



Memorandum

To: Town of Pembroke
Planning Board

Date: November 15, 2018
REV January 24, 2019
Project #: 14239.00

From: Kenneth Staffier, PE
Arianna Goss, PE

Re: Proposed Urgent Care Facility
Stormwater Management Memorandum

On behalf of D and C Real Estate Trust CTS Fiduciary LLC Trustee (the Applicant), VHB respectfully submits the following Stormwater Management Memorandum, to support the Site Plan Approval application and Site Plans prepared by VHB titled "Proposed Urgent Care Facility" dated January 21, 2019 (the "Project") located at 296 Old Oak Street in Pembroke, MA (the "Site").

Project Summary

Currently, the Site is comprised of an existing 11,250-square-foot footprint retail building and associated paved parking, loading areas, utilities (water, septic system, gas and electric), several leaching catch basins and a stormwater detention basin. The majority of the site is impervious with limited landscaping provided within the paved areas. Specifically, the existing site is comprised of 9.3% roofs ("clean" runoff), 67% impervious surfaces (e.g. pavement, concrete walkways, loading areas, etc.) with little to no treatment, and 23.7% pervious (landscaped) areas.

The proposed Project is a redevelopment of this existing site. The Project proposes to construct a 5,230-square-foot urgent care facility in the northeastern portion of the site, which will replace some of the existing pavement and will require the removal of the existing detention basin in this area. The Project also includes the construction of a new load dock area for the existing retail building that will remain. The northeast portion of the Site will be redeveloped with a new parking layout and new landscaped areas to accommodate the proposed building.

The existing front parking lot will also be improved as part of the Project; landscaped islands will be constructed, and the parking lot will be resurfaced. The rear parking lot will not be altered as part of the Project. The Project will decrease paved surface areas by approximately 7,900 sf and will add approximately 1,400 sf of pervious area. The table below summarizes the change in cover types resulting from the Project:

Table 1

Summary of Existing and Proposed Cover Types

<i>Project Area</i>	<i>Existing Conditions (% of Total Lot Area)</i>	<i>Proposed Conditions (% of Total Lot Area)</i>
Roof Area	9 %	15 %
Pavement Area	67 %	60 %
Pervious Area	24 %	25 %



Kenneth S. Staffier
1-25-2019

Existing Stormwater Conditions

The existing stormwater management system is comprised of four (4) leaching catch basins and a detention pond. Stormwater runoff from the site flows to the five Design Points listed below. Figure 1 shows the existing drainage patterns at the site.

Summary of Design Points and their Tributary Drainage Areas

- DP-1: The northwest portion of the Site drains to a leaching catch basin in the rear parking lot which provides for infiltration.
- DP-2: The southwest corner of the site drains offsite towards a drainage swale adjacent to Route 3.
- DP-3: The central and southern portions of the front parking lot drain to three (3) interconnected leaching catch basins. Overflow from the leaching basins is piped to the drainage system in Old Oak Street.
- DP-4: The northeastern portion of parking lot drains to a detention pond from which the discharge enters a headwall inlet at the corner of Old Oak Street and Church Street and is then piped to the Town drainage system.
- DP-5: The southwest corner and eastern edge of the site of the Site drain offsite towards Old Oak Street.

Proposed Stormwater Conditions

The Project will not impact the existing drainage areas tributary to Design Points DP-1, DP-2 and DP-5, therefore, changes to the existing stormwater management in these areas has not been proposed. The existing leaching catchbasins tributary to DP-3 will be replaced with a new infiltration system (System P2A) that replicates the infiltration capacity of the three (3) existing leaching catchbasin, but with improved water quality prior to discharge to the groundwater. The drainage area tributary to DP-4 is significantly impacted by the proposed Project, thus a new stormwater management system for this drainage area is proposed. Below is a summary of the changes to each of the drainage areas. Figure 2 shows the proposed drainage patterns.

Summary of Changes to Design Points and their Tributary Drainage Areas

- DP-1: The northwest portion of the Site will not be altered as part of the Project. This area will continue to drain to the leaching catch basin in the rear parking lot.
- DP-2: The southwest corner of the site will continue to drain offsite towards the ditch adjacent to Route 3 under post-development conditions. Redevelopment in this portion of the site will slightly increase the drainage area to this design point by about 250 sf. This increase is considered de minimis as it does not result in a change in peak flow rates to this design point.
- DP-3: The central and southern portions of the front parking lot will continue to drain westerly toward Old Oak Street. Redevelopment in this portion of the site will decrease the drainage area to this design point by about 5,600 sf and will increase pervious (landscaped) areas. The three (3) existing leaching catch basins will be replaced with three (3) new catchbasins (with deep sumps and hoods) and a new

subsurface infiltration system (System P2A) comprised of 40 Stormtech (SC740) chambers with an isolator row to capture sediment in the stormwater. This system has been designed to replicate the infiltration volume of the existing leaching basins and to treat the first one inch (1") of runoff generated from the paved parking lot. The overflow from the infiltration system will continue to be piped to the drainage system in Old Oak Street. Peak flow rates to DP-3 are decreased under the proposed conditions.

- DP-4: While the Project proposes to redevelop the northeastern portion of the Site, it will continue to drain to the Town drainage system at the corner of Old Oak Street and Church Street.

Runoff generated in the proposed truck dock area at the existing building and from the proposed parking lot for the urgent care facility will be captured in catchbasins with deep sumps and hoods and directed to a subsurface infiltration system (System P3) comprised of 18 Stormtech (SC740) chambers with an isolator row to capture sediment in the stormwater. This system has been designed to treat the first one inch (1") of runoff generated from the paved parking surfaces. The overflow from this infiltration system will be piped to the northeast to the existing headwall drain pipe that discharges into the drain system at the corner of Old Oak Street and Church Street. The headwall inlet will be replaced with a drain manhole structure.

The stormwater runoff from the proposed 5,230 SF urgent care building roof will be directed to a separate subsurface infiltration system (System P1) comprised of 27 Stormtech (SC740) chambers. Because stormwater runoff from roofs does not require treatment, the system does not include an isolator row. Outflow from the roof infiltration system will be piped to the proposed drain manhole at the location of the existing headwall at the corner of Old Oak Street and Church Street.

- DP-5: The southwest corner and eastern edge of the Site will continue to drain offsite towards Old Oak Street under post-development conditions. Redevelopment in this portion of the site will increase the drainage area to this design point by about 500 sf, but will increase pervious area, thus resulting in lower peak flow rates to this design point.

Stormwater Management Standards

As demonstrated below, the proposed Project complies with the Massachusetts Department of Environmental Protection Stormwater Management Standards.

- **Standard 1:** No New Untreated Discharges or Erosion to Wetlands

The Project does not propose any new stormwater discharges and therefore complies with Standard 1.

- **Standard 2:** Peak Rate Attenuation

The following table demonstrates the peak flow rates for the 2-, 10-, 50- and 100-year storms under existing and proposed conditions. The proposed project will match or decrease the peak flow rates for all storms and design points.

Peak Discharge Rates in cubic feet per second (cfs)

Design Point	2-year	10-year	50-year	100-year
Design Point: 1				
Existing	1.6	2.8	4.1	4.7
Proposed	1.6	2.8	4.1	4.7
Design Point: 2				
Existing	0.8	1.6	2.4	2.7
Proposed	0.8	1.5	2.3	2.7
Design Point: 3				
Existing	4.6	7.1	9.7	10.9
Proposed	3.4	5.2	8.4	9.5
Design Point: 4				
Existing	0.8	2.5	3.9	4.6
Proposed	0.6	2.5	3.8	3.8
Design Point: 5				
Existing	1.0	1.9	3.0	3.4
Proposed	0.9	1.8	2.8	3.3

- **Standard 3: Stormwater Recharge**

The Project proposes to decrease impervious area on the Site, thus increasing stormwater infiltration in the landscaped areas. Additionally, the Project proposes to construct three (3) subsurface infiltration systems to treat and infiltrate the stormwater runoff from the existing main parking field, the new truckdock area at the existing retail building and the new parking lot for the proposed urgent care building. The clean stormwater runoff from the new 5,230 SF urgent care building will also be infiltrated. The recharge volume provided by the proposed infiltration systems exceeds the required recharge volume for the Project.

- **Standard 4: Water Quality**

Under existing conditions, the main parking field for the retail building has no water quality devices; stormwater is collected with leaching catchbasin that allow stormwater to enter the groundwater untreated. Runoff from the existing building's truckdock area and the side parking field flows over the pavement to a stone channel and into a landscaped area prior to discharging through a headwall into the stormwater system at the Old Oak Street/Church Street intersection.

The Project proposes to replace the existing leaching catchbasins in the main parking field in front of the existing retail building with modern catchbasins with 4'-deep sumps and oil hoods to clean the stormwater prior to it being directed to a new subsurface infiltration system with an isolator row (System P2). This proposed treatment train will achieve 80% removal of Total Suspended Solids (TSS) from the first 1" of runoff as required for a project site located within a Zone II Wellhead Protection District.

Similarly, runoff generated in the proposed truck dock area at the existing building and runoff from the proposed parking lot for the urgent care facility will also be treated by catchbasins with deep sumps and hoods and the subsurface infiltration system isolator row in proposed System P3.

- **Standard 5:** Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

The Project is not considered a LUHPPL and therefore complies with Standard 5.

- **Standard 6:** Critical Areas

The Project is located within a Zone II Wellhead Protection Area and is designed to comply with the Standards accordingly.

- **Standard 7:** Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable

The Project is considered a redevelopment and has been designed to comply with all ten Stormwater Management Standards.

- **Standard 8:** Construction Period Pollution Prevention and Erosion and Sedimentation Controls

The Project will not disturb more than one (1) acre of land.

- **Standard 9:** Operation and Maintenance Plan

The stormwater management system and surface areas of the site must be maintained regularly to avoid detrimental effects to the groundwater and the environment. The following is the procedure for maintaining each of the proposed stormwater system components:

Pavement

- Check pavement areas frequently for spillage and/or pavement staining and clean as necessary.
- Perform periodic sweeping to prevent sediment and debris from entering the stormwater system and/or discharging from the Project Site.

Catchbasins

- All catch basins shall be inspected at least four times per year and cleaned a minimum of once per year.
- Sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of leaves, snow and ice.

- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Subsurface Infiltration Systems

- The subsurface infiltration systems will be inspected at least once each year by removing the manhole/access port covers and determining the thickness of sediment that has accumulated in the sediment removal (isolator) row.
- If sediment is more than six inches deep, it must be suspended via flushing with clean water and removed using a vacuum truck.
- Follow the manufacturer's specifications and instructions for cleaning the pipe headers.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.
- System will be observed after rainfalls to see if it is properly draining.

Roof Leaders

- Perform routine roof inspections quarterly.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.
- Clean inlets twice per year or as necessary.

Vegetated Areas

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed, or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- The grass vegetation should be cut to a height between three and four inches.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.

- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas but should not be applied on a regular basis unless necessary.
 - Annual application of compost amendments and aeration are recommended.
- **Standard 10:** Prohibition of Illicit Discharges

The Project as designed does not include any proposed illicit discharges and therefore complies with Standard 10.

MassDEP Checklist



Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the [Massachusetts Stormwater Handbook](#). The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

¹ The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

² For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

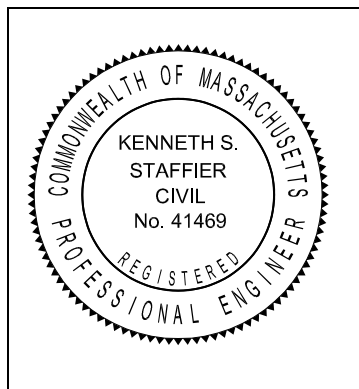
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



1/21/2019

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

- ☐ New development
- ☒ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☒ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☐ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☐ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

¹ 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☒ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The $\frac{1}{2}$ " or ☐ 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

The site is not
considered a LUHPPL

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

- ☒ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- ☒ Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

- ☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
- ☐ Limited Project
 - ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - ☐ Bike Path and/or Foot Path
 - ☐ Redevelopment Project
- ☒ Redevelopment portion of mix of new and redevelopment.
- ☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- ☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- ☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

- ☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- ☐ The project is **not** covered by a NPDES Construction General Permit.
- ☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- ☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

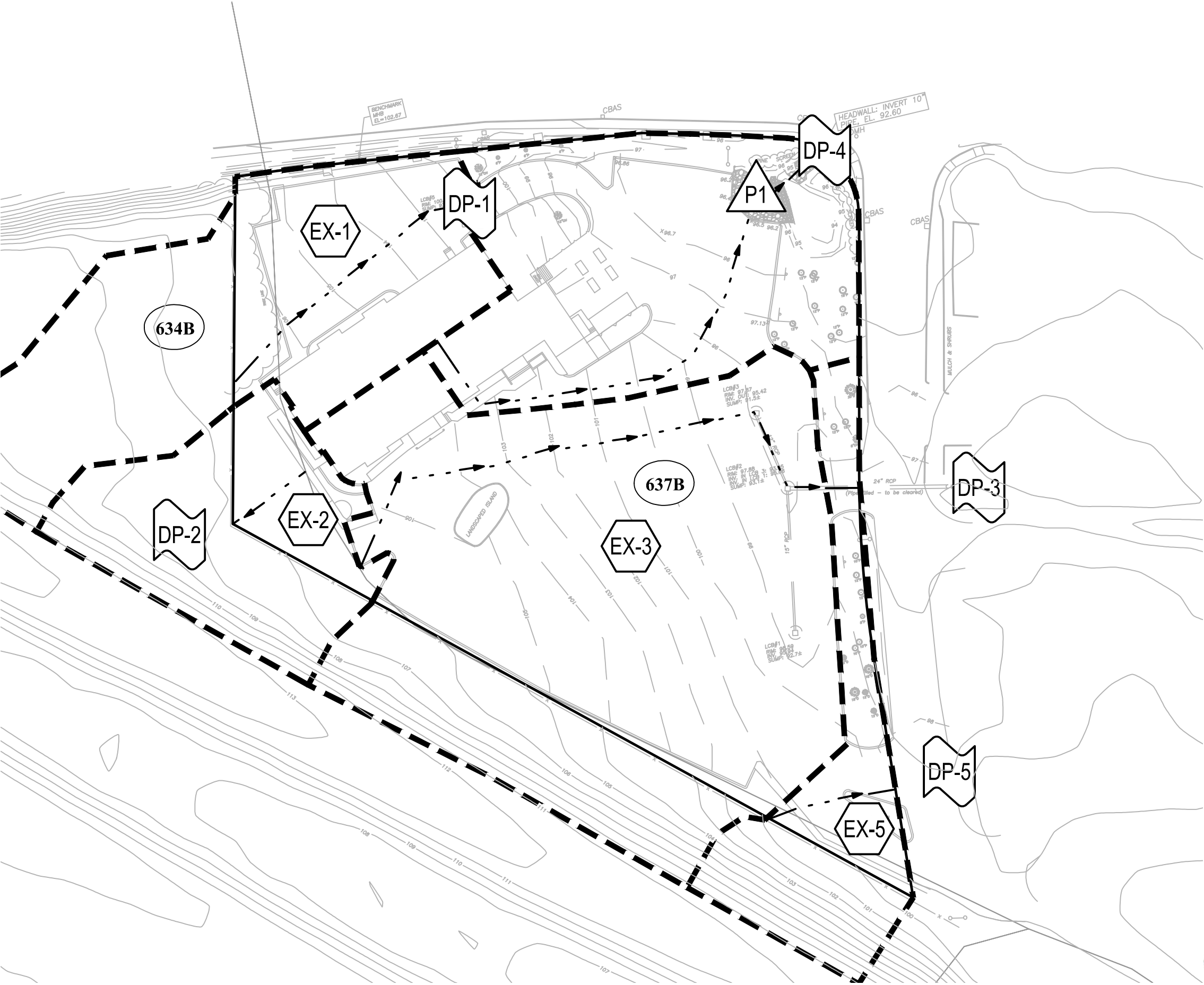
Standard 9: Operation and Maintenance Plan

- ☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - ☐ Name of the stormwater management system owners;
 - ☐ Party responsible for operation and maintenance;
 - ☐ Schedule for implementation of routine and non-routine maintenance tasks;
 - ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
 - ☐ Description and delineation of public safety features;
 - ☐ Estimated operation and maintenance budget; and
 - ☐ Operation and Maintenance Log Form.
- ☐ The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- ☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- ☐ An Illicit Discharge Compliance Statement is attached;
- ☒ NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

Figure 1: Existing Drainage Conditions



Legend

SYMBOLS



DESIGN POINT



DRAINAGE AREA DESIGNATION



POND

LINETYPES



DRAINAGE AREA BOUNDARY



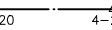
TIME OF CONCENTRATION FLOW LINE



SOIL TYPE BOUNDARY



100' BUFFER ZONE



WETLAND BOUNDARY

SCS SOIL CLASSIFICATIONS



BIRCHWOOD - URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES, HSG B/D



CARVER - URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES, HSG A



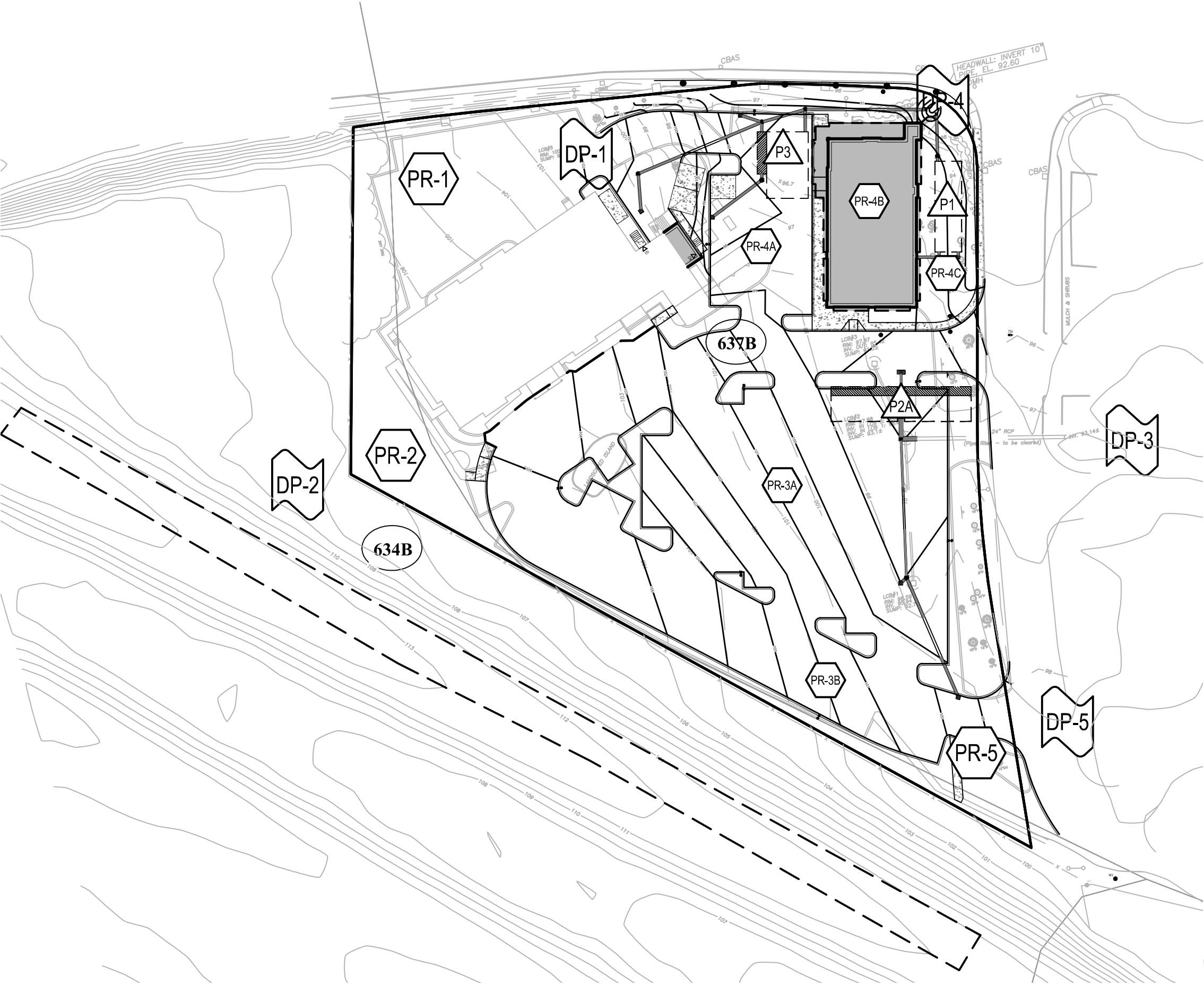
Existing Drainage Conditions

296 Old Oak Street
Pembroke, MA

Figure 1

1/18/2019

Figure 2: Proposed Drainage Conditions



Legend

SYMBOLS

X

DESIGN POINT

X

DRAINAGE AREA DESIGNATION

X

POND

LINETYPES

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW LINE

SOIL TYPE BOUNDARY

100' BUFFER ZONE

WETLAND BOUNDARY

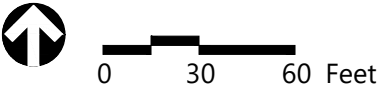
SCS SOIL CLASSIFICATIONS

634B

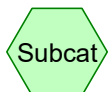
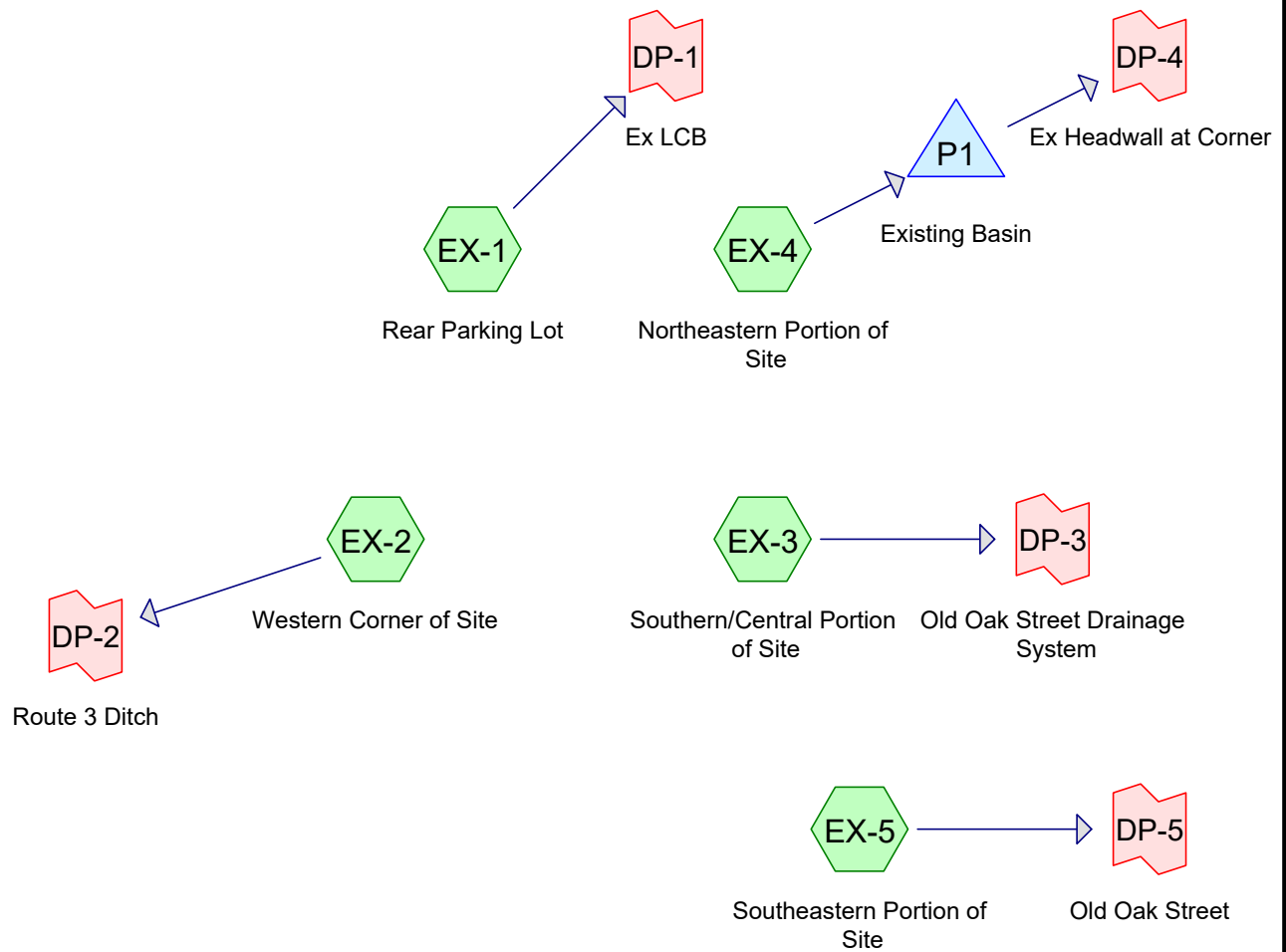
BIRCHWOOD - URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES, HSG B/D

637B

CARVER - URBAN LAND COMPLEX, 0 TO 8 PERCENT SLOPES, HSG A



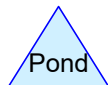
HydroCAD Analysis: Existing Conditions



Subcat



Reach



Pond



Link

Routing Diagram for 14239.00-EX
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
20,390	49	50-75% Grass cover, Fair, HSG A (EX-1, EX-2, EX-3, EX-4, EX-5)
5,945	84	50-75% Grass cover, Fair, HSG D (EX-2, EX-3, EX-5)
82,167	98	Impervious (EX-1, EX-2, EX-3, EX-4, EX-5)
11,168	98	Roof (EX-1, EX-3, EX-4)
54,924	82	Woods/grass comb., Fair, HSG D (EX-1, EX-2, EX-3, EX-5)
174,594	87	TOTAL AREA

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
20,390	HSG A	EX-1, EX-2, EX-3, EX-4, EX-5
0	HSG B	
0	HSG C	
60,869	HSG D	EX-1, EX-2, EX-3, EX-5
93,335	Other	EX-1, EX-2, EX-3, EX-4, EX-5
174,594		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
20,390	0	0	5,945	0	26,335	50-75% Grass cover, Fair
0	0	0	0	82,167	82,167	Impervious
0	0	0	0	11,168	11,168	Roof
0	0	0	54,924	0	54,924	Woods/grass comb., Fair
20,390	0	0	60,869	93,335	174,594	TOTAL AREA

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Rear Parking Lot Runoff Area=36,603 sf 40.34% Impervious Runoff Depth=2.07"
 Flow Length=164' Tc=12.9 min CN=87 Runoff=1.6 cfs 6,329 cf

SubcatchmentEX-2: Western Corner of Site Runoff Area=19,050 sf 6.10% Impervious Runoff Depth=1.68"
 Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=0.8 cfs 2,673 cf

SubcatchmentEX-3: Southern/Central Runoff Area=61,806 sf 85.95% Impervious Runoff Depth=2.82"
 Flow Length=355' Tc=5.0 min CN=95 Runoff=4.6 cfs 14,531 cf

SubcatchmentEX-4: Northeastern Portion Runoff Area=33,110 sf 61.14% Impervious Runoff Depth=1.47"
 Flow Length=319' Tc=5.0 min CN=79 Runoff=1.3 cfs 4,065 cf

SubcatchmentEX-5: Southeastern Portion Runoff Area=24,025 sf 16.82% Impervious Runoff Depth=1.47"
 Flow Length=76' Tc=5.0 min CN=79 Runoff=1.0 cfs 2,950 cf

Pond P1: Existing Basin Peak Elev=95.92' Storage=1,220 cf Inflow=1.3 cfs 4,065 cf
 Outflow=0.8 cfs 3,019 cf

Link DP-1: Ex LCB Inflow=1.6 cfs 6,329 cf
 Primary=1.6 cfs 6,329 cf

Link DP-2: Route 3 Ditch Inflow=0.8 cfs 2,673 cf
 Primary=0.8 cfs 2,673 cf

Link DP-3: Old Oak Street Drainage System Inflow=4.6 cfs 14,531 cf
 Primary=4.6 cfs 14,531 cf

Link DP-4: Ex Headwall at Corner Inflow=0.8 cfs 3,019 cf
 Primary=0.8 cfs 3,019 cf

Link DP-5: Old Oak Street Inflow=1.0 cfs 2,950 cf
 Primary=1.0 cfs 2,950 cf

Total Runoff Area = 174,594 sf Runoff Volume = 30,548 cf Average Runoff Depth = 2.10"
46.54% Pervious = 81,259 sf 53.46% Impervious = 93,335 sf

Summary for Subcatchment EX-1: Rear Parking Lot

Runoff = 1.6 cfs @ 12.17 hrs, Volume= 6,329 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,613	82	Woods/grass comb., Fair, HSG D
36,603	87	Weighted Average
21,837		59.66% Pervious Area
14,766		40.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment EX-2: Western Corner of Site

Runoff = 0.8 cfs @ 12.10 hrs, Volume= 2,673 cf, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,955	82	Woods/grass comb., Fair, HSG D
19,050	82	Weighted Average
17,888		93.90% Pervious Area
1,162		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment EX-3: Southern/Central Portion of Site

Runoff = 4.6 cfs @ 12.07 hrs, Volume= 14,531 cf, Depth= 2.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
1,206	49	50-75% Grass cover, Fair, HSG A
* 50,149	98	Impervious
* 2,973	98	Roof
405	84	50-75% Grass cover, Fair, HSG D
7,073	82	Woods/grass comb., Fair, HSG D
61,806	95	Weighted Average
8,684		14.05% Pervious Area
53,122		85.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	213	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.1	50	0.0290	8.37	6.57	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.3	42	0.0010	2.47	7.75	Pipe Channel, Piped System 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
2.2	355	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-4: Northeastern Portion of Site

