FINAL DRAINAGE REPORT

Dawkins Warehouse Site Plan

Woodland, Washington

Prepared by:
PLS Engineering
Consulting Engineers and Planners
604 W. Evergreen Blvd.
Vancouver, WA 98660
PH: (360) 944-6519
andrew@plsengineering.com

Prepared for:
Mark Dawkins
Pacific Golf and Turf LLC
14625 SE Stark St.
Portland, OR 97233

Submitted: April, 2022

TABLE OF CONTENTS

List of Tables

Technical Appendices – Hydrology and Hydraulics Analysis

CERTIFICATE OF ENGINEER

Dawkins Warehouse Site Plan

Final Drainage Report

The technical information and data contained in this report was prepared under the direction and supervision of the undersigned, whose seal, as a professional engineer licensed to practice as such, is affixed below.

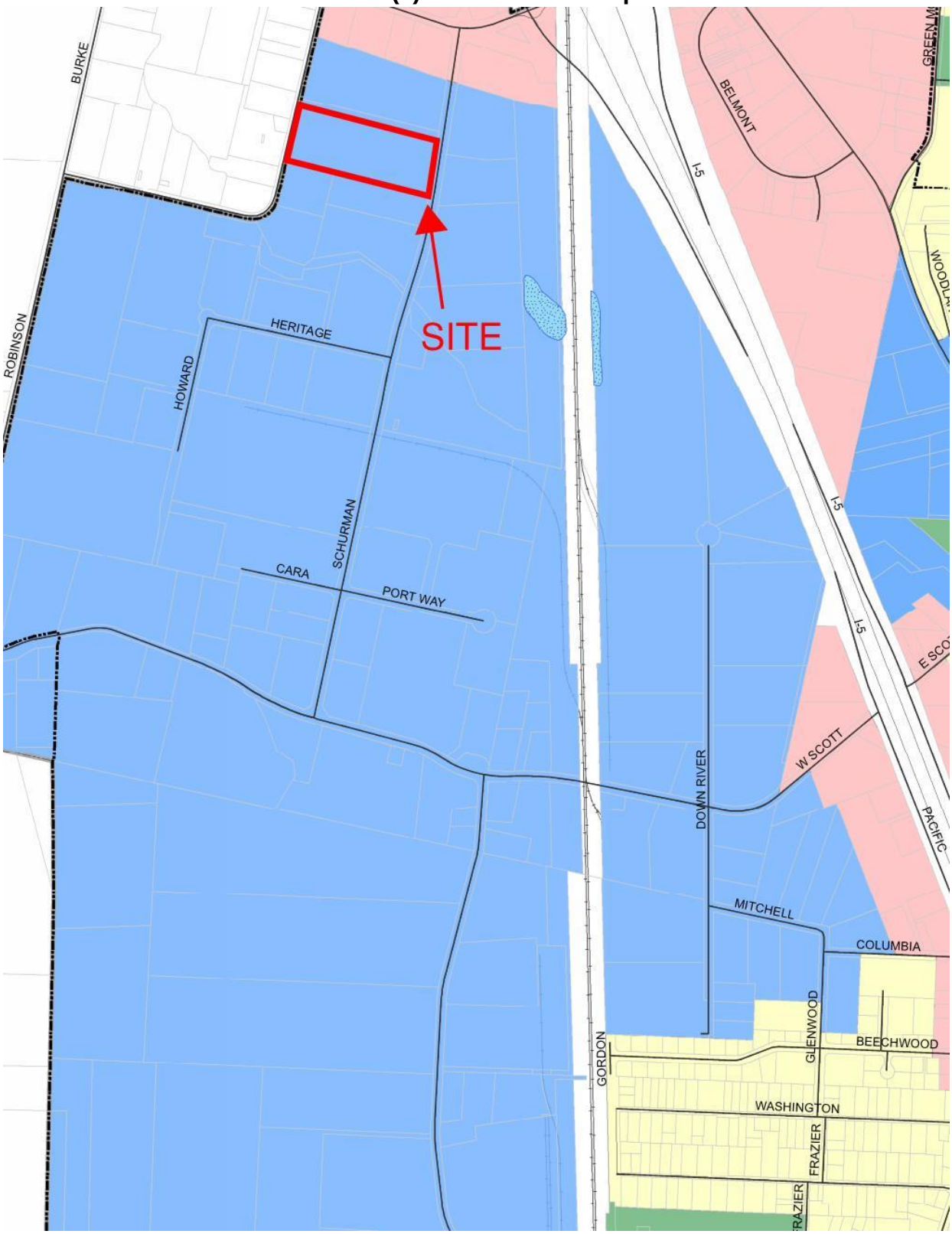
This document was:

Prepared by:

Taylor J Liserre, EIT

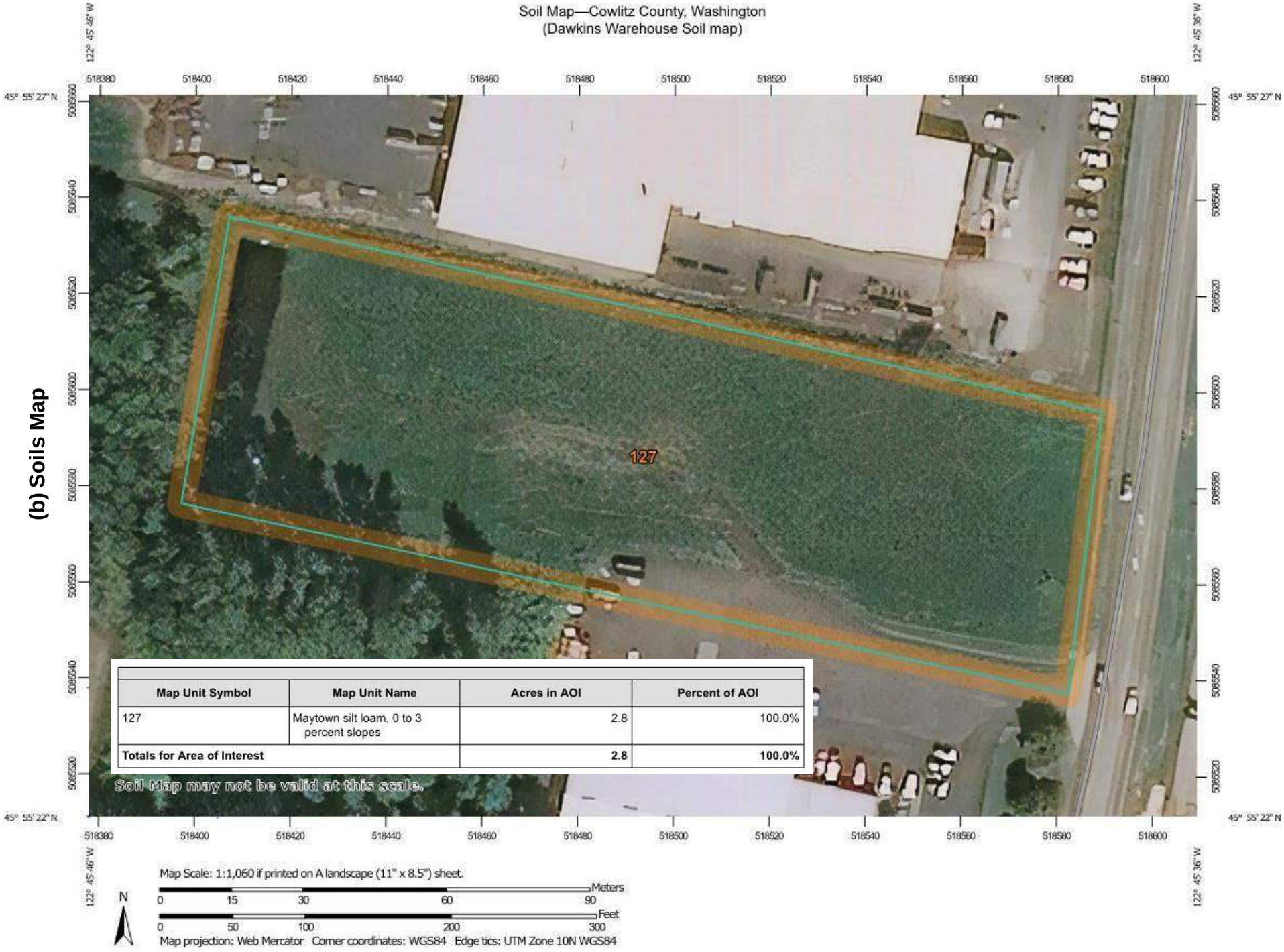
Vicinity Maps

(a) Site Location Map



(b) Soils Map

Soil Map—Cowlitz County, Washington
(Dawkins Warehouse Soil map)



Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
127	Maytown silt loam, 0 to 3 percent slopes	2.8	100.0%
Totals for Area of Interest		**2.8**	**100.0%**

Map Scale: 1:1,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 15 30 60 90

Feet: 0 50 100 200 300

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

Section A – Project Overview

The Dawkins Warehouse Site Plan project involves construction of a new 10,550 square foot industrial building along with associated parking and equipment storage areas and site utilities on a 3.06-acre parcel located in the City of Woodland, Washington. The property is located on the west side of Schurman Way between Redwood Plastics and USNR, Inc. The new building will be used to equip new golf carts and service, repair and refurbish used ones. The building will also provide office and warehouse space and a showroom.

The site was intended to be developed by a previous owner approximately 10 years ago, but the project eventually stalled. The west end of the site has been graded into a detention pond under a grading permit associated with the previous project.

Although the Site Plan application submitted in association with this drainage report requests approval for an initial 10,550 square foot building, the site is laid out and the stormwater facilities are planned to accommodate future expansion of the building, with a potential for an additional 6,250 square feet of building footprint at some point in the future. The stormwater facilities have also been designed to accommodate an additional 9,227 square feet of off-site tributary pavement on the Redwood Plastics site to the south that drains toward the site.

The site is relatively flat with gentle slopes generally from east to west. The new development will have a shared access to Schurman Way by way of an existing driveway on the south property line. The site used to contain a small (approximately 0.23 acres) Class 3 wetland in the west part of the property, but with the aforementioned grading permit the wetland was filled in. The wetland fill was fully permitted by the jurisdictional agencies and was mitigated through the purchase of credits from a wetland mitigation bank near the Port of Vancouver.

Schurman Way along the frontage of the site has already been fully developed including pavement, curb, and sidewalks, so it is not necessary to address stormwater from the roadway in this report.

A total of three biofiltration swales are proposed on the site to provide runoff treatment for the paved areas as well as some tributary drainage area from Redwood Plastics to the south. Outlet piping and a flow control structure will be installed on the north side of the detention pond to provide stormwater quantity control. Subsequent sections of this report discuss the treatment and detention facilities as well as the stormwater conveyance system in much more detail.

Section B – Hydrologic and Hydraulic Analysis

Existing and proposed site runoff conditions were modeled using HydroCAD version 10.0, utilizing SCS TR-20 methodology for hydrograph routing. In modeling the performance of the stormwater systems, the water quality, 2-year, 10-year, and 100-year 24-hour storm events were analyzed. A type 1-A storm distribution was used in the hydrologic analysis consistent with the design storm event that occurs in western Washington. The 24-hour rainfall depths of 2.12”, 3.22” and 5.67” were used for the 2-year, 10-year, and 100-year recurrence storm events, respectively. A water quality storm event of 1.38” was used in sizing water quality treatment facilities, consistent with the requirements of the *Stormwater Management Manual for the Puget Sound Basin*.

Basin Description

In performing the hydrologic calculations for runoff associated with the project, the pre-development runoff conditions for the site and adjacent tributary areas to the south were modeled by separating the total drainage area into four pre-development basins. Pre-development basin boundaries were set to separate the site by differing ground cover conditions and also to separate off-site runoff from onsite runoff. The reason for separating on-site and off-site runoff is that for the 2-year storm event, post-development runoff rates for on-site stormwater need to be reduced to 1/2 of predevelopment runoff rates. It is not appropriate to require off-site runoff draining toward the site to be reduced below existing runoff rates as the Dawkins Warehouse site is not responsible for detaining runoff from these off-site areas. Review of historic aerial photos including SCS Soil Survey Mapping from 1974 and aerial photos from Google Earth indicates the site and surrounding area were primarily covered in pasture grasses and or used agriculturally. However, the west end of this site in and immediately around the former wetlands contained brush with some trees.

Pre-development Basin 1 contains the runoff from most of the eastern part of the site that has historically been covered in pasture grasses. Basin 2 is made up of the southeastern part of the property that is currently covered in pavement. The existing onsite pavement was constructed in association with development of the Redwood Plastics site as Redwood Plastics has an access and utilities easement over a portion of the project property. Basin 3 accounts for runoff from the western portion of the property. This part of the site was covered by brush with some trees up until the work completed with the recent grading permit. Finally, Basin 4 contains the area of the Redwood Plastics property that drains toward the project site. This area is covered completely with pavement.

For the post-development drainage analysis, the site was broken down into thirteen basins. The basins were separated to identify the flow to different stormwater treatment and conveyance facilities on the site. Basin 1 contains the entire area east of the proposed building. This area will drain to the biofiltration swale along the east property line via sheet flow before being conveyed to the detention pond.

Basins 2, 3 & 4 represent the areas that drain to the three catch basins south of the proposed building. Basin 4 also includes the off-site pavement area from the portion of the Redwood Plastics site that drains onto the property. These three basins, along with Basins 5 will drain to the south biofiltration swale before they are conveyed to the detention pond. Basin 5 represents a small area of pavement that will drain directly to the swale via sheet flow.

Basin 6 represents the southern half of the proposed building's roof, that will be piped directly to the detention pond.

Basins 7 & 9 represent the paved area north of the proposed building. Runoff from these basins will be collected in two catch basins and piped to the west biofiltration swale (along the east side of the detention pond). Basins 8 & 10 represent the north half of the proposed building, and the potential future building roof respectively. Runoff from these basins will be piped to the two northern catch basins serving Basins 7 and 9 and into the west bioswale. Basin 11 represents the paved area to the west of the proposed building. This area will sheet flow to the western bioswale.

Basin 12 represents the landscaped area in the western portion of the property. This basin includes the detention pond, gravel pond access, and area surrounding it and has been modeled as draining directly to

the pond. Finally, Basin 13 represents the small perimeter landscape areas of the site that will not drain to the detention pond. The basin includes areas in the southwest corner of the property, along the west property line, and along the north property line. All of these basins can be seen in the Post-Development Basin Map in Appendix A.

Runoff Curve Numbers

Runoff curve numbers (CN's) were selected using Table III-1.3 from the Stormwater Management Manual for the Puget Sound Basin (see copy in Appendix F), based on a combination of existing and proposed ground cover conditions and the hydrologic soils group(s) (HSG) for each basin area. Site soil mapping by the National Resource Conservation Service as included in the Soils Survey for Cowlitz County indicates the site is covered almost entirely by Maytown silt loam soils. The Maytown soils are classified as HSG C soils according to NRCS. A copy of the soils map from the NRCS Soils Survey is included at the start of this report.

As previously mentioned, the eastern part of the site has historically been covered with pasture grasses while the western part of the site has historically been covered in brush and young second growth trees in the pre-developed conditions. As a result, CN's of 85 were selected for the pasture part of the site while a CN of 81 was used for the portion of the site previously covered in brush and trees. A CN of 98 was used for existing pavement in the south part of the property and in the tributary pavement drainage basin on the Redwoods Plastic property. In the post-development hydrologic analysis, a CN of 86 was used for proposed landscaped areas and 98 was used for all roof and pavement areas.

Reach/Pond Description

Post-development analysis of the conveyance and stormwater treatment bioswales for the site is accomplished using reaches in the HydroCAD stormwater model. These will be briefly discussed in this section of the report and examined in more detail in the sections of the report that fully discuss treatment and conveyance system design. A total of 15 reaches were used to aid in the hydraulic modeling. For simplicity's sake, these reach numbers correspond to their respective basins as much as possible. For this reason, a couple of reach numbers are skipped when two basins are entering the same conveyance system.

Reach 1 in the model corresponds to the eastern biofiltration swale. Reaches 2, 3 & 4 correspond with the 8" piping that conveys the runoff from the southern catch basins to the southern biofiltration swale. Reach 5 corresponds to the southern biofiltration swale. Reach 6 corresponds to the 12" pipe that conveys stormwater from the eastern bioswale and proposed building's southern roof area to the detention pond. Reaches 7 & 9 represent the 12" pipe that conveys stormwater from the northern and future roof areas, as well as the paved area north of the building, to the western bioswale. Reach 10 represents the 6" piping from the future building location to the northern catch basins. Reach 11 corresponds to the western bioswale. Reach 12 represents the piping from the southern bioswale to the manhole where runoff from the east and south bioswales meet. Reach 13 represents the 12" pipe from that manhole to the detention pond.

Reach 14 is a theoretical conveyance system used to combine the detention pond's outflow with the outflow from Basin 13 (which will drain off site directly to the north, south and west). By comparing flows to Reach 14 to the Pre-Development site runoff it can easily be determined if the site will comply with the quantity control requirements. Finally, Reaches RD1 & RD2 represent the 6" roof drain piping.

All of the reaches with the exception of Reach 14 can be seen on the Post-Development Basin Map in Appendix A.

The last element of the Post-development HydroCAD model is Pond 1. This point in the system defines the detention pond and control manhole and analyzes quantity control performance of the system. It will be defined in some additional detail in Section C of this report.

Time of Concentration

The remaining component that affects the hydrologic analysis of pre-development and post-development runoff conditions is the time of concentration for each basin. Time of concentration calculations for the pre-development drainage basin were performed following TR-55 methodologies and using Manning's n sheet flow factors and concentrated flow k velocity factors from Table III-1.4 of the *Stormwater Management Manual for the Puget Sound Basin.* This table has been included in Appendix F of the report. The flow path used in estimated the pre-development time of concentration for each of the basins is shown on the Pre-development Basin Map in Appendix A.

For Pre-development Basin 1, the longest runoff flow path included an initial 300-foot segment of sheet flow across the pastured part of the site. A Manning's n value of 0.24 corresponding to deep grass was used in calculating the travel time for this flow segment. Runoff from Basin 1 then travels across approximately 300 feet of shallow concentrated flow in the formerly brushy part of the site. A k velocity factor of 5 corresponding to woodland was selected for this flow segment.

In analyzing the pre-development time of concentration for Basin 2, the portion of the travel path over paved areas was ignored as this would produce a very low travel time. The flow path used for Basin 2 was 300 feet of sheet flow over the formerly brushy part of the site. A Manning's n value of 0.4 corresponding to woods with underbrush was used in measuring the time of concentration.

The time of concentration for Pre-development Basin 3 also used a 300-foot length of sheet flow with a Manning's n value of 0.4. Finally, time of concentration for off-site basin 4 consisted of two flow segments. The first segment is 190 feet of sheet flow over pavement. The grading of the Redwood Plastics site directs runoff from the tributary pavement area to a valley gutter formed in the asphalt. The runoff is then released in a concentrated form in the south part of the site. As a result, the second component of the time of concentration calculations for Pre-development Basin 4 is a shallow concentrated flow segment of 285'.

While pre-development times of concentration were calculated by analyzing individual flow segments for each basin, for the post-development basin analysis, a time of concentration of 6 minutes was selected for all basins. This is the minimum time of concentration recommended by the TR-55 document issued by the Federal Highway Administration. This is a conservative assumption, since longer times of concentration would result in lower peak post-development runoff rates. Since the vast majority of the site will be covered by impervious surfaces after construction, we believe that use of a 6-minute time of concentration for post-development analysis is appropriately conservative.

The pre-development and post-development drainage calculations are provided in Appendix B and Appendix C respectively. Results of the drainage analyses with regard to water quantity control, water quality treatment, and stormwater conveyance are discussed in subsequent sections of this report.

Section C – Quantity Control Analysis and Design

As previously mentioned, runoff from this site will drain to a stormwater detention pond located in the west part of the site. The pond has been designed to comply with the stormwater detention requirements of the *Stormwater Management Manual for the Puget Sound Basin* in accordance with the requirements of the Woodland Municipal Code. The pond has a bottom elevation of 12.5' and a top elevation of 16.5'. Interior side slopes for the pond are a maximum of 3:1 while external fill slopes from the top of pond berm to adjacent existing grades are limited to a maximum of 2:1. Runoff leaving the stormwater facility will be controlled by a stormwater control manhole fitted with two restricting orifices as well as an open end to the control riser allowing for safe overflow of the runoff should one of the orifices become plugged or in the event of a very large storm. The outlet orifices include a 2.7" diameter orifice at the elevation of the bottom of the pond used to control the 2-year storm event and a 5.0" orifice at elevation 14.0' used to restrict release rates in larger storm events. The top of the control riser is set at elevation 15.5'. This places the top of the riser just above the peak calculated 100-year storm ponding depth.

Additionally, an emergency overflow spillway is provided on the north side of the pond that would release to the existing ditch to the north in the event of a very large storm event or failure of some portion of the pond's primary release structure. Reduced copies of select drawings from the construction plan set are included in Appendix D of this report for convenient reference.

The requirements of the Puget Sound Manual dictate that post-development peak runoff rates leaving the site in the 2-year storm be limited to ½ of the peak pre-development runoff rate in that storm event. For the 10-year and 100-year storm events, peak post-development release rates from the site are required to be less than or equal to pre-development runoff rates for the respective storm events. As mentioned in the previous section of this report, in addition to on-site runoff, there is one drainage basin containing off-site runoff from the adjacent Redwood Plastics site that drains to the project property and must be accounted from in the stormwater design. This off-site runoff is represented as Basin 4 in both the pre-development and post-development HydroCAD models. In designing the detention pond for the site, it is not appropriate for the pond to be required to reduce runoff rates from this off-site runoff below existing peak runoff rates.

In order to determine allowable detention pond release rates for the 2-year storm event, Pre-development Basins 1-3 (the on-site runoff) were routed to a common point represented by Reach 1R in the HydroCAD model. The resultant peak runoff rate at Reach 1R (0.28 cfs) was then split in half (0.14 cfs) and the peak 2-year runoff rate from off-site Basin 4 (0.10 cfs) was added to reach an allowable post-development 2-year storm release rate of 0.24 cfs. The determination of allowable post-development release rates in the 10-year and 100-year storm events is more straight-forward since post-development rates are allowed to match pre-development rates. As a result, the pre-development models for these events route Basins 1-4 to a common point (Reach 1) and the resultant peak pre-development flow rate is equal to the allowable post-development pond release rate. The allowable release rates in the 10-year and 100-year storms are 0.72 cfs and 1.78 cfs, respectively. Pre-development HydroCAD model calculations are provided in Appendix B. Table 1 below summarizes the allowable post-development peak runoff release rates for the project.

Table 1: Allowable Post-Development Runoff Release Rates:

Storm Event	Allowable Release Rate (cfs)
2-year	0.24
10-year	0.72
100-year	1.78

The post-development stormwater report includes modeling of the proposed detention pond, identified as Pond 1P in the HydroCAD model, for stage/storage information as well as peak ponding elevation for the 2-year, 10-year and 100-year storm events.

As shown on the routing diagram at the front of the Post-Development Stormwater Modeling (Appendix C) the pond was routed to Reach 14. Reach 14 is a theoretical conveyance system used to combine the detention pond's outflow with the outflow of Basin 13 (which contains runoff that drains off site directly to the north, south and west). By comparing peak flows at Reach 14 to the pre-development flows it can easily be determined if the site will comply with the quantity control requirements. The peak combined flow rates at Reach 14 and peak ponding elevations for water in the detention facility are documented below in Table 2 and confirm the project's compliance with the quantity control requirements set forth in the *Stormwater Management Manual for the Puget Sound Basin*.

Table 2: Detention Pond Performance Summary

Storm Event	Peak Release Rate (cfs)	Peak Ponding Elevation
2-year	0.24	13.92'
10-year	0.69	14.36'
100-year	1.22	15.46'

The true volume of the detention pond is larger than what is reflected in the pond modeling. The Puget Sound Manual requires that the volume of the pond be increased by a safety factor that is dependent on the percentage of tributary runoff that will be covered by impervious surfaces following development. For this site, the percent impervious coverage for runoff from the site and off-site tributary areas is 77.0%. Based on this impervious percentage, a correction factor of 1.412 has been calculated. In order to properly model the safety factor in HydroCAD, the reciprocal of the safety factor is taken and applied to the pond storage volume at every elevation as a percentage reduction factor. As a result, the reciprocal of the 1.412 safety factor is a reduction factor of 70.8%. HydroCAD modeling was thus adjusted to reduce the modeled storage volume to 71% of the true volume available in the pond. A spreadsheet has been included in Appendix F documenting the calculation of this safety factor.

Section D – Water Quality Design

A total of three biofiltration swales are proposed to provide stormwater treatment for runoff from the pavement surfacing proposed with this project. Swales will be located on the west, south, and east sides of the property to effectively treat the runoff. All swales are sized to provide a minimum travel time of 9 minutes in the 6-month storm event. Maximum allowable side slopes for the swales are 3 horizontal:1 vertical. The minimum swale length was held at 100'.

The East Biofiltration Swale is located along the east property line, adjacent to Schurman Way. It will provide treatment for runoff from the parking area on the east side of the building (Basin 1). It is modeled

as Reach 1R in the HydroCAD model and has a base width of 2.5', a length of 100', and a longitudinal slope of 0.5%. Minimum travel time calculated for this swale is 9.2 minutes in the 6-month storm event.

The South Biofiltration Swale is located in the south part of the site and will provide treatment for runoff from post-development Basins 2, 3, 4 & 5. Basin 4 contains over 9,000 square feet of off-site runoff from the Redwood Plastics site. Redwood Plastics originally constructed a bioswale in the general location of the proposed Swale #2. However, this swale is no longer functional. Prior to clearing blackberries from the project site, it was not evident that this swale even existed. It had been completely overgrown and did not contain any grass ground cover due to inundation of blackberry bushes. As a result, this project will restore treatment for a significant amount of off-site impervious area that had not been receiving effective runoff treatment for some time. The South Bioswale will have a base width of 6', a length of 100', and a longitudinal slope of 0.5%. It is represented as Reach 5R in the HydroCAD model. The minimum calculated travel time in the 6-month storm event is 9.4 minutes.

The West Biofiltration Swale is located in the west part of the site, immediately east of the detention pond. It will provide treatment for runoff from the pavement areas north & west of the proposed building (Basins 7, 9, 10 & 11) It is identified as Reach 11R in the HydroCAD model. It will have a 2.5' base width, 105' length, and 0.5% longitudinal slope. The calculated travel time in the 6-month storm event is 9.0 minutes. See the Post-Development Basin Map in Appendix A and in the HydroCAD model in Appendix C for more information.

Section E – Conveyance Systems Analysis & Design

HydroCAD was used to analyze the conveyance system capacity of the site's stormwater conveyance elements including the three biofiltration swales proposed on the site and the storm sewer piping for the entirety of the site.

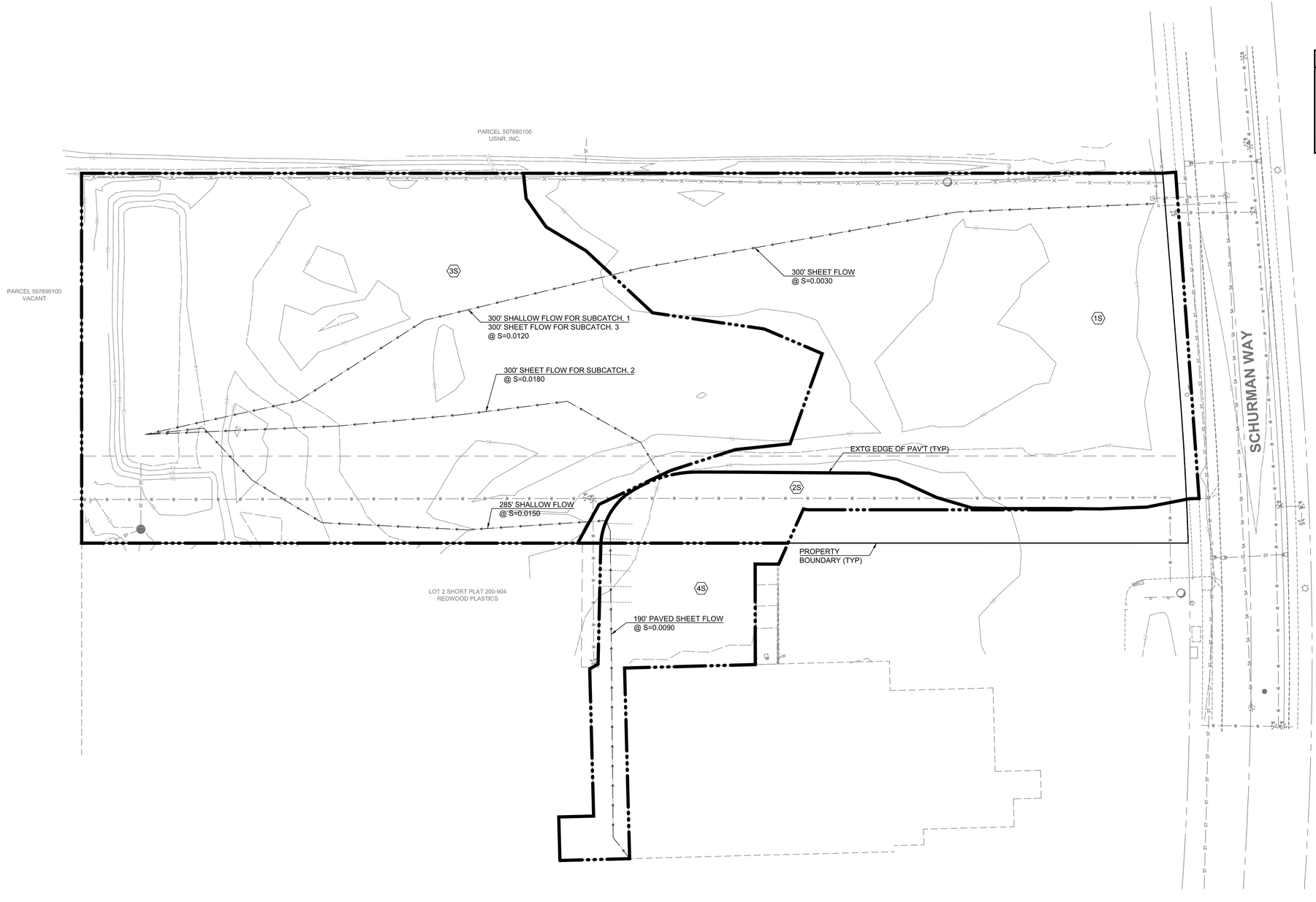
A total of fifteen reaches representing these conveyance system elements were included in the post-development HydroCAD model included in Appendix C. All of the conveyance pipes drain under gravity flow in the 10-year storm event as required. All conveyance pipes except for one (Reach 4R) also drain under gravity conditions in the 100-year storm event. See the Post-Development HydroCAD model in Appendix C for more information.

Slightly pressurized conditions for Reach 4R during the 100-year storm event do not pose any risk. In the event of a storm significantly larger than the 100-year storm an emergency overflow spillway has been provided from the detention pond which outfalls to a storm ditch running parallel to the north property line just north of the site. The rim and grate elevations for all storm structures are above this overflow elevation and therefore no flooding will occur onsite. It should also be noted that there is additional storage in the south and east bioswales that has not been accounted for in the HydroCAD model.

Section F – Soils Evaluation

As mentioned previously, the National Resource Conservation Service maps the soils on this site as Maytown silt loam soils. The NRCS classifies these soils in Hydrologic Soils Group C. HSG C soils are not typically appropriate for infiltration due to their high silt content. No sites in the vicinity of this project are known to have used infiltration as a means of stormwater disposal. As a result, infiltration is not proposed. A geotechnical study of the site's soils was performed in order to assist in the engineering and structural design of site and building construction. A copy of the report is included in Appendix E.

