

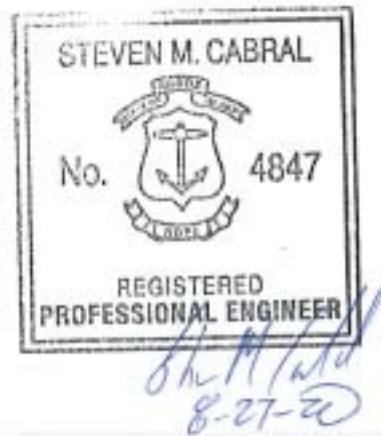
**DRAINAGE NARRATIVE AND ASSESSMENT  
FOR  
TOWER HILL LANDINGS ANNEX  
2095 KINGSTOWN ROAD (ROUTE 108)  
PLAT 32-4, LOT 32  
SOUTH KINGSTOWN, RHODE ISLAND**

**AUGUST 2020**

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## **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



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## **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 ( $F=0.35$ ).

$$\begin{aligned} I &= \text{Design Impervious} = \underline{16,830} \text{ sf} \\ &\text{(refer to Minimum Standard 6: Redevelopment and Infill Projects section)} \\ &= 1'' \times (1' / 12'') \times (0.35 \times 16,830 \text{ sf}) \\ &= \mathbf{491 \text{ cf}} \end{aligned}$$

#### **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.

$$\begin{aligned} \mathbf{RV_P} &= 471 \text{ cf (sand filter) + 955 cf (underground detention system)} \\ &= \mathbf{1,426 \text{ cf}} \end{aligned}$$

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).

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

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

$$\begin{aligned} T_D &= (1,426 \text{ cf}) / [(0.27 \text{ in/hr}) (1' / 12'') (939 \text{ sf})] \\ &= 67.5 \text{ hours} \end{aligned}$$

**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<sub>R</sub>):

$$WQV_R = 1'' \times I / 12$$

Where:  $WQV_R$  = Required Water Quality Volume

$$I = \text{Design Impervious} = 16,830 \text{ sf}$$

(refer to Minimum Standard 6: Redevelopment and Infill Projects section)

$$\begin{aligned} WQV_R &= 1'' \times (1'/12'') \times (16,830 \text{ sf}) \\ &= 1,403 \text{ cf} \end{aligned}$$

Provided Water Quality Volume (WQV<sub>P</sub>):

WQV<sub>P</sub> 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.

$$\begin{aligned} WQV_P &= 471 \text{ cf (sand filter)} + 955 \text{ cf (underground detention system)} \\ &= 1,426 \text{ cf} \end{aligned}$$

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 ft <sup>2</sup> (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	2,482 (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 (28,080)	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 ( <i>Node EA</i> )	2.19	2.83	4.93	6.53	9.70
Post-Development ( <i>Node PA</i> )	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 ( <i>Node EB</i> )	0.05	0.09	0.26	0.42	0.74
Post-Development ( <i>Node PB</i> )	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,

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

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.

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

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

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

$$\text{Design Storage Volume} = 63.0 \times \text{Length of Sediment Trap}$$
$$\text{Length of Sediment Trap} = \text{Design Storage Volume} / 63.0$$

### *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**

<b>PROJECT NAME</b> Tower Hill Landings Annex	(RIDEM USE ONLY)
<b>TOWN</b> South Kingstown	STW/WQC File #:
<b>BRIEF PROJECT DESCRIPTION:</b> 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)

<input checked="" type="checkbox"/> Residential	<input type="checkbox"/> Commercial	<input type="checkbox"/> Federal	<input type="checkbox"/> Retrofit	<input type="checkbox"/> Restoration
<input type="checkbox"/> Road	<input type="checkbox"/> Utility	<input type="checkbox"/> Fill	<input type="checkbox"/> Dredge	<input type="checkbox"/> Mine
<input type="checkbox"/> 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](#).

<input checked="" type="checkbox"/> <b>Groundwater</b>	<input checked="" type="checkbox"/> <b>Surface Water</b>	<input type="checkbox"/> <b>MS4</b>
<input type="checkbox"/> GAA	<input type="checkbox"/> Isolated Wetland	<input type="checkbox"/> RIDOT
<input checked="" type="checkbox"/> GA	<input type="checkbox"/> Named Waterbody	<input type="checkbox"/> RIDOT Alteration Permit is Approved
<input type="checkbox"/> GB	<input checked="" type="checkbox"/> Unnamed Waterbody Connected to Named Waterbody	<input type="checkbox"/> Town
		<input type="checkbox"/> Other (specify):

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

<input checked="" type="checkbox"/> Groundwater or Disconnected Wetland	<input type="checkbox"/> SRWP
<input checked="" type="checkbox"/> Waterbody Name: Unnamed	<input type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater <input checked="" type="checkbox"/> Unassessed
<input checked="" type="checkbox"/> Waterbody ID: RI0010045R-07	<input type="checkbox"/> 4 <sup>th</sup> order stream of pond 50 acres or more
<input checked="" type="checkbox"/> TMDL for: Enterococcus	<input type="checkbox"/> Watershed of flood prone river (e.g., Pocasset River)
<input type="checkbox"/> Contributes to a priority outfall listed in the TMDL	<input type="checkbox"/> Contributes stormwater to a public beach
<input type="checkbox"/> 303(d) list – Impairment(s) for:	<input type="checkbox"/> Contributes to shellfishing grounds

<b>PROJECT HISTORY</b>		
<input type="checkbox"/> RIDEM Pre- Application Meeting	Meeting Date:	<input type="checkbox"/> Minutes Attached
<input checked="" type="checkbox"/> Municipal Master Plan Approval	Approval Date: June 24, 2020	<input checked="" type="checkbox"/> Minutes Attached
<input type="checkbox"/> Subdivision Suitability Required	Approval #:	
<input type="checkbox"/> Previous Enforcement Action has been taken on the property	Enforcement #:	
<b>FLOODPLAIN &amp; FLOODWAY</b> See <a href="#">Guidance Pertaining to Floodplain and Floodways</a>		
<input type="checkbox"/> Riverine 100-year floodplain: <a href="#">FEMA FLOODPLAIN FIRMETTE</a> has been reviewed and the 100-year floodplain is on site		
<input type="checkbox"/> Delineated from FEMA Maps		
<b>NOTE:</b> 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		
<input type="checkbox"/> Calculated by Professional Engineer		
<input type="checkbox"/> Calculations are provided for cut vs. fill/displacement volumes proposed within the 100-year floodplain	Amount of Fill (CY):	
	Amount of Cut (CY):	
<input type="checkbox"/> Restrictions or modifications are proposed to the flow path or velocities in a floodway		
<input type="checkbox"/> Floodplain storage capacity is impacted		
<input checked="" type="checkbox"/> Project area is not within 100-year floodplain as defined by RIDEM		

<b>CRMC JURISDICTION</b>
<input type="checkbox"/> CRMC Assent required
<input type="checkbox"/> Property subject to a Special Area Management Plan (SAMP). If so, specify which SAMP:
<input type="checkbox"/> Sea level rise mitigation has been designed into this project

<b>LUHPPL IDENTIFICATION - MINIMUM STANDARD 8:</b>		
<b>1. OFFICE OF WASTE MANAGEMENT (OWM)</b>		
<input type="checkbox"/> 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))		<b>RIDEM CONTACT:</b>
<input type="checkbox"/> 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)		
<input type="checkbox"/> This site is identified on the <a href="#">RIDEM Environmental Resources Map</a> as one of the following regulated facilities		<b>SITE ID#:</b>
<input type="checkbox"/> CERCLIS/Superfund (NPL)		
<input type="checkbox"/> State Hazardous Waste Site (SHWS)		
<input type="checkbox"/> Environmental Land Usage Restriction (ELUR)		
<input type="checkbox"/> Leaking Underground Storage Tank (LUST)		
<input type="checkbox"/> Closed Landfill		
<b>Note:</b> 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.		
<b>2. PER MINIMUM STANDARD 8 of RICR 8.14.C.1-6 "LUHPPLS," THE SITE IS/HAS:</b>		
<input type="checkbox"/> Industrial Site with RIPDES MSGP, except where No Exposure Certification exists. <a href="http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php">http://www.dem.ri.gov/programs/water/permits/ripdes/stormwater/status.php</a>		
<input type="checkbox"/> Auto Fueling Facility (e.g., gas station)		
<input type="checkbox"/> Exterior Vehicles Service, Maintenance, or Equipment Cleaning Area		

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<input type="checkbox"/>	Road Salt Storage and Loading Areas (exposed to rainwater)	
<input type="checkbox"/>	Outdoor Storage and Loading/Unloading of Hazardous Substances	
<b>3. STORMWATER INDUSTRIAL PERMITTING</b>		
<input type="checkbox"/>	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:
<input type="checkbox"/>	Construction is proposed on a site that is subject to <a href="#">THE MULTI-SECTOR GENERAL PERMIT (MSGP) UNDER RULE 31(B)15 OF THE RIPDES REGULATIONS.</a>	MSGP permit #
<input type="checkbox"/>	Additional stormwater treatment is required by the MSGP Explain:	

<b>REDEVELOPMENT STANDARD – MINIMUM STANDARD 6</b>		
<input checked="" type="checkbox"/> Pre Construction Impervious Area		
<input checked="" type="checkbox"/>	Total Pre-Construction Impervious Area (TIA) = 32,264 sf	
<input checked="" type="checkbox"/>	Total Site Area (TSA) = 63,750 sf	
<input checked="" type="checkbox"/>	Jurisdictional Wetlands (JW) = 0 sf	
<input checked="" type="checkbox"/>	Conservation Land (CL) = 0 sf	
<input checked="" type="checkbox"/> Calculate the Site Size (defined as contiguous properties under same ownership)		
<input checked="" type="checkbox"/>	Site Size (SS) = (TSA) – (JW) – (CL) = 63,750 sf	
<input checked="" type="checkbox"/>	(TIA) / (SS) = 0.56	<input checked="" type="checkbox"/> (TIA) / (SS) >0.4?
<input checked="" type="checkbox"/> YES, Redevelopment		

<b>PART 2. LOW IMPACT DEVELOPMENT ASSESSMENT – MINIMUM STANDARD 1</b> (NOT REQUIRED FOR REDEVELOPMENT OR RETROFITS) This section may be deleted if not required.	
<b>Note:</b> 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: <ul style="list-style-type: none"> <li>• Town requires ... (state the specific local requirement)</li> <li>• Meets Town’s dimensional requirement of ...</li> <li>• Not practical for site because ...</li> <li>• Applying for waiver/variance to achieve this (pending/approved/denied)</li> <li>• Applying for wavier/variance to seek relief from this (pending/approved/denied)</li> </ul>	
<b>A) PRESERVATION OF UNDISTURBED AREAS, BUFFERS, AND FLOODPLAINS</b> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Sensitive resource areas and site constraints are identified (required)</li> <li><input checked="" type="checkbox"/> Local development regulations have been reviewed (required)</li> <li><input checked="" type="checkbox"/> All vegetated buffers and coastal and freshwater wetlands will be protected during and after construction</li> <li><input checked="" type="checkbox"/> Conservation Development or another site design technique has been incorporated to protect open space and pre-development hydrology. <b>Note:</b> If Conservation Development has been used, check box and skip to Subpart C</li> <li><input checked="" type="checkbox"/> As much natural vegetation and pre-development hydrology as possible has been maintained</li> </ul>	<b>IF NOT IMPLEMENTED, EXPLAIN HERE</b>

<p><b>B) LOCATE DEVELOPMENT IN LESS SENSITIVE AREAS AND WORK WITH THE NATURAL LANDSCAPE CONDITIONS, HYDROLOGY, AND SOILS</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Development sites and building envelopes have been appropriately distanced from wetlands and waterbodies</li> <li><input checked="" type="checkbox"/> Development and stormwater systems have been located in areas with greatest infiltration capacity (e.g., soil groups A and B)</li> <li><input type="checkbox"/> Plans show measures to prevent soil compaction in areas designated as Qualified Pervious Areas (QPA's)</li> <li><input checked="" type="checkbox"/> Development sites and building envelopes have been positioned outside of floodplains</li> <li><input checked="" type="checkbox"/> Site design positions buildings, roadways and parking areas in a manner that avoids impacts to surface water features</li> <li><input checked="" type="checkbox"/> Development sites and building envelopes have been located to minimize impacts to steep slopes (<math>\geq 15\%</math>)</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>C) MINIMIZE CLEARING AND GRADING</b></p> <ul style="list-style-type: none"> <li><input checked="" type="checkbox"/> Site clearing has been restricted to <u>minimum area needed</u> for building footprints, development activities, construction access, and safety.</li> <li><input checked="" type="checkbox"/> Site has been designed to position buildings, roadways, and parking areas in a manner that minimizes grading (cut and fill quantities)</li> <li><input type="checkbox"/> 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)</li> <li><input type="checkbox"/> Plan notes specify that public trees removed or damaged during construction shall be replaced with equivalent</li> </ul>	
<p><b>D) REDUCE IMPERVIOUS COVER</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Reduced roadway widths (<math>\leq 22</math> feet for ADT <math>\leq 400</math>; <math>\leq 26</math> feet for ADT 400 - 2,000)</li> <li><input type="checkbox"/> Reduced driveway areas (length minimized via reduced ROW width (<math>\leq 45</math> ft.) and/or reduced (or absolute minimum) front yard setback; width minimized to <math>\leq 9</math> ft. wide one lane; <math>\leq 18</math> ft. wide two lanes; shared driveways; pervious surface)</li> <li><input type="checkbox"/> Reduced building footprint: Explain approach:</li>   <li><input type="checkbox"/> Reduced sidewalk area (<math>\leq 4</math> ft. wide; one side of the street; unpaved path; pervious surface)</li> <li><input type="checkbox"/> Reduced cul-de-sacs (radius <math>&lt; 45</math> ft; vegetated island; alternative turn-around)</li> <li><input type="checkbox"/> Reduced parking lot area: Explain approach:</li> <li><input checked="" type="checkbox"/> Use of pervious surfaces for driveways, sidewalks, parking areas/overflow parking areas, etc.</li> <li><input type="checkbox"/> Minimized impervious surfaces (project meets or is less than maximum specified by Zoning Ordinance)</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>E) DISCONNECT IMPERVIOUS AREA</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Impervious surfaces have been disconnected, and runoff has been diverted to QPAs to the maximum extent possible</li> <li><input type="checkbox"/> Residential street edges allow side-of-the-road drainage into vegetated open swales</li> <li><input type="checkbox"/> Parking lot landscaping breaks up impervious expanse AND accepts runoff</li> <li><input type="checkbox"/> Other (describe):</li> </ul>	
<p><b>F) MITIGATE RUNOFF AT THE POINT OF GENERATION</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Small-scale BMPs have been designated to treat runoff as close as possible to the source</li> </ul>	

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

**PART 3. SUMMARY OF REMAINING STANDARDS**

GROUNDWATER RECHARGE – MINIMUM STANDARD 2		
YES	NO	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	The project has been designed to meet the groundwater recharge standard.
<input type="checkbox"/>	<input type="checkbox"/>	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);
<input type="checkbox"/>	<input type="checkbox"/>	Your waiver request has been explained in the Narrative, if applicable.
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is this site identified as a Regulated Facility in Part 1, Minimum Standard 8: LUHPPL Identification?
<input type="checkbox"/>	<input type="checkbox"/>	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 <sub>v</sub> Required (cu ft)	LID Stormwater Credits (see RISDISM Section 4.6.1)	Recharge Required by Remaining BMPs (cu ft)	Recharge Provided by BMPs (cu ft)
			Portion of Re <sub>v</sub> directed to a QPA (cu ft)		
DP-A: Wetlands	30,377	491	0	491	1,426
<p><u>Notes:</u></p> <p>1. Only BMPs listed in RISDISM Table 3-5 “List of BMPs Acceptable for Recharge” may be used to meet the recharge requirement.</p> <p>2. Recharge requirement must be satisfied for each waterbody ID.</p> <p><input type="checkbox"/> Indicate where the pertinent calculations and/or information for the above items are provided (i.e., name of report/document, page numbers, appendices, etc.):</p>					

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

<b>TABLE 3-1: Summary of Water Quality (see RICR 8.9)</b>					
<b>Design Point and WB ID</b>	<b>Impervious area treated (sq ft)</b>	<b>Total WQv Required (cu ft)</b>	<b>LID Stormwater Credits (see RICR 8.18)</b>	<b>Water Quality Treatment Remaining (cu ft)</b>	<b>Water Quality Provided by BMPs (cu ft)</b>
			<b>WQv directed to a QPA (cu ft)</b>		
DP-A: Wetlands	30,377	1,403	0	1,403	1,426
<b>Notes:</b>					
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.					
<input checked="" type="checkbox"/> YES	This project has met the setback requirements for each BMP.				
<input type="checkbox"/> NO	If “No,” please explain:				
<input checked="" type="checkbox"/>	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				

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<b>CONVEYANCE AND NATURAL CHANNEL PROTECTION (RICR 8.10) – MINIMUM STANDARD 4</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Is this standard waived? If “Yes,” please indicate one or more of the reasons below:
		<input type="checkbox"/> 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. <input type="checkbox"/> The project directs is a small facility with impervious cover of less than or equal to 1 acre. <input type="checkbox"/> 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). ( <u>Note</u> : LID design strategies can greatly reduce the peak discharge rate).
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Conveyance and natural channel protection for the site have been met. If “No,” explain why:  Redevelopment Project

<b>TABLE 4-1: Summary of Channel Protection Volumes (see RICR 8.10)</b>					
<b>Design Point</b>	<b>Receiving Water Body Name</b>	<b>Coldwater Fishery? (Y/N)</b>	<b>Total CPv Required (cu ft)</b>	<b>Total CPv Provided (cu ft)</b>	<b>Average Release Rate Modeled in the 1-yr storm (cfs)</b>
DP-1:					
DP-2:					
DP-3:					
DP-4:					
<b>TOTALS:</b>					
<u>Note</u> : The Channel Protection Volume Standard must be met in each waterbody ID.					
<input type="checkbox"/> YES <input type="checkbox"/> 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).				
<input type="checkbox"/> YES <input type="checkbox"/> NO	Do additional design restrictions apply resulting from any discharge to cold-water fisheries; If “Yes,” please indicate restrictions and solutions below.				
<input type="checkbox"/> 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.).					

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

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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.								
<u>Note:</u> The hydraulic analysis must demonstrate no impact to each individual subwatershed DP unless each DP discharges to the same wetland or water resource.								
<b>Indicate as follows where the pertinent calculations and/or information for the items above are provided</b>						<b>Name of report/document, page numbers, appendices, etc.</b>		
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 <sub>v</sub>	WQ <sub>v</sub>	CP <sub>v</sub> (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	

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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	
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Describe any LUHPPLs identified in Part 1, Minimum Standard 8, Section 2. If not applicable, continue to Minimum Standard 9.
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	Are these activities already covered under an MSGP? If “No,” please explain if you have applied for an MSGP or intend to do so?
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	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:
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	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	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you checked for illicit discharges?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have any been found and/or corrected? If “Yes,” please identify.
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	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	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you included a Soil Erosion and Sediment Control Plan Set and/or Complete Construction Plan Set?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Have you provided a <b>separately-bound</b> document based upon the <a href="#">SESC Template</a> ? If yes, proceed to Minimum Standard 11 (the following items can be assumed to be addressed).

