basin/trench, are shown in Table 2. Infiltration rate was calculated using Equation (1) shown above and dividing the flow volume by basin/trench area. Note that GSI conservatively assumed that impervious area drained by drywells would be conveyed to the infiltration basin. This assumption is conservative because the infiltration basin is the closest infiltration point to the springs, and is necessary because it is difficult to estimate the *x*- and *y*- dimensions for a drywell in the Hantush (1967) equation.

Table 2. Input Parameters for Soakage Trenches and the Infiltration Basin.

Infiltration Site	Length [1] (feet)	Width [1] (feet)	Basin Area (square feet)	Impervious Area Drained [2] (square feet)	Infiltration Volume [3] (cubic feet)	Infiltration Rate [4] (feet/day)
Infiltration Basin	13	110	1,430	118,879	50,127	35.05
Soakage Trench 1	223	3	670	6,971	2,939	4.39
Soakage Trench 2	223	3	670	6,971	2,939	4.39
Soakage Trench 3	131	3	394	3,900	1,645	4.17
Soakage Trench 4	383	3	1,148	11,232	4,736	4.13
Soakage Trench 5	383	3	1,148	11,232	4,736	4.13
Soakage Trench 6	383	3	1,148	11,232	4,736	4.13
Soakage Trench 7	3	259	778	8,160	3,441	4.42
Soakage Trench 8	3	174	523	5,088	2,145	4.10
Soakage Trench 9	3	224	673	6,971	2,939	4.37
Soakage Trench 10	3	404	1,213	12,120	5,111	4.21
Soakage Trench 11	3	424	1,213	12,060	5,085	3.99
Soakage Trench 12	449	3	1,348	14,517	6,121	4.54
Soakage Trench 13	104	3	313	2,400	1,012	3.23

Notes:

(1) For the purpose of the Hantush (1967) equation, length is the dimension in the *x*-direction (also the direction in which groundwater mounding is calculated), and width is the dimension in the *y*-direction. The infiltration basin dimensions are from personal communication (2021a). At soakage trenches, the shorter dimension is 3 feet (personal communication, 2021c) and the longer dimension can be found by dividing the “Actual Area” from 3J Consulting (2020) by 3 feet.
(2) From 3J Consulting (2020). The impervious area drained for the infiltration basin includes the 6,971 square feet of impervious area drained by drywells.
(3) Calculated by Equation (1). Assumes the 25-year storm (i.e., 5.06 inches in a 24 hour period) (City of Florence, 2011).
(4) Calculated by dividing “Infiltration Volume” by “Basin Area.”

Incorporating groundwater mounding effects from all the infiltration basin and all soakage trenches was a two-step process. First, the Hantush (1967) equation was used to calculate the groundwater mound at the springs for each soakage trench/infiltration basin. Second, by the principle of superposition, the mounding from each soakage trench/infiltration basin was summed to calculate a total mounding from stormwater infiltration. The results of the Hantush (1967) analysis are summarized in Table 3. Note that any groundwater mounding less than 0.01 feet (which is the minimum that can be measured by an electronic water level meter) was assigned a value of “<0.01 feet.” Output from the U.S. Geological Survey Hantush (1967) spreadsheets for each infiltration basin/soakage trench is provided in Attachment A. As shown in Table 3, the total groundwater mounding at the springs calculated by a re-run of the Hantush (1967) equation during a 25 year storm at the proposed development is 0.039 feet (0.47 inches).

Table 3. Output from Hantush (1967) Simulations

	IB-1	ST-1	ST-2	ST-3	ST-4	ST-5	ST-6	ST-7	ST-8	ST-9	ST-10	ST-11	ST-12	ST-13
Mounding at Spring (feet)	0.039	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Notes:

IB = Infiltration Basin

ST = Soakage Trench

4. Conclusions of GSI's Technical Review

Using representative and conservative aquifer parameters, GSI calculated total groundwater mounding at the springs from stormwater infiltrated during a 25 year storm with a precipitation rate of 0.422 feet per day (5.06 inches per day). A storm of this size resulted in 0.039 feet (0.47 inches) of mounding at the springs due to infiltration. This additional increase in the groundwater level represents a less than 0.5% increase in the head (i.e., potential energy of groundwater) in the aquifer at the springs [1]. A head increase of less than 0.5% is considered to be negligible.

Although BEI (2021) did not calculate the mounding effects related to soakage trenches and drywells, and used some input parameters that are not representative of the sandy sediments of the Dune Sand and are not conservative (e.g., aquifer thickness), GSI's technical review agrees with the BEI (2021) conclusion that groundwater mounding at the springs is expected to be negligible. Specifically, GSI found that mounding is expected to be negligible for a 25 year storm and the input parameters listed in Tables 1 and 2.

This evaluation addresses the additional stormwater infiltration that could result from the proposed development located northeast of 35th Street and Rhododendron Drive. As stated in Section 1, potential discharge from springs along the toe of the bluff are only one potential cause of erosion (other contributing factors include the steepness of the slope, presence or absence of vegetation, and wind or water erosion). With negligible mounding, there should be minimal impact to groundwater discharge at the springs which is believed to be exacerbating erosion of the Sea Watch Subdivision bluff.

5. References

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Personal Communication. 2021b. Email from Aaron Murphy (3J Consulting) to Matt Kohlbecker (GSI) RE: Soakage Trench Areas. 13 July 2021.

Personal Communication. 2021c. Email from Aaron Murphy (3J Consulting) to Matt Kohlbecker (GSI) RE: Soakage Trench Areas. 14 July 2021.

ATTACHMENT A

Output from Hantush (1967) Groundwater Mounding Simulations

INFILTRATION BASIN

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values

35.0500	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
6.500	**x**	**1/2 length of basin (x direction, in feet)**
55.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

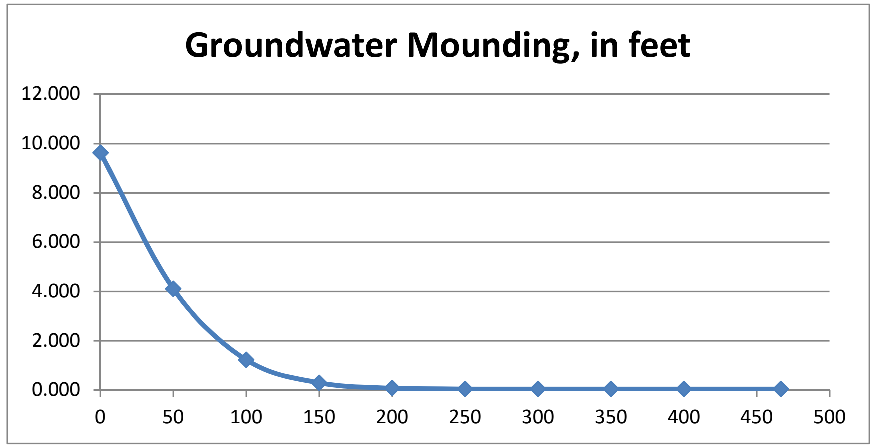
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

24.628	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
9.628	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
9.628	**0**
4.105	**50**
1.227	**100**
0.294	**150**
0.079	**200**
0.044	**250**
0.039	**300**
0.039	**350**
0.039	**400**
0.039	**467**

Re-Calculate Now



Disclaimer

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SOAKAGE TRENCH 1

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values

4.3900	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
111.500	**x**	**1/2 length of basin (x direction, in feet)**
1.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

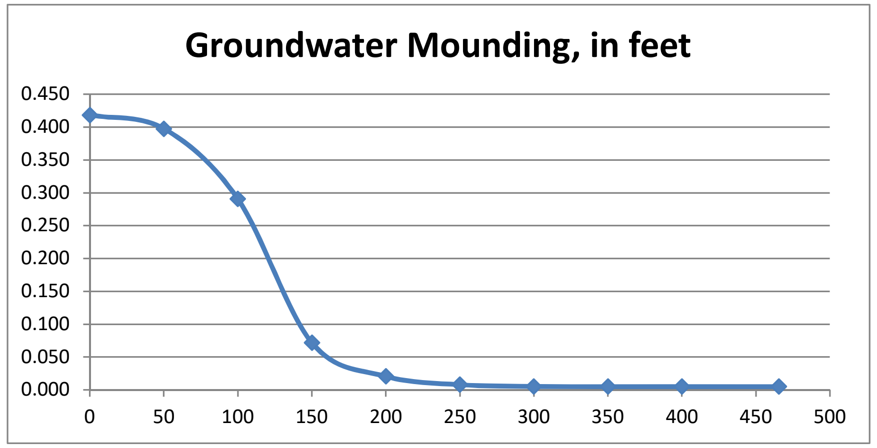
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.419	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.419	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.419	**0**
0.398	**50**
0.291	**100**
0.072	**150**
0.021	**200**
0.008	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**466**

Re-Calculate Now



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SOAKAGE TRENCH 2

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.3900	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
111.500	**x**	**1/2 length of basin (x direction, in feet)**
1.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

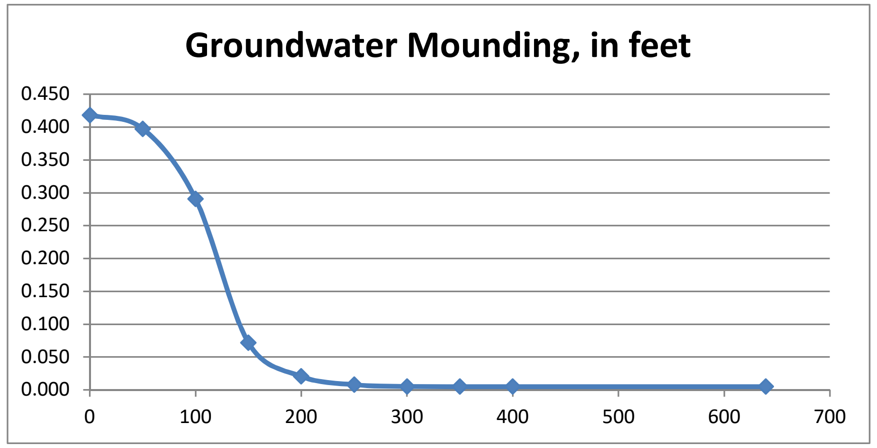
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.419	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.419	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.419	**0**
0.398	**50**
0.291	**100**
0.072	**150**
0.021	**200**
0.008	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**639**

Re-Calculate Now



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SOAKAGE TRENCH 3

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values

4.1700	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
65.500	**x**	**1/2 length of basin (x direction, in feet)**
1.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

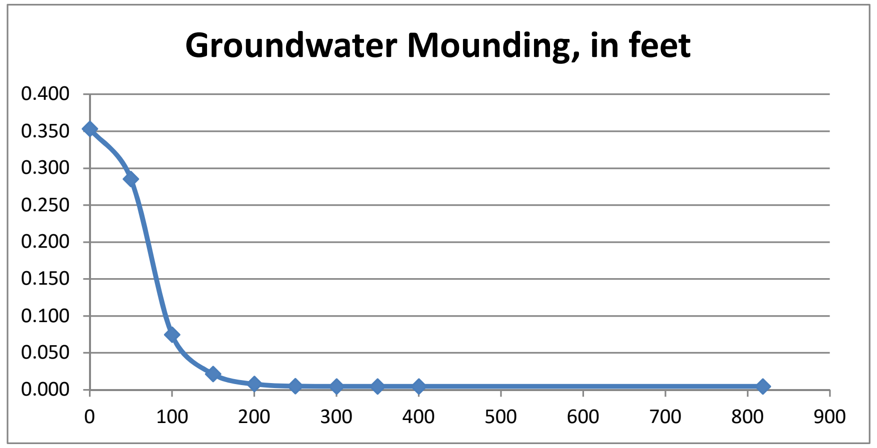
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.353	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.353	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.353	**0**
0.285	**50**
0.075	**100**
0.021	**150**
0.008	**200**
0.005	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**818**

Re-Calculate Now



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SOAKAGE TRENCH 4

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values

4.1300	*R*	**Recharge (infiltration) rate (feet/day)**
0.300	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
191.500	x	**1/2 length of basin (x direction, in feet)**
1.500	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
15.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

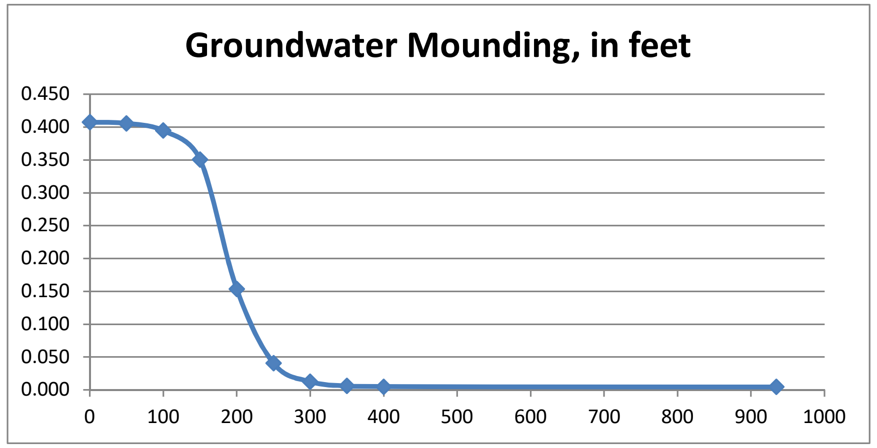
inch/hour	feet/day
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.408	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.408	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.408	0
0.406	50
0.395	100
0.351	150
0.154	200
0.040	250
0.012	300
0.006	350
0.005	400
0.005	935

Re-Calculate Now



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SOAKAGE TRENCH 5

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.1300	*R*	**Recharge (infiltration) rate (feet/day)**
0.300	Sy	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	K	**Horizontal hydraulic conductivity, Kh (feet/day)***
191.500	x	**1/2 length of basin (x direction, in feet)**
1.500	y	**1/2 width of basin (y direction, in feet)**
1.000	t	**duration of infiltration period (days)**
15.000	hi(0)	**initial thickness of saturated zone (feet)**

Conversion Table

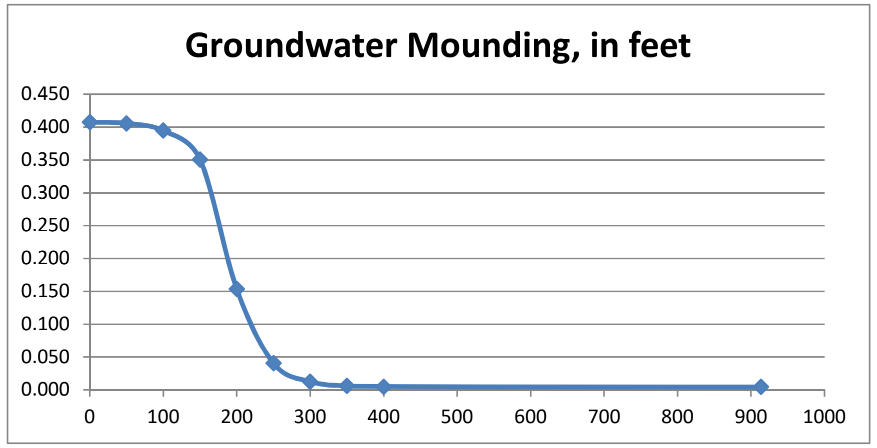
inch/hour	feet/day
0.67	1.33
2.00	4.00
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.408	h(max)	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.408	Δh(max)	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.408	0
0.406	50
0.395	100
0.351	150
0.154	200
0.040	250
0.012	300
0.006	350
0.005	400
0.005	914

Re-Calculate Now



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SOAKAGE TRENCH 6

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The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.1300	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
191.500	**x**	**1/2 length of basin (x direction, in feet)**
1.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

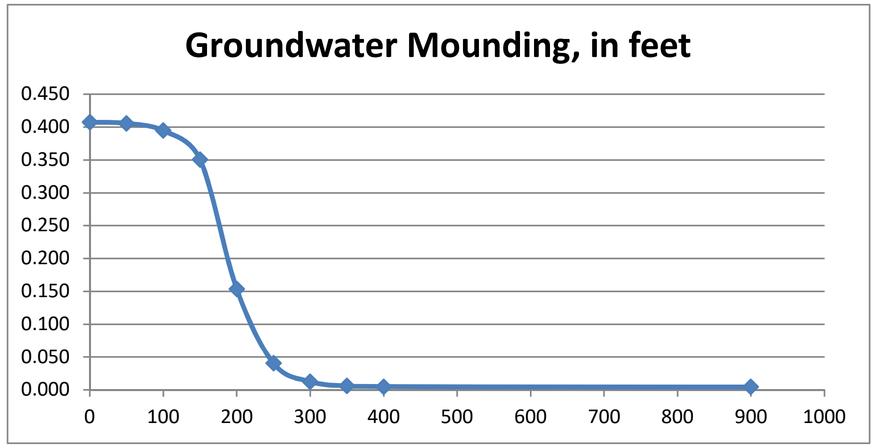
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.408	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.408	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.408	**0**
0.406	**50**
0.395	**100**
0.351	**150**
0.154	**200**
0.040	**250**
0.012	**300**
0.006	**350**
0.005	**400**
0.005	**900**

Re-Calculate Now



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SOAKAGE TRENCH 7

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.4200	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
1.500	**x**	**1/2 length of basin (x direction, in feet)**
129.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

