STORMWATER MANAGEMENT REPORT

Milton CAT Facility

2110 Plainfield Pike
Cranston, Rhode Island

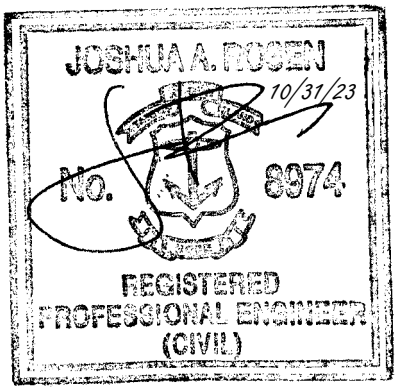
PREPARED FOR

Southworth Milton dba
Milton CAT
100 Quarry Drive
Milford, MA 01757

PREPARED BY

1 Cedar Street, Suite 400
Providence, RI 02903
401.272.8100

June, 2023 Rev October, 2023, Rev November 2023



List of Appendices

Project Description

Existing Conditions

The approximate 10.8± acre project site ("the Site") consists of A.P. 35 Lot 9, further identified as 2110 Plainfield Pike. The Site is in a mixed-use area in Cranston, Rhode Island. The Site includes a currently unoccupied residential structure, three accessory structures (i.e., sheds), a manmade pond, and tillable farmland. There is a gravel driveway providing access to Plainfield Pike.

Undisturbed brush and trees along with the wetland is located in the southern portion of the site. The wetland has a 50'-75' buffer zone and a 20 foot structure setback from the wetland buffer. There is a manmade pond within the wetland.

Based on the information provided on FEMA Firm Map No. 44007C029H dated 10/2/2015, all of the site is within Zone X, area of minimal flood hazard.

The site drains from Plainfield Pike to the south before discharging off site or into the wetland. The downstream water body is tributary to Simmons Lower Reservoir and is located in the Pocasset River watershed. The tributary to Simmons Lower Reservoir has no associated TMDLs per RIDEM Environmental Resource Map accessed on April 4, 2023. Refer to Figure 2 for existing drainage patterns.

Based on the NRCS mapping and VHB testing on site on October 27, 2022, the in-situ soils are predominantly loamy sand and sandy loam with some silt loam at the surface.

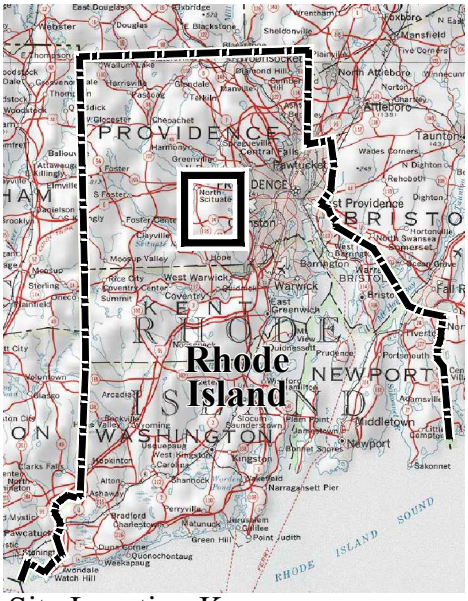
Proposed Conditions

The project involves the construction of a new Milton CAT facility that includes a warehouse, showroom, service area, and wash bay within building structures, outdoor display and equipment storage area, paved parking and paved equipment maneuvering space. New infrastructure to support the facility includes new utilities, stormwater collection and conveyance, stormwater treatment, and landscaping. Low impact development (LID) and other best management practices (BMPs) have been proposed to mitigate the impact of this activity. Existing drainage patterns were maintained to the maximum extent practicable in the proposed design.

The proposed design includes two below grade sand filters that will collect and infiltrate roof runoff and two infiltrating sand filters that will treat and detain runoff from the paved areas and equipment storage areas that are finished with asphalt millings. Pretreatment requirements are achieved through the use of sediment forebays. A lined bioretention area will collect runoff from the diesel storage area. The outlet pipe has a valve on it to be used for emergency shut off to contain any spills associated with the storage and unloading of diesel fuel. A lined stone trench with a perforated pipe and a grass swale are used for conveyance of stormwater runoff. All applicable stormwater features have been sized to adequately convey the discharge from the drainage areas. The site is located with the Pocasset River watershed that has known flooding issues therefore the project was also designed to decrease the volume of runoff leaving the site. See the following table for volume reduction.

Pocasset River Watershed

Runoff Volume			
Existing Conditions		**Proposed Conditions**	
1-year storm:	24,195 CF	1-year storm:	13,817 CF
10-year storm:	80,729 CF	10-year storm:	72,095 CF
100-year storm:	203,883 CF	100-year storm:	200,507 CF



Site Location Key

Source: USGS Quadrangles

0 1000 2000Feet

Site Location Map
2110 Plainfield Pike
Cranston, Rhode Island

Figure 1

April 2023

Appendix A –RIDEM Stormwater Management Checklist and LID Planning Report

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

PROJECT NAME **Milton CAT**	**(RIDEM USE ONLY)** **STW/WQC File #:** **Date Received:**
TOWN **Cranston**	
BRIEF PROJECT DESCRIPTION: The project proposes to construct a 42,125+ SF sales and service facility, a 5,400 SF wash bay building, customer parking, equipment storage, utility infrastructure, landscaping, and stormwater management areas.	

Stormwater Management Plan (SMP) Elements – Minimum Standards

When submitting a SMP,[1] 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)

☐ Residential	☒ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☐ Utility	☐ Fill	☐ Dredge	☐ Mine
☐ 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.)

☒ **Groundwater**	☒ **Surface Water**	☐ **MS4**
☐ GAA	☐ Isolated Wetland	☐ RIDOT
☒ GA	☒ Named Waterbody	☐ RIDOT Alteration Permit is Approved
☐ GB	☐ Unnamed Waterbody Connected to Named Waterbody	☐ Town
		☐ Other (specify):

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

☒ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Tributary to Simmons Lower Reservoir	☐ Coldwater	☐ Warmwater	☒ Unassessed
☒ Waterbody ID: RI0006018R-05	☐ 4th order stream of pond 50 acres or more		
☐ TMDL for: N/A	☒ Watershed of flood prone river (e.g., Pocasset River)		
☐ Contributes to a priority outfall listed in the TMDL	☐ Contributes stormwater to a public beach		
☐ 303(d) list – Impairment(s) for: N/A	☐ Contributes to shellfishing grounds		

[1] 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.

PROJECT HISTORY		
☒ RIDEM Pre- Application Meeting	Meeting Date: March 9, 2023	☒ Minutes Attached
☐ Municipal Master Plan Approval	Approval Date:	☐ Minutes Attached
☐ Subdivision Suitability Required	Approval #:	
☐ Previous Enforcement Action has been taken on the property	Enforcement #:	

FLOODPLAIN & FLOODWAY See Guidance Pertaining to Floodplain and Floodways	
☐ Riverine 100-year floodplain: **FEMA FLOODPLAIN FIRMETTE** has been reviewed and the 100-year floodplain is on site	
☐ Delineated from FEMA Maps	
NOTE: 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	
☐ Calculated by Professional Engineer	
☐ Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):
	Amount of Cut (CY):
☐ Restrictions or modifications are proposed to the flow path or velocities in a floodway	
☐ Floodplain storage capacity is impacted	
☒ Project area is not within 100-year floodplain as defined by RIDEM	

CRMC JURISDICTION
☐ CRMC Assent required
☐ Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
☐ Sea level rise mitigation has been designed into this project

LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:			
1. OFFICE OF Land Revitalization and Sustainable Materials Management (OLRSMM)			
	☐ 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))		**RIDEM CONTACT:**
	☐ 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)		
	☐ This site is identified on the RIDEM Environmental Resources Map as one of the following regulated facilities		**SITE ID#**:
		☐ CERCLIS/Superfund (NPL)	
		☐ State Hazardous Waste Site (SHWS)	
		☐ Environmental Land Usage Restriction (ELUR)	
		☐ Leaking Underground Storage Tank (LUST)	
		☐ Closed Landfill	
Note: If any boxes in 1 above are checked, the applicant must contact the RIDEM OLRSMM 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**.**			
2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:			
	☐ Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php		
	☐ Auto Fueling Facility (e.g., gas station)		
	☐ Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

	☐ Road Salt Storage and Loading Areas (exposed to rainwater)	
	☒ Outdoor Storage and Loading/Unloading of Hazardous Substances	Diesel Pad/storage tank
3.	**STORMWATER INDUSTRIAL PERMITTING**	
	☒ 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: Diesel storage Sector:
	☐ Construction is proposed on a site that is subject to THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.	MSGP permit #
	☐ Additional stormwater treatment is required by the MSGP Explain:	

REDEVELOPMENT STANDARD – MINIMUM STANDARD 6		
☒ Pre Construction Impervious Area		
0.23 ac	☒ Total Pre-Construction Impervious Area (**TIA**)	
10.8 ac	☒ Total Site Area (**TSA**)	
1.47 ac	☒ Jurisdictional Wetlands (**JW**)	
0	☒ Conservation Land (**CL**)	
☒ Calculate the Site Size (defined as contiguous properties under same ownership)		
9.33 ac	☒ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**)	
0.2	☒ (**TIA**) / (**SS**) =	☐ (**TIA**) / (**SS**) >**0.4**?
☐ 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.

Note: 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:

- Town requires … (state the specific local requirement)
- Meets Town's dimensional requirement of …
- Not practical for site because …
- Applying for waiver/variance to achieve this (pending/approved/denied)
- Applying for wavier/variance to seek relief from this (pending/approved/denied)

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS	**IF NOT IMPLEMENTED, EXPLAIN HERE**
☒ Sensitive resource areas and site constraints are identified (required) ☒ Local development regulations have been reviewed (required) ☒ All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction ☐ Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. **Note:** If Conservation Development has been used, check box and skip to Subpart C ☒ As much natural vegetation and pre-development hydrology as possible has been maintained	

B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS ☒ Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies ☐ Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B) ☐ Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's) ☒ Development sites and building envelopes have been positioned outside of floodplains ☒ Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features ☐ Development sites and building envelopes have been located to minimize impacts to steep slopes (≥15%) ☐ Other (describe):	
C) MINIMIZE CLEARING AND GRADING ☒ Site clearing has been restricted to <u>minimum area needed</u> for building footprints, development activities, construction access, and safety. ☐ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☐ 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) ☐ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent	
D) REDUCE IMPERVIOUS COVER ☐ Reduced roadway widths (≤22 feet for ADT ≤ 400; ≤ 26 feet for ADT 400 - 2,000) ☐ Reduced driveway areas (length minimized via reduced ROW width (≤ 45 ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to ≤ 9 ft. wide one lane; ≤ 18 ft. wide two lanes; shared driveways; pervious surface) ☐ Reduced building footprint: Explain approach: ☐ Reduced sidewalk area (≤ 4 ft. wide; one side of the street; unpaved path; pervious surface) ☐ Reduced cul-de-sacs (radius < 45 ft; vegetated island; alternative turn-around) ☐ Reduced parking lot area: Explain approach ☒ Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc. ☐ Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance) ☐ Other (describe):	Asphalt millings used for vehicle storage areas.
E) DISCONNECT IMPERVIOUS AREA ☐ Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible ☐ Residential street edges allow side-of-the-road drainage into vegetated open swales ☐ Parking lot landscaping breaks up impervious expanse AND accepts runoff ☒ Other (describe):	Vegetated swales are used for conveyance.
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☒ Small-scale BMPs have been designated to treat runoff as close as possible to the source	Roof runoff directed to below grade sand filters located close to the source.

G) PROVIDE LOW-MAINTENANCE NATIVE VEGETATION ☒ Low-maintenance landscaping has been proposed using native species and cultivars ☐ Plantings of native trees and shrubs in areas previously cleared of native vegetation are shown on site plan ☐ Lawn areas have been limited/minimized, and yards have been kept undisturbed to the maximum extent practicable on residential lots	
H) RESTORE STREAMS/WETLANDS ☐ Historic drainage patterns have been restored by removing closed drainage systems, daylighting buried streams, and/or restoring degraded stream channels and/or wetlands ☐ Removal of invasive species ☒ Other	Site does not provide the opportunity to restore streams/wetlands. Existing wetlands are protected.

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☒	☐	The project has been designed to meet the groundwater recharge standard.
☐	☐	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);
☐	☐	Your waiver request has been explained in the Narrative, if applicable.
☒	☐	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☒	☐	If "Yes," has approval for infiltration by the OLRSMM Site Project Manager, per Part 1, Minimum Standard 8, been requested? Infiltration is not proposed where LUHPPL runoff is collected.

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)
(Add or Subtract Rows as Necessary)

Waterbody ID	**Impervious Area Treated (sq ft)**	**Total Re_v 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_v directed to a QPA (cu ft)		
RI0006018R-05	240723	5,925	0	5,925	40,541

Notes:
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.

☒ 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 Management Report Appendix B.

WATER QUALITY – MINIMUM STANDARD 3		
YES	**NO**	
☒	☐	Does this project meet or exceed the required water quality volume WQv (see RICR 8.9.E-I)?
☐	☐	Is the proposed final impervious cover greater than 20% of the disturbed area (see RICR 8.9.E-I)?
☒	☐	If "Yes," either the Modified Curve Number Method or the Split Pervious/Impervious method in Hydro-CAD was used to calculate WQv; or,
☐	☐	If "Yes," either TR-55 or TR-20 was used to calculate WQv; and,
☐	☐	If "No," the project meets the minimum WQv of 0.2 watershed inches over the entire disturbed area.
☐	☐	Not Applicable
☒	☐	Does this project meet or exceed the ability to treat required water quality flow WQf (see RICR 8.9.I.1-3)?
☐	☒	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.
☐	☒	RICR 8.36. A Pollutant Loading Analysis is needed and has been completed.
☐	☐	The Water Quality Guidance Document (Water Quality Goals and Pollutant Loading Analysis Guidance for Discharges to Impaired Waters) has been followed as applicable.
☐	☒	BMPs are proposed that are on the approved technology list . If "Yes," please provide all required worksheets from the manufacturer.
☐	☒	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:

TABLE 3-1: Summary of Water Quality (see RICR 8.9)

Design Point and WB ID	Impervious area treated (sq ft)	Total WQ_v Required (cu ft)	LID Stormwater Credits (see RICR 8.18) WQv directed to a QPA (cu ft)	Water Quality Treatment Remaining (cu ft)	Water Quality Provided by BMPs (cu ft)
DP-1:Wetland #1	87001	7,250	0	7,250	7255
DP-2:Offsite SE	153,735	12,811	0	12,811	20,619
TOTALS:	234,736	20061	0	20061	27,874

Notes:
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.

☒ YES ☐ NO	This project has met the setback requirements for each BMP. If "No," please explain:

☒ 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 Management Report Appendix C.

CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4		
YES	**NO**	
☐	☒	Is this standard waived? If "Yes," please indicate one or more of the reasons below:
		☐ 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. ☐ The project is a small facility with impervious cover of less than or equal to 1 acre. ☐ 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). (Note: LID design strategies can greatly reduce the peak discharge rate).
☐	☐	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	Unnamed Tributary to Simmons Res	N	7,580	9330	1.9
DP-2	Unnamed Tributary to Simmons Res	N	677	10465	0.12
TOTALS:			8257	19795	2.02
Note: The Channel Protection Volume Standard must be met in each waterbody ID.					
☒ YES ☐ 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).				
☐ YES ☒ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.				
☒ 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 Report, Appendix D.					

OVERBANK FLOOD PROTECTION (RICR 8.11) AND OTHER POTENTIAL HIGH FLOWS – MINIMUM STANDARD 5			
YES	**NO**		
☐	☒	Is this standard waived? If yes, please indicate one or more of the reasons below:	
		☐	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.
		☐	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).
☐	☒	Does the project flow to an MS4 system or subject to other stormwater requirements? If "Yes," indicate as follows:	
		☐	RIDOT
		☐	Other (specify):
Note: The project could be approved by RIDEM but not meet RIDOT or Town standards. RIDOT's regulations indicate that post-volumes must be **less** 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.			
		Indicate below which model was used for your analysis. ☐ TR-55 ☐ TR-20 ☒ HydroCAD ☐ Bentley/Haestad ☐ Intellisolve ☐ Other (Specify):	
YES	**NO**		
☒	☐	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.):	
☐	☒	Do off-site areas contribute to the sub-watersheds and design points? If "Yes,"	
☐	☐	Are the areas modeled as "present condition" for both pre- and post-development analysis?	
☐	☐	Are the off-site areas shown on the subwatershed maps?	
☐	☐	Does the drainage design confirm safe passage of the 100-year flow through the site for off-site runoff? N/A	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☐	☐	Calculate the following:	
		☒	Area of disturbance within the sub-watershed (areas) 8.3
		☒	Impervious cover (%) 49.4
☐	☒	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)?	
☒	☐	Does this project meet the overbank flood protection standard?	

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:	0.25	0.16	5.17	2.14	18.48	15.06	45.82	33.54
DP-2:	0.00	0.00	1.17	0.12	6.31	6.12	17.79	15.65
TOTALS:	0.25	0.16	6.34	2.37	24.79	20.37	63.61	50.26

** 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.	Stormwater management Report, Appendix E
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.	Stormwater management Report, Appendix E
Final sizing calculations for structural stormwater BMPs, including contributing drainage area, storage, and outlet configuration.	Stormwater management Report, Appendix E
Stage-storage, inflow and outflow hydrographs for storage facilities (e.g., detention, retention, or infiltration facilities).	Stormwater management Report, Appendix E

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)	Re_v	WQ_v	CP_v (Y/N/NA)	Overbank Flood Reduction (Y/N/NA)	External (E) Internal (I) or NA	Yes/No	Technical Justification (Design Report page number)	Distance Provided
SF 1	1	Sand Filter	N	Y	Y	Y	Y	E	Y		
SF 2	2	Sand Filter	N	Y	Y	Y	Y	E	Y		
BIO 1	2	Bioretention	N	N	Y	N	Y	E	Y		
BGSF 1	2	Sand Filter	N	Y	Y	N	Y	I	Y		
BGSF 2	2	Sand Filter	N	Y	Y	N	Y	I	Y		
SFB 1	1	Sediment Forebay	Y	N	N	NA	NA	NA	Y		
SFB 2	2	Sediment Forebay	Y	N	N	NA	NA	NA	Y		
SFB 3	2	Sediment Forebay	Y	N	N	NA	NA	NA	Y		
		TOTALS:									

Table 5.3 Summary of Soils to Evaluate Each BMP									
DP #	**BMP ID**	**BMP Type** (e.g., bioretention, tree filter)	**Soils Analysis for Each BMP**						
			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)	Exfiltration Rate Applied (in/hr)
			Primary	Secondary					
1	SF 1	Sand Filter	TP 1		369.75	374	4.25	C	1.02
2	SF 2	Sand Filter	TP 10		365.0	369	4.0	C	1.02
2	BGSF 1	Sand Filter	TP 7		373.75	377.75	4.0	B	2.41
2	BGSF 2	Sand Filter	TP 3		372.4	376.5	4.1	B	2.41
		TOTALS:							

* 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

LAND USES WITH HIGHER POTENTIAL POLLUTANTS LOADS (LUHPPLs) – MINIMUM STANDARD 8			
YES	**NO**	**N/A**	
☒	☐	☐	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9. Diesel Storage and pad
☐	☒	☐	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so? Intend to register the above ground storage tank.
☒	☐	☐	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: Lined bioretention area with shut off valve(PIV)
☐	☒	☐	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.). Site Plans sheet C2.01 – C5.01

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
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.			
YES	**NO**	**N/A**	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.

☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

SOIL EROSION AND SEDIMENT CONTROL (SESC) – MINIMUM STANDARD 10				
YES	**NO**	**N/A**		
☒	☐	☐	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?	
☒	☐	☐	Have you provided a **separately-bound** document based upon the SESC Template? 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:	
			☐	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:
			☐	Provide Natural Buffers and Maintain Existing Vegetation
			☐	Minimize Area of Disturbance
			☐	Minimize the Disturbance of Steep Slopes
			☐	Preserve Topsoil
			☐	Stabilize Soils
			☐	Protect Storm Drain Inlets
			☐	Protect Storm Drain Outlets
			☐	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures
			☐	Establish Perimeter Controls and Sediment Barriers
			☐	Divert or Manage Run-On from Up-Gradient Areas
			☐	Properly Design Constructed Stormwater Conveyance Channels
			☐	Retain Sediment On-Site
			☐	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows
			☐	Apply Construction Activity Pollution Prevention Control Measures
			☐	Install, Inspect, and Maintain Control Measures and Take Corrective Actions
			☐	Qualified SESC Plan Preparer's Information and Certification
			☐	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
			☐	Description of Control Measures, such as Temporary Sediment Trapping and Conveyance Practices, including design calculations and supporting documentation, as required

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately-bound** 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?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the property owner or homeowner's association responsible for the stormwater maintenance of all BMP's? 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.).
☐	☒	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:
☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: 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.
Pollution Prevention Section		
☐	☐	Designated snow stockpile locations?
☐	☒	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: 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).
☒	☐	Regular sweeping? Please describe:
☒	☐	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).
☒	☐	A prohibition of phosphate-based fertilizers? (Note: 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

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐		Existing and proposed drainage area delineations
☒	☐		Locations of all streams and drainage swales
☒	☐		Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)
☒	☐		Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
☒	☐		Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
☐	☒		Mapped seasonal high-water-table test pit locations
☒	☐		Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
☒	☐		Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
☐	☒		Mapped bedrock outcrops adjacent to any infiltration BMP
☒	☐		Soils were logged by a:
		☒	DEM-licensed Class IV soil evaluator Name: Andrew McNulty D4099
		☐	RI-registered P.E. Name:

141210

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (units)**	**Existing Impervious (units)**	**Proposed Impervious (units)**
DP-1:	ID: RI0006018R-05	141,210 SF	2,695 SF	87,001 SF
DP-2:	ID: RI0006018R-05	228,382 SF	0	153,735 SF
TOTALS:		369,592 SF	2,695 SF	240,736 SF

Site Construction Plans (Indicate that the following applicable specifications are provided)		
YES	**NO**	
☒	☐	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
☒	☐	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
☒	☐	Boundaries of existing predominant vegetation and proposed limits of clearing
☒	☐	Site Location clarification
☒	☐	Location and field-verified boundaries of resource protection areas such as: ► freshwater and coastal wetlands, including lakes and ponds ► coastal shoreline features Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
☒	☐	All required setbacks (e.g., buffers, water-supply wells, septic systems)
☒	☐	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: ► 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; ► Design water surface elevations (applicable storms); ► Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.; ► Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.); ► 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; ► Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting
☒	☐	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
☐	☒	Mapping of any OLRSMM-approved remedial actions/systems (including ELURs)
☒	☐	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; ► Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements; ► 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.); ► Cross sections of roadways, with edge details such as curbs and sidewalks; ► Location and dimensions of channel modifications, such as bridge or culvert crossings
☐	☒	Locations, cross sections, and profiles of all stream or wetland crossings and their method of stabilization

1-23-03

THE CITY OF CRANSTON

ORDINANCE OF THE CITY COUNCIL

IN AMENDMENT OF CHAPTER 17 OF THE CODE OF THE CITY OF CRANSTON, 2005, ENTITLED "ZONING"
(CHANGE OF ZONE - 2110 Plainfield Pike; Assessor's Plat 35 Assessor's Lot 9)

No: 2023-53

Passed:
March 27, 2023

Jessica M. Marino, Council President

Approved:
March 29, 2023

Kenneth J. Hopkins, Mayor

It as ordained by the City Council of the City of Cranston as follows:

Section 1. That the Zoning Map accompanying and made a part of Chapter 17 of the Code of the City of Cranston, Rhode Island, 2005, entitled, "Zoning" as adopted December 1, 2016, as amended, is hereby further amended by:

A. Removing Lot 9 on Assessor's Plat 35 from the A80 Zoning District; and

B. Adding Lot 9 on Assessor's Plat 35 to the M2 Zoning District.

Section 2. This ordinance shall take effect upon its final adoption.

Positive Endorsement:

3/27/2023
City Solicitor Date
John Verdecchia, Asst. City Solicitor

Negative Endorsement: (Attach reasons)

City Solicitor Date

Sponsored by Councilman Campopiano

Petition Filed By: Stephen M. Litwin, Esquire, 116 Orange Street, Providence, Rhode Island 02903

Referred to Ordinance Committee March 16, 2023

202303310027350 Bk:LR6628 Pg:74
RECORDED Cranston,RI 1/15
03/31/2023 08:57:04 AM ZONE CHG ORD

202303310027350 Bk:LR6628 Pg:75
RECORDED Cranston,RI 2/15
03/31/2023 08:57:04 AM ZONE CHG ORD

RECEIVED
23 JAN 11 AM 10:17
CRANSTON
CITY CLERK

CITY OF CRANSTON

APPLICATION FOR CHANGE OF ZONE

Name(s) and address(es) of property owner(s): See Attached

Zoning Plat Number: 35 Lot No.(s)* 9

Street Address or Location on Street 2110 Plainfield Pike

Cranston, Rhode Island

*If only a portion of lot, please attach a full metes and bounds description.

Present Zoning: A80

Zoning Requested: M-2

Property to be used for: See Attached

(listed use must be specific)

Date: January 11, 2023

See Attached
Owner (Print and Sign)

Owner (Print and Sign)

George E. Murphy, III
Applicant (Print and Sign)

George E. Murphy, III, Manager
Teamwork, LLC
Applicant (Print and Sign)

Reviewed and approved by the Planning Department: 1/11/23

AuthentiSign ID: 1D2745EB-4B9D-ED11-AC20-00D0F2705AB1

202303310027350 Bk:LR6628 Pg:76
RECORDED Cranston,RI 3/15
03/31/2023 08:57:04 AM ZONE CHG ORD

PROPERTY OWNERS

2110 Plainfield Pike, Cranston, Rhode Island

Authentisign 01/09/23

Lori Cardillo
60 Old Danielson Pike
Foster, Rhode Island 02825

Authentisign 01/10/23

Sheila Simas
2788 Plainfield Pike
Cranston, Rhode Island

Authentisign 01/09/23

Nicole Wahtera
9 Esek Hopkins Road
North Scituate, Rhode Island 02857

Authentisign 01/10/23

Paul Kelsall
9 Esek Hopkins Road
North Scituate, Rhode Island 02857

Authentisign 01/09/23

Marisa Branch-Benoit
297 Quaker Lane
North Scituate, Rhode Island 02857

Authentisign 01/09/23

Shaunna Vanasse
60 Old Danielson Pike
Foster, Rhode Island 02825

Authentisign 01/09/23

Mikayla Kelsall
60 Old Danielson Pike
Foster, Rhode Island 02825

AuthentiSign ID: 1D2745E8-4B9D-ED11-AC20-00D0F2763AB1

202303310027350 Bk:LR6628 Pg:77
RECORDED Cranston,RI 4/15
03/31/2023 08:57:04 AM ZONE CHG ORD

Authentisign
Lori Cardillo   01/09/23

Lori Cardillo, Administratrix Estate of Emma Rambone
60 Old Danielson Pike
Foster, Rhode Island 02825

Authentisign
JOHN A. RAMBONE   01/09/23

John A. Rambone
2153 Plainfield Pike Rear
Johnston, Rhode Island 02919

Authentisign
Anthony Rambone   01/09/23

Anthony Rambone
2153 Plainfield Pike Rear
Johnston, Rhode Island 02919

Timothy T. Rambone
2153 Plainfield Pike Rear
Johnston, Rhode Island 02919

Authentisign
Lori Cardillo   01/09/23

Lori Cardillo, Administratrix Estate of Louise Rambone
60 Old Danielson Pike
Foster, Rhode Island 02825

202303310027350 Bk:LR6628 Pg:78
RECORDED Cranston,RI 5/15
03/31/2023 08:57:04 AM ZONE CHG ORD

Lori Cardillo, Administratrix Estate of Emma Rambone
60 Old Danielson Pike
Foster, Rhode Island 02825

John A. Rambone

John A. Rambone
2153 Plainfield Pike Rear
Johnston, Rhode Island 02919

Anthony A. Rambone

Anthony Rambone
2153 Plainfield Pike Rear
Johnston, Rhode Island 02919

Timothy T. Rambone

Timothy T. Rambone
2153 Plainfield Pike Rear
Johnston, Rhode Island 02919

Lori Cardillo, Administratrix Estate of Louise Rambone
60 Old Danielson Pike
Foster, Rhode Island 02825

202303310027350 Bk:LR6628 Pg:79
RECORDED Cranston,RI 6/15
03/31/2023 08:57:04 AM ZONE CHG ORD

ATTACHMENT FOR ZONE CHANGE APPLICATION

2110 PLAINFIELD PIKE, CRANSTON, RHODE ISLAND

The Applicant seeks to change to zoning classification of that certain real property located at 2110 Plainfield Pike, Assessors Lot 9 on Assessors Plat 35 ("Property"). Applicant seeks to have the zone change impact the entire parcel.

