

# 526 & 528 Boston Post Road Redevelopment Sudbury, MA

PREPARED FOR

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# Preliminary Stormwater Management Master Plan Narrative

This Preliminary Stormwater Management Master Plan has been prepared to demonstrate compliance with the hydrologic requirements of the Massachusetts Stormwater Management Standards in accordance with the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.00), Water Quality Certification Regulations (314 CMR 9.00), and, to the extent required by any phase of the project, the Town of Sudbury Article V (F) Stormwater Management Regulations to, establish specific measureable goals for future development. The Preliminary Stormwater Management Master Plan serves as a framework for review and comparison of the development of design details for each individual development area of the overall project. Subsequent Stormwater Management Reports prepared for individual development areas of the overall project will further document compliance with the remaining state and local stormwater management requirements and consistency with this hydrologic master analysis.

The Full Build Redevelopment project provides a unique opportunity to enhance the existing on-site stormwater management system. This analysis and the analyses necessary to support individual development areas will demonstrate compliance with current standards developed to improve the existing conditions on the Site by:

- Increasing open space which will contribute to re-establishing components of a more natural water cycle (evapotranspiration, groundwater recharge and runoff) on the Site and additional groundwater recharge.
- Improving surface water quality and groundwater quality.
- Protecting downstream resources through the use of Low Impact Development techniques, where feasible, as well as traditional Best Management Practices combined with a comprehensive Operation and Maintenance Plan.
- Protecting and minimizing disruption to existing wetland resource areas through the maintenance and enhancement of existing protective vegetative buffers
- Maintaining a thorough temporary erosion control system during construction and establishing permanent erosion control measures.
- Implementing an environmentally sensitive design that optimizes proposed open space features providing inviting pedestrian areas and wildlife habitat benefits.



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## Project Description

The Applicant, BPR Sudbury Development LLC, is proposing to construct a multi-phase, mixed-use redevelopment project consisting of various retail and residential uses (the “Full Build Redevelopment”).

The Full Build Redevelopment will include the demolition of nearly all existing buildings, associated parking, and utilities. The Full Build Redevelopment will maintain an existing 15,000 sf Beltran Building located in the rear of the property along the westerly property line, and will upgrade the existing wastewater treatment plant located near the center of the property. The construction of a grocery store, various additional retail/restaurant buildings, multi-family housing, age-restricted housing, senior housing, and open space areas will complete the Full Build Redevelopment.

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## Site Description

The Full Build Redevelopment Site is an approximately 50-acre parcel of land (the Site) located at 526-528 Boston Post Road in Sudbury, Massachusetts (see Figure 1 and 2). The Site is located predominately within the Limited Industrial District (46-acres) with a small portion of the site zoned Residential (RESA). The Site is bounded to the south by Route 20 to the east by commercial properties, to the west by a commercial nursery and open space and to the north by a former railroad right of way.

The existing development on the Site was constructed from the 1950’s to the 1980’s for Raytheon and includes two larger buildings, totaling approximately 8.3-acres, two smaller research buildings, and a wastewater treatment plant. Pervious surfaces on the site include a centrally located vegetated area consisting of a manmade stormwater retention pond and a series of wetlands which were originally designed as stormwater Best Management Practices (BMPs). Additional pervious surfaces include area surrounding the existing buildings, interior landscaped parking aisles, and vegetated areas along the property limits.

The Project Site is located within a Zone II Interim Wellhead Protection Area and within the Town of Sudbury Water Resource Protection Overlay District, but is located outside the FEMA, state and locally regulated 100- or 500-year floodplain. The Site lies within the Town of Sudbury’s Nobscot sub-watershed which flows via an unnamed stream to Hop Brook. An overview of the Nobscot Watershed, as provided on the Town of Sudbury website, is included in Appendix D.



Wetland resource areas on or adjacent to the property are summarized in the Project Notice of Intent prepared by VHB dated October 2015.

According to the National Resources Conservation Service (NRCS), surface soils on the Site are primarily classified as Udorthents-Urban land complex with the majority of soils on surrounding properties classified as loamy sand, type A and type B. In review of the geotechnical findings in addition to the NRCS soil map, a type B soil was used for the hydrologic analysis. Based on the soil evaluation included in Appendix B, the Site is not considered to be within an area of rapid infiltration (soils with a saturated hydraulic conductivity greater than 2.4 inches per hour).

As shown on the preliminary groundwater contour map prepared by Sanborn Head & Associates and included in Appendix B, groundwater elevations throughout the site are relatively shallow, ranging from approximately 5-6 feet below the existing ground elevation, and generally follow the topography of the Site, sloping from west to east.

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## Methodology

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals 2-, 10-, 25-, and 100-years, with rainfall amounts of 3.2", 4.8", 6.0", and 8.6" respectively, as outlined by the Stormwater Management Bylaw Regulations for the Town of Sudbury. A rainfall runoff depth of one-inch (1") was also evaluated. Runoff coefficients for the existing and proposed conditions were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

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## Existing Drainage Conditions

The existing approximately 50-acre commercial site is developed and consists of predominately impervious surfaces including several buildings, most notably two large buildings and large areas of paved parking, with generally flat topography sloping southeasterly.

The existing hydrologic conditions include a centrally located retention basin that collects a majority of the Site area. The retention basin outlets to the on-site closed pipe system. On the western perimeter of the site, stormwater swales and wetlands also collect and convey water to the retention pond. Approximately 36-acres of off-



site area west of the Site flows onto the site and also contributes to the existing retention pond. Outflows from the retention pond combine with the closed drainage system located on the southern portion of the Site, to discharge stormwater to a wetland on the southern side of Boston Post Road, east of the Sudbury Plaza.

The site currently contains a stormwater management system that was constructed prior to the current DEP Stormwater Management Standards and as such is a “grandfathered” existing condition. Raytheon recently undertook a significant maintenance effort, with approval of the Sudbury Conservation Commission, to re-establish and enhance the functional characteristics of the on-site stormwater management system. While the system is compliant as an existing condition, the water quality treatment is not consistent with current state stormwater management standards that would be applicable to new developments. Stormwater from the majority of the parking areas is collected in catch basins and routed to swales and the retention pond prior to discharge. The remainder of the parking and drive aisles directly connected to the closed piping system, which provides some level of treatment, prior to discharge from the site.

For the existing conditions hydrologic analysis, the Site was subdivided into seven (7) drainage areas, with one additional off-site drainage area, which is tributary to the Site. The drainage areas contribute to three Design Points, where peak discharge rates and total volume of runoff were evaluated. See Figure 3 – *Existing Drainage Conditions*.

**Design Point 1** is an existing 48”-diameter drainage pipe located at the southeastern corner of the property. The existing pipe directs runoff under Boston Post Road and ultimately discharges to a large wetland east of the Sudbury Plaza. The vast majority of runoff from the Site contributes to Design Point, including the following drainage areas:

Drainage Area S-1A: This drainage area consists of existing Buildings 1 & 2 and the majority of the southern portion of the Site. Drainage Area S-1A discharges directly to Design Point 1.

Drainage Areas S-1B, S-1C, S-1D, and S-1E: These drainage areas consist of existing Buildings 3, 4, & 5, the existing parking lots in northern portion of the Site, the existing centrally located pervious area, the Beltran building, and the western property line. Drainage Areas S-1B, S-1C, S-1D, and S-1E discharge to the series of on-site retention basin prior to discharging to Design Point 1.

Drainage Area S-1F (off-site area): This drainage area includes off-site area consisting of impervious surface associated with the adjacent commercial greenhouse use and open field/meadow areas. Drainage Area S-1F contributes to the series of on-site retention basin prior to discharging to Design Point 1.





**Design Point 2** is the front property line along Boston Post Road. In the existing condition a small drainage area along the Site frontage flows overland to Boston Post Road. The contributing area is predominately vegetated.

**Design Point 3** is a small off-site wetland (Wetland #9) which collects stormwater from a small strip of pervious site area between the existing parking field and the property line.

Table 2 below provides a summary of the existing conditions hydrologic data.

**Table 2**  
**Existing Conditions Hydrologic Data**

<i>Drainage Area</i>	<i>Discharge Location</i>	<i>Design Point</i>	<i>Area (acres)</i>	<i>Curve Number</i>	<i>Time of Concentration (min)</i>
S-1A	48" RCP Across Boston Post Road	DP-1	11.1	85	5.1
S-1B	Existing Pond at Center of Prop	DP-1	8.3	91	5.0
S-1C	Existing Pond at Center of Prop	DP-1	16.0	84	12.2
S-1D	Existing Pond at Center of Prop	DP-1	7.8	68	5.0
S-1E	Existing Pond at Center of Prop	DP-1	7.1	74	7.7
S-1F	Existing Pond at Center of Prop	DP-1	33.8	51	17.0
S-2	Overland Flow to Boston Post Rd	DP-2	0.9	63	5.0
S-3	Wetland at Northeast Corner	DP-3	0.7	61	5.0
Total:			85.7		

## Proposed Drainage Conditions

As proposed, the Full Build Redevelopment will maintain the existing retention pond and reduce impervious cover on a net basis by approximately 2.5 acres. The reduction in impervious area will improve water quality and balance hydrologic conditions to existing wetland resource areas through the implementation of supplemental Low Impact Development techniques including decentralized stormwater BMPs. The addition of stormwater BMP's will aid to treat the site runoff before discharging to the closed drainage system and introduce the opportunity for additional groundwater recharge to the underlying aquifer. The Full Build Redevelopment will also incorporate appropriate temporary and permanent erosion controls and a comprehensive stormwater management operations and maintenance plan to enable the long-term functionality of the drainage system and associated BMPs.



For the proposed conditions hydrologic analysis, the Site was subdivided into eight (8) drainage areas, with one the additional off-site drainage area as described in the existing conditions. See Figure 4 – *Proposed Drainage Conditions*.

**Design Point 1:**

Drainage Area S-1A: This drainage area consists of a portion of the proposed retail/restaurant buildings located in the southern end of the Site. Drainage Area S-1A discharges directly to Design Point 1.

Drainage Area S-1G: This drainage area consists of the remaining portion of the proposed retail/restaurant buildings located in the southern end of the Site. Drainage Area S-1G will discharge to a subsurface infiltration system, pending further geotechnical analyses, and prior to discharging to Design Point 1.

Drainage Areas S-1B, S-1C, S-1D, and S-1E: These drainage areas consist of the proposed multi-family housing, senior housing, age-restricted housing, the existing centrally located pervious area, the Beltran building, and the western property line. Drainage Areas S-1B, S-1C, S-1D, and S-1E discharge to the series of on-site retention basin prior to discharging to Design Point 1.

**Design Point 2:** In the proposed conditions the contributing area is significantly reduced and consists entirely of vegetated area.

**Design Point 3:** The small strip of pervious site area between the existing parking field and the property line will remain in the proposed conditions.

Figure 4 illustrates the proposed “post construction” drainage conditions for the Full Build Redevelopment. Table 3 below provides a summary of the proposed conditions hydrologic data. Because the proposed conditions is based on an assumed future design, the table below includes a “Proposed Impervious Area” column. The “Proposed Impervious Area” column will allow for easy comparison from what has been assumed here in the master plan model to what will be included in the future detailed designs.



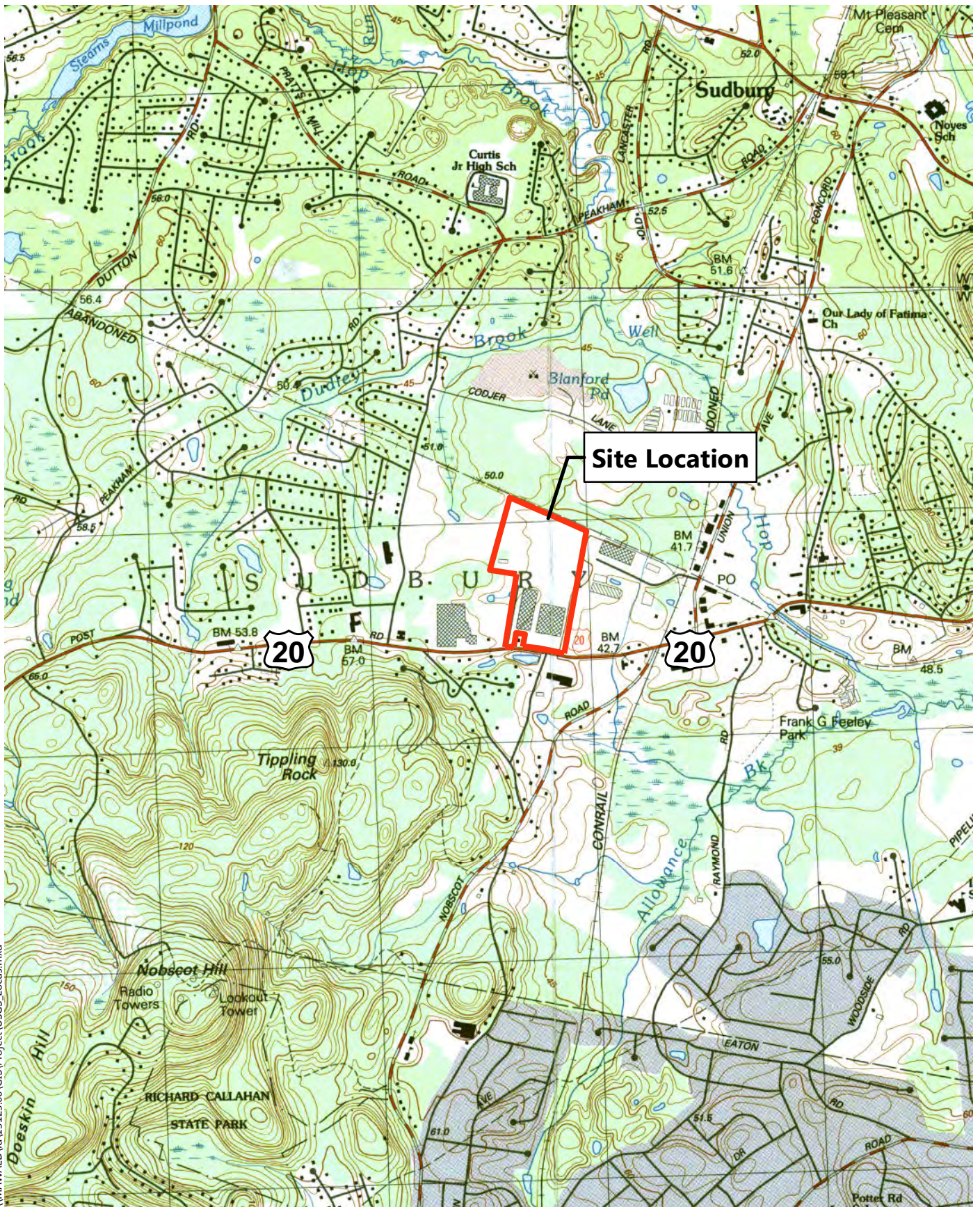
**Table 3  
Proposed Conditions Hydrologic Data**

<i>Drainage Area</i>	<i>Discharge Location</i>	<i>Design Point</i>	<i>Area (acres)</i>	<i>Proposed Impervious Area (acres)</i>	<i>Curve Number</i>	<i>Time of Concentration (min)</i>
S-1A	48" RCP Across Boston Post Road	DP-1	7.4	5.3	87	5.0
S-1B	Ex Pond at Center of Prop	DP-1	9.4	5.6	83	5.0
S-1C	Ex Pond at Center of Prop	DP-1	18.6	10.8	80	12.2
S-1D	Ex Pond at Center of Prop	DP-1	8.3	1.4	67	5.0
S-1E	Ex Pond at Center of Prop	DP-1	4.9	2.3	73	7.7
S-1F	SW Wetland at Western Prop Line	DP-1	33.8	9.9	51	17.0
S-1G	48" RCP Across Boston Post Road	DP-1	2.5	2.3	94	5.0
S-2	Overland Flow to Boston Post Rd	DP-2	0.1	0.0	61	5.0
S-3	Wetland at Northeast Corner	DP-3	0.7	0.0	61	5.0
Total:			85.7	37.6		

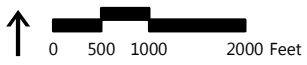
**Environmentally Sensitive and Low Impact Development (LID) Techniques**

The Stormwater Master Plan incorporates Low Impact Development (LID) techniques and stormwater Best Management Practices (BMPs) including increased open space and a corresponding reduction of impervious area, minimized disturbance to existing trees and vegetation, and grassed swales. Additional LID techniques, including, but not limited to, vegetated swales, rain gardens, and/or infiltration basins will be outlined within each subsequent project phase report.





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**Proposed Mixed-Use Redevelopment** 526/528 Boston Post Road, Sudbury, MA

**Figure 1 - Site Location**

Source: MassGIS USGS Quadrangle





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**Proposed Mixed-Use Redevelopment** | 526/528 Boston Post Road, Sudbury, MA

**Figure 2 - Aerial Locus Map**

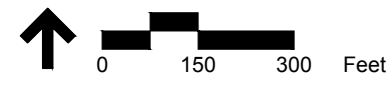
Source: MassGIS 2013







LEGEND	
	POND
	DESIGN POINT
	DRAINAGE AREA DESIGNATION
	DRAINAGE AREA BOUNDARY
	TIME OF CONCENTRATION FLOW LINE
	SOIL TYPE BOUNDARY
SCS SOIL CLASSIFICATIONS	
	UDORTHENTS – URBAN LAND HSG – UNKNOWN
	BIRDSALL MUCKY SILT LOAM HSG – C/D
	WINDSOR LOAMY SAND HSG – A
	DEERFIELD LOAMY SAND 3% HSG – B
	DEERFIELD LOAMY SAND 8% HSG – B



MEADOW WALK  
SUDBURY



Figure #3  
Existing Drainage Conditions  
Sudbury, MA





LEGEND	
	POND
	DESIGN POINT
	DRAINAGE AREA DESIGNATION
	DRAINAGE AREA BOUNDARY
	TIME OF CONCENTRATION FLOW LINE

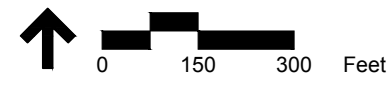


Figure #4  
Proposed Drainage Conditions  
Sudbury, MA





# Regulatory Compliance

The Stormwater analysis for the Preliminary Stormwater Management Master Plan has been designed to comply with the Massachusetts DEP Stormwater Regulations and, to the extent required by any phase of the project, the Stormwater Management Bylaw Regulations for the Town of Sudbury.

