DiPrete Engineering

Stormwater Management Report

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No. 11876
10/29/2021
REGISTERED
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CIVIL

551 Liberty Lane

Located in South Kingstown, RI

Applicant: South County Post & Beam

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Executive Summary

On behalf of the Client, we are submitting drainage calculations for the proposed development at 551 Liberty Lane, South Kingstown, RI. The site is located on Assessors' Plat 21-3 Lot 21. The site exists today as almost entirely wooded with an existing building and associated paved driveway. The client proposes to demolish the building and construct three new buildings with associated parking. The proposed buildings will provide storage space for the existing South County Post & Beam.

The post development stormwater will be treated for water quality using Best Management Practices (BMPs). The Site has been designed to meet the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM).

To mitigate post development flows on site, a series of a lined stone trench and drainage networks are utilized to convey runoff to the sand filters. The sand filter systems are designed to control runoff for the 1 through 100-year storm events. The sediment forebays, sand filters and Precast Porous Concrete Slabs (Stormcrete) areas are designed as water quality BMPs. These will remove 85% or more of TSS (total suspended solids) generated by the proposed parking areas and access roads.

This report details how the site will show no net increase in stormwater runoff from pre development to post development conditions, and how the proposed BMPs will provide water quality treatment for stormwater runoff. The site is designed to fully infiltrate all of the proposed impervious in DP-1 through the 100-year storm event. The increase of the post development flows is from the CN change from woods in pre development to grass in post development in the undetained areas of the proposed site. The volume of stormwater to this design point is either unchanged or decreased through the 100-year storm, therefore reducing impacts to the wetland.

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

Subwatershed (design point)	1.2" Peak Flow		1-yr Peak Flow		10-yr Peak Flow		100-yr Peak Flow	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.00	0.00	0.05	0.13	0.95	1.14	15.06	11.63
DP-2:	0.08	0.00	0.17	0.00	0.57	0.02	1.38	0.07
DP-3:	0.14	0.01	0.28	0.09	1.52	1.04	4.48	3.19
Totals:	0.22	0.01	0.50	0.22	3.04	2.20	20.92	14.89

All flows in cubic feet per second (cfs)

Subwatershed (design point)	1.2" Peak Volume		1-yr Peak Volume		10-yr Peak Volume		100-yr Peak Volume	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.000	0.000	0.021	0.022	0.132	0.097	1.118	0.675
DP-2:	0.006	0.000	0.014	0.000	0.041	0.002	0.098	0.005
DP-3:	0.021	0.001	0.060	0.012	0.237	0.058	0.653	0.178
Totals:	0.027	0.001	0.095	0.034	0.410	0.157	1.869	0.858

All flows in acre-feet (af)

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

PROJECT NAME **551 Liberty Lane**	**(RIDEM USE ONLY)**
TOWN **South Kingstown**	**STW/WQC File #:**
BRIEF PROJECT DESCRIPTION: Construction of three commercial buildings totaling 70,500 sf, associated parking and stormwater facilities.	**Date Received:**

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 Please see attached plan set

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: Chickasheen Brook	☒ Coldwater	☐ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0008039R-05B	☐ 4th order stream of pond 50 acres or more		
☐ TMDL for:	☐ 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: Enterococcus	☐ 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:	☐ 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	
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: 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		
	☒ Total Pre-Construction Impervious Area (**TIA**) 0.25 Ac	
	☒ Total Site Area (**TSA**) 6.31 Ac	
	☒ Jurisdictional Wetlands (**JW**) 0.70 Ac	
	☒ Conservation Land (**CL**) 0.0 Ac	
☒ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☒ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) 6.31 – 0.70 – 0.0 = 5.61 Ac	
	☒ (**TIA**) / (**SS**) = 0.25 / 5.61 = 0.04	☒ (**TIA**) / (**SS**) >**0.4**? No
☐ 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 minimum area needed 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):	
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):	All new impervious areas are directed to dedicated treatment areas to the maximum extent practicable within the site constraints.
F) MITIGATE RUNOFF AT THE POINT OF GENERATION ☒ Small-scale BMPs have been designated to treat runoff as close as possible 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	

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?

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

Design Point	**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)		
DP-1:	121,053	3,531	0	3,531	10,367
DP-2:	0	0	0	0	0
DP-3:	5,522	161	0	161	392
TOTALS:	126,541	3,692	0	3,692	10,759

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 Report

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. The water quality requirements are met by infiltration basins. All rain events up to and including the 10-year storm will be fully infiltrated.
☐	☒	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:	121,053	10,088	0	10,088	10,367
DP-2:	0	0	0	0	0
DP-3:	5,522	460	0	460	392
TOTALS:	126,541	10,548	0	10,548	10,759

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 Report

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:	Chickasheen Brook	Y	828	828*	
DP-2:	N/A	N	N/A	N/A	
DP-3:	Chickasheen Brook	Y	1,481	1,481*	
TOTALS:					
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. *The 1-year storm is fully infiltrated				
☒ 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 Report					

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?	
☐	☒	Is a Downstream Analysis required (see RICR 8.11.E.1)?	
☒	☐	Calculate the following:	
		☒	Area of disturbance within the sub-watershed (areas) 5.59 Ac
		☒	Impervious cover (%) 46.5%
☐	☒	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? Note that while the 10-year post-development storm shows a slight increase in peak runoff, the entire runoff volume will be infiltrated.	

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:	0.00	0.00	0.05	0.13	0.95	1.14	15.06	11.63
DP-2:	0.08	0.00	0.17	0.00	0.57	0.02	1.38	0.07
DP-3:	0.14	0.01	0.28	0.09	1.52	1.04	4.48	3.19
TOTALS:	0.22	0.01	0.50	0.22	3.04	2.20	20.92	14.89

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

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
A1	1	Sand Filter	Y	Y	Y	NA	Y	E	Y		
A2	1	Sand Filter	Y	Y	Y	NA	Y	E	Y		
B	3	Stormcrete	Y	Y	Y	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	A1	Sand Filter	TH-7	TH-6	101.00	104.00	3.0	B	8.27
1	A2	Sand Filter	TH-1	TH-2	101.00	105.00	4.0	B	8.27
3	B	Stormcrete	TH-5	TH-2	101.00	104.16	3.16	B	8.27
		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.
☐	☐	☒	Are these activities already covered under an MSGP? If "No," please explain if you have applied for an MSGP or intend to do so?
☐	☐	☒	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:
☐	☐	☒	Additional BMPs, or additional pretreatment BMP's if any, that meet RIPDES MSGP requirements; Please list BMPs:
			Indicate below where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.).

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
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? Site is largely undeveloped.
☐	☒	☐	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)? See Soil Erosion and Sediment Control Plan

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: See Operation & Maintenance Plan
☒	☐	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: Christian Sutter
		☐	RI-registered P.E. Name:

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (acres)**	**Existing Impervious (acres)**	**Proposed Impervious (acres)**
DP-1:	Chickasheen Brook	5.38	0.18	2.90
DP-2:				
DP-3:				
TOTALS:				

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

1.0 Project Description

The purpose of this report is to specify a Stormwater Management System to be implemented in the new South County Post & Beam storage at 551 Liberty Lane.

The site totals 6.31 acres and is located on Assessor's Plat 21-3 Lot 21 in South Kingstown, Rhode Island. The site is located off of Liberty Lane and Fairgrounds Road. The Chickasheen Brook is located on the northwestern side of the adjacent site. The proposed development will include three new buildings totaling 70,500 sf and associated parking. The site will be serviced by public water and sewer. Water is provided by Kingston Water District and sewer is provided by the South Kingstown Wastewater Division.

The stormwater quality will be improved by utilizing Best Management Practices (BMPs) as established by the RISDISM for the treatment of stormwater runoff from the proposed development. BMPs will consist of sediment forebays, sand filters and Precast Porous Concrete Slabs (Stormcrete). The system has been designed to meet the RIDEM Stormwater Design and Installations Standards Manual.

2.0 Site Conditions

2.1 SOILS

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

Soil Symbol	Description	Hydrologic Group
EfA	Enfield silt loam, 0 to 3 percent slopes	B
EfB	Enfield silt loam, 3 to 8 percent slopes	B

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

2.2 EXISTING SITE CONDITIONS

Currently the site is predominately wooded. There is an existing building along Liberty Lane with associated paved driveway. Stormwater on the site flows overland to three design points: The Chickasheen Brook (DP-1), the Northeast Abutter (DP-2) and Liberty Lane (DP-3).

None of the stormwater on site is treated or detained before being discharged.

2.3 POST SITE CONDITIONS

The proposed drainage analysis uses stormwater management systems to control and treat runoff from the proposed development. The following BMPs are used on site and have been designed to include the following elements:

- Sediment Forebays
    - Pretreatment of roadways and sidewalks
    - 2.0' forebay depth with proposed 2:1 reinforced slopes and 3:1 grassed slopes
    - Sandy-loam or other slower infiltrating soil to be placed under the sediment forebays to inhibit infiltration within sediment forebay in areas with high in situ infiltration rates

- Sand Filters
    - Fully infiltrates the water quality stormwater event
    - 2.0' of sand media mix including 6" of top soil and 1.5' of sand filter sand for stormwater infiltration

- Infiltration Pond
    - Fully infiltrates through the 100-year storm event

- Precast Porous Concrete Slabs (Stormcrete)
    - Extremely high stormwater intake rate of 250 in/hr
    - Fully infiltrates the water quality and 1-year storm event
    - Provides stormwater recharge
    - Washed crushed stone reservoir course

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

The primary goal of increasing water quality treatment is accomplished by providing water quality BMPs. Stormwater runoff mitigation is provided through the use of sediment forebays, sand filters and Precast Porous Concrete Slabs (Stormcrete). By reducing post development stormwater flow rate to a level no greater than the pre development rate, the second goal of the proposed drainage system is achieved. Any potential impacts from the proposed development on the abutting properties and wetland has been mitigated.

3.0 Minimum Standards

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

3.1 Minimum Standard 1: LID Site Planning and Design Strategies

See "Appendix A: Stormwater Management Checklist" from the RISDISM provided at the beginning of this report.

3.2 Minimum Standard 2: Groundwater Recharge

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

Groundwater recharge is determined from the following equation:

Re_V=1"*F*I/12

Where:

Re_V=Groundwater Recharge Volume (cf)

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

I=Impervious Area (sf)

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

Recharge volume for watersheds 1 and 3 are provided through the use of sand filters and Precast Porous Concrete Slabs (Stormcrete). See Table 2-1 of the Appendix A checklist for a summary of recharge values.

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

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

3.3 Minimum Standard 3: Water Quality

All stormwater is treated through an approved BMP before being discharged. This site has been designed to use sediment forebays to treat stormwater before being infiltrated within the sand filters. There are no pollutant-specific requirements and/or pollutant removal efficiencies applicable to the site as the result of SAMP, TMDL, or other watershed-specific requirements.

The sand filters and Precast Porous Concrete Slabs (Stormcrete) have been sized using HydroCAD and an infiltration rate based on a parent material within the footprint of the BMP. The project site largely consists of sand and an infiltration rate was used from table 5-3 in section 5.3.4 of the RISDISM. See Appendix A3.2 for the HydroCAD analysis for the water quality event. The sand filters and Precast Porous Concrete Slabs (Stormcrete) have been designed to fully infiltrate the water quality event. Infiltrometer testing was completed on the site and infiltration rates in the area of Infiltration Pond A was found to be 113.75 in/hr. The water quality section of Pond A was designed using the 8.27 in/hr and the rest of the pond designed at a rate of 56.875 in/hr. See Appendix A2.1 for full information. Sand Filter A1 and the Precast Porous Concrete Slabs (Stormcrete) have been designed using the 8.27 in/hr infiltration rate.

Pretreatment for the sand filters has been provided through the use of sediment forebays. The forebays have been sized per section 6.4 of the RISDISM.

