NORTHEAST ENGINEERS & CONSULTANTS, INC.

Stormwater Runoff Analysis

"Valley Road Mini Golf"
Assessor's Map 107NE, Lot 402A
0 Valley Road
Middletown, RI

Prepared For
Mr. Derek Savas
PO Box 4340
Middletown, RI 02842

Revised June 2022

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Civil ● Site ● Land Development ● Waterfront ● Coastal Engineering ● Environmental ● Geotechnical ● Structural ● Renewable ● Surveying

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1.0 PROJECT NARRATIVE

1.1 SITE INFORMATION

City / Town:	Middletown, Rhode Island
Adjacent Roadways:	Valley Road (RI State Roadway)
Lot(s) identification:	A.P. 107NE Lot 402A
Zoning District:	LBA (Limited Business – Traffic Sensitive)
Current Use:	Vacant
Site Area:	3.72 Acres
FEMA Zone and Map:	Zone "X (Panel 44005C0093J)

1.2 EXISTING IMPROVEMENTS AND SITE CONDITIONS

The existing Site includes a single parcel which was formerly Parcel "A" of a three-lot subdivision of Lot 402 completed in 2021. The Site is, and has historically been, a vacant property. The Site fronts on Valley Road (RI RT 214), a state maintained right of way. The Site also has a small amount of frontage at the rear of the lot on Bristol Road, a town-maintained roadway. There is no formal access to the Site from other roadway. The Site abuts an occupied commercial property to the south, and a vacant commercial property to the northwest, both of which also front on Valley Road. To the rear and northeast of the Site lie small residential properties zoned R20 (high density residential). Ground cover on the Site is limited to primarily grasses, with larger shrub vegetation along the perimeter edges. Municipal sewer is available in Valley Road, while municipal water is available in both Valley Road and Bristol Road. Overhead electrical and communication services are available on the east side of Valley Road. There are no stormwater quality or control devices located on the property. The frontage along Valley Road includes a bituminous concrete sidewalk with precast concrete curbing. Both the sidewalk and the curbing are in poor condition.

1.3 PROTECTED FEATURES

There are no features protected by the state located on the property. The property is located in the town of Middletown Watershed Protection District Zone 2. The ultimate receiving waterbody for the property is Bailey's Brook (WB ID RI0007035R-01). This waterway has been assessed with a TMDL for bacteria (enterococcus).

1.4 SITE TERRAIN AND SOILS

In general, the site slopes from upland residential properties to the northeast towards Valley Road and then northwest towards the vacant abutting property. Only a small portion of the property slopes towards the state-maintained sidewalk. Slopes vary between 3% and 8%. No portion of the property has slopes approaching or exceeding 15%. The soil types on site are mapped as PmA and PmB (Pittstown silt loam) by the USDA Natural Resource Conservation Service. These silt loams are a type C hydrologic soil common to Aquidneck Island. Class IV soil evaluations performed in the area of development revealed **sandy loams** with water tables varying from 40 to 60 inches, increasing towards the front of the site.

1.5 PROPOSED IMPROVEMENTS

The applicant intends to construct a miniature golf course on the vacant property. The development will be limited towards the front half of the property, with the rear half remaining vacant. The 18-hole mini golf course will be supported by a small structure which will house restroom facilities and an office. The site shall be accessed via a new paved driveway from Valley Road. This driveway will require a curb cut, as the site currently has none. This new curb cut is to be situated sufficiently far from the southern property line so as to provide appropriate sight lines past existing and proposed vegetation. The paved access will lead into the site, behind the golf course, into a paved parking area. The proposed lot coverage shall be well within the maximum 35% lot coverage allowable by the zoning ordinance.

New public and private utility services will be provided for the site. The water service is proposed from Bristol Road in order to avoid cutting the state roadway and will require the approval of Newport Water. The proposed sewer service to an existing line on the southerly abutting property will require an easement and approval from the Middletown Public Works Department. All electrical service work from the overhead lines shall be subject to design and approval by National Grid. As no connections to subsurface utilities in Valley Road are proposed, no RIDOT utility permits are expected to be required.

Stormwater control for this development will be provided by an infiltration basin located at the front of the property. Discharge from this device towards the northwesterly abutter shall be via a staged concrete weir. Pretreatment for this device shall be provided by a sediment forebay located to the south of the access driveway. Stormwater from the developed portions of the site shall be conveyed by precast concrete structures located in the parking area and in the aisle. This conveyance includes a diversion manhole that routes low flow to the sediment forebay and higher flow directly to the infiltration basin. A bituminous spill off from the aisle shall convey another component of runoff to the sediment forebay. Closer to Valley Road, a trench drain captures another small portion of runoff and conveys it to the infiltration basin. To the rear of the developed portion of a site, a dry swale runs westerly across the property, effectively routing upstream runoff around the improvements. This device provides additional stormwater treatment for upstream off-site impervious surfaces in order to offset pollutants generated by the development. The 200 feet of grassed area to remain undisturbed will effectively provide pretreatment for the dry swale. Only a small portion of the site will drain via surface flow towards Valley Road, as in the existing conditions.

2.0 PROPOSED ALTERATIONS AND STORMWATER CONSIDERATIONS

2.1 STORMWATER SYSTEM OBJECTIVES

The objectives of the project stormwater system are to accomplish the following:

- **Provide water quality treatment and groundwater recharge for stormwater runoff in accordance with the Rhode Island Stormwater Design and Installation Standards Manual.**
- **Convey stormwater from upland residential properties through the property.**
- **Maintain the overall drainage patterns from the site to the extent practicable.**
- **Ensure no increase in peak runoff to the downstream DOT right of way.**
- **Ensure no increase in total 24-hour volume runoff to the downstream DOT right of way.**

2.2 REDEVELOPMENT SITE

As the existing site lot coverage consists of much less than 40% impervious and there are no existing impervious surfaces to be redeveloped, this project does not qualify as a "redevelopment site" per section 3.2.6 of the RISDISM.

2.3 MINIMUM STORMWATER MANAGEMENT STANDARDS

2.3.1 MINIMUM STANDARD 1: LID SITE PLANNING AND DESIGN STRATEGIES

The proposed development utilizes LID designs conforming to the RISDISM. These elements are located immediately downstream of the new improvements and will directly treat the newly generated runoff with minimal interception of on-site clean runoff.

2.3.2 MINIMUM STANDARD 2: GROUNDWATER RECHARGE

This standard shall be met by infiltrating stormwater runoff in the infiltration basin. A total of **0.410 acres** of impervious surfaces requiring recharge are intercepted by the stormwater system. This equates to a total of **372** cubic feet of recharge volume based on the underlying hydrologic soil type. Per the HydroCAD analysis of the 1.2-inch WQ storm (split pervious method) a total of **2,657** cubic feet of recharge is provided. Refer to Appendix E for complete calculations.

2.3.3 MINIMUM STANDARD 3: WATER QUALITY

This standard shall be met by infiltrating stormwater runoff in the infiltration basin. A total of intercepted **0.410 acres** of impervious surfaces requiring water quality are proposed. This equates to a total of **1,488** cubic feet of water quality volume. Per the HydroCAD analysis of the WQ storm (split pervious method) a total of **2,657** cubic feet of water quality volume is infiltrated by the stormwater system. Refer to Appendix E for complete calculations.

Additional water quality is provided by a dry swale for upland offsite properties. A total of **4,050** cubic feet of water quality volume is provided by this device. Refer to Appendix E for complete calculations.

2.3.4 MINIMUM STANDARD 4: CONVEYANCE AND NATURAL CHANNEL PROTECTION

This standard may be waived for facilities with less than one acre of imperious area. The development area for the miniature golf course and associated parking includes less than one acre of impervious.

2.3.5 MINIMUM STANDARD 5: OVERBANK FLOOD PROTECTION

The TR-20 HydroCAD model demonstrates that the proposed system will successfully mitigate the 100-year storm event. In these calculations, all pre-development land was characterized as "good condition" as required by this standard. An off-site component of runoff from upstream residential properties passes through the development area, which was also modeled as "good condition". The modeling also demonstrates that the structures and stormwater devices will safely pass the 100-year storm event without flooding or breaching.

2.3.6 MINIMUM STANDARD 6: REDEVELOPMENT AND INFILL PROJECTS

As stated in section 2.2 above, this project does not qualify as a re-development project.

2.3.7 MINIMUM STANDARD 7: POLLUTION PREVENTION

Source controls and pollution prevention measures will be present during all phases of construction. A separate stormwater pollution prevention plan (Soil Erosion and Sediment Control Narrative) has been prepared.

2.3.8 MINIMUM STANDARD 8: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

The use of this property does not quality as a LUHPPL and does not require any specific source controls, limited BMPs, or and additional state permitting.

2.3.9 MINIMUM STANDARD 9: ILLICIT DISCHARGES

Neither the using use nor any proposed uses will include any discharges considered to be "illicit" per this section of the Manual.

2.3.10 MINIMUM STANDARD 10: SOILS EROSION AND SEDIMENT CONTROL

Soil erosion and sediment control measures will be implemented during all phases of construction. A SESC plan has been provided in the permitting plan set and a separate Soil Erosion and Sediment Control Narrative has been prepared.

2.3.11 MINIMUM STANDARD 11: STORMWATER MANAGEMENT OPERATIONS AND MAINTENANCE

An Operations and Maintenance (O&M) Document has been prepared and submitted in addition to this narrative. This document satisfies the minimum requirements of this standard.

2.4 OVERALL STORMWATER DESIGN FUNCTION

The overall design of the stormwater system is to provide a reduction in peak rate of runoff and total volume runoff, and will meet the 11 minimum standards established in the RISDISM. All proposed stormwater devices are to be situated downstream of the proposed improvements and upstream of the existing receiving point for the runoff from this catchment. The existing drainage patterns across the site will be minimally impacted. There will be no negative impact to the receiving state right of way.

2.5 POLLUTANT LOADING CALCLUATION

The downstream receiving water body, Bailey's Brook, has a TMDL for bacteria (enterococcus). A pollutant loading analysis (PLA) was performed for the development. Refer to the water quality calculations for the determination of the removal rate for the dry swale which is intended to treat runoff from upland residential properties. This calculation, and the PLA, are located in Appendix E.

3.0 DESIGN MODELING METHODOLOGY

Runoff and routing calculations have been performed for the watershed areas affected by the proposed development under existing and proposed development conditions scenarios. Time of concentration and runoff curve number calculations have been performed using the method described in NRCS Technical Release 55 – Urban Hydrology for Small Watersheds. The TR-20 based HydroCAD modeling software has been utilized to perform the more complex runoff and routing calculations, most of which are beyond the scope of the TR-55 method.

Design rainfall events have been modeled using the Soil Conservation Service (SCS) Type III hydrograph for 24-hour duration storms. The rainfall depth for each return period is taken from the RISDISM. This guidance document splits the state into five regions for rainfall frequency based on county. The project site is located in the **Newport** County region defined in the RISDISM. The rainfall frequency values recommended by RIDEM and used in this drainage analysis are listed in the table below.

Rainfall Frequency Values for **Newport County** Rhode Island with 24-Hour Storm Duration					
RIDEM *Stormwater Design and Installation Standards manual* 3/15					
Frequency	1-Yr	2-Yr	10-Yr	25-Yr	100-Yr
Inches of Rainfall	2.8	3.3	4.9	6.1	8.6

The existing and proposed conditions runoff calculations were analyzed and the proposed stormwater system was designed to mitigate the peak runoff for the 1, 2, 10, 25, and 100-year 24-hour design storms. The resulting design effectively mitigates and treats runoff from newly developed areas of the site before allowing it to discharge in a non-erosive manner to downstream areas in accordance with the RISDISM.

3.1 ANALYSIS DESIGN POINTS AND OFF-SITE CONTRIBUTIONS

The proposed development contributes stormwater runoff to the following design points. These design points provide a direct comparison for pre-construction and post-construction runoff flows and runoff volumes.

1. Valley Road
2. Northwesterly Abutter

The following off-site areas contribute surface stormwater runoff to these design points. This runoff either drains through the project area or contributes in some manner which directly affects the design of the stormwater system and has been included in the design calculations. These areas are:

1. Upstream residential properties

Watershed maps for both the existing and proposed conditions can be found in Appendix B. These maps demonstrate the areas of the site which contribute to each of the design points and indicate the general pattern of surface or piped runoff flow.

4.0 STORMWATER RUNOFF COMPARISONS

Analysis of the existing and proposed runoff during design storms demonstrates that there will no increase in the peak runoff and total volume runoff to the downstream design points as a result of the development. Comparisons of the runoff at the design points are given below in Section 4.1. The runoff volumes given have been evaluated over a 24-hour period. All of the HydroCAD modeling worksheets are attached in Appendix C and D.

In addition to the standard analysis, the stormwater system was also evaluated under zero infiltration conditions to ensure that the stormwater system will not negatively impact downstream areas should infiltration be temporarily unavailable. The results of this secondary conditions are provided in Section 4.2 below.

4.1 SUMMARY OF STORMWATER CALCULATIONS (STANDARD CONDITIONS)

Table 4.1.1 Comparison of Runoff Values at Valley Road (101 vs. 201)

Storm Return Period	Existing Conditions Peak Runoff (cfs)	Proposed Conditions Peak Runoff (cfs)	Existing Conditions 24-hr Volume Runoff (af)	Proposed Conditions Volume 24-hr Runoff (af)
1-year	0.19	0.15	0.016	0.011
2-year	0.26	0.19	0.021	0.014
10-year	0.50	0.32	0.038	0.024
25-year	0.69	0.43	0.052	0.032
100-year	1.10	0.66	0.084	0.049

Table 4.1.2 Comparison of Runoff Values at Northwest Abutter (102 vs. 202)

Storm Return Period	Existing Conditions Peak Runoff (cfs)	Proposed Conditions Peak Runoff (cfs)	Existing Conditions 24-hr Volume Runoff (af)	Proposed Conditions Volume 24-hr Runoff (af)
1-year	6.63	5.71	0.654	0.623
2-year	8.95	8.08	0.861	0.833
10-year	17.18	16.40	1.598	1.51
25-year	23.80	22.88	2.199	2.192
100-year	38.10	37.04	3.519	3.532

4.2 SUMMARY OF STORMWATER CALCULATIONS (ZERO INFILTRATION CONDITIONS)

Table 4.2.1 Comparison of Runoff Values at Valley Road (101 vs. 201)

Storm Return Period	Existing Conditions Peak Runoff (cfs)	Proposed Conditions Peak Runoff (cfs)	Existing Conditions 24-hr Volume Runoff (af)	Proposed Conditions Volume 24-hr Runoff (af)
1-year	0.19	0.15	0.016	0.011
2-year	0.26	0.19	0.021	0.014
10-year	0.50	0.32	0.038	0.024
25-year	0.69	0.43	0.052	0.032
100-year	1.10	0.66	0.084	0.049

Table 4.2.2 Comparison of Runoff Values at Northwest Abutter (102 vs. 202)

Storm Return Period	Existing Conditions Peak Runoff (cfs)	Proposed Conditions Peak Runoff (cfs)	Existing Conditions 24-hr Volume Runoff (af)	Proposed Conditions Volume 24-hr Runoff (af)
1-year	6.63	6.31	0.654	0.714
2-year	8.95	8.74	0.861	0.935
10-year	17.18	16.76	1.598	1.710
25-year	23.80	23.11	2.199	2.332
100-year	38.10	37.27	3.519	3.689

5.0 STORMWATER BMPS

5.1 INFILTRATION BASIN

Description

This basin collects, infiltrates, and temporarily detains high volume stormwater runoff in order to mitigate the downstream effects. The device must maintain a minimum of three feet of separation to the estimated seasonal high groundwater table. Stormwater is released via a staged concrete weir. The detention basin is not intended to have a permanent pool and is intended to drain within 36 hours following a storm event.