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

	If “No,” include a document with your submittal that addresses the following elements of an SESC Plan:	
<input type="checkbox"/>	Soil Erosion and Sediment Control Plan Project Narrative, including a description of how the fifteen (15) Performance Criteria have been met:	
<input type="checkbox"/>	Provide Natural Buffers and Maintain Existing Vegetation	
<input type="checkbox"/>	Minimize Area of Disturbance	
<input type="checkbox"/>	Minimize the Disturbance of Steep Slopes	
<input type="checkbox"/>	Preserve Topsoil	
<input type="checkbox"/>	Stabilize Soils	
<input type="checkbox"/>	Protect Storm Drain Inlets	
<input type="checkbox"/>	Protect Storm Drain Outlets	
<input type="checkbox"/>	Establish Temporary Controls for the Protection of Post-Construction Stormwater Control Measures	
<input type="checkbox"/>	Establish Perimeter Controls and Sediment Barriers	
<input type="checkbox"/>	Divert or Manage Run-On from Up-Gradient Areas	
<input type="checkbox"/>	Properly Design Constructed Stormwater Conveyance Channels	
<input type="checkbox"/>	Retain Sediment On-Site	
<input type="checkbox"/>	Control Temporary Increases in Stormwater Velocity, Volume, and Peak Flows	
<input type="checkbox"/>	Apply Construction Activity Pollution Prevention Control Measures	
<input type="checkbox"/>	Install, Inspect, and Maintain Control Measures and Take Corrective Actions	
<input type="checkbox"/>	Qualified SESC Plan Preparer’s Information and Certification	
<input type="checkbox"/>	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	
<input type="checkbox"/>	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	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have you minimized all sources of pollutant contact with stormwater runoff, to the maximum extent practicable?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Have you provided a <b>separately-bound</b> 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?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Lawn, Garden, and Landscape Management meet the requirements of RISDISM Section G.7? If “No,” why not?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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.).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Is stormwater being directed from public areas to private property? If “Yes,” note the following: <u>Note:</u> 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		

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<input checked="" type="checkbox"/>	<input type="checkbox"/>	Designated snow stockpile locations?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Trash racks to prevent floatables, trash, and debris from discharging to Waters of the State?
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Asphalt-only based sealants?
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Pet waste stations? ( <u>Note</u> : 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).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Regular sweeping? Please describe: Refer to O&M Plan
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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).
<input checked="" type="checkbox"/>	<input type="checkbox"/>	A prohibition of phosphate-based fertilizers? ( <u>Note</u> : 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	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed drainage area delineations
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Locations of all streams and drainage swales
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Drainage flow paths, mapped according to the DEM <i>Guidance for Preparation of Drainage Area Maps</i> (included in RISDISM Appendix K)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Complete drainage area boundaries; include off-site areas in both mapping and analyses, as applicable
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped seasonal high-water-table test pit locations
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped locations of the site-specific borings and/or test pits and soils information from the test pits at the locations of the BMPs
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped locations of the BMPs, with the BMPs consistently identified on the Site Construction Plans
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Mapped bedrock outcrops adjacent to any infiltration BMP
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Soils were logged by a:
	<input checked="" type="checkbox"/>	DEM-licensed Class IV soil evaluator Name: Brian King
	<input checked="" type="checkbox"/>	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

Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8)

<b>Site Construction Plans (Indicate that the following applicable specifications are provided)</b>		
<b>YES</b>	<b>NO</b>	
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed plans (scale not greater than 1" = 40') with North arrow
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Existing and proposed site topography (with 1 or 2-foot contours); 10-foot contours accepted for off-site areas
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Boundaries of existing predominant vegetation and proposed limits of clearing
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Site Location clarification
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Location and field-verified boundaries of resource protection areas such as: <ul style="list-style-type: none"> <li>▶ freshwater and coastal wetlands, including lakes and ponds</li> <li>▶ coastal shoreline features</li> </ul> Perennial and intermittent streams, in addition to Areas Subject to Storm Flowage (ASSFs)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	All required setbacks (e.g., buffers, water-supply wells, septic systems)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	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: <ul style="list-style-type: none"> <li>▶ 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;</li> <li>▶ Design water surface elevations (applicable storms);</li> <li>▶ Structural details of outlet structures, embankments, spillways, stilling basins, grade-control structures, conveyance channels, etc.;</li> <li>▶ Existing and proposed structural elevations (e.g., inverts of pipes, manholes, etc.);</li> <li>▶ 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;</li> <li>▶ Planting plans for structural stormwater BMPs, including species, size, planting methods, and maintenance requirements of proposed planting</li> </ul>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Logs of borings and/or test pit investigations along with supporting soils/geotechnical report and corresponding water tables
<input type="checkbox"/>	<input checked="" type="checkbox"/>	Mapping of any OWM-approved remedial actions/systems (including ELURs)
<input checked="" type="checkbox"/>	<input type="checkbox"/>	Location of existing and proposed roads, buildings, and other structures including limits of disturbance; <ul style="list-style-type: none"> <li>▶ Existing and proposed utilities (e.g., water, sewer, gas, electric) and easements;</li> <li>▶ 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.);</li> <li>▶ Cross sections of roadways, with edge details such as curbs and sidewalks;</li> <li>▶ Location and dimensions of channel modifications, such as bridge or culvert crossings</li> </ul>
<input type="checkbox"/>	<input checked="" type="checkbox"/>	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# 6911  
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.

- 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:

<b>Article IV – Special Requirements: (G) Landscaping</b>	
<i>(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.</i>	
Required:	10’ (minimum)
Proposed:	0’
<b>Article IV – Special Requirements: (H) Multi Household Dwellings</b>	
<i>(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.</i>	
Required:	100’ front yard setback 50’ landscaped buffer zone
Proposed:	25’ front yard setback 25’ landscaped buffer
<i>(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.</i>	
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 with 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.

Tower Hill Landings Annex  
Major Land Development – Conceptual Master Plan Approval  
June 24, 2020

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**



**CROSSMAN ENGINEERING**

Rhode Island  
 151 Centerville Road  
 Warwick, RI 02886  
 Phone: (401) 738-5660  
 Email: cel@crossmaneng.com

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

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**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

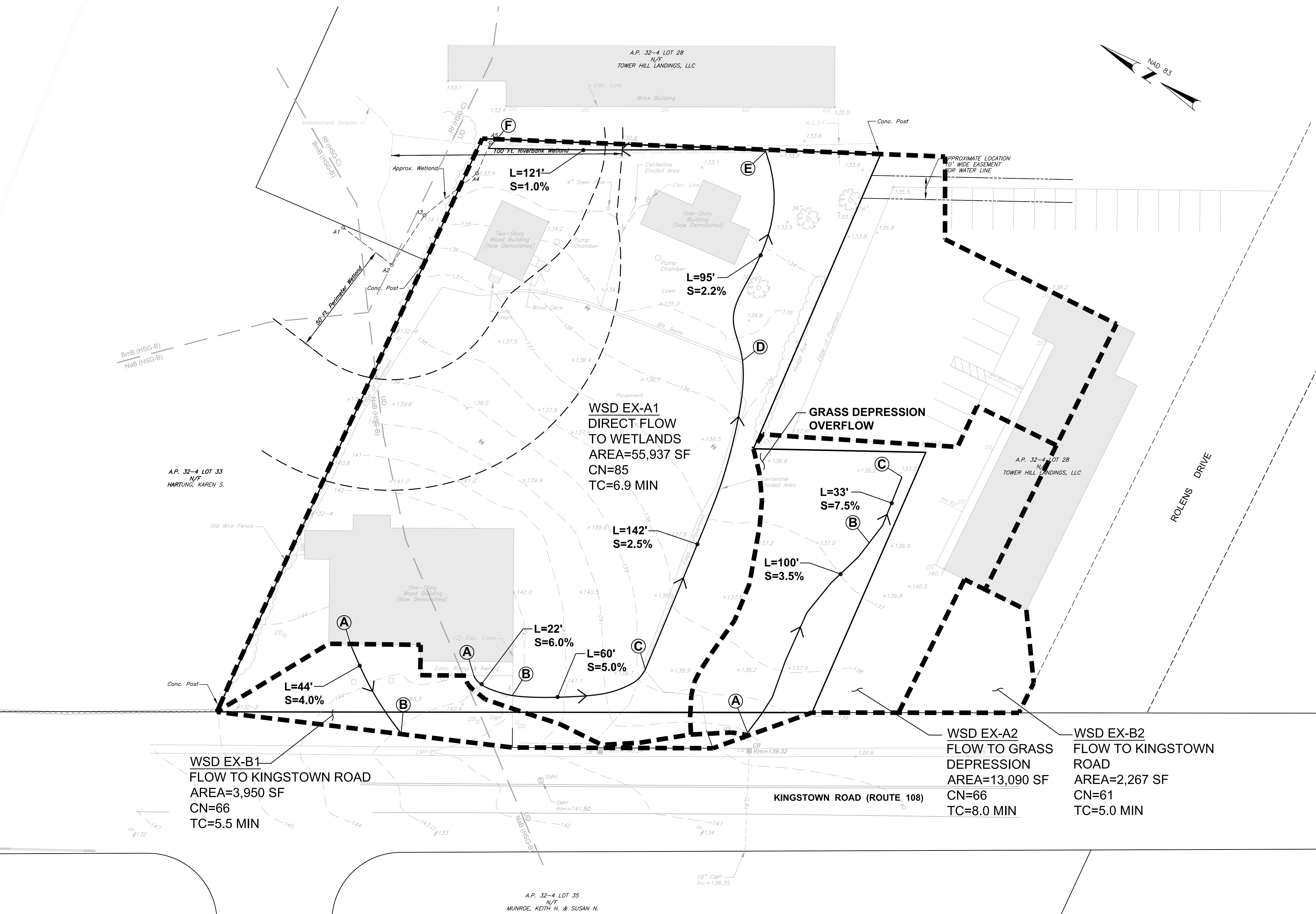
**DRAWING TITLE:**  
**PRE-DEVELOPMENT WATERSHED MAP**

**DATE:** JULY 2020  
**SCALE:** 1"=20'  
**DWG. NAME:** 2449-EXWSD.dwg

**REVISIONS**

NUMBER	REMARKS	DATE

**DRAWING NUMBER:**  
**EX-WSD**  
 SHEET: \_\_\_ OF: \_\_\_

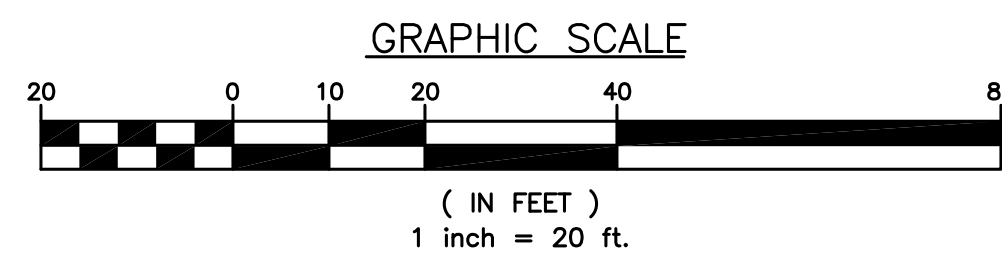


**WSD EX-B1**  
 FLOW TO KINGSTOWN ROAD  
 AREA=3,950 SF  
 CN=66  
 TC=5.5 MIN

**WSD EX-A1**  
 DIRECT FLOW  
 TO WETLANDS  
 AREA=55,937 SF  
 CN=85  
 TC=6.9 MIN

**WSD EX-A2**  
 FLOW TO GRASS  
 DEPRESSION  
 AREA=13,090 SF  
 CN=66  
 TC=8.0 MIN

**WSD EX-B2**  
 FLOW TO KINGSTOWN  
 ROAD  
 AREA=2,267 SF  
 CN=61  
 TC=5.0 MIN





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151 Centerville Road  
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**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**

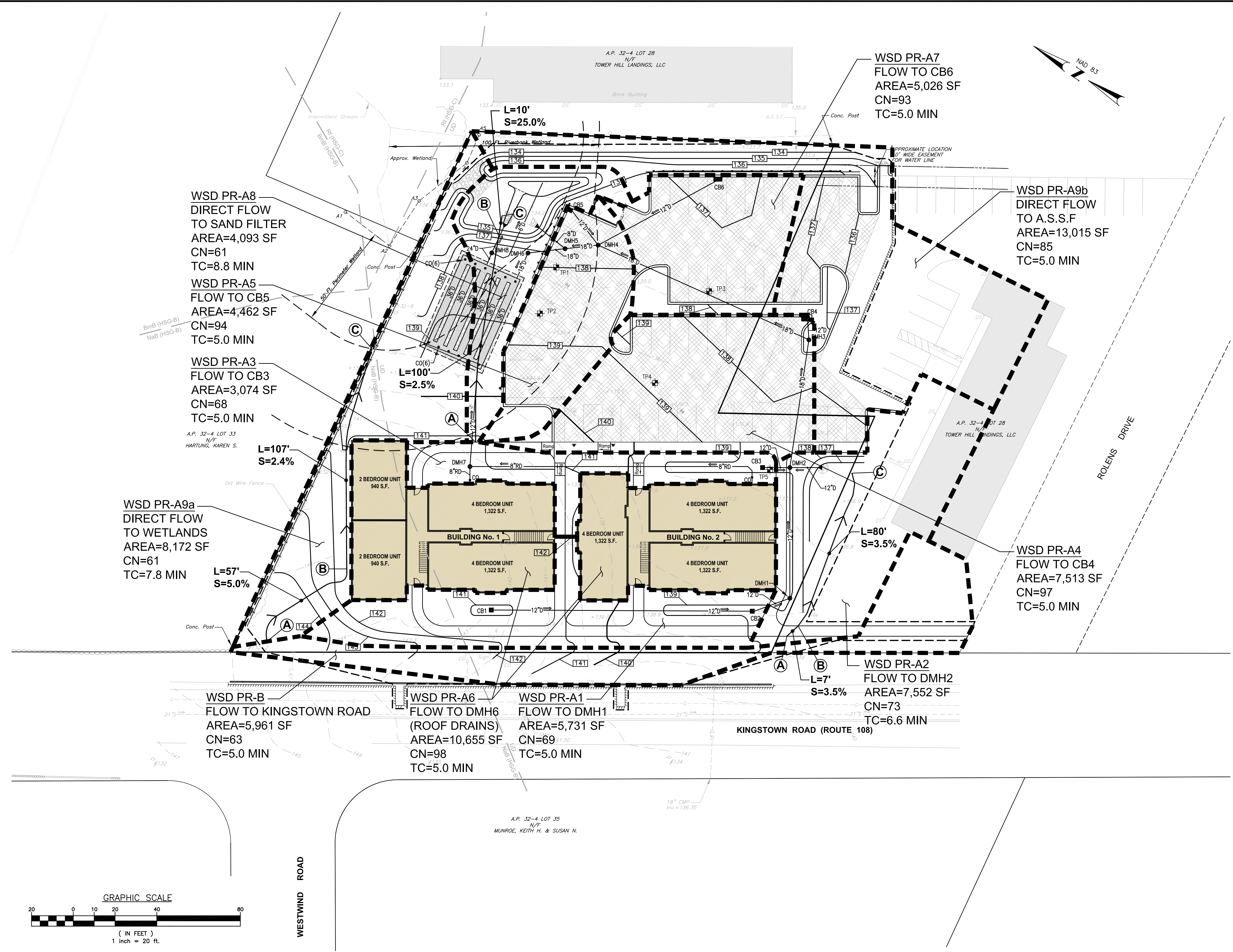
**DATE:** JULY 2020 **SCALE:** 1"=20'

**DWG. NAME:** 2449-PRWSD.dwg

REVISIONS		
NUMBER	REMARKS	DATE

**DRAWING NUMBER**  
**PR-WSD**

SHEET: \_\_\_ OF: \_\_\_



**WSD PR-A8**  
DIRECT FLOW  
TO SAND FILTER  
AREA=4,093 SF  
CN=61  
TC=8.8 MIN

**WSD PR-A5**  
FLOW TO CB5  
AREA=4,462 SF  
CN=94  
TC=5.0 MIN

**WSD PR-A3**  
FLOW TO CB3  
AREA=3,074 SF  
CN=68  
TC=5.0 MIN

**WSD PR-A9a**  
DIRECT FLOW  
TO WETLANDS  
AREA=8,172 SF  
CN=61  
TC=7.8 MIN

**WSD PR-B**  
FLOW TO KINGSTOWN ROAD  
AREA=5,961 SF  
CN=63  
TC=5.0 MIN

**WSD PR-A6**  
FLOW TO DMH6  
(ROOF DRAINS)  
AREA=10,655 SF  
CN=98  
TC=5.0 MIN

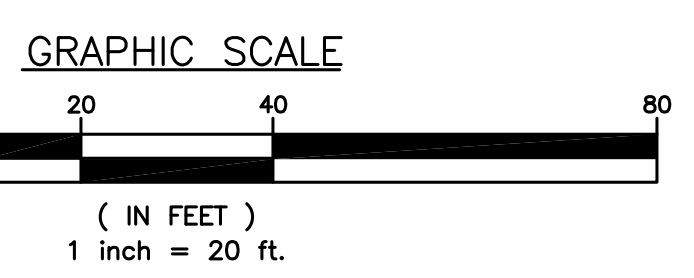
**WSD PR-A1**  
FLOW TO DMH1  
AREA=5,731 SF  
CN=69  
TC=5.0 MIN

**WSD PR-A2**  
FLOW TO DMH2  
AREA=7,552 SF  
CN=73  
TC=6.6 MIN

**WSD PR-A4**  
FLOW TO CB4  
AREA=7,513 SF  
CN=97  
TC=5.0 MIN

**WSD PR-A9b**  
DIRECT FLOW  
TO A.S.S.F  
AREA=13,015 SF  
CN=85  
TC=5.0 MIN

**WSD PR-A7**  
FLOW TO CB6  
AREA=5,026 SF  
CN=93  
TC=5.0 MIN



WESTWIND ROAD

ROLENS DRIVE

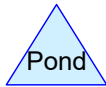
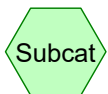
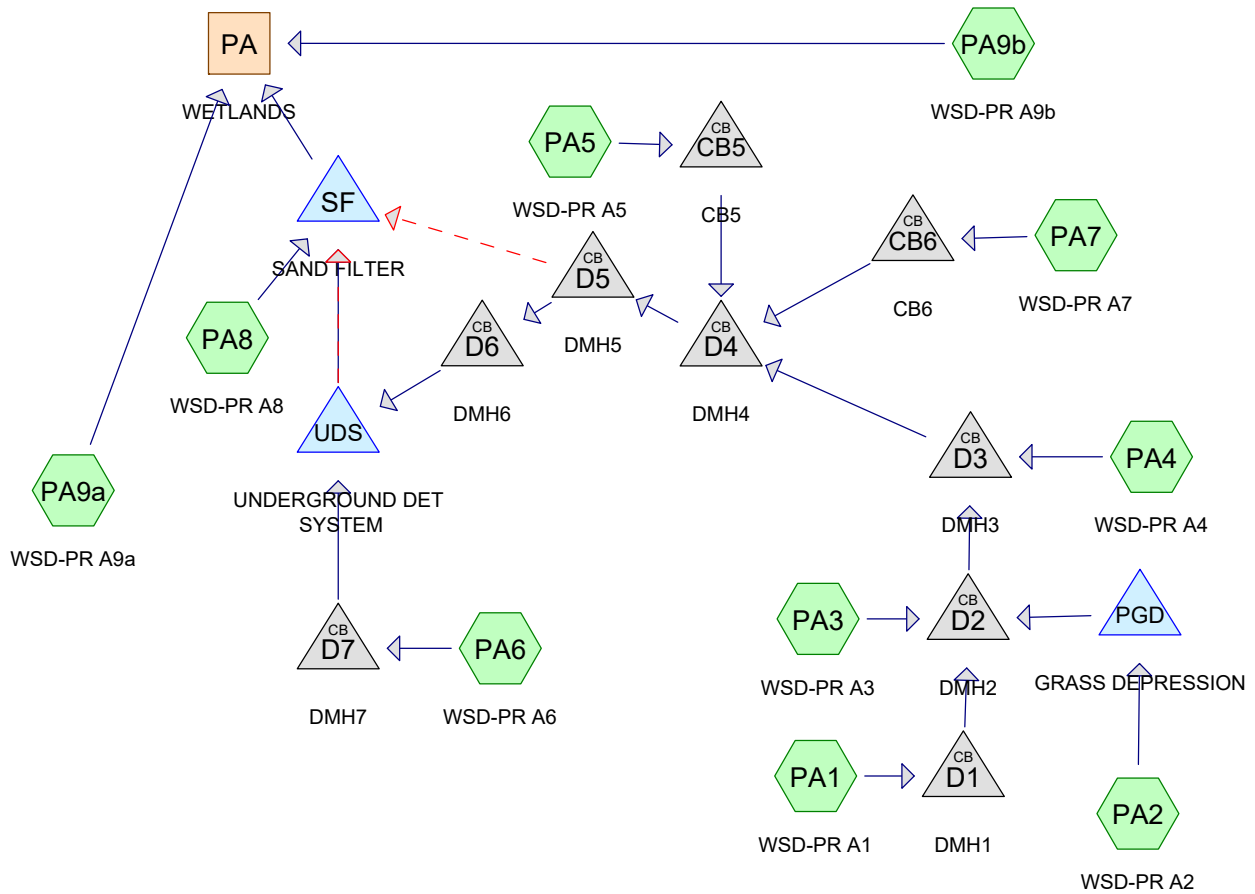
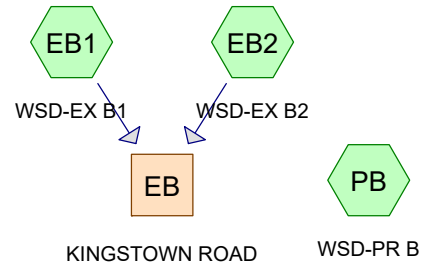
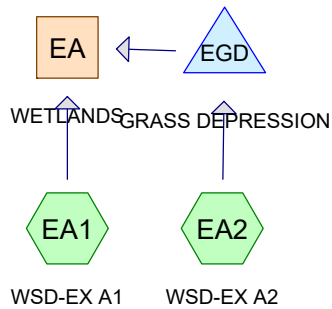
KINGSTOWN ROAD (ROUTE 108)

A.P. 32-4 LOT 35  
N/F  
MUNROE, KEITH H. & SUSAN N.