Compliance with DEP Stormwater Management Standards 2 and 3 regarding the entire Preliminary Stormwater Management Master Plan is demonstrated below. The methods for compliance with the remaining DEP Stormwater Management Standards (specifically regarding Standards 1, and 4-10) are discussed below, and will be further documented in forthcoming reports prepared for each individual project area.

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## Standard 1: No New Untreated Discharges or Erosion to Wetlands

Untreated stormwater discharging to, or causing erosion in wetlands or water bodies, will not be allowed in connection with the Project. Appropriate treatment trains will be provided for each phase prior to discharging to any wetland in order to document velocities and the potential for erosion at the outfalls.

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## Standard 2: Peak Rate Attenuation

The rainfall-runoff response of the Site under existing and proposed conditions was analyzed for storm events with recurrence intervals, 2-, 10-, 25-, and 100-years, with rainfall amounts of 3.2", 4.8", 6.0", and 8.6" respectively, as outlined in the Stormwater Management Bylaw Regulations for the Town of Sudbury. A 1-inch rainfall depth is also evaluated. The results indicate that there is no increase in peak discharge rates or in total volume of discharge between the existing and proposed conditions, as summarized in Tables 4 and 5 below.

Computations and supporting information regarding the hydrologic modeling are included in Appendix A.



**Table 4  
Peak Discharge Rates (cfs\*)**

<i>Design Point</i>	<i>1-inch</i>	<i>2-year</i>	<i>10-year</i>	<i>25-year</i>	<i>100-year</i>
<b>Design Point: DP-1 (48" RCP Across Boston Post Rd)</b>					
Existing	1.8	26.0	45.7	64.2	116.1
Proposed	1.7	20.5	44.8	59.0	110.2
<b>Design Point: DP-2 (Overland Flow to Boston Post Rd)</b>					
Existing	0.0	0.4	1.4	2.3	4.6
Proposed	0.0	0.0	0.2	0.3	0.6
<b>Design Point: DP-3 (Wetland at Northeast Corner)</b>					
Existing	0.0	0.2	0.9	1.5	3.1
Proposed	0.0	0.2	0.9	1.5	3.1

**Table 5  
Total Volume of Discharge (acre-ft)**

<i>Design Point</i>	<i>1-inch</i>	<i>2-year</i>	<i>10-year</i>	<i>25-year</i>	<i>100-year</i>
<b>Design Point: DP-1 (48" RCP Across Boston Post Rd)</b>					
Existing	0.5	6.6	13.5	19.5	33.9
Proposed	0.3	5.8	12.6	18.6	32.9
<b>Design Point: DP-2 (Overland Flow to Boston Post Rd)</b>					
Existing	0.0	0.0	0.1	0.2	0.3
Proposed	0.0	0.0	0.0	0.0	0.0
<b>Design Point: DP-3 (Wetland at Northeast Corner)</b>					
Existing	0.0	0.0	0.1	0.1	0.2
Proposed	0.0	0.0	0.1	0.1	0.2

As shown above, implementing stormwater BMP's, increasing pervious area throughout the site and enhancing the overall stormwater management system maintains or reduces peak rates and total volume of discharge to the design points in the design storms.

### Standard 3: Stormwater Recharge

The Project is anticipated to result in a net increase of pervious area and corresponding decrease in impervious area of approximately 2.5 acres, and consequently does not require recharge.

Based on the existing pervious area at the Site and hydrologic soil groups A and B across the Site, the Existing Recharge Volume for the Project is 36,000 cubic feet.



The proposed decrease of impervious coverage on the site will provide an approximate net increase of 3,000 cubic feet of recharge, resulting in approximately 39,000 cubic feet total of recharge in the proposed conditions. Recharge Volume Calculations are included in Appendix B.

Notwithstanding, subject to confirmation of groundwater elevations, the Project stormwater design will include additional infiltration BMPs, potentially including surface and/or subsurface infiltration basins and drywells to further promote groundwater recharge.

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## Standard 4: Water Quality

The Project's stormwater management system is designed to remove a minimum of 80 percent of the average annual post-construction load of TSS and will be in compliance with the design and pre-treatment requirements for the selected BMPs and specific land use.

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## Standard 5: Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

Any components of the Project which involve land uses with higher potential pollutant loads, such as parking lots with high-intensity-uses, will comply with requirements for such areas, with a focus on source control and BMPs to treat the subject-pollutants. Detailed design of these areas will be presented to the Town as the designs of these areas are finalized.

BMPs anticipated for the project include:

- Deep Sump Catch Basins
- Deep Sump Manholes
- Sediment Forebays
- Water Quality Units
- Bioretention Areas & Rain Gardens
- Drywells: only used for runoff from non-metal roofs (not allowed BMP for runoff from LUHPPLs)
- Infiltration Basins
- Subsurface Infiltration Structures

Potential BMPs that may be included as part of the project include:

- Vegetated Filter Strips
- Constructed Stormwater Wetlands
- Extended Dry Detention Basin
- Proprietary Media Filters (i.e. Sand Filters, Tree Box Filter)



- Wet Basins
- Drainage Channels
- Grassed Channel (Biofilter Swale)
- Water Quality Swale
- Infiltration Trench
- Leaching Catch Basins

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## Standard 6: Critical Areas

The Project is located within a Zone II Interim Wellhead Protection Area and within the Town of Sudbury water resource protection overlay district<sup>1</sup>. Specific source control and pollution prevention measures and the specific structural stormwater BMPs will be employed to prevent an adverse impact to these water supply sources. This includes treatment of the 1-inch water quality volume and pre-treatment requirements prior to infiltration, as required by the Massachusetts DEP Stormwater Standards.

BMPs anticipated for the project include:

- Deep Sump Catch Basins
- Deep Sump Manholes
- Sediment Forebays
- Grassed Channels
- Bioretention Areas & Rain Gardens (44% pretreatment)
- Drywells: only used for runoff from non-metal roofs
- Infiltration Basin
- Subsurface Infiltration Structures

Potential BMPs that may be included as part of the project include:

- Vegetated Filter Strips
- Constructed Stormwater Wetlands
- Proprietary Media Filters (i.e. Sand Filters, Tree Box Filter)
- Wet Basins
- Grassed Channel (Biofilter Swale)
- Water Quality Swales
- Infiltration Trenches

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<sup>1</sup> DEP, 2012. Approved Wellhead Protection Areas (Zone II).





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## **Standard 7: Redevelopments and Other Projects Subject to the Standards only to the Maximum Extent Practicable**

Based on the historic site usage, the Project is considered a redevelopment. Notwithstanding, the Project will be designed to be substantially compliant with the MassDEP Stormwater Management Standards for new development except where impractical due to existing site constraints (for example, depth to groundwater).

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## **Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Controls**

During the Site Plan Review process for the Project with the Town of Sudbury, an erosion control plan will be formulated for each phase of construction which will limit the impacts of erosion, sedimentation and other pollutant sources during construction and land disturbance activities. Erosion control measures will be reevaluated after each phase so that all erosion control measures may function in harmony with other phases if simultaneous phase construction occurs. The Project will also employ LID measures, which will contribute to minimizing these construction related impacts. These efforts will be finalized for the Project in future filings with the Sudbury Conservation Commission and/or Planning Board. The Project will require the preparation of a Stormwater Pollution Prevention Plan (SWPPP) for Construction Activities in compliance with the NPDES regulations and the Town's Stormwater Regulations. The SWPPP will include the details of the erosion, sedimentation and pollution prevention plan implementation.

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## **Standard 9: Operations and Maintenance Plan**

A long-term operation and maintenance plan will be developed and implemented for the Project during the Town of Sudbury review processes, as part of future filings. The property owner will be ultimately responsible for long term maintenance of the stormwater management system.

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## **Standard 10: Prohibition of Illicit Discharges**

A long-term Pollution Prevention Plan will include measures to prevent known illicit discharges of sanitary sewer and stormwater drainage remaining from previous development that are part of the Site to be removed or will be incorporated into updated separate sanitary sewer and stormwater systems. Detailed design plans will be submitted during future filings for the Project, which will include components in full compliance with current standards.





# Appendix A

## Standard 2 Computations and Supporting Information

Rainfall volumes used for this analysis were based on the Stormwater Management Bylaw Regulations for the Town of Sudbury. Runoff coefficients for the existing and proposed conditions, as previously shown in Tables 1 and 2 respectively, were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD. The HydroCAD model is based on the NRCS Technical Release 20 (TR-20) Model for Project Formulation Hydrology.

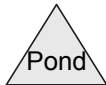
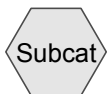
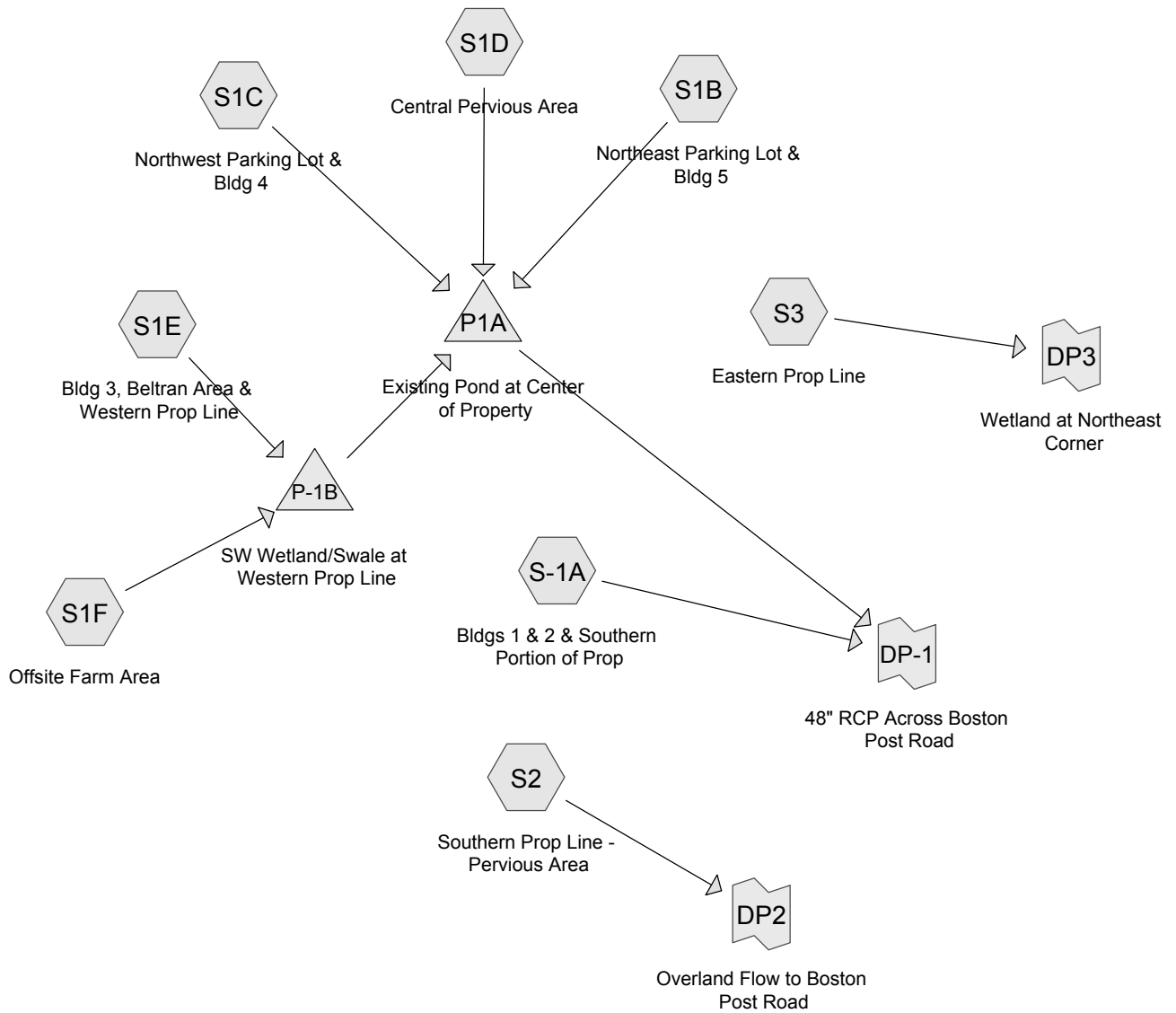
- Existing Hydrologic Calculations
  - Node Diagram
  - 1-inch Storm Event
  - 2-Year Storm Event
  - 10-Year Storm Event
  - 25-Year Storm Event
  - 100-Year Storm Event
  
- Proposed Hydrologic Calculations
  - Node Diagram
  - 1-inch Storm Event
  - 2-Year Storm Event
  - 10-Year Storm Event
  - 25-Year Storm Event
  - 100-Year Storm Event





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## HydroCAD Analysis: Existing Conditions



**Routing Diagram for 13125-EX HydroCAD**  
 Prepared by VHB, Printed 3/29/2016  
 HydroCAD® 10.00-12 s/n 07577 © 2014 HydroCAD Software Solutions LLC



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## 1-inch Storm Event – Existing

**13125-EX HydroCAD**

Prepared by VHB

HydroCAD® 10.00-12 s/n 07577 © 2014 HydroCAD Software Solutions LLC

Type III 24-hr 1-Inch Rainfall=1.00"

Printed 3/29/2016

Page 2

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

<b>SubcatchmentS-1A: Bldgs 1 &amp; 2 &amp;</b>	Runoff Area=482,099 sf 64.58% Impervious	Runoff Depth=0.17"
	Flow Length=1,239' Tc=5.1 min CN=85	Runoff=1.7 cfs 0.2 af
<b>SubcatchmentS1B: Northeast Parking</b>	Runoff Area=362,836 sf 79.83% Impervious	Runoff Depth=0.36"
	Flow Length=375' Tc=5.0 min CN=91	Runoff=3.5 cfs 0.2 af
<b>SubcatchmentS1C: Northwest Parking</b>	Runoff Area=696,274 sf 70.96% Impervious	Runoff Depth=0.15"
	Flow Length=1,845' Tc=12.2 min CN=84	Runoff=1.6 cfs 0.2 af
<b>SubcatchmentS1D: Central Pervious</b>	Runoff Area=340,318 sf 20.22% Impervious	Runoff Depth=0.00"
	Tc=5.0 min CN=68	Runoff=0.0 cfs 0.0 af
<b>SubcatchmentS1E: Bldg 3, Beltran Area</b>	Runoff Area=311,033 sf 48.01% Impervious	Runoff Depth=0.02"
	Flow Length=533' Tc=7.7 min CN=74	Runoff=0.0 cfs 0.0 af
<b>SubcatchmentS1F: Offsite Farm Area</b>	Runoff Area=1,470,921 sf 29.23% Impervious	Runoff Depth=0.00"
	Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51	Runoff=0.0 cfs 0.0 af
<b>SubcatchmentS2: Southern Prop Line -</b>	Runoff Area=39,780 sf 4.56% Impervious	Runoff Depth=0.00"
	Flow Length=285' Slope=0.0280 '/' Tc=5.0 min CN=63	Runoff=0.0 cfs 0.0 af
<b>SubcatchmentS3: Eastern Prop Line</b>	Runoff Area=28,484 sf 0.00% Impervious	Runoff Depth=0.00"
	Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61	Runoff=0.0 cfs 0.0 af
<b>Pond P-1B: SW Wetland/Swale at Western Prop</b>	Peak Elev=151.00' Storage=0 cf	Inflow=0.0 cfs 0.0 af
	24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/'	Outflow=0.0 cfs 0.0 af
<b>Pond P1A: Existing Pond at Center of Property</b>	Peak Elev=144.96' Storage=45,699 cf	Inflow=4.2 cfs 0.5 af
		Outflow=0.2 cfs 0.3 af
<b>Link DP-1: 48" RCP Across Boston Post Road</b>		Inflow=1.8 cfs 0.5 af
		Primary=1.8 cfs 0.5 af
<b>Link DP2: Overland Flow to Boston Post Road</b>		Inflow=0.0 cfs 0.0 af
		Primary=0.0 cfs 0.0 af
<b>Link DP3: Wetland at Northeast Corner</b>		Inflow=0.0 cfs 0.0 af
		Primary=0.0 cfs 0.0 af

**Total Runoff Area = 85.7 ac Runoff Volume = 0.6 af Average Runoff Depth = 0.09"**  
**53.24% Pervious = 45.6 ac 46.76% Impervious = 40.1 ac**



**Summary for Subcatchment S-1A: Bldgs 1 & 2 & Southern Portion of Prop**

Runoff = 1.7 cfs @ 12.10 hrs, Volume= 0.2 af, Depth= 0.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 170,769	61	>75% Grass cover, Good, HSG B
* 99,171	98	Road & Sidewalk
* 212,159	98	Roofs
482,099	85	Weighted Average
170,769		35.42% Pervious Area
311,330		64.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
3.5	537	0.0160	2.57		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.9	652	0.0130	12.71	89.87	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.1	1,239	Total			

**Summary for Subcatchment S1B: Northeast Parking Lot & Bldg 5**

Runoff = 3.5 cfs @ 12.08 hrs, Volume= 0.2 af, Depth= 0.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 62,603	98	Roofs
* 227,035	98	Road & Sidewalk
* 73,198	61	>75% Grass cover, Good, HSG B
362,836	91	Weighted Average
73,198		20.17% Pervious Area
289,638		79.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean

2.3 375 Total, Increased to minimum Tc = 5.0 min

**Summary for Subcatchment S1C: Northwest Parking Lot & Bldg 4**

Runoff = 1.6 cfs @ 12.22 hrs, Volume= 0.2 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 44,716	98	Roofs
* 449,394	98	Road & Sidewalk
* 104,149	61	>75% Grass cover, Good, HSG B
98,015	39	>75% Grass cover, Good, HSG A
696,274	84	Weighted Average
202,164		29.04% Pervious Area
494,110		70.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S1D: Central Pervious Area**

Runoff = 0.0 cfs @ 24.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

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Type III 24-hr 1-Inch Rainfall=1.00"

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Area (sf)	CN	Description
* 961	98	Roofs
* 16,841	98	Road & Sidewalk
* 271,522	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
340,318	68	Weighted Average
271,522		79.78% Pervious Area
68,796		20.22% Impervious Area

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

**Summary for Subcatchment S1E: Bldg 3, Beltran Area & Western Prop Line**

Runoff = 0.0 cfs @ 14.81 hrs, Volume= 0.0 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 68,971	98	Roofs
* 98,296	61	>75% Grass cover, Good, HSG B
* 63,425	39	>75% Grass cover, Good, HSG A
* 80,341	98	Road & Sidewalk
311,033	74	Weighted Average
161,721		51.99% Pervious Area
149,312		48.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S1F: Offsite Farm Area**

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

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Type III 24-hr 1-Inch Rainfall=1.00"

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Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S2: Southern Prop Line - Pervious Area**

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 37,965	61	>75% Grass cover, Good, HSG B
* 1,815	98	Road & Sidewalk
39,780	63	Weighted Average
37,965		95.44% Pervious Area
1,815		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	25	0.0280	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.6	260	0.0280	2.69		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.4	285	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S3: Eastern Prop Line**

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 28,484	61	>75% Grass cover, Good, HSG B
28,484		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 40.9 ac, 32.50% Impervious, Inflow Depth = 0.00" for 1-Inch event  
 Inflow = 0.0 cfs @ 14.81 hrs, Volume= 0.0 af  
 Outflow = 0.0 cfs @ 14.81 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.0 cfs @ 14.81 hrs, Volume= 0.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 151.00' @ 14.81 hrs Surf.Area= 498 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.0 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 1,060.7 - 1,060.7 )

Volume	Invert	Avail.Storage	Storage Description			
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
151.00	498	198.0	0	0	498	
152.00	1,368	715.0	897	897	38,063	
153.00	8,822	6,900.0	4,555	5,452	3,786,066	
154.00	25,925	1,559.0	16,623	22,075	7,381,341	
155.00	50,627	1,626.0	37,594	59,669	7,398,397	
156.00	83,648	1,717.0	66,450	126,119	7,422,663	

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=8.4 cfs @ 14.81 hrs HW=151.00' (Free Discharge)  
 ←1=Culvert (Inlet Controls 8.4 cfs @ 3.88 fps)

**Summary for Pond P1A: Existing Pond at Center of Property**

Inflow Area = 73.0 ac, 45.00% Impervious, Inflow Depth = 0.08" for 1-Inch event  
 Inflow = 4.2 cfs @ 12.10 hrs, Volume= 0.5 af  
 Outflow = 0.2 cfs @ 17.48 hrs, Volume= 0.3 af, Atten= 94%, Lag= 322.6 min  
 Primary = 0.2 cfs @ 17.48 hrs, Volume= 0.3 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 144.96' @ 17.48 hrs Surf.Area= 48,907 sf Storage= 45,699 cf (12,653 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 443.6 min ( 1,330.9 - 887.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=0.2 cfs @ 17.48 hrs HW=144.96' (Free Discharge)

- ↑ 4=Culvert (Passes 0.2 cfs of 19.4 cfs potential flow)
- ↑ 1=Culvert (Barrel Controls 0.2 cfs @ 2.26 fps)
- ↑ 3=Culvert (Passes 0.0 cfs of 4.0 cfs potential flow)
- ↑ 2=Orifice/Grate ( Controls 0.0 cfs)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.1 ac, 47.58% Impervious, Inflow Depth > 0.07" for 1-Inch event  
 Inflow = 1.8 cfs @ 12.10 hrs, Volume= 0.5 af  
 Primary = 1.8 cfs @ 12.10 hrs, Volume= 0.5 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP2: Overland Flow to Boston Post Road**

Inflow Area = 0.9 ac, 4.56% Impervious, Inflow Depth = 0.00" for 1-Inch event  
 Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af  
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Inch event  
 Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af  
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



## 2-Year Storm Event – Existing



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Type III 24-hr 2-Year Rainfall=3.20"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

<b>SubcatchmentS-1A: Bldgs 1 &amp; 2 &amp;</b>	Runoff Area=482,099 sf 64.58% Impervious	Runoff Depth=1.76"
	Flow Length=1,239' Tc=5.1 min CN=85	Runoff=23.6 cfs 1.6 af
<b>SubcatchmentS1B: Northeast Parking</b>	Runoff Area=362,836 sf 79.83% Impervious	Runoff Depth=2.26"
	Flow Length=375' Tc=5.0 min CN=91	Runoff=22.5 cfs 1.6 af
<b>SubcatchmentS1C: Northwest Parking</b>	Runoff Area=696,274 sf 70.96% Impervious	Runoff Depth=1.68"
	Flow Length=1,845' Tc=12.2 min CN=84	Runoff=25.7 cfs 2.2 af
<b>SubcatchmentS1D: Central Pervious</b>	Runoff Area=340,318 sf 20.22% Impervious	Runoff Depth=0.73"
	Tc=5.0 min CN=68	Runoff=6.0 cfs 0.5 af
<b>SubcatchmentS1E: Bldg 3, Beltran Area</b>	Runoff Area=311,033 sf 48.01% Impervious	Runoff Depth=1.04"
	Flow Length=533' Tc=7.7 min CN=74	Runoff=7.7 cfs 0.6 af
<b>SubcatchmentS1F: Offsite Farm Area</b>	Runoff Area=1,470,921 sf 29.23% Impervious	Runoff Depth=0.15"
	Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51	Runoff=1.0 cfs 0.4 af
<b>SubcatchmentS2: Southern Prop Line -</b>	Runoff Area=39,780 sf 4.56% Impervious	Runoff Depth=0.52"
	Flow Length=285' Slope=0.0280 '/' Tc=5.0 min CN=63	Runoff=0.4 cfs 0.0 af
<b>SubcatchmentS3: Eastern Prop Line</b>	Runoff Area=28,484 sf 0.00% Impervious	Runoff Depth=0.44"
	Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61	Runoff=0.2 cfs 0.0 af
<b>Pond P-1B: SW Wetland/Swale at Western Prop</b>	Peak Elev=151.04' Storage=22 cf	Inflow=7.7 cfs 1.0 af
	24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/'	Outflow=7.7 cfs 1.0 af
<b>Pond P1A: Existing Pond at Center of</b>	Peak Elev=147.15' Storage=160,547 cf	Inflow=56.0 cfs 5.3 af
		Outflow=4.2 cfs 5.0 af
<b>Link DP-1: 48" RCP Across Boston Post Road</b>		Inflow=26.0 cfs 6.6 af
		Primary=26.0 cfs 6.6 af
<b>Link DP2: Overland Flow to Boston Post Road</b>		Inflow=0.4 cfs 0.0 af
		Primary=0.4 cfs 0.0 af
<b>Link DP3: Wetland at Northeast Corner</b>		Inflow=0.2 cfs 0.0 af
		Primary=0.2 cfs 0.0 af

**Total Runoff Area = 85.7 ac Runoff Volume = 7.0 af Average Runoff Depth = 0.98"**  
**53.24% Pervious = 45.6 ac 46.76% Impervious = 40.1 ac**

**Summary for Subcatchment S-1A: Bldgs 1 & 2 & Southern Portion of Prop**

Runoff = 23.6 cfs @ 12.08 hrs, Volume= 1.6 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 170,769	61	>75% Grass cover, Good, HSG B
* 99,171	98	Road & Sidewalk
* 212,159	98	Roofs
482,099	85	Weighted Average
170,769		35.42% Pervious Area
311,330		64.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
3.5	537	0.0160	2.57		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.9	652	0.0130	12.71	89.87	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.1	1,239	Total			

**Summary for Subcatchment S1B: Northeast Parking Lot & Bldg 5**

Runoff = 22.5 cfs @ 12.07 hrs, Volume= 1.6 af, Depth= 2.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 62,603	98	Roofs
* 227,035	98	Road & Sidewalk
* 73,198	61	>75% Grass cover, Good, HSG B
362,836	91	Weighted Average
73,198		20.17% Pervious Area
289,638		79.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean

2.3 375 Total, Increased to minimum Tc = 5.0 min

**Summary for Subcatchment S1C: Northwest Parking Lot & Bldg 4**

Runoff = 25.7 cfs @ 12.17 hrs, Volume= 2.2 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 44,716	98	Roofs
* 449,394	98	Road & Sidewalk
* 104,149	61	>75% Grass cover, Good, HSG B
98,015	39	>75% Grass cover, Good, HSG A
696,274	84	Weighted Average
202,164		29.04% Pervious Area
494,110		70.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S1D: Central Pervious Area**

Runoff = 6.0 cfs @ 12.09 hrs, Volume= 0.5 af, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 961	98	Roofs
* 16,841	98	Road & Sidewalk
* 271,522	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
340,318	68	Weighted Average
271,522		79.78% Pervious Area
68,796		20.22% Impervious Area

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

**Summary for Subcatchment S1E: Bldg 3, Beltran Area & Western Prop Line**

Runoff = 7.7 cfs @ 12.12 hrs, Volume= 0.6 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 68,971	98	Roofs
* 98,296	61	>75% Grass cover, Good, HSG B
* 63,425	39	>75% Grass cover, Good, HSG A
* 80,341	98	Road & Sidewalk
311,033	74	Weighted Average
161,721		51.99% Pervious Area
149,312		48.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S1F: Offsite Farm Area**

Runoff = 1.0 cfs @ 12.60 hrs, Volume= 0.4 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

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Type III 24-hr 2-Year Rainfall=3.20"

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Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S2: Southern Prop Line - Pervious Area**

Runoff = 0.4 cfs @ 12.10 hrs, Volume= 0.0 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 37,965	61	>75% Grass cover, Good, HSG B
* 1,815	98	Road & Sidewalk
39,780	63	Weighted Average
37,965		95.44% Pervious Area
1,815		4.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	25	0.0280	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.6	260	0.0280	2.69		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.4	285	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S3: Eastern Prop Line**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 0.0 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 28,484	61	>75% Grass cover, Good, HSG B
28,484		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 40.9 ac, 32.50% Impervious, Inflow Depth = 0.31" for 2-Year event  
 Inflow = 7.7 cfs @ 12.12 hrs, Volume= 1.0 af  
 Outflow = 7.7 cfs @ 12.12 hrs, Volume= 1.0 af, Atten= 0%, Lag= 0.0 min  
 Primary = 7.7 cfs @ 12.12 hrs, Volume= 1.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 151.04' @ 12.12 hrs Surf.Area= 527 sf Storage= 22 cf

Plug-Flow detention time= 0.0 min calculated for 1.0 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 921.9 - 921.8 )

Volume	Invert	Avail.Storage	Storage Description			
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
151.00	498	198.0	0	0	498	
152.00	1,368	715.0	897	897	38,063	
153.00	8,822	6,900.0	4,555	5,452	3,786,066	
154.00	25,925	1,559.0	16,623	22,075	7,381,341	
155.00	50,627	1,626.0	37,594	59,669	7,398,397	
156.00	83,648	1,717.0	66,450	126,119	7,422,663	

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=8.9 cfs @ 12.12 hrs HW=151.04' (Free Discharge)  
 ←1=Culvert (Inlet Controls 8.9 cfs @ 3.95 fps)

**Summary for Pond P1A: Existing Pond at Center of Property**

Inflow Area = 73.0 ac, 45.00% Impervious, Inflow Depth = 0.87" for 2-Year event  
 Inflow = 56.0 cfs @ 12.11 hrs, Volume= 5.3 af  
 Outflow = 4.2 cfs @ 15.00 hrs, Volume= 5.0 af, Atten= 92%, Lag= 173.8 min  
 Primary = 4.2 cfs @ 15.00 hrs, Volume= 5.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 147.15' @ 15.00 hrs Surf.Area= 56,709 sf Storage= 160,547 cf (127,500 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= 552.4 min calculated for 4.2 af (79% of inflow)  
 Center-of-Mass det. time= 388.4 min ( 1,234.9 - 846.5 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=4.2 cfs @ 15.00 hrs HW=147.15' (Free Discharge)

- ↑ 4=Culvert (Passes 4.2 cfs of 35.6 cfs potential flow)
- ↑ 1=Culvert (Barrel Controls 3.6 cfs @ 4.62 fps)
- ↑ 3=Culvert (Passes 0.6 cfs of 17.6 cfs potential flow)
- ↑ 2=Orifice/Grate (Orifice Controls 0.6 cfs @ 1.24 fps)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.1 ac, 47.58% Impervious, Inflow Depth > 0.94" for 2-Year event  
 Inflow = 26.0 cfs @ 12.08 hrs, Volume= 6.6 af  
 Primary = 26.0 cfs @ 12.08 hrs, Volume= 6.6 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP2: Overland Flow to Boston Post Road**

Inflow Area = 0.9 ac, 4.56% Impervious, Inflow Depth = 0.52" for 2-Year event  
 Inflow = 0.4 cfs @ 12.10 hrs, Volume= 0.0 af  
 Primary = 0.4 cfs @ 12.10 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 0.44" for 2-Year event  
 Inflow = 0.2 cfs @ 12.11 hrs, Volume= 0.0 af  
 Primary = 0.2 cfs @ 12.11 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs





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## 10-Year Storm Event – Existing

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Type III 24-hr 10-Year Rainfall=4.80"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**SubcatchmentS-1A: Bldgs 1 & 2 &** Runoff Area=482,099 sf 64.58% Impervious Runoff Depth=3.18"  
 Flow Length=1,239' Tc=5.1 min CN=85 Runoff=42.3 cfs 2.9 af

**SubcatchmentS1B: Northeast Parking** Runoff Area=362,836 sf 79.83% Impervious Runoff Depth=3.79"  
 Flow Length=375' Tc=5.0 min CN=91 Runoff=36.8 cfs 2.6 af

**SubcatchmentS1C: Northwest Parking** Runoff Area=696,274 sf 70.96% Impervious Runoff Depth=3.09"  
 Flow Length=1,845' Tc=12.2 min CN=84 Runoff=47.1 cfs 4.1 af

**SubcatchmentS1D: Central Pervious** Runoff Area=340,318 sf 20.22% Impervious Runoff Depth=1.74"  
 Tc=5.0 min CN=68 Runoff=16.0 cfs 1.1 af

**SubcatchmentS1E: Bldg 3, Beltran Area** Runoff Area=311,033 sf 48.01% Impervious Runoff Depth=2.21"  
 Flow Length=533' Tc=7.7 min CN=74 Runoff=17.3 cfs 1.3 af

**SubcatchmentS1F: Offsite Farm Area** Runoff Area=1,470,921 sf 29.23% Impervious Runoff Depth=0.66"  
 Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51 Runoff=12.1 cfs 1.9 af

**SubcatchmentS2: Southern Prop Line -** Runoff Area=39,780 sf 4.56% Impervious Runoff Depth=1.38"  
 Flow Length=285' Slope=0.0280 '/' Tc=5.0 min CN=63 Runoff=1.4 cfs 0.1 af

**SubcatchmentS3: Eastern Prop Line** Runoff Area=28,484 sf 0.00% Impervious Runoff Depth=1.25"  
 Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61 Runoff=0.9 cfs 0.1 af

**Pond P-1B: SW Wetland/Swale at Western** Peak Elev=152.51' Storage=2,308 cf Inflow=21.8 cfs 3.2 af  
 24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/' Outflow=20.4 cfs 3.2 af

**Pond P1A: Existing Pond at Center of** Peak Elev=148.58' Storage=246,140 cf Inflow=106.5 cfs 11.1 af  
 Outflow=23.2 cfs 10.6 af

**Link DP-1: 48" RCP Across Boston Post Road** Inflow=45.7 cfs 13.5 af  
 Primary=45.7 cfs 13.5 af

**Link DP2: Overland Flow to Boston Post Road** Inflow=1.4 cfs 0.1 af  
 Primary=1.4 cfs 0.1 af

**Link DP3: Wetland at Northeast Corner** Inflow=0.9 cfs 0.1 af  
 Primary=0.9 cfs 0.1 af

**Total Runoff Area = 85.7 ac Runoff Volume = 14.2 af Average Runoff Depth = 1.98"**  
**53.24% Pervious = 45.6 ac 46.76% Impervious = 40.1 ac**

**Summary for Subcatchment S-1A: Bldgs 1 & 2 & Southern Portion of Prop**

Runoff = 42.3 cfs @ 12.07 hrs, Volume= 2.9 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 170,769	61	>75% Grass cover, Good, HSG B
* 99,171	98	Road & Sidewalk
* 212,159	98	Roofs
482,099	85	Weighted Average
170,769		35.42% Pervious Area
311,330		64.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
3.5	537	0.0160	2.57		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.9	652	0.0130	12.71	89.87	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.1	1,239	Total			

**Summary for Subcatchment S1B: Northeast Parking Lot & Bldg 5**

Runoff = 36.8 cfs @ 12.07 hrs, Volume= 2.6 af, Depth= 3.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 62,603	98	Roofs
* 227,035	98	Road & Sidewalk
* 73,198	61	>75% Grass cover, Good, HSG B
362,836	91	Weighted Average
73,198		20.17% Pervious Area
289,638		79.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean

2.3 375 Total, Increased to minimum Tc = 5.0 min

**Summary for Subcatchment S1C: Northwest Parking Lot & Bldg 4**

Runoff = 47.1 cfs @ 12.16 hrs, Volume= 4.1 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 44,716	98	Roofs
* 449,394	98	Road & Sidewalk
* 104,149	61	>75% Grass cover, Good, HSG B
98,015	39	>75% Grass cover, Good, HSG A
696,274	84	Weighted Average
202,164		29.04% Pervious Area
494,110		70.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S1D: Central Pervious Area**