The infiltration basin for this development is identified as follows:

1. Location: southwest end of site adjacent to Valley Road
   Lined or Unlined: Unlined
   Outlet Structure(s) (Y/N): N
   Overflow weir type: Staged concrete weir
   Discharge location: Northwesterly abutter

5.2 SEDIMENT FORBAY

Description:

A sediment forebay is a pre-treatment device which intercepts runoff and collects bulk sediments before overflowing into a primary water quality device. The inlets and outlet of the sediment forebay should be protected by rip-rap. A sediment forebay is grass lined and is not intended to have a permanent pool.

The stormwater design for this development includes the following sediment forebays:

1. Location: Southeast corner of the property adjacent to Valley Road
   Subwatershed served: 202C, 202D. 202E
   Lined or Unlined: Unlined
   Primary device supported: Infiltration Basin D1
   Overflow weir type: PVC outlet pipes
   Diversion Structure: Precast concrete drain manhole "CB3"

5.3 **DRY SWALE**

Description:

A dry swale provides conveyance of stormwater while also proving stormwater treatment for the conveyed water. A dry swale must be constructed above the seasonal high-water table, and provides water quality via a bed of bioretention soil, mulch, and grassed plantings. A perforated pipe underdrain system conveys treated water downstream. The slope, peak flow velocity, and width of a dry swale must be managed in order to allow for water to pond sufficiently enough to infiltrate into the bioretention media.

The stormwater design for this development includes the following dry swales:

1. Location: Along upstream edge of area to be developed
   Subwatershed served: 202A
   Bioretention Media provided: 18 inches
   Pretreatment device: filtering from 200-feet of upstream undisturbed grasses
   Outlet type: PVC underdrain

6.0 LIMITATIONS AND SPECIAL TERMS AND CONDITIONS

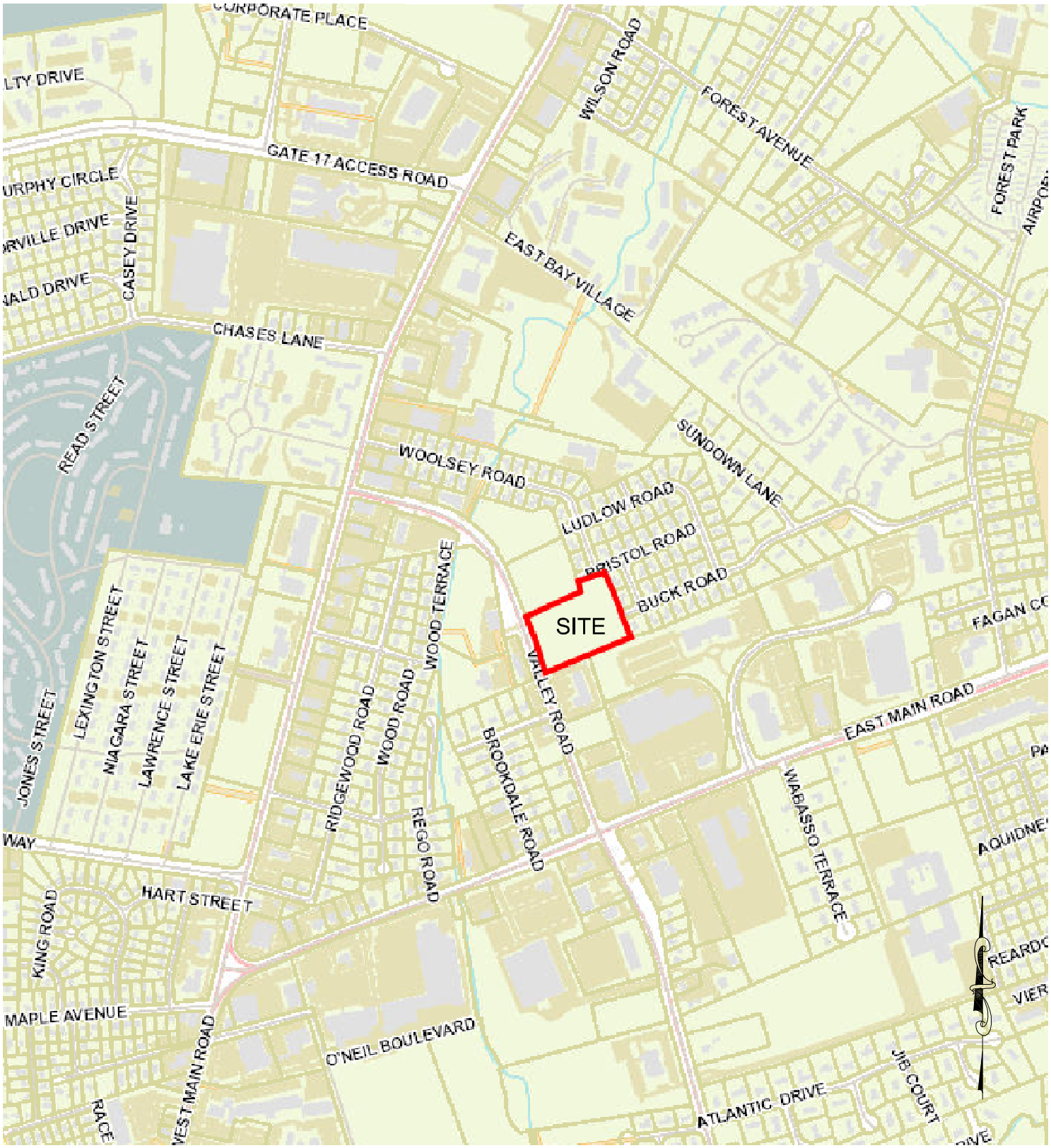
1. NE&C's evaluation was performed in accordance with generally accepted practices of other consultants undertaking similar studies at the same time and in the same geographical area, and NE&C observed the degree of care and skill generally exercised by other consultants under similar circumstances and conditions. No warrantee expressed or implied is made.

2. Any additional research conducted should be reviewed by Northeast Engineers & Consultants, Inc., such that the conclusions presented herein may be modified.

3. All observations documented in this report were performed under the existing conditions at the time of the assessment.

4. This report has been prepared on the behalf of and is for the exclusive use of the Client. This report and findings contained herein shall not, in whole or in part be disseminated or conveyed to any party, nor used by any other party in whole or in part, without the written consent of NE&C.

APPENDIX A FIGURES



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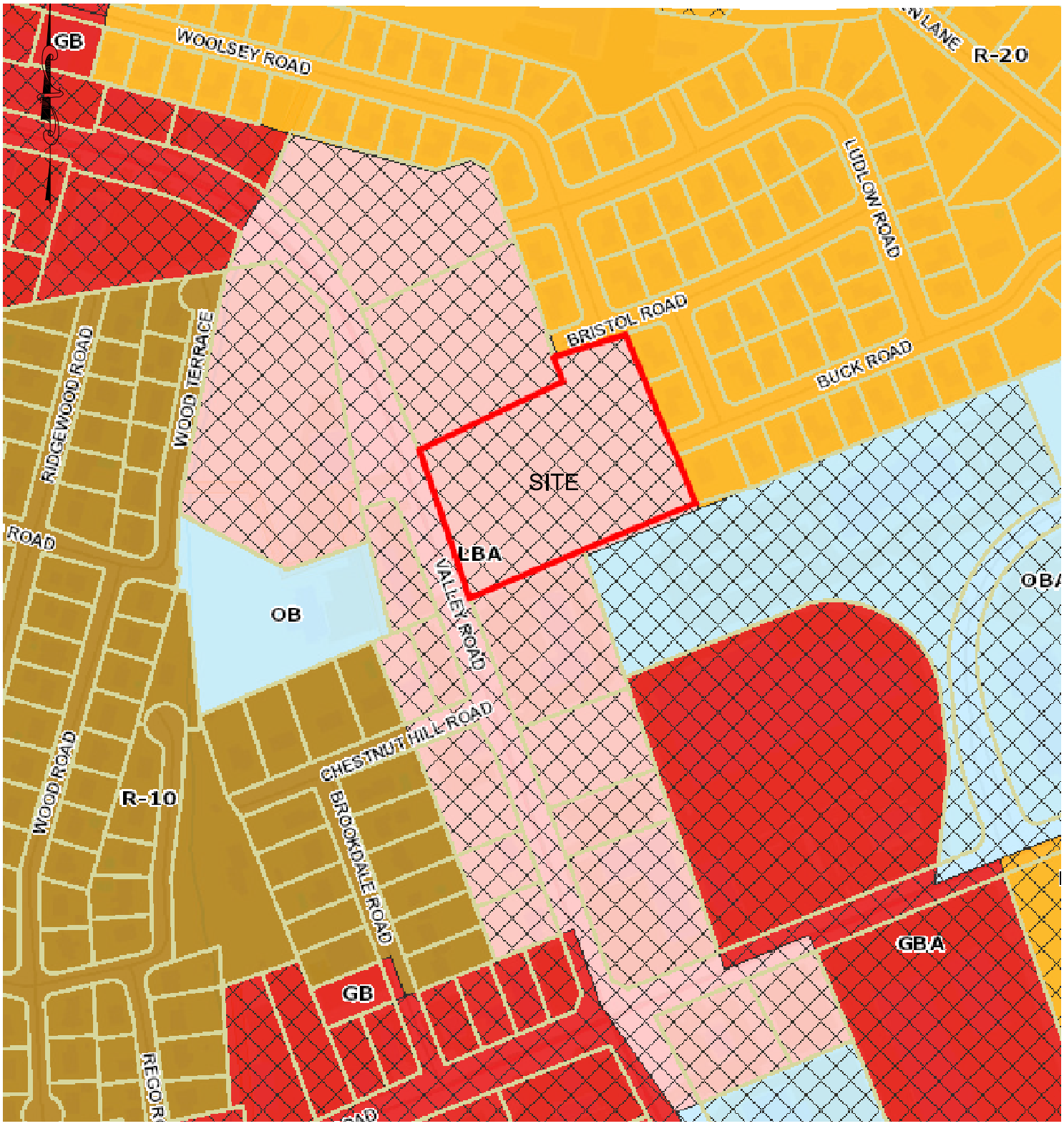
Project Title:	Drawing Title:	
VALLEY ROAD MINI GOLF MIDDLETOWN, RHODE ISLAND	LOCUS MAP	
Issued for:	**Drawing Number:**	**Project Number:**
PERMITTING	FIG 1	18225.2



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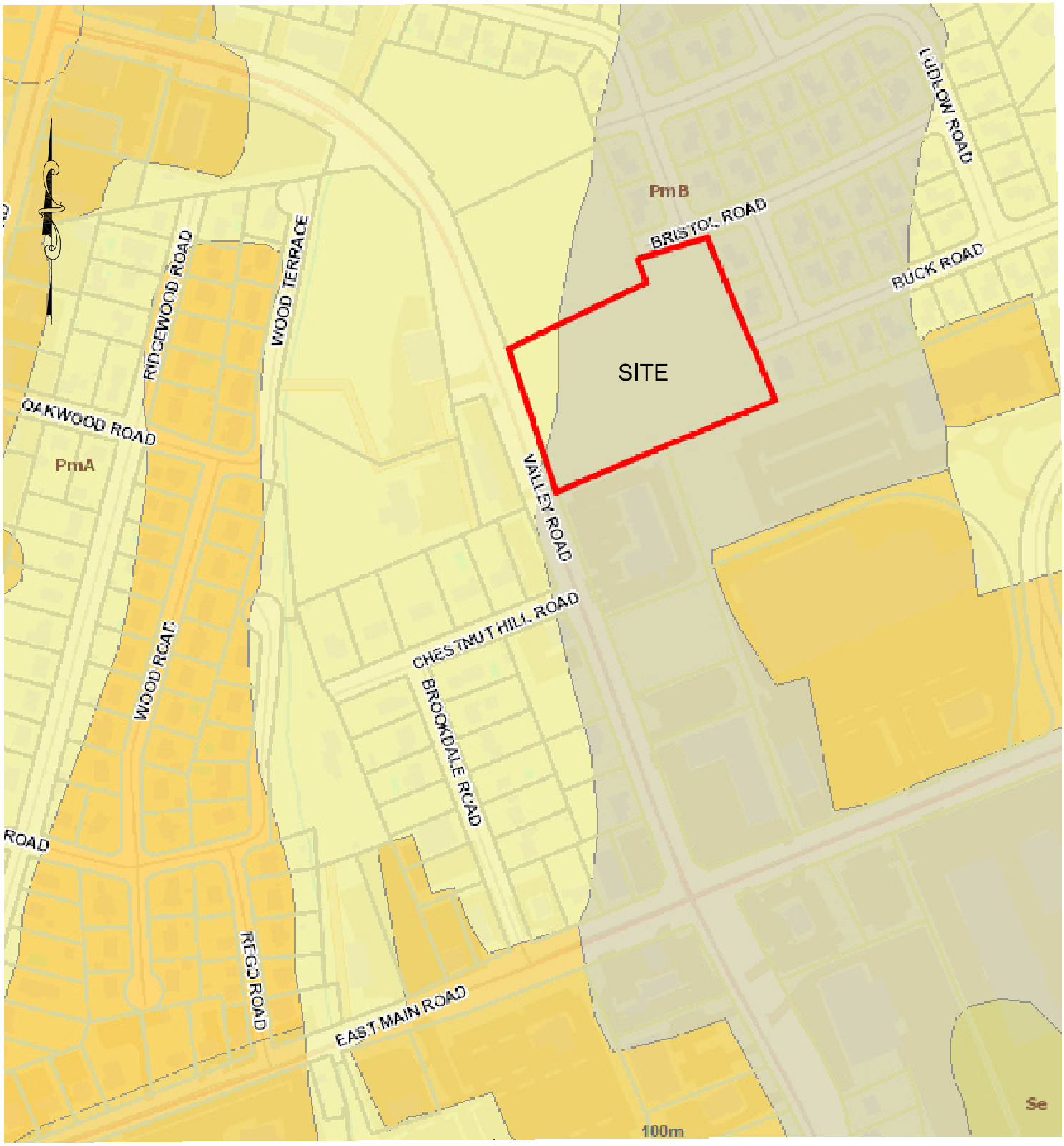
Issued for: PERMITTING		Drawing Number: FIG 2	Project Number: 18225.2	



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Project Title:

VALLEY ROAD MINI GOLF
MIDDLETOWN, RHODE ISLAND

Drawing Title:

SOILS MAP

Issued for:	Drawing Number:	Project Number:
PERMITTING	FIG 3	18225.2

APPENDIX B WATERSHED MAPS

DESIGN POINT 2
ABUTTER (A.P. 107NE LOT 402B)

STORM	PEAK (cfs)	VOL (af)
1-YEAR	6.63	0.016
2-YEAR	8.95	0.021
10-YEAR	17.18	0.038
25-YEAR	23.80	0.052
100-YEAR	38.10	0.084

DESIGN POINT 1
VALLEY ROAD (RI RT 214)

STORM	PEAK (cfs)	VOL (af)
1-YEAR	0.19	0.016
2-YEAR	0.26	0.021
10-YEAR	0.50	0.038
25-YEAR	0.69	0.052
100-YEAR	1.10	0.084

GRAPHIC SCALE

50 0 25 50 100 200

(in feet)
1"=50'

P:\Projects\2018\18225 PW Campbell\Calculations\18225_W1.dwg

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No.	Revision	Date	App.