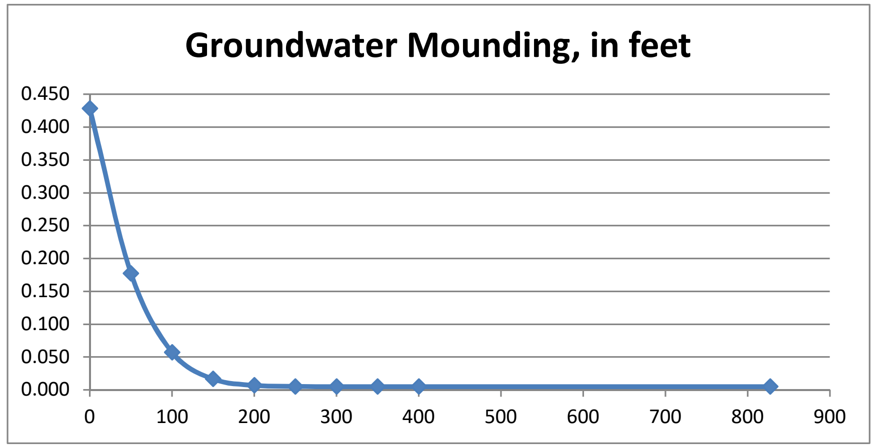
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.428	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.428	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.428	**0**
0.177	**50**
0.057	**100**
0.017	**150**
0.007	**200**
0.005	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**828**

Re-Calculate Now



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SOAKAGE TRENCH 8

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use consistent units (e.g. feet & days **or** inches & hours)

Input Values

4.1000	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
1.500	**x**	**1/2 length of basin (x direction, in feet)**
87.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

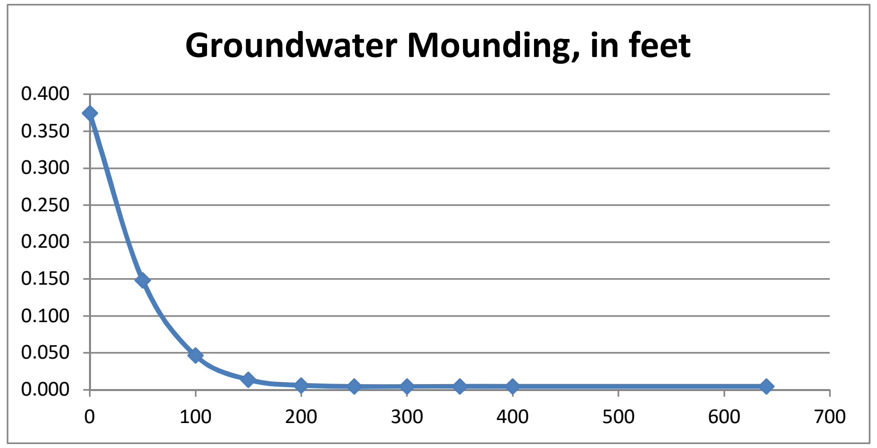
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.375	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.375	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.375	**0**
0.148	**50**
0.047	**100**
0.014	**150**
0.006	**200**
0.005	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**640**

Re-Calculate Now



Disclaimer

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SOAKAGE TRENCH 9

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.3700	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
1.500	**x**	**1/2 length of basin (x direction, in feet)**
112.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**
15.417	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.417	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

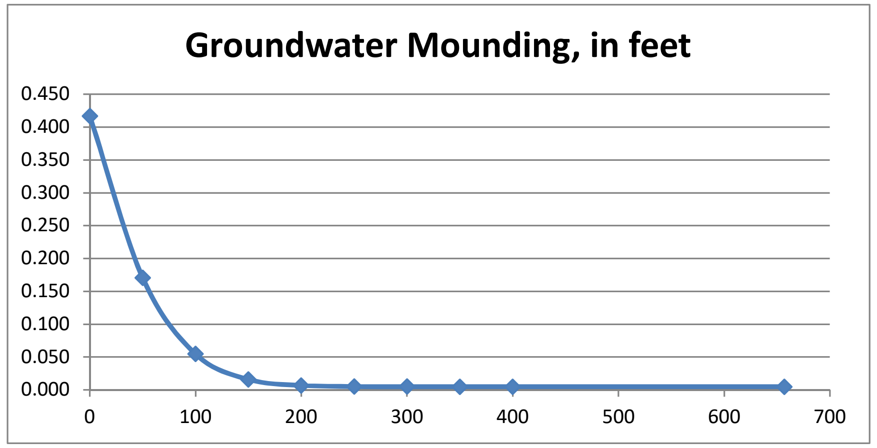
Conversion Table

inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.417	**0**
0.171	**50**
0.055	**100**
0.016	**150**
0.007	**200**
0.005	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**657**

Re-Calculate Now



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SOAKAGE TRENCH 10

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values

4.2100	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
1.500	**x**	**1/2 length of basin (x direction, in feet)**
202.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

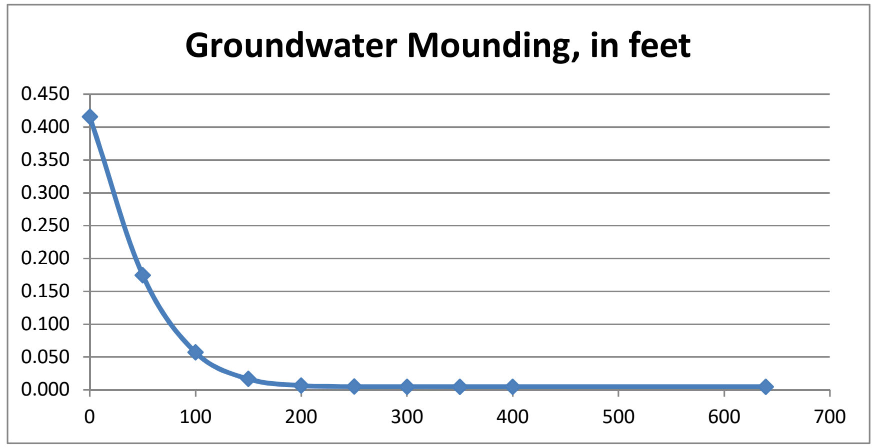
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.416	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.416	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.416	**0**
0.175	**50**
0.057	**100**
0.017	**150**
0.007	**200**
0.005	**250**
0.005	**300**
0.005	**350**
0.005	**400**
0.005	**639**

Re-Calculate Now



Disclaimer

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SOAKAGE TRENCH 11

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
3.9900	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
1.500	**x**	**1/2 length of basin (x direction, in feet)**
212.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

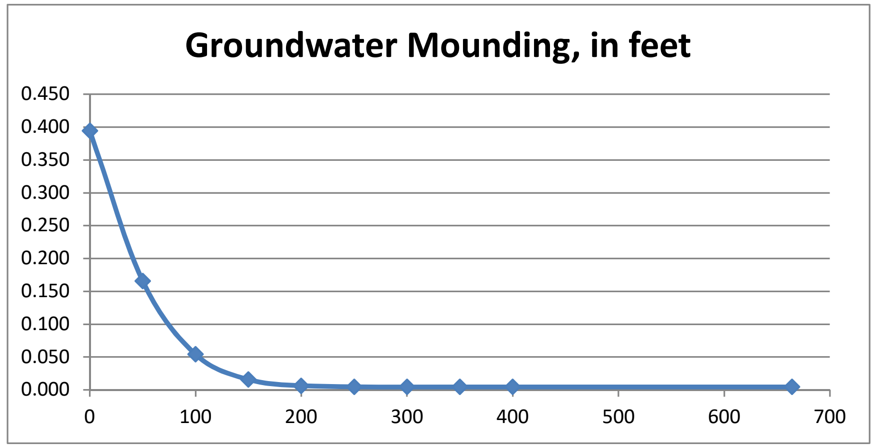
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.394	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.394	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.394	**0**
0.166	**50**
0.054	**100**
0.016	**150**
0.006	**200**
0.005	**250**
0.004	**300**
0.004	**350**
0.004	**400**
0.004	**664**

Re-Calculate Now



Disclaimer

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SOAKAGE TRENCH 12

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
4.5400	*R*	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
224.500	**x**	**1/2 length of basin (x direction, in feet)**
1.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

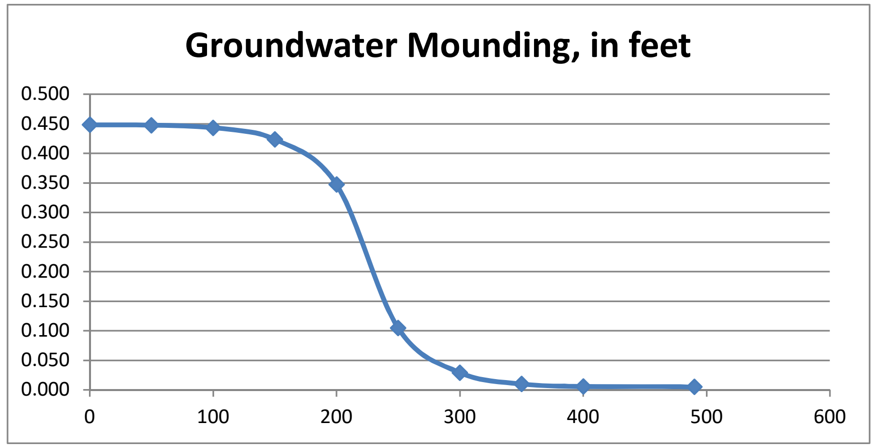
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.448	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.448	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.448	**0**
0.448	**50**
0.443	**100**
0.424	**150**
0.347	**200**
0.104	**250**
0.029	**300**
0.010	**350**
0.006	**400**
0.005	**490**

Re-Calculate Now



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SOAKAGE TRENCH 13

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
3.2300	***R***	**Recharge (infiltration) rate (feet/day)**
0.300	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
62.80	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
52.000	**x**	**1/2 length of basin (x direction, in feet)**
1.500	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
15.000	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

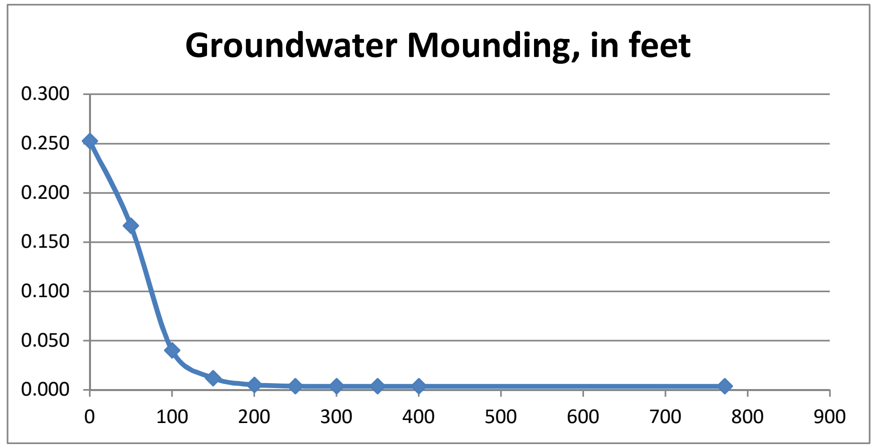
inch/hour	**feet/day**
0.67	1.33
2.00	4.00
hours	**days**
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

15.253	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.253	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	**Distance from center of basin in x direction, in feet**
0.253	**0**
0.167	**50**
0.040	**100**
0.012	**150**
0.005	**200**
0.004	**250**
0.004	**300**
0.004	**350**
0.004	**400**
0.004	**772**

Re-Calculate Now



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STORMWATER MANAGEMENT FACILITY
CITY OF FLORENCE, OREGON
OPERATION & MAINTENANCE AGREEMENT

Sediment and other pollutants that degrade water quality will accumulate in urban stormwater facilities. The operation and maintenance of stormwater management facilities including the implementation of pollution reduction facilities is essential to the protection of the city's water quality. Removal of accumulated pollutants and sediment is important for proper operation. All property owners are expected to conduct business in a manner that promotes resource protection. This agreement contains specific provisions with respect to city maintenance of private stormwater management facilities and use of pollution reduction facilities.

Property Address: Rhododendron Dr & 35th Ave, Florence, OR, 97439

Legal description: LOCATED IN THE SOUTH WEST ONE-QUARTER OF SECTION 15 AND NORTH WEST ONE-QUARTER OF SECTION 22, TOWNSHIP 18 SOUTH, RANGE 12 WEST OF THE WILLAMETTE MERIDIAN, LANE COUNTY, OREGON.

Whereas, APIC Florence Holdings, herein referred to as Owner, has constructed improvements, including but not limited to buildings, pavement, and stormwater management facilities on the property described above. In order to further the goals of the City of Florence to ensure the protection and enhancement of water quality, the City of Florence and Owner hereby enter into this Agreement. The responsibilities of each party to this Agreement are identified below.

Recitals

1. Owner owns the above described property within the City of Florence, Lane County, Oregon.
2. Owner owns and operates stormwater management facilities approved and permitted as required by land use permit PC 20 07 PUD 01 & PC 20 08 SUB 01.
3. Owner has requested the city to provide the functional maintenance of the facility.
4. City approved construction plans dedicating the drainage system conveying the runoff from the residential properties to the stormwater facility as a public drainage system are on file.
5. Access routes for maintenance have been located within a dedicated public easement on private or commonly held property, within the public right-of-way or on city owned property.
6. Sufficient easement area, right-of-way width or property have been provided to accommodate the construction and maintenance of all existing and proposed utilities and public infrastructure.

Owner shall:

1. Implement the stormwater management plan included herein as Attachment "A". (Stormwater disposal and pollution reduction construction details, and source control protection, etc.)
2. Implement the stormwater maintenance plan included herein as Attachment "B". (Owner responsibilities such as vegetation control, debris pickup, etc.)
3. Inspect the facilities monthly and after significant storm events to determine if maintenance activity is warranted.
4. Maintain maintenance and inspection records (in the form of a log book) of steps taken to implement the programs referenced in (1) and (2) above. The log book shall be available for inspection by appointment at 5 Thomas Mellow Cir., Ste 305 San Francisco, CA, 94134. The log book shall catalog any action taken, who took the action, when it was taken, how it was done, and any problems encountered or follow-on actions recommended. Maintenance items ("problems") listed in Attachment "A" shall be inspected as specified in the attached instructions or more often if necessary. The Owner and Users are encouraged to photocopy the individual checklists in Attachment "A" and use them to complete its inspections. These completed checklists would then, in combination, comprise the logbook.
5. Submit an annual report to the City of Florence regarding implementation programs referenced in (1) and (2) above. The report must be submitted on or before June 30 of each calendar year after execution of this agreement. At a minimum, the following items shall be included in the report:
    a. Name, address, and telephone number of the businesses, persons, or firms responsible for maintenance plan implementation, and the persons completing the report.

   b. Time period covered by the report.
   c. A chronological summary of activities conducted to implement the program and plan referenced in (1) and (2) above. A photocopy of the applicable sections of the logbook with any additional explanations needed shall suffice. For any activities conducted by paid parties, include a copy of the invoice for services.
   d. Any outline planned activities for the upcoming year.
6. Allow the City of Florence staff to inspect stormwater management facilities at the above referenced site.

City of Florence shall:

1. Execute the following periodic major maintenance on the subdivision's pollution reduction facilities: sediment removal from facilities, resetting orifice sizes and elevations, and adding baffles.
2. Maintain all stormwater management facility elements within the public rights of way and dedicated easements, such as catch basins, weirs, oil-water separators, and pipes.
3. Provide technical assistance to the Owner in support of its operation and maintenance activities conducted pursuant to its maintenance and source control programs. Said assistance shall be provided upon request and as the City of Florence's time and resources permit.
4. Review the annual report and conduct a minimum of one (1) site visit per year to discuss performance and problems with the stormwater management facilities.
5. Review the agreement with the Owner and modify it as necessary at least once every three (3) years.

Remedies:

1. If the City of Florence determines that maintenance that maintenance or repair work is required to be done to the stormwater management facilities located in the subdivision, the City of Florence shall give the Owner notice of the specific maintenance and/or repair required. The City of Florence shall set a reasonable time in which such work is to be completed the persons who were given notice. If the above required maintenance and/or repair is not completed within the time set by the City of Florence, written notice will be sent to the Owner stating the City of Florence's intention to perform such maintenance and bill the Owner for all incurred expenses.
2. If, at any time, the City of Florence determines that the existing facility creates any imminent threat to public health, safety, or welfare, the City of Florence may take immediate measures to remedy said threat. No notice to the persons listed in Remedies (1), above shall be required under such circumstances. All other

Owner responsibilities shall remain in effect.

1. The Owner shall grant unrestricted authority to the City of Florence for access to any and all stormwater management facilities for the purpose of performing maintenance or repair as may become necessary under Remedies (1) and/or (2).
2. The Owner shall assume responsibility for the cost of maintenance and repairs to the stormwater management facilities, except for those maintenance actions explicitly assumed by the City of Florence in the preceding section. Such responsibility shall include reimbursement to the City of Florence within 90 days of the receipt of the invoice for any such work performed. Overdue payments will require payment of interest at the current legal rate for liquidated judgments. If legal action ensues, any costs or fees incurred by the City of Florence will be borne by the parties responsible for said reimbursements. This Agreement is intended to protect the value and desirability of the real property described above and to benefit all the citizens of the City of Florence. It shall run with the land and be binding on all parties having or acquiring any right, title, or interest or any part thereof, of real property in the subdivision. They shall inure to the benefit of each present or future successor in interest of said property or any part thereof or interest therein, and to the benefit of all citizens of the City of Florence.