A.P. 32-4 LOT 28  
N/F  
TOWER HILL LANDINGS, LLC

A.P. 32-4 LOT 28  
N/F  
TOWER HILL LANDINGS, LLC

**C. Stormwater Runoff Calculations (HydroCAD)**



**Routing Diagram for 2449-HydroCAD (Aug 2020)**  
 Prepared by Crossman Engineering, Printed 8/25/2020  
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**2449-HydroCAD (Aug 2020)**

Prepared by Crossman Engineering

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NRCC 24-hr C 1-Year Rainfall=2.80"

Printed 8/25/2020

**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		<b>Sheet Flow, AB</b> Grass: Dense n= 0.240 P2= 3.30"
0.5	60	0.0500	1.82		<b>Sheet Flow, BC</b> Smooth surfaces n= 0.011 P2= 3.30"
0.9	142	0.0250	2.55		<b>Shallow Concentrated Flow, CD</b> Unpaved Kv= 16.1 fps
1.5	95	0.0220	1.04		<b>Shallow Concentrated Flow, DE</b> Short Grass Pasture Kv= 7.0 fps
1.3	121	0.0100	1.50		<b>Shallow Concentrated Flow, EF</b> Grassed Waterway Kv= 15.0 fps
6.9	440	Total			

**2449-HydroCAD (Aug 2020)**

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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		<b>Sheet Flow, AB</b> Grass: Short n= 0.150 P2= 3.30"
0.3	33	0.0750	1.92		<b>Shallow Concentrated Flow, BC</b> Short Grass Pasture Kv= 7.0 fps
8.0	133	Total			

**2449-HydroCAD (Aug 2020)**

NRCC 24-hr C 1-Year Rainfall=2.80"

Prepared by Crossman Engineering

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**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	<b>Custom Stage Data (Prismatic)</b> 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'	<b>1.020 in/hr Exfiltration over Surface area</b>
#2	Primary	136.60'	<b>10.0' long x 4.0' breadth Broad-Crested Rectangular Weir</b> 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)

**2449-HydroCAD (Aug 2020)**

NRCC 24-hr C 1-Year Rainfall=2.80"

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**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		<b>Sheet Flow, AB</b> 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					<b>Direct Entry,</b>

**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

**2449-HydroCAD (Aug 2020)**

NRCC 24-hr C 1-Year Rainfall=2.80"

Prepared by Crossman Engineering

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**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					<b>Direct Entry,</b>

**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		<b>Sheet Flow, AB</b> Smooth surfaces n= 0.011 P2= 3.30"
6.5	80	0.0350	0.21		<b>Sheet Flow, BC</b> Grass: Short n= 0.150 P2= 3.30"
6.6	87	Total			

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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					<b>Direct Entry,</b>

**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					<b>Direct Entry,</b>

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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					<b>Direct Entry,</b>

**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					<b>Direct Entry,</b>

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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					<b>Direct Entry,</b>

**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		<b>Sheet Flow, AB</b>
					Grass: Short n= 0.150 P2= 3.30"
0.0	10	0.2500	3.50		<b>Shallow Concentrated Flow, BC</b>
					Short Grass Pasture Kv= 7.0 fps
8.8	110	Total			

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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		<b>Sheet Flow, AB</b>
					Grass: Dense n= 0.240 P2= 3.30"
1.6	107	0.0240	1.08		<b>Shallow Concentrated Flow, BC</b>
					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					<b>Direct Entry,</b>

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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'	<b>12.0" Round Culvert</b> L= 60.0' Ke= 0.500 Inlet / Outlet Invert= 135.80' / 135.20' S= 0.0100 1/1 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	<b>Custom Stage Data (Prismatic)</b> 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'	<b>1.020 in/hr Exfiltration over Surface area</b>
#2	Primary	136.50'	<b>12.0" Round Culvert</b> L= 13.0' RCP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 136.50' / 135.80' S= 0.0538 1/1 Cc= 0.900 n= 0.050, Flow Area= 0.79 sf

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*NRCC 24-hr C 1-Year Rainfall=2.80"*

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**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)

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**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'	<b>18.0" Round Culvert</b> 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'	<b>18.0" Round Culvert</b> 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)

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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'	<b>12.0" Round Culvert</b> 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'	<b>12.0" Round Culvert</b> 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)

## 2449-HydroCAD (Aug 2020)

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NRCC 24-hr C 1-Year Rainfall=2.80"

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### 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'	<b>18.0" Round Culvert</b> 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'	<b>18.0" Round Culvert</b> 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'	<b>8.0" Round Culvert</b> 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)

**2449-HydroCAD (Aug 2020)**

NRCC 24-hr C 1-Year Rainfall=2.80"

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**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'	<b>18.0" Round Culvert</b> L= 12.0' Ke= 0.500 Inlet / Outlet Invert= 133.42' / 133.30' S= 0.0100 1' 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	<b>32.75'W x 50.00'L x 4.50'H Field A</b> 7,369 cf Overall - 2,654 cf Embedded = 4,715 cf x 0.0% Voids
#2A	133.00'	2,126 cf	<b>ADS N-12 36" x 12 Inside #1</b> 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'	<b>24.0" Round 24"D</b> 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'	<b>12.0" W x 6.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 1	134.50'	<b>12.0" W x 5.0" H Vert. Orifice/Grate</b> C= 0.600
#4	Device 1	135.95'	<b>5.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#5	Secondary	133.00'	<b>6.0" Round 6"UD</b> 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

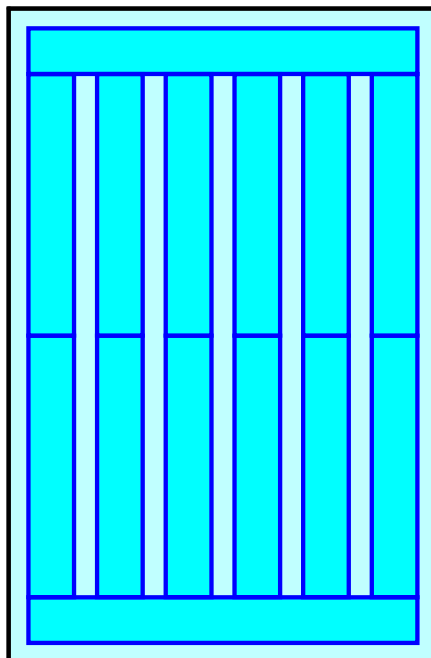
Overall Storage Efficiency = 28.9%

Overall System Size = 50.00' x 32.75' x 4.50'

12 Chambers

272.9 cy Field

174.7 cy Stone



**2449-HydroCAD (Aug 2020)**

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**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	<b>2,125</b>
133.65	170	136.30	<b>2,126</b>
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		

Volume below Sand Filter Weir  
Elev. 134.63 = 955 CF



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**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	<b>Sand Filter (Prismatic)</b> 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'	<b>0.270 in/hr Exfiltration over Surface area</b>									
#2	Primary	134.63'	<b>12.0' long x 10.0' breadth Broad-Crested Rectangular Weir</b>									
			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)

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NRCC 24-hr C 1-Year Rainfall=2.80"

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**Stage-Area-Storage for Pond SF: SAND FILTER**

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
132.67	160	0	135.32	1,152	1,191
132.72	160	3	135.37	1,168	1,250
132.77	160	5	135.42	1,184	1,308
132.82	160	8	135.47	1,200	1,368
132.87	160	11	135.52	1,216	1,428
132.92	160	13	135.57	1,232	1,490
132.97	160	16	135.62	1,248	1,552
133.02	160	18	135.67	1,264	1,614
133.07	160	21	135.72	1,280	1,678
133.12	160	24	135.77	1,296	1,742
133.17	160	26	135.82	1,312	1,808
133.22	160	29	135.87	1,328	1,874
133.27	160	32	135.92	1,344	1,941
133.32	160	34	135.97	<b>1,360</b>	<b>2,008</b>
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			

Volume below Sand Filter Weir  
Elev. 134.63 = 471 CF



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NRCC 24-hr C 1-Year Rainfall=2.80"

Printed 8/25/2020

**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					<b>Direct Entry,</b>

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NRCC 24-hr C 1-Year Rainfall=2.80"

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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

**SubcatchmentEA1: 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

**SubcatchmentEA2: 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

**SubcatchmentEB1: 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

**SubcatchmentEB2: 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

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*NRCC 24-hr C 1-Year Rainfall=2.80"*

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**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**

Flow Length=87'

Runoff Area=7,552 sf 31.21% Impervious Runoff Depth=0.74"

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: UNDERGROUNDET 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**

**2449-HydroCAD (Aug 2020)**

Prepared by Crossman Engineering

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NRCC 24-hr C 2-Year Rainfall=3.30"

Printed 8/25/2020

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

<b>Pond CB5: CB5</b>	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
<b>Pond CB6: CB6</b>	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
<b>Pond D1: DMH1</b>	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
<b>Pond D2: DMH2</b>	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
<b>Pond D3: DMH3</b>	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
<b>Pond D4: DMH4</b>	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
<b>Pond D5: DMH5</b>	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
<b>Pond D6: DMH6</b>	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
<b>Pond D7: DMH7</b>	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
<b>Reach EA: WETLANDS</b>		Inflow=2.83 cfs	0.197 af
		Outflow=2.83 cfs	0.197 af
<b>Subcatchment EA1: WSD-EX A1</b>	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
<b>Subcatchment EA2: WSD-EX A2</b>	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
<b>Reach EB: KINGSTOWN ROAD</b>		Inflow=0.09 cfs	0.007 af
		Outflow=0.09 cfs	0.007 af
<b>Subcatchment EB1: WSD-EX B1</b>	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
<b>Subcatchment EB2: WSD-EX B2</b>	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
<b>Pond EGD: GRASS DEPRESSION</b>	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

**2449-HydroCAD (Aug 2020)**

NRCC 24-hr C 2-Year Rainfall=3.30"

Prepared by Crossman Engineering

Printed 8/25/2020

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**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: UNDERGROUNDET 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**

**2449-HydroCAD (Aug 2020)**

NRCC 24-hr C 10-Year Rainfall=4.90"

Prepared by Crossman Engineering

Printed 8/25/2020

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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







**2449-HydroCAD (Aug 2020)**

Prepared by Crossman Engineering

HydroCAD® 10.00-24 s/n 08202 © 2018 HydroCAD Software Solutions LLC

NRCC 24-hr C 100-Year Rainfall=8.50"

Printed 8/25/2020

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

<b>Pond CB5: CB5</b>	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
<b>Pond CB6: CB6</b>	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
<b>Pond D1: DMH1</b>	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
<b>Pond D2: DMH2</b>	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
<b>Pond D3: DMH3</b>	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
<b>Pond D4: DMH4</b>	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
<b>Pond D5: DMH5</b>	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
<b>Pond D6: DMH6</b>	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
<b>Pond D7: DMH7</b>	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
<b>Reach EA: WETLANDS</b>	Inflow=9.70 cfs 0.737 af Outflow=9.70 cfs 0.737 af
<b>SubcatchmentEA1: WSD-EX A1</b>	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
<b>SubcatchmentEA2: WSD-EX A2</b>	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
<b>Reach EB: KINGSTOWN ROAD</b>	Inflow=0.74 cfs 0.050 af Outflow=0.74 cfs 0.050 af
<b>SubcatchmentEB1: WSD-EX B1</b>	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
<b>SubcatchmentEB2: WSD-EX B2</b>	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
<b>Pond EGD: GRASS DEPRESSION</b>	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



**2449-HydroCAD (Aug 2020)**

Prepared by Crossman Engineering

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NRCC 24-hr C WQF Rainfall=1.20"

Printed 8/25/2020

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

**SubcatchmentEA1: 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

**SubcatchmentEA2: 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

**SubcatchmentEB1: 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

**SubcatchmentEB2: 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

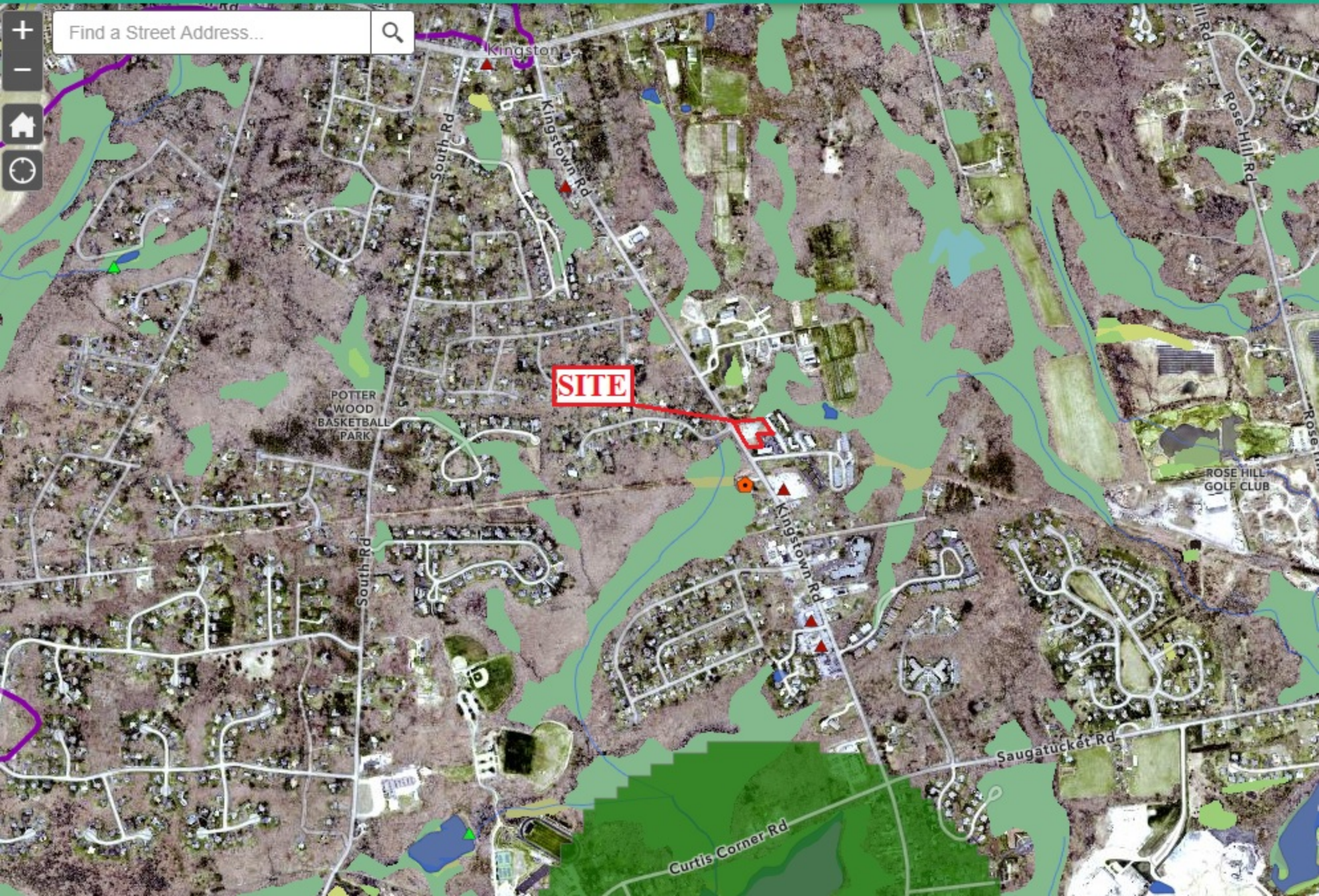
**Pond EGD: GRASS DEPRESSION** Peak Elev=133.81' Storage=69 cf Inflow=0.04 cfs 0.003 af  
 Discarded=0.00 cfs 0.003 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.003 af



**D. RIDEM Environmental Resource Map**



Find a Street Address...



**SITE**

POTTER WOOD BASKETBALL PARK

ROSE HILL GOLF CLUB

Kingston

South Rd

Kingstown Rd

Rose Hill Rd

South Rd

Kingstown Rd

Curtis Corner Rd

Saugatucket Rd

**E. FEMA Flood Map**

# National Flood Hazard Layer FIRMette



41°28'28.86"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

41°28'1.89"N

## Legend

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

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) <i>Zone A, V, A99</i>
		With BFE or Depth <i>Zone AE, AO, AH, VE, AR</i>
		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 <i>Zone X</i>
		Future Conditions 1% Annual Chance Flood Hazard <i>Zone X</i>
		Area with Reduced Flood Risk due to Levee. See Notes. <i>Zone X</i>
		Area with Flood Risk due to Levee <i>Zone D</i>
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard <i>Zone X</i>
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard <i>Zone D</i>
		Channel, Culvert, or Storm Sewer
		Levee, Dike, or Floodwall
OTHER FEATURES		20.2 Cross Sections with 1% Annual Chance
		17.5 Water Surface Elevation
		Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
MAP PANELS		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
		Digital Data Available
		No Digital Data Available
		Unmapped
		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

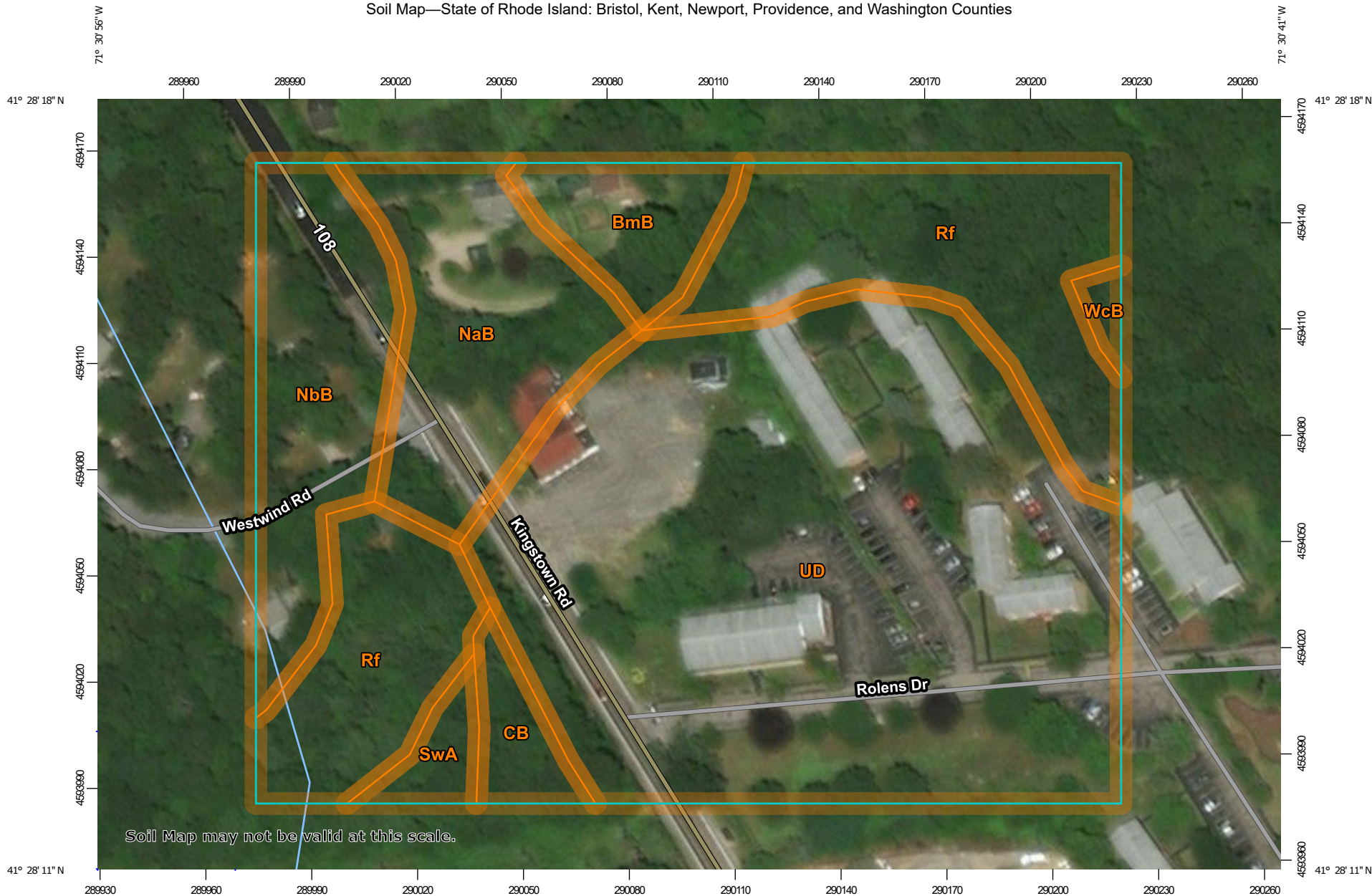
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 6/9/2020 at 4:54:47 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by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

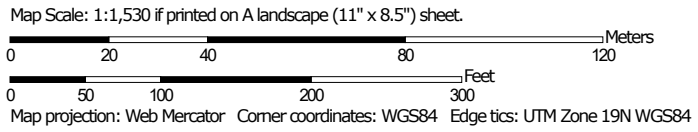
71°30'33.38"W

**F. Soil Survey Map**

Soil Map—State of Rhode Island: Bristol, Kent, Newport, Providence, and Washington Counties




Soil Map may not be valid at this scale.






## 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%
<b>Totals for Area of Interest</b>		<b>11.0</b>	<b>100.0%</b>

**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

Table with columns: TH Horizon, Depth Inches, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Rows include horizons A, B/HTM, C1, 2C, 3C, Bit Pavement, HTM, and C1.

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

Table with 11 columns: TH Horizon, Depth Inches, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Contains data for TH 3 and TH 4 horizons.

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 [X] Time: 8:30-10:30

Table with 11 columns: TH Horizon, Depth Inches, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab., S., Contr.), Texture, Structure, Consistence, Soil Category. Rows include horizons A, HTM, C1, and C2.

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
-  Estimated gradient and direction of slope
-  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.