Designed By: JJR | Drawn by: JR | Checked by: GES
Scale: 1"=50' | Date: 19MAR22

Project Title:

VALLEY ROAD MINI GOLF
A.P. 107NE LOT 402A
VALLEY ROAD
MIDDLETOWN
RHODE ISLAND

Client/Owner:

DEREK SAVAS
PO BOX 4340
MIDDLETOWN, RI 02842

Issued for:

PERMITTING

Drawing Title:

EXISTING
WATERSHED PLAN

JEREMY J. ROSA
No. 9826
19MAR22
REGISTERED PROFESSIONAL ENGINEER
CIVIL

Drawing Number:
W-1

Sheet 1 of 1

Project Number:
18225.2

Survey Index:
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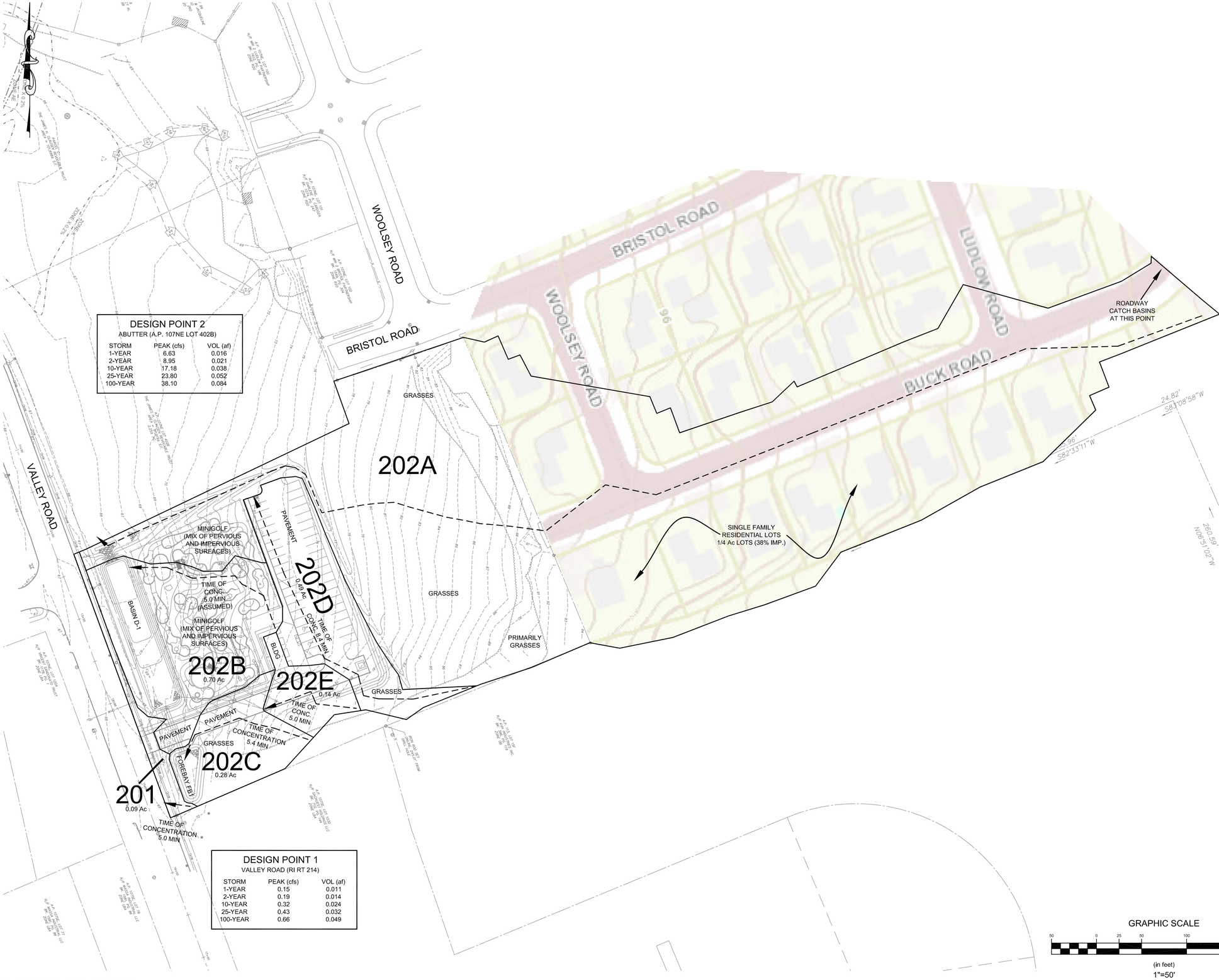

DESIGN POINT 2
ABUTTER (A.P. 107NE LOT 402B)

STORM	PEAK (cfs)	VOL (af)
1-YEAR	6.83	0.016
2-YEAR	8.95	0.021
10-YEAR	17.18	0.038
25-YEAR	23.80	0.052
100-YEAR	38.10	0.084

DESIGN POINT 1
VALLEY ROAD (RI RT 214)

STORM	PEAK (cfs)	VOL (af)
1-YEAR	0.15	0.011
2-YEAR	0.19	0.014
10-YEAR	0.32	0.024
25-YEAR	0.43	0.032
100-YEAR	0.66	0.049

GRAPHIC SCALE
50 0 25 50 100 200
(in feet)
1"=50'

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Project Title:
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A.P. 107NE LOT 402A
VALLEY ROAD
MIDDLETOWN
RHODE ISLAND

Client/Owner:
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Issued for:
PERMITTING

Drawing Title:
PROPOSED
WATERSHED PLAN

JEREMY J. ROSA
No. 9826
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CIVIL
19MAR22

Drawing Number: W-2
Sheet 1 of 1
Project Number: 18225.2
Survey Index: – –

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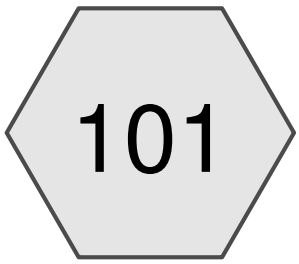
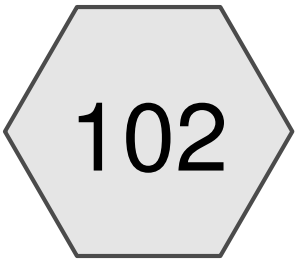
APPENDIX C EXISTING CONDITIONS HYDROCAD



To Valley



To Abutter

Subcat Reach Pond Link

Routing Diagram for 2022-03-18 18225
Prepared by Northeast Engineers & Consultants, Inc., Printed 3/19/2022

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.458	83	1/4 acre lots, 38% imp, HSG C (102)
3.726	74	>75% Grass cover, Good, HSG C (101, 102)
0.032	98	Valley Road Sidewalk (101)

Summary for Subcatchment 101: To Valley

Runoff = 0.19 cfs @ 12.10 hrs, Volume= 0.016 af, Depth> 1.12"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	5,933	74	>75% Grass cover, Good, HSG C
	7,310	79	Weighted Average
	5,933	74	81.16% Pervious Area
	1,377	98	18.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.1	25	0.0500	3.60		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
6.8	125	Total			

Summary for Subcatchment 102: To Abutter

Runoff = 6.63 cfs @ 12.18 hrs, Volume= 0.654 af, Depth> 1.11"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

Area (sf)	CN	Description
150,639	83	1/4 acre lots, 38% imp, HSG C
156,364	74	>75% Grass cover, Good, HSG C
307,003	78	Weighted Average
249,760	74	81.35% Pervious Area
57,243	98	18.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms**
					Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban**
					Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads**
					Paved Kv= 20.3 fps
2.6	594	0.0539	3.74		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
13.1	1,291	Total			

Summary for Subcatchment 101: To Valley

Runoff = 0.26 cfs @ 12.10 hrs, Volume= 0.021 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	5,933	74	>75% Grass cover, Good, HSG C
	7,310	79	Weighted Average
	5,933	74	81.16% Pervious Area
	1,377	98	18.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.1	25	0.0500	3.60		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
6.8	125	Total			

Summary for Subcatchment 102: To Abutter

Runoff = 8.95 cfs @ 12.18 hrs, Volume= 0.861 af, Depth> 1.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

Area (sf)	CN	Description
150,639	83	1/4 acre lots, 38% imp, HSG C
156,364	74	>75% Grass cover, Good, HSG C
307,003	78	Weighted Average
249,760	74	81.35% Pervious Area
57,243	98	18.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms**
					Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban**
					Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads**
					Paved Kv= 20.3 fps
2.6	594	0.0539	3.74		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
13.1	1,291	Total			

Summary for Subcatchment 101: To Valley

Runoff = 0.50 cfs @ 12.10 hrs, Volume= 0.038 af, Depth> 2.73"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	5,933	74	>75% Grass cover, Good, HSG C
	7,310	79	Weighted Average
	5,933	74	81.16% Pervious Area
	1,377	98	18.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.1	25	0.0500	3.60		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
6.8	125	Total			

Summary for Subcatchment 102: To Abutter

Runoff = 17.18 cfs @ 12.18 hrs, Volume= 1.598 af, Depth> 2.72"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

Area (sf)	CN	Description
150,639	83	1/4 acre lots, 38% imp, HSG C
156,364	74	>75% Grass cover, Good, HSG C
307,003	78	Weighted Average
249,760	74	81.35% Pervious Area
57,243	98	18.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms**
					Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban**
					Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads**
					Paved Kv= 20.3 fps
2.6	594	0.0539	3.74		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
13.1	1,291	Total			

Summary for Subcatchment 101: To Valley

Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.052 af, Depth> 3.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	5,933	74	>75% Grass cover, Good, HSG C
	7,310	79	Weighted Average
	5,933	74	81.16% Pervious Area
	1,377	98	18.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.1	25	0.0500	3.60		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
6.8	125	Total			

Summary for Subcatchment 102: To Abutter

Runoff = 23.80 cfs @ 12.18 hrs, Volume= 2.199 af, Depth> 3.74"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

Area (sf)	CN	Description
150,639	83	1/4 acre lots, 38% imp, HSG C
156,364	74	>75% Grass cover, Good, HSG C
307,003	78	Weighted Average
249,760	74	81.35% Pervious Area
57,243	98	18.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms**
					Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban**
					Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads**
					Paved Kv= 20.3 fps
2.6	594	0.0539	3.74		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
13.1	1,291	Total			

Summary for Subcatchment 101: To Valley

Runoff = 1.10 cfs @ 12.10 hrs, Volume= 0.084 af, Depth> 6.00"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	5,933	74	>75% Grass cover, Good, HSG C
	7,310	79	Weighted Average
	5,933	74	81.16% Pervious Area
	1,377	98	18.84% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.7	100	0.0500	0.25		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.1	25	0.0500	3.60		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
6.8	125	Total			

Summary for Subcatchment 102: To Abutter

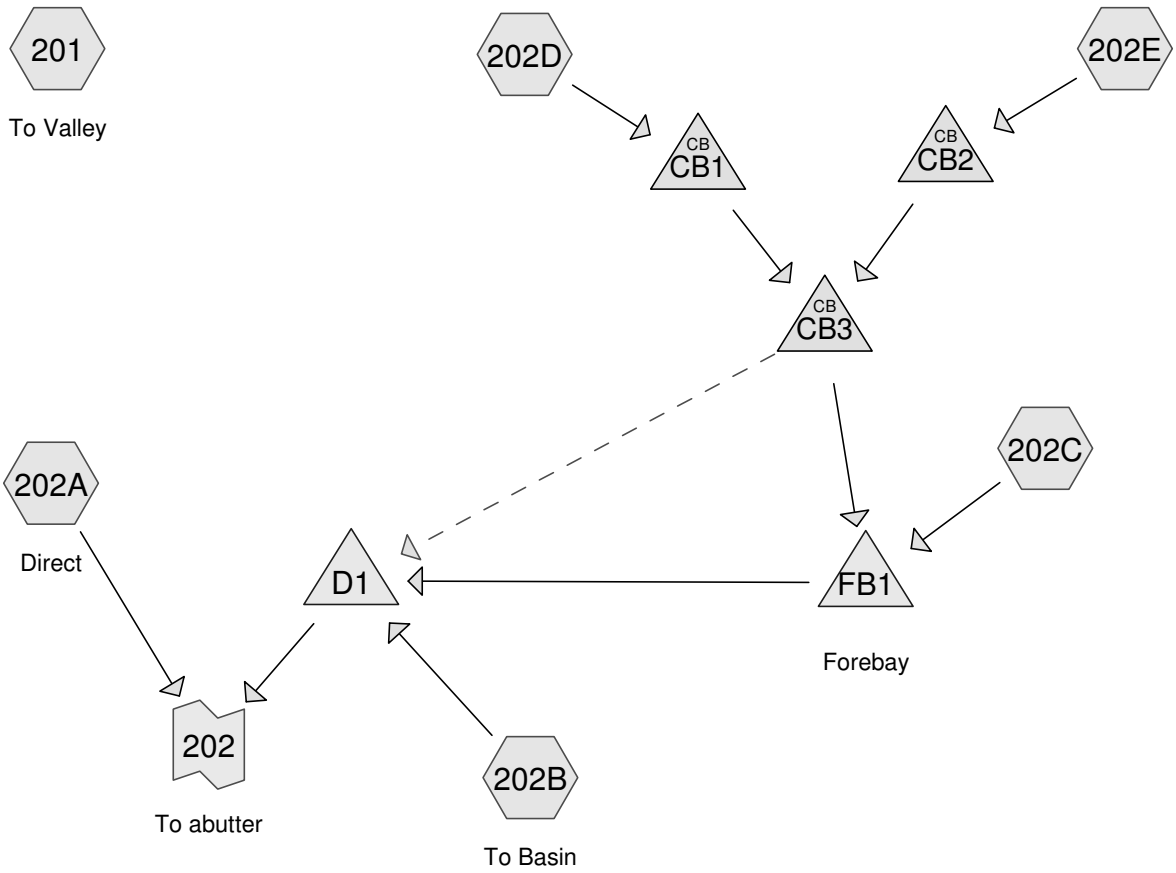
Runoff = 38.10 cfs @ 12.18 hrs, Volume= 3.519 af, Depth> 5.99"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

Area (sf)	CN	Description
150,639	83	1/4 acre lots, 38% imp, HSG C
156,364	74	>75% Grass cover, Good, HSG C
307,003	78	Weighted Average
249,760	74	81.35% Pervious Area
57,243	98	18.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms**
					Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban**
					Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads**
					Paved Kv= 20.3 fps
2.6	594	0.0539	3.74		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
13.1	1,291	Total			

APPENDIX D PROPOSED CONDITIONS HYDROCAD



Subcat Reach Pond Link

Routing Diagram for 2022-03-18 18225

Prepared by Northeast Engineers & Consultants, Inc., Printed 3/19/2022

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.458	83	1/4 acre lots, 38% imp, HSG C (202A)
2.574	74	>75% Grass cover, Good, HSG C (201, 202A, 202B, 202C, 202D, 202E)
0.120	98	Basin (202B)
0.014	98	Building (202E)
0.396	98	Driveway (201, 202B, 202C, 202D, 202E)
0.038	98	Forebay (202C)
0.499	85	Minigolf (202A, 202B)
0.040	98	Sidewalk (201, 202B, 202C)
0.046	98	Sidewalk/Patio (202D, 202E)
0.032	98	Valley Road Sidewalk (201)

Summary for Subcatchment 201: To Valley

Runoff = 0.15 cfs @ 12.07 hrs, Volume= 0.011 af, Depth> 1.58"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	2,098	74	>75% Grass cover, Good, HSG C
*	94	98	Sidewalk
*	214	98	Driveway
	3,783	85	Weighted Average
	2,098	74	55.46% Pervious Area
	1,685	98	44.54% Impervious Area

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

Summary for Subcatchment 202A: Direct

Runoff = 5.58 cfs @ 12.19 hrs, Volume= 0.554 af, Depth> 1.21"
Routed to Link 202 : To abutter

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms** Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban** Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads** Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses** Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Subcatchment 202B: To Basin

Runoff = 1.26 cfs @ 12.07 hrs, Volume= 0.091 af, Depth> 1.55"
Routed to Pond D1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
*	5,210	98	Basin
*	16,123	85	Minigolf
*	927	98	Driveway
*	1,274	98	Sidewalk
	7,142	74	>75% Grass cover, Good, HSG C
	30,676	86	Weighted Average
	23,265	82	75.84% Pervious Area
	7,411	98	24.16% Impervious Area

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

Summary for Subcatchment 202C:

Runoff = 0.40 cfs @ 12.08 hrs, Volume= 0.031 af, Depth> 1.32"
Routed to Pond FB1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
*	1,635	98	Forebay
*	1,694	98	Driveway
*	368	98	Sidewalk
	8,566	74	>75% Grass cover, Good, HSG C
	12,263	81	Weighted Average
	8,566	74	69.85% Pervious Area
	3,697	98	30.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	75	0.0550	0.24		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.3	78	0.0550	4.76		**Shallow Concentrated Flow, Pavement**
					Paved Kv= 20.3 fps
5.4	153	Total			

Summary for Subcatchment 202D:

Runoff = 0.95 cfs @ 12.12 hrs, Volume= 0.081 af, Depth> 1.97"
Routed to Pond CB1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
*	12,654	98	Driveway
*	1,695	98	Sidewalk/Patio
	7,168	74	>75% Grass cover, Good, HSG C
	21,517	90	Weighted Average
	7,168	74	33.31% Pervious Area
	14,349	98	66.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0550	0.26		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.1000	5.09		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
1.8	236	0.0120	2.22		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
8.4	386	Total			

Summary for Subcatchment 202E:

Runoff = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af, Depth> 1.55"
Routed to Pond CB2 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 1-YEAR Rainfall=2.80"

	Area (sf)	CN	Description
*	600	98	Building
*	323	98	Sidewalk/Patio
*	1,775	98	Driveway
	3,614	74	>75% Grass cover, Good, HSG C
	6,312	84	Weighted Average
	3,614	74	57.26% Pervious Area
	2,698	98	42.74% Impervious Area

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

Summary for Pond CB1:

Inflow Area = 0.494 ac, 66.69% Impervious, Inflow Depth > 1.97" for 1-YEAR event
Inflow = 0.95 cfs @ 12.12 hrs, Volume= 0.081 af
Outflow = 0.95 cfs @ 12.12 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min
Primary = 0.95 cfs @ 12.12 hrs, Volume= 0.081 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.34' @ 12.12 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.80'	**12.0" Round 12" ADS** L= 227.0' Ke= 0.500 Inlet / Outlet Invert= 70.80' / 69.50' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.95 cfs @ 12.12 hrs HW=71.34' TW=69.85' (Dynamic Tailwater)
1=12" ADS (Barrel Controls 0.95 cfs @ 3.21 fps)

Summary for Pond CB2:

Inflow Area = 0.145 ac, 42.74% Impervious, Inflow Depth > 1.55" for 1-YEAR event
Inflow = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af
Outflow = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 0.25 cfs @ 12.07 hrs, Volume= 0.019 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 70.24' @ 12.08 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round 12" ADS** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 70.00' / 69.50' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.07 hrs HW=70.24' TW=69.83' (Dynamic Tailwater)
↑**1=12" ADS** (Outlet Controls 0.24 cfs @ 2.50 fps)

Summary for Pond CB3:

Inflow Area = 0.639 ac, 61.26% Impervious, Inflow Depth > 1.88" for 1-YEAR event
Inflow = 1.17 cfs @ 12.11 hrs, Volume= 0.100 af
Outflow = 1.17 cfs @ 12.11 hrs, Volume= 0.100 af, Atten= 0%, Lag= 0.0 min
Primary = 0.68 cfs @ 12.11 hrs, Volume= 0.093 af
Routed to Pond FB1 : Forebay
Secondary = 0.49 cfs @ 12.11 hrs, Volume= 0.007 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 69.85' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**6.0" Round 6" PVC** L= 66.0' Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.50' S= 0.0076 '/' Cc= 0.900 n= 0.010, Flow Area= 0.20 sf
#2	Secondary	69.50'	**12.0" Round 12" ADS** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 69.50' / 68.00' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.68 cfs @ 12.11 hrs HW=69.85' TW=68.85' (Dynamic Tailwater)
↑**1=6" PVC** (Barrel Controls 0.68 cfs @ 3.45 fps)

Secondary OutFlow Max=0.49 cfs @ 12.11 hrs HW=69.85' TW=65.71' (Dynamic Tailwater)
↑**2=12" ADS** (Inlet Controls 0.49 cfs @ 2.01 fps)

Summary for Pond D1:

Inflow Area = 1.625 ac, 39.78% Impervious, Inflow Depth > 1.30" for 1-YEAR event
Inflow = 2.58 cfs @ 12.09 hrs, Volume= 0.176 af
Outflow = 0.71 cfs @ 12.53 hrs, Volume= 0.151 af, Atten= 72%, Lag= 25.9 min
Discarded = 0.08 cfs @ 12.53 hrs, Volume= 0.082 af
Primary = 0.62 cfs @ 12.53 hrs, Volume= 0.069 af
Routed to Link 202 : To abutter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 66.16' @ 12.53 hrs Surf.Area= 3,561 sf Storage= 3,181 cf
Flood Elev= 68.00' Surf.Area= 6,066 sf Storage= 12,571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 110.6 min (907.1 - 796.4)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	12,571 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,055	0	0
66.00	3,247	2,651	2,651
67.00	5,263	4,255	6,906
68.00	6,066	5,665	12,571

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	65.80'	**Staged Concrete Weir, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 1.35 1.35 2.20
			Width (feet) 0.90 0.90 1.55 1.55 3.45 3.45

Discarded OutFlow Max=0.08 cfs @ 12.53 hrs HW=66.16' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.62 cfs @ 12.53 hrs HW=66.16' TW=0.00' (Dynamic Tailwater)
2=Staged Concrete Weir (Weir Controls 0.62 cfs @ 1.95 fps)

Summary for Pond FB1: Forebay

Inflow Area = 0.920 ac, 51.74% Impervious, Inflow Depth > 1.62" for 1-YEAR event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 0.124 af
Outflow = 0.96 cfs @ 12.15 hrs, Volume= 0.114 af, Atten= 11%, Lag= 3.9 min
Discarded = 0.03 cfs @ 12.15 hrs, Volume= 0.036 af
Primary = 0.93 cfs @ 12.15 hrs, Volume= 0.079 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 68.86' @ 12.15 hrs Surf.Area= 1,116 sf Storage= 810 cf
Flood Elev= 70.00' Surf.Area= 1,635 sf Storage= 2,372 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 27.5 min (815.0 - 787.5)

Volume	Invert	Avail.Storage	Storage Description
#1	68.00'	2,372 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.00	764	0	0
69.00	1,172	968	968
70.00	1,635	1,404	2,372

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	68.50'	**6.0" Round 6" PVC X 3.00** L= 60.0' Ke= 0.500
			Inlet / Outlet Invert= 68.50' / 68.00' S= 0.0083 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 12.15 hrs HW=68.86' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.93 cfs @ 12.15 hrs HW=68.86' TW=65.84' (Dynamic Tailwater)
2=6" PVC (Inlet Controls 0.93 cfs @ 2.05 fps)

Summary for Link 202: To abutter

Inflow Area = 7.129 ac, 27.50% Impervious, Inflow Depth > 1.05" for 1-YEAR event
Inflow = 5.71 cfs @ 12.19 hrs, Volume= 0.623 af
Primary = 5.71 cfs @ 12.19 hrs, Volume= 0.623 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 201: To Valley

Runoff = 0.19 cfs @ 12.07 hrs, Volume= 0.014 af, Depth> 1.98"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	2,098	74	>75% Grass cover, Good, HSG C
*	94	98	Sidewalk
*	214	98	Driveway
	3,783	85	Weighted Average
	2,098	74	55.46% Pervious Area
	1,685	98	44.54% Impervious Area

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

Summary for Subcatchment 202A: Direct

Runoff = 7.41 cfs @ 12.19 hrs, Volume= 0.719 af, Depth> 1.57"
Routed to Link 202 : To abutter

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms** Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban** Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads** Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses** Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Subcatchment 202B: To Basin

Runoff = 1.61 cfs @ 12.07 hrs, Volume= 0.115 af, Depth> 1.97"
Routed to Pond D1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
*	5,210	98	Basin
*	16,123	85	Minigolf
*	927	98	Driveway
*	1,274	98	Sidewalk
	7,142	74	>75% Grass cover, Good, HSG C
	30,676	86	Weighted Average
	23,265	82	75.84% Pervious Area
	7,411	98	24.16% Impervious Area

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

Summary for Subcatchment 202C:

Runoff = 0.52 cfs @ 12.08 hrs, Volume= 0.040 af, Depth> 1.69"
Routed to Pond FB1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
*	1,635	98	Forebay
*	1,694	98	Driveway
*	368	98	Sidewalk
	8,566	74	>75% Grass cover, Good, HSG C
	12,263	81	Weighted Average
	8,566	74	69.85% Pervious Area
	3,697	98	30.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	75	0.0550	0.24		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.3	78	0.0550	4.76		**Shallow Concentrated Flow, Pavement**
					Paved Kv= 20.3 fps
5.4	153	Total			

Summary for Subcatchment 202D:

Runoff = 1.16 cfs @ 12.12 hrs, Volume= 0.099 af, Depth> 2.41"
Routed to Pond CB1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
*	12,654	98	Driveway
*	1,695	98	Sidewalk/Patio
	7,168	74	>75% Grass cover, Good, HSG C
	21,517	90	Weighted Average
	7,168	74	33.31% Pervious Area
	14,349	98	66.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0550	0.26		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.1000	5.09		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
1.8	236	0.0120	2.22		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
8.4	386	Total			

Summary for Subcatchment 202E:

Runoff = 0.31 cfs @ 12.07 hrs, Volume= 0.023 af, Depth> 1.94"
Routed to Pond CB2 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YEAR Rainfall=3.30"

	Area (sf)	CN	Description
*	600	98	Building
*	323	98	Sidewalk/Patio
*	1,775	98	Driveway
	3,614	74	>75% Grass cover, Good, HSG C
	6,312	84	Weighted Average
	3,614	74	57.26% Pervious Area
	2,698	98	42.74% Impervious Area

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

Summary for Pond CB1:

Inflow Area = 0.494 ac, 66.69% Impervious, Inflow Depth > 2.41" for 2-YEAR event
Inflow = 1.16 cfs @ 12.12 hrs, Volume= 0.099 af
Outflow = 1.16 cfs @ 12.12 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.0 min
Primary = 1.16 cfs @ 12.12 hrs, Volume= 0.099 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.40' @ 12.12 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.80'	**12.0" Round 12" ADS** L= 227.0' Ke= 0.500 Inlet / Outlet Invert= 70.80' / 69.50' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.16 cfs @ 12.12 hrs HW=71.40' TW=69.93' (Dynamic Tailwater)
1=12" ADS (Barrel Controls 1.16 cfs @ 3.38 fps)

Summary for Pond CB2:

Inflow Area = 0.145 ac, 42.74% Impervious, Inflow Depth > 1.94" for 2-YEAR event
Inflow = 0.31 cfs @ 12.07 hrs, Volume= 0.023 af
Outflow = 0.31 cfs @ 12.07 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Primary = 0.31 cfs @ 12.07 hrs, Volume= 0.023 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 70.28' @ 12.09 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round 12" ADS** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 70.00' / 69.50' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.30 cfs @ 12.07 hrs HW=70.28' TW=69.91' (Dynamic Tailwater)
↑**1=12" ADS** (Outlet Controls 0.30 cfs @ 2.51 fps)

Summary for Pond CB3:

Inflow Area = 0.639 ac, 61.26% Impervious, Inflow Depth > 2.30" for 2-YEAR event
Inflow = 1.44 cfs @ 12.11 hrs, Volume= 0.123 af
Outflow = 1.44 cfs @ 12.11 hrs, Volume= 0.123 af, Atten= 0%, Lag= 0.0 min
Primary = 0.71 cfs @ 12.11 hrs, Volume= 0.111 af
Routed to Pond FB1 : Forebay
Secondary = 0.73 cfs @ 12.11 hrs, Volume= 0.012 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 69.93' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**6.0" Round 6" PVC** L= 66.0' Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.50' S= 0.0076 '/' Cc= 0.900 n= 0.010, Flow Area= 0.20 sf
#2	Secondary	69.50'	**12.0" Round 12" ADS** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 69.50' / 68.00' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 12.11 hrs HW=69.93' TW=68.89' (Dynamic Tailwater)
↑**1=6" PVC** (Barrel Controls 0.71 cfs @ 3.62 fps)

Secondary OutFlow Max=0.73 cfs @ 12.11 hrs HW=69.93' TW=65.97' (Dynamic Tailwater)
↑**2=12" ADS** (Inlet Controls 0.73 cfs @ 2.24 fps)

Summary for Pond D1:

Inflow Area = 1.625 ac, 39.78% Impervious, Inflow Depth > 1.70" for 2-YEAR event
Inflow = 3.29 cfs @ 12.09 hrs, Volume= 0.230 af
Outflow = 1.17 cfs @ 12.43 hrs, Volume= 0.200 af, Atten= 64%, Lag= 20.4 min
Discarded = 0.09 cfs @ 12.43 hrs, Volume= 0.086 af
Primary = 1.08 cfs @ 12.43 hrs, Volume= 0.114 af
Routed to Link 202 : To abutter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 66.31' @ 12.43 hrs Surf.Area= 3,875 sf Storage= 3,761 cf
Flood Elev= 68.00' Surf.Area= 6,066 sf Storage= 12,571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 81.7 min (878.2 - 796.5)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	12,571 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,055	0	0
66.00	3,247	2,651	2,651
67.00	5,263	4,255	6,906
68.00	6,066	5,665	12,571

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	65.80'	**Staged Concrete Weir, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 1.35 1.35 2.20
			Width (feet) 0.90 0.90 1.55 1.55 3.45 3.45

Discarded OutFlow Max=0.09 cfs @ 12.43 hrs HW=66.31' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.09 cfs)

Primary OutFlow Max=1.08 cfs @ 12.43 hrs HW=66.31' TW=0.00' (Dynamic Tailwater)
2=Staged Concrete Weir (Weir Controls 1.08 cfs @ 2.34 fps)

Summary for Pond FB1: Forebay

Inflow Area = 0.920 ac, 51.74% Impervious, Inflow Depth > 1.96" for 2-YEAR event
Inflow = 1.23 cfs @ 12.09 hrs, Volume= 0.150 af
Outflow = 1.10 cfs @ 12.15 hrs, Volume= 0.140 af, Atten= 11%, Lag= 3.6 min
Discarded = 0.03 cfs @ 12.15 hrs, Volume= 0.037 af
Primary = 1.07 cfs @ 12.15 hrs, Volume= 0.103 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 68.90' @ 12.15 hrs Surf.Area= 1,130 sf Storage= 848 cf
Flood Elev= 70.00' Surf.Area= 1,635 sf Storage= 2,372 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 24.8 min (811.5 - 786.6)

Volume	Invert	Avail.Storage	Storage Description
#1	68.00'	2,372 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.00	764	0	0
69.00	1,172	968	968
70.00	1,635	1,404	2,372

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	68.50'	**6.0" Round 6" PVC X 3.00** L= 60.0' Ke= 0.500
			Inlet / Outlet Invert= 68.50' / 68.00' S= 0.0083 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 12.15 hrs HW=68.90' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.07 cfs @ 12.15 hrs HW=68.90' TW=66.08' (Dynamic Tailwater)
2=6" PVC (Inlet Controls 1.07 cfs @ 2.14 fps)

Summary for Link 202: To abutter

Inflow Area = 7.129 ac, 27.50% Impervious, Inflow Depth > 1.40" for 2-YEAR event
Inflow = 8.08 cfs @ 12.19 hrs, Volume= 0.833 af
Primary = 8.08 cfs @ 12.19 hrs, Volume= 0.833 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 201: To Valley

Runoff = 0.32 cfs @ 12.07 hrs, Volume= 0.024 af, Depth> 3.34"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	2,098	74	>75% Grass cover, Good, HSG C
*	94	98	Sidewalk
*	214	98	Driveway
	3,783	85	Weighted Average
	2,098	74	55.46% Pervious Area
	1,685	98	44.54% Impervious Area

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

Summary for Subcatchment 202A: Direct

Runoff = 13.83 cfs @ 12.18 hrs, Volume= 1.305 af, Depth> 2.85"
Routed to Link 202 : To abutter