The Property is currently zoned A80. Applicant seeks to have the zone for the Property changed to – M-2. The Property is located on the southerly side of Plainfield Pike and is located on Plainfield Pike, ear Starline Way.

The use of the Property will storage, sales of equipment, sales of parts, service of equipment and resale of same by Milton/Caterpillar.

202303310027350 Bk:LR6628 Pg:80
RECORDED Cranston,RI 7/15
03/31/2023 08:57:04 AM ZONE CHG ORD

EXHIBIT A

A certain tract of land with the buildings and improvements thereon situated in said Cranston commonly known as the Sine Stephens place bounded westerly by land of Jeremiah Knight estate now or lately the estate of Abram A. Waterman, on which it measures 36 rods 8 inches, southerly by land now or lately of William Fenner on which it measure 13 rods 5 feet, easterly by land of Joshua Beattie now or lately the Anthony Mathewson Estate on which it measures 34 rods 9 feet 6 inches and northerly by Plainfield Road on which it measures 15 rods 6 feet. Being the same premises conveyed to Anthony Mathewson by deed of Elisha A. Lawton dated April 18, 1863 and recorded in Deed Book No. 43 at page 321 in said Cranston.

And also a certain tract of land situated in said Cranston bounded and described as follows: Commencing on the southerly line of Plainfield Road adjoining the northerly corner of land now or lately of W. T. Mountain 33 rods 9 feet 2 inches to land now or lately of William Fenner, thence westerly bounding on said Fenner's land 38 rods 2 feet, thence northerly bounding on the first described tract 34 rods 9 feet 6 inches to said Plainfield Road, thence easterly bounding on said Road 38 rods 2 feet to place of beginning. Being the same premises conveyed to Anthony Mathewson by Deed of Joshua Beattie dated April 4, 1867 and recorded in Deed Book 49 at page 159 in said Cranston.

These two tracts of land together constitute Lot No. 9 on Assessor's Plat No. 35 in said City of Cranston and are the same premises described in Deed Book No. 117 at page 284 in said Cranston.

Excepting therefrom so much of the land as taken by end domain for the purposes of the widening the road and/or highway.

202303310027350 Bk:LR6628 Pg:81
RECORDED Cranston,RI 8/15
03/31/2023 08:57:04 AM ZONE CHG ORD

KENNETH J. HOPKINS
MAYOR

KENNETH M. MALLETTE, JR
CITY ASSESSOR

DAVID COLE
DEPUTY ASSESSOR

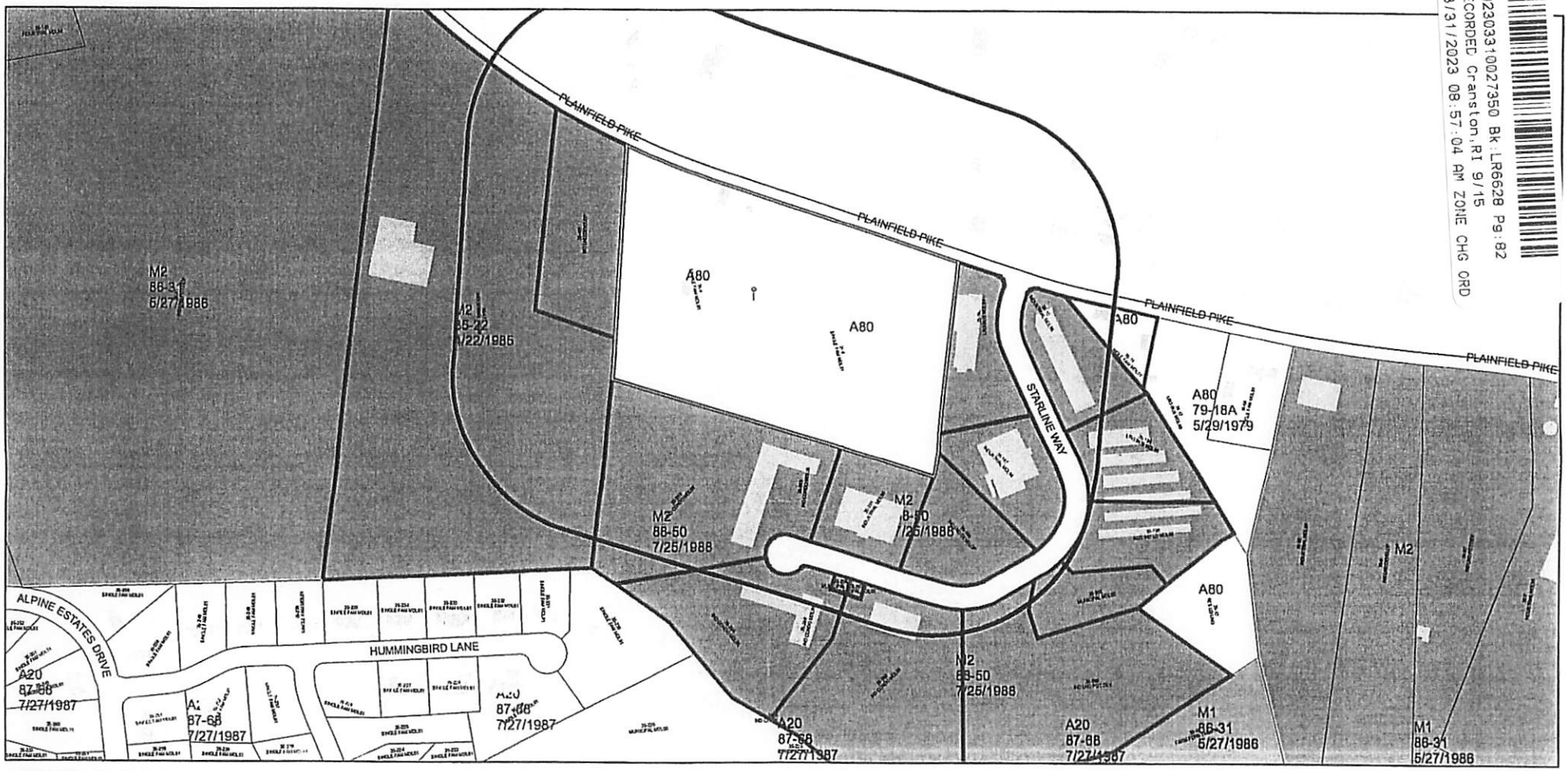
DEPARTMENT OF FINANCE
DIVISION OF ASSESSMENT
869 PARK AVE
CRANSTON, RI 02910

Legal Map Disclaimer

This map/data/geospatial product is not the product of a Professional Land Survey. It was created for general reference, informational, planning and guidance use and is not a legally authoritative source as to location of natural or manmade features. Proper interpretation of this data may require the assistance of appropriate professional services. The City of Cranston makes no warrantee, expressed or implied related to the spatial accuracy, reliability, completeness or currentness of this map/data.

2110 Plainfield Pike 400' Radius Plat 35 Lot 9

20230331O0027350 Bk:LR6628 Pg:82
RECORDED Cranston,RI 9/15
03/31/2023 08:57:04 AM ZONE CHG ORD



10/20/2022, 12:11:47 PM

Parcel ID Labels	Historic Overlay District		A8	C3	MPD		
Streets Names	Zoning		A6	C4	S1		
Cranston Boundary	none		B1	C5	Other		
Parcels	A80		B2	M1			
Buildings	A20		C1	M2			
Zoning Dimensions	A12		C2	EI			

1:2,931

0 0.035 0.07 0.14 mi

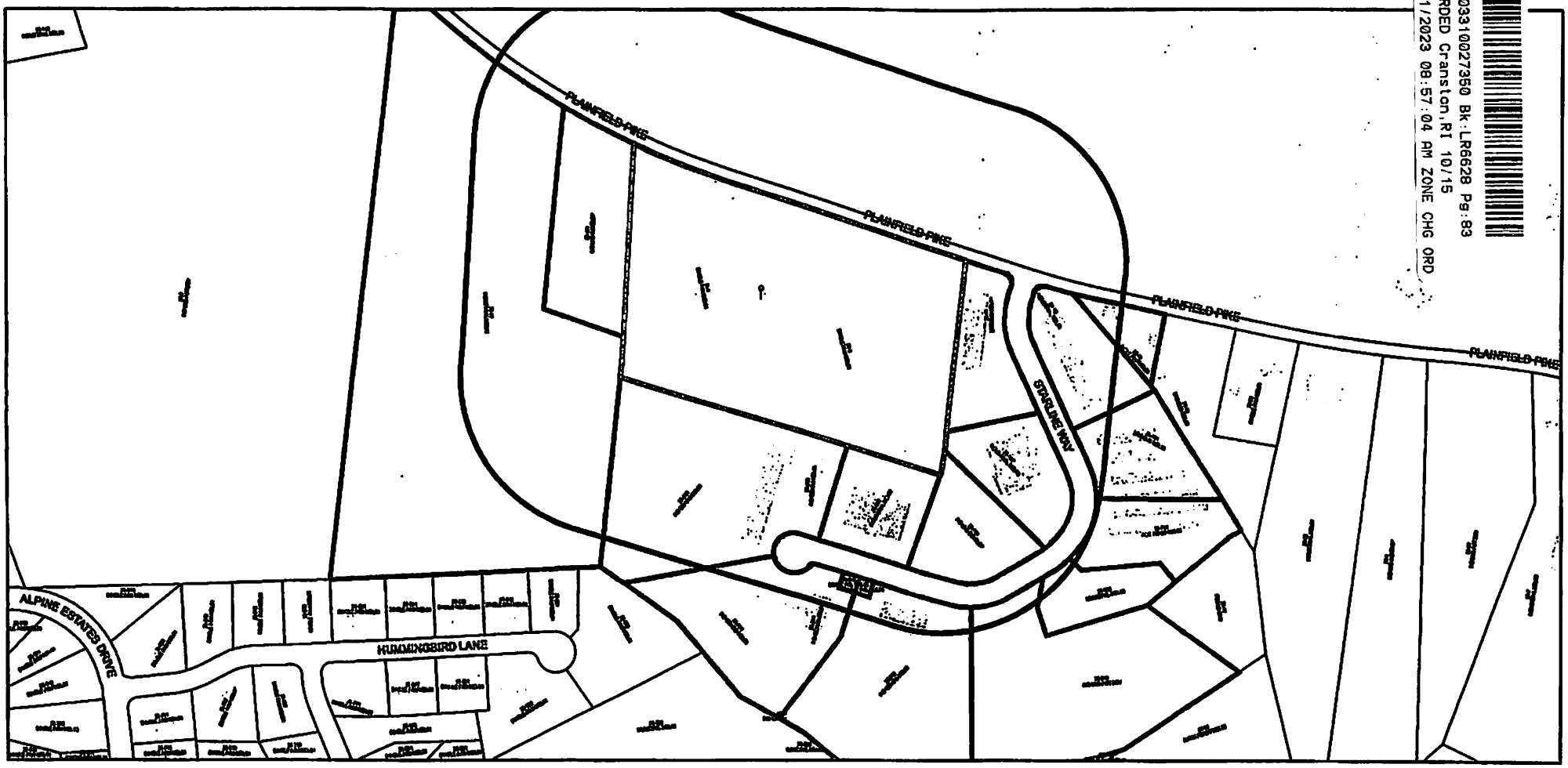
0 0.05 0.1 0.2 km

City of Cranston

Web User
City of Cranston |

2110 Plainfield Pike 400' Radius Plat 35 Lot 9

20230331O0027350 Bk:LR6628 Pg:83
RECORDED Cranston,RI 10/15
03/31/2023 08:57:04 AM ZONE CHG ORD



10/20/2022, 12:19:08 PM

1:2,931

0 0.035 0.07 0.14 mi

0 0.05 0.1 0.2 km

City of Cranston

Web User
City of Cranston |

202303310027350 Bk:LR6628 Pg:84
RECORDED Cranston,RI 11/15
03/31/2023 08:57:04 AM ZONE CHG ORD

RECEIVED
23 MAR 15 AM 9:56
CITY CLERK

Kenneth J. Hopkins
Mayor

Michael E. Smith
President

Jason M. Pezzullo, AICP
Planning Director

CITY PLAN COMMISSION
Cranston City Hall
869 Park Avenue, Cranston, RI 02910

Thomas Barbieri
Richard Bernardo
Robert Coupe
David Exter
Steven Frias
Kathleen Lanphear
Lisa Mancini
Thomas Zidelis

March 14, 2023

Councilwoman Vargas
Ordinance Committee Chair
Cranston City Hall
869 Park Avenue
Cranston, RI 02910

RE: **Ordinance #1-23-03** – in Amendment of Chapter 17 of the Code of the City of Cranston, 2005, Entitled "Zoning" (Change of Zone – 2110 Plainfield Pike, AP 35, Lot 9).

Dear Chairwoman Vargas:

The above-referenced ordinance for 2110 Plainfield Pike was reviewed by the City Plan Commission on March 7, 2023, for the purpose of providing the City Council with an advisory recommendation, as required by Section 45-24-52 of the Rhode Island General Laws and Section 17.120.030 of the Cranston Zoning Code. The ordinance proposes to amend the Zoning Map designation (from "A-80" to "M-2") for one lot located at 2110 Plainfield Pike, further identified as Assessor's Plat 35, Lot 9.

After review and consideration, the City Plan Commission recommendations are as follows:

1) **Ordinance #1-23-03** – in Amendment of Chapter 17 of the Code of the City of Cranston, 2005, Entitled "Zoning" (Change of Zone – 2110 Plainfield Pike, AP 35, Lot 9)

Due to the findings that the rezone from A-80 to M-2 is consistent with the Comprehensive Plan, would bring greater conformity to the zoning of the area, and is consistent with the purposes of zoning as detailed in City Code Section §17.04.010, upon motion made by Mr. Bernardo, and seconded by Ms. Mancini, the City Plan Commission voted unanimously (9-0) to forward a positive recommendation on the application to the City Council.

The Planning Department memo issued for Ordinance #1-23-03 and the proposed language for Ordinance #1-23-03 are attached to this letter as reference.

Respectfully submitted,

Alexander Berardo
Planning Technician/Administrative Officer

Telephone: (401) 461-1000 ext 3136
Fax: (401) 780-3171

202303310027350 Bk:LR6628 Pg:85
RECORDED Cranston,RI 12/15
03/31/2023 08:57:04 AM ZONE CHG ORD

City Planning Department

Memo –

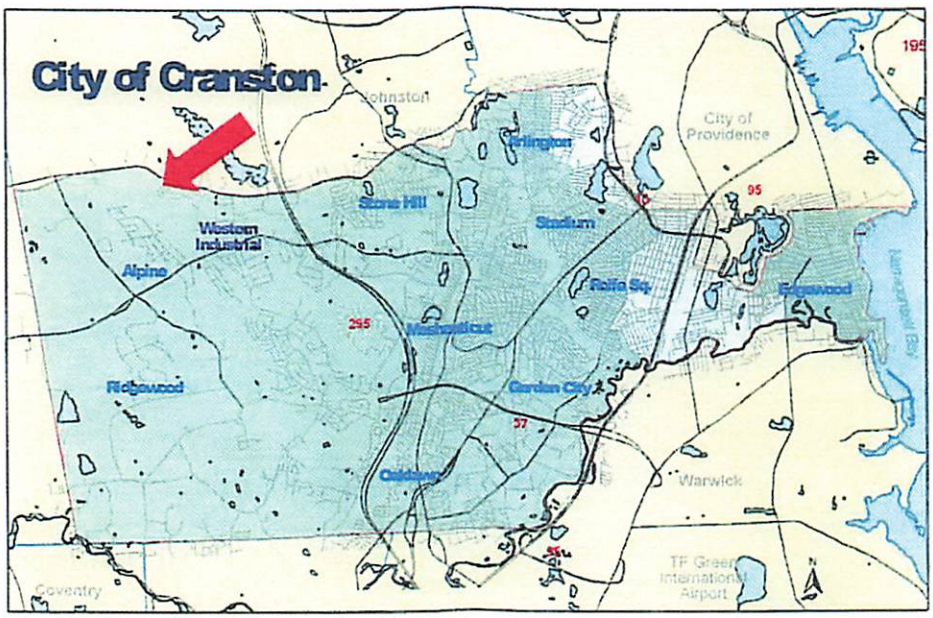
To: Cranston City Plan Commission
From: Alexander Berardo – Planning Technician / Administrative Officer
Amelia Lavallee – Planning Intern
Date: March 3, 2023
Re: Staff Memo for **Ordinance #1-23-03** in Amendment of Chapter 17 of the Code of the City of Cranston, 2005, Entitled "Zoning" (Change of Zone – 2110 Plainfield Pike, AP 35, Lot 9)

I. Ordinance Summaries

- **#1-23-03 Entitled "Zoning" (Change of Zone – 2110 Plainfield Pike)**

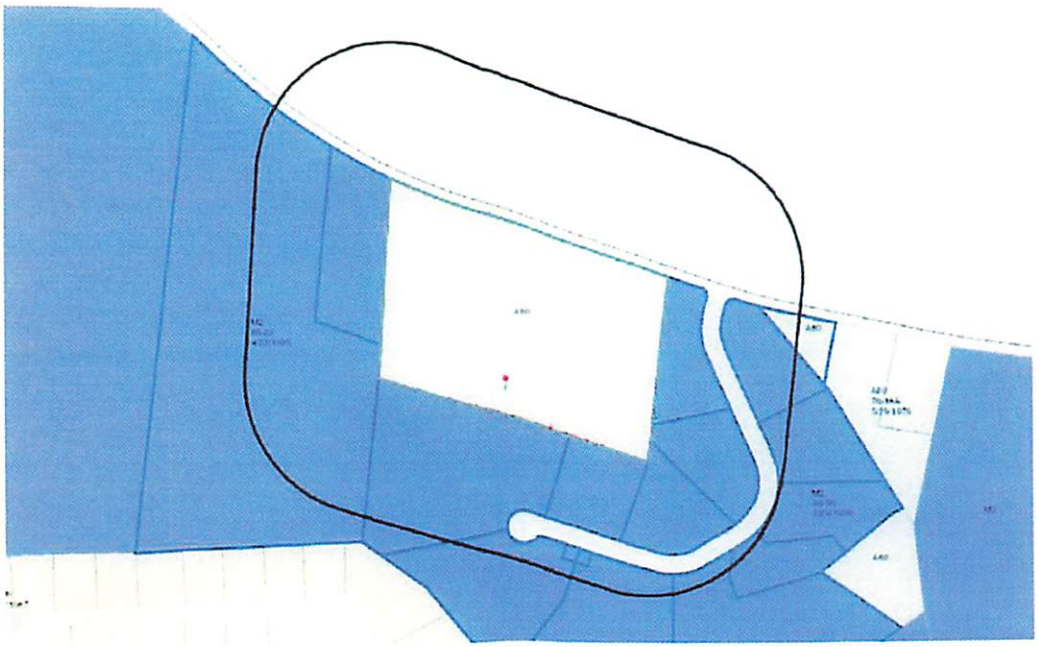
The applicant (Teamwork, LLC) proposes to change the zoning district of AP 35, Lot 9 from A-80 (Single-Family Dwellings on minimum 80,000 ft² lots) to M-2 (General Industry).

LOCATION MAP

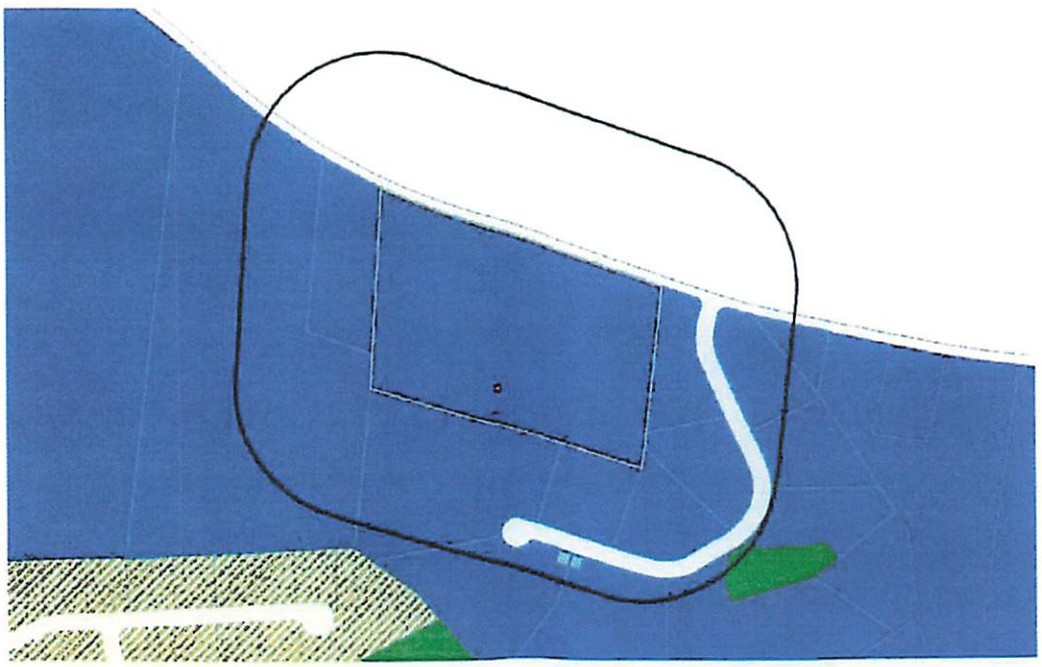


202303310027350 Bk:LR6628 Pg:86
RECORDED Cranston,RI 13/15
03/31/2023 08:57:04 AM ZONE CHG ORD

ZONING MAP

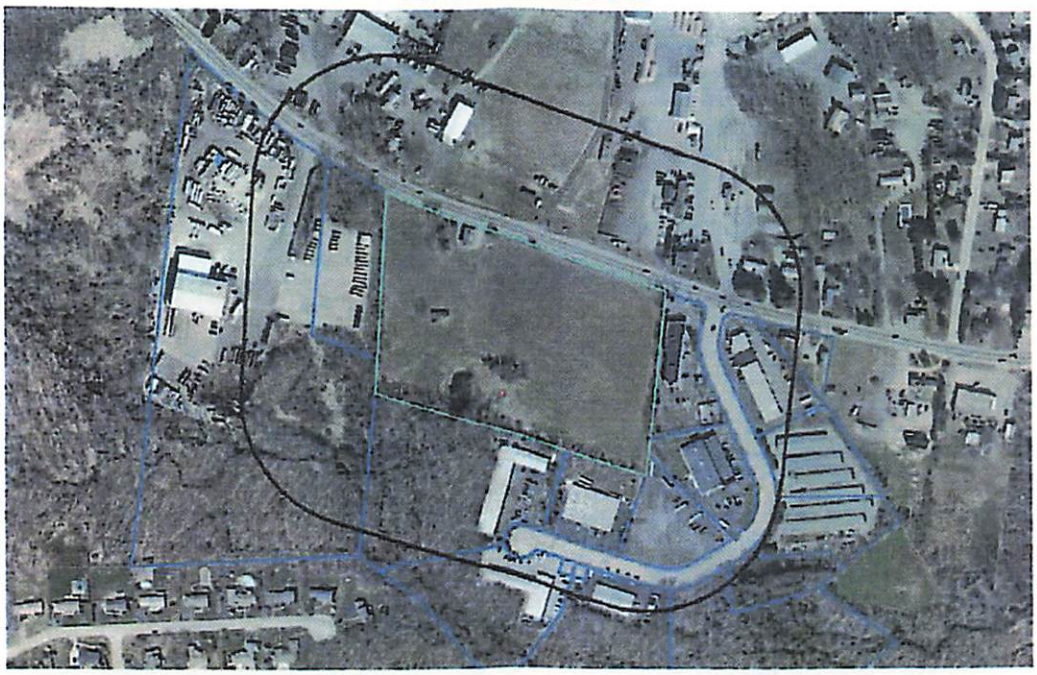


FUTURE LAND USE MAP



202303310027350 Bk:LR6628 Pg:87
RECORDED Cranston,RI 14/15
03/31/2023 08:57:04 AM ZONE CHG ORD

AERIAL IMAGE



STREET VIEW

202303310027350 Bk·LR6628 Pg:88
RECORDED Cranston,RI 15/15
03/31/2023 08:57:04 AM ZONE CHG ORD

II. Planning Analysis

The applicant is proposing a zone change for the subject parcel from A-80 (Single-Family Dwellings on minimum 80,000 ft^2 lots) to M-2 (General Industry). This parcel was the subject of a separate Development Plan Review pre-application meeting held on February 1, 2023, in which a concept to develop a Milton CAT facility for the storage, sale, resale, and servicing of Milton/Caterpillar equipment and associated parts was reviewed.

As shown on the Zoning map on p. 2 of this memo, the subject parcel is surrounded by M-2 zoned lots on all sides within City limits. **Besides bringing the subject parcel into consistency with the surrounding land use, Staff notes that the proposed rezone is specifically recommended by the Comprehensive Plan in Appendix A ("Zoning Consistency Analysis," p.15) and is reflected in the Future Land Use Map.**

R.I.G.L. 45-24-50 requires zoning amendments to be consistent with a community's Comprehensive Plan. Furthermore, Section 13.03 ("Comprehensive plan and its effect") of the City of Cranston's Charter states *"Thereafter no ordinance or other action of the council and no act or order of any department, board, commission, office or agency of the city in violation of the terms of the comprehensive plan or any portion or amendment thereof, adopted as above provided, shall be valid or legally effective."*

III. Findings per City Code §17.120.030

(A): Consistency with the Cranston Comprehensive Plan 2010:

The proposal is not only consistent with multiple Goals and Policies contained within the Comprehensive Plan (LU-16 and LU-24 among the most relevant), but also is explicitly recommended on p.15 of the Comprehensive Plan's Appendix A and the Future Land Use Map. For these reasons, **Ordinance #1-23-03 is consistent with the City's Comprehensive Plan.**

(B). Recognition and Consideration of the Purposes of Zoning in City Code §17.04.010:

The general purposes of zoning as prescribed by city Code Section §17.04.010 have been recognized and considered in review of the proposed ordinance, and the ordinance has been found to be consistent with the general purposes of zoning.

IV. Recommendations

1) **Ordinance #1-23-03 in amendment of Chapter 17 of the Code of the City of Cranston, 2005, entitled "Zoning" (Change of Zone – 2110 Plainfield Pike)**

   Due to the finding that the rezone from A-80 to M-2 is consistent with the Comprehensive Plan, would bring greater conformity to the zoning of the area, and is consistent with the purposes of zoning as detailed in City Code Section §17.04.010, Staff recommends that the Plan Commission send a ***positive recommendation*** on Ordinance #1-23-03 to the City Council.

Appendix B – Minimum Standard 2 – Groundwater Recharge Calculations

- Recharge Summary and Calculations
- 1.0 Year Storm Event HydroCAD for Recharge BMPs

Computations

Project:	MiltonCAT	**Project #**	73375.00
Location:	Cranston, RI	**Sheet:**	1 **of** 1
Calculated By:	KC	**Date:**	10/03/2023Rev 10/30/2023
Checked By:	GB	**Date:**	6/13/2023
Title:	Groundwater Recharge		

Section 3.2.2 Minimum Standard 2: Groundwater Recharge (Re_v.)