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,

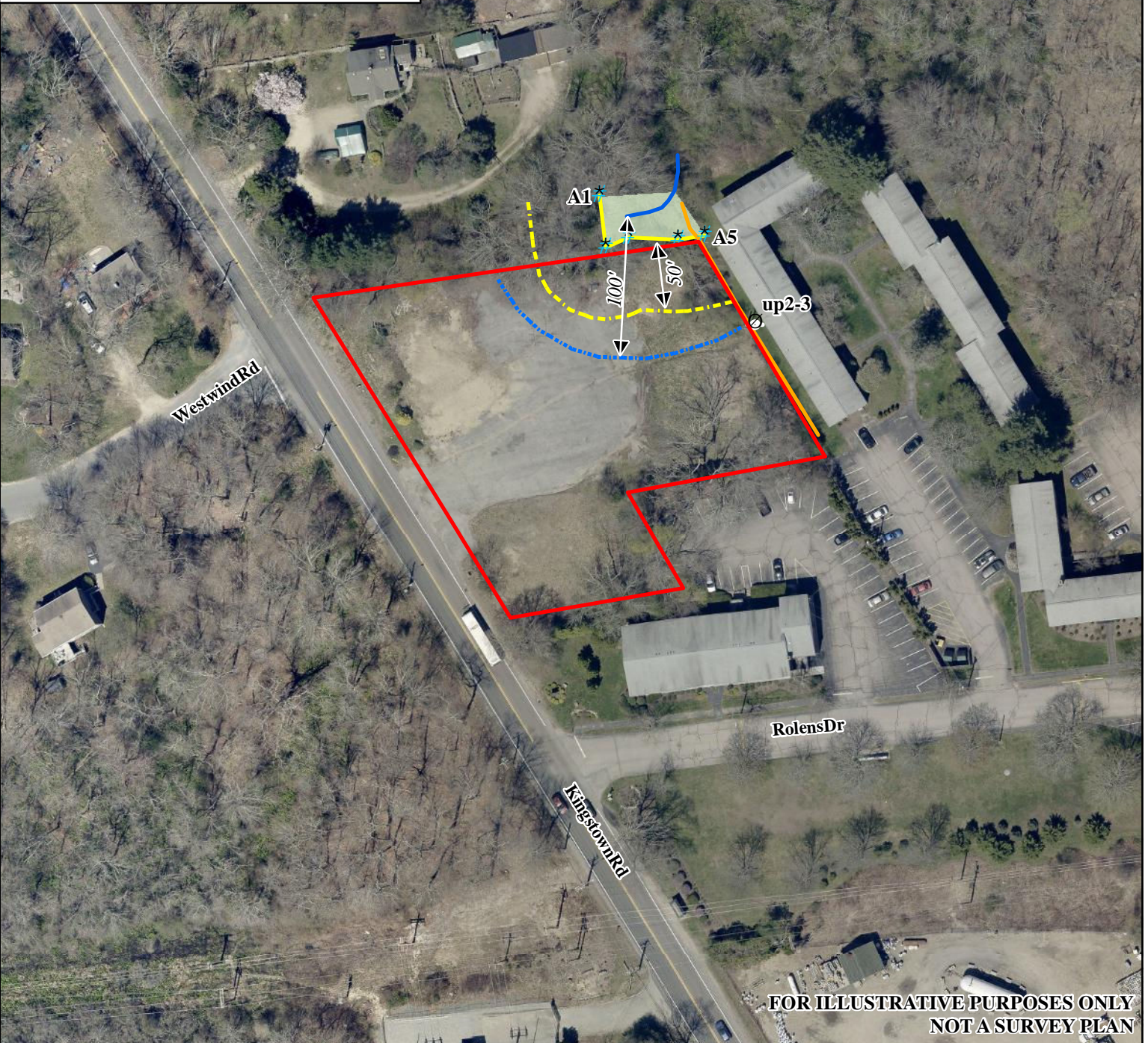
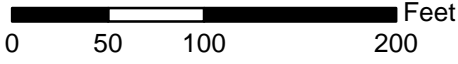
A handwritten signature in blue ink, appearing to read "Scott P. Rabideau", with a long horizontal flourish extending to the right.

Scott P. Rabideau, PWS  
Principal

Enclosures

# Legend

- Approximate Site Location (GIS)
- — Approximate Wetland Delineation
- Approximate Wetland Area
- 50' Perimeter Wetland
- Approximate Intermittent Stream
- 100' Riverbank Wetland
- Approximate ASSF



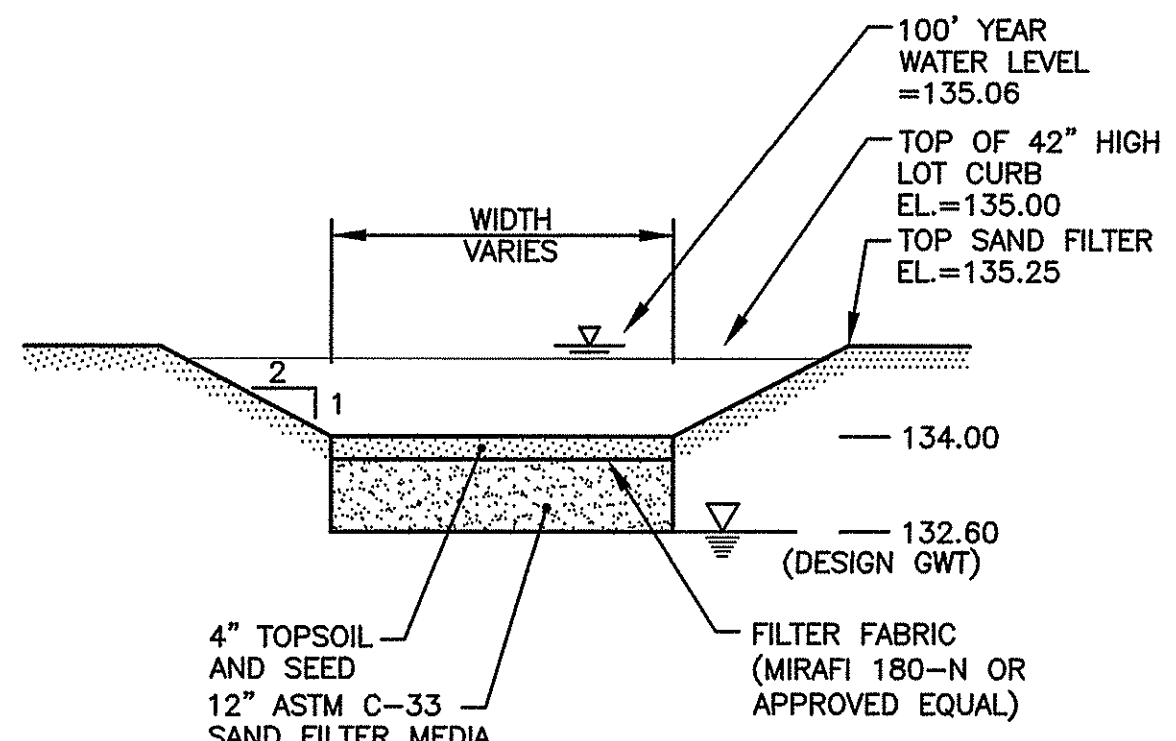
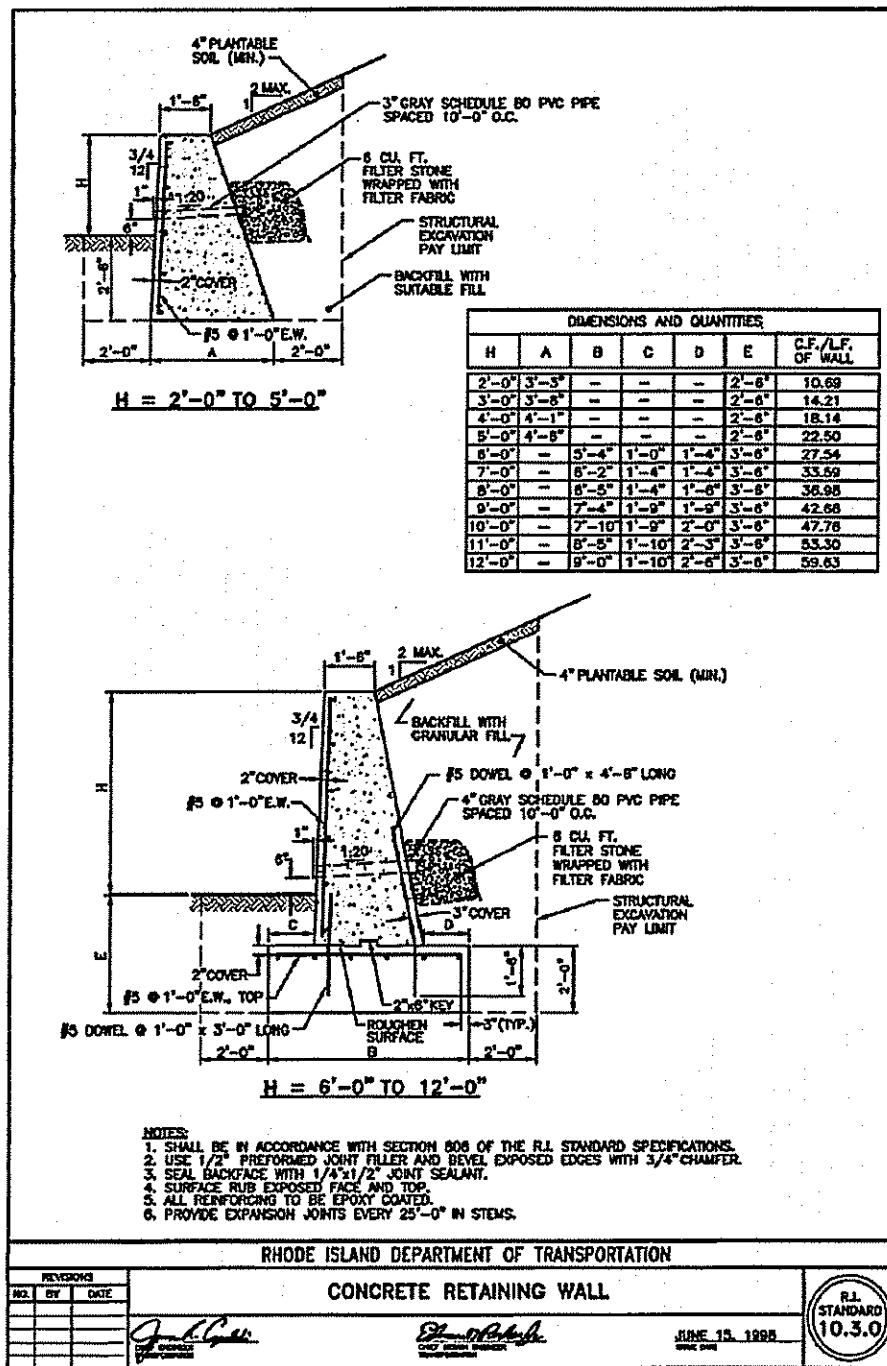
**FOR ILLUSTRATIVE PURPOSES ONLY  
NOT A SURVEY PLAN**

**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)**



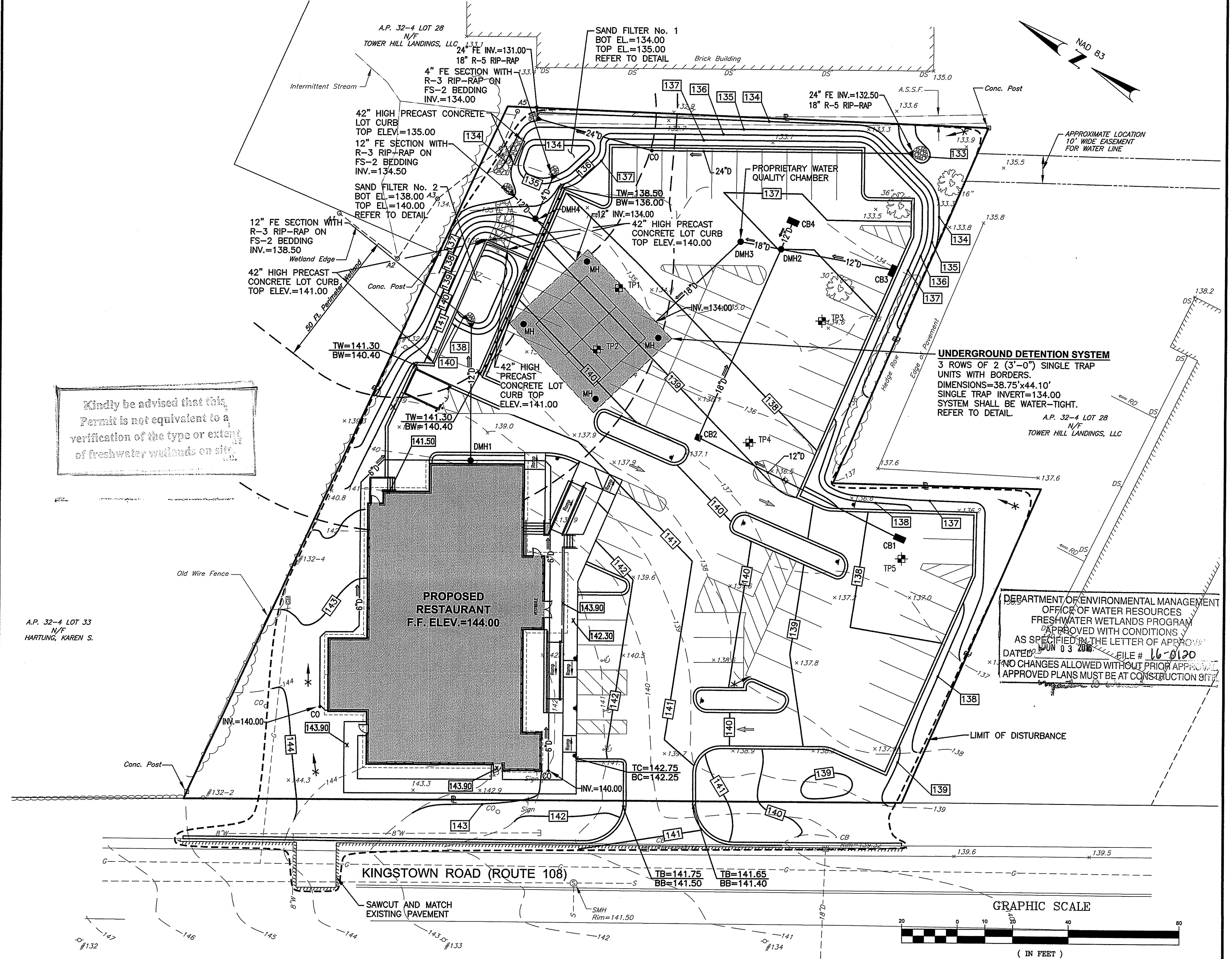
**NOTES:**

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](http://www.dem.ri.gov/pubs/regis/water/swmanual.pdf).
4. CONTRACTOR IS RESPONSIBLE TO SUBMIT SHOP DRAWINGS AND SPECIFICATIONS FOR SAND FILTER MATERIAL PRIOR TO START OF CONSTRUCTION.

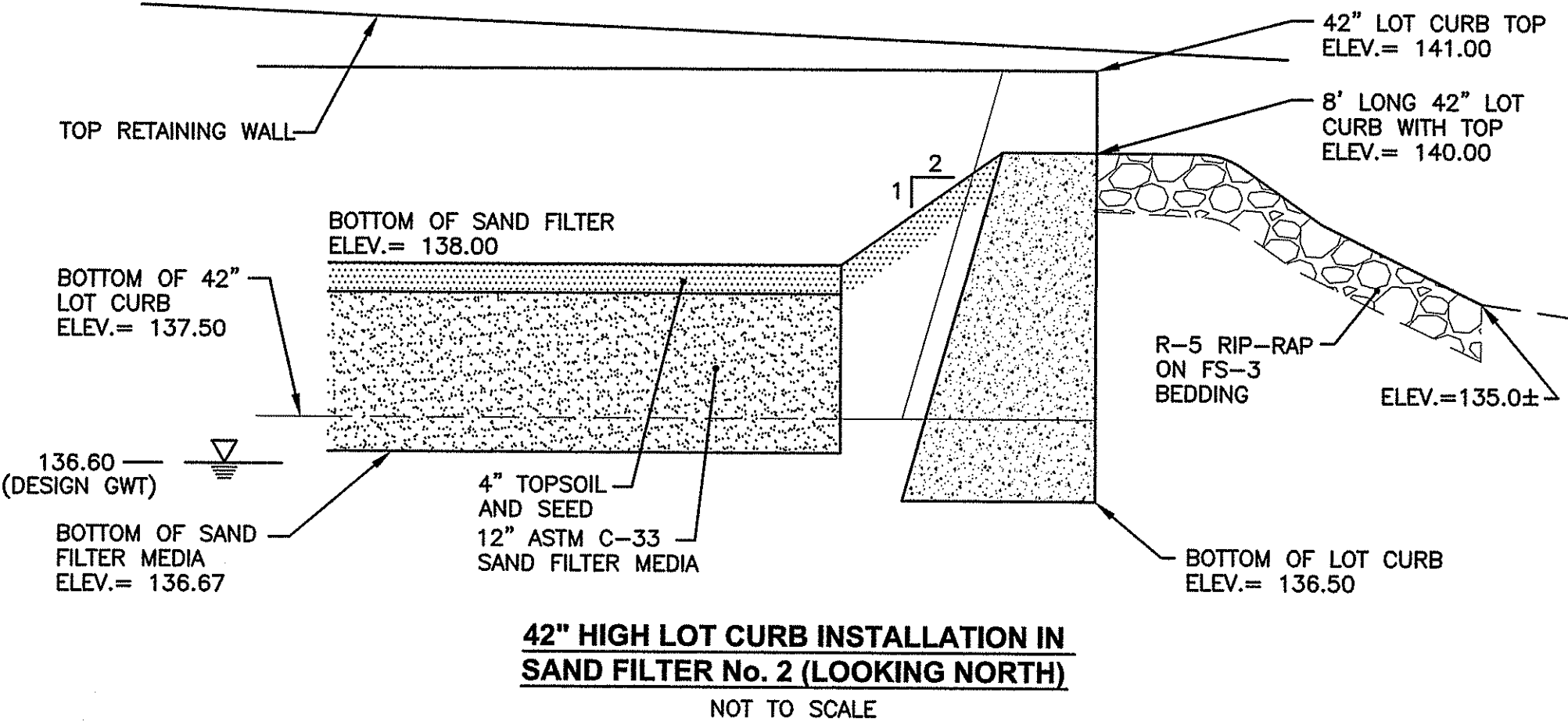
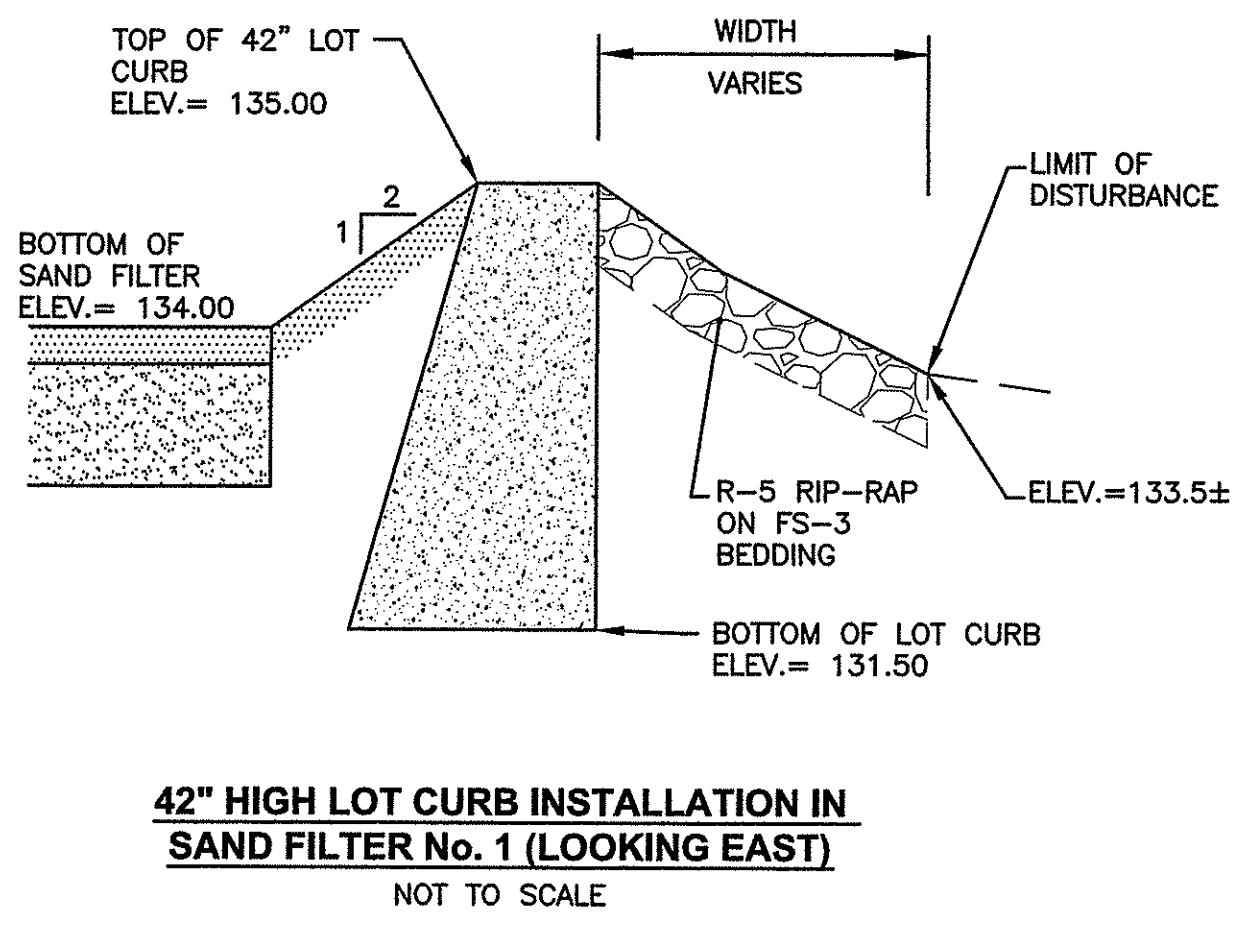
**DRAINAGE STRUCTURE TABLE**

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



Kindly be advised that this Permit is not equivalent to a verification of the type or extent of freshwater wetlands on site.



**Crossman Engineering**  
Rhode Island: 151 Centerville Road, Warwick, RI 02886  
Massachusetts: 103 Commonwealth Avenue, North Attleboro, MA 02763  
Phone: (401) 738-5660  
Email: ce@crossmaneng.com

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

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.