APPENDIX A
BASIN MAPS



Hydrologic Modeling Reference Symbols

Subcatchment Area ID	#
Watershed Basin Divide	
Flow Path for Time of Concentration Calculations	

Scale 1" = 30'

30 15 0 30

Preliminary Pre-Developmnet Basin Map For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

PLS ENGINEERING
Engineering - Surveying - Planning | 604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

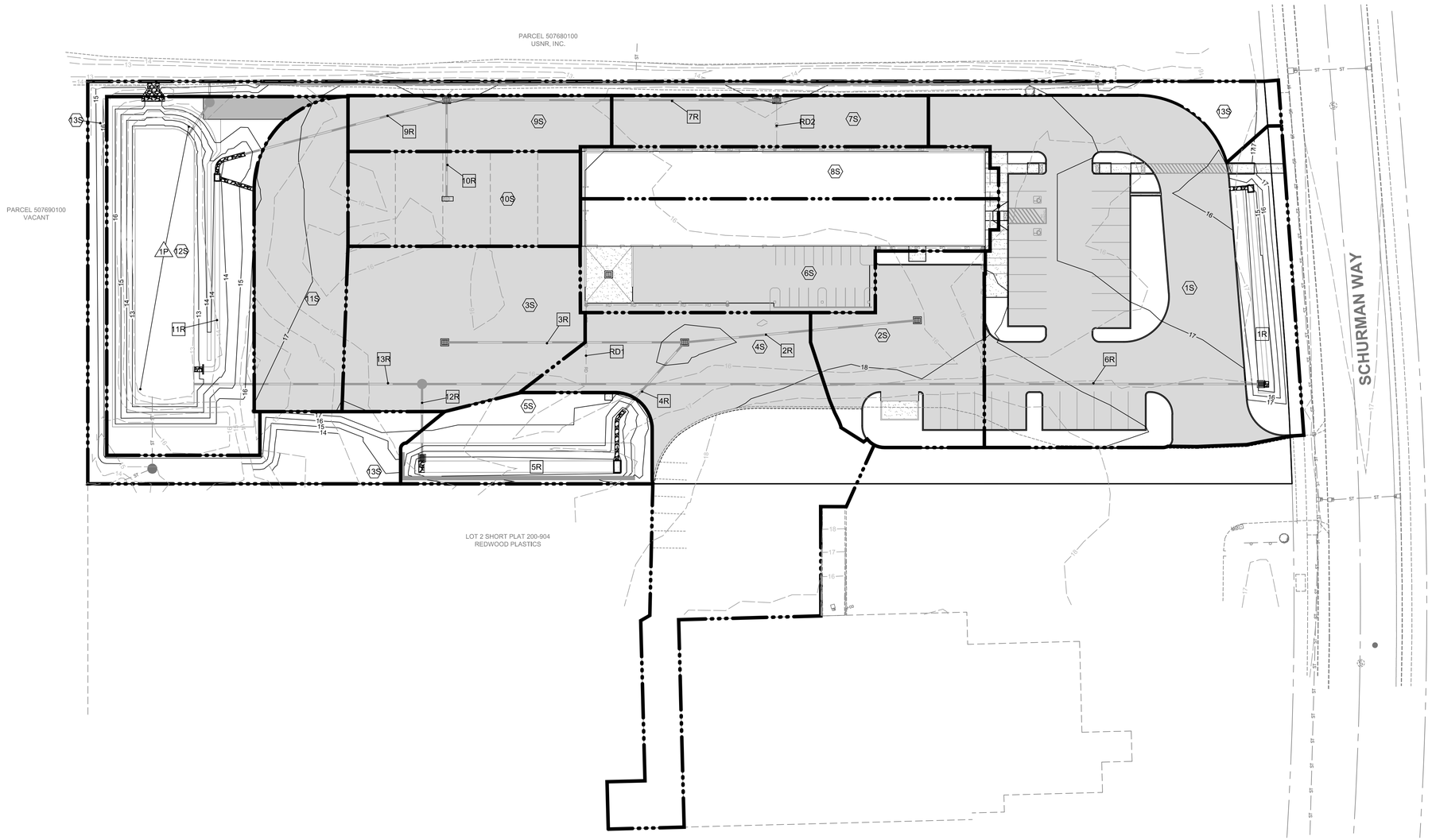
Revisions

1	2	3	4	5	6

ANDREW J. GUNTHER
STATE OF WASHINGTON
59644
REGISTERED
PROFESSIONAL ENGINEER
4/1/22

Project No. 3405	
SCALE:	H: 1" = 30' V: N/A
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

01
02



Legend	
Proposed Asphalt Concrete	
Proposed Cement Concrete	
Proposed Gravel	

Hydrologic Modeling Reference Symbols	
Subcatchment Area ID	(#)
Reach ID	△#
Pond ID	#
Watershed Basin Divide	

Scale 1" = 30'

30 15 0 30

Preliminary Post-Development Basin Map For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

PLS ENGINEERING
Engineering - Surveying - Planning | 604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

Revisions

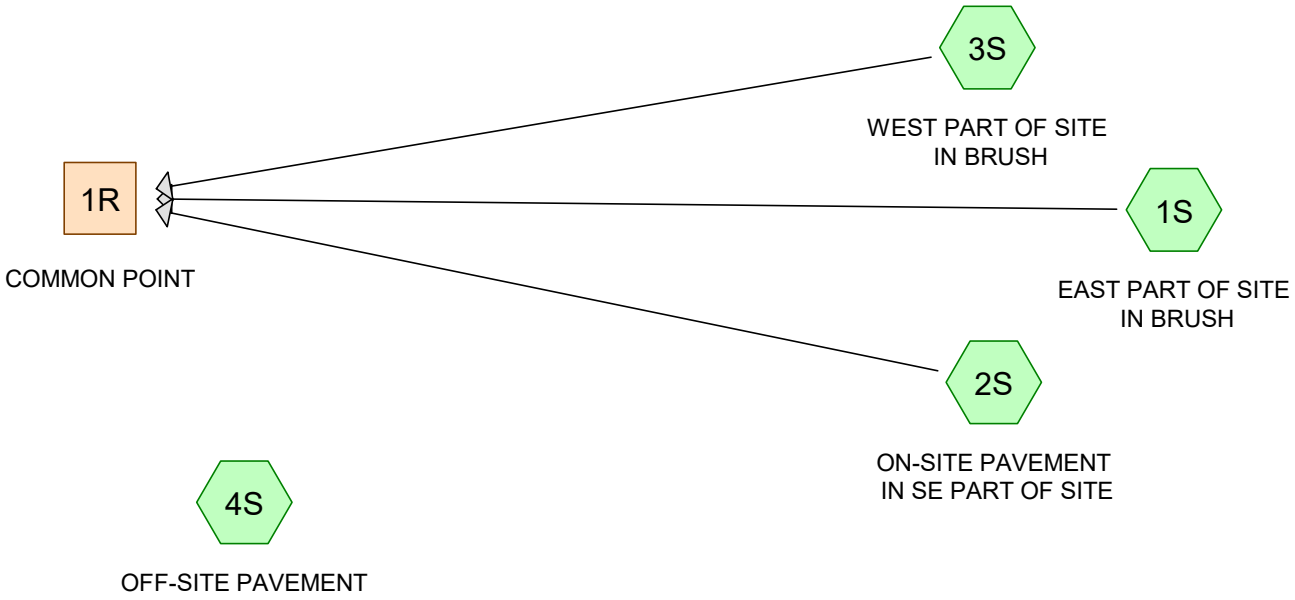
1	2	3	4	5	6

ANDREW J. GUNTHER
STATE OF WASHINGTON
38644
REGISTERED
PROFESSIONAL ENGINEER
4/4/22

Project No.	3405
SCALE:	H: 1" = 30' V: N/A
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

02
02

APPENDIX B
PRE-DEVELOPMENT STORMWATER MODELING CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for 3405 Pre-Dev
Prepared by HP Inc., Printed 2/9/2022

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EAST PART OF SITE IN Runoff Area=53,039 sf 0.00% Impervious Runoff Depth>0.84"
Flow Length=600' Tc=99.3 min CN=85 Runoff=0.13 cfs 0.085 af

Subcatchment 2S: ON-SITE PAVEMENT IN Runoff Area=5,668 sf 100.00% Impervious Runoff Depth>1.85"
Flow Length=300' Slope=0.0180 '/' Tc=66.3 min CN=98 Runoff=0.04 cfs 0.020 af

Subcatchment 3S: WEST PART OF SITE IN Runoff Area=71,592 sf 0.00% Impervious Runoff Depth>0.65"
Flow Length=300' Slope=0.0120 '/' Tc=77.9 min CN=81 Runoff=0.12 cfs 0.089 af

Subcatchment 4S: OFF-SITE PAVEMENT Runoff Area=9,227 sf 100.00% Impervious Runoff Depth>1.88"
Flow Length=475' Tc=18.9 min CN=98 Runoff=0.10 cfs 0.033 af

Reach 1R: COMMON POINT Avg. Flow Depth=0.05' Max Vel=5.53 fps Inflow=0.28 cfs 0.194 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=0.28 cfs 0.194 af

Total Runoff Area = 3.203 ac Runoff Volume = 0.227 af Average Runoff Depth = 0.85"
89.32% Pervious = 2.861 ac 10.68% Impervious = 0.342 ac

Summary for Subcatchment 1S: EAST PART OF SITE IN BRUSH

Runoff = 0.13 cfs @ 9.35 hrs, Volume= 0.085 af, Depth> 0.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	53,039	85	
	53,039		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.2	300	0.0030	0.06		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.12"
9.1	300	0.0120	0.55		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
99.3	600	Total			

Summary for Subcatchment 2S: ON-SITE PAVEMENT IN SE PART OF SITE

Runoff = 0.04 cfs @ 8.66 hrs, Volume= 0.020 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	5,668	98	Pavement
	5,668		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	300	0.0180	0.08		**Sheet Flow, Sheet Flow, Wood/Brush Area** Woods: Light underbrush n= 0.400 P2= 2.12"

Summary for Subcatchment 3S: WEST PART OF SITE IN BRUSH

Runoff = 0.12 cfs @ 9.09 hrs, Volume= 0.089 af, Depth> 0.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	71,592	81	
	71,592		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
77.9	300	0.0120	0.06		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.12"

Summary for Subcatchment 4S: OFF-SITE PAVEMENT

Runoff = 0.10 cfs @ 8.07 hrs, Volume= 0.033 af, Depth> 1.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	9,227	98	
	9,227		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	190	0.0090	0.92		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.12"
15.5	285	0.0150	0.31		**Shallow Concentrated Flow, Shallow Concentrated Flow, Brushy A** Forest w/Heavy Litter Kv= 2.5 fps
18.9	475	Total			

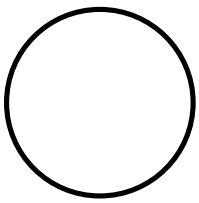
Summary for Reach 1R: COMMON POINT

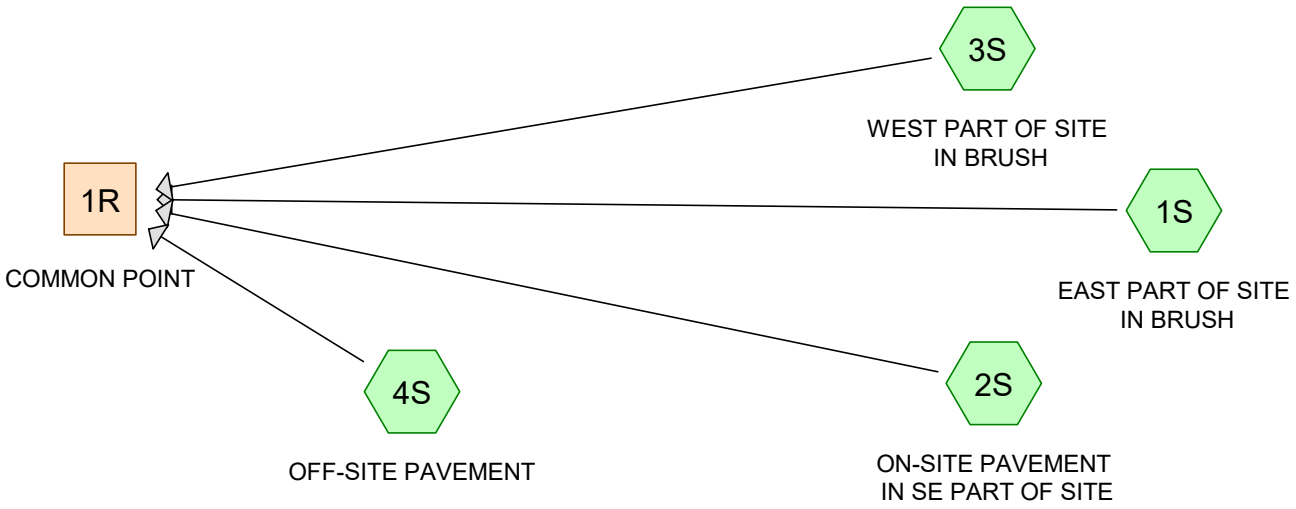
Inflow Area = 2.991 ac, 4.35% Impervious, Inflow Depth > 0.78" for 2-Year event
Inflow = 0.28 cfs @ 9.14 hrs, Volume= 0.194 af
Outflow = 0.28 cfs @ 9.14 hrs, Volume= 0.194 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.53 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.53 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 9.14 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 0.00', Outlet Invert= -0.20'





Subcat Reach Pond Link

Routing Diagram for 3405 Pre-Dev
Prepared by HP Inc., Printed 2/9/2022

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EAST PART OF SITE IN Runoff Area=53,039 sf 0.00% Impervious Runoff Depth>1.69"
Flow Length=600' Tc=99.3 min CN=85 Runoff=0.29 cfs 0.172 af

Subcatchment 2S: ON-SITE PAVEMENT IN Runoff Area=5,668 sf 100.00% Impervious Runoff Depth>2.92"
Flow Length=300' Slope=0.0180 '/' Tc=66.3 min CN=98 Runoff=0.07 cfs 0.032 af

Subcatchment 3S: WEST PART OF SITE IN Runoff Area=71,592 sf 0.00% Impervious Runoff Depth>1.43"
Flow Length=300' Slope=0.0120 '/' Tc=77.9 min CN=81 Runoff=0.33 cfs 0.195 af

Subcatchment 4S: OFF-SITE PAVEMENT Runoff Area=9,227 sf 100.00% Impervious Runoff Depth>2.97"
Flow Length=475' Tc=18.9 min CN=98 Runoff=0.15 cfs 0.052 af

Reach 1R: COMMON POINT Avg. Flow Depth=0.09' Max Vel=6.61 fps Inflow=0.72 cfs 0.451 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=0.72 cfs 0.451 af

Total Runoff Area = 3.203 ac Runoff Volume = 0.451 af Average Runoff Depth = 1.69"
89.32% Pervious = 2.861 ac 10.68% Impervious = 0.342 ac

Summary for Subcatchment 1S: EAST PART OF SITE IN BRUSH

Runoff = 0.29 cfs @ 9.23 hrs, Volume= 0.172 af, Depth> 1.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	53,039	85	
	53,039		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.2	300	0.0030	0.06		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.12"
9.1	300	0.0120	0.55		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
99.3	600	Total			

Summary for Subcatchment 2S: ON-SITE PAVEMENT IN SE PART OF SITE

Runoff = 0.07 cfs @ 8.66 hrs, Volume= 0.032 af, Depth> 2.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	5,668	98	Pavement
	5,668		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	300	0.0180	0.08		**Sheet Flow, Sheet Flow, Wood/Brush Area** Woods: Light underbrush n= 0.400 P2= 2.12"

Summary for Subcatchment 3S: WEST PART OF SITE IN BRUSH

Runoff = 0.33 cfs @ 8.94 hrs, Volume= 0.195 af, Depth> 1.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	71,592	81	
	71,592		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
77.9	300	0.0120	0.06		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.12"

Summary for Subcatchment 4S: OFF-SITE PAVEMENT

Runoff = 0.15 cfs @ 8.06 hrs, Volume= 0.052 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	9,227	98	
	9,227		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	190	0.0090	0.92		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.12"
15.5	285	0.0150	0.31		**Shallow Concentrated Flow, Shallow Concentrated Flow, Brushy A** Forest w/Heavy Litter Kv= 2.5 fps
18.9	475	Total			

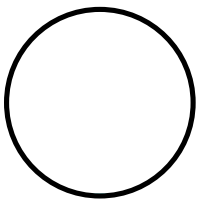
Summary for Reach 1R: COMMON POINT

Inflow Area = 3.203 ac, 10.68% Impervious, Inflow Depth > 1.69" for 10-Year event
Inflow = 0.72 cfs @ 8.97 hrs, Volume= 0.451 af
Outflow = 0.72 cfs @ 8.97 hrs, Volume= 0.451 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.61 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.59 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.97 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 0.00', Outlet Invert= -0.20'



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: EAST PART OF SITE IN Runoff Area=53,039 sf 0.00% Impervious Runoff Depth>3.83"
Flow Length=600' Tc=99.3 min CN=85 Runoff=0.69 cfs 0.389 af

Subcatchment 2S: ON-SITE PAVEMENT IN Runoff Area=5,668 sf 100.00% Impervious Runoff Depth>5.32"
Flow Length=300' Slope=0.0180 '/' Tc=66.3 min CN=98 Runoff=0.12 cfs 0.058 af

Subcatchment 3S: WEST PART OF SITE IN Runoff Area=71,592 sf 0.00% Impervious Runoff Depth>3.46"
Flow Length=300' Slope=0.0120 '/' Tc=77.9 min CN=81 Runoff=0.90 cfs 0.474 af

Subcatchment 4S: OFF-SITE PAVEMENT Runoff Area=9,227 sf 100.00% Impervious Runoff Depth>5.40"
Flow Length=475' Tc=18.9 min CN=98 Runoff=0.27 cfs 0.095 af

Reach 1R: COMMON POINT Avg. Flow Depth=0.14' Max Vel=8.50 fps Inflow=1.78 cfs 1.016 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=1.78 cfs 1.016 af

Total Runoff Area = 3.203 ac Runoff Volume = 1.016 af Average Runoff Depth = 3.81"
89.32% Pervious = 2.861 ac 10.68% Impervious = 0.342 ac

Summary for Subcatchment 1S: EAST PART OF SITE IN BRUSH

Runoff = 0.69 cfs @ 9.16 hrs, Volume= 0.389 af, Depth> 3.83"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	53,039	85	
	53,039		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
90.2	300	0.0030	0.06		**Sheet Flow, Sheet Flow** Grass: Dense n= 0.240 P2= 2.12"
9.1	300	0.0120	0.55		**Shallow Concentrated Flow, Shallow Concentrated Flow** Woodland Kv= 5.0 fps
99.3	600	Total			

Summary for Subcatchment 2S: ON-SITE PAVEMENT IN SE PART OF SITE

Runoff = 0.12 cfs @ 8.66 hrs, Volume= 0.058 af, Depth> 5.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	5,668	98	Pavement
	5,668		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
66.3	300	0.0180	0.08		**Sheet Flow, Sheet Flow, Wood/Brush Area** Woods: Light underbrush n= 0.400 P2= 2.12"

Summary for Subcatchment 3S: WEST PART OF SITE IN BRUSH

Runoff = 0.90 cfs @ 8.89 hrs, Volume= 0.474 af, Depth> 3.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	71,592	81	
	71,592		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
77.9	300	0.0120	0.06		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 2.12"

Summary for Subcatchment 4S: OFF-SITE PAVEMENT

Runoff = 0.27 cfs @ 8.06 hrs, Volume= 0.095 af, Depth> 5.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	9,227	98	
	9,227		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	190	0.0090	0.92		**Sheet Flow, Sheet Flow** Smooth surfaces n= 0.011 P2= 2.12"
15.5	285	0.0150	0.31		**Shallow Concentrated Flow, Shallow Concentrated Flow, Brushy A** Forest w/Heavy Litter Kv= 2.5 fps
18.9	475	Total			

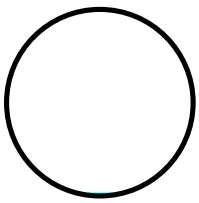
Summary for Reach 1R: COMMON POINT

Inflow Area = 3.203 ac, 10.68% Impervious, Inflow Depth > 3.81" for 100-Year event
Inflow = 1.78 cfs @ 8.93 hrs, Volume= 1.016 af
Outflow = 1.78 cfs @ 8.94 hrs, Volume= 1.016 af, Atten= 0%, Lag= 0.0 min

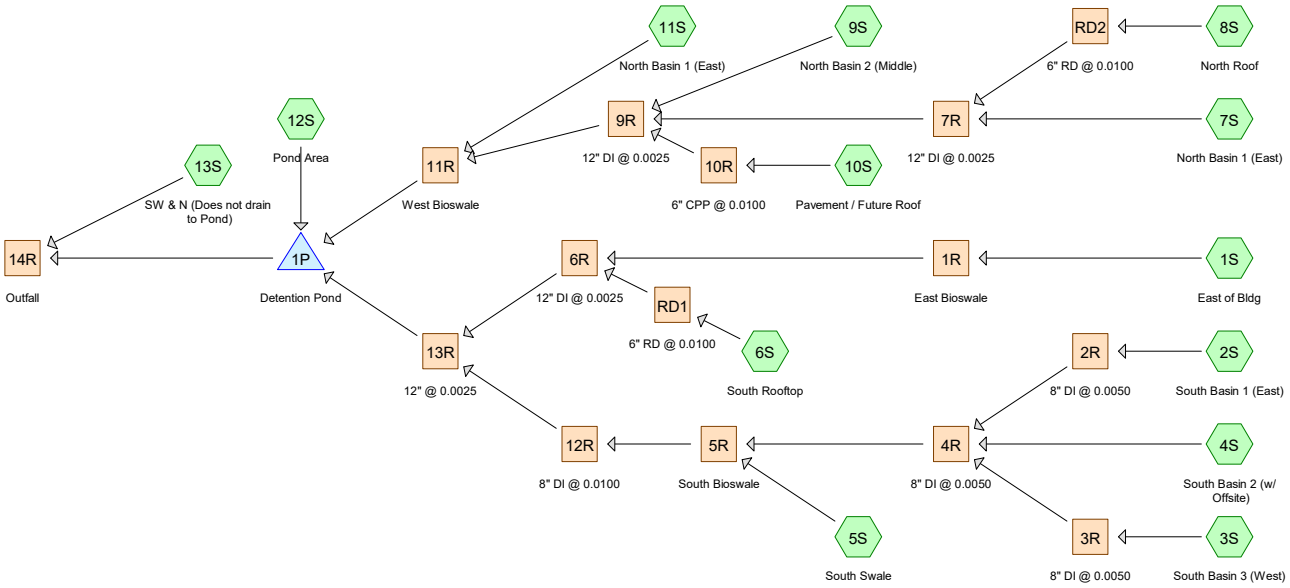
Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 8.50 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 6.05 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.94 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 0.00', Outlet Invert= -0.20'



APPENDIX C
POST-DEVELOPMENT STORMWATER MODELING CALCULATIONS



Subcat Reach Pond Link

Routing Diagram for 3405 Post-Dev
Prepared by HP Inc., Printed 4/12/2022

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: East of Bldg Runoff Area=29,366 sf 73.39% Impervious Runoff Depth>1.59"
Tc=6.0 min CN=95 Runoff=0.28 cfs 0.090 af

Subcatchment 2S: South Basin 1 (East) Runoff Area=7,790 sf 84.36% Impervious Runoff Depth>1.69"
Tc=6.0 min CN=96 Runoff=0.08 cfs 0.025 af

Subcatchment 3S: South Basin 3 (West) Runoff Area=9,915 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.11 cfs 0.036 af

Subcatchment 4S: South Basin 2 (w/ Runoff Area=20,153 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.073 af

Subcatchment 5S: South Swale Runoff Area=5,634 sf 0.00% Impervious Runoff Depth>0.94"
Tc=6.0 min CN=86 Runoff=0.03 cfs 0.010 af

Subcatchment 6S: South Rooftop Runoff Area=10,872 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.12 cfs 0.039 af

Subcatchment 7S: North Basin 1 (East) Runoff Area=4,510 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.016 af

Subcatchment 8S: North Roof Runoff Area=6,009 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.022 af

Subcatchment 9S: North Basin 2 (Middle) Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.05 cfs 0.015 af

Subcatchment 10S: Pavement / Future Runoff Area=6,125 sf 100.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.022 af

Subcatchment 11S: North Basin 1 (East) Runoff Area=7,562 sf 100.00% Impervious Runoff Depth>1.89"
Tc=0.0 min CN=98 Runoff=0.09 cfs 0.027 af

Subcatchment 12S: Pond Area Runoff Area=15,296 sf 4.26% Impervious Runoff Depth>1.00"
Tc=6.0 min CN=87 Runoff=0.08 cfs 0.029 af

Subcatchment 13S: SW & N (Does not drain Runoff Area=12,235 sf 0.00% Impervious Runoff Depth>0.94"
Tc=0.0 min CN=86 Runoff=0.06 cfs 0.022 af

Reach 1R: East Bioswale Avg. Flow Depth=0.35' Max Vel=0.22 fps Inflow=0.28 cfs 0.090 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=2.11 cfs Outflow=0.27 cfs 0.089 af

Reach 2R: 8" DI @ 0.0050 Avg. Flow Depth=0.13' Max Vel=1.62 fps Inflow=0.08 cfs 0.025 af
8.0" Round Pipe n=0.012 L=124.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.08 cfs 0.025 af

Reach 3R: 8" DI @ 0.0050 Avg. Flow Depth=0.16' Max Vel=1.79 fps Inflow=0.11 cfs 0.036 af
8.0" Round Pipe n=0.012 L=127.0' S=0.0050 '/' Capacity=0.92 cfs Outflow=0.11 cfs 0.036 af

Reach 4R: 8" DI @ 0.0050 Avg. Flow Depth=0.31' Max Vel=2.58 fps Inflow=0.42 cfs 0.134 af
8.0" Round Pipe n=0.012 L=48.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.42 cfs 0.134 af

Reach 5R: South Bioswale Avg. Flow Depth=0.30' Max Vel=0.21 fps Inflow=0.44 cfs 0.144 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=6.61 cfs Outflow=0.43 cfs 0.142 af

Reach 6R: 12" DI @ 0.0025 Avg. Flow Depth=0.30' Max Vel=1.91 fps Inflow=0.38 cfs 0.128 af
12.0" Round Pipe n=0.012 L=440.0' S=0.0025 '/' Capacity=1.93 cfs Outflow=0.38 cfs 0.127 af

Reach 7R: 12" DI @ 0.0025 Avg. Flow Depth=0.17' Max Vel=1.36 fps Inflow=0.12 cfs 0.038 af
12.0" Round Pipe n=0.012 L=174.0' S=0.0025 '/' Capacity=1.94 cfs Outflow=0.12 cfs 0.038 af

Reach 9R: 12" DI @ 0.0025 Avg. Flow Depth=0.23' Max Vel=1.67 fps Inflow=0.23 cfs 0.075 af
12.0" Round Pipe n=0.012 L=110.0' S=0.0025 '/' Capacity=1.95 cfs Outflow=0.23 cfs 0.075 af

Reach 10R: 6" CPP @ 0.0100 Avg. Flow Depth=0.11' Max Vel=2.05 fps Inflow=0.07 cfs 0.022 af
6.0" Round Pipe n=0.012 L=53.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.07 cfs 0.022 af

Reach 11R: West Bioswale Avg. Flow Depth=0.37' Max Vel=0.22 fps Inflow=0.31 cfs 0.102 af
n=0.200 L=105.0' S=0.0050 '/' Capacity=3.90 cfs Outflow=0.30 cfs 0.101 af

Reach 12R: 8" DI @ 0.0100 Avg. Flow Depth=0.26' Max Vel=3.36 fps Inflow=0.43 cfs 0.142 af
8.0" Round Pipe n=0.012 L=40.0' S=0.0100 '/' Capacity=1.31 cfs Outflow=0.43 cfs 0.142 af

Reach 13R: 12" @ 0.0025 Avg. Flow Depth=0.42' Max Vel=2.61 fps Inflow=0.81 cfs 0.270 af
12.0" Round Pipe n=0.012 L=120.0' S=0.0033 '/' Capacity=2.23 cfs Outflow=0.81 cfs 0.270 af

Reach 14R: Outfall Avg. Flow Depth=0.04' Max Vel=5.53 fps Inflow=0.24 cfs 0.341 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=0.24 cfs 0.341 af

Reach RD1: 6" RD @ 0.0100 Avg. Flow Depth=0.15' Max Vel=2.42 fps Inflow=0.12 cfs 0.039 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.12 cfs 0.039 af

Reach RD2: 6" RD @ 0.0100 Avg. Flow Depth=0.11' Max Vel=2.04 fps Inflow=0.07 cfs 0.022 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.07 cfs 0.022 af

Pond 1P: Detention Pond Peak Elev=13.92' Storage=5,564 cf Inflow=1.16 cfs 0.400 af
Outflow=0.23 cfs 0.319 af

Total Runoff Area = 3.203 ac Runoff Volume = 0.426 af Average Runoff Depth = 1.60"
29.78% Pervious = 0.954 ac 70.22% Impervious = 2.249 ac

Summary for Subcatchment 1S: East of Bldg

Runoff = 0.28 cfs @ 7.91 hrs, Volume= 0.090 af, Depth> 1.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	7,815	86	Landscaping
*	21,551	98	Pavement/SW
	29,366	95	Weighted Average
	7,815		26.61% Pervious Area
	21,551		73.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 2S: South Basin 1 (East)

Runoff = 0.08 cfs @ 7.90 hrs, Volume= 0.025 af, Depth> 1.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	6,572	98	Pavement/SW
*	1,218	86	Landscaping
	7,790	96	Weighted Average
	1,218		15.64% Pervious Area
	6,572		84.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: South Basin 3 (West)

Runoff = 0.11 cfs @ 7.88 hrs, Volume= 0.036 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	9,915	98	Pavement/SW
	9,915		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4S: South Basin 2 (w/ Offsite)

Runoff = 0.23 cfs @ 7.88 hrs, Volume= 0.073 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	20,153	98	Pavement/SW
	20,153		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 5S: South Swale

Runoff = 0.03 cfs @ 7.98 hrs, Volume= 0.010 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	5,634	86	Landscaping
	5,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 6S: South Rooftop

Runoff = 0.12 cfs @ 7.88 hrs, Volume= 0.039 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	10,872	98	Future Rooftop
	10,872		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: North Basin 1 (East)

Runoff = 0.05 cfs @ 7.88 hrs, Volume= 0.016 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	4,510	98	Pavement/SW
	4,510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: North Roof

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.022 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	6,009	98	Rooftop
	6,009		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: North Basin 2 (Middle)

Runoff = 0.05 cfs @ 7.88 hrs, Volume= 0.015 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	4,059	98	Pavement/SW
	4,059		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: Pavement / Future Roof

Runoff = 0.07 cfs @ 7.88 hrs, Volume= 0.022 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	6,125	98	Rooftop/Pavement
	6,125		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: North Basin 1 (East)

Runoff = 0.09 cfs @ 7.79 hrs, Volume= 0.027 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	7,562	98	Pavement/SW
	7,562		100.00% Impervious Area

Summary for Subcatchment 12S: Pond Area

Runoff = 0.08 cfs @ 7.98 hrs, Volume= 0.029 af, Depth> 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

	Area (sf)	CN	Description
*	14,645	86	Landscaping/Pond Area
*	651	98	Gravel Pond Access
	15,296	87	Weighted Average
	14,645		95.74% Pervious Area
	651		4.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: SW & N (Does not drain to Pond)

Runoff = 0.06 cfs @ 7.91 hrs, Volume= 0.022 af, Depth> 0.94"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Year Rainfall=2.12"

Area (sf)	CN	Description
12,235	86	<50% Grass cover, Poor, HSG C
12,235		100.00% Pervious Area

Summary for Reach 1R: East Bioswale

Inflow Area = 0.674 ac, 73.39% Impervious, Inflow Depth > 1.59" for 2-Year event
Inflow = 0.28 cfs @ 7.91 hrs, Volume= 0.090 af
Outflow = 0.27 cfs @ 8.12 hrs, Volume= 0.089 af, Atten= 3%, Lag= 12.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.22 fps, Min. Travel Time= 7.7 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 14.1 min

Peak Storage= 126 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.00' Flow Area= 5.5 sf, Capacity= 2.11 cfs

2.50' x 1.00' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 8.50'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 14.50', Outlet Invert= 14.00'

‡

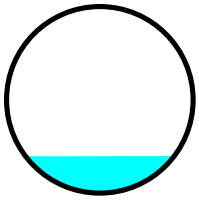
Summary for Reach 2R: 8" DI @ 0.0050

Inflow Area = 0.179 ac, 84.36% Impervious, Inflow Depth > 1.69" for 2-Year event
Inflow = 0.08 cfs @ 7.90 hrs, Volume= 0.025 af
Outflow = 0.08 cfs @ 7.93 hrs, Volume= 0.025 af, Atten= 0%, Lag= 2.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.62 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.91 fps, Avg. Travel Time= 2.3 min

Peak Storage= 6 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 124.0' Slope= 0.0050 '/'
Inlet Invert= 15.47', Outlet Invert= 14.85'



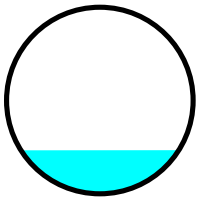
Summary for Reach 3R: 8" DI @ 0.0050

Inflow Area = 0.228 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.11 cfs @ 7.88 hrs, Volume= 0.036 af
Outflow = 0.11 cfs @ 7.91 hrs, Volume= 0.036 af, Atten= 0%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.79 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.01 fps, Avg. Travel Time= 2.1 min

Peak Storage= 8 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.92 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 127.0' Slope= 0.0050 '/'
Inlet Invert= 15.48', Outlet Invert= 14.85'



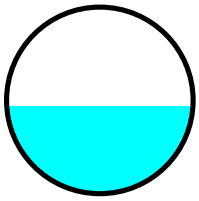
Summary for Reach 4R: 8" DI @ 0.0050

Inflow Area = 0.869 ac, 96.78% Impervious, Inflow Depth > 1.85" for 2-Year event
Inflow = 0.42 cfs @ 7.90 hrs, Volume= 0.134 af
Outflow = 0.42 cfs @ 7.91 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.58 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 0.5 min

Peak Storage= 8 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 48.0' Slope= 0.0050 '/'
Inlet Invert= 14.85', Outlet Invert= 14.61'



Summary for Reach 5R: South Bioswale

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 1.73" for 2-Year event
Inflow = 0.44 cfs @ 7.92 hrs, Volume= 0.144 af
Outflow = 0.43 cfs @ 8.13 hrs, Volume= 0.142 af, Atten= 2%, Lag= 12.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.21 fps, Min. Travel Time= 7.8 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 15.6 min

Peak Storage= 203 cf @ 8.00 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.33' Flow Area= 13.3 sf, Capacity= 6.61 cfs

6.00' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 13.98'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 13.79', Outlet Invert= 13.29'

