DRAINAGE NARRATIVE AND ASSESSMENT
FOR
TOWER HILL LANDINGS ANNEX
2095 KINGSTOWN ROAD (ROUTE 108)
PLAT 32-4, LOT 32
SOUTH KINGSTOWN, RHODE ISLAND

AUGUST 2020

Prepared by: Crossman Engineering
Engineers & Surveyors
151 Centerville Road
Warwick, RI 02886

&

103 Commonwealth Ave
North Attleboro, MA 02763

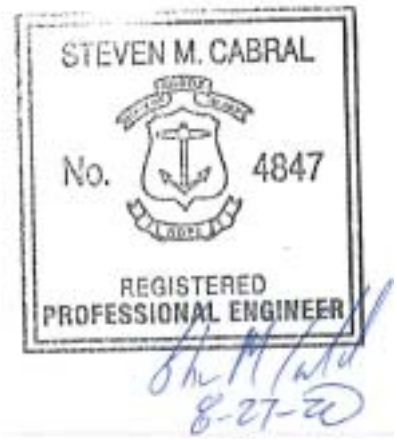


TABLE OF CONTENTS

Section 1: Project Description

This Drainage Narrative and Assessment has been prepared for the Proposed Tower Hill Landings Annex buildings at 2095 Kingstown Road (Route 108) in South Kingstown, Rhode Island. The site is located on Assessor's Plat Map 32-4, Lot 32 and falls within the Town's Commercial Neighborhood Zone (CN), Medium High-Density Residential Zone (R10), and Kingstown Road Special Management District. The property is approximately 1.22 acres in size and categorized as a Redevelopment Project. The site currently consists of bituminous and gravel parking areas with perimeter lawn areas and overgrown vegetation. In 2015 the site was designed for the construction of a new restaurant establishment, Dan's Place, but those plans never came to fruition after Environmental and Town Planning permitting phases. In June 2016 the site was issued an Insignificant Alteration (Preliminary Determination) Permit under Wetlands Application File No. 16-0120 and RIPDES No. RIR101307.

All three buildings previously on the property (the former Cucina Twist Restaurant building and two single family houses) have been demolished, and the property has remained vacant. The adjacent residential apartment facility, Tower Hill Landings, has purchased the property with the intent to expand the apartment complex onto Lot 32 pending Local and State permitting. The proposed improvements for the apartment complex expansion include two (2) new two-story apartment buildings with a total of two (2) two-bedroom units and 9 (9) four-bedrooms units. The project will remove the driveway connection to Kingstown Road and access to the new apartments shall extend off the existing apartment parking lot to the South of Lot 28. The Town expressed interest in having a porous/permeable parking area for recharge benefits, therefore, the new parking area is proposed to be a porous asphalt pavement structure. In determining the water quality, recharge, and peak flow attenuation requirements, the calculations assume the entire parking area (including porous pavement) is impervious (CN=98) for conservative measures.

A freshwater wetland and intermittent stream are present on along the site's northeastern corner. The regulated 50' Perimeter Wetland and 100' riverbank wetland extends into the project area, and proposed disturbances within these areas have been minimized to the greatest extent practicable. An ASSF (area subject to stormwater flowage) is also present along the site's eastern border, which receives runoff from the subject parcel and existing apartment complex prior to discharging flowage into the wetland area. The ASSF shall remain undisturbed and the watershed area draining to it shall be substantially decreased. The majority of the site's catchment area ultimately drains to the wetlands, with the exception of a small portion of the site's frontage which drains to the Kingstown Road closed drainage system.

In addition to the new building, sidewalks, and porous pavement, the project scope includes a new closed drainage system, underground utilities, and landscaping. Stormwater runoff generated on site will be directed to a new underground detention system and/or sand filter prior to discharging into the downstream wetland area. The proposed limit of disturbance is approximately 63,750 square feet (1.46 acres), which includes disturbed areas on the abutting parking lot for the parking lot connection construction. Within the limits of disturbance, there is 32,264 square feet (0.74 acres) of impervious area, including recently demolished building roofs, which yields an existing impervious percentage of 50.6%. If the demolished rooftop areas are excluded from the calculation (6,392 sf), then the existing impervious percentage drops to 40.6%, which is still above the 40%

threshold for a Redevelopment project. The proposed drainage systems have been designed to meet all requirements applicable for a redevelopment project in the Rhode Island Stormwater Design and Installation Standards Manual and South Kingstown Zoning Ordinance. Refer to Figure 1 for the site locus and Figure 2 for the plat map.

Figure 1 – Project Area

Figure 2 – Property Map

Section 2: Stormwater Management Standards

This section discusses the Stormwater Management Standards and in accordance with the Rhode Island Stormwater Design and Installation Standards Manual (RISDISM), amended March 2015, and Chapter 20 – Stormwater Management of the South Kingstown Zoning Ordinance as applicable to the project.

Minimum Standard 2: Groundwater Recharge

The proposed project has been designed to meet the groundwater recharge criteria with the use of a sand filter. The proposed improvements are classified as a Redevelopment; therefore, the required groundwater recharge volume is determined using the redevelopment calculation for Required Stormwater Treatment Area (refer to Minimum Standard 6: Redevelopment and Infill Projects section). The majority of the proposed parking lot shall be porous pavement to improve groundwater recharge capabilities when compared to traditional pavement. The proposed sand filter and underground detention system have been designed and sized to exceed the minimum Required Recharge Volume even when including the proposed porous pavement area as impervious in the required recharge calculation. The supporting calculations are provided below.

Required Recharge Volume (RV_R)**:**

$RV_R = 1" \times F \times I / 12$

Where: RV_R = Required Recharge Volume

F = Recharge Factor (Rhode Island Stormwater Design and Installation Standards Manual) Note: The existing soils within the site are identified as Udorthents-Urban land complex (UD), and Narragansett silt loam, 3-8% slopes (NaB). The Hydrologic soil series associated with NaB is HSG-B, but UD does not have a designated HSG group. The Hydrologic Soil Group B will be used site-wide to determine the post-development recharge volume (F= 0.35).

I = Design Impervious = 16,830 sf
(refer to Minimum Standard 6: Redevelopment and Infill Projects section)

= 1" x (1'/12") x (0.35 x 16,830 sf)

= **491 cf**

Provided Recharge Volume (RV_P):

RV_P is the provided recharge volume and represents the storage volume within the sand filter and underground detention system below the sand filter weir elevation of 134.63. Refer to the Stage-Area-Storage table for the sand filter, Node SF, and the underground detention system, Node UDS, in Stormwater Runoff Calculations in Appendix C.

$\mathbf{RV_P}$ = 471 cf (sand filter) + 955 cf (underground detention system)
= **1,426 cf**

Drawdown Time:

Water within the proposed drainage facilities will infiltrate (drawdown) into the soils below the infiltration systems. Soil evaluations have been conducted on-site to determine the appropriate infiltration design rates based upon the soil textures. The restrictive subsoils on site have been identified as silt and assigned a design infiltration rate of 0.27 in/hr. Section 5.3.2 of the RISDISM requires infiltration systems to fully de-water the entire water quality volume within 48 hours after the storm event. Drawdown calculations are provided below to demonstrate that the proposed infiltration facilities are emptied within 72 hours from the start of the 24-hour storm event (24 hr storm event + 48 hrs = 72 hours total drawdown time maximum).

$T_D = Pv/(K \times A)$

Where: T_D = Drawdown Time Pv = Provided Recharge Volume
K = in/hr A = Surface Area at WQ elevation

T_D = (1,426 cf)/[(0.27 in/hr) (1'/12") (939 sf)]
= 67.5 hours

Minimum Standard 3: Water Quality Improvements

The project has been designed to meet the water quality requirements with the use of a Stormceptor, Sand Filter, Underground Detention System, and Porous Pavement. The stormwater management system has been designed to demonstrate the water quality standards are satisfied without consideration of the porous pavement in an effort to conservatively demonstrate compliance with the Minimum Standards. Stormwater runoff generated on site that enters the proposed catchbasins, drain manholes, and drain pipe shall first be directed to the underground detention system for attenuation prior to entering the sand filter basin. The bottom of the underground detention system is set below the overflow weir outlet of the sand filter, thus allowing some credit towards the provided water quality volume below the outlet. Surface runoff directed to the underground detention system shall first pass through a Stormceptor for pretreatment, while roof runoff from the new buildings shall enter the system without pretreatment. The lower parking lot area will enter the proposed sediment forebay for pretreatment prior to entering the sand filter for recharge and water quality. Provided below and on the following page are the water quality design calculations:

Required Water Quality Volume (WQV_R)**:**

$WQV_R = 1" \times I / 12$

Where: WQV_R = Required Water Quality Volume

I = Design Impervious = 16,830 sf
(refer to Minimum Standard 6: Redevelopment and Infill Projects section)

$\mathbf{WQV_R}$ = 1" x (1'/12") x (16,830 sf)
= **1,403 cf**

Provided Water Quality Volume (WQV_P):

$\mathbf{WQV_P}$ is the provided recharge volume and represents the storage volume within the sand filter and underground detention system below the sand filter weir elevation of 134.63. Refer to the Stage-Area-Storage table for the sand filter, Node SF, and the underground detention system, Node UDS, in Stormwater Runoff Calculations in Appendix C.

$\mathbf{WQV_P}$ = 471 cf (sand filter) + 955 cf (underground detention system)
= **1,426 cf**

Pretreatment

All ground surface runoff directed to the proposed underground detention system shall first flow through DMH5, Stormceptor model STC-900 for pretreatment. The associated peak flow rate during the water quality storm event which the Stormceptor shall receive computes to 0.46 cfs. The maximum Stormceptor water quality flow rates from Table 1 indicates the model STC-900 is sized for the proposed treatment flow rate requirements. Refer to Appendix C for details.

Table 1 – Stormceptor Design Data

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Max. Sediment Capacity ft³ (L)	Water Quality Flow (cfs)	* Approx. Impervious Area (Ac)
STC 450i	470 (1,780)	86 (330)	46 (1,302)	0.283	0.38
STC 900	952 (3,600)	251 (950)	89 (2,520)	0.636	0.85
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)	0.636	0.85
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)	0.636	0.85
EOS 12-590	1,833 (6,940)	590 (2,233)	166 (4,707)	0.636	0.85
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)	1.059	1.42
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)	1.059	1.42
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)	1.766	2.38
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)	1.766	2.38
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)	2.472	3.33
STC 11000	11,194 (42,370)	2,797 (10,590)	1,086 (30,752)	3.531	4.75
STC 13000	13,348 (50,530)	2,797 (10,590)	1,374 (38,907)	3.531	4.75
STC 16000	15,918 (60,260)	3,055 (11,560)	1,677 (47,487)	4.944	6.66

* Impervious areas are approximate only. Actual areas will vary based on site-specific conditions

Minimum Standard 4: Conveyance and Natural Channel Protection

The channel protection volume (CPv) is the 24-hour extended detention of the post-development runoff volume from the 1 year, 24 hour, Type III storm event. As a redevelopment project, the proposed stormwater management systems only have to address Standards 2, 3, and 7-11. Due to the shallow groundwater table and other physical site constraints the proposed drainage system cannot satisfy Minimum Standard 4 and is an allowable practice for redevelopment projects such as this (RISDISM, Section 3.2.6).

Minimum Standard 5: Overbank Flood Protection

This section provides an assessment of the existing and proposed condition peak flow rates for the 1-, 2-, 10-, 25- and 100- year storm events from the project area. The purpose of this criterion is to protect downstream structures from increased runoff flows and velocities from upstream development. The proposed drainage improvements have been designed to reduce peak flow rates leaving the site for all design storm events up to the 100-year storm event.

Hydrograph Methodology:

Hydrographs have been analyzed to compare runoff for Pre- and Post-Development conditions. The hydrographs were computed utilizing "HydroCAD" Version 10.0 software. Generally, the methodology encompasses the Soil Conservation Service's unit hydrograph method used in TR-20 which provided a basis for TR-55. The hydrologic data is the same information required for TR-55 and includes watershed areas, SCS runoff curve numbers, and the travel length from the most remote watershed point. With this data, complete SCS hydrographs can be developed for a 24 hour Type III storm. The watershed time of concentration is computed internally using the velocity method shown in SCS/NCRS Methodologies. The velocity method assumes that time of concentration is the sum of travel times for segments along the hydraulically most distant flow path. The hydraulically most distant point is the point with the longest time to the watershed outlet and not necessarily the point with the longest flow distance to the outlet.

Outlet structures will be designed by modeling stage/storage/discharge relationships within the "HydroCAD" program. The input data required is:

Discharge

Orifice: Outlet Diameter
Pipe: Outlet Diameter
Manning's N-Value
Invert
Length
Slope

Weir: Crest Length
Crest Elevation
Weir Coefficient

Stage/Storage

Surface area at various stage elevations.

The "HydroCAD" program automatically routes hydrographs through infiltration and detention facilities to determine the resulting outflow and also can combine hydrographs to determine cumulative subwatershed flows.

Analysis Summary:

The Existing Conditions (Pre-Development) and Post-Development analyses of the project area were assigned two design points: the rear wetland area and Kingstown Road. Pre- vs. Post-Development peak flow comparisons were conducted to each design point to demonstrate a decrease in peak flow rates leaving the site. The subwatersheds of the pre- and post-development analysis are described below:

Pre-Development

- Watershed EX-A1 (Node EA1): Catchment area, within and upstream of the limits of disturbance, which drain directly to the rear wetland area.
- Watershed EX-A2 (Node EA2): Catchment area, within and upstream of the limits of disturbance, which drain to a depression area for ponding prior to flowing towards the rear wetland area.
- Reach EX-A (Node EA): The total pre-development runoff draining from and through the site to the rear wetland area.
- Watershed EX-B1 (Node EB1): Catchment area along the frontage of the subject property (Lot 32) which drains to Kingstown Road
- Watershed EX-B2 (Node EB2): Catchment area along the frontage of the neighboring property (Lot 28) which drains to Kingstown Road
- Reach EX-B (Node EB): The total pre-development runoff draining to Kingstown Road

Post-Development

- Watershed PR-A1 (Node PA1): Catchment area along the site's frontage captured by CBs 1 & 2, which drain directly to DMH1
- Watershed PR-A2 (Node PA2): Catchment area which drains to the grass depression area for limited attenuation prior to entering DMH2
- Watershed PR-A3 (Node PA3): Catchment area which drains to CB3 (no attenuation) prior to entering DMH2
- Watershed PR-A4 (Node PA4): Parking lot catchment area which drains to CB4
- Watershed PR-A5 (Node PA5): Parking lot catchment area which drains to CB5
- Watershed PR-A6 (Node PA6): New roof catchment area which drains to DMH6
- Watershed PR-A7 (Node PA7): Parking lot catchment area which drains to CB6
- Watershed PR-A8 (Node PA8): Catchment area which flows directly to the sand filter
- Watershed PR-A9a (Node PA9a): Northerly perimeter catchment area which flows directly to the wetland area
- Watershed PR-A9b (Node PA9b): Southerly perimeter catchment area which flows directly to the ASSF prior to the wetland area
- Watershed PR-B (Node PB): The total post-development runoff draining to Kingstown Road

Table 2 summarizes the pre- vs. post-development peak flow rates for the 1-year, 2- year 10-year, 25-year, and 100-year frequency storm events.

Table 2 – Peak Flow Comparison (cfs)

Rear Wetlands	1 Yr.	2 Yr.	10 Yr.	25 Yr.	100 Yr.
Pre-Development *(Node EA)*	2.19	2.83	4.93	6.53	9.70
Post-Development *(Node PA)*	2.13	2.70	4.62	6.26	9.60
Change	-0.06	-0.13	-0.31	-0.27	-0.10

Kingstown Road	1 Yr.	2 Yr.	10 Yr.	25 Yr.	100 Yr.
Pre-Development *(Node EB)*	0.05	0.09	0.26	0.42	0.74
Post-Development *(Node PB)*	0.04	0.08	0.24	0.38	0.70
Change	-0.01	-0.01	-0.02	-0.04	-0.04

The calculations for the 1-year, 2- year,10-year, 25-year, and 100-year frequency storm events are provided in Stormwater Runoff Calculations in Appendix C. The water quality flow storm event (1.2") is included to demonstrate the proposed sand filter treats and infiltrates 100% of the computed water quality flow. Note: The porous pavement has been assigned a Curve Number of 98 for all design storm event analyses to provide a conservative post-development peak flow rate of runoff leaving the site during larger magnitude storms.

Typically, a groundwater mounding analysis is included for infiltration facilities with less than 4 ft of separation from the bottom of the BMP to the seasonal high ground water table. The bottom of the sand filter media is proposed to match the estimated seasonal high groundwater table therefore a mounding analysis would be warranted. However, during the 100-year storm event the peak exfiltration rate only reaches 0.01 cfs, which is less than the 0.10 cfs decrease in peak runoff rates leaving the site during the 100-year storm event. In the event the sand filter could not infiltrate runoff due to a ground water mound, the resulting peak flow rates leaving the site during post-development conditions would still be less than pre-development conditions.

Minimum Standard 6: Redevelopment and Infill Projects

For the redevelopment calculations all disturbed (existing) impervious requires 50% treatment, and all new pavement requires 100% treatment. The required and proposed stormwater treatment areas for the project are computed below. In a conservative effort to demonstrate the stormwater standards are satisfied, the porous pavement is considered impervious in the required treatment calculations below.

Within 63,750 sf limits of disturbance:
Existing Roof = 6,392 sf, Existing Pavement = 25,872 sf
Total Existing Impervious = 6,392 sf + 25,872 sf = 32,264 sf
Existing Impervious Area Percentage = 32,264 sf / 63,750 sf = 50.6% > 40%

Proposed Roof = 10,655 sf, Proposed Pavement/Sidewalks = 5,605 sf,
Proposed Porous Pavement = 16,703 sf
Total Proposed Impervious (Included Porous Pavement) = 10,655 + 5,605 + 16,703 = 32,962 sf
Proposed Impervious Area Percentage = 32,962 sf / 63,750 sf = 51.9%
Increase in Impervious Area = 698 sf

Required Stormwater Treatment Area (RSTA)

RSTA = [Disturbed (existing) Impervious Area (DI) x 50%] + [New Impervious Area]
RSTA = [32,264 sf x 0.50] + [698 sf]
RSTA = 16,830 sf

Provided Stormwater Treatment Area (PSTA)

PSTA = Post-Development Impervious Area Draining to Sand Filter
PSTA = 4,134 sf [pavement/sidewalks] + 14,185 sf [porous pavement] + 10,655 sf [new roof] + 1,403 sf [existing roof]
PSTA = 30,377 sf

Minimum Standard 7: Pollution Prevention

The proposed stormwater pollution prevention practices to be implemented during construction are described and outlined in the accompanying site plans and on the Soil Erosion and Sediment Control Plan (SESCP).