This instrument is intended to be binding upon the parties hereto, their heirs, successors and assignees.

In Witness whereof, the undersigned has executed this instrument on this _________ day of __________________,20____.

OWNER(s):

Signature ____

____
(print name)

STATE OF OREGON,
County of Lane, ss:
This instrument was acknowledged before me this ________ day of _______________________________,
20__,by _______________________________________, owner(s) of the above described premises.

____
Notary Public for Oregon

____
My commission expires

MANAGER, CITY OF FLORENCE
In Witness whereof, the undersigned agent of the City of Florence has executed this instrument and acknowledged
the said instrument to be free and voluntary act and deed on this _______ day of _____________________,
20____ for the purposes herein mentioned and on oath states he is authorized to execute said instrument.

____
City Manager

STATE OF OREGON,
County of Lane, ss:
This instrument was acknowledged before me this ________ day of _______________________________,
20__, by _______________________________________, owner(s) of the above described premises.

____
Notary Public for Oregon

____
My commission expires

Attachment A: Stormwater Management Plan

Construction Plans (reduced to 11"x17")

UTILITIES LEGEND

— FO —	EXISTING FIBER OPTICS LINE
— OHP —	EXISTING OVERHEAD POWER LINE
— SD —	EXISTING STORM DRAIN
— SS —	EXISTING SANITARY SEWER
— W —	EXISTING WATER MAIN
✳	EXISTING FIRE HYDRANT
⊗	EXISTING WATER VALVE
Ⓣ	EXISTING TELEPHONE MANHOLE
-○-	EXISTING UTILITY POLE
◪	EXISTING TELEPHONE PEDESTAL
Ⓓ	EXISTING STORM MANHOLE
▤	EXISTING STORM CATCH BASIN
Ⓢ	EXISTING SANITARY MANHOLE
▨	PROPOSED SOAKAGE TRENCH
– – – – –	PROPOSED PERFORATED STORM PIPE
——	PROPOSED STORM TOP OF BANK
—···—···—	PROPOSED STORM BOTTOM OF BANK
— SD —	PROPOSED STORM PIPE
— SS —	PROPOSED SANITARY PIPE
— W —	PROPOSED WATER MAIN
Ⓓ	PROPOSED STORM MANHOLE
▣	PROPOSED CATCH BASIN
■	PROPOSED CURB INLET
●	PROPOSED ROUND AREA INLET
○	PROPOSED STORM CLEANOUT
Ⓢ	PROPOSED SEWER MANHOLE
○	PROPOSED SEWER CLEANOUT
✳	PROPOSED HYDRANT
●	PROPOSED VALVE
○●	BLOW-OFF / AIR RELEASE ASSY.
● ● ▬ ●	PROPOSED LIGHTING
*	LOT REQUIRES FIRE SPRINKLER SYSTEM (CONFORMING TO NFPA 13)

N
W E
S

SCALE: 1" = 50'
0 50 100 FT

811
Know what's below.
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70657PE
JESSE T. EMERSON
JUNE 16, 2011
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10

ISSUED FOR
PERMIT SET

REVISIONS

COMPOSITE UTILITY PLAN

RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT

APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

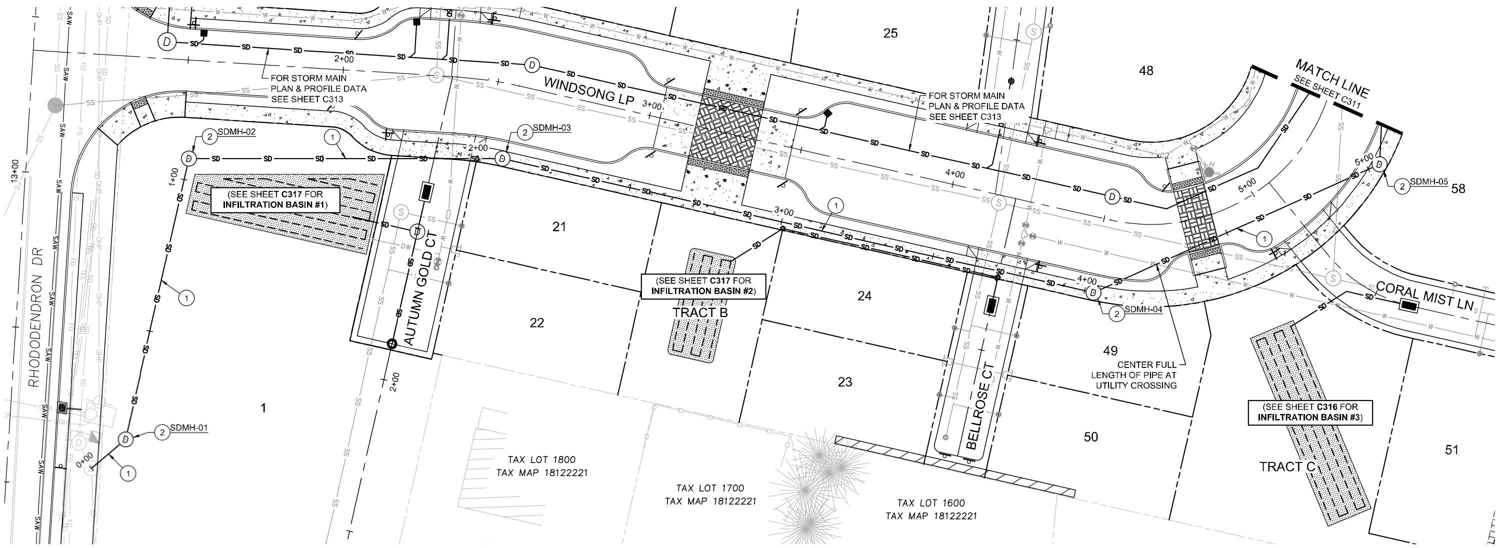
LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION

PROJECT #	19555
LAND USE #	PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S)	700, 1900, 3800
DESIGNED BY	JTE, TEG, ZMS, JKG
CHECKED BY	AJM

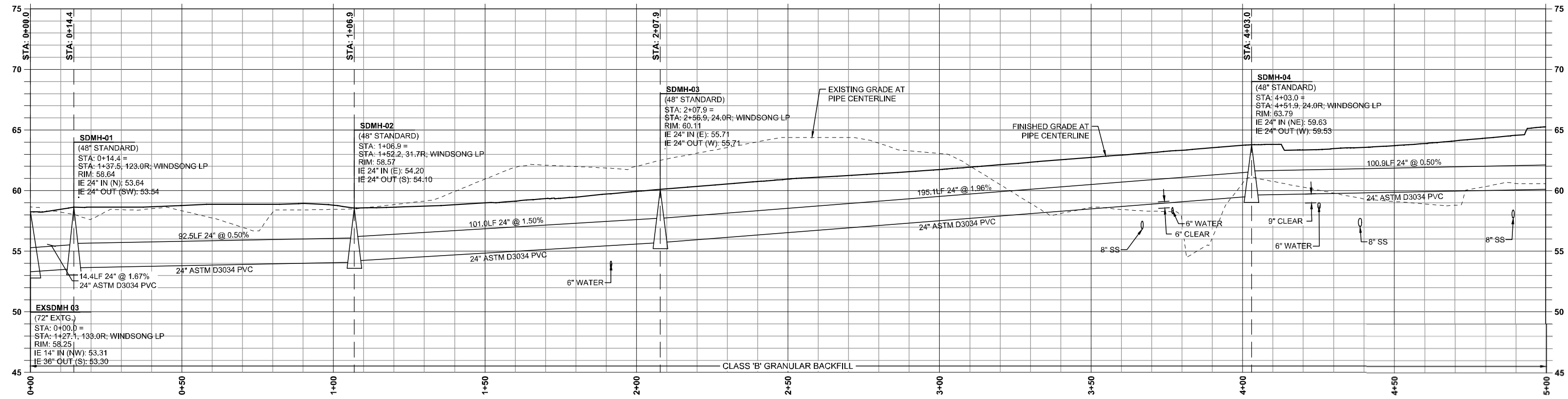
SHEET NUMBER
C300

P:\19555-FLORENCE MASTER PLAN\CAD\01 CORE\CD\19555-COMPOSITE UTILITY.DWG



STORM MAIN BYPASS PLAN

(STA: 0+00 - STA: 5+00)



SD MAIN B PROFILE

(STA: 0+00 - STA: 5+00)
SCALE: 1" = 20' H; 1" = 5' V

STORM DRAIN KEY NOTES

① INSTALL ASTM D3034 PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.

② INSTALL STANDARD 48" MANHOLE PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

③ INSTALL CATCH BASIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

④ INSTALL ROUND AREA DRAIN PER DETAIL ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

⑤ INSTALL FILTER CATCH BASIN PER DETAILS ON SHEET C933. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

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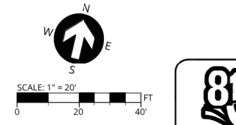
⑦ INSTALL AREA DRAIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

⑧ INSTALL 60" SEDIMENTATION MANHOLE PER DETAILS ON SHEET C932. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

⑨ INSTALL CURB INLET PER DETAILS ON SHEET C932. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

⑩ INSTALL PERFORATED PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.



SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

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70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10

ISSUED FOR
PERMIT SET

STORM MAIN BYPASS (0+00 - 5+00)

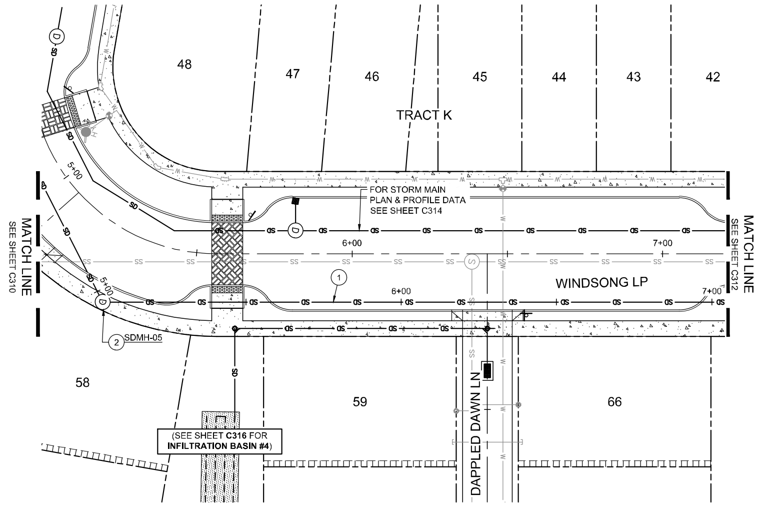
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS
ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION

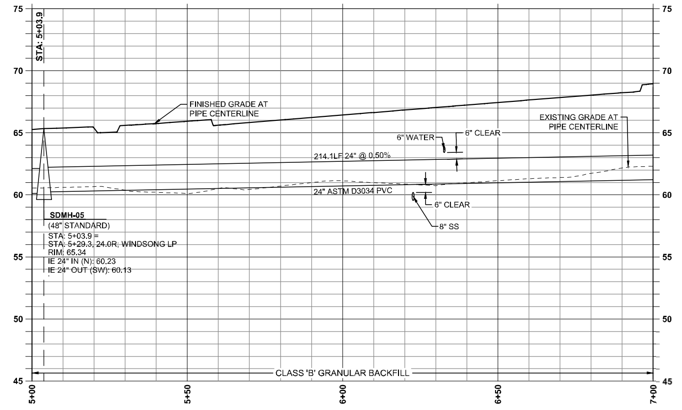
PROJECT #	19555
LAND USE #	PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S)	700, 1900, 3800
DESIGNED BY	JTE, TEG, ZMS, JKG
CHECKED BY	AJM

SHEET NUMBER
C310



STORM MAIN BYPASS PLAN

(STA: 5+00 - STA: 7+00)



SD MAIN B PROFILE

(STA: 5+00 - STA: 7+00)
SCALE: 1" = 20' H; 1" = 5' V

STORM DRAIN KEY NOTES

① INSTALL ASTM D3034 PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.

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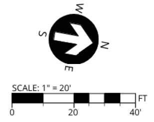

SW 1/4 OF SECTION 15 & NW 1/4 OF
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LANE COUNTY, OREGON

Know what's below.
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REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 18, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET

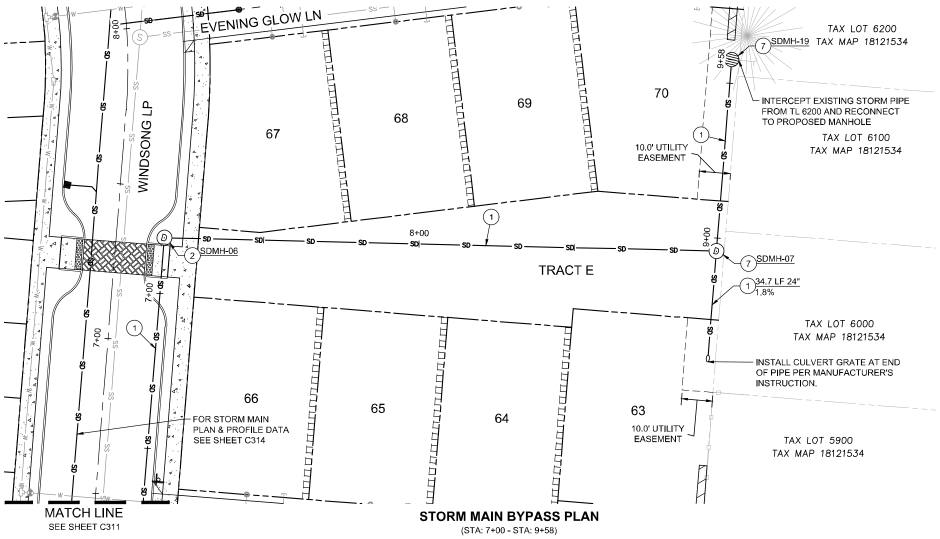
STORM MAIN BYPASS (5+00 - 7+00)
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION

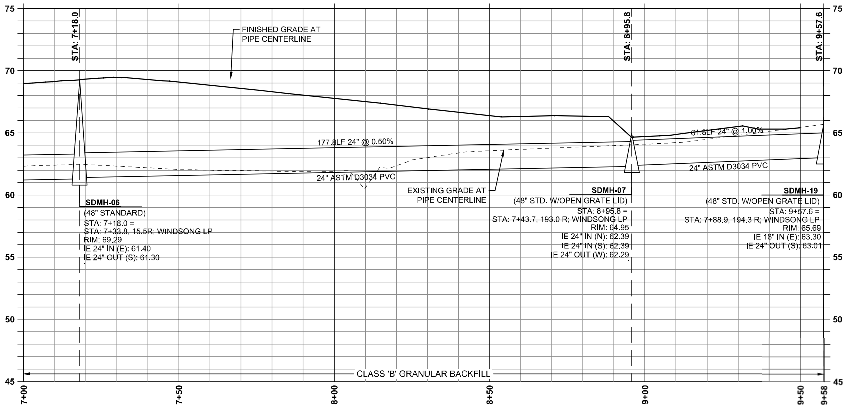
PROJECT #	19555
LAND USE #	PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S)	700, 1900, 3800
DESIGNED BY	JTE, TEG, ZMS, JKG
CHECKED BY	AJM

SHEET NUMBER
C311



STORM MAIN BYPASS PLAN

(STA: 7+00 - STA: 9+58)



SDMH-06
(48" STANDARD)
STA: 7+18.0 =
STA: 7+33.8, 15.5R; WINDSONG LP
RIM: 69.29
IE 24" IN (E): 61.40
IE 24" OUT (S): 61.30

SDMH-07
(48" STD. W/OPEN GRATE LID)
STA: 8+95.8 =
STA: 7+43.7, 193.0 R; WINDSONG LP
RIM: 64.95
IE 24" IN (N): 62.39
IE 24" IN (S): 62.39
IE 24" OUT (W): 62.29

SDMH-19
(48" STD. W/OPEN GRATE LID)
STA: 9+57.6 =
STA: 7+88.9, 194.3 R; WINDSONG LP
RIM: 65.69
IE 18" IN (E): 63.30
IE 24" OUT (S): 63.01

SD MAIN B PROFILE

(STA: 7+00 - STA: 9+58)
SCALE: 1" = 20' H; 1" = 5' V

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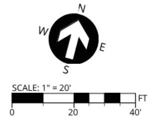

SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

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Know what's below.
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REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 18, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET

STORM MAIN BYPASS (7+00 - 9+58)

RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT

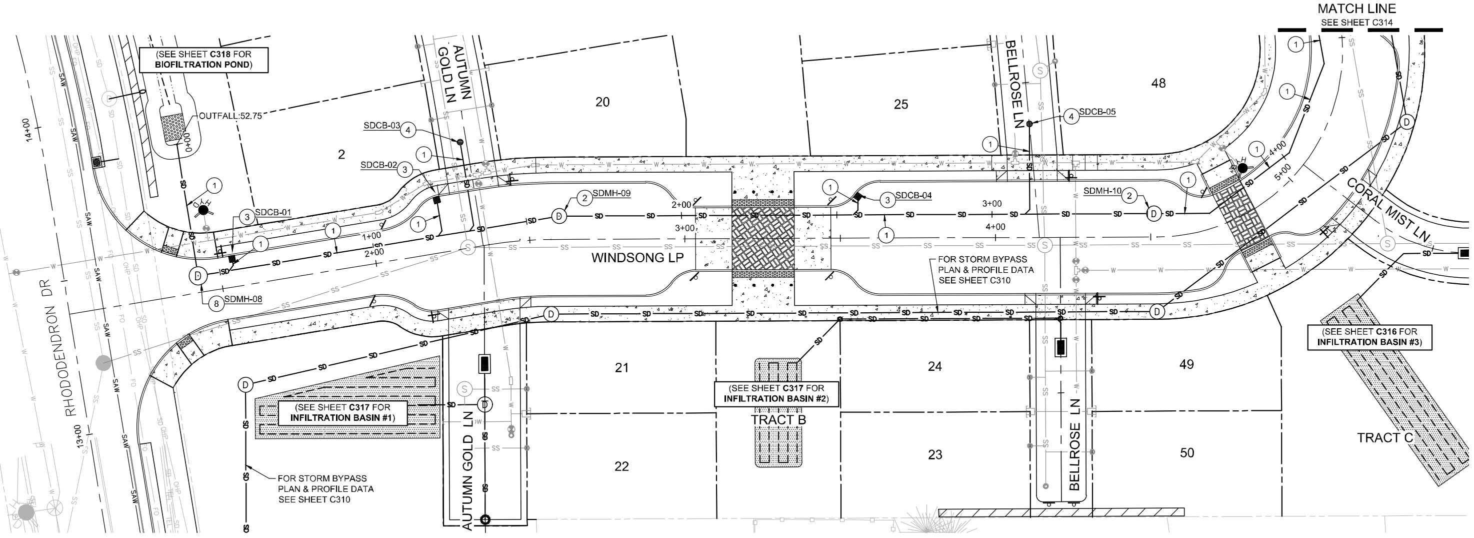
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

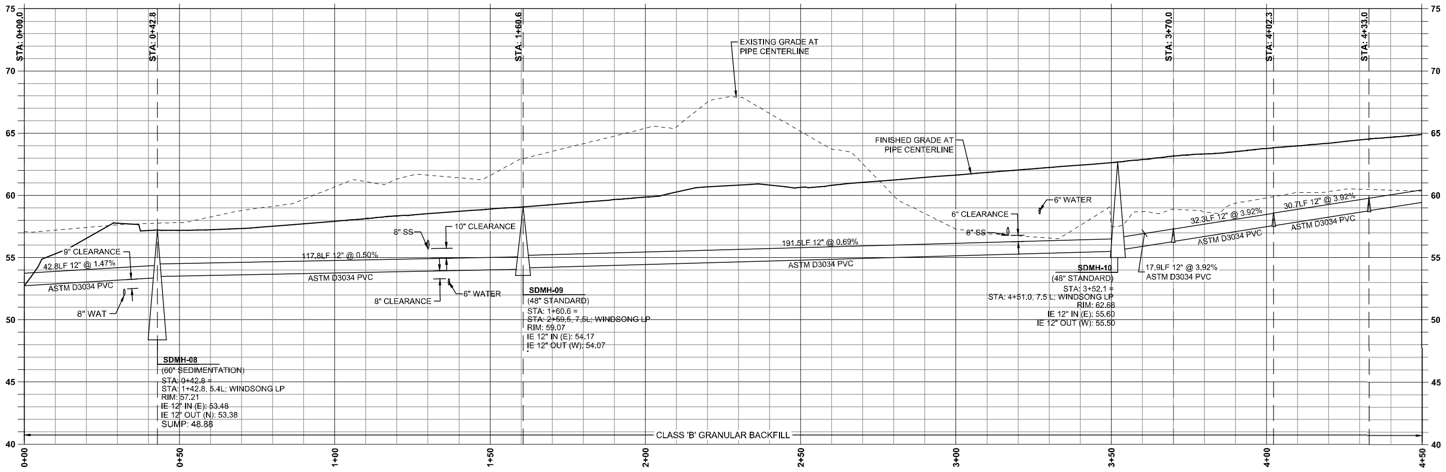
PROJECT INFORMATION

PROJECT #	19555
LAND USE #	PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S)	700, 1900, 3800
DESIGNED BY	JTE, TEG, ZMS, JKG
CHECKED BY	AJM

SHEET NUMBER
C312



STORM DRAIN MAIN PLAN
(STA: 0+00 - STA: 4+50)



SD MAIN A PROFILE
(STA: 0+00 - STA: 4+50)
SCALE: 1" = 20' H; 1" = 5' V

STORM DRAIN KEY NOTES

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INLET TABLE

SDCB-01 TYPE G-2 RIM: 57.11 STA: 1+54.5, 10.0' L WINDSONG LP 12" IE OUT (S): 53.62
SDCB-02 TYPE G-2 RIM: 58.14 STA: 2+23.5, 18.0' L WINDSONG LP 12" IE OUT (S): 54.64
SDCB-03 AREA DRAIN RIM: 58.62 STA: 1+34.0, 2.0' L AUTUMN GOLD LN 12" IE OUT (S): 55.16
SDCB-04 TYPE G-2 RIM: 60.48 STA: 3+54.9, 14.0' L WINDSONG LP 12" IE OUT (S): 57.00
SDCB-05 AREA DRAIN RIM: 61.83 STA: 1+36.6, 0.0' BELLROSE LN 12" IE OUT (S): 57.83

LATERAL TABLE

NAME	SIZE	LENGTH	SLOPE	INVERT AT MAIN	INVERT AT END	COVER AT END	STATION
SDCB-01 LATERAL	12"	4.6 LF	10.0%	53.16	53.62	3.0 FT	STA: 1+54.5, WINDSONG LP
SDCB-02 LATERAL	12"	12.6 LF	7.0%	53.75	54.64	3.6 FT	STA: 2+22.6, WINDSONG LP
SDCB-03 LATERAL	12"	28.6 LF	4.6%	53.83	55.16	3.7 FT	STA: 2+33.0, WINDSONG LP
SDCB-04 LATERAL	12"	6.5 LF	33.0%	54.84	57.00	4.8 FT	STA: 3+55.7, WINDSONG LP
SDCB-05 LATERAL	12"	29.0 LF	9.0%	55.22	57.83	5.6 FT	STA: 4+11.0, WINDSONG LP

N
W E
S

SCALE: 1" = 20'
0 20 40' FT

SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

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REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10

ISSUED FOR
PERMIT SET

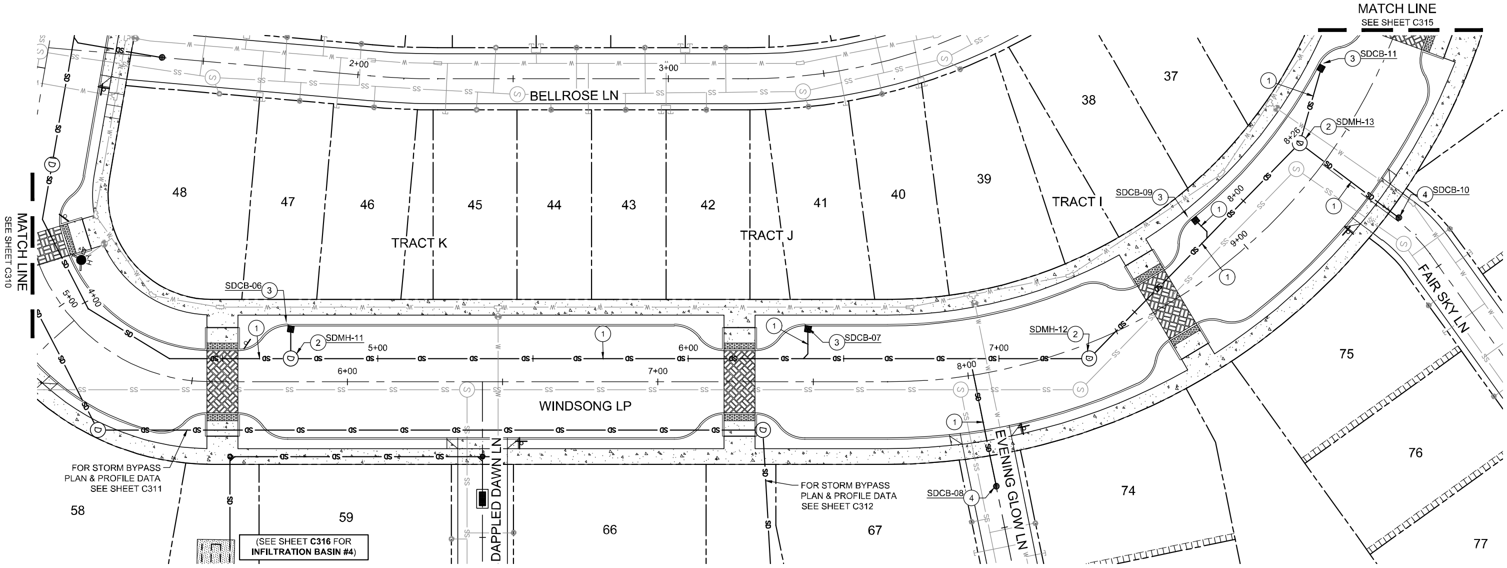
STORM MAIN A (0+00 - 4+50)

RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

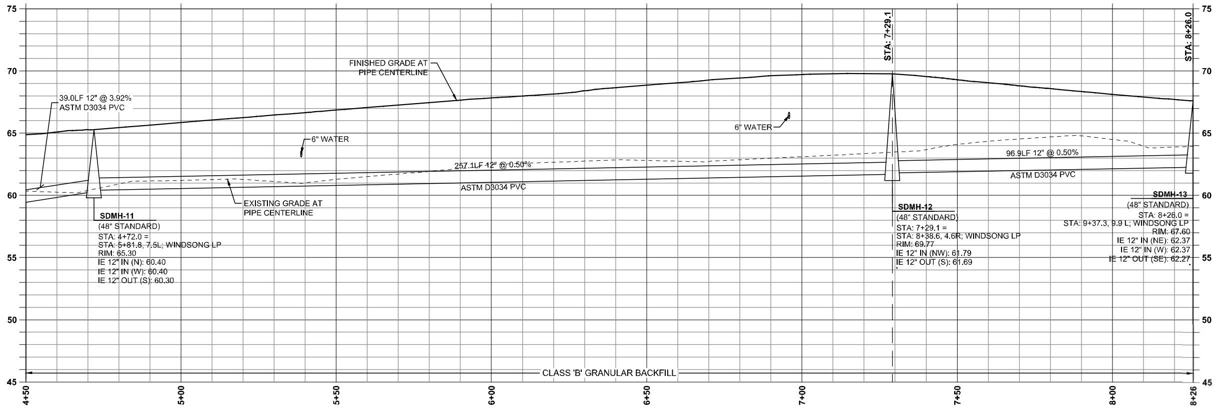
PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C313



STORM DRAIN MAIN PLAN

(STA: 4+50 - STA: 8+26)



SD MAIN A PROFILE

(STA: 4+50 - STA: 8+26)
SCALE: 1" = 20' H; 1" = 5' V

STORM DRAIN KEY NOTES

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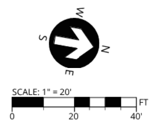
INLET TABLE

SDCB-06 TYPE G-2 RIM: 65.07 STA: 5+80.8, 18.0' L WINDSONG LP 12" IE OUT (E): 61.57
SDCB-07 TYPE G-2 RIM: 68.40 STA: 7+47.3, 18.0' L WINDSONG LP 12" IE OUT (E): 64.90
SDCB-08 AREA DRAIN RIM: 70.07 STA: 1+36.5, 0.0' EVENING GLOW LN 12" IE OUT (W): 66.07
SDCB-09 TYPE G-2 RIM: 68.35 STA: 8+91.5, 18.0' L WINDSONG LP 12" IE OUT (NE): 64.85
SDCB-10 AREA DRAIN RIM: 68.53 STA: 1+30.0, 1.0' L FAIR SKY LN 12" IE OUT (SW): 64.51
SDCB-11 TYPE G-2 RIM: 66.89 STA: 9+64.5, 18.0' L WINDSONG LP 12" IE OUT (E): 63.39

LATERAL TABLE

NAME	SIZE	LENGTH	SLOPE	INVERT AT MAIN	INVERT AT END	COVER AT END	STATION
SDCB-06 LATERAL	12"	10.5 LF	11.1%	60.40	61.57	3.9 FT	STA: 5+81.8, WINDSONG LP
SDCB-07 LATERAL	12"	10.5 LF	34.8%	61.23	64.90	6.4 FT	STA: 7+48.3, WINDSONG LP
SDCB-08 LATERAL	12"	41.9 LF	10.3%	61.77	66.07	6.8 FT	STA: 8+01.5, WINDSONG LP
SDCB-09 LATERAL	12"	7.8 LF	35.6%	62.07	64.85	5.4 FT	STA: 8+93.4, WINDSONG LP
SDCB-10 LATERAL	12"	39.8 LF	5.4%	62.37	64.51	4.2 FT	STA: 9+37.3, WINDSONG LP
SDCB-11 LATERAL	12"	26.3 LF	3.9%	62.37	63.39	4.2 FT	STA: 9+37.3, WINDSONG LP



SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

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70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
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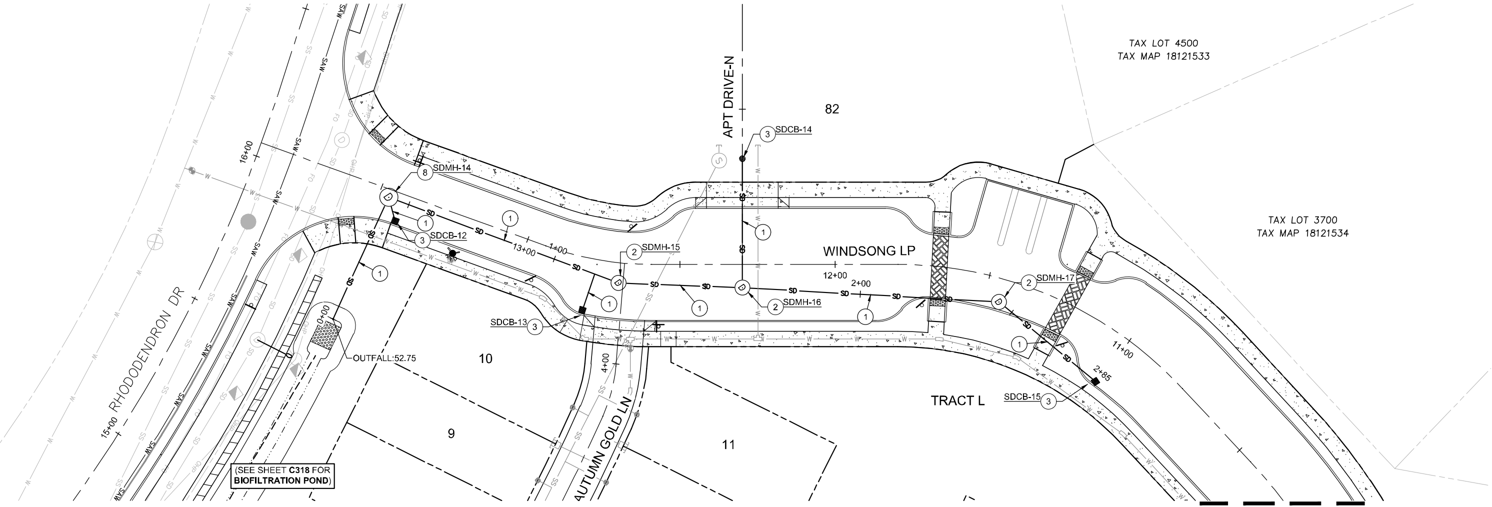
PERMIT SET

STORM MAIN A (4+50 - 8+26)
RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

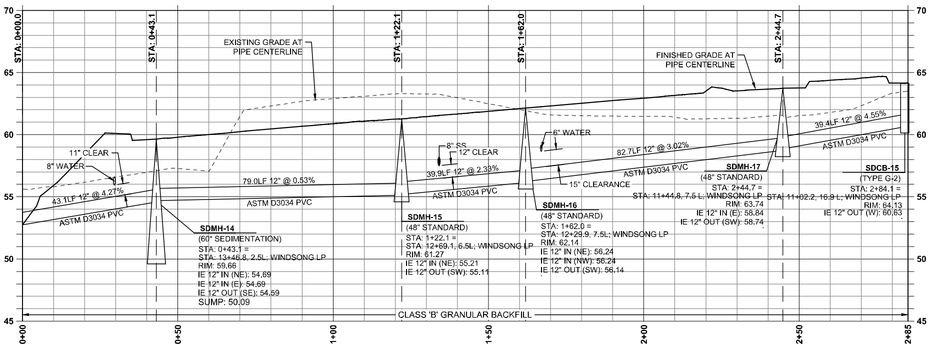
PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C314



STORM DRAIN MAIN PLAN

(STA: 0+00 - STA: 2+85)



SD MAIN C PROFILE

(STA: 0+00 - STA: 2+85)
SCALE: 1" = 20' H; 1" = 5' V

LATERAL TABLE

NAME	SIZE	LENGTH	SLOPE	INVERT AT MAIN	INVERT AT END	COVER AT END	STATION
SDCB-12 LATERAL	12"	7.9 LF	17.9%	54.69	56.11	3.9 FT	STA: 13+46.8, WINDSONG LP
SDCB-13 LATERAL	12"	13.1 LF	17.6%	55.07	57.37	5.0 FT	STA: 12+76.7, WINDSONG LP
SDCB-14 LATERAL	12"	41.5 LF	0.5%	56.45	56.24	5.8 FT	STA: 12+29.9, WINDSONG LP

STORM DRAIN KEY NOTES

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⑧ INSTALL 60" SEDIMENTATION MANHOLE PER DETAILS ON SHEET C932. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
⑨ INSTALL CURB INLET PER DETAILS ON SHEET C932. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
⑩ INSTALL PERFORATED PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.