Runoff = 1.3 cfs @ 12.08 hrs, Volume= 4,065 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
12,865	49	50-75% Grass cover, Fair, HSG A
* 17,187	98	Impervious
* 3,058	98	Roof
33,110	79	Weighted Average
12,865		38.86% Pervious Area
20,245		61.14% Impervious Area

14239.00-EX

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Type III 24-hr 2-yr Rainfall=3.38"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
2.0	56	0.0010	0.47		Shallow Concentrated Flow, Basin/RipRap Grassed Waterway Kv= 15.0 fps
3.1	319	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-5: Southeastern Portion of Site

Runoff = 1.0 cfs @ 12.08 hrs, Volume= 2,950 cf, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
4,410	49	50-75% Grass cover, Fair, HSG A
* 4,040	98	Impervious
1,292	84	50-75% Grass cover, Fair, HSG D
14,283	82	Woods/grass comb., Fair, HSG D
24,025	79	Weighted Average
19,985		83.18% Pervious Area
4,040		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.4	32	0.0280	1.29		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
0.1	26	0.0280	3.40		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
3.6	76	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Existing Basin

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 1.47" for 2-yr event
 Inflow = 1.3 cfs @ 12.08 hrs, Volume= 4,065 cf
 Outflow = 0.8 cfs @ 12.18 hrs, Volume= 3,019 cf, Atten= 40%, Lag= 6.2 min
 Primary = 0.8 cfs @ 12.18 hrs, Volume= 3,019 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 95.92' @ 12.18 hrs Surf.Area= 1,470 sf Storage= 1,220 cf

Plug-Flow detention time= 146.6 min calculated for 3,019 cf (74% of inflow)
 Center-of-Mass det. time= 54.3 min (896.5 - 842.2)

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Type III 24-hr 2-yr Rainfall=3.38"

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Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	2,149 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	1,183	0	0
96.00	1,495	1,339	1,339
96.50	1,745	810	2,149

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	10.0" Round Culvert L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Device 1	95.80'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=0.8 cfs @ 12.18 hrs HW=95.92' (Free Discharge)

↑1=Culvert (Passes 0.8 cfs of 4.5 cfs potential flow)

↑2=Broad-Crested Rectangular Weir(Weir Controls 0.8 cfs @ 0.84 fps)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,603 sf, 40.34% Impervious, Inflow Depth = 2.07" for 2-yr event
 Inflow = 1.6 cfs @ 12.17 hrs, Volume= 6,329 cf
 Primary = 1.6 cfs @ 12.17 hrs, Volume= 6,329 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 19,050 sf, 6.10% Impervious, Inflow Depth = 1.68" for 2-yr event
 Inflow = 0.8 cfs @ 12.10 hrs, Volume= 2,673 cf
 Primary = 0.8 cfs @ 12.10 hrs, Volume= 2,673 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 61,806 sf, 85.95% Impervious, Inflow Depth = 2.82" for 2-yr event
 Inflow = 4.6 cfs @ 12.07 hrs, Volume= 14,531 cf
 Primary = 4.6 cfs @ 12.07 hrs, Volume= 14,531 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 1.09" for 2-yr event
Inflow = 0.8 cfs @ 12.18 hrs, Volume= 3,019 cf
Primary = 0.8 cfs @ 12.18 hrs, Volume= 3,019 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,025 sf, 16.82% Impervious, Inflow Depth = 1.47" for 2-yr event
Inflow = 1.0 cfs @ 12.08 hrs, Volume= 2,950 cf
Primary = 1.0 cfs @ 12.08 hrs, Volume= 2,950 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Rear Parking Lot Runoff Area=36,603 sf 40.34% Impervious Runoff Depth=3.60"
 Flow Length=164' Tc=12.9 min CN=87 Runoff=2.8 cfs 10,996 cf

SubcatchmentEX-2: Western Corner of Site Runoff Area=19,050 sf 6.10% Impervious Runoff Depth=3.11"
 Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=1.6 cfs 4,945 cf

SubcatchmentEX-3: Southern/Central Runoff Area=61,806 sf 85.95% Impervious Runoff Depth=4.46"
 Flow Length=355' Tc=5.0 min CN=95 Runoff=7.1 cfs 22,967 cf

SubcatchmentEX-4: Northeastern Portion Runoff Area=33,110 sf 61.14% Impervious Runoff Depth=2.84"
 Flow Length=319' Tc=5.0 min CN=79 Runoff=2.6 cfs 7,825 cf

SubcatchmentEX-5: Southeastern Portion Runoff Area=24,025 sf 16.82% Impervious Runoff Depth=2.84"
 Flow Length=76' Tc=5.0 min CN=79 Runoff=1.9 cfs 5,678 cf

Pond P1: Existing Basin Peak Elev=96.05' Storage=1,414 cf Inflow=2.6 cfs 7,825 cf
 Outflow=2.5 cfs 6,779 cf

Link DP-1: Ex LCB Inflow=2.8 cfs 10,996 cf
 Primary=2.8 cfs 10,996 cf

Link DP-2: Route 3 Ditch Inflow=1.6 cfs 4,945 cf
 Primary=1.6 cfs 4,945 cf

Link DP-3: Old Oak Street Drainage System Inflow=7.1 cfs 22,967 cf
 Primary=7.1 cfs 22,967 cf

Link DP-4: Ex Headwall at Corner Inflow=2.5 cfs 6,779 cf
 Primary=2.5 cfs 6,779 cf

Link DP-5: Old Oak Street Inflow=1.9 cfs 5,678 cf
 Primary=1.9 cfs 5,678 cf

Total Runoff Area = 174,594 sf Runoff Volume = 52,411 cf Average Runoff Depth = 3.60"
46.54% Pervious = 81,259 sf 53.46% Impervious = 93,335 sf

Summary for Subcatchment EX-1: Rear Parking Lot

Runoff = 2.8 cfs @ 12.17 hrs, Volume= 10,996 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,613	82	Woods/grass comb., Fair, HSG D
36,603	87	Weighted Average
21,837		59.66% Pervious Area
14,766		40.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment EX-2: Western Corner of Site

Runoff = 1.6 cfs @ 12.09 hrs, Volume= 4,945 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,955	82	Woods/grass comb., Fair, HSG D
19,050	82	Weighted Average
17,888		93.90% Pervious Area
1,162		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment EX-3: Southern/Central Portion of Site

Runoff = 7.1 cfs @ 12.07 hrs, Volume= 22,967 cf, Depth= 4.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
1,206	49	50-75% Grass cover, Fair, HSG A
* 50,149	98	Impervious
* 2,973	98	Roof
405	84	50-75% Grass cover, Fair, HSG D
7,073	82	Woods/grass comb., Fair, HSG D
61,806	95	Weighted Average
8,684		14.05% Pervious Area
53,122		85.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	213	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.1	50	0.0290	8.37	6.57	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.3	42	0.0010	2.47	7.75	Pipe Channel, Piped System 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
2.2	355	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-4: Northeastern Portion of Site

Runoff = 2.6 cfs @ 12.07 hrs, Volume= 7,825 cf, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
12,865	49	50-75% Grass cover, Fair, HSG A
* 17,187	98	Impervious
* 3,058	98	Roof
33,110	79	Weighted Average
12,865		38.86% Pervious Area
20,245		61.14% Impervious Area

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Type III 24-hr 10-yr Rainfall=5.04"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
2.0	56	0.0010	0.47		Shallow Concentrated Flow, Basin/RipRap Grassed Waterway Kv= 15.0 fps
3.1	319	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-5: Southeastern Portion of Site

Runoff = 1.9 cfs @ 12.07 hrs, Volume= 5,678 cf, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
4,410	49	50-75% Grass cover, Fair, HSG A
* 4,040	98	Impervious
1,292	84	50-75% Grass cover, Fair, HSG D
14,283	82	Woods/grass comb., Fair, HSG D
24,025	79	Weighted Average
19,985		83.18% Pervious Area
4,040		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.4	32	0.0280	1.29		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
0.1	26	0.0280	3.40		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
3.6	76	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Existing Basin

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 2.84" for 10-yr event
 Inflow = 2.6 cfs @ 12.07 hrs, Volume= 7,825 cf
 Outflow = 2.5 cfs @ 12.10 hrs, Volume= 6,779 cf, Atten= 6%, Lag= 1.6 min
 Primary = 2.5 cfs @ 12.10 hrs, Volume= 6,779 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 96.05' @ 12.10 hrs Surf.Area= 1,520 sf Storage= 1,414 cf

Plug-Flow detention time= 90.5 min calculated for 6,779 cf (87% of inflow)
 Center-of-Mass det. time= 30.5 min (853.6 - 823.2)

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Type III 24-hr 10-yr Rainfall=5.04"

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Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	2,149 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	1,183	0	0
96.00	1,495	1,339	1,339
96.50	1,745	810	2,149

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	10.0" Round Culvert L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Device 1	95.80'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=2.5 cfs @ 12.10 hrs HW=96.05' (Free Discharge)

1=Culvert (Passes 2.5 cfs of 4.6 cfs potential flow)

2=Broad-Crested Rectangular Weir (Weir Controls 2.5 cfs @ 1.24 fps)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,603 sf, 40.34% Impervious, Inflow Depth = 3.60" for 10-yr event
 Inflow = 2.8 cfs @ 12.17 hrs, Volume= 10,996 cf
 Primary = 2.8 cfs @ 12.17 hrs, Volume= 10,996 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 19,050 sf, 6.10% Impervious, Inflow Depth = 3.11" for 10-yr event
 Inflow = 1.6 cfs @ 12.09 hrs, Volume= 4,945 cf
 Primary = 1.6 cfs @ 12.09 hrs, Volume= 4,945 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 61,806 sf, 85.95% Impervious, Inflow Depth = 4.46" for 10-yr event
 Inflow = 7.1 cfs @ 12.07 hrs, Volume= 22,967 cf
 Primary = 7.1 cfs @ 12.07 hrs, Volume= 22,967 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 2.46" for 10-yr event
Inflow = 2.5 cfs @ 12.10 hrs, Volume= 6,779 cf
Primary = 2.5 cfs @ 12.10 hrs, Volume= 6,779 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,025 sf, 16.82% Impervious, Inflow Depth = 2.84" for 10-yr event
Inflow = 1.9 cfs @ 12.07 hrs, Volume= 5,678 cf
Primary = 1.9 cfs @ 12.07 hrs, Volume= 5,678 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

14239.00-EX*Type III 24-hr 50-yr Rainfall=6.87"*

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Rear Parking Lot Runoff Area=36,603 sf 40.34% Impervious Runoff Depth=5.35"
Flow Length=164' Tc=12.9 min CN=87 Runoff=4.1 cfs 16,330 cf

SubcatchmentEX-2: Western Corner of Site Runoff Area=19,050 sf 6.10% Impervious Runoff Depth=4.79"
Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=2.4 cfs 7,611 cf

SubcatchmentEX-3: Southern/Central Runoff Area=61,806 sf 85.95% Impervious Runoff Depth=6.28"
Flow Length=355' Tc=5.0 min CN=95 Runoff=9.7 cfs 32,327 cf

SubcatchmentEX-4: Northeastern Portion Runoff Area=33,110 sf 61.14% Impervious Runoff Depth=4.47"
Flow Length=319' Tc=5.0 min CN=79 Runoff=4.1 cfs 12,321 cf

SubcatchmentEX-5: Southeastern Portion Runoff Area=24,025 sf 16.82% Impervious Runoff Depth=4.47"
Flow Length=76' Tc=5.0 min CN=79 Runoff=3.0 cfs 8,940 cf

Pond P1: Existing Basin Peak Elev=96.13' Storage=1,545 cf Inflow=4.1 cfs 12,321 cf
Outflow=3.9 cfs 11,275 cf

Link DP-1: Ex LCB Inflow=4.1 cfs 16,330 cf
Primary=4.1 cfs 16,330 cf

Link DP-2: Route 3 Ditch Inflow=2.4 cfs 7,611 cf
Primary=2.4 cfs 7,611 cf

Link DP-3: Old Oak Street Drainage System Inflow=9.7 cfs 32,327 cf
Primary=9.7 cfs 32,327 cf

Link DP-4: Ex Headwall at Corner Inflow=3.9 cfs 11,275 cf
Primary=3.9 cfs 11,275 cf

Link DP-5: Old Oak Street Inflow=3.0 cfs 8,940 cf
Primary=3.0 cfs 8,940 cf

Total Runoff Area = 174,594 sf Runoff Volume = 77,530 cf Average Runoff Depth = 5.33"
46.54% Pervious = 81,259 sf 53.46% Impervious = 93,335 sf

Summary for Subcatchment EX-1: Rear Parking Lot

Runoff = 4.1 cfs @ 12.17 hrs, Volume= 16,330 cf, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,613	82	Woods/grass comb., Fair, HSG D
36,603	87	Weighted Average
21,837		59.66% Pervious Area
14,766		40.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment EX-2: Western Corner of Site

Runoff = 2.4 cfs @ 12.09 hrs, Volume= 7,611 cf, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,955	82	Woods/grass comb., Fair, HSG D
19,050	82	Weighted Average
17,888		93.90% Pervious Area
1,162		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment EX-3: Southern/Central Portion of Site

Runoff = 9.7 cfs @ 12.07 hrs, Volume= 32,327 cf, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
1,206	49	50-75% Grass cover, Fair, HSG A
* 50,149	98	Impervious
* 2,973	98	Roof
405	84	50-75% Grass cover, Fair, HSG D
7,073	82	Woods/grass comb., Fair, HSG D
61,806	95	Weighted Average
8,684		14.05% Pervious Area
53,122		85.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	213	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.1	50	0.0290	8.37	6.57	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.3	42	0.0010	2.47	7.75	Pipe Channel, Piped System 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
2.2	355	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-4: Northeastern Portion of Site

Runoff = 4.1 cfs @ 12.07 hrs, Volume= 12,321 cf, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
12,865	49	50-75% Grass cover, Fair, HSG A
* 17,187	98	Impervious
* 3,058	98	Roof
33,110	79	Weighted Average
12,865		38.86% Pervious Area
20,245		61.14% Impervious Area

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Type III 24-hr 50-yr Rainfall=6.87"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
2.0	56	0.0010	0.47		Shallow Concentrated Flow, Basin/RipRap Grassed Waterway Kv= 15.0 fps
3.1	319	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-5: Southeastern Portion of Site

Runoff = 3.0 cfs @ 12.07 hrs, Volume= 8,940 cf, Depth= 4.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
4,410	49	50-75% Grass cover, Fair, HSG A
* 4,040	98	Impervious
1,292	84	50-75% Grass cover, Fair, HSG D
14,283	82	Woods/grass comb., Fair, HSG D
24,025	79	Weighted Average
19,985		83.18% Pervious Area
4,040		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.4	32	0.0280	1.29		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
0.1	26	0.0280	3.40		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
3.6	76	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Existing Basin

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 4.47" for 50-yr event
 Inflow = 4.1 cfs @ 12.07 hrs, Volume= 12,321 cf
 Outflow = 3.9 cfs @ 12.10 hrs, Volume= 11,275 cf, Atten= 4%, Lag= 1.4 min
 Primary = 3.9 cfs @ 12.10 hrs, Volume= 11,275 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 96.13' @ 12.10 hrs Surf.Area= 1,562 sf Storage= 1,545 cf

