STORMWATER MANAGEMENT REPORT

Saint George's School Arden-Diman Dormitories Renovation

372 Purgatory Road
Middletown, Rhode Island

PREPARED FOR

St. George's School
372 Purgatory Road
Middletown, Rhode Island 02842

PREPARED BY

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March 2023

List of Appendices

Project Description

The project site ("the Site") is located within the St. George's School campus located off of Purgatory Road in Middletown, RI on a portion of Assessor's Plat 121SW, Lot 39 (see Figure 1). The project involves the renovation of the Arden-Diman Residence Halls including the construction of a three-story 2,856± SF addition and associated site improvements that include sidewalks for pedestrian circulation, new parking areas, and supporting stormwater and utility infrastructure. The addition will be centered on the west face of the residence hall and include spaces for a student lounge and entrance vestibule providing accessible access to the lower level of the residence hall.

Existing Conditions

The site improvements are focused in the area on the south and west side of the existing Arden-Diman Residence Hall located off of campus road, Kane Avenue. The site area adjacent to the building is currently used for pedestrian building access and includes a mixture of paved parking, driveways, garage access, and grassed / landscaped slopes.

Elevations range from approximately 118' at the northern portion of Kane Avenue to 112' at the southern portion of Kane Avenue. The building entry thresholds range from 125.70' on the east and south side of the building to 114.70' on the west side of the building.

The existing Site drainage area includes 0.62± acres of impervious surfaces consisting of a portion of the roof drainage, paved parking, and concrete/brick

pavers. Stormwater generally flows from the north to south overland either down Kane Avenue or through the grassed field south of the building and into the school's closed drainage system at the south end of Kane Avenue. The closed drainage system conveys stormwater through the campus to the closed drainage system in Purgatory Road. The Site currently experiences ponding issues in the lower paved area on the west side of the residence hall and requires pumps to redirect flow down Kane Avenue. The Purgatory Road drainage system eventually discharges to coastal waters. Refer to Figure 2 for existing drainage patterns.

The Aquidneck Island – Frontal Atlantic Ocean has no associated TMDLs per RIDEM Environmental Resource Map accessed on January 6, 2021.

Based on the NRCS mapping, the in-situ soils are predominantly a Newport silt loam texture in the Hydraulic Soil Group C. A natural infiltration rate of ±0.27 inches per hour have been used. Refer to Appendix C for Soil Information.

Proposed Conditions

The project involves the construction of a new addition with a 1,090± SF footprint and renovation for the Arden-Diman Residence Hall along with associated sidewalks, new parking areas, roadway regrading, stormwater and utility infrastructure. The project will require the disturbance just under one acre. Low impact development (LID) and other best management practices (BMPs) have been proposed to mitigate the impact of this activity and the project is design to comply with the Stormwater Management Design and Installation Rules (250-RICR-150-10-8) and the Rhode Island Soil Erosion and Sediment Control Handbook.

The proposed design includes an pervious parking lot with underdrainage system given the restrictive subsoils and an oversized detention pipe with outlet control structure to mitigate peak flows.

The pervious parking lot captures stormwater south of the building which includes lawn, sidewalk, and its own footprint. The pervious parking areas functions to decrease the peak flows through capture, media storage, natural infiltration, and slow release through the perforated underdrains and outlet control structure. Small orifices in a concrete weir wall located in a downstream control structure will release stormwater at a reduced rate to promote infiltration and minimize peak flows. Stormwater flow from the outlet control structure will daylight south of the parking lot into Kane Avenue (DP1), where it will enter the school's closed drainage system. The closed drainage system will continue to convey the site's stormwater through the campus to the Purgatory Road drainage system (DP3).

In order to address the existing ponding issues on the west side of the building, stormwater from the western portion of the roof as well as the addition, and the parking / plaza / sidewalks on the west side of the building up to Kane Avenue will be captured and conveyed into a closed drainage system that runs westward to an oversized detention pipe. Small orifices in a concrete weir wall located in a downstream control structure will release flows at a flow rate less than the previously

permitted flow rate modeled for this area as part of "Saint George's School – Tennis Courts Stormwater Report dated April 2021". Stormwater flow from the outlet control structure will tie into the previously approved stormwater network adjacent to Lower Road as part of the Tennis project and discharge west of the courts to a swale adjacent to Wolcott Avenue (DP2), whereas it is captured in a closed drainage system that connects to the Purgatory Road drainage system (DP3).

Runoff to Wolcott Avenue Swale (DP2)

Peak Runoff Rate

Storm Event	Previously Permitted Flow Rate from Watershed 4 from SGS Tennis Project	Flow Rate without Detention Pipe	Proposed Flow Rate with Detention Pipe
2-year storm:	0.72 CFS	0.95 CFS	0.47 CFS
10-year storm:	1.08 CFS	1.56 CFS	0.64 CFS
25-year storm:	1.35 CFS	2.03 CFS	0.89 CFS
100-year storm:	1.91 CFS	3.04 CFS	1.80 CFS

The remainder of the site's stormwater flow will maintain the existing drainage pattern to the maximum extent practicable in the proposed design. Qualified Pervious Areas (QPAs) are proposed adjacent to all proposed sidewalks that are able to meet the grading requirements. All applicable stormwater features have been sized to adequately convey the discharge from the drainage areas.

The Site was also analyzed using a common drainage area to the Purgatory Road Design Point (DP3) which includes existing drainage outside of the limits of disturbance. The total analyzed drainage area is approximately 1.36 acres (59,198 SF) including the existing roof.

Site Surface Coverage Table for Drainage Area

Existing Conditions		Proposed Conditions	
Impervious Site Area:	17,858 SF	Impervious Site Area:	14,891 SF
Impervious Roof Area	9,281 SF	Impervious Roof Area	10,294 SF
Pervious Area:	32,059 SF	Pervious Area:	29,475 SF
		Pervious Pavement Area:	4,538 SF
Total	59,198 SF		59,198 SF

Water Quality Treatment Areas

Proposed Conditions	
Impervious treated by Pervious Pavement (includes footprint):	5,422 SF
Impervious Sidewalks treated by Qualified Pervious Areas:	1,600 SF
New Roof Drainage Area	1,090 SF
New Site Impervious in Drainage Area (not treated):	2,457 SF (0.06 AC)

Impervious runoff to the pervious pavement (including its own footprint) is treated in the pavements filter media for the 1.2" water quality storm event and infiltrates under 24 hours. Qualified pervious areas account for the treatment of adjacent sidewalks for the 1.2" water quality storm. Existing roof drainage is exempt from treatment requirements.

As part of the neighboring "St. George's School Tennis Courts" project that was approved by RIDEM (RIPDES File No. RIR102174), St. George School treated all new impervious areas and provided additional water quality storage and treatment in an underground sand filter. Additionally, the project removed 10 existing tennis courts offsite, totaling approximately 1.6 acres of offsite impervious area reduction. The faculty housing project used 0.09 acres of the credit from the offsite impervious area reduction to meet its water quality requirements. The Arden Diman project requests to use an additional 0.06 acres from the impervious reduction to meet its water quality requirement, resulting in a total impervious reduction of 1.45 acres.