Minimum Standard 8: Land Uses with Higher Potential Pollutant Loads

The proposed land use is not classified as a LUHPPL.

Minimum Standard 9: Illicit Discharges

There are no existing or proposed illicit discharges.

Minimum Standard 10: Construction Erosion and Sediment Control

The proposed vegetative and structural practices to be implemented during construction are described and outlined in the accompanying site plans. In addition, the operator shall initiate appropriate permanent stabilization practices on all disturbed areas as soon as possible but not more than fourteen (14) days after the construction activity in that area has temporarily or permanently ceased, unless the activity is to resume within twenty-one (21) days. If construction cannot begin within twenty-one (21) days of completing site preparation activities, all disturbed areas shall be stabilized with loam and seeding.

Additional Controls

- Install perimeter erosion controls and crushed stone construction entrances prior to construction vehicle traffic where indicated on the Temporary Drainage, Soil Erosion and Sediment Control Plans accompanying the SESC Plan/SWPPP, and in any additional locations where necessary or required by the engineer.
- Review SESC Plan/SWPPP construction notes and inspection requirements
- The Contractor is required to notify local authorities and the Rhode Island Department of Environmental Management, Office of Waste Management, of any hazardous material spill.
- The Contractor is required to maintain the site in an orderly and clean state. All construction waste shall be stored in appropriate containers prior to removal and contact with precipitation shall be kept to a minimum.
- General Maintenance procedures are outlined in the accompanying Site Plans. In addition, the Operator/Contractor are required to inspect all erosion controls on the site at least once every seven (7) calendar days and within twenty-four (24) hours after a rain event, which generates 0.25 inches of rain in a twenty-four (24) hour period and/or after a significant amount of runoff. The Operator/Contractor is also responsible for preparing a SESC/SWPPP Inspection Report with each inspection.

Sequence of Construction

Construction activities will include earthwork, grading, paving, building construction, drainage /utility installations, landscaping, soil erosion and sediment control installation and maintenance. In general, the sequence of construction will be as follows:

- Installation of perimeter erosion controls, sediment traps, and construction entrance. Inspect and maintain erosion controls throughout the construction period
- Clearing, grubbing, and tree removal
- Rough site, parking lot, and sand filter basin grading
- Install new drainage structures, pipes, utilities, and adjust existing structures as necessary
- Final site, parking lot, and stormwater system grading. Install pavement structure and other site features (i.e. guardrail, curb, berm, sidewalk etc.)
- Stabilize, loam and seed all disturbed areas
- Remove perimeter and other erosion controls upon final stabilization of site

Temporary Sediment Trap

One temporary sediment trap is proposed in accordance with the Rhode Island Soil Erosion and Sediment Control Handbook (RISESCH) and the RISDISM. These manuals identify three methods for sizing the temporary sediment traps: 134 cubic yards per acre, sediment volume method, or storage for the entire 1" storm event. The greatest of the three computed volumes represents the design volume for the temporary sediment traps. Generally, the 134 cubic yards per acre method yields a substantially larger design volume than the other methods; thus, that method is applied below to size the proposed sediment trap.

The temporary sediment trap shall have 1.5' wet and 2' dry storage depths, and wet storage bottom width of 12' and a top storage width of 18'. Dry storage shall have a maximum side slope of 2:1. Using the wet and dry storage volume formulas in the RISESCH, the minimum required lengths of the traps were computed.

$$V_w = 0.85\ (A_w) \times D_w$$
$$V_d = [(A_w + A_d) / 2] \times D_d$$
$$V = V_w + V_d$$

Where,

V = Sediment trap volume (ft)
V_w = Wet storage volume (ft^3)
A_w = Surface area at top of wet storage (ft^2) D_w = Wet storage depth (ft)
V_d = Dry storage volume (ft^3)
A_d = Surface area at top of dry storage (ft^2) D_d = Dry storage depth (ft)

The equations for wet and dry storage were manipulated in terms of trench width and length, and assumed values for depths and width are input below.

$$V_w = 0.85\ (L \times W) \times D_w = 0.85\ (L \times 18') \times 1.5'$$
$$V_w = 23.0 \times L$$

$$V_d = D_d \times [(L \times W) + (W+2D_d)(L)] / 2 = 2' \times [(L \times 18') + (18'+2x2')(L)] / 2$$
$$V_d = 40 \times L$$

$$V = V_w + V_d = (20.4 \times L) + (17 \times L)$$
$$V = 63.0 \times L$$

Design Storage Volume = 63.0 x Length of Sediment Trap
Length of Sediment Trap = Design Storage Volume / 63.0

Sediment Trap
Contributing Drainage Area = 55,937 sf (WSD EX-A1)= 1.284 acres
Design Storage Volume = 134 cy per acre x 1.284 acres = 172.1 cubic yards (4,646 cubic feet)
Length of Sediment Trap = 4,646 / 63.0 = 73.75 LF; **use 75 LF sediment trap**

Minimum Standard 11: Stormwater Management System – Maintenance Operation

In order to minimize the stormwater management system deterioration and promote system longevity, the owner shall adhere to the stand-alone document entitled "LONG TERM OPERATIONS AND MAINTENANCE PLAN FOR TOWER HILL LANDINGS ANNEX, 2095 KINGSTOWN ROAD (ROUTE 108), PLAT 32-4, LOT 32, SOUTH KINGSTOWN, RHODE ISLAND. PREPARATION DATE: AUGUST 2020," as well as any additional requirements pertaining to inspection and maintenance measures for this site provided in Appendices E and G of the Rhode Island Stormwater Design and Installation Standards Manual.

Section 3: Appendix

A. RI Stormwater Design and Installation Standards Manual, Appendix A: Stormwater Management Checklist

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

PROJECT NAME **Tower Hill Landings Annex**	**(RIDEM USE ONLY)**
TOWN **South Kingstown**	**STW/WQC File #:**
BRIEF PROJECT DESCRIPTION: Redevelopment of former restaurant site for new apartment complex. Scope of work includes construction of new porous pavement parking area, closed drainage system, utility connections, and landscaping.	**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.

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

PART 1. PROJECT AND SITE INFORMATION

PROJECT TYPE (Check all that apply)

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

SITE INFORMATION

☒ Vicinity Map

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

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

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

☒ Groundwater or Disconnected Wetland	☐ SRWP		
☒ Waterbody Name: Unnamed	☐ Coldwater	☐ Warmwater	☒ Unassessed
☒ Waterbody ID: RI0010045R-07	☐ 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:	☐ Contributes to shellfishing grounds		

PROJECT HISTORY		
☐ RIDEM Pre- Application Meeting	Meeting Date:	☐ Minutes Attached
☒ Municipal Master Plan Approval	Approval Date: June 24, 2020	☒ 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**) = 32,264 sf	
	☒ Total Site Area (**TSA**) = 63,750 sf	
	☒ Jurisdictional Wetlands (**JW**) = 0 sf	
	☒ Conservation Land (**CL**) = 0 sf	
☒ Calculate the Site Size (defined as contiguous properties under same ownership)		
	☒ Site Size (**SS**) = (**TSA**) – (**JW**) – (**CL**) = 63,750 sf	
	☒ (**TIA**) / (**SS**) = 0.56	☒ (**TIA**) / (**SS**) >**0.4**?
☒ YES, Redevelopment		

PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1

(NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS)
This section may be deleted if not required.

Note: A written description must be provided specifying why each method is not being used or is not applicable at the Site. Appropriate answers may include:

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

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

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

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

PART 3. SUMMARY OF REMAINING STANDARDS

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	**NO**	
☒	☐	The project has been designed to meet the groundwater recharge standard.
☐	☐	If "No," the justification for groundwater recharge criterion waiver has been explained in the Narrative (e.g., threat of groundwater contamination or physical limitation), if applicable (see RICR 8.8.D);
☐	☐	Your waiver request has been explained in the Narrative, if applicable.
☐	☒	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
☐	☐	If "Yes," has approval for infiltration by the 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)
(Add or Subtract Rows as Necessary)

Design Point	**Impervious Area Treated (sq ft)**	**Total Re_v Required (cu ft)**	**LID Stormwater Credits (see RISDISM Section 4.6.1)** **Portion of Re_v directed to a QPA (cu ft)**	**Recharge Required by Remaining BMPs (cu ft)**	**Recharge Provided by BMPs (cu ft)**
DP-A: Wetlands	30,377	491	0	491	1,426

Notes:
1. Only BMPs listed in RISDISM Table 3-5 "List of BMPs Acceptable for Recharge" may be used to meet the recharge requirement.
2. Recharge requirement must be satisfied for each waterbody ID.

☐ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):

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. 100% infiltration of the water quality volume
☐	☒	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. A Stormceptor STC-2400 is proposed on site. Manufacturer information included in O&M report
☐	☒	Additional pollutant-specific requirements and/or pollutant removal efficiencies are applicable to the site as the result of a TMDL, SAMP, or other watershed-specific requirements. If "Yes," please describe:

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

Design Point and WB ID	Impervious area treated (sq ft)	Total WQ_v Required (cu ft)	LID Stormwater Credits (see RICR 8.18) WQv directed to a QPA (cu ft)	Water Quality Treatment Remaining (cu ft)	Water Quality Provided by BMPs (cu ft)
DP-A: Wetlands	30,377	1,403	0	1,403	1,426

Notes:
1. Only BMPs listed in RICR 8.20 and 8.25 or the Approved Technologies List of BMPs is Acceptable for Water Quality treatment.
2. For each Design Point, the Water Quality Volume Standard must be met for each Waterbody ID.

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

☒ Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):
Drainage Narrative & Assessment, Section 2: Stormwater Management Standards

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: Redevelopment Project

TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)					
Design Point	**Receiving Water Body Name**	**Coldwater Fishery? (Y/N)**	**Total CPv Required (cu ft)**	**Total CPv Provided (cu ft)**	**Average Release Rate Modeled in the 1-yr storm (cfs)**
DP-1:					
DP-2:					
DP-3:					
DP-4:					
TOTALS:					
Note: The Channel Protection Volume Standard must be met in each waterbody ID.					
☐ YES ☐ NO	The CPv is released at roughly a uniform rate over a 24-hour duration (see examples of sizing calculations in Appendix D of the RISDISM).				
☐ YES ☐ NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If "Yes," please indicate restrictions and solutions below.				
☐ 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.).					

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

Table 5-1 Hydraulic Analysis Summary								
Subwatershed (Design Point)	**1.2" Peak Flow** (cfs) **		**1-yr Peak Flow** (cfs)		**10-yr Peak Flow** (cfs)		**100-yr Peak Flow** (cfs)	
	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
DP-A: Wetlands	0.90	0.22	2.19	2.13	4.93	4.62	9.70	9.60
DP-B: Kingstown Road	0.01	0.01	0.05	0.04	0.26	0.24	0.74	0.70

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

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

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

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	Constraint	Distance Provided
1	A	Stormceptor	Y	NA	NA	NA	NA	NA	Y	Wetland	52
2	A	Underground Detention System	NA	NA	NA	NA	Y	NA	Y	Wetland	30
3	A	Sand Filter	NA	Y	Y	NA	Y	NA	Y	Wetland	10

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					
A	3	Sand Filter	TP#1 135.3	TP#2 136.4	13" below grade (TP1) ~133.75 ex grade in sand filter area ~132.67 SHWT	132.67	0 ft (sand filter meda)	B	0.27
* For underground infiltration systems (UICs) bottom equals bottom of stone, for surface infiltration basins bottom equals bottom of basin, for filters bottom equals interface of storage and top of filter layer									

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

ILLICIT DISCHARGES – MINIMUM STANDARD 9			
Illicit discharges are defined as unpermitted discharges to Waters of the State that do not consist entirely of stormwater or uncontaminated groundwater, except for certain discharges identified in the RIPDES Phase II Stormwater General Permit.			
YES	NO	N/A	
☒	☐	☐	Have you checked for illicit discharges?
☐	☒	☐	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: Sewer and Drainage Easements agreed upon by downstream abutter for drainage and sewer connections
☐	☒	Is stormwater being directed from public areas to private property? If "Yes," note the following: Note: This is not allowed unless a funding mechanism is in place to provide the finances for the long-term maintenance of the BMP and drainage, or a funding mechanism is demonstrated that can guarantee the long-term maintenance of a stormwater BMP by an individual homeowner.
Pollution Prevention Section		

☒	☐	Designated snow stockpile locations?
☒	☐	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
☒	☐	Asphalt-only based sealants?
☐	☒	Pet waste stations? (Note: If a receiving water has a bacterial impairment, and the project involves housing units, then this could be an important part of your pollution prevention plan).
☒	☐	Regular sweeping? Please describe: Refer to O&M Plan
☒	☐	De-icing specifications, in accordance with RISDISM Appendix G. (NOTE: If the groundwater is GAA, or this area contributes to a drinking water supply, then this could be an important part of your pollution prevention plan).
☒	☐	A prohibition of phosphate-based fertilizers? (Note: If the site discharges to a phosphorus impaired waterbody, then this could be an important part of your pollution prevention plan).

PART 4. SUBWATERSHED MAPPING AND SITE-PLAN DETAILS

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

Subwatershed and Impervious Area Summary				
Subwatershed (area to each design point)	**First Receiving Water ID or MS4**	**Area Disturbed (acres)**	**Existing Impervious (acres)**	**Proposed Impervious (acres)**
DP-A: Wetland	RI0010045R-07	1.46	0.74	0.76

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

Town of South Kingstown, Rhode Island

PLANNING DEPARTMENT
180 High Street
Wakefield, RI 02879
Tel (401) 789-9331 x1244
Fax (401) 789-9792

RECORDED 06/30/2020 11:01:17 AM
B/P:1747/Pgs 525 - 528; (4 pgs)
INST# 69111
TOWN OF SOUTH KINGSTOWN, RI

June 24, 2020

Tower Hill Landings Annex, LLC
c/o Christopher Bicho
543 Thames Street
Newport, RI 02840

RE: **CONCEPTUAL MASTER PLAN PUBLIC INFORMATIONAL MEETING ON A MAJOR LAND DEVELOPMENT – Tower Hill Landings Annex,** proposed construction of an 11-unit multi-household structure and associated site improvements, AP 32-4, Lot 32, located at 2095 Kingstown Road, Tower Hill Landings Annex, LLC, *applicant*, DCH 1 Realty Holding South, LLC, *owner*

Dear Mr. Bicho:

At the meeting of the South Kingstown Planning Board held on Tuesday, **June 23, 2020** the Board voted as follows:

"The South Kingstown Planning Board hereby grants Conceptual master Plan approval to Tower Hill Landings Annex, an eleven (11) unit multi-family residential development located on AP 32-4, Lot 32 with a physical address of 2095 Kingstown Road, Tower Hill Landings Annex, LLC, *applicant*, DCH 1 Realty Holding South, Inc., *owner*. This approval is based upon plan set entitled: *CONCEPTUAL MASTER PLAN FOR PROPOSED 11 UNIT RESIDENTIAL DEVELOPMENT, TOWER HILL LANDINGS ANNEX, LLC,* Plat 32-4, Lot 32, Zoning Districts: CN and R-10, Commercial Neighborhood and Medium High Density Residential District and Kingstown Road Special Management District, 2095 Kingstown Road (Route 108), South Kingstown, R.I., Sheets 1 through 7, dated May 1, 2020, by Crossman Engineering, 151 Centerville Road, Warwick, RI 02886. This approval is based on the following Findings of Fact and Conditions of Approval:

Findings of Fact

A. The proposed development is consistent with the comprehensive community plan and/or has satisfactorily addressed the issues where there may be inconsistencies;

B. The proposed development is in compliance with the standards and provisions of the municipality's zoning ordinance;

C. There will be no significant negative environmental impacts from the proposed development as shown on the final plan, with all required conditions for approval;

D. The development, as proposed, will not result in the creation of individual lots with any physical constraints to development that building on those lots according to pertinent regulations and building standards would be impracticable. (See definition of Buildable lot). Lots with physical constraints to development may be created only if identified as permanent open space or permanently reserved for a public purpose on the approved, recorded plans; and

E. All proposed land developments and all subdivision lots have adequate and permanent physical access to a public street. Lot frontage on a public street without physical access shall not be considered in compliance with this requirement.

BK 1747/526 INST# 6911

F. Thorough technical review of the subdivision has been conducted by the South Kingstown Technical Review Committee.

Findings of Fact, Inclusionary Zoning & Affordable Units

G. The applicant has proposed that two (2) of the eleven (11) units will be deed restricted affordable to 'low and/or moderate income households' as defined under Rhode Island General Laws §45-53 and the South Kingstown Zoning Ordinance.

H. The Planning Board finds that the proposed affordable units are integrated within the development and that their design is consistent with the design of the market rate units within the development. Based on this finding, the Planning Board has determined that the overall project design meets the intent of Article IV.I of the Town's Subdivision and Land Development Regulations.

I. These affordable units shall be built and available for occupancy simultaneously with the construction and availability for occupancy of the market rate units in each of any separate phases of development.

J. Consistent with Section 502.6.J. of the Zoning Ordinance, the affordable units shall be exempt from the Town's Pacing and Phasing requirements.

K. The affordable units shall be eligible for an exemption from the payment of Fair Share Development Fees pursuant to Section 1101.D.1 of the Zoning Ordinance and Section II, Element 5, III of the Town's Capital Improvement Program.