**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: JUNE 2015  
SCALE: 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

**SOIL EROSION AND SEDIMENT CONTROL PLAN  
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 Avenue  
North Attleboro, MA 02763

# Soil Erosion and Sediment Control Plan

## For:

Proposed 11 Unit Residential Development

Tower Hill Landings Annex

2095 Kingstown Road

South Kingstown, Rhode Island 02879

Plat 32-4, Lot 32

---

**Owner:**

Tower Hill Landings, LLC  
543 Thames Street  
Newport, RI 02840  
Phone: 401-845-2200

---

**Operator:**

To Be Determined Upon Contract Award

---

**Estimated Project Dates:**

Start Date: December 2020  
Completion Date: December 2022

---

**SESC Plan Prepared By:**

Crossman Engineering  
103 Commonwealth Ave, Suite 2B  
North Attleboro, MA 02763  
508-695-1700

---

**SESC Plan  
Preparation Date:**

August 2020

---

**SESC Plan Revision  
Date:**

## OPERATOR CERTIFICATION

*I certify under penalty of law that this document and all attachments were prepared under the direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that it is the responsibility of the owner/operator to implement and amend the Soil Erosion and Sediment Control Plan as appropriate in accordance with the requirements of the RIPDES Construction General Permit.*

---

Operator Signature:

Date

*TO BE DETERMINED UPON CONTRACT AWARD*

Contractor Representative:

Contractor Title:

Contractor Company Name:

Address:

Phone Number:

Email Address:

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## INTRODUCTION

The purpose of erosion, runoff, and sedimentation control measures is to prevent pollutants from leaving the construction site and entering waterways or environmentally sensitive areas during and after construction. This SESC Plan has been prepared prior to the initiation of construction activities to address anticipated worksite conditions. The control measures depicted on the site plan and described in this narrative should be considered the minimum measures required to control erosion, sedimentation, and stormwater runoff at the site. Since construction is a dynamic process with changing site conditions, it is the operator's responsibility to manage the site during each construction phase so as to prevent pollutants from leaving the site. This may require the operator to revise and amend the SESC Plan during construction to address varying site and/or weather conditions, such as by adding or realigning erosion or sediment controls to ensure the SESC Plan remains compliant with the RIPDES Construction General Permit. Records of these changes must be added to the amendment log attached to the SESC Plan, and to the site plans as "red-lined" drawings. Please Note: **Even if practices are correctly installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site.**

It is the responsibility of the site owner and the site operator to maintain the SESC Plan at the site, including all attachments, amendments and inspection records, and to make all records available for inspection by RIDEM during and after construction. (RIPDES CGP - Part III.G)

The site owner, the site operator, and the designated site inspector are required to review the SESC Plan and sign the Party Certification pages (Section 8). The primary contractor (if different) and all subcontractors (if applicable) involved in earthwork or exterior construction activities are also required to review the SESC Plan and sign the certification pages before construction begins.

Any questions regarding the SESC Plan, control measures, inspection requirements, or any other facet of this document may be addressed to the RIDEM Office of Water Resources, at 401-222-4700 or via email: [water@dem.ri.gov](mailto:water@dem.ri.gov).

## SOIL EROSION AND SEDIMENT CONTROL PLAN GUIDANCE

### SECTION 1: SITE DESCRIPTION

#### *1.1 Project/Site Information*

Project/Site Name:

- Proposed 11 Unit Residential Development – Tower Hills Landing Annex
- New apartment buildings, parking areas, landscaping, drainage and utility improvements

Project Street/Location:

- 2095 Kingstown Road, South Kingstown, RI 02879

Soil Erosion and Sediment Control Plan  
Tower Hill Landings Annex

Project Location Map



The following are estimates of the construction site area:

- Total Project Area 1.46 acres
- Total Project Area to be Disturbed 1.46 acres

Yes       No    The Limits of Disturbance have been marked in the field

**1.3    *Natural Heritage Area Information***

RIPDES CGP - Part III.H

Are there any Natural Heritage Areas being disturbed by the construction activity or will discharges be directed to the Natural Heritage Area as a result of the construction activity?

Yes       No

**1.4    *Historic Preservation/Cultural Resources***

Are there any historic properties, historic cemeteries or cultural resources on or near the construction site?

Soil Erosion and Sediment Control Plan  
Tower Hill Landings Annex

Yes       No

Describe how this determination was made and summarize state or tribal review comments:

- Site observations and Review of Online Mapping

If yes, describe or refer to documentation which determines the likelihood of an impact on this historic property, historic cemetery or cultural resource and the steps taken to address that impact including any conditions or mitigation measures that were approved by other parties.

## **SECTION 2: EROSION, RUNOFF, AND SEDIMENT CONTROL**

RIPDES Construction General Permit – Part III.J.1 – Erosion, Runoff, and Sediment Controls

### **2.1      *Avoid and Protect Sensitive Areas and Natural Features***

Areas of existing and remaining vegetation and areas that are to be protected as identified in the Section 1.6 of the SESC Plan must be clearly identified on the SESC Site Plans for each Phase of Construction. Prior to any land disturbance activities commencing on the site, the Contractor shall physically mark limits of disturbance (LOD) on the site and any areas to be protected within the site, so that workers can clearly identify the areas to be protected.

### **2.2      *Minimize Area of Disturbance***

Will >5 acres be disturbed in order to complete this project?

Yes       No

Will <5 acres be disturbed or will disturbance activities be completed within a six (6) month window?

Yes       No

Based on the answers to the above questions will phasing be required for this project?

Yes       No

### **2.3      *Minimize the Disturbance of Steep Slopes***

Are steep slopes (>15%) present within the proposed project area?

Yes       No

### **2.4      *Preserve Topsoil***

Site owners and operators must preserve existing topsoil on the construction site to the maximum extent feasible and as necessary to support healthy vegetation, promote soil stabilization, and increase stormwater infiltration rates in the post-construction phase of the project.

Will existing topsoil be preserved at the site?

Yes       No

Soil Erosion and Sediment Control Plan  
Tower Hill Landings Annex

Soil compaction must be minimized by maintaining limits of disturbance throughout construction. In instances where site soils are compacted the site owner and operator must restore infiltration capacity of the compacted soils by tilling or scarifying compacted soils and amending soils as necessary to ensure a minimum depth of topsoil is available in these areas. In areas where infiltrating stormwater treatment practices are located compacted soils must be amended such that they will comply the design infiltration rates.

**2.5 Stabilize Soils**

Upon completion and acceptance of site preparation and initial installation of erosion, runoff, and sediment controls and temporary pollution prevention measures, the operator shall initiate appropriate temporary or permanent stabilization practices during all phases of construction 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.

Any disturbed areas that will not have active construction activity occurring within 14 days must be stabilized using the control measures depicted in the SESC Site Plans, in accordance with the *RI SESC Handbook*, and per manufacturer product specifications.

Only areas that can be reasonably expected to have active construction work being performed within 14 days of disturbance will be cleared/grubbed at any one time. It is NOT acceptable to clear and grub the entire construction site if portions will not be active within the 14-day time frame. Proper phasing of clearing and grubbing activities shall include temporary stabilization techniques for areas cleared and grubbed that will not be active within the 14-day time frame.

All disturbed soils exposed prior to October 15 of any calendar year shall be seeded by that date if vegetative measures are the intended soil stabilization method. Any such areas that do not have adequate vegetative stabilization, as determined by the site operator or designated inspector, by November 15, must be stabilized through the use of non-vegetative erosion control measures. If work continues within any of these areas during the period from October 15 through April 15, care must be taken to ensure that only the area required for that day's work is exposed, and all erodible soil must be restabilized within 5 working days. In limited circumstances, stabilization may not be required if the intended function of a specific area of the site necessitates that it remain disturbed (i.e. construction of a motocross track).

**2.6 Protect Storm Drain Outlets**

Temporary or permanent outlet protection must be used to prevent scour and erosion at discharge points through the protection of the soil surface, reduction in discharge velocities, and through the promotion of infiltration. Outlets often have high velocity, high volume flows, and require strong materials that will withstand the forces of stormwater. Storm drain outlet control measures also offer a last line of protection against sediment entering environmentally sensitive areas.

All stormwater outlets that may discharge sediment-laden stormwater flow from the construction site must be protected using the control practices depicted on the approved plan set and in accordance with the *RI SESC Handbook*.

Will temporary or permanent point source discharges be generated at the site as the result of construction of sediment traps or basins, diversions, and conveyance channels?

Yes       No

**2.7 Establish Temporary Controls for the Protection of Post-Construction Stormwater Treatment Practices**

Temporary measures shall be installed to protect permanent or long-term stormwater control and treatment measures as they are installed and throughout the construction phase of the project so that they will function properly when they are brought online.

Will long-term stormwater treatment practices be installed at the site?

Yes       No

The inlets to the proposed sand filter shall be protected with riprap to minimize erosive tendencies from stormwater flowage into the post-construction stormwater facilities.

**2.8 Divert or Manage Run-on from Up-gradient Areas**

Is stormwater from off-site areas anticipated to flow onto the project area or onto areas where soils will be disturbed?

Yes       No

Some upstream areas adjacent to the construction site shall flow through the project area and the proposed drainage system. These upstream areas have been accounted for in the drainage system design.

**2.9 Retain Sediment Onsite through Structural and Non-Structural Practices**

**SEDIMENT BARRIERS** must be installed along the perimeter areas of the site that will receive stormwater from disturbed areas. This also may include the use of sediment barriers along the contour of disturbed slopes to maintain sheet flow and minimize rill and gully erosion during construction. Installation and maintenance of sediment barriers must be completed in accordance with the maintenance requirements specified by the product manufacturer or the *RI SESC Handbook*.

Will sediment barriers be utilized at the toe of slopes and other downgradient areas subject to stormwater impacts and erosion during construction?

Yes       No

Compost filter sock, silt fence, or approved equal shall be installed along the construction site perimeter areas where shown on the Soil Erosion and Sediment Control Plan, which is enclosed in the Site Plan Set. Additional sediment barriers may be required on an as needed basis.

Will sediment barriers be utilized along the contour of slopes to maintain sheet flow and minimize rill and gully erosion during construction?

Yes       No

**INLET PROTECTION** will be utilized to prevent soil and debris from entering storm drain inlets. These measures are usually temporary and are implemented before a site is disturbed. ALL stormwater inlets &/or catch basins that are operational during construction and have the potential to receive sediment-laden stormwater flow from the construction site must be protected using control measures outlined in the *RI SESC Handbook*.

For more information on inlet protection refer to the *RI SESC Handbook*, Inlet Protection control measure.

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**Maintenance**

The operator must clean, or remove and replace the inlet protection measures as sediment accumulates, the filter becomes clogged, and/or as performance is compromised. Accumulated sediment adjacent to the inlet protection measures should be removed by the end of the same work day in which it is found or by the end of the following work day if removal by the same work day is not feasible.

Do inlets exist adjacent to or within the project area that require temporary protection?

Yes       No

There are two existing catchbasins in the existing roadway that require silt sack inlet protection with regular inspection and maintenance requirements. All proposed catchbasin inlets will require temporary inlet protection during construction which shall remain until the site is stabilized.

**CONSTRUCTION ENTRANCES** will be used in conjunction with the stabilization of construction roads to reduce the amount of sediment tracking off the project. This project has avoided placing construction entrances on poorly drained soils where possible. Where poorly drained soils could not be eliminated, the detail includes subsurface drainage.

Any construction site access point must employ the control measures on the approved SESC site plans and in accordance with the *RI SESC Handbook*. Construction entrances shall be used in conjunction with the stabilization of construction roads to reduce the amount of mud picked up by construction vehicles. All construction access roads shall be constructed prior to any roadway accepting construction traffic.

The site owner and operator must:

1. Restrict vehicle use to properly designated exit points.
2. Use properly designed and constructed construction entrances at all points that exit onto paved roads so that sediment removal occurs prior to vehicle exit.
3. When and where necessary, use additional controls to remove sediment from vehicle tires prior to exit (i.e. wheel washing racks, rumble strips, and rattle plates).
4. Where sediment has been tracked out from the construction site onto the surface of off-site streets, other paved areas, and sidewalks, the deposited sediment must be removed by the end of the same work day in which the track out occurs. Track-out must be removed by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal.

Will construction entrances be utilized at the proposed construction site?

Yes       No

A construction entrance is required off the Kingstown Road access point into the site.

**STOCKPILE CONTAINMENT** will be used onsite to minimize or eliminate the discharge of soil, topsoil, base material or rubble, from entering drainage systems or surface waters. All stockpiles must be located within the limit of disturbance, protected from run-on with the use of temporary sediment barriers and provided with cover or stabilization to avoid contact with precipitation and wind where and when practical.

Stock pile management consists of procedures and practices designed to minimize or eliminate the discharge of stockpiled material (soil, topsoil, base material, rubble) from entering drainage systems or surface waters.

For any stockpiles or land clearing debris composed, in whole or in part, of sediment or soil, you must comply with the following requirements:

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1. Locate piles within the designated limits of disturbance.
2. Protect from contact with stormwater (including run-on) using a temporary perimeter sediment barrier.
3. Where practicable, provide cover or appropriate temporary vegetative or structural stabilization to avoid direct contact with precipitation or to minimize sediment discharge.
4. NEVER hose down or sweep soil or sediment accumulated on pavement or other impervious surfaces into any stormwater conveyance, storm drain inlet, or surface water.
5. To the maximum extent practicable, contain and securely protect from wind.

**CONSTRUCTED SEDIMENT STRUCTURES**

**TEMPORARY SEDIMENT TRAPS** will be utilized onsite. There will be disturbed drainage areas greater than one acre that will be exposed for longer than six months. Supporting calculations are provided in the Drainage Narrative and Assessment.

Are temporary sediment traps required at the site?

Yes       No

**TEMPORARY SEDIMENT BASIN(S)** will not be utilized onsite. Every effort must be made to prevent erosion and control it near the source.

Are temporary sediment basins required at the site?

Yes       No

**2.10 Properly Design Constructed Stormwater Conveyance Channels**

Are temporary stormwater conveyance practices required in order to properly manage runoff within the proposed construction project?

Yes       No

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**2.11 Erosion, Runoff, and Sediment Control Measure List**

It is expected that this table and corresponding Inspection Reports will be amended as needed throughout the construction project as control measures are added or modified.

Location/Station	Control Measure Description/Reference	Maintenance Requirement
Project Limit of Work	Compost Filter Sock	Refer to RISESCH - Section Six: Sediment Control Measures – Straw Wattles, Compost Tubes, and Fiber Rolls
At all Disturbed Areas	Seed	Refer to RISESCH - Section Four: Erosion Control Measures – Seeding for Temporary Vegetative Cover and Seeding for Permanent Vegetative Cover
At Sand Filter	Roped off to Control Compaction	Refer to RISESCH – Section Two: Erosion, Runoff, and Sediment Control – 2.1 Minimize Disturbed Area and Protect Natural Features and Soil
At drop line adjacent to limit of work  Tree Protection	Tree Protections, Section Three: Pollution Prevent and Good Housekeeping – Tree Protecting – RI SESC Handbook	The area beyond the drop line shall be roped off to protect existing trees from construction equipment. Inspection of tree protection should be made 1/week, replace as needed.

## SECTION 3: CONSTRUCTION ACTIVITY POLLUTION PREVENTION

The purpose of construction activity pollution prevention is to prevent day to day construction activities from causing pollution.

This section describes the key pollution prevention measures that must be implemented to avoid and reduce the discharge of pollutants in stormwater. Example control measures include the proper management of waste, material handling and storage, and equipment/vehicle fueling/washing/maintenance operations.

Where applicable, include *RI SESC Handbook* or the *RI Department of Transportation Standard Specifications for Road and Bridge Construction* (as amended) specifications.

### 3.1 Existing Data of Known Discharges from Site

Are there known discharges from the project area?

Yes  No

Describe how this determination was made:

- Existing Conditions Survey, Online GIS Maps, and Site Observations

Is there existing data on the quality of the known discharges?

Yes  No

### 3.2 Prohibited Discharges

The following discharges are prohibited at the construction site:

- Contaminated groundwater, unless specifically authorized by the DEM. These types of discharges may only be authorized under a separate DEM RIPDES permit.
- Wastewater from washout of concrete, unless the discharge is contained and managed by appropriate control measures.
- Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials.
- Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance. Proper storage and spill prevention practices must be utilized at all construction sites.
- Soaps or solvents used in vehicle and equipment washing.
- Toxic or hazardous substances from a spill or other release.

All types of waste generated at the site shall be disposed of in a manner consistent with State Law and/or regulations.

Will any of the above listed prohibited discharges be generated at the site?

Yes  No

### 3.3 Proper Waste Disposal

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

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

Is waste disposal a significant element of the proposed project?

Yes                       No

**3.4      *Spill Prevention and Control***

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

Are spill prevention and control measures required for this particular project?

Yes                       No

**3.5      *Control of Allowable Non-Stormwater Discharges***

Are there allowable non-Stormwater discharges present on or near the project area?

Yes                       No

Are there any known or proposed contaminated discharges, including anticipated contaminated dewatering operations, planned on or near the project area?

Yes                       No

**3.6      *Control Dewatering Practices***

Site owners and operators are prohibited from discharging groundwater or accumulated stormwater that is removed from excavations, trenches, foundations, vaults, or other similar points of accumulation, unless such waters are first effectively managed by appropriate control measures.

Examples of appropriate control measures include, but are not limited to, temporary sediment basins or sediment traps, sediment socks, dewatering tanks and bags, or filtration systems (e.g. bag or sand filters) that are designed to remove sediment. Uncontaminated, non-turbid dewatering water can be discharged without being routed to a control.

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At a minimum the following discharge requirement must be met for dewatering activities:

1. Do not discharge visible floating solids or foam.
2. To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area.
3. At all points where dewatering water is discharged, utilize velocity dissipation devices.
4. With filter backwash water, either haul it away for disposal or return it to the beginning of the treatment process.
5. Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
6. Dewatering practices must involve the implementation of appropriate control measures as applicable (i.e. containment areas for dewatering earth materials, portable sediment tanks and bags, pumping settling basins, and pump intake protection.)

Is it at all likely that the site operator will need to implement construction dewatering in order to complete the proposed project?

Yes                       No

**3.7      *Establish Proper Building Material Staging Areas***

All construction materials that have the potential to contaminate stormwater must be stored properly and legally in covered areas, with containment systems constructed in or around the storage areas. Areas must be designated for materials delivery and storage. Designated areas shall be approved by the site owner/engineer. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in the discharge of pollutants, or where exposure of a specific material or product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use).

**3.8      *Minimize Dust***

Dust control procedures and practices shall be used to suppress dust on a construction site during the construction process, as applicable. Precipitation, temperature, humidity, wind velocity and direction will determine amount and frequency of applications. However, the best method of controlling dust is to prevent dust production. This can best be accomplished by limiting the amount of bare soil exposed at one time. Dust Control measures outlined in the *RI SESC Handbook* shall be followed. Other dust control methods include watering, chemical application, surface roughening, wind barriers, walls, and covers.

**3.9      *Designate Washout Areas***

At no time shall any material (concrete, paint, chemicals) be washed into storm drains, open ditches, streets, streams, wetlands, or any environmentally sensitive area. The site operator must ensure that construction waste is properly disposed of, to avoid exposure to precipitation, at the end of each working day.

Will washout areas be required for the proposed project?

Yes                       No

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Concrete washout areas will be required for concrete work for concrete drainage structure/pipe installation. The washout area shall be located within the project limits away from any wetland area or buffer zones. The washout area shall be lined with an impervious pvc membrane and surrounded by silt fence or approved equal.

**3.10 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices**

Vehicle fueling shall not take place within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Designated areas shall be depicted on the SESC Site Plans, or shall be approved by the site owner.

Vehicle maintenance and washing shall occur off-site, or in designated areas depicted on the SESC Site Plans or approved of by the site owner. Maintenance or washing areas shall not be within regulated wetlands or buffer zone areas, or within 50-feet of the storm drain system. Maintenance areas shall be clearly designated, and barriers shall be used around the perimeter of the maintenance area to prevent stormwater contamination.

Construction vehicles shall be inspected frequently for leaks. Repairs shall take place immediately. Disposal of all used oil, antifreeze, solvents and other automotive-related chemicals shall be according to applicable regulations; at no time shall any material be washed down the storm drain or in to any environmentally sensitive area.

**3.11 Chemical Treatment for Erosion and Sediment Control**

Chemical stabilizers, polymers, and flocculants are readily available on the market and can be easily applied to construction sites for the purposes of enhancing the control of erosion, runoff, and sedimentation. The following guidelines should be adhered to for construction sites that plan to use treatment chemicals as part of their overall erosion, runoff, and sedimentation control strategy.

The U.S. Environmental Protection Agency has conducted research into the relative toxicity of chemicals commonly used for the treatment of construction stormwater discharges. The research conducted by the EPA focused on different formulations of chitosan, a cationic compound, and both cationic and anionic polyacrylamide (PAM). In summary, the studies found significant toxicity resulting from the use of chitosan and cationic PAM in laboratory conditions, and significantly less toxicity associated with using anionic PAM. EPA's research has led to the conclusion that the use of treatment chemicals for erosion, runoff, and sedimentation control requires proper operator training and appropriate usage to avoid risk to aquatic species. In the case of cationic treatment chemicals additional safeguards may be necessary.