Plug-Flow detention time= 67.0 min calculated for 11,271 cf (91% of inflow)
 Center-of-Mass det. time= 24.2 min (834.4 - 810.2)

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Type III 24-hr 50-yr Rainfall=6.87"

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Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	2,149 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	1,183	0	0
96.00	1,495	1,339	1,339
96.50	1,745	810	2,149

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	10.0" Round Culvert L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Device 1	95.80'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=3.9 cfs @ 12.10 hrs HW=96.13' (Free Discharge)

↑1=Culvert (Passes 3.9 cfs of 4.6 cfs potential flow)

↑2=Broad-Crested Rectangular Weir(Weir Controls 3.9 cfs @ 1.46 fps)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,603 sf, 40.34% Impervious, Inflow Depth = 5.35" for 50-yr event
 Inflow = 4.1 cfs @ 12.17 hrs, Volume= 16,330 cf
 Primary = 4.1 cfs @ 12.17 hrs, Volume= 16,330 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 19,050 sf, 6.10% Impervious, Inflow Depth = 4.79" for 50-yr event
 Inflow = 2.4 cfs @ 12.09 hrs, Volume= 7,611 cf
 Primary = 2.4 cfs @ 12.09 hrs, Volume= 7,611 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 61,806 sf, 85.95% Impervious, Inflow Depth = 6.28" for 50-yr event
 Inflow = 9.7 cfs @ 12.07 hrs, Volume= 32,327 cf
 Primary = 9.7 cfs @ 12.07 hrs, Volume= 32,327 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 4.09" for 50-yr event
Inflow = 3.9 cfs @ 12.10 hrs, Volume= 11,275 cf
Primary = 3.9 cfs @ 12.10 hrs, Volume= 11,275 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,025 sf, 16.82% Impervious, Inflow Depth = 4.47" for 50-yr event
Inflow = 3.0 cfs @ 12.07 hrs, Volume= 8,940 cf
Primary = 3.0 cfs @ 12.07 hrs, Volume= 8,940 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEX-1: Rear Parking Lot Runoff Area=36,603 sf 40.34% Impervious Runoff Depth=6.13"
 Flow Length=164' Tc=12.9 min CN=87 Runoff=4.7 cfs 18,694 cf

SubcatchmentEX-2: Western Corner of Site Runoff Area=19,050 sf 6.10% Impervious Runoff Depth=5.55"
 Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=2.7 cfs 8,806 cf

SubcatchmentEX-3: Southern/Central Runoff Area=61,806 sf 85.95% Impervious Runoff Depth=7.07"
 Flow Length=355' Tc=5.0 min CN=95 Runoff=10.9 cfs 36,428 cf

SubcatchmentEX-4: Northeastern Portion Runoff Area=33,110 sf 61.14% Impervious Runoff Depth=5.20"
 Flow Length=319' Tc=5.0 min CN=79 Runoff=4.8 cfs 14,352 cf

SubcatchmentEX-5: Southeastern Portion Runoff Area=24,025 sf 16.82% Impervious Runoff Depth=5.20"
 Flow Length=76' Tc=5.0 min CN=79 Runoff=3.4 cfs 10,414 cf

Pond P1: Existing Basin Peak Elev=96.17' Storage=1,597 cf Inflow=4.8 cfs 14,352 cf
 Outflow=4.6 cfs 13,305 cf

Link DP-1: Ex LCB Inflow=4.7 cfs 18,694 cf
 Primary=4.7 cfs 18,694 cf

Link DP-2: Route 3 Ditch Inflow=2.7 cfs 8,806 cf
 Primary=2.7 cfs 8,806 cf

Link DP-3: Old Oak Street Drainage System Inflow=10.9 cfs 36,428 cf
 Primary=10.9 cfs 36,428 cf

Link DP-4: Ex Headwall at Corner Inflow=4.6 cfs 13,305 cf
 Primary=4.6 cfs 13,305 cf

Link DP-5: Old Oak Street Inflow=3.4 cfs 10,414 cf
 Primary=3.4 cfs 10,414 cf

Total Runoff Area = 174,594 sf Runoff Volume = 88,693 cf Average Runoff Depth = 6.10"
46.54% Pervious = 81,259 sf 53.46% Impervious = 93,335 sf

Summary for Subcatchment EX-1: Rear Parking Lot

Runoff = 4.7 cfs @ 12.17 hrs, Volume= 18,694 cf, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,613	82	Woods/grass comb., Fair, HSG D
36,603	87	Weighted Average
21,837		59.66% Pervious Area
14,766		40.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment EX-2: Western Corner of Site

Runoff = 2.7 cfs @ 12.09 hrs, Volume= 8,806 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,955	82	Woods/grass comb., Fair, HSG D
19,050	82	Weighted Average
17,888		93.90% Pervious Area
1,162		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment EX-3: Southern/Central Portion of Site

Runoff = 10.9 cfs @ 12.07 hrs, Volume= 36,428 cf, Depth= 7.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
1,206	49	50-75% Grass cover, Fair, HSG A
* 50,149	98	Impervious
* 2,973	98	Roof
405	84	50-75% Grass cover, Fair, HSG D
7,073	82	Woods/grass comb., Fair, HSG D
61,806	95	Weighted Average
8,684		14.05% Pervious Area
53,122		85.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	213	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.1	50	0.0290	8.37	6.57	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
0.3	42	0.0010	2.47	7.75	Pipe Channel, Piped System 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.012 Concrete pipe, finished
2.2	355	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-4: Northeastern Portion of Site

Runoff = 4.8 cfs @ 12.07 hrs, Volume= 14,352 cf, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
12,865	49	50-75% Grass cover, Fair, HSG A
* 17,187	98	Impervious
* 3,058	98	Roof
33,110	79	Weighted Average
12,865		38.86% Pervious Area
20,245		61.14% Impervious Area

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Type III 24-hr 100-yr Rainfall=7.67"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
2.0	56	0.0010	0.47		Shallow Concentrated Flow, Basin/RipRap Grassed Waterway Kv= 15.0 fps
3.1	319	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment EX-5: Southeastern Portion of Site

Runoff = 3.4 cfs @ 12.07 hrs, Volume= 10,414 cf, Depth= 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
4,410	49	50-75% Grass cover, Fair, HSG A
* 4,040	98	Impervious
1,292	84	50-75% Grass cover, Fair, HSG D
14,283	82	Woods/grass comb., Fair, HSG D
24,025	79	Weighted Average
19,985		83.18% Pervious Area
4,040		16.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.4	32	0.0280	1.29		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
0.1	26	0.0280	3.40		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
3.6	76	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Existing Basin

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 5.20" for 100-yr event
 Inflow = 4.8 cfs @ 12.07 hrs, Volume= 14,352 cf
 Outflow = 4.6 cfs @ 12.09 hrs, Volume= 13,305 cf, Atten= 4%, Lag= 1.3 min
 Primary = 4.6 cfs @ 12.09 hrs, Volume= 13,305 cf

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 96.17' @ 12.09 hrs Surf.Area= 1,579 sf Storage= 1,597 cf

Plug-Flow detention time= 60.7 min calculated for 13,305 cf (93% of inflow)
 Center-of-Mass det. time= 22.6 min (828.5 - 805.9)

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Type III 24-hr 100-yr Rainfall=7.67"

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Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	2,149 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
95.00	1,183	0	0
96.00	1,495	1,339	1,339
96.50	1,745	810	2,149

Device	Routing	Invert	Outlet Devices
#1	Primary	92.60'	10.0" Round Culvert L= 20.0' Box, headwall w/3 square edges, Ke= 0.500 Inlet / Outlet Invert= 92.60' / 92.50' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.55 sf
#2	Device 1	95.80'	8.0' long x 3.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32

Primary OutFlow Max=4.6 cfs @ 12.09 hrs HW=96.17' (Free Discharge)

1=Culvert (Passes 4.6 cfs of 4.7 cfs potential flow)

2=Broad-Crested Rectangular Weir (Weir Controls 4.6 cfs @ 1.55 fps)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,603 sf, 40.34% Impervious, Inflow Depth = 6.13" for 100-yr event
 Inflow = 4.7 cfs @ 12.17 hrs, Volume= 18,694 cf
 Primary = 4.7 cfs @ 12.17 hrs, Volume= 18,694 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 19,050 sf, 6.10% Impervious, Inflow Depth = 5.55" for 100-yr event
 Inflow = 2.7 cfs @ 12.09 hrs, Volume= 8,806 cf
 Primary = 2.7 cfs @ 12.09 hrs, Volume= 8,806 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 61,806 sf, 85.95% Impervious, Inflow Depth = 7.07" for 100-yr event
 Inflow = 10.9 cfs @ 12.07 hrs, Volume= 36,428 cf
 Primary = 10.9 cfs @ 12.07 hrs, Volume= 36,428 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 33,110 sf, 61.14% Impervious, Inflow Depth = 4.82" for 100-yr event
Inflow = 4.6 cfs @ 12.09 hrs, Volume= 13,305 cf
Primary = 4.6 cfs @ 12.09 hrs, Volume= 13,305 cf, Atten= 0%, Lag= 0.0 min

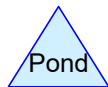
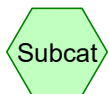
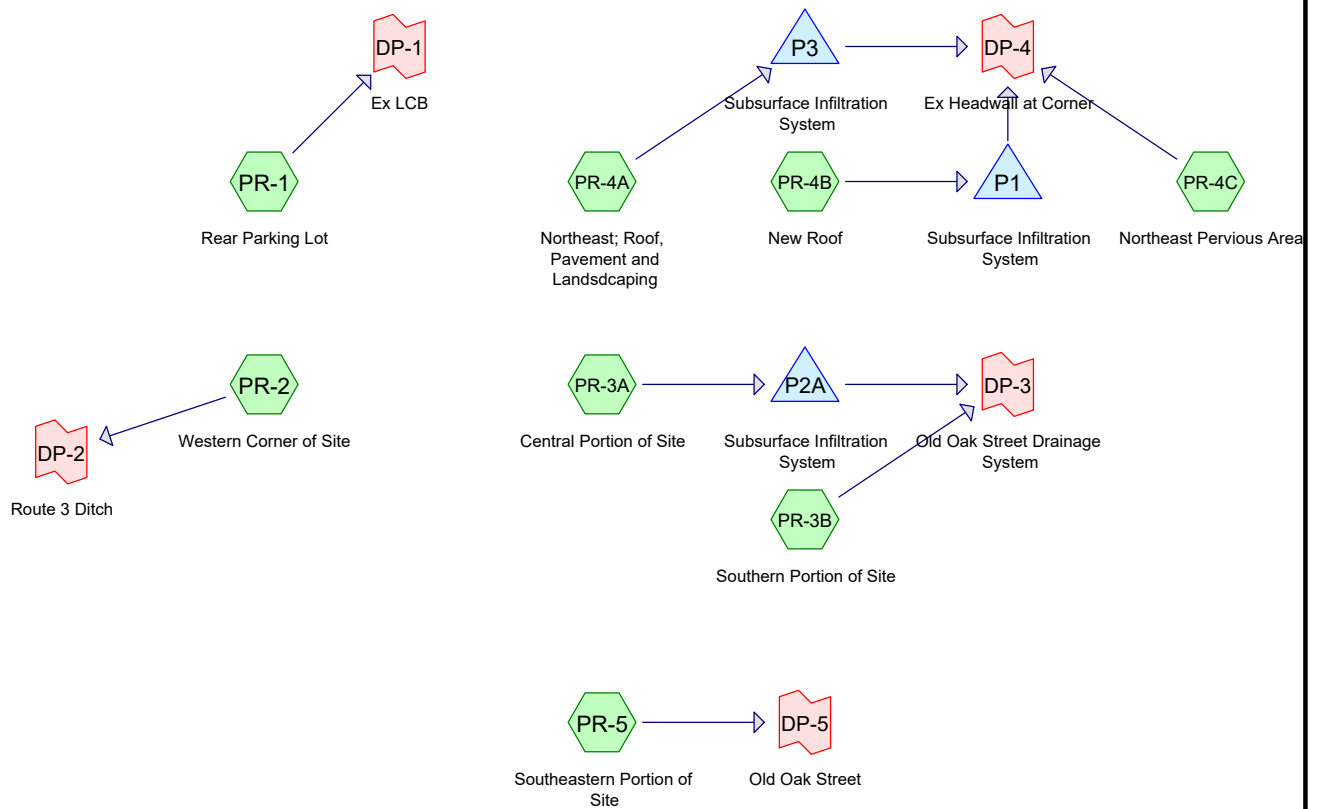
Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,025 sf, 16.82% Impervious, Inflow Depth = 5.20" for 100-yr event
Inflow = 3.4 cfs @ 12.07 hrs, Volume= 10,414 cf
Primary = 3.4 cfs @ 12.07 hrs, Volume= 10,414 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

HydroCAD Analysis: Proposed Conditions



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
22,023	49	50-75% Grass cover, Fair, HSG A (PR-1, PR-2, PR-3A, PR-3B, PR-4A, PR-4C, PR-5)
6,134	84	50-75% Grass cover, Fair, HSG D (PR-2, PR-3A, PR-3B, PR-5)
14,039	98	Impervious (PR-1, PR-2, PR-5)
59,087	98	Paved parking, HSG A (PR-3A, PR-3B, PR-4A, PR-4C)
17,886	98	Roof (PR-1, PR-3A, PR-4A, PR-4B)
54,920	82	Woods/grass comb., Fair, HSG D (PR-1, PR-2, PR-3A, PR-5)
174,089	86	TOTAL AREA

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
81,110	HSG A	PR-1, PR-2, PR-3A, PR-3B, PR-4A, PR-4C, PR-5
0	HSG B	
0	HSG C	
61,054	HSG D	PR-1, PR-2, PR-3A, PR-3B, PR-5
31,925	Other	PR-1, PR-2, PR-3A, PR-4A, PR-4B, PR-5
174,089		TOTAL AREA

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
22,023	0	0	6,134	0	28,157	50-75% Grass cover, Fair
0	0	0	0	14,039	14,039	Impervious
59,087	0	0	0	0	59,087	Paved parking
0	0	0	0	17,886	17,886	Roof
0	0	0	54,920	0	54,920	Woods/grass comb., Fair
81,110	0	0	61,054	31,925	174,089	TOTAL AREA

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Type III 24-hr 2-yr Rainfall=3.38"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Rear Parking Lot Runoff Area=36,835 sf 40.09% Impervious Runoff Depth=2.07"
Flow Length=164' Tc=12.9 min CN=87 Runoff=1.6 cfs 6,369 cf

SubcatchmentPR-2: Western Corner of Site Runoff Area=18,772 sf 6.19% Impervious Runoff Depth=1.68"
Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=0.8 cfs 2,634 cf

SubcatchmentPR-3A: Central Portion of Runoff Area=47,910 sf 76.82% Impervious Runoff Depth=2.52"
Flow Length=320' Tc=5.0 min CN=92 Runoff=3.3 cfs 10,069 cf