Runoff = 16.0 cfs @ 12.08 hrs, Volume= 1.1 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

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Type III 24-hr 10-Year Rainfall=4.80"

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Area (sf)	CN	Description
* 961	98	Roofs
* 16,841	98	Road & Sidewalk
* 271,522	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
340,318	68	Weighted Average
271,522		79.78% Pervious Area
68,796		20.22% Impervious Area

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

**Summary for Subcatchment S1E: Bldg 3, Beltran Area & Western Prop Line**

Runoff = 17.3 cfs @ 12.11 hrs, Volume= 1.3 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 68,971	98	Roofs
* 98,296	61	>75% Grass cover, Good, HSG B
* 63,425	39	>75% Grass cover, Good, HSG A
* 80,341	98	Road & Sidewalk
311,033	74	Weighted Average
161,721		51.99% Pervious Area
149,312		48.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S1F: Offsite Farm Area**

Runoff = 12.1 cfs @ 12.34 hrs, Volume= 1.9 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

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Type III 24-hr 10-Year Rainfall=4.80"

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Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' /' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' /' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S2: Southern Prop Line - Pervious Area**

Runoff = 1.4 cfs @ 12.08 hrs, Volume= 0.1 af, Depth= 1.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 37,965	61	>75% Grass cover, Good, HSG B
* 1,815	98	Road & Sidewalk
39,780	63	Weighted Average
37,965		95.44% Pervious Area
1,815		4.56% Impervious Area

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Type III 24-hr 10-Year Rainfall=4.80"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	25	0.0280	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.6	260	0.0280	2.69		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.4	285	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S3: Eastern Prop Line**

Runoff = 0.9 cfs @ 12.09 hrs, Volume= 0.1 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 28,484	61	>75% Grass cover, Good, HSG B
28,484		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 40.9 ac, 32.50% Impervious, Inflow Depth = 0.93" for 10-Year event  
 Inflow = 21.8 cfs @ 12.16 hrs, Volume= 3.2 af  
 Outflow = 20.4 cfs @ 12.34 hrs, Volume= 3.2 af, Atten= 7%, Lag= 10.8 min  
 Primary = 20.4 cfs @ 12.34 hrs, Volume= 3.2 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 152.51' @ 12.34 hrs Surf.Area= 4,397 sf Storage= 2,308 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 0.4 min ( 890.9 - 890.5 )

Volume	Invert	Avail.Storage	Storage Description			
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
151.00	498	198.0	0	0	498	
152.00	1,368	715.0	897	897	38,063	
153.00	8,822	6,900.0	4,555	5,452	3,786,066	
154.00	25,925	1,559.0	16,623	22,075	7,381,341	
155.00	50,627	1,626.0	37,594	59,669	7,398,397	
156.00	83,648	1,717.0	66,450	126,119	7,422,663	

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

**Primary OutFlow** Max=20.4 cfs @ 12.34 hrs HW=152.51' (Free Discharge)  
 ↑**1=Culvert** (Inlet Controls 20.4 cfs @ 6.49 fps)

**Summary for Pond P1A: Existing Pond at Center of Property**

Inflow Area = 73.0 ac, 45.00% Impervious, Inflow Depth = 1.82" for 10-Year event  
 Inflow = 106.5 cfs @ 12.11 hrs, Volume= 11.1 af  
 Outflow = 23.2 cfs @ 12.75 hrs, Volume= 10.6 af, Atten= 78%, Lag= 38.5 min  
 Primary = 23.2 cfs @ 12.75 hrs, Volume= 10.6 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 148.58' @ 12.75 hrs Surf.Area= 65,036 sf Storage= 246,140 cf (213,094 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= 348.6 min calculated for 9.9 af (89% of inflow)  
 Center-of-Mass det. time= 266.5 min ( 1,101.8 - 835.3 )

Volume	Invert	Avail.Storage	Storage Description			
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
144.00	46,247	909.0	0	0	46,247	
145.00	49,018	939.0	47,626	47,626	50,754	
146.00	51,879	966.0	50,442	98,068	54,957	
147.00	56,154	1,148.0	54,002	152,070	85,592	
148.00	59,900	1,538.0	58,017	210,087	168,964	
149.00	68,930	2,169.0	64,362	274,449	355,114	
150.00	80,674	2,330.0	74,725	349,174	412,799	
151.00	140,074	3,581.0	109,017	458,191	1,001,255	
152.00	267,018	4,717.0	200,163	658,354	1,751,406	

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf



Primary OutFlow Max=23.2 cfs @ 12.75 hrs HW=148.58' (Free Discharge)

↑ 4=Culvert (Passes 23.2 cfs of 42.8 cfs potential flow)

↑ 1=Culvert (Barrel Controls 4.3 cfs @ 5.52 fps)

↑ 3=Culvert (Passes 18.9 cfs of 22.3 cfs potential flow)

↑ 2=Orifice/Grate (Orifice Controls 18.9 cfs @ 4.19 fps)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.1 ac, 47.58% Impervious, Inflow Depth > 1.93" for 10-Year event  
Inflow = 45.7 cfs @ 12.07 hrs, Volume= 13.5 af  
Primary = 45.7 cfs @ 12.07 hrs, Volume= 13.5 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP2: Overland Flow to Boston Post Road**

Inflow Area = 0.9 ac, 4.56% Impervious, Inflow Depth = 1.38" for 10-Year event  
Inflow = 1.4 cfs @ 12.08 hrs, Volume= 0.1 af  
Primary = 1.4 cfs @ 12.08 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 1.25" for 10-Year event  
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 0.1 af  
Primary = 0.9 cfs @ 12.09 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



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## 25-Year Storm Event- Existing

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

<b>SubcatchmentS-1A: Bldgs 1 &amp; 2 &amp;</b>	Runoff Area=482,099 sf 64.58% Impervious	Runoff Depth=4.30"
	Flow Length=1,239' Tc=5.1 min CN=85	Runoff=56.5 cfs 4.0 af
<b>SubcatchmentS1B: Northeast Parking</b>	Runoff Area=362,836 sf 79.83% Impervious	Runoff Depth=4.96"
	Flow Length=375' Tc=5.0 min CN=91	Runoff=47.4 cfs 3.4 af
<b>SubcatchmentS1C: Northwest Parking</b>	Runoff Area=696,274 sf 70.96% Impervious	Runoff Depth=4.20"
	Flow Length=1,845' Tc=12.2 min CN=84	Runoff=63.5 cfs 5.6 af
<b>SubcatchmentS1D: Central Pervious</b>	Runoff Area=340,318 sf 20.22% Impervious	Runoff Depth=2.62"
	Tc=5.0 min CN=68	Runoff=24.6 cfs 1.7 af
<b>SubcatchmentS1E: Bldg 3, Beltran Area</b>	Runoff Area=311,033 sf 48.01% Impervious	Runoff Depth=3.18"
	Flow Length=533' Tc=7.7 min CN=74	Runoff=25.1 cfs 1.9 af
<b>SubcatchmentS1F: Offsite Farm Area</b>	Runoff Area=1,470,921 sf 29.23% Impervious	Runoff Depth=1.22"
	Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51	Runoff=27.8 cfs 3.4 af
<b>SubcatchmentS2: Southern Prop Line -</b>	Runoff Area=39,780 sf 4.56% Impervious	Runoff Depth=2.18"
	Flow Length=285' Slope=0.0280 '/' Tc=5.0 min CN=63	Runoff=2.3 cfs 0.2 af
<b>SubcatchmentS3: Eastern Prop Line</b>	Runoff Area=28,484 sf 0.00% Impervious	Runoff Depth=2.01"
	Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61	Runoff=1.5 cfs 0.1 af
<b>Pond P-1B: SW Wetland/Swale at Western</b>	Peak Elev=153.97' Storage=21,385 cf	Inflow=42.8 cfs 5.3 af
	24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/'	Outflow=27.4 cfs 5.3 af
<b>Pond P1A: Existing Pond at Center of</b>	Peak Elev=149.86' Storage=337,660 cf	Inflow=143.7 cfs 16.1 af
		Outflow=30.7 cfs 15.6 af
<b>Link DP-1: 48" RCP Across Boston Post Road</b>		Inflow=64.2 cfs 19.5 af
		Primary=64.2 cfs 19.5 af
<b>Link DP2: Overland Flow to Boston Post Road</b>		Inflow=2.3 cfs 0.2 af
		Primary=2.3 cfs 0.2 af
<b>Link DP3: Wetland at Northeast Corner</b>		Inflow=1.5 cfs 0.1 af
		Primary=1.5 cfs 0.1 af

**Total Runoff Area = 85.7 ac Runoff Volume = 20.3 af Average Runoff Depth = 2.84"**  
**53.24% Pervious = 45.6 ac 46.76% Impervious = 40.1 ac**

**Summary for Subcatchment S-1A: Bldgs 1 & 2 & Southern Portion of Prop**

Runoff = 56.5 cfs @ 12.07 hrs, Volume= 4.0 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 170,769	61	>75% Grass cover, Good, HSG B
* 99,171	98	Road & Sidewalk
* 212,159	98	Roofs
482,099	85	Weighted Average
170,769		35.42% Pervious Area
311,330		64.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
3.5	537	0.0160	2.57		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.9	652	0.0130	12.71	89.87	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.1	1,239	Total			

**Summary for Subcatchment S1B: Northeast Parking Lot & Bldg 5**

Runoff = 47.4 cfs @ 12.07 hrs, Volume= 3.4 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 62,603	98	Roofs
* 227,035	98	Road & Sidewalk
* 73,198	61	>75% Grass cover, Good, HSG B
362,836	91	Weighted Average
73,198		20.17% Pervious Area
289,638		79.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean

2.3 375 Total, Increased to minimum Tc = 5.0 min

**Summary for Subcatchment S1C: Northwest Parking Lot & Bldg 4**

Runoff = 63.5 cfs @ 12.16 hrs, Volume= 5.6 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 44,716	98	Roofs
* 449,394	98	Road & Sidewalk
* 104,149	61	>75% Grass cover, Good, HSG B
98,015	39	>75% Grass cover, Good, HSG A
696,274	84	Weighted Average
202,164		29.04% Pervious Area
494,110		70.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S1D: Central Pervious Area**

Runoff = 24.6 cfs @ 12.08 hrs, Volume= 1.7 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

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Type III 24-hr 25-Year Rainfall=6.00"

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Area (sf)	CN	Description
* 961	98	Roofs
* 16,841	98	Road & Sidewalk
* 271,522	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
340,318	68	Weighted Average
271,522		79.78% Pervious Area
68,796		20.22% Impervious Area

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

**Summary for Subcatchment S1E: Bldg 3, Beltran Area & Western Prop Line**

Runoff = 25.1 cfs @ 12.11 hrs, Volume= 1.9 af, Depth= 3.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 68,971	98	Roofs
* 98,296	61	>75% Grass cover, Good, HSG B
* 63,425	39	>75% Grass cover, Good, HSG A
* 80,341	98	Road & Sidewalk
311,033	74	Weighted Average
161,721		51.99% Pervious Area
149,312		48.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S1F: Offsite Farm Area**

Runoff = 27.8 cfs @ 12.28 hrs, Volume= 3.4 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

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Type III 24-hr 25-Year Rainfall=6.00"

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Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S2: Southern Prop Line - Pervious Area**

Runoff = 2.3 cfs @ 12.08 hrs, Volume= 0.2 af, Depth= 2.18"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 37,965	61	>75% Grass cover, Good, HSG B
* 1,815	98	Road & Sidewalk
39,780	63	Weighted Average
37,965		95.44% Pervious Area
1,815		4.56% Impervious Area

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Type III 24-hr 25-Year Rainfall=6.00"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	25	0.0280	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.6	260	0.0280	2.69		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.4	285	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S3: Eastern Prop Line**

Runoff = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 28,484	61	>75% Grass cover, Good, HSG B
28,484		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 40.9 ac, 32.50% Impervious, Inflow Depth = 1.56" for 25-Year event  
 Inflow = 42.8 cfs @ 12.19 hrs, Volume= 5.3 af  
 Outflow = 27.4 cfs @ 12.52 hrs, Volume= 5.3 af, Atten= 36%, Lag= 19.2 min  
 Primary = 27.4 cfs @ 12.52 hrs, Volume= 5.3 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 153.97' @ 12.52 hrs Surf.Area= 25,346 sf Storage= 21,385 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)  
 Center-of-Mass det. time= 3.6 min ( 879.3 - 875.7 )

Volume	Invert	Avail.Storage	Storage Description			
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
151.00	498	198.0	0	0	498	
152.00	1,368	715.0	897	897	38,063	
153.00	8,822	6,900.0	4,555	5,452	3,786,066	
154.00	25,925	1,559.0	16,623	22,075	7,381,341	
155.00	50,627	1,626.0	37,594	59,669	7,398,397	
156.00	83,648	1,717.0	66,450	126,119	7,422,663	



Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=27.4 cfs @ 12.52 hrs HW=153.97' (Free Discharge)  
 ↑1=Culvert (Inlet Controls 27.4 cfs @ 8.71 fps)

**Summary for Pond P1A: Existing Pond at Center of Property**

Inflow Area = 73.0 ac, 45.00% Impervious, Inflow Depth = 2.64" for 25-Year event  
 Inflow = 143.7 cfs @ 12.10 hrs, Volume= 16.1 af  
 Outflow = 30.7 cfs @ 13.09 hrs, Volume= 15.6 af, Atten= 79%, Lag= 58.9 min  
 Primary = 30.7 cfs @ 13.09 hrs, Volume= 15.6 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 149.86' @ 13.09 hrs Surf.Area= 78,922 sf Storage= 337,660 cf (304,614 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= 280.0 min calculated for 14.8 af (92% of inflow)  
 Center-of-Mass det. time= 221.1 min ( 1,050.8 - 829.7 )

Volume	Invert	Avail.Storage	Storage Description		
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=30.7 cfs @ 13.09 hrs HW=149.86' (Free Discharge)

4=Culvert (Passes 30.7 cfs of 48.3 cfs potential flow)

1=Culvert (Barrel Controls 4.9 cfs @ 6.22 fps)

3=Culvert (Barrel Controls 25.8 cfs @ 8.22 fps)

2=Orifice/Grate (Passes 25.8 cfs of 31.3 cfs potential flow)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.1 ac, 47.58% Impervious, Inflow Depth > 2.79" for 25-Year event  
Inflow = 64.2 cfs @ 12.08 hrs, Volume= 19.5 af  
Primary = 64.2 cfs @ 12.08 hrs, Volume= 19.5 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP2: Overland Flow to Boston Post Road**

Inflow Area = 0.9 ac, 4.56% Impervious, Inflow Depth = 2.18" for 25-Year event  
Inflow = 2.3 cfs @ 12.08 hrs, Volume= 0.2 af  
Primary = 2.3 cfs @ 12.08 hrs, Volume= 0.2 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 2.01" for 25-Year event  
Inflow = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af  
Primary = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



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## 100-Year Storm Event – Existing

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*Type III 24-hr 100-Year Rainfall=8.60"*

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**SubcatchmentS-1A: Bldgs 1 & 2 &** Runoff Area=482,099 sf 64.58% Impervious Runoff Depth=6.79"  
 Flow Length=1,239' Tc=5.1 min CN=85 Runoff=87.3 cfs 6.3 af

**SubcatchmentS1B: Northeast Parking** Runoff Area=362,836 sf 79.83% Impervious Runoff Depth=7.52"  
 Flow Length=375' Tc=5.0 min CN=91 Runoff=70.2 cfs 5.2 af

**SubcatchmentS1C: Northwest Parking** Runoff Area=696,274 sf 70.96% Impervious Runoff Depth=6.67"  
 Flow Length=1,845' Tc=12.2 min CN=84 Runoff=99.1 cfs 8.9 af

**SubcatchmentS1D: Central Pervious** Runoff Area=340,318 sf 20.22% Impervious Runoff Depth=4.74"  
 Tc=5.0 min CN=68 Runoff=45.1 cfs 3.1 af

**SubcatchmentS1E: Bldg 3, Beltran Area** Runoff Area=311,033 sf 48.01% Impervious Runoff Depth=5.47"  
 Flow Length=533' Tc=7.7 min CN=74 Runoff=43.0 cfs 3.3 af

**SubcatchmentS1F: Offsite Farm Area** Runoff Area=1,470,921 sf 29.23% Impervious Runoff Depth=2.74"  
 Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51 Runoff=73.1 cfs 7.7 af

**SubcatchmentS2: Southern Prop Line -** Runoff Area=39,780 sf 4.56% Impervious Runoff Depth=4.15"  
 Flow Length=285' Slope=0.0280 '/' Tc=5.0 min CN=63 Runoff=4.6 cfs 0.3 af

**SubcatchmentS3: Eastern Prop Line** Runoff Area=28,484 sf 0.00% Impervious Runoff Depth=3.91"  
 Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61 Runoff=3.1 cfs 0.2 af

**Pond P-1B: SW Wetland/Swale at Western** Peak Elev=155.80' Storage=109,941 cf Inflow=99.6 cfs 11.0 af  
 24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/' Outflow=32.4 cfs 11.0 af

**Pond P1A: Existing Pond at Center of** Peak Elev=151.69' Storage=583,106 cf Inflow=220.7 cfs 28.2 af  
 Outflow=35.7 cfs 27.6 af

**Link DP-1: 48" RCP Across Boston Post Road** Inflow=116.1 cfs 33.9 af  
 Primary=116.1 cfs 33.9 af

**Link DP2: Overland Flow to Boston Post Road** Inflow=4.6 cfs 0.3 af  
 Primary=4.6 cfs 0.3 af

**Link DP3: Wetland at Northeast Corner** Inflow=3.1 cfs 0.2 af  
 Primary=3.1 cfs 0.2 af

**Total Runoff Area = 85.7 ac Runoff Volume = 34.9 af Average Runoff Depth = 4.90"**  
**53.24% Pervious = 45.6 ac 46.76% Impervious = 40.1 ac**