Sand Filter Sizing

Name of Sand Filter: A1

Sand Filter Parameters		
At,Total Area to Sand Filter	1.332	(Acres)
Impervious Area To Sand Filter	0.650	(Acres)
d_f, Filter Bed Depth	2.00	(feet)
k, Coefficient of Permeability	3.5	(ft/day)
h_f, Average Height of Water	0.50	(ft)
t_f, Design Filter Bed Drain Time	2.00	(days)
Ponding Depth	12	(in)
Loam Depth	6	(in)

Water Quality Calculations

WQ_v= 1inch x Impervious Area

WQ_v= 2,360 (Cubic Feet)

Minimum Size of Sand Filter Filter Area

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

Required Af= 270 (Square Feet) Where A_f is the required filter bed area

Provided Af= 1,971 (Square Feet)

Sand Filter Pre Treatment

Type of Pre Treatment: Sediment Forebay

As=5,750*Q Q=%WQv/86,400 %WQv=25%

Required As= 39 (Square Feet), where As is the required forebay Area

Provided As= 952 (Square Feet)

25% of Water Quality Volume must be provided in Forebay

Required Volume= 590 (Cubic Feet)

Provided Volume= 2,943 (Cubic Feet)

Required Water Quality Volume

75% of the WQv must be held within system (including forebay)

Required WQ_v 1,770 (Cubic Feet)

Volume of Loam	325 (Cubic Feet)
Volume of Forebay	2,943 (Cubic Feet)
Volume of Ponding	2,269 (Cubic Feet)
Volume of Voids in Filter Bed	1,301 (Cubic Feet)
Total	**6,838 (Cubic Feet)**

DiPrete Engineering
Engineers • Planners • Surveyors

Sand Filter Sizing

Name of Sand Filter: A2

Sand Filter Parameters		
At,Total Area to Sand Filter	1.924	(Acres)
Impervious Area To Sand Filter	1.443	(Acres)
d_f, Filter Bed Depth	2.00	(feet)
k, Coefficient of Permeability	3.5	(ft/day)
h_f, Average Height of Water	0.63	(ft)
t_f, Design Filter Bed Drain Time	2.00	(days)
Ponding Depth	15	(in)
Loam Depth	6	(in)

Water Quality Calculations

WQ_v= 1inch x Impervious Area

WQ_v= 5,238 (Cubic Feet)

Minimum Size of Sand Filter Filter Area

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

Required Af= 570 (Square Feet) Where A_f is the required filter bed area

Provided Af= 1,663 (Square Feet)

Sand Filter Pre Treatment

Type of Pre Treatment: Sediment Forebay

As=5,750*Q Q=%WQv/86,400 %WQv=25%

Required As= 87 (Square Feet), where As is the required forebay Area

Provided As= 755 (Square Feet)

25% of Water Quality Volume must be provided in Forebay

Required Volume= 1,310 (Cubic Feet)

Provided Volume= 2,010 (Cubic Feet)

Required Water Quality Volume

75% of the WQv must be held within system (including forebay)

Required WQ_v 3,929 (Cubic Feet)

Volume of Loam	274 (Cubic Feet)
Volume of Forebay	2,010 (Cubic Feet)
Volume of Ponding	2,471 (Cubic Feet)
Volume of Voids in Filter Bed	1,098 (Cubic Feet)
Total	**5,853 (Cubic Feet)**

3.4 Minimum Standard 4: Conveyance and Natural Channel Protection

3.4.1 Drainage Network Design Parameters:

A. PIPES

- All drainage pipes are HDPE or equivalent unless otherwise noted.
- Manning's coefficient = 0.012 for HDPE Pipe
- Diameters & lengths as specified
- The 100-year design storm is utilized for the drainage pipe design to ensure that the drainage system contains and channels water to the BMP areas as shown on the plans.
- The rational method has been used for the closed drainage system.

B. STRUCTURES

- Catch basins – Pre-cast concrete with 3' sump unless otherwise noted and inverts as specified
- Manholes – Pre-cast concrete with inverts as specified.

3.4.2 Channel Protection Volume:

The site has been designed to fully infiltrate the channel protection volume. The channel protection required has been met.

See table 4-1 of the Appendix A Checklist for a Summary of Channel Protection Volumes. See Appendix A3.5.4.2 for the 1-year storm event HydroCAD analysis.

3.5 Minimum Standard 5: Overbank Flood Protection & Downstream Analysis

3.5.1 Method of Analysis

USDA Soil Conservation Service Method as defined by Technical Release No. 20 (TR-20) determines Stormwater runoff rate and volume. Type III rainfall distribution is utilized. Time of concentration is determined using Technical Release No 55 (TR-55) methodology, through the computer program *HydroCAD ver. 10.0* by HydroCAD Software Solutions LLC.

The sand filters and Precast Porous Concrete Slabs (Stormcrete) have been modeled in HydroCAD with an 8.27 inches/hr infiltration rate per table 5-3 in section 5.3.4 of the RISDISM. Soil evaluations have been performed by DiPrete Engineering. The existing soil has a texture of Sand. Based on table 5-3 in section 5.3.4 of the RISDISM underlying soils have the same infiltration rate.

The drainage system has been designed to mitigate all stormwater flows for the 10- and 100-year storm events.

3.5.2 Design Storm

Analysis of 1-year, 10-year, and 100-year frequency storms are included. The following 24-hour rainfall intensities are obtained from the Rhode Island Stormwater Design and Installation Standards Manual, Table 3-1 for Washington County.

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

3.5.3 Design Point Breakdown

The site is analyzed as three watershed areas. In the pre development stage there are four subcatchments. In the post development stage, there are 12 subcatchments. Each watershed will demonstrate zero increase of runoff due to the proposed development. A description of each watershed and associated subcatchments are summarized as follows, for cover types see color watershed maps located in back of this report. Numbers in parentheses ( ) indicate the HydroCAD Node Number.

Design Point 1:

Watershed #1 flows to Design Point- 1 (DP-1). This watershed consists of the majority of the site, including the offsite areas to the northeast. The design point is the Chickasheen Brook.

In pre development conditions there are two watersheds to Design Point-1.

Pre-01 (10) consists of the majority of the site and includes the offsite runoff area to the Existing Depression (11) located off site.

Pre-02 (12) consists of the completely wooded area that flows overland to the wetlands on site (DP-1)

In post development conditions there are eight sub watersheds:

Post-01 (100) collects runoff from the proposed driveway at the intersection of Fairgrounds Road and discharges to Sediment Forebay A1 (101).

Post-02 (103) consists of the roof of Building 1 and discharges to Sediment Forebay A2 (106) through the drainage network.

Post-03 (104) consists of the proposed impervious driveway between Buildings 1 and 2. This is collected in the drainage network and discharges to Sediment Forebay A2 (106).

Post-04 (105) consists of the roof of Building 3 and discharges to Sediment Forebay A2 (106) through the drainage network.

Post-05 (107) consists of the roof of Building 2 and discharges to Sand Filter A2 (108).

Post-06 (109) is the grassed area directly surrounding Pond A (108 & 110).

Post-07 (111) consists of the offsite area that discharges to the existing depression (112).

Post-08 (113) consists of the grassed area the discharges direct to DP-1.

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

	Area (acres)	CN	Tc (min)
Pre-1	4.269	96	6.0
Post-1	1.332	82	6.0
Post-2	0.516	98	6.0
Post-3	0.995	80	6.0
Post-4	0.413	98	6.0
Post-5	0.685	98	6.0
Post-6	0.316	61	6.0
Post-7	5.046	78	9.7
Post-8	0.887	61	8.2

Design Point 2:

Watershed #2 flows to Design Point-2 (DP-2). This watershed consists of a small portion of the site along the property line and Fairgrounds Road. The design point is the Northeast Abutter.

In pre development conditions there is watershed to Design Point-2.

Pre-03 (20) consists of the offsite impervious and grassed area that flows overland to the Northeast Abutter (DP-2)
In post development conditions there is one sub watershed:

Post-09 (200) consists of the section of grass between the proposed driveway from Fairgrounds Road and the property line.

Below is a summary of the hydrologic parameters for the pre and post development sub-areas in Design Point-2.

	Area (acres)	CN	Tc (min)
Pre-3	0.224	73	6.0
Post-9	0.017	61	6.0

Design Point 3:

Watershed #3 flows to Design Point-3 (DP-3). This watershed consists of the existing building and paved driveway on the site. The design point is Liberty Lane.

In pre development conditions there is one watershed to Design Point-3.

Pre-04 (30) consists of the existing building and paved driveway that flows overland to Liberty Lane (DP-3).

In post development conditions there are three sub watersheds:

Post-10 (300) consists of a small portion of the proposed driveway and the grass area around Building 3 flows overland to DP-3.

Post-11 (301) consists of the grassed area to the south of Building 1 and flows overland direct to DP-3.

Post-12 (302) consists of the proposed driveway that is collected in the Precast Porous Concrete Slab (Stormcrete) system (303).

Below is a summary of the hydrologic parameters for the pre and post development sub-areas in Design Point-3.

	Area (acres)	CN	Tc (min)
Pre-4	1.874	64	40.6
Post-10	0.936	62	6.0
Post-11	0.071	61	6.0
Post-12	0.142	90	6.0

3.5.4 Q_p BMP Calculations

Outlet Protection

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

3.5.5 Downstream Analysis

A downstream analysis is required under the following conditions:

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

The proposed project disturbs 5.38 acres and is 2.9 acres of impervious. This is approximately 54% impervious cover. A downstream analysis is not required.

3.5.6 Overbank Flood Protection Conclusion

The tables below present a summary of the pre development flows vs. the mitigated post development flows. The table shows a decrease in the rate of runoff for all storms included in the analysis.

Pre Development Flows vs. Post Development Flows Mitigated

Subwatershed (design point)	1.2" Peak Flow		1-yr Peak Flow		10-yr Peak Flow		100-yr Peak Flow	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.00	0.00	0.05	0.13	0.95	1.14	15.06	11.63
DP-2:	0.08	0.00	0.17	0.00	0.57	0.02	1.38	0.07
DP-3:	0.14	0.01	0.28	0.09	1.52	1.04	4.48	3.19
Totals:	0.22	0.01	0.50	0.22	3.04	2.20	20.92	14.89

All flows in cubic feet per second (cfs)

Subwatershed (design point)	1.2" Peak Volume		1-yr Peak Volume		10-yr Peak Volume		100-yr Peak Volume	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1:	0.000	0.000	0.021	0.022	0.132	0.097	1.118	0.675
DP-2:	0.006	0.000	0.014	0.000	0.041	0.002	0.098	0.005
DP-3:	0.021	0.001	0.060	0.012	0.237	0.058	0.653	0.178
Totals:	0.027	0.001	0.095	0.034	0.410	0.157	1.869	0.858

All flows in acre-feet (af)

As shown in the tables above, no increase in stormwater runoff flow will occur following the proposed construction during the 1 through 100-year storm events. The site is designed to fully infiltrate all of the proposed impervious in DP-1 through the 100-year storm event. The increase of the post development flows is from the CN change from woods in pre development to grass in post development in the undetained areas of the proposed site. The volume is unchanged or decreased through the 100-year storm, therefore reducing impacts to the wetland.

3.6 Minimum Standard 6: Redevelopment and Infill Projects.

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

3.7 Minimum Standard 7: Pollution Prevention

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

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

The site is not considered LUHPPL.

3.9 Minimum Standard 9: Illicit Discharges

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

3.10 Minimum Standard 10: Construction Activity Soil Erosion, Runoff and Sedimentation and Pollution Prevention Control Measure Requirements

See the SESC for this development prepared by DiPrete Engineering.

