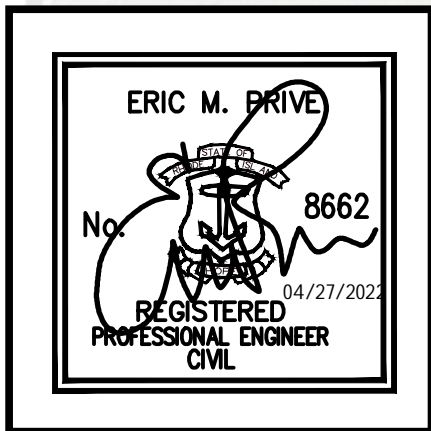




# Stormwater Management Report



## Fieldstone Farms

Located in South Kingstown, RI

Applicant: Old North Land Investments, LLC

4-25-2022

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## Executive Summary

On behalf of Old North Land Investments, LLC, we are submitting drainage calculations for the proposed development located at the intersection of Old North Road and Stony Fort Road in South Kingstown, RI. The site is located on Assessors' Plat 16-4 Lot 9. The site has a total area of 118.60 acres, contains a 56.7 acres of wetland area and is covered by woods. Old North Land Investments, LLC is proposing the construction of 39 residential lots to be serviced by public water and private OWTS. The residential development includes sixteen (16) residential homes with frontage on Old North Road and Stony Fort Road. The remaining twenty three (23) lots will have access off of a new proposed roadway that will intersect with Stony Fort Road.

The development site is located within the Saugatucket Watershed and has a very large wetland complex that discharges to a stream system that ultimately discharges into the Saugatucket Pond which is located south of the development and south of Saugatucket Road. Post development storm water from the site will be treated for water quality using Best Management Practices (BMPs). The site has been designed to meet the Rhode Island Storm Water Design and Installation Manual (RISDISM). The groundwater table through the site ranges from 18" -24" and careful consideration was taken when the site was designed. The sixteen (16) residential homes with frontage on Old North Road and Stony Fort Road are designed with bio-retention areas to treat storm water and promote infiltration. Bio-retention systems promote pollutant removal of phosphorus, nitrogen, pathogens, and other metal removal such as Cadmium, Copper, Lead, and Zinc. Storm water runoff from the proposed roadway will be directed through a closed drainage network to a drainage area that includes a sediment forebay, sand filter, and detention basin. Fifteen (15) of the sixteen (16) homes with frontage along Old North Road and Stony Fort Road are proposed with private OWTS bottomless sand filter systems. The remaining twenty three (23) homes will be connected through a low pressure sewer service to a community OWTS system. All of the proposed OWTS systems are located greater than 150 feet from any wetland edge and they are also all proposed as denitrifying systems as required by RIDEM.

This report details how the proposed development will show no net increase in stormwater runoff from pre development to post development conditions, provide water quality treatment for stormwater runoff, as well as providing provisions for erosion control on site.

Pre development Conditions versus Post Development Conditions for each watershed are summarized below:

Watershed #1: (DP-1)

Conditions	1-Year	10-Year	100-Year
Pre Dev Summation	17.23 cfs	93.13 cfs	275.04 cfs
Post Dev Summation	18.37 cfs	92.34 cfs	268.36 cfs
Net Change	+1.14 cfs	-0.79 cfs	-6.68 cfs

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(cfs = cubic feet per second)

Watershed #2: (DL-2)

Conditions	1-Year	10-Year	100-Year
Pre Dev Summation	0.28 cfs	4.90 cfs	19.97 cfs
Post Dev Summation	0.41 cfs	4.28 cfs	15.49 cfs
Net Change	+0.13 cfs	-0.62 cfs	-4.48 cfs

(cfs = cubic feet per second)

There is a minor increase in storm water flows for the 1-yr storm event due to uncontrolled areas within each watershed. These areas include back of homes that cannot discharge to a drainage BMP due to elevation conflicts and lawn areas that cannot be controlled. There is insignificant discharge from the detention basin during the 1-yr storm event, which meets all channel protection volume requirements, and the storm water flow increase is due to the change in ground cover type in uncontrolled areas.

## **APPENDIX A: STORMWATER MANAGEMENT PLAN CHECKLIST AND LID PLANNING REPORT – STORMWATER DESIGN SUMMARY**

Fieldstone Farms	(RIDEM USE ONLY)
South Kingstown	STW/WQC File #:
39 Residential Subdivision with public water and private OWTS	Date Received:

### Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,<sup>1</sup> submit **four separately bound** documents: Appendix A Checklist; Stormwater Site Planning, Analysis and Design Report with Plan Set/Drawings; Soil Erosion and Sediment Control (SESC) Plan, and Post Construction Operations and Maintenance (O&M) Plan. Please refer to [Suggestions to Promote Brevity](#).

**Note: All stormwater construction projects must create a Stormwater Management Plan (SMP). However, not every element listed below is required per the [RIDEM Stormwater Rules](#) and the [RIPDES Construction General Permit \(CGP\)](#). This checklist will help identify the required elements to be submitted with an Application for Stormwater Construction Permit & Water Quality Certification.**

### **PART 1. PROJECT AND SITE INFORMATION**

#### **PROJECT TYPE** (Check all that apply)

<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Commercial	<input type="checkbox"/> Federal	<input type="checkbox"/> Retrofit	<input type="checkbox"/> Restoration
<input type="checkbox"/> Road	<input type="checkbox"/> Utility	<input type="checkbox"/> Fill	<input type="checkbox"/> Dredge	<input type="checkbox"/> Mine
<input type="checkbox"/> Other (specify):				

#### **SITE INFORMATION**

Vicinity Map

**INITIAL DISCHARGE LOCATION(S):** The WQv discharges to: (You may choose more than one answer if several discharge points are associated with the project.)

<input checked="" type="checkbox"/> <b>Groundwater</b>	<input type="checkbox"/> <b>Surface Water</b>	<input type="checkbox"/> <b>MS4</b>
<input type="checkbox"/> GAA	<input type="checkbox"/> Isolated Wetland	<input type="checkbox"/> RIDOT
<input checked="" type="checkbox"/> GA	<input type="checkbox"/> Named Waterbody	<input type="checkbox"/> RIDOT Alteration Permit is Approved
<input type="checkbox"/> GB	<input type="checkbox"/> Unnamed Waterbody Connected to Named Waterbody	<input type="checkbox"/> Town
<input type="checkbox"/> Other (specify):		

**ULTIMATE RECEIVING WATERBODY LOCATION(S):** Include pertinent information that applies to both WQv and flow from larger storm events including overflows. Choose all that apply, and repeat table for each waterbody.

<input type="checkbox"/> Groundwater or Disconnected Wetland	<input type="checkbox"/> SRWP
<input type="checkbox"/> Waterbody Name: Mitchell Brook/Unnamed	<input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater <input type="checkbox"/> Unassessed
<input type="checkbox"/> Waterbody ID: RI0010045R-03A/RI0010045R-054A	<input type="checkbox"/> 4 <sup>th</sup> order stream of pond 50 acres or more
<input type="checkbox"/> TMDL for: Fecal Coliform	<input type="checkbox"/> Watershed of flood prone river (e.g., Pocasset River)
<input type="checkbox"/> Contributes to a priority outfall listed in the TMDL	<input type="checkbox"/> Contributes stormwater to a public beach
<input type="checkbox"/> 303(d) list – Impairment(s) for: Fecal Coliform	<input type="checkbox"/> Contributes to shellfishing grounds

<sup>1</sup> Applications for a Construction General Permit that do not require any other permits from RIDEM and will disturb less than 5 acres over the entire course of the project do not need to submit a SMP. The Appendix A checklist must still be submitted.

<b>PROJECT HISTORY</b>		
<input type="checkbox"/> RIDEM Pre- Application Meeting	Meeting Date:	<input type="checkbox"/> Minutes Attached
<input type="checkbox"/> Municipal Master Plan Approval	Approval Date:	<input type="checkbox"/> Minutes Attached
<input checked="" type="checkbox"/> Subdivision Suitability Required	Approval #:32-209	
<input type="checkbox"/> Previous Enforcement Action has been taken on the property	Enforcement #:	
<b>FLOODPLAIN &amp; FLOODWAY See <a href="#">Guidance Pertaining to Floodplain and Floodways</a></b>		
<input checked="" type="checkbox"/> Riverine 100-year floodplain: <b>FEMA FLOODPLAIN FIRMETTE</b> has been reviewed and the 100-year floodplain is on site		
<input checked="" type="checkbox"/> Delineated from FEMA Maps		
<b>NOTE:</b> Per Rule 250-RICR-150-10-8-1.1(B)(5)(d)(3), provide volumetric floodplain compensation calculations for cut and fill/displacement calculated by qualified professional		
<input type="checkbox"/> Calculated by Professional Engineer		
<input type="checkbox"/> Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):	
	Amount of Cut (CY):	
<input type="checkbox"/> Restrictions or modifications are proposed to the flow path or velocities in a floodway		
<input type="checkbox"/> Floodplain storage capacity is impacted		
<input checked="" type="checkbox"/> Project area is not within 100-year floodplain as defined by RIDEM		

<b>CRMC JURISDICTION</b>
<input type="checkbox"/> CRMC Assent required
<input type="checkbox"/> Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
<input type="checkbox"/> Sea level rise mitigation has been designed into this project

<b>LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:</b>		
<b>1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)</b>		
<input type="checkbox"/> Known or suspected releases of HAZARDOUS MATERIAL are present at the site (Hazardous Material is defined in Rule 1.4(A)(33) of 250-140-30-1 of the RIDEM Rules and Regulations for Investigation and Remediation of Hazardous Materials (the Remediation Regulations))		<b>RIDEM CONTACT:</b>
<input type="checkbox"/> Known or suspected releases of PETROLEUM PRODUCT are present at the site (Petroleum Product as defined in Rule 1.5(A)(84) of 250-140-25-1 of the RIDEM Rules and Regulations for Underground Storage Facilities Used for Regulated Substances and Hazardous Materials)		
<input type="checkbox"/> This site is identified on the <a href="#">RIDEM Environmental Resources Map</a> as one of the following regulated facilities		<b>SITE ID#:</b>
<input type="checkbox"/> CERCLIS/Superfund (NPL)		
<input type="checkbox"/> State Hazardous Waste Site (SHWS)		
<input type="checkbox"/> Environmental Land Usage Restriction (ELUR)		
<input type="checkbox"/> Leaking Underground Storage Tank (LUST)		
<input type="checkbox"/> Closed Landfill		
<b>Note:</b> If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSM Project Manager associated with the Site to determine if subsurface infiltration of stormwater is allowable for the project. Indicate if the infiltration corresponds to "Red," "Yellow" or "Green" as described in Section 3.2.8 of the RISDISM Guidance (Subsurface Contamination Guidance). Also, note and reference approval in PART 3, Minimum Standard 2: Groundwater Recharge/Infiltration.		
<b>2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:</b>		
<input type="checkbox"/> Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. <a href="http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php">http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php</a>		
<input type="checkbox"/> Auto Fueling Facility (e.g., gas station)		
<input type="checkbox"/> Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<input type="checkbox"/>	Road Salt Storage and Loading Areas (exposed to rainwater)	
<input type="checkbox"/>	Outdoor Storage and Loading/Unloading of Hazardous Substances	
<b>3. STORMWATER INDUSTRIAL PERMITTING</b>		
<input type="checkbox"/>	The site is associated with existing or proposed activities that are considered Land Uses with Higher Potential Pollutant Loads (LUHPPLS) (see RICR 8.14.C)	Activities: Sector:
<input type="checkbox"/>	Construction is proposed on a site that is subject to <a href="#">THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.</a>	MSGP permit #
<input type="checkbox"/>	Additional stormwater treatment is required by the MSGP Explain:	

<b>REDEVELOPMENT STANDARD – MINIMUM STANDARD 6</b>		
<input type="checkbox"/> Pre Construction Impervious Area		
<input type="checkbox"/>	Total Pre-Construction Impervious Area (TIA)	
<input type="checkbox"/>	Total Site Area (TSA)	
<input type="checkbox"/>	Jurisdictional Wetlands (JW)	
<input type="checkbox"/>	Conservation Land (CL)	
<input type="checkbox"/> Calculate the Site Size (defined as contiguous properties under same ownership)		
<input type="checkbox"/>	Site Size (SS) = (TSA) – (JW) – (CL)	
<input type="checkbox"/>	(TIA) / (SS) =	<input type="checkbox"/> (TIA) / (SS) >0.4?
<input type="checkbox"/> YES, Redevelopment		

**PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1**  
(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)  
This section may be deleted if not required.

<p><b>Note:</b> A written description must be provided specifying why each method is not being used or is not applicable at the Site. Appropriate answers may include:</p> <ul style="list-style-type: none"> <li>• Town requires ... (state the specific local requirement)</li> <li>• Meets Town’s dimensional requirement of ...</li> <li>• Not practical for site because ...</li> <li>• Applying for waiver/variance to achieve this (pending/approved/denied)</li> <li>• Applying for wavier/variance to seek relief from this (pending/approved/denied)</li> </ul>	
<p><b>A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Sensitive resource areas and site constraints are identified (required)</li> <li><input checked="" type="checkbox"/> Local development regulations have been reviewed (required)</li> <li><input checked="" type="checkbox"/> All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction</li> <li><input type="checkbox"/> Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. <b>Note:</b> If Conservation Development has been used, check box and skip to Subpart C</li> <li><input checked="" type="checkbox"/> As much natural vegetation and pre-development hydrology as possible has been maintained</li> </ul>	

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<p><b>B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies</li> <li><input checked="" type="checkbox"/> Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B)</li> <li><input checked="" type="checkbox"/> Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's)</li> <li><input checked="" type="checkbox"/> Development sites and building envelopes have been positioned outside of floodplains</li> <li><input checked="" type="checkbox"/> Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features</li> <li><input checked="" type="checkbox"/> Development sites and building envelopes have been located to minimize impacts to steep slopes (<math>\geq 15\%</math>)</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>C) MINIMIZE CLEARING AND GRADING</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Site clearing has been restricted to <u>minimum area needed</u> for building footprints, development activities, construction access, and safety.</li> <li><input checked="" type="checkbox"/> Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities)</li> <li><input checked="" type="checkbox"/> Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s)</li> <li><input checked="" type="checkbox"/> Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent</li> </ul>	
<p><b>D) REDUCE IMPERVIOUS COVER</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Reduced roadway widths (<math>\leq 22</math> feet for ADT <math>\leq 400</math>; <math>\leq 26</math> feet for ADT 400 - 2,000)</li> <li><input checked="" type="checkbox"/> Reduced driveway areas (length minimized via reduced ROW width (<math>\leq 45</math> ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to <math>\leq 9</math> ft. wide one lane; <math>\leq 18</math> ft. wide two lanes; shared driveways; pervious surface)</li> <li><input type="checkbox"/> Reduced building footprint: Explain approach:</li>   <li><input checked="" type="checkbox"/> Reduced sidewalk area (<math>\leq 4</math> ft. wide; one side of the street; unpaved path; pervious surface)</li> <li><input checked="" type="checkbox"/> Reduced cul-de-sacs (radius <math>&lt; 45</math> ft; vegetated island; alternative turn-around)</li> <li><input type="checkbox"/> Reduced parking lot area: Explain approach</li> <li><input type="checkbox"/> Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc.</li> <li><input checked="" type="checkbox"/> Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance)</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	<p>Roadway designed to minimum required, sidewalks on one side only. Lots use existing roadways with common driveways to reduce impervious area.</p>
<p><b>E) DISCONNECT IMPERVIOUS AREA</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible</li> <li><input type="checkbox"/> Residential street edges allow side-of-the-road drainage into vegetated open swales</li> <li><input type="checkbox"/> Parking lot landscaping breaks up impervious expanse AND accepts runoff</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	<p>Roof areas directed to QPAs (existing woods)</p>
<p><b>F) MITIGATE RUNOFF AT THE POINT OF GENERATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Small-scale BMPs have been designated to treat runoff as close as possible to the source</li> </ul>	

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<p><b>G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION</b></p> <p><input type="checkbox"/> Low-maintenance landscaping has been proposed using native species and cultivars</p> <p><input type="checkbox"/> Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan</p> <p><input checked="" type="checkbox"/> Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots</p>	
<p><b>H) RESTORE STREAMS/WETLANDS</b></p> <p><input type="checkbox"/> Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands</p> <p><input type="checkbox"/> Removal of invasive species</p> <p><input type="checkbox"/> Other</p>	N/A

**PART 3. SUMMARY OF REMAINING STANDARDS**

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	NO	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The project has been designed to meet the groundwater recharge standard.
<input type="checkbox"/>	<input type="checkbox"/>	If “No,” the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D);
<input type="checkbox"/>	<input type="checkbox"/>	Your waiver request has been explained in the Narrative, if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
<input type="checkbox"/>	<input type="checkbox"/>	If “Yes,” has approval for infiltration by the OLRSM Site Project Manager, per Part 1, Minimum Standard 8, been requested?

<b>TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)</b> (Add or Subtract Rows as Necessary)					
Design Point	Impervious Area Treated (sq ft)	Total Re <sub>v</sub> Required (cu ft)	LID Stormwater Credits (see RISDISM Section 4.6.1)	Recharge Required by Remaining BMPs (cu ft)	Recharge Provided by BMPs (cu ft)
			Portion of Re <sub>v</sub> directed to a QPA (cu ft)		
DP-1:	195,715	5,710		5,710	13,155
DP-2:	8,145	240		240	0
<b>TOTALS:</b>	203,860	5,950		5,950	13,155
<b>Notes:</b> 1. Only BMPs listed in RISDISM Table 3-5 “List of BMPs Acceptable for Recharge” may be used to meet the recharge requirement. 2. Recharge requirement must be satisfied for each waterbody ID.					
<input checked="" type="checkbox"/> Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Section 3.2 of the Stormwater Report					

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<b>WATER QUALITY – MINIMUM STANDARD 3</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	If “Yes,” either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
<input type="checkbox"/>	<input type="checkbox"/>	If “Yes,” either TR-55 or TR-20 was used to calculate WQv; and,
<input type="checkbox"/>	<input type="checkbox"/>	If “No,” the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
<input type="checkbox"/>	<input type="checkbox"/>	Not Applicable
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Does this project propose an increase of impervious cover to a receiving water body with impairments? If “Yes,” please indicate below the method that was used to address the water quality requirements of no further degradation to a low-quality water.  Fully Infiltrate the water quality volume after filtration through sand filter
<input type="checkbox"/>	<input checked="" type="checkbox"/>	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The Water Quality Guidance Document ( <a href="#">Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters</a> ) has been followed as applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	BMPs are proposed that are on the <a href="#">approved technology list</a> . If “Yes,” please provide all required worksheets from the manufacturer.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements.  If “Yes,” please describe:

<b>TABLE 3-1: Summary of Water Quality (see RICR 8.9)</b>					
<b>Design Point and WB ID</b>	<b>Impervious area treated (sq ft)</b>	<b>Total WQv Required (cu ft)</b>	<b>LID Stormwater Credits (see RICR 8.18)</b>	<b>Water Quality Treatment Remaining (cu ft)</b>	<b>Water Quality Provided by BMPs (cu ft)</b>
			<b>WQv directed to a QPA (cu ft)</b>		
DP-1:	195,715	16,310	3,155	13,155	13,155
DP-2:	8,145	678	678	0	0
<b>TOTALS:</b>	203,860	16,988	3,833	13,155	13,155
<b>Notes:</b>					
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.					
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.					
<input checked="" type="checkbox"/> YES	This project has met the setback requirements for each BMP.				
<input type="checkbox"/> NO	If “No,” please explain:				
<input checked="" type="checkbox"/>	Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.): Stormwater Report section 3.3 and HydroCAD print outs Section A3.3				

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4		
YES	NO	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is this standard waived? If “Yes,” please indicate one or more of the reasons below:
		<input type="checkbox"/> The project directs discharge to a large river (i.e., 4th-order stream or larger. See RISDISM Appendix I for State-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters. <input type="checkbox"/> The project is a small facility with impervious cover of less than or equal to 1 acre. <input type="checkbox"/> The project has a post-development peak discharge rate from the facility that is less than 2 cfs for the 1-year, 24-hour Type III design storm event (prior to any attenuation). ( <u>Note</u> : LID design strategies can greatly reduce the peak discharge rate).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Conveyance and natural channel protection for the site have been met. If “No,” explain why:

**TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)**

Design Point	Receiving Water Body Name	Coldwater Fishery? (Y/N)	Total CPv Required (cu ft)	Total CPv Provided (cu ft)	Average Release Rate Modeled in the 1-yr storm (cfs)
DP-1:	Mitchell Brook	Y	19,282	27,018	0.21
DP-2:	Unnammed Tributary to Saugatucket River	Y	0	0	N/A
<b>TOTALS:</b>			19,282	27,018	0.21

Note: The Channel Protection Volume Standard must be met in each waterbody ID.

<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).
<input type="checkbox"/> YES <input checked="" type="checkbox"/> NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If “Yes,” please indicate restrictions and solutions below.  System fully infiltrates the CPv volume additional volume above the CPv is also released at a uniform rate. The site meets the requirements of CPv and requirements for a cold water fisheries.
<input type="checkbox"/>	Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<b>OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5</b>		
<b>YES</b>	<b>NO</b>	
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is this standard waived? If yes, please indicate one or more of the reasons below:
		<input type="checkbox"/> The project directs discharge to a large river (i.e., 4th-order stream or larger. See Appendix I for state-wide list and map of stream orders), bodies of water >50.0 acres in surface area (i.e., lakes, ponds, reservoirs), or tidal waters. <input type="checkbox"/> A Downstream Analysis (see RICR 8.11.D and E) indicates that peak discharge control would not be beneficial or would exacerbate peak flows in a downstream tributary of a particular site (e.g., through coincident peaks).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Does the project flow to an MS4 system or subject to other stormwater requirements? If “Yes,” indicate as follows:
		<input type="checkbox"/> RIDOT <input type="checkbox"/> Other (specify):
<p><b>Note:</b> The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT’s regulations indicate that post-volumes must be <b>less</b> than pre-volumes for the 10-yr storm at the design point entering the RIDOT system. If you have not already received approval for the discharge to an MS4, please explain below your strategy to comply with RIDEM and the MS4.</p>		
		Indicate below which model was used for your analysis. <input type="checkbox"/> TR-55 <input type="checkbox"/> TR-20 <input checked="" type="checkbox"/> HydroCAD <input type="checkbox"/> Bentley/Haestad <input type="checkbox"/> Intellisolve <input type="checkbox"/> Other (Specify):
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Does the drainage design demonstrate that flows from the 100-year storm event through a BMP will safely manage and convey the 100-year storm? If “No,” please explain briefly below and reference where in the application further documentation can be found (i.e., name of report/document, page numbers, appendices, etc.):
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Do off-site areas contribute to the sub-watersheds and design points? If “Yes,”
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Are the areas modeled as “present condition” for both pre- and post-development analysis?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Are the off-site areas shown on the subwatershed maps?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is a Downstream Analysis required (see RICR 8.11.E.1)?
<input type="checkbox"/>	<input type="checkbox"/>	Calculate the following:
		<input checked="" type="checkbox"/> Area of disturbance within the sub-watershed (areas) 24.49
		<input checked="" type="checkbox"/> Impervious cover (%) 23%
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Does this project meet the overbank flood protection standard?