**Summary for Subcatchment S-1A: Bldgs 1 & 2 & Southern Portion of Prop**

Runoff = 87.3 cfs @ 12.07 hrs, Volume= 6.3 af, Depth= 6.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 170,769	61	>75% Grass cover, Good, HSG B
* 99,171	98	Road & Sidewalk
* 212,159	98	Roofs
482,099	85	Weighted Average
170,769		35.42% Pervious Area
311,330		64.58% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
3.5	537	0.0160	2.57		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.9	652	0.0130	12.71	89.87	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
5.1	1,239	Total			

**Summary for Subcatchment S1B: Northeast Parking Lot & Bldg 5**

Runoff = 70.2 cfs @ 12.07 hrs, Volume= 5.2 af, Depth= 7.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 62,603	98	Roofs
* 227,035	98	Road & Sidewalk
* 73,198	61	>75% Grass cover, Good, HSG B
362,836	91	Weighted Average
73,198		20.17% Pervious Area
289,638		79.83% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean

2.3 375 Total, Increased to minimum Tc = 5.0 min

**Summary for Subcatchment S1C: Northwest Parking Lot & Bldg 4**

Runoff = 99.1 cfs @ 12.16 hrs, Volume= 8.9 af, Depth= 6.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 44,716	98	Roofs
* 449,394	98	Road & Sidewalk
* 104,149	61	>75% Grass cover, Good, HSG B
98,015	39	>75% Grass cover, Good, HSG A
696,274	84	Weighted Average
202,164		29.04% Pervious Area
494,110		70.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S1D: Central Pervious Area**

Runoff = 45.1 cfs @ 12.07 hrs, Volume= 3.1 af, Depth= 4.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

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Type III 24-hr 100-Year Rainfall=8.60"

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Area (sf)	CN	Description
* 961	98	Roofs
* 16,841	98	Road & Sidewalk
* 271,522	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
340,318	68	Weighted Average
271,522		79.78% Pervious Area
68,796		20.22% Impervious Area

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

**Summary for Subcatchment S1E: Bldg 3, Beltran Area & Western Prop Line**

Runoff = 43.0 cfs @ 12.11 hrs, Volume= 3.3 af, Depth= 5.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 68,971	98	Roofs
* 98,296	61	>75% Grass cover, Good, HSG B
* 63,425	39	>75% Grass cover, Good, HSG A
* 80,341	98	Road & Sidewalk
311,033	74	Weighted Average
161,721		51.99% Pervious Area
149,312		48.01% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S1F: Offsite Farm Area**

Runoff = 73.1 cfs @ 12.26 hrs, Volume= 7.7 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

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Type III 24-hr 100-Year Rainfall=8.60"

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Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 ' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S2: Southern Prop Line - Pervious Area**

Runoff = 4.6 cfs @ 12.08 hrs, Volume= 0.3 af, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 37,965	61	>75% Grass cover, Good, HSG B
* 1,815	98	Road & Sidewalk
39,780	63	Weighted Average
37,965		95.44% Pervious Area
1,815		4.56% Impervious Area



Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.8	25	0.0280	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.6	260	0.0280	2.69		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
4.4	285	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S3: Eastern Prop Line**

Runoff = 3.1 cfs @ 12.08 hrs, Volume= 0.2 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 28,484	61	>75% Grass cover, Good, HSG B
28,484		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 40.9 ac, 32.50% Impervious, Inflow Depth = 3.21" for 100-Year event  
 Inflow = 99.6 cfs @ 12.20 hrs, Volume= 11.0 af  
 Outflow = 32.4 cfs @ 12.71 hrs, Volume= 11.0 af, Atten= 67%, Lag= 30.6 min  
 Primary = 32.4 cfs @ 12.71 hrs, Volume= 11.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 155.80' @ 12.71 hrs Surf.Area= 76,300 sf Storage= 109,941 cf

Plug-Flow detention time= 21.5 min calculated for 11.0 af (100% of inflow)  
 Center-of-Mass det. time= 21.5 min ( 877.5 - 856.0 )

Volume	Invert	Avail.Storage	Storage Description			
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)			
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)	
151.00	498	198.0	0	0	498	
152.00	1,368	715.0	897	897	38,063	
153.00	8,822	6,900.0	4,555	5,452	3,786,066	
154.00	25,925	1,559.0	16,623	22,075	7,381,341	
155.00	50,627	1,626.0	37,594	59,669	7,398,397	
156.00	83,648	1,717.0	66,450	126,119	7,422,663	

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=32.4 cfs @ 12.71 hrs HW=155.80' (Free Discharge)

←1=Culvert (Barrel Controls 32.4 cfs @ 10.31 fps)

### Summary for Pond P1A: Existing Pond at Center of Property

Inflow Area =	73.0 ac, 45.00% Impervious, Inflow Depth = 4.63" for 100-Year event
Inflow =	220.7 cfs @ 12.10 hrs, Volume= 28.2 af
Outflow =	35.7 cfs @ 14.57 hrs, Volume= 27.6 af, Atten= 84%, Lag= 148.4 min
Primary =	35.7 cfs @ 14.57 hrs, Volume= 27.6 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3

Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf

Peak Elev= 151.69' @ 14.57 hrs Surf.Area= 223,718 sf Storage= 583,106 cf (550,059 cf above start)

Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= 258.3 min calculated for 26.8 af (95% of inflow)

Center-of-Mass det. time= 220.5 min ( 1,046.6 - 826.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=35.7 cfs @ 14.57 hrs HW=151.69' (Free Discharge)

4=Culvert (Passes 35.7 cfs of 55.2 cfs potential flow)

1=Culvert (Barrel Controls 5.6 cfs @ 7.10 fps)

3=Culvert (Barrel Controls 30.2 cfs @ 9.60 fps)

2=Orifice/Grate (Passes 30.2 cfs of 43.0 cfs potential flow)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.1 ac, 47.58% Impervious, Inflow Depth > 4.83" for 100-Year event  
Inflow = 116.1 cfs @ 12.07 hrs, Volume= 33.9 af  
Primary = 116.1 cfs @ 12.07 hrs, Volume= 33.9 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP2: Overland Flow to Boston Post Road**

Inflow Area = 0.9 ac, 4.56% Impervious, Inflow Depth = 4.15" for 100-Year event  
Inflow = 4.6 cfs @ 12.08 hrs, Volume= 0.3 af  
Primary = 4.6 cfs @ 12.08 hrs, Volume= 0.3 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP3: Wetland at Northeast Corner**

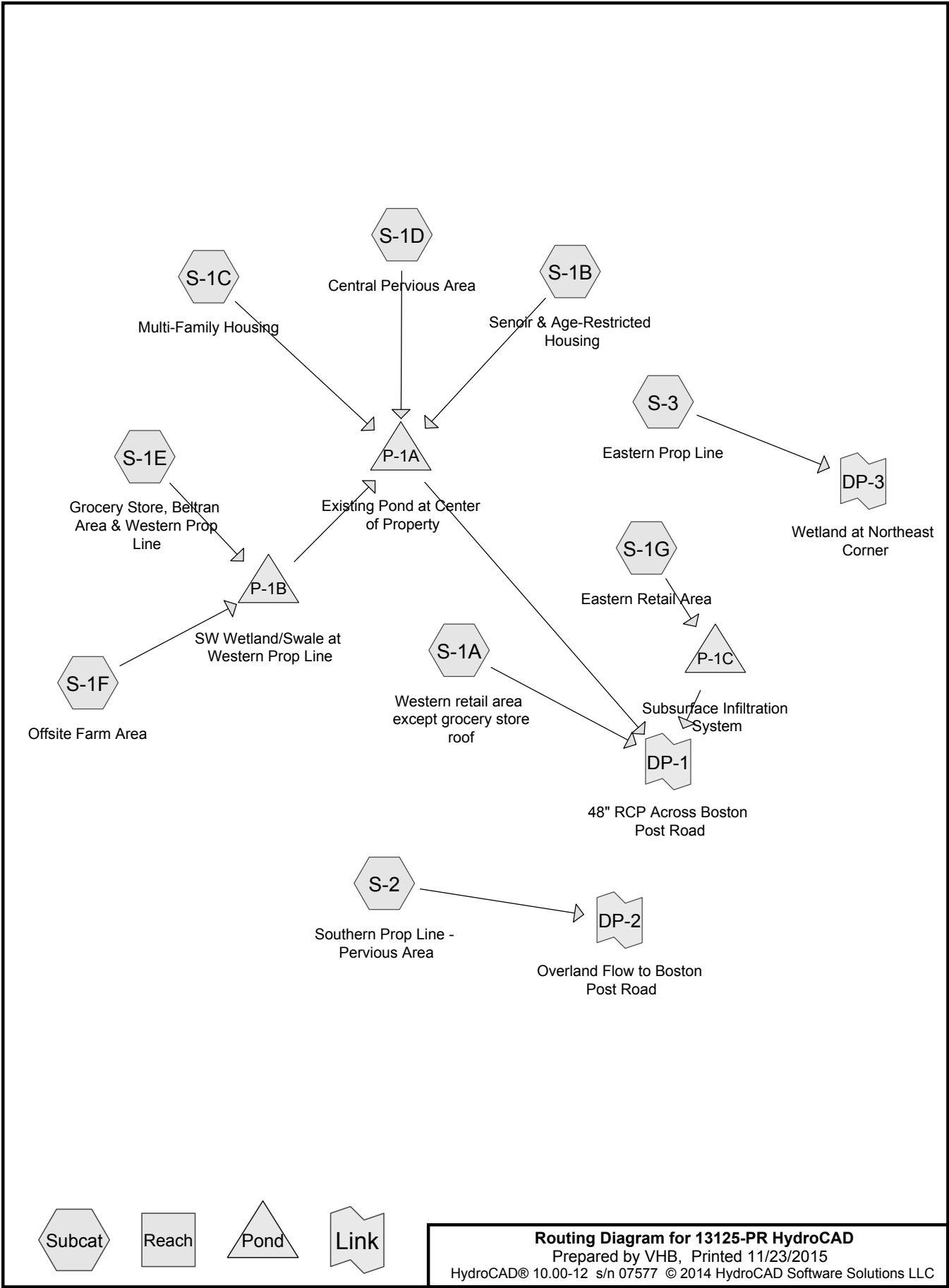
Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 3.91" for 100-Year event  
Inflow = 3.1 cfs @ 12.08 hrs, Volume= 0.2 af  
Primary = 3.1 cfs @ 12.08 hrs, Volume= 0.2 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



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## HydroCAD Analysis: Proposed Conditions



**Routing Diagram for 13125-PR HydroCAD**

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## 1-inch Storm Event – Proposed

**13125-PR HydroCAD**

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Type III 24-hr 1-Inch Rainfall=1.00"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**SubcatchmentS-1A: Western retail area** Runoff Area=323,637 sf 71.20% Impervious Runoff Depth=0.22"  
 Tc=5.0 min CN=87 Runoff=1.7 cfs 0.1 af

**SubcatchmentS-1B: Senoir &** Runoff Area=409,397 sf 60.08% Impervious Runoff Depth=0.13"  
 Flow Length=375' Tc=5.0 min CN=83 Runoff=0.9 cfs 0.1 af

**SubcatchmentS-1C: Multi-Family** Runoff Area=810,445 sf 58.16% Impervious Runoff Depth=0.08"  
 Flow Length=1,845' Tc=12.2 min CN=80 Runoff=0.6 cfs 0.1 af

**SubcatchmentS-1D: Central Pervious** Runoff Area=362,515 sf 16.84% Impervious Runoff Depth=0.00"  
 Tc=5.0 min CN=67 Runoff=0.0 cfs 0.0 af

**SubcatchmentS-1E: Grocery Store,** Runoff Area=210,610 sf 48.42% Impervious Runoff Depth=0.02"  
 Flow Length=533' Tc=7.7 min CN=73 Runoff=0.0 cfs 0.0 af

**SubcatchmentS-1F: Offsite Farm Area** Runoff Area=1,470,921 sf 29.23% Impervious Runoff Depth=0.00"  
 Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51 Runoff=0.0 cfs 0.0 af

**SubcatchmentS-1G: Eastern Retail Area** Runoff Area=109,664 sf 90.46% Impervious Runoff Depth=0.50"  
 Tc=5.0 min CN=94 Runoff=1.5 cfs 0.1 af

**SubcatchmentS-2: Southern Prop Line -** Runoff Area=5,752 sf 0.00% Impervious Runoff Depth=0.00"  
 Tc=5.0 min CN=61 Runoff=0.0 cfs 0.0 af

**SubcatchmentS-3: Eastern Prop Line** Runoff Area=28,587 sf 0.00% Impervious Runoff Depth=0.00"  
 Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61 Runoff=0.0 cfs 0.0 af

**Pond P-1A: Existing Pond at Center of** Peak Elev=144.86' Storage=40,621 cf Inflow=1.2 cfs 0.2 af  
 Outflow=0.1 cfs 0.1 af

**Pond P-1B: SW Wetland/Swale at Western Prop** Peak Elev=151.00' Storage=0 cf Inflow=0.0 cfs 0.0 af  
 24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/' Outflow=0.0 cfs 0.0 af

**Pond P-1C: Subsurface Infiltration System** Peak Elev=145.92' Storage=0.0 af Inflow=1.5 cfs 0.1 af  
 Discarded=0.1 cfs 0.1 af Primary=0.0 cfs 0.0 af Outflow=0.1 cfs 0.1 af

**Link DP-1: 48" RCP Across Boston Post Road** Inflow=1.7 cfs 0.3 af  
 Primary=1.7 cfs 0.3 af

**Link DP-2: Overland Flow to Boston Post Road** Inflow=0.0 cfs 0.0 af  
 Primary=0.0 cfs 0.0 af

**Link DP-3: Wetland at Northeast Corner** Inflow=0.0 cfs 0.0 af  
 Primary=0.0 cfs 0.0 af

**Total Runoff Area = 85.7 ac Runoff Volume = 0.5 af Average Runoff Depth = 0.07"**  
**56.05% Pervious = 48.0 ac 43.95% Impervious = 37.6 ac**

**Summary for Subcatchment S-1A: Western retail area except grocery store roof**

Runoff = 1.7 cfs @ 12.09 hrs, Volume= 0.1 af, Depth= 0.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 93,216	61	>75% Grass cover, Good, HSG B
* 216,535	98	Road & Sidewalk
* 13,886	98	Roofs
323,637	87	Weighted Average
93,216		28.80% Pervious Area
230,421		71.20% Impervious Area

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

**Summary for Subcatchment S-1B: Senoir & Age-Restricted Housing**

Runoff = 0.9 cfs @ 12.11 hrs, Volume= 0.1 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 98,868	98	Roofs
* 147,114	98	Road & Sidewalk
* 163,415	61	>75% Grass cover, Good, HSG B
409,397	83	Weighted Average
163,415		39.92% Pervious Area
245,982		60.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.3	375	Total, Increased to minimum Tc = 5.0 min			



**Summary for Subcatchment S-1C: Multi-Family Housing**

Runoff = 0.6 cfs @ 12.42 hrs, Volume= 0.1 af, Depth= 0.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 175,858	98	Roofs
* 295,473	98	Road & Sidewalk
* 232,176	61	>75% Grass cover, Good, HSG B
106,938	39	>75% Grass cover, Good, HSG A
810,445	80	Weighted Average
339,114		41.84% Pervious Area
471,331		58.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S-1D: Central Pervious Area**

Runoff = 0.0 cfs @ 24.01 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 10,063	98	Road & Sidewalk
1,564	39	>75% Grass cover, Good, HSG A
* 299,894	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
362,515	67	Weighted Average
301,458		83.16% Pervious Area
61,057		16.84% Impervious Area

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

**Summary for Subcatchment S-1E: Grocery Store, Beltran Area & Western Prop Line**

Runoff = 0.0 cfs @ 15.15 hrs, Volume= 0.0 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 54,726	98	Roofs
* 55,331	61	>75% Grass cover, Good, HSG B
* 53,292	39	>75% Grass cover, Good, HSG A
* 47,261	98	Road & Sidewalk
210,610	73	Weighted Average
108,623		51.58% Pervious Area
101,987		48.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S-1F: Offsite Farm Area**

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

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Type III 24-hr 1-Inch Rainfall=1.00"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S-1G: Eastern Retail Area**

Runoff = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 75,018	98	Road & Sidewalk
* 24,187	98	Roof
10,459	61	>75% Grass cover, Good, HSG B
109,664	94	Weighted Average
10,459		9.54% Pervious Area
99,205		90.46% Impervious Area

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

**Summary for Subcatchment S-2: Southern Prop Line - Pervious Area**

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

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Type III 24-hr 1-Inch Rainfall=1.00"

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Area (sf)	CN	Description
* 5,752	61	>75% Grass cover, Good, HSG B
5,752		100.00% Pervious Area

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

**Summary for Subcatchment S-3: Eastern Prop Line**

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 1-Inch Rainfall=1.00"

Area (sf)	CN	Description
* 28,587	61	>75% Grass cover, Good, HSG B
28,587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1A: Existing Pond at Center of Property**

Inflow Area = 74.9 ac, 40.14% Impervious, Inflow Depth = 0.04" for 1-Inch event  
 Inflow = 1.2 cfs @ 12.34 hrs, Volume= 0.2 af  
 Outflow = 0.1 cfs @ 23.68 hrs, Volume= 0.1 af, Atten= 92%, Lag= 680.6 min  
 Primary = 0.1 cfs @ 23.68 hrs, Volume= 0.1 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 144.86' @ 23.68 hrs Surf.Area= 48,615 sf Storage= 40,621 cf (7,574 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)  
 Center-of-Mass det. time= 500.2 min ( 1,443.5 - 943.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

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Type III 24-hr 1-Inch Rainfall=1.00"

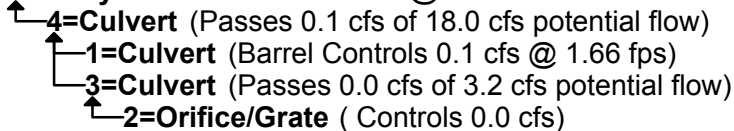
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Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