- Re_v = X" * (F)*(I)/12

  Where:

  Re_v = required recharge volume (CF)

  F = Recharge Factors Based on Hydrologic Soil Group (HSG) from Table 3-4 of RISDISM (pg 3-11)

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

  I = Total impervious area (SF)

  HSG B=109,119 sf x 0.35 x 1/12= 3,183 CF

  HSG C=131,600 sf x 0.25 x 1/12= 2,742 CF

  HSG D= 18 sf x 0.10 x 1/12= 0.15 CF

  TOTAL REQUIRED = 5,925 CF

- TOTAL PROVIDED (1 year discarded volume)

  SF 1 = 11,823 CF

  SF 2 = 17,993 CF

  BGSF 1 = 1,128 CF

  BGSF 2 = 9,597 CF

  TOTAL = 40,541 CF

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Pond BGSF-1: BGSF-1 Peak Elev=379.33' Storage=468 cf Inflow=0.32 cfs 1,128 cf
Discarded=0.02 cfs 1,128 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 1,128 cf

Pond BGSF-2: BGSF-2 Peak Elev=377.31' Storage=3,459 cf Inflow=2.73 cfs 9,595 cf
Discarded=0.24 cfs 9,597 cf Primary=0.00 cfs 0 cf Outflow=0.24 cfs 9,597 cf

Pond SF 2: SF-2 Peak Elev=369.24' Storage=10,838 cf Inflow=5.78 cfs 18,368 cf
Discarded=0.21 cfs 17,993 cf Primary=0.05 cfs 374 cf Outflow=0.26 cfs 18,367 cf

Pond SF-1: SF-1 Peak Elev=375.16' Storage=9,045 cf Inflow=4.65 cfs 15,436 cf
Discarded=0.16 cfs 11,823 cf Primary=0.09 cfs 3,613 cf Outflow=0.26 cfs 15,436 cf

Appendix C – Minimum Standard 3 – Water Quality Calculations

› WQ Summary, Calculations and HydroCAD printouts for BMPs

Computations

Project:	MiltonCAT	**Project #**	73375.00
Location:	Cranston, RI	**Sheet:**	1 **of** 1
Calculated By:	KC	**Date:**	09/26/2023Rev 10/30/2023
Checked By:	gb	**Date:**	06/15/2023
Title:	Water Quality Volume (WQV)		

Section 3.2.3 Minimum Standard 3: Water Quality

- Water Quality Vol. 1”/12 x impervious area (includes pavement, roofs, and millings)
- 1”/12 x 234,597 sf = 19,549 CF

- Provided Stormwater Treatment :

BIO 1 467 CF
BGSF 1 569 CF
BGSF 2 9,118 CF
SF 1 7,255 CF
SF 2 10,465 cf

Total: 27,874 CF

Computations

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	7 of 8
Calculated by:	KC	Date:	9/4/2023
Checked by:	gb	Date:	
Title	Below-Grade Sand Filter		BGSF-1

Sand Filter Design Criteria

Section 5.5.1 Feasibility

- Minimum 3' separation between top of basin and seasonal high groundwater table.
- The bottom of the filtering system must be located at or above the seasonal high groundwater table.

Section 5.5.2 Conveyance

- Synthetic filter fabrics should not be used to separate soil filter media from underdrain bedding material.

Section 5.5.3 Pretreatment *NOT REQUIRED FOR ROOF*

WQV = 1 in * (1 ft/12 in) * 5481 sf = 457 cf

Pretreatment = 0% WQV = 0 cf

Section 5.5.4 Treatment

Pretreatment and treatment = 75% WQV = 343 cf

0% WQV provided by pretreatement, 75% required in treatment: 343 cf

Basin Area (Af) = $A_f = \frac{(WQV)(d_f)}{[(k)(h_f + d_f)(t_f)]} =$ 43.0 sf

Where:

df = Filter Bed Depth = 2 ft

k = Coeff. of perm. filter media = 3.5 ft/day

hf = Ave. height of water above surface = 1.04 ft

tf = Drain Downtime (2 days max) = 2 day(s)

Summary:

Area provided = 310 sf (> required 43 sf)

BMP volume provided = 569 cf (> required 343 cf)

Pretreatment and treatment have been designed per RISDISM

Computations

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	8 of 8
Calculated by:	kc	Date:	6/12/2023
Checked by:	gb	Date:	6/14/2023
Title	Below-Grade Sand Filter		BGSF-2

Sand Filter Design Criteria

Section 5.5.1 Feasibility

- Minimum 3' separation between top of basin and seasonal high groundwater table.
- The bottom of the filtering system must be located at or above the seasonal high groundwater table.

Section 5.5.2 Conveyance

- Synthetic filter fabrics should not be used to separate soil filter media from underdrain bedding material.

Section 5.5.3 Pretreatment *NOT REQUIRED FOR ROOF*

WQV = 1 in * (1 ft/12 in) * 46623 sf = 3886 cf

Pretreatment = 0% WQV = 0 cf

Section 5.5.4 Treatment

Pretreatment and treatment = 75% WQV = 2915 cf

0% WQV provided by pretreatement, 75% required in treatment: 2915 cf

Basin Area (Af) = $A_f = \frac{(WQV)(d_f)}{[(k)(h_f + d_f)(t_f)]} =$ 286.5 sf

Where:

df = Filter Bed Depth = 2 ft

k = Coeff. of perm. filter media = 3.5 ft/day

hf = Ave. height of water above surface = 1.875 ft

tf = Drain Downtime (2 days max) = 2 day(s)

Summary:

Area provided = 5986 sf (> required 286.5 sf)

BMP volume provided = 9118 cf (> required 2915 cf)

Pretreatment and treatment have been designed per RISDISM

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	1 of 8
Calculated by:	kc	Date:	9/22/2023
Checked by:	gb	Date:	6/14/2023
Title	Sediment Forebay		SFB-1

Section 6.4 Sediment Forebay

- As = 5,750 x Q

Where:

Q = Discharge from drainage area (CFS) = % WQV / 86,400 sec = 1 cfs

As = Sedimentation surface area (SF) = 117 sf

Area provided = 152 sf (> required 117 sf)

- The forebay shall be sized to contain a percent of the WQv as well as the required sediment volume.

Percent Required = 25%

Sediment Volume SV= {(76.6 x RA x TE) + (5.3 x DA x TE)} x T

RA = area of roadway or parking lots = 1.89 acres

TE = basin trap efficiency (80% standard)= 90%

DA = contributing land use area = 2.61 acres

T = time in years = 1 year(s)

SV = 143 cf

For % WQV refer to Chapter 5, for pretreatment requirements for each BMP used.

WQV % Required = 25%

WQV = 7007 cf

WQV Required = 1752 cf

SV Required = 143 cf

Total volume required = 1752 cf + 143 cf = 1895 cf

Volume provided = 2521 cf (> required 1895 cf)

Computations

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	5 of 8
Calculated by:	kc	Date:	9/22/2023
Checked by:	gb	Date:	6/14/2023
Title	Sand Filter		SF-1

Sand Filter Design Criteria

Section 5.5.1 Feasibility

- Minimum 3' separation between top of basin and seasonal high groundwater table.
- The bottom of the filtering system must be located at or above the seasonal high groundwater table.

Section 5.5.2 Conveyance

- Synthetic filter fabrics should not be used to separate soil filter media from underdrain bedding material.

Section 5.5.3 Pretreatment

WQV = 1 in * (1 ft/12 in) * 87056 sf = 7255 cf

Pretreatment = 25% WQV = 1814 cf

Section 5.5.4 Treatment

Pretreatment and treatment = 75% WQV = 5442 cf

25% WQV provided by pretreatement, 50% required in treatment: 3628 cf

Basin Area (Af) = $A_f = \frac{(WQV)(d_f)}{[(k)(h_f + d_f)(t_f)]} =$ 706.7 sf

Where:

df = Filter Bed Depth = 1.5 ft

k = Coeff. of perm. filter media = 3.5 ft/day

hf = Ave. height of water above surface = 0.7 ft

tf = Drain Downtime (2 days max) = 2 day(s)

Summary:

Area provided = 4693 sf (> required 706.7 sf)

BMP volume provided = 3649 cf (> required 3628 cf)

Pretreatment and treatment have been designed per RISDISM

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	2 of 8
Calculated by:	sap	Date:	5/3/2023
Checked by:	gb	Date:	6/14/2023
Title	Sediment Forebay		SFB-2

Section 6.4 Sediment Forebay

- As = 5,750 x Q

Where:

Q = Discharge from drainage area (CFS) = % WQV / 86,400 sec = 1 cfs

As = Sedimentation surface area (SF) = 129 sf

Area provided = 967 sf (> required 129 sf)

- The forebay shall be sized to contain a percent of the WQv as well as the required sediment volume.

  Percent Required = 25%

  Sediment Volume SV= {(76.6 x RA x TE) + (5.3 x DA x TE)} x T

  RA = area of roadway or parking lots = 2.13 acres

  TE = basin trap efficiency (80% standard)= 90%

  DA = contributing land use area = 2.6 acres

  T = time in years = 1 year(s)

  SV = 160 cf

For % WQV refer to Chapter 5, for pretreatment requirements for each BMP used.

WQV % Required = 25%

WQV = 7746 cf

WQV Required = 1937 cf

SV Required = 160 cf

Total volume required = 1937 cf + 160 cf = 2097 cf

Volume provided = 2525 cf (> required 2097 cf)

Computations

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	6 of 8
Calculated by:	kc	Date:	6/13/2023rev 10/30/2023
Checked by:	gb	Date:	6/14/2023
Title	Sand Filter		SF-2

Sand Filter Design Criteria

Section 5.5.1 Feasibility

- Minimum 3' separation between top of basin and seasonal high groundwater table.
- The bottom of the filtering system must be located at or above the seasonal high groundwater table.

Section 5.5.2 Conveyance

- Synthetic filter fabrics should not be used to separate soil filter media from underdrain bedding material.

Section 5.5.3 Pretreatment

WQV = 1 in * (1 ft/12 in) * 96110 sf = 8010 cf
Pretreatment = 25% WQV = 2003 cf

Section 5.5.4 Treatment

Pretreatment and treatment = 75% WQV = 6008 cf
25% WQV provided by pretreatement, 50% required in treatment: 4005 cf

Basin Area (Af) = $A_f = \frac{(WQV)(d_f)}{[(k)(h_f + d_f)(t_f)]} =$ 1052.2 sf

Where:

df = Filter Bed Depth = 2 ft
k = Coeff. of perm. filter media = 3.5 ft/day
hf = Ave. height of water above surface = 0.175 ft
tf = Drain Downtime (2 days max) = 2 day(s)

Summary:

Area provided = 8510 sf (> required 1052.2 sf)
BMP volume provided = 10465 cf (> required 4005 cf)
Pretreatment and treatment have been designed per RISDISM

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	3 of 8
Calculated by:	kc	Date:	9/25/2023
Checked by:	gb	Date:	6/14/2023
Title	Sediment Forebay		SFB-3

Section 6.4 Sediment Forebay

- As = 5,750 x Q

Where:

Q = Discharge from drainage area (CFS) = % WQV / 86,400 sec = 1 cfs

As = Sedimentation surface area (SF) = 8 sf

Area provided = 108 sf (> required 8 sf)

- The forebay shall be sized to contain a percent of the WQv as well as the required sediment volume.

Percent Required = 25%

Sediment Volume SV= {(76.6 x RA x TE) + (5.3 x DA x TE)} x T

RA = area of roadway or parking lots = 0.13 acres

TE = basin trap efficiency (80% standard)= 90%

DA = contributing land use area = 0.16 acres

T = time in years = 1 year(s)

SV = 10 cf

For % WQV refer to Chapter 5, for pretreatment requirements for each BMP used.

WQV % Required = 25%

WQV = 454 cf

WQV Required = 114 cf

SV Required = 10 cf

Total volume required = 114 cf + 10 cf = 124 cf

Volume provided = 291 cf (> required 124 cf)

Project:	Milton CAT	Project #	73375.00
Location:	Cranston, RI	Sheet	4 of 8
Calculated by:	kc	Date:	6/13/2023
Checked by:	gb	Date:	6/14/2023
Title	Bioretention Filter		BIO-1

Bioretention Filter Design Criteria

Section 5.5.1 Feasibility

- Minimum 3' separation between top of basin and seasonal high groundwater table.
- The bottom of the filtering system must be located at or above the seasonal high groundwater table.

Section 5.5.2 Conveyance

- Synthetic filter fabrics should not be used to separate soil filter media from underdrain bedding material.

Section 5.5.3 Pretreatment

WQV = 1 in * (1 ft/12 in) * 5453 sf = 455 cf

Pretreatment = 25% WQV = 114 cf

Section 5.5.4 Treatment

Pretreatment and treatment = 75% WQV = 342 cf

25% WQV provided by pretreatement, 50% required in treatment: 228 cf

Basin Area = $A_f = \frac{(WQV)(d_f)}{[(k)(h_f + d_f)(t_f)]} =$ 182.0 sf

Where:

df = Filter Bed Depth = 2 ft

k = Coeff. of perm. filter media = 1 ft/day

hf = Ave. height of water above surface = 0.5 ft

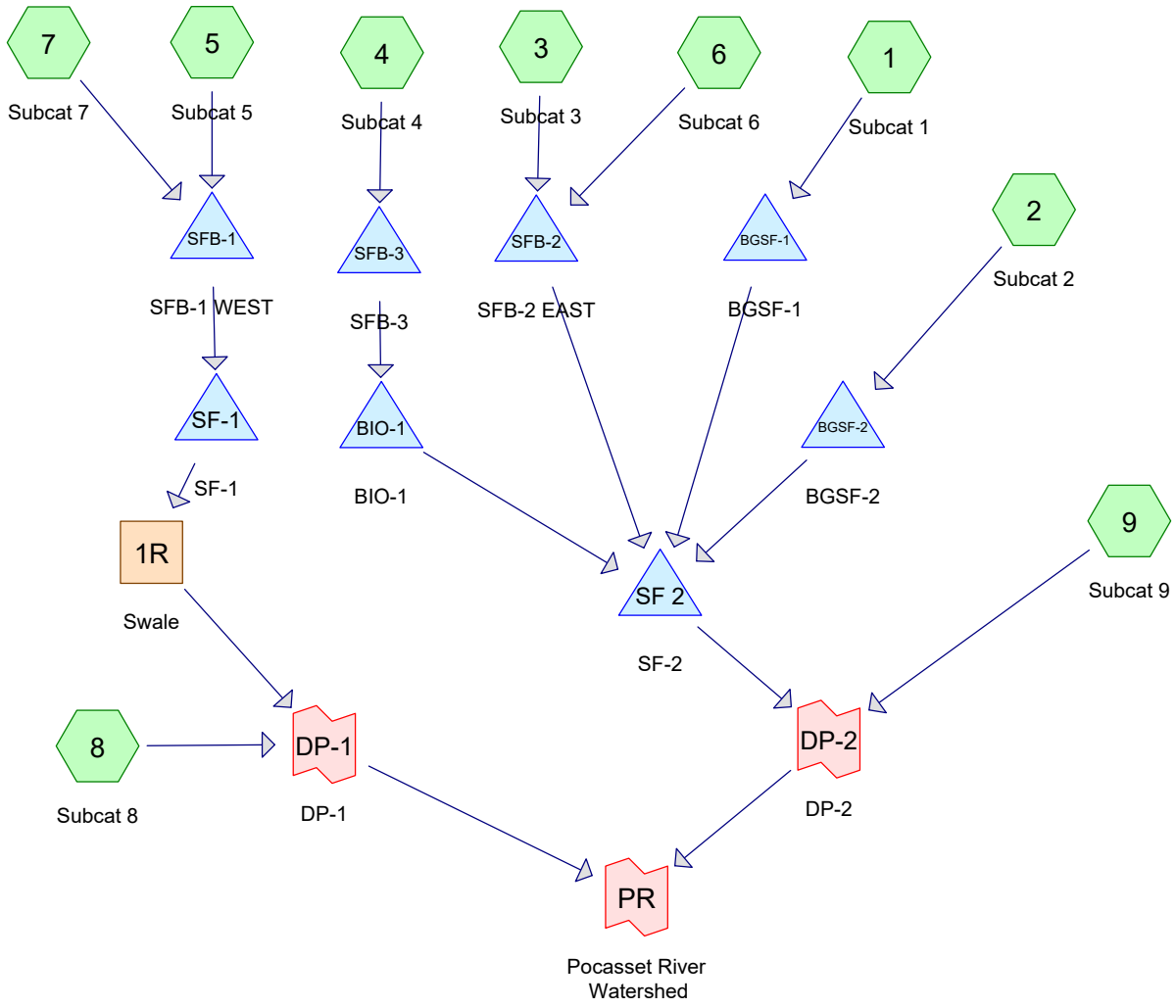
tf = Drain Downtime (2 days max) = 2 day(s)

Summary:

Area provided = 223 sf (> required 182 sf)

BMP volume provided = 467 cf (> required 228 cf)

Pretreatment and treatment have been designed per RISDISM



Subcat Reach Pond Link

Routing Diagram for PR Drainage - REV
Prepared by VHB, Inc, Printed 10/4/2023
HydroCAD® 10.20-3c s/n 01038 © 2023 HydroCAD Software Solutions LLC

Summary for Pond BGSF-1: BGSF-1

Inflow Area = 5,481 sf,100.00% Impervious, Inflow Depth = 0.99" for WQ STORM event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 450 cf
Outflow = 0.02 cfs @ 11.70 hrs, Volume= 450 cf, Atten= 85%, Lag= 0.0 min
Discarded = 0.02 cfs @ 11.70 hrs, Volume= 450 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 377.37' @ 12.59 hrs Surf.Area= 364 sf Storage= 135 cf

Plug-Flow detention time= 42.0 min calculated for 450 cf (100% of inflow)
Center-of-Mass det. time= 42.2 min (824.2 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	376.25'	433 cf	**14.83'W x 24.56'L x 4.08'H Field A** 1,488 cf Overall - 177 cf Embedded = 1,311 cf x 33.0% Voids
#2A	378.50'	177 cf	**ADS_StormTech SC-310 +Cap** x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
		609 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	376.25'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	380.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	376.80'	**12.0" Round Culvert** L= 60.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 376.80' / 376.10' S= 0.0116 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.02 cfs @ 11.70 hrs HW=376.29' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=376.25' (Free Discharge)
3=Culvert (Controls 0.00 cfs)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Stage-Area-Storage for Pond BGSF-1: BGSF-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
376.25	**364**	0
376.30	364	6
376.35	364	12
376.40	364	18
376.45	364	24
376.50	364	30
376.55	364	36
376.60	364	42
376.65	364	48
376.70	364	54
376.75	364	60
376.80	364	66
376.85	364	72
376.90	364	78
376.95	364	84
377.00	364	90
377.05	364	96
377.10	364	102
377.15	364	108
377.20	364	114
377.25	364	120
377.30	364	126
377.35	364	132
377.40	364	138
377.45	364	144
377.50	364	150
377.55	364	156
377.60	364	162
377.65	364	168
377.70	364	174
377.75	364	180
377.80	364	186
377.85	364	192
377.90	364	198
377.95	364	204
378.00	364	210
378.05	364	216
378.10	364	222
378.15	364	228
378.20	364	234
378.25	364	240
378.30	364	246
378.35	364	252
378.40	364	258
378.45	364	264
378.50	364	270
378.55	364	283
378.60	364	296
378.65	364	309
378.70	364	322
378.75	364	334
378.80	364	347
378.85	364	359
378.90	364	371
378.95	364	383
379.00	364	395
379.05	364	407
379.10	364	418
379.15	364	429
379.20	364	440
379.25	364	451
379.30	364	462
379.35	364	472
379.40	364	482
379.45	364	492
379.50	364	501
379.55	364	510
379.60	364	518
379.65	364	525
379.70	364	532
379.75	364	539
379.80	364	545
379.85	364	551
379.90	364	557
379.95	364	563
380.00	364	569
380.05	364	575
380.10	364	581
380.15	364	587
380.20	364	593
380.25	364	599
380.30	364	**605**

Summary for Pond BGSF-2: BGSF-2

Inflow Area = 46,623 sf,100.00% Impervious, Inflow Depth = 0.99" for WQ STORM event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 3,830 cf
Outflow = 0.24 cfs @ 11.80 hrs, Volume= 3,830 cf, Atten= 79%, Lag= 0.0 min
Discarded = 0.24 cfs @ 11.80 hrs, Volume= 3,830 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 375.66' @ 12.50 hrs Surf.Area= 4,377 sf Storage= 949 cf

Plug-Flow detention time= 23.2 min calculated for 3,826 cf (100% of inflow)
Center-of-Mass det. time= 23.2 min (805.2 - 782.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	375.00'	5,764 cf	**58.50'W x 74.82'L x 5.25'H Field A** 22,978 cf Overall - 5,513 cf Embedded = 17,465 cf x 33.0% Voids
#2A	377.25'	5,513 cf	**ADS_StormTech SC-740 +Cap** x 120 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 120 Chambers in 12 Rows
		11,276 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	375.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	379.06'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	375.35'	**12.0" Round Culvert** L= 165.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 375.35' / 373.75' S= 0.0097 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.24 cfs @ 11.80 hrs HW=375.06' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=375.00' (Free Discharge)
3=Culvert (Controls 0.00 cfs)
2=Sharp-Crested Rectangular Weir (Controls 0.00 cfs)

Stage-Area-Storage for Pond BGSF-2: BGSF-2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
375.00	**4,377**	0
375.10	4,377	144
375.20	4,377	289
375.30	4,377	433
375.40	4,377	578
375.50	4,377	722
375.60	4,377	867
375.70	4,377	1,011
375.80	4,377	1,155
375.90	4,377	1,300
376.00	4,377	1,444
376.10	4,377	1,589
376.20	4,377	1,733
376.30	4,377	1,878
376.40	4,377	2,022
376.50	4,377	2,167
376.60	4,377	2,311
376.70	4,377	2,455
376.80	4,377	2,600
376.90	4,377	2,744
377.00	4,377	2,889
377.10	4,377	3,033
377.20	4,377	3,178
377.30	4,377	3,428
377.40	4,377	3,785
377.50	4,377	4,140
377.60	4,377	4,492
377.70	4,377	4,841
377.80	4,377	5,187
377.90	4,377	5,530
378.00	4,377	5,868
378.10	4,377	6,203
378.20	4,377	6,533
378.30	4,377	6,858
378.40	4,377	7,178
378.50	4,377	7,492
378.60	4,377	7,800
378.70	4,377	8,101
378.80	4,377	8,395
378.90	4,377	8,681
379.00	4,377	8,957
379.10	4,377	9,223
379.20	4,377	9,478
379.30	4,377	9,720
379.40	4,377	9,946
379.50	4,377	10,148
379.60	4,377	10,323
379.70	4,377	10,480
379.80	4,377	10,626
379.90	4,377	10,771
380.00	4,377	10,915
380.10	4,377	11,060
380.20	4,377	**11,204**

Summary for Pond SFB-3: SFB-3

Inflow Area = 6,946 sf, 78.49% Impervious, Inflow Depth = 0.78" for WQ STORM event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 454 cf
Outflow = 0.02 cfs @ 12.67 hrs, Volume= 162 cf, Atten= 85%, Lag= 35.0 min
Primary = 0.02 cfs @ 12.67 hrs, Volume= 162 cf
Routed to Pond BIO-1 : BIO-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 381.50' @ 12.65 hrs Surf.Area= 292 sf Storage= 292 cf

Plug-Flow detention time= 322.5 min calculated for 162 cf (36% of inflow)
Center-of-Mass det. time= 182.0 min (967.2 - 785.1)

Volume	Invert	Avail.Storage	Storage Description
#1	380.00'	456 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
380.00	108	41.7	0	0	108
381.00	224	57.6	163	163	243
382.00	368	75.5	293	456	444

Device	Routing	Invert	Outlet Devices
#1	Primary	381.50'	**18.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 12.67 hrs HW=381.50' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.15 fps)

Stage-Area-Storage for Pond SFB-3: SFB-3

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
380.00	108	0
380.02	110	2
380.04	112	4
380.06	114	7
380.08	116	9
380.10	118	11
380.12	120	14
380.14	122	16
380.16	124	19
380.18	126	21
380.20	128	24
380.22	130	26
380.24	132	29
380.26	134	31
380.28	136	34
380.30	138	37
380.32	141	40
380.34	143	42
380.36	145	45
380.38	147	48
380.40	149	51
380.42	152	54
380.44	154	57
380.46	156	60
380.48	158	64
380.50	161	67
380.52	163	70
380.54	165	73
380.56	168	77
380.58	170	80
380.60	173	83
380.62	175	87
380.64	177	90
380.66	180	94
380.68	182	98
380.70	185	101
380.72	187	105
380.74	190	109
380.76	192	113
380.78	195	116
380.80	197	120
380.82	200	124
380.84	203	128
380.86	205	132
380.88	208	137
380.90	211	141
380.92	213	145
380.94	216	149
380.96	219	154
380.98	221	158
381.00	224	163
381.02	227	167
381.04	229	172
381.06	232	176
381.08	234	181
381.10	237	186
381.12	239	190
381.14	242	195
381.16	245	200
381.18	247	205
381.20	250	210
381.22	253	215
381.24	255	220
381.26	258	225
381.28	261	230
381.30	263	236
381.32	266	241
381.34	269	246
381.36	272	252
381.38	275	257
381.40	277	263
381.42	280	268
381.44	283	274
381.46	286	279
381.48	289	285
381.50	292	291
381.52	294	297
381.54	297	303
381.56	300	309
381.58	303	315
381.60	306	321
381.62	309	327
381.64	312	333
381.66	315	340
381.68	318	346
381.70	321	352
381.72	324	359
381.74	327	365
381.76	330	372
381.78	333	378
381.80	336	385
381.82	339	392
381.84	343	399
381.86	346	406
381.88	349	413
381.90	352	420
381.92	355	427
381.94	358	434
381.96	362	441
381.98	365	448
382.00	**368**	**456**

Summary for Pond BIO-1: BIO-1

Inflow Area = 6,946 sf, 78.49% Impervious, Inflow Depth = 0.28" for WQ STORM event
Inflow = 0.02 cfs @ 12.67 hrs, Volume= 162 cf
Outflow = 0.00 cfs @ 12.65 hrs, Volume= 162 cf, Atten= 87%, Lag= 0.0 min
Primary = 0.00 cfs @ 12.65 hrs, Volume= 162 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 378.96' @ 17.97 hrs Surf.Area= 223 sf Storage= 71 cf

Plug-Flow detention time= 314.5 min calculated for 162 cf (100% of inflow)
Center-of-Mass det. time= 314.6 min (1,281.8 - 967.2)

Volume	Invert	Avail.Storage	Storage Description
#1	377.99'	1,000 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
377.99	223	69.8	0.0	0	0	223
378.00	223	69.8	33.0	1	1	224
379.99	223	69.8	33.0	146	147	363
380.00	223	69.8	100.0	2	149	363
381.00	422	87.8	100.0	317	467	602
382.00	653	103.2	100.0	533	1,000	855