3.11 Minimum Standard 11: Stormwater Management System Operation and Maintenance

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

Appendix A

A2.1 Soil Evaluations

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: South County Post and Beam, Inc
Property Location: #551 Liberty Lane South Kingstown, RI
Date of Test Hole: March 25, 2021
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Cloudy, 50's Shaded: Yes ☐ No ☑ Time: 8:00 am

TH 1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-8"	C	S	10YR 3/2			sil	1-sbk	fri	4
Bw	8-30"	C	S	10YR 5/6			sil	1-sbk	fri	4
2C1	30-60"	C	S	2.5Y 5/4			cos	0-sg	L	1
2C2	60-132"			2.5Y 6/3			fs	0-sg	L	1

TH 2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-8"	C	S	10YR 3/2			sil	1-sbk	fri	4
Bw	8-30"	C	S	10YR 5/6			sil	1-sbk	fri	4
2C1	30-90"	C	S	2.5Y 5/4			cos	0-sg	L	1
2C2	90-132"			2.5Y 6/3			fs	0-sg	L	1

TH 1 Soil Class Eoilan/Outwash Total Depth 132" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 96" SHWT 84" (og)
TH 2 Soil Class Eoilan/Outwash Total Depth 132" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 108" SHWT 90" (og)

Comments:

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: South County Post and Beam, Inc
Property Location: #551 Liberty Lane South Kingstown, RI
Date of Test Hole: March 25, 2021
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Cloudy, 50's Shaded: Yes ☐ No ☑ Time: 8:00 am

TH 3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-10"	C	S	10YR 3/2			sil	1-sbk	fri	4
Bw	10-44"	C	S	10YR 5/6			sil	1-sbk	fri	4
2C1	44-90"	C	S	2.5Y 5/4			cos	0-sg	L	1
2C2	90-132"			2.5Y 5/3	7.5YR 5/8	C 3 P	fs	0-sg	L	1

TH 4 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
C1	0-8"	C	S	2.5Y 6/3			s	0-sg	fri	4
C2	8-30"	C	S	2.5Y 5/4			fs	0-sg	fri	4
C3	30-90"			2.5Y 5/2	7.5YR 5/8	C 3 P	s	0-sg	L	1

TH 3 Soil Class Eoilan/Outwash Total Depth 132" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 102" SHWT 90" (og)
TH 4 Soil Class Eoilan/Outwash Total Depth 120" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 84" SHWT 60" (og)

Comments:

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: South County Post and Beam, Inc
Property Location: #551 Liberty Lane South Kingstown, RI
Date of Test Hole: March 25, 2021
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Cloudy, 50's Shaded: Yes ☐ No ☑ Time: 8:00 am

TH 5 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-10"	C	S	10YR 3/2			sil	1-sbk	fri	4
Bw	10-24"	C	S	10YR 5/6			sil	1-sbk	fri	4
2C1	24-70"	C	S	2.5Y 5/4			cos	0-sg	L	1
2C2	70-96"	C	S	2.5Y 6/2			fs	0-sg	L	1
2C3	96-132"			2.5Y 5/2			fs	0-sg	L	1

TH 6 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-10"	C	S	2.5Y 6/3			sl	0-sg	fri	3
Bw	10-30"	C	S	2.5Y 5/4			ls	0-sg	fri	3
2C1	30-84"	C	S	2.5Y 5/3			fs	0-sg	L	1
2C2	84-120"			2.5Y 4/3			vfsl	0-m	fri	7

TH 5 Soil Class Eoilan/Outwash Total Depth 132" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 120" SHWT 90" (og)
TH 6 Soil Class Eoilan/Outwash Total Depth 120" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 78" SHWT 60" (og)

Comments:

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS
Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment Systems Program

Site Evaluation Form
Part A – Soil Profile Description **Application Number** NA

Property Owner: South County Post and Beam, Inc
Property Location: #551 Liberty Lane South Kingstown, RI
Date of Test Hole: March 25, 2021
Soil Evaluator: Chris Sutter License Number: D-4077
Weather: Cloudy, 50's Shaded: Yes ☐ No ☑ Time: 8:00 am

TH 7 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-10"	C	S	10YR 3/2			sil	1-sbk	fri	4
Bw	10-20"	C	S	10YR 5/6			sil	1-sbk	fri	4
2C1	20-90"	C	S	2.5Y 5/4			cos	0-sg	L	7
2C2	90-120"			2.5Y 4/4			vfsl	0-m	fri	7

TH 8 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Ap	0-8"	C	S	10YR 3/1			fsl	1-sbk	fri	4
Bw	8-18"	C	S	10YR 5/6			sl	1-sbk	fri	3
C1	18-32"	C	S	2.5Y 5/4	7.5YR 5/8	C 3 P	ls	0-m	fri	6
C2	32-96"			2.5Y 4/3			sil	0-m	fri	7

TH 7 Soil Class Eoilan/Outwash Total Depth 120" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 90" SHWT 60" (og)
TH 8 Soil Class Eoilan/Outwash Total Depth 96" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 42" SHWT 20" (og)

Comments:

Double Ring Infiltrometer Field Data Sheet

Project Name: 2214-008 Liberty Lane Storage	**Date:**	6/25/21		**Diameter**	**H2O depth**
Test Location: IT #1			**Inner Ring**	12"	5"
Water Source: Supplied Tank			**Outer Ring**	24"	5"
Field Personnel: Chris Sutter, Allison Drake					
Ring Depth (in.): Inner: 5" **Outer:** 6"					
Depth to WT: +/- 96"					

Presoak Data

Start Time	End Time	Starting Water Level/Ending Water Level
8:58 am	9:20 am	10"/0" (65 gal used)

*Reading interval determined based on water level drop during presoak period

				Flow Reading				Liquid	Remarks
Trial #	IT1	Time	Elapsed	Inner Ring		Outer Ring		Temp	Weather Cond., etc
		HR:MIN	Time	in.	Δ in.	in	Δ in.	(F)	
1	START	9:35	-	5.0	1.0	5.0	1.0	72°	Cloudy, 70°
	END	9:36	1.0	4.0		4.0			
2	START	9:37	-	5.0	1.0	5.0	1.0	-	
	END	9:38	1.0	4.0		4.0			
3	START	9:39	-	5.0	1.0	5.0	0.75	-	
	END	9:40	1.0	4.0		4.25			
4	START	9:41	-	5.0	1.0	5.0	0.75	-	
	END	9:42	1.0	4.0		4.25			
5	START	9:43	-	5.0	1.0	5.0	1.0	-	
	END	9:44	1.0	4.0		4.0			
6	START	9:45	-	5.0	1.0	5.0	0.75	-	
	END	9:46	1.0	4.0		4.25			
7	START	9:47	-	5.0	1.0	5.0	1.0	-	
	END	9:48	1.0	4.0		4.0			
8	START	9:49	-	5.0	0.75	5.0	1.0	-	
	END	9:50	1.0	4.25		4.0			
9	START	9:51	-	5.0	1.0	5.0	0.75	-	
	END	9:52	1.0	4.0		4.25			
10	START	9:53	-	5.0	1.0	5.0	0.75	-	
	END	9:54	1.0	4.0		4.25			
11	START	9:55	-	5.0	1.0	5.0	0.75	-	
	END	9:56	1.0	4.0		4.25			
12	START	9:57	-	5.0	1.0	5.0	0.75	-	
	END	9:58	1.0	4.0		4.25			
13	START								
	END								
14	START								
	END								
15	START								
	END								

Infiltration Rate: 11.75 in/12 min = 0.98 in/min = 58.8 in/hr

Double Ring Infiltrometer Field Data Sheet

Project Name: 2214-008 Liberty Lane Storage	**Date:**	6/25/21		**Diameter**	**H2O depth**
Test Location: IT #2			**Inner Ring**	12"	5"
Water Source: Supplied Tank			**Outer Ring**	24"	5"
Field Personnel: Chris Sutter, Allison Drake					
Ring Depth (in.): Inner: 5" **Outer:** 6"					
Depth to WT: +/- 96"					

Presoak Data

Start Time	End Time	Starting Water Level/Ending Water Level
10:53 am	11:15 am	10"/0" (65 gal used)

*Reading interval determined based on water level drop during presoak period

				Flow Reading				Liquid	Remarks
Trial #	IT2	Time	Elapsed	Inner Ring		Outer Ring		Temp	Weather Cond., etc
		HR:MIN	Time	in.	Δ in.	in	Δ in.	(F)	
1	START	11:32	-	5.0	1.5	5.0	1.5	75°	Cloudy, 75°
	END	11:33	1.0	3.5		3.5			
2	START	11:34	-	5.0	1.5	5.0	1.5	-	
	END	11:35	1.0	3.5		3.5			
3	START	11:36	-	5.0	1.25	5.0	1.25	-	
	END	11:37	1.0	3.75		3.75			
4	START	11:39	-	5.0	1.5	5.0	1.5	-	
	END	11:40	1.0	3.5		3.5			
5	START	11:42	-	5.0	1.25	5.0	1.5	-	
	END	11:43	1.0	3.75		3.5			
6	START	11:44	-	5.0	1.25	5.0	1.5	-	
	END	11:45	1.0	3.75		3.5			
7	START	11:46	-	5.0	1.25	5.0	1.5	-	
	END	11:47	1.0	3.75		3.5			
8	START	11:48	-	5.0	1.25	5.0	1.5	-	
	END	11:49	1.0	3.75		3.5			
9	START	11:50	-	5.0	1.25	5.0	1.5	-	
	END	11:51	1.0	3.75		3.5			
10	START	11:52	-	5.0	1.25	5.0	1.5	-	
	END	11:53	1.0	3.75		3.5			
11	START	11:54	-	5.0	1.25	5.0	1.25	-	
	END	11:55	1.0	3.75		3.75			
12	START	11:56	-	5.0	1.25	5.0	1.5	-	
	END	11:57	1.0	3.75		3.5			
13	START								
	END								
14	START								
	END								
15	START								
	END								

Infiltration Rate: 15.75 in/12 min = 1.31 in/min = 78.6 in/hr

Double Ring Infiltrometer Field Data Sheet

Project Name: 2214-008 Liberty Lane Storage	**Date:**	6/25/21		**Diameter**	**H2O depth**
Test Location: IT #3			**Inner Ring**	12"	5"
Water Source: Supplied Tank			**Outer Ring**	24"	5"
Field Personnel: Chris Sutter, Allison Drake					
Ring Depth (in.): Inner: 5" **Outer:** 6"					
Depth to WT: +/- 96"					

Presoak Data

Start Time	End Time	Starting Water Level/Ending Water Level
12:30pm	12:47 pm	10"/0" (65 gal used)

*Reading interval determined based on water level drop during presoak period

				Flow Reading				Liquid	Remarks
Trial #	IT3	Time	Elapsed	Inner Ring		Outer Ring		Temp	Weather Cond., etc
		HR:MIN	Time	in.	Δ in.	in	Δ in.	(F)	
1	START	1:04	-	5.0	2.0	5.0	2.0	75°	Cloudy, 75°
	END	1:05	1.0	3.0		3.0			
2	START	1:06	-	5.0	2.0	5.0	2.0	-	
	END	1:07	1.0	3.0		3.0			
3	START	1:08	-	5.0	1.5	5.0	1.5	-	
	END	1:09	1.0	3.5		3.5			
4	START	1:10	-	5.0	1.75	5.0	1.5	-	
	END	1:11	1.0	3.25		3.5			
5	START	1:12	-	5.0	2.0	5.0	1.5	-	
	END	1:13	1.0	3.0		3.5			
6	START	1:14	-	5.0	1.75	5.0	1.5	-	
	END	1:15	1.0	3.25		3.5			
7	START	1:16	-	5.0	2.0	5.0	1.5	-	
	END	1:17	1.0	3.0		3.5			
8	START	1:18	-	5.0	2.0	5.0	1.5	-	
	END	1:19	1.0	3.0		3.5			
9	START	1:20	-	5.0	2.0	5.0	1.0	-	
	END	1:21	1.0	3.0		4.0			
10	START	1:22	-	5.0	2.0	5.0	1.0	-	
	END	1:23	1.0	3.0		4.0			
11	START	1:24	-	5.0	2.0	5.0	1.5	-	
	END	1:25	1.0	3.0		3.5			
12	START	1:26	-	5.0	1.75	5.0	1.5	-	
	END	1:27	1.0	3.25		3.5			
13	START								
	END								
14	START								
	END								
15	START								
	END								

Infiltration Rate: 22.75 in/12 min = 1.90 in/min = 114 in/hr

A3.2 Water Quality HydroCAD Storm Analysis

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

Subcatchment 10: PRE-01 Runoff Area=7.016 ac 36.58% Impervious Runoff Depth=0.36"
Flow Length=367' Tc=29.9 min CN=57/98 Runoff=1.61 cfs 0.211 af

Subcatchment 12: PRE-02 Runoff Area=1.701 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=207' Tc=22.2 min CN=55/0 Runoff=0.00 cfs 0.000 af

Subcatchment 20: PRE-03 Runoff Area=0.224 ac 31.77% Impervious Runoff Depth=0.31"
Tc=6.0 min CN=61/98 Runoff=0.08 cfs 0.006 af