‡

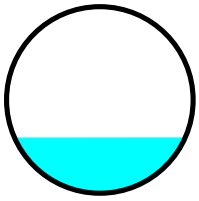
Summary for Reach 6R: 12" DI @ 0.0025

Inflow Area = 0.924 ac, 80.58% Impervious, Inflow Depth > 1.66" for 2-Year event
Inflow = 0.38 cfs @ 8.04 hrs, Volume= 0.128 af
Outflow = 0.38 cfs @ 8.15 hrs, Volume= 0.127 af, Atten= 1%, Lag= 6.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 1.09 fps, Avg. Travel Time= 6.8 min

Peak Storage= 87 cf @ 8.08 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.93 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 440.0' Slope= 0.0025 '/'
Inlet Invert= 14.00', Outlet Invert= 12.90'



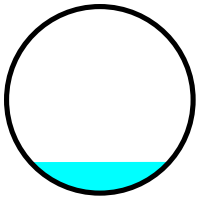
Summary for Reach 7R: 12" DI @ 0.0025

Inflow Area = 0.241 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.12 cfs @ 7.90 hrs, Volume= 0.038 af
Outflow = 0.12 cfs @ 7.96 hrs, Volume= 0.038 af, Atten= 0%, Lag= 3.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.36 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 3.8 min

Peak Storage= 15 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 174.0' Slope= 0.0025 '/'
Inlet Invert= 14.81', Outlet Invert= 14.37'



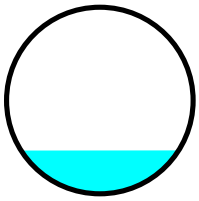
Summary for Reach 9R: 12" DI @ 0.0025

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.23 cfs @ 7.93 hrs, Volume= 0.075 af
Outflow = 0.23 cfs @ 7.96 hrs, Volume= 0.075 af, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.67 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.94 fps, Avg. Travel Time= 1.9 min

Peak Storage= 15 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.95 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 110.0' Slope= 0.0025 '/'
Inlet Invert= 14.42', Outlet Invert= 14.14'



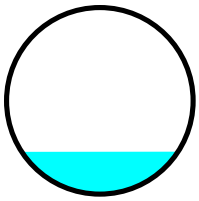
Summary for Reach 10R: 6" CPP @ 0.0100

Inflow Area = 0.141 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.07 cfs @ 7.88 hrs, Volume= 0.022 af
Outflow = 0.07 cfs @ 7.89 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.05 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 0.8 min

Peak Storage= 2 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 53.0' Slope= 0.0100 '/'
Inlet Invert= 14.90', Outlet Invert= 14.37'



Summary for Reach 11R: West Bioswale

Inflow Area = 0.649 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.31 cfs @ 7.91 hrs, Volume= 0.102 af
Outflow = 0.30 cfs @ 8.12 hrs, Volume= 0.101 af, Atten= 4%, Lag= 12.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.22 fps, Min. Travel Time= 7.8 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 14.3 min

Peak Storage= 141 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.33' Flow Area= 8.6 sf, Capacity= 3.90 cfs

2.50' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 10.48'
Length= 105.0' Slope= 0.0050 '/'
Inlet Invert= 13.83', Outlet Invert= 13.30'

‡

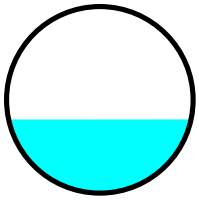
Summary for Reach 12R: 8" DI @ 0.0100

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 1.71" for 2-Year event
Inflow = 0.43 cfs @ 8.13 hrs, Volume= 0.142 af
Outflow = 0.43 cfs @ 8.14 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.36 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.94 fps, Avg. Travel Time= 0.3 min

Peak Storage= 5 cf @ 8.13 hrs
Average Depth at Peak Storage= 0.26'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 40.0' Slope= 0.0100 '/'
Inlet Invert= 13.01', Outlet Invert= 12.61'



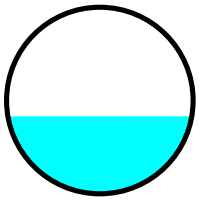
Summary for Reach 13R: 12" @ 0.0025

Inflow Area = 1.922 ac, 82.48% Impervious, Inflow Depth > 1.68" for 2-Year event
Inflow = 0.81 cfs @ 8.14 hrs, Volume= 0.270 af
Outflow = 0.81 cfs @ 8.16 hrs, Volume= 0.270 af, Atten= 0%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.61 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 1.3 min

Peak Storage= 37 cf @ 8.15 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.23 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 120.0' Slope= 0.0033 '/'
Inlet Invert= 12.90', Outlet Invert= 12.50'



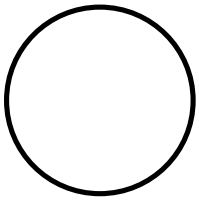
Summary for Reach 14R: Outfall

Inflow Area = 3.203 ac, 70.22% Impervious, Inflow Depth > 1.28" for 2-Year event
Inflow = 0.24 cfs @ 10.95 hrs, Volume= 0.341 af
Outflow = 0.24 cfs @ 11.00 hrs, Volume= 0.341 af, Atten= 0%, Lag= 2.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.53 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.53 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 11.00 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 12.50', Outlet Invert= 12.30'



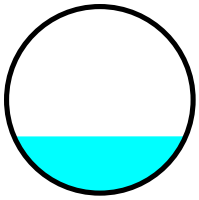
Summary for Reach RD1: 6" RD @ 0.0100

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.12 cfs @ 7.88 hrs, Volume= 0.039 af
Outflow = 0.12 cfs @ 7.91 hrs, Volume= 0.039 af, Atten= 0%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.42 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 1.8 min

Peak Storage= 8 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.50', Outlet Invert= 14.00'



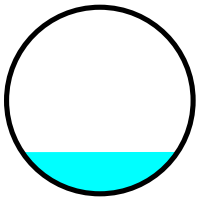
Summary for Reach RD2: 6" RD @ 0.0100

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 1.89" for 2-Year event
Inflow = 0.07 cfs @ 7.88 hrs, Volume= 0.022 af
Outflow = 0.07 cfs @ 7.91 hrs, Volume= 0.022 af, Atten= 0%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.04 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 2.2 min

Peak Storage= 5 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.87', Outlet Invert= 14.37'



Summary for Pond 1P: Detention Pond

Inflow Area = 2.922 ac, 76.97% Impervious, Inflow Depth > 1.64" for 2-Year event
Inflow = 1.16 cfs @ 8.13 hrs, Volume= 0.400 af
Outflow = 0.23 cfs @ 11.86 hrs, Volume= 0.319 af, Atten= 80%, Lag= 223.5 min
Primary = 0.23 cfs @ 11.86 hrs, Volume= 0.319 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 13.92' @ 11.86 hrs Surf.Area= 4,963 sf Storage= 5,564 cf

Plug-Flow detention time= 299.7 min calculated for 0.318 af (80% of inflow)
Center-of-Mass det. time= 171.6 min (890.1 - 718.5)

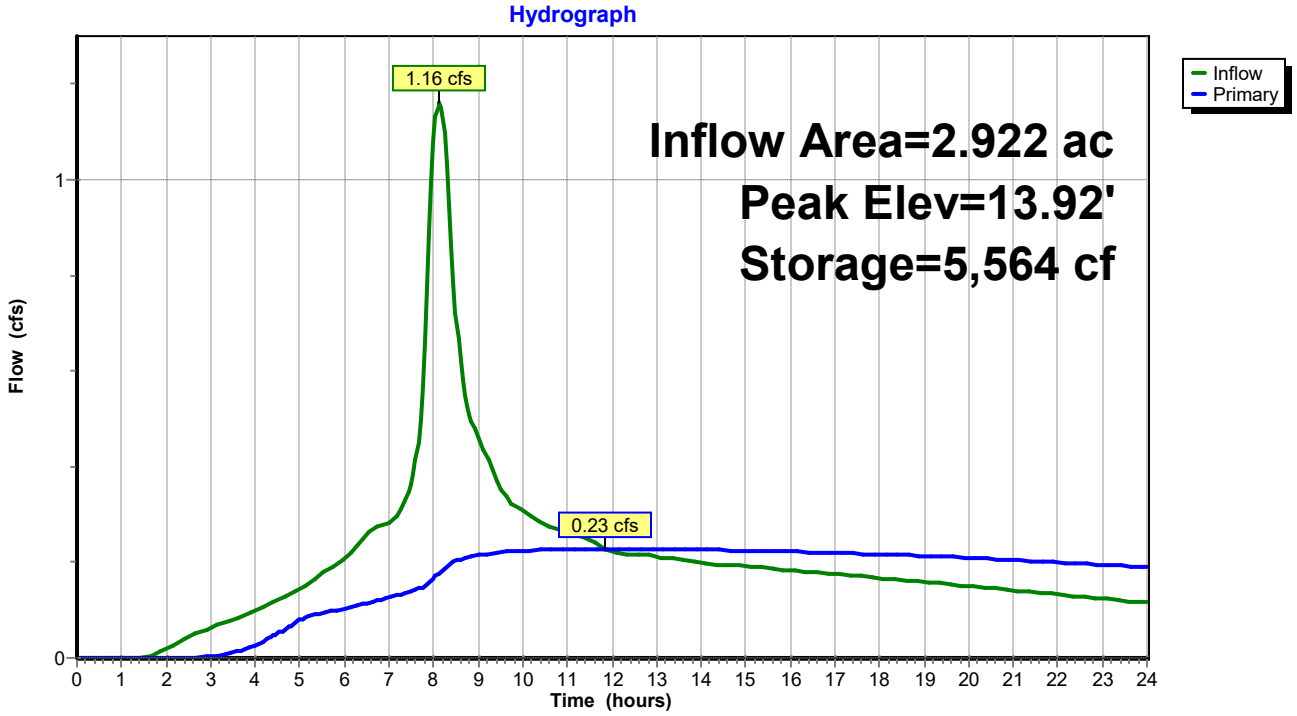
Volume	Invert	Avail.Storage	Storage Description
#1	12.50'	15,331 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.71

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.50	4,453	0	0
13.00	5,073	2,382	2,382
13.50	5,892	2,741	5,123
14.00	7,195	3,272	8,395
14.50	8,350	3,886	12,281
15.00	9,298	4,412	16,693
15.50	10,305	4,901	21,594

Device	Routing	Invert	Outlet Devices
#1	Primary	12.50'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 12.50' / 12.50' S= 0.0000 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	12.50'	**2.7" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.00'	**5.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.23 cfs @ 11.86 hrs HW=13.92' (Free Discharge)
└**1=Culvert** (Passes 0.23 cfs of 2.95 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.23 cfs @ 5.74 fps)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 1P: Detention Pond



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: East of Bldg Runoff Area=29,366 sf 73.39% Impervious Runoff Depth>2.66"
Tc=6.0 min CN=95 Runoff=0.47 cfs 0.149 af

Subcatchment 2S: South Basin 1 (East) Runoff Area=7,790 sf 84.36% Impervious Runoff Depth>2.76"
Tc=6.0 min CN=96 Runoff=0.13 cfs 0.041 af

Subcatchment 3S: South Basin 3 (West) Runoff Area=9,915 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.17 cfs 0.057 af

Subcatchment 4S: South Basin 2 (w/ Runoff Area=20,153 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.35 cfs 0.115 af

Subcatchment 5S: South Swale Runoff Area=5,634 sf 0.00% Impervious Runoff Depth>1.85"
Tc=6.0 min CN=86 Runoff=0.06 cfs 0.020 af

Subcatchment 6S: South Rooftop Runoff Area=10,872 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.19 cfs 0.062 af

Subcatchment 7S: North Basin 1 (East) Runoff Area=4,510 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.026 af

Subcatchment 8S: North Roof Runoff Area=6,009 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.11 cfs 0.034 af

Subcatchment 9S: North Basin 2 (Middle) Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.023 af

Subcatchment 10S: Pavement / Future Runoff Area=6,125 sf 100.00% Impervious Runoff Depth>2.98"
Tc=6.0 min CN=98 Runoff=0.11 cfs 0.035 af

Subcatchment 11S: North Basin 1 (East) Runoff Area=7,562 sf 100.00% Impervious Runoff Depth>2.99"
Tc=0.0 min CN=98 Runoff=0.13 cfs 0.043 af

Subcatchment 12S: Pond Area Runoff Area=15,296 sf 4.26% Impervious Runoff Depth>1.93"
Tc=6.0 min CN=87 Runoff=0.17 cfs 0.056 af

Subcatchment 13S: SW & N (Does not drain Runoff Area=12,235 sf 0.00% Impervious Runoff Depth>1.85"
Tc=0.0 min CN=86 Runoff=0.13 cfs 0.043 af

Reach 1R: East Bioswale Avg. Flow Depth=0.47' Max Vel=0.25 fps Inflow=0.47 cfs 0.149 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=2.11 cfs Outflow=0.46 cfs 0.148 af

Reach 2R: 8" DI @ 0.0050 Avg. Flow Depth=0.17' Max Vel=1.87 fps Inflow=0.13 cfs 0.041 af
8.0" Round Pipe n=0.012 L=124.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.13 cfs 0.041 af

Reach 3R: 8" DI @ 0.0050 Avg. Flow Depth=0.20' Max Vel=2.03 fps Inflow=0.17 cfs 0.057 af
8.0" Round Pipe n=0.012 L=127.0' S=0.0050 '/' Capacity=0.92 cfs Outflow=0.17 cfs 0.057 af

Reach 4R: 8" DI @ 0.0050 Avg. Flow Depth=0.41' Max Vel=2.88 fps Inflow=0.65 cfs 0.213 af
8.0" Round Pipe n=0.012 L=48.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.65 cfs 0.213 af

Reach 5R: South Bioswale Avg. Flow Depth=0.39' Max Vel=0.25 fps Inflow=0.71 cfs 0.233 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=6.61 cfs Outflow=0.70 cfs 0.231 af

Reach 6R: 12" DI @ 0.0025 Avg. Flow Depth=0.39' Max Vel=2.20 fps Inflow=0.64 cfs 0.210 af
12.0" Round Pipe n=0.012 L=440.0' S=0.0025 '/' Capacity=1.93 cfs Outflow=0.63 cfs 0.209 af

Reach 7R: 12" DI @ 0.0025 Avg. Flow Depth=0.21' Max Vel=1.55 fps Inflow=0.18 cfs 0.060 af
12.0" Round Pipe n=0.012 L=174.0' S=0.0025 '/' Capacity=1.94 cfs Outflow=0.18 cfs 0.060 af

Reach 9R: 12" DI @ 0.0025 Avg. Flow Depth=0.29' Max Vel=1.89 fps Inflow=0.36 cfs 0.118 af
12.0" Round Pipe n=0.012 L=110.0' S=0.0025 '/' Capacity=1.95 cfs Outflow=0.36 cfs 0.118 af

Reach 10R: 6" CPP @ 0.0100 Avg. Flow Depth=0.14' Max Vel=2.33 fps Inflow=0.11 cfs 0.035 af
6.0" Round Pipe n=0.012 L=53.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.11 cfs 0.035 af

Reach 11R: West Bioswale Avg. Flow Depth=0.47' Max Vel=0.26 fps Inflow=0.49 cfs 0.161 af
n=0.200 L=105.0' S=0.0050 '/' Capacity=3.90 cfs Outflow=0.47 cfs 0.160 af

Reach 12R: 8" DI @ 0.0100 Avg. Flow Depth=0.35' Max Vel=3.81 fps Inflow=0.70 cfs 0.231 af
8.0" Round Pipe n=0.012 L=40.0' S=0.0100 '/' Capacity=1.31 cfs Outflow=0.70 cfs 0.231 af

Reach 13R: 12" @ 0.0025 Avg. Flow Depth=0.56' Max Vel=2.96 fps Inflow=1.33 cfs 0.440 af
12.0" Round Pipe n=0.012 L=120.0' S=0.0033 '/' Capacity=2.23 cfs Outflow=1.33 cfs 0.440 af

Reach 14R: Outfall Avg. Flow Depth=0.09' Max Vel=6.53 fps Inflow=0.69 cfs 0.570 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=0.69 cfs 0.570 af

Reach RD1: 6" RD @ 0.0100 Avg. Flow Depth=0.19' Max Vel=2.74 fps Inflow=0.19 cfs 0.062 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.19 cfs 0.062 af

Reach RD2: 6" RD @ 0.0100 Avg. Flow Depth=0.14' Max Vel=2.32 fps Inflow=0.11 cfs 0.034 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.11 cfs 0.034 af

Pond 1P: Detention Pond Peak Elev=14.36' Storage=7,901 cf Inflow=1.93 cfs 0.656 af
Outflow=0.65 cfs 0.527 af

Total Runoff Area = 3.203 ac Runoff Volume = 0.705 af Average Runoff Depth = 2.64"
29.78% Pervious = 0.954 ac 70.22% Impervious = 2.249 ac

Summary for Subcatchment 1S: East of Bldg

Runoff = 0.47 cfs @ 7.89 hrs, Volume= 0.149 af, Depth> 2.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	7,815	86	Landscaping
*	21,551	98	Pavement/SW
	29,366	95	Weighted Average
	7,815		26.61% Pervious Area
	21,551		73.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 2S: South Basin 1 (East)

Runoff = 0.13 cfs @ 7.88 hrs, Volume= 0.041 af, Depth> 2.76"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	6,572	98	Pavement/SW
*	1,218	86	Landscaping
	7,790	96	Weighted Average
	1,218		15.64% Pervious Area
	6,572		84.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: South Basin 3 (West)

Runoff = 0.17 cfs @ 7.87 hrs, Volume= 0.057 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	9,915	98	Pavement/SW
	9,915		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4S: South Basin 2 (w/ Offsite)

Runoff = 0.35 cfs @ 7.87 hrs, Volume= 0.115 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	20,153	98	Pavement/SW
	20,153		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 5S: South Swale

Runoff = 0.06 cfs @ 7.95 hrs, Volume= 0.020 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	5,634	86	Landscaping
	5,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 6S: South Rooftop

Runoff = 0.19 cfs @ 7.87 hrs, Volume= 0.062 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	10,872	98	Future Rooftop
	10,872		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: North Basin 1 (East)

Runoff = 0.08 cfs @ 7.87 hrs, Volume= 0.026 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	4,510	98	Pavement/SW
	4,510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: North Roof

Runoff = 0.11 cfs @ 7.87 hrs, Volume= 0.034 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	6,009	98	Rooftop
	6,009		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: North Basin 2 (Middle)

Runoff = 0.07 cfs @ 7.87 hrs, Volume= 0.023 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	4,059	98	Pavement/SW
	4,059		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: Pavement / Future Roof

Runoff = 0.11 cfs @ 7.87 hrs, Volume= 0.035 af, Depth> 2.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	6,125	98	Rooftop/Pavement
	6,125		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: North Basin 1 (East)

Runoff = 0.13 cfs @ 7.78 hrs, Volume= 0.043 af, Depth> 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	7,562	98	Pavement/SW
	7,562		100.00% Impervious Area

Summary for Subcatchment 12S: Pond Area

Runoff = 0.17 cfs @ 7.95 hrs, Volume= 0.056 af, Depth> 1.93"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

	Area (sf)	CN	Description
*	14,645	86	Landscaping/Pond Area
*	651	98	Gravel Pond Access
	15,296	87	Weighted Average
	14,645		95.74% Pervious Area
	651		4.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: SW & N (Does not drain to Pond)

Runoff = 0.13 cfs @ 7.86 hrs, Volume= 0.043 af, Depth> 1.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Year Rainfall=3.22"

Area (sf)	CN	Description
12,235	86	<50% Grass cover, Poor, HSG C
12,235		100.00% Pervious Area

Summary for Reach 1R: East Bioswale

Inflow Area = 0.674 ac, 73.39% Impervious, Inflow Depth > 2.66" for 10-Year event
Inflow = 0.47 cfs @ 7.89 hrs, Volume= 0.149 af
Outflow = 0.46 cfs @ 8.08 hrs, Volume= 0.148 af, Atten= 2%, Lag= 11.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.25 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 12.0 min

Peak Storage= 183 cf @ 7.98 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 5.5 sf, Capacity= 2.11 cfs

2.50' x 1.00' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 8.50'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 14.50', Outlet Invert= 14.00'

‡

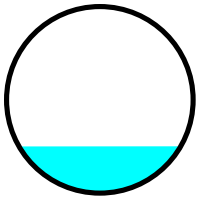
Summary for Reach 2R: 8" DI @ 0.0050

Inflow Area = 0.179 ac, 84.36% Impervious, Inflow Depth > 2.76" for 10-Year event
Inflow = 0.13 cfs @ 7.88 hrs, Volume= 0.041 af
Outflow = 0.13 cfs @ 7.92 hrs, Volume= 0.041 af, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.87 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 2.0 min

Peak Storage= 9 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 124.0' Slope= 0.0050 '/'
Inlet Invert= 15.47', Outlet Invert= 14.85'



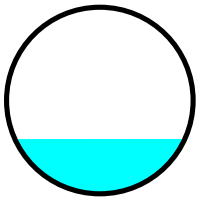
Summary for Reach 3R: 8" DI @ 0.0050

Inflow Area = 0.228 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.17 cfs @ 7.87 hrs, Volume= 0.057 af
Outflow = 0.17 cfs @ 7.90 hrs, Volume= 0.057 af, Atten= 0%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.03 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.15 fps, Avg. Travel Time= 1.8 min

Peak Storage= 11 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.92 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 127.0' Slope= 0.0050 '/'
Inlet Invert= 15.48', Outlet Invert= 14.85'



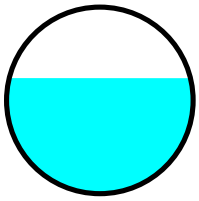
Summary for Reach 4R: 8" DI @ 0.0050

Inflow Area = 0.869 ac, 96.78% Impervious, Inflow Depth > 2.94" for 10-Year event
Inflow = 0.65 cfs @ 7.89 hrs, Volume= 0.213 af
Outflow = 0.65 cfs @ 7.90 hrs, Volume= 0.213 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.88 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.70 fps, Avg. Travel Time= 0.5 min

Peak Storage= 11 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 48.0' Slope= 0.0050 '/'
Inlet Invert= 14.85', Outlet Invert= 14.61'



Summary for Reach 5R: South Bioswale

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 2.80" for 10-Year event
Inflow = 0.71 cfs @ 7.90 hrs, Volume= 0.233 af
Outflow = 0.70 cfs @ 8.09 hrs, Volume= 0.231 af, Atten= 2%, Lag= 11.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.25 fps, Min. Travel Time= 6.6 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 13.1 min

Peak Storage= 280 cf @ 7.98 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.33' Flow Area= 13.3 sf, Capacity= 6.61 cfs

6.00' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 13.98'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 13.79', Outlet Invert= 13.29'

‡

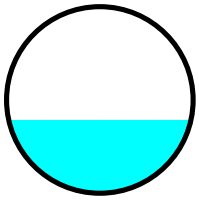
Summary for Reach 6R: 12" DI @ 0.0025

Inflow Area = 0.924 ac, 80.58% Impervious, Inflow Depth > 2.73" for 10-Year event
Inflow = 0.64 cfs @ 8.02 hrs, Volume= 0.210 af
Outflow = 0.63 cfs @ 8.11 hrs, Volume= 0.209 af, Atten= 1%, Lag= 5.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.20 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 1.26 fps, Avg. Travel Time= 5.8 min

Peak Storage= 127 cf @ 8.06 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.93 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 440.0' Slope= 0.0025 '/'
Inlet Invert= 14.00', Outlet Invert= 12.90'



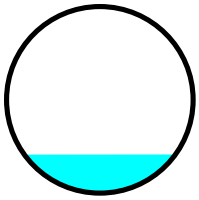
Summary for Reach 7R: 12" DI @ 0.0025

Inflow Area = 0.241 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.18 cfs @ 7.89 hrs, Volume= 0.060 af
Outflow = 0.18 cfs @ 7.94 hrs, Volume= 0.060 af, Atten= 0%, Lag= 3.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.55 fps, Min. Travel Time= 1.9 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 3.3 min

Peak Storage= 21 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 174.0' Slope= 0.0025 '/'
Inlet Invert= 14.81', Outlet Invert= 14.37'



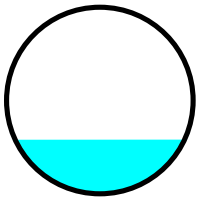
Summary for Reach 9R: 12" DI @ 0.0025

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.36 cfs @ 7.91 hrs, Volume= 0.118 af
Outflow = 0.36 cfs @ 7.94 hrs, Volume= 0.118 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.89 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 1.07 fps, Avg. Travel Time= 1.7 min

Peak Storage= 21 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.95 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 110.0' Slope= 0.0025 '/'
Inlet Invert= 14.42', Outlet Invert= 14.14'



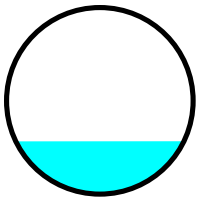
Summary for Reach 10R: 6" CPP @ 0.0100

Inflow Area = 0.141 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.11 cfs @ 7.87 hrs, Volume= 0.035 af
Outflow = 0.11 cfs @ 7.88 hrs, Volume= 0.035 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.33 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 0.7 min

Peak Storage= 2 cf @ 7.87 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 53.0' Slope= 0.0100 '/'
Inlet Invert= 14.90', Outlet Invert= 14.37'



Summary for Reach 11R: West Bioswale

Inflow Area = 0.649 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.49 cfs @ 7.90 hrs, Volume= 0.161 af
Outflow = 0.47 cfs @ 8.09 hrs, Volume= 0.160 af, Atten= 3%, Lag= 11.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.26 fps, Min. Travel Time= 6.8 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 12.3 min

Peak Storage= 195 cf @ 7.97 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.33' Flow Area= 8.6 sf, Capacity= 3.90 cfs

2.50' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 10.48'
Length= 105.0' Slope= 0.0050 '/'
Inlet Invert= 13.83', Outlet Invert= 13.30'

‡

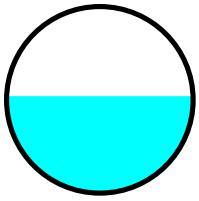
Summary for Reach 12R: 8" DI @ 0.0100

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 2.77" for 10-Year event
Inflow = 0.70 cfs @ 8.09 hrs, Volume= 0.231 af
Outflow = 0.70 cfs @ 8.10 hrs, Volume= 0.231 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.23 fps, Avg. Travel Time= 0.3 min

Peak Storage= 7 cf @ 8.10 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 40.0' Slope= 0.0100 '/'
Inlet Invert= 13.01', Outlet Invert= 12.61'



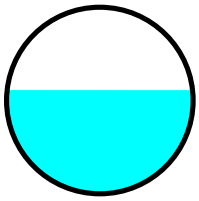
Summary for Reach 13R: 12" @ 0.0025

Inflow Area = 1.922 ac, 82.48% Impervious, Inflow Depth > 2.75" for 10-Year event
Inflow = 1.33 cfs @ 8.11 hrs, Volume= 0.440 af
Outflow = 1.33 cfs @ 8.13 hrs, Volume= 0.440 af, Atten= 0%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.96 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 1.2 min

Peak Storage= 54 cf @ 8.12 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.23 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 120.0' Slope= 0.0033 '/'
Inlet Invert= 12.90', Outlet Invert= 12.50'



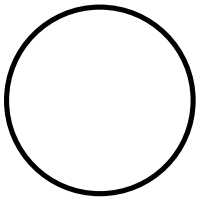
Summary for Reach 14R: Outfall

Inflow Area = 3.203 ac, 70.22% Impervious, Inflow Depth > 2.14" for 10-Year event
Inflow = 0.69 cfs @ 9.06 hrs, Volume= 0.570 af
Outflow = 0.69 cfs @ 9.08 hrs, Volume= 0.570 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 6.53 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.65 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 9.08 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 12.50', Outlet Invert= 12.30'



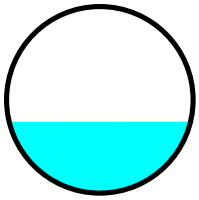
Summary for Reach RD1: 6" RD @ 0.0100

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.19 cfs @ 7.87 hrs, Volume= 0.062 af
Outflow = 0.19 cfs @ 7.90 hrs, Volume= 0.062 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.74 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 1.6 min

Peak Storage= 10 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.50', Outlet Invert= 14.00'



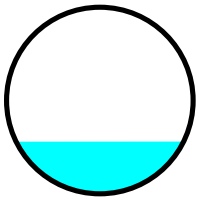
Summary for Reach RD2: 6" RD @ 0.0100

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 2.98" for 10-Year event
Inflow = 0.11 cfs @ 7.87 hrs, Volume= 0.034 af
Outflow = 0.11 cfs @ 7.90 hrs, Volume= 0.034 af, Atten= 0%, Lag= 1.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.32 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 1.9 min

Peak Storage= 7 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.87', Outlet Invert= 14.37'



Summary for Pond 1P: Detention Pond

Inflow Area = 2.922 ac, 76.97% Impervious, Inflow Depth > 2.69" for 10-Year event
Inflow = 1.93 cfs @ 8.08 hrs, Volume= 0.656 af
Outflow = 0.65 cfs @ 9.20 hrs, Volume= 0.527 af, Atten= 66%, Lag= 67.5 min
Primary = 0.65 cfs @ 9.20 hrs, Volume= 0.527 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 14.36' @ 9.20 hrs Surf.Area= 5,697 sf Storage= 7,901 cf

Plug-Flow detention time= 240.7 min calculated for 0.527 af (80% of inflow)
Center-of-Mass det. time= 113.2 min (813.1 - 699.9)

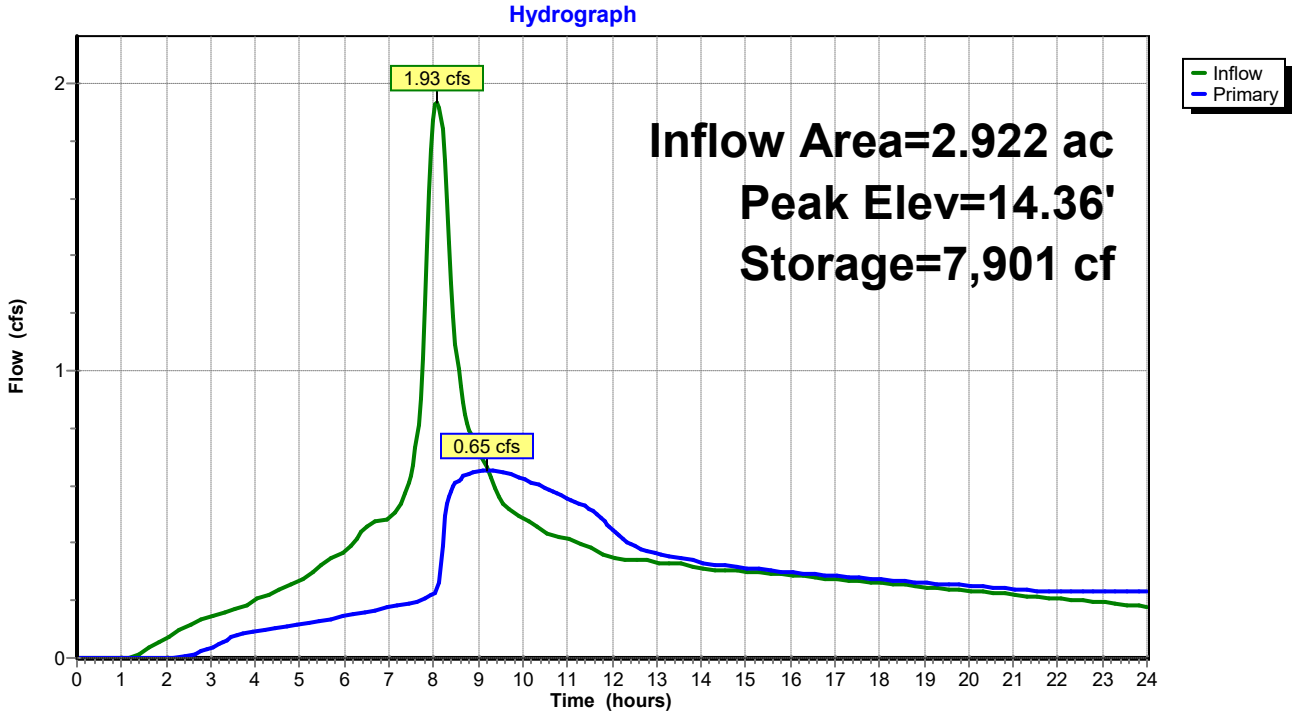
Volume	Invert	Avail.Storage	Storage Description
#1	12.50'	15,331 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.71

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.50	4,453	0	0
13.00	5,073	2,382	2,382
13.50	5,892	2,741	5,123
14.00	7,195	3,272	8,395
14.50	8,350	3,886	12,281
15.00	9,298	4,412	16,693
15.50	10,305	4,901	21,594

Device	Routing	Invert	Outlet Devices
#1	Primary	12.50'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 12.50' / 12.50' S= 0.0000 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	12.50'	**2.7" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.00'	**5.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.65 cfs @ 9.20 hrs HW=14.36' (Free Discharge)
└**1=Culvert** (Passes 0.65 cfs of 4.21 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.26 cfs @ 6.57 fps)
  └**3=Orifice/Grate** (Orifice Controls 0.39 cfs @ 2.89 fps)

Pond 1P: Detention Pond



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: East of Bldg Runoff Area=29,366 sf 73.39% Impervious Runoff Depth>5.08"
Tc=6.0 min CN=95 Runoff=0.89 cfs 0.285 af