Device	Routing	Invert	Outlet Devices
#1	Device 2	381.00'	**5.5" x 5.5" Horiz. Landscape Drain** C= 0.600 Limited to weir flow at low heads
#2	Primary	376.80'	**8.0" Round Culvert** L= 61.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 376.80' / 374.78' S= 0.0330 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Device 4	377.99'	**0.500 in/hr Exfiltration over Surface area**
#4	Device 2	377.03'	**4.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 377.03' / 376.90' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.00 cfs @ 12.65 hrs HW=378.01' (Free Discharge)
- **2=Culvert** (Passes 0.00 cfs of 1.57 cfs potential flow)
  - **1=Landscape Drain** (Controls 0.00 cfs)
  - **4=Culvert** (Passes 0.00 cfs of 0.33 cfs potential flow)
    - **3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Stage-Area-Storage for Pond BIO-1: BIO-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
377.99	223	0
378.04	223	4
378.09	223	7
378.14	223	11
378.19	223	15
378.24	223	18
378.29	223	22
378.34	223	26
378.39	223	29
378.44	223	33
378.49	223	37
378.54	223	40
378.59	223	44
378.64	223	48
378.69	223	52
378.74	223	55
378.79	223	59
378.84	223	63
378.89	223	66
378.94	223	70
378.99	223	74
379.04	223	77
379.09	223	81
379.14	223	85
379.19	223	88
379.24	223	92
379.29	223	96
379.34	223	99
379.39	223	103
379.44	223	107
379.49	223	110
379.54	223	114
379.59	223	118
379.64	223	121
379.69	223	125
379.74	223	129
379.79	223	132
379.84	223	136
379.89	223	140
379.94	223	144
379.99	223	147
380.04	230	158
380.09	238	170
380.14	247	182
380.19	256	195
380.24	265	208
380.29	274	221
380.34	284	235
380.39	293	250
380.44	303	265
380.49	313	280
380.54	323	296
380.59	333	312
380.64	343	329
380.69	354	347
380.74	364	365
380.79	375	383
380.84	386	402
380.89	397	422
380.94	408	442
380.99	420	462
381.04	430	484
381.09	441	505
381.14	451	528
381.19	462	551
381.24	473	574
381.29	484	598
381.34	495	622
381.39	506	647
381.44	517	673
381.49	529	699
381.54	541	726
381.59	552	753
381.64	564	781
381.69	576	810
381.74	588	839
381.79	600	868
381.84	613	899
381.89	625	930
381.94	638	961
381.99	**650**	**993**

Summary for Pond SFB-1: SFB-1 WEST

Inflow Area = 113,642 sf, 43.79% Impervious, Inflow Depth = 0.61" for WQ STORM event
Inflow = 1.57 cfs @ 12.10 hrs, Volume= 5,821 cf
Outflow = 0.76 cfs @ 12.34 hrs, Volume= 3,304 cf, Atten= 52%, Lag= 14.3 min
Primary = 0.76 cfs @ 12.34 hrs, Volume= 3,304 cf
Routed to Pond SF-1 : SF-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 375.04' @ 12.34 hrs Surf.Area= 2,971 sf Storage= 2,643 cf

Plug-Flow detention time= 220.4 min calculated for 3,300 cf (57% of inflow)
Center-of-Mass det. time= 104.2 min (914.4 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	3,961 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
373.00	152	196.0	0	0	152
374.00	1,100	420.0	554	554	11,137
375.00	2,989	637.0	1,967	2,521	29,397
375.50	2,771	506.0	1,440	3,961	41,316

Device	Routing	Invert	Outlet Devices
#1	Primary	375.00'	**36.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Primary OutFlow Max=0.73 cfs @ 12.34 hrs HW=375.04' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.73 cfs @ 0.50 fps)

Stage-Area-Storage for Pond SFB-1: SFB-1 WEST

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
373.00	152	0
373.05	179	8
373.10	208	18
373.15	239	29
373.20	272	42
373.25	308	56
373.30	345	73
373.35	385	91
373.40	427	111
373.45	471	134
373.50	517	158
373.55	566	185
373.60	617	215
373.65	669	247
373.70	724	282
373.75	782	320
373.80	841	360
373.85	902	404
373.90	966	450
373.95	1,032	500
374.00	1,100	554
374.05	1,172	610
374.10	1,247	671
374.15	1,324	735
374.20	1,404	803
374.25	1,486	876
374.30	1,570	952
374.35	1,656	1,033
374.40	1,745	1,118
374.45	1,836	1,207
374.50	1,929	1,301
374.55	2,024	1,400
374.60	2,122	1,504
374.65	2,223	1,612
374.70	2,325	1,726
374.75	2,430	1,845
374.80	2,537	1,969
374.85	2,647	2,099
374.90	2,758	2,234
374.95	2,873	2,375
375.00	**2,989**	2,521
375.05	2,967	2,670
375.10	2,945	2,818
375.15	2,923	2,964
375.20	2,901	3,110
375.25	2,879	3,255
375.30	2,857	3,398
375.35	2,836	3,540
375.40	2,814	3,681
375.45	2,792	3,822
375.50	2,771	**3,961**

Summary for Pond SF-1: SF-1

Inflow Area = 113,642 sf, 43.79% Impervious, Inflow Depth = 0.35" for WQ STORM event
Inflow = 0.76 cfs @ 12.34 hrs, Volume= 3,304 cf
Outflow = 0.11 cfs @ 12.25 hrs, Volume= 3,305 cf, Atten= 85%, Lag= 0.0 min
Discarded = 0.11 cfs @ 12.25 hrs, Volume= 3,305 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Reach 1R : Swale

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 373.10' @ 14.18 hrs Surf.Area= 4,693 sf Storage= 940 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 82.0 min (996.4 - 914.4)

Volume	Invert	Avail.Storage	Storage Description
#1	372.49'	15,527 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
372.49	4,693	605.0	0.0	0	0	4,693
372.50	4,693	605.0	33.0	15	15	4,699
373.99	4,693	605.0	33.0	2,308	2,323	5,601
374.00	4,693	605.0	100.0	47	2,370	5,607
375.00	6,574	629.0	100.0	5,607	7,977	8,043
376.00	8,569	657.0	100.0	7,550	15,527	10,979

Device	Routing	Invert	Outlet Devices
#1	Discarded	372.49'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	375.20'	**36.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	374.26'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.11 cfs @ 12.25 hrs HW=372.50' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=372.49' (Free Discharge)
├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Stage-Area-Storage for Pond SF-1: SF-1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
372.49	4,693	0
372.54	4,693	77
372.59	4,693	155
372.64	4,693	232
372.69	4,693	310
372.74	4,693	387
372.79	4,693	465
372.84	4,693	542
372.89	4,693	619
372.94	4,693	697
372.99	4,693	774
373.04	4,693	852
373.09	4,693	929
373.14	4,693	1,007
373.19	4,693	1,084
373.24	4,693	1,162
373.29	4,693	1,239
373.34	4,693	1,316
373.39	4,693	1,394
373.44	4,693	1,471
373.49	4,693	1,549
373.54	4,693	1,626
373.59	4,693	1,704
373.64	4,693	1,781
373.69	4,693	1,858
373.74	4,693	1,936
373.79	4,693	2,013
373.84	4,693	2,091
373.89	4,693	2,168
373.94	4,693	2,246
373.99	4,693	2,323
374.04	4,762	2,559
374.09	4,849	2,799
374.14	4,937	3,044
374.19	5,026	3,293
374.24	5,116	3,547
374.29	5,206	3,805
374.34	5,297	4,067
374.39	5,389	4,334
374.44	5,482	4,606
374.49	5,575	4,883
374.54	5,669	5,164
374.59	5,765	5,450
374.64	5,860	5,740
374.69	5,957	6,036
374.74	6,055	6,336
374.79	6,153	6,641
374.84	6,252	6,951
374.89	6,352	7,266
374.94	6,452	7,586
374.99	6,554	7,911
375.04	6,649	8,242
375.09	6,743	8,576
375.14	6,837	8,916
375.19	6,933	9,260
375.24	7,029	9,609
375.29	7,125	9,963
375.34	7,223	10,322
375.39	7,321	10,685
375.44	7,419	11,054
375.49	7,519	11,427
375.54	7,619	11,806
375.59	7,719	12,189
375.64	7,820	12,578
375.69	7,922	12,971
375.74	8,025	13,370
375.79	8,128	13,774
375.84	8,232	14,183
375.89	8,337	14,597
375.94	8,442	15,016
375.99	**8,548**	**15,441**

Summary for Pond SFB-2: SFB-2 EAST

Inflow Area = 143,488 sf, 39.32% Impervious, Inflow Depth = 0.51" for WQ STORM event
Inflow = 1.73 cfs @ 12.09 hrs, Volume= 6,134 cf
Outflow = 0.93 cfs @ 12.27 hrs, Volume= 3,610 cf, Atten= 46%, Lag= 10.7 min
Primary = 0.93 cfs @ 12.27 hrs, Volume= 3,610 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 373.44' @ 12.25 hrs Surf.Area= 2,765 sf Storage= 2,642 cf

Plug-Flow detention time= 217.7 min calculated for 3,606 cf (59% of inflow)
Center-of-Mass det. time= 100.5 min (911.4 - 810.9)

Volume	Invert	Avail.Storage	Storage Description
#1	372.00'	4,399 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
372.00	967	395.0	0	0	967
373.00	2,205	428.0	1,544	1,544	3,167
374.00	3,559	461.0	2,855	4,399	5,544

Device	Routing	Invert	Outlet Devices
#1	Primary	373.40'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.85 cfs @ 12.27 hrs HW=373.44' (Free Discharge)
↑—**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.85 cfs @ 0.67 fps)

Stage-Area-Storage for Pond SFB-2: SFB-2 EAST

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
372.00	967	0	373.02	2,229	1,588
372.02	987	20	373.04	2,253	1,633
372.04	1,007	39	373.06	2,277	1,679
372.06	1,027	60	373.08	2,301	1,724
372.08	1,048	81	373.10	2,326	1,771
372.10	1,068	102	373.12	2,350	1,817
372.12	1,089	123	373.14	2,375	1,865
372.14	1,110	145	373.16	2,400	1,912
372.16	1,131	168	373.18	2,425	1,961
372.18	1,153	191	373.20	2,450	2,009
372.20	1,174	214	373.22	2,475	2,059
372.22	1,196	238	373.24	2,501	2,108
372.24	1,218	262	373.26	2,526	2,159
372.26	1,240	286	373.28	2,552	2,209
372.28	1,263	311	373.30	2,577	2,261
372.30	1,286	337	373.32	2,603	2,313
372.32	1,308	363	373.34	2,629	2,365
372.34	1,331	389	373.36	2,655	2,418
372.36	1,355	416	373.38	2,682	2,471
372.38	1,378	443	373.40	2,708	2,525
372.40	1,402	471	373.42	2,734	2,579
372.42	1,426	499	373.44	2,761	2,634
372.44	1,450	528	373.46	2,788	2,690
372.46	1,474	557	373.48	2,815	2,746
372.48	1,498	587	373.50	2,842	2,802
372.50	1,523	617	373.52	2,869	2,859
372.52	1,548	648	373.54	2,896	2,917
372.54	1,573	679	373.56	2,923	2,975
372.56	1,598	711	373.58	2,951	3,034
372.58	1,624	743	373.60	2,979	3,093
372.60	1,649	776	373.62	3,006	3,153
372.62	1,675	809	373.64	3,034	3,214
372.64	1,701	843	373.66	3,062	3,275
372.66	1,728	877	373.68	3,091	3,336
372.68	1,754	912	373.70	3,119	3,398
372.70	1,781	947	373.72	3,147	3,461
372.72	1,808	983	373.74	3,176	3,524
372.74	1,835	1,020	373.76	3,205	3,588
372.76	1,862	1,057	373.78	3,233	3,652
372.78	1,889	1,094	373.80	3,262	3,717
372.80	1,917	1,132	373.82	3,291	3,783
372.82	1,945	1,171	373.84	3,321	3,849
372.84	1,973	1,210	373.86	3,350	3,916
372.86	2,001	1,250	373.88	3,379	3,983
372.88	2,030	1,290	373.90	3,409	4,051
372.90	2,059	1,331	373.92	3,439	4,119
372.92	2,087	1,372	373.94	3,469	4,188
372.94	2,117	1,414	373.96	3,499	4,258
372.96	2,146	1,457	373.98	3,529	4,328
372.98	2,175	1,500	374.00	**3,559**	**4,399**
373.00	2,205	1,544			

Summary for Pond SF 2: SF-2

Inflow Area = 202,538 sf, 56.27% Impervious, Inflow Depth > 1.09" for 1 Year event
Inflow = 5.78 cfs @ 12.10 hrs, Volume= 18,368 cf
Outflow = 0.26 cfs @ 15.51 hrs, Volume= 18,368 cf, Atten= 95%, Lag= 204.2 min
Discarded = 0.21 cfs @ 15.51 hrs, Volume= 17,990 cf
Primary = 0.05 cfs @ 15.51 hrs, Volume= 378 cf
Routed to Link DP-2 : DP-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.24' @ 15.51 hrs Surf.Area= 9,038 sf Storage= 10,838 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 525.2 min (1,384.7 - 859.5)

Volume	Invert	Avail.Storage	Storage Description
#1	365.99'	35,251 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
365.99	8,697	474.0	0.0	0	0	8,697
366.00	8,697	474.0	33.0	29	29	8,702
368.99	8,697	474.0	33.0	8,581	8,610	10,119
369.00	8,697	474.0	100.0	87	8,697	10,124
370.00	10,152	497.0	100.0	9,415	18,112	11,966
371.00	11,677	519.0	100.0	10,906	29,018	13,816
371.50	13,274	544.0	100.0	6,233	35,251	15,947

Device	Routing	Invert	Outlet Devices
#1	Discarded	365.99'	**1.020 in/hr Exfiltration over Surface area**
#2	Device 4	369.20'	**21.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	369.35'	**21.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Primary	367.50'	**18.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 367.50' / 367.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#5	Device 4	370.60'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.21 cfs @ 15.51 hrs HW=369.24' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.05 cfs @ 15.51 hrs HW=369.24' (Free Discharge)
└**4=Culvert** (Passes 0.05 cfs of 8.47 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 0.65 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Stage-Area-Storage for Pond SF 2: SF-2

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
365.99	8,697	0
366.09	8,697	287
366.19	8,697	574
366.29	8,697	861
366.39	8,697	1,148
366.49	8,697	1,435
366.59	8,697	1,722
366.69	8,697	2,009
366.79	8,697	2,296
366.89	8,697	2,583
366.99	8,697	2,870
367.09	8,697	3,157
367.19	8,697	3,444
367.29	8,697	3,731
367.39	8,697	4,018
367.49	8,697	4,305
367.59	8,697	4,592
367.69	8,697	4,879
367.79	8,697	5,166
367.89	8,697	5,453
367.99	8,697	5,740
368.09	8,697	6,027
368.19	8,697	6,314
368.29	8,697	6,601
368.39	8,697	6,888
368.49	8,697	7,175
368.59	8,697	7,462
368.69	8,697	7,749
368.79	8,697	8,036
368.89	8,697	8,323
368.99	8,697	8,610
369.09	8,823	9,485
369.19	8,965	10,375
369.29	9,107	11,278
369.39	9,251	12,196
369.49	9,396	13,129
369.59	9,542	14,076
369.69	9,689	15,037
369.79	9,837	16,013
369.89	9,986	17,005
369.99	10,137	18,011
370.09	10,285	19,032
370.19	10,434	20,068
370.29	10,583	21,119
370.39	10,734	22,184
370.49	10,886	23,265
370.59	11,039	24,362
370.69	11,193	25,473
370.79	11,348	26,600
370.89	11,504	27,743
370.99	11,661	28,901
371.09	11,789	30,074
371.19	11,913	31,259
371.29	12,038	32,456
371.39	12,164	33,666
371.49	12,291	34,889
371.59	12,418	36,125
371.69	12,546	37,373
371.79	12,674	38,634
371.89	12,803	39,908
371.99	**12,933**	**41,194**

Appendix D – Minimum Standard 4 – Conveyance and Natural Channel Protection Calculations

- Hydraulic Calculations
- Channel Protection – CPv

1 Cedar Street
Providence, RI 02903
P 401.272.8100

Storm Drainage Computations

Project	73375	**Project #**	Milton CAT
Calculated by	ED	**Date**	5/10/2023
Checked by	KC	**Date**	6/6/2023

Design Parameters:

Design Storm: 25 Year

k_e= 0.2

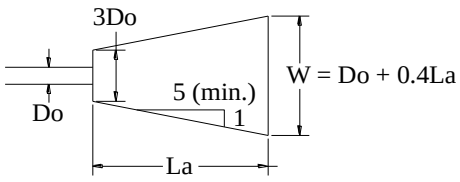
11

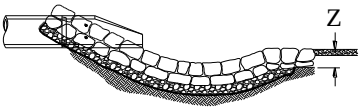
DESCRIPTION	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE						
	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft
PIPE RUN 1	CB111	OCS1	0.49	0.90	0.44	0.44	0.44	5.0	8.6	3.8	5.1	0.012	12	0.0100	3.9	4.9	135	1.35	381.7	378.2	376.9	378.2	3.5
	OCS1	CB113	0.00	0.00	0.00	0.44	0.18	5.4	8.4	3.7	5.5	0.012	12	0.0119	4.2	5.4	59	0.70	382.9	376.8	376.1	376.4	6.5
	CB113	CB114	0.13	0.90	0.12	0.56	0.17	5.2	8.5	4.8	5.6	0.012	15	0.0121	7.7	6.3	58	0.70	382.5	376.0	375.3	375.6	6.9
	CB114	DMH115	0.14	0.90	0.13	0.68	0.17	5.2	8.5	5.8	5.7	0.012	15	0.0105	7.2	5.9	57	0.60	382.5	375.2	374.6	374.8	7.7
	DMH115	DMH116	0.00	0.00	0.00	0.68	0.24	5.2	8.5	5.8	5.7	0.012	15	0.0105	7.2	5.8	81	0.85	382.6	374.5	373.7	374.1	8.5
	CB117	CB118	0.22	0.90	0.20	0.20	0.30	5.0	8.6	1.7	4.1	0.012	12	0.0108	4.0	5.1	74	0.80	381.9	378.4	377.6	378.2	3.7
	CB118	DMH116	0.18	0.90	0.16	0.36	0.42	5.3	8.4	3.0	4.8	0.012	12	0.0104	3.9	5.0	122	1.27	381.9	377.5	376.2	377.2	4.7
	CB119	DMH116	0.33	0.90	0.30	0.30	0.11	5.0	8.6	2.5	4.8	0.012	12	0.0125	4.3	5.5	32	0.40	381.5	378.0	377.6	377.7	3.8
	DMH116	FES2	0.00	0.00	0.00	1.34	0.31	5.8	8.2	11.0	6.8	0.012	18	0.0102	11.5	6.5	127	1.30	382.0	373.3	372.0	372.7	9.3
PIPE RUN 2	CB101	DMH103	0.25	0.90	0.23	0.23	0.08	5.0	8.6	1.9	4.5	0.012	12	0.0130	4.4	5.6	23	0.30	381.9	377.6	377.3	377.3	4.5
	CB102	DMH103	0.17	0.90	0.15	0.15	0.19	5.0	8.6	1.3	3.5	0.012	12	0.0087	3.6	4.6	40	0.35	381.9	377.7	377.3	377.5	4.4
	DMH103	DMH104	0.00	0.00	0.00	0.38	0.55	5.3	8.5	3.2	4.9	0.012	12	0.0105	4.0	5.0	162	1.70	382.0	377.2	375.5	376.9	5.1
	DMH104	FES 5	0.00	0.00	0.00	0.53	0.29	5.5	8.3	4.4	6.1	0.012	12	0.0143	4.6	5.9	105	1.50	382.3	375.5	374.0	375.0	7.3
	CB105	DMH 104	0.17	0.90	0.15	0.15	0.08	5.3	8.5	1.3	4.6	0.012	12	0.0182	5.2	6.6	22	0.40	381.8	376.2	375.8	375.9	5.9
PIPE RUN 3	CB107	DMH108	0.04	0.90	0.04	0.04	0.49	5.0	8.6	0.3	2.3	0.012	12	0.0116	4.2	5.3	69	0.80	379.3	376.7	375.9	376.6	2.6
	CB109	DMH 108	0.58	0.90	0.52	0.52	0.04	5.0	8.6	4.5	6.3	0.012	12	0.0156	4.8	6.1	16	0.25	380.8	376.2	375.9	375.7	5.2
	DMH108	FES 4	0.00	0.00	0.00	0.56	0.48	5.5	8.3	4.7	6.3	0.012	12	0.0154	4.8	6.1	182	2.80	380.7	375.8	373.0	375.3	5.4
PIPE RUN 4	YD 121	DMH 100	0.00	0.00	0.00	0.00	0.21	5.0	8.6	0.6	4.8	0.012	8	0.0331	2.4	6.8	61	2.02	381.0	376.8	374.8	376.5	4.5
	DMH100	FES 3	0.00	0.00	0.00	0.00	0.21	5.2	8.5	0.6	3.9	0.012	12	0.0322	6.3	8.0	143	4.60	382.0	373.6	369.0	373.4	8.6

Outfall Riprap Sizing and Velocity Calculations

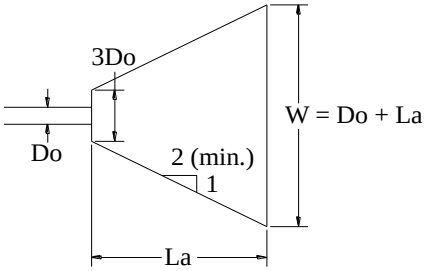
Project	Milton CAT	**Project #**	73375
Calculated by	kc	**Date**	6/7/2023
Checked by		**Date**	

Tw ≥ 0.5Do





Tw < 0.5Do



OUTLET DESCRIPTION:		**FES-1**	**FES-2**	**FES-3**	**FES-4**	**FES-5**
Design Storm	(yr)	25	25	25	25	25
Flow / Discharge (Q)	(cfs)	7.8	11.0	0.6	4.7	4.4
Defined Channel ?	-	NO	YES	NO	YES	YES
Defined Channel Width	(ft)	0	5.3	0	4	4
Outlet Pipe Diameter (D_O)	(in)	18	18	12	12	12
Tailwater Condition (T_W)	(ft)	TW < 0.5D	TW ≥ 0.5D	TW ≥ 0.5D	TW ≥ 0.5D	TW ≥ 0.5D
Apron Length (L_A)	(ft)	14	10	6	6	6
Apron Width at Outlet ($3D_O$)	(ft)	4.5	5.3	3	4	4
Apron Width at End (W)	(ft)	15.5	5.3	3.4	4	4
Median Stone Diameter (d_{50})	(in)	6	12	6	6	6
Largest Stone Diameter	(in)	9	18	9	9	9
Apron Depth (Z)	(in)	13.5	27	13.5	13.5	13.5

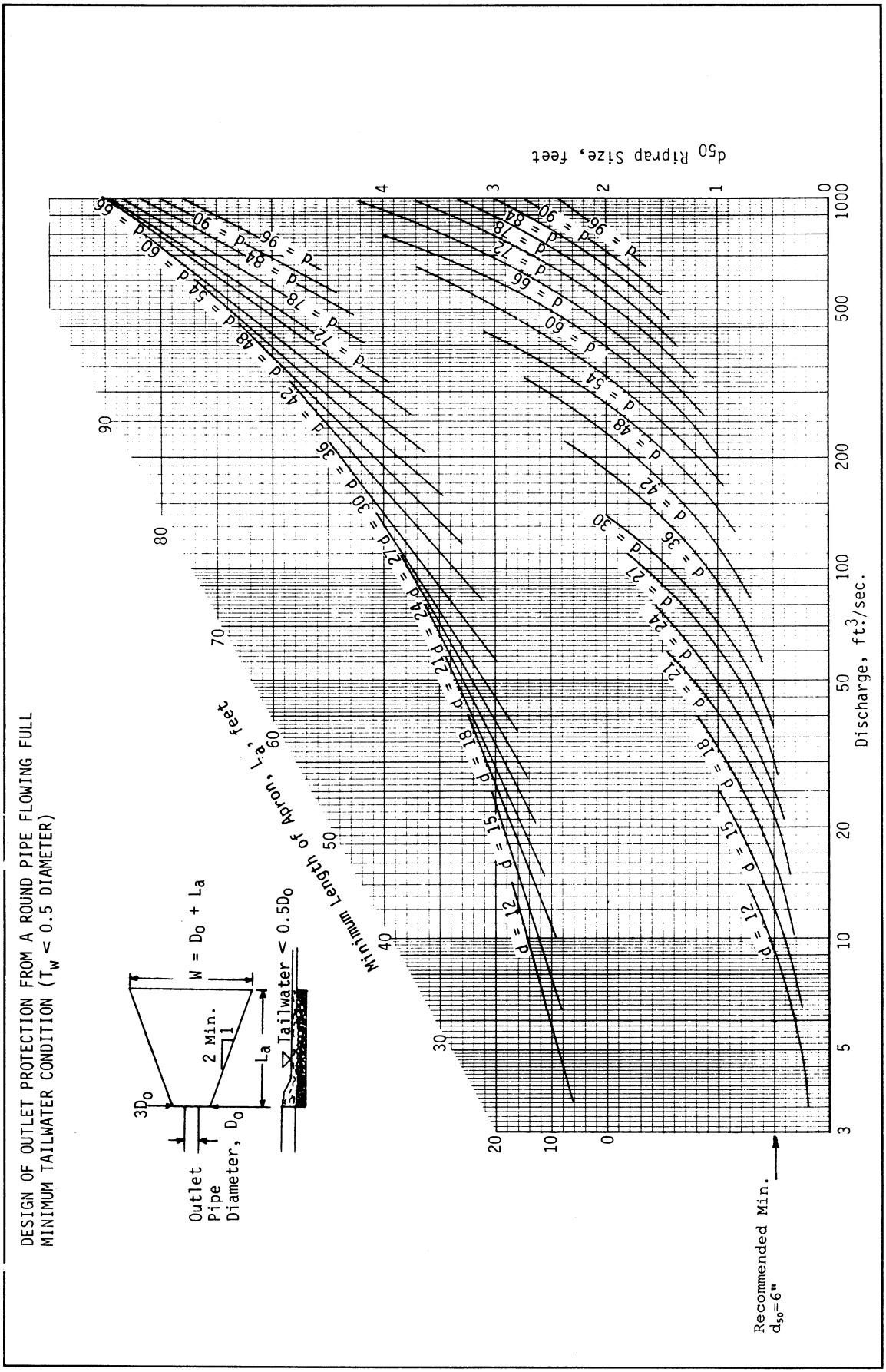
Apron Length (L_A):
Length = From Virginia DCR Handbook - Plate 3.18-3 *if T_W < 0.5D*
Length = From Virginia DCR Handbook - Plate 3.18-4 *if T_W ≥ 0.5D*

Apron Width at Outlet ($3D_O$):
Width = 3 x pipe dia. (or width of channel)

Apron Width at End (W):
Width = dia. + apron length *if T_W < 0.5D*
Width = dia. + 0.4 x apron length *if T_W ≥ 0.5D*
or apron width = channel width if a well defined channel exists