Subcatchment 30: PRE-04 Runoff Area=1.874 ac 13.40% Impervious Runoff Depth=0.13"
Flow Length=165' Tc=40.6 min CN=58/98 Runoff=0.14 cfs 0.021 af

Pond 11: EXISTING DEPRESSION Peak Elev=102.70' Storage=754 cf Inflow=1.61 cfs 0.211 af
Discarded=1.31 cfs 0.211 af Primary=0.00 cfs 0.000 af Outflow=1.31 cfs 0.211 af

Link DP-1: CHICKASHEEN BROOK Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link DP-2: NE ABUTTER Inflow=0.08 cfs 0.006 af
Primary=0.08 cfs 0.006 af

Link DP-3: LIBERTY LANE Inflow=0.14 cfs 0.021 af
Primary=0.14 cfs 0.021 af

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

Subcatchment 100: POST-01 Runoff Area=1.332 ac 58.02% Impervious Runoff Depth=0.57"
Tc=6.0 min CN=61/98 Runoff=0.85 cfs 0.063 af

Subcatchment 103: POST-02 Runoff Area=0.516 ac 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=0/98 Runoff=0.56 cfs 0.042 af

Subcatchment 104: POST-03 Runoff Area=0.995 ac 51.65% Impervious Runoff Depth=0.51"
Tc=6.0 min CN=61/98 Runoff=0.56 cfs 0.042 af

Subcatchment 105: POST-04 Runoff Area=0.413 ac 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=0/98 Runoff=0.45 cfs 0.034 af

Subcatchment 107: POST-05 Runoff Area=0.685 ac 100.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=0/98 Runoff=0.75 cfs 0.056 af

Subcatchment 109: POST-06 Runoff Area=0.316 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=61/0 Runoff=0.00 cfs 0.000 af

Subcatchment 111: POST-07 Runoff Area=5.046 ac 49.85% Impervious Runoff Depth=0.49"
Flow Length=473' Tc=9.7 min CN=58/98 Runoff=2.44 cfs 0.207 af

Subcatchment 113: POST-08 Runoff Area=0.887 ac 0.02% Impervious Runoff Depth=0.00"
Flow Length=179' Tc=8.2 min CN=61/98 Runoff=0.00 cfs 0.000 af

Subcatchment 200: POST-09 Runoff Area=0.017 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=61/0 Runoff=0.00 cfs 0.000 af

Subcatchment 300: POST-10 Runoff Area=0.396 ac 3.28% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=61/98 Runoff=0.01 cfs 0.001 af

Subcatchment 301: POST-11 Runoff Area=0.071 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=61/0 Runoff=0.00 cfs 0.000 af

Subcatchment 302: POST-12 Runoff Area=0.142 ac 79.58% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=61/98 Runoff=0.12 cfs 0.009 af

Pond 101: FOREBAY A1 Peak Elev=106.04' Storage=3,004 cf Inflow=0.85 cfs 0.063 af
Outflow=0.82 cfs 0.063 af

Pond 102: SAND FILTER A1 Peak Elev=103.39' Storage=252 cf Inflow=0.82 cfs 0.063 af
Discarded=0.38 cfs 0.063 af Primary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.063 af

Pond 106: FOREBAY A2 Peak Elev=105.61' Storage=2,142 cf Inflow=1.58 cfs 0.119 af
Outflow=1.54 cfs 0.119 af

Pond 108: SAND FILTER A2 Peak Elev=105.18' Storage=2,316 cf Inflow=2.28 cfs 0.175 af
Discarded=0.31 cfs 0.175 af Primary=0.00 cfs 0.000 af Outflow=0.31 cfs 0.175 af

Pond 110: INFILTRATION POND A Peak Elev=105.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond 112: EXISTING DEPRESSION Peak Elev=102.74' Storage=1,010 cf Inflow=2.44 cfs 0.207 af
Discarded=1.51 cfs 0.207 af Primary=0.00 cfs 0.000 af Outflow=1.51 cfs 0.207 af

Pond 303: STORMCRETE Peak Elev=104.27' Storage=16 cf Inflow=0.12 cfs 0.009 af
Discarded=0.08 cfs 0.009 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.009 af

Link DP-1: CHICKASHEEN BROOK Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link DP-2: NE ABUTTER Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link DP-3: LIBERTY LANE Inflow=0.01 cfs 0.001 af
Primary=0.01 cfs 0.001 af

A3.4.2 Drainage Network Hydraulic Calculations

DiPrete Engineering Engineers • Planners • Surveyors	Project Name: Liberty Lane Storage Project Number: 2214-008	25-Year Storm Date: 7/30/2021

Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
6-7	201.52	24	0.29%	3.6	13.27	1.1	103.50	104.09
5-6	53.20	18	0.50%	3.5	8.05	2.0	104.59	104.86
4-6	55.74	18	0.50%	0.1	8.05	0.1	104.59	104.87
1-2	149.48	12	1.96%	0.2	5.41	0.2	104.00	106.93

DiPrete Engineering Engineers • Planners • Surveyors	Project Name: Liberty Lane Storage Project Number: 2214-008	100-Year Storm Date: 7/30/2021

Pipe Analysis

Pipe ID	Pipe Length	Pipe Size	Pipe Slope	Flow Rate	Capacity Full	Velocity	Invert Down	Invert Up
	(ft)	(in)	(%)	(cfs)	(cfs)	(ft/s)	(Ft)	(ft)
6-7	201.52	24	0.29%	4.6	13.27	1.5	103.50	104.09
5-6	53.20	18	0.50%	4.5	8.05	2.6	104.59	104.86
4-6	55.74	18	0.50%	0.1	8.05	0.1	104.59	104.87
1-2	149.48	12	1.96%	0.2	5.41	0.3	104.00	106.93

DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Liberty Lane Storage 100-Year Storm
Project Number: 2214-008 Date: 7/30/2021

HGL at Structure

Structure	Rim Elevation (ft)	HGL Elevation (ft)	Rim-HGL (ft)
7	106.55	0.00	N/A
6	108.81	107.60	1.20
5	107.82	107.68	0.15
4	108.41	107.65	0.76
2	105.96	0.00	N/A
1	110.52	107.76	2.75

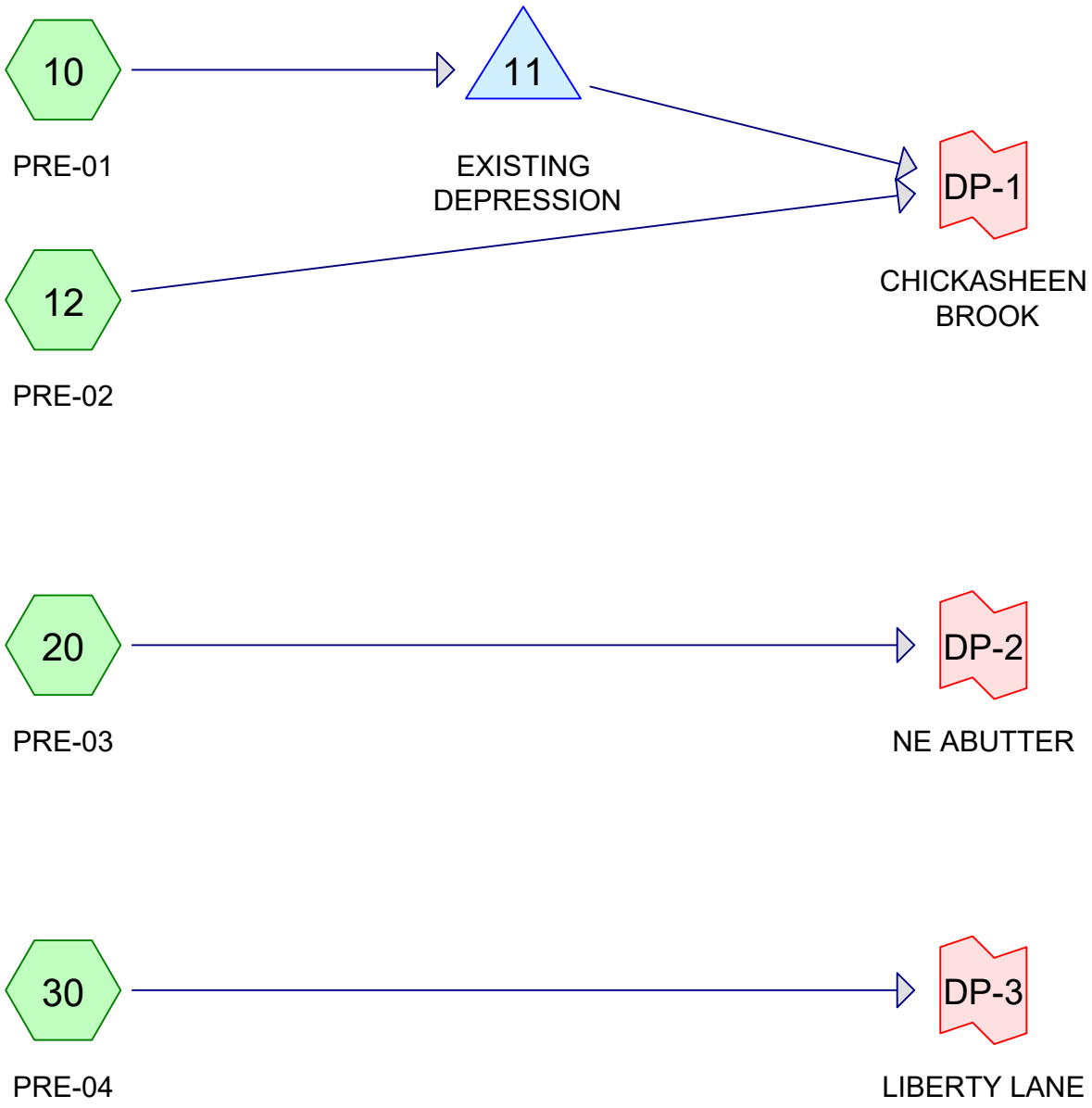
DiPrete Engineering
Engineers • Planners • Surveyors

Project Name: Liberty Lane Storage
Project Number: 2214-008

10-Year Storm
Date: 7/30/2021

Structure	Area	Inlet Time	Intensity	Runoff C	Q=Cia	Q Carry over	Q Captured	Q Bypassed	Bypass Structure	Inlet Type	Curb Opening	Curb Opening	Grate Length	Grate Width	Depth	Spread
	(sf)	(min)	(in/hr)	(C)	(cfs)	(cfs)	(cfs)	(cfs)			(ft)	(ft)	(ft)	(ft)	(ft)	(ft)
5	29,514	6	6.94	0.61	2.89	0	1.53	1.36	---	Grate inlet	---	---	4	2	0.167	11.978
4	604	6	6.938	0.85	0.08	0	0.08	0.00	5	Grate inlet	---	---	2	2	0.045	2.357
1	888	6	6.938	0.9	0.13	0	0.12	0.01	---	Grate inlet	---	---	2	2	0.062	3.088