INLET TABLE

SDCB-12
TYPE G-2
RIM: 59.61
STA: 13+42.2, 9.0' L
WINDSONG LP
12" IE OUT (W): 56.11

SDCB-13
TYPE G-2
RIM: 60.87
STA: 12+77.6, 18.0' L
WINDSONG LP
12" IE OUT (NW): 57.37

SDCB-14
AREA DRAIN
RIM: 63.16
STA: 1+34.0, 0.0'
APT DRIVE-N
12" IE OUT (SE): 56.45

SCALE: 1" = 20'
0 20 40' FT

SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

Know what's below.
Call before you dig.

REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10

ISSUED FOR
PERMIT SET

STORM MAIN C (0+00 - 2+85)

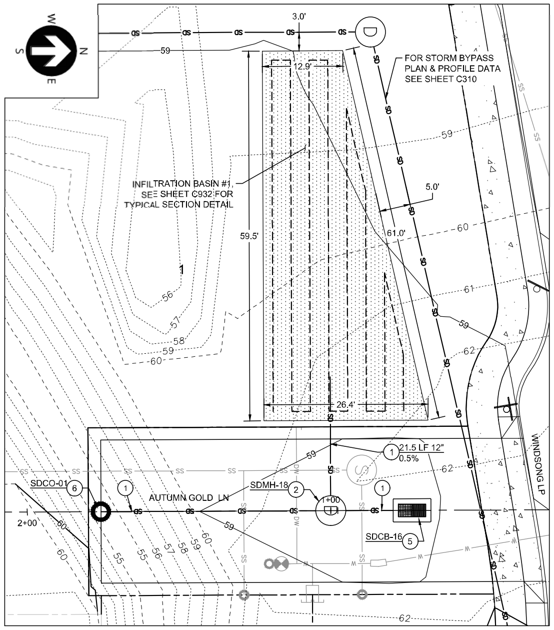
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT

APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

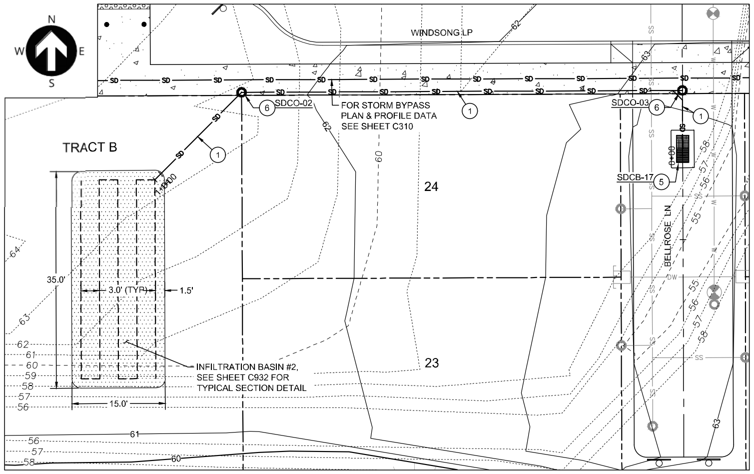
PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C315



INFILTRATION BASIN #1 PLAN

(STA: 0+50 - STA: 1+25)

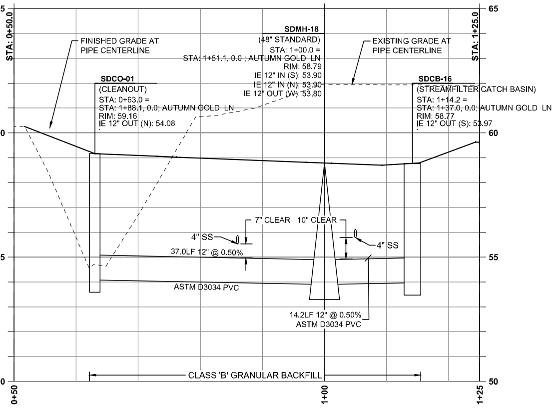


INFILTRATION BASIN #2 PLAN

(STA: 0+00 - STA: 1+01)

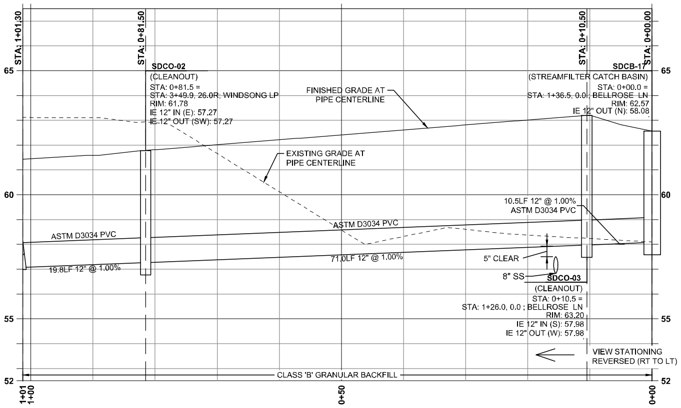
STORM DRAIN KEY NOTES

1. INSTALL ASTM D3034 PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.
2. INSTALL STANDARD 48" MANHOLE PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
3. INSTALL 24" x 24" CATCH BASIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
4. INSTALL 18" ROUND AREA DRAIN PER DETAIL ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
5. INSTALL 24" x 24" FILTER CATCH BASIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
6. INSTALL STORM CLEANOUT PER DETAILS ON SHEET C931. SEE STRUCTURE TABLE ON THIS SHEET FOR ELEVATION INFORMATION.
7. INSTALL 36" x 36" AREA DRAIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
8. INSTALL 60" SEDIMENTATION MANHOLE PER DETAILS ON SHEET C932. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
9. INSTALL CURB INLET PER DETAILS ON SHEET C932. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.
10. INSTALL PERFORATED PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.



INFILTRATION BASIN 1 PROFILE

(STA: 0+50 - STA: 1+25)
SCALE: 1" = 10' H; 1" = 2' V



INFILTRATION BASIN 2 PROFILE

(STA:0+00 - STA:1+01)
SCALE: 1" = 10' H; 1" = 2' V

SCALE: 1" = 10'
0 10 20' FT

SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

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70657PE
JESSE T. EMERSON
JUNE 16, 2011
EXPIRES 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET

INFILTRATION FACILITIES I

RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT

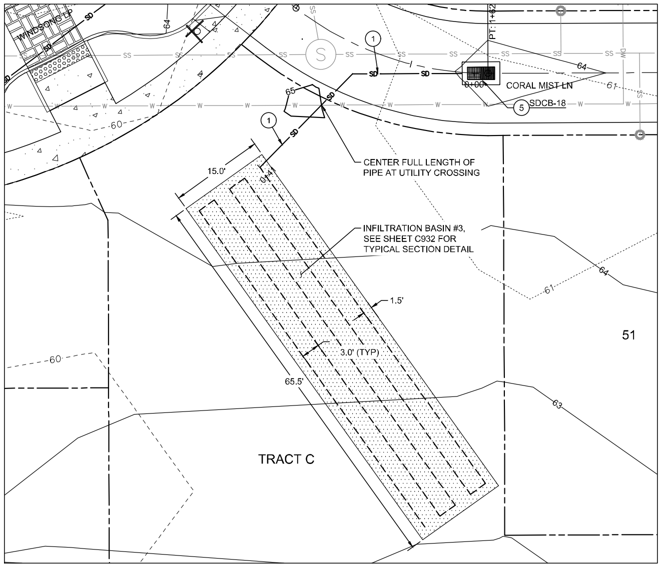
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

3J CONSULTING

PROJECT INFORMATION

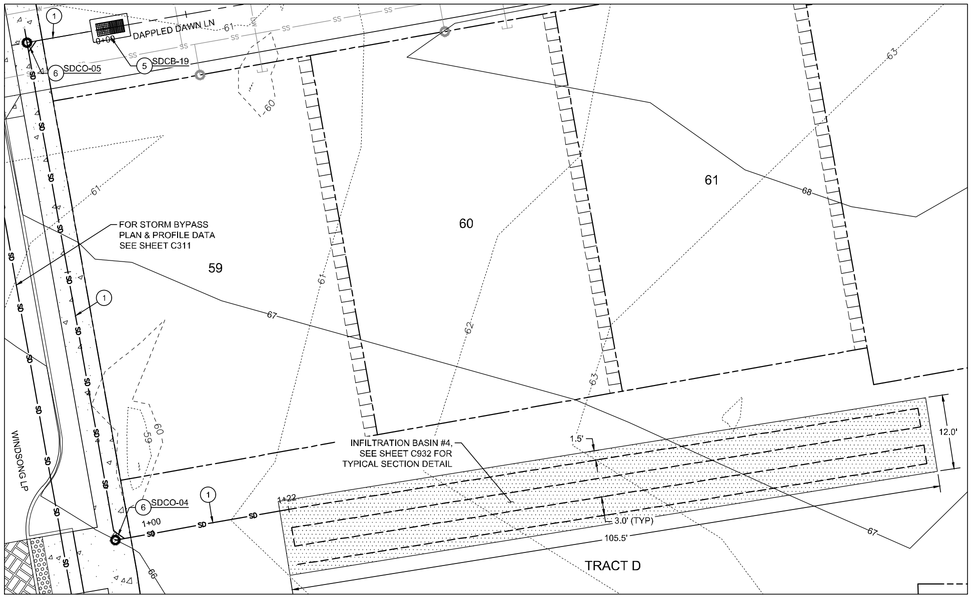
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C316



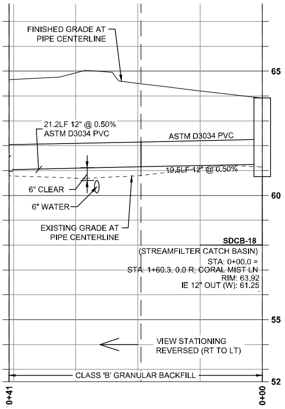
INFILTRATION BASIN #3 PLAN

(STA: 0+00 - STA: 0+41)



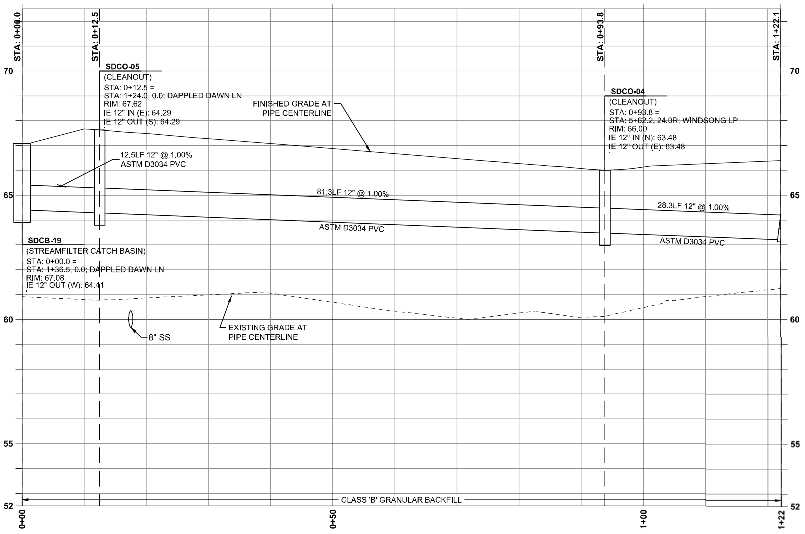
INFILTRATION BASIN #4 PLAN

(STA: 0+00 - STA: 1+22)



INFILTRATION BASIN 3 PROFILE

(STA:0+00 - STA:0+41)
SCALE: 1" = 10' H; 1" = 2' V



INFILTRATION BASIN 4 PROFILE

(STA: 0+00 - STA: 1+22)
SCALE: 1" = 10' H; 1" = 2' V

STORM DRAIN KEY NOTES

① INSTALL ASTM D3034 PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.

② INSTALL STANDARD 48" MANHOLE PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

③ INSTALL 24" x 24" CATCH BASIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

④ INSTALL 18" ROUND AREA DRAIN PER DETAIL ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

⑤ INSTALL 24" x 24" FILTER CATCH BASIN PER DETAILS ON SHEET C931. SEE STRUCTURE DATA ON THIS SHEET FOR ELEVATION INFORMATION.

⑥ INSTALL STORM CLEANOUT PER DETAILS ON SHEET C931. SEE STRUCTURE TABLE ON THIS SHEET FOR ELEVATION INFORMATION.

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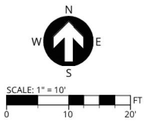

SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

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Know what's below.
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REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET

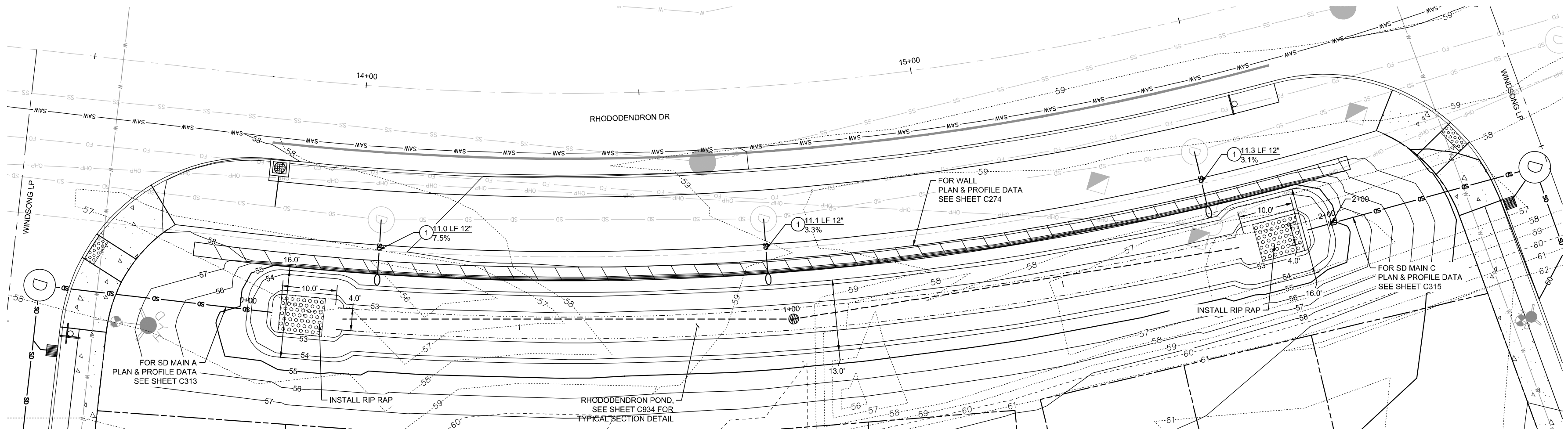
INFILTRATION FACILITIES II
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION

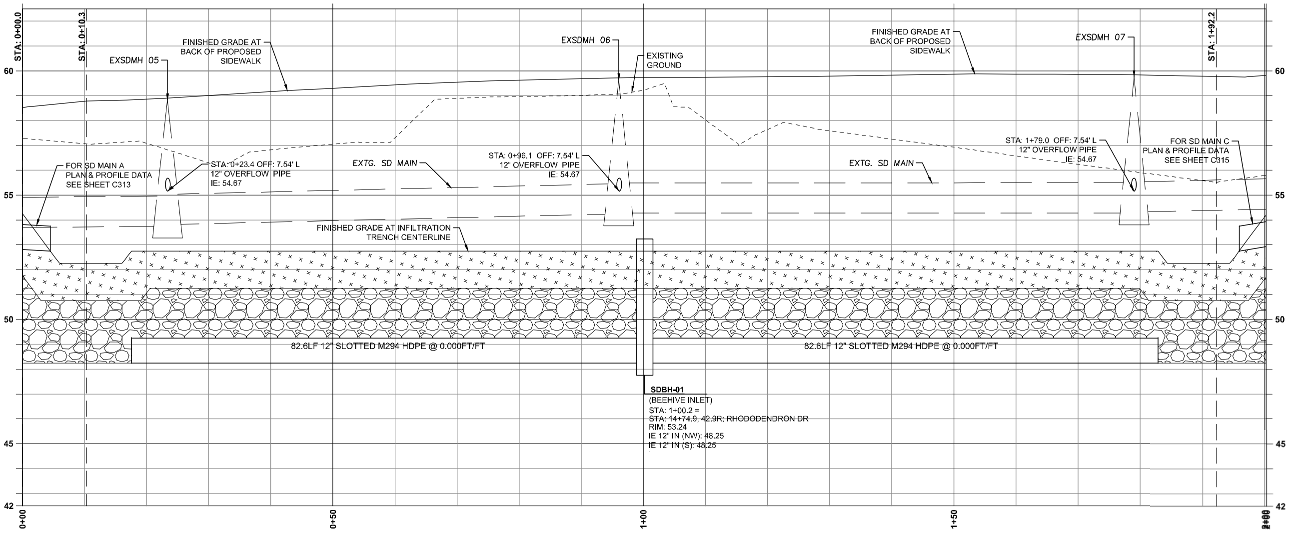
PROJECT #	19555
LAND USE #	PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S)	700, 1900, 3800
DESIGNED BY	JTE, TEG, ZMS, JKG
CHECKED BY	AJM

SHEET NUMBER
C317



BIOFILTRATION POND PLAN

(STA: 0+00 - STA: 2+00)



BIOFILTRATION POND PROFILE

(STA: 0+00 - STA: 2+00)
SCALE: 1" = 10' H; 1" = 2' V

STORM DRAIN KEY NOTES

① INSTALL ASTM D3034 PVC STORM PIPE TO THE SIZE, ALIGNMENT, LENGTH AND SLOPE SHOWN ON THIS SHEET.