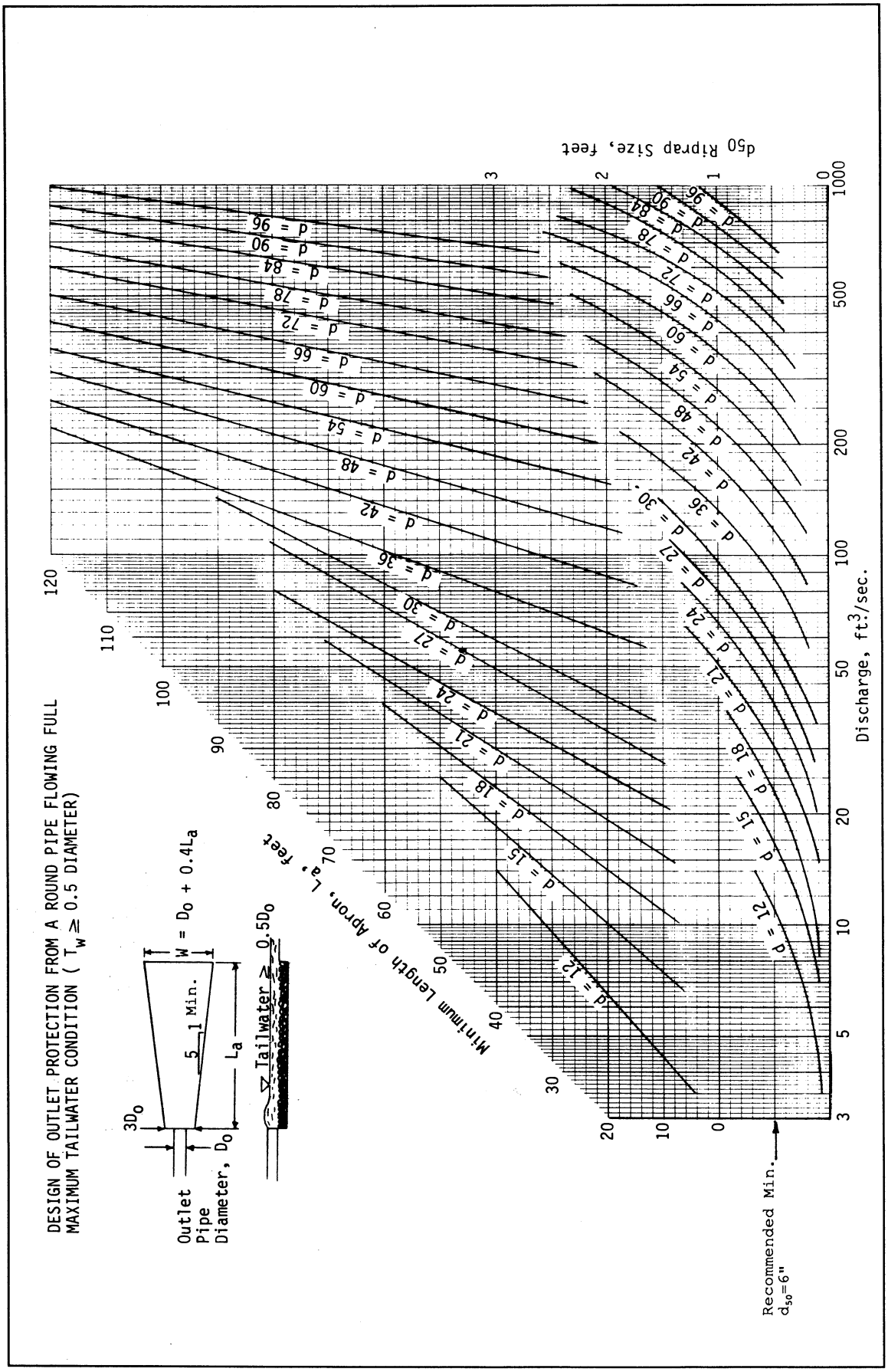
Rock Riprap:
Median Diameter (d_{50}) = From Virginia DCR Handbook - Plate 3.18-3 or 4
Largest stone dia = 1.5 x d_{50}

Apron Depth (Z):
6" or 1.5 x largest stone dia



Source: USDA-SCS

Plate 3.18-3



Source: USDA-SCS

Plate 3.18-4

Swale Velocity

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: Swale Avg. Flow Depth=0.05' Max Vel=0.73 fps Inflow=0.09 cfs 3,613 cf
n=0.035 L=114.0' S=0.0263 '/' Capacity=59.21 cfs Outflow=0.09 cfs 3,613 cf

Swale Capacity

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Reach 1R: Swale Avg. Flow Depth=0.42' Max Vel=2.87 fps Inflow=8.77 cfs 20,506 cf
n=0.035 L=114.0' S=0.0263 '/' Capacity=59.21 cfs Outflow=8.30 cfs 20,506 cf

Channel Protection – CPv

Project Milton CAT
Location CRANSTON, RI
Calculated by KC
Checked by GB
Title CPv

Project # 73375.0
Sheet 1 of 1
Date 9/26/2023 REV 10/30/2023
Date 10.30.23

vhb Computations

DP 1 Runoff Vol. from 1 year storm 12,780 CF

$V_S = CP_V = .65 \times 12,780 = 8,307$ CF

$Q_{CPV} = 8,307 / 24(3600) = 0.09$ cfs

THE V_S RISES TO ELEV 375.67 in SF-1

$375.67 - 374.0 = 1.67$

$0.09 \text{ CFS} = .6(A)(64.4 \times 1.67)^{.5}$

$0.09 \text{ CFS} = 6.22(A)$

$A = .014 = \pi D^2/4 = 0.13 \text{ (12"/FT)} =$

$D = 2"$

DP 2 Runoff VOL. from 1 year STORM 1,042 CF

$V_S = CP_V = .65 \times 1,042 = 677$ CF

$Q_{CPV} = 677 / 24(3600) = 0.008$ CFS

THE V_S RISES TO ELEV 366.23 IN SF 2

THIS ELEV IS WITHIN THE SAND LAYER THAT INFILTRATES

CPv INFILTRATES

Summary for Pond SF 2: SF-2

Inflow Area = 202,538 sf, 56.27% Impervious, Inflow Depth > 1.09" for 1 Year event
Inflow = 5.78 cfs @ 12.10 hrs, Volume= 18,368 cf
Outflow = 0.26 cfs @ 15.48 hrs, Volume= 18,367 cf, Atten= 95%, Lag= 202.3 min
Discarded = 0.21 cfs @ 15.48 hrs, Volume= 17,993 cf
Primary = 0.05 cfs @ 15.48 hrs, Volume= 374 cf
Routed to Link DP-2 : DP-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.24' @ 15.48 hrs Surf.Area= 9,038 sf Storage= 10,838 cf

Plug-Flow detention time= 526.1 min calculated for 18,348 cf (100% of inflow)
Center-of-Mass det. time= 525.4 min (1,384.9 - 859.5)

Volume	Invert	Avail.Storage	Storage Description
#1	365.99'	41,324 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
365.99	8,697	474.0	0.0	0	0	8,697
366.00	8,697	474.0	33.0	29	29	8,702
368.99	8,697	474.0	33.0	8,581	8,610	10,119
369.00	8,697	474.0	100.0	87	8,697	10,124
370.00	10,152	497.0	100.0	9,415	18,112	11,966
371.00	11,677	519.0	100.0	10,906	29,018	13,816
371.50	12,946	534.0	100.0	12,306	41,324	15,179

Device	Routing	Invert	Outlet Devices
#1	Discarded	365.99'	**1.020 in/hr Exfiltration over Surface area**
#2	Device 4	369.20'	**21.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	369.35'	**21.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Primary	367.50'	**18.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 367.50' / 367.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#5	Device 4	370.60'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.21 cfs @ 15.48 hrs HW=369.24' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.05 cfs @ 15.48 hrs HW=369.24' (Free Discharge)
└**4=Culvert** (Passes 0.05 cfs of 8.47 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 0.65 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Hydrograph for Pond SF 2: SF-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	365.99	0.00	0.00	0.00
1.00	0.00	0	365.99	0.00	0.00	0.00
2.00	0.00	0	365.99	0.00	0.00	0.00
3.00	0.00	0	365.99	0.00	0.00	0.00
4.00	0.00	0	365.99	0.00	0.00	0.00
5.00	0.00	0	365.99	0.00	0.00	0.00
6.00	0.00	0	365.99	0.00	0.00	0.00
7.00	0.00	0	365.99	0.00	0.00	0.00
8.00	0.00	0	365.99	0.00	0.00	0.00
9.00	0.00	0	365.99	0.00	0.00	0.00
10.00	0.00	0	365.99	0.00	0.00	0.00
11.00	0.00	0	365.99	0.00	0.00	0.00
12.00	**3.28**	2,342	366.81	0.21	0.21	0.00
13.00	**0.64**	9,378	369.08	0.21	0.21	0.00
14.00	0.40	10,392	369.19	0.21	0.21	0.00
15.00	0.30	**10,799**	**369.24**	**0.25**	**0.21**	**0.04**
16.00	0.22	**10,801**	**369.24**	**0.25**	**0.21**	**0.04**
17.00	0.17	10,618	369.22	0.23	0.21	0.02
18.00	0.13	10,380	369.19	0.21	0.21	0.00
19.00	0.12	10,064	369.16	0.21	0.21	0.00
20.00	0.11	9,710	369.12	0.21	0.21	0.00
21.00	0.10	9,323	369.07	0.21	0.21	0.00
22.00	0.09	8,910	369.02	0.21	0.21	0.00
23.00	0.08	8,473	368.94	0.21	0.21	0.00
24.00	0.07	8,006	368.78	0.21	0.21	0.00
25.00	0.00	7,319	368.54	0.21	0.21	0.00
26.00	0.00	6,596	368.29	0.21	0.21	0.00
27.00	0.00	5,873	368.04	0.21	0.21	0.00
28.00	0.00	5,150	367.78	0.21	0.21	0.00
29.00	0.00	4,427	367.53	0.21	0.21	0.00
30.00	0.00	3,703	367.28	0.21	0.21	0.00
31.00	0.00	2,978	367.03	0.21	0.21	0.00
32.00	0.00	2,254	366.78	0.21	0.21	0.00
33.00	0.00	1,529	366.52	0.21	0.21	0.00
34.00	0.00	803	366.27	0.21	0.21	0.00
35.00	0.00	77	366.02	0.21	0.21	0.00
36.00	0.00	1	365.99	0.00	0.00	0.00
37.00	0.00	0	365.99	0.00	0.00	0.00
38.00	0.00	0	365.99	0.00	0.00	0.00
39.00	0.00	0	365.99	0.00	0.00	0.00
40.00	0.00	0	365.99	0.00	0.00	0.00
41.00	0.00	0	365.99	0.00	0.00	0.00
42.00	0.00	0	365.99	0.00	0.00	0.00
43.00	0.00	0	365.99	0.00	0.00	0.00
44.00	0.00	0	365.99	0.00	0.00	0.00
45.00	0.00	0	365.99	0.00	0.00	0.00
46.00	0.00	0	365.99	0.00	0.00	0.00
47.00	0.00	0	365.99	0.00	0.00	0.00
48.00	0.00	0	365.99	0.00	0.00	0.00

Summary for Pond SF-1: SF-1

Inflow Area = 113,642 sf, 43.79% Impervious, Inflow Depth = 1.63" for 1 Year event
Inflow = 4.65 cfs @ 12.12 hrs, Volume= 15,436 cf
Outflow = 0.26 cfs @ 14.90 hrs, Volume= 15,436 cf, Atten= 94%, Lag= 166.7 min
Discarded = 0.16 cfs @ 14.90 hrs, Volume= 11,823 cf
Primary = 0.09 cfs @ 14.90 hrs, Volume= 3,613 cf
Routed to Reach 1R : Swale

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 375.16' @ 14.90 hrs Surf.Area= 6,873 sf Storage= 9,045 cf

Plug-Flow detention time= 464.8 min calculated for 15,436 cf (100% of inflow)
Center-of-Mass det. time= 464.5 min (1,298.3 - 833.8)

Volume	Invert	Avail.Storage	Storage Description
#1	372.49'	15,527 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
372.49	4,693	605.0	0.0	0	0	4,693
372.50	4,693	605.0	33.0	15	15	4,699
373.99	4,693	605.0	33.0	2,308	2,323	5,601
374.00	4,693	605.0	100.0	47	2,370	5,607
375.00	6,574	629.0	100.0	5,607	7,977	8,043
376.00	8,569	657.0	100.0	7,550	15,527	10,979

Device	Routing	Invert	Outlet Devices
#1	Discarded	372.49'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	375.20'	**36.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	374.26'	**2.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.16 cfs @ 14.90 hrs HW=375.16' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.16 cfs)

Primary OutFlow Max=0.09 cfs @ 14.90 hrs HW=375.16' (Free Discharge)
├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 0.09 cfs @ 4.35 fps)

Hydrograph for Pond SF-1: SF-1

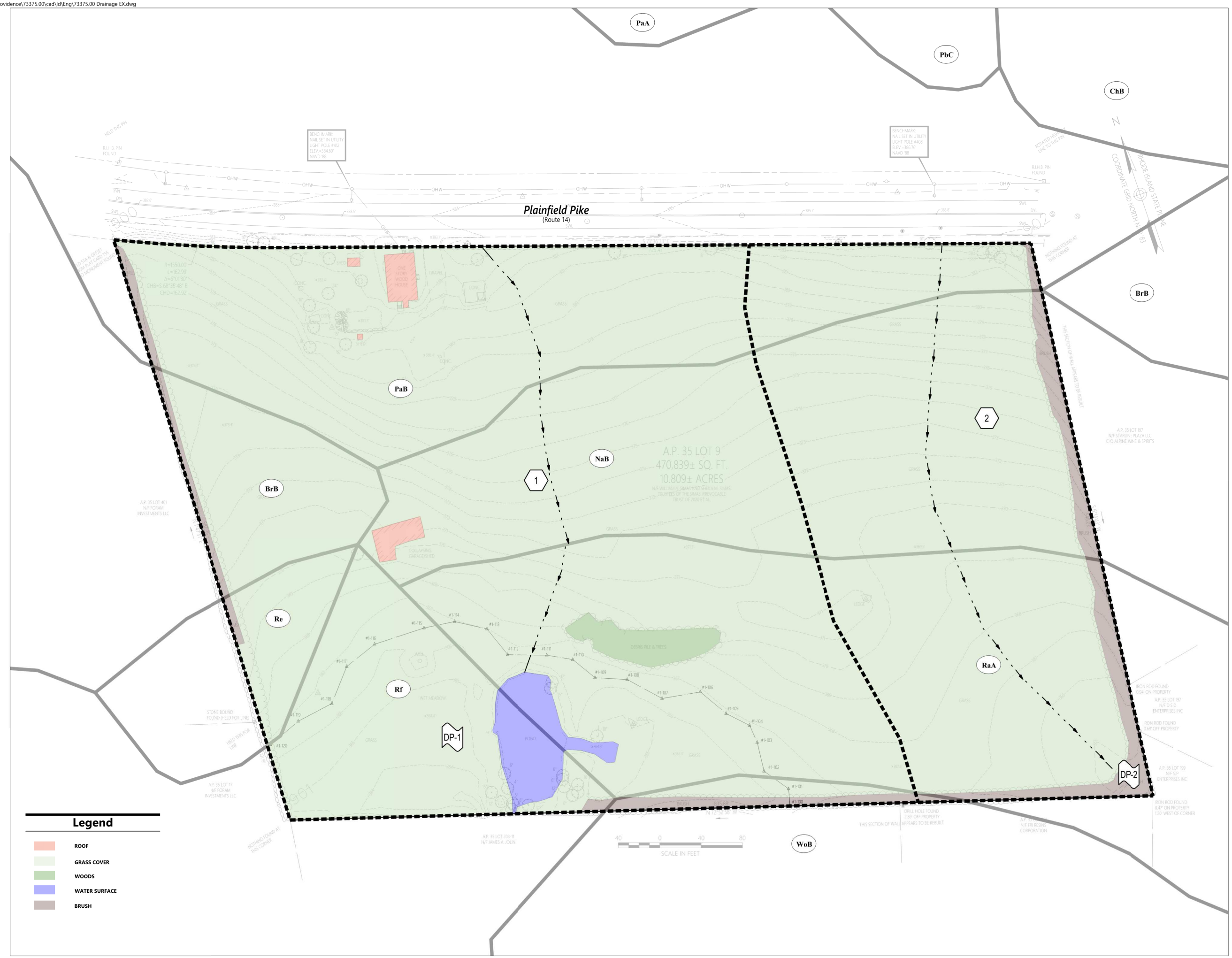
Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	372.49	0.00	0.00	0.00
1.00	0.00	0	372.49	0.00	0.00	0.00
2.00	0.00	0	372.49	0.00	0.00	0.00
3.00	0.00	0	372.49	0.00	0.00	0.00
4.00	0.00	0	372.49	0.00	0.00	0.00
5.00	0.00	0	372.49	0.00	0.00	0.00
6.00	0.00	0	372.49	0.00	0.00	0.00
7.00	0.00	0	372.49	0.00	0.00	0.00
8.00	0.00	0	372.49	0.00	0.00	0.00
9.00	0.00	0	372.49	0.00	0.00	0.00
10.00	0.00	0	372.49	0.00	0.00	0.00
11.00	0.00	0	372.49	0.00	0.00	0.00
12.00	**2.60**	2,103	373.85	0.11	0.11	0.00
13.00	**0.54**	8,369	375.06	0.25	0.16	0.09
14.00	0.33	**8,935**	**375.14**	**0.26**	**0.16**	**0.09**
15.00	0.25	**9,043**	**375.16**	**0.26**	**0.16**	**0.09**
16.00	0.18	8,893	375.14	0.25	0.16	0.09
17.00	0.14	8,547	375.09	0.25	0.16	0.09
18.00	0.11	8,108	375.02	0.24	0.16	0.09
19.00	0.09	7,610	374.94	0.23	0.15	0.08
20.00	0.09	7,108	374.87	0.22	0.15	0.08
21.00	0.08	6,610	374.78	0.21	0.15	0.07
22.00	0.07	6,122	374.70	0.20	0.14	0.06
23.00	0.06	5,648	374.62	0.19	0.14	0.06
24.00	0.06	5,189	374.54	0.18	0.13	0.05
25.00	0.00	4,606	374.44	0.16	0.13	0.03
26.00	0.00	4,070	374.34	0.14	0.13	0.01
27.00	0.00	3,615	374.25	0.12	0.12	0.00
28.00	0.00	3,184	374.17	0.12	0.12	0.00
29.00	0.00	2,767	374.08	0.11	0.11	0.00
30.00	0.00	2,362	374.00	0.11	0.11	0.00
31.00	0.00	1,963	373.76	0.11	0.11	0.00
32.00	0.00	1,564	373.50	0.11	0.11	0.00
33.00	0.00	1,165	373.24	0.11	0.11	0.00
34.00	0.00	766	372.98	0.11	0.11	0.00
35.00	0.00	367	372.73	0.11	0.11	0.00
36.00	0.00	1	372.49	0.01	0.01	0.00
37.00	0.00	0	372.49	0.00	0.00	0.00
38.00	0.00	0	372.49	0.00	0.00	0.00
39.00	0.00	0	372.49	0.00	0.00	0.00
40.00	0.00	0	372.49	0.00	0.00	0.00
41.00	0.00	0	372.49	0.00	0.00	0.00
42.00	0.00	0	372.49	0.00	0.00	0.00
43.00	0.00	0	372.49	0.00	0.00	0.00
44.00	0.00	0	372.49	0.00	0.00	0.00
45.00	0.00	0	372.49	0.00	0.00	0.00
46.00	0.00	0	372.49	0.00	0.00	0.00
47.00	0.00	0	372.49	0.00	0.00	0.00
48.00	0.00	0	372.49	0.00	0.00	0.00

Appendix E – Minimum Standard 5 – Overbank Flood Protection – HydroCAD Calculations

- Existing Conditions - HydroCAD Model
  - 1-Year Storm Event
  - 10-Year Storm Event
  - 100-Year Storm Event
- Proposed Conditions – HydroCAD Model
  - 1-Year Storm Event
  - 10-Year Storm Event
  - 100-Year Storm Event

Existing Conditions – HydroCAD Model

\\vhb.com\gbl\proj\Providence\73375.00\cad\ld\Eng\73375.00 Drainage EX.dwg



Legend

- ROOF
- GRASS COVER
- WOODS
- WATER SURFACE
- BRUSH

vhb.com

vhb

1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

Legend

SYMBOLS

- X — DESIGN POINT
- X — DRAINAGE AREA DESIGNATION
- X — POND

LINETYPES

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPE BOUNDARY
- 100' BUFFER ZONE
- WETLAND BOUNDARY

SCS SOIL CLASSIFICATIONS

BrB	BROADBROOK SILT LOAM, 3 TO 8 PERCENT SLOPES, HSG C
ChB	CANTON AND CHARLTON FINE SANDY LOAMS, 0TO 8 PERCENT SLOPES, VERY STONY, HSG B
NaB	NARRAGANSETT SILT LOAM, 3 TO 8 PERCENT SLOPES, HSG B
PaA	PAXTON FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG C
PaB	PAXTON FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES, HSG C
PbC	PAXTON FINE SANDY LOAM, 8 TO 15 PERCENT SLOPES, VERY STONY, HSG C
RaA	RAINBOW SILT LOAM, 0 TO 3 PERCENT SLOPES, HSG C
Re	RIDGEBURY FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG D
Rf	RIDGEBURY, LEICESTER, AND WHITMAN SOILS, 0 TO 8 PERCENT SLOPES, EXTREMELY STONY, HSG D
WoB	WOODBRIDGE FINE SANDY LOAM, 0 TO 8 PERCENT SLOPES, VERY STONY, HSG C/D

0 20 40 80 Feet

Milton CAT

2110 Plainfield Pike
Cranston, Rhode Island

No.	Revision	Date	Appvd.
1	RIDEM Comments	10/05/2023	

Designed by: SAP
Checked by: SDL
Issued for: Permits
Date: April 1, 2023

Not Approved for Construction

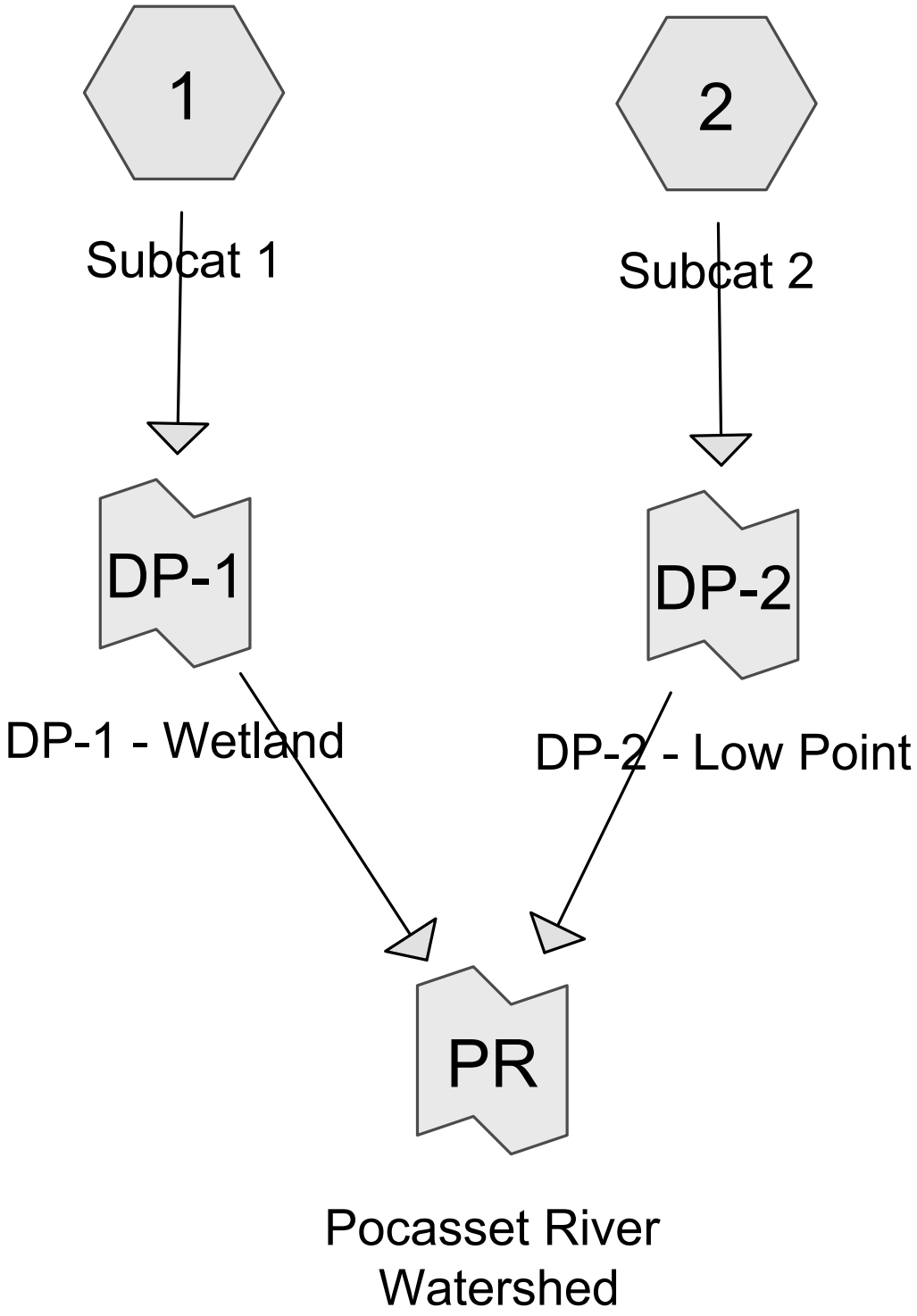
Drawing Title
Existing Drainage Conditions

Drawing Number
FIG-2

Sheet 1 of 2

Project Number
73375.00

Saved Monday, September 25, 2023 3:31:41 PM CMONTEIRO Plotted Thursday, October 5, 2023 8:57:39 AM Karen Crawford



Subcat Reach Pond Link

Routing Diagram for EX Drainage
Prepared by VHB, Printed 6/7/2023
HydroCAD® 10.10-7c s/n 01038 © 2022 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=325,496 sf 3.18% Impervious Runoff Depth=0.69"
Flow Length=440' Tc=6.2 min CN=72/98 Runoff=5.17 cfs 18,830 cf

Subcatchment2: Subcat 2 Runoff Area=145,343 sf 0.00% Impervious Runoff Depth=0.44"
Flow Length=565' Tc=6.6 min CN=67/0 Runoff=1.17 cfs 5,364 cf

Link DP-1: DP-1 - Wetland Inflow=5.17 cfs 18,830 cf
Primary=5.17 cfs 18,830 cf

Link DP-2: DP-2 - Low Point Inflow=1.17 cfs 5,364 cf
Primary=1.17 cfs 5,364 cf

Link PR: Pocasset River Watershed Inflow=6.35 cfs 24,195 cf
Primary=6.35 cfs 24,195 cf

Total Runoff Area = 470,839 sf Runoff Volume = 24,195 cf Average Runoff Depth = 0.62"
97.80% Pervious = 460,478 sf 2.20% Impervious = 10,361 sf

Summary for Subcatchment 1: Subcat 1

Runoff = 5.17 cfs @ 12.11 hrs, Volume= 18,830 cf, Depth= 0.69"
Routed to Link DP-1 : DP-1 - Wetland

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
60,181	61	>75% Grass cover, Good, HSG B
233,139	74	>75% Grass cover, Good, HSG C
11,453	80	>75% Grass cover, Good, HSG D
5,834	65	Brush, Good, HSG C
376	73	Brush, Good, HSG D
1,205	98	Roofs, HSG B
1,490	98	Roofs, HSG C
7,667	98	Water Surface, HSG C
4,151	70	Woods, Good, HSG C
325,496	72	Weighted Average
315,135	72	96.82% Pervious Area
10,361	98	3.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.2	50	0.0400	0.20		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
1.4	265	0.0400	3.22		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
0.6	125	0.0500	3.60		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
6.2	440	Total			

Summary for Subcatchment 2: Subcat 2

Runoff = 1.17 cfs @ 12.13 hrs, Volume= 5,364 cf, Depth= 0.44"
Routed to Link DP-2 : DP-2 - Low Point

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
62,872	61	>75% Grass cover, Good, HSG B
72,347	74	>75% Grass cover, Good, HSG C
3,772	48	Brush, Good, HSG B
6,352	65	Brush, Good, HSG C
145,343	67	Weighted Average
145,343	67	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	50	0.0670	0.24		**Sheet Flow, Grass**
					Grass: Short n= 0.150 P2= 3.30"
0.4	100	0.0670	4.17		**Shallow Concentrated Flow, Grass**
					Unpaved Kv= 16.1 fps
0.5	100	0.0400	3.22		**Shallow Concentrated Flow, Grass**
					Unpaved Kv= 16.1 fps
2.3	315	0.0200	2.28		**Shallow Concentrated Flow, Grass**
					Unpaved Kv= 16.1 fps
6.6	565	Total			