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms** Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban** Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads** Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses** Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Subcatchment 202B: To Basin

Runoff = 2.78 cfs @ 12.07 hrs, Volume= 0.199 af, Depth> 3.39"
Routed to Pond D1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
*	5,210	98	Basin
*	16,123	85	Minigolf
*	927	98	Driveway
*	1,274	98	Sidewalk
	7,142	74	>75% Grass cover, Good, HSG C
	30,676	86	Weighted Average
	23,265	82	75.84% Pervious Area
	7,411	98	24.16% Impervious Area

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

Summary for Subcatchment 202C:

Runoff = 0.95 cfs @ 12.08 hrs, Volume= 0.070 af, Depth> 3.00"
Routed to Pond FB1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
*	1,635	98	Forebay
*	1,694	98	Driveway
*	368	98	Sidewalk
	8,566	74	>75% Grass cover, Good, HSG C
	12,263	81	Weighted Average
	8,566	74	69.85% Pervious Area
	3,697	98	30.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	75	0.0550	0.24		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.3	78	0.0550	4.76		**Shallow Concentrated Flow, Pavement**
					Paved Kv= 20.3 fps
5.4	153	Total			

Summary for Subcatchment 202D:

Runoff = 1.86 cfs @ 12.12 hrs, Volume= 0.159 af, Depth> 3.87"
Routed to Pond CB1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
*	12,654	98	Driveway
*	1,695	98	Sidewalk/Patio
	7,168	74	>75% Grass cover, Good, HSG C
	21,517	90	Weighted Average
	7,168	74	33.31% Pervious Area
	14,349	98	66.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0550	0.26		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.1000	5.09		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
1.8	236	0.0120	2.22		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
8.4	386	Total			

Summary for Subcatchment 202E:

Runoff = 0.54 cfs @ 12.07 hrs, Volume= 0.040 af, Depth> 3.30"
Routed to Pond CB2 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
*	600	98	Building
*	323	98	Sidewalk/Patio
*	1,775	98	Driveway
	3,614	74	>75% Grass cover, Good, HSG C
	6,312	84	Weighted Average
	3,614	74	57.26% Pervious Area
	2,698	98	42.74% Impervious Area

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

Summary for Pond CB1:

Inflow Area = 0.494 ac, 66.69% Impervious, Inflow Depth > 3.87" for 10-YEAR event
Inflow = 1.86 cfs @ 12.12 hrs, Volume= 0.159 af
Outflow = 1.86 cfs @ 12.12 hrs, Volume= 0.159 af, Atten= 0%, Lag= 0.0 min
Primary = 1.86 cfs @ 12.12 hrs, Volume= 0.159 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.61' @ 12.12 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.80'	**12.0" Round 12" ADS** L= 227.0' Ke= 0.500 Inlet / Outlet Invert= 70.80' / 69.50' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=1.86 cfs @ 12.12 hrs HW=71.61' TW=70.16' (Dynamic Tailwater)
1=12" ADS (Outlet Controls 1.86 cfs @ 3.72 fps)

Summary for Pond CB2:

Inflow Area = 0.145 ac, 42.74% Impervious, Inflow Depth > 3.30" for 10-YEAR event
Inflow = 0.54 cfs @ 12.07 hrs, Volume= 0.040 af
Outflow = 0.54 cfs @ 12.07 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.54 cfs @ 12.07 hrs, Volume= 0.040 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 70.42' @ 12.09 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round 12" ADS** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 70.00' / 69.50' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.51 cfs @ 12.07 hrs HW=70.42' TW=70.13' (Dynamic Tailwater)
↑—**1=12" ADS** (Outlet Controls 0.51 cfs @ 2.46 fps)

Summary for Pond CB3:

Inflow Area = 0.639 ac, 61.26% Impervious, Inflow Depth > 3.74" for 10-YEAR event
Inflow = 2.34 cfs @ 12.10 hrs, Volume= 0.199 af
Outflow = 2.34 cfs @ 12.10 hrs, Volume= 0.199 af, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.10 hrs, Volume= 0.164 af
Routed to Pond FB1 : Forebay
Secondary = 1.55 cfs @ 12.10 hrs, Volume= 0.035 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 70.17' @ 12.10 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**6.0" Round 6" PVC** L= 66.0' Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.50' S= 0.0076 '/' Cc= 0.900 n= 0.010, Flow Area= 0.20 sf
#2	Secondary	69.50'	**12.0" Round 12" ADS** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 69.50' / 68.00' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.79 cfs @ 12.10 hrs HW=70.17' TW=68.99' (Dynamic Tailwater)
↑—**1=6" PVC** (Barrel Controls 0.79 cfs @ 4.05 fps)

Secondary OutFlow Max=1.54 cfs @ 12.10 hrs HW=70.17' TW=66.56' (Dynamic Tailwater)
↑—**2=12" ADS** (Inlet Controls 1.54 cfs @ 2.78 fps)

Summary for Pond D1:

Inflow Area = 1.625 ac, 39.78% Impervious, Inflow Depth > 3.08" for 10-YEAR event
Inflow = 5.61 cfs @ 12.09 hrs, Volume= 0.417 af
Outflow = 2.86 cfs @ 12.29 hrs, Volume= 0.374 af, Atten= 49%, Lag= 11.9 min
Discarded = 0.11 cfs @ 12.29 hrs, Volume= 0.098 af
Primary = 2.74 cfs @ 12.29 hrs, Volume= 0.276 af
Routed to Link 202 : To abutter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 66.75' @ 12.29 hrs Surf.Area= 4,766 sf Storage= 5,670 cf
Flood Elev= 68.00' Surf.Area= 6,066 sf Storage= 12,571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 44.5 min (837.3 - 792.7)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	12,571 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,055	0	0
66.00	3,247	2,651	2,651
67.00	5,263	4,255	6,906
68.00	6,066	5,665	12,571

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	65.80'	**Staged Concrete Weir, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 1.35 1.35 2.20
			Width (feet) 0.90 0.90 1.55 1.55 3.45 3.45

Discarded OutFlow Max=0.11 cfs @ 12.29 hrs HW=66.75' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=2.74 cfs @ 12.29 hrs HW=66.75' TW=0.00' (Dynamic Tailwater)
2=Staged Concrete Weir (Weir Controls 2.74 cfs @ 3.20 fps)

Summary for Pond FB1: Forebay

Inflow Area = 0.920 ac, 51.74% Impervious, Inflow Depth > 3.06" for 10-YEAR event
Inflow = 1.74 cfs @ 12.08 hrs, Volume= 0.235 af
Outflow = 1.48 cfs @ 12.15 hrs, Volume= 0.224 af, Atten= 15%, Lag= 3.9 min
Discarded = 0.03 cfs @ 12.15 hrs, Volume= 0.040 af
Primary = 1.45 cfs @ 12.15 hrs, Volume= 0.183 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 69.01' @ 12.15 hrs Surf.Area= 1,178 sf Storage= 983 cf
Flood Elev= 70.00' Surf.Area= 1,635 sf Storage= 2,372 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 22.0 min (806.2 - 784.2)

Volume	Invert	Avail.Storage	Storage Description
#1	68.00'	2,372 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.00	764	0	0
69.00	1,172	968	968
70.00	1,635	1,404	2,372

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	68.50'	**6.0" Round 6" PVC X 3.00** L= 60.0' Ke= 0.500
			Inlet / Outlet Invert= 68.50' / 68.00' S= 0.0083 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 12.15 hrs HW=69.01' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.45 cfs @ 12.15 hrs HW=69.01' TW=66.66' (Dynamic Tailwater)
2=6" PVC (Inlet Controls 1.45 cfs @ 2.47 fps)

Summary for Link 202: To abutter

Inflow Area = 7.129 ac, 27.50% Impervious, Inflow Depth > 2.66" for 10-YEAR event
Inflow = 16.40 cfs @ 12.19 hrs, Volume= 1.581 af
Primary = 16.40 cfs @ 12.19 hrs, Volume= 1.581 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 201: To Valley

Runoff = 0.43 cfs @ 12.07 hrs, Volume= 0.032 af, Depth> 4.42"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	2,098	74	>75% Grass cover, Good, HSG C
*	94	98	Sidewalk
*	214	98	Driveway
	3,783	85	Weighted Average
	2,098	74	55.46% Pervious Area
	1,685	98	44.54% Impervious Area

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

Summary for Subcatchment 202A: Direct

Runoff = 18.97 cfs @ 12.18 hrs, Volume= 1.779 af, Depth> 3.88"
Routed to Link 202 : To abutter

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms** Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban** Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads** Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses** Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Subcatchment 202B: To Basin

Runoff = 3.68 cfs @ 12.07 hrs, Volume= 0.264 af, Depth> 4.51"
Routed to Pond D1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
*	5,210	98	Basin
*	16,123	85	Minigolf
*	927	98	Driveway
*	1,274	98	Sidewalk
	7,142	74	>75% Grass cover, Good, HSG C
	30,676	86	Weighted Average
	23,265	82	75.84% Pervious Area
	7,411	98	24.16% Impervious Area

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

Summary for Subcatchment 202C:

Runoff = 1.29 cfs @ 12.08 hrs, Volume= 0.095 af, Depth> 4.05"
Routed to Pond FB1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
*	1,635	98	Forebay
*	1,694	98	Driveway
*	368	98	Sidewalk
	8,566	74	>75% Grass cover, Good, HSG C
	12,263	81	Weighted Average
	8,566	74	69.85% Pervious Area
	3,697	98	30.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	75	0.0550	0.24		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.3	78	0.0550	4.76		**Shallow Concentrated Flow, Pavement**
					Paved Kv= 20.3 fps
5.4	153	Total			

Summary for Subcatchment 202D:

Runoff = 2.40 cfs @ 12.12 hrs, Volume= 0.205 af, Depth> 4.99"
Routed to Pond CB1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
*	12,654	98	Driveway
*	1,695	98	Sidewalk/Patio
	7,168	74	>75% Grass cover, Good, HSG C
	21,517	90	Weighted Average
	7,168	74	33.31% Pervious Area
	14,349	98	66.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0550	0.26		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.1000	5.09		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
1.8	236	0.0120	2.22		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
8.4	386	Total			

Summary for Subcatchment 202E:

Runoff = 0.71 cfs @ 12.07 hrs, Volume= 0.053 af, Depth> 4.37"
Routed to Pond CB2 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-YEAR Rainfall=6.10"

	Area (sf)	CN	Description
*	600	98	Building
*	323	98	Sidewalk/Patio
*	1,775	98	Driveway
	3,614	74	>75% Grass cover, Good, HSG C
	6,312	84	Weighted Average
	3,614	74	57.26% Pervious Area
	2,698	98	42.74% Impervious Area

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

Summary for Pond CB1:

Inflow Area = 0.494 ac, 66.69% Impervious, Inflow Depth > 4.99" for 25-YEAR event
Inflow = 2.40 cfs @ 12.12 hrs, Volume= 0.205 af
Outflow = 2.40 cfs @ 12.12 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min
Primary = 2.40 cfs @ 12.12 hrs, Volume= 0.205 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.78' @ 12.12 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.80'	**12.0" Round 12" ADS** L= 227.0' Ke= 0.500 Inlet / Outlet Invert= 70.80' / 69.50' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=2.40 cfs @ 12.12 hrs HW=71.78' TW=70.34' (Dynamic Tailwater)
1=12" ADS (Outlet Controls 2.40 cfs @ 3.86 fps)

Summary for Pond CB2:

Inflow Area = 0.145 ac, 42.74% Impervious, Inflow Depth > 4.37" for 25-YEAR event
Inflow = 0.71 cfs @ 12.07 hrs, Volume= 0.053 af
Outflow = 0.71 cfs @ 12.07 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min
Primary = 0.71 cfs @ 12.07 hrs, Volume= 0.053 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 70.54' @ 12.10 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round 12" ADS** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 70.00' / 69.50' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.67 cfs @ 12.07 hrs HW=70.52' TW=70.30' (Dynamic Tailwater)
↑**1=12" ADS** (Outlet Controls 0.67 cfs @ 2.34 fps)

Summary for Pond CB3:

Inflow Area = 0.639 ac, 61.26% Impervious, Inflow Depth > 4.85" for 25-YEAR event
Inflow = 3.04 cfs @ 12.10 hrs, Volume= 0.258 af
Outflow = 3.04 cfs @ 12.10 hrs, Volume= 0.258 af, Atten= 0%, Lag= 0.0 min
Primary = 0.83 cfs @ 12.09 hrs, Volume= 0.202 af
Routed to Pond FB1 : Forebay
Secondary = 2.21 cfs @ 12.11 hrs, Volume= 0.056 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 70.34' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**6.0" Round 6" PVC** L= 66.0' Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.50' S= 0.0076 '/' Cc= 0.900 n= 0.010, Flow Area= 0.20 sf
#2	Secondary	69.50'	**12.0" Round 12" ADS** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 69.50' / 68.00' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.83 cfs @ 12.09 hrs HW=70.33' TW=69.06' (Dynamic Tailwater)
↑**1=6" PVC** (Outlet Controls 0.83 cfs @ 4.21 fps)

Secondary OutFlow Max=2.21 cfs @ 12.11 hrs HW=70.34' TW=66.83' (Dynamic Tailwater)
↑**2=12" ADS** (Inlet Controls 2.21 cfs @ 3.12 fps)

Summary for Pond D1:

Inflow Area = 1.625 ac, 39.78% Impervious, Inflow Depth > 4.17" for 25-YEAR event
Inflow = 7.35 cfs @ 12.09 hrs, Volume= 0.565 af
Outflow = 4.17 cfs @ 12.25 hrs, Volume= 0.518 af, Atten= 43%, Lag= 9.6 min
Discarded = 0.12 cfs @ 12.25 hrs, Volume= 0.105 af
Primary = 4.04 cfs @ 12.25 hrs, Volume= 0.412 af
Routed to Link 202 : To abutter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 67.00' @ 12.25 hrs Surf.Area= 5,256 sf Storage= 6,887 cf
Flood Elev= 68.00' Surf.Area= 6,066 sf Storage= 12,571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 37.8 min (826.5 - 788.7)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	12,571 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,055	0	0
66.00	3,247	2,651	2,651
67.00	5,263	4,255	6,906
68.00	6,066	5,665	12,571

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	65.80'	**Staged Concrete Weir, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 1.35 1.35 2.20
			Width (feet) 0.90 0.90 1.55 1.55 3.45 3.45

Discarded OutFlow Max=0.12 cfs @ 12.25 hrs HW=67.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.12 cfs)

Primary OutFlow Max=4.04 cfs @ 12.25 hrs HW=67.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Staged Concrete Weir** (Weir Controls 4.04 cfs @ 3.36 fps)

Summary for Pond FB1: Forebay

Inflow Area = 0.920 ac, 51.74% Impervious, Inflow Depth > 3.87" for 25-YEAR event
Inflow = 2.12 cfs @ 12.08 hrs, Volume= 0.297 af
Outflow = 1.73 cfs @ 12.15 hrs, Volume= 0.286 af, Atten= 18%, Lag= 4.2 min
Discarded = 0.03 cfs @ 12.15 hrs, Volume= 0.042 af
Primary = 1.70 cfs @ 12.15 hrs, Volume= 0.244 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 69.11' @ 12.15 hrs Surf.Area= 1,223 sf Storage= 1,100 cf
Flood Elev= 70.00' Surf.Area= 1,635 sf Storage= 2,372 cf

Plug-Flow detention time= 43.2 min calculated for 0.286 af (96% of inflow)
Center-of-Mass det. time= 20.8 min (803.1 - 782.3)

Volume	Invert	Avail.Storage	Storage Description
#1	68.00'	2,372 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.00	764	0	0
69.00	1,172	968	968
70.00	1,635	1,404	2,372