**Primary OutFlow** Max=0.1 cfs @ 23.68 hrs HW=144.86' (Free Discharge)



**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 38.6 ac, 31.63% Impervious, Inflow Depth = 0.00" for 1-Inch event  
 Inflow = 0.0 cfs @ 15.15 hrs, Volume= 0.0 af  
 Outflow = 0.0 cfs @ 15.15 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min  
 Primary = 0.0 cfs @ 15.15 hrs, Volume= 0.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 151.00' @ 15.15 hrs Surf.Area= 498 sf Storage= 0 cf

Plug-Flow detention time= 0.0 min calculated for 0.0 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 1,088.6 - 1,088.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

**13125-PR HydroCAD**

Prepared by VHB

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Type III 24-hr 1-Inch Rainfall=1.00"

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Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.00	498	198.0	0	0	498
152.00	1,368	715.0	897	897	38,063
153.00	8,822	6,900.0	4,555	5,452	3,786,066
154.00	25,925	1,559.0	16,623	22,075	7,381,341
155.00	50,627	1,626.0	37,594	59,669	7,398,397
156.00	83,648	1,717.0	66,450	126,119	7,422,663

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

**Primary OutFlow** Max=8.4 cfs @ 15.15 hrs HW=151.00' (Free Discharge)

↑**1=Culvert** (Inlet Controls 8.4 cfs @ 3.88 fps)

**Summary for Pond P-1C: Subsurface Infiltration System**

Inflow Area = 2.5 ac, 90.46% Impervious, Inflow Depth = 0.50" for 1-Inch event  
 Inflow = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af  
 Outflow = 0.1 cfs @ 12.07 hrs, Volume= 0.1 af, Atten= 94%, Lag= 0.0 min  
 Discarded = 0.1 cfs @ 12.07 hrs, Volume= 0.1 af  
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 145.92' @ 14.20 hrs Surf.Area= 0.1 ac Storage= 0.0 af

Plug-Flow detention time= 234.6 min calculated for 0.1 af (100% of inflow)  
 Center-of-Mass det. time= 234.5 min ( 1,066.4 - 831.9 )

Volume	Invert	Avail.Storage	Storage Description
#1A	145.00'	0.1 af	<b>30.00'W x 130.60'L x 3.50'H Field A</b> 0.3 af Overall - 0.1 af Embedded = 0.2 af x 40.0% Voids
#2A	145.50'	0.1 af	<b>ADS_StormTech SC-740</b> x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 6 rows
#3	145.50'	0.0 af	<b>4.00'D x 7.00'H Vertical Cone/Cylinder</b>
		0.2 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	<b>15.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 145.00' / 144.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	148.00'	<b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#3	Discarded	145.00'	<b>1.020 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 12.07 hrs HW=145.52' (Free Discharge)

↳3=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=145.00' (Free Discharge)

↳1=Culvert ( Controls 0.0 cfs)

↳2=Sharp-Crested Rectangular Weir( Controls 0.0 cfs)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.9 ac, 44.36% Impervious, Inflow Depth > 0.04" for 1-Inch event  
Inflow = 1.7 cfs @ 12.09 hrs, Volume= 0.3 af  
Primary = 1.7 cfs @ 12.09 hrs, Volume= 0.3 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-2: Overland Flow to Boston Post Road**

Inflow Area = 0.1 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Inch event  
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af  
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1-Inch event  
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af  
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



## 2-Year Storm Event – Proposed



Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

<b>SubcatchmentS-1A: Western retail area</b>	Runoff Area=323,637 sf 71.20% Impervious	Runoff Depth=1.91"
	Tc=5.0 min CN=87	Runoff=17.3 cfs 1.2 af
<b>SubcatchmentS-1B: Senoir &amp;</b>	Runoff Area=409,397 sf 60.08% Impervious	Runoff Depth=1.61"
	Flow Length=375' Tc=5.0 min CN=83	Runoff=18.4 cfs 1.3 af
<b>SubcatchmentS-1C: Multi-Family</b>	Runoff Area=810,445 sf 58.16% Impervious	Runoff Depth=1.40"
	Flow Length=1,845' Tc=12.2 min CN=80	Runoff=24.6 cfs 2.2 af
<b>SubcatchmentS-1D: Central Pervious</b>	Runoff Area=362,515 sf 16.84% Impervious	Runoff Depth=0.69"
	Tc=5.0 min CN=67	Runoff=5.8 cfs 0.5 af
<b>SubcatchmentS-1E: Grocery Store,</b>	Runoff Area=210,610 sf 48.42% Impervious	Runoff Depth=0.98"
	Flow Length=533' Tc=7.7 min CN=73	Runoff=4.9 cfs 0.4 af
<b>SubcatchmentS-1F: Offsite Farm Area</b>	Runoff Area=1,470,921 sf 29.23% Impervious	Runoff Depth=0.15"
	Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51	Runoff=1.0 cfs 0.4 af
<b>SubcatchmentS-1G: Eastern Retail Area</b>	Runoff Area=109,664 sf 90.46% Impervious	Runoff Depth=2.54"
	Tc=5.0 min CN=94	Runoff=7.5 cfs 0.5 af
<b>SubcatchmentS-2: Southern Prop Line -</b>	Runoff Area=5,752 sf 0.00% Impervious	Runoff Depth=0.44"
	Tc=5.0 min CN=61	Runoff=0.0 cfs 0.0 af
<b>SubcatchmentS-3: Eastern Prop Line</b>	Runoff Area=28,587 sf 0.00% Impervious	Runoff Depth=0.44"
	Flow Length=20' Slope=0.0810 '/' Tc=5.0 min CN=61	Runoff=0.2 cfs 0.0 af
<b>Pond P-1A: Existing Pond at Center of</b>	Peak Elev=146.84' Storage=143,151 cf	Inflow=48.4 cfs 4.7 af
		Outflow=3.5 cfs 4.4 af
<b>Pond P-1B: SW Wetland/Swale at Western Prop</b>	Peak Elev=151.03' Storage=14 cf	Inflow=4.9 cfs 0.8 af
	24.0" Round Culvert n=0.011 L=300.0' S=0.0093 '/'	Outflow=4.9 cfs 0.8 af
<b>Pond P-1C: Subsurface Infiltration System</b>	Peak Elev=148.56' Storage=0.2 af	Inflow=7.5 cfs 0.5 af
	Discarded=0.1 cfs 0.2 af Primary=5.3 cfs 0.2 af	Outflow=5.4 cfs 0.5 af
<b>Link DP-1: 48" RCP Across Boston Post Road</b>		Inflow=20.5 cfs 5.8 af
		Primary=20.5 cfs 5.8 af
<b>Link DP-2: Overland Flow to Boston Post Road</b>		Inflow=0.0 cfs 0.0 af
		Primary=0.0 cfs 0.0 af
<b>Link DP-3: Wetland at Northeast Corner</b>		Inflow=0.2 cfs 0.0 af
		Primary=0.2 cfs 0.0 af

**Total Runoff Area = 85.7 ac Runoff Volume = 6.5 af Average Runoff Depth = 0.91"**  
**56.05% Pervious = 48.0 ac 43.95% Impervious = 37.6 ac**

**Summary for Subcatchment S-1A: Western retail area except grocery store roof**

Runoff = 17.3 cfs @ 12.07 hrs, Volume= 1.2 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 93,216	61	>75% Grass cover, Good, HSG B
* 216,535	98	Road & Sidewalk
* 13,886	98	Roofs
323,637	87	Weighted Average
93,216		28.80% Pervious Area
230,421		71.20% Impervious Area

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

**Summary for Subcatchment S-1B: Senoir & Age-Restricted Housing**

Runoff = 18.4 cfs @ 12.08 hrs, Volume= 1.3 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 98,868	98	Roofs
* 147,114	98	Road & Sidewalk
* 163,415	61	>75% Grass cover, Good, HSG B
409,397	83	Weighted Average
163,415		39.92% Pervious Area
245,982		60.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.3	375	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S-1C: Multi-Family Housing**

Runoff = 24.6 cfs @ 12.17 hrs, Volume= 2.2 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 175,858	98	Roofs
* 295,473	98	Road & Sidewalk
* 232,176	61	>75% Grass cover, Good, HSG B
106,938	39	>75% Grass cover, Good, HSG A
810,445	80	Weighted Average
339,114		41.84% Pervious Area
471,331		58.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S-1D: Central Pervious Area**

Runoff = 5.8 cfs @ 12.09 hrs, Volume= 0.5 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 10,063	98	Road & Sidewalk
1,564	39	>75% Grass cover, Good, HSG A
* 299,894	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
362,515	67	Weighted Average
301,458		83.16% Pervious Area
61,057		16.84% Impervious Area

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

**Summary for Subcatchment S-1E: Grocery Store, Beltran Area & Western Prop Line**

Runoff = 4.9 cfs @ 12.12 hrs, Volume= 0.4 af, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 54,726	98	Roofs
* 55,331	61	>75% Grass cover, Good, HSG B
* 53,292	39	>75% Grass cover, Good, HSG A
* 47,261	98	Road & Sidewalk
210,610	73	Weighted Average
108,623		51.58% Pervious Area
101,987		48.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S-1F: Offsite Farm Area**

Runoff = 1.0 cfs @ 12.60 hrs, Volume= 0.4 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S-1G: Eastern Retail Area**

Runoff = 7.5 cfs @ 12.07 hrs, Volume= 0.5 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 75,018	98	Road & Sidewalk
* 24,187	98	Roof
10,459	61	>75% Grass cover, Good, HSG B
109,664	94	Weighted Average
10,459		9.54% Pervious Area
99,205		90.46% Impervious Area

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

**Summary for Subcatchment S-2: Southern Prop Line - Pervious Area**

Runoff = 0.0 cfs @ 12.11 hrs, Volume= 0.0 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

**13125-PR HydroCAD**

Prepared by VHB

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Type III 24-hr 2-Year Rainfall=3.20"

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Area (sf)	CN	Description
* 5,752	61	>75% Grass cover, Good, HSG B
5,752		100.00% Pervious Area

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

**Summary for Subcatchment S-3: Eastern Prop Line**

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 0.0 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
* 28,587	61	>75% Grass cover, Good, HSG B
28,587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1A: Existing Pond at Center of Property**

Inflow Area = 74.9 ac, 40.14% Impervious, Inflow Depth = 0.76" for 2-Year event  
 Inflow = 48.4 cfs @ 12.11 hrs, Volume= 4.7 af  
 Outflow = 3.5 cfs @ 15.58 hrs, Volume= 4.4 af, Atten= 93%, Lag= 207.9 min  
 Primary = 3.5 cfs @ 15.58 hrs, Volume= 4.4 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 146.84' @ 15.58 hrs Surf.Area= 55,459 sf Storage= 143,151 cf (110,104 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

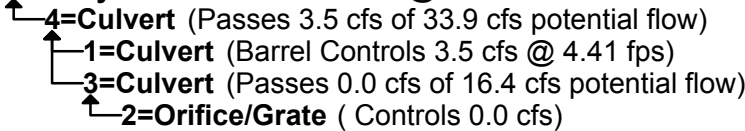
Plug-Flow detention time= 543.3 min calculated for 3.7 af (77% of inflow)  
 Center-of-Mass det. time= 365.7 min ( 1,229.3 - 863.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=3.5 cfs @ 15.58 hrs HW=146.84' (Free Discharge)



**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 38.6 ac, 31.63% Impervious, Inflow Depth = 0.25" for 2-Year event  
 Inflow = 4.9 cfs @ 12.12 hrs, Volume= 0.8 af  
 Outflow = 4.9 cfs @ 12.12 hrs, Volume= 0.8 af, Atten= 0%, Lag= 0.0 min  
 Primary = 4.9 cfs @ 12.12 hrs, Volume= 0.8 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 151.03' @ 12.12 hrs Surf.Area= 516 sf Storage= 14 cf

Plug-Flow detention time= 0.0 min calculated for 0.8 af (100% of inflow)  
 Center-of-Mass det. time= 0.0 min ( 939.2 - 939.2 )

Volume	Invert	Avail.Storage	Storage Description
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.00	498	198.0	0	0	498
152.00	1,368	715.0	897	897	38,063
153.00	8,822	6,900.0	4,555	5,452	3,786,066
154.00	25,925	1,559.0	16,623	22,075	7,381,341
155.00	50,627	1,626.0	37,594	59,669	7,398,397
156.00	83,648	1,717.0	66,450	126,119	7,422,663

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=8.7 cfs @ 12.12 hrs HW=151.03' (Free Discharge)

↑1=Culvert (Inlet Controls 8.7 cfs @ 3.92 fps)

### Summary for Pond P-1C: Subsurface Infiltration System

Inflow Area = 2.5 ac, 90.46% Impervious, Inflow Depth = 2.54" for 2-Year event  
 Inflow = 7.5 cfs @ 12.07 hrs, Volume= 0.5 af  
 Outflow = 5.4 cfs @ 12.14 hrs, Volume= 0.5 af, Atten= 28%, Lag= 4.3 min  
 Discarded = 0.1 cfs @ 10.17 hrs, Volume= 0.2 af  
 Primary = 5.3 cfs @ 12.14 hrs, Volume= 0.2 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
 Peak Elev= 148.56' @ 12.14 hrs Surf.Area= 0.1 ac Storage= 0.2 af

Plug-Flow detention time= 317.3 min calculated for 0.5 af (84% of inflow)  
 Center-of-Mass det. time= 252.6 min ( 1,038.8 - 786.2 )

Volume	Invert	Avail.Storage	Storage Description
#1A	145.00'	0.1 af	<b>30.00'W x 130.60'L x 3.50'H Field A</b> 0.3 af Overall - 0.1 af Embedded = 0.2 af x 40.0% Voids
#2A	145.50'	0.1 af	<b>ADS_StormTech SC-740</b> x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 6 rows
#3	145.50'	0.0 af	<b>4.00'D x 7.00'H Vertical Cone/Cylinder</b>
		0.2 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	<b>15.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 145.00' / 144.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	148.00'	<b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#3	Discarded	145.00'	<b>1.020 in/hr Exfiltration over Surface area</b>



Discarded OutFlow Max=0.1 cfs @ 10.17 hrs HW=145.50' (Free Discharge)

↳3=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=5.2 cfs @ 12.14 hrs HW=148.55' (Free Discharge)

↳1=Culvert (Passes 5.2 cfs of 10.1 cfs potential flow)

↳2=Sharp-Crested Rectangular Weir (Weir Controls 5.2 cfs @ 2.42 fps)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.9 ac, 44.36% Impervious, Inflow Depth > 0.82" for 2-Year event  
Inflow = 20.5 cfs @ 12.12 hrs, Volume= 5.8 af  
Primary = 20.5 cfs @ 12.12 hrs, Volume= 5.8 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-2: Overland Flow to Boston Post Road**

Inflow Area = 0.1 ac, 0.00% Impervious, Inflow Depth = 0.44" for 2-Year event  
Inflow = 0.0 cfs @ 12.11 hrs, Volume= 0.0 af  
Primary = 0.0 cfs @ 12.11 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 0.44" for 2-Year event  
Inflow = 0.2 cfs @ 12.11 hrs, Volume= 0.0 af  
Primary = 0.2 cfs @ 12.11 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



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## 10-Year Storm Event- Proposed

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**SubcatchmentS-1A: Western retail area** Runoff Area=323,637 sf 71.20% Impervious Runoff Depth=3.38"  
 Tc=5.0 min CN=87 Runoff=30.0 cfs 2.1 af

**SubcatchmentS-1B: Senoir &** Runoff Area=409,397 sf 60.08% Impervious Runoff Depth=2.99"  
 Flow Length=375' Tc=5.0 min CN=83 Runoff=34.1 cfs 2.3 af

**SubcatchmentS-1C: Multi-Family** Runoff Area=810,445 sf 58.16% Impervious Runoff Depth=2.72"  
 Flow Length=1,845' Tc=12.2 min CN=80 Runoff=48.5 cfs 4.2 af

**SubcatchmentS-1D: Central Pervious** Runoff Area=362,515 sf 16.84% Impervious Runoff Depth=1.67"  
 Tc=5.0 min CN=67 Runoff=16.2 cfs 1.2 af

**SubcatchmentS-1E: Grocery Store,** Runoff Area=210,610 sf 48.42% Impervious Runoff Depth=2.12"  
 Flow Length=533' Tc=7.7 min CN=73 Runoff=11.2 cfs 0.9 af

**SubcatchmentS-1F: Offsite Farm Area** Runoff Area=1,470,921 sf 29.23% Impervious Runoff Depth=0.66"  
 Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51 Runoff=12.1 cfs 1.9 af

**SubcatchmentS-1G: Eastern Retail Area** Runoff Area=109,664 sf 90.46% Impervious Runoff Depth=4.11"  
 Tc=5.0 min CN=94 Runoff=11.7 cfs 0.9 af

**SubcatchmentS-2: Southern Prop Line -** Runoff Area=5,752 sf 0.00% Impervious Runoff Depth=1.25"  
 Tc=5.0 min CN=61 Runoff=0.2 cfs 0.0 af

**SubcatchmentS-3: Eastern Prop Line** Runoff Area=28,587 sf 0.00% Impervious Runoff Depth=1.25"  
 Flow Length=20' Slope=0.0810 1/1' Tc=5.0 min CN=61 Runoff=0.9 cfs 0.1 af

**Pond P-1A: Existing Pond at Center of** Peak Elev=148.37' Storage=233,098 cf Inflow=101.6 cfs 10.4 af  
 Outflow=19.8 cfs 10.0 af

**Pond P-1B: SW Wetland/Swale at Western Prop** Peak Elev=152.05' Storage=977 cf Inflow=17.9 cfs 2.7 af  
 24.0" Round Culvert n=0.011 L=300.0' S=0.0093 1/1' Outflow=17.6 cfs 2.7 af