Summary for Link DP-1: DP-1 - Wetland

Inflow Area = 325,496 sf, 3.18% Impervious, Inflow Depth = 0.69" for 1-Year event
Inflow = 5.17 cfs @ 12.11 hrs, Volume= 18,830 cf
Primary = 5.17 cfs @ 12.11 hrs, Volume= 18,830 cf, Atten= 0%, Lag= 0.0 min
Routed to Link PR : Pocasset River Watershed

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link DP-2: DP-2 - Low Point

Inflow Area = 145,343 sf, 0.00% Impervious, Inflow Depth = 0.44" for 1-Year event
Inflow = 1.17 cfs @ 12.13 hrs, Volume= 5,364 cf
Primary = 1.17 cfs @ 12.13 hrs, Volume= 5,364 cf, Atten= 0%, Lag= 0.0 min
Routed to Link PR : Pocasset River Watershed

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Summary for Link PR: Pocasset River Watershed

Inflow Area = 470,839 sf, 2.20% Impervious, Inflow Depth = 0.62" for 1-Year event
Inflow = 6.35 cfs @ 12.11 hrs, Volume= 24,195 cf
Primary = 6.35 cfs @ 12.11 hrs, Volume= 24,195 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=325,496 sf 3.18% Impervious Runoff Depth=2.20"
Flow Length=440' Tc=6.2 min CN=72/98 Runoff=18.48 cfs 59,730 cf

Subcatchment2: Subcat 2 Runoff Area=145,343 sf 0.00% Impervious Runoff Depth=1.73"
Flow Length=565' Tc=6.6 min CN=67/0 Runoff=6.31 cfs 20,999 cf

Link DP-1: DP-1 - Wetland Inflow=18.48 cfs 59,730 cf
Primary=18.48 cfs 59,730 cf

Link DP-2: DP-2 - Low Point Inflow=6.31 cfs 20,999 cf
Primary=6.31 cfs 20,999 cf

Link PR: Pocasset River Watershed Inflow=24.77 cfs 80,729 cf
Primary=24.77 cfs 80,729 cf

Total Runoff Area = 470,839 sf Runoff Volume = 80,729 cf Average Runoff Depth = 2.06"
97.80% Pervious = 460,478 sf 2.20% Impervious = 10,361 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=325,496 sf 3.18% Impervious Runoff Depth=5.41"
Flow Length=440' Tc=6.2 min CN=72/98 Runoff=45.82 cfs 146,851 cf

Subcatchment2: Subcat 2 Runoff Area=145,343 sf 0.00% Impervious Runoff Depth=4.71"
Flow Length=565' Tc=6.6 min CN=67/0 Runoff=17.79 cfs 57,032 cf

Link DP-1: DP-1 - Wetland Inflow=45.82 cfs 146,851 cf
Primary=45.82 cfs 146,851 cf

Link DP-2: DP-2 - Low Point Inflow=17.79 cfs 57,032 cf
Primary=17.79 cfs 57,032 cf

Link PR: Pocasset River Watershed Inflow=63.57 cfs 203,883 cf
Primary=63.57 cfs 203,883 cf

Total Runoff Area = 470,839 sf Runoff Volume = 203,883 cf Average Runoff Depth = 5.20"
97.80% Pervious = 460,478 sf 2.20% Impervious = 10,361 sf

Proposed Conditions – HydroCAD Model

\\vhb.com\gbl\proj\Providence\73375.00\cad\ld\Eng\73375.00 Drainage PR.dwg

vhb.com
vhb
1 Cedar Street
Suite 400
Providence, RI 02903
401.272.8100

Legend

SYMBOLS

- DESIGN POINT
- DRAINAGE AREA DESIGNATION
- POND

LINETYPES

- DRAINAGE AREA BOUNDARY
- TIME OF CONCENTRATION FLOW LINE
- SOIL TYPE BOUNDARY
- 100' BUFFER ZONE
- WETLAND BOUNDARY

SCS SOIL CLASSIFICATIONS

BrB	BROADBROOK SILT LOAM, 3 TO 8 PERCENT SLOPES, HSG C
ChB	CANTON AND CHARLTON FINE SANDY LOAMS, 0TO 8 PERCENT SLOPES, VERY STONY, HSG B
NaB	NARRAGANSETT SILT LOAM, 3 TO 8 PERCENT SLOPES, HSG B
PaA	PAXTON FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG C
PaB	PAXTON FINE SANDY LOAM, 3 TO 8 PERCENT SLOPES, HSG C
PbC	PAXTON FINE SANDY LOAM, 8 TO 15 PERCENT SLOPES, VERY STONY, HSG C
RaA	RAINBOW SILT LOAM, 0 TO 3 PERCENT SLOPES, HSG C
Re	RIDGEBURY FINE SANDY LOAM, 0 TO 3 PERCENT SLOPES, HSG D
Rf	RIDGEBURY, LEICESTER, AND WHITMAN SOILS, 0 TO 8 PERCENT SLOPES, EXTREMELY STONY, HSG D
WoB	WOODBRIDGE FINE SANDY LOAM, 0 TO 8 PERCENT SLOPES, VERY STONY, HSG C/D

0 20 40 80 Feet

Milton CAT

2110 Plainfield Pike
Cranston, Rhode Island

No.	Revision	Date	Apprvd.
1	RIDEM Comments	10/05/2023	

Designed by SAP | Checked by JR

Issued for: Permits | Date: April 1, 2023

Not Approved for Construction

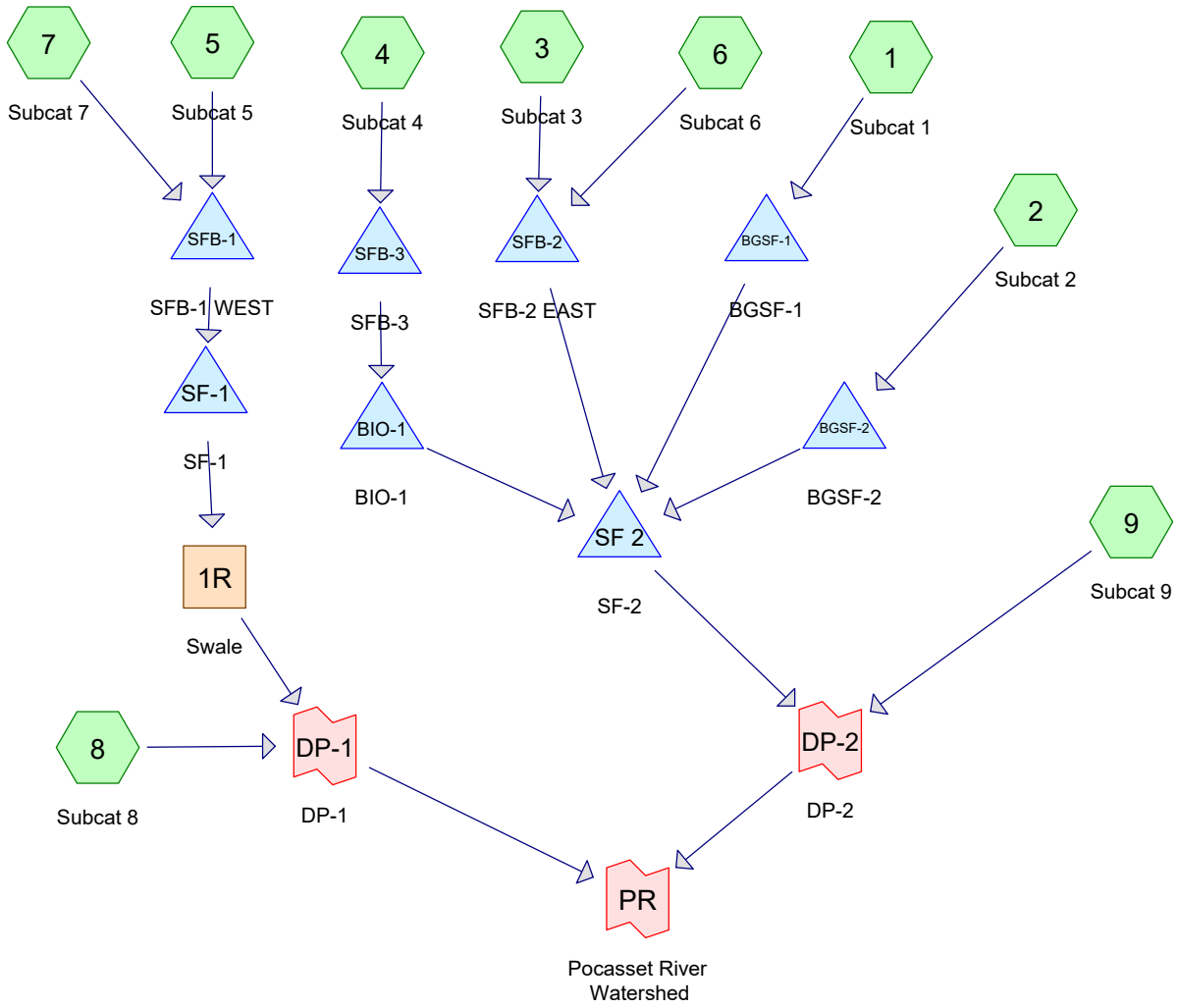
Drawing Title: Proposed Drainage Conditions

Drawing Number: FIG-3

Sheet 2 of 2

Project Number: 73375.00

Saved Thursday, October 5, 2023 7:59:29 AM KCRAWFORD Plotted Thursday, October 5, 2023 8:56:38 AM Karen Crawford



Subcat Reach Pond Link

Routing Diagram for PR Drainage - REV
Prepared by VHB, Inc, Printed 10/30/2023
HydroCAD® 10.20-3c s/n 01038 © 2023 HydroCAD Software Solutions LLC

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=5,481 sf 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=0/98 Runoff=0.32 cfs 1,128 cf

Subcatchment2: Subcat 2 Runoff Area=46,623 sf 100.00% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=0/98 Runoff=2.73 cfs 9,595 cf

Subcatchment3: Subcat 3 Runoff Area=64,653 sf 86.72% Impervious Runoff Depth=2.33"
Flow Length=669' Tc=6.0 min CN=86/98 Runoff=3.60 cfs 12,547 cf

Subcatchment4: Subcat 4 Runoff Area=6,946 sf 78.49% Impervious Runoff Depth=2.08"
Flow Length=62' Slope=0.0170 '/' Tc=6.0 min CN=73/98 Runoff=0.34 cfs 1,207 cf

Subcatchment5: Subcat 5 Runoff Area=56,914 sf 87.44% Impervious Runoff Depth=2.31"
Flow Length=394' Tc=6.0 min CN=83/98 Runoff=3.14 cfs 10,962 cf

Subcatchment6: Subcat 6 Runoff Area=78,835 sf 0.45% Impervious Runoff Depth=1.15"
Flow Length=137' Slope=0.0500 '/' Tc=6.0 min CN=82/98 Runoff=2.37 cfs 7,575 cf

Subcatchment7: Subcat 7 Runoff Area=56,728 sf 0.00% Impervious Runoff Depth=1.48"
Flow Length=113' Tc=11.0 min CN=87/0 Runoff=1.90 cfs 6,997 cf

Subcatchment8: Subcat 8 Runoff Area=133,467 sf 5.74% Impervious Runoff Depth=0.82"
Flow Length=503' Tc=12.3 min CN=74/98 Runoff=2.13 cfs 9,167 cf

Subcatchment9: Subcat 9 Runoff Area=21,177 sf 0.00% Impervious Runoff Depth=0.38"
Flow Length=505' Slope=0.0370 '/' Tc=8.7 min CN=65/0 Runoff=0.12 cfs 663 cf

Reach 1R: Swale Avg. Flow Depth=0.05' Max Vel=0.73 fps Inflow=0.09 cfs 3,613 cf
n=0.035 L=114.0' S=0.0263 '/' Capacity=59.21 cfs Outflow=0.09 cfs 3,613 cf

Pond BGSF-1: BGSF-1 Peak Elev=379.33' Storage=468 cf Inflow=0.32 cfs 1,128 cf
Discarded=0.02 cfs 1,128 cf Primary=0.00 cfs 0 cf Outflow=0.02 cfs 1,128 cf

Pond BGSF-2: BGSF-2 Peak Elev=377.31' Storage=3,459 cf Inflow=2.73 cfs 9,595 cf
Discarded=0.24 cfs 9,597 cf Primary=0.00 cfs 0 cf Outflow=0.24 cfs 9,597 cf

Pond BIO-1: BIO-1 Peak Elev=381.04' Storage=482 cf Inflow=0.34 cfs 919 cf
Outflow=0.05 cfs 774 cf

Pond SF 2: SF-2 Peak Elev=369.24' Storage=10,838 cf Inflow=5.78 cfs 18,368 cf
Discarded=0.21 cfs 17,993 cf Primary=0.05 cfs 374 cf Outflow=0.26 cfs 18,367 cf

Pond SF-1: SF-1 Peak Elev=375.16' Storage=9,045 cf Inflow=4.65 cfs 15,436 cf
Discarded=0.16 cfs 11,823 cf Primary=0.09 cfs 3,613 cf Outflow=0.26 cfs 15,436 cf

Pond SFB-1: SFB-1 WEST Peak Elev=375.14' Storage=2,935 cf Inflow=4.79 cfs 17,959 cf
Outflow=4.65 cfs 15,436 cf

Pond SFB-2: SFB-2 EAST Peak Elev=373.55' Storage=2,950 cf Inflow=5.96 cfs 20,122 cf
Outflow=5.78 cfs 17,594 cf

Pond SFB-3: SFB-3 Peak Elev=381.53' Storage=300 cf Inflow=0.34 cfs 1,207 cf
Outflow=0.34 cfs 919 cf

Link DP-1: DP-1 Inflow=2.14 cfs 12,780 cf
Primary=2.14 cfs 12,780 cf

Link DP-2: DP-2 Inflow=0.12 cfs 1,037 cf
Primary=0.12 cfs 1,037 cf

Link PR: Pocasset River Watershed Inflow=2.25 cfs 13,817 cf
Primary=2.25 cfs 13,817 cf

Total Runoff Area = 470,824 sf Runoff Volume = 59,841 cf Average Runoff Depth = 1.53"
63.59% Pervious = 299,414 sf 36.41% Impervious = 171,410 sf

Summary for Subcatchment 1: Subcat 1

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 1,128 cf, Depth= 2.47"
Routed to Pond BGSF-1 : BGSF-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
5,481	98	Roofs, HSG B
5,481	98	100.00% Impervious Area

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

Summary for Subcatchment 2: Subcat 2

Runoff = 2.73 cfs @ 12.09 hrs, Volume= 9,595 cf, Depth= 2.47"
Routed to Pond BGSF-2 : BGSF-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
30,018	98	Roofs, HSG B
16,605	98	Roofs, HSG C
46,623	98	Weighted Average
46,623	98	100.00% Impervious Area

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

Summary for Subcatchment 3: Subcat 3

Runoff = 3.60 cfs @ 12.09 hrs, Volume= 12,547 cf, Depth= 2.33"
Routed to Pond SFB-2 : SFB-2 EAST

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
0	98	Roofs, HSG B
18,956	98	Paved parking, HSG C
37,111	98	Paved parking, HSG B
3	96	Gravel surface, HSG B
1	61	>75% Grass cover, Good, HSG B
3,917	74	>75% Grass cover, Good, HSG C
4,666	96	Gravel surface, HSG C
64,653	96	Weighted Average
8,586	86	13.28% Pervious Area
56,067	98	86.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0120	0.99		**Sheet Flow, across parking lot** Smooth surfaces n= 0.011 P2= 3.30"
0.6	86	0.0120	2.22		**Shallow Concentrated Flow, across parking lot** Paved Kv= 20.3 fps
2.2	533	0.0065	3.96	3.11	**Pipe Channel, pipe flow** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
2.4					**Direct Entry, Minimum Tc**
6.0	669	Total			

Summary for Subcatchment 4: Subcat 4

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 1,207 cf, Depth= 2.08"
Routed to Pond SFB-3 : SFB-3

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
71	61	>75% Grass cover, Good, HSG B
3,193	98	Paved parking, HSG B
0	98	Roofs, HSG B
2	96	Gravel surface, HSG C
2,258	98	Paved parking, HSG C
1,421	74	>75% Grass cover, Good, HSG C
6,946	93	Weighted Average
1,494	73	21.51% Pervious Area
5,452	98	78.49% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	62	0.0170	1.19		**Sheet Flow, across driveway** Smooth surfaces n= 0.011 P2= 3.30"
5.1					**Direct Entry, Minimum Tc**
6.0	62	Total			

Summary for Subcatchment 5: Subcat 5

Runoff = 3.14 cfs @ 12.09 hrs, Volume= 10,962 cf, Depth= 2.31"
Routed to Pond SFB-1 : SFB-1 WEST

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
2,717	96	Gravel surface, HSG C
52	96	Gravel surface, HSG B
27,094	98	Paved parking, HSG C
22,673	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
4,377	74	>75% Grass cover, Good, HSG C
56,914	96	Weighted Average
7,147	83	12.56% Pervious Area
49,767	98	87.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	36	0.0140	0.99		**Sheet Flow, across concrete pavement** Smooth surfaces n= 0.011 P2= 3.30"
1.1	149	0.0130	2.31		**Shallow Concentrated Flow, across concrete and drive** Paved Kv= 20.3 fps
0.8	209	0.0086	4.56	3.58	**Pipe Channel, drain pipe** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012 Corrugated PP, smooth interior
3.5					**Direct Entry, Minimum Tc**
6.0	394	Total			

Summary for Subcatchment 6: Subcat 6

Runoff = 2.37 cfs @ 12.10 hrs, Volume= 7,575 cf, Depth= 1.15"
Routed to Pond SFB-2 : SFB-2 EAST

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
1,010	96	Gravel surface, HSG B
46	98	Paved parking, HSG B
9,245	61	>75% Grass cover, Good, HSG B
34,144	74	>75% Grass cover, Good, HSG C
2	65	Brush, Good, HSG C
307	98	Paved parking, HSG C
34,080	96	Gravel surface, HSG C
78,835	82	Weighted Average
78,481	82	99.55% Pervious Area
353	98	0.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.75		**Sheet Flow, across millings** Smooth surfaces n= 0.011 P2= 3.30"
0.3	87	0.0500	4.54		**Shallow Concentrated Flow, across millings** Paved Kv= 20.3 fps
5.2					**Direct Entry, Minimum Tc**
6.0	137	Total			

Summary for Subcatchment 7: Subcat 7

Runoff = 1.90 cfs @ 12.16 hrs, Volume= 6,997 cf, Depth= 1.48"
Routed to Pond SFB-1 : SFB-1 WEST

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
24,915	96	Gravel surface, HSG C
18	96	Gravel surface, HSG D
19,643	74	>75% Grass cover, Good, HSG C
2,082	80	>75% Grass cover, Good, HSG D
539	61	>75% Grass cover, Good, HSG B
9,532	96	Gravel surface, HSG B
56,728	87	Weighted Average
56,728	87	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.8	64	0.0460	0.22		**Sheet Flow, overland** Grass: Short n= 0.150 P2= 3.30"
0.2	49	0.0500	4.54		**Shallow Concentrated Flow, across millings** Paved Kv= 20.3 fps
6.0					**Direct Entry, Minimum Tc**
11.0	113	Total			

Summary for Subcatchment 8: Subcat 8

Runoff = 2.13 cfs @ 12.19 hrs, Volume= 9,167 cf, Depth= 0.82"
Routed to Link DP-1 : DP-1

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
108,649	74	>75% Grass cover, Good, HSG C
8,755	80	>75% Grass cover, Good, HSG D
975	73	Brush, Good, HSG D
2,567	61	>75% Grass cover, Good, HSG B
4,854	65	Brush, Good, HSG C
7,667	98	Water Surface, HSG C
133,467	75	Weighted Average
125,800	74	94.26% Pervious Area
7,667	98	5.74% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	90	0.0440	0.16		**Sheet Flow, overland** Grass: Dense n= 0.240 P2= 3.30"
2.9	413	0.0220	2.39		**Shallow Concentrated Flow, grass swale** Unpaved Kv= 16.1 fps
12.3	503	Total			

Summary for Subcatchment 9: Subcat 9

Runoff = 0.12 cfs @ 12.17 hrs, Volume= 663 cf, Depth= 0.38"
Routed to Link DP-2 : DP-2

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 1 Year Rainfall=2.70"

Area (sf)	CN	Description
7,358	74	>75% Grass cover, Good, HSG C
2,711	61	>75% Grass cover, Good, HSG B
7,335	65	Brush, Good, HSG C
3,772	48	Brush, Good, HSG B
21,177	65	Weighted Average
21,177	65	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.0370	0.13		**Sheet Flow, overland** Grass: Dense n= 0.240 P2= 3.30"
2.4	455	0.0370	3.10		**Shallow Concentrated Flow, overland** Unpaved Kv= 16.1 fps
8.7	505	Total			

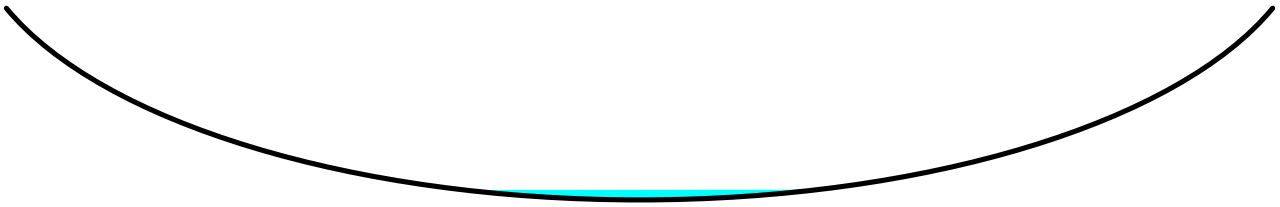
Summary for Reach 1R: Swale

Inflow Area = 113,642 sf, 43.79% Impervious, Inflow Depth = 0.38" for 1 Year event
Inflow = 0.09 cfs @ 14.90 hrs, Volume= 3,613 cf
Outflow = 0.09 cfs @ 14.97 hrs, Volume= 3,613 cf, Atten= 0%, Lag= 4.4 min
Routed to Link DP-1 : DP-1

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.73 fps, Min. Travel Time= 2.6 min
Avg. Velocity = 0.62 fps, Avg. Travel Time= 3.0 min

Peak Storage= 15 cf @ 14.93 hrs
Average Depth at Peak Storage= 0.05' , Surface Width= 3.84'
Bank-Full Depth= 1.00' Flow Area= 11.3 sf, Capacity= 59.21 cfs

17.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 114.0' Slope= 0.0263 '/'
Inlet Invert= 371.00', Outlet Invert= 368.00'



‡

Summary for Pond BGSF-1: BGSF-1

Inflow Area = 5,481 sf,100.00% Impervious, Inflow Depth = 2.47" for 1 Year event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 1,128 cf
Outflow = 0.02 cfs @ 10.80 hrs, Volume= 1,128 cf, Atten= 94%, Lag= 0.0 min
Discarded = 0.02 cfs @ 10.80 hrs, Volume= 1,128 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 379.33' @ 13.64 hrs Surf.Area= 364 sf Storage= 468 cf

Plug-Flow detention time= 183.2 min calculated for 1,127 cf (100% of inflow)
Center-of-Mass det. time= 183.0 min (943.2 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	376.25'	433 cf	**14.83'W x 24.56'L x 4.08'H Field A** 1,488 cf Overall - 177 cf Embedded = 1,311 cf x 33.0% Voids
#2A	378.50'	177 cf	**ADS_StormTech SC-310 +Cap** x 12 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 12 Chambers in 4 Rows
		609 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	376.25'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	380.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	376.80'	**12.0" Round Culvert** L= 60.5' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 376.80' / 376.10' S= 0.0116 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.02 cfs @ 10.80 hrs HW=376.29' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=376.25' (Free Discharge)
└**3=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond BGSF-2: BGSF-2

Inflow Area = 46,623 sf,100.00% Impervious, Inflow Depth = 2.47" for 1 Year event
Inflow = 2.73 cfs @ 12.09 hrs, Volume= 9,595 cf
Outflow = 0.24 cfs @ 11.35 hrs, Volume= 9,597 cf, Atten= 91%, Lag= 0.0 min
Discarded = 0.24 cfs @ 11.35 hrs, Volume= 9,597 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 377.31' @ 12.97 hrs Surf.Area= 4,377 sf Storage= 3,459 cf

Plug-Flow detention time= 102.3 min calculated for 9,587 cf (100% of inflow)
Center-of-Mass det. time= 102.3 min (862.4 - 760.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	375.00'	5,764 cf	**58.50'W x 74.82'L x 5.25'H Field A** 22,978 cf Overall - 5,513 cf Embedded = 17,465 cf x 33.0% Voids
#2A	377.25'	5,513 cf	**ADS_StormTech SC-740 +Cap** x 120 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 120 Chambers in 12 Rows
		11,276 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	375.00'	**2.410 in/hr Exfiltration over Surface area**
#2	Device 3	379.06'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Primary	375.35'	**12.0" Round Culvert** L= 165.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 375.35' / 373.75' S= 0.0097 '/' Cc= 0.900 n= 0.012 Corrugated PP, smooth interior, Flow Area= 0.79 sf

Discarded OutFlow Max=0.24 cfs @ 11.35 hrs HW=375.05' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.24 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=375.00' (Free Discharge)
└**3=Culvert** (Controls 0.00 cfs)
└**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond BIO-1: BIO-1

Inflow Area = 6,946 sf, 78.49% Impervious, Inflow Depth = 1.59" for 1 Year event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 919 cf
Outflow = 0.05 cfs @ 12.66 hrs, Volume= 774 cf, Atten= 86%, Lag= 33.9 min
Primary = 0.05 cfs @ 12.66 hrs, Volume= 774 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 381.04' @ 12.66 hrs Surf.Area= 429 sf Storage= 482 cf

Plug-Flow detention time= 644.4 min calculated for 773 cf (84% of inflow)
Center-of-Mass det. time= 580.0 min (1,414.2 - 834.1)

Volume	Invert	Avail.Storage	Storage Description
#1	377.99'	1,000 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
377.99	223	69.8	0.0	0	0	223
378.00	223	69.8	33.0	1	1	224
379.99	223	69.8	33.0	146	147	363
380.00	223	69.8	100.0	2	149	363
381.00	422	87.8	100.0	317	467	602
382.00	653	103.2	100.0	533	1,000	855

Device	Routing	Invert	Outlet Devices
#1	Device 2	381.00'	**5.5" x 5.5" Horiz. Landscape Drain** C= 0.600 Limited to weir flow at low heads
#2	Primary	376.80'	**8.0" Round Culvert** L= 61.3' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 376.80' / 374.78' S= 0.0330 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.35 sf
#3	Device 4	377.99'	**0.500 in/hr Exfiltration over Surface area**
#4	Device 2	377.03'	**4.0" Round Culvert** L= 25.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 377.03' / 376.90' S= 0.0052 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.09 sf

Primary OutFlow Max=0.04 cfs @ 12.66 hrs HW=381.03' (Free Discharge)
└**2=Culvert** (Passes 0.04 cfs of 3.02 cfs potential flow)
  ├**1=Landscape Drain** (Weir Controls 0.04 cfs @ 0.61 fps)
  └**4=Culvert** (Passes 0.00 cfs of 0.73 cfs potential flow)
    └**3=Exfiltration** (Exfiltration Controls 0.00 cfs)

Summary for Pond SF 2: SF-2

Inflow Area = 202,538 sf, 56.27% Impervious, Inflow Depth > 1.09" for 1 Year event
Inflow = 5.78 cfs @ 12.10 hrs, Volume= 18,368 cf
Outflow = 0.26 cfs @ 15.48 hrs, Volume= 18,367 cf, Atten= 95%, Lag= 202.3 min
Discarded = 0.21 cfs @ 15.48 hrs, Volume= 17,993 cf
Primary = 0.05 cfs @ 15.48 hrs, Volume= 374 cf
Routed to Link DP-2 : DP-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.24' @ 15.48 hrs Surf.Area= 9,038 sf Storage= 10,838 cf

Plug-Flow detention time= 526.1 min calculated for 18,348 cf (100% of inflow)
Center-of-Mass det. time= 525.4 min (1,384.9 - 859.5)