**Application/Installation Minimum Requirements**

If a site operator plans to use polymers, flocculants, or other treatment chemicals during construction the SESC plan must address the following:

1. Treatment chemicals shall not be applied directly to or within 100 feet of any surface water body, wetland, or storm drain inlet.
2. Use conventional erosion, runoff, and sedimentation controls prior to and after the application of treatment chemicals. Use conventional erosion, runoff, and sedimentation controls prior to chemical addition to ensure effective treatment. Chemicals may only be applied where treated stormwater is directed to a sediment control (e.g. temporary sediment basin, temporary sediment trap or sediment barrier) prior to discharge.
3. Sites shall be stabilized as soon as possible using conventional measures to minimize the need to use chemical treatment.
4. Select appropriate treatment chemicals. Chemicals must be selected that are appropriately suited to the types of soils likely to be exposed during construction and to the expected turbidity, pH,

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and flow rate of stormwater flowing into the chemical treatment system or treatment area. **Soil testing is essential. Using the wrong form of chemical treatment will result in some form of performance failure and unnecessary environmental risk.**

5. Minimize discharge risk from stored chemicals. Store all treatment chemicals in leak-proof containers that are kept under storm-resistant cover and surrounded by secondary containment structures (e.g., spill berms, decks, spill containment pallets), or provide equivalent measures, designed and maintained to minimize the potential discharge of treatment chemicals in stormwater or by any other means (e.g., storing chemicals in covered areas or having a spill kit available on site).
6. Use chemicals in accordance with good engineering practices and specifications of the chemical provider/supplier. You must also use treatment chemicals and chemical treatment systems in accordance with good engineering practices, and with dosing specifications and sediment removal design specifications provided by the supplier of the applicable chemicals, or document specific departures from these practices or specifications and how they reflect good engineering practice.

Will chemical stabilizers, polymers, flocculants or other treatment chemicals be utilized on the proposed construction project?

Yes                       No

**3.12 Construction Activity Pollution Prevention Control Measure List**

**It is expected that this table will be amended as needed throughout the construction project.**

Phase No. #		
Location/Station	Control Measure Description/Reference	Maintenance Requirement
On site +100 ft away from wetlands and out of regulatory buffers	Vehicle Fueling, Maintenance and Washing	Refer to RISESCH - Section Four: Erosion Control Measures – Vehicle Fueling, Maintenance and Washing
On site +100 ft away from wetlands and out of regulatory buffers	Concrete Washouts	Refer to RISESCH - Section Three: Pollution Prevention and Good Housekeeping –Concrete Washouts
Project Wide	Street Sweeping	Refer to RISESCH - Section Three: Pollution Prevention and Good Housekeeping – Street Sweeping
Project Wide	Dust Control	Refer to RISESCH - Section Three: Pollution Prevention and Good Housekeeping – Dust Control
Dewatering, if Required	Filter Ring or Bag	Refer to RISESCH – Section Six: Sediment Control Measures – Portable Sediment Tanks and Bags

## SECTION 4: CONTROL MEASURE INSTALLATION, INSPECTION, and MAINTENANCE

### 4.1 Installation

Complete the installation of temporary erosion, runoff, sediment, and pollution prevention control measures by the time each phase of earth-disturbance has begun. All stormwater control measures must be installed in accordance with good judgment, including applicable design and manufacturer specifications. Installation techniques and maintenance requirements may be found in manufacturer specifications and/or the *RI SESC Handbook*.

### 4.2 Monitoring Weather Conditions

Anticipating Weather Events - Care will be taken to the best of the operator's ability to avoid disturbing large areas prior to anticipated precipitation events. Weather forecasts must be routinely checked, and in the case of an expected precipitation event of over 0.25-inches over a 24-hour period, it is highly recommended that all control measures should be evaluated and maintained as necessary, prior to the weather event. In the case of an extreme weather forecast (greater than one-inch of rain over a 24-hour period), additional erosion/sediment controls may need to be installed.

Storm Event Monitoring For Inspections - At a minimum, storm events must be monitored and tracked in order to determine when post-storm event inspections must be conducted. Inspections must be conducted and documented at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt.

The weather gauge station and website that will be utilized to monitor weather conditions on the construction site is as follows:

<https://www.wunderground.com/weather/us/ri/south-kingstown>

### 4.3 Inspections

Minimum Frequency - Each of the following areas must be inspected by or under the supervision of the owner and operator at least once every seven (7) calendar days and within twenty-four (24) hours after any storm event, which generates at least 0.25 inches of rainfall per twenty-four (24) hour period and/or after a significant amount of runoff or snowmelt:

- a. All areas that have been cleared, graded, or excavated and where permanent stabilization has not been achieved;
- b. All stormwater erosion, runoff, and sediment control measures (including pollution prevention control measures) installed at the site;
- c. Construction material, unstabilized soil stockpiles, waste, borrow, or equipment storage, and maintenance areas that are covered by this permit and are exposed to precipitation;
- d. All areas where stormwater typically flows within the site, including temporary drainage ways designed to divert, convey, and/or treat stormwater;
- e. All points of discharge from the site;
- f. All locations where temporary soil stabilization measures have been implemented;

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- g. All locations where vehicles enter or exit the site.

Reductions in Inspection Frequency - If earth disturbing activities are suspended due to frozen conditions, inspections may be reduced to a frequency of once per month. The owner and operator must document the beginning and ending dates of these periods in an inspection report.

Qualified Personnel – The site owner and operator are responsible for designating personnel to conduct inspections and for ensuring that the personnel who are responsible for conducting the inspections are “qualified” to do so. A “qualified person” is a person knowledgeable in the principles and practices of erosion, runoff, sediment, and pollution prevention controls, who possesses the skills to assess conditions at the construction site that could impact stormwater quality, and the skills to assess the effectiveness of any stormwater controls selected and installed to meet the requirements of the permit.

Recordkeeping Requirements - All records of inspections, including records of maintenance and corrective actions must be maintained with the SESC Plan. Inspection records must include the date and time of the inspection, and the inspector’s name, signature, and contact information.

General Notes

- A separate inspection report will be prepared for each inspection.
- The Inspection Reference Number shall be a combination of the RIPDES Construction General Permit No - consecutively numbered inspections. ex Inspection reference number for the 4<sup>th</sup> inspection of a project would be: RIR10####-4
- Each report will be signed and dated by the Inspector and must be kept onsite.
- Each report will be signed and dated by the Site Operator.
- The corrective action log contained in each inspection report must be completed, signed, and dated by the site operator once all necessary repairs have been completed.
- It is the responsibility of the site operator to maintain a copy of the SESC Plan, copies of all completed inspection reports, and amendments as part of the SESC Plan documentation at the site during construction.

**Failure to make and provide documentation of inspections and corrective actions under this part constitutes a violation of your permit and enforcement actions under 46-12 of R.I. General Laws may result.**

**4.4 Maintenance**

Maintenance procedures for erosion and sedimentation controls and stormwater management structures/facilities are described on the SESC Site Plans and in the *RI SESC Handbook*.

Site owners and operators must ensure that all erosion, runoff, sediment, and pollution prevention controls remain in effective operating condition and are protected from activities that would reduce their effectiveness. Erosion, runoff, sedimentation, and pollution prevention control measures must be maintained throughout the course of the project.

**Note: It is recommended that the site operator designates a full-time, on-site contact person responsible for working with the site owner to resolve SESC Plan-related issues.**

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**4.5 Corrective Actions**

If, in the opinion of the designated site inspector, corrective action is required, the inspector shall note it on the inspection report and shall inform the site operator that corrective action is necessary. The site operator must make all necessary repairs whenever maintenance of any of the control measures instituted at the site is required.

In accordance with the *RI SESC Handbook*, the site operator shall initiate work to fix the problem immediately after its discovery, and complete such work by the close of the next work day, if the problem does not require significant repair or replacement, or if the problem can be corrected through routine maintenance.

When installation of a new control or a significant repair is needed, site owners and operators must ensure that the new or modified control measure is installed and made operational by no later than seven (7) calendar days from the time of discovery where feasible. If it is infeasible to complete the installation or repair within seven (7) calendar days, the reasons why it is infeasible must be documented in the SESC Plan along with the schedule for installing the control measures and making it operational as soon as practicable after the 7-day timeframe. Such documentation of these maintenance procedures and timeframes should be described in the inspection report in which the issue was first documented. If these actions result in changes to any of the control measures outlined in the SESC Plan, site owners and operators must also modify the SESC Plan accordingly within seven (7) calendar days of completing this work.

## **SECTION 5: AMENDMENTS**

This SESC Plan is intended to be a working document. It is expected that amendments will be required throughout the active construction phase of the project. **Even if practices are installed on a site according to the approved plan, the site is only in compliance when erosion, runoff, and sedimentation are effectively controlled throughout the entire site for the entire duration of the project.**

The SESC Plan shall be amended within seven (7) days whenever there is a change in design, construction, operation, maintenance or other procedure which has a significant effect on the potential for the discharge of pollutants, or if the SESC Plan proves to be ineffective in achieving its objectives (i.e. the selected control measures are not effective in controlling erosion or sedimentation).

In addition, the SESC Plan shall be amended to identify any new operator that will implement a component of the SESC Plan.

All revisions must be recorded in the Record of Amendments Log Sheet, which is contained in Attachment G of this SESC Plan, and dated red-lined drawings and/or a detailed written description must be appended to the SESC Plan. Inspection Forms must be revised to reflect all amendments. Update the Revision Date and the Version # in the footer of the Report to reflect amendments made.

All SESC Plan Amendments, except minor non-technical revisions, must be approved by the site owner and operator. Any amendments to control measures that involve the practice of engineering must be reviewed, signed, and stamped by a Professional Engineer registered in the State of RI.

The amended SESC plan must be kept on file at the site while construction is ongoing and any modifications must be documented.

Attach a copy of the Amendment Log.

## **SECTION 6: RECORDKEEPING**

### **RIPDES Construction General Permit – Parts III.D, III.G, III.J.3.b.iii, & V.O**

It is the site owner and site operator's responsibility to have the following documents available at the construction site and immediately available for RIDEM review upon request:

- A copy of the fully signed and dated SESC Plan, which includes:
  - A copy of the General Location Map  
INCLUDED AS ATTACHMENT A
  - A copy of all SESC Site Plans  
INCLUDED AS ATTACHMENT B
  - A copy of the RIPDES Construction General Permit  
INCLUDED AS ATTACHMENT C
  - A copy of any regulatory permits (RIDEM Freshwater Wetlands Permit, CRMC Assent, RIDEM Water Quality Certification, RIDEM Groundwater Discharge Permit, RIDEM RIPDES Construction General Permit authorization letter, etc.)  
INCLUDED AS ATTACHMENT D
  - The signed and certified NOI form or permit application form  
INCLUDED AS ATTACHMENT E
  - Completed Inspection Reports w/Completed Corrective Action Logs  
INCLUDED AS ATTACHMENT F
  - SESC Plan Amendment Log  
INCLUDED AS ATTACHMENT G

## SECTION 7: PARTY CERTIFICATIONS

### RIPDES Construction General Permit – Part V.G

All parties working at the project site are required to comply with the Soil Erosion and Sediment Control Plan (SESC Plan including SESC Site Plans) for any work that is performed on-site. The site owner, site operator, contractors and sub-contractors are encouraged to advise all employees working on this project of the requirements of the SESC Plan. A copy of the SESC Plan may be obtained by contacting the site owner or site operator.

The site owner and site operator and each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement.

***I acknowledge that I have read and understand the terms and conditions of the Soil Erosion and Sediment Control (SESC) Plan for the above designated project and agree to follow the control measures described in the SESC Plan and SESC Site Plans.***

Site Owner:

Tower Hill Landings, LLC  
543 Thames Street  
Newport, RI 02840  
401-845-2200

\_\_\_\_\_  
signature/date

Site Operator:

\_\_\_\_\_  
signature/date

Designated Site Inspector:

\_\_\_\_\_  
signature/date

SubContractor SESC Plan Contact:

\_\_\_\_\_  
signature/date

## **LIST OF ATTACHMENTS**

**Attachment A - General Location Map**

**Attachment B - SESC Site Plans**

**Attachment C - Copy of RIPDES Construction General Permit and  
Authorization to Discharge**

**Attachment D - Copy of Other Regulatory Permits**

**Attachment E - Copy of RIPDES NOI**

**Attachment F - Inspection Reports w/ Corrective Action Log**

**Attachment G - SESC Plan Amendment Log**

**Attachment A - General Location Map**



- 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: ce@crossmaneng.com

**TOWER HILL LANDINGS  
 ANNEX  
 2095 KINGSTOWN ROAD  
 SOUTH KINGSTOWN, RI**

**LOCUS MAP**

NOT TO SCALE

DATE: AUGUST 2020

**Attachment B - SESC Site Plans**

**DUST CONTROL NOTES**

ON AN AS-NEEDED BASIS OR AS DIRECTED BY RIDEM OR OWNER, THE CONTRACTOR SHALL UTILIZE ONE OF THE FOLLOWING METHODS TO CONTROL DUST:

- A. THE EXPOSED SOIL SURFACE SHOULD BE MOISTENED PERIODICALLY WITH ADEQUATE WATER TO CONTROL DUST.
- B. CALCIUM CHLORIDE SHOULD BE EITHER LOOSE DRY GRANULES OR FLAKES FINE ENOUGH TO FEED THROUGH A SPREADER AT A RATE THAT WILL KEEP SURFACE MOIST BUT NOT CAUSE POLLUTION OR PLANT DAMAGE.

THE METHODS SHOULD BE REPEATED AS NEEDED, AND SPECIAL ATTENTION MUST BE GIVEN TO THE ACCESS DRIVES.

**INSPECTION/MAINTENANCE NOTES**

- 1. PRIOR TO COMMENCING GRUBBING OPERATIONS AND EARTHWORK, FILTERSOXX SHALL BE PLACED INSIDE SAWCUT EDGE TO PREVENT SEDIMENT FROM ENTERING EXISTING ROADWAY DRAINAGE SYSTEM, WETLAND AREAS AND ABUTTING PROPERTIES.
- 2. EXTREME CARE SHALL BE EXERCISED SO AS TO PREVENT ANY UNSUITABLE MATERIAL FROM ENTERING THE DRAINAGE SYSTEM.
- 3. ALL DISTURBED AREAS WHICH BECOME SUBJECT TO EROSION TENDENCIES WHETHER THEY BE NEWLY FILLED OR EXCAVATED SHALL RECEIVE SLOPE PROTECTION - SUCH AS RIP-RAP.
- 4. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING DRAINAGE AND RUNOFF FLOW DURING PERIODS OF RAINFALL.
- 5. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT / REPLACE DAILY DURING CONSTRUCTION, FOLLOWING RAINFALL AND WEEKLY DURING NON CONSTRUCTION PERIODS.
- 6. ADDITIONAL FILTERSOXX OR SANDBAGS SHALL BE LOCATED AS CONDITIONS WARRANT OR AS DIRECTED BY THE ENGINEER.
- 7. THE LATEST VERSION OF THE "RHODE ISLAND SOIL EROSION AND SEDIMENT CONTROL HANDBOOK" PREPARED BY THE RHODE ISLAND STATE CONSERVATION COMMITTEE (REVISION 2014), MUST BE UTILIZED BY THE CONTRACTOR AS A GUIDE.
- 8. THE CONTRACTOR IS RESPONSIBLE FOR ALL DUST CONTROL AND FOR THE ENTIRE PROJECT DURATION, INCLUDING TEMPORARY SHUT-DOWN PERIODS, MUST MONITOR AND REPAIR, AS NEEDED, ALL SLOPES TO ENSURE A STABLE PRODUCT.

**GENERAL PROJECT WIDE NOTES**

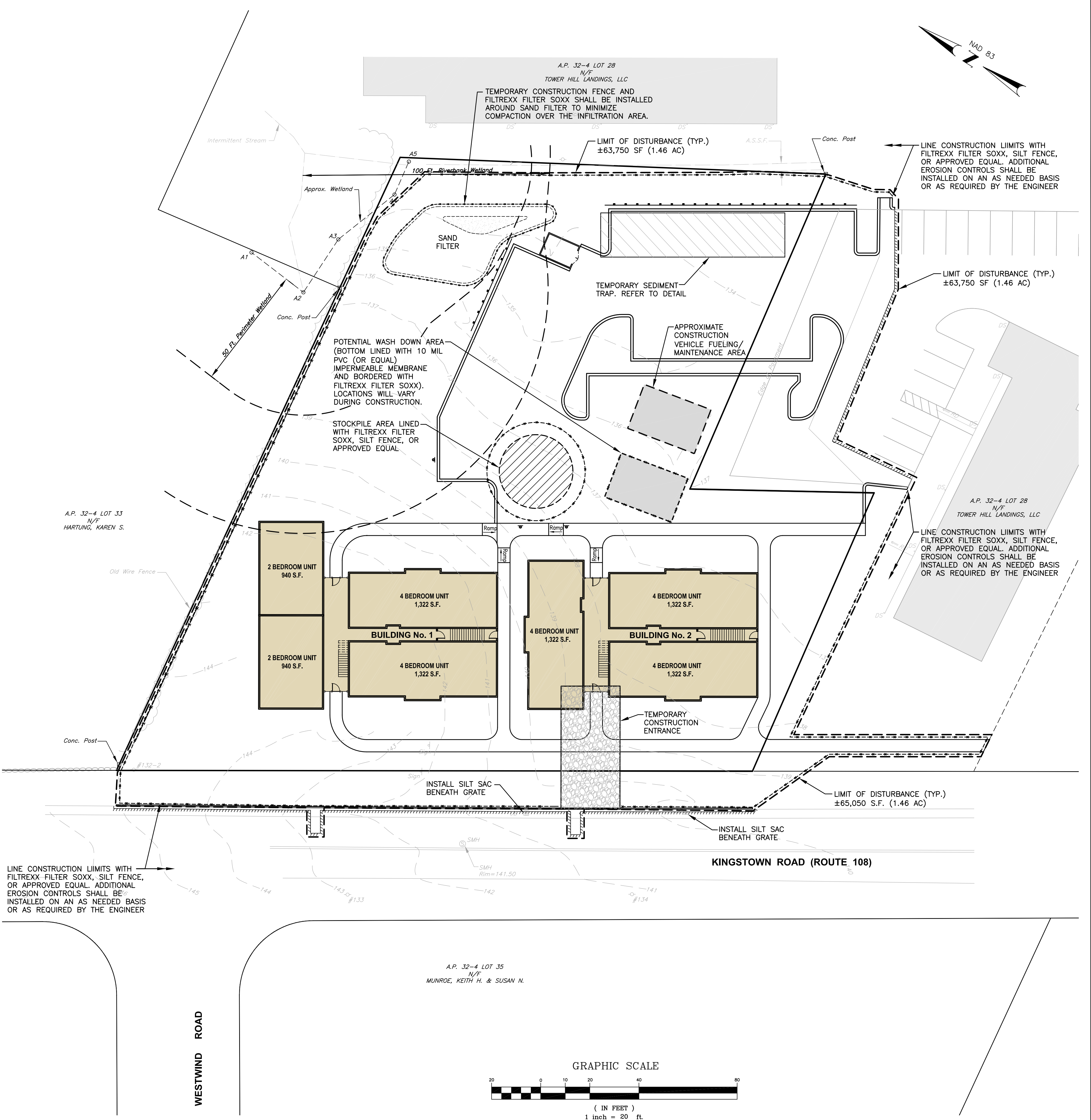
- 1. CONTRACTOR SHALL INSTALL TEMPORARY MEASURES SUCH AS; FIBER MATTING, CRUSHED STONE, HAY OR STRAW IN AREAS WHERE SLOPES OR STABILIZATION HAS FAILED.
- 2. IF SEDIMENT IS TRACKED OR ERODED INTO THE ROADWAY, THE CONTRACTOR WILL BE REQUIRED TO INSTALL SILT SACK OR APPROVED EQUAL UNDER THE EXISTING CATCH BASIN GRATINGS. REMOVE AFTER CONSTRUCTION.
- 3. FILTER SOXX (OR SILT FENCE OR STAKED HAYBALES) SHALL BE INSTALLED AROUND THE PERIMETER OF THE AREA TO BE DISTURBED BY CONSTRUCTION. ADDITIONAL APPLICATIONS OF THESE CONTROLS MEASURES MAY BE REQUIRED DURING THE CONSTRUCTION PROCESS. THE CONTRACTOR SHALL INSPECT THE SITE AT A MINIMUM OF ONCE PER WEEK OR WITHIN 24 HOURS AFTER A STORM EVENT.
- 4. IF EROSION OR EROSION TENDENCIES ARE APPARENT ON THE SITE, THE CONTRACTOR IS RESPONSIBLE TO INSTALL ADDITIONAL CONSTRUCTION BMP'S SUCH AS SAND BAGS AS DIRECTED BY THE TOWN OR ENGINEER DURING CONSTRUCTION.
- 5. IF SEDIMENT OR DEBRIS IS TRACKED ONTO EXISTING PAVED AREAS ADJACENT TO THE CONSTRUCTION AREA, THE CONTRACTOR IS REQUIRED TO SWEEP THE PAVEMENT ON A DAILY BASIS. THE AREA SHALL BE INSPECTED DAILY.
- 6. THE CONTRACTOR IS RESPONSIBLE TO KEEP THE SITE CLEAN OF TRASH. RECOMMENDED DAILY PATROL OF THE CONSTRUCTION SHOULD BE CONDUCTED TO PICK-UP TRASH. THE OPERATOR SHALL REQUIRE THE CONTRACTOR TO HAVE PORTABLE SANITARY FACILITIES ON SITE. ROUTING CLEANING AND WASTE DISPOSAL OF THESE PORTABLE SANITARY FACILITIES IS REQUIRED.


**FILTREXX SOXX NOTE**

CONTRACTOR IS RESPONSIBLE TO BECOME FAMILIAR WITH THE FILTREXX PRODUCTS AND COORDINATE INSTALLATION SCHEDULES AND METHODS WITH THE ENGINEER PRIOR TO PLACEMENT.