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SCALE: 1" = 10'
0 10 20' FT

SW 1/4 OF SECTION 15 & NW 1/4 OF
SECTION 22, T18S., R.12W., W.M.,
LANE COUNTY, OREGON

811
Know what's below.
Call before you dig.

REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 18, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

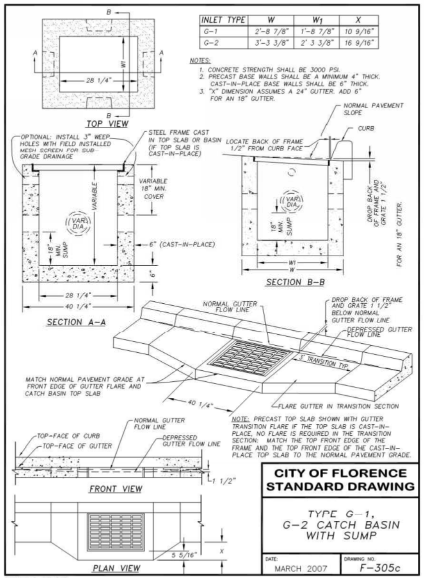
PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET

INFILTRATION FACILITIES III
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C318



INLET TYPE	W	W1	X
G-1	2'-8 7/8"	1'-8 7/8"	10 9/16"
G-2	3'-3 3/8"	2' 3 3/8"	16 9/16"

NOTES:
1. CONCRETE STRENGTH SHALL BE 3000 PSI.
2. PRECAST BASE WALLS SHALL BE A MINIMUM 4" THICK. CAST-IN-PLACE BASE WALLS SHALL BE 6" THICK.
3. "X" DIMENSION ASSUMES A 24" GUTTER. ADD 6" FOR AN 18" GUTTER.

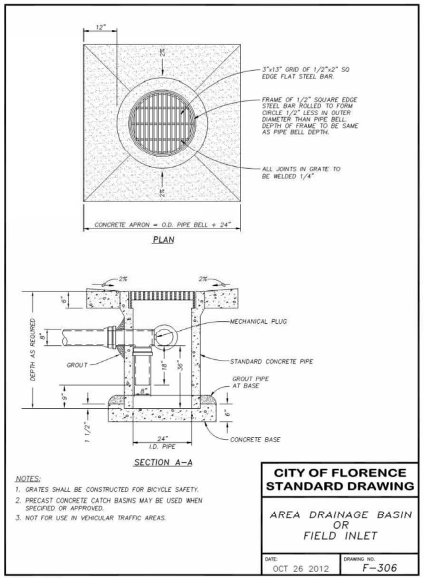
NOTE: PRECAST TOP SLAB SHOWN WITH GUTTER TRANSITION FLARE IF THE TOP SLAB IS CAST-IN-PLACE, NO FLARE IS REQUIRED IN THE TRANSITION SECTION: MATCH THE TOP FRONT EDGE OF THE FRAME AND THE TOP FRONT EDGE OF THE CAST-IN-PLACE TOP SLAB TO THE NORMAL PAVEMENT GRADE.

CITY OF FLORENCE STANDARD DRAWING

TYPE G-1,
G-2 CATCH BASIN
WITH SUMP

DATE: MARCH 2007
DRAWING NO. F-305c

FILENAME: F-305c.DWG



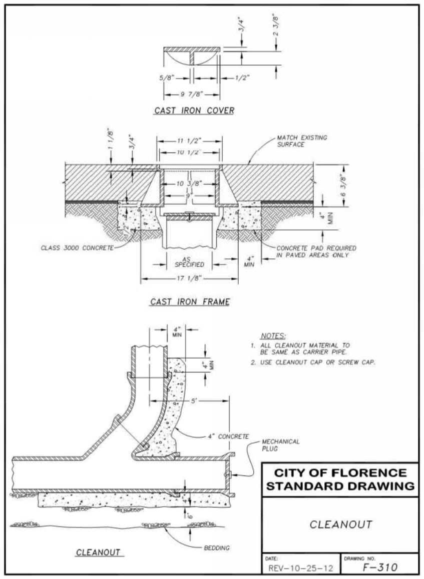
NOTES:
1. GRATES SHALL BE CONSTRUCTED FOR BICYCLE SAFETY.
2. PRECAST CONCRETE CATCH BASINS MAY BE USED WHEN SPECIFIED OR APPROVED.
3. NOT FOR USE IN VEHICULAR TRAFFIC AREAS.

CITY OF FLORENCE STANDARD DRAWING

AREA DRAINAGE BASIN
OR
FIELD INLET

DATE: OCT 26 2012
DRAWING NO. F-306

FILENAME: F-306.DWG

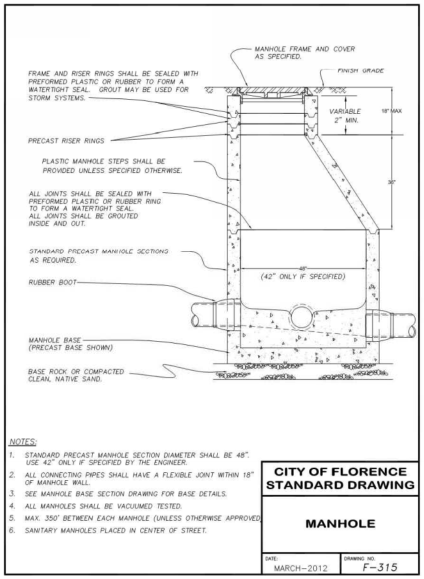


NOTES:
1. ALL CLEANOUT MATERIAL TO BE SAME AS CARRIER PIPE.
2. USE CLEANOUT CAP OR SCREW CAP.

CITY OF FLORENCE STANDARD DRAWING

CLEANOUT

DATE: REV-10-25-12
DRAWING NO. F-310

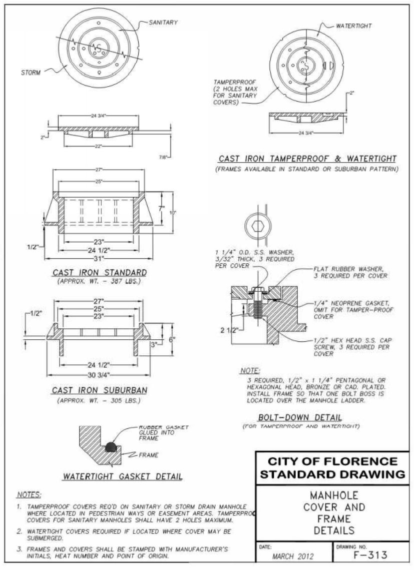


NOTES:
1. STANDARD PRECAST MANHOLE SECTION DIAMETER SHALL BE 48". USE 42" ONLY IF SPECIFIED BY THE ENGINEER.
2. ALL CONNECTING PIPES SHALL HAVE A FLEXIBLE JOINT WITHIN 18" OF MANHOLE WALL.
3. SEE MANHOLE BASE SECTION DRAWING FOR BASE DETAILS.
4. ALL MANHOLES SHALL BE VACUUMED TESTED.
5. MAX. 350' BETWEEN EACH MANHOLE (UNLESS OTHERWISE APPROVED)
6. SANITARY MANHOLES PLACED IN CENTER OF STREET.

CITY OF FLORENCE STANDARD DRAWING

MANHOLE

DATE: MARCH-2012
DRAWING NO. F-315



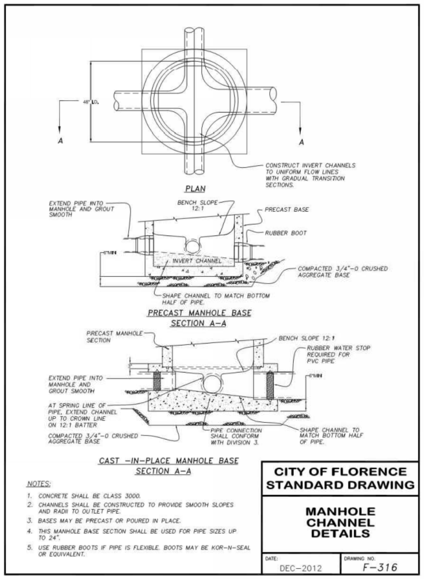
NOTE:
3 REQUIRED, 1/2" x 1 1/4" PENTAGONAL OR HEXAGONAL HEAD, BRONZE OR CAD. PLATED. INSTALL FRAME SO THAT ONE BOLT BOSS IS LOCATED OVER THE MANHOLE LADDER.

NOTES:
1. TAMPERPROOF COVERS REQ'D ON SANITARY OR STORM DRAIN MANHOLE WHERE LOCATED IN PEDESTRIAN WAYS OR EASEMENT AREAS. TAMPERPROOF COVERS FOR SANITARY MANHOLES SHALL HAVE 2 HOLES MAXIMUM.
2. WATERTIGHT COVERS REQUIRED IF LOCATED WHERE COVER MAY BE SUBMERGED.
3. FRAMES AND COVERS SHALL BE STAMPED WITH MANUFACTURER'S INITIALS, HEAT NUMBER AND POINT OF ORIGIN.

CITY OF FLORENCE STANDARD DRAWING

MANHOLE
COVER AND
FRAME
DETAILS

DATE: MARCH 2012
DRAWING NO. F-313



NOTES:
1. CONCRETE SHALL BE CLASS 3000.
2. CHANNELS SHALL BE CONSTRUCTED TO PROVIDE SMOOTH SLOPES AND RADII TO OUTLET PIPE.
3. BASES MAY BE PRECAST OR POURED IN PLACE.
4. THIS MANHOLE BASE SECTION SHALL BE USED FOR PIPE SIZES UP TO 24".
5. USE RUBBER BOOTS IF PIPE IS FLEXIBLE. BOOTS MAY BE KOR-N-SEAL OR EQUIVALENT.

CITY OF FLORENCE STANDARD DRAWING

MANHOLE CHANNEL DETAILS

DATE: DEC-2012
DRAWING NO. F-316

P:\19555-FLORENCE MASTER PLAN\CAD\01 CORE\CD\19555-STORM DETAILS.DWG

REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

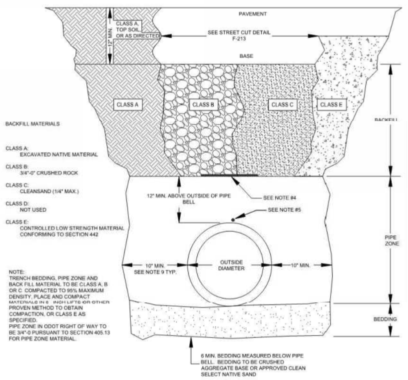
PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET
REVISIONS

STORM DETAILS I
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C931



NOTE:
TRENCH BEDDING, PIPE ZONE AND BACK FILL MATERIAL TO BE CLASS A, B OR C. COMPACTED TO 95% MAXIMUM DENSITY, PLACE AND COMPACT MATERIALS IN 6 INCH LIFTS OR OTHER PROVEN METHOD TO OBTAIN COMPACTION, OR CLASS E AS SPECIFIED.
PIPE ZONE IN ODOT RIGHT OF WAY TO BE 3/4"-0 PURSUANT TO SECTION 405.13 FOR PIPE ZONE MATERIAL.

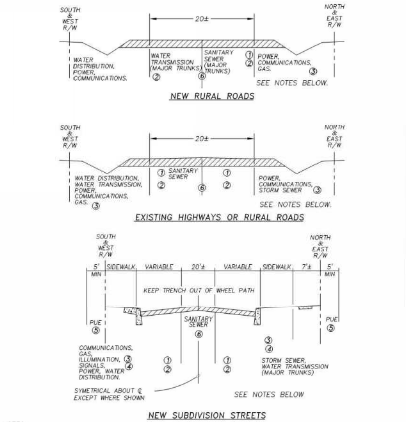
NOTES:

1. SURFACING OF PAVED AREAS SHALL COMPLY WITH STREET CUT STANDARD DRAWING F-213.
2. CENTER PIPE LINE IN TRENCH.
3. PLACE FULL LENGTH OF PVC PIPE ON FIRM, UNIFORM, COMPACTED SUBGRADE AND EXCAVATE FOR PIPE BELLS.
4. PLACE DETECTION TAPE ABOVE PIPE BETWEEN SUBGRADE AND BASE.
5. PLACE TRACER WIRE ON TOP OF PIPE AND HOLD IN PLACE WITH DUCT TAPE AT 10' INTERVALS OR WRAP WIRE AROUND PIPE. DETECTABLE MARKING WIRE SHALL BE NO 12 AWG, MINIMUM, SOLID COPPER WITH COLORED POLYETHYLENE INSULATION - BLUE FOR WATER AND GREEN FOR SEWER (TYP.).
6. SUBMIT DETECTION WIRE CONTINUITY AND ISOLATION TESTS, PRESSURE TESTS, AND BACTERIOLOGICAL TESTS TO ENGINEER. SUBMIT TESTS PRIOR TO SURFACE RESTORATION WORK WHEN POSSIBLE.
7. EXCEPT AS NOTED ALL WORK TO CONFORM TO OREGON 2008 STANDARD SPECIFICATIONS.
8. IN HIGH GROUND WATER AREAS OR AS REQUIRED, PROVIDE 3/4"-0 CRUSHED ROCK TO THE DEPTH NEEDED TO STABILIZE THE PIPE BEDDING SO AS TO PROVIDE A FIRM UNYIELDING SUBGRADE SUITABLE FOR LAYING PIPE.
9. SEE ODOT DRAWING RD300 TABLE A FOR WORK IN HIGHWAY RIGHT OF WAY.

CITY OF FLORENCE STANDARD DRAWING

UTILITY TRENCH

REV: 03-04-13
DATE: 12-22-11
DRAWING NO. F-301



NOTES:

① MANHOLES SHOULD NOT BE INSTALLED IN WHEEL PATH.
② FOUR FOOT MINIMUM COVER FOR DISTRIBUTION FACILITIES TO CROSS.
③ WATER TRANSMISSION AND STORM SEWER SHOULD NOT BE LOCATED IN STREET AREA.
④ VAULTS, HYDRANTS, PEDESTALS THAT BLOCK ZONES SHOULD BE RESOLVED WITH INVOLVED UTILITIES PRIOR TO PLACEMENT.
⑤ RECOMMENDED FOR LESS THAN 60 FOOT RIGHT OF WAY.
⑥ LATERALS TO BE INSTALLED FROM SANITARY SEWER LINE TO RIGHT OF WAY DURING INITIAL CONSTRUCTION.

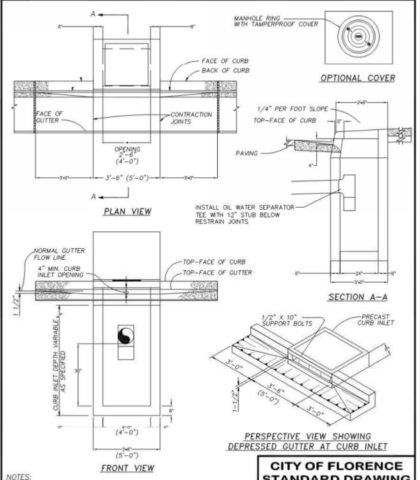
ATTENTION:
VERTICAL AND HORIZONTAL SEPARATION DISTANCES ARE CONTROLLED BY THE DEPARTMENT OF ENVIRONMENTAL QUALITY, DEPARTMENT OF COMMERCE, STATE HEALTH DIVISION, AND LOCAL UTILITY COMPANIES.