The rainfall-runoff response of the Site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2, 10, 25, and 100-years. Runoff coefficients for the pre- and post-development conditions, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. Drainage areas used in the analyses as described in previous sections are shown on Figures 2 and 3. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology. Refer to Appendix B for calculations.

Design Point 1 – DP1 – Kane Avenue

Peak Runoff Rate

Existing Conditions		Proposed Conditions	
2-year storm:	2.84 CFS	2-year storm:	1.56 CFS
10-year storm:	4.83 CFS	10-year storm:	2.71 CFS
25-year storm:	6.40 CFS	25-year storm:	3.59 CFS
100-year storm:	9.73 CFS	100-year storm:	5.45 CFS

Design Point 2 – DP2 – Wolcott Swale

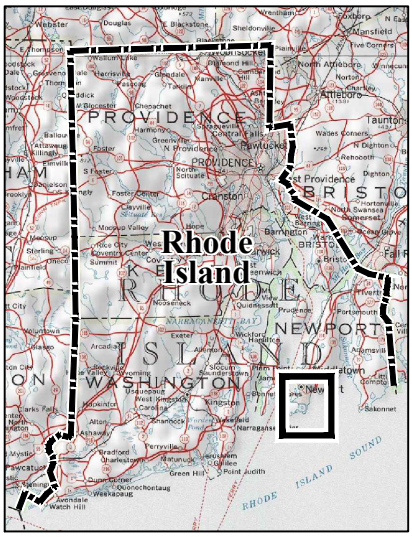
Peak Runoff Rate			
Existing Conditions*		**Proposed Conditions**	
2-year storm:	0.72 CFS	2-year storm:	0.47 CFS
10-year storm:	1.08 CFS	10-year storm:	0.64 CFS
25-year storm:	1.35 CFS	25-year storm:	0.89 CFS
100-year storm:	1.91 CFS	100-year storm:	1.80 CFS

- Analysis from "Saint George's School – Tennis Courts Stormwater Report dated April 2021".

Design Point 3 – DP3 – Purgatory Road analyzed at the intersection of Purgatory Road and Wolcott Avenue

Peak Runoff Rate			
Existing Conditions		**Proposed Conditions**	
2-year storm:	2.84 CFS	2-year storm:	1.97 CFS
10-year storm:	4.83 CFS	10-year storm:	3.25 CFS
25-year storm:	6.40 CFS	25-year storm:	4.22 CFS
100-year storm:	9.73 CFS	100-year storm:	7.16 CFS

In conclusion, the proposed project reduces the overall impervious area and the overall peak rate of runoff to Wolcott Avenue and the Purgatory Road drainage system.



Site Location Key

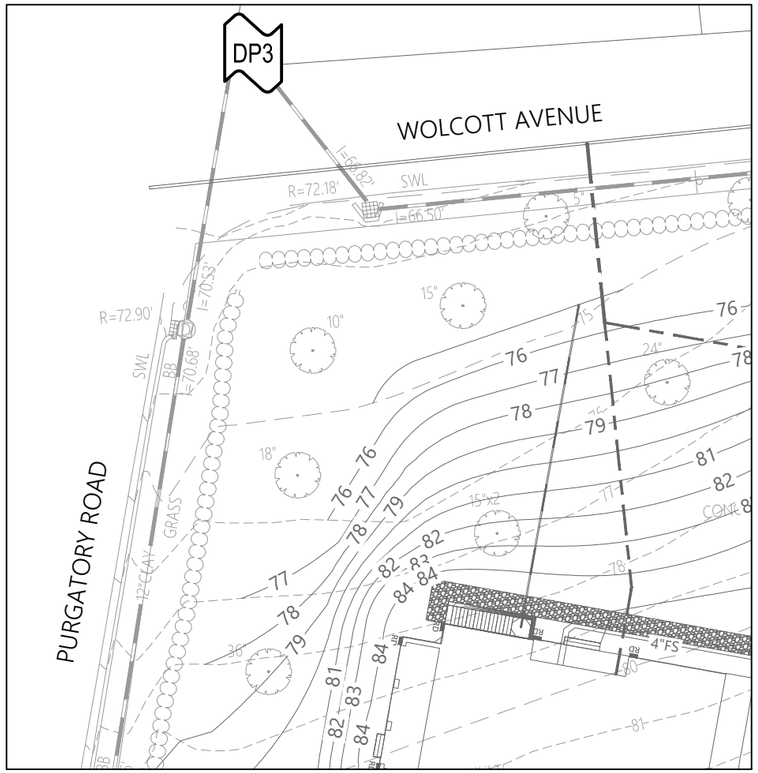
Site

Project Location Map
Arden-Diman Residence Hall
Middletown, Rhode Island

Figure 1

0 2000 Feet

Existing Conditions – Drainage Map



Legend

SYMBOLS

X — **DESIGN POINT**

X — **DRAINAGE AREA DESIGNATION**

X — **POND**

LINETYPES

DRAINAGE AREA BOUNDARY

TIME OF CONCENTRATION FLOW LINE

SCS SOIL CLASSIFICATIONS

NeA — **Newport Silt Loam (C Soils)**

vhb

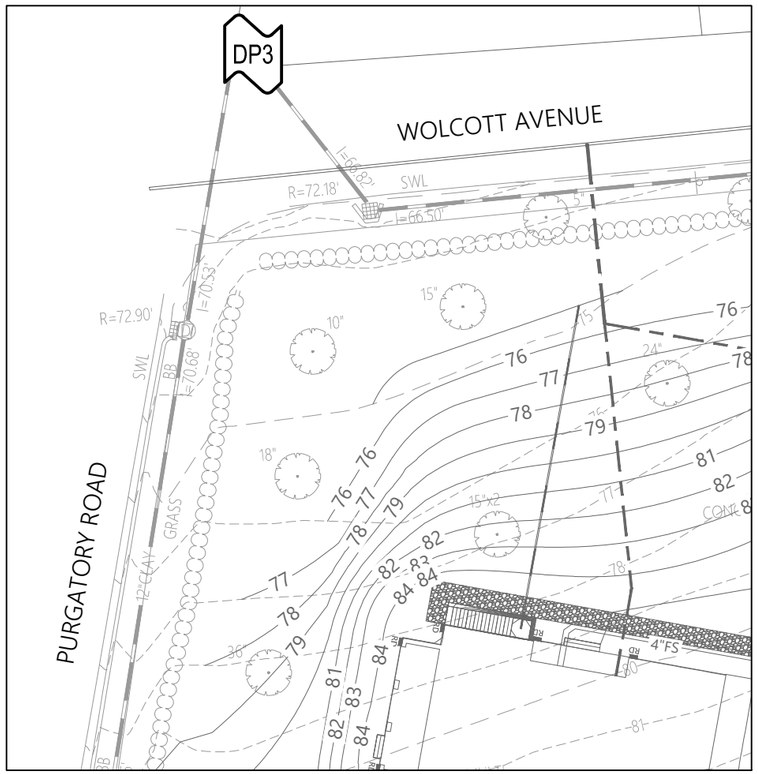
Existing Drainage Conditions **Figure 2**