SubcatchmentPR-3B: Southern Portion of Runoff Area=8,291 sf 82.26% Impervious Runoff Depth=2.52"
Flow Length=320' Tc=5.0 min CN=92 Runoff=0.6 cfs 1,743 cf

SubcatchmentPR-4A: Northeast; Roof, Runoff Area=23,624 sf 90.66% Impervious Runoff Depth=2.62"
Flow Length=302' Tc=5.0 min CN=93 Runoff=1.7 cfs 5,156 cf

SubcatchmentPR-4B: New Roof Runoff Area=6,522 sf 100.00% Impervious Runoff Depth=3.15"
Flow Length=50' Slope=0.0150 '/' Tc=5.0 min CN=98 Runoff=0.5 cfs 1,710 cf

SubcatchmentPR-4C: Northeast Pervious Runoff Area=7,568 sf 3.61% Impervious Runoff Depth=0.19"
Flow Length=137' Tc=5.0 min CN=51 Runoff=0.0 cfs 121 cf

SubcatchmentPR-5: Southeastern Portion Runoff Area=24,567 sf 13.22% Impervious Runoff Depth=1.28"
Flow Length=79' Tc=5.0 min CN=76 Runoff=0.9 cfs 2,618 cf

Pond P1: Subsurface Infiltration System Peak Elev=93.53' Storage=859 cf Inflow=0.5 cfs 1,710 cf
Discarded=0.0 cfs 1,710 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 1,710 cf

Pond P2A: Subsurface Infiltration System Peak Elev=94.43' Storage=2,485 cf Inflow=3.3 cfs 10,069 cf
Discarded=0.0 cfs 3,902 cf Primary=2.9 cfs 6,167 cf Outflow=2.9 cfs 10,069 cf

Pond P3: Subsurface Infiltration System Peak Elev=95.17' Storage=2,236 cf Inflow=1.7 cfs 5,156 cf
Discarded=0.0 cfs 3,631 cf Primary=0.6 cfs 1,525 cf Outflow=0.6 cfs 5,156 cf

Link DP-1: Ex LCB Inflow=1.6 cfs 6,369 cf
Primary=1.6 cfs 6,369 cf

Link DP-2: Route 3 Ditch Inflow=0.8 cfs 2,634 cf
Primary=0.8 cfs 2,634 cf

Link DP-3: Old Oak Street Drainage System Inflow=3.4 cfs 7,909 cf
Primary=3.4 cfs 7,909 cf

Link DP-4: Ex Headwall at Corner Inflow=0.6 cfs 1,647 cf
Primary=0.6 cfs 1,647 cf

Link DP-5: Old Oak Street Inflow=0.9 cfs 2,618 cf
Primary=0.9 cfs 2,618 cf

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Type III 24-hr 2-yr Rainfall=3.38"

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Total Runoff Area = 174,089 sf Runoff Volume = 30,421 cf Average Runoff Depth = 2.10"
47.72% Pervious = 83,077 sf 52.28% Impervious = 91,012 sf

Summary for Subcatchment PR-1: Rear Parking Lot

Runoff = 1.6 cfs @ 12.17 hrs, Volume= 6,369 cf, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,845	82	Woods/grass comb., Fair, HSG D
36,835	87	Weighted Average
22,069		59.91% Pervious Area
14,766		40.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment PR-2: Western Corner of Site

Runoff = 0.8 cfs @ 12.10 hrs, Volume= 2,634 cf, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,677	82	Woods/grass comb., Fair, HSG D
18,772	82	Weighted Average
17,610		93.81% Pervious Area
1,162		6.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment PR-3A: Central Portion of Site

Runoff = 3.3 cfs @ 12.07 hrs, Volume= 10,069 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
3,785	49	50-75% Grass cover, Fair, HSG A
35,706	98	Paved parking, HSG A
* 1,097	98	Roof
252	84	50-75% Grass cover, Fair, HSG D
7,070	82	Woods/grass comb., Fair, HSG D
47,910	92	Weighted Average
11,107		23.18% Pervious Area
36,803		76.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-3B: Southern Portion of Site

Runoff = 0.6 cfs @ 12.07 hrs, Volume= 1,743 cf, Depth= 2.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
793	49	50-75% Grass cover, Fair, HSG A
6,820	98	Paved parking, HSG A
678	84	50-75% Grass cover, Fair, HSG D
8,291	92	Weighted Average
1,471		17.74% Pervious Area
6,820		82.26% Impervious Area

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Type III 24-hr 2-yr Rainfall=3.38"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4A: Northeast; Roof, Pavement and Landscaping

Runoff = 1.7 cfs @ 12.07 hrs, Volume= 5,156 cf, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
2,206	49	50-75% Grass cover, Fair, HSG A
16,288	98	Paved parking, HSG A
* 5,130	98	Roof
23,624	93	Weighted Average
2,206		9.34% Pervious Area
21,418		90.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	39	0.0050	4.17	3.28	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
1.3	302	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4B: New Roof

Runoff = 0.5 cfs @ 12.07 hrs, Volume= 1,710 cf, Depth= 3.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
* 6,522	98	Roof
6,522		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.8	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4C: Northeast Pervious Area

Runoff = 0.0 cfs @ 12.38 hrs, Volume= 121 cf, Depth= 0.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
7,295	49	50-75% Grass cover, Fair, HSG A
273	98	Paved parking, HSG A
7,568	51	Weighted Average
7,295		96.39% Pervious Area
273		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.0570	0.22		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
1.2	102	0.0090	1.42		Shallow Concentrated Flow, Grassed Grassed Waterway Kv= 15.0 fps
3.9	137	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-5: Southeastern Portion of Site

Runoff = 0.9 cfs @ 12.08 hrs, Volume= 2,618 cf, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-yr Rainfall=3.38"

Area (sf)	CN	Description
6,035	49	50-75% Grass cover, Fair, HSG A
3,248	98	Impervious
956	84	50-75% Grass cover, Fair, HSG D
14,328	82	Woods/grass comb., Fair, HSG D
24,567	76	Weighted Average
21,319		86.78% Pervious Area
3,248		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.6	61	0.0330	1.57		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
3.7	79	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Subsurface Infiltration System

Inflow Area = 6,522 sf, 100.00% Impervious, Inflow Depth = 3.15" for 2-yr event
 Inflow = 0.5 cfs @ 12.07 hrs, Volume= 1,710 cf
 Outflow = 0.0 cfs @ 9.67 hrs, Volume= 1,710 cf, Atten= 96%, Lag= 0.0 min
 Discarded = 0.0 cfs @ 9.67 hrs, Volume= 1,710 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 93.53' @ 14.94 hrs Surf.Area= 842 sf Storage= 859 cf

Plug-Flow detention time= 369.7 min calculated for 1,710 cf (100% of inflow)
 Center-of-Mass det. time= 369.7 min (1,124.0 - 754.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	694 cf	15.75'W x 53.46'L x 3.50'H Field A 2,947 cf Overall - 965 cf Embedded = 1,982 cf x 35.0% Voids
#2A	92.40'	965 cf	ADS_StormTech SC-740 +Cap x 21 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 7 Chambers
		1,658 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.90'	12.0" Round DMH Outlet L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.90' / 94.20' S= 0.0233 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 9.67 hrs HW=91.94' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=91.90' (Free Discharge)
 ↳ **1=DMH Outlet** (Controls 0.0 cfs)
 ↳ **3=Outlet at bottom of system** (Controls 0.0 cfs)

Summary for Pond P2A: Subsurface Infiltration System

Inflow Area = 47,910 sf, 76.82% Impervious, Inflow Depth = 2.52" for 2-yr event
 Inflow = 3.3 cfs @ 12.07 hrs, Volume= 10,069 cf
 Outflow = 2.9 cfs @ 12.11 hrs, Volume= 10,069 cf, Atten= 11%, Lag= 2.3 min
 Discarded = 0.0 cfs @ 8.29 hrs, Volume= 3,902 cf
 Primary = 2.9 cfs @ 12.11 hrs, Volume= 6,167 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 94.43' @ 12.11 hrs Surf.Area= 1,534 sf Storage= 2,485 cf

Plug-Flow detention time= 202.2 min calculated for 10,068 cf (100% of inflow)
 Center-of-Mass det. time= 202.3 min (997.1 - 794.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,236 cf	20.50'W x 74.82'L x 3.50'H Field A 5,368 cf Overall - 1,838 cf Embedded = 3,530 cf x 35.0% Voids
#2A	92.40'	1,838 cf	ADS_StormTech SC-740 +Cap x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Rows of 10 Chambers
		3,073 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.60'	24.0" Round OCS Outlet L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.60' / 93.50' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 8.29 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.9 cfs @ 12.11 hrs HW=94.43' (Free Discharge)

↑ **1=OCS Outlet** (Barrel Controls 2.9 cfs @ 3.47 fps)

↑ **3=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

↑ **4=Outlet at bottom of system** (Passes 2.9 cfs of 3.4 cfs potential flow)

Summary for Pond P3: Subsurface Infiltration System

Inflow Area = 23,624 sf, 90.66% Impervious, Inflow Depth = 2.62" for 2-yr event
 Inflow = 1.7 cfs @ 12.07 hrs, Volume= 5,156 cf
 Outflow = 0.6 cfs @ 12.33 hrs, Volume= 5,156 cf, Atten= 65%, Lag= 15.5 min
 Discarded = 0.0 cfs @ 8.74 hrs, Volume= 3,631 cf
 Primary = 0.6 cfs @ 12.33 hrs, Volume= 1,525 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 95.17' @ 12.33 hrs Surf.Area= 1,170 sf Storage= 2,236 cf

Plug-Flow detention time= 523.6 min calculated for 5,155 cf (100% of inflow)
 Center-of-Mass det. time= 523.7 min (1,313.5 - 789.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,156 cf	25.25'W x 46.34'L x 4.00'H Field A 4,680 cf Overall - 1,378 cf Embedded = 3,302 cf x 35.0% Voids
#2A	92.40'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 6 Chambers
		2,534 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.80'	12.0" Round OCS Outlet L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.80' / 94.30' S= 0.0065 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	8.0" Round Outlet at bottom of system L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#4	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.0 cfs @ 8.74 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.6 cfs @ 12.33 hrs HW=95.17' (Free Discharge)

↑ **1=OCS Outlet** (Barrel Controls 0.6 cfs @ 3.06 fps)

↑ **3=Outlet at bottom of system** (Passes < 1.0 cfs potential flow)

↑ **4=Broad-Crested Rectangular Weir** (Passes < 1.6 cfs potential flow)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,835 sf, 40.09% Impervious, Inflow Depth = 2.07" for 2-yr event
Inflow = 1.6 cfs @ 12.17 hrs, Volume= 6,369 cf
Primary = 1.6 cfs @ 12.17 hrs, Volume= 6,369 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 18,772 sf, 6.19% Impervious, Inflow Depth = 1.68" for 2-yr event
Inflow = 0.8 cfs @ 12.10 hrs, Volume= 2,634 cf
Primary = 0.8 cfs @ 12.10 hrs, Volume= 2,634 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 56,201 sf, 77.62% Impervious, Inflow Depth = 1.69" for 2-yr event
Inflow = 3.4 cfs @ 12.11 hrs, Volume= 7,909 cf
Primary = 3.4 cfs @ 12.11 hrs, Volume= 7,909 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 37,714 sf, 74.81% Impervious, Inflow Depth = 0.52" for 2-yr event
Inflow = 0.6 cfs @ 12.33 hrs, Volume= 1,647 cf
Primary = 0.6 cfs @ 12.33 hrs, Volume= 1,647 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,567 sf, 13.22% Impervious, Inflow Depth = 1.28" for 2-yr event
Inflow = 0.9 cfs @ 12.08 hrs, Volume= 2,618 cf
Primary = 0.9 cfs @ 12.08 hrs, Volume= 2,618 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10-yr Rainfall=5.04"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
 Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Rear Parking Lot Runoff Area=36,835 sf 40.09% Impervious Runoff Depth=3.60"
 Flow Length=164' Tc=12.9 min CN=87 Runoff=2.8 cfs 11,066 cf

SubcatchmentPR-2: Western Corner of Site Runoff Area=18,772 sf 6.19% Impervious Runoff Depth=3.11"
 Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=1.5 cfs 4,873 cf

SubcatchmentPR-3A: Central Portion of Runoff Area=47,910 sf 76.82% Impervious Runoff Depth=4.13"
 Flow Length=320' Tc=5.0 min CN=92 Runoff=5.2 cfs 16,482 cf

SubcatchmentPR-3B: Southern Portion of Runoff Area=8,291 sf 82.26% Impervious Runoff Depth=4.13"
 Flow Length=320' Tc=5.0 min CN=92 Runoff=0.9 cfs 2,852 cf

SubcatchmentPR-4A: Northeast; Roof, Runoff Area=23,624 sf 90.66% Impervious Runoff Depth=4.24"
 Flow Length=302' Tc=5.0 min CN=93 Runoff=2.6 cfs 8,342 cf

SubcatchmentPR-4B: New Roof Runoff Area=6,522 sf 100.00% Impervious Runoff Depth=4.80"
 Flow Length=50' Slope=0.0150 '/' Tc=5.0 min CN=98 Runoff=0.8 cfs 2,610 cf

SubcatchmentPR-4C: Northeast Pervious Runoff Area=7,568 sf 3.61% Impervious Runoff Depth=0.76"
 Flow Length=137' Tc=5.0 min CN=51 Runoff=0.1 cfs 482 cf

SubcatchmentPR-5: Southeastern Portion Runoff Area=24,567 sf 13.22% Impervious Runoff Depth=2.57"
 Flow Length=79' Tc=5.0 min CN=76 Runoff=1.8 cfs 5,258 cf

Pond P1: Subsurface Infiltration System Peak Elev=94.92' Storage=1,518 cf Inflow=0.8 cfs 2,610 cf
 Discarded=0.0 cfs 2,595 cf Primary=0.0 cfs 15 cf Outflow=0.0 cfs 2,610 cf

Pond P2A: Subsurface Infiltration System Peak Elev=94.93' Storage=2,823 cf Inflow=5.2 cfs 16,482 cf
 Discarded=0.0 cfs 4,176 cf Primary=4.4 cfs 12,307 cf Outflow=4.5 cfs 16,483 cf

Pond P3: Subsurface Infiltration System Peak Elev=95.71' Storage=2,456 cf Inflow=2.6 cfs 8,342 cf
 Discarded=0.0 cfs 3,924 cf Primary=2.4 cfs 4,418 cf Outflow=2.4 cfs 8,342 cf

Link DP-1: Ex LCB Inflow=2.8 cfs 11,066 cf
 Primary=2.8 cfs 11,066 cf

Link DP-2: Route 3 Ditch Inflow=1.5 cfs 4,873 cf
 Primary=1.5 cfs 4,873 cf

Link DP-3: Old Oak Street Drainage System Inflow=5.2 cfs 15,159 cf
 Primary=5.2 cfs 15,159 cf

Link DP-4: Ex Headwall at Corner Inflow=2.5 cfs 4,915 cf
 Primary=2.5 cfs 4,915 cf