Subcatchment 2S: South Basin 1 (East) Runoff Area=7,790 sf 84.36% Impervious Runoff Depth>5.19"
Tc=6.0 min CN=96 Runoff=0.24 cfs 0.077 af

Subcatchment 3S: South Basin 3 (West) Runoff Area=9,915 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.31 cfs 0.103 af

Subcatchment 4S: South Basin 2 (w/ Runoff Area=20,153 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.63 cfs 0.209 af

Subcatchment 5S: South Swale Runoff Area=5,634 sf 0.00% Impervious Runoff Depth>4.09"
Tc=6.0 min CN=86 Runoff=0.14 cfs 0.044 af

Subcatchment 6S: South Rooftop Runoff Area=10,872 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.34 cfs 0.113 af

Subcatchment 7S: North Basin 1 (East) Runoff Area=4,510 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.14 cfs 0.047 af

Subcatchment 8S: North Roof Runoff Area=6,009 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.19 cfs 0.062 af

Subcatchment 9S: North Basin 2 (Middle) Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.13 cfs 0.042 af

Subcatchment 10S: Pavement / Future Runoff Area=6,125 sf 100.00% Impervious Runoff Depth>5.42"
Tc=6.0 min CN=98 Runoff=0.19 cfs 0.064 af

Subcatchment 11S: North Basin 1 (East) Runoff Area=7,562 sf 100.00% Impervious Runoff Depth>5.43"
Tc=0.0 min CN=98 Runoff=0.24 cfs 0.079 af

Subcatchment 12S: Pond Area Runoff Area=15,296 sf 4.26% Impervious Runoff Depth>4.20"
Tc=6.0 min CN=87 Runoff=0.39 cfs 0.123 af

Subcatchment 13S: SW & N (Does not drain Runoff Area=12,235 sf 0.00% Impervious Runoff Depth>4.10"
Tc=0.0 min CN=86 Runoff=0.30 cfs 0.096 af

Reach 1R: East Bioswale Avg. Flow Depth=0.65' Max Vel=0.30 fps Inflow=0.89 cfs 0.285 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=2.11 cfs Outflow=0.87 cfs 0.283 af

Reach 2R: 8" DI @ 0.0050 Avg. Flow Depth=0.23' Max Vel=2.22 fps Inflow=0.24 cfs 0.077 af
8.0" Round Pipe n=0.012 L=124.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.24 cfs 0.077 af

Reach 3R: 8" DI @ 0.0050 Avg. Flow Depth=0.27' Max Vel=2.38 fps Inflow=0.31 cfs 0.103 af
8.0" Round Pipe n=0.012 L=127.0' S=0.0050 '/' Capacity=0.92 cfs Outflow=0.31 cfs 0.103 af

Reach 4R: 8" DI @ 0.0050 Avg. Flow Depth=0.67' Max Vel=3.02 fps Inflow=1.18 cfs 0.389 af
8.0" Round Pipe n=0.012 L=48.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.93 cfs 0.389 af

Reach 5R: South Bioswale Avg. Flow Depth=0.49' Max Vel=0.29 fps Inflow=1.06 cfs 0.433 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=6.61 cfs Outflow=1.06 cfs 0.430 af

Reach 6R: 12" DI @ 0.0025 Avg. Flow Depth=0.57' Max Vel=2.59 fps Inflow=1.20 cfs 0.396 af
12.0" Round Pipe n=0.012 L=440.0' S=0.0025 '/' Capacity=1.93 cfs Outflow=1.19 cfs 0.395 af

Reach 7R: 12" DI @ 0.0025 Avg. Flow Depth=0.28' Max Vel=1.84 fps Inflow=0.33 cfs 0.109 af
12.0" Round Pipe n=0.012 L=174.0' S=0.0025 '/' Capacity=1.94 cfs Outflow=0.33 cfs 0.109 af

Reach 9R: 12" DI @ 0.0025 Avg. Flow Depth=0.40' Max Vel=2.23 fps Inflow=0.64 cfs 0.215 af
12.0" Round Pipe n=0.012 L=110.0' S=0.0025 '/' Capacity=1.95 cfs Outflow=0.64 cfs 0.214 af

Reach 10R: 6" CPP @ 0.0100 Avg. Flow Depth=0.19' Max Vel=2.74 fps Inflow=0.19 cfs 0.064 af
6.0" Round Pipe n=0.012 L=53.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.19 cfs 0.064 af

Reach 11R: West Bioswale Avg. Flow Depth=0.64' Max Vel=0.30 fps Inflow=0.87 cfs 0.293 af
n=0.200 L=105.0' S=0.0050 '/' Capacity=3.90 cfs Outflow=0.86 cfs 0.291 af

Reach 12R: 8" DI @ 0.0100 Avg. Flow Depth=0.46' Max Vel=4.18 fps Inflow=1.06 cfs 0.430 af
8.0" Round Pipe n=0.012 L=40.0' S=0.0100 '/' Capacity=1.31 cfs Outflow=1.06 cfs 0.430 af

Reach 13R: 12" @ 0.0025 Avg. Flow Depth=0.83' Max Vel=3.23 fps Inflow=2.25 cfs 0.825 af
12.0" Round Pipe n=0.012 L=120.0' S=0.0033 '/' Capacity=2.23 cfs Outflow=2.25 cfs 0.825 af

Reach 14R: Outfall Avg. Flow Depth=0.12' Max Vel=7.80 fps Inflow=1.22 cfs 1.189 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=1.22 cfs 1.189 af

Reach RD1: 6" RD @ 0.0100 Avg. Flow Depth=0.27' Max Vel=3.18 fps Inflow=0.34 cfs 0.113 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.34 cfs 0.113 af

Reach RD2: 6" RD @ 0.0100 Avg. Flow Depth=0.19' Max Vel=2.73 fps Inflow=0.19 cfs 0.062 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.19 cfs 0.062 af

Pond 1P: Detention Pond Peak Elev=15.46' Storage=15,065 cf Inflow=3.45 cfs 1.239 af
Outflow=1.12 cfs 1.093 af

Total Runoff Area = 3.203 ac Runoff Volume = 1.344 af Average Runoff Depth = 5.03"
29.78% Pervious = 0.954 ac 70.22% Impervious = 2.249 ac

Summary for Subcatchment 1S: East of Bldg

Runoff = 0.89 cfs @ 7.88 hrs, Volume= 0.285 af, Depth> 5.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	7,815	86	Landscaping
*	21,551	98	Pavement/SW
	29,366	95	Weighted Average
	7,815		26.61% Pervious Area
	21,551		73.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 2S: South Basin 1 (East)

Runoff = 0.24 cfs @ 7.87 hrs, Volume= 0.077 af, Depth> 5.19"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	6,572	98	Pavement/SW
*	1,218	86	Landscaping
	7,790	96	Weighted Average
	1,218		15.64% Pervious Area
	6,572		84.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: South Basin 3 (West)

Runoff = 0.31 cfs @ 7.87 hrs, Volume= 0.103 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	9,915	98	Pavement/SW
	9,915		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4S: South Basin 2 (w/ Offsite)

Runoff = 0.63 cfs @ 7.87 hrs, Volume= 0.209 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	20,153	98	Pavement/SW
	20,153		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 5S: South Swale

Runoff = 0.14 cfs @ 7.92 hrs, Volume= 0.044 af, Depth> 4.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	5,634	86	Landscaping
	5,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 6S: South Rooftop

Runoff = 0.34 cfs @ 7.87 hrs, Volume= 0.113 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	10,872	98	Future Rooftop
	10,872		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: North Basin 1 (East)

Runoff = 0.14 cfs @ 7.87 hrs, Volume= 0.047 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	4,510	98	Pavement/SW
	4,510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: North Roof

Runoff = 0.19 cfs @ 7.87 hrs, Volume= 0.062 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	6,009	98	Rooftop
	6,009		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: North Basin 2 (Middle)

Runoff = 0.13 cfs @ 7.87 hrs, Volume= 0.042 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	4,059	98	Pavement/SW
	4,059		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: Pavement / Future Roof

Runoff = 0.19 cfs @ 7.87 hrs, Volume= 0.064 af, Depth> 5.42"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	6,125	98	Rooftop/Pavement
	6,125		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: North Basin 1 (East)

Runoff = 0.24 cfs @ 7.78 hrs, Volume= 0.079 af, Depth> 5.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	7,562	98	Pavement/SW
	7,562		100.00% Impervious Area

Summary for Subcatchment 12S: Pond Area

Runoff = 0.39 cfs @ 7.91 hrs, Volume= 0.123 af, Depth> 4.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

	Area (sf)	CN	Description
*	14,645	86	Landscaping/Pond Area
*	651	98	Gravel Pond Access
	15,296	87	Weighted Average
	14,645		95.74% Pervious Area
	651		4.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: SW & N (Does not drain to Pond)

Runoff = 0.30 cfs @ 7.82 hrs, Volume= 0.096 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Year Rainfall=5.67"

Area (sf)	CN	Description
12,235	86	<50% Grass cover, Poor, HSG C
12,235		100.00% Pervious Area

Summary for Reach 1R: East Bioswale

Inflow Area = 0.674 ac, 73.39% Impervious, Inflow Depth > 5.08" for 100-Year event
Inflow = 0.89 cfs @ 7.88 hrs, Volume= 0.285 af
Outflow = 0.87 cfs @ 8.04 hrs, Volume= 0.283 af, Atten= 1%, Lag= 9.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.30 fps, Min. Travel Time= 5.5 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 9.8 min

Peak Storage= 289 cf @ 7.95 hrs
Average Depth at Peak Storage= 0.65'
Bank-Full Depth= 1.00' Flow Area= 5.5 sf, Capacity= 2.11 cfs

2.50' x 1.00' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 8.50'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 14.50', Outlet Invert= 14.00'

‡

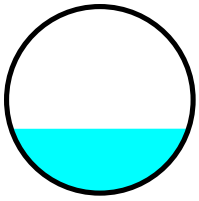
Summary for Reach 2R: 8" DI @ 0.0050

Inflow Area = 0.179 ac, 84.36% Impervious, Inflow Depth > 5.19" for 100-Year event
Inflow = 0.24 cfs @ 7.87 hrs, Volume= 0.077 af
Outflow = 0.24 cfs @ 7.90 hrs, Volume= 0.077 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.27 fps, Avg. Travel Time= 1.6 min

Peak Storage= 13 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 124.0' Slope= 0.0050 '/'
Inlet Invert= 15.47', Outlet Invert= 14.85'



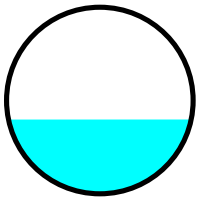
Summary for Reach 3R: 8" DI @ 0.0050

Inflow Area = 0.228 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.31 cfs @ 7.87 hrs, Volume= 0.103 af
Outflow = 0.31 cfs @ 7.90 hrs, Volume= 0.103 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.38 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 1.5 min

Peak Storage= 17 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.92 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 127.0' Slope= 0.0050 '/'
Inlet Invert= 15.48', Outlet Invert= 14.85'



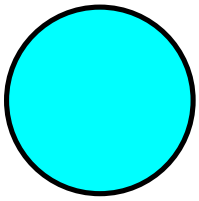
Summary for Reach 4R: 8" DI @ 0.0050

Inflow Area = 0.869 ac, 96.78% Impervious, Inflow Depth > 5.37" for 100-Year event
Inflow = 1.18 cfs @ 7.88 hrs, Volume= 0.389 af
Outflow = 0.93 cfs @ 7.65 hrs, Volume= 0.389 af, Atten= 21%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.02 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.00 fps, Avg. Travel Time= 0.4 min

Peak Storage= 17 cf @ 7.70 hrs
Average Depth at Peak Storage= 0.67'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 48.0' Slope= 0.0050 '/'
Inlet Invert= 14.85', Outlet Invert= 14.61'



Summary for Reach 5R: South Bioswale

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 5.21" for 100-Year event
Inflow = 1.06 cfs @ 7.92 hrs, Volume= 0.433 af
Outflow = 1.06 cfs @ 8.09 hrs, Volume= 0.430 af, Atten= 0%, Lag= 10.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.29 fps, Min. Travel Time= 5.8 min
Avg. Velocity = 0.16 fps, Avg. Travel Time= 10.5 min

Peak Storage= 369 cf @ 7.99 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 1.33' Flow Area= 13.3 sf, Capacity= 6.61 cfs

6.00' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 13.98'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 13.79', Outlet Invert= 13.29'

‡

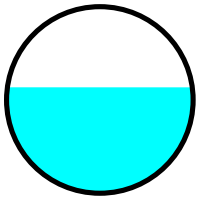
Summary for Reach 6R: 12" DI @ 0.0025

Inflow Area = 0.924 ac, 80.58% Impervious, Inflow Depth > 5.15" for 100-Year event
Inflow = 1.20 cfs @ 8.00 hrs, Volume= 0.396 af
Outflow = 1.19 cfs @ 8.08 hrs, Volume= 0.395 af, Atten= 1%, Lag= 4.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.59 fps, Min. Travel Time= 2.8 min
Avg. Velocity = 1.51 fps, Avg. Travel Time= 4.9 min

Peak Storage= 203 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.93 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 440.0' Slope= 0.0025 '/'
Inlet Invert= 14.00', Outlet Invert= 12.90'



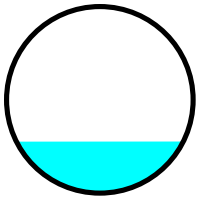
Summary for Reach 7R: 12" DI @ 0.0025

Inflow Area = 0.241 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.33 cfs @ 7.88 hrs, Volume= 0.109 af
Outflow = 0.33 cfs @ 7.93 hrs, Volume= 0.109 af, Atten= 0%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.84 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.05 fps, Avg. Travel Time= 2.8 min

Peak Storage= 31 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 174.0' Slope= 0.0025 '/'
Inlet Invert= 14.81', Outlet Invert= 14.37'



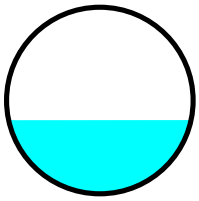
Summary for Reach 9R: 12" DI @ 0.0025

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.64 cfs @ 7.90 hrs, Volume= 0.215 af
Outflow = 0.64 cfs @ 7.93 hrs, Volume= 0.214 af, Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.23 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.28 fps, Avg. Travel Time= 1.4 min

Peak Storage= 32 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.95 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 110.0' Slope= 0.0025 '/'
Inlet Invert= 14.42', Outlet Invert= 14.14'



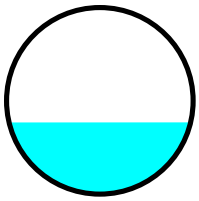
Summary for Reach 10R: 6" CPP @ 0.0100

Inflow Area = 0.141 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.19 cfs @ 7.87 hrs, Volume= 0.064 af
Outflow = 0.19 cfs @ 7.87 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.74 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 1.58 fps, Avg. Travel Time= 0.6 min

Peak Storage= 4 cf @ 7.87 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 53.0' Slope= 0.0100 '/'
Inlet Invert= 14.90', Outlet Invert= 14.37'



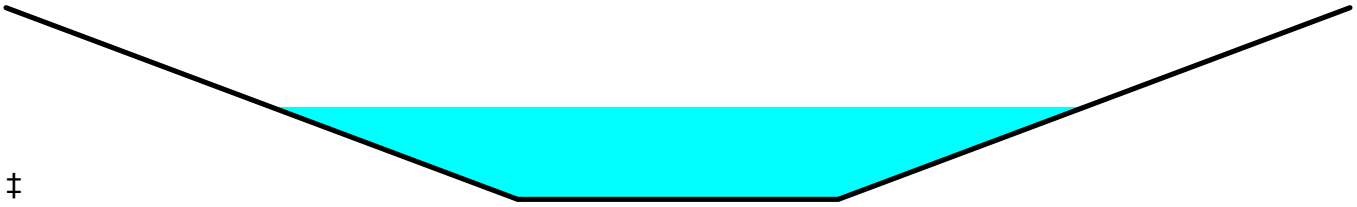
Summary for Reach 11R: West Bioswale

Inflow Area = 0.649 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.87 cfs @ 7.89 hrs, Volume= 0.293 af
Outflow = 0.86 cfs @ 8.05 hrs, Volume= 0.291 af, Atten= 2%, Lag= 9.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.30 fps, Min. Travel Time= 5.8 min
Avg. Velocity = 0.17 fps, Avg. Travel Time= 10.2 min

Peak Storage= 298 cf @ 7.96 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 1.33' Flow Area= 8.6 sf, Capacity= 3.90 cfs

2.50' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 10.48'
Length= 105.0' Slope= 0.0050 '/'
Inlet Invert= 13.83', Outlet Invert= 13.30'



‡

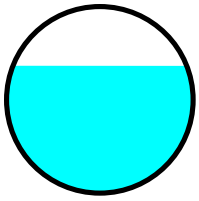
Summary for Reach 12R: 8" DI @ 0.0100

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 5.17" for 100-Year event
Inflow = 1.06 cfs @ 8.09 hrs, Volume= 0.430 af
Outflow = 1.06 cfs @ 8.09 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 4.18 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 0.3 min

Peak Storage= 10 cf @ 8.09 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 40.0' Slope= 0.0100 '/'
Inlet Invert= 13.01', Outlet Invert= 12.61'



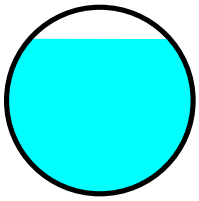
Summary for Reach 13R: 12" @ 0.0025

Inflow Area = 1.922 ac, 82.48% Impervious, Inflow Depth > 5.15" for 100-Year event
Inflow = 2.25 cfs @ 8.08 hrs, Volume= 0.825 af
Outflow = 2.25 cfs @ 8.10 hrs, Volume= 0.825 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.23 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.07 fps, Avg. Travel Time= 1.0 min

Peak Storage= 84 cf @ 8.09 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.23 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 120.0' Slope= 0.0033 '/'
Inlet Invert= 12.90', Outlet Invert= 12.50'



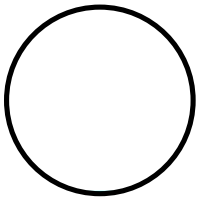
Summary for Reach 14R: Outfall

Inflow Area = 3.203 ac, 70.22% Impervious, Inflow Depth > 4.45" for 100-Year event
Inflow = 1.22 cfs @ 8.74 hrs, Volume= 1.189 af
Outflow = 1.22 cfs @ 8.74 hrs, Volume= 1.189 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 7.80 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 6.40 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 8.74 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 12.50', Outlet Invert= 12.30'



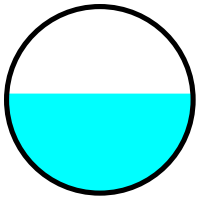
Summary for Reach RD1: 6" RD @ 0.0100

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.34 cfs @ 7.87 hrs, Volume= 0.113 af
Outflow = 0.34 cfs @ 7.89 hrs, Volume= 0.113 af, Atten= 0%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.18 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.87 fps, Avg. Travel Time= 1.3 min

Peak Storage= 16 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.50', Outlet Invert= 14.00'



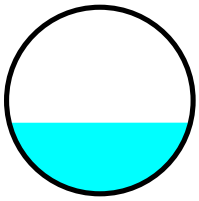
Summary for Reach RD2: 6" RD @ 0.0100

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 5.42" for 100-Year event
Inflow = 0.19 cfs @ 7.87 hrs, Volume= 0.062 af
Outflow = 0.19 cfs @ 7.90 hrs, Volume= 0.062 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.73 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.57 fps, Avg. Travel Time= 1.6 min

Peak Storage= 10 cf @ 7.88 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.87', Outlet Invert= 14.37'



Summary for Pond 1P: Detention Pond

Inflow Area = 2.922 ac, 76.97% Impervious, Inflow Depth > 5.09" for 100-Year event
Inflow = 3.45 cfs @ 8.04 hrs, Volume= 1.239 af
Outflow = 1.12 cfs @ 9.28 hrs, Volume= 1.093 af, Atten= 67%, Lag= 74.1 min
Primary = 1.12 cfs @ 9.28 hrs, Volume= 1.093 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 15.46' @ 9.28 hrs Surf.Area= 7,264 sf Storage= 15,065 cf

Plug-Flow detention time= 202.8 min calculated for 1.093 af (88% of inflow)
Center-of-Mass det. time= 120.7 min (800.8 - 680.1)

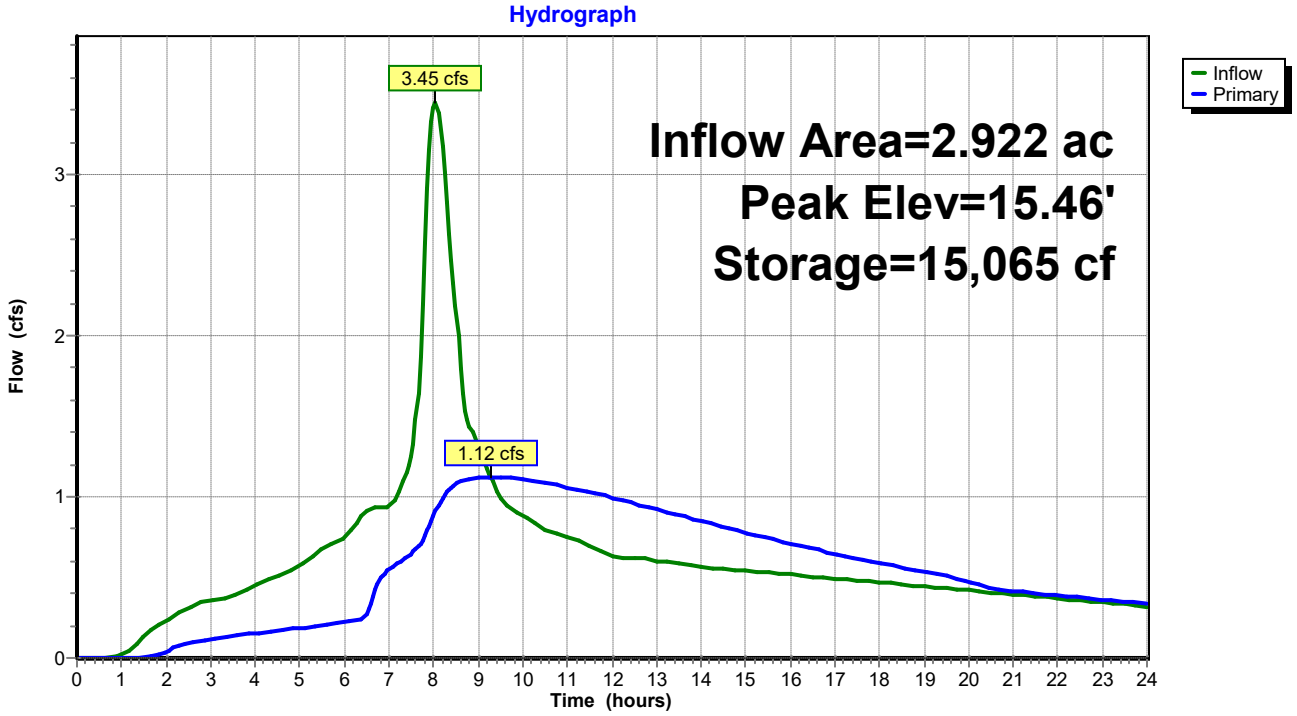
Volume	Invert	Avail.Storage	Storage Description
#1	12.50'	15,331 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.71

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.50	4,453	0	0
13.00	5,073	2,382	2,382
13.50	5,892	2,741	5,123
14.00	7,195	3,272	8,395
14.50	8,350	3,886	12,281
15.00	9,298	4,412	16,693
15.50	10,305	4,901	21,594

Device	Routing	Invert	Outlet Devices
#1	Primary	12.50'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 12.50' / 12.50' S= 0.0000 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	12.50'	**2.7" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.00'	**5.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.12 cfs @ 9.28 hrs HW=15.46' (Free Discharge)
└**1=Culvert** (Passes 1.12 cfs of 5.94 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.33 cfs @ 8.29 fps)
  └**3=Orifice/Grate** (Orifice Controls 0.79 cfs @ 5.82 fps)

Pond 1P: Detention Pond



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: East of Bldg Runoff Area=29,366 sf 73.39% Impervious Runoff Depth>0.90"
Tc=6.0 min CN=95 Runoff=0.16 cfs 0.051 af

Subcatchment 2S: South Basin 1 (East) Runoff Area=7,790 sf 84.36% Impervious Runoff Depth>0.98"
Tc=6.0 min CN=96 Runoff=0.05 cfs 0.015 af

Subcatchment 3S: South Basin 3 (West) Runoff Area=9,915 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.07 cfs 0.022 af

Subcatchment 4S: South Basin 2 (w/ Runoff Area=20,153 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.14 cfs 0.045 af

Subcatchment 5S: South Swale Runoff Area=5,634 sf 0.00% Impervious Runoff Depth>0.41"
Tc=6.0 min CN=86 Runoff=0.01 cfs 0.004 af

Subcatchment 6S: South Rooftop Runoff Area=10,872 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.08 cfs 0.024 af

Subcatchment 7S: North Basin 1 (East) Runoff Area=4,510 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.03 cfs 0.010 af

Subcatchment 8S: North Roof Runoff Area=6,009 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.013 af

Subcatchment 9S: North Basin 2 (Middle) Runoff Area=4,059 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.03 cfs 0.009 af

Subcatchment 10S: Pavement / Future Runoff Area=6,125 sf 100.00% Impervious Runoff Depth>1.16"
Tc=6.0 min CN=98 Runoff=0.04 cfs 0.014 af

Subcatchment 11S: North Basin 1 (East) Runoff Area=7,562 sf 100.00% Impervious Runoff Depth>1.16"
Tc=0.0 min CN=98 Runoff=0.05 cfs 0.017 af

Subcatchment 12S: Pond Area Runoff Area=15,296 sf 4.26% Impervious Runoff Depth>0.45"
Tc=6.0 min CN=87 Runoff=0.03 cfs 0.013 af

Subcatchment 13S: SW & N (Does not drain Runoff Area=12,235 sf 0.00% Impervious Runoff Depth>0.41"
Tc=0.0 min CN=86 Runoff=0.02 cfs 0.010 af

Reach 1R: East Bioswale Avg. Flow Depth=0.25' Max Vel=0.18 fps Inflow=0.16 cfs 0.051 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=2.11 cfs Outflow=0.15 cfs 0.050 af

Reach 2R: 8" DI @ 0.0050 Avg. Flow Depth=0.10' Max Vel=1.38 fps Inflow=0.05 cfs 0.015 af
8.0" Round Pipe n=0.012 L=124.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.05 cfs 0.015 af

Reach 3R: 8" DI @ 0.0050 Avg. Flow Depth=0.12' Max Vel=1.55 fps Inflow=0.07 cfs 0.022 af
8.0" Round Pipe n=0.012 L=127.0' S=0.0050 '/' Capacity=0.92 cfs Outflow=0.07 cfs 0.022 af

Reach 4R: 8" DI @ 0.0050 Avg. Flow Depth=0.24' Max Vel=2.26 fps Inflow=0.25 cfs 0.081 af
8.0" Round Pipe n=0.012 L=48.0' S=0.0050 '/' Capacity=0.93 cfs Outflow=0.25 cfs 0.081 af

Reach 5R: South Bioswale Avg. Flow Depth=0.22' Max Vel=0.18 fps Inflow=0.26 cfs 0.086 af
n=0.200 L=100.0' S=0.0050 '/' Capacity=6.61 cfs Outflow=0.25 cfs 0.085 af

Reach 6R: 12" DI @ 0.0025 Avg. Flow Depth=0.22' Max Vel=1.61 fps Inflow=0.21 cfs 0.074 af
12.0" Round Pipe n=0.012 L=440.0' S=0.0025 '/' Capacity=1.93 cfs Outflow=0.21 cfs 0.074 af

Reach 7R: 12" DI @ 0.0025 Avg. Flow Depth=0.13' Max Vel=1.18 fps Inflow=0.07 cfs 0.023 af
12.0" Round Pipe n=0.012 L=174.0' S=0.0025 '/' Capacity=1.94 cfs Outflow=0.07 cfs 0.023 af

Reach 9R: 12" DI @ 0.0025 Avg. Flow Depth=0.18' Max Vel=1.45 fps Inflow=0.14 cfs 0.046 af
12.0" Round Pipe n=0.012 L=110.0' S=0.0025 '/' Capacity=1.95 cfs Outflow=0.14 cfs 0.046 af

Reach 10R: 6" CPP @ 0.0100 Avg. Flow Depth=0.09' Max Vel=1.79 fps Inflow=0.04 cfs 0.014 af
6.0" Round Pipe n=0.012 L=53.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.04 cfs 0.014 af

Reach 11R: West Bioswale Avg. Flow Depth=0.28' Max Vel=0.19 fps Inflow=0.19 cfs 0.063 af
n=0.200 L=105.0' S=0.0050 '/' Capacity=3.90 cfs Outflow=0.18 cfs 0.062 af

Reach 12R: 8" DI @ 0.0100 Avg. Flow Depth=0.20' Max Vel=2.90 fps Inflow=0.25 cfs 0.085 af
8.0" Round Pipe n=0.012 L=40.0' S=0.0100 '/' Capacity=1.31 cfs Outflow=0.25 cfs 0.085 af

Reach 13R: 12" @ 0.0025 Avg. Flow Depth=0.31' Max Vel=2.24 fps Inflow=0.46 cfs 0.158 af
12.0" Round Pipe n=0.012 L=120.0' S=0.0033 '/' Capacity=2.23 cfs Outflow=0.46 cfs 0.158 af

Reach 14R: Outfall Avg. Flow Depth=0.03' Max Vel=5.53 fps Inflow=0.18 cfs 0.219 af
96.0" Round Pipe n=0.012 L=2.0' S=0.1000 '/' Capacity=3,124.60 cfs Outflow=0.18 cfs 0.219 af

Reach RD1: 6" RD @ 0.0100 Avg. Flow Depth=0.12' Max Vel=2.11 fps Inflow=0.08 cfs 0.024 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.08 cfs 0.024 af

Reach RD2: 6" RD @ 0.0100 Avg. Flow Depth=0.09' Max Vel=1.78 fps Inflow=0.04 cfs 0.013 af
6.0" Round Pipe n=0.012 L=150.0' S=0.0100 '/' Capacity=0.61 cfs Outflow=0.04 cfs 0.013 af

Pond 1P: Detention Pond Peak Elev=13.26' Storage=2,681 cf Inflow=0.66 cfs 0.233 af
Outflow=0.17 cfs 0.209 af

Total Runoff Area = 3.203 ac Runoff Volume = 0.246 af Average Runoff Depth = 0.92"
29.78% Pervious = 0.954 ac 70.22% Impervious = 2.249 ac

Summary for Subcatchment 1S: East of Bldg

Runoff = 0.16 cfs @ 7.93 hrs, Volume= 0.051 af, Depth> 0.90"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	7,815	86	Landscaping
*	21,551	98	Pavement/SW
	29,366	95	Weighted Average
	7,815		26.61% Pervious Area
	21,551		73.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 2S: South Basin 1 (East)

Runoff = 0.05 cfs @ 7.92 hrs, Volume= 0.015 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	6,572	98	Pavement/SW
*	1,218	86	Landscaping
	7,790	96	Weighted Average
	1,218		15.64% Pervious Area
	6,572		84.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 3S: South Basin 3 (West)

Runoff = 0.07 cfs @ 7.89 hrs, Volume= 0.022 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	9,915	98	Pavement/SW
	9,915		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 4S: South Basin 2 (w/ Offsite)

Runoff = 0.14 cfs @ 7.89 hrs, Volume= 0.045 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	20,153	98	Pavement/SW
	20,153		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 5S: South Swale

Runoff = 0.01 cfs @ 8.00 hrs, Volume= 0.004 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	5,634	86	Landscaping
	5,634		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 6S: South Rooftop

Runoff = 0.08 cfs @ 7.89 hrs, Volume= 0.024 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	10,872	98	Future Rooftop
	10,872		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 7S: North Basin 1 (East)

Runoff = 0.03 cfs @ 7.89 hrs, Volume= 0.010 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	4,510	98	Pavement/SW
	4,510		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 8S: North Roof

Runoff = 0.04 cfs @ 7.89 hrs, Volume= 0.013 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	6,009	98	Rooftop
	6,009		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 9S: North Basin 2 (Middle)

Runoff = 0.03 cfs @ 7.89 hrs, Volume= 0.009 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	4,059	98	Pavement/SW
	4,059		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 10S: Pavement / Future Roof

Runoff = 0.04 cfs @ 7.89 hrs, Volume= 0.014 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	6,125	98	Rooftop/Pavement
	6,125		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 11S: North Basin 1 (East)

Runoff = 0.05 cfs @ 7.80 hrs, Volume= 0.017 af, Depth> 1.16"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	7,562	98	Pavement/SW
	7,562		100.00% Impervious Area

Summary for Subcatchment 12S: Pond Area

Runoff = 0.03 cfs @ 8.00 hrs, Volume= 0.013 af, Depth> 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (sf)	CN	Description
*	14,645	86	Landscaping/Pond Area
*	651	98	Gravel Pond Access
	15,296	87	Weighted Average
	14,645		95.74% Pervious Area
	651		4.26% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry,**

Summary for Subcatchment 13S: SW & N (Does not drain to Pond)

Runoff = 0.02 cfs @ 7.93 hrs, Volume= 0.010 af, Depth> 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQ Rainfall=1.38"

Area (sf)	CN	Description
12,235	86	<50% Grass cover, Poor, HSG C
12,235		100.00% Pervious Area