A3.5.4.1 HydroCAD Node Diagram

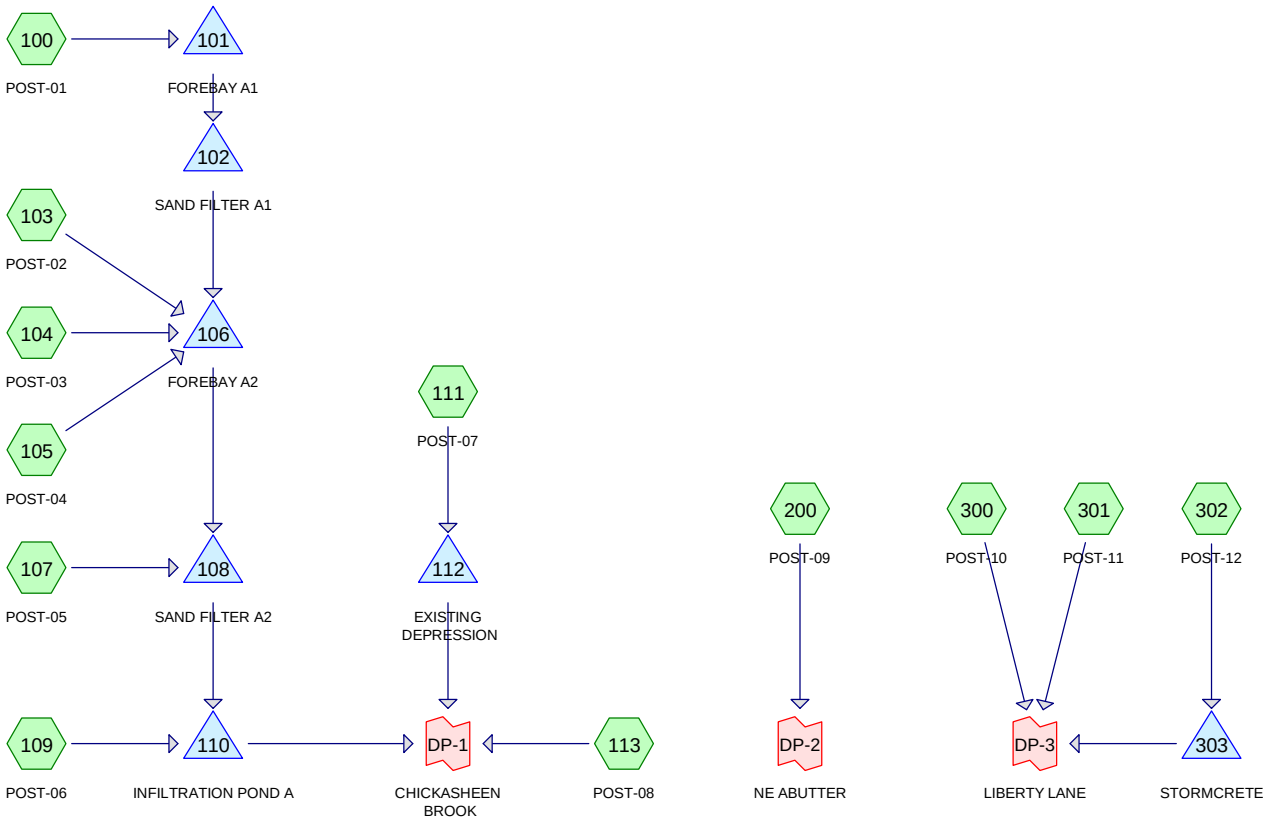


Subcat Reach Pond Link

Routing Diagram for 2214-008-EHCD
Prepared by DiPrete Engineering, Printed 8/2/2021
HydroCAD® 10.10-4b s/n 01125 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.662	61	>75% Grass cover, Good, HSG B (10, 20, 30)
0.154	98	Impervious, HSG B (30)
2.637	98	Offsite Impervious, HSG B (10, 20)
0.097	98	Roofs, HSG B (30)
5.264	55	Woods, Good, HSG B (10, 12, 30)
10.814	**68**	**TOTAL AREA**



Subcat Reach Pond Link

Routing Diagram for 2214-008-PHCD
Prepared by DiPrete Engineering, Printed 10/29/2021
HydroCAD® 10.10-4b s/n 01125 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
4.055	61	>75% Grass cover, Good, HSG B (100, 104, 109, 111, 113, 200, 300, 301, 302)
1.290	98	Impervious, HSG B (100, 104, 113, 300, 302)
2.637	98	Offsite Impervious, HSG B (100, 111)
1.615	98	Roofs, HSG B (100, 103, 104, 105, 107, 113)
1.218	55	Woods, Good, HSG B (111)

A3.5.4.2 HydroCAD 1-Year Storm Analysis

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

Subcatchment 10: PRE-01 Runoff Area=7.016 ac 36.58% Impervious Runoff Depth=0.69"
Flow Length=367' Tc=29.9 min CN=72 Runoff=2.84 cfs 0.404 af

Subcatchment 12: PRE-02 Runoff Area=1.701 ac 0.00% Impervious Runoff Depth=0.14"
Flow Length=207' Tc=22.2 min CN=55 Runoff=0.05 cfs 0.021 af

Subcatchment 20: PRE-03 Runoff Area=0.224 ac 31.77% Impervious Runoff Depth=0.74"
Tc=6.0 min CN=73 Runoff=0.17 cfs 0.014 af

Subcatchment 30: PRE-04 Runoff Area=1.874 ac 13.40% Impervious Runoff Depth=0.38"
Flow Length=165' Tc=40.6 min CN=64 Runoff=0.28 cfs 0.060 af

Pond 11: EXISTING DEPRESSION Peak Elev=102.85' Storage=2,044 cf Inflow=2.84 cfs 0.404 af
Discarded=1.89 cfs 0.404 af Primary=0.00 cfs 0.000 af Outflow=1.89 cfs 0.404 af

Link DP-1: CHICKASHEEN BROOK Inflow=0.05 cfs 0.021 af
Primary=0.05 cfs 0.021 af

Link DP-2: NE ABUTTER Inflow=0.17 cfs 0.014 af
Primary=0.17 cfs 0.014 af

Link DP-3: LIBERTY LANE Inflow=0.28 cfs 0.060 af
Primary=0.28 cfs 0.060 af

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

Subcatchment 100: POST-01 Runoff Area=1.332 ac 58.02% Impervious Runoff Depth=1.22"
Tc=6.0 min CN=82 Runoff=1.89 cfs 0.136 af

Subcatchment 103: POST-02 Runoff Area=0.516 ac 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=98 Runoff=1.40 cfs 0.110 af

Subcatchment 104: POST-03 Runoff Area=0.995 ac 51.65% Impervious Runoff Depth=1.10"
Tc=6.0 min CN=80 Runoff=1.26 cfs 0.091 af

Subcatchment 105: POST-04 Runoff Area=0.413 ac 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=98 Runoff=1.12 cfs 0.088 af

Subcatchment 107: POST-05 Runoff Area=0.685 ac 100.00% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=98 Runoff=1.85 cfs 0.147 af

Subcatchment 109: POST-06 Runoff Area=0.316 ac 0.00% Impervious Runoff Depth=0.29"
Tc=6.0 min CN=61 Runoff=0.05 cfs 0.008 af

Subcatchment 111: POST-07 Runoff Area=5.046 ac 49.85% Impervious Runoff Depth=0.99"
Flow Length=473' Tc=9.7 min CN=78 Runoff=4.94 cfs 0.416 af

Subcatchment 113: POST-08 Runoff Area=0.887 ac 0.02% Impervious Runoff Depth=0.29"
Flow Length=179' Tc=8.2 min CN=61 Runoff=0.13 cfs 0.022 af

Subcatchment 200: POST-09 Runoff Area=0.017 ac 0.00% Impervious Runoff Depth=0.29"
Tc=6.0 min CN=61 Runoff=0.00 cfs 0.000 af

Subcatchment 300: POST-10 Runoff Area=0.396 ac 3.28% Impervious Runoff Depth=0.32"
Tc=6.0 min CN=62 Runoff=0.08 cfs 0.011 af

Subcatchment 301: POST-11 Runoff Area=0.071 ac 0.00% Impervious Runoff Depth=0.29"
Tc=6.0 min CN=61 Runoff=0.01 cfs 0.002 af

Subcatchment 302: POST-12 Runoff Area=0.142 ac 79.58% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=90 Runoff=0.30 cfs 0.021 af

Pond 101: FOREBAY A1 Peak Elev=106.08' Storage=3,069 cf Inflow=1.89 cfs 0.136 af
Outflow=1.86 cfs 0.136 af

Pond 102: SAND FILTER A1 Peak Elev=105.08' Storage=1,470 cf Inflow=1.86 cfs 0.136 af
Discarded=0.38 cfs 0.136 af Primary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.136 af

Pond 106: FOREBAY A2 Peak Elev=105.86' Storage=2,474 cf Inflow=3.77 cfs 0.290 af
Outflow=3.51 cfs 0.290 af

Pond 108: SAND FILTER A2 Peak Elev=105.85' Storage=3,768 cf Inflow=5.36 cfs 0.437 af
Discarded=0.31 cfs 0.335 af Primary=3.86 cfs 0.102 af Outflow=4.18 cfs 0.437 af

Pond 110: INFILTRATION POND A Peak Elev=105.01' Storage=30 cf Inflow=3.91 cfs 0.110 af
Discarded=3.91 cfs 0.110 af Primary=0.00 cfs 0.000 af Outflow=3.91 cfs 0.110 af

Pond 112: EXISTING DEPRESSION Peak Elev=102.96' Storage=3,127 cf Inflow=4.94 cfs 0.416 af
Discarded=2.20 cfs 0.416 af Primary=0.00 cfs 0.000 af Outflow=2.20 cfs 0.416 af

Pond 303: STORMCRETE Peak Elev=105.52' Storage=173 cf Inflow=0.30 cfs 0.021 af
Discarded=0.08 cfs 0.021 af Primary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.021 af

Link DP-1: CHICKASHEEN BROOK Inflow=0.13 cfs 0.022 af
Primary=0.13 cfs 0.022 af

Link DP-2: NE ABUTTER Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link DP-3: LIBERTY LANE Inflow=0.09 cfs 0.012 af
Primary=0.09 cfs 0.012 af

A3.5.4.3 HydroCAD 10-Year Storm Analysis

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

Subcatchment 10: PRE-01 Runoff Area=7.016 ac 36.58% Impervious Runoff Depth=2.12"
Flow Length=367' Tc=29.9 min CN=72 Runoff=9.73 cfs 1.240 af

Subcatchment 12: PRE-02 Runoff Area=1.701 ac 0.00% Impervious Runoff Depth=0.93"
Flow Length=207' Tc=22.2 min CN=55 Runoff=0.95 cfs 0.132 af

Subcatchment 20: PRE-03 Runoff Area=0.224 ac 31.77% Impervious Runoff Depth=2.20"
Tc=6.0 min CN=73 Runoff=0.57 cfs 0.041 af

Subcatchment 30: PRE-04 Runoff Area=1.874 ac 13.40% Impervious Runoff Depth=1.52"
Flow Length=165' Tc=40.6 min CN=64 Runoff=1.52 cfs 0.237 af

Pond 11: EXISTING DEPRESSION Peak Elev=103.78' Storage=15,015 cf Inflow=9.73 cfs 1.240 af
Discarded=3.23 cfs 1.240 af Primary=0.00 cfs 0.000 af Outflow=3.23 cfs 1.240 af

Link DP-1: CHICKASHEEN BROOK Inflow=0.95 cfs 0.132 af
Primary=0.95 cfs 0.132 af

Link DP-2: NE ABUTTER Inflow=0.57 cfs 0.041 af
Primary=0.57 cfs 0.041 af

Link DP-3: LIBERTY LANE Inflow=1.52 cfs 0.237 af
Primary=1.52 cfs 0.237 af

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

Subcatchment 100: POST-01 Runoff Area=1.332 ac 58.02% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=82 Runoff=4.66 cfs 0.332 af

Subcatchment 103: POST-02 Runoff Area=0.516 ac 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=2.47 cfs 0.200 af

Subcatchment 104: POST-03 Runoff Area=0.995 ac 51.65% Impervious Runoff Depth=2.81"
Tc=6.0 min CN=80 Runoff=3.27 cfs 0.233 af

Subcatchment 105: POST-04 Runoff Area=0.413 ac 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=1.98 cfs 0.161 af

Subcatchment 107: POST-05 Runoff Area=0.685 ac 100.00% Impervious Runoff Depth=4.66"
Tc=6.0 min CN=98 Runoff=3.28 cfs 0.266 af

Subcatchment 109: POST-06 Runoff Area=0.316 ac 0.00% Impervious Runoff Depth=1.31"
Tc=6.0 min CN=61 Runoff=0.44 cfs 0.034 af

Subcatchment 111: POST-07 Runoff Area=5.046 ac 49.85% Impervious Runoff Depth=2.63"
Flow Length=473' Tc=9.7 min CN=78 Runoff=13.70 cfs 1.105 af

Subcatchment 113: POST-08 Runoff Area=0.887 ac 0.02% Impervious Runoff Depth=1.31"
Flow Length=179' Tc=8.2 min CN=61 Runoff=1.14 cfs 0.097 af

Subcatchment 200: POST-09 Runoff Area=0.017 ac 0.00% Impervious Runoff Depth=1.31"
Tc=6.0 min CN=61 Runoff=0.02 cfs 0.002 af

