

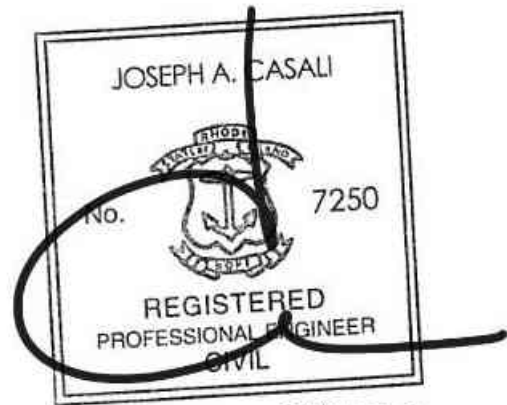
# Project Narrative and Stormwater Management Report

For a Proposed

## 5-Lot Major Subdivision Saugatucket Farms

216 Saugatucket Road  
South Kingstown, Rhode Island  
AP 42, Lot 8

**Prepared for:**  
Denali Building Co.  
Attn: Mr. Peter Abbenante Jr.  
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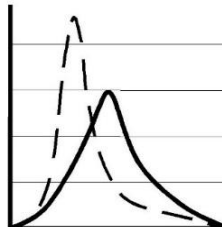
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**Submission Date:**  
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**Submitted by:**

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## **APPENDICES**

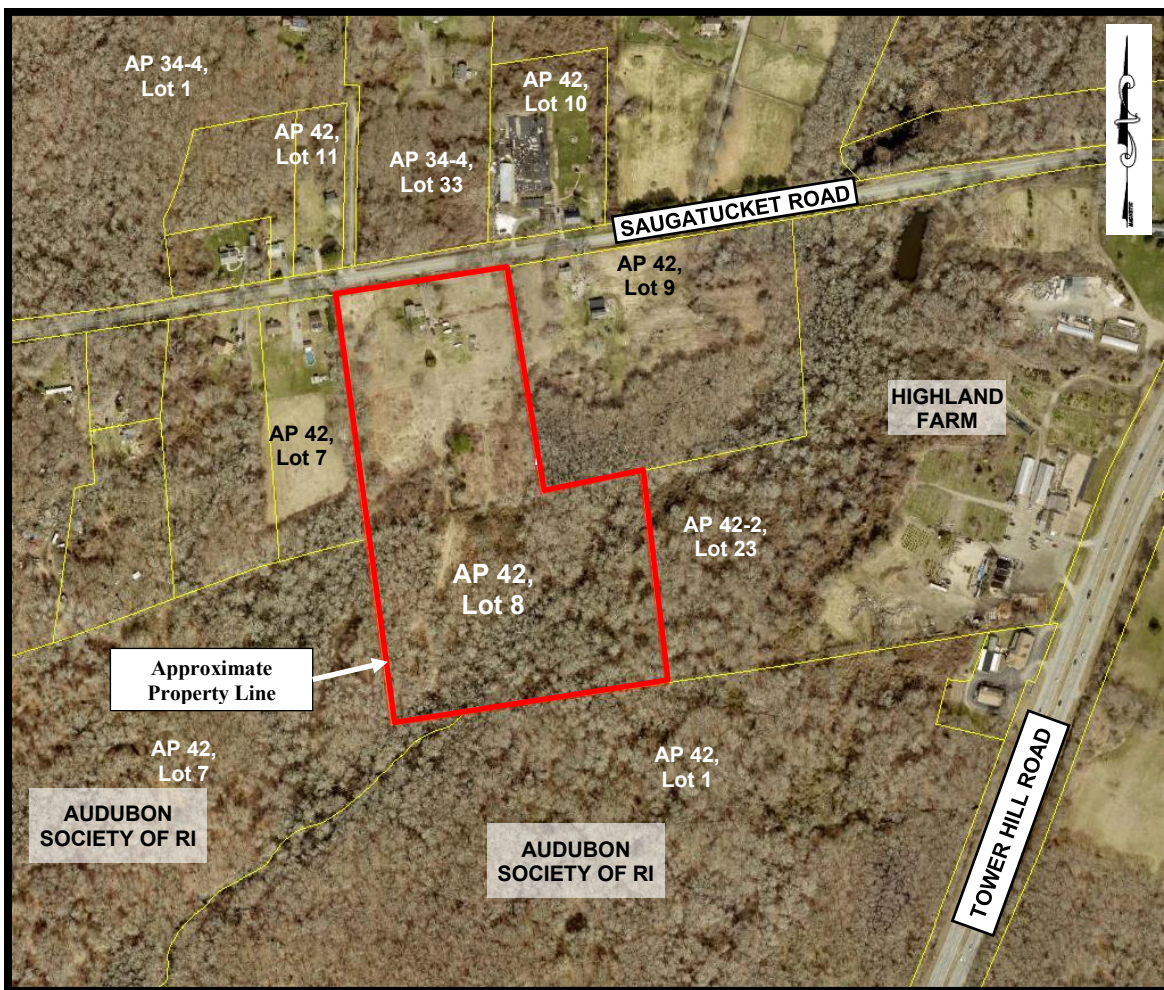
- Appendix A: Soil Evaluation Test Hole Logs, prepared by Avizinis Environmental Services, Inc., dated October 2024
- Appendix B: Soil Evaluation Test Hole Logs, prepared by JCE, dated June 2025
- Appendix C: Freshwater Wetland Delineation Report, prepared by Natural Resource Services, Inc., dated December 2023
- Appendix D: RIDEM Edge Verification letter (Application No. 24-0177)
- Appendix E: Existing Condition Watershed Map
- Appendix F: Existing Condition HydroCAD Calculations
- Appendix G: Proposed Condition Watershed Map
- Appendix H: Proposed Condition HydroCAD Calculations
- Appendix I: Water Quality HydroCAD Calculations

## **1 INTRODUCTION**

On behalf of Denali Building Co., Joe Casali Engineering, Inc. (JCE) has prepared the following Project Narrative and Stormwater Management Report to identify existing and proposed site conditions related to Saugatucket Farms, a proposed 5-lot major residential subdivision of 216 Saugatucket Road in South Kingstown, Rhode Island. The subject property can also be identified as Tax Assessor's Plat Map (AP) 42, Lot 8. The property lies within the medium density residential (R40) Zoning District. In an effort to blend in with the natural character of the surrounding area, the Applicant is proposing to utilize the flexible frontage provision of the South Kingstown Zoning Ordinance for the subdivision design, providing access to the proposed 5-lots via a shared access driveway.

## 2 SITE LOCATION AND PHYSICAL DESCRIPTION

According to a Class I Boundary Survey completed by Ocean State Planners, Inc. in August 2024, the subject parcel is approximately 597,477 sq. ft. (13.72 acres) in area. The subject parcel is bound by Saugatucket Rd. to the north, residential properties to the west and east, and a large parcel owned by the Audubon Society of Rhode Island to the south. The parcel is currently occupied by a single-family dwelling with accessory structures and gravel driveway, constructed in 1880. The lot has a history of agricultural activity. A review of historical aerials of the site shows maintenance of an open field from 1939 to 1981 that extended from the home to the stone wall that bisects the property. Since 1981, there have been irregular periods of maintenance and regrowth of the field area towards the center of the parcel.



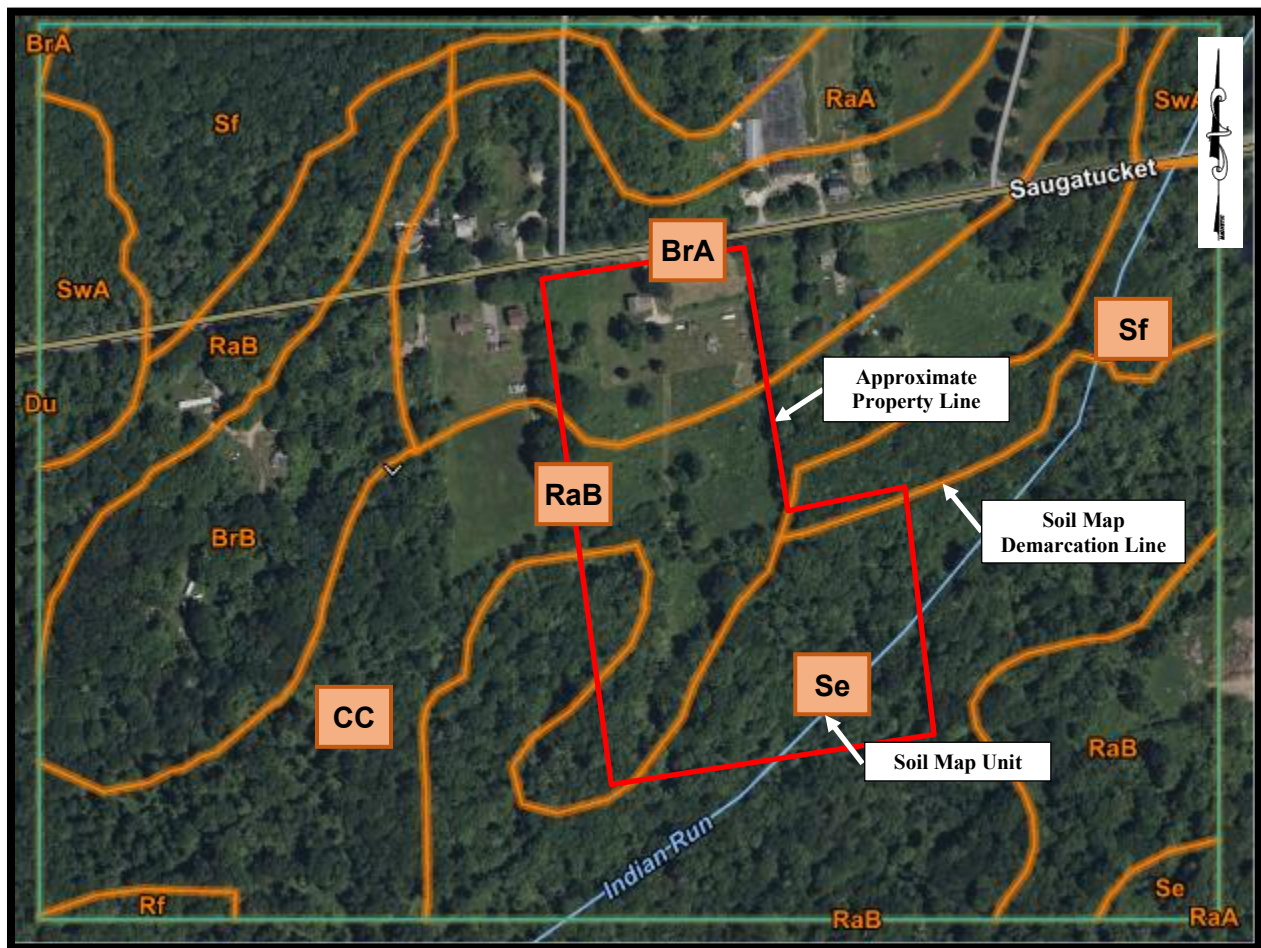
**Figure 1 – Locus Map**

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### 2.1 Soil Classification

According to the *Web Soil Survey (WSS)* operated by the US Department of Agriculture Natural Resources Conservation Service (NRCS), produced by the National Cooperative Soil Survey, the soils on site consist primarily of Broadbrook silt loam, 0 to 3 percent slopes (BrA) and Rainbow

silt loam, 3 to 8 percent slopes (RaB). BrA soils generally consist of coarse-loamy eolian deposits over coarse-loamy lodgment till derived from granite and gneiss and/or schist and/or shale and siltstone; while RaB soils generally consist of coarse-loamy eolian deposits over coarse-loamy lodgment till derived from granite and gneiss and/or schist. Both BrA and RaB soils generally consist of a depth to the seasonal high groundwater table of 18 to 30-inches below the ground surface, belonging to Hydrologic Soil Group C.



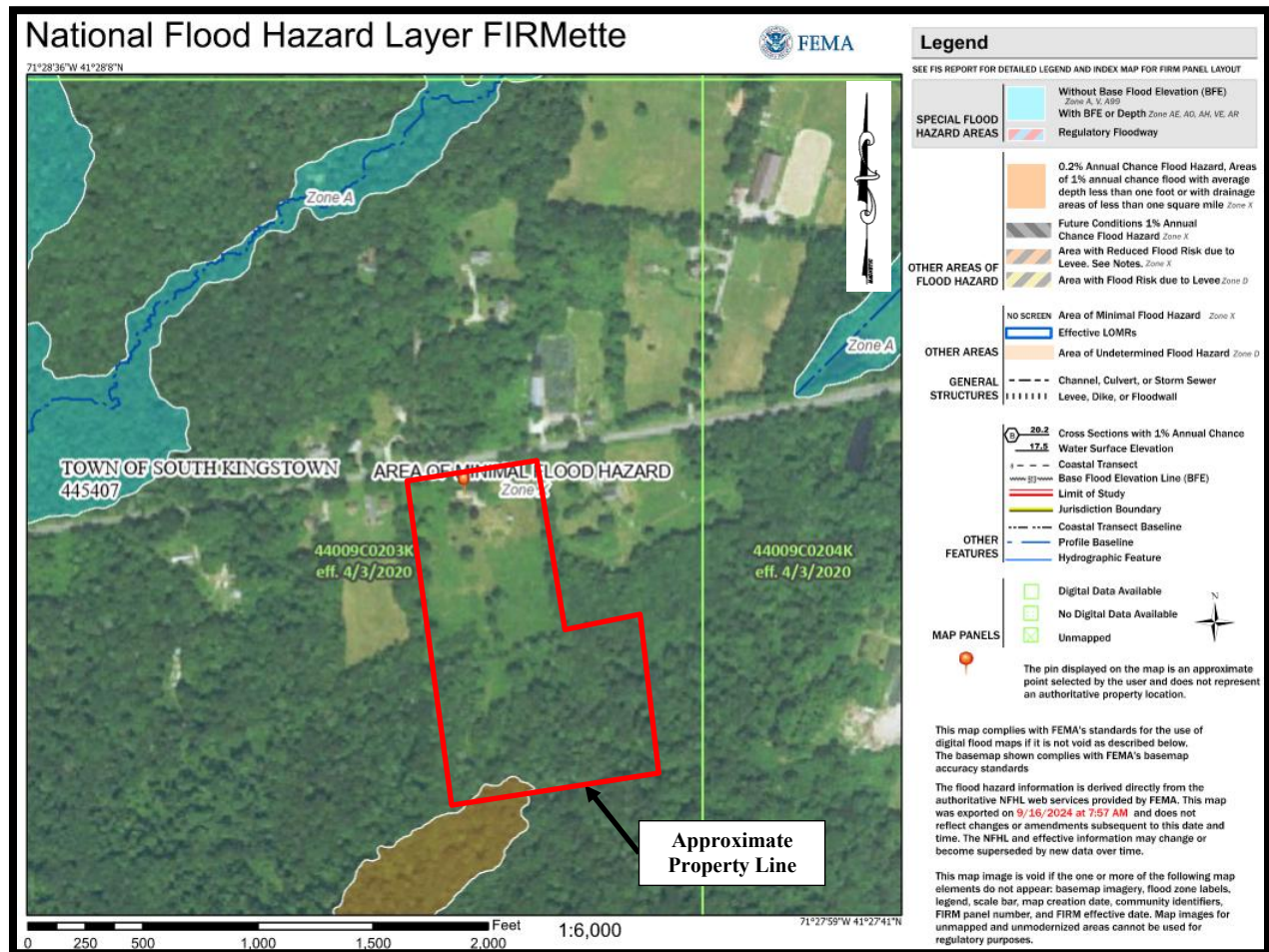
***Figure 2 – Soils Map***

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Soil evaluations for on-site wastewater treatment system design (OWTS) were performed by Avizinis Environmental Services, Inc. in October 2024. Eight (8) soil evaluations were completed (TH 1-1 through TH 4-2) for OWTS design. The depth to the seasonal high groundwater table (SHGWT) ranged from 18- to 32-inches below the ground surface. Ledge was not encountered during excavation. Refer to Appendix A for logs. Additional soil evaluations for stormwater management design were completed by JCE in June 2025. Two (2) soil evaluations were completed (TH-SW1 and TH-SW2). The depth to the SHGWT ranged from 33- to 26-inches below the ground surface. Ledge was not encountered during excavation. Refer to Appendix B for logs.

## 2.2 Flood Zone Classification

The site is located on the Federal Emergency Management Agency (FEMA), Flood Insurance Rate Map for the Town of South Kingstown, Rhode Island, Map Number 44009C0203K, effective date April 3, 2020. The project site is located entirely within Flood Zone X, which is defined as areas determined to be outside the 0.2% annual chance flood plain. A very small portion of the subject property to the south is located within Flood Zone X – 0.2% Annual Chance Flood Hazard, which is defined as areas of 1% annual chance flood with average depth of less than one square mile.



**Figure 3 – Flood Map**

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## 2.3 Natural and Recreational Resource Inventory

Based on a Freshwater Wetland Delineation and report prepared by Natural Resource Services, Inc., we understand that a deciduous forested swamp exists within the southern portion of the site, continuing off-site to the south, encompassing greater than 10-acres in area. Swamps of this size are subject to a 75-ft buffer zone. In addition, a blue-lined perennial stream is located within the wetlands on site; the Indian Run Brook. Blue-lined perennial streams are considered a river

for state wetland regulatory purposes and therefore the river is subject to a 100-ft buffer zone. In addition to the buffer zone standards above, any primary structure requires an additional 20-ft setback from the buffer or existing vegetated land within the buffer zone and a 5-ft setback for any secondary structures proposed. NRS's Freshwater Wetland Delineation report is included in Appendix C.

Wetland edges were field surveyed, and a Wetland Edge Verification application was submitted to the Rhode Island Department of Environmental Management (RIDEM) in July 2024. The wetland edge, as depicted, was confirmed by RIDEM, as evidenced by the Edge Verification letter (Application No. 24-0177), included in Appendix D.