CITY OF FLORENCE STANDARD DRAWING

UTILITY LOCATIONS

DATE: MARCH 2007
DRAWING NO. F-501

FILENAME: F-501.DWG



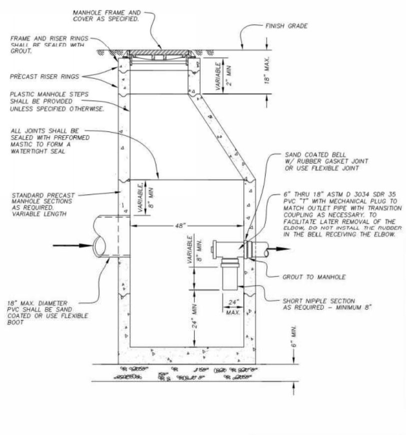
NOTES:

1. CURB INLET TOP AND BASE SHALL MEET H20 LOADING.
2. CURB INLET BASE MAY BE PRECAST OR CAST-IN-PLACE.
3. FOR STEEP GRADES USE STD. PRECAST INLET WITH 4'-0" OPENING OR TWO 2'-6" OPENING INLETS.
4. CONCRETE STRENGTH SHALL BE 3000 PSI.
5. ALL FABRICATED METAL PARTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION.
6. DIMENSIONS SHOWN ABOVE IN PARENTHESIES ARE FOR 4A INLETS.
7. A 1 1/2 A INLET SHALL HAVE A CURB INLET OPENING WIDTH OF 1'6" AND AN OUTSIDE WIDTH OF 2'6"; ALL OTHER DIMENSIONS AND DETAILS SHALL BE AS SHOWN.

CITY OF FLORENCE STANDARD DRAWING

PRECAST CURB INLET 1-1/2A, 2-1/2A 4A

DATE: 12-2011
DRAWING NO. F-304



NOTE:

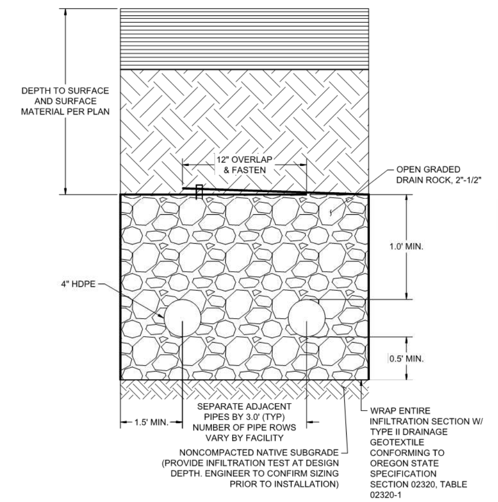
1. STANDARD PRECAST MANHOLE SECTION DIAMETER TO BE 48" (42" ONLY IF DIRECTED BY ENGINEER).
2. ALL PRECAST SECTIONS SHALL CONFORM TO REQUIREMENTS OF ASTM C 478.
3. ALL CONNECTING PIPE SHALL HAVE A FLEXIBLE JOINT WITHIN 18" OF MANHOLE WALL.
4. ALL MANHOLES SHALL BE VACUUMED TESTED.

CITY OF FLORENCE STANDARD DRAWING

POLLUTION CONTROL MANHOLE WITH ELBOW

REVISION: 3-9-10 ELIMINATE MH STEPS
DATE: MARCH 2007
DRAWING NO. F-315b

FILENAME: F-315b.DWG



NOT TO SCALE
DETAIL NUMBER
3

TYPICAL SOAKAGE TRENCH SECTION

REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET
REVISIONS

STORM DETAILS II

RHODODENDRON ARBOR PLANNED UNIT DEVELOPMENT

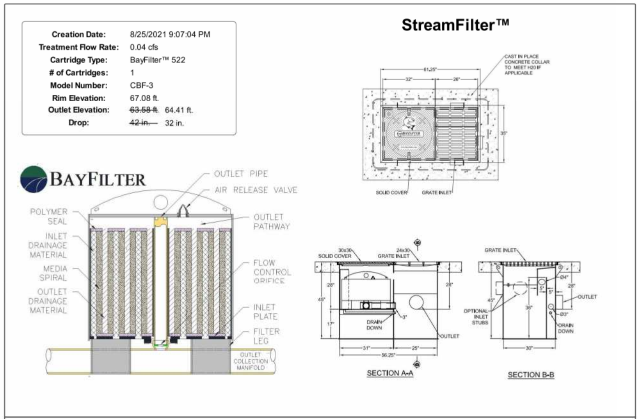
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C932

Creation Date:	8/25/2021 9:07:04 PM
Treatment Flow Rate:	0.04 cfs
Cartridge Type:	BayFilter™ 522
# of Cartridges:	1
Model Number:	CBF-3
Rim Elevation:	67.08 ft.
Outlet Elevation:	~~63.58 ft.~~ 64.41 ft.
Drop:	~~42 in.~~ 32 in.

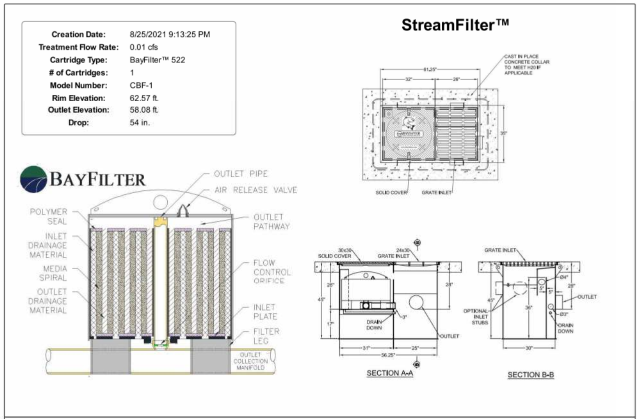


BAYSAVER TECHNOLOGIES ADS

ADS PLAN PRESENTATION DISCLAIMER: "ADVANCED DRAINAGE SYSTEMS, INC ("ADS") HAS PREPARED THIS DRAWING BASED ON THE INFORMATION PROVIDED BY THE DESIGN ENGINEER FOR THE SPECIFIC PROJECT. THIS DRAWING IS NOT FOR CONSTRUCTION AND IS INTENDED TO DEPICT THE NECESSARY COMPONENTS FOR COMPLIANCE WITH THE ENGINEER'S DESIGN AND/OR LAYOUT. ADS HAS NOT PERFORMED ANY ENGINEERING SERVICES ON THIS PROJECT. NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED BY THE DESIGN ENGINEER. THE DESIGN ENGINEER SHOULD REVIEW THE DRAWING TO INSURE THAT IT IS IN COMPLIANCE WITH THE SPECIFIC DESIGN PROJECT.

SDCB-19

Creation Date:	8/25/2021 9:13:25 PM
Treatment Flow Rate:	0.01 cfs
Cartridge Type:	BayFilter™ 522
# of Cartridges:	1
Model Number:	CBF-1
Rim Elevation:	62.57 ft.
Outlet Elevation:	58.08 ft.
Drop:	54 in.

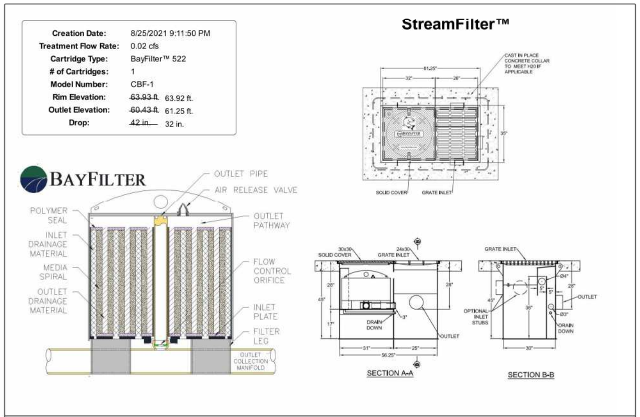


BAYSAVER TECHNOLOGIES ADS

ADS PLAN PRESENTATION DISCLAIMER: "ADVANCED DRAINAGE SYSTEMS, INC ("ADS") HAS PREPARED THIS DRAWING BASED ON THE INFORMATION PROVIDED BY THE DESIGN ENGINEER FOR THE SPECIFIC PROJECT. THIS DRAWING IS NOT FOR CONSTRUCTION AND IS INTENDED TO DEPICT THE NECESSARY COMPONENTS FOR COMPLIANCE WITH THE ENGINEER'S DESIGN AND/OR LAYOUT. ADS HAS NOT PERFORMED ANY ENGINEERING SERVICES ON THIS PROJECT. NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED BY THE DESIGN ENGINEER. THE DESIGN ENGINEER SHOULD REVIEW THE DRAWING TO INSURE THAT IT IS IN COMPLIANCE WITH THE SPECIFIC DESIGN PROJECT.

SDCB-17

Creation Date:	8/25/2021 9:11:50 PM
Treatment Flow Rate:	0.02 cfs
Cartridge Type:	BayFilter™ 522
# of Cartridges:	1
Model Number:	CBF-1
Rim Elevation:	~~63.93 ft.~~ 63.92 ft.
Outlet Elevation:	~~60.43 ft.~~ 61.25 ft.
Drop:	~~42 in.~~ 32 in.



BAYSAVER TECHNOLOGIES ADS

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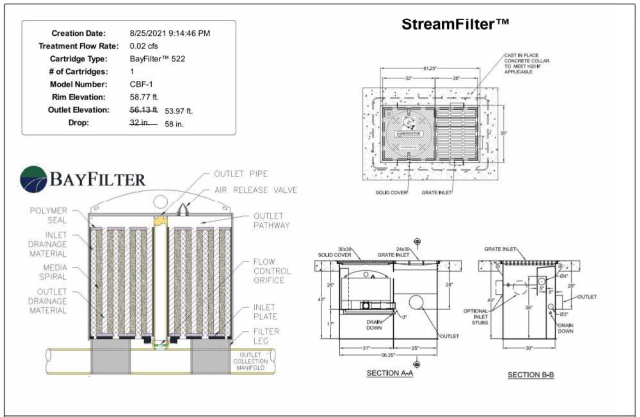
SDCB-18

Creation Date:	8/25/2021 9:14:46 PM
Treatment Flow Rate:	0.02 cfs
Cartridge Type:	BayFilter™ 522
# of Cartridges:	1
Model Number:	CBF-1
Rim Elevation:	58.77 ft.
Outlet Elevation:	~~56.13 ft.~~ 53.97 ft.
Drop:	~~32 in.~~ 58 in.



BAYSAVER TECHNOLOGIES ADS

ADS PLAN PRESENTATION DISCLAIMER: "ADVANCED DRAINAGE SYSTEMS, INC ("ADS") HAS PREPARED THIS DRAWING BASED ON THE INFORMATION PROVIDED BY THE DESIGN ENGINEER FOR THE SPECIFIC PROJECT. THIS DRAWING IS NOT FOR CONSTRUCTION AND IS INTENDED TO DEPICT THE NECESSARY COMPONENTS FOR COMPLIANCE WITH THE ENGINEER'S DESIGN AND/OR LAYOUT. ADS HAS NOT PERFORMED ANY ENGINEERING SERVICES ON THIS PROJECT. NOR HAS ADS INDEPENDENTLY VERIFIED THE INFORMATION SUPPLIED BY THE DESIGN ENGINEER. THE DESIGN ENGINEER SHOULD REVIEW THE DRAWING TO INSURE THAT IT IS IN COMPLIANCE WITH THE SPECIFIC DESIGN PROJECT.

SDCB-16 (WITH CUSTOM OUTLET)

REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET
REVISIONS

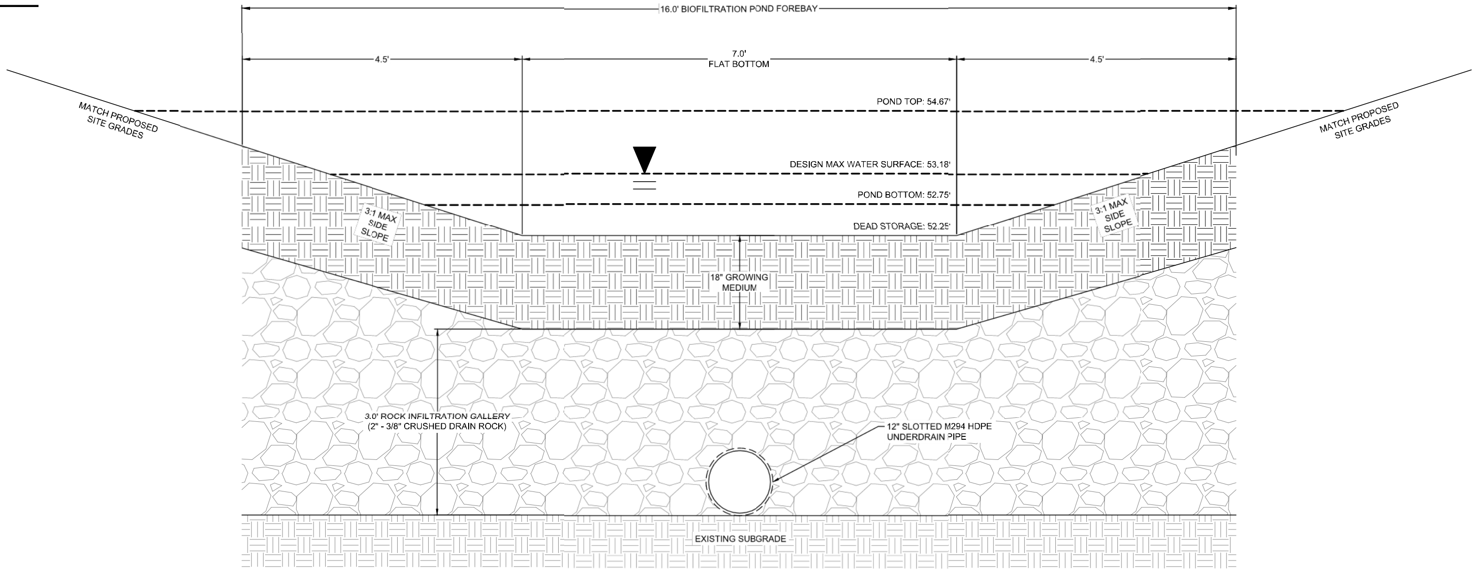
apic

STORM DETAILS III
RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

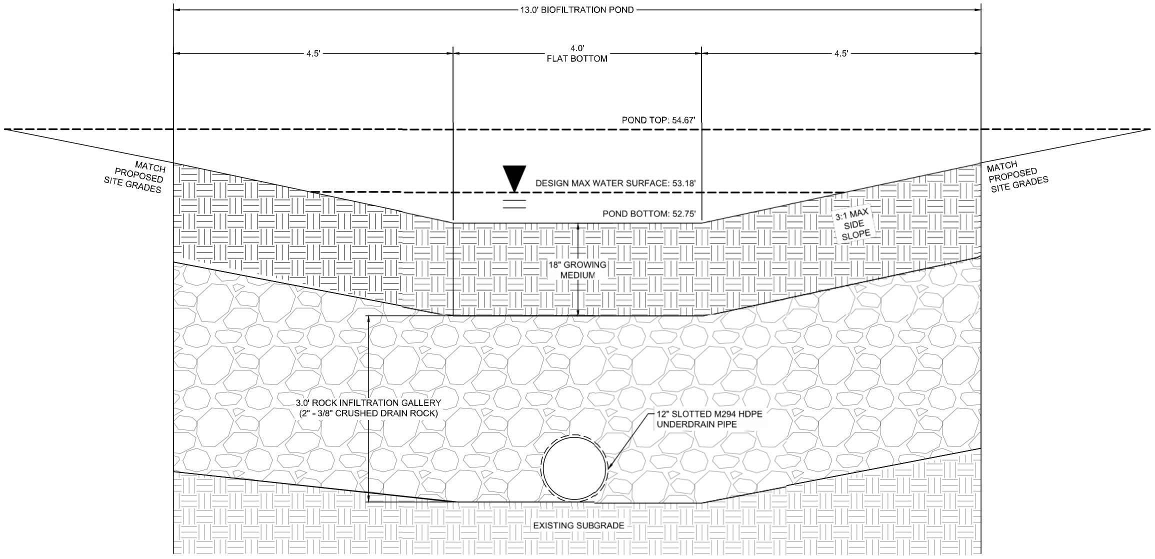
LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C933



BIOFILTRATION POND FOREBAY SECTION



BIOFILTRATION POND MAIN SECTION

P:\19555-FLORENCE MASTER PLAN\CAD\01 CORE\CD\19555-STORM DETAILS.DWG

REGISTERED PROFESSIONAL ENGINEER
70657PE
OREGON
JUNE 16, 2011
JESSE T. EMERSON
EXPIRES: 12/31/21

PUBLISH DATE
2021-12-10
ISSUED FOR
PERMIT SET
REVISIONS

Apic

STORM DETAILS IV

RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
APIC FLORENCE HOLDINGS, LLC
FLORENCE, OR

LRS ARCHITECTS
PLACE
3J CONSULTING

PROJECT INFORMATION
PROJECT # | 19555
LAND USE # | PC 20 07 PUD 01 & PC 20 08 SUB 01
TAX LOT(S) | 700, 1900, 3800
DESIGNED BY | JTE, TEG, ZMS, JKG
CHECKED BY | AJM

SHEET NUMBER
C934

Attachment B: Stormwater Maintenance Plan

Operations & Maintenance Plan

After Recording Return to:
Name:
Address:

Place Recording Label Here

APPENDIX A.4

Form O&M: Operations and Maintenance Plan

Permit Application No . PC 20 07 PUD 01 & PC 20 08 SUB 01

Owner Name: APIC Florence Holdings, LLC

Phone: *(area code required)* 503-704-9934

Mailing Address: *(return address for records)* 5 Thomas Mellow Cir., Ste 305, San Francisco, CA, 94134

City/State/Zip: San Francisco, CA, 94134

Site Address: Rhododendron Dr & 35th Ave

City/State/Zip: Florence, OR, 97439

Site Legal Description:
LOCATED IN THE SOUTH WEST ONE-QUARTER OF SECTION 15 AND NORTH WEST ONE-QUARTER OF SECTION 22, TOWNSHIP 18 SOUTH, RANGE 12 WEST OF THE WILLAMETTE MERIDIAN, LANE COUNTY, OREGON.