Subcatchment 300: POST-10 Runoff Area=0.396 ac 3.28% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=62 Runoff=0.59 cfs 0.045 af

Subcatchment 301: POST-11 Runoff Area=0.071 ac 0.00% Impervious Runoff Depth=1.31"
Tc=6.0 min CN=61 Runoff=0.10 cfs 0.008 af

Subcatchment 302: POST-12 Runoff Area=0.142 ac 79.58% Impervious Runoff Depth=3.78"
Tc=6.0 min CN=90 Runoff=0.61 cfs 0.045 af

Pond 101: FOREBAY A1 Peak Elev=106.37' Storage=3,685 cf Inflow=4.66 cfs 0.332 af
Outflow=4.61 cfs 0.332 af

Pond 102: SAND FILTER A1 Peak Elev=106.37' Storage=4,563 cf Inflow=4.61 cfs 0.332 af
Discarded=0.38 cfs 0.304 af Primary=0.25 cfs 0.028 af Outflow=0.63 cfs 0.332 af

Pond 106: FOREBAY A2 Peak Elev=106.01' Storage=2,675 cf Inflow=7.72 cfs 0.621 af
Outflow=7.57 cfs 0.621 af

Pond 108: SAND FILTER A2 Peak Elev=105.95' Storage=4,001 cf Inflow=10.82 cfs 0.888 af
Discarded=0.31 cfs 0.454 af Primary=10.45 cfs 0.434 af Outflow=10.76 cfs 0.888 af

Pond 110: INFILTRATION POND A Peak Elev=105.91' Storage=3,219 cf Inflow=10.89 cfs 0.468 af
Discarded=5.12 cfs 0.468 af Primary=0.00 cfs 0.000 af Outflow=5.12 cfs 0.468 af

Pond 112: EXISTING DEPRESSION Peak Elev=103.73' Storage=14,234 cf Inflow=13.70 cfs 1.105 af
Discarded=3.18 cfs 1.105 af Primary=0.00 cfs 0.000 af Outflow=3.18 cfs 1.105 af

Pond 303: STORMCRETE Peak Elev=106.01' Storage=382 cf Inflow=0.61 cfs 0.045 af
Discarded=0.08 cfs 0.040 af Primary=0.49 cfs 0.005 af Outflow=0.57 cfs 0.045 af

Link DP-1: CHICKASHEEN BROOK Inflow=1.14 cfs 0.097 af
Primary=1.14 cfs 0.097 af

Link DP-2: NE ABUTTER Inflow=0.02 cfs 0.002 af
Primary=0.02 cfs 0.002 af

Link DP-3: LIBERTY LANE Inflow=1.04 cfs 0.058 af
Primary=1.04 cfs 0.058 af

A3.5.4.5 HydroCAD 100-Year Storm Analysis

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

Subcatchment 10: PRE-01 Runoff Area=7.016 ac 36.58% Impervious Runoff Depth=5.14"
Flow Length=367' Tc=29.9 min CN=72 Runoff=23.90 cfs 3.003 af

Subcatchment 12: PRE-02 Runoff Area=1.701 ac 0.00% Impervious Runoff Depth=3.13"
Flow Length=207' Tc=22.2 min CN=55 Runoff=3.88 cfs 0.444 af

Subcatchment 20: PRE-03 Runoff Area=0.224 ac 31.77% Impervious Runoff Depth=5.26"
Tc=6.0 min CN=73 Runoff=1.38 cfs 0.098 af

Subcatchment 30: PRE-04 Runoff Area=1.874 ac 13.40% Impervious Runoff Depth=4.18"
Flow Length=165' Tc=40.6 min CN=64 Runoff=4.48 cfs 0.653 af

Pond 11: EXISTING DEPRESSION Peak Elev=104.64' Storage=31,892 cf Inflow=23.90 cfs 3.003 af
Discarded=3.99 cfs 2.328 af Primary=12.87 cfs 0.674 af Outflow=16.86 cfs 3.003 af

Link DP-1: CHICKASHEEN BROOK Inflow=15.06 cfs 1.118 af
Primary=15.06 cfs 1.118 af

Link DP-2: NE ABUTTER Inflow=1.38 cfs 0.098 af
Primary=1.38 cfs 0.098 af

Link DP-3: LIBERTY LANE Inflow=4.48 cfs 0.653 af
Primary=4.48 cfs 0.653 af

Summary for Subcatchment 10: PRE-01

Runoff = 23.90 cfs @ 12.40 hrs, Volume= 3.003 af, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
1.654	61	>75% Grass cover, Good, HSG B
2.566	98	Offsite Impervious, HSG B
2.796	55	Woods, Good, HSG B
7.016	72	Weighted Average
4.449	57	63.42% Pervious Area
2.566	98	36.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
26.9	100	0.0110	0.06		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.30"
2.8	229	0.0070	1.35		**Shallow Concentrated Flow, B** Unpaved Kv= 16.1 fps
0.2	38	0.0550	3.78		**Shallow Concentrated Flow, C** Unpaved Kv= 16.1 fps
29.9	367	Total			

Summary for Subcatchment 12: PRE-02

Runoff = 3.88 cfs @ 12.32 hrs, Volume= 0.444 af, Depth= 3.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
1.701	55	Woods, Good, HSG B
1.701	55	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.6	100	0.0190	0.08		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.30"
0.6	107	0.0370	3.10		**Shallow Concentrated Flow, B** Unpaved Kv= 16.1 fps
22.2	207	Total			

Summary for Subcatchment 20: PRE-03

Runoff = 1.38 cfs @ 12.09 hrs, Volume= 0.098 af, Depth= 5.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.153	61	>75% Grass cover, Good, HSG B
0.071	98	Offsite Impervious, HSG B
0.224	73	Weighted Average
0.153	61	68.23% Pervious Area
0.071	98	31.77% Impervious Area

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

Summary for Subcatchment 30: PRE-04

Runoff = 4.48 cfs @ 12.58 hrs, Volume= 0.653 af, Depth= 4.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.856	61	>75% Grass cover, Good, HSG B
0.154	98	Impervious, HSG B
0.097	98	Roofs, HSG B
0.767	55	Woods, Good, HSG B
1.874	64	Weighted Average
1.623	58	86.60% Pervious Area
0.251	98	13.40% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
40.3	100	0.0040	0.04		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.30"
0.3	65	0.0420	3.30		**Shallow Concentrated Flow, B** Unpaved Kv= 16.1 fps
40.6	165	Total			

Summary for Pond 11: EXISTING DEPRESSION

Inflow Area = 7.016 ac, 36.58% Impervious, Inflow Depth = 5.14" for 100-Year event
Inflow = 23.90 cfs @ 12.40 hrs, Volume= 3.003 af
Outflow = 16.86 cfs @ 12.68 hrs, Volume= 3.003 af, Atten= 29%, Lag= 16.5 min
Discarded = 3.99 cfs @ 12.50 hrs, Volume= 2.328 af
Primary = 12.87 cfs @ 12.68 hrs, Volume= 0.674 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 104.64' @ 12.68 hrs Surf.Area= 26,370 sf Storage= 31,892 cf

Plug-Flow detention time= 49.4 min calculated for 3.002 af (100% of inflow)
Center-of-Mass det. time= 49.4 min (889.6 - 840.2)

Volume	Invert	Avail.Storage	Storage Description
#1	102.50'	44,125 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
102.50	580	0	0
102.75	8,256	1,105	1,105
103.00	12,177	2,554	3,659
103.25	13,885	3,258	6,916
103.50	15,385	3,659	10,575
103.75	16,744	4,016	14,591
104.00	18,053	4,350	18,941
104.25	19,425	4,685	23,626
104.50	20,833	5,032	28,658
105.00	41,037	15,468	44,125

Device	Routing	Invert	Outlet Devices
#1	Discarded	102.50'	**8.270 in/hr Exfiltration over Surface area below 104.50'** Phase-In= 0.01'
#2	Primary	104.20'	**16.5' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=3.99 cfs @ 12.50 hrs HW=104.51' (Free Discharge)
1=Exfiltration (Exfiltration Controls 3.99 cfs)

Primary OutFlow Max=12.87 cfs @ 12.68 hrs HW=104.64' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Weir Controls 12.87 cfs @ 1.78 fps)

Summary for Link DP-1: CHICKASHEEN BROOK

Inflow Area = 8.717 ac, 29.44% Impervious, Inflow Depth = 1.54" for 100-Year event
Inflow = 15.06 cfs @ 12.65 hrs, Volume= 1.118 af
Primary = 15.06 cfs @ 12.65 hrs, Volume= 1.118 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP-2: NE ABUTTER

Inflow Area = 0.224 ac, 31.77% Impervious, Inflow Depth = 5.26" for 100-Year event
Inflow = 1.38 cfs @ 12.09 hrs, Volume= 0.098 af
Primary = 1.38 cfs @ 12.09 hrs, Volume= 0.098 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP-3: LIBERTY LANE

Inflow Area = 1.874 ac, 13.40% Impervious, Inflow Depth = 4.18" for 100-Year event
Inflow = 4.48 cfs @ 12.58 hrs, Volume= 0.653 af
Primary = 4.48 cfs @ 12.58 hrs, Volume= 0.653 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment 100: POST-01 Runoff Area=1.332 ac 58.02% Impervious Runoff Depth=6.34"
Tc=6.0 min CN=82 Runoff=9.64 cfs 0.703 af

Subcatchment 103: POST-02 Runoff Area=0.516 ac 100.00% Impervious Runoff Depth=8.26"
Tc=6.0 min CN=98 Runoff=4.31 cfs 0.355 af

Subcatchment 104: POST-03 Runoff Area=0.995 ac 51.65% Impervious Runoff Depth=6.10"
Tc=6.0 min CN=80 Runoff=6.98 cfs 0.505 af

Subcatchment 105: POST-04 Runoff Area=0.413 ac 100.00% Impervious Runoff Depth=8.26"
Tc=6.0 min CN=98 Runoff=3.45 cfs 0.284 af

Subcatchment 107: POST-05 Runoff Area=0.685 ac 100.00% Impervious Runoff Depth=8.26"
Tc=6.0 min CN=98 Runoff=5.72 cfs 0.471 af

Subcatchment 109: POST-06 Runoff Area=0.316 ac 0.00% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=61 Runoff=1.41 cfs 0.101 af

Subcatchment 111: POST-07 Runoff Area=5.046 ac 49.85% Impervious Runoff Depth=5.85"
Flow Length=473' Tc=9.7 min CN=78 Runoff=30.20 cfs 2.462 af

Subcatchment 113: POST-08 Runoff Area=0.887 ac 0.02% Impervious Runoff Depth=3.83"
Flow Length=179' Tc=8.2 min CN=61 Runoff=3.66 cfs 0.283 af

Subcatchment 200: POST-09 Runoff Area=0.017 ac 0.00% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=61 Runoff=0.07 cfs 0.005 af

Subcatchment 300: POST-10 Runoff Area=0.396 ac 3.28% Impervious Runoff Depth=3.95"
Tc=6.0 min CN=62 Runoff=1.82 cfs 0.130 af

Subcatchment 301: POST-11 Runoff Area=0.071 ac 0.00% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=61 Runoff=0.32 cfs 0.023 af

Subcatchment 302: POST-12 Runoff Area=0.142 ac 79.58% Impervious Runoff Depth=7.30"
Tc=6.0 min CN=90 Runoff=1.13 cfs 0.086 af

Pond 101: FOREBAY A1 Peak Elev=107.42' Storage=6,336 cf Inflow=9.64 cfs 0.703 af
Outflow=5.88 cfs 0.703 af

Pond 102: SAND FILTER A1 Peak Elev=107.42' Storage=7,974 cf Inflow=5.88 cfs 0.703 af
Discarded=0.38 cfs 0.435 af Primary=1.67 cfs 0.269 af Outflow=2.05 cfs 0.703 af

Pond 106: FOREBAY A2 Peak Elev=107.25' Storage=4,643 cf Inflow=15.44 cfs 1.414 af
Outflow=12.99 cfs 1.414 af

Pond 108: SAND FILTER A2 Peak Elev=107.25' Storage=7,635 cf Inflow=18.71 cfs 1.885 af
Discarded=0.31 cfs 0.579 af Primary=13.12 cfs 1.306 af Outflow=13.43 cfs 1.885 af