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	1.2" Peak Flow (cfs) **		1-yr Peak Flow (cfs)		10-yr Peak Flow (cfs)		100-yr Peak Flow (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-1:	0.59	0.98	17.23	18.37	93.13	92.34	275.04	268.36
DP-2:	0.00	0.15	0.28	0.41	4.90	4.28	19.97	15.79
<b>TOTALS:</b>	0.59	1.13	17.51	18.78	98.03	96.62	295.01	284.15

\*\* Utilize modified curve number method or split pervious /impervious method in HydroCAD.

Note: The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.

Indicate as follows where the pertinent calculations and/or information for the items above are provided	Name of report/document, page numbers, appendices, etc.
Existing conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, and water surface elevations showing methodologies used and supporting calculations.	Section A3.5.4.x SWMR and Watershed Maps
Proposed conditions analysis for each subwatershed, including curve numbers, times of concentration, runoff rates, volumes, water surface elevations, and routing showing the methodologies used and supporting calculations.	Section A3.5.4.x SWMR and Watershed Maps
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Section A3.5.4.x SWMR and Watershed Maps
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Section A3.5.4.x SWMR and Watershed Maps

**Table 5-2 Summary of Best Management Practices**

BMP ID	DP #	BMP Type (e.g., bioretention, tree filter)	BMP Functions					Bypass Type	Horizontal Setback Criteria are met per RICR 8.21.B.10, 8.22.D.11, and 8.35.B.4		
			Pre-Treatment (Y/N/NA)	Rev	WQ <sub>v</sub>	CP <sub>v</sub> (Y/N/NA)	Overbank Flood Reduction (Y/N/NA)		External (E) Internal (I) or NA	Yes/No	Technical Justification (Design Report page number)
Sand Filter	1	Sand filter	Y	Y	Y	Y	NA	E	Y		
Basin 1	1	Detention Basin	N/A	N/A	N/A	CP <sub>v</sub>	Y	N/A	Y		
L1&2	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L3	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L4&5	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L6&7	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L8&9	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L10&L11	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L12&L13	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		
L14	2	Bioretention	Y	Y	Y	Y	Y	N/A	Y		

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<b>Table 5.3 Summary of Soils to Evaluate Each BMP</b>									
DP #	BMP ID	BMP Type (e.g., bioretention, tree filter)	Soils Analysis for Each BMP						Exfiltration Rate Applied (in/hr)
			Test Pit ID# and Ground Elevation		SHWT Elevation (ft)	Bottom of Practice Elevation* (ft)	Separation Distance Provided (ft)	Hydrologic Soil Group (A, B, C, D)	
			Primary	Secondary					
1	Sand Filter	Sand filter	#1B	#1A	230	233	3	B	1.02
1	Basin 1	Detention Basin	#1B	#1A	230	230	0	B	N/A
2	L1&2	Bioretention	07-4	07-11	233.5	237	3.5	B	1.02
2	L3	Bioretention	14-1	14-2	239	243	4	B	1.02
2	L4&5	Bioretention	2012-1	201-5	244.3- 245.8	249-249.5	4.7-3.7	B	1.02
2	L6&7	Bioretention	2012-10	201-32	249.3- 250.25	253- 253.25	3.7-3	B	1.02
2	L8&9	Bioretention	2012-18	2012-16	254- 254.25	257- 257.25	3	B	1.02
2	L10&L11	Bioretention	2012-29	2012-30	257.4	261	3.6	B	1.02
2	L12&L13	Bioretention	28-4	28-3	260.5	265	4.5	B	1.02
2	L14	Bioretention	OS-1	29-1	262.25	265.25	3	B	1.02
		<b>TOTALS:</b>							

\* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer

<b>LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8</b>			
YES	NO	N/A	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Are these activities already covered under an MSGP? If “No,” please explain if you have applied for an MSGP or intend to do so?
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	List the specific BMPs that are proposed for this project that receive stormwater from LUHPPL drainage areas. These BMP types must be listed in RISDISM Table 3-3, “Acceptable BMPs for Use at LUHPPLs.” Please list BMPs:
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Additional BMPs, or additional pretreatment BMP’s if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

**ILLICIT DISCHARGES – MINIMUM STANDARD 9**

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
<b>YES</b>	<b>NO</b>	<b>N/A</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you checked for illicit discharges?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have any been found and/or corrected? If “Yes,” please identify.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

<b>SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10</b>			
<b>YES</b>	<b>NO</b>	<b>N/A</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you provided a <b>separately-bound</b> document based upon the <a href="#">SESC Template</a> ? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).
If “No,” include a document with your submittal that addresses the following elements of an SESC Plan:			
<input type="checkbox"/>			Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
<input type="checkbox"/>			Provide Natural Buffers and Maintain Existing Vegetation
<input type="checkbox"/>			Minimize Area of Disturbance
<input type="checkbox"/>			Minimize the Disturbance of Steep Slopes
<input type="checkbox"/>			Preserve Topsoil
<input type="checkbox"/>			Stabilize Soils
<input type="checkbox"/>			Protect Storm Drain Inlets
<input type="checkbox"/>			Protect Storm Drain Outlets
<input type="checkbox"/>			Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
<input type="checkbox"/>			Establish Perimeter Controls and Sediment Barriers
<input type="checkbox"/>			Divert or Manage Run-On from Up-Gradient Areas
<input type="checkbox"/>			Properly Design Constructed Stormwater Conveyance Channels
<input type="checkbox"/>			Retain Sediment On-Site
<input type="checkbox"/>			Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
<input type="checkbox"/>			Apply Construction Activity Pollution Prevention Control Measures
<input type="checkbox"/>			Install, Inspect, and Maintain Control Measures and Take Corrective Actions
<input type="checkbox"/>			Qualified SESC Plan Preparer’s Information and Certification
<input type="checkbox"/>			Operator’s Information and Certification; if not known at the time of application, the Operator must certify the SESC Plan upon selection and prior to initiating site activities
<input type="checkbox"/>			Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

<b>STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9</b>			
<b>Operation and Maintenance Section</b>			
<b>YES</b>	<b>NO</b>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>		Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
<input checked="" type="checkbox"/>	<input type="checkbox"/>		Have you provided a <b>separately-bound</b> Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
<input checked="" type="checkbox"/>	<input type="checkbox"/>		Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If “No,” why not?
<input checked="" type="checkbox"/>	<input type="checkbox"/>		Is the property owner or homeowner’s association responsible for the stormwater maintenance of all BMP’s?

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

		If “No,” you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If “Yes,” have you obtained them? Or please explain your plan to obtain them:
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is stormwater being directed from public areas to private property? If “Yes,” note the following: <u>Note:</u> This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
<b>Pollution Prevention Section</b>		
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Designated snow stockpile locations?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Asphalt-only based sealants?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pet waste stations? ( <u>Note:</u> If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Regular sweeping? Please describe: Part of O&M
<input checked="" type="checkbox"/>	<input type="checkbox"/>	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A prohibition of phosphate-based fertilizers? ( <u>Note:</u> If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

**PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS**

<b>Existing and Proposed Subwatershed Mapping (REQUIRED)</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed drainage area delineations
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Locations of all streams and drainage swales
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Drainage flow paths, mapped according to the DEM <i>Guidance for Preparation of Drainage Area Maps</i> (included in RISDISM Appendix K)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped seasonal high-water-table test pit locations
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped bedrock outcrops adjacent to any infiltration BMP
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Soils were logged by a:
	<input checked="" type="checkbox"/>	DEM-licensed Class IV soil evaluator Name: Chris Sutter (D-4077)
	<input type="checkbox"/>	RI-registered P.E. Name:

**Subwatershed and Impervious Area Summary**

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<b>Subwatershed (area to each design point)</b>	<b>First Receiving Water ID or MS4</b>	<b>Area Disturbed (acres)</b>	<b>Existing Impervious (acres)</b>	<b>Proposed Impervious (units)</b>
<b>DP-1:</b>	Mitchell Brook (RI0010045R-03A)	19.12	0.00	5.40
<b>DP-2:</b>	Unnamed Stream (RI0010045R-054A)	5.37	0.00	0.19
<b>TOTALS:</b>		24.49	0.00	5.59

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<b>Site Construction Plans (Indicate that the following applicable specifications are provided)</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Boundaries of existing predominant vegetation and proposed limits of clearing
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site Location clarification
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Location and field-verified boundaries of resource protection areas such as: <ul style="list-style-type: none"> <li>▶ freshwater and coastal wetlands, including lakes and ponds</li> <li>▶ coastal shoreline features</li> </ul> Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	All required setbacks (e.g., buffers, water-supply wells, septic systems)
<input type="checkbox"/>	<input type="checkbox"/>	Representative cross-section and profile drawings, and notes and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.), which include: <ul style="list-style-type: none"> <li>▶ Location and size of the stormwater treatment practices (type of practice, depth, area). Stormwater treatment practices (BMPs) must have labels that correspond to RISDISM Table 5-2;</li> <li>▶ Design water surface elevations (applicable storms);</li> <li>▶ Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.;</li> <li>▶ Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.);</li> <li>▶ Location of floodplain and, if applicable, floodway limits and relationship of site to upstream and downstream properties or drainage that could be affected by work in the floodplain;</li> <li>▶ Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting</li> </ul>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapping of any OLRSM-approv ed remedial actions/systems (including ELURs)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; <ul style="list-style-type: none"> <li>▶ Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements;</li> <li>▶ Location of existing and proposed conveyance systems, such as grass channels, swales, and storm drains, and location(s) of final discharge point(s) (wetland, waterbody, etc.);</li> <li>▶ Cross sections of roadways, with edge details such as curbs and sidewalks;</li> <li>▶ Location and dimensions of channel modifications, such as bridge or culvert crossings</li> </ul>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

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## 1.0 Project Description

The purpose of this report is to specify a “Storm Water Management System” and a “Soil Erosion and Sediment Control Plan” to be implemented in the construction and maintenance of Fieldstone Farms Subdivision located at the intersection of Old North Road and Stony Fort Road in South Kingstown, Rhode Island.

The major subdivision is located on South Kingstown Assessors Plat 16-4 Lot 9. The owner and applicant of the residential development is Old North Land Investments, LLC. The site has a total area of 118.60 acres and contains a 56.7 acres of wetland area. The property is zoned residential R-40 and is surrounded by R-30 and Government and Institutional Zoning. The surrounding areas are serviced by wells, public water, private OWTS, and above ground utilities. The site is entirely wooded with a large wetland complex located through the central area of the site. The wetland edges were delineated by Natural Resource Services, Inc. and field located by DiPrete Engineering. The wetland edges were verified by RIDEM under application #06-0374. The site is located in FEMA flood zone X and this zone is where minimal flooding occurs. The site has a mixture soil types which are classified as B & D soils. All of the proposed development is located within the area of B Soils. These B soils include Scio soils and Narragansett soils which both are suitable for development.

The proposed development includes a total of thirty nine (39) residential lots and is designed as a flexible design residential project. Sixteen (16) residential homes are proposed with frontage on Old North Road and Stony Fort Road. The remaining twenty three (23) lots will have access off of a new proposed roadway that will intersect with Stony Fort Road. The storm water quality will be improved by utilizing Best Management Practices (BMPs) as established by the RISDISM for the treatment of storm water runoff from the proposed development. Storm water from the residential homes and driveways with frontage on Old North Road and Stony Fort Road are designed with bio-retention areas to treat storm water and promote infiltration. Storm water runoff from the proposed roadway will be directed through a closed drainage network to a drainage area that includes a sediment forebay, sand filter, and detention basin. The system has been designed to meet the RIDEM Stormwater Design and Installations Standards Manual November 2018.

## 2.0 Site Conditions

### 2.1 SOILS

The following are soil types identified within the analyzed area of the Site as mapped by the NRCS USDA Soil Conservation service:

Soil Symbol	Description	Hydrologic Group
NbB	Narragansett very stony silt loam, 0 to 8% slopes	B
Rf	Ridgebury, Whitman, and Leicester extremely stony fine sandy loams	D

ScA	Scio silt loam, 0 to 3 percent slopes	B
SdB	Scio very stony silt loam, 0 to 8 percent slopes	B

Site specific soil evaluations can be found in Appendix A2.1.

## 2.2 EXISTING SITE CONDITIONS

The development is located on South Kingstown Assessors Plat 16-4 Lot 9. The site has a total area of 118.60 acres, contains 56.7 acres of wetland area. The site is located within the Saugatucket River Watershed. The property is zoned residential R-40 and is surrounded by R-30 and Government and Institutional Zoning. The surrounding areas are serviced by wells, public water, private OWTS, and above ground utilities. The site is entirely wooded with a large wetland complex located through the central area of the site. The wetland edges were delineated by Natural Resource Services, Inc. and field located by DiPrete Engineering. The wetland edges were verified by RIDEM under application #06-0374. The site is located in FEMA flood zone X and this zone is where minimal flooding occurs. The site has a mixture soil types which are classified as B & D soils. All of the proposed development is located within the area of B Soils. These B soils include Scio soils and Narragansett soils which both are suitable for development.

## 2.3 POST SITE CONDITIONS

The proposed drainage analysis uses stormwater management systems to control and treat runoff from the proposed development. All of the homes with frontage on Old North Road will have bio-retention areas to treat and control storm water runoff from proposed house roofs and driveways. Storm water runoff from the proposed roadway and remaining homes will be conveyed by a closed drainage network to a sediment forebay, sand filter, and detention basin. All storm water runoff is directed to an existing wetland that is great than 50 acres in size and the length of the system conveying the water is approximately 3,000 linear feet.

The following BMP's are used on site and have been designed to include the following elements:

- Bio Retention Areas
  - Equipped with grass filter strip for pretreatment
  - 2.75' of bioretention soil under bioretention areas for stormwater filtration with 3" of mulch.
  - Stores 75% of WQv
  - Maximum 9" of Ponding
- Sand Filter
  - Equipped with sediment forebay for pretreatment

- 
- 2.5' of filter media which shall be ASTM C-33 sand for sand filters with 6" of Loam and Seed.
  - Stores 75% of WQv
  - Safely convey the 100 year storm.
  - Extended Detention Basin
    - All stormwater is treated before entering the stormwater basin
    - Stores Channel Protection Volume (CPv)
    - Provided Overbank Flood Protection (Qp) for the 2-100 year storm events

The above elements will be used to meet the design standards of the Rhode Island Stormwater Design and Installation Standard.

The primary goal of increasing water quality treatment is accomplished by providing water quality BMPs. Stormwater runoff mitigation is provided through the use of bio retention areas, sediment forebay and a sand filter. By reducing post development stormwater flow rate to a level no greater than the pre development rate for all storm events besides the 1-yr storm, the second goal of the proposed drainage system is achieved. Any potential impact from the proposed development on the abutting properties and wetlands has been mitigated.

There is a minor increase in storm water flows for the 1-yr storm event due to uncontrolled areas within each watershed. These areas include back of homes that cannot discharge to a drainage BMP due to elevation conflicts and lawn areas that cannot be controlled. There is insignificant discharge from the detention basin during the 1-yr storm event, which meets all channel protection volume requirements, and the storm water flow increase is due to the change in ground cover type in uncontrolled areas. The wetland on site has a total area of 56.7 acres and there is 0.294 af of volume increase which will result in an additional 0.06" over the entire wetland area which is negligible.

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### 3.0 Minimum Standards

The site has been designed to meet the minimum standards as outlined in the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM) dated November 2018. The following sections outline how the site meets and exceeds the minimum required standards.

#### 3.1 Minimum Standard 1: LID Site Planning and Design Strategies

See Section "Appendix A: Stormwater Management Checklist" from the RISDISM

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### 3.2 Minimum Standard 2: Groundwater Recharge

Groundwater is to be recharged per watershed based impervious area coverage in accordance with section 3.2.2 of the RISDISM.

Groundwater recharge is determined from the following equation:

$$Re_v = 1'' * F * I / 12$$

Where:

$Re_v$  = Groundwater Recharge Volume (ac-ft)

F = Recharge Factor based on Hydrologic Soil Groups (HSG) (see table below)

I = Impervious Area (acres)

HSG	Recharge Factor (F)
A	0.60
B	0.35
C	0.25
D	0.10

Watershed	HSG	F	I (Acres)	$Re_v$	$Re_v$ Provided
1	B	0.35	4.493	0.131	0.302
2	B	0.35	0.187	0.005	0.000

Recharge volume for watershed 1 is provided through the use of bio-retention areas and a sand filter. Recharge volume is not met within watershed 2 because it is an uncontrolled watershed that contains a small amount of proposed roadway, proposed homes, lawn areas, and driveways. We have provided more than double the required recharge volume for watershed 1. Watershed 1 and watershed 2 although analyzed separately ultimate discharge to the same watershed, the Saugatucket River Watershed.

The required recharge volume is based on all impervious area, not just areas which are captured in the proposed BMPs.

See Appendix A3.2 for the water quality storm HydroCAD analysis. The water quality storm is calculated in HydroCAD using the 'calculate separate Pervious/Impervious runoff' option.

---

### 3.3 Minimum Standard 3: Water Quality

All stormwater is treated through an approved BMP before being discharged. This site has been designed to use grass filter strips, bio-retention areas, sediment forebays, and a sand filter to treat stormwater before being discharged to the wetland area. Bio-retention areas are proposed for all the residential lots on Old North Road. Each of these bio-retention areas will have grass filter strips providing pre-treatment to storm water prior to entering the bio-retention area. See bio retention and sand filter design sheets for water quality requirements. Stormwater for the remainder of the residential development will be directed to the proposed roadway and then conveyed by a closed drainage network to a sediment forebay and sand filter that will provide pre-treatment prior to entering the detention basin. The backs of the residential homes including the lawn areas will receive pre-treatment through the existing wooded areas that are considered qualified pervious areas and are well oversized per RIDEM sizing requirements. The site has two design points. The design points discharge to Mitchell Brook and an unnamed stream. Both streams eventually combine with the Saugatucket River. Mitchell Brook and the Saugatucket River are both impaired for Fecal Coliform. The water quality BMPs have been designed to filter and infiltrate the water quality storm to eliminate Fecal Coliform runoff from the proposed development.

---

Sand Filter Calculations

**Sand Filter Sizing**

Name of Sand Filter: Sand Filter

**Water Quality Calculations**

WQ<sub>v</sub> = 1inch x Impervious Area  
WQ<sub>v</sub> = 8,236 (Cubic Feet)

**Minimum Size of Sand Filter Filter Area**

$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$   
Required A<sub>f</sub> = 1,070 (Square Feet)    Where A<sub>f</sub> is the required filter bed area  
Provided A<sub>f</sub> = 2,990 (Square Feet)

<u><b>Sand Filter Parameters</b></u>	
At, Total Area to Sand Filter	10.100 (Acres)
Impervious Area To Sand Filter	2.269 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.50 (feet)
k, Coefficient of Permeability	3.5 (ft/day)
h <sub>f</sub> , Average Height of Water	0.25 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	6 (in)
Loam Depth	6 (in)

**Sand Filter Pre Treatment**

Type of Pre Treatment: Sediment Forebay

As = 5,750 \* Q    Q = %WQ<sub>v</sub> / 86,400    %WQ<sub>v</sub> = 25%  
Required As = 137 (Square Feet), where As is the required forebay Area  
Provided As = 710 (Square Feet)

25% of Water Quality Volume must be provided in Forebay  
Required Volume = 2,059 (Cubic Feet)  
Provided Volume = 2,132 (Cubic Feet)

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system (including forebay)  
Required WQ<sub>v</sub> = 6,177 (Cubic Feet)

Volume of Loam 493 (Cubic Feet)  
Volume of Forebay 2,132 (Cubic Feet)  
Volume of Ponding 1,583 (Cubic Feet)  
Volume of Voids in Filter Bed 2,467 (Cubic Feet)  

---

**Total 6,675 (Cubic Feet)**

---

## Bio Retention Calculations

Bio-retention calculations were completed for one of the proposed residential lots with shared driveways. For the calculation Lots 4 & 5 were used for the spreadsheet analysis. Each of the proposed lots and bio retention areas were modeled in HydroCAD to ensure no runoff from the 100-yr storm would occur. The front of the proposed homes and a portion of the proposed driveways will be directed to these bio retention areas. The house foot prints and driveways locations are subject to change at time of construction. A calculation was completed taking an average area of the areas directed to the bio retention areas to evaluate how many approximate square feet of bio retention area is required per 100 square feet of impervious area. This will inform the developer whether they will need to increase or decrease the size of the bio retention areas depending on the total amount of impervious area. A landscape architect will prepare final plans prior to construction and the bio retention area locations and sizes are subject to change but will be sized to handle the 100-yr storm event. A note is located on Sheet 5 of the Submission plan set and to the bio retention detail that states "Proposed home footprints along Old North Road may change prior to construction. Bio-retention areas must be sized accordingly with the revised footprints. Approximately 225 sf of bio-retention area is required for every 1000 square feet of increase in impervious area and vice versa if decreased." All of the bio-retention areas that are proposed are sized accordingly and we have provided all of the HydroCAD analysis sheets for all the bio retention area designs.