**EROSION CONTROL AND SOIL STABILIZATION PROGRAM**

- 1. EXTREME CARE SHALL BE EXERCISED SO AS TO PREVENT ANY UNSUITABLE MATERIAL FROM ENTERING THE DRAINAGE SYSTEM, WETLAND AREAS, ADJACENT PROPERTY, WETLANDS AND ROADWAYS.
- 2. TEMPORARY TREATMENTS SHALL CONSIST OF A HAY, STRAW, OR FIBER MULCH PROTECTIVE COVERS, SUCH AS A MAT OR FIBER LINING (BURLAP, JUTE, FIBERGLASS NETTING, EXCELSIOR BLANKETS), THEY SHALL BE INCORPORATED INTO THE WORK AS WARRANTED OR AS ORDERED BY THE OWNER.
- 3. HAY OR STRAW APPLICATIONS SHALL BE IN THE AMOUNT OF 3,000-4,000 LBS/ACRE.
- 4. STOCKPILES SHALL HAVE NO SLOPE STEEPER THAN 2:1 AND SHALL BE SURROUNDED BY STAKED HAY BALES OR SILT FENCING.
- 5. STOCKPILES EXPOSED FOR EXCESSIVE PERIODS SHALL RECEIVE TEMPORARY TREATMENT CONSISTING OF HAY, STRAW OR FIBER MATTING.
- 6. DURING CONSTRUCTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL EROSION CONTROL MAINTENANCE AND SHALL INSPECT/REPLACE AS NEEDED.
- 7. ADDITIONAL HAY BALES OR SANDBAGS SHALL BE LOCATED AS CONDITIONS WARRANT OR AS DIRECTED BY THE ENGINEER, OWNER, MUNICIPAL REPRESENTATIVES OR LOCAL D.O.T.
- 8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING DUST CONTROL AT NO ADDITIONAL COST TO THE OWNER.
- 9. ALL CATCH BASINS ADJACENT TO THE CONSTRUCTION AREA SHALL BE PROTECTED BY SILT SACKS.
- 10. ALL PROPOSED CATCH BASINS SHALL BE PROTECTED BY STAKED HAY BALES, SILT FENCING OR SILT SACKS.
- 11. THE FILTREXX FILTER SOXX MAY BE INSTALLED ON THE EXISTING PAVEMENT /IMPERVIOUS AREAS WITH OUT STAKES. CONTRACTOR SHALL INSPECT DAILY, IF SOIL EROSION OR SEDIMENT IS OBSERVED IN THESE AREAS, THE CONTRACTOR SHALL RELOCATE OR INSTALL ADDITIONAL FILTREXX FILTER SOXX IN LOCATIONS THAT CAN BE STAKED. THIS WORK IS INCLUDED IN THE PROJECT SCOPE.
- 12. SILT FENCE OR STAKED HAYBALES MAY BE USED IN LIEU OF FILTREXX FILTER SOXX.
- 13. AN ALTERNATE COMPOST SOCK OR STRAW WATTLE PRODUCT MAY BE USED IN LIEU OF FILTREXX FILTER SOCK UPON APPROVAL OF THE ENGINEER.
- 14. RUNOFF SHALL NOT BE DIRECTED TO THE STORMWATER MANAGEMENT SYSTEM UNTIL THE SITE IS STABLE.





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

**CROSSMAN ENGINEERING**  
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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

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DRAWING TITLE:  
**SOIL EROSION and SEDIMENT CONTROL PLAN**

DATE: JULY 2020      SCALE: 1"=20'

DWG. NAME: 2449-C08-SOIL.dwg

NUMBER	REMARKS	DATE

DRAWING NUMBER  
**C8**

SHEET: 9 OF 18

**Attachment C - Copy of RIPDES Construction General Permit  
and Authorization to Discharge**

*An electronic copy can be downloaded at:*

<http://www.dem.ri.gov/programs/benviron/water/permits/ripdes/stwater/conindex.htm>

**Attachment D - Copy of Other Regulatory Permits**

**Attachment E - Copy of RIPDES NOI**

**Attachment F - Inspection Reports w/ Corrective Action Log**

## SESC Plan Inspection Report

Project Information			
Name	Tower Hill Landings Annex		
Location	2095 Kingstown Road, South Kingstown, RI 02879		
DEM Permit No.			
Site Owner	Name	Phone	Email
Site Operator	Name	Phone	Email
Inspection Information			
Inspector Name	Name	Phone	Email
Inspection Date		Start/End Time	
Inspection Type <input type="checkbox"/> Weekly <input type="checkbox"/> Pre-storm event <input type="checkbox"/> During storm event <input type="checkbox"/> Post-storm event <input type="checkbox"/> Other			
Weather Information			
Last Rain Event			
Date:	Duration (hrs):	Approximate Rainfall (in):	
Rain Gauge Location & Source:			
Weather at time of this inspection:			

**Check statement that applies then sign and date below:**

I, as the designated Inspector, certify that this site has been inspected as required by regulation and I have determined that maintenance and corrective actions are not required at this time.

I, as the designated Inspector, certify that this site has been inspected as required by regulation and I have made the determination that the site requires corrective actions. The required corrective actions are noted within this inspection report.

<b>Inspector:</b>	Print Name	Signature	Date
The Site Operator acknowledges by his/her signature, the receipt of this SESC Plan inspection report and its findings. He/she acknowledges that all recommended corrective actions must be completed and documentation of all such corrective actions must be made in this inspection report per applicable regulations.			
<b>Operator:</b>	Print Name	Signature	Date

**Site-specific Control Measures**

Number the structural and non-structural stormwater control measures identified in the SESC Plan and on the SESC Site Plans and list them below (add as necessary). Bring a copy of this inspection form and any applicable SESC Site Plans with you during your inspections. This list will assist you to inspect all control measures at your site.

FILL THIS TABLE USING THE SESC PLAN TABLES 2.11 & 3.12.

	Location/Station	Control Measure Description	Installed & Operating Properly?	Assoc. Photo/ Figure #	Corrective Action Needed (Yes or No; if 'Yes', please detail action required)
1			<input type="checkbox"/> Yes <input type="checkbox"/> No		
2			<input type="checkbox"/> Yes <input type="checkbox"/> No		
3			<input type="checkbox"/> Yes <input type="checkbox"/> No		
4			<input type="checkbox"/> Yes <input type="checkbox"/> No		
5			<input type="checkbox"/> Yes <input type="checkbox"/> No		
6			<input type="checkbox"/> Yes <input type="checkbox"/> No		
7			<input type="checkbox"/> Yes <input type="checkbox"/> No		
8			<input type="checkbox"/> Yes <input type="checkbox"/> No		
9			<input type="checkbox"/> Yes <input type="checkbox"/> No		
10			<input type="checkbox"/> Yes <input type="checkbox"/> No		
11			<input type="checkbox"/> Yes <input type="checkbox"/> No		
12			<input type="checkbox"/> Yes <input type="checkbox"/> No		
13			<input type="checkbox"/> Yes <input type="checkbox"/> No		
14			<input type="checkbox"/> Yes <input type="checkbox"/> No		

(add more as necessary)

**General Site Issues**

Below are some general site issues that should be assessed during inspections. Please **customize** this list as needed for conditions at the site.

	<b>Compliance Question</b>		<b>Assoc. Photo/ Figure #</b>	<b>Corrective Action Needed (If 'Yes', please detail action required and include location/station)</b>
1	Have all control measures been installed as specified in the RISESC Handbook and prior to any earth disturbing activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
2	Are appropriate limits of disturbance (LOD) established?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
3	Are controls that limit runoff from exposed soils by diverting, retaining, or detaining flows (such as check dams, sediment basins, etc.) in place?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
4	Are all temporary conveyance practices installed correctly and functioning as designed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
5	Has maintenance been performed as required to ensure continued proper function of all temporary conveyances practices?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
6	Were all exposed soils seeded by October 15 <sup>th</sup> ?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
7	Have soils been stabilized where earth disturbance activities have permanently or temporarily ceased on any portion of the site and will not resume for more than 14 days?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
8	In instances where adequate vegetative stabilization was not established by November 15 <sup>th</sup> , have non-vegetative erosion control measures must be employed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
9	If work is to continue from October 15 <sup>th</sup> through April 15 <sup>th</sup> , are steps taken to ensure that only the day's work area will be exposed and all erodible soil is stabilized within 5 working days?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
10	Have inlet protection measures (such as fabric drop inlet protection, curb drop inlet protection, etc.) been properly installed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
11	Has the operator cleaned and maintained inlet protection measures when needed?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
12	Has the operator removed accumulated sediment adjacent to inlet protection measures within 24 hours of detection?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		

	Compliance Question		Assoc. Photo/ Figure #	Corrective Action Needed (If 'Yes', please detail action required and include location/station)
13	Has the operator properly installed outlet protection (such as riprap, turf mats, etc.) at all temporary and permanent discharge points?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
14	Are all outlet protection measures functioning properly in order to reduce discharge velocity, promote infiltration, and eliminate scour?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
15	Have all discharge points been inspected to ensure the prevention of scouring and channel erosion?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
16	Have sediment controls been installed along perimeter areas that will receive stormwater from earth disturbing activities?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
17	Is the operator maintaining sediment controls in accordance with the requirements in the <i>RI SESC Handbook</i> ?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
18	Have temporary sediment barriers been installed around permanent infiltration areas (such as bioretention areas, infiltration basins, etc.)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
19	Have staging areas and equipment routing been implemented to avoid compaction where permanent infiltration areas will be located?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
20	Are surface outlet structures (such as skimmers, siphons, etc.) installed for each temporary sediment basin? [Exception: frozen conditions]	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
21	Have all temporary sediment basins or traps been inspected and maintained as required to ensure proper function?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
22	Does the project include the use of polymers, flocculants, or other chemicals to control erosion, sedimentation, or runoff from the site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
23	Are all chemicals being managed in accordance with Appendix J of the <i>RI SESC Handbook</i> and current best management practices?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
24	Has the site operator taken steps to <b>prohibit</b> the following pollutant discharges on the site?			
a	Contaminated groundwater.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		

	<b>Compliance Question</b>		<b>Assoc. Photo/ Figure #</b>	<b>Corrective Action Needed (If 'Yes', please detail action required and include location/station)</b>
b	Wastewater from washout of concrete; unless properly contained, managed, and disposed of.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
c	Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction products.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
d	Fuels, oils, or other pollutants used in vehicle and equipment operation and maintenance.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
e	Soaps or solvents used in vehicle and equipment washing.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
f	Toxic or hazardous substances from a spill or other release.	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
25	Is the operator using properly constructed entrances/exits to the site so sediment removal occurs prior to vehicles exiting?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
26	If needed, are additional controls (such as rumble strips, rattle plates, etc.) in place to remove sediment from tires prior to exiting?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
27	Is sediment track-out being removed by the end of the same workday in which it occurs (via sweeping, shoveling, or vacuuming)?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
28	Are all wastes generated at the site being managed and properly disposed of by the end of each workday?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
29	Are all chemicals and hazardous waste materials stored properly in covered areas and surrounded by containment control systems?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
30	Has the operator established highly visible locations for the storage of spill prevention and control equipment on the construction site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
31	Are allowable non-stormwater discharges being managed properly with adequate controls?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
32	Is the site operator properly managing groundwater or stormwater that is removed from excavations, trenches, or similar points of accumulation?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
33	Are proper procedures and controls in place for the storage of materials that may discharge pollutants if	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		

	<b>Compliance Question</b>		<b>Assoc. Photo/ Figure #</b>	<b>Corrective Action Needed (If 'Yes', please detail action required and include location/station)</b>
	exposed to stormwater?			
	Are stockpiles located within the limits of disturbance?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
	Are stockpiles being protected from contact with stormwater using a temporary sediment barrier?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
	Where needed, has cover or appropriate temporary vegetative or structural stabilization been utilized for stockpiles?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
	Is the operator effectively managing the generation of dust through the use of water, chemicals, or minimization of exposed soil?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
	Are designated washout areas (such as wheel washing stations, washout for concrete, paint, stucco, etc.) clearly marked on the site?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
	Are vehicle fueling and maintenance areas properly located to prevent pollutants from impacting stormwater and sensitive receptors?	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
	(Other)			

(add more as necessary)

**General Field Comments:**

**Photos:**

Photo #:	Station:
	Description:

Photo #:	Station:
	Description:

Photo #:	Station:
	Description:

Photo #:	Station:
	Description:

Photo #:	Station:
	Description:

Photo #:	Station:
	Description:

(add more as necessary)

# Corrective Action Log

## TO BE FILLED OUT BY SITE OPERATOR

*Describe repair, replacement, and maintenance of control measures, actions taken, date completed, and note the person that completed the work.*

	Location/Station	Corrective Action	Date Completed	Person Responsible
<b>Operator Signature:</b>				<b>Date:</b>

**Attachment G – SESC Plan Amendment Log**

## Amendment Log

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### TO BE FILLED OUT BY SITE OPERATOR

Describe amendment(s) to be made to the SESC Plan, the date, and the person/title making the amendment. ALL amendments must be approved by the Site Owner.

#	Date	Description of Amendment	Amended by: Person/Title	Site Owner Must Initial
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Add more lines/pages as necessary

**LONG TERM OPERATION AND MAINTENANCE PLAN  
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 Avenue  
North Attleboro, MA 02763

## **Stormwater Management System – Maintenance Operation**

### Owner Contact Information:

Tower Hill Landings, LLC  
543 Thames Street  
Newport, RI 02840  
Phone: 401-845-2200

In order to minimize the stormwater management system deterioration, the owner shall adhere to the following Operation and Maintenance Plan 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. Upon project completion, the site owner shall adhere to the following maintenance recommendations.

### 1. Catchbasins and Manholes

An inspection shall occur on an annual basis by qualified personnel to ensure proper operation. The inspection shall, as a minimum, concentrate on the following:

- Damage to grate
- Evidence of standing water
- Presence of Debris
- Structural alignment/integrity

### 2. Sediment Removal

Following construction, sediment removal shall be conducted as deemed necessary by the system inspections. All removed sediment is to be tested to determine pollutant content. The sediment is to be properly disposed in upland areas based upon the test results and local, state, and federal regulations.

### 3. Stormceptor Pretreatment Chamber

Regular inspections and maintenance of the Stormceptor devices are required to minimize stormwater pollution and flooding. Inspections shall occur following post-construction, after every storm event with greater than one inch of rainfall, and immediately after oil, fuel or other chemical spills. Inspections shall be conducted every other month for the first year of operation, and a minimum of two times per year for the following years. The Stormceptors are required to be cleaned annually and whenever sediment depths reach 15% of the unit's total storage capacity (8" depth for the STC-900).

If the system is not maintained regularly, sediment removal efficiency may be reduced, oil spills may not be properly captured, and clogging (resulting in flooding) may occur. The Stormceptor devices shall be inspected and maintained by professional vacuum

cleaning service providers with experience in the maintenance of underground tanks, sewers, and catchbasins. Typically, maintenance cleaning of accumulated sediment is performed with a vacuum truck. If oil is present, oil is typically pumped into a separate containment using a small pump and tubing. The disposal of sediment or recovered pollutants shall be at an approved and permitted upland location. If any parts or pieces of the Stormceptor devices break or become damaged, the local supplier of authentic Stormceptor components must be contacted to replace broken parts. The “Stormceptor® STC Inspection and Maintenance Information” shall be followed to insure proper function and performance.

4. Underground Detention System

The underground detention chambers shall be inspected annually and after storm events greater than or equal to the 1-year, 24-hour Type III precipitation event to identify build-ups of sediment, litter, or debris. The inlets and outlets shall also be inspected quarterly for clogging. When the accumulated sediment volume exceeds 5% of the total storage volume, accumulated material shall be disposed of at an approved and permitted upland location. The underground detention systems shall also be inspected routinely for structural integrity. Inspections shall occur at the inlet drain manholes, clean out ports, and outlet control structure for sediment accumulation. If the outlet control orifices or pipes are clogged, they shall be cleaned manually during the time of inspection. If sediment, debris, trash, etc. accumulation is observed in any of the system laterals, the system shall be flushed and/or vacuumed by a professional vacuum cleaning service provider.

5. Sand Filter

Sand filters shall be inspected annually and after storm events greater than or equal to the 1-year, 24-hour Type III precipitation event. Sediment shall be removed from the filter bed when sediment accumulation exceeds one inch. All oil, sludge, sediment, solids, trash, debris and floatable material shall be removed from the sand filter. Materials deposited on the surface of the sand filter (e.g., trash and litter) shall be removed manually. Oil and sludge removal shall be accomplished via catch vac or vactor truck and the sand filter bottom shall be restored to its original design criteria. After cleaning, all resulting waste including oil, sludge, sediment, and water shall be disposed of in accordance with all applicable federal and local regulations.

If standing water is observed more than 48 hours after a storm event, then the top 6 inches of sand shall be removed and replaced with new materials. If discolored or contaminated material is found below this removed surface then that material shall also be removed and replaced until all contaminated sand has been removed from the filter chamber. The sand shall be disposed of in accordance with all applicable federal and local regulations. All structural components, which include the outlet structure, valves, pipes, frame and grate, cover, underdrain system, and structural concrete, shall be inspected and any deficiencies shall be reported.

6. Permeable Pavement

Permeable pavements performing as infiltration practices require regular vacuum sweeping or hosing (minimum every three months or as recommended by manufacturer) to keep the surface from clogging. Maintenance frequency needs may be more or less depending on the traffic volume at the site. The site should be inspected regularly to ensure that the paving surface drains properly after storms.

Inspect the surface annually for deterioration or spalling. If surface needs to be repaired, ensure that it is not repaved or resealed with impermeable materials. Maintenance activities include the following: minimize use of sand and salt in winter months, keep adjacent landscape areas well maintained and stabilized (erosion gullying quickly corrected), post signs identifying permeable pavement, mow and reseed grass pavers as needed, and add joint material (e.g., sand) periodically to replace material that has been transported from paving stones/bricks. Attach rollers to the bottoms of snowplows to prevent them from catching on the edges of grass pavers and some paving stones.

7. Street and Parking Lot Sweeping

Annual parking lot and driveway sweeping of non-porous pavement shall be conducted during the spring of every year. Some debris collected from streets and parking lots may be regulated as a hazardous waste. For these cases, debris must be disposed of in accordance with appropriate practice and applicable regulatory standards. Appendix A of the *Rules and Regulations for Composting Facilities and Solid Waste Management Facilities*, which is entitled “Management of Street Sweepings in Rhode Island,” shall be reviewed. For further information, contact the DEM Office of Waste Management.

8. Deicing and Salt Storage

Deicing and sanding operations are often necessary for safety during winter storms; however, the materials used create water quality problems. Use deicing chemicals and sand judiciously. The information in Table G-1 from Appendix G of the RISDISM shall be utilized when selecting a deicer.

9. Snow Disposal

Improper snow disposal can be a threat to public health and the environment. Disposal shall consider site selection, site preparation and maintenance, and emergency snow disposal locations and procedures. Refer to DEM’s Snow Disposal Policy for more details on these topics. Snow storage in the sand filter or on permeable pavement is not allowed.

**Appendix**

Stormwater Management Systems Inspection and Maintenance Log

Sand/Organic Filter System Operation, Maintenance, and Management Inspection Checklist

Underground Detention System Operation, Maintenance, and Management Inspection Checklist

Permeable Pavement Operation, Maintenance, and Management Inspection Checklist

Stormceptor® STC Inspection and Maintenance Information

BMP Location Plan

Stormwater Facility Maintenance Agreement

Stormwater Management Systems  
 Inspection and Maintenance Log

Site: Tower Hill Landings Annex
Site Address: 2095 Kingstown Road, South Kingstown, RI
Date:
Inspector:

Item	Inspection OK	Service Required	Service Performed	Supervisor Notified
1.0 Catch basins				
1.1 Sediment and debris accumulation within 6" of Outlet Service Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Frame and Grate in Good Condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Inlet and Outlet Pipes Free of Debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.4 Integrity of Catch basin Structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.5 Describe Service Provided:				
2.0 Manholes and Outlet Structures				
2.1 Invert free of sediment and debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2 Sediment and debris accumulation within 6" of Outlet Service Required	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3 Frame and Cover in Good Condition	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4 Inlet and Outlet Pipes free of debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5 Integrity of Manhole Structure	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6 Describe Service Provided:				

3.0	Miscellaneous						
	3.1	Erosion of maintenance path	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3.2	Evidence of erosion within landscape areas or on embankments.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3.3	Describe Service Provided:					
4.0	General Comments:						

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### Sand/Organic Filter Operation, Maintenance, and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
<b>1. Debris Cleanout (Annual, After Major Storms)</b>		
Contributing areas clean of debris		
Filtration facility clean of debris		
Inlet and outlets clear of debris		
<b>2. Oil and Grease (Annual, After Major Storms)</b>		
No evidence of filter surface clogging		
Activities in drainage area minimize oil and grease entry		
<b>3. Vegetation (Semi-annually)</b>		
Contributing drainage area stabilized		
No evidence of erosion		
Area mowed and clipping removed		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Water Retention Where Required (Annual, After Major Storms)		
Water holding chambers at normal pool		
No evidence of leakage		
5. Sediment Deposition (Annual, After Major Storms)		
Filter chamber free of sediments		
Sedimentation chamber not more than half full of sediments		
6. Structural Components (Annual, After Major Storms)		
No evidence of structural deterioration		
Any grates are in good condition		
No evidence of spalling or cracking of structural parts		
7. Outlet/Overflow Spillway (Annual, After Major Storms)		
Good condition, no need for repairs		
No evidence of erosion (if draining into natural channel)		
8. Overall Function of Facility (Annual, After Major Storms)		
Evidence of flow bypassing facility		
No noticeable odors		

Comments:

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Actions to be Taken:

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## Underground Detention System Operation, Maintenance, and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
1. Debris Cleanout (Annual)		
Trench/chamber or basin surface clear of debris		
Inflow pipes clear of debris		
Overflow spillway clear of debris		
Inlet area clear of debris		
2. Sediment Traps or Forebays (Annual)		
Obviously trapping sediment		
Greater than 50% of storage volume remaining		
3. Dewatering (Annual)		
Trench/chamber or basin dewateres between storms		
4. Sediment Cleanout of Trench/Chamber or Basin (Annual)		

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MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
No evidence of sedimentation in trench/chamber or basin		
Sediment accumulation doesn't yet require cleanout		
<b>5. Inlets (Annual)</b>		
Good condition		
No evidence of erosion		
<b>6. Outlet/Overflow Spillway (Annual)</b>		
Good condition, no need for repair		
No evidence of erosion		
<b>7. Aggregate Repairs (Annual)</b>		
Surface of aggregate clean		
Top layer of stone does not need replacement		
Trench/Chamber or basin does not need rehabilitation		

Comments:

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Actions to be Taken:

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### Permeable Pavement Operation, Maintenance, and Management Inspection Checklist

Project:

Location:

Site Status:

Date:

Time:

Inspector:

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
<b>1. Sediment and Debris Cleanout (3 Months or Manufacturer's Recommendation)</b>		
Contributing area free of sediment and debris		
Contributing area stabilized and mown, with grass clippings removed		
Surface free of sediment and debris (e.g., mulch, leaves, trash, etc.)		
No signs of clogging (e.g., standing water)		
Surface does not require vacuuming		
<b>2. Dewatering (Monthly)</b>		
Permeable pavement dewateres between storms		
<b>3. Underdrain Outfall, if present (Annual)</b>		
No evidence of erosion		

MAINTENANCE ITEM	SATISFACTORY / UNSATISFACTORY	COMMENTS
4. Surface Repairs (Annual)		
Surface has not been sealed		
No evidence of surface deterioration or spalling		
Surface (top and base course) does not need to be replaced		

Comments:

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Actions to be Taken:

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## Stormceptor® STC Inspection and Maintenance Information

### Stormceptor® Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and are required to insure proper functioning of the Stormceptor System. Both inspection and maintenance of the Stormceptor system is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

#### *When is inspection needed?*

- Post-construction inspection is required prior to putting the Stormceptor System into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Specifically for New Jersey installations, regulations require all BMPs to be inspected a minimum four times per year and after every storm with greater than one inch of rainfall.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after an oil, fuel or other chemical spill.