Arden-Diman Dormitory Renovation
Providence, Rhode Island

02/22/2023

Proposed Conditions – Drainage Map

\\vhb.com\gbl\proj\Providence\73096.40\cad\ld\Eng\73096.40-PR Drainage.dwg



STORMWATER ENTERS CLOSED DRAINAGE SYSTEM WHICH DAYLIGHTS TO SWALE ADJACENT TO WOLCOTT AVENUE AND ULTIMATELY GETS ROUTED TO PURGATORY ROAD

STORMWATER ENTERS CLOSED DRAINAGE SYSTEM IN KANE AND GETS ROUTED TO PURGATORY ROAD

DP1 DP2 P1 P2 1a 1b 2 NeA

KANE AVENUE

0 20 40 Feet

Legend

SYMBOLS

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

LINETYPES

- **DRAINAGE AREA BOUNDARY**
- **TIME OF CONCENTRATION FLOW LINE**

SCS SOIL CLASSIFICATIONS

- NeA — **Newport Silt Loam (C Soils)**

Proposed Drainage Conditions **Figure 3**

Arden-Diman Dormitory Renovation
Providence, Rhode Island

02/22/2023

Appendix A – Water Quality Calculations

Water Quality Volume Calculations

Project	SGS - Arden Diman	**Project #**	73096.40
Calculated by	DDH	**Date**	2/24/2023
Checked by	KC/JS	**Date**	3/8/2023

Pervious Pavement

Water Quality Storm Runoff Depth (in)	1.2	
Total Impervious Area (ft^2)	8,112	

BASIN WQV:

Required Volume:	**Runoff Depth to be Treated (in)**	**Required Volume (ft^3)**
	1.2	**811**

		Provided Volume (ft^3)
Provided Volume:	From QPA*	**165**
Credit Volume:	From tennis court removal	**646**

Note: The project will take credit from the removal of the 10 tennis courts that were located on the Saint George's School campus south of the project site. These totaled 1.6 acres of removed impervious. The Faculty Housing project utilitzed 0.09 acres of this credit. The Arden Diman Residence Hall will use an additional 0.06 acres credit from the removal of the tennis courts.

* See attached QPA area summary

0 10 20 40 Feet

Arden-Diman
Dormitory Renovation
St. George's School
372 Purgatory Road
Middletown, Rhode Island 02842

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REGISTERED PROFESSIONAL ENGINEER (CIVIL)
3/8/23

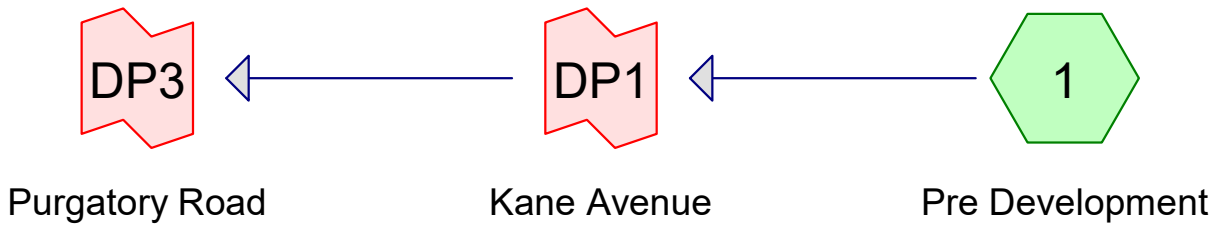
PERMIT SET
NOT FOR CONSTRUCTION

Revision	
Date	2023-03-03
Title	DRAINAGE PLAN
Scale	1" = 20'
Drawn By	DDH

C3.01

Contractor to verify all dimensions in field and inform Architect of any discrepancies before starting work.

Appendix B – HydroCAD Calculations



Subcat Reach Pond Link

Routing Diagram for 73096.40 - EX HYDROCAD
Prepared by VHB, Printed 3/1/2023

Summary for Subcatchment 1: Pre Development

Runoff = 2.84 cfs @ 12.09 hrs, Volume= 9,886 cf, Depth= 2.00"
Routed to Link DP1 : Kane Avenue

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
32,059	74	>75% Grass cover, Good, HSG C
17,858	98	Paved parking, HSG C
9,281	98	Roofs, HSG C
59,199	85	Weighted Average
32,059	74	54.16% Pervious Area
27,139	98	45.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Minimum**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Link DP1: Kane Avenue

Inflow Area = 59,199 sf, 45.84% Impervious, Inflow Depth = 2.00" for 2 year event
Inflow = 2.84 cfs @ 12.09 hrs, Volume= 9,886 cf
Primary = 2.84 cfs @ 12.09 hrs, Volume= 9,886 cf, Atten= 0%, Lag= 0.0 min
Routed to Link DP3 : Purgatory Road

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

Summary for Link DP3: Purgatory Road

Inflow Area = 59,199 sf, 45.84% Impervious, Inflow Depth = 2.00" for 2 year event
Inflow = 2.84 cfs @ 12.09 hrs, Volume= 9,886 cf
Primary = 2.84 cfs @ 12.09 hrs, Volume= 9,886 cf, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment 1: Pre Development Runoff Area=59,199 sf 45.84% Impervious Runoff Depth=0.49"
Tc=6.0 min CN=74/98 Runoff=0.67 cfs 2,394 cf

Link DP1: Kane Avenue Inflow=0.67 cfs 2,394 cf
Primary=0.67 cfs 2,394 cf

Link DP3: Purgatory Road Inflow=0.67 cfs 2,394 cf
Primary=0.67 cfs 2,394 cf

Total Runoff Area = 59,199 sf Runoff Volume = 2,394 cf Average Runoff Depth = 0.49"
54.16% Pervious = 32,059 sf 45.84% Impervious = 27,139 sf

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

Subcatchment 1: Pre Development Runoff Area=59,199 sf 45.84% Impervious Runoff Depth=2.00"
Tc=6.0 min CN=74/98 Runoff=2.84 cfs 9,886 cf

Link DP1: Kane Avenue Inflow=2.84 cfs 9,886 cf
Primary=2.84 cfs 9,886 cf

Link DP3: Purgatory Road Inflow=2.84 cfs 9,886 cf
Primary=2.84 cfs 9,886 cf

Total Runoff Area = 59,199 sf Runoff Volume = 9,886 cf Average Runoff Depth = 2.00"
54.16% Pervious = 32,059 sf 45.84% Impervious = 27,139 sf

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

Subcatchment 1: Pre Development Runoff Area=59,199 sf 45.84% Impervious Runoff Depth=3.38"
Tc=6.0 min CN=74/98 Runoff=4.83 cfs 16,651 cf

Link DP1: Kane Avenue Inflow=4.83 cfs 16,651 cf
Primary=4.83 cfs 16,651 cf

Link DP3: Purgatory Road Inflow=4.83 cfs 16,651 cf
Primary=4.83 cfs 16,651 cf

Total Runoff Area = 59,199 sf Runoff Volume = 16,651 cf Average Runoff Depth = 3.38"
54.16% Pervious = 32,059 sf 45.84% Impervious = 27,139 sf