**Bioretention Sizing**

Name of Bioretention: L1&2

**Water Quality Calculations**

WQ<sub>v</sub>= 1inch x Impervious Area

WQ<sub>v</sub>= 741 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub>= 326 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

Provided A<sub>f</sub>= 2,000 (Square Feet)

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.268 (Acres)
Impervious Area To Bioretention	0.204 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 556 (Cubic Feet)

Volume of Mulch 165 (Cubic Feet)

Volume of Ponding 1,800 (Cubic Feet)

Volume of Voids in Filter Bed 1,815 (Cubic Feet)

---

**Total 3,780 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L3

**Water Quality Calculations**

WQ<sub>v</sub> = 1 inch x Impervious Area  
WQ<sub>v</sub> = 369 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub> = 162 (Square Feet)

Provided A<sub>f</sub> = 975 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.135 (Acres)
Impervious Area To Bioretention	0.102 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 277 (Cubic Feet)

Volume of Mulch 80 (Cubic Feet)

Volume of Ponding 909 (Cubic Feet)

Volume of Voids in Filter Bed 885 (Cubic Feet)

---

**Total 1,875 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L4&5

**Water Quality Calculations**

WQ<sub>v</sub>= 1inch x Impervious Area

WQ<sub>v</sub>= 820 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub>= 361 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

Provided A<sub>f</sub>= 2,175 (Square Feet)

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.295 (Acres)
Impervious Area To Bioretention	0.226 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 615 (Cubic Feet)

Volume of Mulch 179 (Cubic Feet)

Volume of Ponding 1,950 (Cubic Feet)

Volume of Voids in Filter Bed 1,974 (Cubic Feet)

---

**Total 4,103 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L6&7

**Water Quality Calculations**

WQ<sub>v</sub> = 1 inch x Impervious Area

WQ<sub>v</sub> = 766 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub> = 337 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

Provided A<sub>f</sub> = 2,040 (Square Feet)

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.277 (Acres)
Impervious Area To Bioretention	0.211 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 574 (Cubic Feet)

Volume of Mulch 168 (Cubic Feet)

Volume of Ponding 1,842 (Cubic Feet)

Volume of Voids in Filter Bed 1,851 (Cubic Feet)

---

**Total 3,861 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L6&7

**Water Quality Calculations**

WQ<sub>v</sub>= 1inch x Impervious Area

WQ<sub>v</sub>= 766 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub>= 337 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

Provided A<sub>f</sub>= 2,040 (Square Feet)

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.277 (Acres)
Impervious Area To Bioretention	0.211 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 574 (Cubic Feet)

Volume of Mulch 168 (Cubic Feet)

Volume of Ponding 1,842 (Cubic Feet)

Volume of Voids in Filter Bed 1,851 (Cubic Feet)

---

**Total 3,861 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L6&7

**Water Quality Calculations**

WQ<sub>v</sub>= 1inch x Impervious Area

WQ<sub>v</sub>= 813 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub>= 358 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

Provided A<sub>f</sub>= 2,274 (Square Feet)

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.286 (Acres)
Impervious Area To Bioretention	0.224 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 610 (Cubic Feet)

Volume of Mulch 188 (Cubic Feet)

Volume of Ponding 1,863 (Cubic Feet)

Volume of Voids in Filter Bed 2,064 (Cubic Feet)

---

**Total 4,114 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L6&7

**Water Quality Calculations**

WQ<sub>v</sub>= 1inch x Impervious Area

WQ<sub>v</sub>= 813 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub>= 358 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

Provided A<sub>f</sub>= 2,225 (Square Feet)

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.284 (Acres)
Impervious Area To Bioretention	0.224 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 610 (Cubic Feet)

Volume of Mulch 184 (Cubic Feet)

Volume of Ponding 1,819 (Cubic Feet)

Volume of Voids in Filter Bed 2,019 (Cubic Feet)

---

**Total 4,022 (Cubic Feet)**

**Bioretention Sizing**

Name of Bioretention: L14

**Water Quality Calculations**

WQ<sub>v</sub>= 1inch x Impervious Area

WQ<sub>v</sub>= 105 (Cubic Feet)

**Minimum Size of Bioretention Filter Area**

$$A_f = (WQ_v) \times (d_f) / [(k) \times (h_f + d_f) \times (t_f)]$$

Required A<sub>f</sub>= 46 (Square Feet)

Provided A<sub>f</sub>= 350 (Square Feet)

Where A<sub>f</sub> is the required filter bed area

<b><u>Bioretention Parameters</u></b>	
At, Total Area to Bioretention	0.044 (Acres)
Impervious Area To Bioretention	0.029 (Acres)
d <sub>f</sub> , Filter Bed Depth	2.75 (feet)
k, Coefficient of Permeability	1.0 (ft/day)
h <sub>f</sub> , Average Height of Water	0.38 (ft)
t <sub>f</sub> , Design Filter Bed Drain Time	2.00 (days)
Ponding Depth	9 (in)
Mulch Depth	3 (in)

**Bioretention Pre Treatment**

Type of Pre Treatment: Other

**Required Water Quality Volume**

75% of the WQ<sub>v</sub> must be held within system

Required WQ<sub>v</sub> 79 (Cubic Feet)

Volume of Mulch 29 (Cubic Feet)

Volume of Ponding 379 (Cubic Feet)

Volume of Voids in Filter Bed 318 (Cubic Feet)

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**Total 725 (Cubic Feet)**

### 3.4 Minimum Standard 4: Conveyance and Natural Channel Protection

#### Drainage Network Design Parameters:

##### A. PIPES

- All drainage pipes are RCP or equivalent unless otherwise noted.
- Manning's coefficient = 0.013
- Diameters & lengths as specified
- The 25-year design storm is utilized for the drainage pipe design to ensure that the drainage system contains and channels water to the BMP areas as shown on the plans.
- The rational method has been used for the closed drainage system.

##### B. STRUCTURES

- Catch basins – Pre-cast concrete with 4' sump unless otherwise noted and inverts as specified
- Manholes – Pre-cast concrete with inverts as specified.

#### Channel Protection Volume:

The detention basins have been designed to release the 1 year storm volume over a 24 hour time span in accordance with Section 3.2.4 of the RISDISM and RISDISM Guidance for Natural Channel Protection dated June 14, 2017.

The Channel Protection Volume is determined from the following equation:

$$CP_V = 0.65V_r$$

$CP_V$  = required channel protection storage volume

$V_r$  = runoff volume from the 1-year, 24-hour storm (obtained from HydroCAD)

Average release rate,  $CP_{q_{avg}} = 0.65 * V_r / T$

Max Release Rate =  $CP_{q_{max}} = 2 * CP_{q_{avg}}$

T = extended detention time (24 hours)

The orifice(s) has been sized using HydroCAD to have a max rate twice the average.

#### CP<sub>v</sub> Provided by BMP per Receiving Waterbody

##### Waterbody 1:

BMP / Subcatchment	$V_r$ (cf) To BMPs	$CP_V$ (cf) Required (0.65* $V_r$ )	$CP_V$ (cf) BMP Volume Infiltrated	$CP_V$ (cf) Released by $CP_V$ Orifice	$CP_V$ (cf) Total	$CP_V$ Storage Elev.	Required Max Release Rate (cfs)	Provided Max Release Rate (cfs)
1	29,664	19,282	20,255	6,763	27,018	231.50	0.45	0.21

Infiltration is provide within the bio retention areas and the sand filter. The WQ BMPs infiltrate the required  $CP_V$  volume. Additional  $CP_V$  is provided within the detention basin.

See Appendix A3.5.4.2 for the 1-year storm event HydroCAD analysis.

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## 3.5 Minimum Standard 5: Overbank Flood Protection & Downstream Analysis

### 3.5.1 Method of Analysis

USDA Soil Conservation Service Method as defined by Technical Release No. 20 (TR-20) determines Stormwater runoff rate and volume. Type III rainfall distribution is utilized. Time of concentration is determined using Technical Release No 55 (TR-55) methodology, through the computer program *HydroCAD ver. 9.0* by Applied Microcomputer Systems.

The drainage system has been designed to mitigate all stormwater flows for the 10 and 100 year storm events. The emergency outlets have been sized to handle the 100 year storm event.

### 3.5.2 Design Storm

Analysis of 1-year, 10-year, and 100-year frequency storms are included. The following 24-hour rainfall intensities are obtained from the Rhode Island Stormwater Design and Installation Standards Manual November 2018,

Table 3-1 for Washington County.

1 year =	2.8 inches
10 year =	4.9 inches
100 year=	8.5 inches

### 3.5.3 Design Point Breakdown

The site is analyzed as two watersheds but ultimately all storm water from the development site discharges toward the same wetland complex. All discharge from the wetland complex flows south toward Mooresfield Road and ends up within the Saugatucket River. In the pre development state there are two watershed areas with one watershed discharging to the wetland complex and the other watershed discharging east off site. In the post development stage the same watersheds are analyzed but there are two watersheds and three sub catchments areas. Each watershed will demonstrate zero increase of runoff due to the proposed development. A description of each watershed and associated subcatchments are summarized as follows:

#### Design Point #1:

Watershed #1 flows to Design Point- 1 (DP-1). Design Point 1 is located at the site boundary where an existing unnamed stream continues off site. Watershed #1 contains sub catchment Pre-1(100) and the area that discharges to the unnamed stream contains existing homes, driveways, grass lawn areas, and a large majority of wooded areas. This watershed had a total area of 128.39 acres, a time of concentration of 49.9 minutes, and curve number of 64. This time of concentration could have been increased by starting the time of concentration closer to Old North Road. This was not analyzed this way because the post development time of concentration would have been increased and using the same time of concentration provides a conservative analysis.

In post development conditions there are two (2) sub catchment areas that discharge to Design Point- 1 (DP-1). Sub catchment Post-1 (101) contains all of the existing homes, driveways, lawn areas along Old North Road and it also includes all the new proposed homes, driveways, and lawn areas along Old North

Road. All of the proposed homes and driveways along Old North Road are proposed with bio-retention areas that are oversized to allow infiltration of up to the 100-yr storm event. Due to the proposed elevations the backs of the proposed homes will not be able to be directed to a bio retention area. The proposed homes will also utilize shared driveways to reduce the overall impervious area on site. These driveways will also have a boulevard area with landscaping separating the two drives. This landscape area will assist in the absorbing runoff from the proposed driveways at the source but we have not accounted for this within our drainage calculations. In addition to the bio retention areas all of the stormwater from the proposed homes, driveways, and lawn areas will have to travel through existing wooded areas prior to entering the unnamed stream. These existing wooded areas qualify as QPA areas and will provide additional treatment. Post-1 has a total area of 120.42 Acres, a curve number of 65, and a time of concentration of 49.9 minutes. Sub catchment Post-2 (102) contains proposed homes along Stony Fort Road, approximately 1375 linear feet of proposed roadway, proposed homes, driveways, and lawn areas. All storm water runoff from the front of the proposed homes will be directed to the proposed roadway. The proposed roadway has a closed drainage network that will convey stormwater to a sediment forebay, sand filter, and detention basin. Post-102 has a total area of 10.1 acres, a curve number of 67, and a time of concentration of 23.9 minutes.

Below is a summary of the hydrologic parameters for the pre and post development sub-areas in Design Point-1.

	Area (acres)	CN	Tc (min)
Pre-100 (100)	128.39	64	49.9
Post-101 (101)	120.42	65	49.9
Post-102 (102)	10.10	67	23.9

Design Line #2:

Watershed #2 flows to Design Line- 2 (DL-2). Design line 2 is located along the northeast site boundary. In pre development conditions this entire watershed is wooded and storm water from the watershed is not directed toward the existing wetland on site. Storm water from this watershed does however eventually connect back to the wetland complex further south of the development. The area off site that this storm water is directed to contains an existing school and a large area of woods. Sub catchment Pre-2 (200) has a total area of 9.5 acres, a curve number of 55, and a time of concentration of 27.0 minutes. All storm water runoff from this watershed will have to travel through extensive wooded areas prior to entering the stream system so significant treatment will be provided.

In post development conditions there is one sub catchment area that discharges to design line 2 (DP-2). This sub catchment area contains a portion of proposed roadway, proposed homes, driveways, lawn areas, and existing wooded areas. Sub catchment Post-201 (201) has a total area of 5.51 acres, a curve number of 58, and a time of concentration of 18.0 minutes. Although there is an increase in impervious

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area and a reduction in time of concentration the overall reduction in area allows a reduction in stormwater flows.

	Area (acres)	CN	Tc (min)
Pre-2 (200)	9.50	55	27.0
Post-3 (201)	5.51	58	18.0

---

### 3.5.4 Q<sub>p</sub> BMP Calculations

The section includes calculations for each Q<sub>p</sub> BMP for the site. Calculations include Rip Rap Aprons, Anti Seep Collars, and the Emergency Outlet Calculations.

The emergency overflow weir on the detention basin has been sized to safely pass the 100 year storm and beyond without erosion or excessive velocities. For this analysis, the detention basin was assumed to have all of the orifices clogged and only the emergency overflow weir functioning. Under normal conditions, no stormwater will flow over the emergency spillway and the basin will have a minimum of one foot of freeboard.

Basin	Q(cfs)	V (ft/s)	Top of Basin	Flood Elevation
Basin 1	29.26	2.42	235.00	234.81

The velocity over the spillway is less than 3 ft/s thus no erosion will take place on the embankment or downstream. The basin maintains freeboard even with all orifices clogged and the 100 year storm flowing over the embankment. See attached HydroCAD in Section A3.5.5

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## Outlet Protection

Rip rap aprons are designed at the drainage pipe discharges and detention basin outlets. The rip rap aprons are designed to prevent scour at the storm water outlet and to minimize the potential for downstream erosion by reducing the velocity of concentrated storm water flows.

Basin 1

$$La = \frac{1.7*Q}{Do^{3/2}} + 8*Do$$

For discharges where Tailwater < 0.5\*Do

$$W = 3*Do + La$$

For discharges where Tailwater >= 0.5\*Do

$$W = 3*Do + 0.4*La$$

d-50 is determined by the following formula

$$d-50 = \frac{0.02}{TW} * \frac{Q}{Do}^{4/3}$$

La = length of apron

Do = diameter of outlet pipe

W = width of apron

d-50 = median stone diameter

TW = tailwater depth

---

Outlet Protection Table (Sized for 100 Year Storm Event)

Outlet	Discharge (cfs)	Do (ft)	La (ft)	TW* (ft)	W (ft)	d-50 (in)	Riprap Class
FES 1	9.07	1.25	22	1.00	13.00	3	R-3
FES 2	33.56	2.00	37	1.00	21.00	10	R-6
FES 3	29.16	2.00	34	1.00	20.00	9	R-5

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## Anti Seep Collars Basin 1

The first step in designing the anti-seep collar is to determine the length of pipe within the saturation zone of the embankment. This can be done by using the following equation, assuming that the upstream slope of the embankment intersects the invert of the pipe at its upstream end.

$$L_s = y(z + 4) (1 + (\text{pipe slope} / (0.25 - \text{pipe slope})))$$

$$y = 4.0 \quad \text{ft (maximum depth of water)}$$

$$z = 3.0 \quad (\text{slope of upslope embankment } ? : 1)$$

$$\text{slope} = 0.0200 \quad \text{ft/ft (pipe slope)}$$

$$L_s = 30.4 \quad \text{ft}$$

The second step in the design process is to establish the number of collars to be used. The equation below can then be used to determine the collar projection beyond the outside wall of the pipe.

Using the equation:

$$\frac{0.15 L}{2 n} = V \quad (\text{for a 15\% increase in flow length})$$

$$L_s = 30.4 \quad \text{ft}$$

$$n = 2$$

$$\frac{0.15 \times 30.4}{2 \times 2} = 1.14$$

$$V = 1.1 \quad \text{ft (projection of collar beyond pipe)}$$

### Overall Collar Dimensions

$$D = 2 \quad \text{ft (diameter of pipe)}$$

$$V = 1.1 \quad \text{ft (projection)}$$

$$OA = 5 \quad \text{ft (minimum overall dimension of collar)}$$

### 3.5.5 Downstream Analysis

A downstream analysis is required under the following conditions:

Area of Disturbance (Acres)	Impervious Cover (%)
>5 to 10	>75
>10 to 25	>50
>25 to 50	>25
>50	All Projects

The proposed project disturbs 20.59 acres and is 5.59 acres of impervious. This is approximately 23% impervious cover. A downstream analysis is not required.

### 3.5.6 Overbank Flood Protection Conclusion

Pre development Conditions versus Post Development Conditions for each watershed are summarized below:

Watershed #1: (DP-1)

Conditions	1-Year	10-Year	100-Year
Pre Dev Summation	17.23 cfs	93.13 cfs	275.04 cfs
Post Dev Summation	18.37 cfs	92.34 cfs	268.36 cfs
Net Change	+1.14 cfs	-0.79 cfs	-6.68 cfs

(cfs = cubic feet per second)

Watershed #2: (DL-2)

Conditions	1-Year	10-Year	100-Year
Pre Dev Summation	0.28 cfs	4.90 cfs	19.97 cfs
Post Dev Summation	0.41 cfs	4.28 cfs	15.49 cfs
Net Change	+0.13 cfs	-0.62 cfs	-4.48 cfs

(cfs = cubic feet per second)

There is a minor increase in storm water flows for the 1-yr storm event due to uncontrolled areas within each watershed. These areas include back of homes that cannot discharge to a drainage BMP due to elevation conflicts and lawn areas that cannot be controlled. There is insignificant discharge from the detention basin during the 1-yr storm event, which meets all channel protection volume requirements, and the storm water flow increase is due to the change in ground cover type in uncontrolled areas.

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### 3.6 Minimum Standard 6: Redevelopment and Infill Projects.

The site is not classified as a redevelopment or infill project.

### 3.7 Minimum Standard 7: Pollution Prevention

A Soil Erosion and Sediment Control Plan (SESC) for this development can be found under a separate document. See the Soil Erosion and Sediment Control Plan for the development prepared by DiPrete Engineering. The SESC contains information for construction pollution prevention. For post construction pollution prevention see the Operations and Maintenance (O&M) document prepared for this development by DiPrete Engineering.

### 3.8 Minimum Standard 8: Land Uses with High Potential Pollutant Loads (LUHPPs)

The site is not considered LUHPL.

### 3.9 Minimum Standard 9: Illicit Discharges

There are no proposed Illicit Discharges on site. The site will be serviced by public water and private OWTS.

### 3.10 Minimum Standard 10: Construction Erosion and Sedimentation Control

See the SESC for this development prepared by DiPrete Engineering.

### 3.11 Minimum Standard 11: Stormwater Management System Operation and Maintenance

See the O&M for this development prepared by DiPrete Engineering.

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Appendix A

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## A2.1 Soil Evaluations



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number N/A

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 22, 2007  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Clear, 70° F Shaded: Yes  No  Time: 2:00 pm

TH 07-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 2/2					fsl	l-sbk	vfr	4
Bw	8-22"	C	W	10YR 5/6					fsl	l-sbk	fri	4
C	22-42"	C	W	2.5Y 6/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	42-96"			2.5Y 5/4					ls	0-m	fri	6
TH 07-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-6"	C	S	10YR 2/2					fsl	l-sbk	vfr	4
Bw	6-21"	C	W	10YR 5/6					fsl	l-sbk	fri	4
C	21-40"	C	W	2.5Y 6/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	40-96"			2.5Y 5/3					ls	0-m	fri	6

Soil Class: Compact Ablation Till  
 Depth to Groundwater Seepage: None  
 Estimated Seasonal High Water Table: 07-1=20" 07-2=20"

Total Depth of each Test Hole: 07-1=96" 07-2=96"  
 Depth to Impervious or Limiting Layer: None  
 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description Application Number N/A

Property Owner: Picrme Real Estate Group  
 Property Location: Old North Rd AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 22, 2007  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Clear, 70° F Shaded: Yes  No  Time: 2:00 pm

TH 07-3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-6"	C	S	10YR 3/3					fsl	1-sbk	vfr	4
Bw	6-21"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	21-38"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	38-96"			2.5Y 5/4					ls	0-m	fri	6
TH 07-4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-6"	C	S	10YR 3/3					fsl	1-sbk	vfr	4
Bw	6-20"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	20-40"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	40-96"			2.5Y 5/3					ls	0-m	fri	6

Soil Class: Compact Ablation Till Total Depth of each Test Hole: 07-3=96" 07-4=96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 07-3=18" 07-4=21" 30 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description Application Number N/A

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 22, 2007  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Clear, 70° F Shaded: Yes  No  Time: 2:00 pm

TH 07-9 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	10-18"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	18-36"	C	W	2.5Y 6/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	36-96"			2.5Y 5/3					ls	0-m	fri	6
TH 07-10 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	10-22"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	22-40"	C	W	2.5Y 6/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	40-96"			2.5Y 5/3					gls	0-m	fri	6

Soil Class: Compact Ablation Till Total Depth of each Test Hole: 07-9=96" 07-10=96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 07-9=19" 07-10=20" 31 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
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Site Evaluation Form  
 Part A - Soil Profile Description Application Number N/A

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 22, 2007  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Clear, 70° F Shaded: Yes  No  Time: 2:00 pm

TH <u>07-11</u> Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/3					fsl	1-sbk	vfr	4
Bw	10-24"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	24-48"	C	W	2.5Y 6/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	48-96"			2.5Y 5/3					ls	0-m	fri	6
TH _____ Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				

Soil Class: Compact Ablation Till Total Depth of each Test Hole: 07-11=96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 07-11=22" 32 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 29-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-9"	C	S	10YR 3/4					fsl	1-sbk	vfr	4
Bw	9-18"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	18-36"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	36-96"			2.5Y 5/4					gls	0-m	fri	6
TH 29-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/4					fsl	1-sbk	vfr	4
Bw	8-18"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	18-34"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	34-96"			2.5Y 5/4					gls	0-m	fri	6

Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 29-1=18" 29-2=18"  
 33 Comments: \_\_\_\_\_



**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS**  
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**Site Evaluation Form**  
**Part A - Soil Profile Description**

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 1-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-18"	C	S	10YR 4/6 10YR 5/6					fsl	1-sbk	fri	4
C	18-46"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	46-96"			2.5Y 5/3					gls	0-m	fri	6
TH 1-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-19"	C	S	10YR 4/6					fsl	1-sbk	fri	4
C	19-33"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	33-96"			2.5Y 6/3					gls	0-m	fri	6

Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 1-1=18" 1-2=18" 34 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH <u>1-3</u> Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-19"	C	S	10YR 4/6 10YR 5/6					fsl	1-sbk	fri	4
C	19-30"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	30-96"			2.5Y 5/3					gls	0-m	fri	6
TH Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				

Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 1-3=19" Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
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Site Evaluation Form  
 Part A - Soil Profile Description Application Number SDW

Property Owner: Piceme Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 10-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	10-20"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	20-37"	C	W	2.5Y 5/3	7.5YR 5/6	C	3	P	fsl	0-m	fri	7
2C	37-96"			2.5Y 6/3					gls/cos	0-m	fri	6
TH 10-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	10-25"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	25-96"			2.5Y 6/3	7.5YR 5/8	C	3	P	gls	0-m	fri	6

Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 10-1=18" 10-2=18" 36 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
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Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 27-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-9"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	9-20"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	20-33"	C	W	2.5Y 5/4	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	33-96"			2.5Y 6/3					gls	0-m	fri	6
TH 27-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-20"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	20-39"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	39-96"			2.5Y 6/3					gls	0-m	fri	6

Soil Class: Eolian over Ablation Till  
 Depth to Groundwater Seepage: None  
 Estimated Seasonal High Water Table: 27-1=20" 27-2=20"  
 Total Depth of each Test Hole: 96"  
 Depth to Impervious or Limiting Layer: None  
 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 27-3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-7"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	7-19"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	19-36"	C	W	2.5Y 5/4	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	36-96"			2.5Y 6/3					gls	0-m	fri	6
TH 27-4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-8"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	18-35"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	35-96"			2.5Y 6/3					gls	0-m	fri	6

Soil Class: Eolian over Ablation Till  
 Depth to Groundwater Seepage: None  
 Estimated Seasonal High Water Table: 27-3=18" 27-4=18"  
 Total Depth of each Test Hole: 96"  
 Depth to Impervious or Limiting Layer: None  
 Comments: \_\_\_\_\_



**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS**  
 Department of Environmental Management  
 Office of Water Resources



**Site Evaluation Form**  
**Part A - Soil Profile Description**

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 28-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-19"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	19-32"	C	W	2.5Y 5/4	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	32-96"			2.5Y 6/3					gls	0-m	fri	6
TH 28-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-9"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	19-38"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	38-96"			2.5Y 6/3					gls	0-m	fri	6

Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 28-1=18" 28-2=20" Comments: \_\_\_\_\_



**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS**  
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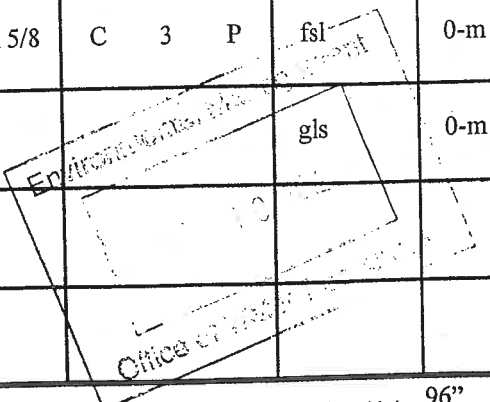


**Site Evaluation Form**  
**Part A - Soil Profile Description**

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 28-3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-7"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	7-19"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	19-33"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	33-96"			2.5Y 5/4					gls	0-m	fri	6
TH 28-4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-9"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	19-38"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	38-96"			2.5Y 5/4					gls	0-m	fri	6



Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 28-3=18" 28-4=18" Comments: \_\_\_\_\_



**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS**  
 Department of Environmental Management  
 Office of Water Resources



**Site Evaluation Form**  
**Part A - Soil Profile Description**

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH OS-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-6"	C	S	10YR 3/4					fsl	1-sbk	vfr	4
Bw	6-18"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	18-34"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	34-96"			2.5Y 5/4					gls	0-m	fri	6
TH OS-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-7"	C	S	10YR 3/4					fsl	1-sbk	vfr	4
Bw	7-20"	C	W	10YR 4/6					fsl	1-sbk	fri	4
C	20-34"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	34-96"			2.5Y 5/4					gls	0-m	fri	6

Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: OS-1=18" OS-2=18" Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC  
 Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI  
 Date of Test Hole: SEPTEMBER 12, 2012  
 Soil Evaluator: CHRIS SUTTIE License Number: D-4077  
 Weather: CLEAR, 75°F Shaded: Yes  No  Time: 12:00 PM

TH 2012-32 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR2.3/2					fsl	1-sbk.	fri	4
Bw	10-20"	C	S	10YR2.4/6					fsl	1-sbk.	fri	4
BC	20-31"	C	W	5.5Y5/4	7.5YR2.5/8	C	2	D	fsl/ ufsl	0-m	fri	7
C	31-44"	C	W	2.5Y5/2	7.5YR2.5/8	C	3	P	ufsl	0-m	fri	7
2C	44-96"			2.5Y5/4					gls	0-m	fri	6
TH 2012-33 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-9"	C	S	10YR2.3/2					fsl	1-sbk	fri	4
Bw	9-21"	C	S	10YR2.4/6					fsl	1-sbk	fri	4
BC	21-35"	C	W	5Y5/4	7.5YR2.5/6	C	2	D	fsl/ ufsl	0-m	fri	7
C	35-54"	C	W	2.5Y5/2	7.5YR2.5/8	C	3	P	ufsl	0-m	fri	4
2C	54-96"			2.5Y5/4					gls	0-m	fri	6

Soil Class: FOLIAN OVER Abolition Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: NONE Depth to Impervious or Limiting Layer: NONE  
 Estimated Seasonal High Water Table: 2012-32 = 20" 2012-33 = 21" Comments: \_\_\_\_\_



**STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS**  
 Department of Environmental Management  
 Office of Water Resources

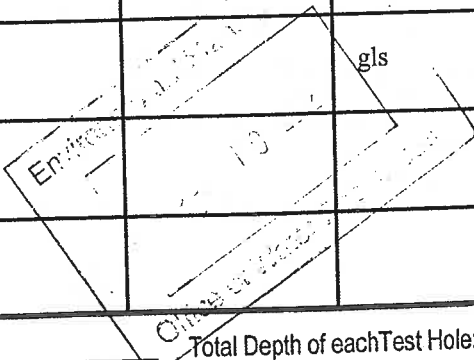


**Site Evaluation Form**  
**Part A - Soil Profile Description**

Application Number SDW

Property Owner: Picerne Real Estate Group  
 Property Location: Old North Rd. AP 16/4 Lot 9 South Kingstown, RI  
 Date of Test Hole: October 1-6, 2009  
 Soil Evaluator: Chris Sutter License Number: D-4077  
 Weather: Mostly Clear, 65° F Shaded: Yes  No  Time: 2:00 pm

TH 14-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	8-19"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	19-37"	C	W	2.5Y 5/3	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	37-96"			2.5Y 6/3					gls	0-m	fri	6
TH 14-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	vfr	4
Bw	10-18"	C	W	10YR 5/6					fsl	1-sbk	fri	4
C	18-35"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	fsl	0-m	fri	7
2C	35-96"			2.5Y 6/3					gls	0-m	fri	6



Soil Class: Eolian over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: None Depth to Impervious or Limiting Layer: None  
 Estimated Seasonal High Water Table: 14-1=18" 14-2=18" Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC  
 Property Location: OLD NORTH RD AP16-4 Lot 9 SOUTH KINGSTOWN, RI  
 Date of Test Hole: SEPTEMBER 12, 2012  
 Soil Evaluator: CHRIS SUTTER License Number: D-4077  
 Weather: CLEAR, 75°F Shaded: Yes  No  Time: 12:00 PM

TH2012-1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR2.3/1					fsl	1-sbk	vfr	4
Bw	8-20"	C	S	10YR2.4/6					fsl	1-sbk	fri	4
C	2-40"	C	W	2.5Y5/2	7.5YR2.5/8	C	3	P	ufsl	0-m	fri	7
2C	40-96"			2.5Y5/4					gls	0-m	fri	6
TH2012-2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-7"	C	S	10YR2.3/2					fsl	1-sbk	vfr	4
Bw	7-19"	C	S	10YR2.4/6					fsl	1-sbk	fri	4
C	19-36"	C	W	2.5Y5/2	7.5YR2.5/8	C	3	P	ufsl	0-m	fri	7
2C	36-96"			2.5Y5/4					gls	0-m	fri	6

Soil Class: Epilon over Ablation Till Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: NONE Depth to Impervious or Limiting Layer: NONE  
 Estimated Seasonal High Water Table: 2012-1 = 20" 2012-2 = 19" Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

License Number: D-4077

Soil Evaluator: CHRIS SUTTER

Shaded: Yes  No  Time: 12:00 PM

Weather: CLEAR, 75°F

TH2012-3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-7"	C	S	10YR3/2					fsl	1-sbk	vfr	4
Bw	7-20"	C	S	10YR4/6	7.5YR2.5/6 @ 18"	F	2	P	fsl	1-sbk	fri	4
C	20-37"	C	W	2.5Y5/3	7.5YR2.5/8	C	3	P	ufsl	0-m	fri	7
ZC	37-96"			2.5Y5/4					gls	0-m	fri	6
TH2012-4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-8"	C	S	10YR3/2					fsl	1-sbk	vfr	4
Bw	8-20"	C	S	10YR5/4	7.5YR2.5/6 @ 19"	F	2	P	fsl	1-sbk	fri	4
C	20-39"	C	W	2.5Y5/3	7.5YR2.5/8	C	3	P	ufsl	0-m	fri	7
ZC	39-96"			2.5Y5/4					gls	0-m	fri	6

Environmental Management  
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Soil Class: FOLIAR OVER Abolition Till

Total Depth of each Test Hole: 96"

Depth to Groundwater Seepage: NONE

Depth to Impervious or Limiting Layer: NONE

Estimated Seasonal High Water Table: 2012-3 = 18" - 2012-4 = 19"

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management

Office of Water Resources



Site Evaluation Form

Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SUITER

License Number: D-4077

Weather: CLEAR, 75°F

Shaded: Yes  No  Time: 12:00 PM

TH2012-5 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-9"	C	S	10YR2/2					fsl	1-sbk	ufr	4
Bw	9-21"	C	S	10YR2/6					fsl	1-sbk	fri	4
BC	21-26"	C	W	2.5Y5/4	7.5YR5/6	C	2	P	sl/ufsl	0-m	fri	7
C	26-40"	C	W	2.5Y5/3	7.5YR5/8	C	3	P	ufsl	0-m	fri	7
2C	40-96"			2.5Y5/4					gls	0-m	fri	6
TH2012-6 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR2/2					fsl	1-sbk	ufr	4
Bw	8-21"	C	S	10YR2/6					fsl	1-sbk	fri	4
BC	21-28"	C	W	2.5Y5/4	7.5YR5/6	C	2	P	sl/ufsl	0-m	fri	7
C	28-40"	C	W	2.5Y5/3	7.5YR5/8	C	3	P	ufsl	0-m	fri	7
2C	40-96"			2.5Y5/4					gls	0-m	fri	6

Soil Class: FOLLON OVER ABLESTON TILL

Total Depth of each Test Hole: 96"

Depth to Groundwater Seepage: NONE

Depth to Impervious or Limiting Layer: NONE

Estimated Seasonal High Water Table: 2012-5=20" 2012-6=19"

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 Lot 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SUTER

License Number: D-4077

Weather: Clear, 75°F

Shaded: Yes  No  Time: 12:00 PM

TH2012-7 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-8"	C	S	10YR 3/1					fsl	1-sbk	ufr	4
Bw1	8-20"	C	S	10YR 5/6					fsl	1-sbk	fri	4
Bw2	20-25"	C	S	2.5Y 5/6	10YR 5/8 3 21" F	F	2	F	fsl	1-sbk	fri	4
C	25-48"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	ufsl	0-m	fri	7
2C	48-96"			2.5Y 5/4					gls	0-m	fri	6
TH2012-8 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-10"	C	S	10YR 3/1					fsl	1-sbk	ufr	4
Bw1	10-19"	C	S	10YR 5/6					fsl	1-sbk	fri	4
Bw2	19-29"	C	W	2.5Y 5/6	10YR 5/8 19"	F	2	F	fsl	1-sbk	fri	4
C	29-46"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	ufsl	0-m	fri	7
2C	46-96"			2.5Y 5/4					gls	0-m	fri	6

Soil Class: Euilan over Ablonon Tlu

Total Depth of each Test Hole: 96"

Depth to Groundwater Seepage: NONE

Depth to Impervious or Limiting Layer: NONE

Estimated Seasonal High Water Table: 2012-75-2" 2012-8-19"

Comments:



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

License Number: D-4077

Soil Evaluator: CHRIS SUTTER

Shaded: Yes  No  Time: 12:00 PM

Weather: CLEAR, 75°F

TH2012-9 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
A	0-6"	C	S	10YR3/2					fsl	1-sbk	fri	4
Bw1	6-19"	C	S	10YR5/6					fsl	1-sbk	fri	4
Bw2	19-26"	C	W	10YR5/4	7.5YR5/8	C	2	P	fsl	1-sbk	fri	4
C	26-44"	C	W	2.5Y5/2	7.5YR5/8	C	3	P	vfsl	0-m	fri	7
ZC	44-96"			2.5Y5/4					gls	0-m	fri	6
TH2012-10 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-8"	C	S	10YR3/2					fsl	1-sbk	fri	4
BW	8-21"	C	S	10YR4/6					fsl	1-sbk	fri	4
BC	21-28"	C	W	10YR5/6	7.5YR5/6	C	2	P	fsl	0-m	fri	7
C	28-40"	C	W	2.5Y5/2	7.5YR5/8	C	3	P	vfsl	0-m	fri	7
ZC	40-96"			7.5YR5/8	Emm				gls	0-m	fri	6

Soil Class: FOLIAN OVER Ablation Till

Depth to Groundwater Seepage: NONE

Estimated Seasonal High Water Table: 2012-9=19" 2012-10=21"

Total Depth of each Test Hole: 96"

Depth to Impervious or Limiting Layer: NONE

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9, SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

License Number: D-4077

Soil Evaluator: CHRIS SWITZER

Shaded: Yes  No  Time: 12:00 PM

Weather: Clear, 75°F

TH 2012-11 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
A	0-10"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw1	10-18"	C	S	10YR 5/6					fsl	1-sbk	fri	4
Bw2	18-27"	C	W	2.5Y 5/6	7.5YR 5/6	C	2	D	fsl	1-sbk	fri	4
C	27-41"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
Zc	41-96"			2.5Y 5/4					gls	0-m	fri	6
<div style="border: 1px solid black; padding: 5px; display: inline-block;">             Environmental              10 10 12           </div>												
TH 2012-12 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	10-19"	C	S	10YR 4/6					fsl	1-sbk	fri	4
C	19-46"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
Zc	46-96"			2.5Y 5/4					gls	0-m	fri	6

Soil Class: Entisol over Abolition Till

Depth to Groundwater Seepage: NONE

Total Depth of each Test Hole: 96"

Depth to Impervious or Limiting Layer: NONE

Estimated Seasonal High Water Table: 2012-11-18" 2012-12-18"

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SUTER

License Number: D-4077

Weather: CLEAR, 75°F

Shaded: Yes  No  Time: 12:00 PM

TH 2012-13 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
A	0-8"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw1	8-18"	C	S	10YR 5/6					fsl	1-sbk	fri	4
Bw2	18-24"	C	S	10YR 5/6	2.5YR 5/6	C	2	D	fsl	1-sbk	fri	4
C	24-38"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
2C	38-96"			2.5Y 5/4					gls	0-m	fri	6
TH 2012-14 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
A	0-10"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	10-20"	C	S	10YR 5/6					fsl	1-sbk	fri	4
C	20-35"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
2C	35-96"			2.5Y 5/4					gls	0-m	fri	6

Emitted on 10/12/12

Soil Class: Episodic Over Ablation Till

Depth to Groundwater Seepage: NONE

Total Depth of each Test Hole: \_\_\_\_\_

Depth to Impervious or Limiting Layer: \_\_\_\_\_

Estimated Seasonal High Water Table: 2012-13 = 18" - 2012-14 = 19"

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC  
 Property Location: OLD NORTH RD AP16-4 Lot 9 SOUTH KINGSTOWN, RI  
 Date of Test Hole: SEPTEMBER 12, 2012  
 Soil Evaluator: CHRIS SWITZER License Number: D-9077  
 Weather: CLEAR, 75°F Shaded: Yes  No  Time: 12:00 PM

TH 2012-16 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	8-22"	C	S	10YR 5/6					fsl	1-sbk	fri	4
Bc	22-30"	C	W	2.5Y 5/6	7.5YR 5/6	C	2	P	fsl	1-sbk	fri	4
C	30-45"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	ufsl	0-m	fri	7
Zc	45-96"			2.5Y 5/4					gls	0-m	fri	6
TH 2012-17 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	10-19"	C	S	10YR 5/6					fsl	1-sbk	fri	4
C	19-30"	C	W	2.5Y 7/2	7.5YR 5/8	C	3	P	ufsl	0-m	fri	7
Zc	30-96"			2.5Y 5/4					gls	0-m	fri	6

EMPHATICALLY PROHIBITED TO BE USED FOR ANY PURPOSES WITHOUT THE WRITTEN PERMISSION OF THE STATE OF RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT

Soil Class: FOLIAN OVER ABOLIATION TIL Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: NONE Depth to Impervious or Limiting Layer: NONE  
 Estimated Seasonal High Water Table: 2012-16 = 21" - 2012-17 = 19" Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 Lot 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SUTTER

License Number: D-4077

Weather: CLEAR, 75°F

Shaded: Yes  No  Time: 12:00 PM

TH 2012-18 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-10"	C	S	10YR 3/2					fsl	1-sbk	ufr	4
Bw1	10-20"	C	S	10YR 4/6					fsl	1-sbk	fri	4
Bw2	20-26"	C	W	10YR 5/6	2.5YR 5/6	C	2	D	fsl	1-sbk	fri	4
C	26-50"	C	W	2.5Y 5/2	2.5YR 5/8	C	3	P	vfsl	0-m	fri	7
Zc	50-96"			2.5Y 5/4					gls	0-m	fri	6
TH 2012-19 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
A	0-10"	C	S	10YR 3/2					fsl	1-sbk	vfri	4
Bw	10-21"	C	S	10YR 4/6					fsl	1-sbk	fri	4
C	21-45"	C	W	2.5Y 5/2	2.5YR 5/8	C	3	P	vfsl	0-m	fri	7
Zc	45-96"			2.5Y 5/4					gls	0-m	fri	6

Soil Class: Epillic over Abolition Tlc.

Depth to Groundwater Seepage: NONE

Estimated Seasonal High Water Table: 2012-18 = 21" 2012-19 = 20"

Total Depth of each Test Hole: 96"

Depth to Impervious or Limiting Layer: NONE

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form

Part A - Soil Profile Description

Application Number

SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SUTER

License Number: D-4077

Weather: CLEAR, 75°F

Shaded: Yes  No  Time: 12:00 PM

TH2012-22 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-10"	C	S	10YR2.5/2					fsl	1-sbk	fri	4
Bw	10-21"	C	S	10YR2.5/6					fsl	1-sbk	fri	4
C	21-34"	C	W	2.5Y5/2	7.5YR5/8	C	3	P	v-fsl	0-m	fri	7
2C	34-96"			2.5Y5/4	Em				gls	0-m	fri	6
TH2012-23 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
Horizon	Depth	Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR2.5/2					fsl	1-sbk	fri	4
Bw	8-20"	C	S	10YR2.5/6					fsl	1-sbk	fri	4
C	20-40"	C	W	2.5Y5/2	7.5YR5/8	C	3	P	v-fsl	0-m	fri	7
2C	40-96"			2.5Y5/4					gls	0-m	fri	6

Soil Class: FOLIAR OVER ABLOTION TIL

Total Depth of each Test Hole: 96"

Depth to Groundwater Seepage: NONE

Depth to Impervious or Limiting Layer: NONE

Estimated Seasonal High Water Table: 2012: 82-80" 2012-23: 80"

Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management

Office of Water Resources



Site Evaluation Form

Part A - Soil Profile Description

Application Number

SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SWITZER

License Number: D-4077

Weather: CLEAR, 75°F

Shaded: Yes [ ] No [x] Time: 12:00 PM

TH 2012-24 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-9"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	9-20"	C	S	10YR 5/6					fsl	1-sbk	fri	4
C	20-32"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
Zc	32-96"			2.5Y 5/4					gls	0-m	fri	6
TH 2012-25 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
Ap	0-8"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	8-22"	C	S	10YR 5/6					fsl	1-sbk	fri	4
C	22-40"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
Zc	40-96"			2.5Y 5/4					gls	0-m	fri	6

10 2012  
 OFFICE OF WATER RESOURCES  
 DEPARTMENT OF ENVIRONMENTAL MANAGEMENT  
 STATE OF RHODE ISLAND

Soil Class: FOLIAR OVER ABLATION TIL

Total Depth of each Test Hole: 96"

Depth to Groundwater Seepage: NONE

Depth to Impervious or Limiting Layer: NONE

Estimated Seasonal High Water Table: 2012-24 = 20" 2012-25 = 20"

Comments:



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management

Office of Water Resources



Site Evaluation Form

Part A - Soil Profile Description

Application Number

SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC

Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI

Date of Test Hole: SEPTEMBER 12, 2012

Soil Evaluator: CHRIS SUTTER

License Number: D-4077

Weather: CLEAR, 75°F

Shaded: Yes [ ] No [x] Time: 12:00 PM

TH 2012-26 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-9"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw1	9-18"	C	S	2.5Y 5/6 2.5Y 5/4*					fsl	1-sbk	fri	4
Bw2	18-22"	C	W	2.5Y 5/4	7.5YR 5/6	C	2	D	fsl	1-sbk	fri	4
C	22-40"	C	W	2.5Y 5/2	2.5YR 5/8	C	3	P	vfsl	0-m	fri	7
ZC	40-96"			2.5Y 5/4					gls	0-m	fri	6
TH 2012-27 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-8"	C	S	10YR 3/2					fsl	1-sbk	fri	4
Bw	8-19"	C	S	10YR 5/6					fsl	1-sbk	fri	4
BC	19-28"	C	S	10YR 5/6 2.5Y 5/4	7.5YR 5/6	C	2	D	fsl	1-sbk	fri	4
C	28-44"	C	W	2.5Y 5/2	7.5YR 5/8	C	3	P	vfsl	0-m	fri	7
ZC	44-96"			2.5Y 5/4	Enrichment				gls	0-m	fri	6

Soil Class: FOLIAR OUSL ABLATION TILL

Depth to Groundwater Seepage: NONE

Estimated Seasonal High Water Table: 2012-26 = 18" 2012-27 = 19"

Total Depth of each Test Hole: 96"

Depth to Impervious or Limiting Layer: NONE

Comments:

\* 2 MATRIX COLORS IN Bw1 - 2.5Y 5/6 (DOMINANT) w/ INCLUSIONS OF 2.5Y 5/4



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC  
 Property Location: OLD NORTH RD AP16-4 LOT 9 SOUTH KINGSTOWN, RI  
 Date of Test Hole: SEPTEMBER 12, 2012  
 Soil Evaluator: CHRIS SUTER License Number: D-4077  
 Weather: CLEAR, 75°F Shaded: Yes  No  Time: 12:00 PM