Summary for Reach 1R: East Bioswale

Inflow Area = 0.674 ac, 73.39% Impervious, Inflow Depth > 0.90" for WQ event
Inflow = 0.16 cfs @ 7.93 hrs, Volume= 0.051 af
Outflow = 0.15 cfs @ 8.17 hrs, Volume= 0.050 af, Atten= 4%, Lag= 14.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.18 fps, Min. Travel Time= 9.2 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 17.0 min

Peak Storage= 83 cf @ 8.02 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 5.5 sf, Capacity= 2.11 cfs

2.50' x 1.00' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 8.50'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 14.50', Outlet Invert= 14.00'

‡

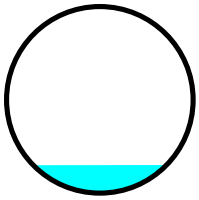
Summary for Reach 2R: 8" DI @ 0.0050

Inflow Area = 0.179 ac, 84.36% Impervious, Inflow Depth > 0.98" for WQ event
Inflow = 0.05 cfs @ 7.92 hrs, Volume= 0.015 af
Outflow = 0.05 cfs @ 7.96 hrs, Volume= 0.015 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.38 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 2.6 min

Peak Storage= 4 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.10'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 124.0' Slope= 0.0050 '/'
Inlet Invert= 15.47', Outlet Invert= 14.85'



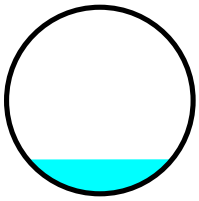
Summary for Reach 3R: 8" DI @ 0.0050

Inflow Area = 0.228 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.07 cfs @ 7.89 hrs, Volume= 0.022 af
Outflow = 0.07 cfs @ 7.93 hrs, Volume= 0.022 af, Atten= 0%, Lag= 2.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.55 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.87 fps, Avg. Travel Time= 2.4 min

Peak Storage= 6 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.92 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 127.0' Slope= 0.0050 '/'
Inlet Invert= 15.48', Outlet Invert= 14.85'



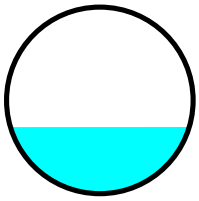
Summary for Reach 4R: 8" DI @ 0.0050

Inflow Area = 0.869 ac, 96.78% Impervious, Inflow Depth > 1.12" for WQ event
Inflow = 0.25 cfs @ 7.91 hrs, Volume= 0.081 af
Outflow = 0.25 cfs @ 7.93 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.26 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 0.6 min

Peak Storage= 5 cf @ 7.92 hrs
Average Depth at Peak Storage= 0.24'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 0.93 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 48.0' Slope= 0.0050 '/'
Inlet Invert= 14.85', Outlet Invert= 14.61'



Summary for Reach 5R: South Bioswale

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 1.03" for WQ event
Inflow = 0.26 cfs @ 7.93 hrs, Volume= 0.086 af
Outflow = 0.25 cfs @ 8.18 hrs, Volume= 0.085 af, Atten= 3%, Lag= 15.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.18 fps, Min. Travel Time= 9.4 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 18.9 min

Peak Storage= 144 cf @ 8.03 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 1.33' Flow Area= 13.3 sf, Capacity= 6.61 cfs

6.00' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 13.98'
Length= 100.0' Slope= 0.0050 '/'
Inlet Invert= 13.79', Outlet Invert= 13.29'

‡

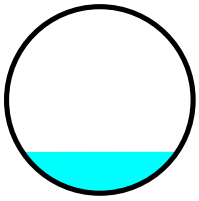
Summary for Reach 6R: 12" DI @ 0.0025

Inflow Area = 0.924 ac, 80.58% Impervious, Inflow Depth > 0.96" for WQ event
Inflow = 0.21 cfs @ 8.06 hrs, Volume= 0.074 af
Outflow = 0.21 cfs @ 8.20 hrs, Volume= 0.074 af, Atten= 2%, Lag= 8.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.61 fps, Min. Travel Time= 4.6 min
Avg. Velocity = 0.92 fps, Avg. Travel Time= 7.9 min

Peak Storage= 57 cf @ 8.12 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.93 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 440.0' Slope= 0.0025 '/'
Inlet Invert= 14.00', Outlet Invert= 12.90'



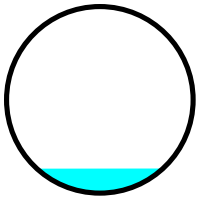
Summary for Reach 7R: 12" DI @ 0.0025

Inflow Area = 0.241 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.07 cfs @ 7.91 hrs, Volume= 0.023 af
Outflow = 0.07 cfs @ 7.98 hrs, Volume= 0.023 af, Atten= 0%, Lag= 4.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.66 fps, Avg. Travel Time= 4.4 min

Peak Storage= 11 cf @ 7.94 hrs
Average Depth at Peak Storage= 0.13'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.94 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 174.0' Slope= 0.0025 '/'
Inlet Invert= 14.81', Outlet Invert= 14.37'



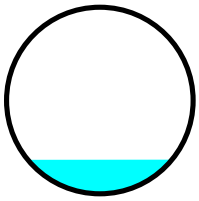
Summary for Reach 9R: 12" DI @ 0.0025

Inflow Area = 0.475 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.14 cfs @ 7.94 hrs, Volume= 0.046 af
Outflow = 0.14 cfs @ 7.98 hrs, Volume= 0.046 af, Atten= 0%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.45 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.82 fps, Avg. Travel Time= 2.2 min

Peak Storage= 11 cf @ 7.96 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 1.95 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 110.0' Slope= 0.0025 '/'
Inlet Invert= 14.42', Outlet Invert= 14.14'



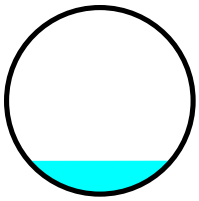
Summary for Reach 10R: 6" CPP @ 0.0100

Inflow Area = 0.141 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.04 cfs @ 7.89 hrs, Volume= 0.014 af
Outflow = 0.04 cfs @ 7.90 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.79 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 0.9 min

Peak Storage= 1 cf @ 7.89 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 53.0' Slope= 0.0100 '/'
Inlet Invert= 14.90', Outlet Invert= 14.37'



Summary for Reach 11R: West Bioswale

Inflow Area = 0.649 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.19 cfs @ 7.93 hrs, Volume= 0.063 af
Outflow = 0.18 cfs @ 8.16 hrs, Volume= 0.062 af, Atten= 6%, Lag= 13.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.19 fps, Min. Travel Time= 9.1 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 16.9 min

Peak Storage= 100 cf @ 8.01 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.33' Flow Area= 8.6 sf, Capacity= 3.90 cfs

2.50' x 1.33' deep channel, n= 0.200
Side Slope Z-value= 3.0 '/' Top Width= 10.48'
Length= 105.0' Slope= 0.0050 '/'
Inlet Invert= 13.83', Outlet Invert= 13.30'

‡

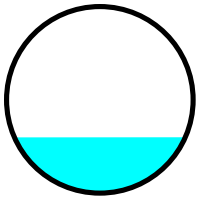
Summary for Reach 12R: 8" DI @ 0.0100

Inflow Area = 0.998 ac, 84.25% Impervious, Inflow Depth > 1.02" for WQ event
Inflow = 0.25 cfs @ 8.18 hrs, Volume= 0.085 af
Outflow = 0.25 cfs @ 8.19 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.90 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.67 fps, Avg. Travel Time= 0.4 min

Peak Storage= 4 cf @ 8.18 hrs
Average Depth at Peak Storage= 0.20'
Bank-Full Depth= 0.67' Flow Area= 0.3 sf, Capacity= 1.31 cfs

8.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 40.0' Slope= 0.0100 '/'
Inlet Invert= 13.01', Outlet Invert= 12.61'



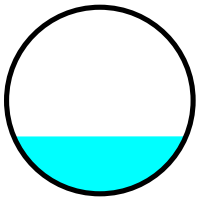
Summary for Reach 13R: 12" @ 0.0025

Inflow Area = 1.922 ac, 82.48% Impervious, Inflow Depth > 0.99" for WQ event
Inflow = 0.46 cfs @ 8.19 hrs, Volume= 0.158 af
Outflow = 0.46 cfs @ 8.22 hrs, Volume= 0.158 af, Atten= 0%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.24 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.29 fps, Avg. Travel Time= 1.6 min

Peak Storage= 25 cf @ 8.20 hrs
Average Depth at Peak Storage= 0.31'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.23 cfs

12.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 120.0' Slope= 0.0033 '/'
Inlet Invert= 12.90', Outlet Invert= 12.50'



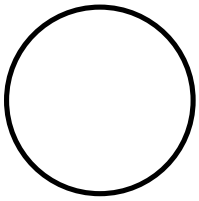
Summary for Reach 14R: Outfall

Inflow Area = 3.203 ac, 70.22% Impervious, Inflow Depth > 0.82" for WQ event
Inflow = 0.18 cfs @ 10.56 hrs, Volume= 0.219 af
Outflow = 0.18 cfs @ 10.57 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 5.53 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 5.53 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 10.57 hrs
Average Depth at Peak Storage= 0.03'
Bank-Full Depth= 8.00' Flow Area= 50.3 sf, Capacity= 3,124.60 cfs

96.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 2.0' Slope= 0.1000 '/'
Inlet Invert= 12.50', Outlet Invert= 12.30'



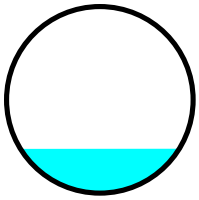
Summary for Reach RD1: 6" RD @ 0.0100

Inflow Area = 0.250 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.08 cfs @ 7.89 hrs, Volume= 0.024 af
Outflow = 0.08 cfs @ 7.92 hrs, Volume= 0.024 af, Atten= 0%, Lag= 2.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.11 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.19 fps, Avg. Travel Time= 2.1 min

Peak Storage= 5 cf @ 7.90 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.50', Outlet Invert= 14.00'



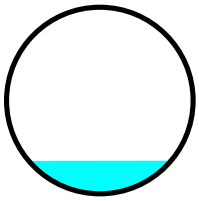
Summary for Reach RD2: 6" RD @ 0.0100

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 1.16" for WQ event
Inflow = 0.04 cfs @ 7.89 hrs, Volume= 0.013 af
Outflow = 0.04 cfs @ 7.93 hrs, Volume= 0.013 af, Atten= 0%, Lag= 2.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.78 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 2.5 min

Peak Storage= 4 cf @ 7.91 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50' Flow Area= 0.2 sf, Capacity= 0.61 cfs

6.0" Round Pipe
n= 0.012 Concrete pipe, finished
Length= 150.0' Slope= 0.0100 '/'
Inlet Invert= 15.87', Outlet Invert= 14.37'



Summary for Pond 1P: Detention Pond

Inflow Area = 2.922 ac, 76.97% Impervious, Inflow Depth > 0.96" for WQ event
Inflow = 0.66 cfs @ 8.19 hrs, Volume= 0.233 af
Outflow = 0.17 cfs @ 10.58 hrs, Volume= 0.209 af, Atten= 75%, Lag= 143.4 min
Primary = 0.17 cfs @ 10.58 hrs, Volume= 0.209 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Peak Elev= 13.26' @ 10.58 hrs Surf.Area= 3,908 sf Storage= 2,681 cf

Plug-Flow detention time= 213.4 min calculated for 0.209 af (90% of inflow)
Center-of-Mass det. time= 145.8 min (887.3 - 741.5)

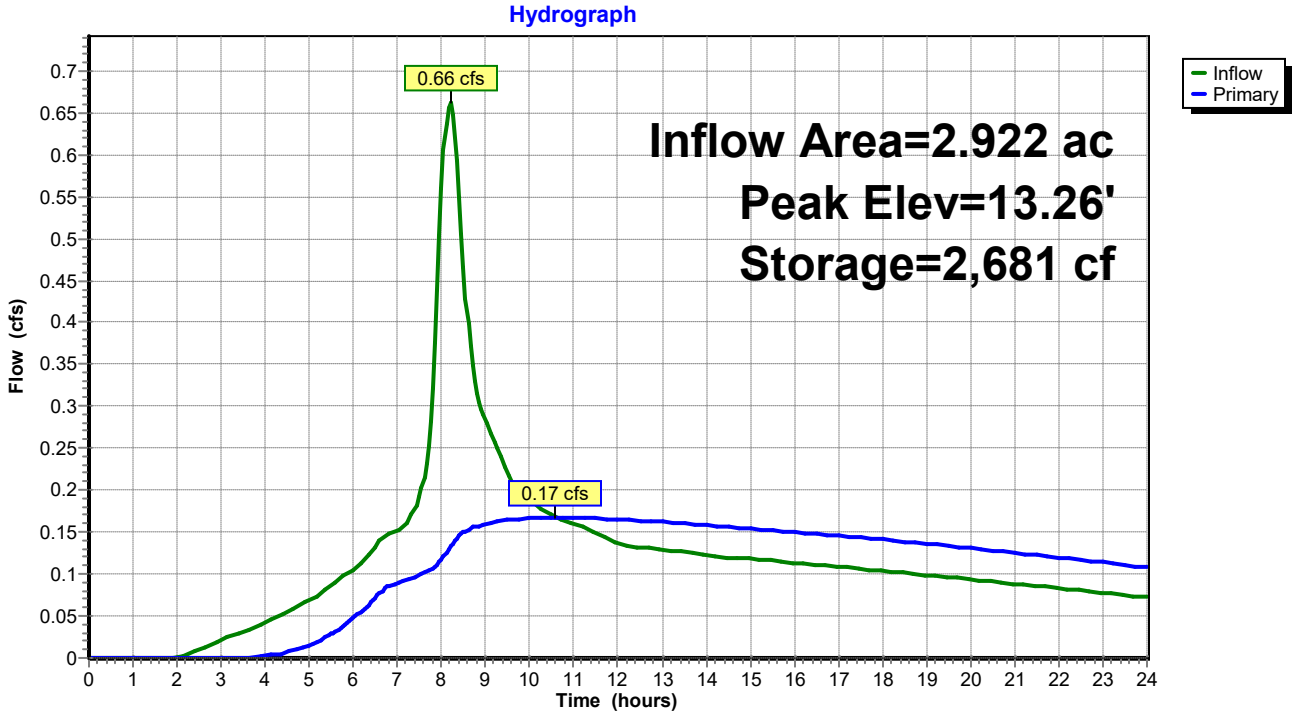
Volume	Invert	Avail.Storage	Storage Description
#1	12.50'	15,331 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 0.71

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
12.50	4,453	0	0
13.00	5,073	2,382	2,382
13.50	5,892	2,741	5,123
14.00	7,195	3,272	8,395
14.50	8,350	3,886	12,281
15.00	9,298	4,412	16,693
15.50	10,305	4,901	21,594

Device	Routing	Invert	Outlet Devices
#1	Primary	12.50'	**12.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 12.50' / 12.50' S= 0.0000 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	12.50'	**2.7" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	14.00'	**5.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.17 cfs @ 10.58 hrs HW=13.26' (Free Discharge)
└─**1=Culvert** (Passes 0.17 cfs of 1.19 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.17 cfs @ 4.21 fps)
  └─**3=Orifice/Grate** (Controls 0.00 cfs)

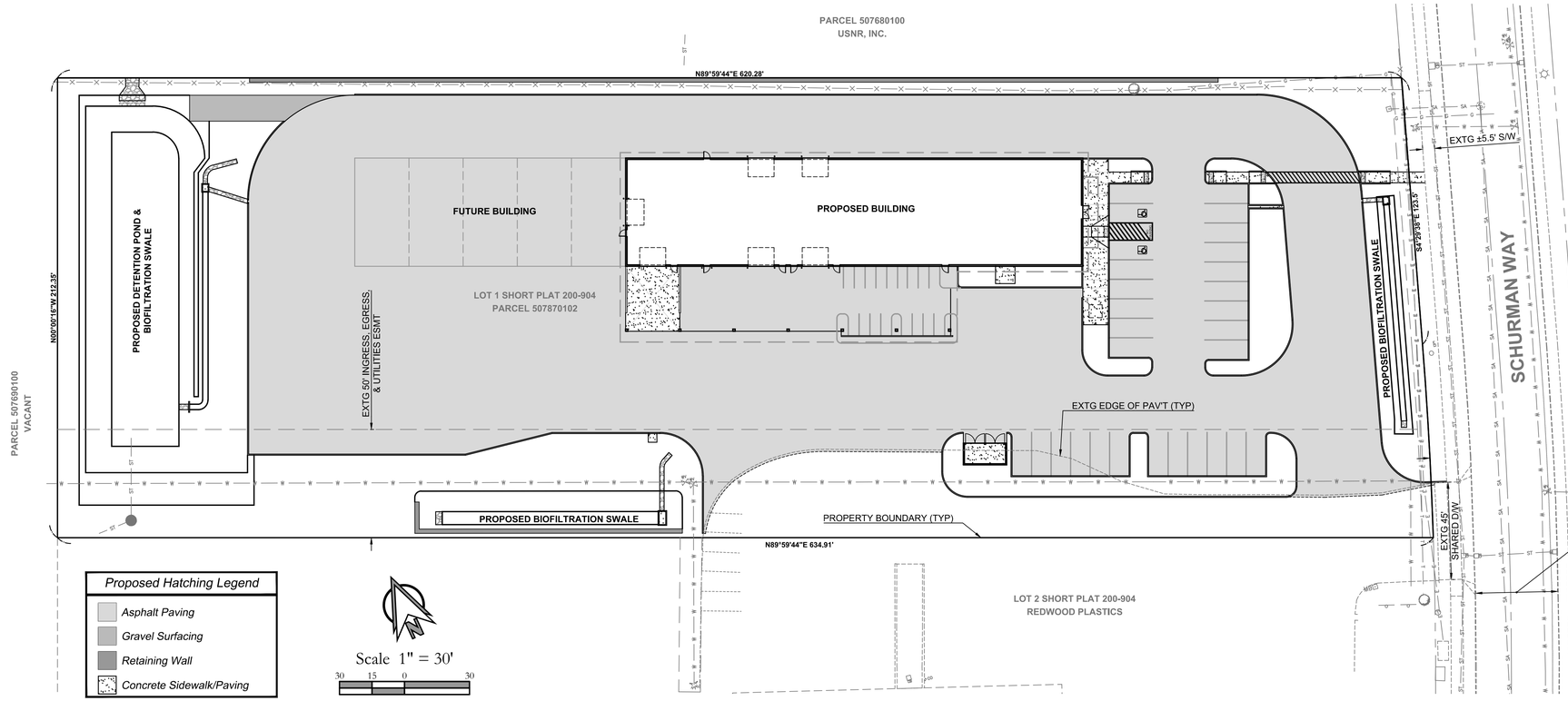
Pond 1P: Detention Pond



APPENDIX D
SELECT CONSTRUCTION DRAWINGS

Dawkins Warehouse

Located in the NW 1/4 of Section 13 T5N, R1W, W.M.
City of Woodland, Washington



VICINITY MAP
NOT TO SCALE

Sheet Index
01 - Cover Sheet
02 - General Notes & Legend
03 - Existing Conditions
04 - Grading & Erosion Control Plan (West)
05 - Grading & Erosion Control Plan (East)
06 - Erosion Control Details
07 - Drainage & Site Improvement Plan (West)
08 - Drainage & Site Improvement Plan (East)
09 - Sanitary Sewer & Water Plan
10 - Miscellaneous Details
11 - Miscellaneous Details
12 - City of Woodland Standard Transportation & Drainage Details
13 - City of Woodland Standard Water Details
14 - City of Woodland Standard Water Details
15 - City of Woodland Standard Sewer Details

Proposed Hatching Legend

- Asphalt Paving
- Gravel Surfacing
- Retaining Wall
- Concrete Sidewalk/Paving

Scale 1" = 30'
30 15 0 30

CITY OF WOODLAND
PO Box 9 / 230 Davidson
Woodland, WA 98674
www.ci.woodland,wa.us
Phone: 360-887-4609
Fax: 360-887-0862

Permit Number: _____

Signature _____
Fire Chief or Designee Date

CITY OF WOODLAND
PUBLIC WORKS DEPARTMENT
PO Box 9 - 300 E Scott Ave
Woodland, WA 98674
www.ci.woodland.wa.us
Phone: (360) 225-7999
Fax: (360) 225-7467

Plans Reviewed for Compliance
with City Standards and Policies

Permit Number: _____

Recommended for Approval: _____
Public Works Director Date

Improvement Summary				
Street Improvements			0	LF
Water Main Footage			21	LF
Sewer Main Footage			0	LF
Septic System Decommission			0	EA
Trenching with City Right-of-Way			0	LF
Total Impervious Surface			88,752	SF
Private Impervious Surface			2.04	AC
Grading	Cut	524* CY	Fill 4,782*	CY

*Grading quantities provided are gross volumes between existing grade & proposed finish grade with no adjustments for strippings, imported rock and asphalt, compaction factors, trench spoils, or other construction factors.

GENERAL INFORMATION:

Applicant:
Wilson Architects PLLC
Attn: Ryan Wilson
404 E 15th St. #7
Vancouver, WA 98663
Phone: (360) 696-4722
Fax: (360) 696-0392
Email: Ryan@WilsonArchitects.us

Civil Engineer
PLS Engineering,
Andrew Gunther
604 W Evergreen Blvd.
Vancouver, WA 98660
Ph. (360) 944-6519
Fax (360) 944-6539
e-mail: Andrew@PLSengineering.com

Owner/Developer:
Pacific Golf and Turf LLC
Mark Dawkins
14625 SE Stark St.
Portland, OR 97233

Site Address/Parcel Number:
1951 Schurman Way
Woodland, WA 98674
Parcel #507870102

Project Benchmark is a 9/16" stainless steel rod with datum point, sleeve, and Cowlitz County GIS Department access cover stamped "Dike Access 1993". Access benchmark by taking Exit 22 from I-5, go easterly 0.1± mile to gravel road left, turn left and go northerly on the gravel road 0.10 miles to the station on the left. Benchmark elevation 38.205, NAVD 88.

A minimum of 2 full working days and a maximum of 10 working days prior to beginning construction, the Contractor shall call 1-800-553-4344 (Northwest Utilities Notification Counter) for location mark-up of existing utilities.

All work in City right-of way will conform to the requirements of the City of Woodland. A right-of-way permit from the City will be required prior to work in the right-of-way.

All site grading and erosion control, construction, materials and workmanship shall conform to the Engineering Standards of the City of Woodland and the latest edition of the "Standard Specifications for Road, Bridge, and Municipal Construction" as prepared by WSDOT/APWA.

Any archaeological findings shall be immediately (within 24 hours) reported to the City Planning Department and any state agency required by Washington State law. Construction in the vicinity of the findings shall be ceased immediately and the findings shall be protected from outside intrusion.

A pre-construction conference shall be held prior to the start of construction.

PLS ENGINEERING
604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

Cover Sheet For:
Dawkins Warehouse
A Site Located in the City of Woodland, Washington
Engineering - Surveying - Planning

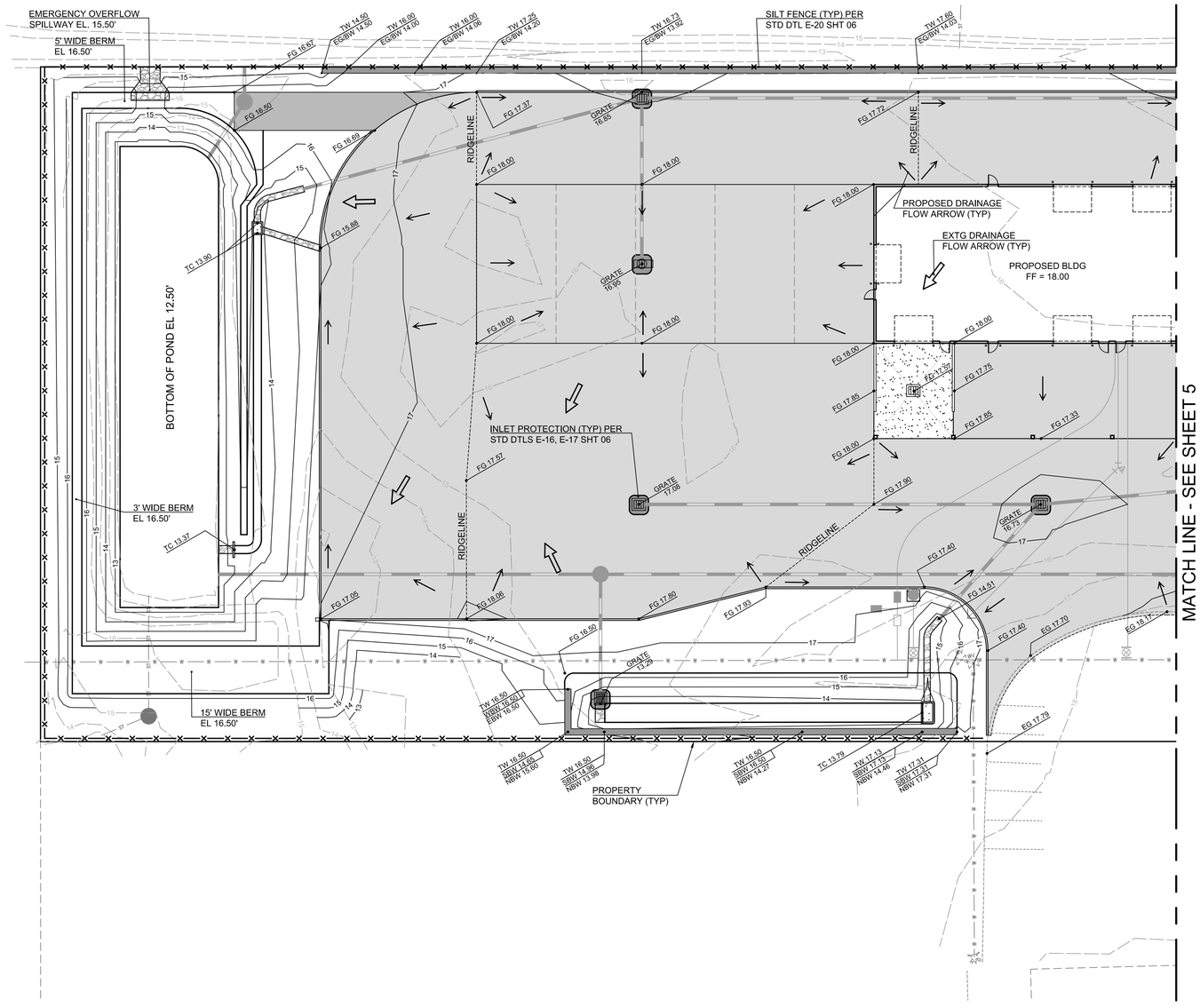
Revisions

1	2	3	4	5	6

ANDREW J. GUNTHER
STATE OF WASHINGTON
39644
REGISTERED PROFESSIONAL ENGINEER
4/1/22

Project No. 3405	
SCALE:	H: 1" = 30' V: N/A
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

01
15



GRADING SPOT ELEVATION ABBREVIATIONS

TC = TOP OF CURB OR TOP OF CONCRETE ELEVATION
FG = FINISH GRADE AT TOP OF PAV'T OR EXTERNAL TO BLDG
SW = FINISH GRADE FOR SIDEWALK
EG = EXTG GRADE AT EDGE OF PAV'T (FOR REFERENCE)
GRATE = CATCH BASIN OR INLET RIM ELEVATION
TW = FINISHED GRADE AT TOP OF WALL
BW = FINISHED GRADE AT BOTTOM OF WALL
NBW = FINISHED GRADE AT BOTTOM OF WALL ON NORTH SIDE
EBW = FINISHED GRADE AT BOTTOM OF WALL ON EAST SIDE
SBW = FINISHED GRADE AT BOTTOM OF WALL ON SOUTH SIDE
WBW = FINISHED GRADE AT BOTTOM OF WALL ON WEST SIDE

GRADING NOTES:

1. ALL TOP OF CURB ELEVATIONS ARE 0.5' ABOVE PAVEMENT FINISH GRADE (FG) ELEVATION SHOWN UNLESS OTHERWISE INDICATED.
2. SIDEWALK CROSS-SLOPES SHALL NORMALLY BE 2% TOWARD ADJACENT PAVEMENT (AWAY FROM THE BUILDING) UNLESS OTHERWISE INDICATED ON THIS PLAN BY SPOT GRADES.
3. EXCEPT WHERE OTHERWISE NOTED BY FG ELEVATIONS, FINISH GRADE EXTERNAL TO THE BUILDING IS EQUAL TO BLDG FINISH FLOOR.

Scale 1" = 20'

20 10 0 20

Proposed Hatching Legend

- Asphalt Paving
- Gravel Surfacing
- Retaining Wall
- Concrete Sidewalk/Paving

Grading & Erosion Control Plan (West) For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

Engineering - Surveying - Planning | 604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

PLS ENGINEERING

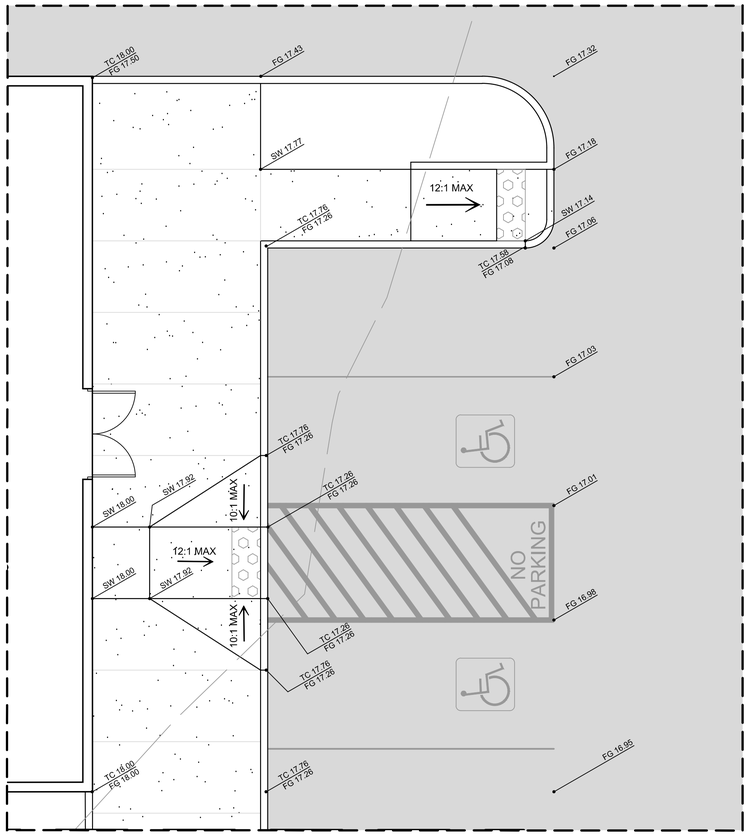
Revisions

1	2	3	4	5	6

ANDREW J. GUNTHER
STATE OF WASHINGTON
39644
REGISTERED
PROFESSIONAL ENGINEER
4/8/22

Project No. 3405	
SCALE:	H: 1" = 20' V: N/A
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

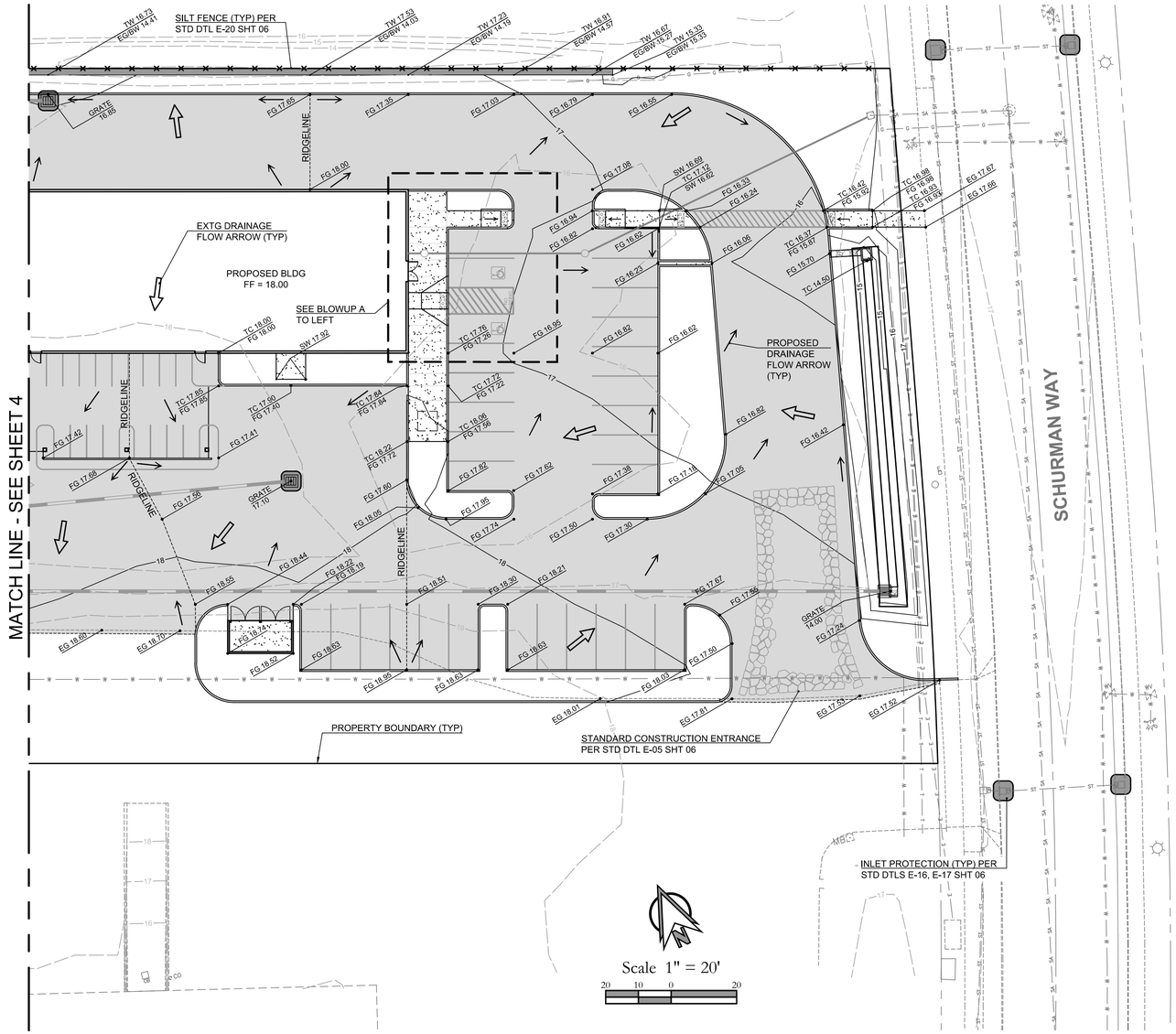
04
15



BLOWUP A

Scale 1" = 5'

5 2.5 0 5



Scale 1" = 20'

20 10 0 20

Proposed Hatching Legend
Asphalt Paving
Gravel Surfacing
Retaining Wall
Concrete Sidewalk/Paving

GRADING SPOT ELEVATION ABBREVIATIONS

TC = TOP OF CURB OR TOP OF CONCRETE ELEVATION
FG = FINISH GRADE AT TOP OF PAV'T OR EXTERNAL TO BLDG
SW = FINISH GRADE FOR SIDEWALK
EG = EXTG GRADE AT EDGE OF PAV'T (FOR REFERENCE)
GRATE = CATCH BASIN OR INLET RIM ELEVATION
TW = FINISHED GRADE AT TOP OF WALL
BW = FINISHED GRADE AT BOTTOM OF WALL

GRADING NOTES:

1. ALL TOP OF CURB ELEVATIONS ARE 0.5' ABOVE PAVEMENT FINISH GRADE (FG) ELEVATION SHOWN UNLESS OTHERWISE INDICATED.
2. SIDEWALK CROSS-SLOPES SHALL NORMALLY BE 2% TOWARD ADJACENT PAVEMENT (AWAY FROM THE BUILDING) UNLESS OTHERWISE INDICATED ON THIS PLAN BY SPOT GRADES.
3. EXCEPT WHERE OTHERWISE NOTED BY FG ELEVATIONS, FINISH GRADE EXTERNAL TO THE BUILDING IS EQUAL TO BLDG FINISH FLOOR.