There are no known existing public, recreational or cultural resources within the subject site. The parcel is not located in any known historic planning district or a land conservation area. Mapping from the Rhode Island Department of Environmental Management (RIDEM) Environmental Resource Mapping (ERM) database indicates that the subject parcel is within a Natural Heritage Area (NHA). Based on data obtained from the RIDEM, we understand that this NHA is associated with American featherfoil (*Hottonia inflata*), a species of state concern. This species was last observed in 1992, approximately 0.15 miles to the east of the subject site. This species generally occurs within wetlands, typically lakes and ponds.

## **2.4 Watershed**

The site is located within the Saugatucket River watershed (RIDEM ID# 010900050401); specifically, runoff from the subject site flows towards the south and to the Indian Run Brook (RI0010045R-02). Indian Run Brook flows to the south to a confluence with the Saugatucket River in Peace Dale. Indian Run Brook is identified as impaired based on the RIDEM ERM; impairments include heavy metals (copper and zinc) and fecal coliform. Total Maximum Daily Loads have been established for fecal coliform and zinc.

## **2.5 Easements**

According to the Class I Boundary Survey performed by Ocean State Planners, Inc. in August 2024, there are no known easements within or immediately adjacent to the subject parcel.

## **2.6 Zoning**

According to the Town of South Kingstown Zoning Ordinance and Map, the site is currently within the R40 Medium Density Residential Zoning District. From the Town's Zoning Ordinance: "This district allows a residential density of up to one (1) dwelling per acre. The minimum lot size for single household detached dwellings is forty thousand (40,000) square feet. Residential compounds will be the preferred type of residential development because they have low visual and environmental impact and fit the rural landscape. This district presently includes large estates, farms and large single-household residential lots, and the character of these lands should be maintained. Any intensive development here is not recommended. However, if major subdivision activity is proposed, cluster zoning techniques should be encouraged. Public water

and public sewer services may be available but are not required. In addition, topographic and soil conditions in some portions of this district make large-scale development impractical. These areas may be environmentally sensitive and may contain much of the town's wetlands and prime agricultural areas.”

The following are the current dimensional requirements for an R40 Zoning District:

<b>Requirement</b>	<b>R40 Zone</b>
Minimum Lot Area	40,000 sf
Minimum Lot Frontage	150 ft
Min. Front Yard Setback	40 ft
Min. Side Yard Setback	20 ft
Min. Corner Side Yard Setback	30 ft
Min. Rear Yard Setback	40 ft
Max. Building Coverage	20%
Max. Building Height	35 ft
Max. Accessory Bldg. Height	20 ft
Min. Accessory Bldg. Side Yard Setback	15 ft
Min. Accessory Bldg. Rear Yard Setback	10 ft

## 2.7 Existing Utilities

Water: A 12-inch water main exists within Saugatucket Road, owned and maintained by Veolia Water Company. It appears that the existing single-family dwelling on the subject property is serviced via the existing 12-inch main; service size is unknown.

Sewer: Public sewer is not available in the project area; the existing single-family dwelling on the subject property is serviced via an on-site wastewater treatment system (OWTS).

Electric/Communications: Electric and communication services are available via overhead lines along the northern side of Saugatucket Road. Electrical poles and associated utilities are owned and maintained by RI Energy. Telecommunications lines are owned and maintained by Verizon and/or Cox Communications.

## 3 PROPOSED SCOPE OF WORK

### 3.1 General

The proposed development includes the subdivision of the existing parcel into five (5) new residential lots, with a single-family dwelling proposed on four (4) of the lots and the existing dwelling will be rehabilitated and situated on its own lot. Each new residential lot is proposed to

be constructed with associated utilities and driveways. The proposed subdivision has been designed in accordance with the current Town of South Kingstown Zoning Ordinance and the Land Development and Subdivision Regulations. All proposed residential lots have been designed to meet the dimensional requirements of the R40 Zone.

To conform to the Town's Zoning Ordinance, specifically "...residential compounds will be the preferred type of residential development because they have low visual and environmental impact and fit the rural landscape...", the Applicant is proposing to proceed with the Flexible Frontage provisions of the Town's Zoning Ordinance (Section 502.2). As per the requirements of Section 502.2, a Yield Plan has been prepared presenting a conventional subdivision with five (5) by-right lots. The development data is broken down as follows:

- Total Lot Area = 597,477 sq. ft. (A)
- Unbuildable Area (wetlands) = 370,111 sq. ft. (B)
- Total Developable Area (A-B) = 227,366 sq. ft. (C)
- Max. Yield (C / 40,000 sq. ft.) = 5.68 lots; say 5 lots

The Applicant is proposing to develop five (5) flexible frontage lots; one of which will have adequate frontage (greater than 150-ft) while the remaining four lots will have reduced frontage. The five (5) lots will be accessed via a shared access driveway with stormwater mitigation area. A hammerhead turnaround area will be located at the end of the access driveway for fire apparatus and other delivery vehicles. Apart from lot frontage and width, each lot will otherwise conform to the R40 zoning requirements.

### **3.2 Utilities**

Water: A new domestic water service is proposed to be extended to the development from the existing 12-inch main within Saugatucket Road. Each new dwelling will be serviced by a new 1-inch diameter domestic water service.

Sewer: Sewer service is not available within the project area; therefore, an individual on-site wastewater treatment system (OWTs) will service each residence. The proposed subdivision consists of five (5) lots or less with frontage on an existing road; therefore, Subdivision Suitability approval is not required and OWTS applications will be submitted for each individual lot prior to submitting for a building permit.

Electric/Telecommunications: Electric and telecommunications services are proposed to be extended to the new dwellings from existing infrastructure along the north side of Saugatucket Road. Services within the proposed development will be subsurface. Review and approval from Rhode Island Energy will be required.

Stormwater: Stormwater mitigation will be achieved via individual Best Management Practices (BMPs) following the State of Rhode Island Stormwater Management Guidance for Individual Single-Family Residential Lot Development. BMP's such as bioretention basins, underground infiltration chamber systems, sediment forebays, stormwater basins and water quality trenches will be located adjacent to proposed dwellings, driveways, and roadways to provide water quality and offset proposed impervious areas.

### **3.3 Local Permit Requirements**

#### **3.3.1 South Kingstown Planning Board**

The project would be considered a Minor Subdivision, as the proposal includes five (5) lots. However, the Applicant is proposing to proceed with the Flexible Frontage provision of the Zoning Ordinance, which is considered a variance/waiver, which “upgrades” the project to a Major Subdivision. The Major Subdivision review process consists of abutter notifications, public meetings, and Planning Board approval: Pre-Application, Master Plan, Preliminary Plan and Final Plan. On January 28, 2025, the Planning Board approved the applicant’s request to combine Master Plan and Preliminary Plan. The project consists of three stages of review:

1. Pre-Application Meeting (completed December 10, 2024)
2. Combined Master Plan and Preliminary Plan
3. Final Plan

#### **3.3.2 Union Fire District**

The proposed project’s layout will require review and approval from the Union Fire District’s Fire Marshal.

#### **3.3.3 Veolia Water**

Should the project proceed with connection into the existing water main for domestic water service to the development, the design will require review and approval from Veolia Water.

### **3.4 State Permitting Requirements**

#### **3.4.1 Rhode Island Department of Environmental Management (RIDEM)**

The proposed project will likely require a Freshwater Wetlands Permit from the Rhode Island Department of Environmental Management (RIDEM) Office of Water Resources. In the event that the proposed site improvements can be confined completely outside of the 100-ft wetland jurisdictional zone, a Wetlands Permit may not be required; however, a Rhode Island Pollutant Discharge Elimination System (RIPDES) permit will likely be required, as the area of disturbance will exceed one (1) acre.

## 4 STORMWATER MANAGEMENT PLAN

The proposed major subdivision is subject to the Rhode Island Stormwater Management, Design, and Installation Rules (250-RICR-150-10-8) by both the Rhode Island Department of Environmental Management (RIDEM). The proposed stormwater management system will be designed to generally mimic existing conditions. The stormwater management system design will adhere to all State (RIDEM) and local (Town of South Kingstown) standards and provide attenuation of peak stormwater runoff rates for the 1-, 2-, 10-, 25- and 100-year storm events while improving the quality of the stormwater leaving the site.

The proposed Stormwater Management Plan improves the overall quality of stormwater leaving the site through the use of Best Management Practices (BMPs). These water quality BMPs incorporate low-impact development techniques, including a sand filter basin. Pre-treatment has been included with the BMP designs to help reduce overall maintenance and to extend the design life of the BMPs. Pre-treatment practices include a sediment forebay.

### 4.1 Standard 1: LID Planning and Design Strategies

LID site planning and design strategies must be used to the maximum extent practicable.

#### *Standard Met*

LID practices of a sand filter basin and maintenance planning have been included in the site's stormwater management design. Proposed drainage patterns have been designed to closely mimic those of existing conditions. The stormwater BMP's were designed to capture, filter, and infiltrate the stormwater quality volume generated from the proposed site improvements.

### 4.2 Standard 2: Groundwater Recharge

Stormwater must be recharged within the same subwatershed to maintain baseflow at pre-development recharge levels to the maximum extent practicable.

#### *Standard Met*

Groundwater recharge will be provided on-site for the shared driveway and individual driveways via the proposed sand filter basin; and for the dwellings via small rain gardens within each proposed lot. All calculations were completed in accordance with Section 8.8 of the Stormwater Rules using the following formula:

$$Re_v = (1')(F)(I)/12$$

Based on the results of the soil evaluation test holes, a recharge factor of 0.25 was used for Hydrologic Soil Group C.

**Table 1: Groundwater Recharge Requirements**

<b>Design Point</b>	<b>DP2</b>
<i>Subwatershed</i>	<b>2A</b>
<i>Treatment System</i>	Sand Filter
<i>Total Impervious Area (sf)</i>	15,321
<i>Recharge factor (in)</i>	0.25
<i>Required (100%) Recharge Volume (cf)</i>	319
<i>Provided Recharge Volume (cf)</i>	3,648
<i>Recharge Requirement Met</i>	Yes

- Notes: 1. Recharge Volumes are calculated as the Static Storage Volume.  
 2. Static Storage Volume = Volume of system below outlet

### 4.3 Standard 3: Water Quality

The stormwater runoff from the site must be treated prior to discharge.

#### *Standard Met*

Because the site is not considered a redevelopment, 100% treatment for the water quality volume and recharge must be provided. Existing impervious areas being directed to the site do not require treatment. Treatment for the water quality volume will be met for the shared driveway and individual driveways via the proposed sand filter basin; and for the dwellings via small rain gardens. Systems have been sized to capture and treat the required water quality volume prior to discharge. Pre-treatment for the shared and individual driveways will be provided via the sediment forebay. Calculations are provided in Appendix H. Calculations were completed in accordance with Section 8.9 of the Stormwater Rules using the following formula:

$$WQ_v = (1'') (I) / 12 \text{ in/ft}$$

Tables 2 and 3 below provide sizing calculations for the Water Quality Volume (WQ<sub>v</sub>) of the pretreatment area and the treatment area, respectively. Water quality calculations are for rooftops and conventional pavement areas and are included in Appendix I.

**Table 2: Pre-Treatment Requirements**

<b>Design Point</b>	<b>DP2</b>
<b><i>Subwatershed</i></b>	<b>2A</b>
<i>Treatment Type</i>	Sediment Forebay
<i>Total Impervious Area (SF)<sup>1</sup></i>	11,649
<i>Water Quality Factor (in)</i>	1.00
<i>Required WQv (CF)</i>	971
<i>Required Static Volume for Pretreatment (25% of WQv)</i>	243
<i>Provided Static Storage Volume for Pretreatment</i>	748
<i>Pretreatment Requirement Met</i>	Yes

**Table 3: Treatment Requirements**

<b>Design Point</b>	<b>DP2</b>	<b>DP2</b>
<b><i>Subwatershed</i></b>	<b>Rooftops</b>	<b>2A</b>
<i>Treatment Type</i>	Typ. Rain Gardens	Sand Filter
<i>Impervious Area (sf)</i>	1,560	11,649
<i>Water Quality Factor (in)</i>	1.00	1.00
<i>Required WQv Volume (cf)</i>	130	971
<i>Required Volume for Treatment (%)</i>	100%	75%
<i>Required Static Storage Volume for Treatment (CF)</i>	130	728
<i>Provided Static Storage Volume for Treatment (CF)</i>	130	3,648
<i>Treatment Requirement Met</i>	Yes	Yes

Notes:

1. Rooftop stormwater runoff is exempt from pretreatment requirements.
2. Static storage volume (sand filter) = Storage volume of system below outlet.

As shown in Tables 1 through 3 above, the site’s overall proposed stormwater management system exceeds the requirements for water quality pre-treatment volume, water quality treatment volume, and groundwater recharge. This is in accordance with all Stormwater Rules and Town of South Kingstown’s Standards and ultimately eliminates or reduces any instances of untreated stormwater flow towards the Indian Run Brook.

#### **4.4 Standard 4: Conveyance and Natural Channel Protection**

This standard is designed to prevent erosive flow within natural channels and drainage ways.

*Standard Waived*

The proposed project is eligible for a waiver from this requirement because the project is a small facility with impervious cover of less than or equal to 1 acre. In addition, 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). However, the proposed stormwater management system is designed to reduce both peak stormwater rates for all design storm events, up to and including the 100-yr design storm event (see Section 5).

#### **4.5 Standard 5: Overbank Flood Protection**

Downstream overbank flood protection must be provided by attenuating the post development peak discharge rate to the pre-development levels for the 1, 2, 10, 25 and 100-year, Type III design storm events.

##### *Standard Met*

The HydroCAD calculations for the proposed site, included in Appendix H, show that post-development peak discharge rates are less than the pre-development peak discharges for the 1-, 2-, 10-, 25- and 100-year storm events. See Section 5.4 and Appendices F and H for supporting documentation and calculations.

#### **4.6 Standard 6: Redevelopment and Infill Projects**

For redevelopment sites with 40% or more existing impervious surface coverage and infill sites, only Standards 2, 3, and 7-11 must be addressed.

##### *Standard Not Met*

As shown below, the proposed site improvements are not considered a redevelopment project.

Total Pre-Construction Impervious Area (TIA): 1,917 sq. ft.

Total Site Area (TSA): 597,477 sq. ft.

Jurisdictional Wetlands (JW): 370,111 sq. ft.

Conservation Land (CL): 0 sq. ft.

Site Size (SS) = TSA – JW – CL = 227,366 sq. ft.

TIA / SS = 0.008 (0.84%)

TIA / SS > 0.4? No

More than 10,0000 sq. ft. to be disturbed? No

Redevelopment? No

#### **4.7 Standard 7: Pollution Prevention**

All development sites require the use of source control and pollution prevention measures to minimize the impact that the proposed land use may have on stormwater runoff quality.

##### *Standard Met*

A Soil Erosion and Sediment Control Plan (SESCP) has been prepared in accordance with the Stormwater Rules and has been submitted under separate cover. An Operation and Maintenance Plan (O&M) has been prepared in accordance with the Stormwater Rules and has also been submitted under separate cover.

#### **4.8 Standard 8: Land Uses with Higher Potential Pollutant Loads**

Stormwater discharges from land uses with higher potential pollutant loads (LUHPPLs) require the use of specific source control and pollution prevention measures and the specific stormwater BMPs approved for such use.

A stormwater LUHPPL is defined as by the following land uses and activities:

1. Areas within an industrial site (as defined in RIPDES Rule 31(b)(15)) that are the location of activities subject to the RIPDES Multi-Sector General Permit (except where a No Exposure Certification for Exclusion from RIPDES Stormwater Permitting has been executed);
2. Auto fueling facilities (i.e., gas stations);
3. Exterior vehicle service, maintenance and equipment cleaning areas;
4. Road salt storage and loading areas (if exposed to rainfall); and
5. Outdoor storage and loading/unloading of hazardous substances.

#### *Standard Not Applicable*

The project site does not meet the definition of a LUHPPL as defined in the Manual.

#### **4.9 Standard 9: Illicit Discharges**

All illicit discharges to stormwater management systems are prohibited, including discharges from OWTS, and sub-drains and French drains near OWTSs that do not meet the State's OWTS Rules.

#### *Standard Met*

There are no known illicit discharges at the site, and none are proposed as part of this project.

#### **4.10 Standard 10: Construction and Erosion Sedimentation Control**

Erosion and sedimentation control (ESC) practices must be utilized during the construction phase as well as during any land disturbing activities.

#### *Standard Met*

Soil Erosion and Sedimentation Control Practices have been employed to avoid and minimize impacts to abutting properties and roadways. Detailed notes have been included in the plans to ensure effective implementation of erosion and sedimentation controls, which include a compost filter sock around the perimeter of the site, and a crushed stone construction access at the entrance to the site. The soil erosion and sedimentation control measures will be installed prior to the initiation of construction activities and maintained throughout construction. Once

established, these measures will be monitored daily until construction activities are complete. The compost filter sock line will serve as the strict limits of disturbance for the project. No alterations, including vegetative clearing or surface disturbance, will occur beyond this line. The limits of clearing, grading, and disturbance will be kept to a minimum within the proposed area of construction. All areas outside of these limits, as depicted on the project site plans, will be totally undisturbed, to remain in a completely natural condition.

#### **4.11 Standard 11: Stormwater Management System Operation and Maintenance**

The stormwater management system, including all structural stormwater controls and conveyances, must have an operation and maintenance plan to ensure that it continues to function as designed.

##### *Standard Met*

A long-term Stormwater Operation and Maintenance Plan has been prepared for the development in accordance with the Stormwater Rules and has been submitted under separate cover.

## **5 DRAINAGE ANALYSIS**

### **5.1 Methodology**

The comparative pre-development vs. post-development hydrologic analysis was performed using the Soil Conservation Service, Technical Release 20 and 55 (TR-20 and TR-55) methodology. The 1-, 2-, 10-, 25-, and 100-year storm events were modeled for a 24-hour, Type III storm utilizing HydroCAD version 10.20. As shown in the following sections, the proposed stormwater management system has been designed to attenuate peak stormwater runoff rates leaving the site for the 1-, 2-, 10-, 25-, and 100-year design storm events. HydroCAD modeling reports for the existing and proposed conditions can be found in Appendices E and G, respectfully.