#### *When is maintenance cleaning needed?*

- For optimum performance, the unit should be cleaned out once the sediment depth reaches 15% of the unit's total storage capacity (see Table 1). Generally, the minimum cleaning frequency is once annually, although the frequency can be based on historical inspection results.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

Table 1

<b>Sediment Maintenance Depth* and Oil Capacity</b>		
<b>STC Model</b>	<b>Sediment Depth* (inches)</b>	<b>Oil Capacity (gallons)</b>
450i	8	86
900	8	251
1200	10	251
1800	15	251
2400	12	840

3600	17	840
4800	15	909
6000	18	909
7200	15	1059
11000	17	2797
13000	20	2797
16000	17	3055
* based on 15% of the lower chamber volume		

***What conditions can compromise the Stormceptor System performance?***

- If the system is not maintained regularly and fills with sediment and debris beyond the capacity indicated in Table 1, sediment removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur in the system and removal efficiency of sediment and hydrocarbons may be reduced.

***What training is required?***

The Stormceptor System is inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins. For typical inspection and maintenance activities, no specific supplemental training is required for the Stormceptor System. Information provided in this document or the Stormceptor Operation and Maintenance Manual (provided to the system owner) contains sufficient guidance to maintain the system properly.

In unusual circumstances, such as if a damaged component needs replacement or some other condition requires manned entry into the vessel, confined space entry procedures must be followed. Only professional maintenance service providers trained in these procedures should enter the vessel. Service provider companies typically have personnel who are trained and certified in confined space entry procedures according to local, state, and federal standards.

***What equipment is typically required for inspection?***

- Manhole access cover lifting tool
- Oil dipstick
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hat, safety shoes, safety glasses, and chemical-resistant gloves

***How is the Stormceptor System inspected?***

- The Stormceptor System can be inspected through a standard surface manhole

access cover.

- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick. Oil depth is measured through the oil inspection port. Sediment depth can be measured through the oil inspection port or exit riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

***What equipment is typically required for maintenance?***

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick
- Sediment probe
- Flashlight
- Camera
- Data log
- Safety cones and caution tape
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, and safety harness for specially trained personnel if confined space entry is required

***How is the Stormceptor System maintained?***

- The Stormceptor System can be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
- For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe.
- For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole.
- Using the vacuum hose, decant the water from the lower chamber to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
- Remove the sludge from the bottom of the unit using the vacuum hose.
- Re-fill the lower chamber with water where required by the local jurisdiction.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using proper confined space entry procedures.

***What is required for proper disposal?***

- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.

### **What about oil spills?**

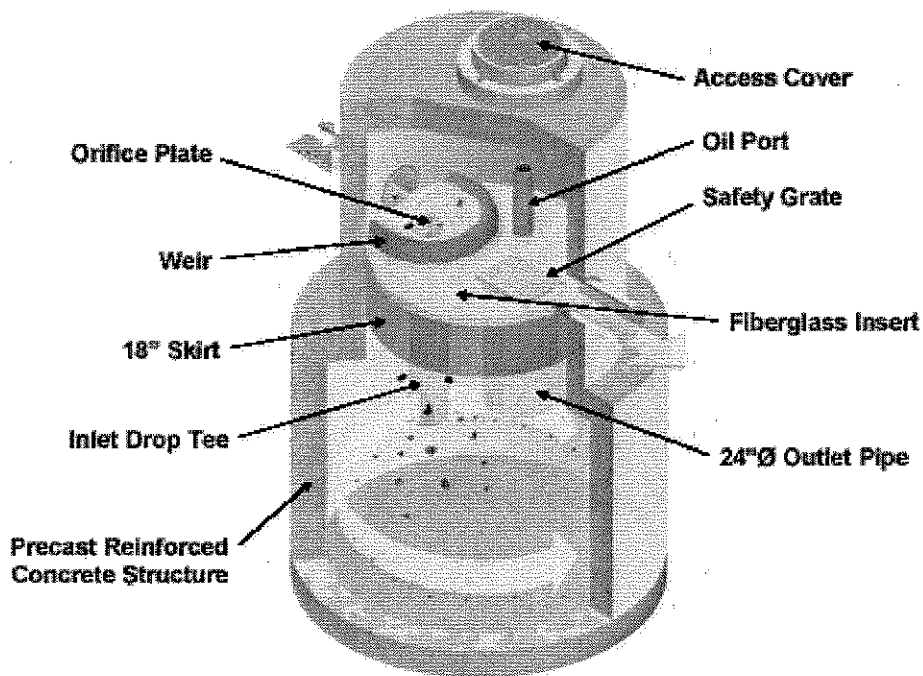
- Petroleum-based pollutants captured by the Stormceptor system (oil/chemical/fuel spills) should be removed and disposed of by a licensed waste management company.
- Although Stormceptor captures virtually all free oil, a sheen at the outlet **does not** mean the unit isn't working. A rainbow or sheen can be visible at oil concentrations of less than 10 mg/L (ppm).

### **What factors affect the costs involved with inspection/maintenance?**

- Inspection and maintenance costs are based on unit size, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

### **System schematic and component functions**

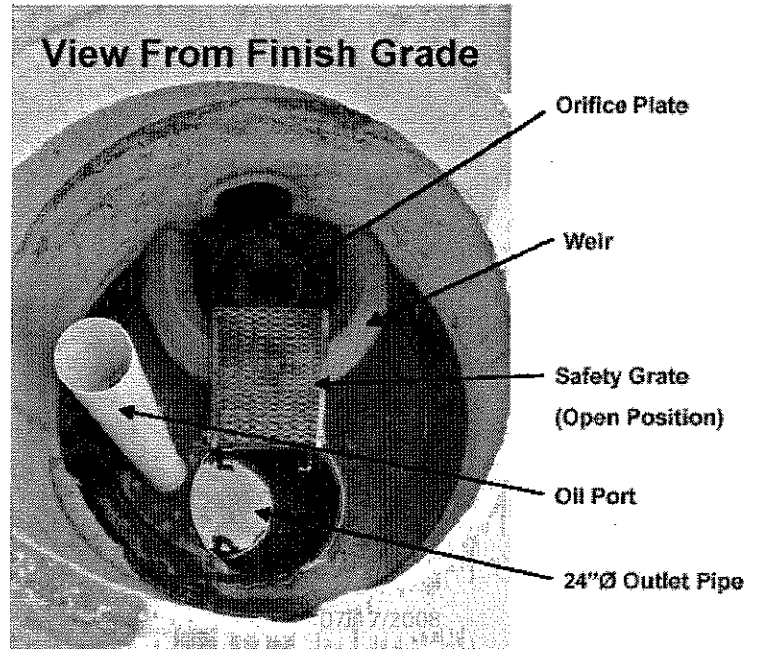
Below is a schematic of the Stormceptor System with key components identified and their functions briefly described.



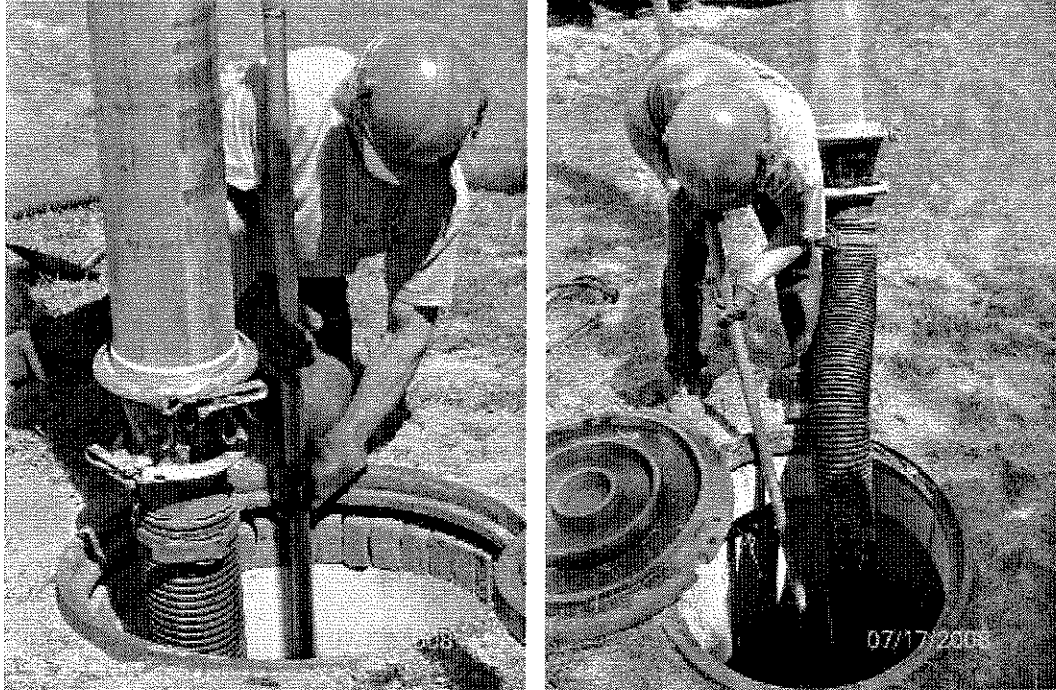
- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower treatment chamber
- **Orifice plate** – controls water flow rate into the lower treatment chamber and prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower treatment chamber and splits flow into two opposite tangential streams
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vector access port for sediment removal

- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

The Stormceptor System has no moving parts to wear out and therefore maintenance activities are generally focused on pollutant removal.



The depth of sediment can be measured from the surface by using a sediment probe or dipstick tube equipped with a ball check valve and inserted through the 24-inch outlet riser pipe. Oil level can similarly be checked through the oil inspection port.



A maintenance worker stationed on the surface uses a vacuum hose to evacuate water, sediment, and debris from the system.

***Purchasing replacement parts***

Since there are no moving parts in the Stormceptor System, broken, damaged, or worn parts are not typically encountered. However, if replacement parts are necessary, they may be obtained by contacting the following supplier of authentic Stormceptor components.

In New Jersey, contact:

Camtek Construction Products Corp.  
3481 Treeline Drive  
Murrysville, PA 15668  
Phone: (724) 327-3400

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.



**CROSSMAN ENGINEERING**  
 Rhode Island Massachusetts  
 151 Centerville Road 103 Commonwealth Avenue  
 Warwick, RI 02886 North Attleboro, MA 02763  
 Phone: (401) 738-5660 Phone: (508) 695-1700  
 Email: cel@crossmaneng.com

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**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

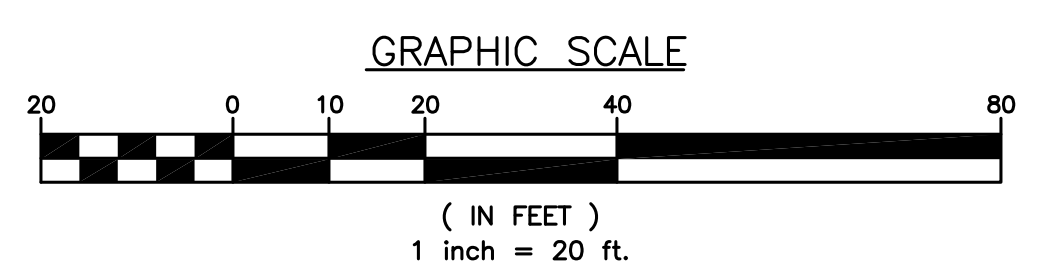
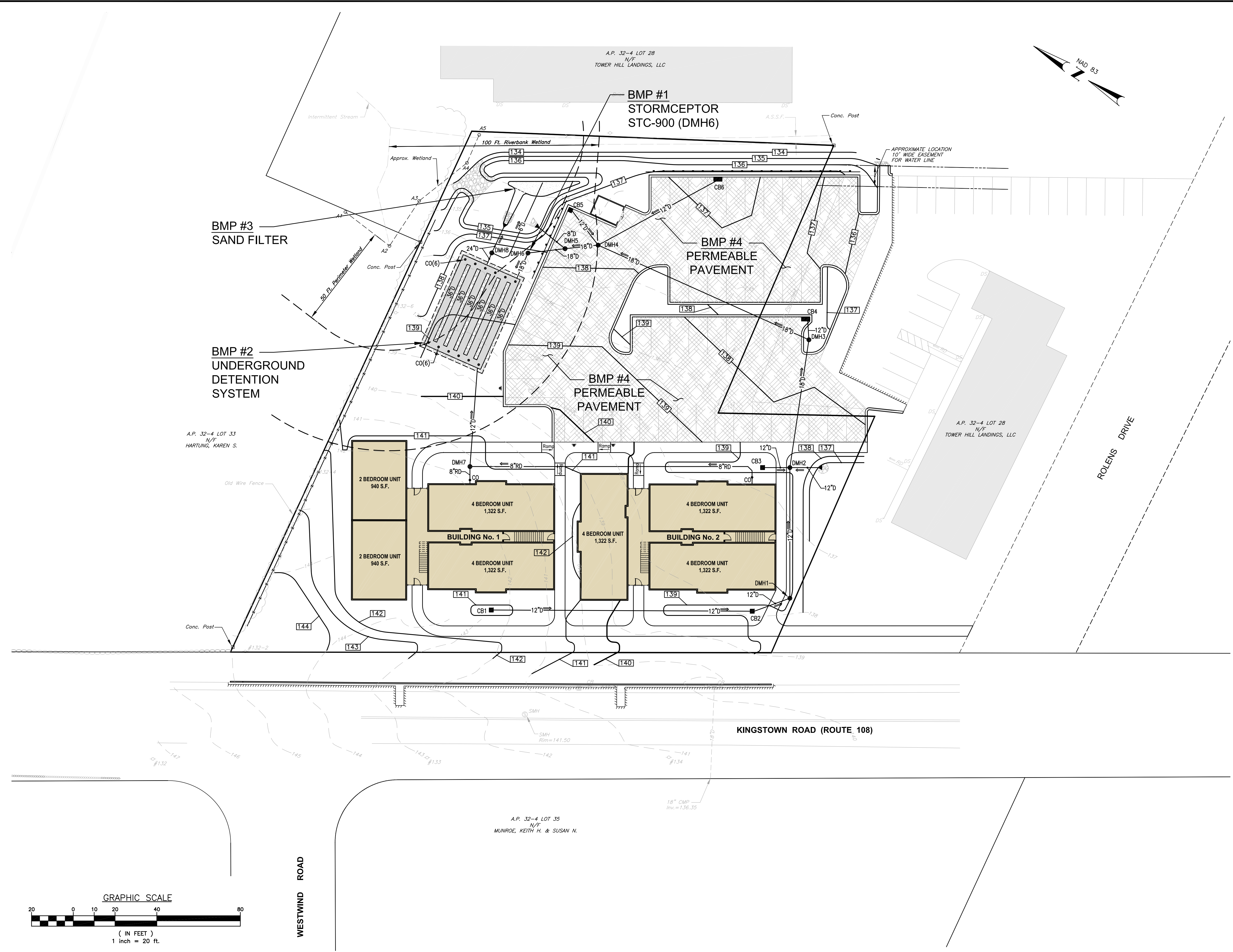
**DRAWING TITLE:**  
**BMP LOCATION PLAN**

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

**DWG. NAME:** 2449-BMP.dwg

REVISIONS		
NUMBER	REMARKS	DATE

**DRAWING NUMBER**  
**BMP**  
 SHEET: \_\_\_ OF: \_\_\_



## **Stormwater Facility Maintenance Agreement**

THIS AGREEMENT, made and entered into this \_\_\_\_ day of \_\_\_\_\_, 2020, between Tower Hill Landings Annex, LLC, hereinafter called the "Operator", and the Rhode Island Department of Environmental Management, hereinafter called "RIDEM". WITNESSETH, that WHEREAS, the Operator of certain property described as the Proposed 11 Unit Residential Development, hereinafter called the "Property". WHEREAS, the Operator is proceeding to build on and develop the property; and WHEREAS, the Site Plan known as Tower Hill Landings Annex, hereinafter called the "Plan", which is expressly made a part hereof, as approved or to be approved by RIDEM, provides for water quality, recharge of stormwater and peak flow attenuation within the confines of the property; and WHEREAS, RIDEM and the operator, its successors and assigns, agree that the health, safety, and welfare of the residents of South Kingstown require that on-site stormwater management facilities be constructed and maintained on the Property; and WHEREAS, RIDEM requires that on-site stormwater management facilities as shown on the Plan be constructed and adequately maintained by the Operator, its successors and assigns. NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater management facilities shall be constructed by the Operator, its successors and assigns, in accordance with the plans and specifications identified in the Plan.
2. The Operator, its successors and assigns shall adequately maintain the stormwater management facilities in accordance with the required Operation and Maintenance Plan. This includes vegetation provided to control the quantity and quality of the stormwater. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions. The Stormwater Best Management Practices Operation, Maintenance and Management Checklists are to be used to establish what good working condition is acceptable to RIDEM.
3. The Operator, its successors and assigns, shall inspect the stormwater management facility and retain on file an annual inspection report. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, catch basins, outlet structure, system areas, etc. Deficiencies shall be noted in the inspection report.
4. The Operator, its successors and assigns, hereby grant permission to RIDEM, its authorized agents and employees, to enter upon the Property and to inspect the stormwater management facilities whenever RIDEM deems necessary. The purpose of inspection is to follow-up on reported deficiencies and/or to respond to citizen complaints. RIDEM shall provide the Landowner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs if necessary.

5. In the event the Operator, its successors and assigns, fails to maintain the stormwater management facilities in good working condition acceptable to RIDEM, RIDEM may enter upon the Property and take whatever steps necessary to correct deficiencies identified in the inspection report and to charge the costs of such repairs to the Operator, its successors and assigns. This provision shall not be construed to allow RIDEM to erect any structure of permanent nature on the land of the Operator outside of the easement for the stormwater management facilities. It is expressly understood and agreed that RIDEM is under no obligation to routinely maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on RIDEM.
6. The Operator, its successors and assigns, will perform the work necessary to keep these facilities in good working order as appropriate. In the event a maintenance schedule for the stormwater management facilities (including sediment removal) is outlined on the approved plans, the schedule will be followed.
7. In the event RIDEM pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the RIDEM upon demand, within thirty (30) days of receipt thereof for all actual costs incurred by RIDEM hereunder.
8. This Agreement imposes no liability of any kind whatsoever on RIDEM and the Operator agrees to hold the RIDEM harmless from any liability in the event the stormwater management facilities fail to operate properly.
9. This Agreement shall be recorded among the land records of South Kingstown and shall constitute a covenant running with the land, and shall be binding on the Operator, its administrators, executors, assigns, heirs and any other successors in interests.

WITNESS the following signatures and seals:

\_\_\_\_\_  
Company/Corporation/Partnership Name (Seal)

By: \_\_\_\_\_  
(Type Name and Title)

The foregoing Agreement was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by

\_\_\_\_\_  
\_\_\_\_\_

My Commission Expires: \_\_\_\_\_

By: \_\_\_\_\_  
\_\_\_\_\_  
(Type Name and Title)

The foregoing Agreement was acknowledged before me this \_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by

\_\_\_\_\_  
\_\_\_\_\_

NOTARY PUBLIC

My Commission Expires: \_\_\_\_\_

Approved as to Form:

\_\_\_\_\_  
Attorney Date