PLS ENGINEERING

Grading & Erosion Control Plan (East) For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

Engineering - Surveying - Planning | 604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

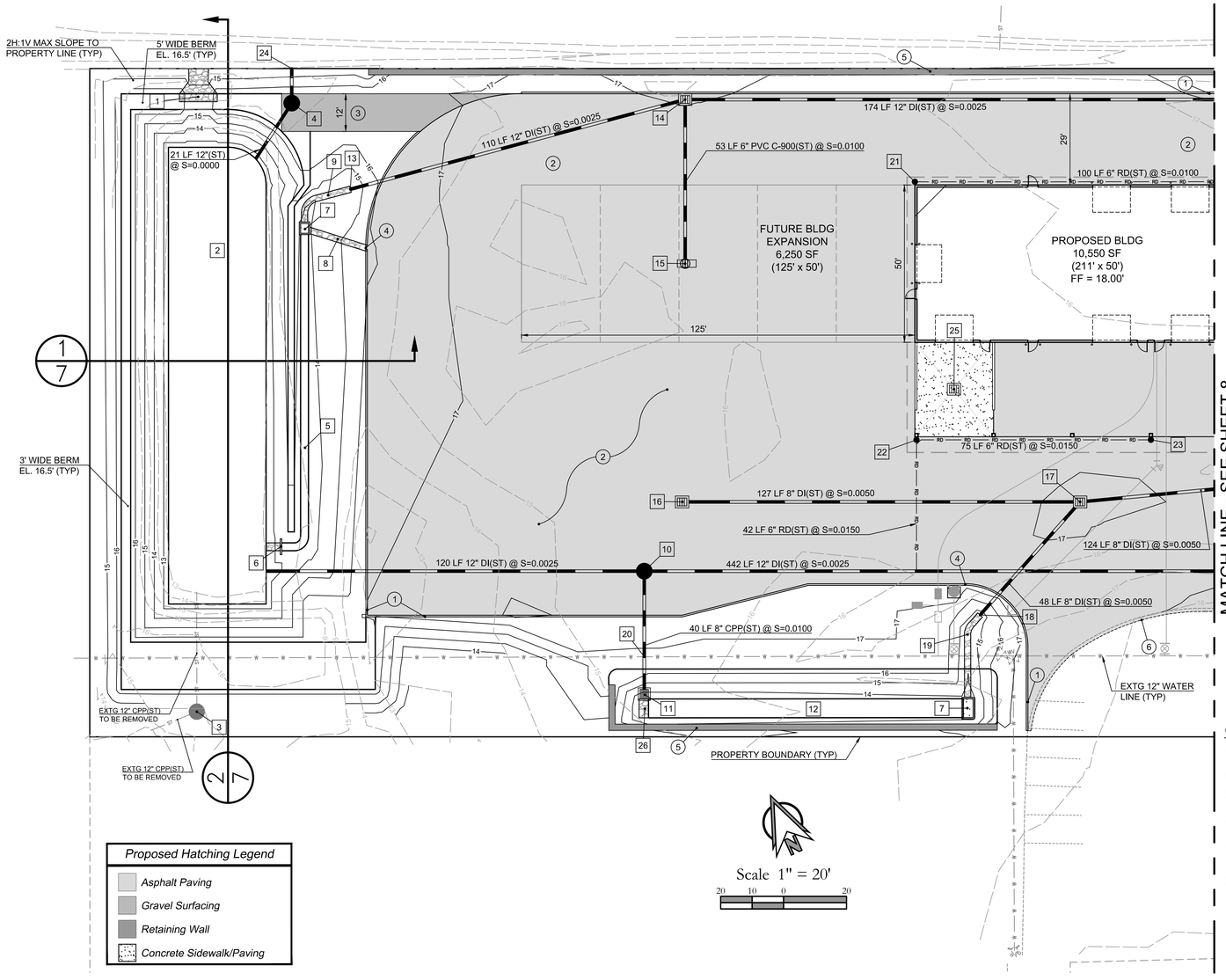
Revisions

1	2	3	4	5	6

ANDREW J. GUNTHER
STATE OF WASHINGTON
39644
REGISTERED
PROFESSIONAL ENGINEER
4/1/22

Project No. 3405	
SCALE:	H: 1" = 20' V: N/A
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

05
15



Scale 1" = 20'

20 10 0 20

Proposed Hatching Legend

- *Asphalt Paving*
- *Gravel Surfacing*
- *Retaining Wall*
- *Concrete Sidewalk/Paving*

STORM CONSTRUCTION NOTES:

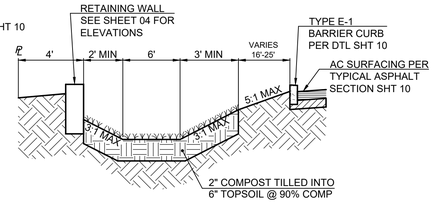
ALL ON-SITE STORMWATER FACILITIES ARE TO BE PRIVATELY OWNED AND MAINTAINED.

*DETENTION POND & BIOFILTRATION SWALE FACILITY DIMENSIONS ARE MEASURED AT THE BOTTOM OF FACILITY.

1. 6' BASE WIDTH EMERGENCY OVERFLOW SPILLWAY PER DTL SHT 10 BOTTOM EL. 15.50'
2. *PROPOSED 31'x145' DETENTION POND BOTTOM EL. 12.50' SEE TYPICAL SECTIONS 1/7 & 2/7 & PLANTING/SEEDING INFO THIS SHT
3. EXTG STORM MH TO BE REMOVED
4. INSTALL STORM CONTROL MH-1 PER DTL SHT 10 RIM 17.00' EXTG 12" IE IN (SW) 12.50' EXTG 12" IE OUT (N) 12.50'
5. *WEST BIOFILTRATION SWALE 2.5' BASE x 105' LONG, S=0.0050 START EL. 13.90', END EL. 13.37' SEE SECTION 1/7 FOR TYPICAL SECTION & PLANTING/SEEDING INFO THIS SHT
6. INSTALL CONCRETE FLOW SPREADER PER DTL SHT 10
7. INSTALL BIOSWALE SEDIMENT TRAP PER DTL SHT 10 SEE SHT 04 FOR ELEVATIONS
8. INSTALL 2' WIDE x 19' LONG x 1' DEEP QUARRY SPALLS PAD
9. INSTALL 2' WIDE x 21' LONG x 1' DEEP QUARRY SPALLS PAD
10. INSTALL 48" STORM MH-2 PER CITY OF WOODLAND STD DTLS D-10 & D-14 SHT 12 RIM 17.49' 8" IE IN (S) 12.89' 12" IE IN (E) 12.80' 12" IE OUT (SW) 12.80'
11. INSTALL DITCH INLET 1 PER DTL SHT 10 RIM 13.29' 8" IE OUT (N) 13.29'
12. *SOUTH BIOFILTRATION SWALE 6' BASE x 100' LONG, S=0.0050 START EL. 13.79', END EL. 13.29' SEE SOUTH BIOFILTRATION SWALE TYPICAL SECTION & PLANTING/SEEDING INFO THIS SHT
13. 12" DI OUTLET IE 14.14'
14. INSTALL STORM CB-1 PER DTL SHT 10 RIM 16.85' 6" IE IN (S) 14.41' 12" IE IN (E) 14.41' 12" IE OUT (W) 14.41'
15. INSTALL STORM AD-1 PER DTL SHT 10 RIM 16.95' 6" IE OUT (N) 14.94'
16. INSTALL STORM CB-3 PER DTL SHT 10 RIM 17.08' 8" IE OUT (E) 15.38'
17. INSTALL STORM CB-4 PER DTL SHT 10 RIM 16.73' 8" IE IN (E,W) 14.75' 8" IE OUT (SW) 14.75'
18. 8" DI OUTLET IE 14.51'
19. INSTALL 2' WIDE x 36' LONG x 1' DEEP QUARRY SPALLS PAD
20. CONTRACTOR TO VERIFY EXTG WATER LINE EL. PRIOR TO CONSTRUCTION & NOTIFY THE ENGINEER OF ANY POTENTIAL UTILITY CONFLICT
21. STORM DS-1 6" IE 16.17'
22. STORM DS-4 6" IE 13.91'
23. STORM DS-5 6" IE 15.04'
24. INSTALL 3' WIDE RIPRAP PAD AROUND OUTLET. SEE TYPICAL OUTLET PROTECTION DTL SHT 10
25. INSTALL LOW POINT DRAIN GRATE RIM 17.57' CONNECT DRAIN TO BUILDING SANITARY SEWER PIPING. SEE PLUMBING DRAWINGS.
26. INSTALL 6' WIDE x 3' LONG x 1' DEEP QUARRY SPALLS PAD

GENERAL CONSTRUCTION NOTES:

1. INSTALL TYPE E-1 BARRIER CURB PER DTL SHT 10
2. INSTALL NEW ASPHALT PAVEMENT PER TYPICAL SECTION SHT 10
3. INSTALL GRAVEL CONTROL MH ACCESS PER TYPICAL SECTION SHT 10
4. INSTALL CURB CUT PER DTL SHT 10
5. RETAINING WALL DESIGN BY OTHERS SEE SHTS 04 & 05 FOR DETAILED GRADING
6. SAWCUT A MINIMUM OF 1' INTO EXTG PAVEMENT TO PROVIDE CLEAN PAVEMENT EDGE



South Biofiltration Swale Typical Section

NTS

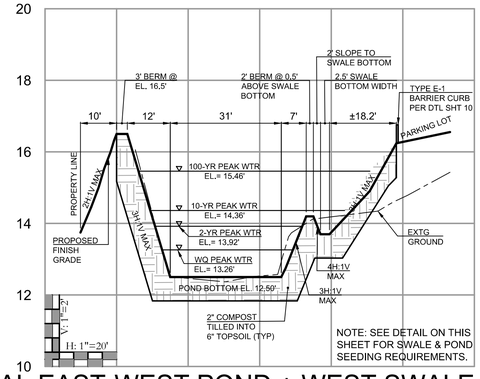
STORMWATER FACILITY SEED MIX:

SUNMARK NATIVE SWALE MIX:
(OR APPROVED EQUAL)
50% BLUE WILDRYE
15% NATIVE RED FESCUE
10% MEADOW BARLEY
10% NORTHWESTERN MANNAGRASS
10% AMERICAN SLOUGHGRASS
5% TUFTED HAIRGRASS
APPLICATION RATE 1 LB/1,000 SQ FT

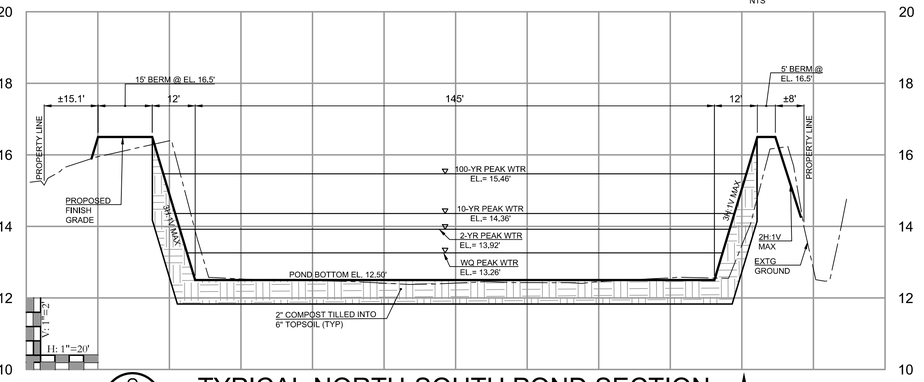
NOTES:

1. IF FACILITY IS INSTALLED DURING A PERIOD OF WET WEATHER, IT CAN BE ESTABLISHED BY SODDING. SINCE SOD IS NOT AVAILABLE IN RECOMMENDED GRASSES IT SHOULD BE OVER SOWN WITH A RECOMMENDED MIX AT THE BEGINNING OF THE GROWING SEASON. IT IS RECOMMENDED TO INSTALL A SOD THAT IS A MIX OF CREEPING FESCUE AND HARD & SHEEP FESCUES.
2. SOD SHALL BE LAID PERPENDICULAR TO SLOPE FROM BOTTOM TO TOP, WITH JOINTS STAGGERED.
3. SWALE SHALL HAVE A VIABLE STAND OF GRASS APPROVED BY THE CITY INSPECTOR PRIOR TO PAVING.

STORMWATER FACILITY PLANTING/SEEDING



1/7 TYPICAL EAST-WEST POND + WEST SWALE SECTION



2/7 TYPICAL NORTH-SOUTH POND SECTION

Drainage & Site Improvement Plan (West) For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

Engineering - Surveying - Planning

PLS ENGINEERING
604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

Revisions

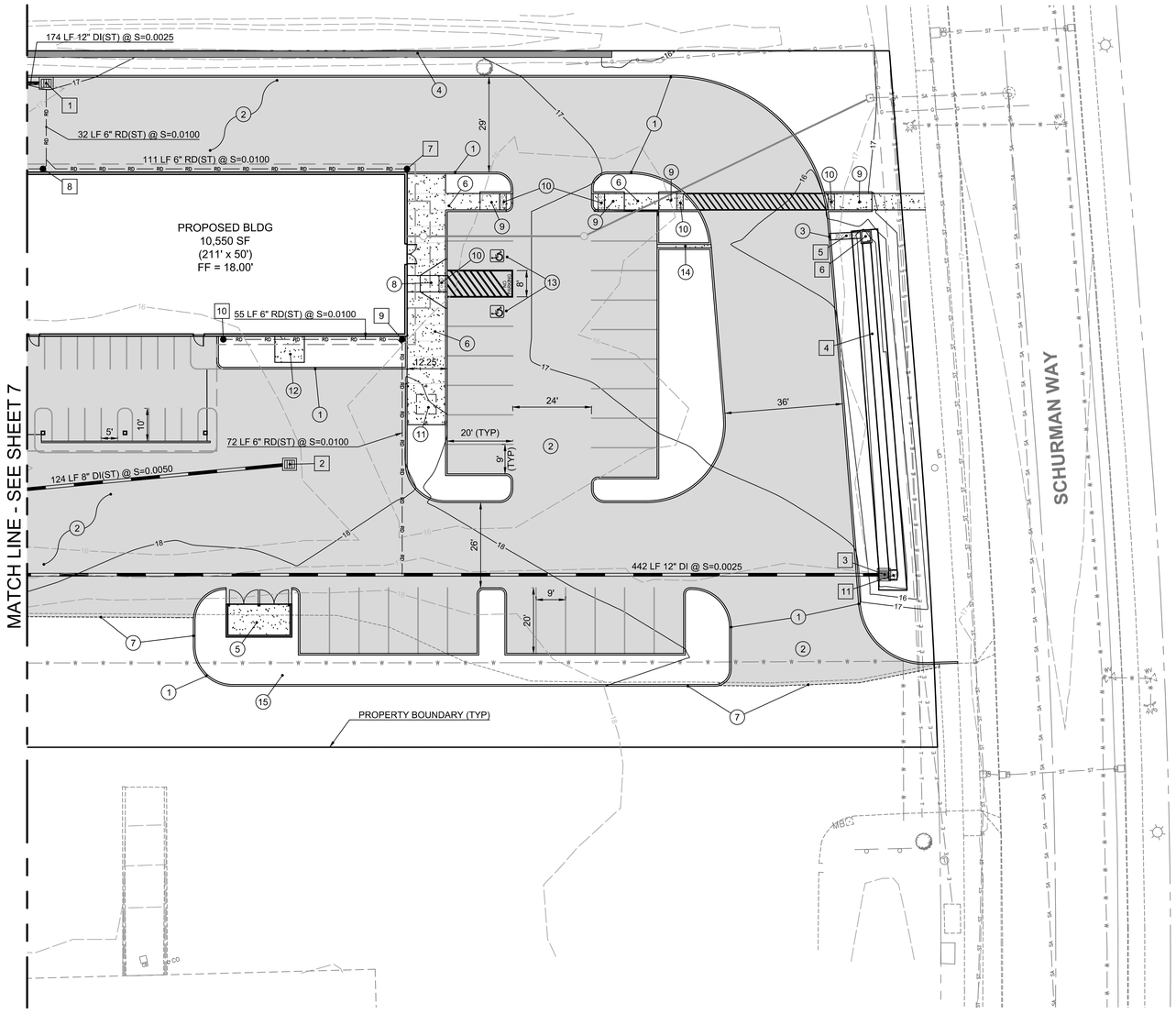
1	2	3	4	5	6

ANDREW J. GUNTHER — STATE OF WASHINGTON — 39644 — REGISTERED PROFESSIONAL ENGINEER — 4/1/22

Project No.	3405
SCALE:	H: 1" = 20' V:
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

07

15



STORM CONSTRUCTION NOTES:

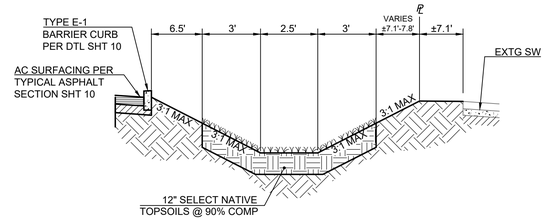
ALL ON-SITE STORMWATER FACILITIES ARE TO BE PRIVATELY OWNED AND MAINTAINED.

*BIOFILTRATION SWALE DIMENSIONS ARE MEASURED AT THE BOTTOM OF FACILITY.

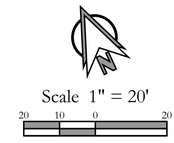
1. INSTALL STORM CB-2 PER DTL SHT 10
   RIM 16.85'
   6" IE IN (S) 14.85'
   12" IE OUT (W) 14.85'
2. INSTALL STORM CB-5 PER DTL SHT 10
   RIM 17.10'
   8" IE OUT (W) 15.37'
3. INSTALL DITCH INLET 2
   PER DTL SHT 10
   RIM 14.00'
   12" IE OUT (W) 13.91'
4. EAST BIOFILTRATION SWALE
   2.5' BASE x 100' LONG, S=0.0050
   START EL. 14.50', END EL. 14.00'
   SEE EAST BIOFILTRATION SWALE
   TYPICAL SECTION THIS SHT &
   PLANTING/SEEDING INFO SHT 07
5. INSTALL 2' WIDE x 9' LONG x 1' DEEP
   QUARRY SPALLS PAD
6. BIOSWALE SEDIMENT TRAP
   PER DTL SHT 10
7. STORM DS-2
   6" IE 16.25'
8. STORM DS-3
   6" IE 15.17'
9. STORM DS-6
   6" IE 14.60'
10. STORM DS-7
    6" IE 15.15'
11. INSTALL 2.5' WIDE x 3' LONG x 1' DEEP
    QUARRY SPALLS PAD

GENERAL CONSTRUCTION NOTES:

1. INSTALL TYPE E-1 BARRIER CURB PER DTL SHT 10
2. INSTALL NEW ASPHALT PAVEMENT
   PER TYPICAL SECTION SHT 10
3. INSTALL CURB CUT PER DTL SHT 10
4. RETAINING WALL DESIGN BY OTHERS
   SEE SHTS 04 & 05 FOR DETAILED GRADING
5. TRASH ENCLOSURE DESIGN BY OTHERS
6. TYPICAL ON-SITE SIDEWALK PER DTL SHT 11
7. SAWCUT A MINIMUM OF 1' INTO EXTG PAVEMENT
   REMOVE EXTG PAVEMENT UNDER PROPOSED CURB
8. INSTALL SIDEWALK RAMP TYPE 1 PER DTL 11
   DETAILED GRADING ON SHT 05
9. INSTALL SIDEWALK RAMP TYPE 2 PER DTL 11
   DETAILED GRADING ON SHT 05
10. TRUNCATED DOMES/DETECTABLE WARNING PATTERN
    PER CITY OF WOODLAND STD DTL T-21 SHT 12
11. TRANSFORMER PAD
    SEE ELECTRICAL DRAWINGS
12. MECHANICAL EQUIPMENT PAD
    SEE MECHANICAL DRAWINGS
13. INSTALL ADA PARKING & HANDICAP SIGNS PER DTLS SHT 11
    PAVEMENT CROSS SECTION PER DTL SHT 10
14. CURB SCUPPER PER DTL SHT 11
15. REMOVE EXTG PAVEMENT NORTH AND EAST OF NEW CURB LINE



East Biofiltration Swale
Typical Section
NTS



Proposed Hatching Legend

- *Asphalt Paving*
- *Gravel Surfacing*
- *Retaining Wall*
- *Concrete Sidewalk/Paving*

Drainage & Site Improvement Plan (East) For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

Engineering - Surveying - Planning | 604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

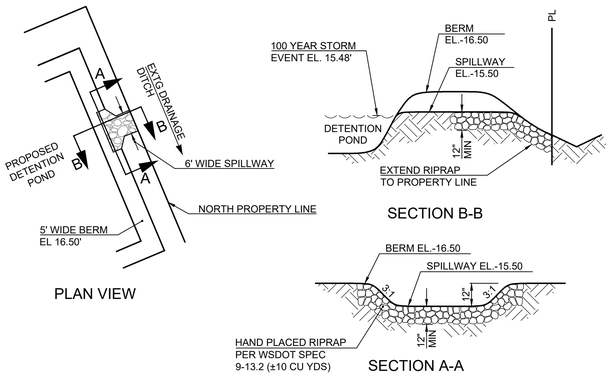
PLS ENGINEERING

Revisions: 1 2 3 4 5 6

ANDREW J. GUNTHER — STATE OF WASHINGTON — 39644 — REGISTERED PROFESSIONAL ENGINEER — 4/8/22

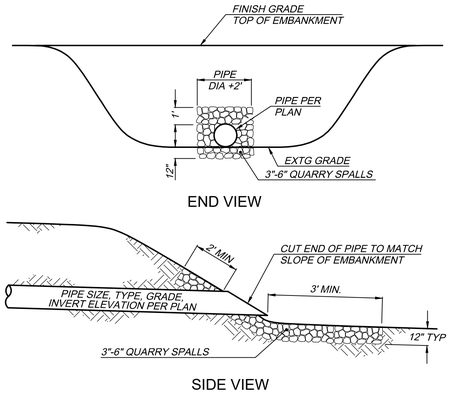
Project No. 3405	
SCALE:	H: N/A V: 1" = 20'
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

08
15



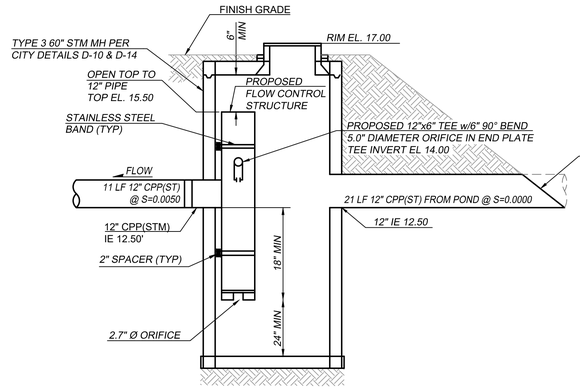
Emergency Overflow Spillway

NTS



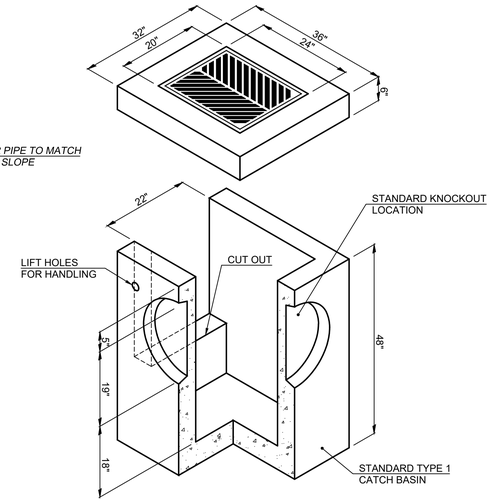
Typical Outlet Protection Detail

NTS



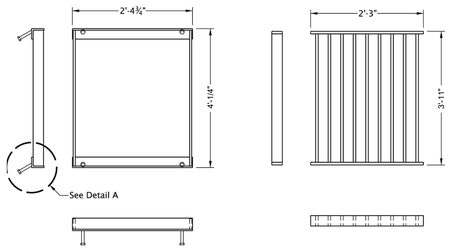
Storm Control Manhole

NTS



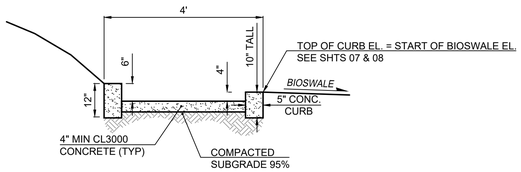
Catch Basin Detail

NTS

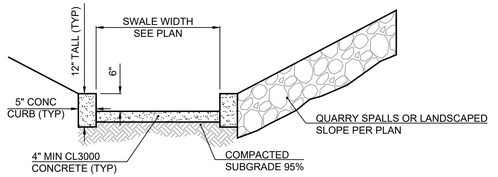


G-2 FRAME

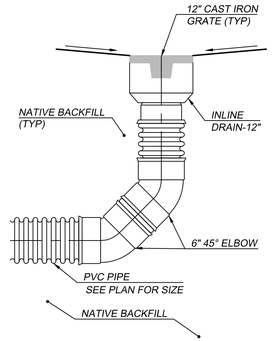
G-2 GRATE (TYPE 1)



Cross Section 1-1



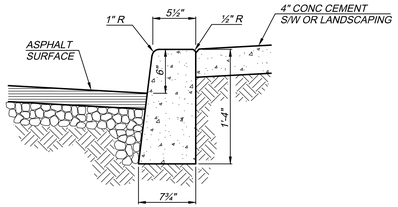
Cross Section 2-2



Private Area Drain

NTS

Notes:
For detailed construction specifications see ADS surface drainage products manual.

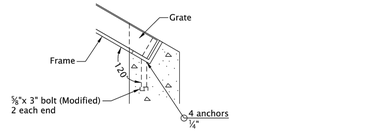


Notes:

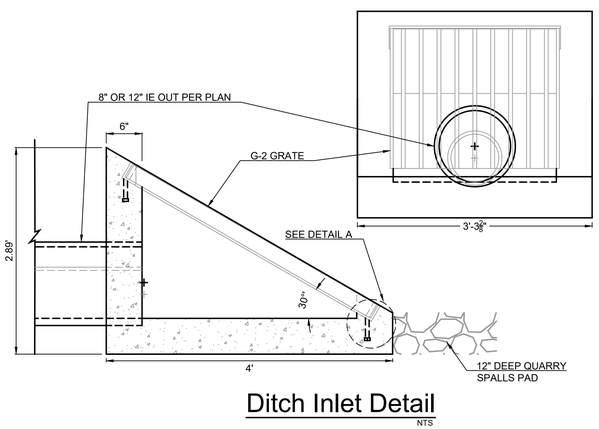
1. Concrete shall be class 3000.
2. Curbs adjacent to pavement or sidewalk to have expansion and/or contraction joints to match existing patterns.
3. 3/8" expansion joints shall be placed at 45' maximum spacing, on both sides of catch basins, at tops of driveways, and all changes in direction. 1½" cut joints to be placed at 15' maximum spacing.
4. Compact subgrade and aggregated to 95% of max. dry density.
5. Curb to be brush finished.

Type E-1 Barrier Curb

NTS

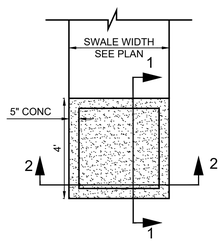


DETAIL A



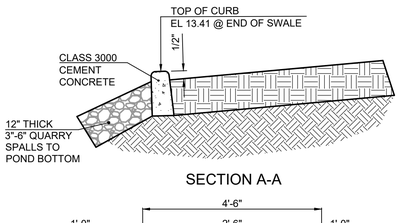
Ditch Inlet Detail

NTS

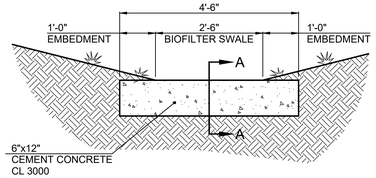


Bioswale Sediment Trap

NTS

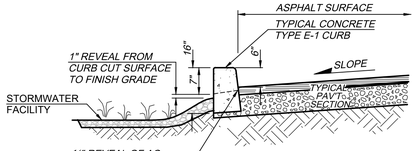


SECTION A-A

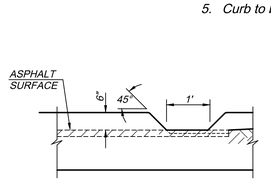


Concrete Flow Spreader Detail

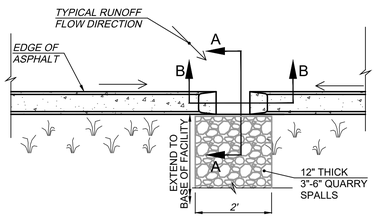
NTS



SECTION A-A

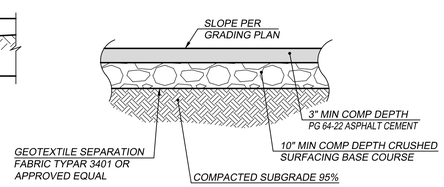


SECTION B-B



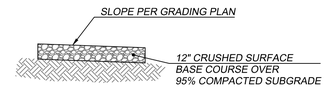
Curb Cut

NTS



Typical Asphalt Section

NTS



Gravel Control MH Access Typical Section

NTS

Miscellaneous Details For:

Dawkins Warehouse

A Site Located in the City of Woodland, Washington

Engineering - Surveying - Planning | 604 W. Evergreen Blvd., Vancouver, WA 98660 | PH (360) 944-6519 | Fax (360) 944-6539

PLS ENGINEERING

Revisions

1	2	3	4	5	6

ANDREW J. GUNTHER — STATE OF WASHINGTON — 39644 — REGISTERED PROFESSIONAL ENGINEER — 4/5/22

Project No.	3405
SCALE:	H: N/A V: N/A
DESIGNED BY:	TJL
DRAFTED BY:	TJL
REVIEWED BY:	AJG

10

15

APPENDIX E
GEOTECHNICAL REPORT

GEOTECHNICAL ENGINEERING STUDY

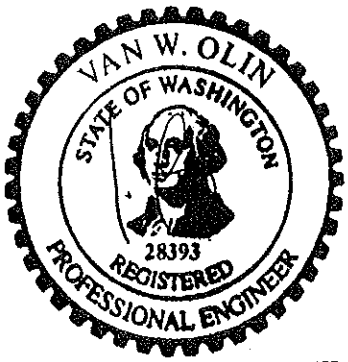
Proposed HCT Building - Schurman Way
Woodland, Washington

Prepared for:
Schlecht Construction, Inc.
9407 NE Vancouver Mall Drive, Suite #201
Vancouver, Washington 98662

Prepared By:

Donald J. Bruno, EG
Engineering Geologist

Van W. Olin, PE
Project Engineer



Project No. G17-0511
{June 2011}

Geotechnical & Environmental Services Inc.
215 W 4th Street / Vancouver, Washington 98660
(360) 696-3443 / (fax) 696-3553

GE Services Inc.