Link DP-5: Old Oak Street Inflow=1.8 cfs 5,258 cf
 Primary=1.8 cfs 5,258 cf

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Type III 24-hr 10-yr Rainfall=5.04"

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Total Runoff Area = 174,089 sf Runoff Volume = 51,966 cf Average Runoff Depth = 3.58"
47.72% Pervious = 83,077 sf 52.28% Impervious = 91,012 sf

Summary for Subcatchment PR-1: Rear Parking Lot

Runoff = 2.8 cfs @ 12.17 hrs, Volume= 11,066 cf, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,845	82	Woods/grass comb., Fair, HSG D
36,835	87	Weighted Average
22,069		59.91% Pervious Area
14,766		40.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment PR-2: Western Corner of Site

Runoff = 1.5 cfs @ 12.09 hrs, Volume= 4,873 cf, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,677	82	Woods/grass comb., Fair, HSG D
18,772	82	Weighted Average
17,610		93.81% Pervious Area
1,162		6.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment PR-3A: Central Portion of Site

Runoff = 5.2 cfs @ 12.07 hrs, Volume= 16,482 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
3,785	49	50-75% Grass cover, Fair, HSG A
35,706	98	Paved parking, HSG A
* 1,097	98	Roof
252	84	50-75% Grass cover, Fair, HSG D
7,070	82	Woods/grass comb., Fair, HSG D
47,910	92	Weighted Average
11,107		23.18% Pervious Area
36,803		76.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-3B: Southern Portion of Site

Runoff = 0.9 cfs @ 12.07 hrs, Volume= 2,852 cf, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
793	49	50-75% Grass cover, Fair, HSG A
6,820	98	Paved parking, HSG A
678	84	50-75% Grass cover, Fair, HSG D
8,291	92	Weighted Average
1,471		17.74% Pervious Area
6,820		82.26% Impervious Area

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Type III 24-hr 10-yr Rainfall=5.04"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4A: Northeast; Roof, Pavement and Landscaping

Runoff = 2.6 cfs @ 12.07 hrs, Volume= 8,342 cf, Depth= 4.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
2,206	49	50-75% Grass cover, Fair, HSG A
16,288	98	Paved parking, HSG A
* 5,130	98	Roof
23,624	93	Weighted Average
2,206		9.34% Pervious Area
21,418		90.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	39	0.0050	4.17	3.28	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
1.3	302	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4B: New Roof

Runoff = 0.8 cfs @ 12.07 hrs, Volume= 2,610 cf, Depth= 4.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
* 6,522	98	Roof
6,522		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.8	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4C: Northeast Pervious Area

Runoff = 0.1 cfs @ 12.10 hrs, Volume= 482 cf, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
7,295	49	50-75% Grass cover, Fair, HSG A
273	98	Paved parking, HSG A
7,568	51	Weighted Average
7,295		96.39% Pervious Area
273		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.0570	0.22		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
1.2	102	0.0090	1.42		Shallow Concentrated Flow, Grassed Grassed Waterway Kv= 15.0 fps
3.9	137	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-5: Southeastern Portion of Site

Runoff = 1.8 cfs @ 12.08 hrs, Volume= 5,258 cf, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-yr Rainfall=5.04"

Area (sf)	CN	Description
6,035	49	50-75% Grass cover, Fair, HSG A
3,248	98	Impervious
956	84	50-75% Grass cover, Fair, HSG D
14,328	82	Woods/grass comb., Fair, HSG D
24,567	76	Weighted Average
21,319		86.78% Pervious Area
3,248		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.6	61	0.0330	1.57		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
3.7	79	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Subsurface Infiltration System

Inflow Area = 6,522 sf, 100.00% Impervious, Inflow Depth = 4.80" for 10-yr event
 Inflow = 0.8 cfs @ 12.07 hrs, Volume= 2,610 cf
 Outflow = 0.0 cfs @ 15.56 hrs, Volume= 2,610 cf, Atten= 97%, Lag= 209.4 min
 Discarded = 0.0 cfs @ 8.42 hrs, Volume= 2,595 cf
 Primary = 0.0 cfs @ 15.56 hrs, Volume= 15 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 94.92' @ 15.56 hrs Surf.Area= 842 sf Storage= 1,518 cf

Plug-Flow detention time= 652.4 min calculated for 2,610 cf (100% of inflow)
 Center-of-Mass det. time= 652.4 min (1,399.4 - 747.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	694 cf	15.75'W x 53.46'L x 3.50'H Field A 2,947 cf Overall - 965 cf Embedded = 1,982 cf x 35.0% Voids
#2A	92.40'	965 cf	ADS_StormTech SC-740 +Cap x 21 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 7 Chambers
		1,658 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.90'	12.0" Round DMH Outlet L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.90' / 94.20' S= 0.0233 ' S= 0.0233 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 8.42 hrs HW=91.94' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 15.56 hrs HW=94.92' (Free Discharge)
 ↳ **1=DMH Outlet** (Inlet Controls 0.0 cfs @ 0.53 fps)
 ↳ **3=Outlet at bottom of system** (Passes 0.0 cfs of 0.6 cfs potential flow)

Summary for Pond P2A: Subsurface Infiltration System

Inflow Area = 47,910 sf, 76.82% Impervious, Inflow Depth = 4.13" for 10-yr event
 Inflow = 5.2 cfs @ 12.07 hrs, Volume= 16,482 cf
 Outflow = 4.5 cfs @ 12.12 hrs, Volume= 16,483 cf, Atten= 14%, Lag= 2.7 min
 Discarded = 0.0 cfs @ 6.60 hrs, Volume= 4,176 cf
 Primary = 4.4 cfs @ 12.12 hrs, Volume= 12,307 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 94.93' @ 12.12 hrs Surf.Area= 1,534 sf Storage= 2,823 cf

Plug-Flow detention time= 136.4 min calculated for 16,481 cf (100% of inflow)
 Center-of-Mass det. time= 136.5 min (918.0 - 781.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,236 cf	20.50'W x 74.82'L x 3.50'H Field A 5,368 cf Overall - 1,838 cf Embedded = 3,530 cf x 35.0% Voids
#2A	92.40'	1,838 cf	ADS_StormTech SC-740 +Cap x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Rows of 10 Chambers
		3,073 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.60'	24.0" Round OCS Outlet L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.60' / 93.50' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 6.60 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=4.4 cfs @ 12.12 hrs HW=94.93' (Free Discharge)

↑ **1=OCS Outlet** (Passes 4.4 cfs of 6.6 cfs potential flow)

↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 0.1 cfs @ 0.51 fps)

↑ **4=Outlet at bottom of system** (Inlet Controls 4.4 cfs @ 5.56 fps)

Summary for Pond P3: Subsurface Infiltration System

Inflow Area = 23,624 sf, 90.66% Impervious, Inflow Depth = 4.24" for 10-yr event
 Inflow = 2.6 cfs @ 12.07 hrs, Volume= 8,342 cf
 Outflow = 2.4 cfs @ 12.10 hrs, Volume= 8,342 cf, Atten= 8%, Lag= 1.9 min
 Discarded = 0.0 cfs @ 7.17 hrs, Volume= 3,924 cf
 Primary = 2.4 cfs @ 12.10 hrs, Volume= 4,418 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 95.71' @ 12.10 hrs Surf.Area= 1,170 sf Storage= 2,456 cf

Plug-Flow detention time= 354.8 min calculated for 8,340 cf (100% of inflow)
 Center-of-Mass det. time= 355.0 min (1,132.1 - 777.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,156 cf	25.25'W x 46.34'L x 4.00'H Field A 4,680 cf Overall - 1,378 cf Embedded = 3,302 cf x 35.0% Voids
#2A	92.40'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 6 Chambers
		2,534 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.80'	12.0" Round OCS Outlet L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.80' / 94.30' S= 0.0065 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	8.0" Round Outlet at bottom of system L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#4	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.0 cfs @ 7.17 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=2.4 cfs @ 12.10 hrs HW=95.71' (Free Discharge)

↑ **1=OCS Outlet** (Barrel Controls 2.4 cfs @ 4.20 fps)

↑ **3=Outlet at bottom of system** (Passes < 1.6 cfs potential flow)

↑ **4=Broad-Crested Rectangular Weir** (Passes < 9.6 cfs potential flow)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,835 sf, 40.09% Impervious, Inflow Depth = 3.60" for 10-yr event
Inflow = 2.8 cfs @ 12.17 hrs, Volume= 11,066 cf
Primary = 2.8 cfs @ 12.17 hrs, Volume= 11,066 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 18,772 sf, 6.19% Impervious, Inflow Depth = 3.11" for 10-yr event
Inflow = 1.5 cfs @ 12.09 hrs, Volume= 4,873 cf
Primary = 1.5 cfs @ 12.09 hrs, Volume= 4,873 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 56,201 sf, 77.62% Impervious, Inflow Depth = 3.24" for 10-yr event
Inflow = 5.2 cfs @ 12.11 hrs, Volume= 15,159 cf
Primary = 5.2 cfs @ 12.11 hrs, Volume= 15,159 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 37,714 sf, 74.81% Impervious, Inflow Depth = 1.56" for 10-yr event
Inflow = 2.5 cfs @ 12.10 hrs, Volume= 4,915 cf
Primary = 2.5 cfs @ 12.10 hrs, Volume= 4,915 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,567 sf, 13.22% Impervious, Inflow Depth = 2.57" for 10-yr event
Inflow = 1.8 cfs @ 12.08 hrs, Volume= 5,258 cf
Primary = 1.8 cfs @ 12.08 hrs, Volume= 5,258 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Type III 24-hr 50-yr Rainfall=6.87"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Rear Parking Lot Runoff Area=36,835 sf 40.09% Impervious Runoff Depth=5.35"
Flow Length=164' Tc=12.9 min CN=87 Runoff=4.1 cfs 16,434 cf

SubcatchmentPR-2: Western Corner of Site Runoff Area=18,772 sf 6.19% Impervious Runoff Depth=4.79"
Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=2.3 cfs 7,500 cf

SubcatchmentPR-3A: Central Portion of Runoff Area=47,910 sf 76.82% Impervious Runoff Depth=5.93"
Flow Length=320' Tc=5.0 min CN=92 Runoff=7.4 cfs 23,661 cf

SubcatchmentPR-3B: Southern Portion of Runoff Area=8,291 sf 82.26% Impervious Runoff Depth=5.93"
Flow Length=320' Tc=5.0 min CN=92 Runoff=1.3 cfs 4,095 cf

SubcatchmentPR-4A: Northeast; Roof, Runoff Area=23,624 sf 90.66% Impervious Runoff Depth=6.04"
Flow Length=302' Tc=5.0 min CN=93 Runoff=3.7 cfs 11,896 cf

SubcatchmentPR-4B: New Roof Runoff Area=6,522 sf 100.00% Impervious Runoff Depth=6.63"
Flow Length=50' Slope=0.0150 '/' Tc=5.0 min CN=98 Runoff=1.0 cfs 3,604 cf

SubcatchmentPR-4C: Northeast Pervious Runoff Area=7,568 sf 3.61% Impervious Runoff Depth=1.68"
Flow Length=137' Tc=5.0 min CN=51 Runoff=0.3 cfs 1,061 cf

SubcatchmentPR-5: Southeastern Portion Runoff Area=24,567 sf 13.22% Impervious Runoff Depth=4.14"
Flow Length=79' Tc=5.0 min CN=76 Runoff=2.8 cfs 8,479 cf

Pond P1: Subsurface Infiltration System Peak Elev=95.18' Storage=1,594 cf Inflow=1.0 cfs 3,604 cf
Discarded=0.0 cfs 2,787 cf Primary=0.3 cfs 817 cf Outflow=0.3 cfs 3,604 cf

Pond P2A: Subsurface Infiltration System Peak Elev=95.24' Storage=2,988 cf Inflow=7.4 cfs 23,661 cf
Discarded=0.0 cfs 4,363 cf Primary=7.1 cfs 19,299 cf Outflow=7.2 cfs 23,662 cf

Pond P3: Subsurface Infiltration System Peak Elev=96.22' Storage=2,534 cf Inflow=3.7 cfs 11,896 cf
Discarded=0.0 cfs 4,079 cf Primary=3.5 cfs 7,798 cf Outflow=3.6 cfs 11,877 cf

Link DP-1: Ex LCB Inflow=4.1 cfs 16,434 cf
Primary=4.1 cfs 16,434 cf

Link DP-2: Route 3 Ditch Inflow=2.3 cfs 7,500 cf
Primary=2.3 cfs 7,500 cf

Link DP-3: Old Oak Street Drainage System Inflow=8.4 cfs 23,393 cf
Primary=8.4 cfs 23,393 cf

Link DP-4: Ex Headwall at Corner Inflow=3.8 cfs 9,676 cf
Primary=3.8 cfs 9,676 cf

Link DP-5: Old Oak Street Inflow=2.8 cfs 8,479 cf
Primary=2.8 cfs 8,479 cf

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Type III 24-hr 50-yr Rainfall=6.87"

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Total Runoff Area = 174,089 sf Runoff Volume = 76,730 cf Average Runoff Depth = 5.29"
47.72% Pervious = 83,077 sf 52.28% Impervious = 91,012 sf

Summary for Subcatchment PR-1: Rear Parking Lot

Runoff = 4.1 cfs @ 12.17 hrs, Volume= 16,434 cf, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,845	82	Woods/grass comb., Fair, HSG D
36,835	87	Weighted Average
22,069		59.91% Pervious Area
14,766		40.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment PR-2: Western Corner of Site

Runoff = 2.3 cfs @ 12.09 hrs, Volume= 7,500 cf, Depth= 4.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,677	82	Woods/grass comb., Fair, HSG D
18,772	82	Weighted Average
17,610		93.81% Pervious Area
1,162		6.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment PR-3A: Central Portion of Site

Runoff = 7.4 cfs @ 12.07 hrs, Volume= 23,661 cf, Depth= 5.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
3,785	49	50-75% Grass cover, Fair, HSG A
35,706	98	Paved parking, HSG A
* 1,097	98	Roof
252	84	50-75% Grass cover, Fair, HSG D
7,070	82	Woods/grass comb., Fair, HSG D
47,910	92	Weighted Average
11,107		23.18% Pervious Area
36,803		76.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-3B: Southern Portion of Site

Runoff = 1.3 cfs @ 12.07 hrs, Volume= 4,095 cf, Depth= 5.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
793	49	50-75% Grass cover, Fair, HSG A
6,820	98	Paved parking, HSG A
678	84	50-75% Grass cover, Fair, HSG D
8,291	92	Weighted Average
1,471		17.74% Pervious Area
6,820		82.26% Impervious Area

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Type III 24-hr 50-yr Rainfall=6.87"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4A: Northeast; Roof, Pavement and Landscaping

Runoff = 3.7 cfs @ 12.07 hrs, Volume= 11,896 cf, Depth= 6.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
2,206	49	50-75% Grass cover, Fair, HSG A
16,288	98	Paved parking, HSG A
* 5,130	98	Roof
23,624	93	Weighted Average
2,206		9.34% Pervious Area
21,418		90.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	39	0.0050	4.17	3.28	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
1.3	302	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4B: New Roof