1 Responsible Party for Maintenance *(check one)*

_ Homeowner association ✓ Property Owner _ Other *(describe)*

____

2 Contact Information for Responsible Party(ies) if Other than Owner

Daytime Phone: *(area code required)* ________- __________-_____________
Emergency/After Hours Phone: ________- __________-______________
Contact Name and Address:

____

Instructions

Simplified Sizing Approach: *Attach O&M Specifications from the Florence Stormwater Design Manual Appendix H.*

Presumptive and Performance Sizing Approach: *Attach the site-specific O&M Plan (See Stormwater Design Manual Section 6).*

3 Site Plan
Show all facility locations in relation to labeled streets, buildings, or other permanent features on the site. Also show the sources of runoff entering the facility, and the final onsite/offsite discharge point.
Please complete the table below

Maintaining the stormwater management facility on this site plan is a required condition of building permit approval for the identified property. The property owner is required to operate and maintain this facility in accordance with the O&M specifications or plan on file with the City of Florence. That requirement is binding on all current and future owners of the property. Failure to comply with the O&M specifications or plan may result in enforcement action, including penalties. The O&M specifications or plan may be modified by written consent of new owners and written approval by re-filing with the Community Development Department.

Complete and recorded O&M Forms shall be submitted to:
Community Development Department, 250 Highway 101, Florence, OR, 97439
Office hours are 8 - 5, Monday through Friday. Call 541-997-3436 for assistance.

Required Site Plan (insert here or attach separate sheet)

☑ I Have Attached a Site Plan

Please complete this table

Facility Type	Size (sf)	Drainage is from:	Impervious Area Treated (sf)	Discharge Point	
See Attached					

BY SIGNING BELOW *filer accepts and agrees to the terms and conditions contained in this O&M Form and in any document executed by filer and recorded with it. To be signed in the presence of a notary.*

____
Filer signature

____

INDIVIDUAL Acknowledgement
STATE of OREGON county of:

____
This instrument was acknowledged before me on:
____

By:
____

Notary Signature:
____

My Commission Expires: __________________________ *for notary seal*

CORPORATE Acknowledgement
STATE of OREGON county of:

____

This instrument was acknowledged before me on:

____

By:

____

As (title):

____

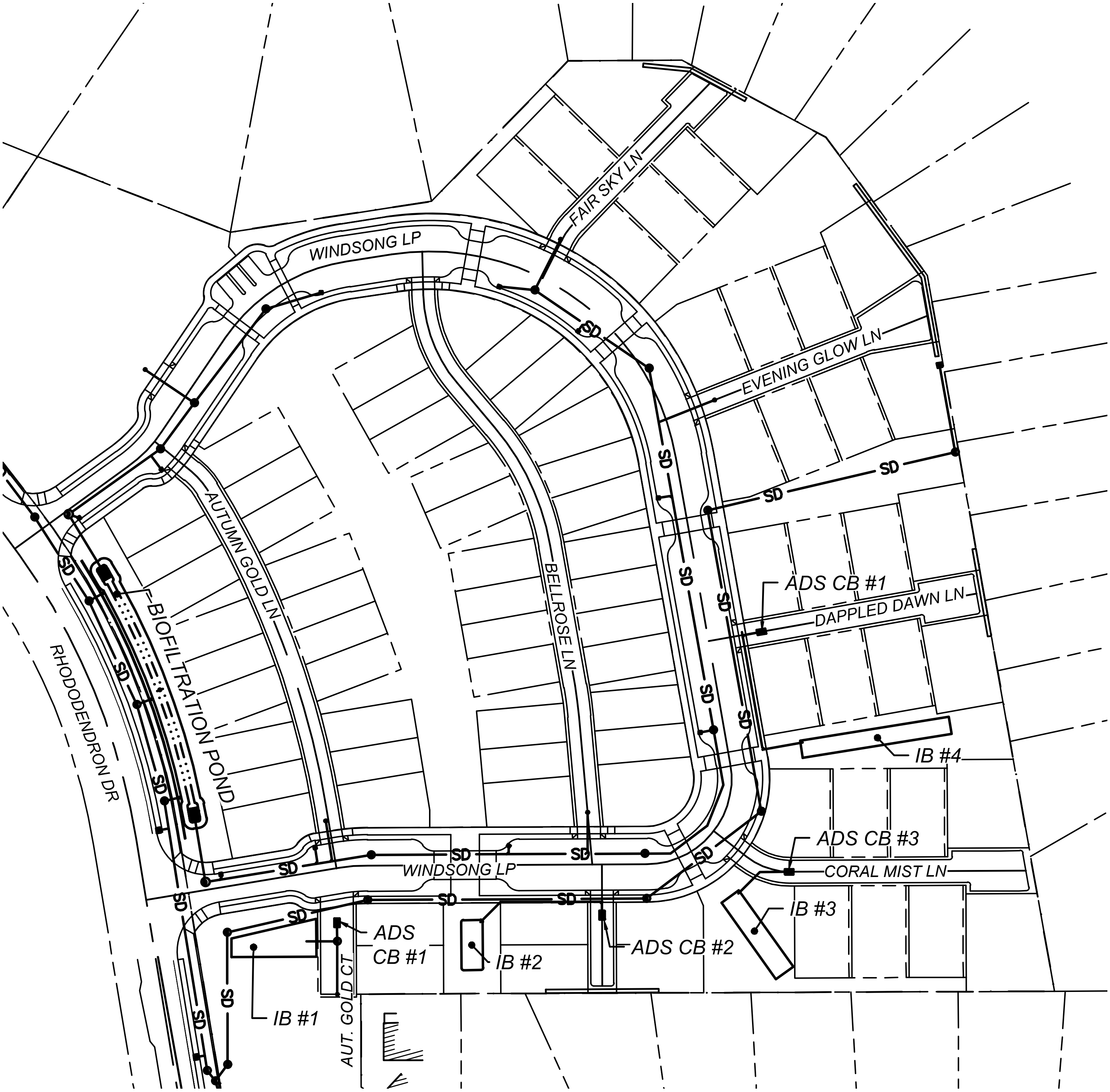
Of (corporation):

____

Notary Signature:

____

My Commission Expires: ____________________________



N
W E
S

SCALE: 1" = 100'
FT
0 100

ABBREVIATIONS

IB:	INFILTRATION BASIN
ADS CB:	ADS STREAMFILTER CATCH BASIN

SEPT 2021

3J CONSULTING
CIVIL ENGINEERING . WATER RESOURCES . COMMUNITY PLANNING

RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT

O&M FORM
SITE PLAN

OPERATIONS & MAINTENANCE PLAN FOR STORMWATER FACILITIES

At:

RHODODENDRON ARBOR
PLANNED UNIT DEVELOPMENT
Rhododendron Dr & 35th Ave
Florence, OR

Land Use #: PC 20 07 PUD 01 & PC 20 08 SUB 01

December 2021

Prepared For:

APIC Florence Holdings, LLC
5 Thomas Mellon Cir., STE 305
San Francisco, CA 94134

Prepared By:

3J Consulting, Inc.
9600 SW Nimbus Avenue, Suite 100
Beaverton, Oregon 97008
Project No: 19555
KEF

INTRODUCTION

Project Site

The project site is approximately 9.28 ac and is located along Rhododendron Dr in Florence, OR (Tax Lots 18121534 3800, 18121533 700, & 18122221 1900). The site is zoned for multi-family use. The project proposed a Planned Unit Development to include the construction of: internal streets, utilities, hardscaping, landscaping, and stormwater management facilities.

Purpose

The purpose of this Operations & Maintenance (O&M) Plan is to bring attention to the on-going needs of the stormwater management facilities located at Rhododendron Arbor Planned Unit Development located in Florence, OR. It is essential to maintain facilities, so they function as intended and limit offsite environmental impacts. O&M of private stormwater facilities is the responsibility of the persons owning, operating, or occupying the property. This O&M program was prepared per the City of Florence's *Stormwater Design Manual* (SDM, 2011).

Stormwater Management Facilities

The stormwater facilities requiring O&M are as follows (also refer to attached Private Storm Drain Layout Exhibit & Construction Plans):

- Biofiltration Pond – Treatment and infiltration facility located east of Rhododendron Dr, between both Windsong Lp intersections.
- Infiltration Basins (IB) – Quantity management only
    - IB #1 – located southwest of the intersection of Windsong Lp & Autumn Gold Ct.
    - IB #2 – located south Windsong Lp., between Autumn Gold Ct & Bellrose Ln.
    - IB #3 – located south of the intersection of Windsong Lp & Coral Mist Ln.
    - IB #4 – located east of Windsong Lp, between Dappled Dawn Ln & Coral Mist Ln.
- Manufactured Treatment Technologies – Treatment only
    - StreamFilter #1 – located upstream of IB #1, within Autumn Gold Ct.
    - StreamFilter #2 – located upstream of IB #2, within Bellrose Ln.
    - StreamFilter #3 – located upstream of IB #3, within Coral Mist Ln.
    - StreamFilter #4 – located upstream of IB #4, within Dappled Dawn Ln.

Stormwater Management Facilities					
Facility Type	Size (sf)	Drainage is from:	[2]Contributing impervious Area (sf)	[2]Impervious Area Treated (sf)	Discharge Point
Biofiltration Pond	2,678	Concrete/AC	99,922	99,922	Infiltration
Infiltration Basin (IB) #1	1,170	Concrete/AC/Roofs	14,631	0	Infiltration
IB #2	523	Concrete/AC/Roofs	4,934	0	Infiltration
IB #3	983	Concrete/AC	14,260	0	Infiltration
IB #4	1,266	Concrete/AC	19,584	0	Infiltration
StreamFilter(1) #1	N/A	Concrete/AC	9,831	9,831	IB #1
StreamFilter(1) #2	N/A	Concrete/AC	1,934	1,934	IB #2
StreamFilter(1) #3	N/A	Concrete/AC	5,260	5,260	IB #3
StreamFilter(1) #4	N/A	Concrete/AC	10,584	10,584	IB #4

(1)ADS StreamFilter is an Manufactured Treatment Technology

(1)includes Future Impervious Area

All facilities were designed in accordance with the requirements of the and the City’s SDM. Stormwater management facilities will be proposed as part of future phases in the development, which will require the preparation of separate O&M Plan(s). O&M procedures for those facilities are not included in this document.

OWNER’S RESPONSIBILITIES FOR INSPECTION & MAINTENANCE

Owners are required to check their facilities regularly to determine maintenance needs. Routine inspection and maintenance can help keep overall maintenance costs low by detecting problems early and avoiding large repair or replacement costs.

Biofiltration Pond & Infiltration Basins

Structural components must be operated and maintained in accordance with the design specifications.		
	Maintenance Indicator	Corrective Action
	Clogged inlets or outlets	Remove sediment, debris, and blockages from catch basins, trench drains, curb inlets, and pipes to maintain at least 50% conveyance at all times.
	Broken inlets or outlets, including grates	Repair or replace broken downspouts, curb cuts, standpipes, and screens as needed.
	Cracked or exposed drain pipes	Repair or seal cracks. Replace when repair is insufficient. Cover with 6 inches of growing medium to prevent freeze/thaw and UV damage.
	Perforated liner	Replace or repair liner as needed.
Vegetation must cover at least 90% of the facility at maturity		
	Dead or stressed vegetation	Replant per original planting plan, or substitute from the plant list in Appendix G of the SDM. Irrigate and mulch as needed; prune tall, dry grasses, and remove clippings.
	Tall grass and vegetation	Maintain grass height at 4”-9”. Trim to allow sight lines and foot traffic, also to ensure inlets and outlets freely convey stormwater into and/or out of facility.
	Weeds	Manually remove weeds.
Growing medium must sustain healthy plant cover and drain within 48 hours.		
	Gullies, erosion, exposed soil, sediment accumulation	Fill in and lightly compact areas of erosion with City-approved soil mix (see Appendix B in SDM). and replant according to planting plan or substitute from the plant list in Appendix G of the SDM. Erosion more than 2 inches deep must be addressed. Sediment more than 4 inches deep must be removed.
	Scouring at the inlet(s)	Ensure splash blocks or inlet gravel/rock are placed correctly to prevent erosion.
	Slope slippage	Stabilize 3:1 slopes/banks with plantings from the original planting plan or from the plant list in Appendix G of the SDM.
	Ponding	Rake, till, or amend soil surface with City-approved soil mix to restore infiltration rate. Remove sediment at entrance.

<u>Annual Maintenance Schedule</u>

- Summer: Make structural repairs; clean gutters and downspouts; remove any build-up of weeds or organic debris.

- Fall: Replant exposed soil and replace dead plants. Remove sediment and plant debris.
- Winter: Clear gutters and downspouts.
- Spring: Remove sediment and plant debris. replant exposed soil and replace dead plants.
- All seasons: Weed as necessary.

StreamFilters

The maintenance schedule of the BayFilter system will be driven mostly by the actual soils load on the filter. The system should be periodically monitored to be certain it is operating correctly. For more information, please refer to the attached element "BayFilter Inspection & Maintenance Manual".

Maintenance Records

All facility operators are required to keep an inspection and maintenance log. Record date, description, and contractor (if applicable) for all repairs, landscape maintenance, and facility cleanout activities. Keep work orders and invoices on file and make available upon request of the City inspector.

Fertilizers

heir use is strongly discouraged because of the potential for negative environmental impacts. Never apply fertilizer before testing the fertility of the growing medium to determine whether fertilizer is needed and appropriate application rates. Use only organic, slow-release fertilizers.

Pesticides/Herbicides

Their use is prohibited.

Pollution Prevention

All sites shall implement best management practices to prevent hazardous wastes, litter, or excessive oil and sediment from contaminating stormwater. Contact City of Florence Public Works Maintenance Department at 503-538-8321 for immediate assistance with responding to spills. Record time/date, weather, and site conditions if site activities are found to contaminate stormwater.

Infiltration/Flow Control

All facilities shall drain within 48 hours. Record time/date, weather, and conditions when ponding occurs.

Vectors (Mosquitoes and Rodents)

Stormwater facilities shall not harbor mosquito larvae or rats that pose a threat to public health or that undermine the facility structure. Record the time/date, weather and site conditions when vector activity observed. Record when vector abatement started and ended.

Access

Maintain ingress/egress per design standards, maintaining access to the entirety of the facility for inspection & maintenance.

ELEMENTS

1. Operations & Maintenance Logs
2. BayFilter Inspection & Maintenance Manual (from BaySaver Technologies)
3. Construction Drawings

MAINTENANCE LOGS

Year: Initial & Date	Stormwater Facility	Notes
January		
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

BAYFILTER™ INSPECTION AND MAINTENANCE MANUAL

The BayFilter system requires periodic maintenance to continue operating at the design efficiency. The maintenance process is comprised of the removal and replacement of each BayFilter cartridge, vertical drain down module; and the cleaning of the vault or manhole with a vacuum truck.

The maintenance cycle of the BayFilter system will be driven mostly by the actual solids load on the filter. The system should be periodically monitored to be certain it is operating correctly. Since stormwater solids loads can be variable, it is possible that the maintenance cycle could be more or less than the projected duration.

BayFilter systems in volume-based applications are designed to treat the WQv in 24 to 48 hours initially. Late in the operational cycle of the BayFilter, the flow rate will diminish as a result of occlusion. When the drain down exceeds the regulated standard, maintenance should be performed.

When a BayFilter system is first installed, it is recommended that it be inspected every six (6) months. When the filter system exhibits flows below design levels the system should be maintained. Filter cartridge replacement should also be considered when sediment levels are at or above the level of the manifold system. Please contact the BaySaver Technologies Engineering Department for maintenance cycle estimations or assistance at **1.800.229.7283**.

BayFilter System Cleanout

Vactor Truck Maintenance

Jet Vactoring Through Access Hatch

Maintenance Procedures

1. Contact BaySaver Technologies for replacement filter cartridge pricing and availability at 1-800-229-7283.
2. Remove the manhole covers and open all access hatches.
3. Before entering the system make sure the air is safe per OSHA Standards or use a breathing apparatus. Use low O_2, high CO, or other applicable warning devices per regulatory requirements.
4. Using a vacuum truck remove any liquid and sediments that can be removed prior to entry.
5. Remove the hold down bars. Using a small lift or the boom of the vacuum truck, remove used cartridges by lifting them out.
6. Any cartridges that cannot be readily lifted can be easily slid along the floor to a location they can be lifted via a boom lift.
7. When all the cartridges have been removed, it is now practical to remove the balance of the solids and water. Loosen the stainless clamps on the Fernco couplings for the manifold and remove the drain pipes as well. Carefully cap the manifold and the Fernco and rinse the floor, washing away the balance of any remaining collected solids.
8. Clean the manifold pipes, inspect, and reinstall.
9. Install the exchange cartridges, reinstall the hold down bars and close all covers.
10. The used cartridges may be sent back to BaySaver Technologies for recycling.

Manifold Tee View of a Cleaned System

Cartridge Hoist Point

For more information please see the BaySaver website at www.baysaver.com or contact 1-800-229-7283.

*THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™*

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

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