Geotechnical & Environmental Consultants

Mark Jackson
Schlecht Construction Inc.
9407 NE Vancouver Mall Drive, Suite #201
Vancouver, WA 98662

June 17th 2011
G17-0511

Subject: **Geotechnical Study - Proposed HCT Building**
Schurman Way, Woodland, Washington

Hello Mark,

We are pleased to submit our report titled "Geotechnical Engineering Study, Proposed HCT Building, Vancouver, Washington." This report presents the results of our field exploration, selective laboratory tests and engineering analyses.

Based on the results of this study, it is our opinion that construction of the proposed light industrial building and associated driveway/parking area is feasible from a geotechnical standpoint, provided recommendations presented in this report are included in the project design.

We appreciate the opportunity to have been of service to you and look forward to working with you in the future. Should you have any questions about the content of this report, or if we can be of further assistance, please call.

Respectfully Submitted,
GE Services Inc.

Donald J. Bruno, EG
Engineering Geologist

Van W. Olin, PE
Project Engineer

TABLE OF CONTENTS
{G17-0511}

INTRODUCTION

General

This report presents the results of the geotechnical engineering study completed by GE Services Inc. (GE Services) for the proposed light industrial building for the HCT Corporation. The general location of the site is shown on the *Topographic Vicinity Map, Figure 1.* At the time our study was performed, the site and our exploratory locations were approximately as shown on the *Site Plan, Figure 2.*

The purpose of this study was to explore subsurface conditions at the site, and based on the conditions encountered provide geotechnical recommendations for the proposed construction.

Project Description

Based on the information that was provided to us by Schlecht Construction it is our understanding that HCT plans to develop the subject site with a two-story building that will provide approximately 12,110 square feet of floor space. The building footprint will be about 9,360 square feet. The second level will provide about 2,750 square feet. A future addition to be constructed adjacent to the west side of the newly proposed building will provide 10,000 square feet of floor space.

The building will be constructed with a steel frame, metal siding and a slab on grade floor. It is our understanding that the subject site will require about three to five feet of fill to achieve the desired design grade. Improvements will also include an asphalt paved driveway, ~ twenty-one (21) parking spaces and a gravel storage yard.

If any of the above information is incorrect or changes, we should be consulted to review the recommendations contained in this report. In any case, it is recommended that GE Services perform a general review of the final design.

SITE CONDITIONS

Surface

The subject site encompasses approximately three acres and slopes gently downward from the east to the west. The site was covered with grass, blackberries and several deciduous trees. A wetlands area was observed at the northwest side of the site. The property is bordered to the north and south by existing industrial facilities, to the east by Thurman Way and to the west by a wetlands area.

Subsurface

For this study the site was explored by excavating three test pits at the approximate locations shown on the *Site Plan, Figure 2.* All soil was classified following the *Unified Soil Classification System (USCS).* A USCS Legend is included as Plate A1. A description of the field exploration methods is included in Appendix A.

The following is a generalized description of the subsurface conditions encountered. In our test pit excavations we encountered one foot of topsoil that consists of soft to very soft Silt (ML), underlain by soft to firm Silt and Clayey Silt with lenses of fine sand to a depth of about three to four feet below the surface. Below the silt we encountered medium dense clean Sand (SP) to a depth of about six and one half feet below the surface. Below the sand we encountered soft to firm elastic silt (MH) with fine sand to the maximum exploration depth of nine feet below the existing ground surface.

The test pits could not be excavated below nine feet due to heavy groundwater seepage, which caused the cohesion less sand layer to collapse. Please refer to the test pit logs, Plates A2 through A4, for a more detailed description of the conditions encountered at each location explored.

Groundwater

Heavy groundwater seepage was encountered in our test pits at depths ranging from two and one-half to three feet below the existing ground surface during the time of our field exploration. It is important to note that groundwater conditions are not static; fluctuations may be expected in the level and seepage flow depending on the season, amount of rainfall, surface water runoff, and other factors. Generally, the groundwater level is higher and seepage rate is greater in the wetter winter months (typically October through May).

General Regional Geology

General information about geologic conditions and soil in the vicinity of the site was obtained by reviewing the Geologic Map of Washington-Southwest Quadrant, WA. State Department of Natural Resources, (Geologic Map GM-34, 1987) and the Geologic Map of the Vancouver Quadrangle, Washington & Oregon, (DLNR), Open File Report 87-10. These maps provide general information about geologic units in the Woodland, Washington area.

Our review of existing geologic information indicates that soils west of Woodland consist of Quaternary sedimentary alluvial deposits. The alluvium consists predominantly of inter-bedded layers of fine grained silt and fine to medium grained sand deposited along the flood plains of the Columbia River. In some areas organic silt is prevalent as organic material was buried and decomposed in backwater low energy environments.

LABORATORY TESTING

Laboratory tests were conducted on representative soil samples to verify or modify the field soil classification of the units encountered, and to evaluate the general physical properties as well as the engineering characteristics of the soils encountered. The following provides information about the testing procedures performed on representative soil samples and the general condition of subsurface soil conditions encountered:

- *Moisture Content (ASTM-D2216-92)* tests were performed on representative samples. In the upper layer of silt the moisture content ranges from thirty-two to thirty-five percent (32% - 35%). The intermediate layer of clean sand has a soil moisture content that ranges from twenty to twenty-eight percent (20% - 28%). The deepest layer of elastic Silt has a moisture content that ranges from twenty-six to twenty-nine percent (26% - 29%).

- Grain Size Analyses (ASTM-D1140-97) were performed on representative samples at the subject site. These tests confirm that subsurface soils, from three to six and one half feet below the surface consist predominantly of clean Sand. The percent fines or percent passing the #200 sieve in the sandy soil ranges from one to five percent (1% to 5%).

- In-Situ Soil Density (ASTM-D4564-93) by the sleeve method was performed on representative samples to determine the wet and dry density of native soil. The in-situ density provides a relative indication of soil support characteristics. The dry and wet densities of the upper layer of silt is one hundred and one (101) pounds per cubic foot (pcf) and seventy-three (73) pcf, respectively. The dry and wet densities of the lower layer of clayey silt are one hundred and twenty-two (122) and ninety-four (94) pcf, respectively.

- *Atterberg Limits (ASTM-D4318-95)* were performed on representative samples to determine the "water-plasticity" ratio of in-situ soil. This test also provides an indication of relative soil strength as well as the potential for soil volume changes with variation in moisture content. Testing indicates the upper layer of silt has a low plasticity.

- *Consolidation Testing (ASTM-D2435-04)* were performed on representative samples to determine the "water-plasticity" ratio of in-situ soil. This test also provides an indication of relative soil strength as well as the potential for soil volume changes with variation in moisture content. Testing indicates a relatively low degree of consolidation under the anticipated loads.

Laboratory testing confirms that subsurface soil consist of a variety of soils. Silt, clean Sand and Elastic Silt were encountered in our test pits. The predominance of these soils, exclusive of the clean sand is sensitive to changes in moisture content. Moisture sensitive soils are discussed in more detail in the *Site Preparation and Grading* section of this report.

The results of laboratory tests performed on specific samples are provided at the appropriate sample depth on the individual test pit logs and in *Appendix B, Laboratory Testing.* However, it is important to note that some variation of subsurface conditions may exist. Our geotechnical recommendations are based on our interpretation of these test results.

SEISMIC HAZARD EVALUATION

The following provides a seismic hazard evaluation for the subject site. Our evaluation is based on subsurface conditions encountered at the site during the time of our geotechnical study, a review of geotechnical studies by others, a review of applicable geologic maps (Washington Department of Natural Resources, Geologic Map of Washington - Southwest Quadrant, 1987), a review of Ecology well logs and the International Building Code (IBC 2006) guidelines.

In general, supportive soil at the subject site consists of soft to firm silt and loose to medium dense sand. As previously discussed heavy groundwater seepage was encountered in our test pits about two to three feet below the surface. The referenced geologic map indicates that no known active faults are located within one-mile of the subject site.

In general, soils encountered to a depth of nine feet below the site are classified as a type "E" soil in accordance with "Site Class Definitions (IBC 2006, Section 1613, Table 1613.5.2, page 303). For more detail regarding soil conditions refer to the test pit logs in Appendix A of this report.

Liquefaction:

Structures are subject to damage from earthquakes due to direct and indirect action. Shaking represents direct action. Indirect action is represented by foundation failures and is typified by liquefaction. Liquefaction occurs when soil loses all shear strength for short periods of time during an earthquake. Ground shaking of sufficient duration results in the loss of grain to grain contact as well as a rapid increase in pore water pressure. This causes the soil to assume physical properties of a fluid.

To have potential for liquefaction a soil must be loose, cohesion-less (generally sands and silts), below the groundwater table, and must be subjected to sufficient magnitude and duration of ground shaking. The effects of liquefaction may be large total settlement and/or large differential settlement for structures with foundations in or above the liquefied soil.

Based on the soft to medium dense soil conditions encountered and the presence of a near surface groundwater table, it is likely that soil liquefaction would occur at the subject site during a moderate to strong seismic event.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our study, it is our opinion that the site can be developed provided the geotechnical recommendations contained in this report are incorporated into the final design.

During our field exploration we encountered soft to firm saturated soils and medium dense clean sand in the vicinity of the proposed building area to a depth of approximately nine feet below the existing ground surface. As previously discussed heavy groundwater seepage was observed at about two to three feet below the surface. Our review of Ecology water well logs in the vicinity of the subject site indicates that the static groundwater level ranges from about four to ten feet below the existing ground surface.

Due to the non-cohesive soil conditions and a shallow water table there is a moderate to high potential for soil liquefaction during a seismic event. Therefore, we recommend that the building be supported on conventional shallow spread footings or thickened floor slabs that bear upon a geo-grid reinforced "gravel mat". This type of foundation system will reduce the potential for settlement and act to bridge softer areas below foundations.

Additionally, we suggest that the foundation and floor slab be provided with additional steel reinforcement to increase foundation rigidity. Flexible connections should also be used for utilities to account for potential differences in settlement during a seismic event.

It is important to note that during a strong seismic event there is potential that some areas below the conventional footings and mat reinforced floor slabs could temporarily liquefy and cause some settlement. The degree of settlement is dependent on the duration of the seismic event and will dictate the amount of foundation and/or building repair that may be required.

By constructing the proposed building on a reinforced "gravel mat", the potential for settlement during a seismic event will be significantly reduced. However, if no degree of risk can be assumed by the owner then it will be necessary to support the entire building and floor slabs on a deep foundation system. A deep pile foundation system can be provided at the owner's request.

Details for a conventional spread foundations or thickened floor slabs with a geo-grid reinforced gravel-mat are discussed in more detail in the *Site Preparation & Grading* section as well as the *Foundation* sections of this report.

As previously discussed, the near surface soil encountered at the site consists of moisture sensitive silt. Therefore, earthwork grading and foundation construction may be difficult during the wet winter and spring seasons. Based on this condition we suggest that grading and foundation construction be completed during the drier summer and fall seasons.

This report has been prepared for specific application to this project only and in a manner consistent with that level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area for the exclusive use of HCT Corporation and their representatives. This report, in its entirety, should be included in the project documents for information to the contractor. No warranty, expressed or implied, is made.

Site Preparation and Grading

The site shall be stripped and cleared of all vegetation, organics matter and any other deleterious material. Stripped material should not be mixed with any soils to be used as fill. We suggest that the upper one foot of soft saturated topsoil be removed from the building and pavement areas prior to the placement of structural fill. Stripped soil could potentially be used for topsoil at landscape areas after removing vegetation and screening out organic matter.

Building Area:

After clearing and stripping the site the geo-grid reinforced gravel mat can be constructed at the building area. The mat consists of a eighteen-inch thick layer of gravel with geo-grid placed below and above the gravel section. The mat should extend a minimum of two feet beyond the building footprint.

The soil exposed after stripping should be static compacted with a segmented pad roller if soil moisture conditions will allow. A geo-grid is then placed on the exposed soil surface followed by eighteen inches of one and one-quarter inch (1-1/4") minus clean angular gravel. The gravel should be compacted following the structural fill procedures described below. A second layer of geo- grid is placed over the compacted gravel to complete the mat.

Fill can then be placed over the "gravel mat" to the desired design elevation. We recommend that a minimum of six inches of crushed rock be placed and compacted above the mat.

It should be noted that this type of "gravel mat" foundation system is designed to provide a more rigid and homogeneous base below foundations as well as bridge potential soft pockets that may be encountered. It is possible that soil conditions may be considerably more saturated and softer than anticipated. If poor support conditions are encountered across the predominance of the excavated area then it may be necessary to over excavate and replace additional unsuitable soil with compacted structural fill.

A tri-axial geo-grid designed for foundation improvement applications can be used for the mat system. We recommend that a geo-textile representative provide recommendations for which geo-grid product will work best for the proposed application. The installation and compaction procedures should be observed by a representative from our office.

Moisture Sensitive Soils:

Field observations and laboratory testing indicates that on-site native soil is moisture sensitive due to the percentage of fine-grained material (silt). As such in an exposed condition moisture sensitive soil can become disturbed during normal construction activity, especially when in a wet or saturated condition. Once disturbed, in a wet condition, these soils will be unsuitable for support of foundations, floor slabs and pavements. Therefore, where soil is exposed and will support new construction, care must be taken not to disturb their condition. If disturbed soil conditions develop, the affected soil must be removed and replaced with structural fill. The depth of removal will be dependent on the depth of disturbance developed during construction.

Structural Fill:

Structural fill is defined as any soil placed under buildings, pavements or any other load bearing-areas. Structural fill placed under footings and floor slabs should be placed in thin horizontal lifts not exceeding eight inches, and compacted to a minimum ninety-five percent (95%) of its maximum dry density (Modified Proctor). The fill material should be placed within three percent of the optimum moisture content.

Fill under driveway and parking area pavements should also be placed in lifts approximately eight inches thick and compacted to a minimum of ninety percent (90%) of its maximum dry density (modified proctor), except for the top twelve (12) inches which should be compacted to 95 percent of the maximum dry density. Recommendations for pavement sections are described in the *Pavement Areas* section of this report.

We recommend that structural fill consist of a well graded granular material having a maximum size of two inches and no more than five percent (5 %) fines passing the #200 sieve, based on the ¾ inch fraction. It is recommended that any structural fill planned for on-site use, be submitted for approval prior to import.

Exclusive of the base rock compacted below all foundations, slabs and pavements any soil could potentially be used as structural fill. However, it is important to note that the material must be free of organics, non-expansive and compacted within two percent of the soils optimum moisture content. Extensive aeration and mixing may be required to work soil to a compactable condition. Moisture sensitive silts may not be compactable during wet weather conditions.

The placement and compaction of structural fill should be observed by a representative from our office to verify that fill has been placed and compacted in accordance with the approved project plans and specifications.

Foundations

Based on the subsurface soil conditions encountered, preliminary building design criteria and assuming compliance with the preceding *Site Preparation and Grading* section, the proposed structure can be supported on conventional shallow spread footings bearing on a structural fill mat.

Footings for the one level sections of the building should be at least twelve (12) inches in width and should extend to a minimum depth of eighteen (18) inches below the exterior sub grade or twelve inches below the top of the interior floor slab surface. Individual spread footings or continuous wall footings providing support for the proposed building may be designed for a maximum allowable bearing capacity value of two- thousand five hundred (2500) pounds per square foot (psf).

These basic allowable bearing values are for dead plus live loads and may be increased one-third for combined dead, live, wind, and seismic forces. It is estimated that total and differential footing settlements for the relatively light buildings will be approximately three-quarters and one-half inch, respectively. Lateral loads can be resisted by friction between the foundation and the supporting sub grade or by passive earth pressure acting on the buried portions of the foundation. For the latter, the foundations must be poured "neat" against the existing soil or back filled with a compacted fill meeting the requirements of structural fill.

- Passive Pressure = 300 pcf equivalent fluid weight
- Coefficient of Friction = 0.40

We recommend that all footing excavations be observed by a representative of GE Services prior to placing forms or rebar, to verify that sub grade support conditions are as anticipated in this report, and/or provide modifications in the design as required.

Slab On Grade

The building floor slab may be supported on structural fill as described in the Site Preparation and Grading section of this report. Any disturbed soils must be re-compacted prior to pouring concrete. As previously discussed some of the subsurface soils have the potential for liquefaction during a seismic event. Therefore, we suggest that additional steel reinforcement be incorporated in the floor slab to provide a rigid platform which will effectively reduce settlement during an earthquake. Slab on grade floors should be designed by the project structural engineer based on the anticipated load conditions and sub grade support characteristics.

Temporary Excavations

The following information is provided solely as a service to our client. Under no circumstances should this information be interpreted to mean that GE Services is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

In no case should excavation slopes be greater than the limits specified in local, state and federal safety regulations. Based on the information obtained from our field exploration and laboratory testing, the site soils expected to be encountered in excavations, soft to firm Silt (ML), loose to medium dense clean Sand (SP) with freely seeping groundwater would be classified as Type "C" soils by OSHA guidelines.

Therefore, temporary excavations and cuts greater than four feet in height, should be sloped at an inclination no steeper than 1-1/2H : 1V (horizontal:vertical) for type "C" soils. If this inclination, or flatter, cannot be constructed or if excavations greater than ten feet in depth are required, temporary shoring may be necessary.

The shoring would help protect against slope or excavation collapse, and would provide protection to workmen in the excavation. If temporary shoring is required, we will be available to provide shoring design criteria, if requested.

Site Drainage

Groundwater seepage was encountered at two to three feet below the surface during the time of field exploration. It is likely that groundwater may be encountered in utility trench excavations depending on the planned design depth. Isolated areas of groundwater seepage may also be encountered in foundation excavations during construction.

If seepage is encountered in utility trench or foundation excavations during construction, the bottom of the excavation should be sloped to one or shallower sump pits. The collected water can be pumped from these pits to a positive and permanent discharge, such as a nearby storm drain. Depending on the magnitude of seepage it may be necessary to interconnect the sump pits by a system of connector trenches.

We recommend that the appropriate locations of subsurface drains, if needed, be established during grading and excavation operations by this office, at which time the seepage areas may be more clearly defined. The site should be graded so that surface water is directed off the site. Water should not be allowed to stand in any area where buildings or slabs are to be constructed. Final site grades should allow for drainage away from the building foundations. The ground should be sloped at a gradient of three percent for a distance of at least ten feet away from the building.

Footing Drains should be installed around the perimeter of the proposed building, just below the invert of the footing with a gradient sufficient to initiate flow. Under no circumstances should the roof down spouts be connected to the footing drain system.

We recommend that clean outs be installed at several accessible locations to allow for the periodic maintenance of the footing drain system. Details for the footing drain have been included as *Figure 3, Footing Subdrain Detail.*

Utility Support and Back Fill

Based on the conditions encountered, the soil to be exposed by utility trenches should provide adequate support for utilities. Utility trench backfill is a concern in reducing the potential for settlement along utility alignments, particularly in pavement areas. It is also important that each section of utility line be adequately supported in the bedding material. The back fill material should be hand tamped to ensure support is provided around the pipe haunches.

Fill should be carefully placed and hand tamped to about twelve inches above the crown of the pipe before any compaction equipment is used. The remainder of the trench back fill should be placed in lifts having a loose thickness of eight inches. A typical trench backfill section and compaction requirements for load supporting and non-load supporting areas is presented on *Figure 4, Utility Trench Backfill Detail.* Trench back fill may consist of imported granular fill provided the material is placed and compacted near the optimum moisture content. Material to be used as backfill should be submitted to our laboratory at least one week prior to construction so that we can determine the suitability of the soil and provide a laboratory proctor for field density testing.

Pavement Areas

The durability of driveway and parking area pavements is related in part to the condition of the underlying sub grade. To provide a properly prepared sub grade for pavements, we recommend the sub grade be treated and prepared as described in the *Site Preparation and Grading* section of this report. It is possible that some localized areas of soft, wet or unstable sub grade may still exist after this process. Before placement of any base rock, the sub grade should be compacted with suitable compaction equipment. Yielding areas that are identified should be excavated to firm material and replaced with compacted two inch-minus clean-crushed rock.

The following pavement section is recommended for the proposed driveway and parking areas:

- Three inches of Asphalt Concrete (AC) over ten inches of compacted Crushed Rock Base (CRB) material (optional: over a geo-grid consisting of Tensar BX1100 or equivalent).

The geo-grid should be placed directly on the sub grade surface of the driveways and parking areas prior to placement of base rock. Geogrids have been suggested as an option. Appropriate geo-textiles have been designed to increase the strength of the sub grade and extend pavement life.

Asphaltic Cement (AC) and Crushed Rock Base (CRB) materials should conform to WSDOT specifications. All base rock should be compacted to at least 95 percent of the ASTM D-1557-91 laboratory test standard. We recommend that a minimum of eight inches of compacted CRB be placed below all exterior slabs. Exterior concrete slabs that are subject to vehicle traffic loads should be at least six inches in thickness. It is also suggested that nominal reinforcement such as "6x6-10/10" welded wire mesh be installed, near midpoint, in new exterior concrete slabs and paving. Fiber mesh concrete may be used in lieu of welded wire mesh.

Additional Services & Construction Monitoring

GE Services will be available to provide consultation services related to review of the final design to verify that the recommendations within our purview have been properly interpreted and implemented in the approved construction plans and specifications.

A representative from our office will be available to attend a pre-construction meeting to discuss and/or clarify all geotechnical issues related to the proposed project.

In addition, it is suggested that this office be retained to provide geotechnical services during construction to observe compliance with the design concepts and project specifications and to allow design changes in the event subsurface conditions differ from those anticipated.

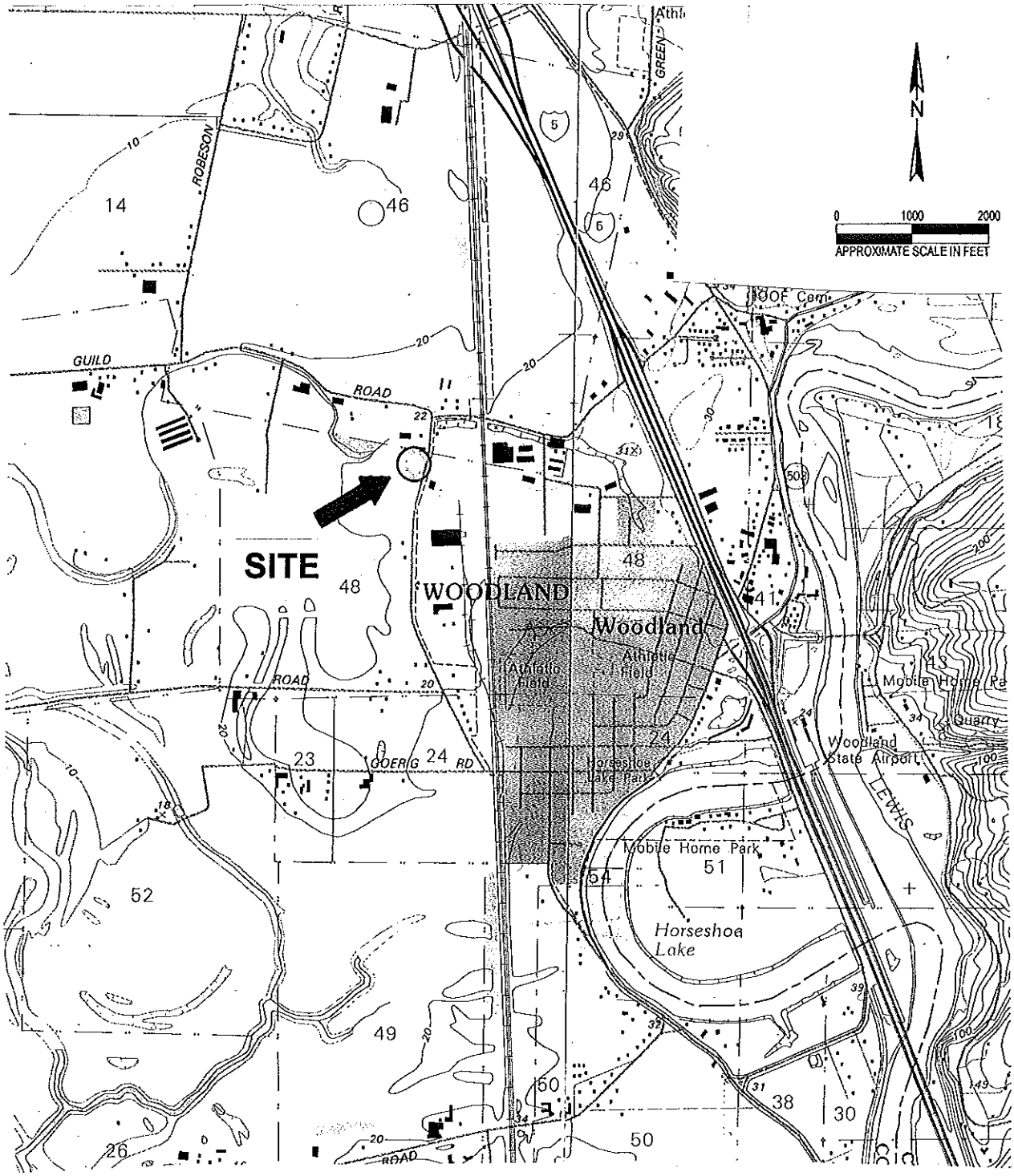
Our construction services would include monitoring and documenting the following:

- *Site grading, foundation excavations, construction of a "gravel-mat" foundation*
- *The installation of foundation drainage systems*
- *Utility trench backfill & compaction*
- *Compressive strength testing of foundation and floor slab concrete*
- *Pavement geo-grid installation and base rock compaction*
- *Pavement sub-grade proof rolling*
- *Density testing of asphalt pavements*

LIMITATIONS

Our recommendations and conclusions are based on the site materials observed, selective laboratory testing, engineering analyses, the design information provided to GE Services and our experience as well as engineering judgment. The conclusions and recommendations are professional opinions derived in a manner consistent with that level of care and skill ordinarily exercised by other members of the profession currently practicing under similar conditions in this area. No warranty is expressed or implied.

The recommendations submitted in this report are based upon the data obtained from the test pits. Soil and groundwater conditions test pits may vary from those encountered. The nature and extent of variations may not become evident until construction. If variations do appear, GE Services Inc. should be requested to reevaluate the recommendations contained in this report and to modify or verify them in writing prior to proceeding with the proposed construction.



VICINITY TOPOGRAPHIC MAP

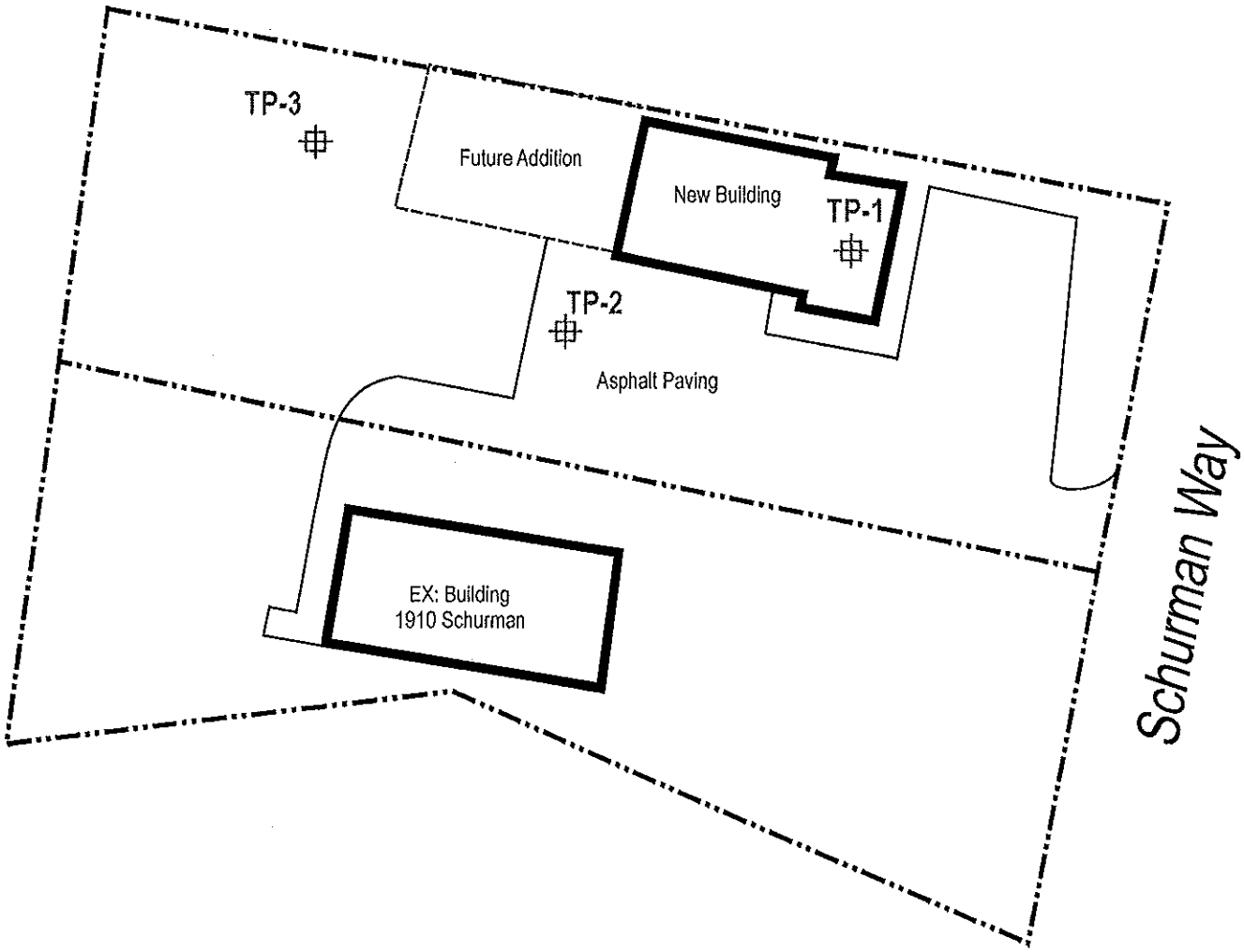
Source: USGS 7.5 x 1.5 Quad, Woodland, WA -1990 & Deer Island, OR-WA

GE Services GEOTECHNICAL & ENVIRONMENTAL SERVICES	*CLIENT:* Schlecht/HCT Building	*DRAWN:* SC
	PROJECT: Shurman Way Woodland, Washington	*DATE:* 6/21/11
		FIGURE: 1
		PRO. #: G17-0611

Site Plan

N

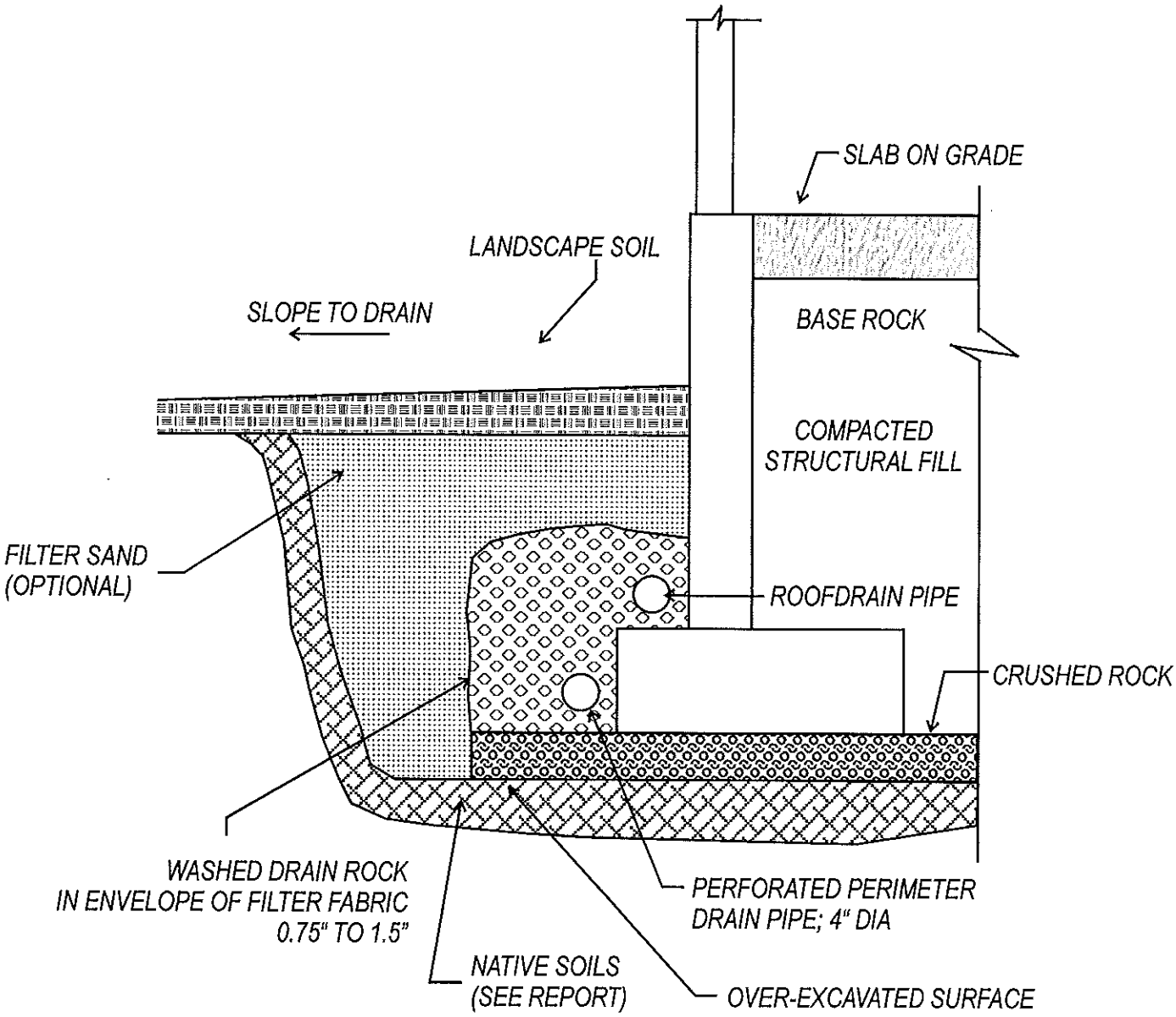
Not to Scale



Legend

TP-3 ⌗ Approximate Test Pit Location

GE Services GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS	*CLIENT:* Schlecht / HCT Building	*DRAWN:* SC
	PROJECT: Schurman Way Woodland, Washington	*DATE:* 6/16/11
		FIGURE: 2
		PRO. #: G17-0611