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

Subcatchment 1: Pre Development Runoff Area=59,199 sf 45.84% Impervious Runoff Depth=4.46"
Tc=6.0 min CN=74/98 Runoff=6.40 cfs 21,991 cf

Link DP1: Kane Avenue Inflow=6.40 cfs 21,991 cf
Primary=6.40 cfs 21,991 cf

Link DP3: Purgatory Road Inflow=6.40 cfs 21,991 cf
Primary=6.40 cfs 21,991 cf

Total Runoff Area = 59,199 sf Runoff Volume = 21,991 cf Average Runoff Depth = 4.46"
54.16% Pervious = 32,059 sf 45.84% Impervious = 27,139 sf

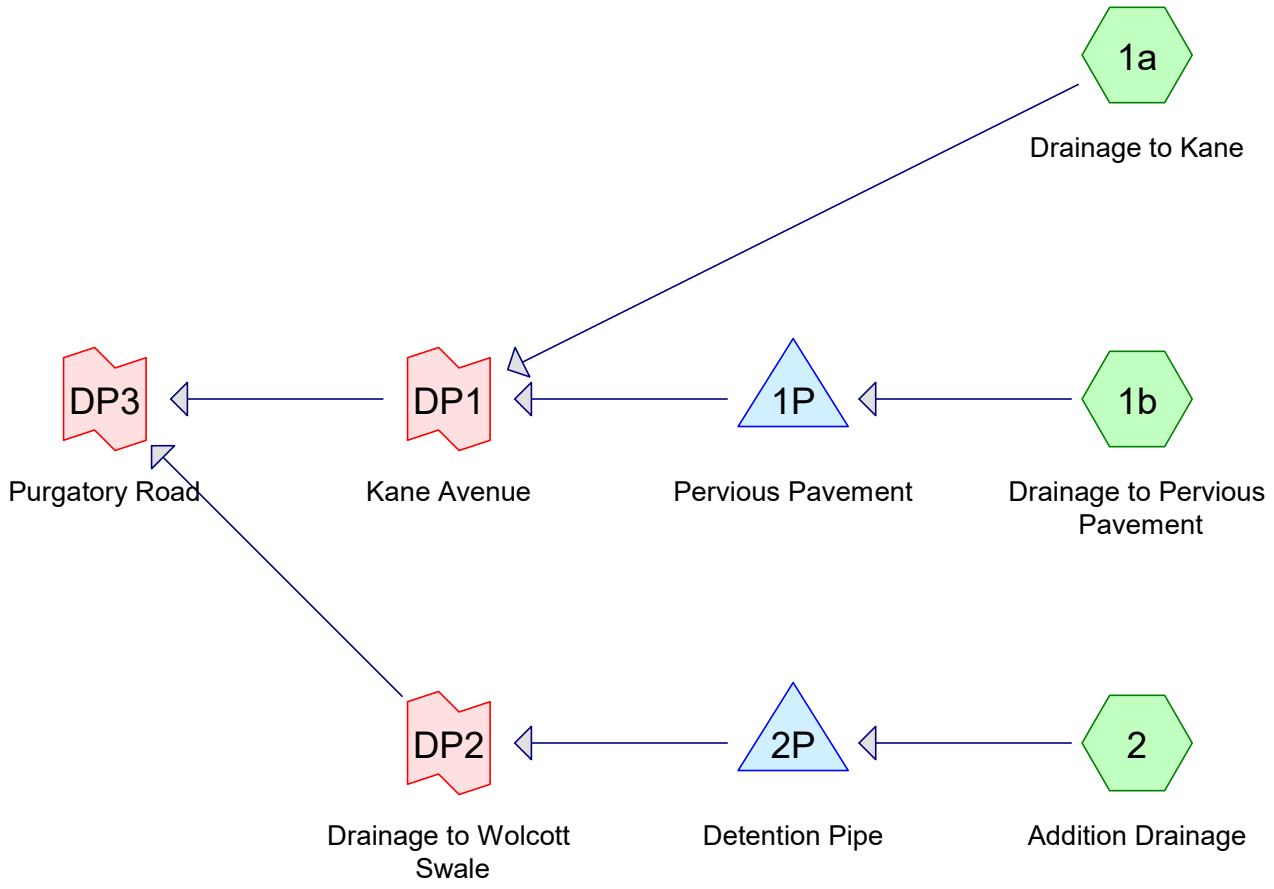
Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: Pre Development Runoff Area=59,199 sf 45.84% Impervious Runoff Depth=6.79"
Tc=6.0 min CN=74/98 Runoff=9.73 cfs 33,509 cf

Link DP1: Kane Avenue Inflow=9.73 cfs 33,509 cf
Primary=9.73 cfs 33,509 cf

Link DP3: Purgatory Road Inflow=9.73 cfs 33,509 cf
Primary=9.73 cfs 33,509 cf

Total Runoff Area = 59,199 sf Runoff Volume = 33,509 cf Average Runoff Depth = 6.79"
54.16% Pervious = 32,059 sf 45.84% Impervious = 27,139 sf



Subcat Reach Pond Link

Routing Diagram for 73096.40 - PR HYDROCAD
Prepared by VHB, Printed 3/1/2023

Summary for Subcatchment 1a: Drainage to Kane

Runoff = 1.51 cfs @ 12.09 hrs, Volume= 5,270 cf, Depth= 1.96"
Routed to Link DP1 : Kane Avenue

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
18,191	74	>75% Grass cover, Good, HSG C
9,830	98	Paved parking, HSG C
4,239	98	Roofs, HSG C
32,261	84	Weighted Average
18,191	74	56.39% Pervious Area
14,069	98	43.61% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, min**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Subcatchment 1b: Drainage to Pervious Pavement

Runoff = 0.45 cfs @ 12.11 hrs, Volume= 1,528 cf, Depth= 2.03"
Routed to Pond 1P : Pervious Pavement

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
3,591	74	>75% Grass cover, Good, HSG C
4,538	96	Gravel surface, HSG C
884	98	Paved parking, HSG C
0	98	Roofs, HSG C
9,013	87	Weighted Average
8,129	86	90.19% Pervious Area
884	98	9.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0					**Direct Entry, Extended Tc for Media Staging**

Summary for Subcatchment 2: Addition Drainage

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 3,323 cf, Depth= 2.22"
Routed to Pond 2P : Detention Pipe

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.30"

Area (sf)	CN	Description
7,692	74	>75% Grass cover, Good, HSG C
4,177	98	Paved parking, HSG C
6,055	98	Roofs, HSG C
17,924	88	Weighted Average
7,692	74	42.92% Pervious Area
10,231	98	57.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, min**
5.0	0	Total, Increased to minimum Tc = 6.0 min			