### **5.2 Existing Conditions**

The existing site is composed of three (3) subwatershed areas, discharging to two (2) design points, as shown on the Existing Conditions Watershed Map included in Appendix D.

#### *Design Point 1 – Existing Roadway Grassed Swale*

Subwatershed 1A consists of 30,852 sq. ft. of area, consisting primarily of grass and wooded areas associated with the existing single-family dwelling. This watershed has been assigned a  $T_c$  of 10.1 minutes and a CN of 75. Stormwater runoff from this watershed area is conveyed via overland flow in a northerly direction towards a stormwater conveyance grass swale along Saugatucket Road, Design Point 1. Ultimately, stormwater runoff from this watershed is conveyed to a tributary to Indian Run Brook.

Subwatershed 1B consists of 43,981 sq. ft. of area, consisting entirely of pervious surfaces associated with the northwestern portion of the project area. This subwatershed has been assigned a Time of Concentration ( $T_c$ ) of 13.8 minutes and a Composite Runoff Number (CN) of 72. Stormwater runoff from this watershed area is conveyed via overland flow in a northerly direction towards a stormwater conveyance grass swale along Saugatucket Road, Design Point 1. Ultimately, stormwater runoff from this watershed is conveyed to a tributary to Indian Run Brook.

#### Design Point 2 – Indian Run Brook

Watershed 2 consists of 512,096 sq. ft. of area, consisting primarily of pervious areas associated with the remaining portion of the project area and undeveloped portion of the subject property to the north of the existing brook. This watershed has been assigned a  $T_c$  of 20.3 minutes and a CN of 71. Stormwater runoff from this watershed area is conveyed via overland flow in a southerly direction towards Indian Run Brook, Design Point 2.

### **5.3 Proposed Conditions**

In general, the proposed drainage patterns mimic existing conditions, discharging to the same design point as under existing conditions. Under proposed conditions, stormwater runoff associated with the proposed improvements will be conveyed to a sand filter and qualified pervious areas for water quality. The stormwater management system will treat stormwater runoff pollutants and reduce peak stormwater runoff rates and volumes. These conditions are shown in detail on the Proposed Condition Watershed Map.

#### Design Point 1 – Existing Roadway Grassed Swale

Under proposed conditions, Subwatershed 1A decreases in size to 10,986 square feet. This subwatershed remains mostly unchanged aside from the entrance to the proposed shared driveway. Watershed 1A has been assigned a Time of Concentration ( $T_c$ ) of 10.1 minutes and a Composite Runoff Number (CN) of 73. Stormwater runoff from this watershed area is conveyed via overland flow in a northerly direction towards a stormwater conveyance grass swale along Saugatucket Road, Design Point 1. Ultimately, stormwater runoff from this watershed is conveyed to a tributary to Indian Run Brook.

Subwatershed 1B consists of 12,090 sq. ft. of area, consisting primarily of grass and wooded areas associated with the existing single-family dwelling. This watershed has been assigned a  $T_c$  of 6.4 minutes and a CN of 76. Stormwater runoff from this watershed area is conveyed via overland flow in a northerly direction towards a stormwater conveyance grass swale along Saugatucket Road, Design Point 1. Ultimately, stormwater runoff from this watershed is conveyed to a tributary to Indian Run Brook.

Subwatershed 1C consists of 46,766 sq. ft. of area, consisting entirely of pervious surfaces associated with the northwestern portion of the project area. This subwatershed has been assigned a  $T_c$  of 13.8 minutes and a CN of 72. Stormwater runoff from this watershed area is

conveyed via overland flow in a northerly direction towards a stormwater conveyance grass swale along Saugatucket Road, Design Point 1. Ultimately, stormwater runoff from this watershed is conveyed to a tributary to Indian Run Brook.

#### *Design Point 2 – Indian Run Brook*

Under proposed conditions, Watershed 2 has been subdivided into two (2) subwatersheds. Subwatershed 2A consists of 63,654 sq. ft. of mostly pervious areas with some impervious areas associated with the proposed residential dwellings and driveways. This subwatershed has been assigned a Time of Concentration ( $T_c$ ) of 27.1 minutes and a Composite Runoff Number (CN) of 79. Stormwater runoff from this watershed area sheet flows to the sediment forebay for pre-treatment before outletting to the sand filter for water quality and groundwater recharge. Excess treated stormwater runoff overflows the emergency weir and is conveyed via overland flow in a southerly direction towards Indian Run Brook, Design Point 2.

Subwatershed 2B consists of 453,433 sq. ft. of mostly pervious area with some impervious areas associated with the remaining portions of the proposed rooftops. This subwatershed has been assigned a Time of Concentration ( $T_c$ ) of 20.3 minutes and a Composite Runoff Number (CN) of 71. Stormwater runoff from the rear portion of every proposed rooftop area is conveyed to an individual qualified pervious area for water quality treatment. Stormwater runoff from this watershed area sheet flows in a southerly direction towards Indian Run Brook, Design Point 2.

#### **5.4 Results Summary**

A runoff analysis of the pre- and post-construction conditions was completed using the TR-20 methodology and is summarized in the table below. Supporting calculations are included in Appendices F and H.

**Table 4: Watershed Data**

	Area (square feet)	CN	Tc (min)
<b><i>Existing Condition</i></b>			
Subwatershed 1A	30,852	75	10.1
Subwatershed 1B	43,981	72	13.8
Watershed 2	512,096	71	6.0
<b><i>Existing Site Total</i></b>	<b>586,929</b>	<b>71</b>	--
<b><i>Proposed Condition</i></b>			
Watershed 1A	10,986	73	10.1
Subwatershed 1B	12,090	76	6.4
Subwatershed 1C	46,766	72	13.8
Subwatershed 2A	63,654	79	27.1
Subwatershed 2B	453,433	71	20.3
<b><i>Proposed Site Total</i></b>	<b>586,929</b>	<b>72</b>	--
$\Delta$	<b>0</b>	<b>+1</b>	--

Note: Minimum Tc = 6 minutes.

As shown in Table 4 above, the overall watershed area remains unchanged when comparing existing to proposed conditions and the CN value has increased slightly due to the moderate increase in impervious areas.

**Table 5: Stormwater Runoff Discharge Rates**

	Peak Discharge (cfs)				
	1-yr	2-yr	10-yr	25-yr	100-yr
<b><i>Design Point 1 – Grass Swale</i></b>					
Existing Stormwater Runoff	0.97	1.59	3.53	5.13	8.75
Proposed Stormwater Runoff	0.84	1.41	3.14	4.58	7.86
$\Delta Q$	-0.13	-0.18	-0.39	-0.55	-0.89
<b><i>Design Point 2 – Indian Run Brook</i></b>					
Existing Stormwater Runoff	4.58	7.90	18.42	27.28	47.76
Proposed Stormwater Runoff	4.06	6.99	16.31	27.00	47.72
$\Delta Q$	-0.52	-0.91	-2.11	-0.28	-0.04

As shown in Table 5 above, due to the implementation of the proposed BMPs, the peak stormwater runoff rates realized at all design points have decreased for all design storm events when comparing the existing condition to the proposed condition.

**Table 6: Stormwater Runoff Discharge Volumes**

	Volume (cf)				
	1-yr	2-yr	10-yr	25-yr	100-yr
<b><i>Design Point 1 – Grass Swale</i></b>					
Existing Stormwater Runoff	4,311	6,625	13,863	19,929	34,072
Proposed Stormwater Runoff	3,924	6,057	12,754	18,381	31,527
$\Delta V$	-387	-568	-1,109	-1,548	-2,545
<b><i>Design Point 2 – Indian Run Brook</i></b>					
Existing Stormwater Runoff	25,358	40,064	87,107	127,151	221,593
Proposed Stormwater Runoff	22,453	35,868	83,590	124,323	220,186
$\Delta V$	-2,905	-4,196	-3,517	-2,828	-1,407

As shown in Table 6 above, the total stormwater runoff volumes realized at realized at all design points have decreased for all design storm events when comparing the existing condition to the proposed condition.

## 6 CONCLUSIONS

As summarized above, the proposed site improvements have been designed to minimize impacts of the proposed site development by reducing peak stormwater runoff rates for the 1-, 2-, 10-, 25-, and 100-year storm events. The stormwater management system as designed will not have any negative impacts to the surrounding land areas since both peak flow rates for all storm events have been reduced compared to existing conditions. Due to the implementation of the sand filter and the qualified pervious areas, the proposed stormwater management system will improve the overall quality of stormwater runoff exiting the site by providing groundwater infiltration and reducing impairments to Indian Run Brook.

# *Appendix A*

## Soil Evaluation Test Hole Logs

*Prepared by Avizinis Environmental Services, Inc., dated October 2024*



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

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



Site Evaluation Form
Part A - Soil Profile Description Application Number 2432-1165

Property Owner: Janice Calitri
Property Location: 216 Saugatucket Road (A.P. 42, Lot 8), South Kingstown, Rhode Island
Date of Test Hole: October 18, 2024
Soil Evaluator: Amber K. Hardy, M.S. License Number: D4098
Weather: Sunny, 55° F Shaded: Yes No Time: 9:00 am

Table with 11 columns: TH 1-1 Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab. S. Contr.), Texture, Structure, Consistence, Soil Category. Rows include horizons ^C, Ap, Bw, 2Cd and TH 1-2 horizons Ap, Bw, 2Cd.

TH 1-1 Soil Class G/A Total Depth 96 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 18 (og)

TH 1-2 Soil Class G/A Total Depth 102 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 18 (og)

Comments:

**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: 3 – 8%
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO  YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO  YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO  YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO  YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO  YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO  YES
8. Site's potential for flooding or ponding: NONE  SLIGHT  MODERATE  SEVERE
9. Landscape position: Shoulder
10. Vegetation: Agricultural field, grass, field flowers, landscape trees
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: *Subwarsky* Signature License #D4098 Part B prepared by: *Subwarsky* Signature License # D4098

**DO NOT WRITE IN THIS SPACE**

Witnessed Soil Evaluation Decision: Concur  Inconclusive  Disclaim   
Unwitnessed Soil Evaluations Decision: Accept  Inconclusive  Disclaim

Wet Season Determination required  Additional Field Review Required

Explanation: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Signature Authorized Agent \_\_\_\_\_

\_\_\_\_\_ Date



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

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



Site Evaluation Form
Part A - Soil Profile Description Application Number 2432-1165

Property Owner: Janice Calitri
Property Location: 216 Saugatucket Road (A.P. 42, Lot 8), South Kingstown, Rhode Island
Date of Test Hole: October 18, 2024
Soil Evaluator: Amber K. Hardy, M.S. License Number: D4098
Weather: Sunny, 55° F Shaded: Yes No Time: 9:00 am

Table with 11 columns: TH 2-1 Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab. S. Contr.), Texture, Structure, Consistence, Soil Category. Contains data for two soil profiles (TH 2-1 and TH 2-2).

TH 2-1 Soil Class G/A Total Depth 96 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 24 (og)

TH 2-2 Soil Class G/A Total Depth 102 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 24 (og)

Comments:

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: 3 – 8%
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO  YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO  YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO  YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO  YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO  YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO  YES
8. Site's potential for flooding or ponding: NONE  SLIGHT  MODERATE  SEVERE
9. Landscape position: Shoulder
10. Vegetation: Agricultural field, grass, field flowers, landscape trees
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: *Subwarsky* Signature License #D4098 Part B prepared by: *Subwarsky* Signature License # D4098

DO NOT WRITE IN THIS SPACE

Witnessed Soil Evaluation Decision: Concur  Inconclusive  Disclaim   
 Unwitnessed Soil Evaluations Decision: Accept  Inconclusive  Disclaim

Wet Season Determination required  Additional Field Review Required

Explanation: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Signature Authorized Agent \_\_\_\_\_

Date \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

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



Site Evaluation Form
Part A - Soil Profile Description Application Number 2432-1165

Property Owner: Janice Calitri
Property Location: 216 Saugatucket Road (A.P. 42, Lot 8), South Kingstown, Rhode Island
Date of Test Hole: October 18, 2024
Soil Evaluator: Amber K. Hardy, M.S. License Number: D4098
Weather: Sunny, 55° F Shaded: Yes No Time: 9:00 am

Table with 11 columns: TH 3-1 Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab. S. Contr.), Texture, Structure, Consistence, Soil Category. Contains data for two soil profiles (TH 3-1 and TH 3-2).

TH 3-1 Soil Class G/A Total Depth 108 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 32 (og)

TH 3-2 Soil Class G/A Total Depth 108 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 32 (og)

Comments:

**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: 3 – 8%
2. Presence of any watercourse, wetlands or surface water bodies, within 200 feet of test holes? If yes, locate on above sketch. NO  YES
3. Restrictive Layer or Bedrock within 4' below original ground within 25 feet of test hole? Provide all test hole locations & depths above. NO  YES
4. Presence of existing or proposed private drinking water wells within 200 feet of test holes? If yes, locate on above sketch. NO  YES
5. Public drinking water wells within 500 feet of test holes? If yes, locate on above sketch. NO  YES
6. Is site within the watershed of a public drinking water reservoir or other critical area defined in Rule 6.42? NO  YES
7. Has soil been excavated from or fill deposited on site? If yes, locate on above sketch. NO  YES
8. Site's potential for flooding or ponding: NONE  SLIGHT  MODERATE  SEVERE
9. Landscape position: Backslope
10. Vegetation: Agricultural field, grass, field flowers, landscape trees
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: *Subwarsky* Signature License #D4098 Part B prepared by: *Subwarsky* Signature License # D4098

**DO NOT WRITE IN THIS SPACE**

Witnessed Soil Evaluation Decision: Concur  Inconclusive  Disclaim   
Unwitnessed Soil Evaluations Decision: Accept  Inconclusive  Disclaim

Wet Season Determination required  Additional Field Review Required

Explanation: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Signature Authorized Agent \_\_\_\_\_ Date \_\_\_\_\_



STATE OF RHODE ISLAND AND PROVIDENCE PLANTATIONS

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



Site Evaluation Form
Part A - Soil Profile Description Application Number 2432-1165

Property Owner: Janice Calitri
Property Location: 216 Saugatucket Road (A.P. 42, Lot 8), South Kingstown, Rhode Island
Date of Test Hole: October 18, 2024
Soil Evaluator: Amber K. Hardy, M.S. License Number: D4098
Weather: Sunny, 55° F Shaded: Yes No Time: 9:00 am

Table with 11 columns: TH 4-1 Horizon, Depth, Horizon Boundaries (Dist, Topo), Soil Colors (Matrix, Re-Dox Features), Re-Dox (Ab. S. Contr.), Texture, Structure, Consistence, Soil Category. Rows include Ap, Bw, 2Cd horizons for both TH 4-1 and TH 4-2.

TH 4-1 Soil Class G/A Total Depth 96 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 24 (og)

TH 4-2 Soil Class G/A Total Depth 102 Impervious/Limiting Layer Depth none (og) GW Seepage Depth none SHWT 24 (og)

Comments:

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

Certification

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Part A prepared by: *Subwarsky* Signature License #D4098 Part B prepared by: *Subwarsky* Signature License # D4098

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 \_\_\_\_\_

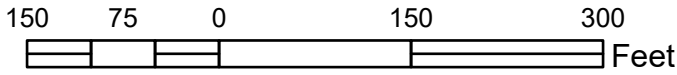


2024 AERIAL MAP  
A.P. 42, Lot 8 | 216 Saugatucket Road  
South Kingstown, Rhode Island

LEGEND

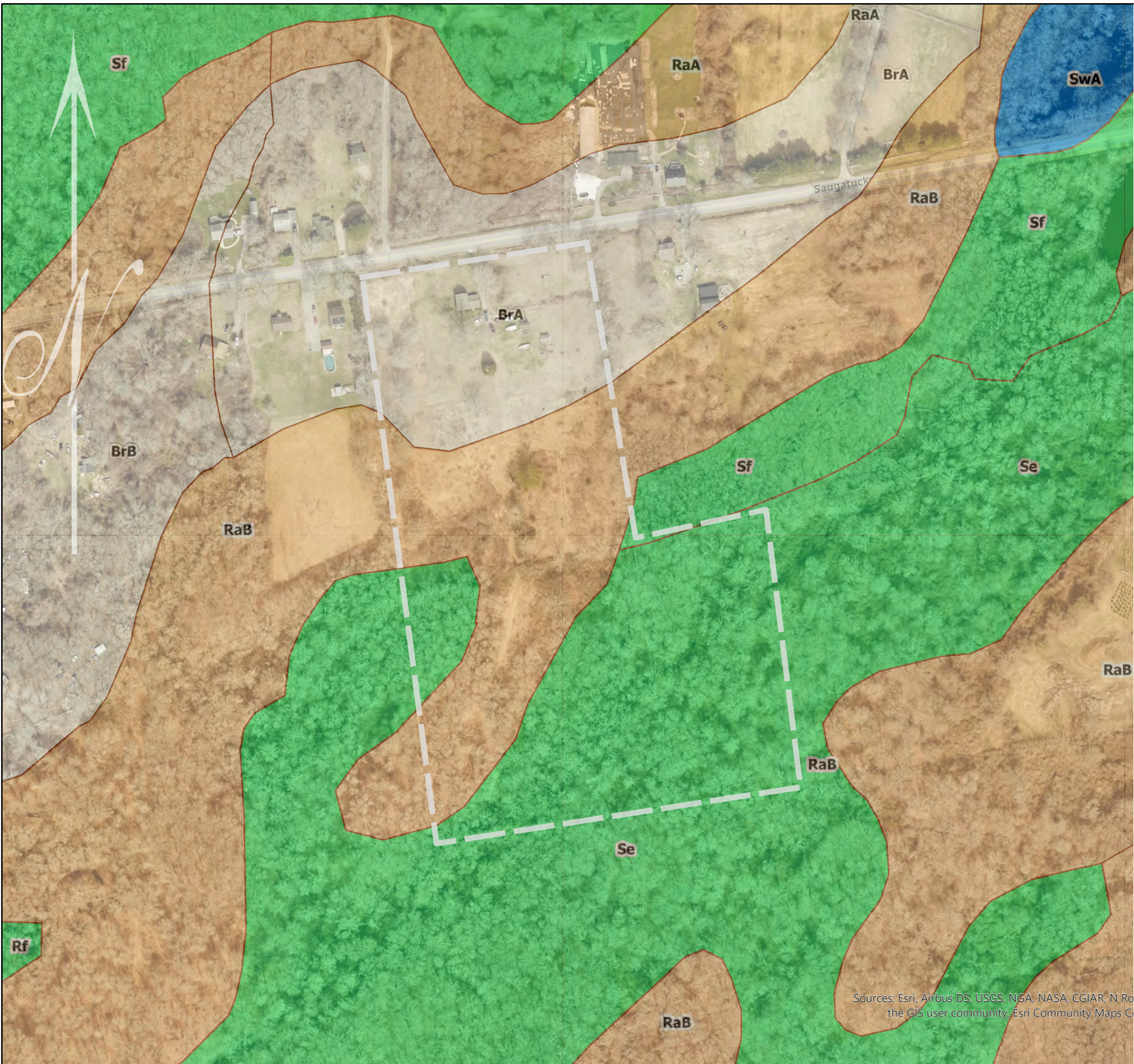


PROPERTY LINE



- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
  2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
  3. Aerial photograph base map and other data layers acquired from the RI DEM and RIGIS database.