Findings of Fact, Requested Relief

In accordance with Article VIII, Section B(1) of the Subdivision and Land Development Regulations with regard to waivers, the Planning Board hereby grants the waivers proposed:

Article IV – Special Requirements: (G) Landscaping	
(G.3) Perimeter Landscaping – Parking Lots and Loading Facilities: *No less than ten (10) feet in width where the parking area contains five (5) spaces or more or which exceeds 2500 sq. ft. of paved area.*	
Required:	10' (minimum)
Proposed:	**0'**
Article IV – Special Requirements: (H) Multi Household Dwellings	
(H.7) Front Yard Setbacks for Multi-Household Land Development Projects: *Multi-Household Land Development Projects (Use Code 12.1 and 12.3), when located along any public street, shall provide a minimum front yard setback of 100 feet along said public street. No building, accessory building, parking lot or utility area shall be located in any such front yard. In addition, a landscaped or natural buffer zone of 50-foot width, shall be maintained along said public street and may be used for any required yard, open space or recreation space, for access driveways (no parking allowed) or for other necessary entrance and exit facilities.*	
Required:	100' front yard setback 50' landscaped buffer zone
Proposed:	**25' front yard setback** **25' landscaped buffer**
(H.9) Distance between Buildings on Same Lot: *In any Multi-Household Land Development Project, the minimum distance between two (2) buildings or any two (2) rows of buildings, substantially parallel to each other, shall be fifty (50) feet. The minimum distance between two (2) abutting ends of buildings in the same general plane or row, shall be twenty-five (25) feet, if such walls contain no windows serving habitable rooms or shall otherwise be fifty (50) feet.*	
Required:	50' (minimum)
Proposed:	**10'**

In doing so, the Planning Board finds that:

L. The waiver(s) or modification(s) is/are reasonable and within the general purposes and intents of these regulations; and that

M. Literal enforcement of the regulations is impracticable and will exact undue hardship because of the peculiar conditions pertaining to the land in question; or waiver or modification of the regulations is in the best interest of good planning practice or design as evidenced by consistency will the Comprehensive Community Plan and the Zoning Ordinance.

Conditions of Approval

1. The use of the property shall be limited to Use Code 12 (Multi-household Detached Structure up to 12 units) for residential development as proposed unless further amended by the South Kingstown Planning Board during the Preliminary Plan stage of review.
2. This approval is limited to eleven (11) residential units in total.
3. This approval is further limited to nine (9) market rate units and two (2) affordable units for a total of eleven (11) units.
4. Fair Share Development Fees as required in the Zoning Ordinance and as amended annually in the Capital Improvement Program shall be required for each of the nine (9) market rate units.
5. The applicant shall obtain a Special Use Permit from the Zoning Board of Review in accordance with Section 504.14 (Household occupancy by more than three unrelated individuals) of the Zoning Ordinance for the proposed use prior to submittal of the Preliminary Plan application for this project.
6. As part of the Preliminary submittal, the applicant shall provide a traffic report detailing the anticipated traffic impacts from the proposed development and the adequacy of the existing and proposed roadways to safely accommodate existing and projected traffic.
7. The parking lot shall be designed and installed with pervious pavement to minimize potential water quality impacts from stormwater subject to RIDEM approval.
8. The applicant shall utilize low impact drainage methodologies in conformance with the Rhode Island Stormwater Design and Installation Standards Manual or other best management practices.
9. The applicant shall submit a downstream carrying capacity analysis to the Department of Public Services for review and approval prior to submittal of the Preliminary Plan application. Approval of the sewer connection from the Department of Public Services shall be included with the Preliminary Plan at the time of application submittal.
10. The preliminary project design shall include a detailed erosion and sedimentation control plan including any proposed stockpile containment. The plan shall clearly identify the proposed limits of disturbance and incorporate best management practices as outlined in the Rhode Island Soil Erosion and Sedimentation Control Handbook.
11. A 'No Access Easement' shall be granted to the Town of South Kingstown (as a grantee) prohibiting any future driveway or other vehicular access from Kingstown road.
12. An 'Open Space Easement' shall be granted to the Town of South Kingstown (as a grantee) for the purposes of enforcing the covenants of the easement.
13. The development shall satisfy its affordable housing component requirement with the dedication of two (2) units restricted for ownership/occupancy by 'low/moderate-income households' as defined under Rhode Island General Laws §45-53 and the South Kingstown Zoning Ordinance. The lease, sale or transfer of these affordable units shall remain affordable to low or moderate income households earning a maximum of eighty percent area-median income (80% AMI) for a period of ninety-nine (99) years.

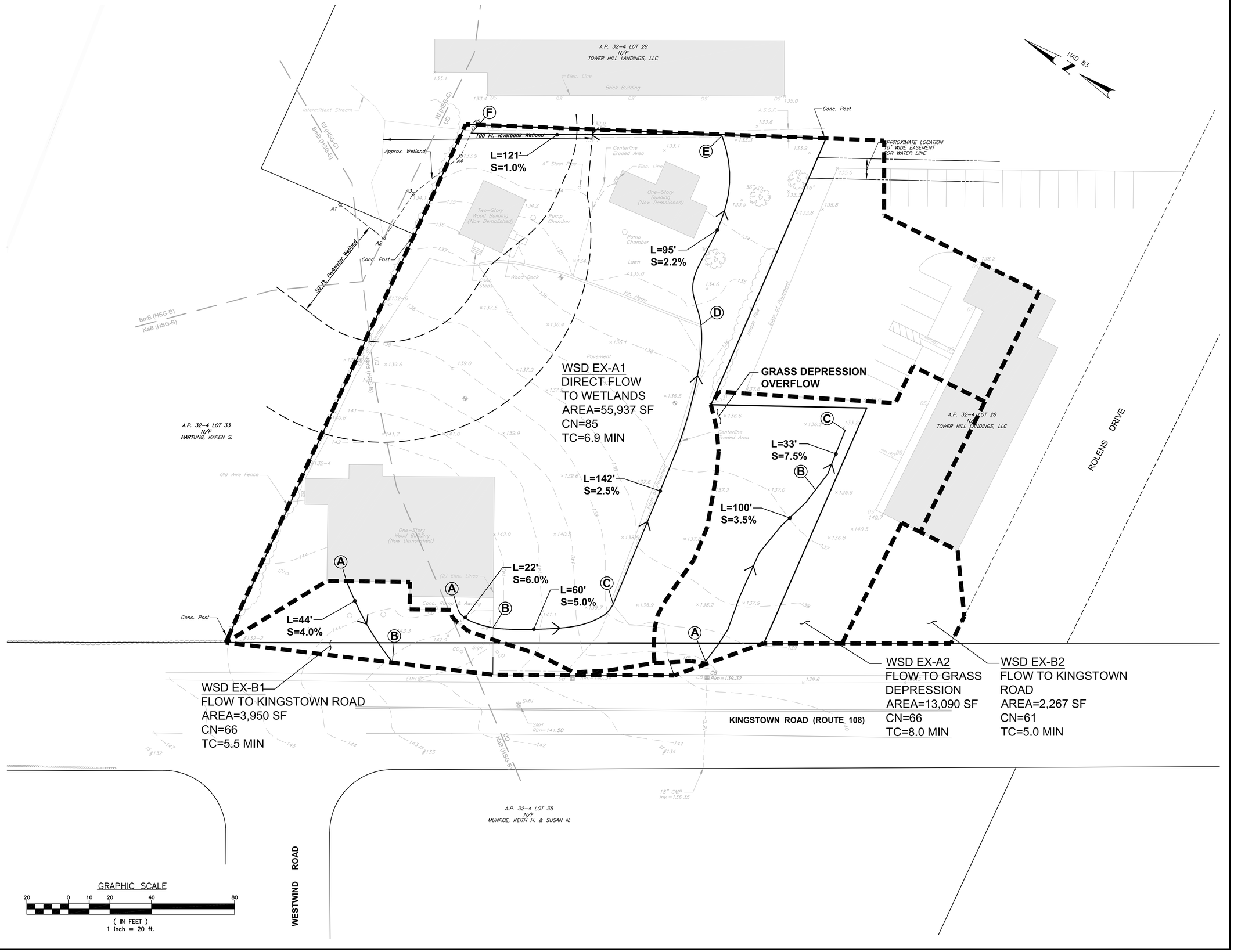
14. The affordable units must meet the criteria for subsidy and deed restrictions such that the units count toward the low and moderate income housing stock within the Town.
15. As part of the Preliminary Plan submittal, the applicant shall indicate which specific units will contain the LMI Housing units and shall propose the schedule by which the LMI Housing units will be constructed. Said schedule shall not exceed the construction of three (3) market-rate units for every one (1) LMI Housing unit.
16. The monitoring agent for the project shall be certified and qualified by the Rhode Island Housing and Mortgage Finance Corporation.
17. As part of the Preliminary Plan submittal, the applicant shall provide drafts of a 'Monitoring Agreement' and a 'Deed Restriction' that will ensure that affordability guidelines will be met. Such documents shall be subject to the review and approval of the Town's Special Legal Counsel and the Planning Board.
18. The monitoring agreement between the developer and the monitoring agent shall require notification to the Town of South Kingstown, as a party with a vested interest, of the availability of affordable housing units for purchase or lease. Any such notification shall be directed to the Director of Planning.

Sincerely,

Jean A. Riendeau, Chair
South Kingstown Planning Board

cc: John F. Kenyon, Esq.
Steven Cabral, P.E.

B. Pre- and Post-Development Watershed Maps



• Civil
• Transportation
• Environmental
• Site Planning
• Surveying
• Permitting
• Landscape Architecture

CROSSMAN ENGINEERING

Rhode Island
151 Centerville Road
Warwick, RI 02886
Phone: (401) 738-5660

Massachusetts
103 Commonwealth Avenue
North Attleboro, MA 02763
Phone: (508) 695-1700

Email: cel@crossmaneng.com

THESE DRAWINGS ARE THE PROPERTY OF CROSSMAN ENGINEERING AND HAVE BEEN PREPARED FOR THEIR CLIENT FOR A SPECIFIC SITE AND PROJECT. THESE DRAWINGS ARE NOT TO BE COPIED OR USED FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF CROSSMAN ENGINEERING.

PROJECT TITLE:

TOWER HILL LANDINGS ANNEX LLC

PLAT MAP 32-4, LOT 32
ZONING DISTRICT: CN and R-10
COMMERCIAL NEIGHBORHOOD and
MEDIUM HIGH DENSITY RESIDENTIAL DISTRICT
and KINGSTOWN ROAD
SPECIAL MANAGEMENT DISTRICT

2095 KINGSTOWN ROAD (ROUTE 108)
SOUTH KINGSTOWN, R.I.

PREPARED FOR:

TOWER HILL LANDINGS, LLC

543 THAMES STREET
NEWPORT, RHODE ISLAND
02840

DRAWING TITLE:

PRE-DEVELOPMENT WATERSHED MAP

DATE:	*SCALE:*
JULY 2020	1"=20'

DWG. NAME: 2449-EXWSD.dwg

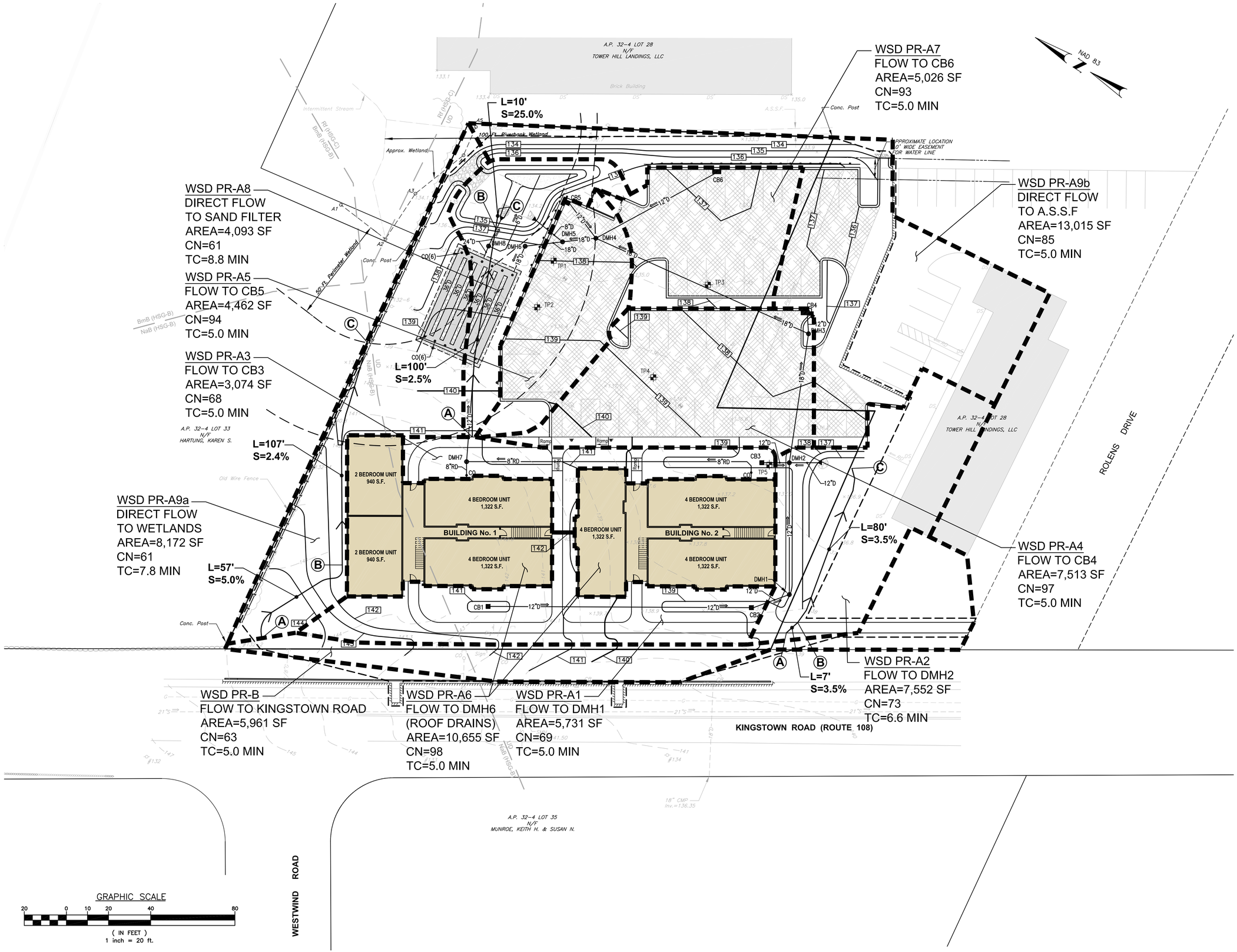
REVISIONS

NUMBER	*REMARKS*	*DATE*

DRAWING NUMBER

EX-WSD

SHEET: ___ *OF:* ___



• Civil
• Transportation
• Environmental
• Site Planning
• Surveying
• Permitting
• Landscape Architecture

CROSSMAN ENGINEERING

Rhode Island
151 Centerville Road
Warwick, RI 02886
Phone: (401) 738-5660

Massachusetts
103 Commonwealth Avenue
North Attleboro, MA 02763
Phone: (508) 695-1700

Email: cel@crossmaneng.com

THESE DRAWINGS ARE THE PROPERTY OF CROSSMAN ENGINEERING AND HAVE BEEN PREPARED FOR THEIR CLIENT FOR A SPECIFIC SITE AND PROJECT. THESE DRAWINGS ARE NOT TO BE COPIED OR USED FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF CROSSMAN ENGINEERING.

PROJECT TITLE:

TOWER HILL LANDINGS ANNEX LLC

PLAT MAP 32-4, LOT 32
ZONING DISTRICT: CN and R-10
COMMERCIAL NEIGHBORHOOD and
MEDIUM HIGH DENSITY RESIDENTIAL DISTRICT
and KINGSTOWN ROAD
SPECIAL MANAGEMENT DISTRICT

2095 KINGSTOWN ROAD (ROUTE 108)
SOUTH KINGSTOWN, R.I.

PREPARED FOR:

TOWER HILL LANDINGS, LLC

543 THAMES STREET
NEWPORT, RHODE ISLAND
02840

DRAWING TITLE:

POST-DEVELOPMENT WATERSHED MAP

DATE: JULY 2020

SCALE: 1"=20'

DWG. NAME: 2449-PRWSD.dwg

REVISIONS

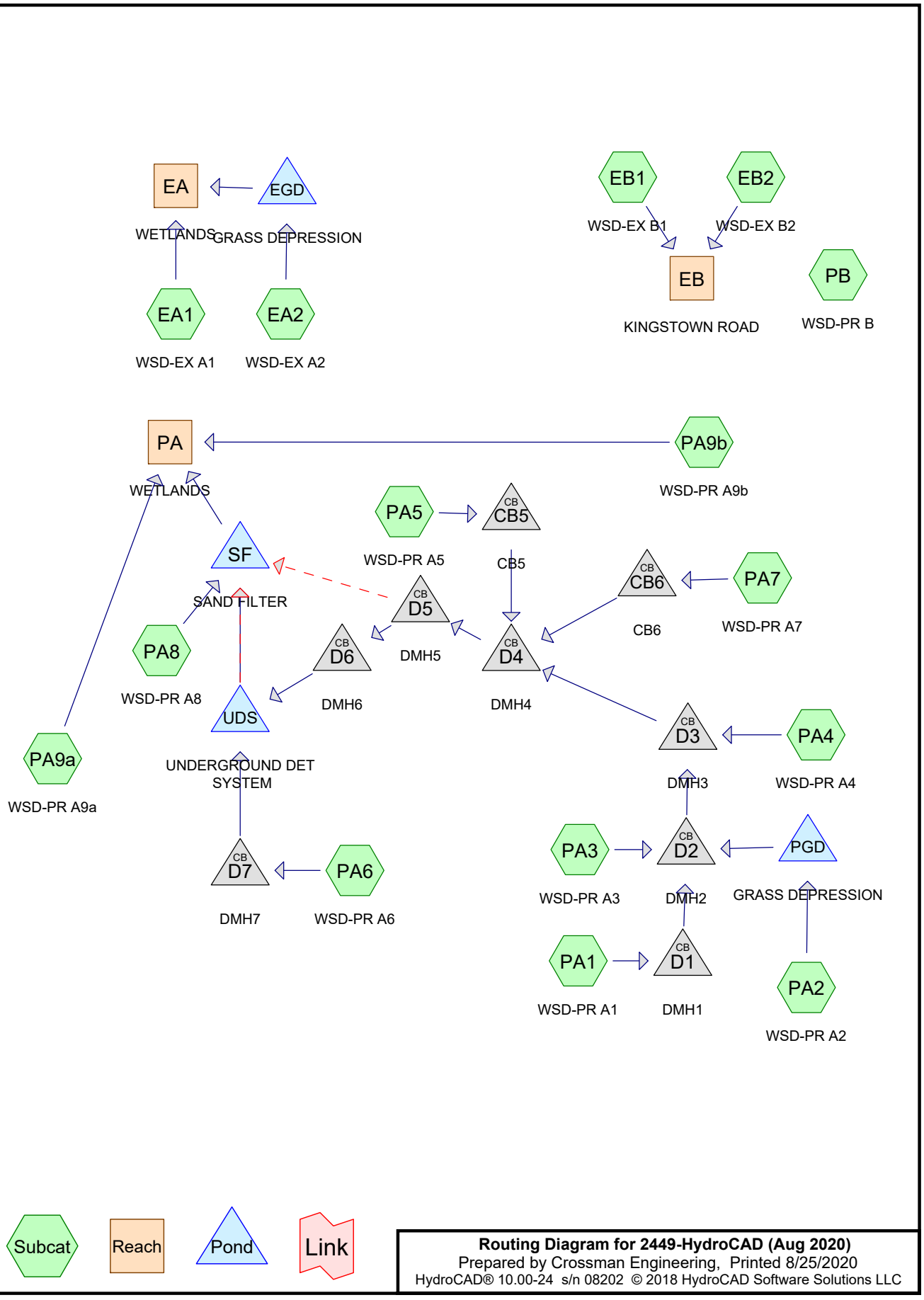
NUMBER	REMARKS	DATE

DRAWING NUMBER

PR-WSD

SHEET: __ *OF:* __

C. Stormwater Runoff Calculations (HydroCAD)



Routing Diagram for 2449-HydroCAD (Aug 2020)
Prepared by Crossman Engineering, Printed 8/25/2020
HydroCAD® 10.00-24 s/n 08202 © 2018 HydroCAD Software Solutions LLC