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	68.50'	**6.0" Round 6" PVC X 3.00** L= 60.0' Ke= 0.500
			Inlet / Outlet Invert= 68.50' / 68.00' S= 0.0083 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 12.15 hrs HW=69.11' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=1.70 cfs @ 12.15 hrs HW=69.11' TW=66.93' (Dynamic Tailwater)
↑—**2=6" PVC** (Inlet Controls 1.70 cfs @ 2.89 fps)

Summary for Link 202: To abutter

Inflow Area = 7.129 ac, 27.50% Impervious, Inflow Depth > 3.69" for 25-YEAR event
Inflow = 22.88 cfs @ 12.19 hrs, Volume= 2.192 af
Primary = 22.88 cfs @ 12.19 hrs, Volume= 2.192 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 201: To Valley

Runoff = 0.66 cfs @ 12.07 hrs, Volume= 0.049 af, Depth> 6.75"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	2,098	74	>75% Grass cover, Good, HSG C
*	94	98	Sidewalk
*	214	98	Driveway
	3,783	85	Weighted Average
	2,098	74	55.46% Pervious Area
	1,685	98	44.54% Impervious Area

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

Summary for Subcatchment 202A: Direct

Runoff = 30.04 cfs @ 12.18 hrs, Volume= 2.818 af, Depth> 6.14"
Routed to Link 202 : To abutter

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms** Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban** Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads** Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses** Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Subcatchment 202B: To Basin

Runoff = 5.55 cfs @ 12.07 hrs, Volume= 0.404 af, Depth> 6.89"
Routed to Pond D1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
*	5,210	98	Basin
*	16,123	85	Minigolf
*	927	98	Driveway
*	1,274	98	Sidewalk
	7,142	74	>75% Grass cover, Good, HSG C
	30,676	86	Weighted Average
	23,265	82	75.84% Pervious Area
	7,411	98	24.16% Impervious Area

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

Summary for Subcatchment 202C:

Runoff = 2.01 cfs @ 12.08 hrs, Volume= 0.149 af, Depth> 6.33"
Routed to Pond FB1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
*	1,635	98	Forebay
*	1,694	98	Driveway
*	368	98	Sidewalk
	8,566	74	>75% Grass cover, Good, HSG C
	12,263	81	Weighted Average
	8,566	74	69.85% Pervious Area
	3,697	98	30.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	75	0.0550	0.24		**Sheet Flow, Grasses**
					Grass: Short n= 0.150 P2= 3.30"
0.3	78	0.0550	4.76		**Shallow Concentrated Flow, Pavement**
					Paved Kv= 20.3 fps
5.4	153	Total			

Summary for Subcatchment 202D:

Runoff = 3.53 cfs @ 12.11 hrs, Volume= 0.304 af, Depth> 7.39"
Routed to Pond CB1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
*	12,654	98	Driveway
*	1,695	98	Sidewalk/Patio
	7,168	74	>75% Grass cover, Good, HSG C
	21,517	90	Weighted Average
	7,168	74	33.31% Pervious Area
	14,349	98	66.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0550	0.26		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.1000	5.09		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
1.8	236	0.0120	2.22		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
8.4	386	Total			

Summary for Subcatchment 202E:

Runoff = 1.09 cfs @ 12.07 hrs, Volume= 0.081 af, Depth> 6.70"
Routed to Pond CB2 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YEAR Rainfall=8.60"

	Area (sf)	CN	Description
*	600	98	Building
*	323	98	Sidewalk/Patio
*	1,775	98	Driveway
	3,614	74	>75% Grass cover, Good, HSG C
	6,312	84	Weighted Average
	3,614	74	57.26% Pervious Area
	2,698	98	42.74% Impervious Area

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

Summary for Pond CB1:

Inflow Area = 0.494 ac, 66.69% Impervious, Inflow Depth > 7.39" for 100-YEAR event
Inflow = 3.53 cfs @ 12.11 hrs, Volume= 0.304 af
Outflow = 3.53 cfs @ 12.11 hrs, Volume= 0.304 af, Atten= 0%, Lag= 0.0 min
Primary = 3.53 cfs @ 12.11 hrs, Volume= 0.304 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 73.28' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.80'	**12.0" Round 12" ADS** L= 227.0' Ke= 0.500 Inlet / Outlet Invert= 70.80' / 69.50' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=3.54 cfs @ 12.11 hrs HW=73.27' TW=70.88' (Dynamic Tailwater)
1=12" ADS (Outlet Controls 3.54 cfs @ 4.50 fps)

Summary for Pond CB2:

Inflow Area = 0.145 ac, 42.74% Impervious, Inflow Depth > 6.70" for 100-YEAR event
Inflow = 1.09 cfs @ 12.07 hrs, Volume= 0.081 af
Outflow = 1.09 cfs @ 12.07 hrs, Volume= 0.081 af, Atten= 0%, Lag= 0.0 min
Primary = 1.09 cfs @ 12.07 hrs, Volume= 0.081 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 70.98' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round 12" ADS** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 70.00' / 69.50' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.77 cfs @ 12.07 hrs HW=70.85' TW=70.78' (Dynamic Tailwater)
↑**1=12" ADS** (Outlet Controls 0.77 cfs @ 1.45 fps)

Summary for Pond CB3:

Inflow Area = 0.639 ac, 61.26% Impervious, Inflow Depth > 7.23" for 100-YEAR event
Inflow = 4.51 cfs @ 12.10 hrs, Volume= 0.385 af
Outflow = 4.51 cfs @ 12.10 hrs, Volume= 0.385 af, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.09 hrs, Volume= 0.279 af
Routed to Pond FB1 : Forebay
Secondary = 3.58 cfs @ 12.10 hrs, Volume= 0.106 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 70.89' @ 12.10 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**6.0" Round 6" PVC** L= 66.0' Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.50' S= 0.0076 '/' Cc= 0.900 n= 0.010, Flow Area= 0.20 sf
#2	Secondary	69.50'	**12.0" Round 12" ADS** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 69.50' / 68.00' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.93 cfs @ 12.09 hrs HW=70.88' TW=69.27' (Dynamic Tailwater)
↑**1=6" PVC** (Outlet Controls 0.93 cfs @ 4.75 fps)

Secondary OutFlow Max=3.57 cfs @ 12.10 hrs HW=70.89' TW=67.20' (Dynamic Tailwater)
↑**2=12" ADS** (Inlet Controls 3.57 cfs @ 4.55 fps)

Summary for Pond D1:

Inflow Area = 1.625 ac, 39.78% Impervious, Inflow Depth > 6.52" for 100-YEAR event
Inflow = 10.92 cfs @ 12.08 hrs, Volume= 0.882 af
Outflow = 7.18 cfs @ 12.20 hrs, Volume= 0.832 af, Atten= 34%, Lag= 7.1 min
Discarded = 0.13 cfs @ 12.20 hrs, Volume= 0.118 af
Primary = 7.05 cfs @ 12.20 hrs, Volume= 0.714 af
Routed to Link 202 : To abutter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 67.34' @ 12.20 hrs Surf.Area= 5,540 sf Storage= 8,769 cf
Flood Elev= 68.00' Surf.Area= 6,066 sf Storage= 12,571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 33.2 min (814.4 - 781.2)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	12,571 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,055	0	0
66.00	3,247	2,651	2,651
67.00	5,263	4,255	6,906
68.00	6,066	5,665	12,571

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	65.80'	**Staged Concrete Weir, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 1.35 1.35 2.20
			Width (feet) 0.90 0.90 1.55 1.55 3.45 3.45

Discarded OutFlow Max=0.13 cfs @ 12.20 hrs HW=67.34' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=7.05 cfs @ 12.20 hrs HW=67.34' TW=0.00' (Dynamic Tailwater)
2=Staged Concrete Weir (Weir Controls 7.05 cfs @ 3.33 fps)

Summary for Pond FB1: Forebay

Inflow Area = 0.920 ac, 51.74% Impervious, Inflow Depth > 5.57" for 100-YEAR event
Inflow = 2.95 cfs @ 12.08 hrs, Volume= 0.427 af
Outflow = 2.14 cfs @ 12.16 hrs, Volume= 0.416 af, Atten= 27%, Lag= 5.0 min
Discarded = 0.03 cfs @ 12.16 hrs, Volume= 0.044 af
Primary = 2.11 cfs @ 12.16 hrs, Volume= 0.371 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 69.36' @ 12.16 hrs Surf.Area= 1,337 sf Storage= 1,416 cf
Flood Elev= 70.00' Surf.Area= 1,635 sf Storage= 2,372 cf

Plug-Flow detention time= 35.4 min calculated for 0.416 af (97% of inflow)
Center-of-Mass det. time= 18.7 min (797.0 - 778.3)

Volume	Invert	Avail.Storage	Storage Description
#1	68.00'	2,372 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.00	764	0	0
69.00	1,172	968	968
70.00	1,635	1,404	2,372

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	68.50'	**6.0" Round 6" PVC X 3.00** L= 60.0' Ke= 0.500
			Inlet / Outlet Invert= 68.50' / 68.00' S= 0.0083 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.20 sf

Discarded OutFlow Max=0.03 cfs @ 12.16 hrs HW=69.36' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=2.11 cfs @ 12.16 hrs HW=69.36' TW=67.33' (Dynamic Tailwater)
2=6" PVC (Barrel Controls 2.11 cfs @ 3.58 fps)

Summary for Link 202: To abutter

Inflow Area = 7.129 ac, 27.50% Impervious, Inflow Depth > 5.95" for 100-YEAR event
Inflow = 37.04 cfs @ 12.18 hrs, Volume= 3.532 af
Primary = 37.04 cfs @ 12.18 hrs, Volume= 3.532 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

APPENDIX E SUPPLEMENTARY CALCULATIONS

Northeast Engineers & Consultants, Inc.

Minimum Standard 3: Water Quality

Project: 18225.2 Valley Road Mini Golf

Infiltration Basin D-1 Water Quality Volume Calculations:

Pavement =	0.396	ac		
Roof =	0.014	ac		
Offsite Impervious =	0.000	ac		
		ac		
Site Impervious Area:	0.410	ac		
Tot. Impervious Area:	0.410	ac	**WQ_R:**	**1,488 cf**

Total Volume below outlet per HydroCAD = 2,651 cf

Total Volume infiltrated in a WQ Storm = 2,657 cf
(1.2" Split Pervious Method)

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SW-1: Dry Swale

Project: 18225.2 Valley Road Mini Golf

Water Quality Volume Calculation (RIDEM Minimum Standard 3):

The dry swale provides water quality for upstream residential properties which have no existing water quality treatment. This device is included in the design to compensate for the increased pollutant loads generated by the site.

Length of Swale =	450	feet
Width of Swale =	3	feet
Area of Swale =	1,350	square feet

With this area, the WQ volume is calculated using the following equation:

$$WQ_V = A / [df / [(k) X (hf + df) X (tf)]]$$

Where,

A =	Area of swale	1,350	sf
d_f =	swale bed depth (ft)	1.5	ft
k =	Coefficient of permeability of filter media (ft/day)	1.0	ft/day
h_f =	Average height of water above surface of media	0.75	ft
t_f =	Design filter bed drain time	2	days

Therefore, the provided WQ volume is:

WQ_V = 4,050 cf

The upstream off-site residential catchment has an area of 3.458 acres of which approximately 38% is impervious. The water quality requirment is therefore:

Catchment =	3.458	acres
% impervious =	38%	
Impervious area =	57,240	sq. ft.
WQ_{REQ} =	**4,770**	**cf**

As the required WQ volume is less than the provided WQ volume, the treatment provided by the device reflected in the pollutant loading calculations is shown as a percentage of the treatment normally provided by the device.

Standard % removal of bacteria from a dry swale:	**70%**
% of required WQ provided by dry swale:	**85%**
Resulting % removal reflected in PLA:	**59%**

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Sedimentation Basin

Project: 18225.2 Valley Road Mini Golf

Sediment Volume Calculations:

$V = [(DA)(A)(DR)(TE)(2{,}000 \text{ lbs/ton})] / [(y)(43{,}560 \text{ sq. ft./ac})]$

where:

V =	volume of sediment trapped in ac. ft./yr			
DA =	drainage area in acres	=	**1.63**	ac
A =	the average annual erosion in tons per acre per year	=	**50.00**	ton/ac/yr
DR =	delivery ratio	=	**70.0%**	
TE =	trap efficiency	=	**80.0%**	
y =	estimated sediment density in lbs / cu. ft.	=	**75**	

V = 0.028 ac. ft. /yr

Sediment basin must accommodate at least one (1) year of predicted sediment load.

V (MIN) = 3,702 cu. ft.

V (PROVIDED) = 4,527 cu. ft.

Basin Dimensional Calculations:

$W_R = 10 (Qs)^{1/2}$

where:

W_R =	required width			
Qs =	peak discharge from a 5-year storm event	=	**4.58**	cfs

W_R = 21 ft

$W_{PROVIDED}$ = 30 ft

Effective length must be at least twice the width

L_R = 43 ft

$L_{PROVIDED}$ = 171 ft

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Minimum Standard 2: Groundwater Recharge

Project: 18225.2 Valley Road Mini Golf

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

Impervious Area*: 17,860 sf **F =** 0.25

$WRec_V$ = (Impervious Area) / 12 X F

$WRec_V$ = **372** cf

Volume of Infiltration for a WQ storm:** **2,657** **cf**

* Summarized from HydroCAD Report

** As shown in the HydroCAD analysis for the 1.2" WQ storm (24-hr)

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Pollutant Loading Analysis

The following method for Pollutant Loading Analysis (PLA) Calculations has been developed from the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM), Appendix H.3.

Stormwater pollutant export load (L, in pounds or billion colonies) from a developed site can be determined by solving the following equation.