Pond 110: INFILTRATION POND A Peak Elev=107.25' Storage=9,110 cf Inflow=14.48 cfs 1.407 af
Discarded=6.36 cfs 1.407 af Primary=0.00 cfs 0.000 af Outflow=6.36 cfs 1.407 af

Pond 112: EXISTING DEPRESSION Peak Elev=104.57' Storage=30,155 cf Inflow=30.20 cfs 2.462 af
Discarded=3.99 cfs 2.070 af Primary=9.93 cfs 0.392 af Outflow=13.92 cfs 2.462 af

Pond 303: STORMCRETE Peak Elev=106.01' Storage=385 cf Inflow=1.13 cfs 0.086 af
Discarded=0.08 cfs 0.061 af Primary=1.05 cfs 0.025 af Outflow=1.13 cfs 0.086 af

Link DP-1: CHICKASHEEN BROOK Inflow=11.63 cfs 0.675 af
Primary=11.63 cfs 0.675 af

Link DP-2: NE ABUTTER Inflow=0.07 cfs 0.005 af
Primary=0.07 cfs 0.005 af

Link DP-3: LIBERTY LANE Inflow=3.19 cfs 0.178 af
Primary=3.19 cfs 0.178 af

Summary for Subcatchment 100: POST-01

Runoff = 9.64 cfs @ 12.09 hrs, Volume= 0.703 af, Depth= 6.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.559	61	>75% Grass cover, Good, HSG B
0.650	98	Impervious, HSG B
0.122	98	Offsite Impervious, HSG B
0.000	98	Roofs, HSG B
1.332	82	Weighted Average
0.559	61	41.98% Pervious Area
0.773	98	58.02% Impervious Area

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

Summary for Subcatchment 103: POST-02

Runoff = 4.31 cfs @ 12.08 hrs, Volume= 0.355 af, Depth= 8.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.516	98	Roofs, HSG B
0.516	98	100.00% Impervious Area

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

Summary for Subcatchment 104: POST-03

Runoff = 6.98 cfs @ 12.09 hrs, Volume= 0.505 af, Depth= 6.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.481	61	>75% Grass cover, Good, HSG B
0.514	98	Impervious, HSG B
0.000	98	Roofs, HSG B
0.995	80	Weighted Average
0.481	61	48.35% Pervious Area
0.514	98	51.65% Impervious Area

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

Summary for Subcatchment 105: POST-04

Runoff = 3.45 cfs @ 12.08 hrs, Volume= 0.284 af, Depth= 8.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.413	98	Roofs, HSG B
0.413	98	100.00% Impervious Area

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

Summary for Subcatchment 107: POST-05

Runoff = 5.72 cfs @ 12.08 hrs, Volume= 0.471 af, Depth= 8.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.685	98	Roofs, HSG B
0.685	98	100.00% Impervious Area

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

Summary for Subcatchment 109: POST-06

Runoff = 1.41 cfs @ 12.09 hrs, Volume= 0.101 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.316	61	>75% Grass cover, Good, HSG B
0.316	61	100.00% Pervious Area

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

Summary for Subcatchment 111: POST-07

Runoff = 30.20 cfs @ 12.13 hrs, Volume= 2.462 af, Depth= 5.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
1.312	61	>75% Grass cover, Good, HSG B
2.515	98	Offsite Impervious, HSG B
1.218	55	Woods, Good, HSG B
5.046	78	Weighted Average
2.531	58	50.15% Pervious Area
2.515	98	49.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.4000	0.26		**Sheet Flow, A** Woods: Light underbrush n= 0.400 P2= 3.30"
2.2	205	0.0090	1.53		**Shallow Concentrated Flow, B** Unpaved Kv= 16.1 fps
1.0	138	0.0220	2.39		**Shallow Concentrated Flow, C** Unpaved Kv= 16.1 fps
0.1	30	0.0730	4.35		**Shallow Concentrated Flow, D** Unpaved Kv= 16.1 fps
9.7	473	Total			

Summary for Subcatchment 113: POST-08

Runoff = 3.66 cfs @ 12.12 hrs, Volume= 0.283 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.887	61	>75% Grass cover, Good, HSG B
0.000	98	Impervious, HSG B
0.000	98	Roofs, HSG B
0.887	61	Weighted Average
0.887	61	99.98% Pervious Area
0.000	98	0.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	100	0.0410	0.23		**Sheet Flow, A**
					Grass: Short n= 0.150 P2= 3.30"
1.0	79	0.0065	1.30		**Shallow Concentrated Flow, B**
					Unpaved Kv= 16.1 fps
8.2	179	Total			

Summary for Subcatchment 200: POST-09

Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.017	61	>75% Grass cover, Good, HSG B
0.017	61	100.00% Pervious Area

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

Summary for Subcatchment 300: POST-10

Runoff = 1.82 cfs @ 12.09 hrs, Volume= 0.130 af, Depth= 3.95"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

	Area (ac)	CN	Description
	0.383	61	>75% Grass cover, Good, HSG B
*	0.013	98	Impervious, HSG B
	0.396	62	Weighted Average
	0.383	61	96.72% Pervious Area
	0.013	98	3.28% Impervious Area

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

Summary for Subcatchment 301: POST-11

Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 3.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.071	61	>75% Grass cover, Good, HSG B
0.071	61	100.00% Pervious Area

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

Summary for Subcatchment 302: POST-12

Runoff = 1.13 cfs @ 12.08 hrs, Volume= 0.086 af, Depth= 7.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.50"

Area (ac)	CN	Description
0.113	98	Impervious, HSG B
0.029	61	>75% Grass cover, Good, HSG B
0.142	90	Weighted Average
0.029	61	20.42% Pervious Area
0.113	98	79.58% Impervious Area

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

Summary for Pond 101: FOREBAY A1

Inflow Area = 1.332 ac, 58.02% Impervious, Inflow Depth = 6.34" for 100-Year event
Inflow = 9.64 cfs @ 12.09 hrs, Volume= 0.703 af
Outflow = 5.88 cfs @ 12.08 hrs, Volume= 0.703 af, Atten= 39%, Lag= 0.0 min
Primary = 5.88 cfs @ 12.08 hrs, Volume= 0.703 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 106.00' Surf.Area= 1,990 sf Storage= 2,914 cf
Peak Elev= 107.42' @ 12.53 hrs Surf.Area= 2,780 sf Storage= 6,336 cf (3,422 cf above start)

Plug-Flow detention time= 87.4 min calculated for 0.636 af (90% of inflow)
Center-of-Mass det. time= 14.2 min (810.2 - 795.9)

Volume	Invert	Avail.Storage	Storage Description
#1	104.00'	8,022 cf	**Forebay Storage (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.00	952	0	0
105.00	1,443	1,198	1,198
106.00	1,990	1,717	2,914
107.00	2,594	2,292	5,206
108.00	3,037	2,816	8,022

Device	Routing	Invert	Outlet Devices
#1	Primary	106.00'	**37.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=106.61' TW=106.67' (Dynamic Tailwater)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 102: SAND FILTER A1

Inflow Area = 1.332 ac, 58.02% Impervious, Inflow Depth = 6.34" for 100-Year event
Inflow = 5.88 cfs @ 12.08 hrs, Volume= 0.703 af
Outflow = 2.05 cfs @ 12.83 hrs, Volume= 0.703 af, Atten= 65%, Lag= 44.8 min
Discarded = 0.38 cfs @ 10.62 hrs, Volume= 0.435 af
Primary = 1.67 cfs @ 12.83 hrs, Volume= 0.269 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 107.42' @ 12.52 hrs Surf.Area= 1,971 sf Storage= 7,974 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 75.5 min (885.7 - 810.2)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	8,834 cf	**Ponding Storage (Prismatic)** Listed below (Recalc) -Impervious
#2	103.00'	1,301 cf	**Sand/Loam (Prismatic)** Listed below (Recalc) 3,942 cf Overall x 33.0% Voids
		10,135 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
105.00	1,971	0	0
106.00	2,566	2,269	2,269
107.00	3,338	2,952	5,221
108.00	3,889	3,614	8,834

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.00	1,971	0	0
105.00	1,971	3,942	3,942

Device	Routing	Invert	Outlet Devices
#1	Discarded	103.00'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	106.00'	**18.00" Round 18" Outlet** L= 510.0' Ke= 0.500 Inlet / Outlet Invert= 106.00' / 103.50' S= 0.0049 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Discarded OutFlow Max=0.38 cfs @ 10.62 hrs HW=103.05' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=1.70 cfs @ 12.83 hrs HW=107.29' TW=107.00' (Dynamic Tailwater)
2=18" Outlet (Outlet Controls 1.70 cfs @ 1.41 fps)

Summary for Pond 106: FOREBAY A2

Inflow Area = 3.256 ac, 68.05% Impervious, Inflow Depth = 5.21" for 100-Year event
Inflow = 15.44 cfs @ 12.09 hrs, Volume= 1.414 af
Outflow = 12.99 cfs @ 12.08 hrs, Volume= 1.414 af, Atten= 16%, Lag= 0.0 min
Primary = 12.99 cfs @ 12.08 hrs, Volume= 1.414 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Starting Elev= 105.50' Surf.Area= 1,255 sf Storage= 1,997 cf
Peak Elev= 107.25' @ 12.49 hrs Surf.Area= 1,777 sf Storage= 4,643 cf (2,646 cf above start)

Plug-Flow detention time= 42.1 min calculated for 1.368 af (97% of inflow)
Center-of-Mass det. time= 6.7 min (780.1 - 773.4)

Volume	Invert	Avail.Storage	Storage Description
#1	103.50'	7,117 cf	**Forebay Storage (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
103.50	755	0	0
104.50	992	874	874
105.50	1,255	1,124	1,997
106.50	1,542	1,399	3,396
107.50	1,854	1,698	5,094
108.50	2,192	2,023	7,117

Device	Routing	Invert	Outlet Devices
#1	Primary	105.50'	**15.0' long x 21.0' breadth Overflow Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.00 cfs @ 12.08 hrs HW=106.33' TW=106.34' (Dynamic Tailwater)
1=Overflow Weir (Controls 0.00 cfs)

Summary for Pond 108: SAND FILTER A2

Inflow Area = 3.941 ac, 73.60% Impervious, Inflow Depth = 5.74" for 100-Year event
Inflow = 18.71 cfs @ 12.08 hrs, Volume= 1.885 af
Outflow = 13.43 cfs @ 12.07 hrs, Volume= 1.885 af, Atten= 28%, Lag= 0.0 min
Discarded = 0.31 cfs @ 7.54 hrs, Volume= 0.579 af
Primary = 13.12 cfs @ 12.07 hrs, Volume= 1.306 af

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

Peak Elev= 107.25' @ 12.48 hrs Surf.Area= 1,633 sf Storage= 7,635 cf

Plug-Flow detention time= 42.5 min calculated for 1.885 af (100% of inflow)
Center-of-Mass det. time= 42.5 min (812.7 - 770.2)

Volume	Invert	Avail.Storage	Storage Description
#1	104.50'	10,775 cf	**Ponding Storage (Prismatic)** Listed below (Recalc) -Impervious
#2	102.50'	1,078 cf	**Sand/Loam (Prismatic)** Listed below (Recalc) 3,266 cf Overall x 33.0% Voids
		11,853 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.50	1,633	0	0
105.50	2,152	1,893	1,893
106.50	2,771	2,462	4,354
107.50	3,202	2,987	7,341
108.50	3,667	3,435	10,775

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
102.50	1,633	0	0
104.50	1,633	3,266	3,266

Device	Routing	Invert	Outlet Devices
#1	Discarded	102.50'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	105.75'	**50.0' long x 5.0' 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) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.31 cfs @ 7.54 hrs HW=102.56' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.31 cfs)

Primary OutFlow Max=0.00 cfs @ 12.07 hrs HW=106.24' TW=106.31' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 110: INFILTRATION POND A