TH <u>2012-28</u> Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-10"	C	S	10YR3/2					fsl	1-sbk	fri	4
Bw1	10-20"	C	S	10YR4/6					fsl	1-sbk	fri	4
Bw2	20-26"	C	W	10YR5/6	7.5YR5/8	C	2	P	fsl	1-sbk	fri	4
C	26-36"	C	W	2.5Y5/2	7.5YR5/8	C	3	P	ufsl	0-m	fri	7
2C	36-96"			2.5Y5/4					gls	0-m	fri	6
<del>TH <u>2012-27</u></del>												
TH <u>2012-27</u> Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-10"	C	S	10YR3/2					fsl	1-sbk	fri	4
Bw	10-20"	C	W	10YR5/6					fsl	1-sbk	fri	4
C	20-40"	C	W	2.5Y5/3	7.5YR5/8	C	3	P	ufsl	0-m	fri	7
2C	40-96"			2.5Y5/4					gls	0-m	fn	6

Soil Class: FOUR OVER ABSTENTION TUE  
 Depth to Groundwater Seepage: NONE  
 Estimated Seasonal High Water Table: 2012-28 = 20" 2012-29 = 19"  
 Total Depth of each Test Hole: 96"  
 Depth to Impervious or Limiting Layer: NONE  
 Comments: \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS  
 Department of Environmental Management  
 Office of Water Resources



Site Evaluation Form  
 Part A - Soil Profile Description

Application Number SDW

Property Owner: OLD NORTH LAND INVESTMENTS, LLC  
 Property Location: OLD NORTH RD AP16-4 Lot 9 SOUTH KINGSTOWN, RI  
 Date of Test Hole: SEPTEMBER 12, 2012  
 Soil Evaluator: CHRIS SUTTER License Number: D-4077  
 Weather: CLEAR, 75°F Shaded: Yes  No  Time: 12:00 PM

TH <u>2012-30</u> Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox Description			Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab.	S.	Con.				
AP	0-8"	C	S	10YR3/2					fsl	1-sbk	fri	4
Bw1	8-20"	C	S	10YR2.5/6					fsl	1-sbk	fri	4
Bw2	20-30"	C	W	2.5YR5/6	2.5YR2.5/6	C	2	D	fsl	1-sbk	fri	4
C	30-40"	C	W	2.5YR2	2.5YR2.5/8	C	3	P	vfsl	0-m	fri	7
2C	40-96"			2.5YR5/4					gls	0-m	fri	6

Emp. [unclear]  
 2012  
 Office of Water Resources

Soil Class: FOLIAR OVER Abolition TIL Total Depth of each Test Hole: 96"  
 Depth to Groundwater Seepage: NONE Depth to Impervious or Limiting Layer: NONE  
 Estimated Seasonal High Water Table: 2012-30 = 20" Comments: \_\_\_\_\_

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### A3.2 Water Quality HydroCAD 1.2" Storm Analysis

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 1.2" WQ Storm Rainfall=1.20"

Prepared by DiPrete Engineering

Printed 4/25/2022

HydroCAD® 10.10-6a s/n 01125 © 2020 HydroCAD Software Solutions LLC

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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, Split Pervious/Imperv.  
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Subcat 100 Ex**

Runoff Area=128.390 ac 0.95% Impervious Runoff Depth=0.01"  
Flow Length=3,830' Tc=49.9 min CN=63/98 Runoff=0.59 cfs 0.101 af

**Subcatchment 200: Subcat 200 Ex**

Runoff Area=9.500 ac 0.00% Impervious Runoff Depth=0.00"  
Flow Length=911' Slope=0.0200 '/ Tc=27.0 min CN=55/0 Runoff=0.00 cfs 0.000 af

**Reach DL-2.: Design Line 2**

Inflow=0.00 cfs 0.000 af  
Outflow=0.00 cfs 0.000 af

**Reach DP-1.: Design Line 1**

Inflow=0.59 cfs 0.101 af  
Outflow=0.59 cfs 0.101 af

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points  
 Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.  
 Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 101: Subcat 101 Pr</b>	Runoff Area=120.420 ac 1.67% Impervious Runoff Depth=0.02" Flow Length=3,830' Tc=49.9 min CN=64/98 Runoff=0.98 cfs 0.175 af
<b>Subcatchment 102: Subcat 102 Pr</b>	Runoff Area=10.100 ac 22.47% Impervious Runoff Depth=0.22" Flow Length=1,646' Tc=23.9 min CN=58/98 Runoff=1.57 cfs 0.186 af
<b>Subcatchment 201: Subcat 201 Pr</b>	Runoff Area=5.510 ac 3.39% Impervious Runoff Depth=0.03" Flow Length=100' Slope=0.0300 '/ Tc=18.0 min CN=56/98 Runoff=0.15 cfs 0.015 af
<b>Subcatchment L1&amp;2: Lot 1 &amp; Lot 2</b>	Runoff Area=11,690 sf 76.05% Impervious Runoff Depth=0.75" Tc=6.0 min CN=61/98 Runoff=0.22 cfs 0.017 af
<b>Subcatchment L10&amp;11: Lot 10 &amp; 11</b>	Runoff Area=12,446 sf 78.36% Impervious Runoff Depth=0.77" Tc=6.0 min CN=61/98 Runoff=0.25 cfs 0.018 af
<b>Subcatchment L12&amp;13: Lot 12 &amp; 13</b>	Runoff Area=12,378 sf 78.79% Impervious Runoff Depth=0.78" Tc=6.0 min CN=61/98 Runoff=0.25 cfs 0.018 af
<b>Subcatchment L14: L14</b>	Runoff Area=1,925 sf 65.71% Impervious Runoff Depth=0.65" Tc=6.0 min CN=61/98 Runoff=0.03 cfs 0.002 af
<b>Subcatchment L3: Lot 3</b>	Runoff Area=5,878 sf 75.33% Impervious Runoff Depth=0.74" Tc=6.0 min CN=61/98 Runoff=0.11 cfs 0.008 af
<b>Subcatchment L4&amp;5: Lot 4 &amp; 5</b>	Runoff Area=12,865 sf 76.49% Impervious Runoff Depth=0.75" Tc=6.0 min CN=61/98 Runoff=0.25 cfs 0.019 af
<b>Subcatchment L6&amp;7: Lot 6 &amp; 7</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=0.75" Tc=6.0 min CN=61/98 Runoff=0.23 cfs 0.017 af
<b>Subcatchment L8&amp;9: Lot 8 &amp; 9</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=0.75" Tc=6.0 min CN=61/98 Runoff=0.23 cfs 0.017 af
<b>Reach 1R: Pond Discharge</b>	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af n=0.400 L=1,214.0' S=0.0229 '/ Capacity=85.73 cfs Outflow=0.00 cfs 0.000 af
<b>Reach 2R: Stream</b>	Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af n=0.030 L=2,015.0' S=0.0129 '/ Capacity=90.16 cfs Outflow=0.00 cfs 0.000 af
<b>Reach DL-2: Design Line 2</b>	Inflow=0.15 cfs 0.015 af Outflow=0.15 cfs 0.015 af
<b>Reach DP-1: Design Point 1</b>	Inflow=0.98 cfs 0.175 af Outflow=0.98 cfs 0.175 af
<b>Pond 3P: Forebay</b>	Peak Elev=233.41' Storage=2,717 cf Inflow=1.57 cfs 0.186 af Outflow=1.54 cfs 0.186 af

**Pond 13P: Basin 1** Peak Elev=230.00' Storage=0 cf Inflow=0.00 cfs 0.000 af  
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

**Pond 103: Bypass U** Peak Elev=233.63' Inflow=1.57 cfs 0.186 af  
Primary=1.57 cfs 0.186 af Secondary=0.00 cfs 0.000 af Outflow=1.57 cfs 0.186 af

**Pond 104P: Sand Filter** Peak Elev=233.41' Storage=4,233 cf Inflow=1.54 cfs 0.186 af  
Discarded=0.07 cfs 0.186 af Primary=0.00 cfs 0.000 af Outflow=0.07 cfs 0.186 af

**Pond B1&2: Bio-Retention Area** Peak Elev=234.26' Storage=173 cf Inflow=0.22 cfs 0.017 af  
Discarded=0.05 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.017 af

**Pond B10&11: Bio-Retention Area** Peak Elev=258.25' Storage=185 cf Inflow=0.25 cfs 0.018 af  
Discarded=0.05 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.018 af

**Pond B12&13: Bio-Retention Area** Peak Elev=262.26' Storage=188 cf Inflow=0.25 cfs 0.018 af  
Discarded=0.05 cfs 0.018 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.018 af

**Pond B14: Bio-Retention Area** Peak Elev=262.43' Storage=21 cf Inflow=0.03 cfs 0.002 af  
Discarded=0.01 cfs 0.002 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.002 af

**Pond B3: Bio-Retention Area** Peak Elev=240.27' Storage=88 cf Inflow=0.11 cfs 0.008 af  
Discarded=0.02 cfs 0.008 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.008 af

**Pond B4&5: Bio-Retention Area** Peak Elev=246.27' Storage=194 cf Inflow=0.25 cfs 0.019 af  
Discarded=0.05 cfs 0.019 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.019 af

**Pond B6&7: Bio-Retention Area** Peak Elev=250.27' Storage=181 cf Inflow=0.23 cfs 0.017 af  
Discarded=0.05 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.017 af

**Pond B8&9: Bio-Retention Area** Peak Elev=254.27' Storage=181 cf Inflow=0.23 cfs 0.017 af  
Discarded=0.05 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.017 af

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### A3.4.1 Channel Protection (CP<sub>v</sub>) HydroCAD 1-Year Storm Analysis

**0161-184-ALLS-EPHCD-INHS**

Prepared by DiPrete Engineering

HydroCAD® 10.10-6a s/n 01125 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 1-Year Rainfall=2.80"

Printed 4/25/2022

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Subcat 100 Ex**

Runoff Area=128.390 ac 0.95% Impervious Runoff Depth=0.38"  
Flow Length=3,830' Tc=49.9 min CN=64 Runoff=17.23 cfs 4.112 af

**Subcatchment 200: Subcat 200 Ex**

Runoff Area=9.500 ac 0.00% Impervious Runoff Depth=0.14"  
Flow Length=911' Slope=0.0200 '/ Tc=27.0 min CN=55 Runoff=0.28 cfs 0.115 af

**Reach DL-2.: Design Line 2**

Inflow=0.28 cfs 0.115 af  
Outflow=0.28 cfs 0.115 af

**Reach DP-1.: Design Line 1**

Inflow=17.23 cfs 4.112 af  
Outflow=17.23 cfs 4.112 af

**0161-184-ALLS-EPHCD-INHS**

Prepared by DiPrete Engineering

HydroCAD® 10.10-6a s/n 01125 © 2020 HydroCAD Software Solutions LLC

Type III 24-hr 1-Year Rainfall=2.80"

Printed 4/25/2022

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 101: Subcat 101 Pr</b>	Runoff Area=120.420 ac 1.67% Impervious Runoff Depth=0.42" Flow Length=3,830' Tc=49.9 min CN=65 Runoff=18.37 cfs 4.192 af
<b>Subcatchment 102: Subcat 102 Pr</b>	Runoff Area=10.100 ac 22.47% Impervious Runoff Depth=0.49" Flow Length=1,646' Tc=23.9 min CN=67 Runoff=2.75 cfs 0.411 af
<b>Subcatchment 201: Subcat 201 Pr</b>	Runoff Area=5.510 ac 3.39% Impervious Runoff Depth=0.21" Flow Length=100' Slope=0.0300 '/ Tc=18.0 min CN=58 Runoff=0.41 cfs 0.098 af
<b>Subcatchment L1&amp;2: Lot 1 &amp; Lot 2</b>	Runoff Area=11,690 sf 76.05% Impervious Runoff Depth=1.72" Tc=6.0 min CN=89 Runoff=0.54 cfs 0.038 af
<b>Subcatchment L10&amp;11: Lot 10 &amp; 11</b>	Runoff Area=12,446 sf 78.36% Impervious Runoff Depth=1.80" Tc=6.0 min CN=90 Runoff=0.60 cfs 0.043 af
<b>Subcatchment L12&amp;13: Lot 12 &amp; 13</b>	Runoff Area=12,378 sf 78.79% Impervious Runoff Depth=1.80" Tc=6.0 min CN=90 Runoff=0.60 cfs 0.043 af
<b>Subcatchment L14: L14</b>	Runoff Area=1,925 sf 65.71% Impervious Runoff Depth=1.42" Tc=6.0 min CN=85 Runoff=0.07 cfs 0.005 af
<b>Subcatchment L3: Lot 3</b>	Runoff Area=5,878 sf 75.33% Impervious Runoff Depth=1.72" Tc=6.0 min CN=89 Runoff=0.27 cfs 0.019 af
<b>Subcatchment L4&amp;5: Lot 4 &amp; 5</b>	Runoff Area=12,865 sf 76.49% Impervious Runoff Depth=1.72" Tc=6.0 min CN=89 Runoff=0.59 cfs 0.042 af
<b>Subcatchment L6&amp;7: Lot 6 &amp; 7</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=1.72" Tc=6.0 min CN=89 Runoff=0.56 cfs 0.040 af
<b>Subcatchment L8&amp;9: Lot 8 &amp; 9</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=1.72" Tc=6.0 min CN=89 Runoff=0.56 cfs 0.040 af
<b>Reach 1R: Pond Discharge</b>	Avg. Flow Depth=0.06' Max Vel=0.06 fps Inflow=0.21 cfs 0.216 af n=0.400 L=1,214.0' S=0.0229 '/ Capacity=85.73 cfs Outflow=0.18 cfs 0.215 af
<b>Reach 2R: Stream</b>	Avg. Flow Depth=0.03' Max Vel=0.40 fps Inflow=0.18 cfs 0.215 af n=0.030 L=2,015.0' S=0.0129 '/ Capacity=90.16 cfs Outflow=0.18 cfs 0.214 af
<b>Reach DL-2: Design Line 2</b>	Inflow=0.41 cfs 0.098 af Outflow=0.41 cfs 0.098 af
<b>Reach DP-1: Design Point 1</b>	Inflow=18.37 cfs 4.406 af Outflow=18.37 cfs 4.406 af
<b>Pond 3P: Forebay</b>	Peak Elev=233.57' Storage=2,989 cf Inflow=2.16 cfs 0.393 af Outflow=2.15 cfs 0.393 af

**Pond 13P: Basin 1** Peak Elev=230.80' Storage=3,392 cf Inflow=0.72 cfs 0.216 af  
Primary=0.21 cfs 0.216 af Secondary=0.00 cfs 0.000 af Outflow=0.21 cfs 0.216 af

**Pond 103: Bypass U** Peak Elev=233.75' Inflow=2.75 cfs 0.411 af  
Primary=2.16 cfs 0.393 af Secondary=0.59 cfs 0.018 af Outflow=2.75 cfs 0.411 af

**Pond 104P: Sand Filter** Peak Elev=233.57' Storage=4,783 cf Inflow=2.15 cfs 0.393 af  
Discarded=0.07 cfs 0.195 af Primary=0.69 cfs 0.198 af Outflow=0.76 cfs 0.393 af

**Pond B1&2: Bio-Retention Area** Peak Elev=234.98' Storage=650 cf Inflow=0.54 cfs 0.038 af  
Discarded=0.05 cfs 0.038 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.038 af

**Pond B10&11: Bio-Retention Area** Peak Elev=258.95' Storage=715 cf Inflow=0.60 cfs 0.043 af  
Discarded=0.05 cfs 0.043 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.043 af

**Pond B12&13: Bio-Retention Area** Peak Elev=262.98' Storage=716 cf Inflow=0.60 cfs 0.043 af  
Discarded=0.05 cfs 0.043 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.043 af

**Pond B14: Bio-Retention Area** Peak Elev=262.94' Storage=80 cf Inflow=0.07 cfs 0.005 af  
Discarded=0.01 cfs 0.005 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.005 af

**Pond B3: Bio-Retention Area** Peak Elev=241.03' Storage=331 cf Inflow=0.27 cfs 0.019 af  
Discarded=0.02 cfs 0.019 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.019 af

**Pond B4&5: Bio-Retention Area** Peak Elev=247.00' Storage=718 cf Inflow=0.59 cfs 0.042 af  
Discarded=0.05 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.042 af

**Pond B6&7: Bio-Retention Area** Peak Elev=251.00' Storage=673 cf Inflow=0.56 cfs 0.040 af  
Discarded=0.05 cfs 0.040 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.040 af

**Pond B8&9: Bio-Retention Area** Peak Elev=255.00' Storage=673 cf Inflow=0.56 cfs 0.040 af  
Discarded=0.05 cfs 0.040 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.040 af

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### A3.4.2 Drainage Network Hydraulic Calculations

# Pipes

Line No.	Line ID	Line Length (ft)	Line Size (in)	Line Slope (%)	Flow Rate (cfs)	Capac Full (cfs)	Cover Dn (ft)	Cover Up (ft)	Invert Dn (ft)	Invert Up (ft)	Vel Ave (ft/s)	HGL Dn (ft)	HGL Up (ft)	Rim-Hw (ft)	Gnd/Rim EI Dn (ft)	Gnd/Rim EI Up (ft)	Q Byp (cfs)	Q Capt (cfs)	Q Carry (cfs)	Known Q (cfs)
1	DMH2-DMH3	9.235	24	0.97	13.76	24.19	-1.25	0.79	232.41	232.50	7.02	233.50	233.83	1.46	233.16	235.29	....	....	....	0.00
2	CB10-DMH2	153.000	24	0.94	13.92	23.77	0.79	1.57	232.50	233.94	6.23	233.83	235.28	2.23	235.29	237.51	0.00	4.02	0.00	0.00
3	CB9-CB10	20.000	24	1.00	11.76	24.50	1.57	1.37	233.94	234.14	5.52	235.28	235.37 j	2.14	237.51	237.51	0.00	0.80	0.00	0.00
4	CB8-CB9	80.047	24	1.00	11.40	24.50	1.37	2.03	234.14	234.94	5.68	235.37	236.15 j	2.05	237.51	238.97	0.00	0.33	0.00	0.00
5	CB6-CB8	255.000	24	1.05	10.37	25.12	1.53	2.83	235.44	238.12	6.57	236.34	239.27	3.68	238.97	242.95	0.00	2.56	0.00	0.00
6	CB4-CB5	299.749	18	1.75	7.84	15.06	2.83	3.02	238.62	243.87	7.17	239.39	244.95	3.44	242.95	248.39	0.00	2.44	0.00	0.00
7	DMH1-CB4	94.067	15	1.24	3.87	7.80	3.02	3.31	244.12	245.29	4.58	244.95	246.09 j	3.76	248.39	249.85	....	....	....	0.00
8	CB2-DMH1	205.000	15	1.25	3.96	7.82	3.31	3.03	245.29	247.85	4.78	246.09	248.65	3.48	249.85	252.13	0.00	1.49	0.00	0.00
9	CB1-CB2	20.000	15	1.00	3.09	7.00	3.03	2.83	247.85	248.05	4.01	248.65	248.76 j	3.37	252.13	252.13	0.00	3.09	0.00	0.00
10	CB3-CB4	20.000	15	1.00	2.70	7.00	3.02	2.82	244.12	244.32	3.61	244.95	244.98 j	3.41	248.39	248.39	0.00	2.70	0.00	0.00
11	CB5-CB6	20.000	15	4.00	2.26	13.99	2.83	2.03	238.87	239.67	5.26	239.27	240.27	2.68	242.95	242.95	0.00	2.26	0.00	0.00
12	CB7-CB8	20.000	15	1.00	2.04	7.00	3.06	2.86	234.66	234.86	1.67	236.92	236.93	1.99	238.97	238.97	0.00	2.04	0.00	0.00

Project File: 0161-184-Drainage Pipe Analysis.stm

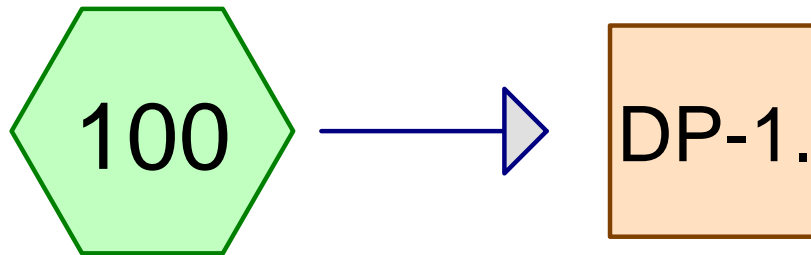
Number of lines: 12

Date: 1/31/2013

NOTES: \*\* Critical depth

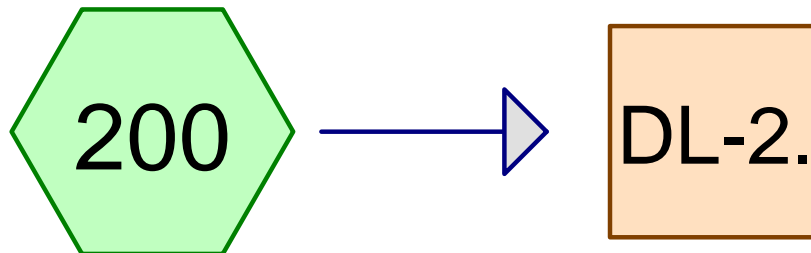
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### A3.5.4.1 HydroCAD Node Diagram



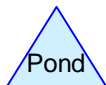
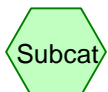
Subcat 100 Ex