Summary for Pond 1P: Pervious Pavement

Inflow Area = 9,013 sf, 9.81% Impervious, Inflow Depth = 2.03" for 2 year event
Inflow = 0.45 cfs @ 12.11 hrs, Volume= 1,528 cf
Outflow = 0.13 cfs @ 12.49 hrs, Volume= 1,528 cf, Atten= 71%, Lag= 22.7 min
Discarded = 0.03 cfs @ 11.55 hrs, Volume= 882 cf
Primary = 0.10 cfs @ 12.49 hrs, Volume= 647 cf
Routed to Link DP1 : Kane Avenue

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 113.06' @ 12.49 hrs Surf.Area= 4,452 sf Storage= 460 cf

Plug-Flow detention time= 42.5 min calculated for 1,527 cf (100% of inflow)
Center-of-Mass det. time= 42.5 min (855.9 - 813.4)

Volume	Invert	Avail.Storage	Storage Description
#1	112.75'	3,306 cf	**42.00'W x 106.00'L x 2.25'H Pervious Pavement Media** 10,017 cf Overall x 33.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Primary	112.75'	**8.0" Round Outlet Pipe** L= 79.6' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 112.75' / 112.35' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Discarded	112.75'	**0.270 in/hr Infiltration to Silt Loam over Surface area**
#3	Device 1	114.90'	**3.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#4	Device 1	112.75'	**3.0" Vert. 3" Drawdown Orifice** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 11.55 hrs HW=112.77' (Free Discharge)
└**2=Infiltration to Silt Loam** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.10 cfs @ 12.49 hrs HW=113.06' (Free Discharge)
└**1=Outlet Pipe** (Passes 0.10 cfs of 0.22 cfs potential flow)
  ├**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=3" Drawdown Orifice** (Orifice Controls 0.10 cfs @ 2.09 fps)

Summary for Pond 2P: Detention Pipe

Inflow Area = 17,924 sf, 57.08% Impervious, Inflow Depth = 2.22" for 2 year event
Inflow = 0.95 cfs @ 12.09 hrs, Volume= 3,323 cf
Outflow = 0.47 cfs @ 12.25 hrs, Volume= 3,323 cf, Atten= 51%, Lag= 9.9 min
Primary = 0.47 cfs @ 12.25 hrs, Volume= 3,323 cf
Routed to Link DP2 : Drainage to Wolcott Swale

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs / 6
Peak Elev= 104.66' @ 12.25 hrs Surf.Area= 432 sf Storage= 448 cf

Plug-Flow detention time= 8.8 min calculated for 3,319 cf (100% of inflow)
Center-of-Mass det. time= 8.8 min (786.8 - 778.0)

Volume	Invert	Avail.Storage	Storage Description
#1	103.25'	1,420 cf	**48.0" Round Pipe Storage** L= 113.0'

Device	Routing	Invert	Outlet Devices
#1	Primary	103.25'	**12.0" Round Culvert Out** L= 93.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 103.25' / 102.10' S= 0.0124 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	107.20'	**6.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#3	Device 1	103.25'	**4.0" Vert. 4" Drawdown Orifice** C= 0.600 Limited to weir flow at low heads
#4	Device 1	106.50'	**6.0" Vert. 4" Control Orifice** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.47 cfs @ 12.25 hrs HW=104.66' (Free Discharge)
└**1=Culvert Out** (Passes 0.47 cfs of 3.61 cfs potential flow)
├**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
├**3=4" Drawdown Orifice** (Orifice Controls 0.47 cfs @ 5.37 fps)
└**4=4" Control Orifice** (Controls 0.00 cfs)

Summary for Link DP1: Kane Avenue

Inflow Area = 41,274 sf, 36.23% Impervious, Inflow Depth = 1.72" for 2 year event
Inflow = 1.56 cfs @ 12.09 hrs, Volume= 5,916 cf
Primary = 1.56 cfs @ 12.09 hrs, Volume= 5,916 cf, Atten= 0%, Lag= 0.0 min
Routed to Link DP3 : Purgatory Road

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

Summary for Link DP2: Drainage to Wolcott Swale

Inflow Area = 17,924 sf, 57.08% Impervious, Inflow Depth = 2.22" for 2 year event
Inflow = 0.47 cfs @ 12.25 hrs, Volume= 3,323 cf
Primary = 0.47 cfs @ 12.25 hrs, Volume= 3,323 cf, Atten= 0%, Lag= 0.0 min
Routed to Link DP3 : Purgatory Road

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

Summary for Link DP3: Purgatory Road

Inflow Area = 59,198 sf, 42.54% Impervious, Inflow Depth = 1.87" for 2 year event
Inflow = 1.97 cfs @ 12.10 hrs, Volume= 9,239 cf
Primary = 1.97 cfs @ 12.10 hrs, Volume= 9,239 cf, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment 1a: Drainage to Kane Runoff Area=32,261 sf 43.61% Impervious Runoff Depth=0.46"
Tc=6.0 min CN=74/98 Runoff=0.35 cfs 1,249 cf

Subcatchment 1b: Drainage to Pervious Runoff Area=9,013 sf 9.81% Impervious Runoff Depth=0.37"
Tc=8.0 min CN=86/98 Runoff=0.07 cfs 280 cf

Subcatchment 2: Addition Drainage Runoff Area=17,924 sf 57.08% Impervious Runoff Depth=0.59"
Tc=6.0 min CN=74/98 Runoff=0.25 cfs 880 cf

Pond 1P: Pervious Pavement Peak Elev=112.79' Storage=53 cf Inflow=0.07 cfs 280 cf
Discarded=0.03 cfs 267 cf Primary=0.00 cfs 13 cf Outflow=0.03 cfs 280 cf

Pond 2P: Detention Pipe Peak Elev=103.62' Storage=67 cf Inflow=0.25 cfs 880 cf
Outflow=0.19 cfs 880 cf

Link DP1: Kane Avenue Inflow=0.35 cfs 1,262 cf
Primary=0.35 cfs 1,262 cf

Link DP2: Drainage to Wolcott Swale Inflow=0.19 cfs 880 cf
Primary=0.19 cfs 880 cf

Link DP3: Purgatory Road Inflow=0.52 cfs 2,142 cf
Primary=0.52 cfs 2,142 cf

Total Runoff Area = 59,198 sf Runoff Volume = 2,409 cf Average Runoff Depth = 0.49"
57.46% Pervious = 34,013 sf 42.54% Impervious = 25,185 sf

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

Subcatchment 1a: Drainage to Kane Runoff Area=32,261 sf 43.61% Impervious Runoff Depth=1.96"
Tc=6.0 min CN=74/98 Runoff=1.51 cfs 5,270 cf

Subcatchment 1b: Drainage to Pervious Runoff Area=9,013 sf 9.81% Impervious Runoff Depth=2.03"
Tc=8.0 min CN=86/98 Runoff=0.45 cfs 1,528 cf

Subcatchment 2: Addition Drainage Runoff Area=17,924 sf 57.08% Impervious Runoff Depth=2.22"
Tc=6.0 min CN=74/98 Runoff=0.95 cfs 3,323 cf