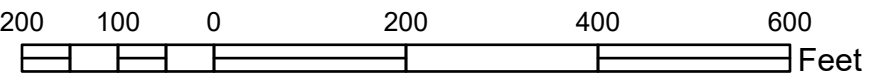
Map created by:   
Patrick J. Loveland, GIS Specialist 10/18/2024



USDA - NRCS SOIL SURVEY MAP  
 A.P. 42, Lot 8 | 216 Saugatucket Road  
 South Kingstown, Rhode Island


LEGEND

- BrA - Broadbrook silt loam, 0 to 3 percent slopes
- BrB - Broadbrook silt loam, 3 to 8 percent slopes
- RaA - Rainbow silt loam, 0 to 3 percent slopes
- RaB - Rainbow silt loam, 3 to 8 percent slopes
- Se - Stissing silt loam
- Sf - Stissing very stony silt loam
- SwA - Swansea muck, 0 to 1 percent slopes



- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
  2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
  3. Aerial photograph base map and other data layers acquired from the RI DEM and RIGIS database.

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Ro the GIS user community, Esri Community Maps C

Map created by:   
 Patrick J. Loveland, GIS Specialist

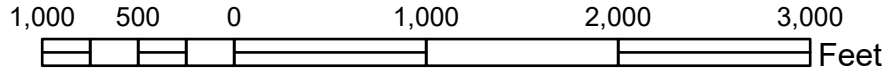
10/18/2024



USGS TOPOGRAPHIC MAP  
 A.P. 42, Lot 8 | 216 Saugatucket Road  
 South Kingstown, Rhode Island

LEGEND

 PROPERTY LINE



- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for accurate site feature locations.
  2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
  3. Aerial photograph base map and other data layers acquired from the RI DEM and RIGIS database.

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, NRC, the GIS user community, Copyright: © 2013 National Geographic

Map created by: Patrick J. Loveland, GIS Specialist

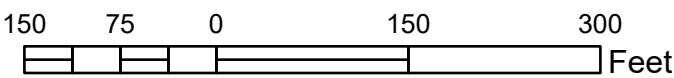
10/18/2024



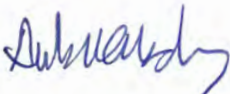
2024 SOIL EVALUATION MAP  
 A.P. 42, Lot 8 | 216 Saugatucket Road  
 South Kingstown, Rhode Island

LEGEND

-  PROPERTY LINE
-  SOIL EVALUATION



- General Notes:
1. This map should not be interpreted as a survey quality graphic. It is designed for preliminary planning purposes only. AES recommends consultation with a Professional Land Surveyor for an accurate site plan.
  2. Property lines as depicted on this map have been approximated from plat maps available from the town assessor's online database.
  3. Aerial photograph base map and other data layers acquired from the RI DEM and RIGIS database.
  4. Site features located with a Juniper Geode Submetric GNSS receiver with SWmaps data collection software. Non-delineated wetland edges have not been field verified and are depicted for graphic purposes only. The required 20-foot construction setbacks are not shown on this map.

Delineation performed by:   
 Amber K. Hardy, M.S., Soil Evaluator D4098 10/18/2024

Map created by:   
 Patrick J. Loveland, GIS Specialist 11/06/2024


## *Appendix B*

Soil Evaluation Test Hole Logs

*Prepared by Joe Casali Engineering, Inc., dated June 2025*


<b>TEST HOLE LOCATION:</b> See Test Pit Location Plan <b>GROUND SURFACE EL. / DATUM:</b> 90.0' / NAVD88 <b>EXCAVATOR TYPE:</b> CAT 416F2 <b>OPERATOR:</b> Denali Corp.	<b>DATE START/FINISH:</b> June 9, 2025 <b>WEATHER:</b> Overcast, 70 Deg. F <b>EXCAVATOR REACH:</b> Approx. 10-Ft <b>JCE REPRESENTATIVE:</b> D. DeCesaris, PE (RI 10162)	<h1>TH-SW1</h1>
		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE/NO.	LAYER	REMARKS/NOTES	SOIL / ROCK DESCRIPTION	EST. HYDRAULIC CONDUCTIVITY
1		TS		(0-8") SILTY SAND (SM); Dark brown/black, dry, 55% fine to medium sand, 35% nonplastic fines, 10% fine to coarse gravel, TOPSOIL. <i>USDA Class: Sandy Loam/Loamy Sand.</i>	N/A
2		GLACIAL DEPOSITS		(8-33") SILTY SAND (SM); Brown, dry, 50% fine to medium sand, 40% nonplastic fines, 10% fine gravel. <i>USDA Class: Sandy Loam.</i>	HSG C 1.02 in/hr
3			Iron oxide staining observed below 33-inches.	(33-72") Gleyed bluish gray, moist, 50% nonplastic fines, 40% fine sand, 10% fine to coarse gravel. <i>USDA Class: Sandy Loam / Loam.</i>	
4			Occasional cobbles (max. size = 8") below 48-inches.		
5					
6				Bottom of test hole at 72-inches; excavation backfilled with previously excavated material upon completion.	
7					
8					
9					
10					
11					
12					

<b>NOTES:</b>  <b>PROJECT NAME:</b> Saugatucket Rd. Subdivision <b>PROJECT NUMBER:</b> 24-20	<b>SHGWT:</b> 33-inches <b>IMPERVIOUS / LIMITING LAYER:</b> Not encountered  <div style="text-align: right;">  <p> <b>JCE</b>  <small>JOE CASALI ENGINEERING, INC.            CIVIL - SITE DEVELOPMENT - TRANSPORTATION            DRAINAGE - WETLANDS - ISDS - TRAFFIC - FLOODPLAIN            300 FIRST ROAD, WARREN, RI 02886            (401) 866-1300 (401) 866-1313 FAX WWW.JOECASALI.COM</small> </p> </div>
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<b>TEST HOLE LOCATION:</b> See Test Pit Location Plan <b>GROUND SURFACE EL. / DATUM:</b> 89.0' / NAVD88 <b>EXCAVATOR TYPE:</b> CAT 416F2 <b>OPERATOR:</b> Denali Corp.	<b>DATE START/FINISH:</b> June 9, 2025 <b>WEATHER:</b> Overcast, 70 Deg. F <b>EXCAVATOR REACH:</b> Approx. 10-Ft <b>JCE REPRESENTATIVE:</b> D. DeCesaris, PE (RI 10162)	<h1>TH-SW2</h1>
		PAGE 1 OF 1

DEPTH (FT)	SAMPLE TYPE/NO.	LAYER	REMARKS/ NOTES	SOIL / ROCK DESCRIPTION	EST. HYDRAULIC CONDUCTIVITY
1		TS		(0-8") SILTY SAND (SM); Dark brown/black, dry, 55% fine to medium sand, 35% nonplastic fines, 10% fine to coarse gravel, TOPSOIL. <i>USDA Class: Sandy Loam/Loamy Sand.</i>	N/A
2		GLACIAL DEPOSITS		(8-33") SILTY SAND (SM); Brown, dry, 50% fine to medium sand, 40% nonplastic fines, 10% fine gravel. <i>USDA Class: Sandy Loam.</i>	HSG C 1.02 in/hr
3			Iron oxide staining observed below 36-inches.	(36-72") Gleyed bluish gray, moist, 50% nonplastic fines, 40% fine sand, 10% fine to coarse gravel. <i>USDA Class: Sandy Loam / Loam.</i>	
4			Occasional cobbles (max. size = 10") below 48-inches.		
5					
6				Bottom of test hole at 72-inches; excavation backfilled with previously excavated material upon completion.	
7					
8					
9					
10					
11					
12					

<b>NOTES:</b>  <b>PROJECT NAME:</b> Saugatucket Rd. Subdivision <b>PROJECT NUMBER:</b> 24-20	<b>SHGWT:</b> 36-inches <b>IMPERVIOUS / LIMITING LAYER:</b> Not encountered  <div style="text-align: right;">  <p> <b>JCE</b>  <small>JOE CASALI ENGINEERING, INC.            CIVIL - SITE DEVELOPMENT - TRANSPORTATION            DRAINAGE - WETLANDS - ISDS - TRAFFIC - FLOODPLAIN            300 FIRST ROAD, WARREN, RI 02886            (401) 866-1300 (401) 866-1313 FAX WWW.JOECASALI.COM</small> </p> </div>
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# *Appendix C*

Freshwater Wetland Delineation Report

*Prepared by Natural Resource Services, Inc., dated December 14, 2023*



## **Natural Resource Services, Inc.**

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December 14, 2023

Peter Abbenante Jr.  
Denali Corp  
620 Old Baptist Road  
North Kingstown, RI 02852

RE: Freshwater Wetland Delineation  
216 Saugatucket Road; A.P. 42, Lot 8  
South Kingstown, Rhode Island

Dear Mr. Abbenante:

Natural Resource Services, Inc. (NRS) has completed the freshwater wetland delineation within the above referenced property. This fieldwork was performed by staff biologist Hannah Chace on December 6, 2023. The wetland delineation was established in accordance with the standards outlined in Section 3.21 of the Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act (250 RICR 150-15-3). 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 3.9.3 (D) 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 verified 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 town tax assessor's database has the subject lot listed as approximately 13.75 acres in size. The property is located along the southern side of Saugatucket Road. The site is developed with a single family home constructed in 1880. The lot has a history of agricultural activity. A review of historic aerials of the site shows maintenance of open field from 1939 to 1981 that extended from the home to the stone wall that bisects the property. Since 1981 there has been irregular periods of maintenance and regrowth in the mid section of the property.

The DEM freshwater wetland regulations establish a 200-foot jurisdictional area (JA) from all rivers and streams, and a 100-foot JA from all vegetated wetlands. The combined river and vegetated wetland JA is depicted as a dashed black line on the attached GIS graphic. Any land disturbing activities proposed within the JA require a permit from the DEM.

The rules regulate wetlands and assign buffer zones based on three (3) factors: 1) the river region in which the property is located; 2) the size of the wetland; and 3) the vegetational composition and classification of the wetland. This property falls in River Region 2.

There is a watercourse located within the wetlands onsite identified as Indian Run Brook. By definition, a blue-lined perennial stream is considered a river for state wetland regulatory purposes. This river should be located by survey to be accurately represented on any site plan to DEM. The river is subject to a 100-foot buffer zone.

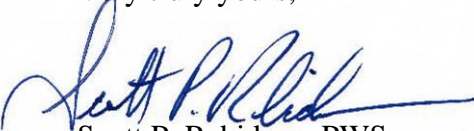
Flagging labeled W1-W48 and B1- B29 depicts a deciduous forested swamp. This swamp continues off-site to the south and appears to be greater than ten (10) acres in size. Swamps of this size are subject to a 75-foot buffer zone. When a wetland subtype, in this case a *Phragmites australis* dominated marsh, falls within 50 feet of the delineated wetland edge, the buffer zone is increased an additional 25 feet. As such flags approximately from B27-B29 would receive a 100-foot buffer zone.

According to Section 3.7.1(D) of the regulations, these buffer zones may be subject to changes upon the Department's review. Due to the presence of a Natural Heritage area within the property, the DEM may consider some of the wetlands as "rare freshwater wetland" that could result in an enhanced buffer zone. The Department will need to be contacted to identify potential rare species to determine if larger buffer zones are required. Although they may be expanded, the buffer zones may not exceed the 100-foot jurisdictional area assigned to vegetated wetlands.

In the case of any new development, the regulations apply construction setback standards in addition to the buffer zone standards outlined above. Any primary structure shall require an additional 20 feet of setback from the buffer, or existing vegetated land within the buffer zone, and 5 feet of setback for any secondary structures proposed.

Please do not hesitate to contact me if you have any questions regarding the information presented in this letter of findings or require more guidance.