Summary for Subcatchment EA1: WSD-EX A1

Runoff = 2.19 cfs @ 12.14 hrs, Volume= 0.152 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	28,090	98	Pavement & Sidewalks
*	7,788	98	Roofs
	19,349	61	>75% Grass cover, Good, HSG B
	710	55	Woods, Good, HSG B
	55,937	85	Weighted Average
	20,059	61	35.86% Pervious Area
	35,878	98	64.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	22	0.0600	0.14		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.30"
0.5	60	0.0500	1.82		**Sheet Flow, BC** Smooth surfaces n= 0.011 P2= 3.30"
0.9	142	0.0250	2.55		**Shallow Concentrated Flow, CD** Unpaved Kv= 16.1 fps
1.5	95	0.0220	1.04		**Shallow Concentrated Flow, DE** Short Grass Pasture Kv= 7.0 fps
1.3	121	0.0100	1.50		**Shallow Concentrated Flow, EF** Grassed Waterway Kv= 15.0 fps
6.9	440	Total			

Summary for Subcatchment EA2: WSD-EX A2

Runoff = 0.12 cfs @ 12.17 hrs, Volume= 0.011 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	381	98	Pavement & Sidewalks
*	1,403	98	Roofs
	11,306	61	>75% Grass cover, Good, HSG B
	13,090	66	Weighted Average
	11,306	61	86.37% Pervious Area
	1,784	98	13.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	100	0.0350	0.22		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.30"
0.3	33	0.0750	1.92		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
8.0	133	Total			

Summary for Pond EGD: GRASS DEPRESSION

Inflow Area = 0.301 ac, 13.63% Impervious, Inflow Depth = 0.45" for 1-Year event
Inflow = 0.12 cfs @ 12.17 hrs, Volume= 0.011 af
Outflow = 0.01 cfs @ 17.63 hrs, Volume= 0.011 af, Atten= 94%, Lag= 327.8 min
Discarded = 0.01 cfs @ 17.63 hrs, Volume= 0.011 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.68' @ 17.63 hrs Surf.Area= 286 sf Storage= 249 cf

Plug-Flow detention time= 508.2 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 508.7 min (1,432.2 - 923.5)

Volume	Invert	Avail.Storage	Storage Description
#1	133.00'	3,298 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
133.00	36	0	0
134.00	158	97	97
135.00	345	252	349
136.00	753	549	898
137.00	4,047	2,400	3,298

Device	Routing	Invert	Outlet Devices
#1	Discarded	133.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	136.60'	**10.0' long x 4.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32

Discarded OutFlow Max=0.01 cfs @ 17.63 hrs HW=134.68' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=133.00' TW=0.00' (Dynamic Tailwater)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment EB1: WSD-EX B1

Runoff = 0.04 cfs @ 12.14 hrs, Volume= 0.003 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	565	98	Pavement & Sidewalks
	3,385	61	>75% Grass cover, Good, HSG B
	3,950	66	Weighted Average
	3,385	61	85.70% Pervious Area
	565	98	14.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	44	0.0400	0.13		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.30"

Summary for Subcatchment EB2: WSD-EX B2

Runoff = 0.01 cfs @ 12.15 hrs, Volume= 0.001 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

Area (sf)	CN	Description
2,267	61	>75% Grass cover, Good, HSG B
2,267	61	100.00% Pervious Area

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

Summary for Reach EA: WETLANDS

Inflow Area = 1.585 ac, 54.56% Impervious, Inflow Depth = 1.15" for 1-Year event
Inflow = 2.19 cfs @ 12.14 hrs, Volume= 0.152 af
Outflow = 2.19 cfs @ 12.14 hrs, Volume= 0.152 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Reach EB: KINGSTOWN ROAD

Inflow Area = 0.143 ac, 9.09% Impervious, Inflow Depth = 0.39" for 1-Year event
Inflow = 0.05 cfs @ 12.15 hrs, Volume= 0.005 af
Outflow = 0.05 cfs @ 12.15 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment PA1: WSD-PR A1

Runoff = 0.08 cfs @ 12.13 hrs, Volume= 0.006 af, Depth= 0.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	1,227	98	Pavement & Sidewalks
*	0	98	Roofs
	4,504	61	>75% Grass cover, Good, HSG B
	5,731	69	Weighted Average
	4,504	61	78.59% Pervious Area
	1,227	98	21.41% Impervious Area

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

Summary for Subcatchment PA2: WSD-PR A2

Runoff = 0.15 cfs @ 12.15 hrs, Volume= 0.011 af, Depth= 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	954	98	Pavement & Sidewalks
*	1,403	98	Roofs
	5,195	61	>75% Grass cover, Good, HSG B
	7,552	73	Weighted Average
	5,195	61	68.79% Pervious Area
	2,357	98	31.21% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0350	1.03		**Sheet Flow, AB**
					Smooth surfaces n= 0.011 P2= 3.30"
6.5	80	0.0350	0.21		**Sheet Flow, BC**
					Grass: Short n= 0.150 P2= 3.30"
6.6	87	Total			

Summary for Subcatchment PA3: WSD-PR A3

Runoff = 0.04 cfs @ 12.13 hrs, Volume= 0.003 af, Depth= 0.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	604	98	Pavement & Sidewalks
*	0	98	Roofs
	2,470	61	>75% Grass cover, Good, HSG B
	3,074	68	Weighted Average
	2,470	61	80.35% Pervious Area
	604	98	19.65% Impervious Area

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

Summary for Subcatchment PA4: WSD-PR A4

Runoff = 0.48 cfs @ 12.11 hrs, Volume= 0.035 af, Depth= 2.46"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	902	98	Pavement & Sidewalks
*	0	98	Roofs
	260	61	>75% Grass cover, Good, HSG B
*	6,351	98	Porous Pavement
	7,513	97	Weighted Average
	260	61	3.46% Pervious Area
	7,253	98	96.54% Impervious Area

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

Summary for Subcatchment PA5: WSD-PR A5

Runoff = 0.26 cfs @ 12.11 hrs, Volume= 0.018 af, Depth= 2.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	211	98	Pavement & Sidewalks
	537	61	>75% Grass cover, Good, HSG B
*	3,714	98	Porous Pavement
	4,462	94	Weighted Average
	537	61	12.03% Pervious Area
	3,925	98	87.97% Impervious Area

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

Summary for Subcatchment PA6: WSD-PR A6

Runoff = 0.69 cfs @ 12.11 hrs, Volume= 0.052 af, Depth= 2.57"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	0	98	Pavement & Sidewalks
*	10,655	98	Roofs
	0	61	>75% Grass cover, Good, HSG B
	10,655	98	Weighted Average
	10,655	98	100.00% Impervious Area

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

Summary for Subcatchment PA7: WSD-PR A7

Runoff = 0.29 cfs @ 12.11 hrs, Volume= 0.020 af, Depth= 2.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	236	98	Pavement & Sidewalks
	671	61	>75% Grass cover, Good, HSG B
*	4,119	98	Porous Pavement
	5,026	93	Weighted Average
	671	61	13.35% Pervious Area
	4,355	98	86.65% Impervious Area

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

Summary for Subcatchment PA8: WSD-PR A8

Runoff = 0.02 cfs @ 12.21 hrs, Volume= 0.002 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

Area (sf)	CN	Description
4,093	61	>75% Grass cover, Good, HSG B
4,093	61	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.8	100	0.0250	0.19		**Sheet Flow, AB** Grass: Short n= 0.150 P2= 3.30"
0.0	10	0.2500	3.50		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
8.8	110	Total			

Summary for Subcatchment PA9a: WSD-PR A9a

Runoff = 0.03 cfs @ 12.20 hrs, Volume= 0.005 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

Area (sf)	CN	Description
8,172	61	>75% Grass cover, Good, HSG B
8,172	61	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	57	0.0500	0.15		**Sheet Flow, AB** Grass: Dense n= 0.240 P2= 3.30"
1.6	107	0.0240	1.08		**Shallow Concentrated Flow, BC** Short Grass Pasture Kv= 7.0 fps
7.8	164	Total			

Summary for Subcatchment PA9b: WSD-PR A9b

Runoff = 0.54 cfs @ 12.12 hrs, Volume= 0.035 af, Depth= 1.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	4,416	98	Pavement & Sidewalks
*	1,396	98	Roofs
	4,653	61	>75% Grass cover, Good, HSG B
*	2,550	98	Porous Pavement
	13,015	85	Weighted Average
	4,653	61	35.75% Pervious Area
	8,362	98	64.25% Impervious Area

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

Summary for Pond D1: DMH1

Inflow Area = 0.132 ac, 21.41% Impervious, Inflow Depth = 0.57" for 1-Year event
Inflow = 0.08 cfs @ 12.13 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.13 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.13 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 135.94' @ 12.13 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	135.80'	**12.0" Round Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 135.80' / 135.20' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.13 hrs HW=135.94' TW=135.18' (Dynamic Tailwater)
1=Culvert (Barrel Controls 0.08 cfs @ 1.80 fps)

Summary for Pond PGD: GRASS DEPRESSION

Inflow Area = 0.173 ac, 31.21% Impervious, Inflow Depth = 0.74" for 1-Year event
Inflow = 0.15 cfs @ 12.15 hrs, Volume= 0.011 af
Outflow = 0.01 cfs @ 13.50 hrs, Volume= 0.011 af, Atten= 90%, Lag= 81.5 min
Discarded = 0.01 cfs @ 13.50 hrs, Volume= 0.011 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 136.49' @ 13.50 hrs Surf.Area= 611 sf Storage= 171 cf

Plug-Flow detention time= 143.2 min calculated for 0.011 af (100% of inflow)
Center-of-Mass det. time= 143.2 min (1,032.6 - 889.4)

Volume	Invert	Avail.Storage	Storage Description
#1	136.00'	2,213 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
136.00	90	0	0
137.00	1,160	625	625
138.00	2,015	1,588	2,213

Device	Routing	Invert	Outlet Devices
#1	Discarded	136.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	136.50'	**12.0" Round Culvert** L= 13.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 136.50' / 135.80' S= 0.0538 '/' Cc= 0.900 n= 0.050, Flow Area= 0.79 sf

Discarded OutFlow Max=0.01 cfs @ 13.50 hrs HW=136.49' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=136.00' TW=135.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)

Summary for Pond D2: DMH2

Inflow Area = 0.376 ac, 25.60% Impervious, Inflow Depth = 0.30" for 1-Year event
Inflow = 0.12 cfs @ 12.13 hrs, Volume= 0.009 af
Outflow = 0.12 cfs @ 12.13 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.13 hrs, Volume= 0.009 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 135.19' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	135.00'	**18.0" Round Culvert** L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 135.00' / 134.35' S= 0.0108 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.11 cfs @ 12.13 hrs HW=135.18' TW=134.91' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.11 cfs @ 1.38 fps)

Summary for Pond D3: DMH3

Inflow Area = 0.548 ac, 47.93% Impervious, Inflow Depth = 0.98" for 1-Year event
Inflow = 0.60 cfs @ 12.12 hrs, Volume= 0.045 af
Outflow = 0.60 cfs @ 12.12 hrs, Volume= 0.045 af, Atten= 0%, Lag= 0.0 min
Primary = 0.60 cfs @ 12.12 hrs, Volume= 0.045 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.91' @ 12.14 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.35'	**18.0" Round Culvert** L= 108.0' Ke= 0.500 Inlet / Outlet Invert= 134.35' / 133.70' S= 0.0060 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.49 cfs @ 12.12 hrs HW=134.90' TW=134.78' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.49 cfs @ 1.24 fps)

Summary for Pond CB5: CB5

Inflow Area = 0.102 ac, 87.97% Impervious, Inflow Depth = 2.16" for 1-Year event
Inflow = 0.26 cfs @ 12.11 hrs, Volume= 0.018 af
Outflow = 0.26 cfs @ 12.11 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min
Primary = 0.26 cfs @ 12.11 hrs, Volume= 0.018 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.89' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.40'	**12.0" Round Culvert** L= 20.0' Ke= 0.500 Inlet / Outlet Invert= 134.40' / 134.20' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.14 cfs @ 12.11 hrs HW=134.80' TW=134.78' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.14 cfs @ 0.72 fps)

Summary for Pond CB6: CB6

Inflow Area = 0.115 ac, 86.65% Impervious, Inflow Depth = 2.06" for 1-Year event
Inflow = 0.29 cfs @ 12.11 hrs, Volume= 0.020 af
Outflow = 0.29 cfs @ 12.11 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.11 hrs, Volume= 0.020 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.89' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	134.20'	**12.0" Round Culvert** L= 63.0' Ke= 0.500 Inlet / Outlet Invert= 134.20' / 133.70' S= 0.0079 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=0.00 cfs @ 12.11 hrs HW=134.78' TW=134.78' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Summary for Pond D4: DMH4

Inflow Area = 0.766 ac, 59.12% Impervious, Inflow Depth = 1.30" for 1-Year event
Inflow = 1.15 cfs @ 12.11 hrs, Volume= 0.083 af
Outflow = 1.15 cfs @ 12.11 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.11 hrs, Volume= 0.083 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.89' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.70'	**18.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 133.70' / 133.60' S= 0.0062 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.11 hrs HW=134.78' TW=134.79' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Summary for Pond D5: DMH5

Inflow Area = 0.766 ac, 59.12% Impervious, Inflow Depth = 1.30" for 1-Year event
Inflow = 1.15 cfs @ 12.11 hrs, Volume= 0.083 af
Outflow = 1.15 cfs @ 12.11 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.11 hrs, Volume= 0.082 af
Secondary = 0.04 cfs @ 12.25 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.88' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.60'	**18.0" Round Culvert** L= 16.0' Ke= 0.500 Inlet / Outlet Invert= 133.60' / 133.50' S= 0.0062 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf
#2	Secondary	134.75'	**8.0" Round Culvert** L= 15.0' Ke= 0.500 Inlet / Outlet Invert= 134.75' / 134.60' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf

Primary OutFlow Max=0.00 cfs @ 12.11 hrs HW=134.79' TW=134.81' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Secondary OutFlow Max=0.05 cfs @ 12.25 hrs HW=134.88' TW=134.74' (Dynamic Tailwater)
2=Culvert (Outlet Controls 0.05 cfs @ 1.44 fps)

Summary for Pond D6: DMH6

Inflow Area = 0.766 ac, 59.12% Impervious, Inflow Depth = 1.29" for 1-Year event
Inflow = 1.15 cfs @ 12.11 hrs, Volume= 0.082 af
Outflow = 1.15 cfs @ 12.11 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Primary = 1.15 cfs @ 12.11 hrs, Volume= 0.082 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.88' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	133.42'	**18.0" Round Culvert** L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 133.42' / 133.30' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.77 sf

Primary OutFlow Max=0.00 cfs @ 12.11 hrs HW=134.81' TW=134.85' (Dynamic Tailwater)
1=Culvert (Controls 0.00 cfs)

Summary for Pond UDS: UNDERGROUND DET SYSTEM

Inflow Area = 1.010 ac, 69.02% Impervious, Inflow Depth = 1.60" for 1-Year event
Inflow = 1.84 cfs @ 12.11 hrs, Volume= 0.135 af
Outflow = 1.64 cfs @ 12.14 hrs, Volume= 0.122 af, Atten= 11%, Lag= 1.7 min
Primary = 1.40 cfs @ 12.14 hrs, Volume= 0.095 af
Secondary = 0.24 cfs @ 12.14 hrs, Volume= 0.027 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.88' @ 12.15 hrs Surf.Area= 1,637 sf Storage= 1,176 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 196.3 min (981.2 - 784.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	132.50'	0 cf	**32.75'W x 50.00'L x 4.50'H Field A** 7,369 cf Overall - 2,654 cf Embedded = 4,715 cf x 0.0% Voids
#2A	133.00'	2,126 cf	**ADS N-12 36"** x 12 Inside #1 Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.1 cf 12 Chambers in 6 Rows 29.75' Header x 7.10 sf x 2 = 422.4 cf Inside
		2,126 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	134.00'	**24.0" Round 24"D** L= 13.0' Ke= 0.500 Inlet / Outlet Invert= 134.00' / 134.00' S= 0.0000 '/' Cc= 0.900 n= 0.013, Flow Area= 3.14 sf
#2	Device 1	133.50'	**12.0" W x 6.0" H Vert. Orifice/Grate** C= 0.600
#3	Device 1	134.50'	**12.0" W x 5.0" H Vert. Orifice/Grate** C= 0.600
#4	Device 1	135.95'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#5	Secondary	133.00'	**6.0" Round 6"UD** L= 45.0' Ke= 0.500 Inlet / Outlet Invert= 133.00' / 132.92' S= 0.0018 '/' Cc= 0.900 n= 0.013, Flow Area= 0.20 sf

Primary OutFlow Max=1.27 cfs @ 12.14 hrs HW=134.87' TW=134.77' (Dynamic Tailwater)
└─**1=24"D** (Passes 1.27 cfs of 1.70 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.76 cfs @ 1.52 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.51 cfs @ 1.38 fps)
  └─**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Secondary OutFlow Max=0.22 cfs @ 12.14 hrs HW=134.87' TW=134.77' (Dynamic Tailwater)
└─**5=6"UD** (Outlet Controls 0.22 cfs @ 1.11 fps)