Runoff = 1.0 cfs @ 12.07 hrs, Volume= 3,604 cf, Depth= 6.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
* 6,522	98	Roof
6,522		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.8	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4C: Northeast Pervious Area

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,061 cf, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
7,295	49	50-75% Grass cover, Fair, HSG A
273	98	Paved parking, HSG A
7,568	51	Weighted Average
7,295		96.39% Pervious Area
273		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.0570	0.22		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
1.2	102	0.0090	1.42		Shallow Concentrated Flow, Grassed Grassed Waterway Kv= 15.0 fps
3.9	137	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-5: Southeastern Portion of Site

Runoff = 2.8 cfs @ 12.07 hrs, Volume= 8,479 cf, Depth= 4.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-yr Rainfall=6.87"

Area (sf)	CN	Description
6,035	49	50-75% Grass cover, Fair, HSG A
3,248	98	Impervious
956	84	50-75% Grass cover, Fair, HSG D
14,328	82	Woods/grass comb., Fair, HSG D
24,567	76	Weighted Average
21,319		86.78% Pervious Area
3,248		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.6	61	0.0330	1.57		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
3.7	79	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Subsurface Infiltration System

Inflow Area = 6,522 sf, 100.00% Impervious, Inflow Depth = 6.63" for 50-yr event
 Inflow = 1.0 cfs @ 12.07 hrs, Volume= 3,604 cf
 Outflow = 0.3 cfs @ 12.33 hrs, Volume= 3,604 cf, Atten= 67%, Lag= 15.8 min
 Discarded = 0.0 cfs @ 7.17 hrs, Volume= 2,787 cf
 Primary = 0.3 cfs @ 12.33 hrs, Volume= 817 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 95.18' @ 12.33 hrs Surf.Area= 842 sf Storage= 1,594 cf

Plug-Flow detention time= 524.0 min calculated for 3,603 cf (100% of inflow)
 Center-of-Mass det. time= 524.1 min (1,266.3 - 742.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	694 cf	15.75'W x 53.46'L x 3.50'H Field A 2,947 cf Overall - 965 cf Embedded = 1,982 cf x 35.0% Voids
#2A	92.40'	965 cf	ADS_StormTech SC-740 +Cap x 21 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 7 Chambers
		1,658 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.90'	12.0" Round DMH Outlet L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.90' / 94.20' S= 0.0233 ' S= 0.0233 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 7.17 hrs HW=91.94' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.3 cfs @ 12.33 hrs HW=95.18' (Free Discharge)
 ↳ **1=DMH Outlet** (Inlet Controls 0.3 cfs @ 1.80 fps)
 ↳ **3=Outlet at bottom of system** (Passes 0.3 cfs of 2.0 cfs potential flow)

Summary for Pond P2A: Subsurface Infiltration System

Inflow Area = 47,910 sf, 76.82% Impervious, Inflow Depth = 5.93" for 50-yr event
 Inflow = 7.4 cfs @ 12.07 hrs, Volume= 23,661 cf
 Outflow = 7.2 cfs @ 12.09 hrs, Volume= 23,662 cf, Atten= 2%, Lag= 1.0 min
 Discarded = 0.0 cfs @ 5.04 hrs, Volume= 4,363 cf
 Primary = 7.1 cfs @ 12.09 hrs, Volume= 19,299 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 95.24' @ 12.09 hrs Surf.Area= 1,534 sf Storage= 2,988 cf

Plug-Flow detention time= 102.8 min calculated for 23,658 cf (100% of inflow)
 Center-of-Mass det. time= 102.9 min (875.2 - 772.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,236 cf	20.50'W x 74.82'L x 3.50'H Field A 5,368 cf Overall - 1,838 cf Embedded = 3,530 cf x 35.0% Voids
#2A	92.40'	1,838 cf	ADS_StormTech SC-740 +Cap x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Rows of 10 Chambers
		3,073 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.60'	24.0" Round OCS Outlet L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.60' / 93.50' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 5.04 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=7.1 cfs @ 12.09 hrs HW=95.24' (Free Discharge)

↑ **1=OCS Outlet** (Passes 7.1 cfs of 9.3 cfs potential flow)

↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 2.3 cfs @ 1.68 fps)

↑ **4=Outlet at bottom of system** (Inlet Controls 4.8 cfs @ 6.17 fps)

Summary for Pond P3: Subsurface Infiltration System

Inflow Area = 23,624 sf, 90.66% Impervious, Inflow Depth = 6.04" for 50-yr event
 Inflow = 3.7 cfs @ 12.07 hrs, Volume= 11,896 cf
 Outflow = 3.6 cfs @ 12.07 hrs, Volume= 11,877 cf, Atten= 3%, Lag= 0.0 min
 Discarded = 0.0 cfs @ 5.77 hrs, Volume= 4,079 cf
 Primary = 3.5 cfs @ 12.07 hrs, Volume= 7,798 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 96.22' @ 12.07 hrs Surf.Area= 1,170 sf Storage= 2,534 cf

Plug-Flow detention time= 262.6 min calculated for 11,875 cf (100% of inflow)
 Center-of-Mass det. time= 261.7 min (1,030.1 - 768.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,156 cf	25.25'W x 46.34'L x 4.00'H Field A 4,680 cf Overall - 1,378 cf Embedded = 3,302 cf x 35.0% Voids
#2A	92.40'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 6 Chambers
		2,534 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.80'	12.0" Round OCS Outlet L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.80' / 94.30' S= 0.0065 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	8.0" Round Outlet at bottom of system L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#4	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.0 cfs @ 5.77 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=3.5 cfs @ 12.07 hrs HW=96.22' (Free Discharge)

↑ **1=OCS Outlet** (Barrel Controls 3.5 cfs @ 4.49 fps)

↑ **3=Outlet at bottom of system** (Passes < 2.0 cfs potential flow)

↑ **4=Broad-Crested Rectangular Weir** (Passes < 20.1 cfs potential flow)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,835 sf, 40.09% Impervious, Inflow Depth = 5.35" for 50-yr event
Inflow = 4.1 cfs @ 12.17 hrs, Volume= 16,434 cf
Primary = 4.1 cfs @ 12.17 hrs, Volume= 16,434 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 18,772 sf, 6.19% Impervious, Inflow Depth = 4.79" for 50-yr event
Inflow = 2.3 cfs @ 12.09 hrs, Volume= 7,500 cf
Primary = 2.3 cfs @ 12.09 hrs, Volume= 7,500 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 56,201 sf, 77.62% Impervious, Inflow Depth = 4.99" for 50-yr event
Inflow = 8.4 cfs @ 12.09 hrs, Volume= 23,393 cf
Primary = 8.4 cfs @ 12.09 hrs, Volume= 23,393 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 37,714 sf, 74.81% Impervious, Inflow Depth = 3.08" for 50-yr event
Inflow = 3.8 cfs @ 12.07 hrs, Volume= 9,676 cf
Primary = 3.8 cfs @ 12.07 hrs, Volume= 9,676 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,567 sf, 13.22% Impervious, Inflow Depth = 4.14" for 50-yr event
Inflow = 2.8 cfs @ 12.07 hrs, Volume= 8,479 cf
Primary = 2.8 cfs @ 12.07 hrs, Volume= 8,479 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-yr Rainfall=7.67"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPR-1: Rear Parking Lot Runoff Area=36,835 sf 40.09% Impervious Runoff Depth=6.13"
Flow Length=164' Tc=12.9 min CN=87 Runoff=4.7 cfs 18,813 cf

SubcatchmentPR-2: Western Corner of Site Runoff Area=18,772 sf 6.19% Impervious Runoff Depth=5.55"
Flow Length=50' Slope=0.0125 '/' Tc=6.6 min CN=82 Runoff=2.7 cfs 8,677 cf

SubcatchmentPR-3A: Central Portion of Runoff Area=47,910 sf 76.82% Impervious Runoff Depth=6.72"
Flow Length=320' Tc=5.0 min CN=92 Runoff=8.3 cfs 26,817 cf

SubcatchmentPR-3B: Southern Portion of Runoff Area=8,291 sf 82.26% Impervious Runoff Depth=6.72"
Flow Length=320' Tc=5.0 min CN=92 Runoff=1.4 cfs 4,641 cf

SubcatchmentPR-4A: Northeast; Roof, Runoff Area=23,624 sf 90.66% Impervious Runoff Depth=6.84"
Flow Length=302' Tc=5.0 min CN=93 Runoff=4.1 cfs 13,456 cf

SubcatchmentPR-4B: New Roof Runoff Area=6,522 sf 100.00% Impervious Runoff Depth=7.43"
Flow Length=50' Slope=0.0150 '/' Tc=5.0 min CN=98 Runoff=1.2 cfs 4,038 cf

SubcatchmentPR-4C: Northeast Pervious Runoff Area=7,568 sf 3.61% Impervious Runoff Depth=2.15"
Flow Length=137' Tc=5.0 min CN=51 Runoff=0.4 cfs 1,357 cf

SubcatchmentPR-5: Southeastern Portion Runoff Area=24,567 sf 13.22% Impervious Runoff Depth=4.86"
Flow Length=79' Tc=5.0 min CN=76 Runoff=3.3 cfs 9,947 cf

Pond P1: Subsurface Infiltration System Peak Elev=95.27' Storage=1,620 cf Inflow=1.2 cfs 4,038 cf
Discarded=0.0 cfs 2,856 cf Primary=0.5 cfs 1,182 cf Outflow=0.6 cfs 4,038 cf

Pond P2A: Subsurface Infiltration System Peak Elev=95.32' Storage=3,029 cf Inflow=8.3 cfs 26,817 cf
Discarded=0.0 cfs 4,420 cf Primary=8.1 cfs 22,397 cf Outflow=8.2 cfs 26,817 cf

Pond P3: Subsurface Infiltration System Peak Elev=96.09' Storage=2,534 cf Inflow=4.1 cfs 13,456 cf
Discarded=0.0 cfs 4,127 cf Primary=3.4 cfs 9,107 cf Outflow=3.4 cfs 13,234 cf

Link DP-1: Ex LCB Inflow=4.7 cfs 18,813 cf
Primary=4.7 cfs 18,813 cf

Link DP-2: Route 3 Ditch Inflow=2.7 cfs 8,677 cf
Primary=2.7 cfs 8,677 cf

Link DP-3: Old Oak Street Drainage System Inflow=9.5 cfs 27,038 cf
Primary=9.5 cfs 27,038 cf

Link DP-4: Ex Headwall at Corner Inflow=3.8 cfs 11,647 cf
Primary=3.8 cfs 11,647 cf

Link DP-5: Old Oak Street Inflow=3.3 cfs 9,947 cf
Primary=3.3 cfs 9,947 cf

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Type III 24-hr 100-yr Rainfall=7.67"

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Total Runoff Area = 174,089 sf Runoff Volume = 87,747 cf Average Runoff Depth = 6.05"
47.72% Pervious = 83,077 sf 52.28% Impervious = 91,012 sf

Summary for Subcatchment PR-1: Rear Parking Lot

Runoff = 4.7 cfs @ 12.17 hrs, Volume= 18,813 cf, Depth= 6.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
1,224	49	50-75% Grass cover, Fair, HSG A
* 9,629	98	Impervious
* 5,137	98	Roof
20,845	82	Woods/grass comb., Fair, HSG D
36,835	87	Weighted Average
22,069		59.91% Pervious Area
14,766		40.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	41	0.0125	0.06		Sheet Flow, Wooded
					Woods: Light underbrush n= 0.400 P2= 3.40"
0.6	123	0.0330	3.69		Shallow Concentrated Flow, Pavement
					Paved Kv= 20.3 fps
12.9	164	Total			

Summary for Subcatchment PR-2: Western Corner of Site

Runoff = 2.7 cfs @ 12.09 hrs, Volume= 8,677 cf, Depth= 5.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
685	49	50-75% Grass cover, Fair, HSG A
* 1,162	98	Impervious
4,248	84	50-75% Grass cover, Fair, HSG D
12,677	82	Woods/grass comb., Fair, HSG D
18,772	82	Weighted Average
17,610		93.81% Pervious Area
1,162		6.19% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	50	0.0125	0.13		Sheet Flow, Grassed
					Grass: Short n= 0.150 P2= 3.40"

Summary for Subcatchment PR-3A: Central Portion of Site

Runoff = 8.3 cfs @ 12.07 hrs, Volume= 26,817 cf, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
3,785	49	50-75% Grass cover, Fair, HSG A
35,706	98	Paved parking, HSG A
* 1,097	98	Roof
252	84	50-75% Grass cover, Fair, HSG D
7,070	82	Woods/grass comb., Fair, HSG D
47,910	92	Weighted Average
11,107		23.18% Pervious Area
36,803		76.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-3B: Southern Portion of Site

Runoff = 1.4 cfs @ 12.07 hrs, Volume= 4,641 cf, Depth= 6.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
793	49	50-75% Grass cover, Fair, HSG A
6,820	98	Paved parking, HSG A
678	84	50-75% Grass cover, Fair, HSG D
8,291	92	Weighted Average
1,471		17.74% Pervious Area
6,820		82.26% Impervious Area

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Type III 24-hr 100-yr Rainfall=7.67"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
1.0	220	0.0320	3.63		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	50	0.0050	3.47	2.73	Pipe Channel, Piped System 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Concrete pipe, finished
2.0	320	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4A: Northeast; Roof, Pavement and Landscaping

Runoff = 4.1 cfs @ 12.07 hrs, Volume= 13,456 cf, Depth= 6.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
2,206	49	50-75% Grass cover, Fair, HSG A
16,288	98	Paved parking, HSG A
* 5,130	98	Roof
23,624	93	Weighted Average
2,206		9.34% Pervious Area
21,418		90.66% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	38	0.3300	3.59		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.9	225	0.0400	4.06		Shallow Concentrated Flow, Pavement Paved Kv= 20.3 fps
0.2	39	0.0050	4.17	3.28	Pipe Channel, Pipe 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010 PVC, smooth interior
1.3	302	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4B: New Roof

Runoff = 1.2 cfs @ 12.07 hrs, Volume= 4,038 cf, Depth= 7.43"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
* 6,522	98	Roof
6,522		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0150	1.10		Sheet Flow, Roof Smooth surfaces n= 0.011 P2= 3.40"
0.8	50	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-4C: Northeast Pervious Area

Runoff = 0.4 cfs @ 12.08 hrs, Volume= 1,357 cf, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
7,295	49	50-75% Grass cover, Fair, HSG A
273	98	Paved parking, HSG A
7,568	51	Weighted Average
7,295		96.39% Pervious Area
273		3.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	35	0.0570	0.22		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
1.2	102	0.0090	1.42		Shallow Concentrated Flow, Grassed Grassed Waterway Kv= 15.0 fps
3.9	137	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment PR-5: Southeastern Portion of Site

Runoff = 3.3 cfs @ 12.07 hrs, Volume= 9,947 cf, Depth= 4.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-yr Rainfall=7.67"