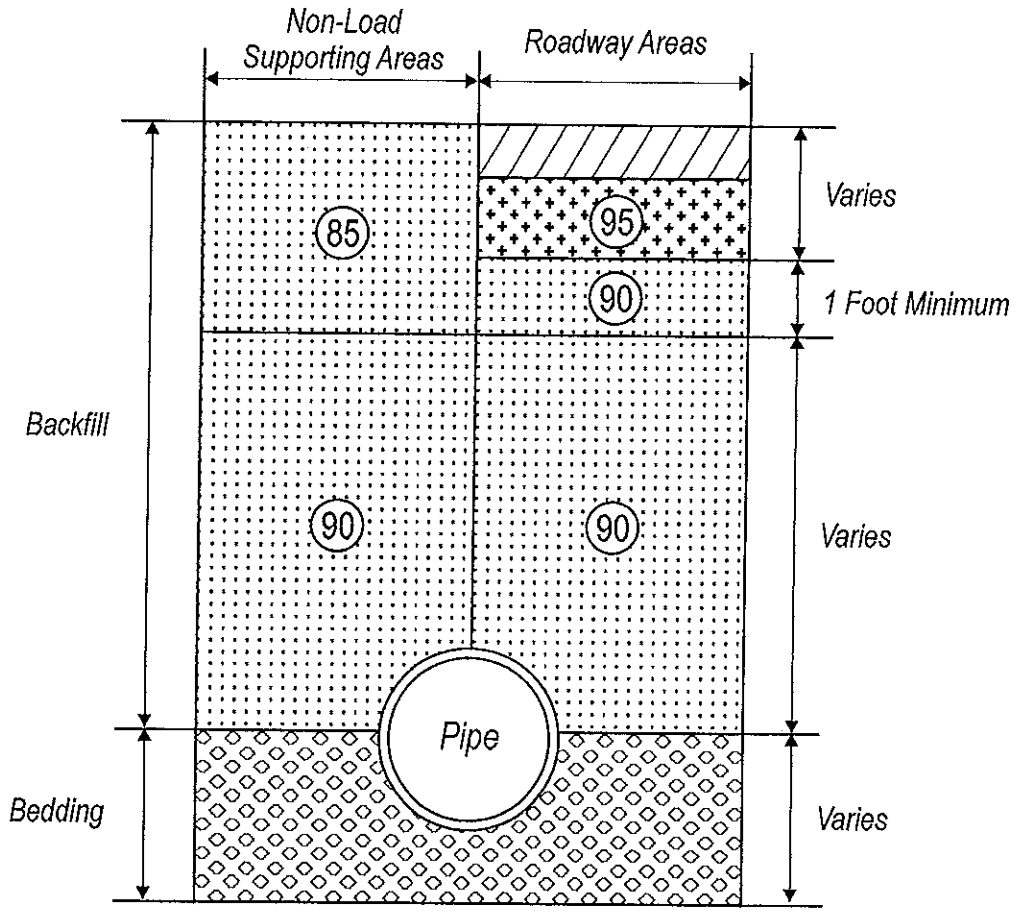
NOTES:

1. PERFORATED OR SLOTTED RIGID PVC PIPE WITH A POSITIVE DRAINAGE GRADIENT
2. FILTER SAND - FINE AGGREGATE FOR PORTLAND CEMENT; SECTION 9=03.1(2)
3. FILTER FABRIC OPTIONAL IF FILTER SAND USED

TYPICAL FOOTING SUBDRAIN DETAIL

Not to Scale

GE Services GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS	CLIENT: Schlecht / HCT Building	DRAWN: SC
	PROJECT: HCT Building Schurman Way Woodland, Washington	DATE: 6/21/11
		FIGURE: 3
		PRO. #: G17-0511



LEGEND

Asphalt or Concrete Pavement

Base Material or Base Rock

Backfill: Compacted on-site soil or imported select fill material as described in the site preparation of the general Earthwork Section of the attached report text.

(90) Minimum percentage of maximum Laboratory Dry Density as determined by ASTM Test method D1557 (Modified Proctor),unless otherwise specified in the attached report text.

Bedding Material: Material type depends on type of pipe and laying conditions. Bedding should conform to the manufacturer's recommendations for the type of pipe selected.

UTILITY TRENCH BACKFILL DETAIL

Not to Scale

GE Services GEOTECHNICAL & ENVIRONMENTAL CONSULTANTS	CLIENT: Schlecht / HCT Building	DRAWN: SC
	PROJECT: HCT Building Schurman Way Woodland, Washington	DATE: 6/22/11
		FIGURE: 4
		PRO. #: G17-0511

APPENDIX A

(FIELD EXPLORATION)

FIELD EXPLORATION

Our field exploration was performed on May 19th 2011. Subsurface conditions at the site were explored by excavating three test pits to the maximum depth of nine feet below the existing ground surface. The test pits were excavated using a track-hoe.

The approximate test pit locations were determined by taping from existing property corners. The locations of these test pits should be considered accurate only to the degree implied by the method used. These approximate locations are shown on the *Site Plan, Figure 2.*

The field exploration was monitored by a GE Services representative, who classified the soils that we encountered and maintained a log of each test pit, obtained representative samples, and observed pertinent site features. Representative soil samples were placed in closed containers and returned to the laboratory for further examination and testing.

All samples were identified using the Standard Classification of Soils for Engineering Purposes (ASTM D2487-93) in accordance with the Unified Soil Classification System (USCS), which is presented on Plate A1. Logs of the test pits are presented in Appendix A. The final logs represent our interpretations of the field logs and the results of the laboratory tests on field samples. The stratification lines on the logs represent the approximate boundaries between soil types. In fact, the transitions may be more gradual.

UNIFIED SOIL CLASSIFICATION SYSTEM
LEGEND

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTION
Coarse Grained Soils	Gravel and Gravelly Soils More Than 50% Coarse Fraction Retained on No 4 Sieve	Clean Gravels (little or no fines)		GW gw	Well-Graded Gravels, Gravel-Sand Mixtures Little or no Fines
				GP gp	Poorly-Graded Gravels, Gravel-Sand Mixtures, Little or no Fines
		Gravels with Fines (appreciable amount of fines)		GM gm	Silty Gravels, Gravel-Sand-Silt Mixtures
				GC gc	Clayey Gravels, Gravel-Sand-Clay Mixtures
More Than 50% Material Larger Than No 200 Sieve Size	Sand and Sandy Soils More Than 50% Coarse Fraction Passing No 4 Sieve	Clean Sand (little or no fines)		SW sw	Well-graded Sands, Gravelly Sands Little or no Fines
				SP sp	Poorly-Graded Sands, Gravelly Sands Little or no Fines
		Sands with Fines (appreciable amount of fines)		SM sm	Silty Sands, Sand-Silt Mixtures
				SC sc	Clayey Sands, Sand-Clay Mixtures
Fine Grained Soils	Silts and Clays	Liquid Limit Less than 50		ML ml	Inorganic Silts and Very Fine Sands, Rock Flour, Silty-Clayey Fine Sands; Clayey Silts w/ slight Plasticity
				CL cl	Inorganic Clays of Low to Medium Plasticity, Gravelly Clays, Sandy Clays, Silty Clays, Lean
				OL ol	Organic Silts and Organic Silty Clays of Low Plasticity
More Than 50% Material Smaller Than No 200 Sieve Size	Silts and Clays	Liquid Limit Greater than 50		MH mh	Inorganic Silts, Micaceous or Diatomaceous Fine Sand or Silty Soils
				CH ch	Inorganic Clays of High Plasticity, Fat Clays
				OH oh	Organic Clays of Medium to High Plasticity, Organic Silts
Highly Organic Soils				PT pt	Peat, Humus, Swamp Soils with High Organic Contents

Topsoil		Humus and Duff Layer
Fill		Highly Variable Constituents

GE Services
GEOTECHNICAL & ENVIRONMENTAL SERVICES

CLIENT:	Schlecht/HCT Building	DRAWN: SC
PROJECT:	Shurman Way Woodland, Washington	DATE: 6/16/11
		PLATE: A1
		PRO. #: G17-0611

LOG OF TEST PIT — TP-1

ELEVATION: ~ 20 feet
EXPLORATORY EQUIPMENT: TRACK HOE
DATE: 5/27/11

DEPTH IN FEET	SAMPLES	SOILS CLASSIFICATION	LITHOLOGY (USGS)	COLOR	MOISTURE	CONSISTENCY	MOISTURE CONTENT % OF DRY WEIGHT	PERCENT PASS NUMBER 200
		6 - 8" grass						
1	•	**Silt,** trace sand (topsoil)		Dark Brown	Wet	Very Soft	35	-
2	☒	**Silt (ML)** w/ lenses of fine sand		Light Brown	Wet	Firm	32	-
3	•	clean, fine to medium **Sand (SP)**		Grey	Water Bearing	Medium Dense	28	5
4								
5								
6	•						20	
7	•	elastic **Silt (MH)** w/ fine sand		Grey Brown	Wet to Saturated	Firm	29	-
8								

Bottom of test pit at 8.0 feet below existing ground surface { test pit collapse }.
Heavy groundwater seepage encountered at 2.5 feet below ground surface.

▼ *Groundwater level*

GE Services
GEOTECHNICAL & ENVIRONMENTAL SERVICES

CLIENT: Schlecht / HCT Building		DRAWN: SC
PROJECT: HCT building Shurman Way Woodland, Washington		DATE: 6/21/11
		PLATE: A2
		PRO. #: G17-0511

LOG OF TEST PIT — TP-2

ELEVATION: ~ 20 feet
EXPLORATORY EQUIPMENT: TRACK HOE
DATE: 5/27/11

DEPTH IN FEET	SAMPLES	SOILS CLASSIFICATION	LITHOLOGY (USGS)	COLOR	MOISTURE	CONSISTENCY	MOISTURE CONTENT % OF DRY WEIGHT	PERCENT PASS NUMBER 200
0		6 - 8" grass						
1		**Silt** (topsoil)		Dark Brown	Wet	Very Soft	-	-
2	X	clayey **Silt (ML)** trace sand		Light Brown	Wet	Soft to Firm	34 28	-
3	•	▼ { wet density - 100 pcf / Dry density - 75 pcf }						
4								
5	•	Clean **Sand (SP)**		Grey Brown	Water Bearing	Loose to Medium Dense	27	1
6								
7	•	elastic **Silt (MH)** w/ fine sand		Mottled Grey Brown	Wet to Saturated	Soft to Firm	26	-
8								
9								

Bottom of test pit at 9.0 feet below existing ground surface { test pit collapse }.
Heavy groundwater seepage encountered at 2.5 feet below ground surface.

▼ *Groundwater level*

GE Services
GEOTECHNICAL & ENVIRONMENTAL SERVICES

CLIENT:	Schlecht / HCT Building	DRAWN:	SC
PROJECT:	HCT building Shurman Way Woodland, Washington	DATE:	6/21/11
		PLATE:	A3
		PRO. #:	G17-0511

LOG OF TEST PIT — TP-3

ELEVATION: ~ 20 feet
EXPLORATORY EQUIPMENT: TRACK HOE
DATE: 5/27/11

DEPTH IN FEET	SAMPLES	SOILS CLASSIFICATION	LITHOLOGY (USGS)	COLOR	MOISTURE	CONSISTENCY	MOISTURE CONTENT % OF DRY WEIGHT	PERCENT PASS NUMBER 200
		8' blackberries						
1		**Silt** (topsoil)		Dark Brown	Wet	Soft	-	-
2		**Silt (ML)** w/ trace sand		Light Brown	Wet	Firm	-	-
3								
4								
5		Clean **Sand (SP)**		Grey Brown	Water Bearing	Medium Dense	-	-
6								
7		elastic **Silt (MH)**		Grey Brown	Saturated	Firm	-	-
8								
9								

Bottom of test pit at 8.0 feet below existing ground surface { test pit collapse }.
Heavy groundwater seepage encountered at 3.0 feet below ground surface.

▼ *Groundwater level*

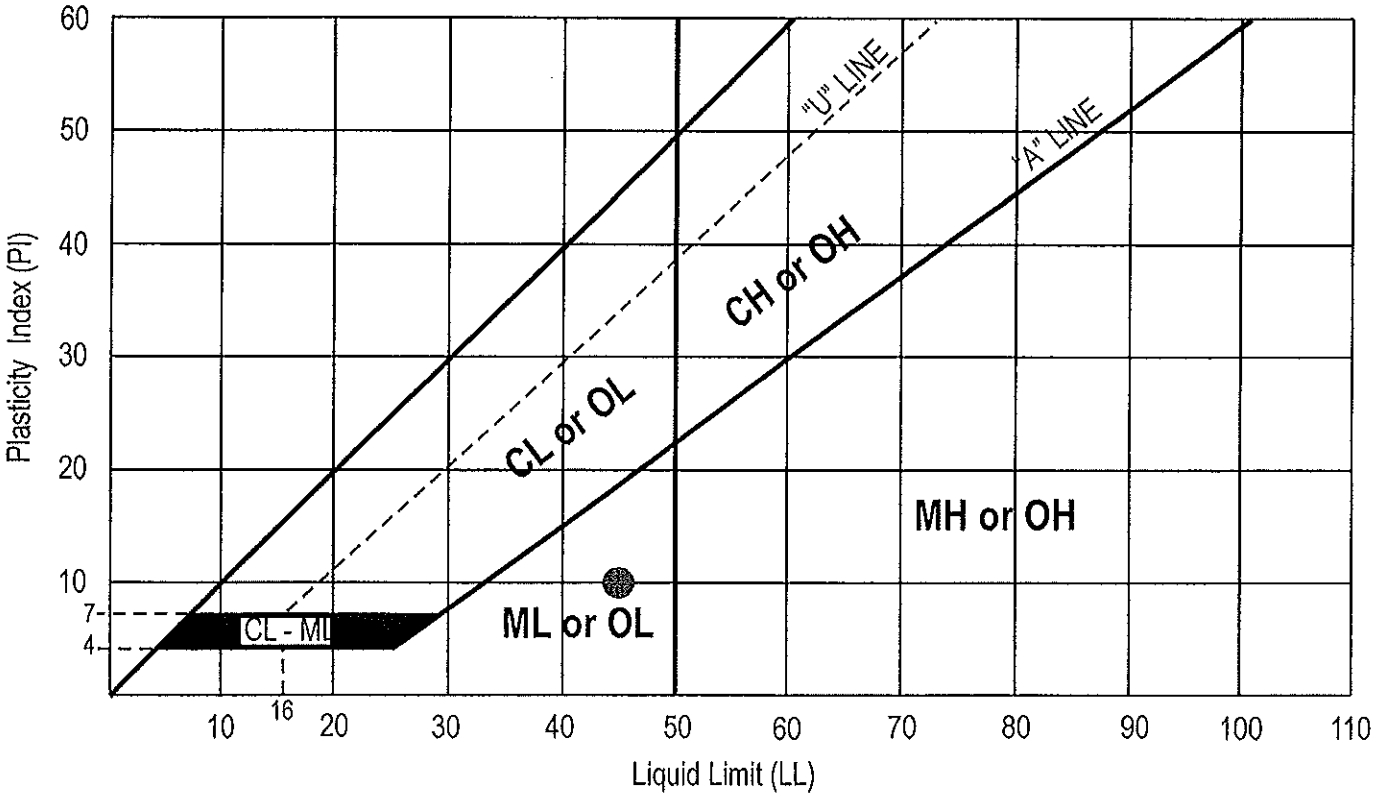
GE Services
GEOTECHNICAL & ENVIRONMENTAL SERVICES

CLIENT:	Schlecht / HCT Building	DRAWN:	SC
PROJECT:	HCT building Shurman Way Woodland, Washington	DATE:	6/21/11
		PLATE:	A4
		PRO. #:	G17-0511

APPENDIX B

(LABORATORY TESTING)

ATTERBERG LIMITS
ASTM D427 & D4318



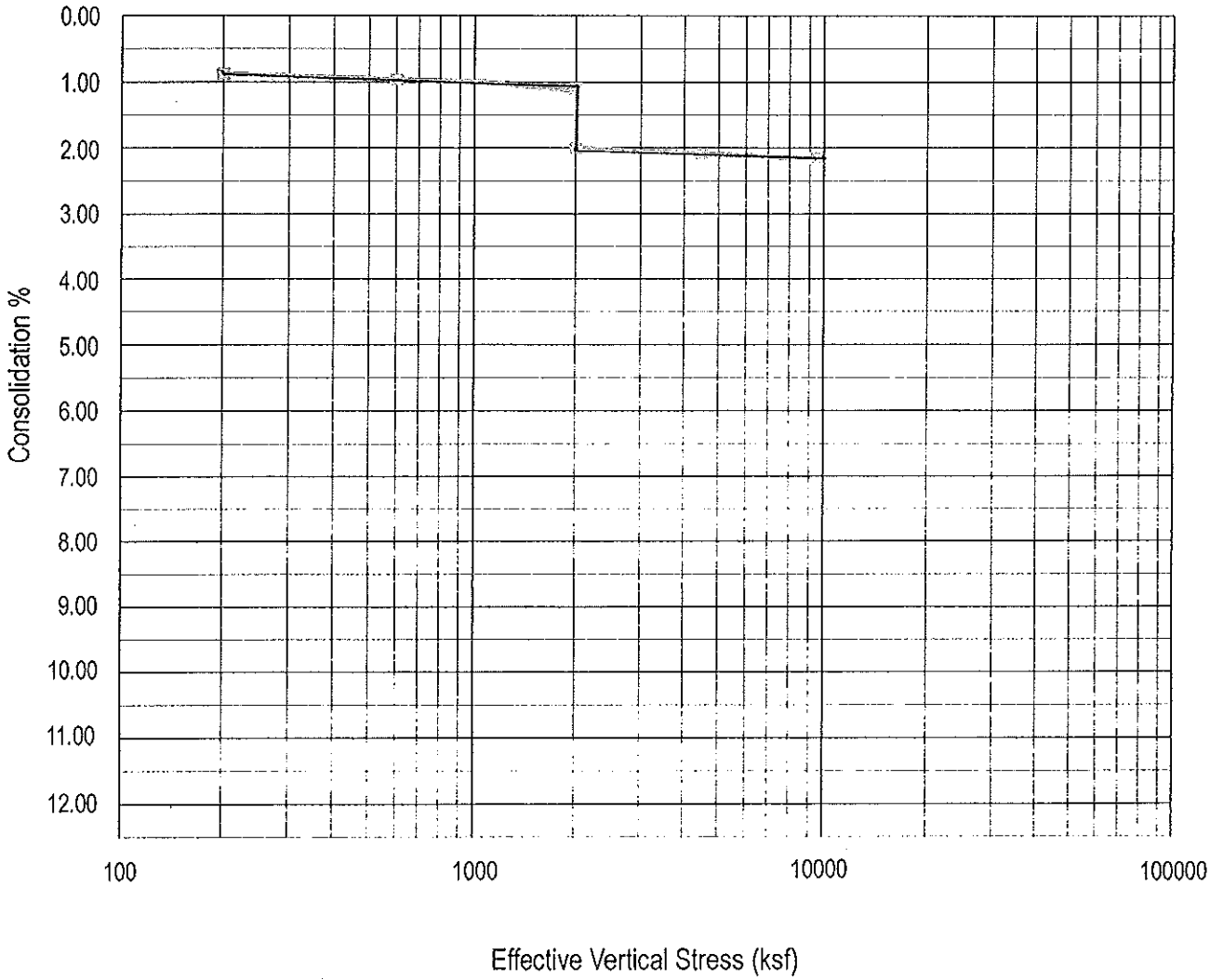
● TP - 2 @ 2.5' feet - Silt (ML)

Liquid Limit (LL) = 45 / Plastic Limit (PL) = 35
Plastic Index (PI) = 10

GE Services GEOTECHNICAL & ENVIRONMENTAL SERVICES	CLIENT: Schlecht / HCT Building	DRAWN: JM
	PROJECT: Schurman Way Woodland, Washington	DATE: 6/16/11
		PLATE: B1
		PRO. #: G17-0611

CONSOLIDATION GRAPH

MATERIAL SOURCE: **TP-1**	*TEST DATE:* **6/13/11**
SAMPLE DEPTH: **6.5' feet - (SM)**	*TEST METHOD:* **ASTM D2435**
WET DENSITY : **122.2 pcf**	*DRY DENSITY :* **94.3 pcf**

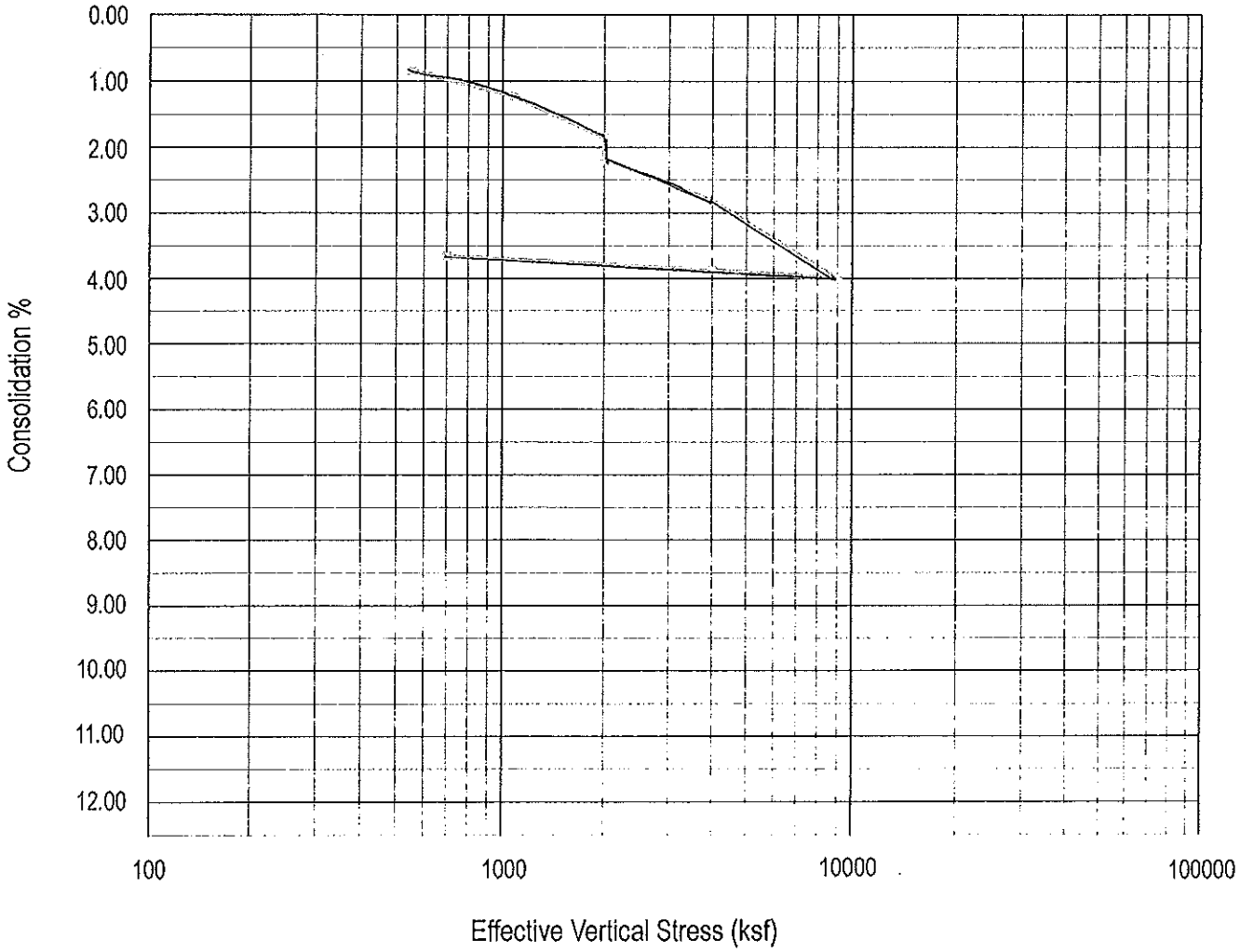


GE Services
GEOTECHNICAL & ENVIRONMENTAL SERVICES

CLIENT: Schlecht / HCT Building		*DRAWN:* JM
PROJECT: Schurman Way Woodland, Washington		*DATE:* 6/21/11
		PLATE: B2
		PRO. #: G17-0611

CONSOLIDATION GRAPH

MATERIAL SOURCE: **TP-2**	*TEST DATE:* **6/13/11**
SAMPLE DEPTH: **2.5' feet - (MH)**	*TEST METHOD:* **ASTM D2435**
WET DENSITY : **102.4 pcf**	*DRY DENSITY :* **71.3 pcf**



GE Services
GEOTECHNICAL & ENVIRONMENTAL SERVICES

CLIENT: Schlecht / HCT Building		*DRAWN:* JM
PROJECT: Schurman Way Woodland, Washington		*DATE:* 6/21/11
		PLATE: B3
		PRO. #: G17-0611

DISTRIBUTION

{G17-0511}

3 Copies

Schlecht Construction Inc.
9407 NE Vancouver Mall Drive, Suite #201
Vancouver, Washington 98662

Attention : Mark Jackson

APPENDIX F
DESIGN REFERENCE DATA

TABLE III-1.3
RUNOFF CURVE NUMBERS

Table III-1.3 SCS Western Washington Runoff Curve Numbers
(Published by SCS in 1982) Runoff curve numbers for selected agricultural, suburban and urban land use for Type 1A rainfall distribution, 24-hour storm duration.

LAND USE DESCRIPTION		CURVE NUMBERS BY HYDROLOGIC SOIL GROUP A	B	C	D
Cultivated land(1):	winter condition	86	91	94	95
Mountain open areas:	low growing brush & grasslands	74	82	89	92
Meadow or pasture:		65	78	85	89
Wood or forest land:	undisturbed	42	64	76	81
Wood or forest land:	young second growth or brush	55	72	81	86
Orchard:	with cover crop	81	88	92	94
Open spaces, lawns, parks, golf courses, cemeteries, landscaping.					
Good condition:	grass cover on ≥75% of the area	68	80	86	90
Fair condition:	grass cover on 50-75% of the area	77	85	90	92
Gravel roads & parking lots:		76	85	89	91
Dirt roads & parking lots:		72	82	87	89
Impervious surfaces, pavement, roofs etc.		98	98	98	98
Open water bodies:	lakes, wetlands, ponds etc.	100	100	100	100
Single family residential(2):					
Dwelling Unit/Gross Acre	%Impervious(3)				
1.0 DU/GA	15				
1.5 DU/GA	20				
2.0 DU/GA	25				
2.5 DU/GA	30				
3.0 DU/GA	34				
3.5 DU/GA	38				
4.0 DU/GA	42				
4.5 DU/GA	46				
5.0 DU/GA	48				
5.5 DU/GA	50				
6.0 DU/GA	52				
6.5 DU/GA	54				
7.0 DU/GA	56				
PUD's, condos, apartments, commercial businesses & industrial areas	%impervious must be computed				
		Separate curve number shall be selected for pervious & impervious portions of the site or basin			

(1) For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Sec. 4, Hydrology, Chapter 9, August 1972.
(2) Assumes roof and driveway runoff is directed into street/storm system.
(3) The remaining pervious areas (lawn) are considered to be in good condition for these curve numbers.

TABLE III-1.4
"n" AND "k" VALUES USED IN TIME CALCULATIONS FOR HYDROGRAPHS

Table III-1.4 "n" AND "k" Values Used in Time Calculations for Hydrographs

"n_s" Sheet Flow Equation Manning's Values (for the initial 300 ft. of travel)	n_s
Smooth surfaces (concrete, asphalt, gravel, or bare hand packed soil)	0.011
Fallow fields or loose soil surface (no residue)	0.05
Cultivated soil with residue cover (s≤ 0.20 ft/ft)	0.06
Cultivated soil with residue cover (s> 0.20 ft/ft)	0.17
Short prairie grass and lawns	0.15
Dense grasses	0.24
Bermuda grass	0.41
Range (natural)	0.13
Woods or forest with light underbrush	0.40
Woods or forest with dense underbrush	0.80

*Manning values for sheet flow only, from Overton and Meadows 1976 (See TR-55, 1986)

"k" Values Used in Travel Time/Time of Concentration Calculations

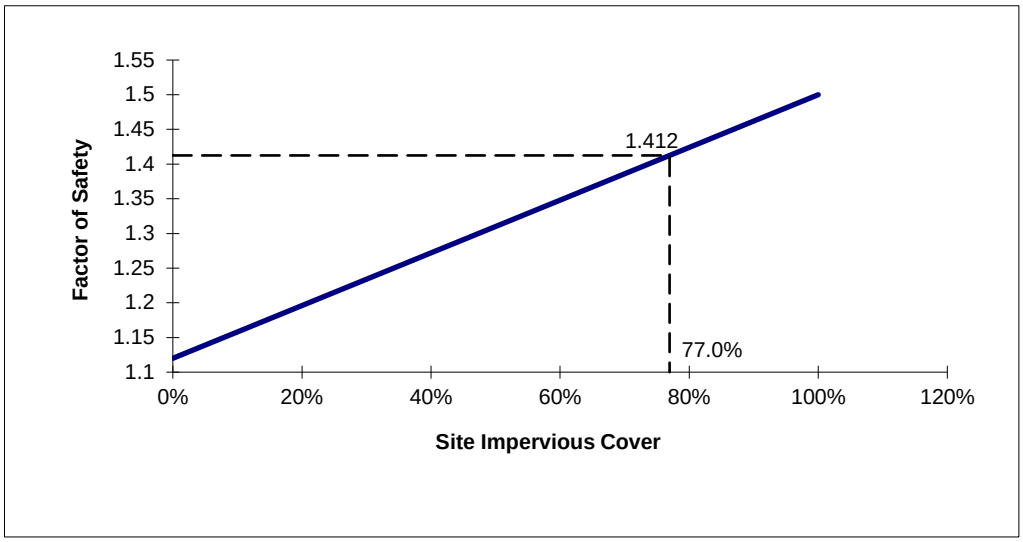
Shallow Concentrated Flow (After the initial 300 ft. of sheet flow, R = 0.1)	k_s
1. Forest with heavy ground litter and meadows (n = 0.10)	3
2. Brushy ground with some trees (n = 0.060)	5
3. Fallow or minimum tillage cultivation (n = 0.040)	8
4. High grass (n = 0.035)	9
5. Short grass, pasture and lawns (n = 0.030)	11
6. Nearly bare ground (n = 0.25)	13
7. Paved and gravel areas (n = 0.012)	27

Channel Flow (intermittent) (At the beginning of visible channels R = 0.2)	k_c
1. Forested swale with heavy ground litter (n = 0.10)	5
2. Forested drainage course/ravine with defined channel bed (n = 0.050)	10
3. Rock-lined waterway (n = 0.035)	15
4. Grassed waterway (n = 0.030)	17
5. Earth-lined waterway (n = 0.025)	20
6. CMP pipe (n = 0.024)	21
7. Concrete pipe (0.012)	42
8. Other waterways and pipe 0.508/n	

Channel Flow (Continuous stream, R = 0.4)	k_c
9. Meandering stream with some pools (n = 0.040)	20
10. Rock-lined stream (n = 0.035)	23
11. Grass-lined stream (n = 0.030)	27
12. Other streams, man-made channels and pipe 0.807/n**	

POND CORRECTION FACTOR CALCULATION

DAWKINS WAREHOUSE PRELIMINARY POND CORECTION FACTOR



Factor of Safety for Detention Ponds and Vaults

Percent of site impervious cover = 77.0%

TOTAL AREA TO POND(ACRES)	2.922
IMPERVIOUS AREA TO POND(ACRES)	2.249
IMPERVIOUS %	77.0%
CORRECTION FACTOR	1.412478
RECIPROCAL*	70.8%

THE RECIPROCAL OF THE CORRECTION FACTOR IS THE VALUE TO BE ENTERED INTO HYDROCAD WHEN PROMPTED FOR % OPEN SPACE IN ORDER FOR HYDROCAD TO AUTOMATICALLY CORRECT THE STORAGE VOLUMES IN ITS CALCULATIONS.