Pond UDS: UNDERGROUND DET SYSTEM - Chamber Wizard Field A

Chamber Model = ADS N-12 36" (ADS N-12® Pipe)
Inside= 36.1"W x 36.1"H => 7.10 sf x 20.00'L = 142.0 cf
Outside= 42.0"W x 42.0"H => 8.86 sf x 20.00'L = 177.1 cf

42.0" Wide + 21.0" Spacing = 63.0" C-C Row Spacing

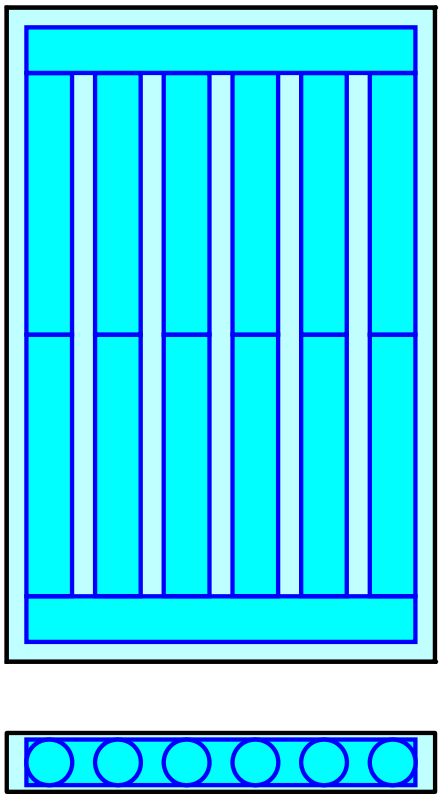
2 Chambers/Row x 20.00' Long +3.50' Header x 2 = 47.00' Row Length +18.0" End Stone x 2 = 50.00' Base Length
6 Rows x 42.0" Wide + 21.0" Spacing x 5 + 18.0" Side Stone x 2 = 32.75' Base Width
6.0" Base + 42.0" Chamber Height + 6.0" Cover = 4.50' Field Height

12 Chambers x 142.0 cf + 29.75' Header x 7.10 sf x 2 = 2,126.4 cf Chamber Storage
12 Chambers x 177.1 cf + 29.75' Header x 8.86 sf x 2 = 2,652.7 cf Displacement

7,368.7 cf Field - 2,652.7 cf Chambers = 4,716.0 cf Stone x 0.0% Voids = 0.0 cf Stone Storage

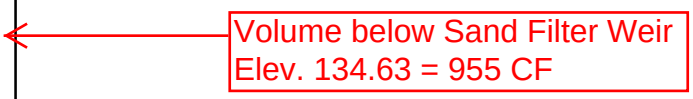
Chamber Storage = 2,126.4 cf = 0.049 af
Overall Storage Efficiency = 28.9%
Overall System Size = 50.00' x 32.75' x 4.50'

12 Chambers
272.9 cy Field
174.7 cy Stone



Stage-Area-Storage for Pond UDS: UNDERGROUND DET SYSTEM

Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
132.50	0	135.15	1,419
132.55	0	135.20	1,462
132.60	0	135.25	1,505
132.65	0	135.30	1,547
132.70	0	135.35	1,589
132.75	0	135.40	1,630
132.80	0	135.45	1,670
132.85	0	135.50	1,709
132.90	0	135.55	1,748
132.95	0	135.60	1,786
133.00	0	135.65	1,822
133.05	0	135.70	1,858
133.10	0	135.75	1,892
133.15	0	135.80	1,925
133.20	0	135.85	1,956
133.25	0	135.90	1,986
133.30	8	135.95	2,014
133.35	23	136.00	2,040
133.40	41	136.05	2,064
133.45	62	136.10	2,086
133.50	86	136.15	2,104
133.55	112	136.20	2,118
133.60	140	136.25	**2,125**
133.65	170	136.30	**2,126**
133.70	202	136.35	2,126
133.75	234	136.40	2,126
133.80	269	136.45	2,126
133.85	304	136.50	2,126
133.90	341	136.55	2,126
133.95	378	136.60	2,126
134.00	417	136.65	2,126
134.05	456	136.70	2,126
134.10	497	136.75	2,126
134.15	538	136.80	2,126
134.20	579	136.85	2,126
134.25	621	136.90	2,126
134.30	664	136.95	2,126
134.35	707	137.00	2,126
134.40	751		
134.45	795		
134.50	839		
134.55	884		
134.60	928		
134.65	973		
134.70	1,018		
134.75	1,063		
134.80	1,108		
134.85	1,153		
134.90	1,198		
134.95	1,243		
135.00	1,287		
135.05	1,332		
135.10	1,376		



Summary for Pond SF: SAND FILTER

Inflow Area = 1.104 ac, 63.14% Impervious, Inflow Depth = 1.36" for 1-Year event
Inflow = 1.66 cfs @ 12.14 hrs, Volume= 0.125 af
Outflow = 1.61 cfs @ 12.16 hrs, Volume= 0.122 af, Atten= 3%, Lag= 0.9 min
Discarded = 0.01 cfs @ 12.16 hrs, Volume= 0.025 af
Primary = 1.61 cfs @ 12.16 hrs, Volume= 0.097 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 134.77' @ 12.16 hrs Surf.Area= 982 sf Storage= 608 cf

Plug-Flow detention time= 205.9 min calculated for 0.122 af (98% of inflow)
Center-of-Mass det. time= 142.4 min (1,122.2 - 979.8)

Volume	Invert	Avail.Storage	Storage Description
#1	132.67'	2,049 cf	**Sand Filter (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
132.67	160	0.0	0	0
133.99	160	33.0	70	70
134.00	220	100.0	2	72
134.50	900	100.0	280	352
135.00	1,050	100.0	488	839
136.00	1,370	100.0	1,210	2,049

Device	Routing	Invert	Outlet Devices
#1	Discarded	132.67'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	134.63'	**12.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.01 cfs @ 12.16 hrs HW=134.77' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=1.58 cfs @ 12.16 hrs HW=134.77' TW=0.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 0.93 fps)

Stage-Area-Storage for Pond SF: SAND FILTER

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
132.67	160	0
132.72	160	3
132.77	160	5
132.82	160	8
132.87	160	11
132.92	160	13
132.97	160	16
133.02	160	18
133.07	160	21
133.12	160	24
133.17	160	26
133.22	160	29
133.27	160	32
133.32	160	34
133.37	160	37
133.42	160	40
133.47	160	42
133.52	160	45
133.57	160	48
133.62	160	50
133.67	160	53
133.72	160	55
133.77	160	58
133.82	160	61
133.87	160	63
133.92	160	66
133.97	160	69
134.02	247	76
134.07	315	90
134.12	383	108
134.17	451	129
134.22	519	153
134.27	587	181
134.32	655	212
134.37	723	246
134.42	791	284
134.47	859	325
134.52	906	370
134.57	921	415
134.62	936	462
134.67	951	509
134.72	966	557
134.77	981	606
134.82	996	655
134.87	1,011	705
134.92	1,026	756
134.97	1,041	808
135.02	1,056	860
135.07	1,072	913
135.12	1,088	967
135.17	1,104	1,022
135.22	1,120	1,078
135.27	1,136	1,134
135.32	1,152	1,191
135.37	1,168	1,250
135.42	1,184	1,308
135.47	1,200	1,368
135.52	1,216	1,428
135.57	1,232	1,490
135.62	1,248	1,552
135.67	1,264	1,614
135.72	1,280	1,678
135.77	1,296	1,742
135.82	1,312	1,808
135.87	1,328	1,874
135.92	1,344	1,941
135.97	**1,360**	**2,008**

Volume below Sand Filter Weir Elev. 134.63 = 471 CF

Summary for Reach PA: WETLANDS

Inflow Area = 1.591 ac, 55.90% Impervious, Inflow Depth = 1.04" for 1-Year event
Inflow = 2.13 cfs @ 12.15 hrs, Volume= 0.137 af
Outflow = 2.13 cfs @ 12.15 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment PB: WSD-PR B

Runoff = 0.04 cfs @ 12.15 hrs, Volume= 0.004 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NRCC 24-hr C 1-Year Rainfall=2.80"

	Area (sf)	CN	Description
*	262	98	Pavement & Sidewalks
	5,699	61	>75% Grass cover, Good, HSG B
	5,961	63	Weighted Average
	5,699	61	95.60% Pervious Area
	262	98	4.40% Impervious Area

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

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond CB5: CB5 Peak Elev=134.89' Inflow=0.26 cfs 0.018 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.26 cfs 0.018 af

Pond CB6: CB6 Peak Elev=134.89' Inflow=0.29 cfs 0.020 af
12.0" Round Culvert n=0.013 L=63.0' S=0.0079 '/' Outflow=0.29 cfs 0.020 af

Pond D1: DMH1 Peak Elev=135.94' Inflow=0.08 cfs 0.006 af
12.0" Round Culvert n=0.013 L=60.0' S=0.0100 '/' Outflow=0.08 cfs 0.006 af

Pond D2: DMH2 Peak Elev=135.19' Inflow=0.12 cfs 0.009 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0108 '/' Outflow=0.12 cfs 0.009 af

Pond D3: DMH3 Peak Elev=134.91' Inflow=0.60 cfs 0.045 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0060 '/' Outflow=0.60 cfs 0.045 af

Pond D4: DMH4 Peak Elev=134.89' Inflow=1.15 cfs 0.083 af
18.0" Round Culvert n=0.013 L=16.0' S=0.0062 '/' Outflow=1.15 cfs 0.083 af

Pond D5: DMH5 Peak Elev=134.88' Inflow=1.15 cfs 0.083 af
Primary=1.15 cfs 0.082 af Secondary=0.04 cfs 0.000 af Outflow=1.15 cfs 0.083 af

Pond D6: DMH6 Peak Elev=134.88' Inflow=1.15 cfs 0.082 af
18.0" Round Culvert n=0.013 L=12.0' S=0.0100 '/' Outflow=1.15 cfs 0.082 af

Pond D7: DMH7 Peak Elev=135.92' Inflow=0.69 cfs 0.052 af
12.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=0.69 cfs 0.052 af

Reach EA: WETLANDS Inflow=2.19 cfs 0.152 af
Outflow=2.19 cfs 0.152 af

Subcatchment EA1: WSD-EX A1 Runoff Area=55,937 sf 64.14% Impervious Runoff Depth=1.42"
Flow Length=440' Tc=6.9 min CN=85 Runoff=2.19 cfs 0.152 af

Subcatchment EA2: WSD-EX A2 Runoff Area=13,090 sf 13.63% Impervious Runoff Depth=0.45"
Flow Length=133' Tc=8.0 min CN=66 Runoff=0.12 cfs 0.011 af

Reach EB: KINGSTOWN ROAD Inflow=0.05 cfs 0.005 af
Outflow=0.05 cfs 0.005 af

Subcatchment EB1: WSD-EX B1 Runoff Area=3,950 sf 14.30% Impervious Runoff Depth=0.45"
Flow Length=44' Slope=0.0400 '/' Tc=5.5 min CN=66 Runoff=0.04 cfs 0.003 af

Subcatchment EB2: WSD-EX B2 Runoff Area=2,267 sf 0.00% Impervious Runoff Depth=0.29"
Tc=5.0 min CN=61 Runoff=0.01 cfs 0.001 af

Pond EGD: GRASS DEPRESSION Peak Elev=134.68' Storage=249 cf Inflow=0.12 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Reach PA: WETLANDS Inflow=2.13 cfs 0.137 af
Outflow=2.13 cfs 0.137 af

Subcatchment PA1: WSD-PR A1 Runoff Area=5,731 sf 21.41% Impervious Runoff Depth=0.57"
Tc=5.0 min CN=69 Runoff=0.08 cfs 0.006 af

Subcatchment PA2: WSD-PR A2 Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=0.74"
Flow Length=87' Slope=0.0350 '/' Tc=6.6 min CN=73 Runoff=0.15 cfs 0.011 af

Subcatchment PA3: WSD-PR A3 Runoff Area=3,074 sf 19.65% Impervious Runoff Depth=0.53"
Tc=5.0 min CN=68 Runoff=0.04 cfs 0.003 af

Subcatchment PA4: WSD-PR A4 Runoff Area=7,513 sf 96.54% Impervious Runoff Depth=2.46"
Tc=5.0 min CN=97 Runoff=0.48 cfs 0.035 af

Subcatchment PA5: WSD-PR A5 Runoff Area=4,462 sf 87.97% Impervious Runoff Depth=2.16"
Tc=5.0 min CN=94 Runoff=0.26 cfs 0.018 af

Subcatchment PA6: WSD-PR A6 Runoff Area=10,655 sf 100.00% Impervious Runoff Depth=2.57"
Tc=5.0 min CN=98 Runoff=0.69 cfs 0.052 af

Subcatchment PA7: WSD-PR A7 Runoff Area=5,026 sf 86.65% Impervious Runoff Depth=2.06"
Tc=5.0 min CN=93 Runoff=0.29 cfs 0.020 af

Subcatchment PA8: WSD-PR A8 Runoff Area=4,093 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=110' Tc=8.8 min CN=61 Runoff=0.02 cfs 0.002 af

Subcatchment PA9a: WSD-PR A9a Runoff Area=8,172 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=164' Tc=7.8 min CN=61 Runoff=0.03 cfs 0.005 af

Subcatchment PA9b: WSD-PR A9b Runoff Area=13,015 sf 64.25% Impervious Runoff Depth=1.42"
Tc=5.0 min CN=85 Runoff=0.54 cfs 0.035 af

Subcatchment PB: WSD-PR B Runoff Area=5,961 sf 4.40% Impervious Runoff Depth=0.35"
Tc=5.0 min CN=63 Runoff=0.04 cfs 0.004 af

Pond PGD: GRASS DEPRESSION Peak Elev=136.49' Storage=171 cf Inflow=0.15 cfs 0.011 af
Discarded=0.01 cfs 0.011 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.011 af

Pond SF: SAND FILTER Peak Elev=134.77' Storage=608 cf Inflow=1.66 cfs 0.125 af
Discarded=0.01 cfs 0.025 af Primary=1.61 cfs 0.097 af Outflow=1.61 cfs 0.122 af

Pond UDS: UNDERGROUND DET SYSTEM Peak Elev=134.88' Storage=1,176 cf Inflow=1.84 cfs 0.135 af
Primary=1.40 cfs 0.095 af Secondary=0.24 cfs 0.027 af Outflow=1.64 cfs 0.122 af

Total Runoff Area = 3.455 ac Runoff Volume = 0.360 af Average Runoff Depth = 1.25"
48.69% Pervious = 1.682 ac 51.31% Impervious = 1.773 ac

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond CB5: CB5 Peak Elev=134.95' Inflow=0.32 cfs 0.023 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.32 cfs 0.023 af

Pond CB6: CB6 Peak Elev=134.95' Inflow=0.35 cfs 0.024 af
12.0" Round Culvert n=0.013 L=63.0' S=0.0079 '/' Outflow=0.35 cfs 0.024 af

Pond D1: DMH1 Peak Elev=135.98' Inflow=0.13 cfs 0.009 af
12.0" Round Culvert n=0.013 L=60.0' S=0.0100 '/' Outflow=0.13 cfs 0.009 af

Pond D2: DMH2 Peak Elev=135.24' Inflow=0.19 cfs 0.016 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0108 '/' Outflow=0.19 cfs 0.016 af

Pond D3: DMH3 Peak Elev=134.98' Inflow=0.76 cfs 0.058 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0060 '/' Outflow=0.76 cfs 0.058 af

Pond D4: DMH4 Peak Elev=134.95' Inflow=1.43 cfs 0.105 af
18.0" Round Culvert n=0.013 L=16.0' S=0.0062 '/' Outflow=1.43 cfs 0.105 af

Pond D5: DMH5 Peak Elev=134.95' Inflow=1.43 cfs 0.105 af
Primary=1.42 cfs 0.104 af Secondary=0.10 cfs 0.001 af Outflow=1.43 cfs 0.105 af

Pond D6: DMH6 Peak Elev=134.94' Inflow=1.42 cfs 0.104 af
18.0" Round Culvert n=0.013 L=12.0' S=0.0100 '/' Outflow=1.42 cfs 0.104 af

Pond D7: DMH7 Peak Elev=135.97' Inflow=0.82 cfs 0.063 af
12.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=0.82 cfs 0.063 af

Reach EA: WETLANDS Inflow=2.83 cfs 0.197 af
Outflow=2.83 cfs 0.197 af

Subcatchment EA1: WSD-EX A1 Runoff Area=55,937 sf 64.14% Impervious Runoff Depth=1.84"
Flow Length=440' Tc=6.9 min CN=85 Runoff=2.83 cfs 0.197 af

Subcatchment EA2: WSD-EX A2 Runoff Area=13,090 sf 13.63% Impervious Runoff Depth=0.69"
Flow Length=133' Tc=8.0 min CN=66 Runoff=0.21 cfs 0.017 af

Reach EB: KINGSTOWN ROAD Inflow=0.09 cfs 0.007 af
Outflow=0.09 cfs 0.007 af

Subcatchment EB1: WSD-EX B1 Runoff Area=3,950 sf 14.30% Impervious Runoff Depth=0.69"
Flow Length=44' Slope=0.0400 '/' Tc=5.5 min CN=66 Runoff=0.07 cfs 0.005 af

Subcatchment EB2: WSD-EX B2 Runoff Area=2,267 sf 0.00% Impervious Runoff Depth=0.49"
Tc=5.0 min CN=61 Runoff=0.02 cfs 0.002 af

Pond EGD: GRASS DEPRESSION Peak Elev=135.17' Storage=413 cf Inflow=0.21 cfs 0.017 af
Discarded=0.01 cfs 0.017 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.017 af

Reach PA: WETLANDS Inflow=2.70 cfs 0.184 af
Outflow=2.70 cfs 0.184 af

Subcatchment PA1: WSD-PR A1 Runoff Area=5,731 sf 21.41% Impervious Runoff Depth=0.84"
Tc=5.0 min CN=69 Runoff=0.13 cfs 0.009 af

Subcatchment PA2: WSD-PR A2 Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=1.05"
Flow Length=87' Slope=0.0350 '/' Tc=6.6 min CN=73 Runoff=0.21 cfs 0.015 af

Subcatchment PA3: WSD-PR A3 Runoff Area=3,074 sf 19.65% Impervious Runoff Depth=0.79"
Tc=5.0 min CN=68 Runoff=0.06 cfs 0.005 af