(Eq 1) $L = [(P)(P_j)(R_V)/12](C)(A)(2.72)$

Where:

- P = rainfall depth in inches (from Figure H-8 from Appendix H.3 of the RISDISM)
- P_j = rainfall correction factor
- R_V = runoff coefficient expressing the fraction of rainfall converted to runoff
- C = flow weighted mean concentration of the pollutant in urban runoff (mg/L)
- A = contributing drainage area of development site (acres)

For bacteria, the conversion factor is modified, so the loadning equation is:

(Eq 1a) $L = 1.03(10^{-3})(P)(P_j)(R_V)](C')(A)$

Where:

- P = rainfall depth in inches (from Figure H-8 from Appendix H.3 of the RISDISM)
- P_j = rainfall correction factor
- R_V = runoff coefficient expressing the fraction of rainfall converted to runoff
- C' = flow weighted mean of bacteria concentration (#col/100 mL)
- A = contributing drainage area of development site (acres)

The runoff coefficient R_V can be determined from the following equation:

(Eq 2) $R_V = 0.05 + 0.009(\%I)$

Where:

- $\%I$ = percent of the site imperviousness

Site:	Valley Road Mini Golf	
Contributing Site Area (ac):	**7.216**	
Pollutant Assessed:	**Bacteria (fecal coliform)**	
Rainfall Depth (P):	**47**	(from Figure H-8 of the RISDISM)
Rainfall Correction Factor (P_j):	**0.9**	(use 0.9)
C or C' (as applicable):	**varies**	(from Table H-2 of the RISDISM)
Area of Existing Impervious (ac):	**1.346**	
Existing Percent Impervious:	**18.65%**	
Area of Proposed Impervious:	**2.266**	
Proposed Percent Impervious:	**31.41%**	

Existing Conditions (L) = **416** Billion Colonies/year

Proposed Conditions (L) = **187** Billion Colonies/year

Total Pollutant Load Attributed to Improvements = **-230** Billion Colonies/year

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Pollutant Loading Analysis (Bacteria)

Project: Valley Road Minigolf
Job Number: 18225.2
Date: 17-Mar-22

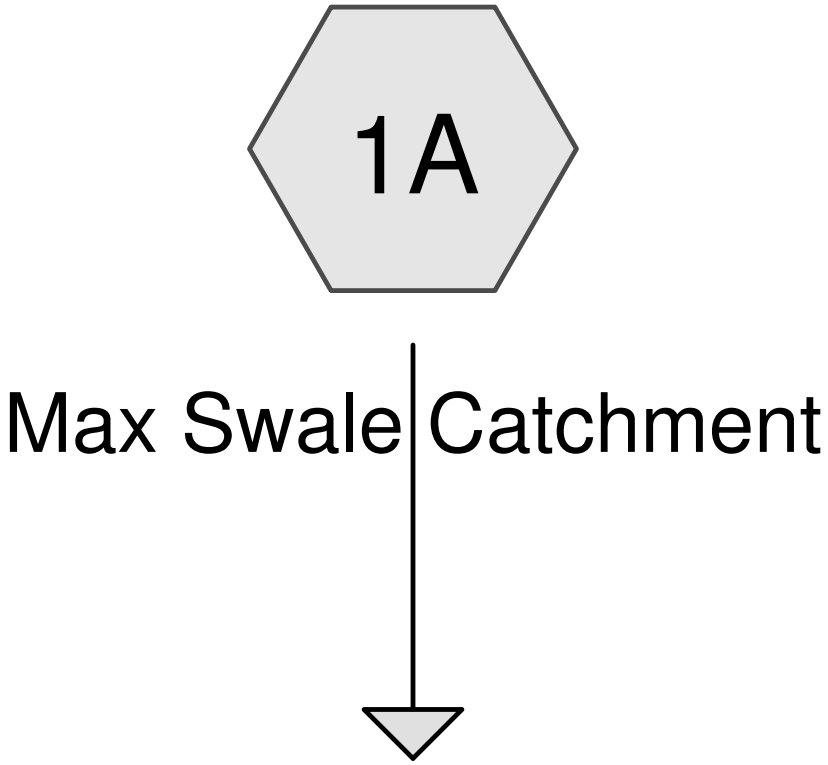
Rainfall Depth (P): 47 (from Figure H-8 of the RISDISM)
Rainfall Correction Factor (P_J): 0.9
Pollutant Load (L): $= 1.03(10^{-3})(P)(Pj)(RV)](C')(A)$

Existing Area Loading Calculations

	Area Description	A = Area (ac)	Impervious Area (ac)	Percent Impervious ($I_{\%}$)	$R_V = 0.05 + (0.009 \times I_{\%})$	$1.03 \times 10^{-3} \times P \times P_J =$	C = Loading Rate	L= Load (bc/y)	Treatment % from BMPs	FL = Final Load after Treatment (bc/y)
(1)	Onsite Area	3.758	0.032	0.9%	0.0577	0.0436	300	2.8	0%	2.8
(2)	Offsite Area	3.458	1.314	38.0%	0.3920	0.0436	7000	413.4	0%	413.4
(3)	**Totals:**	**7.216**	**1.346**					**416.2**		**416.2**

Proposed Loading Calculations

	Area Description	A = Area (ac)	Impervious Area (ac)	Percent Impervious ($I_{\%}$)	$R_V = 0.05 + (0.009 \times I_{\%})$	$1.03 \times 10^{-3} \times P \times P_J =$	C = Loading Rate	L= Load (bc/y)	Treatment % from BMPs	FL = Final Load after Treatment (bc/y)
(4)	To Infiltration	1.625	0.804	49.4%	0.4950	0.0436	4600	161.2	95%	8.1
(5)	To Dry Swale (offsite)	3.458	1.314	38.0%	0.3920	0.0436	7000	413.4	59%	169.5
(6)	To Dry Swale	2.047	0.110	5.4%	0.0982	0.0436	300	2.6	59%	1.1
(7)	Uncaptured	0.087	0.039	44.93%	0.4544	0.0436	4600	7.9	0%	7.9
(8)	**Totals:**	**7.216**	**2.266**					**585.2**		**186.5**



Subcat Reach Pond Link

Routing Diagram for 2022-03-18 18225
Prepared by Northeast Engineers & Consultants, Inc., Printed 3/19/2022

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.458	83	1/4 acre lots, 38% imp, HSG C (1A)
1.918	74	>75% Grass cover, Good, HSG C (1A)
0.129	85	Minigolf (1A)

Summary for Subcatchment 1A: Max Swale Catchment

Runoff = 13.83 cfs @ 12.18 hrs, Volume= 1.305 af, Depth> 2.85"
Routed to Reach SW1 : Swale

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YEAR Rainfall=4.90"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms** Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban** Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads** Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses** Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Reach SW1: Swale

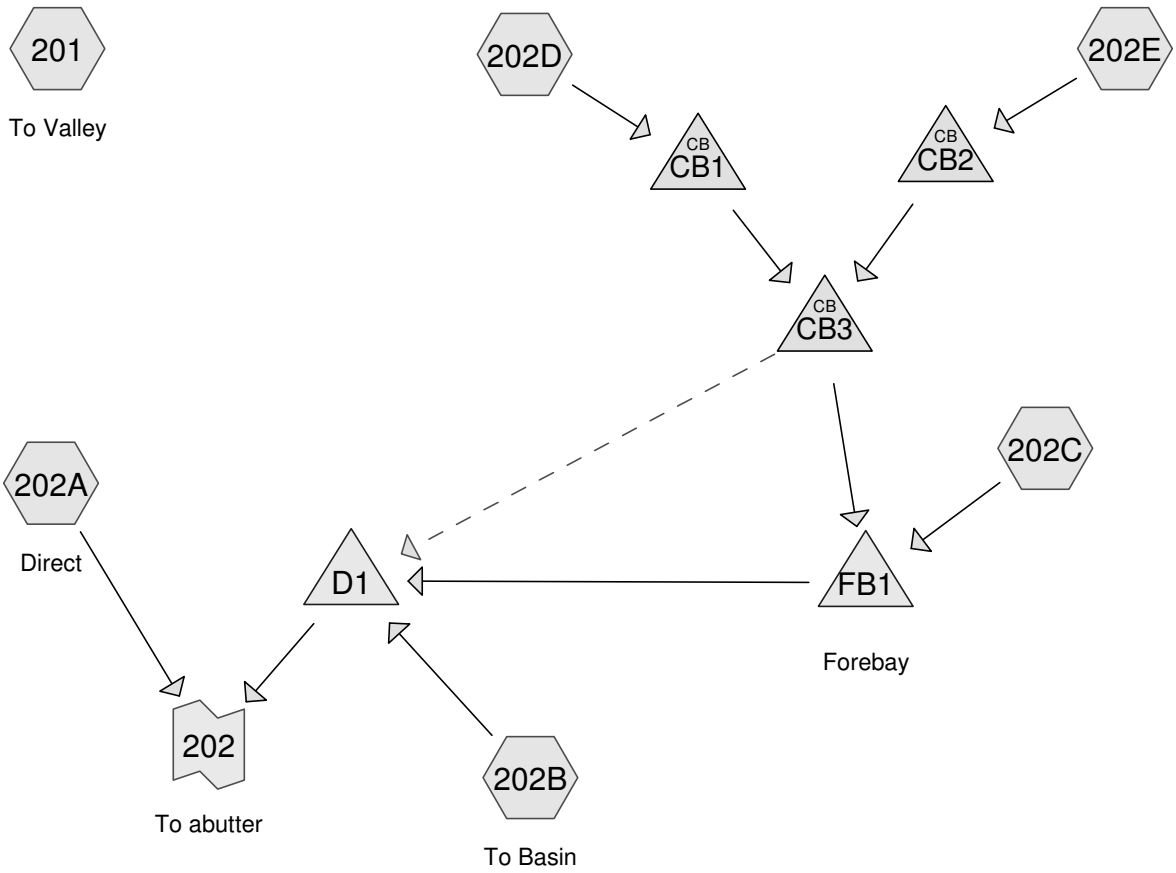
Inflow Area = 5.505 ac, 23.87% Impervious, Inflow Depth > 2.85" for 10-YEAR event
Inflow = 13.83 cfs @ 12.18 hrs, Volume= 1.305 af
Outflow = 12.68 cfs @ 12.24 hrs, Volume= 1.301 af, Atten= 8%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.52 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.51 fps, Avg. Travel Time= 14.6 min

Peak Storage= 3,757 cf @ 12.24 hrs
Average Depth at Peak Storage= 1.24' , Surface Width= 10.45'
Bank-Full Depth= 1.50' Flow Area= 11.3 sf, Capacity= 18.98 cfs

3.00' x 1.50' deep channel, n= 0.150 Sheet flow over Short Grass
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 450.0' Slope= 0.0333 '/'
Inlet Invert= 83.00', Outlet Invert= 68.00'

APPENDIX F WQ STORM ANALYSIS (SPLIT PERVIOUS METHOD)



Subcat Reach Pond Link

Routing Diagram for 2022-03-18 18225

Prepared by Northeast Engineers & Consultants, Inc., Printed 3/19/2022

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
3.458	83	1/4 acre lots, 38% imp, HSG C (202A)
2.574	74	>75% Grass cover, Good, HSG C (201, 202A, 202B, 202C, 202D, 202E)
0.120	98	Basin (202B)
0.014	98	Building (202E)
0.396	98	Driveway (201, 202B, 202C, 202D, 202E)
0.038	98	Forebay (202C)
0.499	85	Minigolf (202A, 202B)
0.040	98	Sidewalk (201, 202B, 202C)
0.046	98	Sidewalk/Patio (202D, 202E)
0.032	98	Valley Road Sidewalk (201)

Summary for Subcatchment 201: To Valley

Runoff = 0.04 cfs @ 12.07 hrs, Volume= 0.003 af, Depth> 0.47"

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Rainfall=1.20"

	Area (sf)	CN	Description
*	1,377	98	Valley Road Sidewalk
	2,098	74	>75% Grass cover, Good, HSG C
*	94	98	Sidewalk
*	214	98	Driveway
	3,783	85	Weighted Average
	2,098	74	55.46% Pervious Area
	1,685	98	44.54% Impervious Area

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

Summary for Subcatchment 202A: Direct

Runoff = 1.15 cfs @ 12.18 hrs, Volume= 0.129 af, Depth> 0.28"
Routed to Link 202 : To abutter

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Rainfall=1.20"

	Area (sf)	CN	Description
	150,639	83	1/4 acre lots, 38% imp, HSG C
	83,527	74	>75% Grass cover, Good, HSG C
*	5,625	85	Minigolf
	239,791	80	Weighted Average
	182,548	74	76.13% Pervious Area
	57,243	98	23.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	100	0.0300	0.20		**Sheet Flow, Lawms**
					Grass: Short n= 0.150 P2= 3.30"
0.5	97	0.0400	3.22		**Shallow Concentrated Flow, Lawns/Urban**
					Unpaved Kv= 16.1 fps
1.8	500	0.0500	4.54		**Shallow Concentrated Flow, Roads**
					Paved Kv= 20.3 fps
2.8	630	0.0539	3.74		**Shallow Concentrated Flow, Grasses**
					Unpaved Kv= 16.1 fps
13.3	1,327	Total			

Summary for Subcatchment 202B: To Basin

Runoff = 0.28 cfs @ 12.08 hrs, Volume= 0.023 af, Depth> 0.39"
Routed to Pond D1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Rainfall=1.20"

	Area (sf)	CN	Description
*	5,210	98	Basin
*	16,123	85	Minigolf
*	927	98	Driveway
*	1,274	98	Sidewalk
	7,142	74	>75% Grass cover, Good, HSG C
	30,676	86	Weighted Average
	23,265	82	75.84% Pervious Area
	7,411	98	24.16% Impervious Area

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

Summary for Subcatchment 202C:

Runoff = 0.09 cfs @ 12.08 hrs, Volume= 0.008 af, Depth> 0.34"
Routed to Pond FB1 : Forebay

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Rainfall=1.20"

	Area (sf)	CN	Description
*	1,635	98	Forebay
*	1,694	98	Driveway
*	368	98	Sidewalk
	8,566	74	>75% Grass cover, Good, HSG C
	12,263	81	Weighted Average
	8,566	74	69.85% Pervious Area
	3,697	98	30.15% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	75	0.0550	0.24		**Sheet Flow, Grasses** Grass: Short n= 0.150 P2= 3.30"
0.3	78	0.0550	4.76		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
5.4	153	Total			

Summary for Subcatchment 202D:

Runoff = 0.33 cfs @ 12.11 hrs, Volume= 0.028 af, Depth> 0.68"
Routed to Pond CB1 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Rainfall=1.20"

	Area (sf)	CN	Description
*	12,654	98	Driveway
*	1,695	98	Sidewalk/Patio
	7,168	74	>75% Grass cover, Good, HSG C
	21,517	90	Weighted Average
	7,168	74	33.31% Pervious Area
	14,349	98	66.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	100	0.0550	0.26		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.30"
0.2	50	0.1000	5.09		**Shallow Concentrated Flow, Grass** Unpaved Kv= 16.1 fps
1.8	236	0.0120	2.22		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
8.4	386	Total			

Summary for Subcatchment 202E:

Runoff = 0.07 cfs @ 12.07 hrs, Volume= 0.006 af, Depth> 0.46"
Routed to Pond CB2 :

Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr WQ Rainfall=1.20"

	Area (sf)	CN	Description
*	600	98	Building
*	323	98	Sidewalk/Patio
*	1,775	98	Driveway
	3,614	74	>75% Grass cover, Good, HSG C
	6,312	84	Weighted Average
	3,614	74	57.26% Pervious Area
	2,698	98	42.74% Impervious Area

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

Summary for Pond CB1:

Inflow Area = 0.494 ac, 66.69% Impervious, Inflow Depth > 0.68" for WQ event
Inflow = 0.33 cfs @ 12.11 hrs, Volume= 0.028 af
Outflow = 0.33 cfs @ 12.11 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.11 hrs, Volume= 0.028 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 71.11' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.80'	**12.0" Round 12" ADS** L= 227.0' Ke= 0.500 Inlet / Outlet Invert= 70.80' / 69.50' S= 0.0057 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.33 cfs @ 12.11 hrs HW=71.11' TW=69.42' (Dynamic Tailwater)
1=12" ADS (Barrel Controls 0.33 cfs @ 2.43 fps)

Summary for Pond CB2:

Inflow Area = 0.145 ac, 42.74% Impervious, Inflow Depth > 0.46" for WQ event
Inflow = 0.07 cfs @ 12.07 hrs, Volume= 0.006 af
Outflow = 0.07 cfs @ 12.07 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 12.07 hrs, Volume= 0.006 af
Routed to Pond CB3 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Peak Elev= 70.13' @ 12.07 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	70.00'	**12.0" Round 12" ADS** L= 35.0' Ke= 0.500 Inlet / Outlet Invert= 70.00' / 69.50' S= 0.0143 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.07 cfs @ 12.07 hrs HW=70.13' TW=69.40' (Dynamic Tailwater)
↑—**1=12" ADS** (Inlet Controls 0.07 cfs @ 1.21 fps)

Summary for Pond CB3:

Inflow Area = 0.639 ac, 61.26% Impervious, Inflow Depth > 0.63" for WQ event
Inflow = 0.40 cfs @ 12.11 hrs, Volume= 0.033 af
Outflow = 0.40 cfs @ 12.11 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Primary = 0.40 cfs @ 12.11 hrs, Volume= 0.033 af
Routed to Pond FB1 : Forebay
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 69.43' @ 12.11 hrs
Flood Elev= 74.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	69.00'	**6.0" Round 6" PVC** L= 66.0' Ke= 0.500 Inlet / Outlet Invert= 69.00' / 68.50' S= 0.0076 '/' Cc= 0.900 n= 0.010, Flow Area= 0.20 sf
#2	Secondary	69.50'	**12.0" Round 12" ADS** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 69.50' / 68.00' S= 0.0250 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf

Primary OutFlow Max=0.39 cfs @ 12.11 hrs HW=69.42' TW=68.48' (Dynamic Tailwater)
↑—**1=6" PVC** (Inlet Controls 0.39 cfs @ 2.22 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=69.00' TW=65.00' (Dynamic Tailwater)
↑—**2=12" ADS** (Controls 0.00 cfs)