Volume	Invert	Avail.Storage	Storage Description
#1	365.99'	41,324 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
365.99	8,697	474.0	0.0	0	0	8,697
366.00	8,697	474.0	33.0	29	29	8,702
368.99	8,697	474.0	33.0	8,581	8,610	10,119
369.00	8,697	474.0	100.0	87	8,697	10,124
370.00	10,152	497.0	100.0	9,415	18,112	11,966
371.00	11,677	519.0	100.0	10,906	29,018	13,816
371.50	12,946	534.0	100.0	12,306	41,324	15,179

Device	Routing	Invert	Outlet Devices
#1	Discarded	365.99'	**1.020 in/hr Exfiltration over Surface area**
#2	Device 4	369.20'	**21.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	369.35'	**21.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Primary	367.50'	**18.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 367.50' / 367.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#5	Device 4	370.60'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.21 cfs @ 15.48 hrs HW=369.24' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.05 cfs @ 15.48 hrs HW=369.24' (Free Discharge)
└─**4=Culvert** (Passes 0.05 cfs of 8.47 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 0.65 fps)
  ├─**3=Orifice/Grate** (Controls 0.00 cfs)
  └─**5=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond SF 2: SF-2

Inflow Area = 202,538 sf, 56.27% Impervious, Inflow Depth > 1.09" for 1 Year event
Inflow = 5.78 cfs @ 12.10 hrs, Volume= 18,368 cf
Outflow = 0.26 cfs @ 15.51 hrs, Volume= 18,368 cf, Atten= 95%, Lag= 204.2 min
Discarded = 0.21 cfs @ 15.51 hrs, Volume= 17,990 cf
Primary = 0.05 cfs @ 15.51 hrs, Volume= 378 cf
Routed to Link DP-2 : DP-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 369.24' @ 15.51 hrs Surf.Area= 9,038 sf Storage= 10,838 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 525.2 min (1,384.7 - 859.5)

Volume	Invert	Avail.Storage	Storage Description
#1	365.99'	35,251 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
365.99	8,697	474.0	0.0	0	0	8,697
366.00	8,697	474.0	33.0	29	29	8,702
368.99	8,697	474.0	33.0	8,581	8,610	10,119
369.00	8,697	474.0	100.0	87	8,697	10,124
370.00	10,152	497.0	100.0	9,415	18,112	11,966
371.00	11,677	519.0	100.0	10,906	29,018	13,816
371.50	13,274	544.0	100.0	6,233	35,251	15,947

Device	Routing	Invert	Outlet Devices
#1	Discarded	365.99'	**1.020 in/hr Exfiltration over Surface area**
#2	Device 4	369.20'	**21.0" W x 4.0" H Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 4	369.35'	**21.0" W x 8.0" H Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads
#4	Primary	367.50'	**18.0" Round Culvert** L= 43.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 367.50' / 367.00' S= 0.0116 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#5	Device 4	370.60'	**48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.21 cfs @ 15.51 hrs HW=369.24' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.05 cfs @ 15.51 hrs HW=369.24' (Free Discharge)
└**4=Culvert** (Passes 0.05 cfs of 8.47 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 0.65 fps)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond SFB-1: SFB-1 WEST

Inflow Area = 113,642 sf, 43.79% Impervious, Inflow Depth = 1.90" for 1 Year event
Inflow = 4.79 cfs @ 12.11 hrs, Volume= 17,959 cf
Outflow = 4.65 cfs @ 12.12 hrs, Volume= 15,436 cf, Atten= 3%, Lag= 1.0 min
Primary = 4.65 cfs @ 12.12 hrs, Volume= 15,436 cf
Routed to Pond SF-1 : SF-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 375.14' @ 12.12 hrs Surf.Area= 2,927 sf Storage= 2,935 cf

Plug-Flow detention time= 105.4 min calculated for 15,436 cf (86% of inflow)
Center-of-Mass det. time= 42.9 min (833.8 - 790.9)

Volume	Invert	Avail.Storage	Storage Description
#1	373.00'	3,961 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
373.00	152	196.0	0	0	152
374.00	1,100	420.0	554	554	11,137
375.00	2,989	637.0	1,967	2,521	29,397
375.50	2,771	506.0	1,440	3,961	41,316

Device	Routing	Invert	Outlet Devices
#1	Primary	375.00'	**36.0' long x 9.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.46 2.55 2.70 2.69 2.68 2.68 2.67 2.64 2.64 2.64 2.65 2.64 2.65 2.65 2.66 2.67 2.69

Primary OutFlow Max=4.52 cfs @ 12.12 hrs HW=375.14' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 4.52 cfs @ 0.91 fps)

Summary for Pond SFB-2: SFB-2 EAST

Inflow Area = 143,488 sf, 39.32% Impervious, Inflow Depth = 1.68" for 1 Year event
Inflow = 5.96 cfs @ 12.09 hrs, Volume= 20,122 cf
Outflow = 5.78 cfs @ 12.10 hrs, Volume= 17,594 cf, Atten= 3%, Lag= 0.8 min
Primary = 5.78 cfs @ 12.10 hrs, Volume= 17,594 cf
Routed to Pond SF 2 : SF-2

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 373.55' @ 12.10 hrs Surf.Area= 2,912 sf Storage= 2,950 cf

Plug-Flow detention time= 98.4 min calculated for 17,594 cf (87% of inflow)
Center-of-Mass det. time= 39.9 min (835.1 - 795.2)

Volume	Invert	Avail.Storage	Storage Description
#1	372.00'	4,399 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
372.00	967	395.0	0	0	967
373.00	2,205	428.0	1,544	1,544	3,167
374.00	3,559	461.0	2,855	4,399	5,544

Device	Routing	Invert	Outlet Devices
#1	Primary	373.40'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=5.71 cfs @ 12.10 hrs HW=373.55' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 5.71 cfs @ 1.27 fps)

Summary for Pond SFB-3: SFB-3

Inflow Area = 6,946 sf, 78.49% Impervious, Inflow Depth = 2.08" for 1 Year event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 1,207 cf
Outflow = 0.34 cfs @ 12.09 hrs, Volume= 919 cf, Atten= 2%, Lag= 0.2 min
Primary = 0.34 cfs @ 12.09 hrs, Volume= 919 cf
Routed to Pond BIO-1 : BIO-1

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 381.53' @ 12.09 hrs Surf.Area= 296 sf Storage= 300 cf

Plug-Flow detention time= 150.6 min calculated for 918 cf (76% of inflow)
Center-of-Mass det. time= 65.8 min (834.1 - 768.3)

Volume	Invert	Avail.Storage	Storage Description
#1	380.00'	456 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
380.00	108	41.7	0	0	108
381.00	224	57.6	163	163	243
382.00	368	75.5	293	456	444

Device	Routing	Invert	Outlet Devices
#1	Primary	381.50'	**18.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.32 cfs @ 12.09 hrs HW=381.53' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Weir Controls 0.32 cfs @ 0.57 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=5,481 sf 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=0/98 Runoff=0.59 cfs 2,130 cf

Subcatchment2: Subcat 2 Runoff Area=46,623 sf 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=0/98 Runoff=5.01 cfs 18,118 cf

Subcatchment3: Subcat 3 Runoff Area=64,653 sf 86.72% Impervious Runoff Depth=4.49"
Flow Length=669' Tc=6.0 min CN=86/98 Runoff=6.78 cfs 24,202 cf

Subcatchment4: Subcat 4 Runoff Area=6,946 sf 78.49% Impervious Runoff Depth=4.13"
Flow Length=62' Slope=0.0170 '/' Tc=6.0 min CN=73/98 Runoff=0.67 cfs 2,393 cf

Subcatchment5: Subcat 5 Runoff Area=56,914 sf 87.44% Impervious Runoff Depth=4.46"
Flow Length=394' Tc=6.0 min CN=83/98 Runoff=5.92 cfs 21,177 cf

Subcatchment6: Subcat 6 Runoff Area=78,835 sf 0.45% Impervious Runoff Depth=3.00"
Flow Length=137' Slope=0.0500 '/' Tc=6.0 min CN=82/98 Runoff=6.21 cfs 19,691 cf

Subcatchment7: Subcat 7 Runoff Area=56,728 sf 0.00% Impervious Runoff Depth=3.47"
Flow Length=113' Tc=11.0 min CN=87/0 Runoff=4.39 cfs 16,419 cf

Subcatchment8: Subcat 8 Runoff Area=133,467 sf 5.74% Impervious Runoff Depth=2.42"
Flow Length=503' Tc=12.3 min CN=74/98 Runoff=6.89 cfs 26,931 cf

Subcatchment9: Subcat 9 Runoff Area=21,177 sf 0.00% Impervious Runoff Depth=1.59"
Flow Length=505' Slope=0.0370 '/' Tc=8.7 min CN=65/0 Runoff=0.76 cfs 2,801 cf

Reach 1R: Swale Avg. Flow Depth=0.42' Max Vel=2.87 fps Inflow=8.77 cfs 20,506 cf
n=0.035 L=114.0' S=0.0263 '/' Capacity=59.21 cfs Outflow=8.30 cfs 20,506 cf

Pond BGSF-1: BGSF-1 Peak Elev=380.11' Storage=582 cf Inflow=0.59 cfs 2,130 cf
Discarded=0.02 cfs 1,562 cf Primary=0.46 cfs 555 cf Outflow=0.48 cfs 2,117 cf

Pond BGSF-2: BGSF-2 Peak Elev=378.77' Storage=8,298 cf Inflow=5.01 cfs 18,118 cf
Discarded=0.24 cfs 18,117 cf Primary=0.00 cfs 0 cf Outflow=0.24 cfs 18,117 cf

Pond BIO-1: BIO-1 Peak Elev=381.28' Storage=592 cf Inflow=0.66 cfs 2,103 cf
Outflow=0.54 cfs 1,952 cf

Pond SF 2: SF-2 Peak Elev=369.83' Storage=16,414 cf Inflow=13.38 cfs 43,875 cf
Discarded=0.23 cfs 22,016 cf Primary=5.65 cfs 21,856 cf Outflow=5.88 cfs 43,873 cf

Pond SF-1: SF-1 Peak Elev=375.38' Storage=10,585 cf Inflow=9.61 cfs 35,070 cf
Discarded=0.17 cfs 14,594 cf Primary=8.77 cfs 20,506 cf Outflow=8.94 cfs 35,100 cf

Pond SFB-1: SFB-1 WEST Peak Elev=375.23' Storage=3,188 cf Inflow=9.84 cfs 37,596 cf
Outflow=9.61 cfs 35,070 cf

Pond SFB-2: SFB-2 EAST Peak Elev=373.66' Storage=3,261 cf Inflow=12.98 cfs 43,893 cf
Outflow=12.66 cfs 41,368 cf

Pond SFB-3: SFB-3 Peak Elev=381.55' Storage=306 cf Inflow=0.67 cfs 2,393 cf
Outflow=0.66 cfs 2,103 cf

Link DP-1: DP-1 Inflow=15.06 cfs 47,437 cf
Primary=15.06 cfs 47,437 cf

Link DP-2: DP-2 Inflow=6.11 cfs 24,657 cf
Primary=6.11 cfs 24,657 cf

Link PR: Pocasset River Watershed Inflow=20.39 cfs 72,095 cf
Primary=20.39 cfs 72,095 cf

Total Runoff Area = 470,824 sf Runoff Volume = 133,862 cf Average Runoff Depth = 3.41"
63.59% Pervious = 299,414 sf 36.41% Impervious = 171,410 sf

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1: Subcat 1 Runoff Area=5,481 sf 100.00% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=0/98 Runoff=1.05 cfs 3,864 cf

Subcatchment2: Subcat 2 Runoff Area=46,623 sf 100.00% Impervious Runoff Depth=8.46"
Tc=6.0 min CN=0/98 Runoff=8.93 cfs 32,868 cf

Subcatchment3: Subcat 3 Runoff Area=64,653 sf 86.72% Impervious Runoff Depth=8.27"
Flow Length=669' Tc=6.0 min CN=86/98 Runoff=12.25 cfs 44,543 cf

Subcatchment4: Subcat 4 Runoff Area=6,946 sf 78.49% Impervious Runoff Depth=7.81"
Flow Length=62' Slope=0.0170 '/' Tc=6.0 min CN=73/98 Runoff=1.26 cfs 4,520 cf

Subcatchment5: Subcat 5 Runoff Area=56,914 sf 87.44% Impervious Runoff Depth=8.23"
Flow Length=394' Tc=6.0 min CN=83/98 Runoff=10.74 cfs 39,044 cf

Subcatchment6: Subcat 6 Runoff Area=78,835 sf 0.45% Impervious Runoff Depth=6.54"
Flow Length=137' Slope=0.0500 '/' Tc=6.0 min CN=82/98 Runoff=13.17 cfs 42,934 cf

Subcatchment7: Subcat 7 Runoff Area=56,728 sf 0.00% Impervious Runoff Depth=7.13"
Flow Length=113' Tc=11.0 min CN=87/0 Runoff=8.71 cfs 33,718 cf

Subcatchment8: Subcat 8 Runoff Area=133,467 sf 5.74% Impervious Runoff Depth=5.72"
Flow Length=503' Tc=12.3 min CN=74/98 Runoff=16.40 cfs 63,653 cf

Subcatchment9: Subcat 9 Runoff Area=21,177 sf 0.00% Impervious Runoff Depth=4.47"
Flow Length=505' Slope=0.0370 '/' Tc=8.7 min CN=65/0 Runoff=2.27 cfs 7,884 cf

Reach 1R: Swale Avg. Flow Depth=0.57' Max Vel=3.59 fps Inflow=17.36 cfs 53,015 cf
n=0.035 L=114.0' S=0.0263 '/' Capacity=59.21 cfs Outflow=17.18 cfs 53,015 cf

Pond BGSF-1: BGSF-1 Peak Elev=380.18' Storage=591 cf Inflow=1.05 cfs 3,864 cf
Discarded=0.02 cfs 1,920 cf Primary=1.02 cfs 1,949 cf Outflow=1.04 cfs 3,868 cf

Pond BGSF-2: BGSF-2 Peak Elev=379.67' Storage=10,428 cf Inflow=8.93 cfs 32,868 cf
Discarded=0.24 cfs 22,984 cf Primary=5.77 cfs 9,899 cf Outflow=6.01 cfs 32,884 cf

Pond BIO-1: BIO-1 Peak Elev=381.69' Storage=808 cf Inflow=1.24 cfs 4,229 cf
Outflow=0.85 cfs 4,078 cf

Pond SF 2: SF-2 Peak Elev=371.03' Storage=29,410 cf Inflow=28.87 cfs 100,878 cf
Discarded=0.28 cfs 24,931 cf Primary=14.20 cfs 75,955 cf Outflow=14.47 cfs 100,887 cf

Pond SF-1: SF-1 Peak Elev=375.48' Storage=11,338 cf Inflow=18.25 cfs 70,247 cf
Discarded=0.18 cfs 17,237 cf Primary=17.36 cfs 53,015 cf Outflow=17.53 cfs 70,252 cf

Pond SFB-1: SFB-1 WEST Peak Elev=375.34' Storage=3,520 cf Inflow=18.60 cfs 72,762 cf
Outflow=18.25 cfs 70,247 cf

Pond SFB-2: SFB-2 EAST Peak Elev=373.80' Storage=3,721 cf Inflow=25.42 cfs 87,477 cf
Outflow=24.86 cfs 84,952 cf

Pond SFB-3: SFB-3 Peak Elev=381.58' Storage=314 cf Inflow=1.26 cfs 4,520 cf
Outflow=1.24 cfs 4,229 cf

Link DP-1: DP-1 Inflow=33.54 cfs 116,668 cf
Primary=33.54 cfs 116,668 cf

Link DP-2: DP-2 Inflow=15.65 cfs 83,839 cf
Primary=15.65 cfs 83,839 cf

Link PR: Pocasset River Watershed Inflow=49.16 cfs 200,507 cf
Primary=49.16 cfs 200,507 cf

Total Runoff Area = 470,824 sf Runoff Volume = 273,029 cf Average Runoff Depth = 6.96"
63.59% Pervious = 299,414 sf 36.41% Impervious = 171,410 sf

Hydrograph for Pond BGSF-1: BGSF-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	376.25	0.00	0.00	0.00
1.00	0.00	1	376.26	0.00	0.00	0.00
2.00	0.01	2	376.26	0.01	0.01	0.00
3.00	0.01	2	376.27	0.01	0.01	0.00
4.00	0.01	3	376.27	0.01	0.01	0.00
5.00	0.01	3	376.28	0.01	0.01	0.00
6.00	0.02	4	376.28	0.02	**0.02**	0.00
7.00	0.02	5	376.29	0.02	**0.02**	0.00
8.00	0.03	20	376.42	0.02	0.02	0.00
9.00	0.04	66	376.80	0.02	0.02	0.00
10.00	0.05	158	377.56	0.02	0.02	0.00
11.00	0.08	316	378.68	0.02	0.02	0.00
12.00	**0.68**	**586**	**380.13**	**0.67**	0.02	**0.65**
13.00	**0.09**	**573**	**380.03**	**0.09**	0.02	**0.07**
14.00	0.06	571	380.02	0.06	0.02	0.04
15.00	0.04	571	380.01	0.04	0.02	0.02
16.00	0.03	570	380.01	0.03	0.02	0.01
17.00	0.02	570	380.00	0.02	0.02	0.00
18.00	0.02	568	379.99	0.02	0.02	0.00
19.00	0.02	556	379.89	0.02	0.02	0.00
20.00	0.01	538	379.74	0.02	0.02	0.00
21.00	0.01	515	379.58	0.02	0.02	0.00
22.00	0.01	487	379.42	0.02	0.02	0.00
23.00	0.01	454	379.26	0.02	0.02	0.00
24.00	0.01	418	379.10	0.02	0.02	0.00
25.00	0.00	348	378.80	0.02	0.02	0.00
26.00	0.00	274	378.52	0.02	0.02	0.00
27.00	0.00	201	377.92	0.02	0.02	0.00
28.00	0.00	128	377.32	0.02	0.02	0.00
29.00	0.00	55	376.71	0.02	0.02	0.00
30.00	0.00	0	376.25	0.00	0.00	0.00
31.00	0.00	0	376.25	0.00	0.00	0.00
32.00	0.00	0	376.25	0.00	0.00	0.00
33.00	0.00	0	376.25	0.00	0.00	0.00
34.00	0.00	0	376.25	0.00	0.00	0.00
35.00	0.00	0	376.25	0.00	0.00	0.00
36.00	0.00	0	376.25	0.00	0.00	0.00
37.00	0.00	0	376.25	0.00	0.00	0.00
38.00	0.00	0	376.25	0.00	0.00	0.00
39.00	0.00	0	376.25	0.00	0.00	0.00
40.00	0.00	0	376.25	0.00	0.00	0.00
41.00	0.00	0	376.25	0.00	0.00	0.00
42.00	0.00	0	376.25	0.00	0.00	0.00
43.00	0.00	0	376.25	0.00	0.00	0.00
44.00	0.00	0	376.25	0.00	0.00	0.00
45.00	0.00	0	376.25	0.00	0.00	0.00
46.00	0.00	0	376.25	0.00	0.00	0.00
47.00	0.00	0	376.25	0.00	0.00	0.00
48.00	0.00	0	376.25	0.00	0.00	0.00

Hydrograph for Pond BGSF-2: BGSF-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	375.00	0.00	0.00	0.00
1.00	0.03	7	375.00	0.02	0.02	0.00
2.00	0.06	17	375.01	0.06	0.06	0.00
3.00	0.08	25	375.02	0.08	0.08	0.00
4.00	0.10	31	375.02	0.10	0.10	0.00
5.00	0.12	37	375.03	0.12	0.12	0.00
6.00	0.14	43	375.03	0.14	0.14	0.00
7.00	0.18	56	375.04	0.18	0.18	0.00
8.00	0.23	71	375.05	0.23	**0.23**	0.00
9.00	0.33	211	375.15	0.24	**0.24**	0.00
10.00	0.44	734	375.51	0.24	0.24	0.00
11.00	0.66	1,823	376.26	0.24	0.24	0.00
12.00	**5.82**	**7,054**	**378.36**	**0.24**	0.24	**0.00**
13.00	**0.76**	**9,452**	**379.19**	**0.85**	0.24	**0.61**
14.00	0.48	9,309	379.13	0.51	0.24	0.27
15.00	0.36	9,236	379.11	0.38	0.24	0.13
16.00	0.25	9,168	379.08	0.28	0.24	0.04
17.00	0.20	9,065	379.04	0.24	0.24	0.00
18.00	0.15	8,827	378.95	0.24	0.24	0.00
19.00	0.14	8,468	378.83	0.24	0.24	0.00
20.00	0.12	8,058	378.69	0.24	0.24	0.00
21.00	0.11	7,603	378.54	0.24	0.24	0.00
22.00	0.10	7,110	378.38	0.24	0.24	0.00
23.00	0.09	6,578	378.21	0.24	0.24	0.00
24.00	0.08	6,009	378.04	0.24	0.24	0.00
25.00	0.00	5,157	377.79	0.24	0.24	0.00
26.00	0.00	4,278	377.54	0.24	0.24	0.00
27.00	0.00	3,399	377.29	0.24	0.24	0.00
28.00	0.00	2,520	376.74	0.24	0.24	0.00
29.00	0.00	1,641	376.14	0.24	0.24	0.00
30.00	0.00	762	375.53	0.24	0.24	0.00
31.00	0.00	6	375.00	0.02	0.02	0.00
32.00	0.00	0	375.00	0.00	0.00	0.00
33.00	0.00	0	375.00	0.00	0.00	0.00
34.00	0.00	0	375.00	0.00	0.00	0.00
35.00	0.00	0	375.00	0.00	0.00	0.00
36.00	0.00	0	375.00	0.00	0.00	0.00
37.00	0.00	0	375.00	0.00	0.00	0.00
38.00	0.00	0	375.00	0.00	0.00	0.00
39.00	0.00	0	375.00	0.00	0.00	0.00
40.00	0.00	0	375.00	0.00	0.00	0.00
41.00	0.00	0	375.00	0.00	0.00	0.00
42.00	0.00	0	375.00	0.00	0.00	0.00
43.00	0.00	0	375.00	0.00	0.00	0.00
44.00	0.00	0	375.00	0.00	0.00	0.00
45.00	0.00	0	375.00	0.00	0.00	0.00
46.00	0.00	0	375.00	0.00	0.00	0.00
47.00	0.00	0	375.00	0.00	0.00	0.00
48.00	0.00	0	375.00	0.00	0.00	0.00

Hydrograph for Pond BIO-1: BIO-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	377.99	0.00
1.00	0.00	0	377.99	0.00
2.00	0.00	0	377.99	0.00
3.00	0.00	0	377.99	0.00
4.00	0.00	0	377.99	0.00
5.00	0.00	0	377.99	0.00
6.00	0.00	0	377.99	0.00
7.00	0.00	0	377.99	0.00
8.00	0.03	50	378.67	0.00
9.00	0.04	164	380.07	0.00
10.00	0.06	329	380.64	0.00
11.00	0.09	490	381.05	0.08
12.00	**0.79**	**595**	**381.28**	**0.54**
13.00	**0.11**	**497**	**381.07**	**0.12**
14.00	0.07	487	381.05	0.07
15.00	0.05	484	381.04	0.05
16.00	0.04	479	381.03	0.04
17.00	0.03	476	381.02	0.03
18.00	0.02	473	381.02	0.02
19.00	0.02	472	381.01	0.02
20.00	0.02	472	381.01	0.02
21.00	0.02	471	381.01	0.02
22.00	0.01	470	381.01	0.02
23.00	0.01	470	381.01	0.01
24.00	0.01	469	381.01	0.01
25.00	0.00	453	380.97	0.00
26.00	0.00	436	380.93	0.00
27.00	0.00	419	380.88	0.00
28.00	0.00	403	380.84	0.00
29.00	0.00	387	380.80	0.00
30.00	0.00	371	380.76	0.00
31.00	0.00	356	380.72	0.00
32.00	0.00	341	380.68	0.00
33.00	0.00	327	380.63	0.00
34.00	0.00	313	380.59	0.00
35.00	0.00	299	380.55	0.00
36.00	0.00	286	380.51	0.00
37.00	0.00	273	380.47	0.00
38.00	0.00	260	380.43	0.00
39.00	0.00	248	380.38	0.00
40.00	0.00	236	380.34	0.00
41.00	0.00	224	380.30	0.00
42.00	0.00	213	380.26	0.00
43.00	0.00	202	380.22	0.00
44.00	0.00	191	380.18	0.00
45.00	0.00	181	380.13	0.00
46.00	0.00	171	380.09	0.00
47.00	0.00	161	380.05	0.00
48.00	0.00	151	380.01	0.00

Hydrograph for Pond SF 2: SF-2

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	365.99	0.00	0.00	0.00
1.00	0.00	0	365.99	0.00	0.00	0.00
2.00	0.00	0	365.99	0.00	0.00	0.00
3.00	0.00	0	365.99	0.00	0.00	0.00
4.00	0.00	0	365.99	0.00	0.00	0.00
5.00	0.00	0	365.99	0.00	0.00	0.00
6.00	0.00	0	365.99	0.00	0.00	0.00
7.00	0.31	134	366.04	0.21	0.21	0.00
8.00	0.44	749	366.25	0.21	0.21	0.00
9.00	0.70	2,035	366.70	0.21	0.21	0.00
10.00	1.02	4,395	367.52	0.21	0.21	0.00
11.00	1.72	8,460	368.94	0.21	0.21	0.00
12.00	**16.42**	**18,459**	**370.03**	**8.84**	**0.24**	**8.60**
13.00	**3.10**	**16,475**	**369.84**	**5.97**	**0.23**	**5.73**
14.00	1.82	13,437	369.52	2.07	0.22	1.84
15.00	1.29	12,876	369.46	1.42	0.22	1.20
16.00	0.85	12,434	369.42	0.97	0.22	0.75
17.00	0.64	12,075	369.38	0.71	0.22	0.49
18.00	0.49	11,850	369.35	0.55	0.22	0.34
19.00	0.43	11,638	369.33	0.48	0.22	0.27
20.00	0.39	11,478	369.31	0.43	0.22	0.21
21.00	0.35	11,346	369.30	0.39	0.22	0.17
22.00	0.32	11,226	369.28	0.36	0.21	0.14
23.00	0.29	11,095	369.27	0.33	0.21	0.11
24.00	0.26	10,962	369.26	0.29	0.21	0.08
25.00	0.00	10,247	369.18	0.21	0.21	0.00
26.00	0.00	9,509	369.09	0.21	0.21	0.00
27.00	0.00	8,780	369.01	0.21	0.21	0.00
28.00	0.00	8,057	368.80	0.21	0.21	0.00
29.00	0.00	7,334	368.55	0.21	0.21	0.00
30.00	0.00	6,610	368.29	0.21	0.21	0.00
31.00	0.00	5,886	368.04	0.21	0.21	0.00
32.00	0.00	5,162	367.79	0.21	0.21	0.00
33.00	0.00	4,437	367.54	0.21	0.21	0.00
34.00	0.00	3,712	367.28	0.21	0.21	0.00
35.00	0.00	2,986	367.03	0.21	0.21	0.00
36.00	0.00	2,260	366.78	0.21	0.21	0.00
37.00	0.00	1,534	366.52	0.21	0.21	0.00
38.00	0.00	808	366.27	0.21	0.21	0.00
39.00	0.00	81	366.02	0.21	0.21	0.00
40.00	0.00	0	365.99	0.00	0.00	0.00
41.00	0.00	0	365.99	0.00	0.00	0.00
42.00	0.00	0	365.99	0.00	0.00	0.00
43.00	0.00	0	365.99	0.00	0.00	0.00
44.00	0.00	0	365.99	0.00	0.00	0.00
45.00	0.00	0	365.99	0.00	0.00	0.00
46.00	0.00	0	365.99	0.00	0.00	0.00
47.00	0.00	0	365.99	0.00	0.00	0.00
48.00	0.00	0	365.99	0.00	0.00	0.00