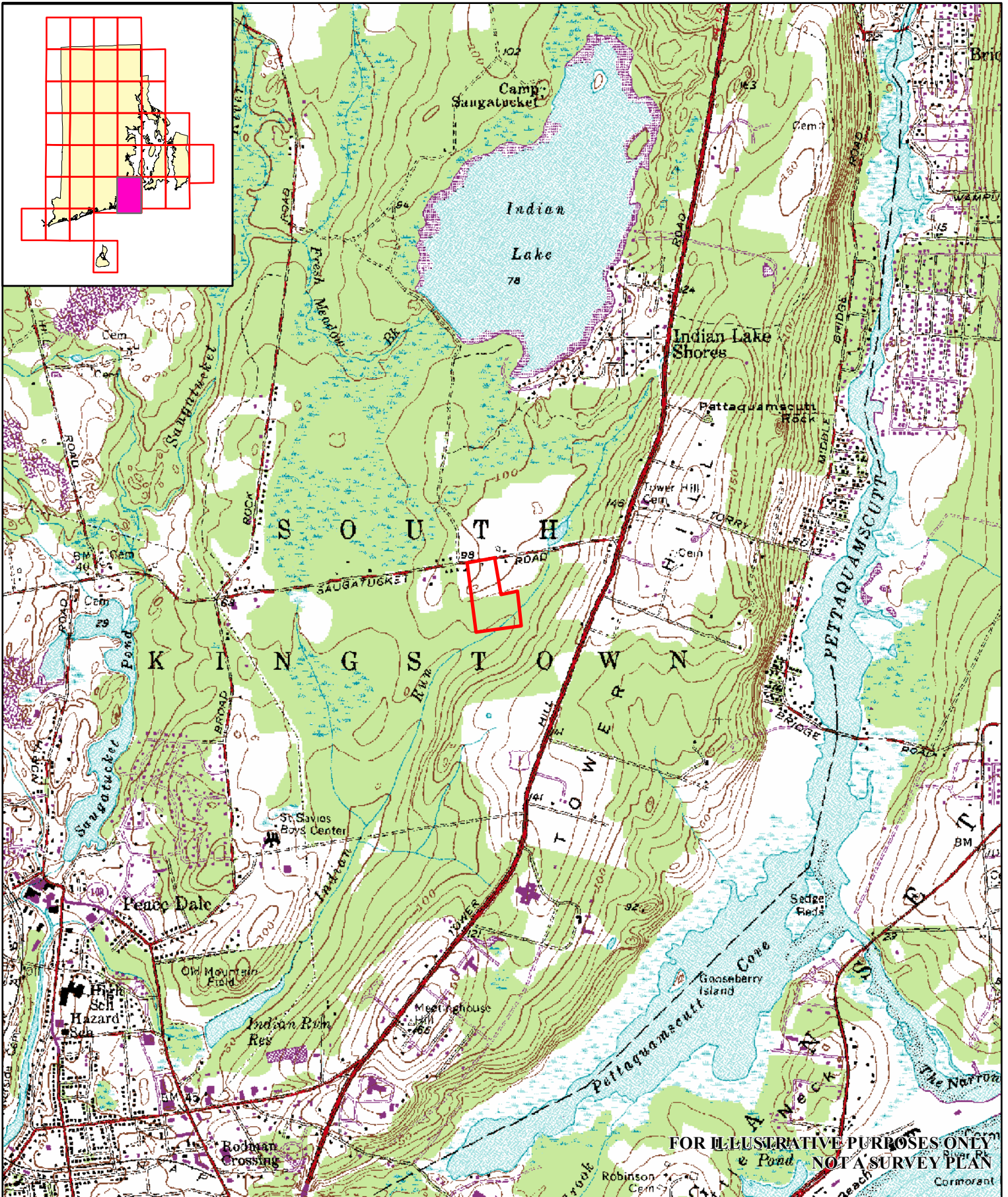
Very truly yours,




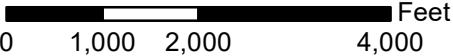
Scott P. Rabideau, PWS  
Principal

Enclosures


Cc: Chris Palmer, PLS

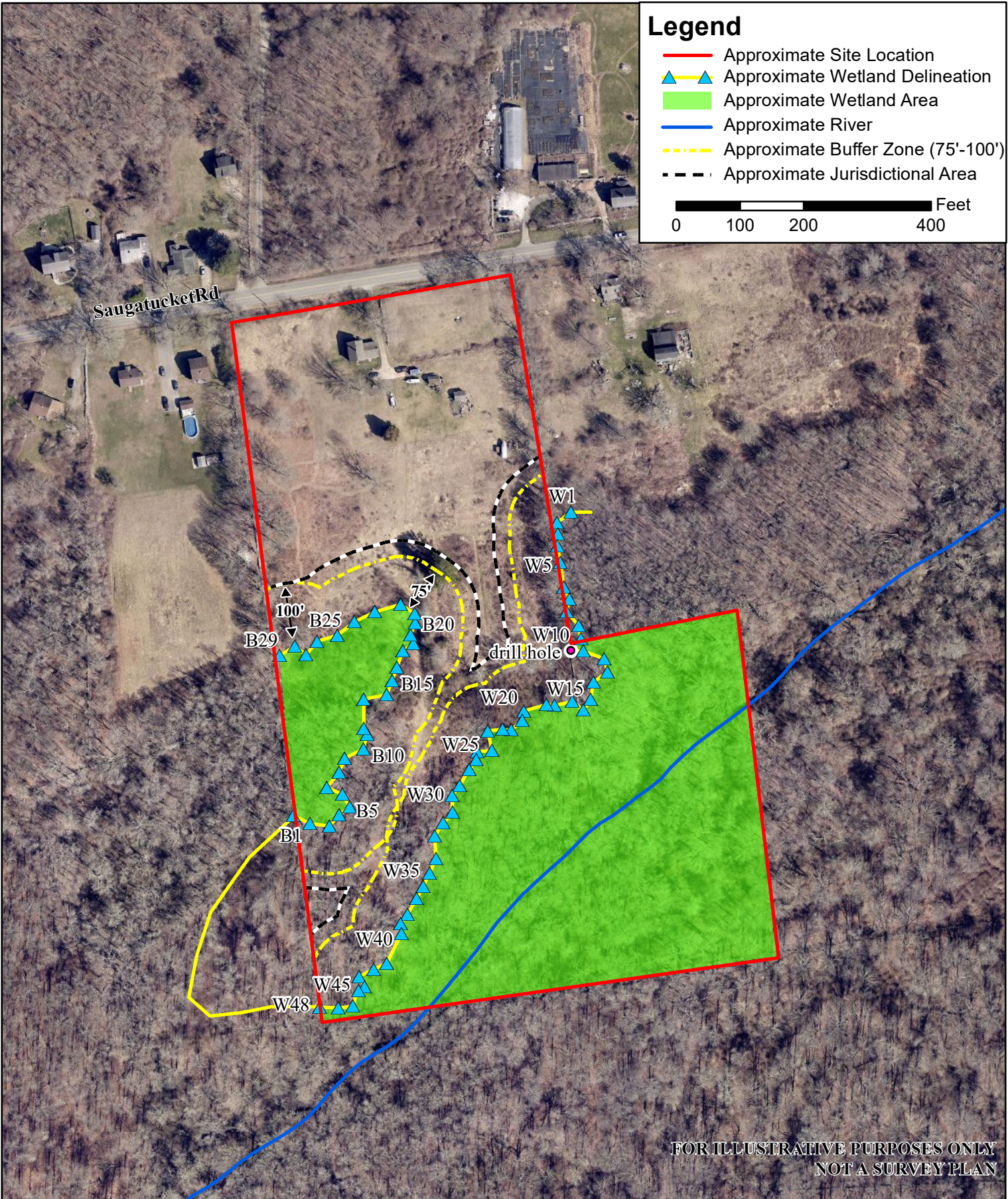


**USGS Topographic Map**  
**216 Saugatucket Rd**  
**A.P. 42, Lot 8**  
 South Kingstown, RI  
 Narragansett Pier Quad Map

 **Approximate Site Location**  
 USGS Topographic Series  
 Contour Interval 10 Feet  
 National Geodetic Vertical Datum of 1929  
 **Feet**

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

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



FOR ILLUSTRATIVE PURPOSES ONLY  
NOT A SURVEY PLAN

**Site Sketch Depicting  
Approximate Wetland Delineation**  
216 Saugatucket Rd  
A.P. 42, Lot 8  
South Kingstown, RI

Performed by:  
Staff biologist Hannah Chace - 12/5/2023  
Located using a hand-held Trimble GeoXH

N  
W E

**RIGIS** Spring 2023 aerial  
RI DEM Mapping  
**Natural Resource Services, Inc.**

PO Box 311  
180 Tinkham Lane  
Harrisville, RI 02830

p: (401) 568-7390  
(c) RIGIS

## Wetland Edge Delineation Data Form (WETLAND)

Applicant: \_\_\_\_\_  
 Project Name: 216 Saugatucket Road  
 City/Town: South Kingstown

Wetland No. \_\_\_\_\_  
 Flag No. Sequence: W1-W48  
 Delineation Date: 12/5/2023

**Vegetation:** List the three dominant species in each vegetative strata along with their NWI status:

Tree	Indicator Status	Herbs	Indicator Status
Acer rubrum	FAC	Osmundastrum cinnamomea	FACW
Quercus rubra	FACU	Sphagnum sp.	OBL
Quercus bicolor	FACW		

Saplings/Shrubs	Indicator Status	Woody Vines	Indicator Status
Vaccinium corymbosm	FACW	Smilax rotundifolia	FAC

List other vegetative species noted which may have affected determination of the wetland edge: \_\_\_\_\_  
 \_\_\_\_\_

**Soil:** SCS Soil Survey Mapping Unit: Se  
 On Hydric Soils List?  YES  NO

Soil Profile (Note wetland flag no. nearest soil test pit): W29

Horizon	Depth	Matrix Color	Mottling Description	Depth to Saturation	Depth to Free Water
Ap	0-8"	10YR 2/1		Surface	
Bg	8-17"	5Y 5/2	10YR 4/6		
Stony	17"				

Other indicators exhibiting an absence of wetland hydrology (e.g. water marks, drainage patterns, root rhizospheres, etc.; see § 3.21.1 (D) of the Rules): \_\_\_\_\_

Landscape position: Toeslope

Altered/atypical situation? (describe): \_\_\_\_\_  
 \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_

## Wetland Edge Delineation Data Form (UPLAND)

Applicant: \_\_\_\_\_  
 Project Name: 216 Saugatucket Road  
 City/Town: South Kingstown

Wetland No. \_\_\_\_\_  
 Flag No. Sequence: W1-W48  
 Delineation Date: 12/5/2023

**Vegetation:** List the three dominant species in each vegetative strata along with their NWI status:

Tree	Indicator Status	Herbs	Indicator Status
		Solidago canadensis	FACU
		Osmundastrum cinnamomea	FACW

Saplings/Shrubs	Indicator Status	Woody Vines	Indicator Status
Ilex opaca	FACU	Smilax rotundifolia	FAC
Vaccinium corymbosm	FACW		
Frangula alnus	FAC		

List other vegetative species noted which may have affected determination of the wetland edge: \_\_\_\_\_  
 \_\_\_\_\_

**Soil:** SCS Soil Survey Mapping Unit: RaB  
 On Hydric Soils List?  YES  NO  
 Soil Profile (Note wetland flag no. nearest soil test pit): W29

Horizon	Depth	Matrix Color	Mottling Description	Depth to Saturation	Depth to Free Water
Ap	0-10"	10YR 2/1			
Bw	10-20"+	2.5Y 4/4	10YR 4/6		

Other indicators exhibiting an absence of wetland hydrology (e.g. absence of water marks, lack of redoximorphic features, lack of oxidized rhizospheres, etc.): \_\_\_\_\_

Landscape position: Footslope

Altered/atypical situation? (describe): \_\_\_\_\_  
 \_\_\_\_\_

Comments: \_\_\_\_\_  
 \_\_\_\_\_

## *Appendix D*

Edge Verification Letter, Application No. 24-0177

*Prepared by RI Department of Environmental Management, dated September 5, 2024*



**RHODE ISLAND DEPARTMENT OF ENVIRONMENTAL MANAGEMENT**

**OFFICE OF WATER RESOURCES**

235 Promenade Street  
Providence, Rhode Island 02908

September 5, 2024

Janice V. Calitri  
216 Saugatucket Road  
Wakefield, RI, 02879

**RE:** Application No. **24-0177** in reference to the property located:

Approximately 500 feet south of Saugatucket Road, opposite Utility Pole No. 14, and approximately 2,145 feet southwest of its intersection with Tower Hill Road (Route 1), Assessor's Plat 42, Lot 8, South Kingstown, RI.

Dear Ms. Calitri:

Kindly be advised that the Department of Environmental Management's ("DEM") Freshwater Wetlands Program ("Program") has completed its review of your Request to verify freshwater wetland edges. This review included an inspection of the above referenced property ("subject property") as described by the site plans submitted with your application and received on July 17, 2024.

Per Rule 250-RICR-150-15-3.23, the **Statewide Buffer Zone Designation**, your property falls within:

- River Protection Region 2

Based upon the Program's observations and review, it is our determination that freshwater wetlands are present on or are in close proximity to the subject property. These freshwater wetlands and other jurisdictional areas are regulated by this Department and include, but are not limited to, at least the following types:

**Jurisdictional Areas:**

- Freshwater Wetlands (see below)
- Buffer: All areas of undeveloped vegetated land adjacent to a freshwater wetland that is to be retained in its natural undisturbed condition or is to be created to resemble a naturally occurring vegetated area. For the purpose of defining buffer in these Rules, "adjacent to" means land area within the buffer zone.
- Floodplain
- Contiguous areas that extend outward two-hundred (200') feet from the edge of a river or stream
- Contiguous areas that extend one-hundred feet (100') from the edge of all other freshwater wetlands

**Freshwater Wetlands and associated Statewide Buffer Zone Designation** include at least the following types:

- Swamp greater than 10 acres (B and W flagging) = 75-foot Buffer Zone.
- River (Indian Run Brook) = 100-foot Buffer Zone.

The DEM has completed an inspection and review of the wetland edges delineated by you on-site and are referenced as Flag Nos. W-11 through W-48 and B-1 through B-29. It is our determination that these wetland edges delineated on-site are accurate. These wetland edges have been shown on the site plan submitted with your application.

The depicted Jurisdictional Areas associated with off site wetland flags (W-1 to W-10) appear to be accurately depicted.

Please note that although Phragmites was observed in the vicinity of wetland flags B-27 to B-29 the size of the Phragmites patch was not large enough (less than 0.25 acres) to classify as a subtype. Therefore, a 75-foot Buffer Zone (not a 100-foot Buffer Zone) applies to this portion of wetland.

The Department has verified only those edges delineated and shown by you on-site and on the site plans submitted with your application and as qualified in this letter. Should you wish to verify the edge of additional wetlands, a new application will be required.

This letter does not constitute an approval or permit for any proposed project on the subject property. Pursuant to R.I. Gen. Laws § 2-1-21(a) of the Freshwater Wetlands Act and the Rules and Regulations Governing the Administration and Enforcement of the Freshwater Wetlands Act, 250-RICR150-15-3, a permit is required from this Program prior to the commencement of any activity which impacts or alters freshwater wetlands.

This Program assumes that the edges of freshwater wetlands, as flagged or marked on site, have been accurately surveyed and portrayed on site plans submitted in support of your application. This Program makes no guarantee or representation that such survey is accurate.

In addition, you should note that freshwater wetlands are present on this property which may be regulated under Section 404 of the Clean Water Act (Federal Water Pollution Control Act, as amended 33 U.S.C. 1344). Accordingly, a permit may be required from the U.S. Army Corps of Engineers for alteration of these wetland areas.

In accordance with 250-RICR-150-15-3.9.3(H), this verification of the delineated edge of freshwater wetlands is valid for a limited period of five (5) years from the date of issue.

Please contact Lucianna Faraone Coccia of this Office telephone: (401-537-4225) should you have any questions regarding this letter.

Sincerely,



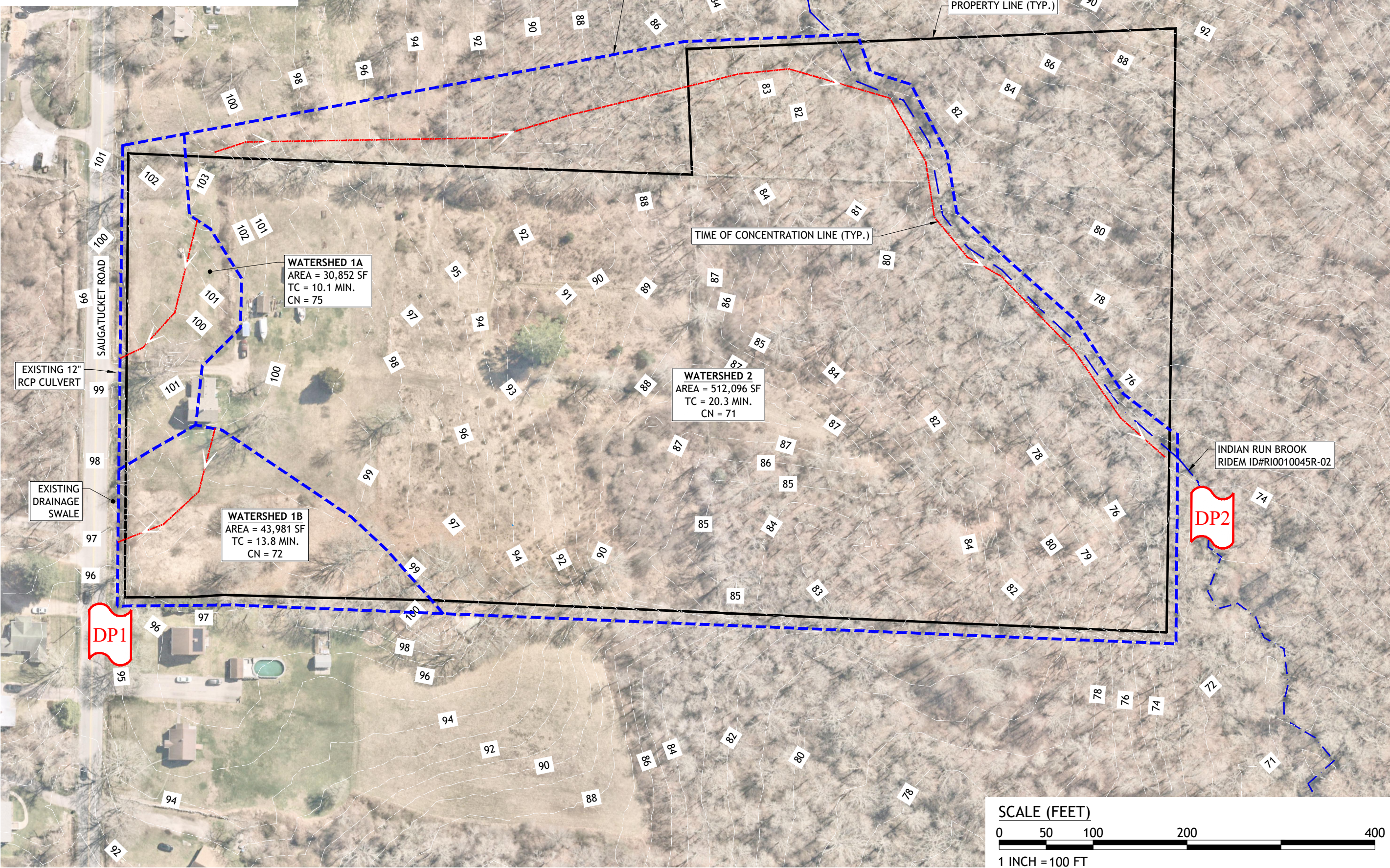
Andy Charpentier, Environmental Scientist III  
Office of Water Resources  
Freshwater Wetlands Program  
AC/LFC/lfc

cc: Joseph A. Casali, Casali Engineering  
Scott P. Rabideau, Natural Resource Services, Inc.

## *Appendix E*

### *Existing Condition Watershed Map*

**LEGEND:**  
 - - - WATERSHED BOUNDARY LINE  
 - - - TIME OF CONCENTRATION LINE  
 - - - UNDERGROUND TIME OF CONCENTRATION LINE



OVERALL WATERSHED  
 AREA = 586,929 SF

WATERSHED 1A  
 AREA = 30,852 SF  
 TC = 10.1 MIN.  
 CN = 75

WATERSHED 2  
 AREA = 512,096 SF  
 TC = 20.3 MIN.  
 CN = 71

WATERSHED 1B  
 AREA = 43,981 SF  
 TC = 13.8 MIN.  
 CN = 72

TIME OF CONCENTRATION LINE (TYP.)

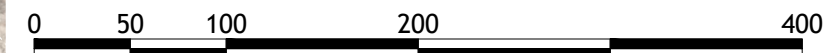
PROPERTY LINE (TYP.)