Summary for Pond D1:

Inflow Area = 1.625 ac, 39.78% Impervious, Inflow Depth > 0.25" for WQ event
Inflow = 0.30 cfs @ 12.30 hrs, Volume= 0.033 af
Outflow = 0.06 cfs @ 13.30 hrs, Volume= 0.033 af, Atten= 82%, Lag= 59.6 min
Discarded = 0.06 cfs @ 13.30 hrs, Volume= 0.033 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 202 : To abutter

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 65.25' @ 13.30 hrs Surf.Area= 2,348 sf Storage= 541 cf
Flood Elev= 68.00' Surf.Area= 6,066 sf Storage= 12,571 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 83.2 min (893.0 - 809.8)

Volume	Invert	Avail.Storage	Storage Description
#1	65.00'	12,571 cf	**Detention Basin (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
65.00	2,055	0	0
66.00	3,247	2,651	2,651
67.00	5,263	4,255	6,906
68.00	6,066	5,665	12,571

Device	Routing	Invert	Outlet Devices
#1	Discarded	65.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	65.80'	**Staged Concrete Weir, Cv= 2.62 (C= 3.28)**
			Head (feet) 0.00 1.00 1.00 1.35 1.35 2.20
			Width (feet) 0.90 0.90 1.55 1.55 3.45 3.45

Discarded OutFlow Max=0.06 cfs @ 13.30 hrs HW=65.25' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=65.00' TW=0.00' (Dynamic Tailwater)
2=Staged Concrete Weir (Controls 0.00 cfs)

Summary for Pond FB1: Forebay

Inflow Area = 0.920 ac, 51.74% Impervious, Inflow Depth > 0.54" for WQ event
Inflow = 0.49 cfs @ 12.10 hrs, Volume= 0.041 af
Outflow = 0.20 cfs @ 12.35 hrs, Volume= 0.039 af, Atten= 58%, Lag= 15.0 min
Discarded = 0.02 cfs @ 12.35 hrs, Volume= 0.028 af
Primary = 0.18 cfs @ 12.35 hrs, Volume= 0.011 af
Routed to Pond D1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 68.64' @ 12.35 hrs Surf.Area= 1,027 sf Storage= 576 cf
Flood Elev= 70.00' Surf.Area= 1,635 sf Storage= 2,372 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 112.4 min (906.3 - 793.9)

Volume	Invert	Avail.Storage	Storage Description
#1	68.00'	2,372 cf	**Sediment Forebay (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
68.00	764	0	0
69.00	1,172	968	968
70.00	1,635	1,404	2,372

Device	Routing	Invert	Outlet Devices
#1	Discarded	68.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	68.50'	**6.0" Round 6" PVC X 3.00** L= 60.0' Ke= 0.500
			Inlet / Outlet Invert= 68.50' / 68.00' S= 0.0083 '/' Cc= 0.900
			n= 0.010, Flow Area= 0.20 sf

Discarded OutFlow Max=0.02 cfs @ 12.35 hrs HW=68.64' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.18 cfs @ 12.35 hrs HW=68.64' TW=65.14' (Dynamic Tailwater)
2=6" PVC (Inlet Controls 0.18 cfs @ 1.29 fps)

Summary for Link 202: To abutter

Inflow Area = 7.129 ac, 27.50% Impervious, Inflow Depth > 0.22" for WQ event
Inflow = 1.15 cfs @ 12.18 hrs, Volume= 0.129 af
Primary = 1.15 cfs @ 12.18 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

APPENDIX G 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 _____

Property Owner: REGAL LLC
Property Location: A.P. 107NE, Lots 402A, 402B, and 402C | Valley Road, Middletown, Rhode Island
Date of Test Hole: November 15, 2021
Soil Evaluator: Edward J. Avizinis, CPSS, PWS License Number: D4083
Weather: Partly Cloudy – 70° Shaded: Yes ☐ No ☒ Time: 1pm

TH 1 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
A	0 – 5	c	s	10YR 3/2	-	-	fSL	2 m gr	fr	4
Bw1	5 – 17	g	w	10YR 4/3	-	-	SL	1 m sbk	fr	3
Bw2	17 – 33	c	i	10YR 5/4	-	-	SL	1 m sbk	fr	3
2Cd	33 – 96	-	-	2.5Y 3/2	10YR 5/6	f 2 P	grSL	0 m	vfr	8

TH 2 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
A	0 – 4	c	s	10YR 3/2	-	-	fSL	2 m gr	fr	4
Bw1	4 – 28	c	w	10YR 4/3	-	-	fSL	1 m sbk	fr	4
Bw2	28 – 60	g	w	10YR 5/4	-	-	vfSL	1 m sbk	fr	5
2Cd	60 – 96	-	-	2.5Y 3/2	-	-	gSL	0 m	vfr	8

TH 1 Soil Class A Total Depth 96 Impervious/Limiting Layer Depth >96 (og) GW Seepage Depth >96 SHWT 60" (og)

TH 2 Soil Class A Total Depth 96 Impervious/Limiting Layer Depth >96 (og) GW Seepage Depth >96 SHWT 60" (og)

Comments:

Revised 11/25/18

Part B

Key:
- Approximate location of test holes
- Approximate location of bedrock test holes
- Estimated gradient and direction of slope
- Approximate direction of due north

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer

Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*
   *OFFSETS MUST BE SHOWN

Bedrock THs	
TH	Depth

1. Relief and Slope: 3 – 5%
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO ☐ YES ☐
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO ☐ YES ☐
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO ☐ YES ☐
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO ☐ YES ☐
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO ☐ YES ☐
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO ☐ YES ☐
8. Site's potential for flooding or ponding: NONE ☐ SLIGHT ☐ MODERATE ☐ SEVERE ☐
9. Landscape position: Footslope
10. Vegetation:
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site:

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: _____ Part B prepared by: _____

Signature Edward J. Avizinis, CPSS, PWS | President License #D4083

Signature Edward J. Avizinis, CPSS, PWS | President License # D4083

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur ☐ Inconclusive ☐ Disclaim ☐

Unwitnessed Soil Evaluations Decision: Accept ☐ Inconclusive ☐ Disclaim ☐

Wet Season Determination required ☐ Additional Field Review Required ☐

Explanation: _____

_____

_____

_____ _____

Signature Authorized Agent Date

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 _____

Property Owner: REGAL LLC
Property Location: A.P. 107NE, Lots 402A, 402B, and 402C | Valley Road, Middletown, Rhode Island
Date of Test Hole: November 15, 2021
Soil Evaluator: Edward J. Avizinis, CPSS, PWS License Number: D4083
Weather: Partly Cloudy – 70° Shaded: Yes ☐ No ☒ Time: 2pm

TH 3 Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
A	0 – 4	c	s	10YR 3/2	-	-	SL	2 m gr	fr	3
Bw1	4 – 13	c	w	10YR 3/3	-	-	fSL	1 m sbk	fr	4
Bw2	13 – 39	c	w	10YR 5/4	-	-	vfSL	1 m sbk	fr	5
2Cd	39 – 96	-	-	2.5Y 3/2	-	-	vgSL	0 m	vfr	8

TH Horizon	Depth	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				

TH 1 Soil Class A Total Depth 96" Impervious/Limiting Layer Depth >96" (og) GW Seepage Depth >96" SHWT 40" (og)

TH _____ Soil Class _____ Total Depth _____ Impervious/Limiting Layer Depth _____ (og) GW Seepage Depth _____ SHWT _____ (og)

Comments: _____

Revised 11/25/18

Part B

Site Evaluation – to be completed by Soil Evaluator or Class II or III Designer

Please use the area below to locate:

1. Test holes and bedrock test holes,
2. Approximate direction of due north,
3. Offsets from all test holes to fixed points such as street, utility pole, or other permanent, marked object.*
   *OFFSETS MUST BE SHOWN

Key:
- Approximate location of test holes
- Approximate location of bedrock test holes
- Estimated gradient and direction of slope
- Approximate direction of due north

Bedrock THs	
TH	Depth

1. Relief and Slope: 5 – 8%
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO ☐ YES ☐
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO ☐ YES ☐
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO ☐ YES ☐
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO ☐ YES ☐
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO ☐ YES ☐
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO ☐ YES ☐
8. Site's potential for flooding or ponding: NONE ☐ SLIGHT ☐ MODERATE ☐ SEVERE ☐
9. Landscape position: Backslope
10. Vegetation:
11. Indicate approximate location of property lines and roadways.
12. Additional comments, site constraints or additional information regarding site:

Certification

The undersigned hereby certifies that all information on this application and accompanying forms, submittals and sketches are true and accurate and that I have been authorized by the owner(s) to conduct these necessary field investigations and submit this request.

Part A prepared by: _____ Part B prepared by: _____

Signature Edward J. Avizinis, CPSS, PWS | President License #D4083

Signature Edward J. Avizinis, CPSS, PWS | President License # D4083

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur ☐ Inconclusive ☐ Disclaim ☐

Unwitnessed Soil Evaluations Decision: Accept ☐ Inconclusive ☐ Disclaim ☐

Wet Season Determination required ☐ Additional Field Review Required ☐

Explanation: _____

Signature Authorized Agent _____ Date _____

APPENDIX H RISDISM STORMWATER CHECKLIST (APPENDIX A)

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

PROJECT NAME Valley Road Mini Golf	(RIDEM USE ONLY)
TOWN Middletown	STW/WQC File #:
BRIEF PROJECT DESCRIPTION: **Construction of a miniature golf course with restroom facilities, utilities, and stormwater controls on a vacant lot of record.**	Date Received:

Stormwater Management Plan (SMP) Elements – Minimum Standards

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.

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

☐ Residential	☒ Commercial	☐ Federal	☐ Retrofit	☐ Restoration
☐ Road	☐ Utility	☐ Fill	☐ Dredge	☐ Mine
☐ Other (specify):				

SITE INFORMATION

☒ Vicinity Map

INITIAL DISCHARGE LOCATION(S): The WQv discharges to:

☒ **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):

☒ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Bailey's Brook	☐ Coldwater	☒ Warmwater	☐ Unassessed
☒ Waterbody ID: RI0007035R-01	☐ 4th order stream of pond 50 acres or more		
☒ TMDL for: Enterococcus	☐ 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, phosphorus, Lead	☐ Contributes to shell fishing grounds		

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 WASTE MANAGEMENT (OWM)			
	☐ 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 OWM 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**)	
	☐ Total Site Area (**TSA**)	
	☐ Jurisdictional Wetlands (**JW**)	
	☐ Conservation Land (**CL**)	
☐ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☐ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) 9.2 acres	
	☐ (**TIA**) / (**SS**) = 0.1%	☒ **(TIA) / (SS) >0.4? No**
☐ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS ☒ 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	No sensitive resource areas are located on site. There are no environmental restraints.
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):**	No QPAs are located on site. Development restricted to deeper water table areas. No wetlands or waterbodies located on site.
C) MINIMIZE CLEARING AND GRADING ☒ Site clearing has been restricted to <u>minimum area needed</u> for building footprints, development activities, construction access, and safety. ☒ Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities) ☐ Protection for stands of trees and individual trees and their root zones to be preserved has been specified, and such protection extends at least to the tree canopy drip line(s) ☐ Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent	There are minimal trees located in the area of development along Valley Road. These trees are to be removed.
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):	Proposed drive is minimum width allowed by the fire department. Building footprint shown is the realistic minimum for two restroom facilities.

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):	No QPAs possible.
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	50% of lot to remain undisturbed vegetation.
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	N/A

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 Office of Waste Management Site Project Manager, per Part 1, Minimum Standard 8, been requested?

TABLE 2-1: Summary of Recharge (see RISDISM Section 3.3.2)

Design Point	**Impervious Area Treated (acres)**	**Total Re_v Required (cu ft)**	**LID Stormwater Credits (see RISDISM Section 4.6.1)** **Portion of Re_v directed to a QPA (cu ft)**	**Recharge Required by Remaining BMPs (cu ft)**	**Recharge Provided by BMPs (cu ft)**
Abutting private prop.	0.410	372	0	372	2,657
TOTALS:					

☒ 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, Appendix E

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. **BMPs have been designed in accordance with the manual. WQ provided exceeds that which is required. Downstream water body is impaired for bacteria per TMDL.**
☒	☐	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: Treatment provided for off-site impervious surfaces to compensate for pollutants generated by the development.

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

Catchment and WB ID	Impervious area treated (acres)	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)
On Site to Abutter RI0007035R-01	0.410	1,488	0	1,488	2,657
Off Site to Abutter RI0007035R-01	1.314	4,770	0	4,770	4,050

☒ 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 Narrative: Appendix E

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 directs 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:	

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):
Zero increase in volume runoff requirement has been met.			
		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) 1.83 **acres**
		☒	Impervious cover (%) 22**%**
☐	☒	Is a dam breach analysis required (earthen embankments over six (6) feet in height, or a capacity of 15 acre-feet or more, and contributes to a significant or high hazard dam)?	
☒	☐	Does this project meet the overbank flood protection standard?	

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
Valley Road	0.03	0.04	0.19	0.15	0.50	0.32	1.10	0.66
Abutter	1.15	1,15	6.63	5.71	17.18	16.40	38.10	37.04
TOTALS:								

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

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

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
1	2	Infiltration Basin	Y	2,657	2,657	n/a	Y	E	Y	n/a	n/a
1	2	Dry Swale	Y	0	4,050	n/a	n/a	n/a	Y	n/a	n/a
		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					
Abutter	1	Infiltration Basin	TH#2	TH#1	varies	65.0	3	C	1.02 (per soil eval)
Abutter	2	Dry Swale	TH#3		Varies	Varies	3	C	none
		TOTALS:							

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?
☐	☒	☐	Have any been found and/or corrected? If "Yes," please identify.
☒	☐	☐	Does your report explain preventative measures that keep non-stormwater discharges out of the Waters of the State (during and after construction)?

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

STORMWATER MANAGEMENT SYSTEM OPERATION, MAINTENANCE, AND POLLUTION PREVENTION PLAN – MINIMUM STANDARDS 7 AND 9		
Operation and Maintenance Section		
YES	**NO**	
☒	☐	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
☒	☐	Have you provided a **separately-bound** Operation and Maintenance Plan for the site and for all of the BMPs, and does it address each element of RICR 8.17 and RISDISM Appendix C and E?
☒	☐	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If "No," why not?
☒	☐	Is the **property owner** or homeowner's association responsible for the stormwater maintenance of all BMP's? If "No," you must provide a legally binding and enforceable maintenance agreement (see RISDISM Appendix E, page 26) that identifies the entity that will be responsible for maintenance of the stormwater. Indicate where this agreement can be found in your report (i.e., name of report/document, page numbers, appendices, etc.).
☐	☒	Do you anticipate that you will need legal agreements related to the stormwater structures? (e.g. off-site easements, deed restrictions, covenants, or ELUR per the Remediation Regulations). If "Yes," have you obtained them? Or please explain your plan to obtain them: Homeowner maintenance agreement

		will be required. Will be established as part of town permitting and recorded as required by town.
☐	☒	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). **No pets are expected at this establishment.**
☒	☐	Regular sweeping? Please describe:
☐	☒	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☒	☐	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

Existing and Proposed Subwatershed Mapping (REQUIRED)			
YES	**NO**		
☒	☐		Existing and proposed drainage area delineations
☒	☐		Locations of all streams and drainage swales
☒	☐		Drainage flow paths, mapped according to the DEM *Guidance for Preparation of Drainage Area Maps* (included in RISDISM Appendix K)
☒	☐		Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
☒	☐		Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
☒	☐		Mapped seasonal high-water-table test pit locations
☒	☐		Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
☒	☐		Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
☐	☒		Mapped bedrock outcrops adjacent to any infiltration BMP
☒	☐		Soils were logged by a:
		☒	DEM-licensed Class IV soil evaluator Name: Edward J. Avizinis, CPSS, PWS
		☐	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)**
Abutter	RI0007035R-01	1.83	0	0.410
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 OWM-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