Hydrograph for Pond SF-1: SF-1

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0	372.49	0.00	0.00	0.00
1.00	0.00	0	372.49	0.00	0.00	0.00
2.00	0.00	0	372.49	0.00	0.00	0.00
3.00	0.00	0	372.49	0.00	0.00	0.00
4.00	0.00	0	372.49	0.00	0.00	0.00
5.00	0.00	0	372.49	0.00	0.00	0.00
6.00	0.00	0	372.49	0.00	0.00	0.00
7.00	0.29	186	372.61	0.11	0.11	0.00
8.00	0.41	1,042	373.16	0.11	0.11	0.00
9.00	0.63	2,468	374.02	0.11	0.11	0.00
10.00	0.89	4,725	374.46	0.17	0.13	0.04
11.00	1.38	8,012	375.01	0.24	0.16	0.09
12.00	**10.83**	**10,646**	**375.38**	**9.64**	**0.17**	**9.46**
13.00	**1.95**	**9,756**	**375.26**	**2.05**	**0.17**	**1.88**
14.00	1.18	9,599	375.24	1.21	0.17	1.04
15.00	0.88	9,540	375.23	0.90	0.17	0.73
16.00	0.63	9,468	375.22	0.65	0.17	0.49
17.00	0.49	9,415	375.21	0.50	0.16	0.34
18.00	0.38	9,375	375.21	0.39	0.16	0.23
19.00	0.33	9,356	375.20	0.34	0.16	0.17
20.00	0.30	9,344	375.20	0.30	0.16	0.14
21.00	0.27	9,334	375.20	0.28	0.16	0.11
22.00	0.25	9,316	375.20	0.26	0.16	0.10
23.00	0.22	9,222	375.18	0.26	0.16	0.10
24.00	0.20	9,045	375.16	0.26	0.16	0.09
25.00	0.00	8,271	375.04	0.25	0.16	0.09
26.00	0.00	7,415	374.91	0.23	0.15	0.08
27.00	0.00	6,613	374.79	0.21	0.15	0.07
28.00	0.00	5,869	374.66	0.20	0.14	0.06
29.00	0.00	5,185	374.54	0.18	0.13	0.05
30.00	0.00	4,569	374.43	0.16	0.13	0.03
31.00	0.00	4,039	374.33	0.13	0.12	0.01
32.00	0.00	3,586	374.25	0.12	0.12	0.00
33.00	0.00	3,157	374.16	0.12	0.12	0.00
34.00	0.00	2,740	374.08	0.11	0.11	0.00
35.00	0.00	2,336	373.99	0.11	0.11	0.00
36.00	0.00	1,937	373.74	0.11	0.11	0.00
37.00	0.00	1,538	373.48	0.11	0.11	0.00
38.00	0.00	1,139	373.23	0.11	0.11	0.00
39.00	0.00	740	372.97	0.11	0.11	0.00
40.00	0.00	341	372.71	0.11	0.11	0.00
41.00	0.00	0	372.49	0.00	0.00	0.00
42.00	0.00	0	372.49	0.00	0.00	0.00
43.00	0.00	0	372.49	0.00	0.00	0.00
44.00	0.00	0	372.49	0.00	0.00	0.00
45.00	0.00	0	372.49	0.00	0.00	0.00
46.00	0.00	0	372.49	0.00	0.00	0.00
47.00	0.00	0	372.49	0.00	0.00	0.00
48.00	0.00	0	372.49	0.00	0.00	0.00

Hydrograph for Pond SFB-1: SFB-1 WEST

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	373.00	0.00
1.00	0.03	25	373.13	0.00
2.00	0.06	197	373.57	0.00
3.00	0.09	465	373.92	0.00
4.00	0.12	830	374.22	0.00
5.00	0.16	1,339	374.52	0.00
6.00	0.21	2,006	374.81	0.00
7.00	0.30	2,583	375.02	0.29
8.00	0.41	2,602	375.03	0.41
9.00	0.63	2,628	375.04	0.63
10.00	0.90	2,658	375.05	0.89
11.00	1.40	2,705	375.06	1.38
12.00	**11.48**	**3,240**	**375.24**	**10.83**
13.00	**1.90**	**2,753**	**375.08**	**1.95**
14.00	1.17	2,687	375.06	1.18
15.00	0.88	2,658	375.05	0.88
16.00	0.62	2,628	375.04	0.63
17.00	0.49	2,612	375.03	0.49
18.00	0.38	2,599	375.03	0.38
19.00	0.33	2,592	375.02	0.33
20.00	0.30	2,585	375.02	0.30
21.00	0.27	2,579	375.02	0.27
22.00	0.25	2,574	375.02	0.25
23.00	0.22	2,568	375.02	0.22
24.00	0.19	2,563	375.01	0.20
25.00	0.00	2,521	375.00	0.00
26.00	0.00	2,521	375.00	0.00
27.00	0.00	2,521	375.00	0.00
28.00	0.00	2,521	375.00	0.00
29.00	0.00	2,521	375.00	0.00
30.00	0.00	2,521	375.00	0.00
31.00	0.00	2,521	375.00	0.00
32.00	0.00	2,521	375.00	0.00
33.00	0.00	2,521	375.00	0.00
34.00	0.00	2,521	375.00	0.00
35.00	0.00	2,521	375.00	0.00
36.00	0.00	2,521	375.00	0.00
37.00	0.00	2,521	375.00	0.00
38.00	0.00	2,521	375.00	0.00
39.00	0.00	2,521	375.00	0.00
40.00	0.00	2,521	375.00	0.00
41.00	0.00	2,521	375.00	0.00
42.00	0.00	2,521	375.00	0.00
43.00	0.00	2,521	375.00	0.00
44.00	0.00	2,521	375.00	0.00
45.00	0.00	2,521	375.00	0.00
46.00	0.00	2,521	375.00	0.00
47.00	0.00	2,521	375.00	0.00
48.00	0.00	2,521	375.00	0.00

Hydrograph for Pond SFB-2: SFB-2 EAST

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	372.00	0.00
1.00	0.03	28	372.03	0.00
2.00	0.07	224	372.21	0.00
3.00	0.10	528	372.44	0.00
4.00	0.13	931	372.69	0.00
5.00	0.16	1,434	372.95	0.00
6.00	0.21	2,101	373.24	0.00
7.00	0.32	2,583	373.42	0.31
8.00	0.44	2,597	373.43	0.44
9.00	0.71	2,625	373.44	0.70
10.00	1.03	2,654	373.45	1.02
11.00	1.65	2,704	373.47	1.64
12.00	**16.25**	**3,364**	**373.69**	**15.23**
13.00	**2.26**	**2,751**	**373.48**	**2.30**
14.00	1.43	2,690	373.46	1.44
15.00	1.08	2,660	373.45	1.08
16.00	0.76	2,632	373.44	0.77
17.00	0.60	2,615	373.43	0.61
18.00	0.46	2,600	373.43	0.47
19.00	0.41	2,594	373.43	0.41
20.00	0.37	2,589	373.42	0.37
21.00	0.34	2,586	373.42	0.34
22.00	0.31	2,582	373.42	0.31
23.00	0.27	2,579	373.42	0.28
24.00	0.24	2,573	373.42	0.24
25.00	0.00	2,525	373.40	0.00
26.00	0.00	2,525	373.40	0.00
27.00	0.00	2,525	373.40	0.00
28.00	0.00	2,525	373.40	0.00
29.00	0.00	2,525	373.40	0.00
30.00	0.00	2,525	373.40	0.00
31.00	0.00	2,525	373.40	0.00
32.00	0.00	2,525	373.40	0.00
33.00	0.00	2,525	373.40	0.00
34.00	0.00	2,525	373.40	0.00
35.00	0.00	2,525	373.40	0.00
36.00	0.00	2,525	373.40	0.00
37.00	0.00	2,525	373.40	0.00
38.00	0.00	2,525	373.40	0.00
39.00	0.00	2,525	373.40	0.00
40.00	0.00	2,525	373.40	0.00
41.00	0.00	2,525	373.40	0.00
42.00	0.00	2,525	373.40	0.00
43.00	0.00	2,525	373.40	0.00
44.00	0.00	2,525	373.40	0.00
45.00	0.00	2,525	373.40	0.00
46.00	0.00	2,525	373.40	0.00
47.00	0.00	2,525	373.40	0.00
48.00	0.00	2,525	373.40	0.00

Hydrograph for Pond SFB-3: SFB-3

Time (hours)	Inflow (cfs)	Storage (cubic-feet)	Elevation (feet)	Primary (cfs)
0.00	0.00	0	380.00	0.00
1.00	0.00	3	380.03	0.00
2.00	0.01	22	380.18	0.00
3.00	0.01	51	380.40	0.00
4.00	0.01	90	380.64	0.00
5.00	0.01	137	380.88	0.00
6.00	0.02	192	381.13	0.00
7.00	0.02	259	381.39	0.00
8.00	0.03	292	381.50	0.03
9.00	0.04	292	381.50	0.04
10.00	0.06	293	381.51	0.06
11.00	0.09	294	381.51	0.09
12.00	**0.81**	**308**	**381.56**	**0.79**
13.00	**0.11**	**295**	**381.51**	**0.11**
14.00	0.07	293	381.51	0.07
15.00	0.05	293	381.51	0.05
16.00	0.04	292	381.50	0.04
17.00	0.03	292	381.50	0.03
18.00	0.02	292	381.50	0.02
19.00	0.02	292	381.50	0.02
20.00	0.02	292	381.50	0.02
21.00	0.02	292	381.50	0.02
22.00	0.01	292	381.50	0.01
23.00	0.01	291	381.50	0.01
24.00	0.01	291	381.50	0.01
25.00	0.00	291	381.50	0.00
26.00	0.00	291	381.50	0.00
27.00	0.00	291	381.50	0.00
28.00	0.00	291	381.50	0.00
29.00	0.00	291	381.50	0.00
30.00	0.00	291	381.50	0.00
31.00	0.00	291	381.50	0.00
32.00	0.00	291	381.50	0.00
33.00	0.00	291	381.50	0.00
34.00	0.00	291	381.50	0.00
35.00	0.00	291	381.50	0.00
36.00	0.00	291	381.50	0.00
37.00	0.00	291	381.50	0.00
38.00	0.00	291	381.50	0.00
39.00	0.00	291	381.50	0.00
40.00	0.00	291	381.50	0.00
41.00	0.00	291	381.50	0.00
42.00	0.00	291	381.50	0.00
43.00	0.00	291	381.50	0.00
44.00	0.00	291	381.50	0.00
45.00	0.00	291	381.50	0.00
46.00	0.00	291	381.50	0.00
47.00	0.00	291	381.50	0.00
48.00	0.00	291	381.50	0.00

Appendix F – Minimum Standard 6 – Redevelopment and Infill Calculations

PROJECT IS NOT A REDEVELOPMENT OR INFILL PROJECT

Appendix G – Minimum Standard 7 and 11 – Stormwater Management System Operation and Maintenance Plan and Source Control and Pollution Prevention Plan (Bound Separately)

Appendix H – Minimum Standard 10 – Soil Erosion and Sediment Control Plan (Bound Separately)

Appendix I – Soils Information

- Test Pit Logs
- NRCS Soils Data

Test Pit Logs

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP1

Location: 2110 Plainfield Pike, Cranston
Total Depth: 93", boulder refusal
Free Water Depth: 68"
Notes: SHWT indicators observed at 21" below grade.

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-12	^Apu	clear	smooth	10YR 4/3	-	-	-	-	gravelly sandy loam	medium subangular blocky to fine granular	very friable	many fine roots; brick fragments
12-21	Bw	clear	smooth	10YR 5/6	-	-	-	-	gravelly silt loam	moderate medium subangular	very friable	common roots; 5-10% stones
21-54	Cd1	abrupt	smooth	10YR 5/6	10YR 5/3, 7.5YR 5/8	common	fine/medium	distinct	gravelly sandy loam	massive	firm	no roots
54-93	2C	clear	wavy	2.5Y 6/3	-	-	-	-	extremely bouldery loamy sand	single grain	loose	no roots
93	R	-	-	-	-	-	-	-	-		-	refusal on boulders or bedrock

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP2

Location: 2110 Plainfield Pike, Cranston
Total Depth: 64", boulder refusal
Free Water Depth: -
Notes: SHWT indicators not observed

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				many fine roots
0-9	Ap	clear	wavy	7.5YR 4/3	-	-	-	-	sandy loam	weak fine granular	very friable	Common fine roots.
9-33	Bwb	clear	wavy	10YR 6/6	-	-	-	-	silt loam	moderate medium subangular blocky	friable	no roots
33-64	2Cd	clear	smooth	10YR 6/2	-	-	-	-	very gravelly laomy sand	massive	firm	no roots
64	R	-	-	-	-	-	-	-			-	refusal on bedrock or boulders

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP3

Location: 2110 Plainfield Pike, Cranston
Total Depth: 100", max reach
Free Water Depth: 100+
Notes: SHWT indicators at 37" below grade

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-13	Ap	gradual	smooth	10YR 4/4	-	-	-	-	Silt loam	moderate medium subangular blocky	very friable	Many fine roots.
13-17	Bw1	clear	smooth	10YR 5/6	-	-	-	-	silt loam	strong medium subangular blocky	friable	common roots
17-37	Bw2	clear	smooth	7.5YR 5/4	-	-	-	-	silt loam	weak medium subangular blocky	friable	few fine roots
37-45	Bw3/2C	clear	wavy	10YR 5/4	2.5Y 6/2, 10YR 4/6	common	medium	distinct	loamy sand	massive	friable	no roots
45-78	2Cd	abrupt	smooth	10YR 7/2	-	-	-	-	gravelly loamy sand	massive	firm	no roots
78-100	2C	clear	smooth	10YR 7/2	_	-	-	-	very gravelly loamy sand	massive	friable	no roots, excavation terminated at 100"

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Jeffrey Peterson D4039
Test Hole: TP-4

Location: 2110 Plainfield Pike, Cranston
Total Depth: 37", competent bedrock refusal
Free Water Depth: None encountered
Notes: SHWT indicators observed at 25" below grade.

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-9	Ap1	abrupt	smooth	10YR 3/3	-	-	-	-	silt loam	moderate medium granular	friable	Many fine roots.
9-14	Ap2	abrupt	smooth	10YR 3/3	-	-	-	-	silt loam	weak medium subangular blocky	friable	Common fine roots.
14-25	Bw	abrupt	smooth	10YR 5/6	-	-	-	-	silt loam	weak medium subangular blocky	friable	Few fine roots and 1/4" vertical krotovenas (10YR 3/3).
25-35	2C1	clear	smooth	2.5Y 6/2	-	-	-	-	very gravelly loamy sand	massive	friable	Few fine roots and 1/4" vertical krotovenas (10YR 3/3).
35-60	2Cd2	abrupt	wavy	2.5Y 6/2	2.5Y 5/3	common	fine/medium	faint	very gravelly loamy sand	massive	firm	No roots
60-65	3Cr3	abrupt	smooth	2.5Y 6/2					rippable bedrock	massive	firm	Interstices of weathered rock filled with loamy sand
65	R											Competent bedrock.

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP-5

Location: 2110 Plainfield Pike, Cranston
Total Depth: 100", max reach
Free Water Depth: 98"
Notes: SHWT indicators observed at 30" below grade.

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-13	Ap1	clear	smooth	10YR 4/3	-	-	-	-	silt loam	moderate medium subangular blocky	very friable	Many fine roots.
13-23	A/B	clear	smooth	10YR 5/6	-	-	-	-	gravelly silt loam	moderate medium subangular blocky	very friable	Common fine roots. Streaking of Ap (10YR 4/3)
23-30	Bw	clear	smooth	10YR 5/6	-	-	-	-	silt loam	moderate medium subangular blocky	friable	few roots
30-54	2Cd1	clear	smooth	5Y 7/2	5Y 7/1, 10YR 4/6	common	coarse	prominent	gravelly loamy sand	massive	firm	no roots
54-100	2C2			5Y 7/2	-	-	-	-	stony loamy caorse sand	single grain	loose	Excavation terminated at 100"

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP-6

Location: 2110 Plainfield Pike, Cranston
Total Depth: 65", competent bedrock refusal
Free Water Depth: None encountered
Notes: SHWT indicators not observed

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-6	Ap1	clear	smooth	10YR 4/3	-	-	-	-	gravelly silt loam	strong medium granular	friable	many roots
6-15	Ap2	clear	smooth	10YR 4/3	-	-	-	-	gravelly silt loam	weak medium subangular blocky	very friable	common fine roots
15-27	Bw	clear	smooth	10YR 6/6	-	-	-	-	fine sandy loam	weak medium subangular blocky	very friable	few fine roots
27-30	Bw	clear	smooth	10YR 6/6	-	-	-	-	fine sandy loam	weak medium subangular blocky	very friable	few coarse distinct 10YR 6/4 "depletions" throughout
30-46	2Cd	clear	smooth	2.5Y 6/3	-	-	-	-	stony sandy loam	massive	firm	no roots
46-65	Cr	abrupt	smooth	2.5Y 6/3	-	-	-	-	stony loamy sand	single grain	loose	no roots
65	R											Competent bedrock.

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP-7

Location: 2110 Plainfield Pike, Cranston
Total Depth: 54", competent bedrock refusal
Free Water Depth: None encountered
Notes: SHWT indicators not observed

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-12	^Ap	clear	smooth	10YR 4/4	-	-	-	-	silt loam	moderate medium granular	friable	few glass, common brick fragments thoughout; many fine roots
12-21	Bw	clear	smooth	10YR 5/4	-	-	-	-	gravelly silt loam	weak medium subangular blocky	friable	few roots
21-54	2Cd	clear	smooth	10YR 6/2	-	-	-	-	gravelly sandy loam	massive	firm	no roots
54	R											Competent bedrock

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP-8

Location: 2110 Plainfield Pike, Cranston
Total Depth: 74", competent bedrock refusal
Free Water Depth: None encountered
Notes: SHWT indicators not observed

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-14	Ap	clear	smooth	10YR 4/3	-	-	-	-	silt loam	moderate medium subangular blocky	friable	~10% gravels; common fine roots
14-30	Bw	gradual	smooth	10YR 5/4	-	-	-	-	gravelly silt loam	moderate medium subangular blocky	very friable	Few fine roots and 1/4" vertical krotovenas (10YR 4/3).
30-46	2Cd	clear	smooth	2.5Y 6/3	-	-	-	-	stony sandy loam	massive	firm	no roots
65	R											competent bedrock

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP-9

Location: 2110 Plainfield Pike, Cranston
Total Depth: 75", boulder refusal
Free Water Depth: 64"
Notes: SHWT indicators observed at 31" below grade

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-16	^Apu	gradual	smooth	10YR 4/2	-	-	-	-	gravelly silt loam	moderate medium granular	friable	few brick fragments throughout; common fine roots
16-31	Bw1	gradual	smooth	10YR 5/6	-	-	-	-	gravelly sandy loam	weak medium subangular blocky	very friable	few fine roots
31-38	Bw2	clear	smooth	5Y 6/4	10YR 6/1, 7.5YR 5/8	many	coarse, medium	prominent	silt loam	weak medium subangular blocky	very friable	no roots
68-64	2Cd1	abrupt	smooth	2.5Y 6/3	-	-	-	-	gravelly loamy sand	massive	firm	no roots
64-75	3Cr2	-	-	2.5Y 6/3	-	-	-	-	extremely bouldery	massive	friable	refusal on partially weathered boulders at 75 inches

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Jeff Peterson, D4039
Test Hole: TP 10

Location: 2110 Plainfield Pike, Cranston
Total Depth: 34" bedrock refusal
Free Water Depth: None encountered
Notes: SHWT indicators observed at 28" below grade.

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-2	Ap1	abrupt	smooth	10YR 3/3	-	-	-	-	fine sandy loam	moderate medium granular	friable	Many fine roots.
2-12	Ap2	abrupt	smooth	10YR 3/4	-	-	-	-	gravelly sandy loam	weak fine granular	friable	Many fine roots.
12-14	B/2C	abrupt	smooth	10YR 4/6 & 2.5Y 5/3	-	-	-	-	gravelly sl/very gravelly ls	massive	friable	No roots.
14-25	2C1	clear	wavy	2.5Y 5/3	-	-	-	-	very gravelly ls with masses of sl	massive	friable	No roots.
25-37	2Cd2	abrupt	smooth	2.5Y 5/2	10YR 5/4	common	medium	distinct	loamy fine sand /loamy sand	massive	firm	No roots.
37	R	-	-									Competent bedrock.

Project: 73375.00
Date: 10/27/2022
Soil Evaluator: Andrew McNulty, D4099
Test Hole: TP-11

Location: 2110 Plainfield Pike, Cranston
Total Depth: 39" bedrock refusal
Free Water Depth: None encountered
Notes: SHWT indicators not observed

Depth	Horizon	Horizon Boundaries		Soil Colors		Redox Description			Texture	Structure	Consistence	HTM artifacts/Other Notes
(inches)		Dist	Topo	Matrix	Redox Features	Abundance	Size	Contrast				
0-14	Ap	clear	smooth	10YR 4/3	-	-	-	-	gravelly silt loam	moderate medium granular	friable	common fine roots
14-31	Bw	clear	smooth	10YR 6/6	-	-	-	-	silt loam	weak fine subangular blocky	very friable	few fine roots
31-39	2Cd	abrupt	smooth	10YR 7/2	-	-	-	-	gravelly sandy loam	massive	firm	no roots
39	R	-	-									Competent bedrock

NRCS Soils Data

Soil Map—State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
(Plainfield Pike Cranston, RI)

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BrB	Broadbrook silt loam, 3 to 8 percent slopes	17.9	7.1%
CdA	Canton and Charlton fine sandy loams, 0 to 3 percent slopes	0.0	0.0%
CdB	Canton and Charlton fine sandy loams, 3 to 8 percent slopes	0.8	0.3%
CeC	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, very rocky	3.1	1.2%
ChB	Canton and Charlton fine sandy loams, 0 to 8 percent slopes, very stony	29.6	11.7%
ChC	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	8.7	3.4%
LgC	Lippitt gravelly sandy loam, very rocky, 3 to 15 percent slopes	1.3	0.5%
NaA	Narragansett silt loam, 0 to 3 percent slopes	2.1	0.8%
NaB	Narragansett silt loam, 3 to 8 percent slopes	14.4	5.7%
NbB	Narragansett very stony silt loam, 0 to 8 percent slopes	1.9	0.7%
PaA	Paxton fine sandy loam, 0 to 3 percent slopes	6.6	2.6%
PaB	Paxton fine sandy loam, 3 to 8 percent slopes	34.4	13.6%
PbC	Paxton fine sandy loam, 8 to 15 percent slopes, very stony	5.3	2.1%
RaA	Rainbow silt loam, 0 to 3 percent slopes	7.7	3.1%
Re	Ridgebury fine sandy loam, 0 to 3 percent slopes	2.1	0.8%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	58.8	23.3%
StA	Sutton fine sandy loam, 0 to 3 percent slopes	1.4	0.6%
StB	Sutton fine sandy loam, 3 to 8 percent slopes	3.1	1.2%

Appendix J – Meeting Notes

RHODE ISLAND
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
235 Promenade Street, Providence, RI 02908-5767 401-222-4700

Meeting Minutes – Milton Cat redevelopment, 2110 Plainfield Pike, Cranston

June 1, 2023

Meeting held via Teams on March 9, 2023

Meeting Participants

Adam Rosenblatt, VHB	**Joseph Antonio, DEM/OCTA**
Josh Rosen, VHB	**Nicholas Pisani, DEM/Stormwater Mgmt.**
Karen Crawford, VHB	**Martin Wencek, DEM/Freshwater Wetlands**
Ethan Flinkstrom, New Tech Co., Inc.	

Purpose of the Meeting

The purpose of this meeting was to discuss a proposed commercial development project to be located at 2110 Plainfield Pike in Cranston.

According to the consultant:

> "The project site location is an approximate 10-acre parcel of land located at AP 35 Lot 9, 2110 Plainfield Pike in Cranston (southerly side of Plainfield Pike). The proposed development includes demolishing all existing structures on the site and constructing a new ±45,000 SF industrial building, a ±5,400 SF accessory structure, associated parking, and drive aisles for a Milton Cat Sales and Service Facility. The site drains generally north to south from Plainfield Pike to the rear of the property. VHB has flagged an edge of wet meadow in the southwest corner of the property that abuts an off-site forested deciduous swamp greater than 10 acres. The parcel was previously farmed and is currently non-wooded and contains predominately open mowed ground cover within the site limits. Along with the proposed buildings and parking considerations, the site improvements will include approximately 1.2/1.3 acres of open exterior storage areas (millings, recycled asphalt) as well as stormwater management controls, utility connections, site grading and retaining walls as required." The consultants indicated that they will be treating all impervious areas, including the proposed areas of gravel/asphalt millings parking areas.

In addition, the site owner hopes to maximize impervious areas for machine storage.

It was noted that municipal water (no wells) serves the site. The site owner will need to check to make sure there are no wells for agricultural purposes.

The proposed development is part of a 5-year Master Plan Expansion that Milton Cat is undertaking in both the Cranston and Providence area.

Below are notes from this meeting.

1. It was mentioned that there will need to be a 50' buffer zone plus a 25' bump-out, for a combined 75' buffer zone. The applicant will need to determine what amount is buffer is within the buffer zone (i.e., natural vegetation) and try avoiding disturbing that area. If the buffer cannot be avoided the design must minimized that encroachment and should attempt to mitigate that disturbance.

2. The area that is currently being cut on a regular basis may be classified as disturbed. The forested area just northeast of the pond is considered as buffer.

3. It was mentioned that there will be perimeter access around the southern part of the proposed industrial building and that parking will be established north of the building.

   It was also mentioned that slope grading will eventually be needed, due to the site draining from Plainfield Pike to the south.

4. It was mentioned that roof runoff will be collected and sent to a below-grade sand filter. The sand filters must have at least 18" of sand. Groundwater is 20"-30" below existing grade. Bedrock was identified in some of the test pits.

   Parking lot runoff will be diverted to a catch basin and a sediment forebay to a sand filter for water quality treatment. Another option mentioned was a stone trench with an underdrain to a sediment forebay and detention system.

5. The consultant informed the Department that the diesel pad area will be treated using grooves. Runoff cannot be infiltrated unless via a bio-retention system, as the diesel pad is considered by the Department to be a land use with higher potential pollutant loads (LUHPPL) area. However, because the LUHPPL area must be at least 1,000 feet from a drinking well, the Department recommends that the diesel pad be relocated. The pad and filling area must be isolated, and the runoff must be captured. Spill containment is also needed. In addition, water quality volume treatment is to be provided for these areas. If the diesel pad is too close to Plainfield Pike, then the site owner may need DOT approval.

   It was also mentioned that a canopy will be required. Runoff from the canopy can be diverted to infiltration.

6. In accordance with Wetland Rule, Section 3.7.1(B4), it was stated that revegetation/new buffer needs to be created/reestablished between grading limits of disturbance and the buffer edge. It was also mentioned that most likely a variance is needed as a result of the current design. It was noted that encroachment of the buffer area will be scrutinized by the Department.

7. It was mentioned that the watershed is a tributary to the nearby Simmons River. No increases of runoff volume to the Pocasset Watershed are expected. It was mentioned that the project site may need more water storage, as the river is known as a flood-prone river.

8. It was suggested that a steep slope stabilization method, such as fiber matting --not loam and seed—be proposed.

9. The site owner is proposing a 4' groundwater separation for infiltration for large storm events to avoid having to perform a groundwater mounding analysis.

This concludes the Department's understanding of the issues raised during the meeting. Please be aware that this letter is not to be construed as a permit or an approval to undertake work or any indication that any permit for this project will ultimately be granted. This meeting summary does not relieve the property owner form his/her obligation to obtain any local, state, or federal approvals or permits required by ordinance or law.