Design Line 1



Subcat 200 Ex

Design Line 2



**0161-184-ALLS-EPHCD-INHS**

Prepared by DiPrete Engineering

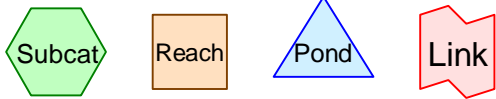
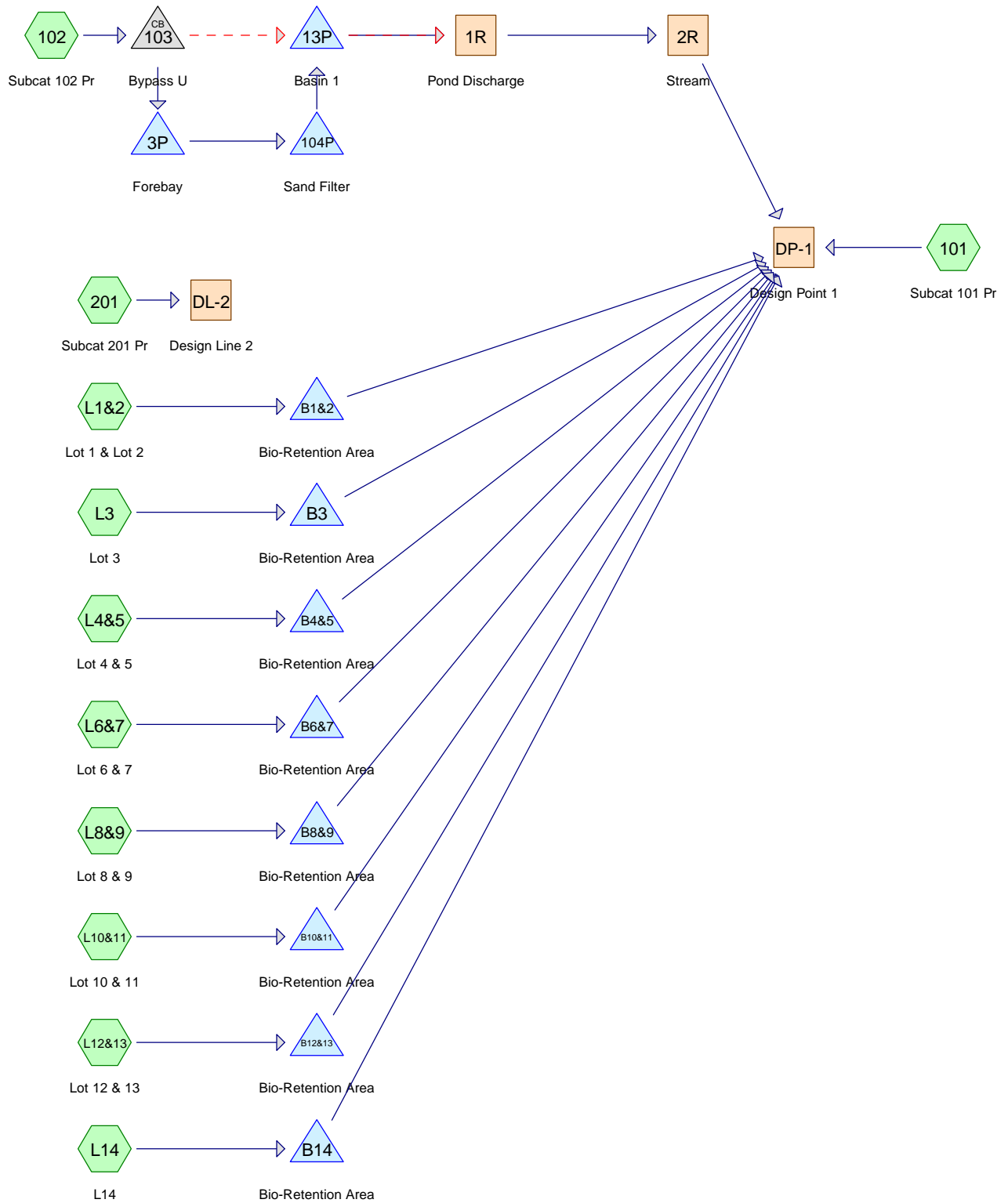
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Printed 4/25/2022

**Area Listing (selected nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
13.180	61	>75% Grass cover, Good, HSG B (100)
0.190	80	>75% Grass cover, Good, HSG D (100)
1.220	98	Impervious (100)
79.860	55	Woods, Good, HSG B (100, 200)
43.440	77	Woods, Good, HSG D (100)
<b>137.890</b>	<b>63</b>	<b>TOTAL AREA</b>



**Routing Diagram for 0161-184-ALLS-EPHCD-INHS**  
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Printed 4/25/2022

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**Area Listing (selected nodes)**

Area (acres)	CN	Description (subcatchment-numbers)
5.355	61	>75% Grass cover, Good, HSG B (102, 201, L1&2, L10&11, L12&13, L14, L3, L4&5, L6&7, L8&9)
17.632	61	>75% Grass cover, Good, HSG B (0.44 to Bio) (101)
0.190	80	>75% Grass cover, Good, HSG D (101)
0.910	98	Driveways (L1&2, L10&11, L12&13, L14, L3, L4&5, L6&7, L8&9)
1.220	98	Existing Impervious Area (101)
0.521	98	Front of Large Homes (L1&2, L10&11, L12&13, L3, L4&5, L6&7, L8&9)
0.206	98	Paved parking, HSG A (102, 201)
0.173	98	Paved parking, HSG B (101)
0.800	98	Proposed Driveways (102, 201)
0.330	98	Proposed Driveways (0.91 to Bio) (101)
0.680	98	Proposed Homes (102, 201)
0.290	98	Proposed Homes (0.52 to Bio) (101)
0.700	98	Proposed Road (102)
0.070	98	Roadway (201)
65.380	55	Woods, Good, HSG B (101, 102, 201)
43.440	77	Woods, Good, HSG D (101)
<b>137.896</b>	<b>65</b>	<b>TOTAL AREA</b>

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#### A3.5.4.2 HydroCAD 10-Year Storm Analysis

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 10-Year Rainfall=4.90"

Prepared by DiPrete Engineering

Printed 4/25/2022

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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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Subcat 100 Ex**

Runoff Area=128.390 ac 0.95% Impervious Runoff Depth=1.52"  
Flow Length=3,830' Tc=49.9 min CN=64 Runoff=93.13 cfs 16.220 af

**Subcatchment 200: Subcat 200 Ex**

Runoff Area=9.500 ac 0.00% Impervious Runoff Depth=0.93"  
Flow Length=911' Slope=0.0200 '/ Tc=27.0 min CN=55 Runoff=4.90 cfs 0.737 af

**Reach DL-2.: Design Line 2**

Inflow=4.90 cfs 0.737 af  
Outflow=4.90 cfs 0.737 af

**Reach DP-1.: Design Line 1**

Inflow=93.13 cfs 16.220 af  
Outflow=93.13 cfs 16.220 af

**0161-184-ALLS-EPHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 10-Year Rainfall=4.90"

Printed 4/25/2022

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 101: Subcat 101 Pr</b>	Runoff Area=120.420 ac 1.67% Impervious Runoff Depth=1.59" Flow Length=3,830' Tc=49.9 min CN=65 Runoff=92.31 cfs 15.929 af
<b>Subcatchment 102: Subcat 102 Pr</b>	Runoff Area=10.100 ac 22.47% Impervious Runoff Depth=1.73" Flow Length=1,646' Tc=23.9 min CN=67 Runoff=12.31 cfs 1.459 af
<b>Subcatchment 201: Subcat 201 Pr</b>	Runoff Area=5.510 ac 3.39% Impervious Runoff Depth=1.11" Flow Length=100' Slope=0.0300 '/ Tc=18.0 min CN=58 Runoff=4.28 cfs 0.512 af
<b>Subcatchment L1&amp;2: Lot 1 &amp; Lot 2</b>	Runoff Area=11,690 sf 76.05% Impervious Runoff Depth=3.68" Tc=6.0 min CN=89 Runoff=1.12 cfs 0.082 af
<b>Subcatchment L10&amp;11: Lot 10 &amp; 11</b>	Runoff Area=12,446 sf 78.36% Impervious Runoff Depth=3.78" Tc=6.0 min CN=90 Runoff=1.22 cfs 0.090 af
<b>Subcatchment L12&amp;13: Lot 12 &amp; 13</b>	Runoff Area=12,378 sf 78.79% Impervious Runoff Depth=3.78" Tc=6.0 min CN=90 Runoff=1.22 cfs 0.090 af
<b>Subcatchment L14: L14</b>	Runoff Area=1,925 sf 65.71% Impervious Runoff Depth=3.28" Tc=6.0 min CN=85 Runoff=0.17 cfs 0.012 af
<b>Subcatchment L3: Lot 3</b>	Runoff Area=5,878 sf 75.33% Impervious Runoff Depth=3.68" Tc=6.0 min CN=89 Runoff=0.57 cfs 0.041 af
<b>Subcatchment L4&amp;5: Lot 4 &amp; 5</b>	Runoff Area=12,865 sf 76.49% Impervious Runoff Depth=3.68" Tc=6.0 min CN=89 Runoff=1.24 cfs 0.090 af
<b>Subcatchment L6&amp;7: Lot 6 &amp; 7</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=3.68" Tc=6.0 min CN=89 Runoff=1.16 cfs 0.085 af
<b>Subcatchment L8&amp;9: Lot 8 &amp; 9</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=3.68" Tc=6.0 min CN=89 Runoff=1.16 cfs 0.085 af
<b>Reach 1R: Pond Discharge</b>	Avg. Flow Depth=0.17' Max Vel=0.13 fps Inflow=7.90 cfs 1.256 af n=0.400 L=1,214.0' S=0.0229 '/ Capacity=85.73 cfs Outflow=1.83 cfs 1.253 af
<b>Reach 2R: Stream</b>	Avg. Flow Depth=0.08' Max Vel=0.80 fps Inflow=1.83 cfs 1.253 af n=0.030 L=2,015.0' S=0.0129 '/ Capacity=90.16 cfs Outflow=1.72 cfs 1.252 af
<b>Reach DL-2: Design Line 2</b>	Inflow=4.28 cfs 0.512 af Outflow=4.28 cfs 0.512 af
<b>Reach DP-1: Design Point 1</b>	Inflow=92.34 cfs 17.181 af Outflow=92.34 cfs 17.181 af
<b>Pond 3P: Forebay</b>	Peak Elev=233.74' Storage=3,272 cf Inflow=4.30 cfs 0.930 af Outflow=3.81 cfs 0.930 af

Pond 13P: Basin 1 Peak Elev=232.46' Storage=12,059 cf Inflow=11.59 cfs 1.256 af  
Primary=7.90 cfs 1.256 af Secondary=0.00 cfs 0.000 af Outflow=7.90 cfs 1.256 af

Pond 103: Bypass U Peak Elev=234.22' Inflow=12.31 cfs 1.459 af  
Primary=4.30 cfs 0.930 af Secondary=8.20 cfs 0.529 af Outflow=12.31 cfs 1.459 af

Pond 104P: Sand Filter Peak Elev=233.72' Storage=5,279 cf Inflow=3.81 cfs 0.930 af  
Discarded=0.07 cfs 0.204 af Primary=3.65 cfs 0.727 af Outflow=3.72 cfs 0.930 af

Pond B1&2: Bio-Retention Area Peak Elev=236.80' Storage=1,848 cf Inflow=1.12 cfs 0.082 af  
Discarded=0.05 cfs 0.082 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.082 af

Pond B10&11: Bio-Retention Area Peak Elev=260.63' Storage=1,977 cf Inflow=1.22 cfs 0.090 af  
Discarded=0.05 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.090 af

Pond B12&13: Bio-Retention Area Peak Elev=264.70' Storage=1,980 cf Inflow=1.22 cfs 0.090 af  
Discarded=0.05 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.090 af

Pond B14: Bio-Retention Area Peak Elev=264.48' Storage=258 cf Inflow=0.17 cfs 0.012 af  
Discarded=0.01 cfs 0.012 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.012 af

Pond B3: Bio-Retention Area Peak Elev=242.93' Storage=942 cf Inflow=0.57 cfs 0.041 af  
Discarded=0.02 cfs 0.041 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.041 af

Pond B4&5: Bio-Retention Area Peak Elev=248.85' Storage=2,044 cf Inflow=1.24 cfs 0.090 af  
Discarded=0.05 cfs 0.090 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.090 af

Pond B6&7: Bio-Retention Area Peak Elev=252.85' Storage=1,916 cf Inflow=1.16 cfs 0.085 af  
Discarded=0.05 cfs 0.085 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.085 af

Pond B8&9: Bio-Retention Area Peak Elev=256.85' Storage=1,916 cf Inflow=1.16 cfs 0.085 af  
Discarded=0.05 cfs 0.085 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.085 af

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#### A3.5.4.3 HydroCAD 100-Year Storm Analysis

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/25/2022

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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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Subcatchment 100: Subcat 100 Ex**

Runoff Area=128.390 ac 0.95% Impervious Runoff Depth=4.18"  
Flow Length=3,830' Tc=49.9 min CN=64 Runoff=275.04 cfs 44.764 af

**Subcatchment 200: Subcat 200 Ex**

Runoff Area=9.500 ac 0.00% Impervious Runoff Depth=3.13"  
Flow Length=911' Slope=0.0200 '/' Tc=27.0 min CN=55 Runoff=19.97 cfs 2.479 af

**Reach DL-2.: Design Line 2**

Inflow=19.97 cfs 2.479 af  
Outflow=19.97 cfs 2.479 af

**Reach DP-1.: Design Line 1**

Inflow=275.04 cfs 44.764 af  
Outflow=275.04 cfs 44.764 af

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/25/2022

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**Summary for Subcatchment 100: Subcat 100 Ex**

Runoff = 275.04 cfs @ 12.70 hrs, Volume= 44.764 af, Depth= 4.18"

Routed to Reach DP-1. : Design Line 1

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-Year Rainfall=8.50"

Area (ac)	CN	Description
* 1.220	98	Impervious
0.190	80	>75% Grass cover, Good, HSG D
13.180	61	>75% Grass cover, Good, HSG B
70.360	55	Woods, Good, HSG B
43.440	77	Woods, Good, HSG D
128.390	64	Weighted Average
127.170	63	99.05% Pervious Area
1.220	98	0.95% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.0200	0.08		<b>Sheet Flow, 1A - 1B</b>
					Woods: Light underbrush n= 0.400 P2= 3.30"
28.8	3,730	0.0180	2.16		<b>Shallow Concentrated Flow, 1B-1C</b>
					Unpaved Kv= 16.1 fps
49.9	3,830	Total			

**Summary for Subcatchment 200: Subcat 200 Ex**

Runoff = 19.97 cfs @ 12.39 hrs, Volume= 2.479 af, Depth= 3.13"

Routed to Reach DL-2. : Design Line 2

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-Year Rainfall=8.50"

Area (ac)	CN	Description
9.500	55	Woods, Good, HSG B
9.500	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.0200	0.08		<b>Sheet Flow, 2A - 2B</b>
					Woods: Light underbrush n= 0.400 P2= 3.30"
5.9	811	0.0200	2.28		<b>Shallow Concentrated Flow, 2B - 2C</b>
					Unpaved Kv= 16.1 fps
27.0	911	Total			

**Summary for Reach DL-2.: Design Line 2**

Inflow Area = 9.500 ac, 0.00% Impervious, Inflow Depth = 3.13" for 100-Year event  
Inflow = 19.97 cfs @ 12.39 hrs, Volume= 2.479 af  
Outflow = 19.97 cfs @ 12.39 hrs, Volume= 2.479 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

**Summary for Reach DP-1.: Design Line 1**

Inflow Area = 128.390 ac, 0.95% Impervious, Inflow Depth = 4.18" for 100-Year event  
Inflow = 275.04 cfs @ 12.70 hrs, Volume= 44.764 af  
Outflow = 275.04 cfs @ 12.70 hrs, Volume= 44.764 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

**0161-184-ALLS-EPHCD-INHS**

Prepared by DiPrete Engineering

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Type III 24-hr 100-Year Rainfall=8.50"

Printed 4/25/2022

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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

<b>Subcatchment 101: Subcat 101 Pr</b>	Runoff Area=120.420 ac 1.67% Impervious Runoff Depth=4.30" Flow Length=3,830' Tc=49.9 min CN=65 Runoff=265.68 cfs 43.173 af
<b>Subcatchment 102: Subcat 102 Pr</b>	Runoff Area=10.100 ac 22.47% Impervious Runoff Depth=4.54" Flow Length=1,646' Tc=23.9 min CN=67 Runoff=33.56 cfs 3.821 af
<b>Subcatchment 201: Subcat 201 Pr</b>	Runoff Area=5.510 ac 3.39% Impervious Runoff Depth=3.48" Flow Length=100' Slope=0.0300 '/' Tc=18.0 min CN=58 Runoff=15.49 cfs 1.597 af
<b>Subcatchment L1&amp;2: Lot 1 &amp; Lot 2</b>	Runoff Area=11,690 sf 76.05% Impervious Runoff Depth=7.18" Tc=6.0 min CN=89 Runoff=2.12 cfs 0.161 af
<b>Subcatchment L10&amp;11: Lot 10 &amp; 11</b>	Runoff Area=12,446 sf 78.36% Impervious Runoff Depth=7.30" Tc=6.0 min CN=90 Runoff=2.28 cfs 0.174 af
<b>Subcatchment L12&amp;13: Lot 12 &amp; 13</b>	Runoff Area=12,378 sf 78.79% Impervious Runoff Depth=7.30" Tc=6.0 min CN=90 Runoff=2.26 cfs 0.173 af
<b>Subcatchment L14: L14</b>	Runoff Area=1,925 sf 65.71% Impervious Runoff Depth=6.70" Tc=6.0 min CN=85 Runoff=0.33 cfs 0.025 af
<b>Subcatchment L3: Lot 3</b>	Runoff Area=5,878 sf 75.33% Impervious Runoff Depth=7.18" Tc=6.0 min CN=89 Runoff=1.06 cfs 0.081 af
<b>Subcatchment L4&amp;5: Lot 4 &amp; 5</b>	Runoff Area=12,865 sf 76.49% Impervious Runoff Depth=7.18" Tc=6.0 min CN=89 Runoff=2.33 cfs 0.177 af
<b>Subcatchment L6&amp;7: Lot 6 &amp; 7</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=7.18" Tc=6.0 min CN=89 Runoff=2.19 cfs 0.166 af
<b>Subcatchment L8&amp;9: Lot 8 &amp; 9</b>	Runoff Area=12,061 sf 76.20% Impervious Runoff Depth=7.18" Tc=6.0 min CN=89 Runoff=2.19 cfs 0.166 af
<b>Reach 1R: Pond Discharge</b>	Avg. Flow Depth=0.37' Max Vel=0.22 fps Inflow=29.16 cfs 3.604 af n=0.400 L=1,214.0' S=0.0229 '/' Capacity=85.73 cfs Outflow=10.18 cfs 3.601 af
<b>Reach 2R: Stream</b>	Avg. Flow Depth=0.17' Max Vel=1.34 fps Inflow=10.18 cfs 3.601 af n=0.030 L=2,015.0' S=0.0129 '/' Capacity=90.16 cfs Outflow=9.14 cfs 3.600 af
<b>Reach DL-2: Design Line 2</b>	Inflow=15.49 cfs 1.597 af Outflow=15.49 cfs 1.597 af
<b>Reach DP-1: Design Point 1</b>	Inflow=268.36 cfs 46.888 af Outflow=268.36 cfs 46.888 af
<b>Pond 3P: Forebay</b>	Peak Elev=234.02' Storage=3,781 cf Inflow=9.07 cfs 1.795 af Outflow=8.68 cfs 1.795 af

**Pond 13P: Basin 1** Peak Elev=233.86' Storage=21,162 cf Inflow=32.21 cfs 3.604 af  
Primary=29.16 cfs 3.604 af Secondary=0.00 cfs 0.000 af Outflow=29.16 cfs 3.604 af

**Pond 103: Bypass U** Peak Elev=236.31' Inflow=33.56 cfs 3.821 af  
Primary=9.07 cfs 1.795 af Secondary=24.54 cfs 2.026 af Outflow=33.56 cfs 3.821 af

**Pond 104P: Sand Filter** Peak Elev=233.96' Storage=6,164 cf Inflow=8.68 cfs 1.795 af  
Discarded=0.07 cfs 0.217 af Primary=7.80 cfs 1.578 af Outflow=7.87 cfs 1.795 af

**Pond B1&2: Bio-Retention Area** Peak Elev=237.77' Storage=3,823 cf Inflow=2.12 cfs 0.161 af  
Discarded=0.05 cfs 0.144 af Primary=0.12 cfs 0.016 af Outflow=0.16 cfs 0.161 af

**Pond B10&11: Bio-Retention Area** Peak Elev=261.76' Storage=4,154 cf Inflow=2.28 cfs 0.174 af  
Discarded=0.05 cfs 0.159 af Primary=0.11 cfs 0.015 af Outflow=0.16 cfs 0.174 af

**Pond B12&13: Bio-Retention Area** Peak Elev=265.77' Storage=4,065 cf Inflow=2.26 cfs 0.173 af  
Discarded=0.05 cfs 0.156 af Primary=0.13 cfs 0.017 af Outflow=0.18 cfs 0.173 af

**Pond B14: Bio-Retention Area** Peak Elev=265.75' Storage=576 cf Inflow=0.33 cfs 0.025 af  
Discarded=0.01 cfs 0.022 af Primary=0.02 cfs 0.002 af Outflow=0.03 cfs 0.025 af

**Pond B3: Bio-Retention Area** Peak Elev=243.76' Storage=1,891 cf Inflow=1.06 cfs 0.081 af  
Discarded=0.02 cfs 0.071 af Primary=0.08 cfs 0.009 af Outflow=0.10 cfs 0.081 af

**Pond B4&5: Bio-Retention Area** Peak Elev=249.77' Storage=4,158 cf Inflow=2.33 cfs 0.177 af  
Discarded=0.05 cfs 0.157 af Primary=0.15 cfs 0.019 af Outflow=0.20 cfs 0.177 af

**Pond B6&7: Bio-Retention Area** Peak Elev=253.77' Storage=3,910 cf Inflow=2.19 cfs 0.166 af  
Discarded=0.05 cfs 0.148 af Primary=0.13 cfs 0.018 af Outflow=0.18 cfs 0.166 af

**Pond B8&9: Bio-Retention Area** Peak Elev=257.77' Storage=3,910 cf Inflow=2.19 cfs 0.166 af  
Discarded=0.05 cfs 0.148 af Primary=0.13 cfs 0.018 af Outflow=0.18 cfs 0.166 af

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

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**Summary for Subcatchment 101: Subcat 101 Pr**

Runoff = 265.68 cfs @ 12.70 hrs, Volume= 43.173 af, Depth= 4.30"

Routed to Reach DP-1 : Design Point 1

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-Year Rainfall=8.50"

Area (ac)	CN	Description
57.145	55	Woods, Good, HSG B
43.440	77	Woods, Good, HSG D
* 0.290	98	Proposed Homes (0.52 to Bio)
* 0.330	98	Proposed Driveways (0.91 to Bio)
* 17.632	61	>75% Grass cover, Good, HSG B (0.44 to Bio)
* 1.220	98	Existing Impervious Area
0.190	80	>75% Grass cover, Good, HSG D
0.173	98	Paved parking, HSG B
120.420	65	Weighted Average
118.407	64	98.33% Pervious Area
2.013	98	1.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.1	100	0.0200	0.08		<b>Sheet Flow, 1A-1B</b>
					Woods: Light underbrush n= 0.400 P2= 3.30"
28.8	3,730	0.0180	2.16		<b>Shallow Concentrated Flow, 1B-1C</b>
					Unpaved Kv= 16.1 fps
49.9	3,830	Total			