INDIAN RUN BROOK  
 RIDEM ID#R10010045R-02

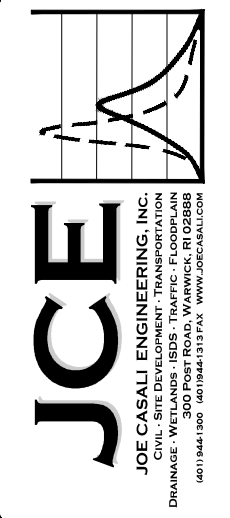
DP1

DP2

SCALE (FEET)



1 INCH = 100 FT



**PROPOSED RESIDENTIAL SUBDIVISION**  
 216 SAUGATUCKET ROAD  
 SOUTH KINGSTOWN, RHODE ISLAND  
 AP 42, LOT 8

NO.	DATE	DESCRIPTION

DESIGNED BY: SD  
 DRAWN BY: SD  
 CHECKED BY: JAC  
 DATE: JUNE 2025  
 PROJECT NO: 24-20

STORMWATER REPORT

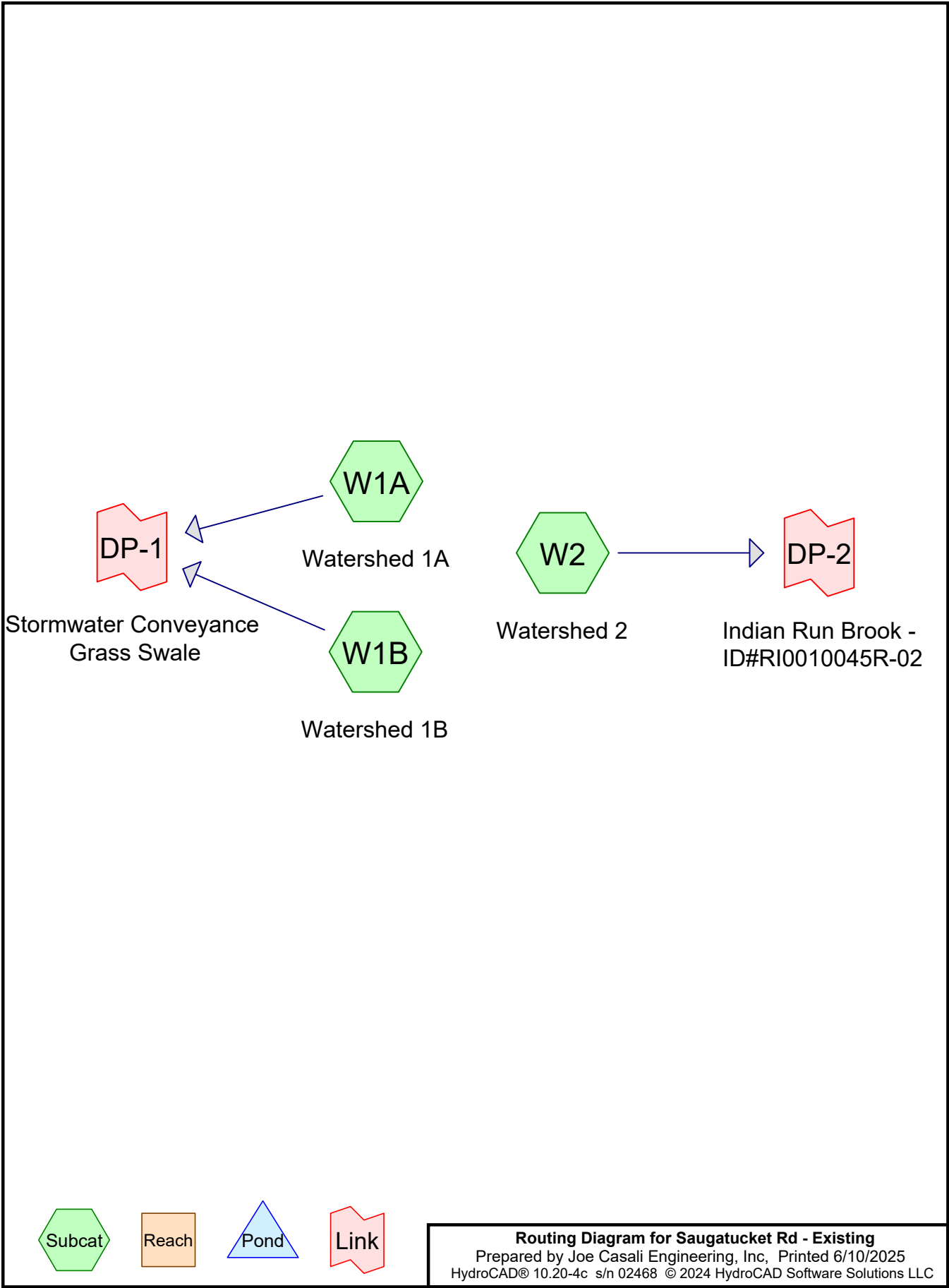
**EXISTING WATERSHED MAP**

**SHEET 1 OF 1**

Q:\24-20 Denali\_Corp\Drainage\Watershed Map\216 Saugatucket Rd [Watershed Map].dwg Jun. 09, 2025 3:41pm

## *Appendix F*

### *Existing Condition HydroCAD Calculations*



## Saugatucket Rd - Existing

Prepared by Joe Casali Engineering, Inc

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### Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
69,066	74	>75% Grass cover, Good, HSG C (W1A, W1B, W2)
5,465	96	Gravel surface, HSG C (W1A, W2)
1,917	98	Roofs, HSG A (W1A, W2)
325,228	70	Woods, Good, HSG C (W2)
185,253	72	Woods/grass comb., Good, HSG C (W1A, W1B, W2)
<b>586,929</b>	<b>71</b>	<b>TOTAL AREA</b>

**Saugatucket Rd - Existing**

Type III 24-hr 1-Year Rainfall=2.70"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentW1A: Watershed 1A** Runoff Area=30,852 sf 2.28% Impervious Runoff Depth=0.77"  
Flow Length=162' Slope=0.0200 '/' Tc=10.1 min CN=75 Runoff=0.51 cfs 1,981 cf

**SubcatchmentW1B: Watershed 1B** Runoff Area=43,981 sf 0.00% Impervious Runoff Depth=0.64"  
Flow Length=150' Tc=13.8 min CN=72 Runoff=0.50 cfs 2,330 cf

**SubcatchmentW2: Watershed 2** Runoff Area=512,096 sf 0.24% Impervious Runoff Depth=0.59"  
Flow Length=1,318' Tc=20.3 min CN=71 Runoff=4.58 cfs 25,358 cf

**Link DP-1: Stormwater Conveyance Grass Swale** Inflow=0.97 cfs 4,311 cf  
Primary=0.97 cfs 4,311 cf

**Link DP-2: Indian Run Brook - ID#RI0010045R-02** Inflow=4.58 cfs 25,358 cf  
Primary=4.58 cfs 25,358 cf

**Total Runoff Area = 586,929 sf Runoff Volume = 29,669 cf Average Runoff Depth = 0.61"**  
**99.67% Pervious = 585,012 sf 0.33% Impervious = 1,917 sf**

# Saugatucket Rd - Existing

Type III 24-hr 1-Year Rainfall=2.70"

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## Summary for Subcatchment W1A: Watershed 1A

Runoff = 0.51 cfs @ 12.16 hrs, Volume= 1,981 cf, Depth= 0.77"  
 Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
 Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
703	98	Roofs, HSG A
1,002	96	Gravel surface, HSG C
19,448	74	>75% Grass cover, Good, HSG C
9,699	72	Woods/grass comb., Good, HSG C
30,852	75	Weighted Average
30,149	74	97.72% Pervious Area
703	98	2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

**Saugatucket Rd - Existing**

Type III 24-hr 1-Year Rainfall=2.70"

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**Summary for Subcatchment W1B: Watershed 1B**

Runoff = 0.50 cfs @ 12.22 hrs, Volume= 2,330 cf, Depth= 0.64"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
6,163	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
43,981	72	Weighted Average
43,981	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b> Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

**Saugatucket Rd - Existing**

Type III 24-hr 1-Year Rainfall=2.70"

Prepared by Joe Casali Engineering, Inc

Printed 6/10/2025

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**Summary for Subcatchment W2: Watershed 2**

Runoff = 4.58 cfs @ 12.33 hrs, Volume= 25,358 cf, Depth= 0.59"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
1,214	98	Roofs, HSG A
4,463	96	Gravel surface, HSG C
43,455	74	>75% Grass cover, Good, HSG C
325,228	70	Woods, Good, HSG C
137,736	72	Woods/grass comb., Good, HSG C
512,096	71	Weighted Average
510,882	71	99.76% Pervious Area
1,214	98	0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

## Saugatucket Rd - Existing

Prepared by Joe Casali Engineering, Inc

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Type III 24-hr 1-Year Rainfall=2.70"

Printed 6/10/2025

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### Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 74,833 sf, 0.94% Impervious, Inflow Depth = 0.69" for 1-Year event  
Inflow = 0.97 cfs @ 12.19 hrs, Volume= 4,311 cf  
Primary = 0.97 cfs @ 12.19 hrs, Volume= 4,311 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Saugatucket Rd - Existing

Prepared by Joe Casali Engineering, Inc

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Type III 24-hr 1-Year Rainfall=2.70"

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### Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 512,096 sf, 0.24% Impervious, Inflow Depth = 0.59" for 1-Year event  
Inflow = 4.58 cfs @ 12.33 hrs, Volume= 25,358 cf  
Primary = 4.58 cfs @ 12.33 hrs, Volume= 25,358 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

**Saugatucket Rd - Existing**

Type III 24-hr 2-Year Rainfall=3.30"

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**Summary for Subcatchment W1A: Watershed 1A**

Runoff = 0.80 cfs @ 12.15 hrs, Volume= 2,988 cf, Depth= 1.16"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
703	98	Roofs, HSG A
1,002	96	Gravel surface, HSG C
19,448	74	>75% Grass cover, Good, HSG C
9,699	72	Woods/grass comb., Good, HSG C
30,852	75	Weighted Average
30,149	74	97.72% Pervious Area
703	98	2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

**Summary for Subcatchment W1B: Watershed 1B**

Runoff = 0.84 cfs @ 12.21 hrs, Volume= 3,637 cf, Depth= 0.99"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
6,163	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
43,981	72	Weighted Average
43,981	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b>
					Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

# Saugatucket Rd - Existing

Type III 24-hr 2-Year Rainfall=3.30"

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## Summary for Subcatchment W2: Watershed 2

Runoff = 7.90 cfs @ 12.31 hrs, Volume= 40,064 cf, Depth= 0.94"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 2-Year Rainfall=3.30"

Area (sf)	CN	Description
1,214	98	Roofs, HSG A
4,463	96	Gravel surface, HSG C
43,455	74	>75% Grass cover, Good, HSG C
325,228	70	Woods, Good, HSG C
137,736	72	Woods/grass comb., Good, HSG C
512,096	71	Weighted Average
510,882	71	99.76% Pervious Area
1,214	98	0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

## Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 74,833 sf, 0.94% Impervious, Inflow Depth = 1.06" for 2-Year event

Inflow = 1.59 cfs @ 12.18 hrs, Volume= 6,625 cf

Primary = 1.59 cfs @ 12.18 hrs, Volume= 6,625 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 512,096 sf, 0.24% Impervious, Inflow Depth = 0.94" for 2-Year event

Inflow = 7.90 cfs @ 12.31 hrs, Volume= 40,064 cf

Primary = 7.90 cfs @ 12.31 hrs, Volume= 40,064 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

**Saugatucket Rd - Existing**

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Type III 24-hr 10-Year Rainfall=4.90"

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**Summary for Subcatchment W1A: Watershed 1A**

Runoff = 1.69 cfs @ 12.15 hrs, Volume= 6,089 cf, Depth= 2.37"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
703	98	Roofs, HSG A
1,002	96	Gravel surface, HSG C
19,448	74	>75% Grass cover, Good, HSG C
9,699	72	Woods/grass comb., Good, HSG C
30,852	75	Weighted Average
30,149	74	97.72% Pervious Area
703	98	2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

**Summary for Subcatchment W1B: Watershed 1B**

Runoff = 1.92 cfs @ 12.20 hrs, Volume= 7,774 cf, Depth= 2.12"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
6,163	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
43,981	72	Weighted Average
43,981	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b>
					Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

# Saugatucket Rd - Existing

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Type III 24-hr 10-Year Rainfall=4.90"

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## Summary for Subcatchment W2: Watershed 2

Runoff = 18.42 cfs @ 12.29 hrs, Volume= 87,107 cf, Depth= 2.04"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 10-Year Rainfall=4.90"

Area (sf)	CN	Description
1,214	98	Roofs, HSG A
4,463	96	Gravel surface, HSG C
43,455	74	>75% Grass cover, Good, HSG C
325,228	70	Woods, Good, HSG C
137,736	72	Woods/grass comb., Good, HSG C
512,096	71	Weighted Average
510,882	71	99.76% Pervious Area
1,214	98	0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

## Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 74,833 sf, 0.94% Impervious, Inflow Depth = 2.22" for 10-Year event

Inflow = 3.53 cfs @ 12.17 hrs, Volume= 13,863 cf

Primary = 3.53 cfs @ 12.17 hrs, Volume= 13,863 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 512,096 sf, 0.24% Impervious, Inflow Depth = 2.04" for 10-Year event

Inflow = 18.42 cfs @ 12.29 hrs, Volume= 87,107 cf

Primary = 18.42 cfs @ 12.29 hrs, Volume= 87,107 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

**Saugatucket Rd - Existing**

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Type III 24-hr 25-Year Rainfall=6.10"

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**Summary for Subcatchment W1A: Watershed 1A**

Runoff = 2.41 cfs @ 12.15 hrs, Volume= 8,658 cf, Depth= 3.37"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
703	98	Roofs, HSG A
1,002	96	Gravel surface, HSG C
19,448	74	>75% Grass cover, Good, HSG C
9,699	72	Woods/grass comb., Good, HSG C
30,852	75	Weighted Average
30,149	74	97.72% Pervious Area
703	98	2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

**Summary for Subcatchment W1B: Watershed 1B**

Runoff = 2.82 cfs @ 12.20 hrs, Volume= 11,271 cf, Depth= 3.08"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
6,163	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
43,981	72	Weighted Average
43,981	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b>
					Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

# Saugatucket Rd - Existing

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Type III 24-hr 25-Year Rainfall=6.10"

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## Summary for Subcatchment W2: Watershed 2

Runoff = 27.28 cfs @ 12.29 hrs, Volume= 127,151 cf, Depth= 2.98"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 25-Year Rainfall=6.10"

Area (sf)	CN	Description
1,214	98	Roofs, HSG A
4,463	96	Gravel surface, HSG C
43,455	74	>75% Grass cover, Good, HSG C
325,228	70	Woods, Good, HSG C
137,736	72	Woods/grass comb., Good, HSG C
512,096	71	Weighted Average
510,882	71	99.76% Pervious Area
1,214	98	0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

## Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 74,833 sf, 0.94% Impervious, Inflow Depth = 3.20" for 25-Year event

Inflow = 5.13 cfs @ 12.17 hrs, Volume= 19,929 cf

Primary = 5.13 cfs @ 12.17 hrs, Volume= 19,929 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 512,096 sf, 0.24% Impervious, Inflow Depth = 2.98" for 25-Year event

Inflow = 27.28 cfs @ 12.29 hrs, Volume= 127,151 cf

Primary = 27.28 cfs @ 12.29 hrs, Volume= 127,151 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

**Saugatucket Rd - Existing**

Type III 24-hr 100-Year Rainfall=8.70"

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**Summary for Subcatchment W1A: Watershed 1A**

Runoff = 4.03 cfs @ 12.14 hrs, Volume= 14,597 cf, Depth= 5.68"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
703	98	Roofs, HSG A
1,002	96	Gravel surface, HSG C
19,448	74	>75% Grass cover, Good, HSG C
9,699	72	Woods/grass comb., Good, HSG C
30,852	75	Weighted Average
30,149	74	97.72% Pervious Area
703	98	2.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

**Summary for Subcatchment W1B: Watershed 1B**

Runoff = 4.87 cfs @ 12.19 hrs, Volume= 19,475 cf, Depth= 5.31"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
6,163	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
43,981	72	Weighted Average
43,981	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b>
					Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

# Saugatucket Rd - Existing

Type III 24-hr 100-Year Rainfall=8.70"

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## Summary for Subcatchment W2: Watershed 2

Runoff = 47.76 cfs @ 12.28 hrs, Volume= 221,593 cf, Depth= 5.19"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 100-Year Rainfall=8.70"

Area (sf)	CN	Description
1,214	98	Roofs, HSG A
4,463	96	Gravel surface, HSG C
43,455	74	>75% Grass cover, Good, HSG C
325,228	70	Woods, Good, HSG C
137,736	72	Woods/grass comb., Good, HSG C
512,096	71	Weighted Average
510,882	71	99.76% Pervious Area
1,214	98	0.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

## Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 74,833 sf, 0.94% Impervious, Inflow Depth = 5.46" for 100-Year event

Inflow = 8.75 cfs @ 12.17 hrs, Volume= 34,072 cf

Primary = 8.75 cfs @ 12.17 hrs, Volume= 34,072 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 512,096 sf, 0.24% Impervious, Inflow Depth = 5.19" for 100-Year event

Inflow = 47.76 cfs @ 12.28 hrs, Volume= 221,593 cf

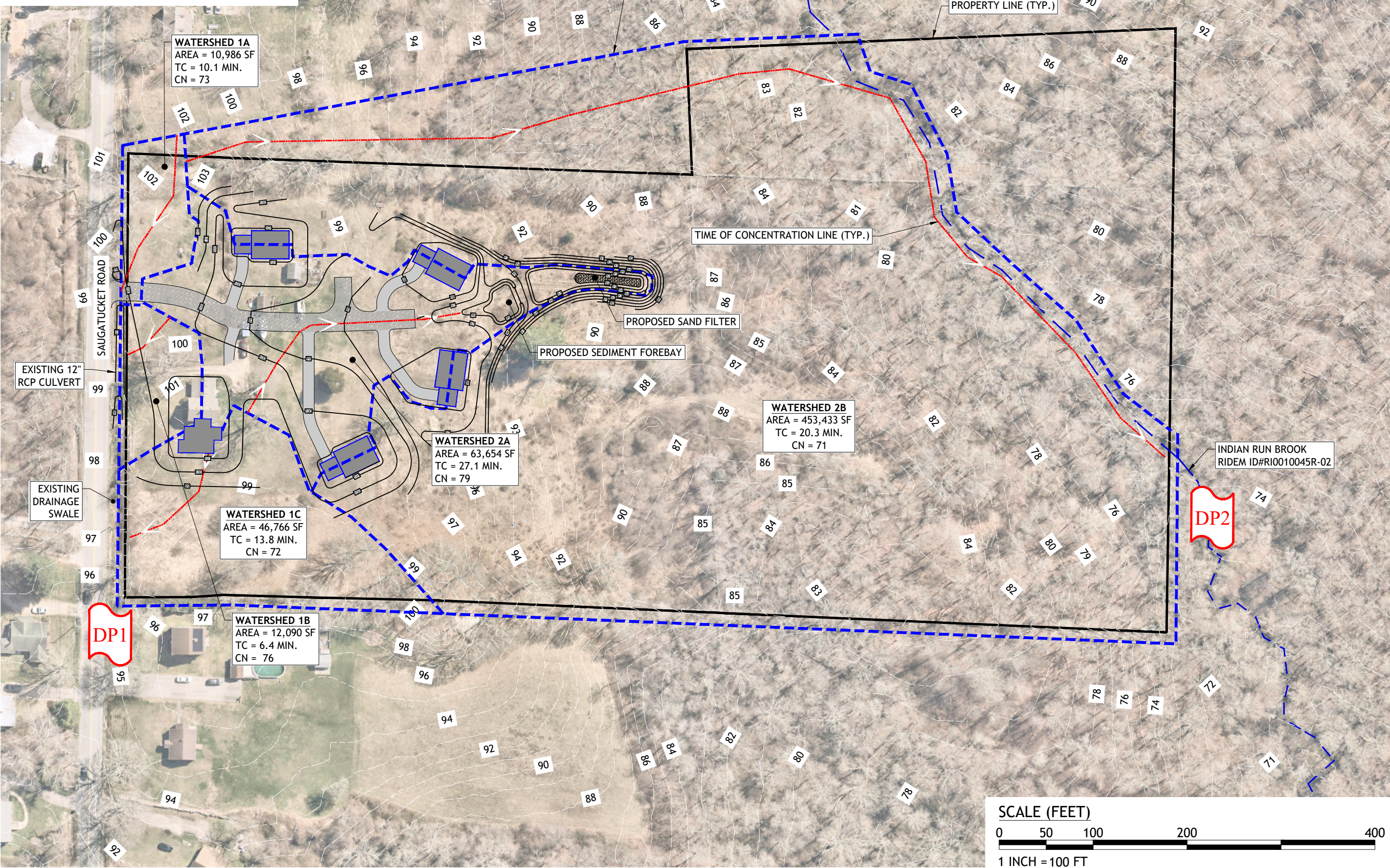
Primary = 47.76 cfs @ 12.28 hrs, Volume= 221,593 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## *Appendix G*