Area (sf)	CN	Description
6,035	49	50-75% Grass cover, Fair, HSG A
3,248	98	Impervious
956	84	50-75% Grass cover, Fair, HSG D
14,328	82	Woods/grass comb., Fair, HSG D
24,567	76	Weighted Average
21,319		86.78% Pervious Area
3,248		13.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.1	18	0.0110	0.10		Sheet Flow, Grass Grass: Short n= 0.150 P2= 3.40"
0.6	61	0.0330	1.57		Sheet Flow, Pavement Smooth surfaces n= 0.011 P2= 3.40"
3.7	79	Total, Increased to minimum Tc = 5.0 min			

Summary for Pond P1: Subsurface Infiltration System

Inflow Area = 6,522 sf, 100.00% Impervious, Inflow Depth = 7.43" for 100-yr event
 Inflow = 1.2 cfs @ 12.07 hrs, Volume= 4,038 cf
 Outflow = 0.6 cfs @ 12.20 hrs, Volume= 4,038 cf, Atten= 52%, Lag= 8.0 min
 Discarded = 0.0 cfs @ 6.73 hrs, Volume= 2,856 cf
 Primary = 0.5 cfs @ 12.20 hrs, Volume= 1,182 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 95.27' @ 12.20 hrs Surf.Area= 842 sf Storage= 1,620 cf

Plug-Flow detention time= 483.4 min calculated for 4,038 cf (100% of inflow)
 Center-of-Mass det. time= 483.5 min (1,224.3 - 740.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	694 cf	15.75'W x 53.46'L x 3.50'H Field A 2,947 cf Overall - 965 cf Embedded = 1,982 cf x 35.0% Voids
#2A	92.40'	965 cf	ADS_StormTech SC-740 +Cap x 21 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 7 Chambers
		1,658 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.90'	12.0" Round DMH Outlet L= 30.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.90' / 94.20' S= 0.0233 ' S= 0.0233 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 ' S= 0.0000 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 6.73 hrs HW=91.94' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.5 cfs @ 12.20 hrs HW=95.27' (Free Discharge)
 ↳ **1=DMH Outlet** (Inlet Controls 0.5 cfs @ 2.07 fps)
 ↳ **3=Outlet at bottom of system** (Passes 0.5 cfs of 2.3 cfs potential flow)

Summary for Pond P2A: Subsurface Infiltration System

Inflow Area = 47,910 sf, 76.82% Impervious, Inflow Depth = 6.72" for 100-yr event
 Inflow = 8.3 cfs @ 12.07 hrs, Volume= 26,817 cf
 Outflow = 8.2 cfs @ 12.08 hrs, Volume= 26,817 cf, Atten= 1%, Lag= 0.8 min
 Discarded = 0.0 cfs @ 4.50 hrs, Volume= 4,420 cf
 Primary = 8.1 cfs @ 12.08 hrs, Volume= 22,397 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 95.32' @ 12.08 hrs Surf.Area= 1,534 sf Storage= 3,029 cf

Plug-Flow detention time= 93.3 min calculated for 26,814 cf (100% of inflow)
 Center-of-Mass det. time= 93.4 min (862.7 - 769.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,236 cf	20.50'W x 74.82'L x 3.50'H Field A 5,368 cf Overall - 1,838 cf Embedded = 3,530 cf x 35.0% Voids
#2A	92.40'	1,838 cf	ADS_StormTech SC-740 +Cap x 40 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 4 Rows of 10 Chambers
		3,073 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	93.60'	24.0" Round OCS Outlet L= 12.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 93.60' / 93.50' S= 0.0083 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Device 1	92.40'	12.0" Round Outlet at bottom of system L= 1.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.0 cfs @ 4.50 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=8.1 cfs @ 12.08 hrs HW=95.32' (Free Discharge)

↑ **1=OCS Outlet** (Passes 8.1 cfs of 9.9 cfs potential flow)

↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 3.1 cfs @ 1.89 fps)

↑ **4=Outlet at bottom of system** (Inlet Controls 5.0 cfs @ 6.31 fps)

Summary for Pond P3: Subsurface Infiltration System

Inflow Area = 23,624 sf, 90.66% Impervious, Inflow Depth = 6.84" for 100-yr event
 Inflow = 4.1 cfs @ 12.07 hrs, Volume= 13,456 cf
 Outflow = 3.4 cfs @ 12.07 hrs, Volume= 13,234 cf, Atten= 18%, Lag= 0.0 min
 Discarded = 0.0 cfs @ 5.13 hrs, Volume= 4,127 cf
 Primary = 3.4 cfs @ 12.07 hrs, Volume= 9,107 cf

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 2
 Peak Elev= 96.09' @ 12.07 hrs Surf.Area= 1,170 sf Storage= 2,534 cf

Plug-Flow detention time= 250.4 min calculated for 13,232 cf (98% of inflow)
 Center-of-Mass det. time= 240.0 min (1,005.5 - 765.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	91.90'	1,156 cf	25.25'W x 46.34'L x 4.00'H Field A 4,680 cf Overall - 1,378 cf Embedded = 3,302 cf x 35.0% Voids
#2A	92.40'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 6 Chambers
		2,534 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	94.80'	12.0" Round OCS Outlet L= 77.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 94.80' / 94.30' S= 0.0065 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#2	Discarded	91.90'	1.020 in/hr Exfiltration over Surface area Phase-In= 0.01'
#3	Device 1	92.40'	8.0" Round Outlet at bottom of system L= 10.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 92.40' / 92.40' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf
#4	Device 1	94.90'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.0 cfs @ 5.13 hrs HW=91.94' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=3.4 cfs @ 12.07 hrs HW=96.09' (Free Discharge)

↑ **1=OCS Outlet** (Inlet Controls 3.4 cfs @ 4.28 fps)

↑ **3=Outlet at bottom of system** (Passes < 1.9 cfs potential flow)

↑ **4=Broad-Crested Rectangular Weir** (Passes < 17.3 cfs potential flow)

Summary for Link DP-1: Ex LCB

Inflow Area = 36,835 sf, 40.09% Impervious, Inflow Depth = 6.13" for 100-yr event
Inflow = 4.7 cfs @ 12.17 hrs, Volume= 18,813 cf
Primary = 4.7 cfs @ 12.17 hrs, Volume= 18,813 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-2: Route 3 Ditch

Inflow Area = 18,772 sf, 6.19% Impervious, Inflow Depth = 5.55" for 100-yr event
Inflow = 2.7 cfs @ 12.09 hrs, Volume= 8,677 cf
Primary = 2.7 cfs @ 12.09 hrs, Volume= 8,677 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-3: Old Oak Street Drainage System

Inflow Area = 56,201 sf, 77.62% Impervious, Inflow Depth = 5.77" for 100-yr event
Inflow = 9.5 cfs @ 12.08 hrs, Volume= 27,038 cf
Primary = 9.5 cfs @ 12.08 hrs, Volume= 27,038 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-4: Ex Headwall at Corner

Inflow Area = 37,714 sf, 74.81% Impervious, Inflow Depth = 3.71" for 100-yr event
Inflow = 3.8 cfs @ 12.07 hrs, Volume= 11,647 cf
Primary = 3.8 cfs @ 12.07 hrs, Volume= 11,647 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Link DP-5: Old Oak Street

Inflow Area = 24,567 sf, 13.22% Impervious, Inflow Depth = 4.86" for 100-yr event
Inflow = 3.3 cfs @ 12.07 hrs, Volume= 9,947 cf
Primary = 3.3 cfs @ 12.07 hrs, Volume= 9,947 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Recharge Calculations



Recharge Calculations

Project Name: Urgent Care Facilit **Proj. No.:** 14239.00

Date: 1/18/2019

Project Location: Pembroke, MA **Calculated by:** SKE

Proposed New Impervious Surface Summary

Net Proposed New Impervious Areas by Hydrologic Soil Group (HSG) in acres

Subcatchment	HSG A	HSG B	HSG C	HSG D	Total Area
PR-1	0		0		
PR-2	0		0		
PR-3A & -3B	-0.2		0		0
PR-4A, -4B, & -4C	0.2				0
PR-5	0.0		0		
TOTAL	-0.06	0.00	0.00	0.00	-0.06

Project proposes to increase impervious area in PR-4.

Required Recharge Volume (Cubic Feet)

HSG	Area (acres)	Recharge Depth* (in.)	Volume (c.f.)
A	0.2	0.60	336
B	0.0	0.35	0
C	0.0	0.25	0
D	0.0	0.10	0
TOTAL			336

Assumptions:

* Massachusetts DEP Infiltration requirement: HSG A = 0.60 in; HSG B = 0.35 in; HSG C = 0.25 in; HSG D = 0.10 in.

Capture Area Adjustment

Required Recharge Volume 336 c.f.

Total Impervious Area in PR-4 0.15 acres

Total Impervious Area Draining to Recharge Facilities in PR-4 0.15 acres

Capture Area Adjustment Factor 1.00 -

Adjusted Required Recharge Volume: 336 c.f.

Subcatchment PR-3

Project does not result in an increase in impervious area in PR-4.

Project proposes to remove the three existing leaching catch basins in this subcatchment and replace their infiltration capacity with Subsurface System P2.

Estimated Storage Provided By Existing LCBs to be Removed:

LCBs are ±3' deep. Assume LCBs are 8' diameter with 4' perimeter of stone.

Volume provided by each Existing LCB = 603 cf

Total Volume Provided by Existing LCBs = 1809 cf

Infiltration Volume Provided by System P2 & Surrounding Stone: 2805 cf*

*Storage Volume Below Outlet

Subcatchment PR-4

Project results in an increase in impervious area in PR-3 by 0.15 ac.

Project proposes to infiltrate runoff in Subsurface Infiltration Systems P1 and P3.

Infiltration Volume Provided by System P1 & Surrounding Stone: 1511 cf*

*Storage Volume Below Outlet

Infiltration Volume Provided by System P3 & Surrounding Stone:

1728 cf*

*Storage Volume Below Outlet

Drawdown Calculations

[Summary](#)[Wizards](#)[Hydrograph](#)[Discharge](#)[Storage](#)[Events](#)[Sizing](#)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
91.90	842	0
92.00	842	29
92.10	842	59
92.20	842	88
92.30	842	118
92.40	842	147
92.50	842	213
92.60	842	278
92.70	842	343
92.80	842	408
92.90	842	472
93.00	842	535
93.10	842	598
93.20	842	660
93.30	842	721
93.40	842	782
93.50	842	842
93.60	842	900
93.70	842	958
93.80	842	1,015
93.90	842	1,070
94.00	842	1,125
94.10	842	1,177
94.20	842	1,228
94.30	842	1,277
94.40	842	1,325
94.50	842	1,369
94.60	842	1,411
94.70	842	1,448
94.80	842	1,481
94.90	842	1,511
95.00	842	1,541
95.10	842	1,570
95.20	842	1,600
95.30	842	1,629
95.40	842	1,658
95.50	842	1,658
95.60	842	1,658
95.70	842	1,658
95.80	842	1,658
95.90	842	1,658

[Summary](#)[Wizards](#)[Hydrograph](#)[Discharge](#)[Storage](#)[Events](#)[Sizing](#)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
91.90	1,534	0
92.00	1,534	54
92.10	1,534	107
92.20	1,534	161
92.30	1,534	215
92.40	1,534	268
92.50	1,534	391
92.60	1,534	513
92.70	1,534	634
92.80	1,534	755
92.90	1,534	874
93.00	1,534	992
93.10	1,534	1,109
93.20	1,534	1,225
93.30	1,534	1,340
93.40	1,534	1,453
93.50	1,534	1,564
93.60	1,534	1,673
93.70	1,534	1,781
93.80	1,534	1,886
93.90	1,534	1,990
94.00	1,534	2,090
94.10	1,534	2,188
94.20	1,534	2,283
94.30	1,534	2,374
94.40	1,534	2,462
94.50	1,534	2,545
94.60	1,534	2,621
94.70	1,534	2,689
94.80	1,534	2,749
94.90	1,534	2,805
95.00	1,534	2,859
95.10	1,534	2,912
95.20	1,534	2,966
95.30	1,534	3,020
95.40	1,534	3,073
95.50	1,534	3,073
95.60	1,534	3,073



Summary

Wizards

Hydrograph

Discharge

Storage

Events

Sizing

(feet)	(sq-ft)	(cubic-feet)
91.90	963	0
92.00	963	34
92.10	963	67
92.20	963	101
92.30	963	135
92.40	963	169
92.50	963	243
92.60	963	318
92.70	963	392
92.80	963	466
92.90	963	539
93.00	963	612
93.10	963	684
93.20	963	755
93.30	963	825
93.40	963	894
93.50	963	962
93.60	963	1,029
93.70	963	1,095
93.80	963	1,160
93.90	963	1,224
94.00	963	1,286
94.10	963	1,346
94.20	963	1,404
94.30	963	1,460
94.40	963	1,514
94.50	963	1,566
94.60	963	1,613
94.70	963	1,655
94.80	963	1,693
94.90	963	1,728
95.00	963	1,761
95.10	963	1,795
95.20	963	1,829
95.30	963	1,863
95.40	963	1,896
95.50	963	1,896
95.60	963	1,896
95.70	963	1,896
95.80	963	1,896
95.90	963	1,896
96.00	963	1,896
96.10	963	1,896

Water Quality Volume Calculations



Water Quality Volume Calculations

Project Name: Urgent Care Facility

Proj. No.: 14239.00

Date: Jan-19

Project Location: Pembroke, MA

Calculated by: AFG

Drainage Area PR-3A

Water Quality Volume

Total Area of Impervious Cover (acres) = 0.8 Does not include roof areas.

Required WQV:

Required:

Runoff Depth to be Treated (in.)

1.00

Required
Volume (cu.ft.)
2,946

Subsurface Infiltration Basin P2

WQV (cu.ft.) Provided by SC-740 Chambers & Surrounding Stone = 3073*

*From HydroCAD Model

Drainage Area PR-4A

Water Quality Volume

Total Area of Impervious Cover (acres) = 0.3 Does not include roof areas.

Required WQV:

Required:

Runoff Depth to be Treated (in.)

1.00

Required
Volume (cu.ft.)
1,254

Subsurface Infiltration Basin P3

WQV (cu.ft.) Provided by SC-740 Chambers & Surrounding Stone = 1455*

*From HydroCAD Model

TSS Removal Calculations



101 Walnut Street
Post Office Box 9151
Watertown, MA 02471
P 617.924.1770

TSS Removal Calculation Worksheet

Project Name: **Urgent Care Facility**
Project Number: **14239.00**
Location: **Pembroke, MA**
Discharge Point: **DP-3 & DP-4**
Drainage Area(s): **PR-3 & PR-4**

Sheet: **1 of 1**
Date: **14-Nov-2018**
Computed by: **AFG**
Checked by: **SRC**

1. Pre-Treatment prior to Infiltration

BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	25%	100%	25%	75%
Isolator Row	25%	75%	19%	56%
	0%	56%	0%	56%
Pre-Treatment TSS Removal =				44%

2. Total TSS Removal including Pretreatment 1.

BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Subsurface Infiltration Structure	80%	100%	80%	20%
	0%	20%	0%	20%
	0%	20%	0%	20%
	0%	20%	0%	20%
Treatment Train TSS Removal =				80%

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.

** Equals remaining load from previous BMP (E)