**Summary for Subcatchment 102: Subcat 102 Pr**

Runoff = 33.56 cfs @ 12.34 hrs, Volume= 3.821 af, Depth= 4.54"

Routed to Pond 103 : Bypass U

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-Year Rainfall=8.50"

Area (ac)	CN	Description
4.024	55	Woods, Good, HSG B
3.807	61	>75% Grass cover, Good, HSG B
* 0.660	98	Proposed Homes
* 0.700	98	Proposed Road
* 0.750	98	Proposed Driveways
0.159	98	Paved parking, HSG A
10.100	67	Weighted Average
7.831	58	77.53% Pervious Area
2.269	98	22.47% Impervious Area

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Type III 24-hr 100-Year Rainfall=8.50"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	100	0.0300	0.09		<b>Sheet Flow, 2A-2B</b> Woods: Light underbrush n= 0.400 P2= 3.30"
3.9	539	0.0200	2.28		<b>Shallow Concentrated Flow, 2B-2C</b> Unpaved Kv= 16.1 fps
2.0	1,007	0.0100	8.51	26.74	<b>Pipe Channel, 2C-2D</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
23.9	1,646	Total			

**Summary for Subcatchment 201: Subcat 201 Pr**

Runoff = 15.49 cfs @ 12.26 hrs, Volume= 1.597 af, Depth= 3.48"  
Routed to Reach DL-2 : Design Line 2

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-Year Rainfall=8.50"

Area (ac)	CN	Description
4.211	55	Woods, Good, HSG B
* 0.020	98	Proposed Homes
* 0.050	98	Proposed Driveways
1.112	61	>75% Grass cover, Good, HSG B
* 0.070	98	Roadway
0.047	98	Paved parking, HSG A
5.510	58	Weighted Average
5.323	56	96.61% Pervious Area
0.187	98	3.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	100	0.0300	0.09		<b>Sheet Flow, 2A-2B</b> Woods: Light underbrush n= 0.400 P2= 3.30"

**Summary for Subcatchment L1&2: Lot 1 & Lot 2**

Runoff = 2.12 cfs @ 12.08 hrs, Volume= 0.161 af, Depth= 7.18"  
Routed to Pond B1&2 : Bio-Retention Area

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-Year Rainfall=8.50"

Area (sf)	CN	Description
* 3,490	98	Front of Large Homes
* 5,400	98	Driveways
2,800	61	>75% Grass cover, Good, HSG B
11,690	89	Weighted Average
2,800	61	23.95% Pervious Area
8,890	98	76.05% Impervious Area

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Type III 24-hr 100-Year Rainfall=8.50"

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

**Summary for Subcatchment L10&11: Lot 10 & 11**

Runoff = 2.28 cfs @ 12.08 hrs, Volume= 0.174 af, Depth= 7.30"  
Routed to Pond B10&11 : Bio-Retention Area

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-Year Rainfall=8.50"

Area (sf)	CN	Description
* 3,490	98	Front of Large Homes
* 6,263	98	Driveways
2,693	61	>75% Grass cover, Good, HSG B
12,446	90	Weighted Average
2,693	61	21.64% Pervious Area
9,753	98	78.36% Impervious Area

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

**Summary for Subcatchment L12&13: Lot 12 & 13**

Runoff = 2.26 cfs @ 12.08 hrs, Volume= 0.173 af, Depth= 7.30"  
Routed to Pond B12&13 : Bio-Retention Area

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-Year Rainfall=8.50"

Area (sf)	CN	Description
* 3,490	98	Front of Large Homes
* 6,263	98	Driveways
2,625	61	>75% Grass cover, Good, HSG B
12,378	90	Weighted Average
2,625	61	21.21% Pervious Area
9,753	98	78.79% Impervious Area

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

**Summary for Subcatchment L14: L14**

Runoff = 0.33 cfs @ 12.08 hrs, Volume= 0.025 af, Depth= 6.70"  
 Routed to Pond B14 : Bio-Retention Area

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-Year Rainfall=8.50"

Area (sf)	CN	Description
* 1,265	98	Driveways
660	61	>75% Grass cover, Good, HSG B
1,925	85	Weighted Average
660	61	34.29% Pervious Area
1,265	98	65.71% Impervious Area

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

**Summary for Subcatchment L3: Lot 3**

Runoff = 1.06 cfs @ 12.08 hrs, Volume= 0.081 af, Depth= 7.18"  
 Routed to Pond B3 : Bio-Retention Area

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-Year Rainfall=8.50"

Area (sf)	CN	Description
* 1,745	98	Front of Large Homes
* 2,683	98	Driveways
1,450	61	>75% Grass cover, Good, HSG B
5,878	89	Weighted Average
1,450	61	24.67% Pervious Area
4,428	98	75.33% Impervious Area

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

**Summary for Subcatchment L4&5: Lot 4 & 5**

Runoff = 2.33 cfs @ 12.08 hrs, Volume= 0.177 af, Depth= 7.18"  
 Routed to Pond B4&5 : Bio-Retention Area

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-Year Rainfall=8.50"

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Type III 24-hr 100-Year Rainfall=8.50"

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	Area (sf)	CN	Description
*	3,490	98	Front of Large Homes
*	6,350	98	Driveways
	3,025	61	>75% Grass cover, Good, HSG B
	12,865	89	Weighted Average
	3,025	61	23.51% Pervious Area
	9,840	98	76.49% Impervious Area

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

**Summary for Subcatchment L6&7: Lot 6 & 7**

Runoff = 2.19 cfs @ 12.08 hrs, Volume= 0.166 af, Depth= 7.18"  
 Routed to Pond B6&7 : Bio-Retention Area

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-Year Rainfall=8.50"

	Area (sf)	CN	Description
*	3,490	98	Front of Large Homes
*	5,700	98	Driveways
	2,871	61	>75% Grass cover, Good, HSG B
	12,061	89	Weighted Average
	2,871	61	23.80% Pervious Area
	9,190	98	76.20% Impervious Area

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

**Summary for Subcatchment L8&9: Lot 8 & 9**

Runoff = 2.19 cfs @ 12.08 hrs, Volume= 0.166 af, Depth= 7.18"  
 Routed to Pond B8&9 : Bio-Retention Area

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-Year Rainfall=8.50"

	Area (sf)	CN	Description
*	3,490	98	Front of Large Homes
*	5,700	98	Driveways
	2,871	61	>75% Grass cover, Good, HSG B
	12,061	89	Weighted Average
	2,871	61	23.80% Pervious Area
	9,190	98	76.20% Impervious Area

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

**Summary for Reach 1R: Pond Discharge**

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 4.28" for 100-Year event  
 Inflow = 29.16 cfs @ 12.46 hrs, Volume= 3.604 af  
 Outflow = 10.18 cfs @ 13.07 hrs, Volume= 3.601 af, Atten= 65%, Lag= 36.7 min  
 Routed to Reach 2R : Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Max. Velocity= 0.22 fps, Min. Travel Time= 90.9 min  
 Avg. Velocity = 0.06 fps, Avg. Travel Time= 329.8 min

Peak Storage= 55,550 cf @ 13.07 hrs  
 Average Depth at Peak Storage= 0.37' , Surface Width= 183.48'  
 Bank-Full Depth= 1.00' Flow Area= 200.0 sf, Capacity= 85.73 cfs

300.00' x 1.00' deep Parabolic Channel, n= 0.400 Sheet flow: Woods+light brush  
 Length= 1,214.0' Slope= 0.0229 '/  
 Inlet Invert= 228.75', Outlet Invert= 201.00'



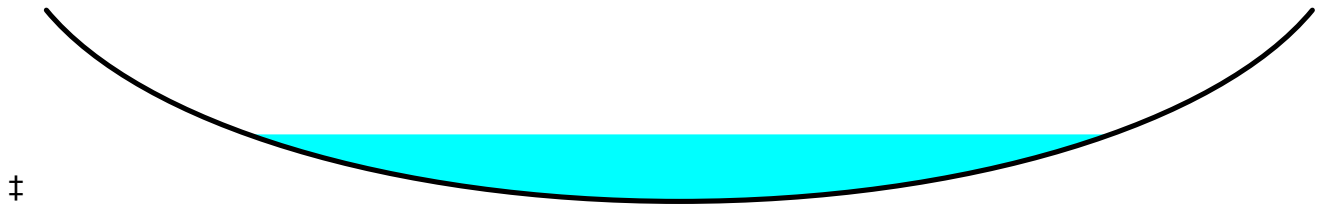
**Summary for Reach 2R: Stream**

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth > 4.28" for 100-Year event  
 Inflow = 10.18 cfs @ 13.07 hrs, Volume= 3.601 af  
 Outflow = 9.14 cfs @ 13.53 hrs, Volume= 3.600 af, Atten= 10%, Lag= 27.1 min  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Max. Velocity= 1.34 fps, Min. Travel Time= 25.1 min  
 Avg. Velocity = 0.39 fps, Avg. Travel Time= 85.9 min

Peak Storage= 13,772 cf @ 13.53 hrs  
 Average Depth at Peak Storage= 0.17' , Surface Width= 58.97'  
 Bank-Full Depth= 0.50' Flow Area= 33.3 sf, Capacity= 90.16 cfs

100.00' x 0.50' deep Parabolic Channel, n= 0.030 Earth, grassed & winding  
 Length= 2,015.0' Slope= 0.0129 '/  
 Inlet Invert= 201.00', Outlet Invert= 175.00'



**Summary for Reach DL-2: Design Line 2**

Inflow Area = 5.510 ac, 3.39% Impervious, Inflow Depth = 3.48" for 100-Year event  
 Inflow = 15.49 cfs @ 12.26 hrs, Volume= 1.597 af  
 Outflow = 15.49 cfs @ 12.26 hrs, Volume= 1.597 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

**Summary for Reach DP-1: Design Point 1**

Inflow Area = 132.386 ac, 4.31% Impervious, Inflow Depth = 4.25" for 100-Year event  
 Inflow = 268.36 cfs @ 12.70 hrs, Volume= 46.888 af  
 Outflow = 268.36 cfs @ 12.70 hrs, Volume= 46.888 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

**Summary for Pond 3P: Forebay**

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 2.13" for 100-Year event  
 Inflow = 9.07 cfs @ 12.35 hrs, Volume= 1.795 af  
 Outflow = 8.68 cfs @ 12.35 hrs, Volume= 1.795 af, Atten= 4%, Lag= 0.2 min  
 Primary = 8.68 cfs @ 12.35 hrs, Volume= 1.795 af

Routed to Pond 104P : Sand Filter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Starting Elev= 233.00' Surf.Area= 1,422 sf Storage= 2,103 cf  
 Peak Elev= 234.02' @ 12.47 hrs Surf.Area= 1,873 sf Storage= 3,781 cf (1,678 cf above start)

Plug-Flow detention time= 37.2 min calculated for 1.747 af (97% of inflow)

Center-of-Mass det. time= 13.2 min ( 923.7 - 910.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	231.00'	5,857 cf	<b>Ponding (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
231.00	710	0	0
232.00	1,037	874	874
233.00	1,422	1,230	2,103
234.00	1,863	1,643	3,746
235.00	2,360	2,112	5,857

Device	Routing	Invert	Outlet Devices
#1	Primary	233.00'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b>

Head (feet) 0.20 0.40 0.60 0.80 1.00  
 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=8.31 cfs @ 12.35 hrs HW=233.97' TW=233.89' (Dynamic Tailwater)  
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 8.31 cfs @ 1.43 fps)

**Summary for Pond 13P: Basin 1**

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 4.28" for 100-Year event  
 Inflow = 32.21 cfs @ 12.32 hrs, Volume= 3.604 af  
 Outflow = 29.16 cfs @ 12.46 hrs, Volume= 3.604 af, Atten= 9%, Lag= 8.3 min  
 Primary = 29.16 cfs @ 12.46 hrs, Volume= 3.604 af  
 Routed to Reach 1R : Pond Discharge  
 Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af  
 Routed to Reach 1R : Pond Discharge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 233.86' @ 12.46 hrs Surf.Area= 7,160 sf Storage= 21,162 cf

Plug-Flow detention time= 56.6 min calculated for 3.604 af (100% of inflow)  
 Center-of-Mass det. time= 56.6 min ( 907.6 - 851.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	230.00'	29,951 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
230.00	3,939	0	0
231.00	4,692	4,316	4,316
232.00	5,501	5,097	9,412
233.00	6,366	5,934	15,346
234.00	7,289	6,828	22,173
235.00	8,267	7,778	29,951

Device	Routing	Invert	Outlet Devices
#1	Device 2	229.00'	<b>24.0" Round Culvert</b> L= 27.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 229.00' / 228.86' S= 0.0052 ' / ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#2	Primary	228.86'	<b>24.0" Round Culvert</b> L= 22.0' RCP, groove end projecting, Ke= 0.200 Inlet / Outlet Invert= 228.86' / 228.75' S= 0.0050 ' / ' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#3	Device 1	229.00'	<b>2.5" Vert. Low Flow (CPv)</b> C= 0.600 Limited to weir flow at low heads
#4	Secondary	234.00'	<b>15.0' long x 8.0' breadth Emergency Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#5	Device 1	231.50'	<b>30.0" W x 27.0" H Vert. Orifice</b> C= 0.600 Limited to weir flow at low heads

**Primary OutFlow** Max=29.16 cfs @ 12.46 hrs HW=233.86' TW=228.99' (Dynamic Tailwater)

↳ **2=Culvert** (Passes 29.16 cfs of 37.62 cfs potential flow)

↳ **1=Culvert** (Passes 29.16 cfs of 36.38 cfs potential flow)

↳ **3=Low Flow (CPv)** (Orifice Controls 0.36 cfs @ 10.50 fps)

↳ **5=Orifice** (Orifice Controls 28.80 cfs @ 5.12 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=230.00' TW=228.75' (Dynamic Tailwater)

↳ **4=Emergency Weir** ( Controls 0.00 cfs)

### Summary for Pond 103: Bypass U

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 4.54" for 100-Year event  
 Inflow = 33.56 cfs @ 12.34 hrs, Volume= 3.821 af  
 Outflow = 33.56 cfs @ 12.34 hrs, Volume= 3.821 af, Atten= 0%, Lag= 0.0 min  
 Primary = 9.07 cfs @ 12.35 hrs, Volume= 1.795 af  
 Routed to Pond 3P : Forebay  
 Secondary = 24.54 cfs @ 12.32 hrs, Volume= 2.026 af  
 Routed to Pond 13P : Basin 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 236.31' @ 12.35 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 3	233.65'	<b>6.0' long Overflow Weir</b> 2 End Contraction(s)
#2	Primary	233.00'	<b>15.0" Round Culvert</b> L= 17.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 233.00' / 231.50' S= 0.0852 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 4	230.69'	<b>24.0" Round Culvert</b> L= 88.1' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 230.69' / 230.25' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#4	Secondary	230.25'	<b>24.0" Round Culvert</b> L= 50.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 230.25' / 230.00' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

**Primary OutFlow** Max=9.05 cfs @ 12.35 hrs HW=236.31' TW=233.96' (Dynamic Tailwater)

↳ **2=Culvert** (Inlet Controls 9.05 cfs @ 7.38 fps)

**Secondary OutFlow** Max=24.37 cfs @ 12.32 hrs HW=236.24' TW=233.65' (Dynamic Tailwater)

↳ **4=Culvert** ( Controls 24.37 cfs)

↳ **3=Culvert** (Inlet Controls 24.37 cfs @ 7.76 fps)

↳ **1=Overflow Weir** (Passes 24.37 cfs of 74.84 cfs potential flow)

### Summary for Pond 104P: Sand Filter

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 2.13" for 100-Year event  
 Inflow = 8.68 cfs @ 12.35 hrs, Volume= 1.795 af  
 Outflow = 7.87 cfs @ 12.49 hrs, Volume= 1.795 af, Atten= 9%, Lag= 8.3 min  
 Discarded = 0.07 cfs @ 9.07 hrs, Volume= 0.217 af  
 Primary = 7.80 cfs @ 12.49 hrs, Volume= 1.578 af  
 Routed to Pond 13P : Basin 1

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

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Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 233.96' @ 12.48 hrs Surf.Area= 2,990 sf Storage= 6,164 cf

Plug-Flow detention time= 94.5 min calculated for 1.795 af (100% of inflow)  
 Center-of-Mass det. time= 94.6 min ( 1,018.2 - 923.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	230.00'	2,960 cf	<b>Sand Filter &amp; Top Soil (Prismatic)</b> Listed below (Recalc) 8,970 cf Overall x 33.0% Voids
#2	233.00'	7,435 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		10,395 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
230.00	2,990	0	0
233.00	2,990	8,970	8,970

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	2,990	0	0
233.50	3,341	1,583	1,583
234.00	3,705	1,762	3,344
235.00	4,476	4,091	7,435

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	233.50'	<b>15.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

**Discarded OutFlow** Max=0.07 cfs @ 9.07 hrs HW=230.05' (Free Discharge)  
 ↑1=Exfiltration (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=7.91 cfs @ 12.49 hrs HW=233.96' TW=233.85' (Dynamic Tailwater)  
 ↑2=Broad-Crested Rectangular Weir (Weir Controls 7.91 cfs @ 1.14 fps)

**Summary for Pond B1&2: Bio-Retention Area**

Inflow Area = 0.268 ac, 76.05% Impervious, Inflow Depth = 7.18" for 100-Year event  
 Inflow = 2.12 cfs @ 12.08 hrs, Volume= 0.161 af  
 Outflow = 0.16 cfs @ 13.12 hrs, Volume= 0.161 af, Atten= 92%, Lag= 62.4 min  
 Discarded = 0.05 cfs @ 9.26 hrs, Volume= 0.144 af  
 Primary = 0.12 cfs @ 13.12 hrs, Volume= 0.016 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

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Peak Elev= 237.77' @ 13.12 hrs Surf.Area= 2,000 sf Storage= 3,823 cf

Plug-Flow detention time= 664.6 min calculated for 0.161 af (100% of inflow)  
Center-of-Mass det. time= 664.6 min ( 1,441.9 - 777.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	234.00'	1,980 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 6,000 cf Overall x 33.0% Voids
#2	237.00'	2,500 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		4,480 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
234.00	2,000	0	0
237.00	2,000	6,000	6,000

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
237.00	2,000	0	0
237.75	2,800	1,800	1,800
238.00	2,800	700	2,500

Device	Routing	Invert	Outlet Devices
#1	Primary	237.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	234.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.05 cfs @ 9.26 hrs HW=234.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.12 cfs @ 13.12 hrs HW=237.77' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.12 cfs @ 0.30 fps)

**Summary for Pond B10&11: Bio-Retention Area**

Inflow Area = 0.286 ac, 78.36% Impervious, Inflow Depth = 7.30" for 100-Year event  
 Inflow = 2.28 cfs @ 12.08 hrs, Volume= 0.174 af  
 Outflow = 0.16 cfs @ 13.29 hrs, Volume= 0.174 af, Atten= 93%, Lag= 72.5 min  
 Discarded = 0.05 cfs @ 9.30 hrs, Volume= 0.159 af  
 Primary = 0.11 cfs @ 13.29 hrs, Volume= 0.015 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 261.76' @ 13.29 hrs Surf.Area= 2,274 sf Storage= 4,154 cf

Plug-Flow detention time= 642.3 min calculated for 0.174 af (100% of inflow)  
 Center-of-Mass det. time= 642.4 min ( 1,416.6 - 774.2 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

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Volume	Invert	Avail.Storage	Storage Description
#1	258.00'	2,251 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 6,822 cf Overall x 33.0% Voids
#2	261.00'	2,536 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		4,787 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
258.00	2,274	0	0
261.00	2,274	6,822	6,822

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
261.00	2,274	0	0
261.75	2,693	1,863	1,863
262.00	2,693	673	2,536

Device	Routing	Invert	Outlet Devices
#1	Primary	261.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	258.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.05 cfs @ 9.30 hrs HW=258.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.11 cfs @ 13.29 hrs HW=261.76' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.11 cfs @ 0.30 fps)

**Summary for Pond B12&13: Bio-Retention Area**

Inflow Area = 0.284 ac, 78.79% Impervious, Inflow Depth = 7.30" for 100-Year event  
 Inflow = 2.26 cfs @ 12.08 hrs, Volume= 0.173 af  
 Outflow = 0.18 cfs @ 13.06 hrs, Volume= 0.173 af, Atten= 92%, Lag= 58.8 min  
 Discarded = 0.05 cfs @ 9.26 hrs, Volume= 0.156 af  
 Primary = 0.13 cfs @ 13.06 hrs, Volume= 0.017 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 265.77' @ 13.06 hrs Surf.Area= 2,225 sf Storage= 4,065 cf

Plug-Flow detention time= 634.3 min calculated for 0.173 af (100% of inflow)  
 Center-of-Mass det. time= 634.3 min ( 1,408.5 - 774.2 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/25/2022

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Volume	Invert	Avail.Storage	Storage Description
#1	262.00'	2,203 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 6,675 cf Overall x 33.0% Voids
#2	265.00'	2,475 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		4,678 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.00	2,225	0	0
265.00	2,225	6,675	6,675

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
265.00	2,225	0	0
265.75	2,625	1,819	1,819
266.00	2,625	656	2,475

Device	Routing	Invert	Outlet Devices
#1	Primary	265.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	262.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.05 cfs @ 9.26 hrs HW=262.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.13 cfs @ 13.06 hrs HW=265.77' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.31 fps)

**Summary for Pond B14: Bio-Retention Area**

Inflow Area = 0.044 ac, 65.71% Impervious, Inflow Depth = 6.70" for 100-Year event  
 Inflow = 0.33 cfs @ 12.08 hrs, Volume= 0.025 af  
 Outflow = 0.03 cfs @ 13.08 hrs, Volume= 0.025 af, Atten= 92%, Lag= 59.4 min  
 Discarded = 0.01 cfs @ 9.87 hrs, Volume= 0.022 af  
 Primary = 0.02 cfs @ 13.08 hrs, Volume= 0.002 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 265.75' @ 13.08 hrs Surf.Area= 350 sf Storage= 576 cf