Pond 1P: Pervious Pavement Peak Elev=113.06' Storage=460 cf Inflow=0.45 cfs 1,528 cf
Discarded=0.03 cfs 882 cf Primary=0.10 cfs 647 cf Outflow=0.13 cfs 1,528 cf

Pond 2P: Detention Pipe Peak Elev=104.66' Storage=448 cf Inflow=0.95 cfs 3,323 cf
Outflow=0.47 cfs 3,323 cf

Link DP1: Kane Avenue Inflow=1.56 cfs 5,916 cf
Primary=1.56 cfs 5,916 cf

Link DP2: Drainage to Wolcott Swale Inflow=0.47 cfs 3,323 cf
Primary=0.47 cfs 3,323 cf

Link DP3: Purgatory Road Inflow=1.97 cfs 9,239 cf
Primary=1.97 cfs 9,239 cf

Total Runoff Area = 59,198 sf Runoff Volume = 10,121 cf Average Runoff Depth = 2.05"
57.46% Pervious = 34,013 sf 42.54% Impervious = 25,185 sf

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

Subcatchment 1a: Drainage to Kane Runoff Area=32,261 sf 43.61% Impervious Runoff Depth=3.32"
Tc=6.0 min CN=74/98 Runoff=2.60 cfs 8,931 cf

Subcatchment 1b: Drainage to Pervious Runoff Area=9,013 sf 9.81% Impervious Runoff Depth=3.50"
Tc=8.0 min CN=86/98 Runoff=0.76 cfs 2,629 cf

Subcatchment 2: Addition Drainage Runoff Area=17,924 sf 57.08% Impervious Runoff Depth=3.64"
Tc=6.0 min CN=74/98 Runoff=1.56 cfs 5,441 cf

Pond 1P: Pervious Pavement Peak Elev=113.34' Storage=870 cf Inflow=0.76 cfs 2,629 cf
Discarded=0.03 cfs 1,194 cf Primary=0.16 cfs 1,435 cf Outflow=0.19 cfs 2,629 cf

Pond 2P: Detention Pipe Peak Elev=105.74' Storage=930 cf Inflow=1.56 cfs 5,441 cf
Outflow=0.64 cfs 5,441 cf

Link DP1: Kane Avenue Inflow=2.71 cfs 10,366 cf
Primary=2.71 cfs 10,366 cf

Link DP2: Drainage to Wolcott Swale Inflow=0.64 cfs 5,441 cf
Primary=0.64 cfs 5,441 cf

Link DP3: Purgatory Road Inflow=3.25 cfs 15,807 cf
Primary=3.25 cfs 15,807 cf

Total Runoff Area = 59,198 sf Runoff Volume = 17,001 cf Average Runoff Depth = 3.45"
57.46% Pervious = 34,013 sf 42.54% Impervious = 25,185 sf

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

Subcatchment 1a: Drainage to Kane Runoff Area=32,261 sf 43.61% Impervious Runoff Depth=4.40"
Tc=6.0 min CN=74/98 Runoff=3.45 cfs 11,828 cf

Subcatchment 1b: Drainage to Pervious Runoff Area=9,013 sf 9.81% Impervious Runoff Depth=4.64"
Tc=8.0 min CN=86/98 Runoff=1.00 cfs 3,483 cf

Subcatchment 2: Addition Drainage Runoff Area=17,924 sf 57.08% Impervious Runoff Depth=4.75"
Tc=6.0 min CN=74/98 Runoff=2.03 cfs 7,094 cf

Pond 1P: Pervious Pavement Peak Elev=113.57' Storage=1,208 cf Inflow=1.00 cfs 3,483 cf
Discarded=0.03 cfs 1,377 cf Primary=0.20 cfs 2,107 cf Outflow=0.23 cfs 3,483 cf

Pond 2P: Detention Pipe Peak Elev=106.72' Storage=1,308 cf Inflow=2.03 cfs 7,094 cf
Outflow=0.89 cfs 7,093 cf

Link DP1: Kane Avenue Inflow=3.59 cfs 13,935 cf
Primary=3.59 cfs 13,935 cf

Link DP2: Drainage to Wolcott Swale Inflow=0.89 cfs 7,093 cf
Primary=0.89 cfs 7,093 cf

Link DP3: Purgatory Road Inflow=4.22 cfs 21,028 cf
Primary=4.22 cfs 21,028 cf

Total Runoff Area = 59,198 sf Runoff Volume = 22,405 cf Average Runoff Depth = 4.54"
57.46% Pervious = 34,013 sf 42.54% Impervious = 25,185 sf

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

Subcatchment 1a: Drainage to Kane Runoff Area=32,261 sf 43.61% Impervious Runoff Depth=6.73"
Tc=6.0 min CN=74/98 Runoff=5.27 cfs 18,087 cf

Subcatchment 1b: Drainage to Pervious Runoff Area=9,013 sf 9.81% Impervious Runoff Depth=7.06"
Tc=8.0 min CN=86/98 Runoff=1.49 cfs 5,300 cf

Subcatchment 2: Addition Drainage Runoff Area=17,924 sf 57.08% Impervious Runoff Depth=7.12"
Tc=6.0 min CN=74/98 Runoff=3.04 cfs 10,631 cf

Pond 1P: Pervious Pavement Peak Elev=114.08' Storage=1,951 cf Inflow=1.49 cfs 5,300 cf
Discarded=0.03 cfs 1,663 cf Primary=0.26 cfs 3,637 cf Outflow=0.29 cfs 5,300 cf

Pond 2P: Detention Pipe Peak Elev=107.25' Storage=1,420 cf Inflow=3.04 cfs 10,631 cf
Outflow=1.80 cfs 10,248 cf

Link DP1: Kane Avenue Inflow=5.45 cfs 21,724 cf
Primary=5.45 cfs 21,724 cf

Link DP2: Drainage to Wolcott Swale Inflow=1.80 cfs 10,248 cf
Primary=1.80 cfs 10,248 cf

Link DP3: Purgatory Road Inflow=7.16 cfs 31,972 cf
Primary=7.16 cfs 31,972 cf

Total Runoff Area = 59,198 sf Runoff Volume = 34,018 cf Average Runoff Depth = 6.90"
57.46% Pervious = 34,013 sf 42.54% Impervious = 25,185 sf

Appendix C – Soils Calculations

Map Scale: 1:802 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 35 70 140 210

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 22, Sep 12, 2022

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
NeA	Newport silt loam, 0 to 3 percent slopes	C	3.2	100.0%
Totals for Area of Interest			**3.2**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Appendix D – SWPPP

Saint George's School Arden-Diman Dormitories Renovation

372 Purgatory Road
Middletown, Rhode Island

PREPARED FOR

St. George's School
372 Purgatory Road
Middletown, Rhode Island 02842

PREPARED BY

1 Cedar Street, Suite 400
Providence, RI 02903
401.272.8100

February, 2023

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Attachments

1

Erosion and Sedimentation Control Plan

The following erosion and sedimentation controls are for use during the earthwork and construction phases of the project. The following controls are provided as recommendations for the site contractor and do not constitute or replace the final Soil Erosion and Sediment Control Plan that must be fully implemented by the Contractor and Owner in Compliance with RIDEM RIPDES regulations and local regulations. Refer to plans SESC-1 and SESC-2 (attached) for additional requirements and restrictions.