### *Proposed Condition Watershed Map*

**LEGEND:**  
 - - - WATERSHED BOUNDARY LINE  
 - - - TIME OF CONCENTRATION LINE  
 - - - UNDERGROUND TIME OF CONCENTRATION LINE



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**PROPOSED RESIDENTIAL SUBDIVISION**  
 216 SAUGATUCKET ROAD  
 SOUTH KINGSTOWN, RHODE ISLAND  
 AP 42, LOT 8

REVISIONS:

NO.	DATE	DESCRIPTION

DESIGNED BY: SD  
 DRAWN BY: SD  
 CHECKED BY: JAC  
 DATE: JUNE 2025  
 PROJECT NO: 24-20

STORMWATER REPORT

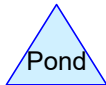
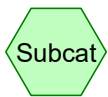
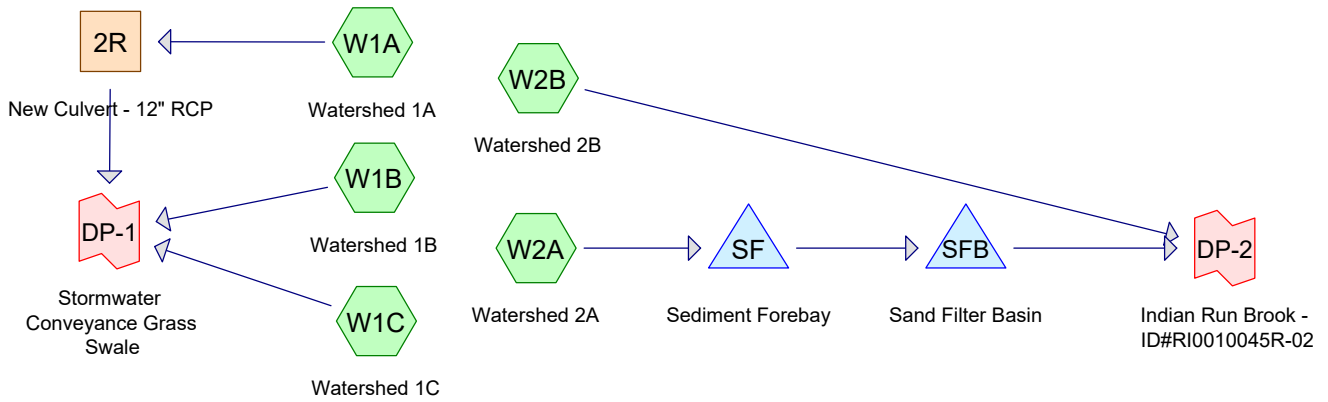
**PROPOSED CONDITIONS WATERSHED MAP**

**SHEET 1 OF 1**

Q:\24-20 Denali Corp\Drainage\Watershed Map\216 Saugatucket Rd [Watershed Map].dwg Jun. 10, 2025 1:52pm

## *Appendix H*

### *Proposed Condition HydroCAD Calculations*



**Routing Diagram for Saugatucket Rd - Proposed**  
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# Saugatucket Rd - Proposed

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## Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
66,164	74	>75% Grass cover, Good, HSG C (W1A, W1B, W1C, W2A)
4,935	98	Driveways, HSG C (W2A)
6,714	96	Gravel Roadway, HSG C (W2A)
2,100	96	Gravel surface, HSG C (W1A, W1B, W2B)
3,120	98	Proposed Roofs, HSG C (W2B)
4,222	98	Roofs, HSG C (W1B, W2A)
331,772	70	Woods, Good, HSG C (W1A, W2A, W2B)
167,902	72	Woods/grass comb., Good, HSG C (W1A, W1B, W1C, W2B)
<b>586,929</b>	<b>72</b>	<b>TOTAL AREA</b>

# Saugatucket Rd - Proposed

Prepared by Joe Casali Engineering, Inc

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Type III 24-hr 1-Year Rainfall=2.70"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentW1A: Watershed 1A** Runoff Area=10,986 sf 0.00% Impervious Runoff Depth=0.68"  
Flow Length=162' Slope=0.0200 '/' Tc=10.1 min CN=73 Runoff=0.15 cfs 622 cf

**SubcatchmentW1B: Watershed 1B** Runoff Area=12,090 sf 4.55% Impervious Runoff Depth=0.82"  
Flow Length=60' Slope=0.0200 '/' Tc=6.4 min CN=76 Runoff=0.24 cfs 825 cf

**SubcatchmentW1C: Watershed 1C** Runoff Area=46,766 sf 0.00% Impervious Runoff Depth=0.64"  
Flow Length=150' Tc=13.8 min CN=72 Runoff=0.53 cfs 2,478 cf

**SubcatchmentW2A: Watershed 2A** Runoff Area=63,654 sf 13.52% Impervious Runoff Depth=0.97"  
Flow Length=273' Tc=27.1 min CN=79 Runoff=0.95 cfs 5,167 cf

**SubcatchmentW2B: Watershed 2B** Runoff Area=453,433 sf 0.69% Impervious Runoff Depth=0.59"  
Flow Length=1,318' Tc=20.3 min CN=71 Runoff=4.06 cfs 22,453 cf

**Reach 2R: New Culvert - 12" RCP** Avg. Flow Depth=0.16' Max Vel=1.89 fps Inflow=0.15 cfs 622 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0052 '/' Capacity=2.78 cfs Outflow=0.15 cfs 622 cf

**Pond SF: Sediment Forebay** Peak Elev=95.76' Storage=830 cf Inflow=0.95 cfs 5,167 cf  
Outflow=0.94 cfs 4,406 cf

**Pond SFB: Sand Filter Basin** Peak Elev=93.26' Storage=2,276 cf Inflow=0.94 cfs 4,406 cf  
Discarded=0.07 cfs 3,718 cf Primary=0.00 cfs 0 cf Outflow=0.07 cfs 3,718 cf

**Link DP-1: Stormwater Conveyance Grass Swale** Inflow=0.84 cfs 3,924 cf  
Primary=0.84 cfs 3,924 cf

**Link DP-2: Indian Run Brook - ID#RI0010045R-02** Inflow=4.06 cfs 22,453 cf  
Primary=4.06 cfs 22,453 cf

**Total Runoff Area = 586,929 sf Runoff Volume = 31,545 cf Average Runoff Depth = 0.64"**  
**97.91% Pervious = 574,652 sf 2.09% Impervious = 12,277 sf**

# Saugatucket Rd - Proposed

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Type III 24-hr 1-Year Rainfall=2.70"

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## Summary for Subcatchment W1A: Watershed 1A

Runoff = 0.15 cfs @ 12.16 hrs, Volume= 622 cf, Depth= 0.68"  
Routed to Reach 2R : New Culvert - 12" RCP

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
448	96	Gravel surface, HSG C
4,370	74	>75% Grass cover, Good, HSG C
2,158	72	Woods/grass comb., Good, HSG C
4,010	70	Woods, Good, HSG C
10,986	73	Weighted Average
10,986	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

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## Summary for Subcatchment W1B: Watershed 1B

Runoff = 0.24 cfs @ 12.11 hrs, Volume= 825 cf, Depth= 0.82"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
550	98	Roofs, HSG C
1,002	96	Gravel surface, HSG C
7,047	74	>75% Grass cover, Good, HSG C
3,491	72	Woods/grass comb., Good, HSG C
12,090	76	Weighted Average
11,540	75	95.45% Pervious Area
550	98	4.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	60	0.0200	0.16		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"

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## Summary for Subcatchment W1C: Watershed 1C

Runoff = 0.53 cfs @ 12.22 hrs, Volume= 2,478 cf, Depth= 0.64"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
8,948	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
46,766	72	Weighted Average
46,766	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b> Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

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Type III 24-hr 1-Year Rainfall=2.70"

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**Summary for Subcatchment W2A: Watershed 2A**

Runoff = 0.95 cfs @ 12.40 hrs, Volume= 5,167 cf, Depth= 0.97"

Routed to Pond SF : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
3,672	98	Roofs, HSG C
* 6,714	96	Gravel Roadway, HSG C
45,799	74	>75% Grass cover, Good, HSG C
* 4,935	98	Driveways, HSG C
2,534	70	Woods, Good, HSG C
63,654	79	Weighted Average
55,047	76	86.48% Pervious Area
8,607	98	13.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	60	0.0100	0.05		<b>Sheet Flow, SEG A</b> Woods: Light underbrush n= 0.400 P2= 3.30"
3.2	40	0.0500	0.21		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
1.3	124	0.0100	1.61		<b>Shallow Concentrated Flow, SEG C</b> Unpaved Kv= 16.1 fps
4.1	49	0.0420	0.20		<b>Sheet Flow, SEG D</b> Grass: Short n= 0.150 P2= 3.30"
27.1	273	Total			

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**Summary for Subcatchment W2B: Watershed 2B**

Runoff = 4.06 cfs @ 12.33 hrs, Volume= 22,453 cf, Depth= 0.59"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr 1-Year Rainfall=2.70"

Area (sf)	CN	Description
* 3,120	98	Proposed Roofs, HSG C
650	96	Gravel surface, HSG C
325,228	70	Woods, Good, HSG C
124,435	72	Woods/grass comb., Good, HSG C
453,433	71	Weighted Average
450,313	71	99.31% Pervious Area
3,120	98	0.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

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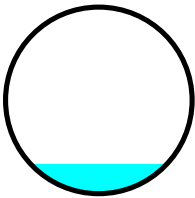
## Summary for Reach 2R: New Culvert - 12" RCP

Inflow Area = 10,986 sf, 0.00% Impervious, Inflow Depth = 0.68" for 1-Year event  
Inflow = 0.15 cfs @ 12.16 hrs, Volume= 622 cf  
Outflow = 0.15 cfs @ 12.17 hrs, Volume= 622 cf, Atten= 1%, Lag= 0.4 min  
Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Routing by Stor-Ind+Trans method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Max. Velocity= 1.89 fps, Min. Travel Time= 0.2 min  
Avg. Velocity = 0.81 fps, Avg. Travel Time= 0.6 min

Peak Storage= 2 cf @ 12.16 hrs  
Average Depth at Peak Storage= 0.16' , Surface Width= 0.73'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.78 cfs

12.0" Round Pipe  
n= 0.012 Concrete pipe, finished  
Length= 27.0' Slope= 0.0052 '/'  
Inlet Invert= 98.50', Outlet Invert= 98.36'



# Saugatucket Rd - Proposed

Type III 24-hr 1-Year Rainfall=2.70"

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## Summary for Pond SF: Sediment Forebay

Inflow Area = 63,654 sf, 13.52% Impervious, Inflow Depth = 0.97" for 1-Year event  
 Inflow = 0.95 cfs @ 12.40 hrs, Volume= 5,167 cf  
 Outflow = 0.94 cfs @ 12.40 hrs, Volume= 4,406 cf, Atten= 1%, Lag= 0.0 min  
 Primary = 0.94 cfs @ 12.40 hrs, Volume= 4,406 cf  
 Routed to Pond SFB : Sand Filter Basin

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 95.76' @ 12.40 hrs Surf.Area= 1,307 sf Storage= 830 cf

Plug-Flow detention time= 94.0 min calculated for 4,398 cf (85% of inflow)  
 Center-of-Mass det. time= 28.9 min ( 903.9 - 875.0 )

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	1,156 cf	<b>Custom Stage Data (Conic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
95.00	880	0	0	880
96.00	1,457	1,156	1,156	1,469

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	<b>18.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=0.94 cfs @ 12.40 hrs HW=95.76' (Free Discharge)  
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 0.94 cfs @ 0.82 fps)

**Saugatucket Rd - Proposed**

Type III 24-hr 1-Year Rainfall=2.70"

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**Summary for Pond SFB: Sand Filter Basin**

Inflow Area = 63,654 sf, 13.52% Impervious, Inflow Depth = 0.83" for 1-Year event  
 Inflow = 0.94 cfs @ 12.40 hrs, Volume= 4,406 cf  
 Outflow = 0.07 cfs @ 16.23 hrs, Volume= 3,718 cf, Atten= 92%, Lag= 229.8 min  
 Discarded = 0.07 cfs @ 16.23 hrs, Volume= 3,718 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 93.26' @ 16.23 hrs Surf.Area= 3,136 sf Storage= 2,276 cf

Plug-Flow detention time= 352.4 min calculated for 3,718 cf (84% of inflow)  
 Center-of-Mass det. time= 283.6 min ( 1,187.5 - 903.9 )

Volume	Invert	Avail.Storage	Storage Description
#1	92.00'	4,138 cf	<b>Custom Stage Data (Conic)</b> Listed below (Recalc)
#2	90.50'	283 cf	<b>Sand Filter Layer (Prismatic)</b> Listed below (Recalc)
		857 cf Overall x 33.0% Voids	
		4,421 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.00	571	0	0	571
93.00	2,361	1,364	1,364	2,366
94.00	3,208	2,774	4,138	3,233

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.50	571	0	0
92.00	571	857	857

Device	Routing	Invert	Outlet Devices
#1	Primary	93.75'	<b>34.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#2	Discarded	90.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.07 cfs @ 16.23 hrs HW=93.26' (Free Discharge)  
 ↳2=Exfiltration (Exfiltration Controls 0.07 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=90.50' (Free Discharge)  
 ↳1=Sharp-Crested Rectangular Weir( Controls 0.00 cfs)

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Type III 24-hr 1-Year Rainfall=2.70"

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### Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 69,842 sf, 0.79% Impervious, Inflow Depth = 0.67" for 1-Year event  
Inflow = 0.84 cfs @ 12.19 hrs, Volume= 3,924 cf  
Primary = 0.84 cfs @ 12.19 hrs, Volume= 3,924 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Saugatucket Rd - Proposed

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Type III 24-hr 1-Year Rainfall=2.70"

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### Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 517,087 sf, 2.27% Impervious, Inflow Depth = 0.52" for 1-Year event  
Inflow = 4.06 cfs @ 12.33 hrs, Volume= 22,453 cf  
Primary = 4.06 cfs @ 12.33 hrs, Volume= 22,453 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

# *Appendix I*

## *Water Quality HydroCAD Calculations*

## Water Quality Volume Calculation WorkSheet

This worksheet is designed to assist the project engineer with a determination of the required water quality treatment area. The worksheet leads the designer through redevelopment applicability first and then receiving water requirements. This tool is intended to compliment to the Redevelopment Criteria Guidance and the Water Quality Guidance and assist both the designer and the permit application reviewer towards consistent results. Enter information into only the **YELLOW** Boxes.

[Redevelopment Criteria Guidance](#)  
[Water Quality Goals "Stormwater Compensation Method"](#)

**Step 1 - Determine which office in OWR you are applying to:** [Application Guidance](#)

**Step 2 - Site Information** value/calculation units

Total Site Area (total area of project parcels)	TS	13.72	acres
Total Jurisdictional Wetlands and/or floodplain within the above TSA	JW1	8.50	acres
Existing impervious also within the Jurisdictional Wetlands	-JW2	0.00	acres
Conservation Land within the TSA		0.00	acres
<b>Site Size = (TSA)-(JW1-JW2)-CL</b>	<b>SS=</b>	<b>5.22</b>	<b>acres</b>

**Step 3 - Redevelopment Applicability**

Total Impervious Area (pre-construction)	TIA=	0.04	acres
% Impervious (if ≥40% - redevelopment standard 3.2.6 applies)		0.01	

**REPEAT IF NECESSARY Steps 4, 5 and 6 for EACH Waterbody ID ( RIVER-ID as found in the GIS Map Server)**

**Step 4 - Receiving waterbody information**

<a href="#">Waterbody ID or RIVER ID from GIS Map Server</a>	RI0010045R-02
Waterbody Name from GIS Map Server	Indian Run Brook & Tribs
Name the sub-watersheds (design-points) contributing to this Waterbody ID	DP-1
Is this Waterbody Impaired/TMDL for any Phosphorus, Metals or Bacteria?	NO
Is this Waterbody Impaired for Nitrogen?	NO

**Step 5 - Pre-Post Construction Conditions to the Waterbody**

Total Pre-Construction Impervious Surface to this Waterbody ID	0.02	acres
Total Disturbed Existing Impervious (DI)	0.00	acres
Total Post-Construction Impervious to this Waterbody ID	0.02	acres
Net Increased Impervious (NII)	0.00	acres

**Step 6 - Infiltration and BMP information** - Note: Increasing infiltration will likely decrease stormwater treatment area for Metals, Bacteria and Phosphorus

I am proposing to infiltrate this percentage WQv to this WBID	0%	%
I am proposing this number of BMP's	0	#

**RESULTS - Select the Larger Number of the 2 numbers provided**

Applicable Condition	Min Water Quality Treatment Area	Min Treatment w/o WQ consideration
No Impairment or TMDL - New Development	0.00	0.00
No Impairment or TMDL - Redevelopment		
Only Phosphorus, Metals or Bacteria Impairment - New Development		
Only Phosphorus, Metals or Bacteria Impairment - Redevelopment		
Nitrogen Impairment - New Development		
Nitrogen Impairment - Redevelopment		

**REQUIRED STORMWATER TREATMENT AREA** **0.0** acres

\* Enter the name of the STP (both type and label) which has been designed to treat this particular Rev or Rea.