Inflow Area = 4.257 ac, 68.15% Impervious, Inflow Depth = 3.97" for 100-Year event
Inflow = 14.48 cfs @ 12.07 hrs, Volume= 1.407 af
Outflow = 6.36 cfs @ 12.47 hrs, Volume= 1.407 af, Atten= 56%, Lag= 23.5 min
Discarded = 6.36 cfs @ 12.47 hrs, Volume= 1.407 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 107.25' @ 12.47 hrs Surf.Area= 4,831 sf Storage= 9,110 cf

Plug-Flow detention time= 12.1 min calculated for 1.407 af (100% of inflow)
Center-of-Mass det. time= 12.1 min (786.7 - 774.6)

Volume	Invert	Avail.Storage	Storage Description
#1	105.00'	15,628 cf	**Pond Storage (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
105.00	3,200	0	0
105.50	3,554	1,689	1,689
106.50	4,374	3,964	5,653
107.50	4,982	4,678	10,331
108.50	5,613	5,298	15,628

Device	Routing	Invert	Outlet Devices
#1	Discarded	105.00'	**56.875 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	107.75'	**20.0' long x 17.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=6.36 cfs @ 12.47 hrs HW=107.25' (Free Discharge)
1=Exfiltration (Exfiltration Controls 6.36 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=105.00' TW=0.00' (Dynamic Tailwater)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Summary for Pond 112: EXISTING DEPRESSION

Inflow Area = 5.046 ac, 49.85% Impervious, Inflow Depth = 5.85" for 100-Year event
Inflow = 30.20 cfs @ 12.13 hrs, Volume= 2.462 af
Outflow = 13.92 cfs @ 12.38 hrs, Volume= 2.462 af, Atten= 54%, Lag= 14.6 min
Discarded = 3.99 cfs @ 12.26 hrs, Volume= 2.070 af
Primary = 9.93 cfs @ 12.38 hrs, Volume= 0.392 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 104.57' @ 12.38 hrs Surf.Area= 23,220 sf Storage= 30,155 cf

Plug-Flow detention time= 48.5 min calculated for 2.461 af (100% of inflow)
Center-of-Mass det. time= 48.5 min (857.1 - 808.6)

Volume	Invert	Avail.Storage	Storage Description
#1	102.50'	43,463 cf	**Pond Storage (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
102.50	580	0	0
102.75	8,256	1,105	1,105
103.00	12,177	2,554	3,659
103.25	13,885	3,258	6,916
103.50	15,385	3,659	10,575
103.75	16,744	4,016	14,591
104.00	18,053	4,350	18,941
104.25	19,425	4,685	23,626
104.50	20,833	5,032	28,658
105.00	38,387	14,805	43,463

Device	Routing	Invert	Outlet Devices
#1	Discarded	102.50'	**8.270 in/hr Exfiltration over Surface area below 104.50'** Phase-In= 0.01'
#2	Primary	104.20'	**16.5' long x 20.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=3.99 cfs @ 12.26 hrs HW=104.50' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 3.99 cfs)

Primary OutFlow Max=9.93 cfs @ 12.38 hrs HW=104.57' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 9.93 cfs @ 1.64 fps)

Summary for Pond 303: STORMCRETE

Inflow Area = 0.142 ac, 79.58% Impervious, Inflow Depth = 7.30" for 100-Year event
Inflow = 1.13 cfs @ 12.08 hrs, Volume= 0.086 af
Outflow = 1.13 cfs @ 12.09 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.2 min
Discarded = 0.08 cfs @ 11.24 hrs, Volume= 0.061 af
Primary = 1.05 cfs @ 12.09 hrs, Volume= 0.025 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 106.01' @ 12.09 hrs Surf.Area= 432 sf Storage= 385 cf

Plug-Flow detention time= 21.1 min calculated for 0.086 af (100% of inflow)
Center-of-Mass det. time= 21.1 min (795.3 - 774.2)

Volume	Invert	Avail.Storage	Storage Description
#1	105.50'	225 cf	**6" Surface Storage (Prismatic)** Listed below (Recalc) -Impervious
#2	105.00'	43 cf	**6" Stormcrete Slab (Prismatic)** Listed below (Recalc) -Impervious 216 cf Overall x 20.0% Voids
#3	104.83'	24 cf	**2" Leveling Course (No. 8 Stone) (Prismatic)** Listed below (Recalc) -Impervious 73 cf Overall x 33.0% Voids
#4	104.16'	96 cf	**8" Reservoir (No. 57 Stone) (Prismatic)** Listed below (Recalc) 289 cf Overall x 33.0% Voids
		388 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
105.50	432	0	0
106.02	432	225	225

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
105.00	432	0	0
105.50	432	216	216

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.83	432	0	0
105.00	432	73	73

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
104.16	432	0	0
104.83	432	289	289

Device	Routing	Invert	Outlet Devices
#1	Discarded	104.16'	**8.270 in/hr Exfiltration over Surface area** Phase-In= 0.01'
#2	Primary	106.00'	**216.0' long Curb Overflow** 2 End Contraction(s)

Discarded OutFlow Max=0.08 cfs @ 11.24 hrs HW=104.18' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=1.05 cfs @ 12.09 hrs HW=106.01' TW=0.00' (Dynamic Tailwater)
↑—**2=Curb Overflow** (Weir Controls 1.05 cfs @ 0.37 fps)

Summary for Link DP-1: CHICKASHEEN BROOK

Inflow Area = 10.189 ac, 53.16% Impervious, Inflow Depth = 0.79" for 100-Year event
Inflow = 11.63 cfs @ 12.36 hrs, Volume= 0.675 af
Primary = 11.63 cfs @ 12.36 hrs, Volume= 0.675 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP-2: NE ABUTTER

Inflow Area = 0.017 ac, 0.00% Impervious, Inflow Depth = 3.83" for 100-Year event
Inflow = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af
Primary = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP-3: LIBERTY LANE

Inflow Area = 0.609 ac, 20.68% Impervious, Inflow Depth = 3.51" for 100-Year event
Inflow = 3.19 cfs @ 12.09 hrs, Volume= 0.178 af
Primary = 3.19 cfs @ 12.09 hrs, Volume= 0.178 af, Atten= 0%, Lag= 0.0 min

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

LEGEND

- WOODS - A SOILS
- WOODS - B SOILS
- WOODS - C SOILS
- WOODS - D SOILS
- GRASS - A SOILS
- GRASS - B SOILS
- GRASS - C SOILS
- GRASS - D SOILS
- GRAVEL - A SOILS
- GRAVEL - B SOILS
- GRAVEL - C SOILS
- GRAVEL - D SOILS
- IMPERVIOUS
- BRUSH - A SOILS
- BRUSH - B SOILS
- BRUSH - C SOILS
- BRUSH - D SOILS
- WATER

LEGEND

- TC LINE WITH ELEVATIONS (A, B)
- SUBCATCHMENT AREA
- SOIL BOUNDARY
- REACH
- SUBCATCHMENT (100)
- DRAINAGE POND/BIO RETENTION/SAND FILTER/INFILTRATING SWALE (100)
- DRAINAGE STRUCTURE/POND WITH INSIGNIFICANT STORAGE (100)
- SWALE (100)
- DESIGN POINT (DP-1)

SCALE: 1"=50'

0 25' 50' 100'

PRE-DEVELOPMENT WATERSHED MAP

551 LIBERTY LANE

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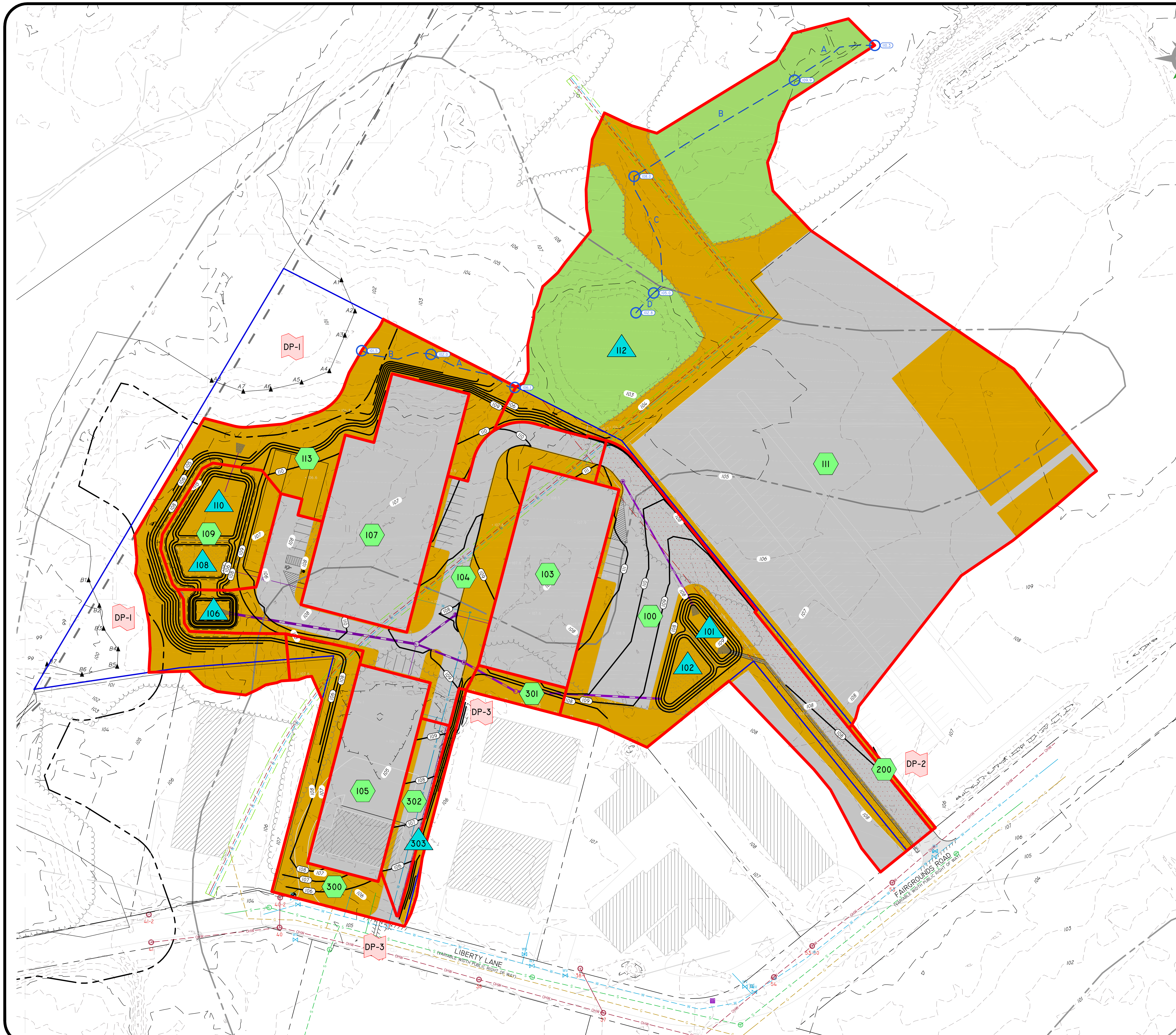
Z:\DEMAIN\PROJECTS\224-008 LIBERTY LANE STORAGE\AUTOCAD DRAWINGS\224-008-WMP.DWG PLOTTED: 10/29/2021



LEGEND

WOODS - A SOILS	
WOODS - B SOILS	
WOODS - C SOILS	
WOODS - D SOILS	
GRASS - A SOILS	
GRASS - B SOILS	
GRASS - C SOILS	
GRASS - D SOILS	
GRAVEL - A SOILS	
GRAVEL - B SOILS	
GRAVEL - C SOILS	
GRAVEL - D SOILS	
IMPERVIOUS	
BRUSH - A SOILS	
BRUSH - B SOILS	
BRUSH - C SOILS	
BRUSH - D SOILS	
WATER	

LEGEND

TC LINE WITH ELEVATIONS	37.5 A 32.5 B
SUBCATCHMENT AREA	
SOIL BOUNDARY	
REACH	
SUBCATCHMENT	100
DRAINAGE POND/BIO RETENTION/SAND FILTER/INFILTRATING SWALE	100
DRAINAGE STRUCTURE/POND WITH INSIGNIFICANT STORAGE	100
SWALE	100
DESIGN POINT	DP-1

SCALE: 1"=50'
0 25' 50' 100'

POST-DEVELOPMENT WATERSHED MAP

551 LIBERTY LANE

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