Siltsocks

siltsocks will be placed to trap sediment transported by runoff before it reaches the drainage system or leaves the construction site. Bales will be set at least four inches into the existing ground to minimize undercutting by runoff.

Catch Basin Protection

Newly constructed and existing catch basins will be protected with hay bale barriers (where appropriate) or silt sacks throughout construction.

Gravel and Construction Exit

A temporary crushed-stone construction exit will be constructed. A cross slope will be placed in the entrance to direct runoff to a protected catch basin inlet or settling

area. If deemed necessary after construction begins, a wash pad may be included to wash off vehicle wheels before leaving the project site.

Diversion Channels

Diversion channels will be used to collect runoff from construction areas and discharge to either sedimentation basins or protected catch basin inlets.

Temporary Sediment Basins

Temporary sediment basins will be designed either as excavations or bermed stormwater detention structures (depending on grading) that will retain runoff for a sufficient period of time to allow suspended soil particles to settle out prior to discharge. These temporary basins will be located based on construction needs as determined by the contractor and outlet devices will be designed to control velocity and sediment. Points of discharge from sediment basins will be stabilized to minimize erosion.

Vegetative Slope Stabilization

Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation. Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or flatter. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be established by hydro seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer and water will be provided for effective establishment of these vegetative stabilization methods. Mulch will also be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

Maintenance

- Under the supervision of the owner, the contractor or subcontractor will be responsible for implementing each control shown on the SESC Plans.
- The on site contractor will inspect all sediment and erosion control structures periodically and after each rainfall event that exceeds 0.25 inches in 24-hours. Records of the inspections will be prepared and maintained on site by the contractor. Following final stabilization of the site, the owner shall maintain these records for a period of five years.
- Silt shall be removed from behind barriers if greater than 6 inches from the top of the barrier.
- Damaged or deteriorated items shall be repaired immediately after identification.

- The underside of siltsocks should be kept in close contact with the earth and reset as necessary.
- Sediment that is collected in structures shall be disposed of properly or covered, if stored on site.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be regraded and stabilized as necessary.

Nature and Sequence of Construction Activities

Prior to initiating work, perimeter sediment controls will be installed at the limits of work as depicted on the SESC Plans.

Construction will commence with clearing and grubbing and earthwork activities including excavation and temporary stockpiling of topsoil and grading the land surface. If soil is to be temporarily stockpiled on-Site, soil piles will be located in a suitable upland location away from stormwater structures and other proposed stormwater management areas as shown on the SESC Plans and covered with a tarp between periods of disturbance to minimize exposure to precipitation. Alternatively, if these stockpiles are not to be disturbed within 21 days, they may be seeded and mulched as soon as possible but not more than fourteen (14) days after the stockpiling has been completed.

If groundwater is encountered during excavation, diversion trenches and a temporary dewatering basin(s) will be utilized proximate to the work area to detain and filter turbid pump discharges. Soils removed from the excavation will be stockpiled as described above.

Throughout these various processes, general site dust control will be maintained through the use of water. Once construction is complete and the site is stabilized, perimeter sediment controls and any accumulated sediment will be removed and disposed of properly.

Prohibited Discharges

The following discharges are prohibited at the construction site:

- Contaminated groundwater, unless authorized by separate the RIDEM RIDPES permit.
- Wastewater from washout of concrete, stucco, paint, form release oils, curing compounds, and other construction materials.
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.
- Soaps or solvents used in vehicle and equipment washing.
- Toxic or hazardous substances from a spill or other release.

Proper Waste Disposal

Building materials and other construction site wastes must be properly managed and disposed of in a manner consistent with State Law and/or regulations.

- A waste collection area shall be designated on the site that does not receive a substantial amount of runoff from upland areas and does not drain directly to a waterbody or storm drain.
- All waste containers shall be covered to avoid contact with wind and precipitation.
- Waste collection shall be scheduled frequently enough to prevent containers from overfilling.
- All construction site wastes shall be collected, removed, and disposed of in accordance with applicable regulatory requirements and only at authorized disposal sites.
- Equipment and containers shall be checked for leaks, corrosion, support or foundation failure, or other signs of deterioration. Those that are found to be defective shall be immediately repaired or replaced.

Spill Prevention and Control

All chemicals and/or hazardous waste material must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. All areas where potential spills can occur and their accompanying drainage points must be described. The owner and operator must establish spill prevention and control measures to reduce the chance of spills, stop the source of spills, contain and clean-up spills, and dispose of materials contaminated by spills. The operator must establish and make highly visible location(s) for the storage of spill prevention and control equipment and provide training for personnel responsible for spill prevention and control on the construction site.

- A field spill plan would include information on fuels and oils being used, approximate amounts in each container or type of equipment, location, fueling location, secondary containment, response and notification procedures, including contact phone numbers, etc. All personnel shall be briefed on spill prevention and response prior to the commencement of construction. The state-specific EG-501 and EG-502 shall be followed in the event of a spill.
- All spills of OHM shall be immediately stopped and contained, if it is safe to do so. For releases of oils or hazardous materials owned by a contractor, the contractor is responsible to make all required notifications to regulatory agencies and to ensure that the release is properly responded to. The contractor is also responsible for hiring contractors for the cleanup of these releases and properly disposal of any related waste off-site at an appropriate facility. All releases of OHM to the environment in Rhode Island are considered “Reportable”.

Attachment A –

- Soil Erosion and Sediment Control- General Notes and Details
- Soil Erosion and Sediment Control- Site Plan

Saint George's School Arden-Diman Dormitories Renovation

372 Purgatory Road
Middletown, Rhode Island

PREPARED FOR

St. George's School
372 Purgatory Road
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PREPARED BY

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February, 2023

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1

Long Term Stormwater Operation and Maintenance Measures

Owner/Operator Responsible for Operation and Maintenance

St. George's School
372 Purgatory Road
Middletown, Rhode Island 02842

Maintenance of Stormwater Systems

The following maintenance program shall ensure the continued effectiveness of the structural water quantity and quality controls shown on the project Site Plans prepared by VHB. Refer to the attached Operation and Maintenance Location Plan.

Pavement Systems

Regular Asphalt Pavement

- Sealants for asphalt pavement are a major source of polycyclic aromatic hydrocarbons (PAHs) in our environment. Asphalt based sealants are allowed. Coal-tar based sealants are not allowed.

- Sweep or vacuum standard asphalt pavement areas at least once per year with a commercial cleaning unit and properly dispose of removed material.
- More frequent sweeping of paved surfaces will result in less accumulation in catchment areas, less cleaning of subsurface structures, and less disposal costs.