## Water Quality Volume Calculation WorkSheet

This worksheet is designed to assist the project engineer with a determination of the required water quality treatment area. The worksheet leads the designer through redevelopment applicability first and then receiving water requirements. This tool is intended to compliment to the Redevelopment Criteria Guidance and the Water Quality Guidance and assist both the designer and the permit application reviewer towards consistent results. Enter information into only the **YELLOW** Boxes.

[Redevelopment Criteria Guidance](#)  
[Water Quality Goals "Stormwater Compensation Method"](#)

**Step 1 - Determine which office in OWR you are applying to:** [Application Guidance](#)

**Step 2 - Site Information** value/calculation units

Total Site Area (total area of project parcels)	TS	13.72	acres
Total Jurisdictional Wetlands and/or floodplain within the above TSA	JW1	8.50	acres
Existing impervious also within the Jurisdictional Wetlands	-JW2	0.00	acres
Conservation Land within the TSA		0.00	acres
<b>Site Size = (TSA)-(JW1-JW2)-CL</b>	<b>SS=</b>	<b>5.22</b>	<b>acres</b>

**Step 3 - Redevelopment Applicability**

Total Impervious Area (pre-construction)	TIA=	0.04	acres
% Impervious (if ≥40% - redevelopment standard 3.2.6 applies)		0.01	

**REPEAT IF NECESSARY Steps 4, 5 and 6 for EACH Waterbody ID ( RIVER-ID as found in the GIS Map Server)**

**Step 4 - Receiving waterbody information**

<a href="#">Waterbody ID or RIVER ID from GIS Map Server</a>	RI0010045R-02
Waterbody Name from GIS Map Server	Indian Run Brook & Tribs
Name the sub-watersheds (design-points) contributing to this Waterbody ID	DP-2
Is this Waterbody Impaired/TMDL for any Phosphorus, Metals or Bacteria?	NO
Is this Waterbody Impaired for Nitrogen?	NO

**Step 5 - Pre-Post Construction Conditions to the Waterbody**

Total Pre-Construction Impervious Surface to this Waterbody ID	0.03	acres
Total Disturbed Existing Impervious (DI)	0.00	acres
Total Post-Construction Impervious to this Waterbody ID	0.30	acres
Net Increased Impervious (NII)	0.27	acres

**Step 6 - Infiltration and BMP information** - Note: Increasing infiltration will likely decrease stormwater treatment area for Metals, Bacteria and Phosphorus

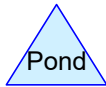
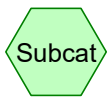
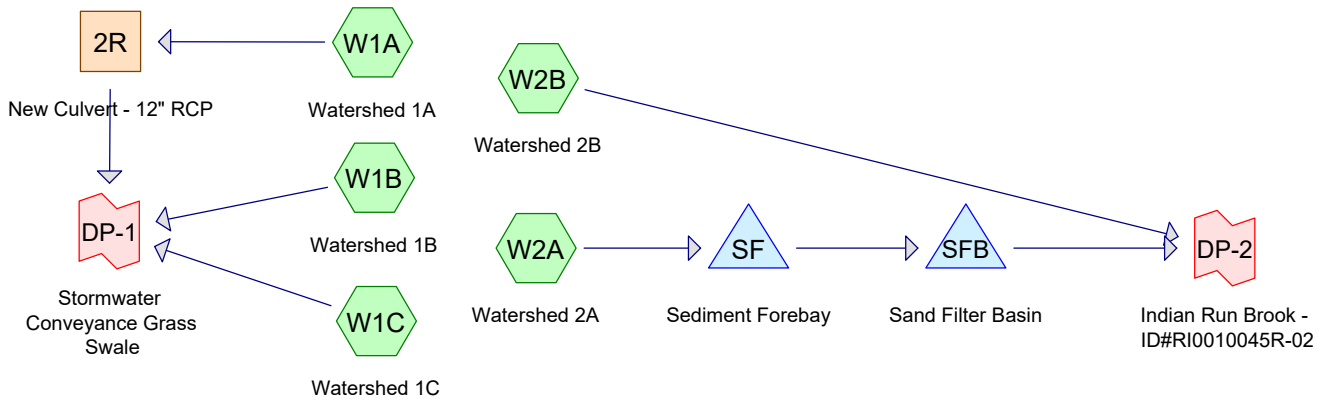
I am proposing to infiltrate this percentage WQv to this WBID	100%	%
I am proposing this number of BMP's	5	#

**RESULTS - Select the Larger Number of the 2 numbers provided**

Applicable Condition	Min Water Quality Treatment Area	Min Treatment w/o WQ consideration
No Impairment or TMDL - New Development	0.27	0.27
No Impairment or TMDL - Redevelopment		
Only Phosphorus, Metals or Bacteria Impairment - New Development		
Only Phosphorus, Metals or Bacteria Impairment - Redevelopment		
Nitrogen Impairment - New Development		
Nitrogen Impairment - Redevelopment		

**REQUIRED STORMWATER TREATMENT AREA** **0.3** acres

\* Enter the name of the STP (both type and label) which has been designed to treat this particular Rev or Rea.



**Routing Diagram for Saugatucket Rd - Proposed WQ**  
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# Saugatucket Rd - Proposed WQ

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## Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
66,164	74	>75% Grass cover, Good, HSG C (W1A, W1B, W1C, W2A)
4,935	98	Driveways, HSG C (W2A)
6,714	96	Gravel Roadway, HSG C (W2A)
2,100	96	Gravel surface, HSG C (W1A, W1B, W2B)
3,120	98	Proposed Roofs, HSG C (W2B)
4,222	98	Roofs, HSG C (W1B, W2A)
331,772	70	Woods, Good, HSG C (W1A, W2A, W2B)
167,902	72	Woods/grass comb., Good, HSG C (W1A, W1B, W1C, W2B)
<b>586,929</b>	<b>72</b>	<b>TOTAL AREA</b>

# Saugatucket Rd - Proposed WQ

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Type III 24-hr WQV Rainfall=1.20"

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Time span=0.00-28.00 hrs, dt=0.05 hrs, 561 points  
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q  
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**SubcatchmentW1A: Watershed 1A** Runoff Area=10,986 sf 0.00% Impervious Runoff Depth=0.08"  
Flow Length=162' Slope=0.0200 '/' Tc=10.1 min CN=WQ Runoff=0.01 cfs 69 cf

**SubcatchmentW1B: Watershed 1B** Runoff Area=12,090 sf 4.55% Impervious Runoff Depth=0.16"  
Flow Length=60' Slope=0.0200 '/' Tc=6.4 min CN=WQ Runoff=0.03 cfs 161 cf

**SubcatchmentW1C: Watershed 1C** Runoff Area=46,766 sf 0.00% Impervious Runoff Depth=0.05"  
Flow Length=150' Tc=13.8 min CN=WQ Runoff=0.01 cfs 176 cf

**SubcatchmentW2A: Watershed 2A** Runoff Area=63,654 sf 13.52% Impervious Runoff Depth=0.26"  
Flow Length=273' Tc=27.1 min CN=WQ Runoff=0.22 cfs 1,403 cf

**SubcatchmentW2B: Watershed 2B** Runoff Area=453,433 sf 0.69% Impervious Runoff Depth=0.04"  
Flow Length=1,318' Tc=20.3 min CN=WQ Runoff=0.06 cfs 1,417 cf

**Reach 2R: New Culvert - 12" RCP** Avg. Flow Depth=0.04' Max Vel=0.79 fps Inflow=0.01 cfs 69 cf  
12.0" Round Pipe n=0.012 L=27.0' S=0.0052 '/' Capacity=2.78 cfs Outflow=0.01 cfs 69 cf

**Pond SF: Sediment Forebay** Peak Elev=95.71' Storage=761 cf Inflow=0.22 cfs 1,403 cf  
Outflow=0.06 cfs 655 cf

**Pond SFB: Sand Filter Basin** Peak Elev=91.64' Storage=215 cf Inflow=0.06 cfs 655 cf  
Discarded=0.01 cfs 655 cf Primary=0.00 cfs 0 cf Outflow=0.01 cfs 655 cf

**Link DP-1: Stormwater Conveyance Grass Swale** Inflow=0.04 cfs 406 cf  
Primary=0.04 cfs 406 cf

**Link DP-2: Indian Run Brook - ID#RI0010045R-02** Inflow=0.06 cfs 1,417 cf  
Primary=0.06 cfs 1,417 cf

**Total Runoff Area = 586,929 sf Runoff Volume = 3,226 cf Average Runoff Depth = 0.07"**  
**97.91% Pervious = 574,652 sf 2.09% Impervious = 12,277 sf**

# Saugatucket Rd - Proposed WQ

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Type III 24-hr WQV Rainfall=1.20"

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## Summary for Subcatchment W1A: Watershed 1A

Runoff = 0.01 cfs @ 12.14 hrs, Volume= 69 cf, Depth= 0.08"  
 Routed to Reach 2R : New Culvert - 12" RCP

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
 Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
448	96	Gravel surface, HSG C
4,370	74	>75% Grass cover, Good, HSG C
2,158	72	Woods/grass comb., Good, HSG C
4,010	70	Woods, Good, HSG C
10,986		Weighted Average
10,986	73	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b>
					Grass: Short n= 0.150 P2= 3.30"
0.5	62	0.0200	2.12		<b>Shallow Concentrated Flow, SEG B</b>
					Grassed Waterway Kv= 15.0 fps
10.1	162	Total			

**Saugatucket Rd - Proposed WQ**

Type III 24-hr WQV Rainfall=1.20"

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**Summary for Subcatchment W1B: Watershed 1B**

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 161 cf, Depth= 0.16"  
 Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
 Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
550	98	Roofs, HSG C
1,002	96	Gravel surface, HSG C
7,047	74	>75% Grass cover, Good, HSG C
3,491	72	Woods/grass comb., Good, HSG C
12,090		Weighted Average
11,540	75	95.45% Pervious Area
550	98	4.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.4	60	0.0200	0.16		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"

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## Summary for Subcatchment W1C: Watershed 1C

Runoff = 0.01 cfs @ 12.95 hrs, Volume= 176 cf, Depth= 0.05"

Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
8,948	74	>75% Grass cover, Good, HSG C
37,818	72	Woods/grass comb., Good, HSG C
46,766		Weighted Average
46,766	72	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.0200	0.17		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
4.2	50	0.0400	0.20		<b>Sheet Flow, SEGB</b> Grass: Short n= 0.150 P2= 3.30"
13.8	150	Total			

**Saugatucket Rd - Proposed WQ**

Type III 24-hr WQV Rainfall=1.20"

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**Summary for Subcatchment W2A: Watershed 2A**

Runoff = 0.22 cfs @ 12.37 hrs, Volume= 1,403 cf, Depth= 0.26"

Routed to Pond SF : Sediment Forebay

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
3,672	98	Roofs, HSG C
* 6,714	96	Gravel Roadway, HSG C
45,799	74	>75% Grass cover, Good, HSG C
* 4,935	98	Driveways, HSG C
2,534	70	Woods, Good, HSG C
63,654		Weighted Average
55,047	76	86.48% Pervious Area
8,607	98	13.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.5	60	0.0100	0.05		<b>Sheet Flow, SEG A</b> Woods: Light underbrush n= 0.400 P2= 3.30"
3.2	40	0.0500	0.21		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
1.3	124	0.0100	1.61		<b>Shallow Concentrated Flow, SEG C</b> Unpaved Kv= 16.1 fps
4.1	49	0.0420	0.20		<b>Sheet Flow, SEG D</b> Grass: Short n= 0.150 P2= 3.30"
27.1	273	Total			

**Saugatucket Rd - Proposed WQ**

Type III 24-hr WQV Rainfall=1.20"

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**Summary for Subcatchment W2B: Watershed 2B**

Runoff = 0.06 cfs @ 12.27 hrs, Volume= 1,417 cf, Depth= 0.04"

Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

Type III 24-hr WQV Rainfall=1.20"

Area (sf)	CN	Description
* 3,120	98	Proposed Roofs, HSG C
650	96	Gravel surface, HSG C
325,228	70	Woods, Good, HSG C
124,435	72	Woods/grass comb., Good, HSG C
453,433		Weighted Average
450,313	71	99.31% Pervious Area
3,120	98	0.69% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	100	0.0400	0.23		<b>Sheet Flow, SEG A</b> Grass: Short n= 0.150 P2= 3.30"
11.1	578	0.0300	0.87		<b>Shallow Concentrated Flow, SEG B</b> Woodland Kv= 5.0 fps
1.9	640	0.0150	5.58	55.78	<b>Channel Flow, Indian Brook</b> Area= 10.0 sf Perim= 9.0' r= 1.11' n= 0.035 Earth, dense weeds
20.3	1,318	Total			

## Saugatucket Rd - Proposed WQ

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Type III 24-hr WQV Rainfall=1.20"

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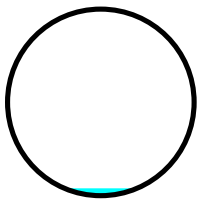
### Summary for Reach 2R: New Culvert - 12" RCP

Inflow Area = 10,986 sf, 0.00% Impervious, Inflow Depth = 0.08" for WQV event  
Inflow = 0.01 cfs @ 12.14 hrs, Volume= 69 cf  
Outflow = 0.01 cfs @ 12.16 hrs, Volume= 69 cf, Atten= 1%, Lag= 1.0 min  
Routed to Link DP-1 : Stormwater Conveyance Grass Swale

Routing by Stor-Ind+Trans method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs  
Max. Velocity= 0.79 fps, Min. Travel Time= 0.6 min  
Avg. Velocity = 0.42 fps, Avg. Travel Time= 1.1 min

Peak Storage= 0 cf @ 12.15 hrs  
Average Depth at Peak Storage= 0.04' , Surface Width= 0.39'  
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.78 cfs

12.0" Round Pipe  
n= 0.012 Concrete pipe, finished  
Length= 27.0' Slope= 0.0052 '/'  
Inlet Invert= 98.50', Outlet Invert= 98.36'



**Saugatucket Rd - Proposed WQ**

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Type III 24-hr WQV Rainfall=1.20"

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**Summary for Pond SF: Sediment Forebay**

Inflow Area = 63,654 sf, 13.52% Impervious, Inflow Depth = 0.26" for WQV event  
 Inflow = 0.22 cfs @ 12.37 hrs, Volume= 1,403 cf  
 Outflow = 0.06 cfs @ 13.13 hrs, Volume= 655 cf, Atten= 73%, Lag= 45.5 min  
 Primary = 0.06 cfs @ 13.13 hrs, Volume= 655 cf  
 Routed to Pond SFB : Sand Filter Basin

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 95.71' @ 13.13 hrs Surf.Area= 1,275 sf Storage= 761 cf

Plug-Flow detention time= 299.7 min calculated for 655 cf (47% of inflow)  
 Center-of-Mass det. time= 157.2 min ( 1,002.7 - 845.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	95.00'	1,156 cf	<b>Custom Stage Data (Conic)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
95.00	880	0	0	880
96.00	1,457	1,156	1,156	1,469

Device	Routing	Invert	Outlet Devices
#1	Primary	95.70'	<b>18.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)

**Primary OutFlow** Max=0.06 cfs @ 13.13 hrs HW=95.71' (Free Discharge)  
 ↑1=Sharp-Crested Rectangular Weir (Weir Controls 0.06 cfs @ 0.32 fps)

**Summary for Pond SFB: Sand Filter Basin**

Inflow Area = 63,654 sf, 13.52% Impervious, Inflow Depth = 0.12" for WQV event  
 Inflow = 0.06 cfs @ 13.13 hrs, Volume= 655 cf  
 Outflow = 0.01 cfs @ 13.05 hrs, Volume= 655 cf, Atten= 77%, Lag= 0.0 min  
 Discarded = 0.01 cfs @ 13.05 hrs, Volume= 655 cf  
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf  
 Routed to Link DP-2 : Indian Run Brook - ID#RI0010045R-02

Routing by Stor-Ind method, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs / 2  
 Peak Elev= 91.64' @ 17.54 hrs Surf.Area= 571 sf Storage= 215 cf

Plug-Flow detention time= 182.7 min calculated for 654 cf (100% of inflow)  
 Center-of-Mass det. time= 182.6 min ( 1,185.3 - 1,002.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	92.00'	4,138 cf	<b>Custom Stage Data (Conic)</b> Listed below (Recalc)
#2	90.50'	283 cf	<b>Sand Filter Layer (Prismatic)</b> Listed below (Recalc)
			857 cf Overall x 33.0% Voids
		4,421 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
92.00	571	0	0	571
93.00	2,361	1,364	1,364	2,366
94.00	3,208	2,774	4,138	3,233

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
90.50	571	0	0
92.00	571	857	857

Device	Routing	Invert	Outlet Devices
#1	Primary	93.75'	<b>34.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#2	Discarded	90.50'	<b>1.020 in/hr Exfiltration over Surface area</b>

**Discarded OutFlow** Max=0.01 cfs @ 13.05 hrs HW=90.54' (Free Discharge)  
 ↳2=Exfiltration (Exfiltration Controls 0.01 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=90.50' (Free Discharge)  
 ↳1=Sharp-Crested Rectangular Weir( Controls 0.00 cfs)

## Saugatucket Rd - Proposed WQ

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### Summary for Link DP-1: Stormwater Conveyance Grass Swale

Inflow Area = 69,842 sf, 0.79% Impervious, Inflow Depth = 0.07" for WQV event  
Inflow = 0.04 cfs @ 12.10 hrs, Volume= 406 cf  
Primary = 0.04 cfs @ 12.10 hrs, Volume= 406 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs

## Saugatucket Rd - Proposed WQ

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### Summary for Link DP-2: Indian Run Brook - ID#RI0010045R-02

Inflow Area = 517,087 sf, 2.27% Impervious, Inflow Depth = 0.03" for WQV event  
Inflow = 0.06 cfs @ 12.27 hrs, Volume= 1,417 cf  
Primary = 0.06 cfs @ 12.27 hrs, Volume= 1,417 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-28.00 hrs, dt= 0.05 hrs