Subcatchment PA4: WSD-PR A4 Runoff Area=7,513 sf 96.54% Impervious Runoff Depth=2.96"
Tc=5.0 min CN=97 Runoff=0.57 cfs 0.042 af

Subcatchment PA5: WSD-PR A5 Runoff Area=4,462 sf 87.97% Impervious Runoff Depth=2.64"
Tc=5.0 min CN=94 Runoff=0.32 cfs 0.023 af

Subcatchment PA6: WSD-PR A6 Runoff Area=10,655 sf 100.00% Impervious Runoff Depth=3.07"
Tc=5.0 min CN=98 Runoff=0.82 cfs 0.063 af

Subcatchment PA7: WSD-PR A7 Runoff Area=5,026 sf 86.65% Impervious Runoff Depth=2.54"
Tc=5.0 min CN=93 Runoff=0.35 cfs 0.024 af

Subcatchment PA8: WSD-PR A8 Runoff Area=4,093 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=110' Tc=8.8 min CN=61 Runoff=0.04 cfs 0.004 af

Subcatchment PA9a: WSD-PR A9a Runoff Area=8,172 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=164' Tc=7.8 min CN=61 Runoff=0.08 cfs 0.008 af

Subcatchment PA9b: WSD-PR A9b Runoff Area=13,015 sf 64.25% Impervious Runoff Depth=1.84"
Tc=5.0 min CN=85 Runoff=0.69 cfs 0.046 af

Subcatchment PB: WSD-PR B Runoff Area=5,961 sf 4.40% Impervious Runoff Depth=0.56"
Tc=5.0 min CN=63 Runoff=0.08 cfs 0.006 af

Pond PGD: GRASS DEPRESSION Peak Elev=136.58' Storage=233 cf Inflow=0.21 cfs 0.015 af
Discarded=0.02 cfs 0.013 af Primary=0.02 cfs 0.002 af Outflow=0.03 cfs 0.015 af

Pond SF: SAND FILTER Peak Elev=134.79' Storage=630 cf Inflow=2.05 cfs 0.159 af
Discarded=0.01 cfs 0.025 af Primary=1.99 cfs 0.131 af Outflow=2.00 cfs 0.156 af

Pond UDS: UNDERGROUND DET SYSTEM Peak Elev=134.94' Storage=1,230 cf Inflow=2.24 cfs 0.166 af
Primary=1.70 cfs 0.122 af Secondary=0.28 cfs 0.032 af Outflow=1.99 cfs 0.154 af

Total Runoff Area = 3.455 ac Runoff Volume = 0.467 af Average Runoff Depth = 1.62"
48.69% Pervious = 1.682 ac 51.31% Impervious = 1.773 ac

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond CB5: CB5 Peak Elev=135.20' Inflow=0.49 cfs 0.036 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.49 cfs 0.036 af

Pond CB6: CB6 Peak Elev=135.21' Inflow=0.55 cfs 0.039 af
12.0" Round Culvert n=0.013 L=63.0' S=0.0079 '/' Outflow=0.55 cfs 0.039 af

Pond D1: DMH1 Peak Elev=136.08' Inflow=0.31 cfs 0.021 af
12.0" Round Culvert n=0.013 L=60.0' S=0.0100 '/' Outflow=0.31 cfs 0.021 af

Pond D2: DMH2 Peak Elev=135.42' Inflow=0.54 cfs 0.045 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0108 '/' Outflow=0.54 cfs 0.045 af

Pond D3: DMH3 Peak Elev=135.23' Inflow=1.38 cfs 0.110 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0060 '/' Outflow=1.38 cfs 0.110 af

Pond D4: DMH4 Peak Elev=135.20' Inflow=2.42 cfs 0.185 af
18.0" Round Culvert n=0.013 L=16.0' S=0.0062 '/' Outflow=2.42 cfs 0.185 af

Pond D5: DMH5 Peak Elev=135.19' Inflow=2.42 cfs 0.185 af
Primary=2.25 cfs 0.178 af Secondary=0.47 cfs 0.008 af Outflow=2.42 cfs 0.185 af

Pond D6: DMH6 Peak Elev=135.19' Inflow=2.25 cfs 0.178 af
18.0" Round Culvert n=0.013 L=12.0' S=0.0100 '/' Outflow=2.25 cfs 0.178 af

Pond D7: DMH7 Peak Elev=136.09' Inflow=1.23 cfs 0.095 af
12.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=1.23 cfs 0.095 af

Reach EA: WETLANDS Inflow=4.93 cfs 0.351 af
Outflow=4.93 cfs 0.351 af

Subcatchment EA1: WSD-EX A1 Runoff Area=55,937 sf 64.14% Impervious Runoff Depth=3.28"
Flow Length=440' Tc=6.9 min CN=85 Runoff=4.93 cfs 0.351 af

Subcatchment EA2: WSD-EX A2 Runoff Area=13,090 sf 13.63% Impervious Runoff Depth=1.66"
Flow Length=133' Tc=8.0 min CN=66 Runoff=0.56 cfs 0.042 af

Reach EB: KINGSTOWN ROAD Inflow=0.26 cfs 0.018 af
Outflow=0.26 cfs 0.018 af

Subcatchment EB1: WSD-EX B1 Runoff Area=3,950 sf 14.30% Impervious Runoff Depth=1.66"
Flow Length=44' Slope=0.0400 '/' Tc=5.5 min CN=66 Runoff=0.18 cfs 0.013 af

Subcatchment EB2: WSD-EX B2 Runoff Area=2,267 sf 0.00% Impervious Runoff Depth=1.31"
Tc=5.0 min CN=61 Runoff=0.08 cfs 0.006 af

Pond EGD: GRASS DEPRESSION Peak Elev=136.13' Storage=1,020 cf Inflow=0.56 cfs 0.042 af
Discarded=0.03 cfs 0.042 af Primary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.042 af

Reach PA: WETLANDS Inflow=4.62 cfs 0.351 af
Outflow=4.62 cfs 0.351 af

Subcatchment PA1: WSD-PR A1 Runoff Area=5,731 sf 21.41% Impervious Runoff Depth=1.89"
Tc=5.0 min CN=69 Runoff=0.31 cfs 0.021 af

Subcatchment PA2: WSD-PR A2 Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=2.20"
Flow Length=87' Slope=0.0350 '/' Tc=6.6 min CN=73 Runoff=0.46 cfs 0.032 af

Subcatchment PA3: WSD-PR A3 Runoff Area=3,074 sf 19.65% Impervious Runoff Depth=1.81"
Tc=5.0 min CN=68 Runoff=0.16 cfs 0.011 af

Subcatchment PA4: WSD-PR A4 Runoff Area=7,513 sf 96.54% Impervious Runoff Depth=4.55"
Tc=5.0 min CN=97 Runoff=0.86 cfs 0.065 af

Subcatchment PA5: WSD-PR A5 Runoff Area=4,462 sf 87.97% Impervious Runoff Depth=4.21"
Tc=5.0 min CN=94 Runoff=0.49 cfs 0.036 af

Subcatchment PA6: WSD-PR A6 Runoff Area=10,655 sf 100.00% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=98 Runoff=1.23 cfs 0.095 af

Subcatchment PA7: WSD-PR A7 Runoff Area=5,026 sf 86.65% Impervious Runoff Depth=4.10"
Tc=5.0 min CN=93 Runoff=0.55 cfs 0.039 af

Subcatchment PA8: WSD-PR A8 Runoff Area=4,093 sf 0.00% Impervious Runoff Depth=1.31"
Flow Length=110' Tc=8.8 min CN=61 Runoff=0.13 cfs 0.010 af

Subcatchment PA9a: WSD-PR A9a Runoff Area=8,172 sf 0.00% Impervious Runoff Depth=1.31"
Flow Length=164' Tc=7.8 min CN=61 Runoff=0.27 cfs 0.020 af

Subcatchment PA9b: WSD-PR A9b Runoff Area=13,015 sf 64.25% Impervious Runoff Depth=3.28"
Tc=5.0 min CN=85 Runoff=1.21 cfs 0.082 af

Subcatchment PB: WSD-PR B Runoff Area=5,961 sf 4.40% Impervious Runoff Depth=1.45"
Tc=5.0 min CN=63 Runoff=0.24 cfs 0.016 af

Pond PGD: GRASS DEPRESSION Peak Elev=136.77' Storage=385 cf Inflow=0.46 cfs 0.032 af
Discarded=0.02 cfs 0.018 af Primary=0.19 cfs 0.013 af Outflow=0.21 cfs 0.032 af

Pond SF: SAND FILTER Peak Elev=134.86' Storage=695 cf Inflow=3.36 cfs 0.278 af
Discarded=0.01 cfs 0.026 af Primary=3.30 cfs 0.249 af Outflow=3.30 cfs 0.275 af

Pond UDS: UNDERGROUND DET SYSTEM Peak Elev=135.17' Storage=1,436 cf Inflow=3.48 cfs 0.273 af
Primary=2.55 cfs 0.211 af Secondary=0.41 cfs 0.049 af Outflow=2.96 cfs 0.260 af

Total Runoff Area = 3.455 ac Runoff Volume = 0.838 af Average Runoff Depth = 2.91"
48.69% Pervious = 1.682 ac 51.31% Impervious = 1.773 ac

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond CB5: CB5 Peak Elev=135.45' Inflow=0.62 cfs 0.046 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.62 cfs 0.046 af

Pond CB6: CB6 Peak Elev=135.45' Inflow=0.70 cfs 0.051 af
12.0" Round Culvert n=0.013 L=63.0' S=0.0079 '/' Outflow=0.70 cfs 0.051 af

Pond D1: DMH1 Peak Elev=136.14' Inflow=0.46 cfs 0.031 af
12.0" Round Culvert n=0.013 L=60.0' S=0.0100 '/' Outflow=0.46 cfs 0.031 af

Pond D2: DMH2 Peak Elev=135.58' Inflow=0.96 cfs 0.071 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0108 '/' Outflow=0.96 cfs 0.071 af

Pond D3: DMH3 Peak Elev=135.48' Inflow=2.01 cfs 0.153 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0060 '/' Outflow=2.01 cfs 0.153 af

Pond D4: DMH4 Peak Elev=135.45' Inflow=3.32 cfs 0.250 af
18.0" Round Culvert n=0.013 L=16.0' S=0.0062 '/' Outflow=3.32 cfs 0.250 af

Pond D5: DMH5 Peak Elev=135.42' Inflow=3.32 cfs 0.250 af
Primary=2.90 cfs 0.234 af Secondary=0.88 cfs 0.017 af Outflow=3.32 cfs 0.250 af

Pond D6: DMH6 Peak Elev=135.42' Inflow=2.90 cfs 0.234 af
18.0" Round Culvert n=0.013 L=12.0' S=0.0100 '/' Outflow=2.90 cfs 0.234 af

Pond D7: DMH7 Peak Elev=136.18' Inflow=1.53 cfs 0.119 af
12.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=1.53 cfs 0.119 af

Reach EA: WETLANDS Inflow=6.53 cfs 0.471 af
Outflow=6.53 cfs 0.471 af

Subcatchment EA1: WSD-EX A1 Runoff Area=55,937 sf 64.14% Impervious Runoff Depth=4.40"
Flow Length=440' Tc=6.9 min CN=85 Runoff=6.53 cfs 0.471 af

Subcatchment EA2: WSD-EX A2 Runoff Area=13,090 sf 13.63% Impervious Runoff Depth=2.51"
Flow Length=133' Tc=8.0 min CN=66 Runoff=0.86 cfs 0.063 af

Reach EB: KINGSTOWN ROAD Inflow=0.42 cfs 0.028 af
Outflow=0.42 cfs 0.028 af

Subcatchment EB1: WSD-EX B1 Runoff Area=3,950 sf 14.30% Impervious Runoff Depth=2.51"
Flow Length=44' Slope=0.0400 '/' Tc=5.5 min CN=66 Runoff=0.28 cfs 0.019 af

Subcatchment EB2: WSD-EX B2 Runoff Area=2,267 sf 0.00% Impervious Runoff Depth=2.07"
Tc=5.0 min CN=61 Runoff=0.13 cfs 0.009 af

Pond EGD: GRASS DEPRESSION Peak Elev=136.41' Storage=1,485 cf Inflow=0.86 cfs 0.063 af
Discarded=0.05 cfs 0.063 af Primary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.063 af

Reach PA: WETLANDS Inflow=6.26 cfs 0.486 af
Outflow=6.26 cfs 0.486 af

Subcatchment PA1: WSD-PR A1 Runoff Area=5,731 sf 21.41% Impervious Runoff Depth=2.79"
Tc=5.0 min CN=69 Runoff=0.46 cfs 0.031 af

Subcatchment PA2: WSD-PR A2 Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=3.17"
Flow Length=87' Slope=0.0350 '/' Tc=6.6 min CN=73 Runoff=0.67 cfs 0.046 af

Subcatchment PA3: WSD-PR A3 Runoff Area=3,074 sf 19.65% Impervious Runoff Depth=2.70"
Tc=5.0 min CN=68 Runoff=0.24 cfs 0.016 af

Subcatchment PA4: WSD-PR A4 Runoff Area=7,513 sf 96.54% Impervious Runoff Depth=5.74"
Tc=5.0 min CN=97 Runoff=1.08 cfs 0.083 af

Subcatchment PA5: WSD-PR A5 Runoff Area=4,462 sf 87.97% Impervious Runoff Depth=5.40"
Tc=5.0 min CN=94 Runoff=0.62 cfs 0.046 af

Subcatchment PA6: WSD-PR A6 Runoff Area=10,655 sf 100.00% Impervious Runoff Depth=5.86"
Tc=5.0 min CN=98 Runoff=1.53 cfs 0.119 af

Subcatchment PA7: WSD-PR A7 Runoff Area=5,026 sf 86.65% Impervious Runoff Depth=5.28"
Tc=5.0 min CN=93 Runoff=0.70 cfs 0.051 af

Subcatchment PA8: WSD-PR A8 Runoff Area=4,093 sf 0.00% Impervious Runoff Depth=2.07"
Flow Length=110' Tc=8.8 min CN=61 Runoff=0.21 cfs 0.016 af

Subcatchment PA9a: WSD-PR A9a Runoff Area=8,172 sf 0.00% Impervious Runoff Depth=2.07"
Flow Length=164' Tc=7.8 min CN=61 Runoff=0.44 cfs 0.032 af

Subcatchment PA9b: WSD-PR A9b Runoff Area=13,015 sf 64.25% Impervious Runoff Depth=4.40"
Tc=5.0 min CN=85 Runoff=1.60 cfs 0.109 af

Subcatchment PB: WSD-PR B Runoff Area=5,961 sf 4.40% Impervious Runoff Depth=2.25"
Tc=5.0 min CN=63 Runoff=0.38 cfs 0.026 af

Pond PGD: GRASS DEPRESSION Peak Elev=136.88' Storage=492 cf Inflow=0.67 cfs 0.046 af
Discarded=0.02 cfs 0.021 af Primary=0.38 cfs 0.024 af Outflow=0.40 cfs 0.046 af

Pond SF: SAND FILTER Peak Elev=134.91' Storage=745 cf Inflow=4.51 cfs 0.374 af
Discarded=0.01 cfs 0.027 af Primary=4.45 cfs 0.344 af Outflow=4.45 cfs 0.371 af

Pond UDS: UNDERGROUND DET SYSTEM Peak Elev=135.39' Storage=1,625 cf Inflow=4.44 cfs 0.353 af
Primary=3.19 cfs 0.279 af Secondary=0.51 cfs 0.062 af Outflow=3.69 cfs 0.341 af

Total Runoff Area = 3.455 ac Runoff Volume = 1.136 af Average Runoff Depth = 3.95"
48.69% Pervious = 1.682 ac 51.31% Impervious = 1.773 ac

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond CB5: CB5 Peak Elev=136.06' Inflow=0.88 cfs 0.066 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.88 cfs 0.066 af

Pond CB6: CB6 Peak Elev=136.06' Inflow=0.99 cfs 0.074 af
12.0" Round Culvert n=0.013 L=63.0' S=0.0079 '/' Outflow=0.99 cfs 0.074 af

Pond D1: DMH1 Peak Elev=136.28' Inflow=0.79 cfs 0.052 af
12.0" Round Culvert n=0.013 L=60.0' S=0.0100 '/' Outflow=0.79 cfs 0.052 af

Pond D2: DMH2 Peak Elev=136.10' Inflow=1.77 cfs 0.131 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0108 '/' Outflow=1.77 cfs 0.131 af

Pond D3: DMH3 Peak Elev=136.08' Inflow=3.24 cfs 0.248 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0060 '/' Outflow=3.24 cfs 0.248 af

Pond D4: DMH4 Peak Elev=136.05' Inflow=5.10 cfs 0.388 af
18.0" Round Culvert n=0.013 L=16.0' S=0.0062 '/' Outflow=5.10 cfs 0.388 af

Pond D5: DMH5 Peak Elev=136.00' Inflow=5.10 cfs 0.388 af
Primary=4.01 cfs 0.348 af Secondary=1.58 cfs 0.039 af Outflow=5.10 cfs 0.388 af

Pond D6: DMH6 Peak Elev=135.98' Inflow=4.01 cfs 0.348 af
18.0" Round Culvert n=0.013 L=12.0' S=0.0100 '/' Outflow=4.01 cfs 0.348 af

Pond D7: DMH7 Peak Elev=136.34' Inflow=2.14 cfs 0.168 af
12.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=2.14 cfs 0.168 af

Reach EA: WETLANDS Inflow=9.70 cfs 0.737 af
Outflow=9.70 cfs 0.737 af

Subcatchment EA1: WSD-EX A1 Runoff Area=55,937 sf 64.14% Impervious Runoff Depth=6.70"
Flow Length=440' Tc=6.9 min CN=85 Runoff=9.70 cfs 0.717 af

Subcatchment EA2: WSD-EX A2 Runoff Area=13,090 sf 13.63% Impervious Runoff Depth=4.42"
Flow Length=133' Tc=8.0 min CN=66 Runoff=1.53 cfs 0.111 af

Reach EB: KINGSTOWN ROAD Inflow=0.74 cfs 0.050 af
Outflow=0.74 cfs 0.050 af

Subcatchment EB1: WSD-EX B1 Runoff Area=3,950 sf 14.30% Impervious Runoff Depth=4.42"
Flow Length=44' Slope=0.0400 '/' Tc=5.5 min CN=66 Runoff=0.50 cfs 0.033 af