Permeable Asphalt Pavement

- Vacuum permeable asphalt pavement areas every three months with a commercial vacuum sweeper to keep the surface from clogging. The site should be inspected after every two-inch rainfall event to ensure that the paving surface drains properly.
- Inspect the surface annually for deterioration or spalling. If surface needs to be repaired, ensure it is not repaved or resealed with impermeable materials.
- Minimize the use of sand and salt.
- Do not use pavement sealants.
- Keep the adjacent landscape areas well maintained and stabilized.
- Post signs identifying the permeable pavement.
- Attach rollers to the bottoms of snowplows to prevent them from catching on the edges of the pavers.

Structural Stormwater Management Devices

Catch Basins and Outlet Control Structures

- Inspect the unit post construction, prior to being placed into service and ensure unit is clean and free of any structural damage.
- Inspect quarterly for the first year to determine the oil and sediment accumulation rate.
- Cleaning is required annually and whenever the depth of sediment is greater than or equal to half the sump depth.
- Inspect the units immediately after an oil, fuel or chemical spill.
- A licensed waste management company should remove oil and sediment and dispose per state and local regulations.

Roof Drain Leaders

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

Subsurface Detention Pipe System

- The subsurface infiltration systems will be inspected at least twice each year by removing the manhole/access port covers and determining the thickness of sediment that has accumulated in the chamber.
- If sediment is more than six inches deep, it must be suspended via flushing with clean water and removed using a vactor truck.
- Emergency overflow pipes will be examined at least once each year and verified that no blockage has occurred.
- System will be observed after rainfalls greater than 2.7 inches to see if it is properly draining.

Vegetated Stormwater Management Devices

Qualifying Pervious Area

- Qualified pervious ares (QPAs) are natural or restored upland vegetated areas that meet specific requirements. QPAs are relatively flat with well-drained soils, and receive small volumes of runoff as sheet flow.
- Inspect the qualifying pervious area yearly and remove any deposited sediment (sand from winter sanding operations). Correct any ponding, erosion, and replant any vegetation that has died.

Stone Diaphragm, Energy Dissipaters and Rip-rap Maintenance

- The stone areas shall be inspected annually for missing or dislodged stones. Replace stone as necessary.
- Deposited sediments shall be removed manually at least once per year.
- Trash and debris shall be removed as necessary.

General Vegetated Areas Maintenance

Although not a structural component of the drainage system, the maintenance of vegetated areas may affect the functioning of stormwater management practices. This includes the health/density of vegetative cover and activities such as the application and disposal of lawn and garden care products, disposal of leaves and yard trimmings.

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- The grass vegetation should be cut to a height between three and four inches.

- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.

2

Pollution Prevention and Source Control

A comprehensive source control program will be implemented at the Site, which includes the following components:

- Regular pavement sweeping and vacuuming as defined previously in this manual.
- Asphalt pavement sealants are a major source of polycyclic aromatic hydrocarbons (PAHs) in our environment. Asphalt based sealants are allowed. Coal-tar based sealants are not allowed.
- Catch basin cleaning.
- Clearing litter from the parking area, islands, and perimeter landscape areas.
- Trash and recycling receptacles must be provided with regular collection.
- Enclosure and regular maintenance of all dumpsters.
- Spill Prevention training. Maintenance personnel will be instructed in the proper clean-up procedures for spilled materials and the location of clean-up materials. Any washing water used on machinery will be discharge to the sanitary sewerage system after filtering of sediment.
- Sand and deicing chemicals shall be stored under cover so as to prevent exposure to stormwater. Use calcium chloride and calcium magnesium acetate (CMA) in sensitive ecosystem areas.
- Snow storage areas will be managed to prevent blockage of storm drain catch basins and stormwater drainage swales. Snow combined with sand and debris may block a storm drainage system, diminishing the infiltration capacity of the system and causing localized flooding.

- Snow shall not be dumped into any water body, pond, or wetland resource area.
- Grounds Management:
  - Conduct soil evaluation every 1-3 years to determine suitability for supporting lawn, and to determine how to optimize growing conditions.
  - Mowing and thatch management.
  - Weed management.
  - Pest management.
  - Sensible irrigation.

Inspection Date: ____/____/____ Inspection Performed By: _____

Regular Asphalt Pavement Areas **– Sweep or vacuum pavement at least once per year with a commercial cleaning unit and properly dispose of removed material. More frequent sweeping will result in less accumulation in other stormwater features.**

Street Name	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
Parking Lot Near Addition				/ /	
Kane Avenue					

Permeable Asphalt Pavement Areas **- Vacuum pavement every three months with a commercial vacuum sweeper and properly dispose of removed material. Inspect surface annually for deterioration or spalling. Do not use pavement sealants or resurfacing. Minimize the use of sand and salt / de-icers. Do not power wash. Do not expose to heavy loads for extended periods of time. Keep adjacent landscape areas well maintained and stabilized. Post signs identifying the permeable pavement. Do not store snow / ice / mulch / debris on pavement surface. Attach rollers to the bottom of snowplows to prevent them from catching on the edges of the pavers.**

Street Name	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
Permeable Parking Lot South of Dormitories				/ /	

Catch Basins **– Inspect quarterly for first year to determine oil and sediment accumulation rate. Clean annually and when sediment depth is greater than half the sump depth.**

Catch Basin	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damaged)
CB 2				/ /	
CB 4				/ /	

Inspection Date: ____/____/____ Inspection Performed By: _____

***Outlet Control Structures* – Inspect quarterly for first year to determine debris and sediment accumulation rate. Clean annually and when sediment blocks outlet orifices.**

Outlet Control Structure	Inspected (Y/N)	Debris clogging outlets (Y/N)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Damage)
OCS 1				/ /	
OCS 2				/ /	
				/ /	

***Roof Runoff Downspouts* – Inspect downspouts and roofs twice per year. Keep roofs clean of debris. Clean inlets twice per year.**

Bldg #	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
RD-1				/ /	
RD-2				/ /	
RD-3					
RD-4					
RD-5					
RD-6					
ALL RD OTHERWISE NOT LISTED					

***Subsurface Detention Pipe* – Inspect twice per year by removing the manhole/access port covers. If sediment is more than 6 inches deep, it must be suspended by flushing with clean water and removing sediment by vactor truck.**

Basin	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Sediment, Damage)
Oversized Detention Pipe (West)				/ /	
				/ /	

Inspection Date: ____/____/____ Inspection Performed By: _____

Qualifying Pervious Areas **– Inspect annually and remove any deposited sediment. Correct any ponding and erosion, and replant vegetation, as needed.**

Qualifying Pervious Area	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
QPA 1				/ /	
QPA 2				/ /	
QPA 3					
QPA 4					

Rip-rap Outfalls **– Inspect annually, replace any dislodged rip-rap, remove sediment and excess vegetation, and remove any debris.**

Outfall	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
FES				/ /	

Landscape Areas **- Inspect twice per year. Remove any deposited sediment, leaf litter and debris. Reseed or replace any vegetation that has died. Keep mowed to about 4-inches. Fertilizer usage should be avoided. If needed, a slow release fertilizer should be used.**

Areas	Inspected (Y/N)	Sediment Depth (inches)	Cleaning needed (Y/N)	Date Cleaned	Comments (Trash, Oil, Pet waste, Lawn Debris, Damage)
Perimeter and interior island landscaping				/ /	