**Pond P-1C: Subsurface Infiltration System** Peak Elev=149.48' Storage=0.2 af Inflow=11.7 cfs 0.9 af  
 Discarded=0.1 cfs 0.2 af Primary=11.6 cfs 0.5 af Outflow=11.7 cfs 0.8 af

**Link DP-1: 48" RCP Across Boston Post Road** Inflow=44.8 cfs 12.6 af  
 Primary=44.8 cfs 12.6 af

**Link DP-2: Overland Flow to Boston Post Road** Inflow=0.2 cfs 0.0 af  
 Primary=0.2 cfs 0.0 af

**Link DP-3: Wetland at Northeast Corner** Inflow=0.9 cfs 0.1 af  
 Primary=0.9 cfs 0.1 af

**Total Runoff Area = 85.7 ac Runoff Volume = 13.5 af Average Runoff Depth = 1.89"**  
**56.05% Pervious = 48.0 ac 43.95% Impervious = 37.6 ac**

**Summary for Subcatchment S-1A: Western retail area except grocery store roof**

Runoff = 30.0 cfs @ 12.07 hrs, Volume= 2.1 af, Depth= 3.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 93,216	61	>75% Grass cover, Good, HSG B
* 216,535	98	Road & Sidewalk
* 13,886	98	Roofs
323,637	87	Weighted Average
93,216		28.80% Pervious Area
230,421		71.20% Impervious Area

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

**Summary for Subcatchment S-1B: Senoir & Age-Restricted Housing**

Runoff = 34.1 cfs @ 12.07 hrs, Volume= 2.3 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 98,868	98	Roofs
* 147,114	98	Road & Sidewalk
* 163,415	61	>75% Grass cover, Good, HSG B
409,397	83	Weighted Average
163,415		39.92% Pervious Area
245,982		60.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.3	375	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S-1C: Multi-Family Housing**

Runoff = 48.5 cfs @ 12.17 hrs, Volume= 4.2 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 175,858	98	Roofs
* 295,473	98	Road & Sidewalk
* 232,176	61	>75% Grass cover, Good, HSG B
106,938	39	>75% Grass cover, Good, HSG A
810,445	80	Weighted Average
339,114		41.84% Pervious Area
471,331		58.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S-1D: Central Pervious Area**

Runoff = 16.2 cfs @ 12.08 hrs, Volume= 1.2 af, Depth= 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 10,063	98	Road & Sidewalk
1,564	39	>75% Grass cover, Good, HSG A
* 299,894	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
362,515	67	Weighted Average
301,458		83.16% Pervious Area
61,057		16.84% Impervious Area

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

**Summary for Subcatchment S-1E: Grocery Store, Beltran Area & Western Prop Line**

Runoff = 11.2 cfs @ 12.11 hrs, Volume= 0.9 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 54,726	98	Roofs
* 55,331	61	>75% Grass cover, Good, HSG B
* 53,292	39	>75% Grass cover, Good, HSG A
* 47,261	98	Road & Sidewalk
210,610	73	Weighted Average
108,623		51.58% Pervious Area
101,987		48.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S-1F: Offsite Farm Area**

Runoff = 12.1 cfs @ 12.34 hrs, Volume= 1.9 af, Depth= 0.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

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Type III 24-hr 10-Year Rainfall=4.80"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S-1G: Eastern Retail Area**

Runoff = 11.7 cfs @ 12.07 hrs, Volume= 0.9 af, Depth= 4.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 75,018	98	Road & Sidewalk
* 24,187	98	Roof
10,459	61	>75% Grass cover, Good, HSG B
109,664	94	Weighted Average
10,459		9.54% Pervious Area
99,205		90.46% Impervious Area

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

**Summary for Subcatchment S-2: Southern Prop Line - Pervious Area**

Runoff = 0.2 cfs @ 12.09 hrs, Volume= 0.0 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

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Type III 24-hr 10-Year Rainfall=4.80"

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Area (sf)	CN	Description
* 5,752	61	>75% Grass cover, Good, HSG B
5,752		100.00% Pervious Area

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

**Summary for Subcatchment S-3: Eastern Prop Line**

Runoff = 0.9 cfs @ 12.09 hrs, Volume= 0.1 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
* 28,587	61	>75% Grass cover, Good, HSG B
28,587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1A: Existing Pond at Center of Property**

Inflow Area = 74.9 ac, 40.14% Impervious, Inflow Depth = 1.67" for 10-Year event  
 Inflow = 101.6 cfs @ 12.11 hrs, Volume= 10.4 af  
 Outflow = 19.8 cfs @ 12.86 hrs, Volume= 10.0 af, Atten= 81%, Lag= 44.8 min  
 Primary = 19.8 cfs @ 12.86 hrs, Volume= 10.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 148.37' @ 12.86 hrs Surf.Area= 63,202 sf Storage= 233,098 cf (200,052 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= 361.7 min calculated for 9.2 af (88% of inflow)  
 Center-of-Mass det. time= 275.0 min ( 1,122.4 - 847.4 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)



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Type III 24-hr 10-Year Rainfall=4.80"

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Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

**Primary OutFlow** Max=19.8 cfs @ 12.86 hrs HW=148.37' (Free Discharge)

- ↑ **4=Culvert** (Passes 19.8 cfs of 41.8 cfs potential flow)
- ↑ **1=Culvert** (Barrel Controls 4.2 cfs @ 5.40 fps)
- ↑ **3=Culvert** (Passes 15.5 cfs of 21.7 cfs potential flow)
- ↑ **2=Orifice/Grate** (Orifice Controls 15.5 cfs @ 3.76 fps)

**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 38.6 ac, 31.63% Impervious, Inflow Depth = 0.85" for 10-Year event  
 Inflow = 17.9 cfs @ 12.28 hrs, Volume= 2.7 af  
 Outflow = 17.6 cfs @ 12.33 hrs, Volume= 2.7 af, Atten= 2%, Lag= 2.9 min  
 Primary = 17.6 cfs @ 12.33 hrs, Volume= 2.7 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 152.05' @ 12.33 hrs Surf.Area= 1,605 sf Storage= 977 cf

Plug-Flow detention time= 0.2 min calculated for 2.7 af (100% of inflow)  
 Center-of-Mass det. time= 0.2 min ( 899.8 - 899.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.00	498	198.0	0	0	498
152.00	1,368	715.0	897	897	38,063
153.00	8,822	6,900.0	4,555	5,452	3,786,066
154.00	25,925	1,559.0	16,623	22,075	7,381,341
155.00	50,627	1,626.0	37,594	59,669	7,398,397
156.00	83,648	1,717.0	66,450	126,119	7,422,663

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=17.6 cfs @ 12.33 hrs HW=152.05' (Free Discharge)

↑1=Culvert (Inlet Controls 17.6 cfs @ 5.60 fps)

### Summary for Pond P-1C: Subsurface Infiltration System

Inflow Area =	2.5 ac, 90.46% Impervious, Inflow Depth = 4.11" for 10-Year event
Inflow =	11.7 cfs @ 12.07 hrs, Volume= 0.9 af
Outflow =	11.7 cfs @ 12.07 hrs, Volume= 0.8 af, Atten= 0%, Lag= 0.2 min
Discarded =	0.1 cfs @ 8.70 hrs, Volume= 0.2 af
Primary =	11.6 cfs @ 12.07 hrs, Volume= 0.5 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Peak Elev= 149.48' @ 12.07 hrs Surf.Area= 0.1 ac Storage= 0.2 af

Plug-Flow detention time= 204.6 min calculated for 0.8 af (90% of inflow)  
Center-of-Mass det. time= 156.1 min ( 929.8 - 773.7 )

Volume	Invert	Avail.Storage	Storage Description
#1A	145.00'	0.1 af	<b>30.00'W x 130.60'L x 3.50'H Field A</b> 0.3 af Overall - 0.1 af Embedded = 0.2 af x 40.0% Voids
#2A	145.50'	0.1 af	<b>ADS_StormTech SC-740</b> x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 6 rows
#3	145.50'	0.0 af	<b>4.00'D x 7.00'H Vertical Cone/Cylinder</b>
		0.2 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	<b>15.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 145.00' / 144.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	148.00'	<b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#3	Discarded	145.00'	<b>1.020 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 8.70 hrs HW=145.50' (Free Discharge)

↳3=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=11.6 cfs @ 12.07 hrs HW=149.47' (Free Discharge)

↳1=Culvert (Inlet Controls 11.6 cfs @ 9.44 fps)

↳2=Sharp-Crested Rectangular Weir (Passes 11.6 cfs of 21.7 cfs potential flow)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.9 ac, 44.36% Impervious, Inflow Depth > 1.79" for 10-Year event  
Inflow = 44.8 cfs @ 12.07 hrs, Volume= 12.6 af  
Primary = 44.8 cfs @ 12.07 hrs, Volume= 12.6 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-2: Overland Flow to Boston Post Road**

Inflow Area = 0.1 ac, 0.00% Impervious, Inflow Depth = 1.25" for 10-Year event  
Inflow = 0.2 cfs @ 12.09 hrs, Volume= 0.0 af  
Primary = 0.2 cfs @ 12.09 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 1.25" for 10-Year event  
Inflow = 0.9 cfs @ 12.09 hrs, Volume= 0.1 af  
Primary = 0.9 cfs @ 12.09 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



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## 25-Year Storm Event- Proposed

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Type III 24-hr 25-Year Rainfall=6.00"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**SubcatchmentS-1A: Western retail area** Runoff Area=323,637 sf 71.20% Impervious Runoff Depth=4.52"  
 Tc=5.0 min CN=87 Runoff=39.6 cfs 2.8 af

**SubcatchmentS-1B: Senoir &** Runoff Area=409,397 sf 60.08% Impervious Runoff Depth=4.09"  
 Flow Length=375' Tc=5.0 min CN=83 Runoff=46.2 cfs 3.2 af

**SubcatchmentS-1C: Multi-Family** Runoff Area=810,445 sf 58.16% Impervious Runoff Depth=3.78"  
 Flow Length=1,845' Tc=12.2 min CN=80 Runoff=67.2 cfs 5.9 af

**SubcatchmentS-1D: Central Pervious** Runoff Area=362,515 sf 16.84% Impervious Runoff Depth=2.53"  
 Tc=5.0 min CN=67 Runoff=25.2 cfs 1.8 af

**SubcatchmentS-1E: Grocery Store,** Runoff Area=210,610 sf 48.42% Impervious Runoff Depth=3.09"  
 Flow Length=533' Tc=7.7 min CN=73 Runoff=16.5 cfs 1.2 af

**SubcatchmentS-1F: Offsite Farm Area** Runoff Area=1,470,921 sf 29.23% Impervious Runoff Depth=1.22"  
 Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51 Runoff=27.8 cfs 3.4 af

**SubcatchmentS-1G: Eastern Retail Area** Runoff Area=109,664 sf 90.46% Impervious Runoff Depth=5.30"  
 Tc=5.0 min CN=94 Runoff=14.9 cfs 1.1 af

**SubcatchmentS-2: Southern Prop Line -** Runoff Area=5,752 sf 0.00% Impervious Runoff Depth=2.01"  
 Tc=5.0 min CN=61 Runoff=0.3 cfs 0.0 af

**SubcatchmentS-3: Eastern Prop Line** Runoff Area=28,587 sf 0.00% Impervious Runoff Depth=2.01"  
 Flow Length=20' Slope=0.0810 1' Tc=5.0 min CN=61 Runoff=1.5 cfs 0.1 af

**Pond P-1A: Existing Pond at Center of** Peak Elev=149.69' Storage=324,395 cf Inflow=144.5 cfs 15.5 af  
 Outflow=30.2 cfs 15.0 af

**Pond P-1B: SW Wetland/Swale at Western** Peak Elev=153.67' Storage=14,652 cf Inflow=37.2 cfs 4.7 af  
 24.0" Round Culvert n=0.011 L=300.0' S=0.0093 1' Outflow=26.1 cfs 4.7 af

**Pond P-1C: Subsurface Infiltration System** Peak Elev=151.88' Storage=0.2 af Inflow=14.9 cfs 1.1 af  
 Discarded=0.1 cfs 0.2 af Primary=14.8 cfs 0.8 af Outflow=14.9 cfs 1.0 af

**Link DP-1: 48" RCP Across Boston Post Road** Inflow=59.0 cfs 18.6 af  
 Primary=59.0 cfs 18.6 af

**Link DP-2: Overland Flow to Boston Post Road** Inflow=0.3 cfs 0.0 af  
 Primary=0.3 cfs 0.0 af

**Link DP-3: Wetland at Northeast Corner** Inflow=1.5 cfs 0.1 af  
 Primary=1.5 cfs 0.1 af

**Total Runoff Area = 85.7 ac Runoff Volume = 19.5 af Average Runoff Depth = 2.74"**  
**56.05% Pervious = 48.0 ac 43.95% Impervious = 37.6 ac**

**Summary for Subcatchment S-1A: Western retail area except grocery store roof**

Runoff = 39.6 cfs @ 12.07 hrs, Volume= 2.8 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 93,216	61	>75% Grass cover, Good, HSG B
* 216,535	98	Road & Sidewalk
* 13,886	98	Roofs
323,637	87	Weighted Average
93,216		28.80% Pervious Area
230,421		71.20% Impervious Area

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

**Summary for Subcatchment S-1B: Senoir & Age-Restricted Housing**

Runoff = 46.2 cfs @ 12.07 hrs, Volume= 3.2 af, Depth= 4.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 98,868	98	Roofs
* 147,114	98	Road & Sidewalk
* 163,415	61	>75% Grass cover, Good, HSG B
409,397	83	Weighted Average
163,415		39.92% Pervious Area
245,982		60.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.3	375	Total, Increased to minimum Tc = 5.0 min			

**Summary for Subcatchment S-1C: Multi-Family Housing**

Runoff = 67.2 cfs @ 12.16 hrs, Volume= 5.9 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 175,858	98	Roofs
* 295,473	98	Road & Sidewalk
* 232,176	61	>75% Grass cover, Good, HSG B
106,938	39	>75% Grass cover, Good, HSG A
810,445	80	Weighted Average
339,114		41.84% Pervious Area
471,331		58.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S-1D: Central Pervious Area**

Runoff = 25.2 cfs @ 12.08 hrs, Volume= 1.8 af, Depth= 2.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 10,063	98	Road & Sidewalk
1,564	39	>75% Grass cover, Good, HSG A
* 299,894	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
362,515	67	Weighted Average
301,458		83.16% Pervious Area
61,057		16.84% Impervious Area

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

**Summary for Subcatchment S-1E: Grocery Store, Beltran Area & Western Prop Line**

Runoff = 16.5 cfs @ 12.11 hrs, Volume= 1.2 af, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 54,726	98	Roofs
* 55,331	61	>75% Grass cover, Good, HSG B
* 53,292	39	>75% Grass cover, Good, HSG A
* 47,261	98	Road & Sidewalk
210,610	73	Weighted Average
108,623		51.58% Pervious Area
101,987		48.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S-1F: Offsite Farm Area**

Runoff = 27.8 cfs @ 12.28 hrs, Volume= 3.4 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected



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Type III 24-hr 25-Year Rainfall=6.00"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S-1G: Eastern Retail Area**

Runoff = 14.9 cfs @ 12.07 hrs, Volume= 1.1 af, Depth= 5.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 75,018	98	Road & Sidewalk
* 24,187	98	Roof
10,459	61	>75% Grass cover, Good, HSG B
109,664	94	Weighted Average
10,459		9.54% Pervious Area
99,205		90.46% Impervious Area

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

**Summary for Subcatchment S-2: Southern Prop Line - Pervious Area**

Runoff = 0.3 cfs @ 12.08 hrs, Volume= 0.0 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

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Type III 24-hr 25-Year Rainfall=6.00"

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Area (sf)	CN	Description
* 5,752	61	>75% Grass cover, Good, HSG B
5,752		100.00% Pervious Area

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

**Summary for Subcatchment S-3: Eastern Prop Line**

Runoff = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
* 28,587	61	>75% Grass cover, Good, HSG B
28,587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1A: Existing Pond at Center of Property**

Inflow Area = 74.9 ac, 40.14% Impervious, Inflow Depth = 2.48" for 25-Year event  
 Inflow = 144.5 cfs @ 12.11 hrs, Volume= 15.5 af  
 Outflow = 30.2 cfs @ 12.98 hrs, Volume= 15.0 af, Atten= 79%, Lag= 52.1 min  
 Primary = 30.2 cfs @ 12.98 hrs, Volume= 15.0 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 149.69' @ 12.98 hrs Surf.Area= 76,880 sf Storage= 324,395 cf (291,348 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

Plug-Flow detention time= 281.2 min calculated for 14.2 af (92% of inflow)  
 Center-of-Mass det. time= 221.6 min ( 1,060.9 - 839.3 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

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Type III 24-hr 25-Year Rainfall=6.00"

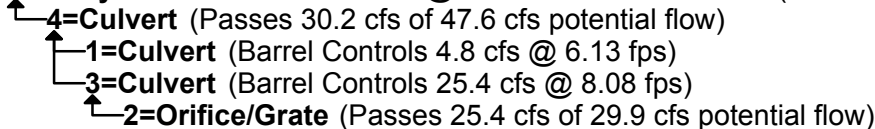
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Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

**Primary OutFlow** Max=30.2 cfs @ 12.98 hrs HW=149.69' (Free Discharge)



**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 38.6 ac, 31.63% Impervious, Inflow Depth = 1.45" for 25-Year event  
 Inflow = 37.2 cfs @ 12.24 hrs, Volume= 4.7 af  
 Outflow = 26.1 cfs @ 12.50 hrs, Volume= 4.7 af, Atten= 30%, Lag= 15.3 min  
 Primary = 26.1 cfs @ 12.50 hrs, Volume= 4.7 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 153.67' @ 12.50 hrs Surf.Area= 19,295 sf Storage= 14,652 cf

Plug-Flow detention time= 2.4 min calculated for 4.7 af (100% of inflow)  
 Center-of-Mass det. time= 2.4 min ( 885.1 - 882.7 )