Subcatchment EB2: WSD-EX B2 Runoff Area=2,267 sf 0.00% Impervious Runoff Depth=3.83"
Tc=5.0 min CN=61 Runoff=0.25 cfs 0.017 af

Pond EGD: GRASS DEPRESSION Peak Elev=136.65' Storage=2,091 cf Inflow=1.53 cfs 0.111 af
Discarded=0.07 cfs 0.090 af Primary=0.29 cfs 0.021 af Outflow=0.36 cfs 0.111 af

Reach PA: WETLANDS Inflow=9.60 cfs 0.770 af
Outflow=9.60 cfs 0.770 af

Subcatchment PA1: WSD-PR A1 Runoff Area=5,731 sf 21.41% Impervious Runoff Depth=4.78"
Tc=5.0 min CN=69 Runoff=0.79 cfs 0.052 af

Subcatchment PA2: WSD-PR A2 Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=5.26"
Flow Length=87' Slope=0.0350 '/' Tc=6.6 min CN=73 Runoff=1.09 cfs 0.076 af

Subcatchment PA3: WSD-PR A3 Runoff Area=3,074 sf 19.65% Impervious Runoff Depth=4.66"
Tc=5.0 min CN=68 Runoff=0.41 cfs 0.027 af

Subcatchment PA4: WSD-PR A4 Runoff Area=7,513 sf 96.54% Impervious Runoff Depth=8.14"
Tc=5.0 min CN=97 Runoff=1.51 cfs 0.117 af

Subcatchment PA5: WSD-PR A5 Runoff Area=4,462 sf 87.97% Impervious Runoff Depth=7.78"
Tc=5.0 min CN=94 Runoff=0.88 cfs 0.066 af

Subcatchment PA6: WSD-PR A6 Runoff Area=10,655 sf 100.00% Impervious Runoff Depth=8.26"
Tc=5.0 min CN=98 Runoff=2.14 cfs 0.168 af

Subcatchment PA7: WSD-PR A7 Runoff Area=5,026 sf 86.65% Impervious Runoff Depth=7.66"
Tc=5.0 min CN=93 Runoff=0.99 cfs 0.074 af

Subcatchment PA8: WSD-PR A8 Runoff Area=4,093 sf 0.00% Impervious Runoff Depth=3.83"
Flow Length=110' Tc=8.8 min CN=61 Runoff=0.40 cfs 0.030 af

Subcatchment PA9a: WSD-PR A9a Runoff Area=8,172 sf 0.00% Impervious Runoff Depth=3.83"
Flow Length=164' Tc=7.8 min CN=61 Runoff=0.83 cfs 0.060 af

Subcatchment PA9b: WSD-PR A9b Runoff Area=13,015 sf 64.25% Impervious Runoff Depth=6.70"
Tc=5.0 min CN=85 Runoff=2.38 cfs 0.167 af

Subcatchment PB: WSD-PR B Runoff Area=5,961 sf 4.40% Impervious Runoff Depth=4.07"
Tc=5.0 min CN=63 Runoff=0.70 cfs 0.046 af

Pond PGD: GRASS DEPRESSION Peak Elev=137.04' Storage=667 cf Inflow=1.09 cfs 0.076 af
Discarded=0.03 cfs 0.025 af Primary=0.73 cfs 0.051 af Outflow=0.75 cfs 0.076 af

Pond SF: SAND FILTER Peak Elev=134.99' Storage=833 cf Inflow=6.78 cfs 0.573 af
Discarded=0.01 cfs 0.027 af Primary=6.71 cfs 0.543 af Outflow=6.72 cfs 0.571 af

Pond UDS: UNDERGROUND DET SYSTEM Peak Elev=135.94' Storage=2,011 cf Inflow=6.15 cfs 0.517 af
Primary=4.40 cfs 0.417 af Secondary=0.70 cfs 0.087 af Outflow=5.10 cfs 0.504 af

Total Runoff Area = 3.455 ac Runoff Volume = 1.761 af Average Runoff Depth = 6.12"
48.69% Pervious = 1.682 ac 51.31% Impervious = 1.773 ac

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Split Pervious/Imperv.
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Pond CB5: CB5 Peak Elev=134.65' Inflow=0.10 cfs 0.007 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.10 cfs 0.007 af

Pond CB6: CB6 Peak Elev=134.65' Inflow=0.12 cfs 0.008 af
12.0" Round Culvert n=0.013 L=63.0' S=0.0079 '/' Outflow=0.12 cfs 0.008 af

Pond D1: DMH1 Peak Elev=135.89' Inflow=0.03 cfs 0.002 af
12.0" Round Culvert n=0.013 L=60.0' S=0.0100 '/' Outflow=0.03 cfs 0.002 af

Pond D2: DMH2 Peak Elev=135.10' Inflow=0.05 cfs 0.003 af
18.0" Round Culvert n=0.013 L=60.0' S=0.0108 '/' Outflow=0.05 cfs 0.003 af

Pond D3: DMH3 Peak Elev=134.65' Inflow=0.24 cfs 0.017 af
18.0" Round Culvert n=0.013 L=108.0' S=0.0060 '/' Outflow=0.24 cfs 0.017 af

Pond D4: DMH4 Peak Elev=134.65' Inflow=0.46 cfs 0.033 af
18.0" Round Culvert n=0.013 L=16.0' S=0.0062 '/' Outflow=0.46 cfs 0.033 af

Diversion Structure
Pond D5: DMH5 100% of WQ flow to Stormceptor (primary outflow) Peak Elev=134.65' Inflow=0.46 cfs 0.033 af
Primary=0.46 cfs 0.033 af Secondary=0.00 cfs 0.000 af Outflow=0.46 cfs 0.033 af

Stormceptor STC-900
Pond D6: DMH6 Stormceptor Water Quality Flow Rate Peak Elev=134.65' Inflow=0.46 cfs 0.033 af
18.0" Round Culvert n=0.013 L=12.0' S=0.0100 '/' Outflow=0.46 cfs 0.033 af

Pond D7: DMH7 Peak Elev=135.76' Inflow=0.28 cfs 0.020 af
12.0" Round Culvert n=0.013 L=46.0' S=0.0109 '/' Outflow=0.28 cfs 0.020 af

Reach EA: WETLANDS Inflow=0.90 cfs 0.068 af
Outflow=0.90 cfs 0.068 af

Subcatchment EA1: WSD-EX A1 Runoff Area=55,937 sf 64.14% Impervious Runoff Depth=0.63"
Flow Length=440' Tc=6.9 min CN=61/98 Runoff=0.90 cfs 0.068 af

Subcatchment EA2: WSD-EX A2 Runoff Area=13,090 sf 13.63% Impervious Runoff Depth=0.13"
Flow Length=133' Tc=8.0 min CN=61/98 Runoff=0.04 cfs 0.003 af

Reach EB: KINGSTOWN ROAD Inflow=0.01 cfs 0.001 af
Outflow=0.01 cfs 0.001 af

Subcatchment EB1: WSD-EX B1 Runoff Area=3,950 sf 14.30% Impervious Runoff Depth=0.14"
Flow Length=44' Slope=0.0400 '/' Tc=5.5 min CN=61/98 Runoff=0.01 cfs 0.001 af

Subcatchment EB2: WSD-EX B2 Runoff Area=2,267 sf 0.00% Impervious Runoff Depth=0.00"
Tc=5.0 min CN=61/0 Runoff=0.00 cfs 0.000 af

Pond EGD: GRASS DEPRESSION Peak Elev=133.81' Storage=69 cf Inflow=0.04 cfs 0.003 af
Discarded=0.00 cfs 0.003 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.003 af

Reach PA: WETLANDS Inflow=0.22 cfs 0.029 af
Outflow=0.22 cfs 0.029 af

Subcatchment PA1: WSD-PR A1 Runoff Area=5,731 sf 21.41% Impervious Runoff Depth=0.21"
Tc=5.0 min CN=61/98 Runoff=0.03 cfs 0.002 af

Subcatchment PA2: WSD-PR A2 Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=0.31"
Flow Length=87' Slope=0.0350 '/' Tc=6.6 min CN=61/98 Runoff=0.06 cfs 0.004 af

Subcatchment PA3: WSD-PR A3 Runoff Area=3,074 sf 19.65% Impervious Runoff Depth=0.19"
Tc=5.0 min CN=61/98 Runoff=0.02 cfs 0.001 af

Subcatchment PA4: WSD-PR A4 Runoff Area=7,513 sf 96.54% Impervious Runoff Depth=0.95"
Tc=5.0 min CN=61/98 Runoff=0.19 cfs 0.014 af

Subcatchment PA5: WSD-PR A5 Runoff Area=4,462 sf 87.97% Impervious Runoff Depth=0.87"
Tc=5.0 min CN=61/98 Runoff=0.10 cfs 0.007 af

Subcatchment PA6: WSD-PR A6 Runoff Area=10,655 sf 100.00% Impervious Runoff Depth=0.99"
Tc=5.0 min CN=0/98 Runoff=0.28 cfs 0.020 af

Subcatchment PA7: WSD-PR A7 Runoff Area=5,026 sf 86.65% Impervious Runoff Depth=0.85"
Tc=5.0 min CN=61/98 Runoff=0.12 cfs 0.008 af

Subcatchment PA8: WSD-PR A8 Runoff Area=4,093 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=110' Tc=8.8 min CN=61/0 Runoff=0.00 cfs 0.000 af

Subcatchment PA9a: WSD-PR A9a Runoff Area=8,172 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=164' Tc=7.8 min CN=61/0 Runoff=0.00 cfs 0.000 af

Subcatchment PA9b: WSD-PR A9b Runoff Area=13,015 sf 64.25% Impervious Runoff Depth=0.63"
Tc=5.0 min CN=61/98 Runoff=0.22 cfs 0.016 af

Subcatchment PB: WSD-PR B Runoff Area=5,961 sf 4.40% Impervious Runoff Depth=0.04"
Tc=5.0 min CN=61/98 Runoff=0.01 cfs 0.000 af

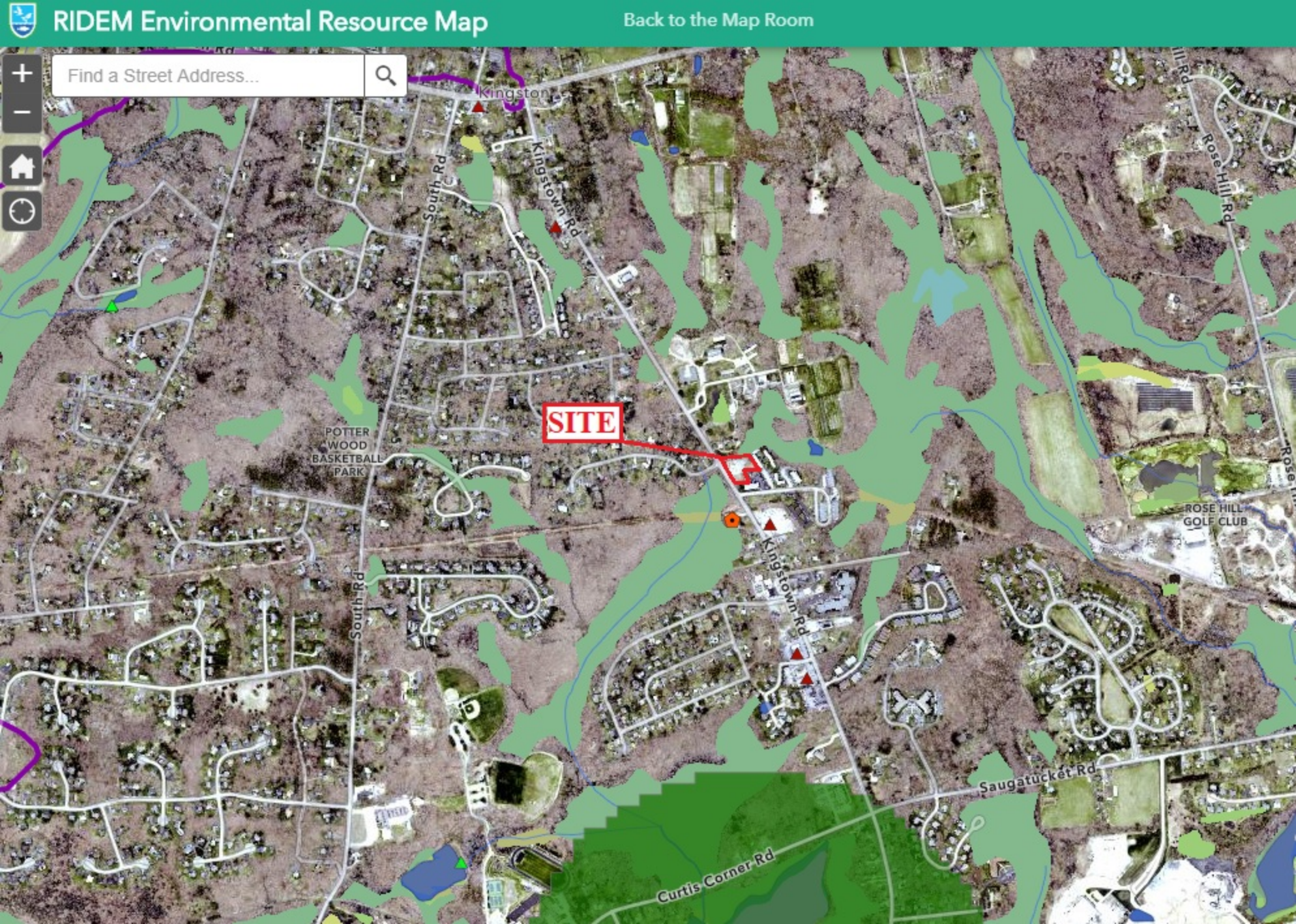
Pond PGD: GRASS DEPRESSION Peak Elev=136.27' Storage=65 cf Inflow=0.06 cfs 0.004 af
Discarded=0.01 cfs 0.004 af Primary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.004 af

Pond SF: SAND FILTER Peak Elev=134.65' Storage=489 cf Inflow=0.39 cfs 0.040 af
Discarded=0.01 cfs 0.024 af Primary=0.08 cfs 0.013 af Outflow=0.08 cfs 0.038 af

Pond UDS: UNDERGROUND DET SYSTEM Peak Elev=134.65' Storage=972 cf Inflow=0.74 cfs 0.053 af
Primary=0.27 cfs 0.027 af Secondary=0.13 cfs 0.013 af Outflow=0.39 cfs 0.040 af

Total Runoff Area = 3.455 ac Runoff Volume = 0.146 af Average Runoff Depth = 0.51"
48.69% Pervious = 1.682 ac 51.31% Impervious = 1.773 ac

D. RIDEM Environmental Resource Map


RIDEM Environmental Resource Map
Back to the Map Room
Find a Street Address...
Kingstown
South Rd
Kingstown Rd
SITE
POTTER WOOD BASKETBALL PARK
Rose Hill Rd
ROSE HILL GOLF CLUB
Saugatucket Rd
Curtis Corner Rd

E. FEMA Flood Map

National Flood Hazard Layer FIRMette

FEMA

41°28'28.86"N

71°31'10.83"W

71°30'33.38"W

41°28'1.89"N

0 250 500 1,000 1,500 2,000 Feet

1:6,000

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/9/2020 at 4:54:47 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

F. Soil Survey Map

Map Scale: 1:1,530 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties
Survey Area Data: Version 19, Sep 12, 2019

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

Date(s) aerial images were photographed: Dec 31, 2009—Apr 1, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
BmB	Bridgehampton silt loam, till substratum, 3 to 8 percent slopes	0.5	4.2%
CB	Canton-Urban land complex	0.2	2.2%
NaB	Narragansett silt loam, 3 to 8 percent slopes	1.2	11.3%
NbB	Narragansett very stony silt loam, 0 to 8 percent slopes	1.1	10.2%
Rf	Ridgebury, Leicester, and Whitman soils, 0 to 8 percent slopes, extremely stony	2.3	21.0%
SwA	Swansea muck, 0 to 1 percent slopes	0.2	1.6%
UD	Udorthents-Urban land complex	5.4	49.0%
WcB	Wapping very stony silt loam, 0 to 8 percent slopes	0.1	0.6%
Totals for Area of Interest		**11.0**	**100.0%**

G. Soil Evaluations

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment System Program

Site Evaluation Form
Part A – Soil Profile Description

Application Number _____

Property Owner: Dan's Place
Property Location: 2095 Kingstown Rd. South Kingstown
Date of Test Hole: 4-30-15
Soil Evaluator: Brian King License Number: D4010
Weather: 50 degrees - Cloudy Shaded: Yes ☐ No ☒ Time: 8:30-10:30

TH 1 Horizon	Depth Inches	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
A	0-10			10YR 3/4	___	_____	fsl	gr	fr	
B/HTM	10-19	c	w	10YR 4/6	7.5YR 5/8	13" c m p	ls	Osg	vfr	
C1	19-28	c	w	2.5Y 3/1	7.5Y 5/8	c m p	s	Osg	l	
2C	28-36	c	w	5Y 3/1	7.5Y 5/8	c m p	vfsl-sil	Om	fi	
3C	36-48	c	w	G 1 2.5/N	____	_____	sil-peat	Om	vfr	

TH 2 Horizon	Depth Inches	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Bit Pavement	0-2			____	____	_____	Bituminous Pavement	_____	_____	
HTM	2-36	s	a	10YR 4/6	7.5YR 5/8	10" m m d	mix of ls, sil, peat & bricks	Om	fr	
C1	36-78	c	w	2.5Y 4/2	2.5Y 6/1 7.5YR 5/8	m m p	vfls/sl w/pockets of sil	Om	fr/fi	

TH 1 Soil Class Basil Till Total Depth 48" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 30" SHWT 13" (og)

TH 2 Soil Class Basil Till Total Depth 78" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 57" SHWT 10" (og)

Comments: 1. TP 1&2 possible wetland prior to past fill operations

2. Redox in upper horizons likely due to slow downward movement of water (TP1) but entire profile has redox so design SHWT is 13" & 10" respectively

3. TP2, C1 horizon is saturated.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment System Program

Site Evaluation Form
Part A – Soil Profile Description

Application Number _____

Property Owner: Dan's Place
Property Location: 2095 Kingstown Rd. South Kingstown
Date of Test Hole: 4-30-15
Soil Evaluator: Brian King License Number: D4010
Weather: 50 degrees - Cloudy Shaded: Yes ☐ No ☒ Time: 8:30-10:30

TH 3 Horizon	Depth Inches	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
A	0-8			10YR 3/4			fsl	gr	fr	
HTM/C	8-34	c	g	2.5Y 5/3	7.5YR 5/8	10" c m p	vfsl	Om	fr	
C1	34-44	c	g	2.5Y 5/3	10YR 5/8	m m p	vfsl/sl	Om	fr/fi	
C2	44-86	c	w	2.5Y 4/2	2.5Y 7.5YR 5/8	c m p	vfsl/sl	Om	fr/fi	

TH 4 Horizon	Depth Inches	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
Bit. Pavement	0-8			____	_____	_____	Bituminous Pavement	____	_____	
HTM	8-35	s	a	10YR 4/6	7.5YR 5/8	8" m m	mix of s, grav, st	Om	fr	
C1	35-72	c	g	2.5Y 4/4	2.5Y 6/1 7.5 YR 5/8	m m p	vfls & stones w/pockets of sil	Om	fi	
2C	72-93	c	w	5Y 4/2	____	_____	gs	Osg	l	

TH 3 Soil Class Basil Till Total Depth 86" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth (*) 42" SHWT 10" (og)

TH 4 Soil Class Basil Till Total Depth 93" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 78" SHWT 8" (og)

Comments: 1. TP3 at edge of leach field. (*) Water seepage in pit likely due to leach field.

STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

Department of Environmental Management
Office of Water Resources
Onsite Wastewater Treatment System Program

Site Evaluation Form
Part A – Soil Profile Description

Application Number _____

Property Owner: Dan's Place
Property Location: 2095 Kingstown Rd. South Kingstown
Date of Test Hole: 4-30-15
Soil Evaluator: Brian King License Number: D4010
Weather: 50 degrees - Cloudy Shaded: Yes ☐ No ☒ Time: 8:30-10:30

TH 5 Horizon	Depth Inches	Horizon Boundaries		Soil Colors		Re-Dox	Texture	Structure	Consistence	Soil Category
		Dist	Topo	Matrix	Re-Dox Features	Ab. S. Contr.				
A	0-5			10YR 3/2			fsl	gr	fr	
HTM	5-14	c	w	10YR 4/6	____	_____	gs	Osg	1	
HTM	14-34	c	w	2.5Y 3/1	____	_____	vfls/s	Om	fr/fi	
C1	34-47	c	g	2.5Y 4/1	7.5YR 5/8	m m p	sil	Om	fr/fi	
C2	47-101	c	g	2.5Y 4/2	2.5Y 6/1 7.5YR 5/8	m m p	vfls/sl with pockets of sil	Om	fr/fi	

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

TH 5 Soil Class Basil Till Total Depth 101" Impervious/Limiting Layer Depth NA (og) GW Seepage Depth 36" & 86" SHWT * (og)

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

Comments: * SHWT likely in HTM Horizon 14"-34". Use depth similar to TP 1 through 4.

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
- x% Estimated gradient and direction of slope
- N Approximate direction of due north

Bedrock THs	
TH	Depth

1. Relief and Slope: 2% - 3%
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 38? 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: Shoulder -foot
10. Vegetation: Pavement, grass & gravel parking
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: _____ (Signature) _____ (License #)

Part B prepared by: _____ (Signature) _____ (License #)

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)

H. Wetland Delineation Report

Natural Resource Services, Inc.

March 2, 2020

Steven Cabral, PE
Crossman Engineering
151 Centerville Road
Warwick, RI 02886

RE: Freshwater Wetland Delineation
2095 Kingstown Road; A.P. 32-4, Lot 32
South Kingstown, Rhode Island

Dear Mr. Cabral:

Natural Resource Services, Inc. (NRS) has completed the freshwater wetland delineation within and immediately adjacent to the above referenced property. This field work was performed by Edward J. Avizinis, PWS, CPSS on February 28, 2020. The wetland delineation was established in accordance with the standards outlined in Appendix 2 of the Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (250 RICR 150-15-1). These land-use regulations are administered by the RI Department of Environmental Management (DEM), Office of Water Resources (OWR). It is important to note that in accordance with Section 1.8 (C)(4) of these regulations, all delineations performed by wetland consultants are not considered to be accurate for state regulatory purposes until the work is reviewed and approved by the DEM, OWR.

As part of our work, a hand-held GPS unit was used to locate the established wetland flagging. While this location work should not be construed as a professional survey, the data obtained is valuable for preliminary planning purposes. An aerial photograph is attached to this letter. The GPS data has been added as an overlay on the photo to provide a visual representation of the established wetland delineation.

The property is listed in the South Kingstown tax assessor's database as a 1.23 acre parcel. The property is a vacant parcel with frontage on Kingstown Road.

Flag series A1-A5 depicts the limit of a swamp. The freshwater wetland regulations define a swamp as a wetland which is dominated with woody vegetation, primarily trees, and is greater than three (3) acres in overall size. This wetland extends off property to the north and therefore does appear to meet this three acre threshold. The regulations require the addition of a 50 foot perimeter wetland to the delineated edge of any swamp.

P.O. Box 311 Harrisville, RI 02830 401-568-7390 FAX 401-568-7490

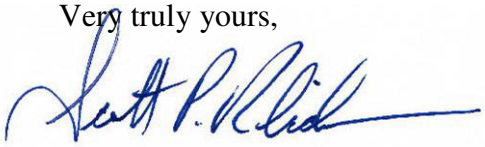
The 50 foot perimeter wetland is considered an extension of the swamp under the freshwater wetland regulations. Any and all proposed land disturbing activities within either the swamp or 50 foot perimeter wetland requires a permit from the DEM, OWR.

In addition, there is a stream present within the swamp. The freshwater wetland regulations require the application of a 100 foot riverbank wetland to each side of this stream. As with the 50 foot perimeter wetland, any proposed construction within the 100 foot riverbank wetland requires a permit from the DEM. There is also an Area Subject to Storm Flowage (ASSF) located along the eastern property boundary, any proposed construction within the ASSF requires a permit from the DEM.

It is important to note that a new state freshwater wetlands law was enacted in July of 2015. This law made changes to the jurisdictional limits currently utilized in the regulations. The Department of Environmental Management (DEM) is writing new regulations which will require buffer zones for all freshwater wetlands. While a comprehensive timeline has not been established for the enactment of these rules, it is anticipated that they will be in effect at some point in 2020. If you submit an application prior to the promulgation of these rules, your project would then be grandfathered under the current setback standards.

Please do not hesitate to contact me if you have questions regarding the field work performed or any of the information presented in this letter of findings.

Very truly yours,



Scott P. Rabideau, PWS
Principal

Enclosures

Site Sketch Depicting Approximate Wetland Delineation
2095 Kingstown Rd
A.P. 32-4, Lot 32

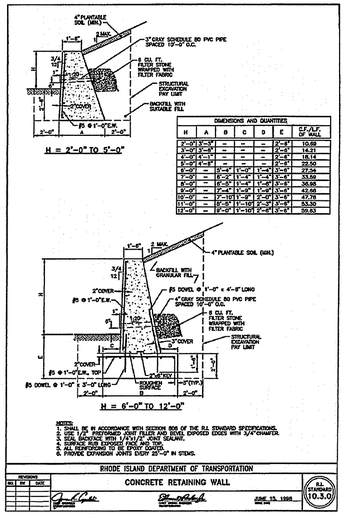
South Kingstown, RI

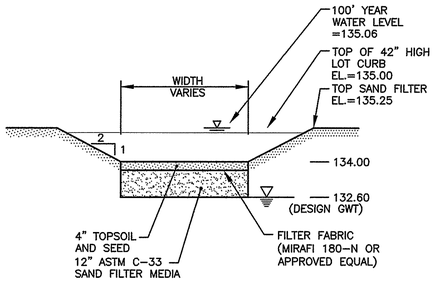
Performed by
Edward J. Avizinis, PWS, CPSS - 2/28/2020
Located using hand-held Trimble GeoXH

April 2019 aerial
RI DEM Mapping

Natural Resource Services, Inc.
PO Box 311
180 Tinkham Lane
Harrisville, RI 02830
p: (401) 568-7390
f: (401) 568-7490

I. 2016 Previous Design of "Dan's Place" Grading and Drainage Plan (File #16-0120)





SAND FILTER No. 1 DETAIL
NOT TO SCALE

NOTES:

1. PREPARE THE 4" TOPSOIL WITH THE FOLLOWING SAND, LOAM AND ORGANIC SOIL MIX: USDA LOAMY SAND OR SANDY LOAM SOIL TYPE MEETING THE FOLLOWING SPECIFICATION:

   ORGANIC MATTER: 2–5%
   CLAY: 0–2%
   SILT: 0–12%
   SAND: 85–88%

   FILTER FABRIC PLACED BETWEEN SAND AND TOPSOIL LAYERS SHALL BE MIRAFI 180–N OR APPROVED EQUAL.

2. SAND FILTER CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE RHODE ISLAND STORMWATER DESIGN AND INSTALLATION STANDARDS MANUAL, APPENDIX F.5, CONSTRUCTION STANDARDS/SPECIFICATIONS FOR FILTER BMP'S.

2. MATERIAL USED FOR SAND FILTER SHALL MEET THE REQUIREMENTS OF TABLE F–16 IN APPENDIX F.5.

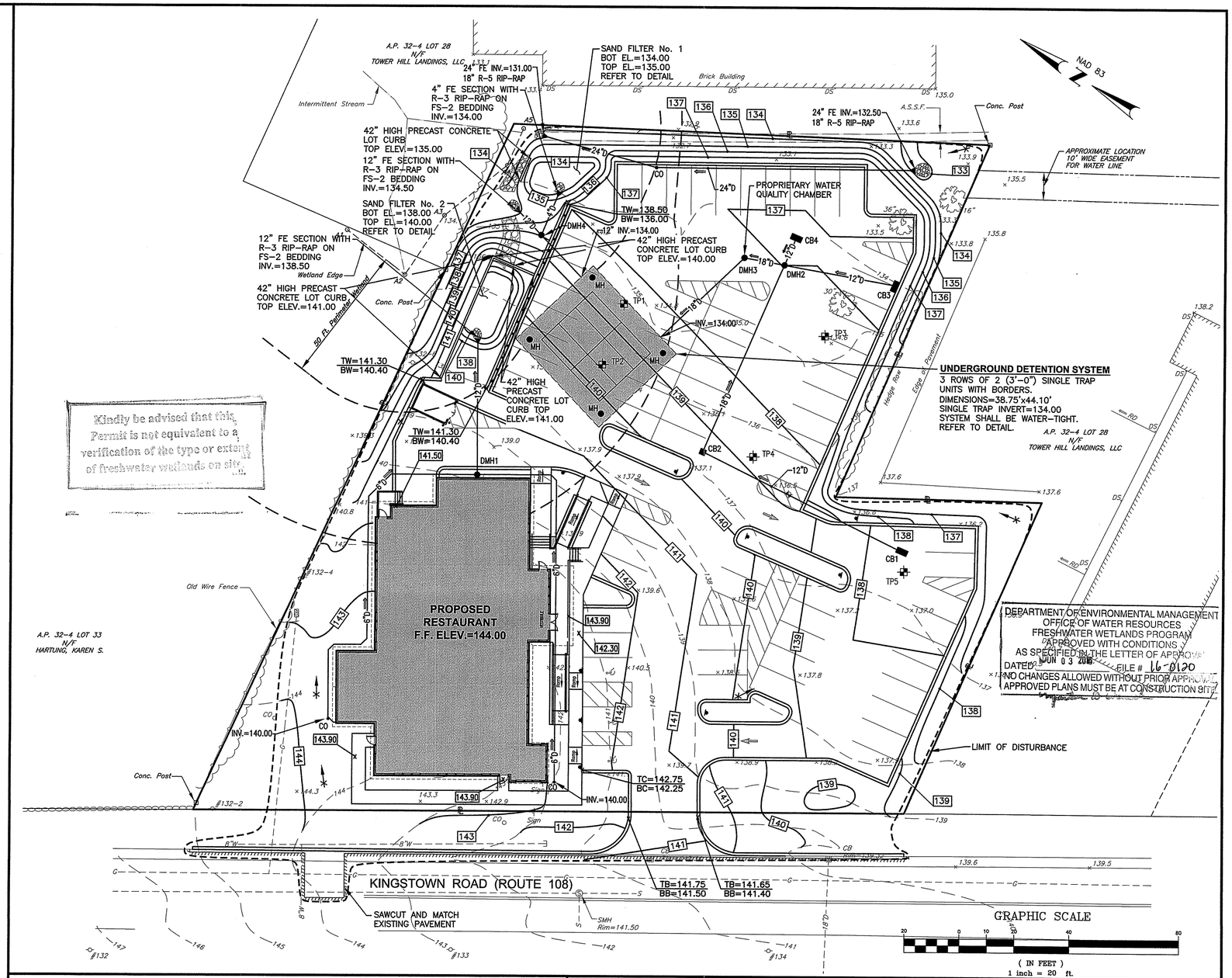
3. THE CONTRACTOR IS RESPONSIBLE TO BECOME FAMILIAR WITH THE ABOVE REFERENCED MANUAL. THE MANUAL CAN BE FOUND FOUND AT HTTP://WWW.DEM.RI.GOV/PUBS/REGS/WATER/SWMANUAL.PDF.

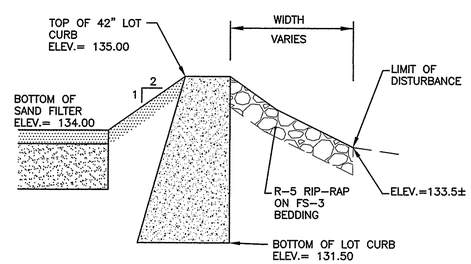
4. CONTRACTOR IS RESPONSIBLE TO SUBMIT SHOP DRAWINGS AND SPECIFICATIONS FOR SAND FILTER MATERIAL PRIOR TO START OF CONSTRUCTION.

DRAINAGE STRUCTURE TABLE

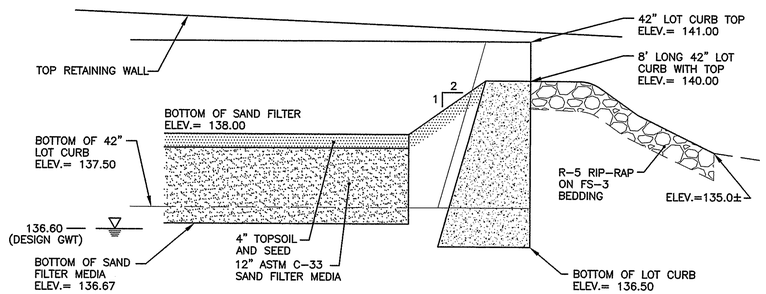
NUMBER	STRUCTURE	FRAME AND GRATE/COVER	RIM	INVERT (IN)	INVERT (OUT)
CB 1*	PRECAST CONCRETE (4' DIA.)	R.I. STD. 6.3.0 (DOUBLE)	137.65	---	135.50 (12")
CB 2	PRECAST CONCRETE (4' DIA.)	R.I. STD. 6.3.0	139.15	134.80 (12")	134.75 (18")
CB 3*	PRECAST CONCRETE (4' DIA.)	R.I. STD. 6.3.0 (DOUBLE)	136.80	---	134.70 (12")
CB 4*	PRECAST CONCRETE (4' DIA.)	R.I. STD. 6.3.0 (DOUBLE)	136.80	---	134.70 (12")
DMH 1	PRECAST CONCRETE (4' DIA.)	R.I. STD. 6.2.1	141.90	139.00 (6") 139.00 (6")	139.00 (12")
DMH 2*	PRECAST CONCRETE (6' DIA.)	R.I. STD. 6.2.1	137.00	134.35 (12") 134.35 (12") 134.35 (18")	134.30 (18")
DMH 3	STORMCEPTOR STC 2400	---	137.20	134.20 (18")	134.12 (18")
DMH 4	PRECAST CONCRETE (4' DIA.)	R.I. STD. 6.2.1	138.00	134.00 (12")	134.00 (4") 135.00 (12")

* PRECAST TOP SLAB CANNOT BE UTILIZED DUE TO PIPE CLEARANCE





42" HIGH LOT CURB INSTALLATION IN SAND FILTER No. 1 (LOOKING EAST)
NOT TO SCALE



42" HIGH LOT CURB INSTALLATION IN SAND FILTER No. 2 (LOOKING NORTH)
NOT TO SCALE

• Civil
• Transportation
• Environmental
• Site Planning
• Surveying
• Permitting
• Landscape Architecture

CROSSMAN ENGINEERING

Rhode Island
151 Centerville Road
Warwick, RI 02886
Phone: (401) 738-5660

Massachusetts
103 Commonwealth Avenue
North Attleboro, MA 02763
Phone: (508) 695-1700

Email: cel@crossmaneng.com

THESE DRAWINGS ARE THE PROPERTY OF CROSSMAN ENGINEERING AND HAVE BEEN PREPARED FOR THEIR CLIENT FOR A SPECIFIC SITE AND PROJECT. THESE DRAWINGS ARE NOT TO BE COPIED OR USED FOR ANY OTHER PURPOSE WITHOUT THE WRITTEN CONSENT OF CROSSMAN ENGINEERING.

STEVEN M. CABRAL
No. 4847
REGISTERED PROFESSIONAL ENGINEER
5-10-16

KEY PLAN

PROJECT TITLE:

PROPOSED RESTAURANT

PLAT MAP 32-4, LOT 32
ZONING DISTRICT: CN and R-10
COMMERCIAL NEIGHBORHOOD and MEDIUM HIGH DENSITY RESIDENTIAL DISTRICT and KINGSTOWN ROAD
SPECIAL MANAGEMENT DISTRICT

2089 KINGSTOWN ROAD (ROUTE 108)
SOUTH KINGSTOWN, R.I.

PREPARED FOR:

DAN'S PLACE

880 VICTORY HIGHWAY
WEST GREENWICH, RI

DRAWING TITLE:

GRADING and DRAINAGE PLAN

DATE:	SCALE:
JUNE 2015	1"=20'

DWG. NAME: 2072-C06-GRADE-R4.dwg

REVISIONS

NUMBER	REMARKS	DATE
1	RIDOT COMMENTS	8/21/15
2	TOWN SUBMISSION	8/28/15
3	RIDEM COMMENTS	10/30/15
4	DRAINAGE MODIFICATION	04/04/16

DRAWING NUMBER

C6

SHEET: 7 OF: 15