Plug-Flow detention time= 592.8 min calculated for 0.025 af (100% of inflow)  
 Center-of-Mass det. time= 592.8 min ( 1,381.2 - 788.4 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

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Volume	Invert	Avail.Storage	Storage Description
#1	262.25'	347 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 1,050 cf Overall x 33.0% Voids
#2	265.25'	544 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		890 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
262.25	350	0	0
265.25	350	1,050	1,050

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
265.25	350	0	0
266.00	660	379	379
266.25	660	165	544

Device	Routing	Invert	Outlet Devices
#1	Primary	265.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	262.25'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.01 cfs @ 9.87 hrs HW=262.29' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.02 cfs @ 13.08 hrs HW=265.75' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.02 cfs @ 0.16 fps)

**Summary for Pond B3: Bio-Retention Area**

Inflow Area = 0.135 ac, 75.33% Impervious, Inflow Depth = 7.18" for 100-Year event  
 Inflow = 1.06 cfs @ 12.08 hrs, Volume= 0.081 af  
 Outflow = 0.10 cfs @ 12.93 hrs, Volume= 0.081 af, Atten= 91%, Lag= 50.6 min  
 Discarded = 0.02 cfs @ 9.20 hrs, Volume= 0.071 af  
 Primary = 0.08 cfs @ 12.93 hrs, Volume= 0.009 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 243.76' @ 12.93 hrs Surf.Area= 975 sf Storage= 1,891 cf

Plug-Flow detention time= 666.6 min calculated for 0.081 af (100% of inflow)  
 Center-of-Mass det. time= 666.7 min ( 1,443.9 - 777.3 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

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Volume	Invert	Avail.Storage	Storage Description
#1	240.00'	965 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc) 2,925 cf Overall x 33.0% Voids
#2	243.00'	1,272 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		2,237 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
240.00	975	0	0
243.00	975	2,925	2,925

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
243.00	975	0	0
243.75	1,450	909	909
244.00	1,450	363	1,272

Device	Routing	Invert	Outlet Devices
#1	Primary	243.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	240.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.02 cfs @ 9.20 hrs HW=240.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.02 cfs)

**Primary OutFlow** Max=0.08 cfs @ 12.93 hrs HW=243.76' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.26 fps)

**Summary for Pond B4&5: Bio-Retention Area**

Inflow Area = 0.295 ac, 76.49% Impervious, Inflow Depth = 7.18" for 100-Year event  
 Inflow = 2.33 cfs @ 12.08 hrs, Volume= 0.177 af  
 Outflow = 0.20 cfs @ 13.01 hrs, Volume= 0.177 af, Atten= 91%, Lag= 55.5 min  
 Discarded = 0.05 cfs @ 9.24 hrs, Volume= 0.157 af  
 Primary = 0.15 cfs @ 13.01 hrs, Volume= 0.019 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 249.77' @ 13.01 hrs Surf.Area= 2,175 sf Storage= 4,158 cf

Plug-Flow detention time= 657.3 min calculated for 0.177 af (100% of inflow)  
 Center-of-Mass det. time= 657.4 min ( 1,434.6 - 777.3 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

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Volume	Invert	Avail.Storage	Storage Description
#1	246.00'	2,153 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 6,525 cf Overall x 33.0% Voids
#2	249.00'	2,706 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		4,860 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
246.00	2,175	0	0
249.00	2,175	6,525	6,525

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
249.00	2,175	0	0
249.75	3,025	1,950	1,950
250.00	3,025	756	2,706

Device	Routing	Invert	Outlet Devices
#1	Primary	249.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	246.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.05 cfs @ 9.24 hrs HW=246.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.15 cfs @ 13.01 hrs HW=249.77' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.15 cfs @ 0.33 fps)

**Summary for Pond B6&7: Bio-Retention Area**

Inflow Area = 0.277 ac, 76.20% Impervious, Inflow Depth = 7.18" for 100-Year event  
 Inflow = 2.19 cfs @ 12.08 hrs, Volume= 0.166 af  
 Outflow = 0.18 cfs @ 13.03 hrs, Volume= 0.166 af, Atten= 92%, Lag= 56.6 min  
 Discarded = 0.05 cfs @ 9.24 hrs, Volume= 0.148 af  
 Primary = 0.13 cfs @ 13.03 hrs, Volume= 0.018 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 253.77' @ 13.03 hrs Surf.Area= 2,040 sf Storage= 3,910 cf

Plug-Flow detention time= 660.7 min calculated for 0.166 af (100% of inflow)  
 Center-of-Mass det. time= 660.8 min ( 1,438.0 - 777.3 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/25/2022

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Volume	Invert	Avail.Storage	Storage Description
#1	250.00'	2,020 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 6,120 cf Overall x 33.0% Voids
#2	253.00'	2,559 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		4,579 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
250.00	2,040	0	0
253.00	2,040	6,120	6,120

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
253.00	2,040	0	0
253.75	2,871	1,842	1,842
254.00	2,871	718	2,559

Device	Routing	Invert	Outlet Devices
#1	Primary	253.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	250.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.05 cfs @ 9.24 hrs HW=250.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.13 cfs @ 13.03 hrs HW=253.77' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.32 fps)

**Summary for Pond B8&9: Bio-Retention Area**

Inflow Area = 0.277 ac, 76.20% Impervious, Inflow Depth = 7.18" for 100-Year event  
 Inflow = 2.19 cfs @ 12.08 hrs, Volume= 0.166 af  
 Outflow = 0.18 cfs @ 13.03 hrs, Volume= 0.166 af, Atten= 92%, Lag= 56.6 min  
 Discarded = 0.05 cfs @ 9.24 hrs, Volume= 0.148 af  
 Primary = 0.13 cfs @ 13.03 hrs, Volume= 0.018 af  
 Routed to Reach DP-1 : Design Point 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 257.77' @ 13.03 hrs Surf.Area= 2,040 sf Storage= 3,910 cf

Plug-Flow detention time= 660.7 min calculated for 0.166 af (100% of inflow)  
 Center-of-Mass det. time= 660.8 min ( 1,438.0 - 777.3 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/25/2022

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Volume	Invert	Avail.Storage	Storage Description
#1	254.00'	2,020 cf	<b>Bio Media and Mulch (Prismatic)</b> Listed below (Recalc) 6,120 cf Overall x 33.0% Voids
#2	257.00'	2,559 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		4,579 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
254.00	2,040	0	0
257.00	2,040	6,120	6,120

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
257.00	2,040	0	0
257.75	2,871	1,842	1,842
258.00	2,871	718	2,559

Device	Routing	Invert	Outlet Devices
#1	Primary	257.75'	<b>25.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74
#2	Discarded	254.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'

**Discarded OutFlow** Max=0.05 cfs @ 9.24 hrs HW=254.04' (Free Discharge)

↑**2=Exfiltration** (Exfiltration Controls 0.05 cfs)

**Primary OutFlow** Max=0.13 cfs @ 13.03 hrs HW=257.77' TW=0.00' (Dynamic Tailwater)

↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 0.32 fps)

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### A3.5.5 HydroCAD 100-Year Emergency Outlet Calculations

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/8/2022

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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 Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**Pond 3P: Forebay** Peak Elev=234.82' Storage=5,447 cf Inflow=9.60 cfs 1.191 af  
Outflow=8.72 cfs 1.191 af

**Pond 13P: Basin 1** Peak Elev=234.81' Storage=28,376 cf Inflow=30.64 cfs 3.541 af  
Outflow=29.26 cfs 3.032 af

**Subcatchment 102: Subcat 102 Pr** Runoff Area=10.100 ac 22.47% Impervious Runoff Depth=4.54"  
Flow Length=1,646' Tc=23.9 min CN=67 Runoff=33.56 cfs 3.821 af

**Pond 103: Bypass U** Peak Elev=237.22' Inflow=33.56 cfs 3.821 af  
Primary=9.60 cfs 1.191 af Secondary=24.08 cfs 2.629 af Outflow=33.56 cfs 3.821 af

**Pond 104P: Sand Filter** Peak Elev=234.81' Storage=9,566 cf Inflow=8.72 cfs 1.191 af  
Discarded=0.07 cfs 0.279 af Primary=8.16 cfs 0.912 af Outflow=8.23 cfs 1.191 af

**Total Runoff Area = 10.100 ac Runoff Volume = 3.821 af Average Runoff Depth = 4.54"**  
**77.53% Pervious = 7.831 ac 22.47% Impervious = 2.269 ac**

**Summary for Pond 3P: Forebay**

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 1.42" for 100-Year event  
 Inflow = 9.60 cfs @ 12.30 hrs, Volume= 1.191 af  
 Outflow = 8.72 cfs @ 12.35 hrs, Volume= 1.191 af, Atten= 9%, Lag= 2.9 min  
 Primary = 8.72 cfs @ 12.35 hrs, Volume= 1.191 af  
 Routed to Pond 104P : Sand Filter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Starting Elev= 233.00' Surf.Area= 1,422 sf Storage= 2,103 cf  
 Peak Elev= 234.82' @ 12.48 hrs Surf.Area= 2,272 sf Storage= 5,447 cf (3,344 cf above start)

Plug-Flow detention time= 83.8 min calculated for 1.143 af (96% of inflow)  
 Center-of-Mass det. time= 49.5 min ( 859.9 - 810.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	231.00'	5,857 cf	<b>Ponding (Prismatic)</b> Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
231.00	710	0	0
232.00	1,037	874	874
233.00	1,422	1,230	2,103
234.00	1,863	1,643	3,746
235.00	2,360	2,112	5,857

Device	Routing	Invert	Outlet Devices
#1	Primary	233.00'	<b>6.0' long x 0.5' breadth Broad-Crested Rectangular Weir</b> Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

**Primary OutFlow** Max=0.00 cfs @ 12.35 hrs HW=234.68' TW=234.69' (Dynamic Tailwater)  
 ↑1=**Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

**Summary for Pond 13P: Basin 1**

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 4.21" for 100-Year event  
 Inflow = 30.64 cfs @ 12.34 hrs, Volume= 3.541 af  
 Outflow = 29.26 cfs @ 12.46 hrs, Volume= 3.032 af, Atten= 4%, Lag= 7.1 min  
 Secondary = 29.26 cfs @ 12.46 hrs, Volume= 3.032 af  
 Routed to Reach 1R : Pond Discharge

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 234.81' @ 12.46 hrs Surf.Area= 8,079 sf Storage= 28,376 cf

Plug-Flow detention time= 92.3 min calculated for 3.032 af (86% of inflow)  
 Center-of-Mass det. time= 30.2 min ( 884.5 - 854.3 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/8/2022

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Volume	Invert	Avail.Storage	Storage Description
#1	230.00'	29,951 cf	<b>Custom Stage Data (Prismatic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
230.00	3,939	0	0
231.00	4,692	4,316	4,316
232.00	5,501	5,097	9,412
233.00	6,366	5,934	15,346
234.00	7,289	6,828	22,173
235.00	8,267	7,778	29,951

Device	Routing	Invert	Outlet Devices
#1	Secondary	234.00'	<b>15.0' long x 8.0' breadth Emergency Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

**Secondary OutFlow** Max=29.26 cfs @ 12.46 hrs HW=234.81' TW=228.93' (Dynamic Tailwater)  
 ↳ **1=Emergency Weir** (Weir Controls 29.26 cfs @ 2.42 fps)

**Summary for Subcatchment 102: Subcat 102 Pr**

Runoff = 33.56 cfs @ 12.34 hrs, Volume= 3.821 af, Depth= 4.54"  
 Routed to Pond 103 : Bypass U

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-Year Rainfall=8.50"

Area (ac)	CN	Description
4.024	55	Woods, Good, HSG B
3.807	61	>75% Grass cover, Good, HSG B
* 0.660	98	Proposed Homes
* 0.700	98	Proposed Road
* 0.750	98	Proposed Driveways
0.159	98	Paved parking, HSG A
10.100	67	Weighted Average
7.831	58	77.53% Pervious Area
2.269	98	22.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.0	100	0.0300	0.09		<b>Sheet Flow, 2A-2B</b> Woods: Light underbrush n= 0.400 P2= 3.30"
3.9	539	0.0200	2.28		<b>Shallow Concentrated Flow, 2B-2C</b> Unpaved Kv= 16.1 fps
2.0	1,007	0.0100	8.51	26.74	<b>Pipe Channel, 2C-2D</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
23.9	1,646	Total			

### Summary for Pond 103: Bypass U

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 4.54" for 100-Year event  
 Inflow = 33.56 cfs @ 12.34 hrs, Volume= 3.821 af  
 Outflow = 33.56 cfs @ 12.34 hrs, Volume= 3.821 af, Atten= 0%, Lag= 0.0 min  
 Primary = 9.60 cfs @ 12.30 hrs, Volume= 1.191 af  
 Routed to Pond 3P : Forebay  
 Secondary = 24.08 cfs @ 12.35 hrs, Volume= 2.629 af  
 Routed to Pond 13P : Basin 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 237.22' @ 12.35 hrs

Device	Routing	Invert	Outlet Devices
#1	Device 3	233.65'	<b>6.0' long Overflow Weir</b> 2 End Contraction(s)
#2	Primary	233.00'	<b>15.0" Round Culvert</b> L= 17.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 233.00' / 231.50' S= 0.0852 ' S= 0.0852 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 4	230.69'	<b>24.0" Round Culvert</b> L= 88.1' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 230.69' / 230.25' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#4	Secondary	230.25'	<b>24.0" Round Culvert</b> L= 50.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 230.25' / 230.00' S= 0.0050 ' S= 0.0050 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

**Primary OutFlow** Max=9.50 cfs @ 12.30 hrs HW=237.04' TW=234.46' (Dynamic Tailwater)  
 ↳ **2=Culvert** (Inlet Controls 9.50 cfs @ 7.74 fps)

**Secondary OutFlow** Max=23.94 cfs @ 12.35 hrs HW=237.20' TW=234.70' (Dynamic Tailwater)  
 ↳ **4=Culvert** ( Controls 23.94 cfs)  
 ↳ **3=Culvert** (Inlet Controls 23.94 cfs @ 7.62 fps)  
 ↳ **1=Overflow Weir** (Passes 23.94 cfs of 108.36 cfs potential flow)

### Summary for Pond 104P: Sand Filter

Inflow Area = 10.100 ac, 22.47% Impervious, Inflow Depth = 1.42" for 100-Year event  
 Inflow = 8.72 cfs @ 12.35 hrs, Volume= 1.191 af  
 Outflow = 8.23 cfs @ 12.50 hrs, Volume= 1.191 af, Atten= 6%, Lag= 9.0 min  
 Discarded = 0.07 cfs @ 9.07 hrs, Volume= 0.279 af  
 Primary = 8.16 cfs @ 12.50 hrs, Volume= 0.912 af  
 Routed to Pond 13P : Basin 1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs  
 Peak Elev= 234.81' @ 12.47 hrs Surf.Area= 2,990 sf Storage= 9,566 cf

Plug-Flow detention time= 239.5 min calculated for 1.191 af (100% of inflow)  
 Center-of-Mass det. time= 239.5 min ( 1,099.4 - 859.9 )

**0161-184-ALLS-EPHCD-INHS**

Type III 24-hr 100-Year Rainfall=8.50"

Prepared by DiPrete Engineering

Printed 4/8/2022

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Volume	Invert	Avail.Storage	Storage Description
#1	230.00'	2,960 cf	<b>Sand Filter &amp; Top Soil (Prismatic)</b> Listed below (Recalc) 8,970 cf Overall x 33.0% Voids
#2	233.00'	7,435 cf	<b>Ponding Storage (Prismatic)</b> Listed below (Recalc) -Impervious
		10,395 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
230.00	2,990	0	0
233.00	2,990	8,970	8,970

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
233.00	2,990	0	0
233.50	3,341	1,583	1,583
234.00	3,705	1,762	3,344
235.00	4,476	4,091	7,435

Device	Routing	Invert	Outlet Devices
#1	Discarded	230.00'	<b>1.020 in/hr Exfiltration over Surface area</b> Phase-In= 0.01'
#2	Primary	233.50'	<b>15.0' long x 8.0' breadth Broad-Crested Rectangular Weir</b> 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 5.00 5.50 Coef. (English) 2.43 2.54 2.70 2.69 2.68 2.68 2.66 2.64 2.64 2.64 2.65 2.65 2.66 2.66 2.68 2.70 2.74

**Discarded OutFlow** Max=0.07 cfs @ 9.07 hrs HW=230.05' (Free Discharge)

↑1=Exfiltration (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=10.12 cfs @ 12.50 hrs HW=234.81' TW=234.80' (Dynamic Tailwater)

↑2=Broad-Crested Rectangular Weir (Weir Controls 10.12 cfs @ 0.52 fps)

---

## Watershed Maps



SITE  
 AP 16 BLOCK 4 LOT 9  
 N/F  
 OLD NORTH LAND INVESTMENTS, LLC  
 AREA:  
 (118.00± ACRES)  
 SUITABLE AREA:  
 (61.83± ACRES)

**FLOW PATH DISTANCES & SLOPES**

1A-1B SHEET FLOW  
 100' S=0.020'/', 21.1 MIN.  
 SHALLOW CONCENTRATED  
 3,730' S=0.018'/', 28.8 MIN.  
 49.9' MIN.

2A-2B SHEET FLOW  
 100' S=0.020'/', 21.1 MIN.  
 SHALLOW CONCENTRATED  
 811' S=0.020'/', 5.9 MIN.  
 27.0' MIN.

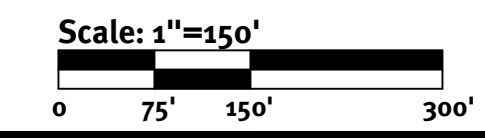
**LEGEND**

- WOODS - B SOILS
- WOODS - D SOILS
- IMPERVIOUS
- GRASS - B SOILS
- GRASS - D SOILS

- WOODS - B SOILS
- WOODS - D SOILS
- IMPERVIOUS
- GRASS - B SOILS
- GRASS - D SOILS

- TC LINE
- SUBCAT AREA
- SOIL BOUNDARY
- SOIL TYPE
- SUBCATCHMENT

- TC LINE
- SUBCAT AREA
- SOIL BOUNDARY
- SOIL TYPE
- SUBCATCHMENT



**DiPrete Engineering**  
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NO.	DATE	DESCRIPTION	BY
1	12/20/21	REVISION	DR
2	4/26/22	REVISION	DR

Design By: R.E.S.

**Pre Watershed Map**  
**Fieldstone Farms**  
 Assessor's Block 164, Lot 9  
 South Kingstown, Rhode Island

Prepared For:  
**Old North Land Investments LLC**  
 75 Lambert Lind Highway  
 Warwick, Rhode Island 02886

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SHEET **1** OF 2

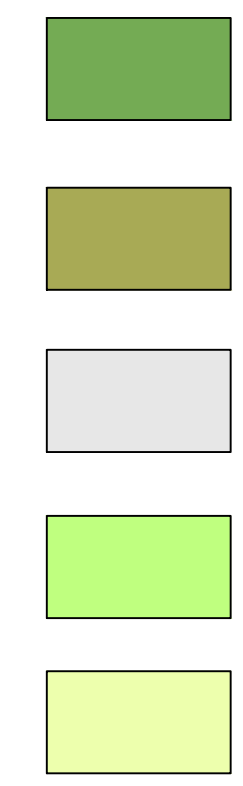


**FLOW PATH DISTANCES & SLOPES**

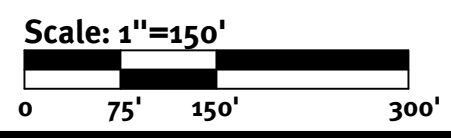
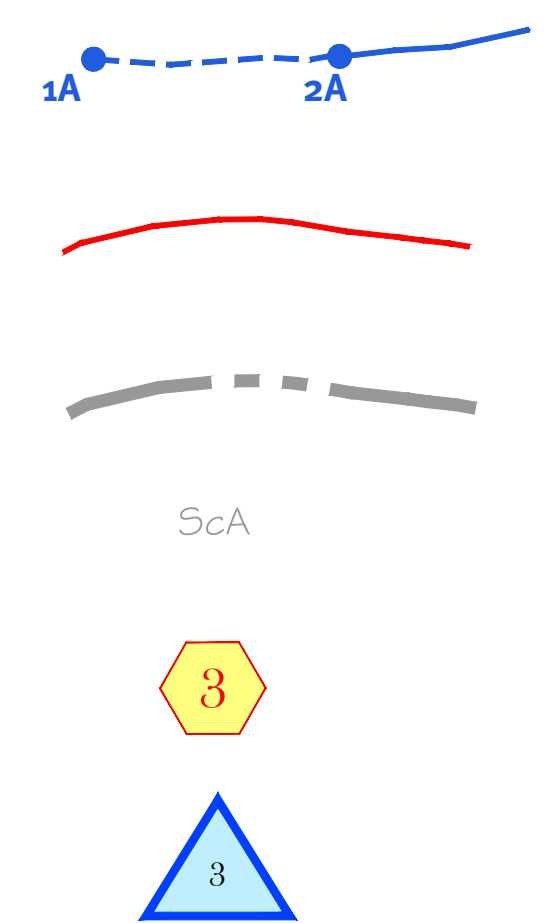
1A-1B	SHEET FLOW 100' S=0.020'/', 21.1 MIN. SHALLOW CONCENTRATED 3,730' S=0.018'/', 28.8 MIN. 49.9' MIN.
2A-2B	SHEET FLOW 100' S=0.030'/', 18.0 MIN. SHALLOW CONCENTRATED 239' S=0.020'/', 3.9 MIN. PIPE CHANNEL 1,007' S=0.010'/', 2.0 23.9' MIN.
2A-2B	SHEET FLOW 100' S=0.030'/', 18.0 MIN. 18.0' MIN.

**LEGEND**

- WOODS - B SOILS
- WOODS - D SOILS
- IMPERVIOUS
- GRASS - B SOILS
- GRASS - D SOILS



- TO LINE
- SUBCAT AREA
- SOIL BOUNDARY
- SOIL TYPE
- SUBCATCHMENT
- DRAINAGE POND



Post Watershed Map  
**Fieldstone Farms**  
 Assessors Block 164, Lot 9  
 South Kingstown, Rhode Island  
 Prepared for  
**Old North Land Investments LLC**  
 75 Lambert Lind Highway  
 Warwick, Rhode Island 02886  
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REV	DATE	DESCRIPTION	BY	CHK
2	6/26/22	REVISION SUBMISSION		
1	12/30/21	REVISION SUBMISSION		
0	2/8/21	REVISION SUBMISSION		
1/0				

Design By: R.B.S.