Volume	Invert	Avail.Storage	Storage Description
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.00	498	198.0	0	0	498
152.00	1,368	715.0	897	897	38,063
153.00	8,822	6,900.0	4,555	5,452	3,786,066
154.00	25,925	1,559.0	16,623	22,075	7,381,341
155.00	50,627	1,626.0	37,594	59,669	7,398,397
156.00	83,648	1,717.0	66,450	126,119	7,422,663

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=26.1 cfs @ 12.50 hrs HW=153.67' (Free Discharge)

↑1=Culvert (Inlet Controls 26.1 cfs @ 8.30 fps)

### Summary for Pond P-1C: Subsurface Infiltration System

Inflow Area =	2.5 ac, 90.46% Impervious, Inflow Depth = 5.30" for 25-Year event
Inflow =	14.9 cfs @ 12.07 hrs, Volume= 1.1 af
Outflow =	14.9 cfs @ 12.07 hrs, Volume= 1.0 af, Atten= 0%, Lag= 0.2 min
Discarded =	0.1 cfs @ 7.75 hrs, Volume= 0.2 af
Primary =	14.8 cfs @ 12.07 hrs, Volume= 0.8 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Peak Elev= 151.88' @ 12.07 hrs Surf.Area= 0.1 ac Storage= 0.2 af

Plug-Flow detention time= 166.6 min calculated for 1.0 af (92% of inflow)  
Center-of-Mass det. time= 125.8 min ( 893.4 - 767.6 )

Volume	Invert	Avail.Storage	Storage Description
#1A	145.00'	0.1 af	<b>30.00'W x 130.60'L x 3.50'H Field A</b> 0.3 af Overall - 0.1 af Embedded = 0.2 af x 40.0% Voids
#2A	145.50'	0.1 af	<b>ADS_StormTech SC-740</b> x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 6 rows
#3	145.50'	0.0 af	<b>4.00'D x 7.00'H Vertical Cone/Cylinder</b>
		0.2 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	<b>15.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 145.00' / 144.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	148.00'	<b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#3	Discarded	145.00'	<b>1.020 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 7.75 hrs HW=145.50' (Free Discharge)

↳3=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=14.7 cfs @ 12.07 hrs HW=151.86' (Free Discharge)

↳1=Culvert (Inlet Controls 14.7 cfs @ 12.02 fps)

↳2=Sharp-Crested Rectangular Weir (Passes 14.7 cfs of 79.9 cfs potential flow)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.9 ac, 44.36% Impervious, Inflow Depth > 2.63" for 25-Year event  
Inflow = 59.0 cfs @ 12.08 hrs, Volume= 18.6 af  
Primary = 59.0 cfs @ 12.08 hrs, Volume= 18.6 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-2: Overland Flow to Boston Post Road**

Inflow Area = 0.1 ac, 0.00% Impervious, Inflow Depth = 2.01" for 25-Year event  
Inflow = 0.3 cfs @ 12.08 hrs, Volume= 0.0 af  
Primary = 0.3 cfs @ 12.08 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 2.01" for 25-Year event  
Inflow = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af  
Primary = 1.5 cfs @ 12.08 hrs, Volume= 0.1 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs



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## 100-Year Storm Event – Proposed

**13125-PR HydroCAD**

Prepared by VHB

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Type III 24-hr 100-Year Rainfall=8.60"

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Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 points  
 Runoff by SCS TR-20 method, UH=SCS, Weighted-CN  
 Reach routing by Stor-Ind method - Pond routing by Stor-Ind method

**SubcatchmentS-1A: Western retail area** Runoff Area=323,637 sf 71.20% Impervious Runoff Depth=7.03"  
 Tc=5.0 min CN=87 Runoff=60.3 cfs 4.4 af

**SubcatchmentS-1B: Senoir &** Runoff Area=409,397 sf 60.08% Impervious Runoff Depth=6.55"  
 Flow Length=375' Tc=5.0 min CN=83 Runoff=72.5 cfs 5.1 af

**SubcatchmentS-1C: Multi-Family** Runoff Area=810,445 sf 58.16% Impervious Runoff Depth=6.19"  
 Flow Length=1,845' Tc=12.2 min CN=80 Runoff=108.6 cfs 9.6 af

**SubcatchmentS-1D: Central Pervious** Runoff Area=362,515 sf 16.84% Impervious Runoff Depth=4.62"  
 Tc=5.0 min CN=67 Runoff=46.8 cfs 3.2 af

**SubcatchmentS-1E: Grocery Store,** Runoff Area=210,610 sf 48.42% Impervious Runoff Depth=5.35"  
 Flow Length=533' Tc=7.7 min CN=73 Runoff=28.5 cfs 2.2 af

**SubcatchmentS-1F: Offsite Farm Area** Runoff Area=1,470,921 sf 29.23% Impervious Runoff Depth=2.74"  
 Flow Length=1,734' Tc=17.0 min UI Adjusted CN=51 Runoff=73.1 cfs 7.7 af

**SubcatchmentS-1G: Eastern Retail Area** Runoff Area=109,664 sf 90.46% Impervious Runoff Depth=7.88"  
 Tc=5.0 min CN=94 Runoff=21.7 cfs 1.7 af

**SubcatchmentS-2: Southern Prop Line -** Runoff Area=5,752 sf 0.00% Impervious Runoff Depth=3.91"  
 Tc=5.0 min CN=61 Runoff=0.6 cfs 0.0 af

**SubcatchmentS-3: Eastern Prop Line** Runoff Area=28,587 sf 0.00% Impervious Runoff Depth=3.91"  
 Flow Length=20' Slope=0.0810 1/1' Tc=5.0 min CN=61 Runoff=3.1 cfs 0.2 af

**Pond P-1A: Existing Pond at Center of** Peak Elev=151.71' Storage=587,879 cf Inflow=231.3 cfs 27.8 af  
 Outflow=35.8 cfs 27.2 af

**Pond P-1B: SW Wetland/Swale at Western** Peak Elev=155.54' Storage=91,695 cf Inflow=90.2 cfs 9.9 af  
 24.0" Round Culvert n=0.011 L=300.0' S=0.0093 1/1' Outflow=31.8 cfs 9.9 af

**Pond P-1C: Subsurface Infiltration System** Peak Elev=159.20' Storage=0.2 af Inflow=21.7 cfs 1.7 af  
 Discarded=0.1 cfs 0.3 af Primary=21.8 cfs 1.3 af Outflow=21.9 cfs 1.6 af

**Link DP-1: 48" RCP Across Boston Post Road** Inflow=110.2 cfs 32.9 af  
 Primary=110.2 cfs 32.9 af

**Link DP-2: Overland Flow to Boston Post Road** Inflow=0.6 cfs 0.0 af  
 Primary=0.6 cfs 0.0 af

**Link DP-3: Wetland at Northeast Corner** Inflow=3.1 cfs 0.2 af  
 Primary=3.1 cfs 0.2 af

**Total Runoff Area = 85.7 ac Runoff Volume = 34.1 af Average Runoff Depth = 4.77"**  
**56.05% Pervious = 48.0 ac 43.95% Impervious = 37.6 ac**

**Summary for Subcatchment S-1A: Western retail area except grocery store roof**

Runoff = 60.3 cfs @ 12.07 hrs, Volume= 4.4 af, Depth= 7.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 93,216	61	>75% Grass cover, Good, HSG B
* 216,535	98	Road & Sidewalk
* 13,886	98	Roofs
323,637	87	Weighted Average
93,216		28.80% Pervious Area
230,421		71.20% Impervious Area

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

**Summary for Subcatchment S-1B: Senoir & Age-Restricted Housing**

Runoff = 72.5 cfs @ 12.07 hrs, Volume= 5.1 af, Depth= 6.55"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 98,868	98	Roofs
* 147,114	98	Road & Sidewalk
* 163,415	61	>75% Grass cover, Good, HSG B
409,397	83	Weighted Average
163,415		39.92% Pervious Area
245,982		60.08% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.20		<b>Sheet Flow,</b> Smooth surfaces n= 0.011 P2= 3.20"
1.2	175	0.0150	2.49		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
0.4	150	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
2.3	375	Total, Increased to minimum Tc = 5.0 min			



**Summary for Subcatchment S-1C: Multi-Family Housing**

Runoff = 108.6 cfs @ 12.16 hrs, Volume= 9.6 af, Depth= 6.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 175,858	98	Roofs
* 295,473	98	Road & Sidewalk
* 232,176	61	>75% Grass cover, Good, HSG B
106,938	39	>75% Grass cover, Good, HSG A
810,445	80	Weighted Average
339,114		41.84% Pervious Area
471,331		58.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
3.9	500	0.0180	2.16		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
1.2	471	0.0150	6.57	5.16	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
0.3	141	0.0150	8.60	15.20	<b>Pipe Channel,</b> 18.0" Round Area= 1.8 sf Perim= 4.7' r= 0.38' n= 0.011 Concrete pipe, straight & clean
0.3	188	0.0150	10.42	32.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.9	495	0.0070	9.33	65.95	<b>Pipe Channel,</b> 36.0" Round Area= 7.1 sf Perim= 9.4' r= 0.75' n= 0.011 Concrete pipe, straight & clean
12.2	1,845	Total			

**Summary for Subcatchment S-1D: Central Pervious Area**

Runoff = 46.8 cfs @ 12.08 hrs, Volume= 3.2 af, Depth= 4.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 10,063	98	Road & Sidewalk
1,564	39	>75% Grass cover, Good, HSG A
* 299,894	61	>75% Grass cover, Good, HSG B
50,994	98	Water Surface, HSG B
362,515	67	Weighted Average
301,458		83.16% Pervious Area
61,057		16.84% Impervious Area

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

**Summary for Subcatchment S-1E: Grocery Store, Beltran Area & Western Prop Line**

Runoff = 28.5 cfs @ 12.11 hrs, Volume= 2.2 af, Depth= 5.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 54,726	98	Roofs
* 55,331	61	>75% Grass cover, Good, HSG B
* 53,292	39	>75% Grass cover, Good, HSG A
* 47,261	98	Road & Sidewalk
210,610	73	Weighted Average
108,623		51.58% Pervious Area
101,987		48.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.2	178	0.0220	2.39		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.9	305	0.0100	5.36	4.21	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.011 Concrete pipe, straight & clean
7.7	533	Total			

**Summary for Subcatchment S-1F: Offsite Farm Area**

Runoff = 73.1 cfs @ 12.26 hrs, Volume= 7.7 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Adj	Description
10,003	98		Water Surface, HSG B
181,224	61		>75% Grass cover, Good, HSG B
859,788	30		Meadow, non-grazed, HSG A
301,859	98		Roofs, HSG B
118,047	98		Unconnected pavement, HSG B
1,470,921	54	51	Weighted Average, UI Adjusted
1,041,012			70.77% Pervious Area
429,909			29.23% Impervious Area
118,047			27.46% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0210	0.15		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
0.6	264	0.1900	7.02		<b>Shallow Concentrated Flow,</b> Unpaved Kv= 16.1 fps
0.8	100	0.0100	2.03		<b>Shallow Concentrated Flow,</b> Paved Kv= 20.3 fps
4.9	610	0.0050	2.08	1.64	<b>Pipe Channel,</b> 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.020 Corrugated PE, corrugated interior
0.6	307	0.0100	8.51	26.74	<b>Pipe Channel,</b> 24.0" Round Area= 3.1 sf Perim= 6.3' r= 0.50' n= 0.011 Concrete pipe, straight & clean
0.3	140	0.0200	8.87	70.94	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
4.1	172	0.0100	0.70		<b>Shallow Concentrated Flow,</b> Short Grass Pasture Kv= 7.0 fps
0.2	91	0.0100	6.27	50.16	<b>Trap/Vee/Rect Channel Flow,</b> Bot.W=0.00' D=2.00' Z= 2.0 '/' Top.W=8.00' n= 0.022 Earth, clean & straight
17.0	1,734	Total			

**Summary for Subcatchment S-1G: Eastern Retail Area**

Runoff = 21.7 cfs @ 12.07 hrs, Volume= 1.7 af, Depth= 7.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 75,018	98	Road & Sidewalk
* 24,187	98	Roof
10,459	61	>75% Grass cover, Good, HSG B
109,664	94	Weighted Average
10,459		9.54% Pervious Area
99,205		90.46% Impervious Area

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

**Summary for Subcatchment S-2: Southern Prop Line - Pervious Area**

Runoff = 0.6 cfs @ 12.08 hrs, Volume= 0.0 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

**13125-PR HydroCAD**

Type III 24-hr 100-Year Rainfall=8.60"

Prepared by VHB

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Area (sf)	CN	Description
* 5,752	61	>75% Grass cover, Good, HSG B
5,752		100.00% Pervious Area

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

**Summary for Subcatchment S-3: Eastern Prop Line**

Runoff = 3.1 cfs @ 12.08 hrs, Volume= 0.2 af, Depth= 3.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
* 28,587	61	>75% Grass cover, Good, HSG B
28,587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.5	20	0.0810	0.22		<b>Sheet Flow,</b> Grass: Short n= 0.150 P2= 3.20"
1.5	20	Total, Increased to minimum Tc = 5.0 min			

**Summary for Pond P-1A: Existing Pond at Center of Property**

Inflow Area = 74.9 ac, 40.14% Impervious, Inflow Depth = 4.45" for 100-Year event  
 Inflow = 231.3 cfs @ 12.10 hrs, Volume= 27.8 af  
 Outflow = 35.8 cfs @ 14.34 hrs, Volume= 27.2 af, Atten= 85%, Lag= 134.2 min  
 Primary = 35.8 cfs @ 14.34 hrs, Volume= 27.2 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Starting Elev= 144.70' Surf.Area= 48,178 sf Storage= 33,047 cf  
 Peak Elev= 151.71' @ 14.34 hrs Surf.Area= 226,584 sf Storage= 587,879 cf (554,832 cf above start)  
 Flood Elev= 152.00' Surf.Area= 267,018 sf Storage= 658,354 cf (625,307 cf above start)

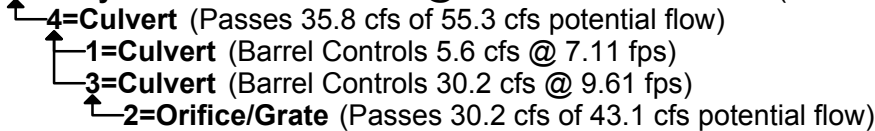
Plug-Flow detention time= 256.4 min calculated for 26.5 af (95% of inflow)  
 Center-of-Mass det. time= 219.2 min ( 1,050.8 - 831.6 )

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	658,354 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
144.00	46,247	909.0	0	0	46,247
145.00	49,018	939.0	47,626	47,626	50,754
146.00	51,879	966.0	50,442	98,068	54,957
147.00	56,154	1,148.0	54,002	152,070	85,592
148.00	59,900	1,538.0	58,017	210,087	168,964
149.00	68,930	2,169.0	64,362	274,449	355,114
150.00	80,674	2,330.0	74,725	349,174	412,799
151.00	140,074	3,581.0	109,017	458,191	1,001,255
152.00	267,018	4,717.0	200,163	658,354	1,751,406

Device	Routing	Invert	Outlet Devices
#1	Device 4	144.70'	<b>12.0" Round Culvert</b> L= 382.0' Ke= 0.500 Inlet / Outlet Invert= 144.70' / 142.80' S= 0.0050 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 0.79 sf
#2	Device 3	147.00'	<b>36.0" W x 18.0" H Vert. Orifice/Grate</b> C= 0.600
#3	Device 4	144.00'	<b>24.0" Round Culvert</b> L= 372.0' Ke= 0.500 Inlet / Outlet Invert= 144.00' / 142.80' S= 0.0032 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf
#4	Primary	142.60'	<b>36.0" Round Culvert</b> L= 1,295.0' Ke= 0.500 Inlet / Outlet Invert= 142.60' / 140.90' S= 0.0013 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 7.07 sf

Primary OutFlow Max=35.8 cfs @ 14.34 hrs HW=151.71' (Free Discharge)



**Summary for Pond P-1B: SW Wetland/Swale at Western Prop Line**

Inflow Area = 38.6 ac, 31.63% Impervious, Inflow Depth = 3.07" for 100-Year event  
 Inflow = 90.2 cfs @ 12.22 hrs, Volume= 9.9 af  
 Outflow = 31.8 cfs @ 12.70 hrs, Volume= 9.9 af, Atten= 65%, Lag= 28.4 min  
 Primary = 31.8 cfs @ 12.70 hrs, Volume= 9.9 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3  
 Peak Elev= 155.54' @ 12.70 hrs Surf.Area= 67,562 sf Storage= 91,695 cf

Plug-Flow detention time= 17.6 min calculated for 9.9 af (100% of inflow)  
 Center-of-Mass det. time= 17.5 min ( 878.6 - 861.1 )

Volume	Invert	Avail.Storage	Storage Description
#1	151.00'	126,119 cf	<b>Custom Stage Data (Irregular)</b> Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
151.00	498	198.0	0	0	498
152.00	1,368	715.0	897	897	38,063
153.00	8,822	6,900.0	4,555	5,452	3,786,066
154.00	25,925	1,559.0	16,623	22,075	7,381,341
155.00	50,627	1,626.0	37,594	59,669	7,398,397
156.00	83,648	1,717.0	66,450	126,119	7,422,663

Device	Routing	Invert	Outlet Devices
#1	Primary	149.70'	<b>24.0" Round Culvert</b> L= 300.0' Ke= 0.500 Inlet / Outlet Invert= 149.70' / 146.90' S= 0.0093 '/' Cc= 0.900 n= 0.011 Concrete pipe, straight & clean, Flow Area= 3.14 sf

Primary OutFlow Max=31.8 cfs @ 12.70 hrs HW=155.54' (Free Discharge)

↑1=Culvert (Barrel Controls 31.8 cfs @ 10.12 fps)

### Summary for Pond P-1C: Subsurface Infiltration System

Inflow Area =	2.5 ac, 90.46% Impervious, Inflow Depth = 7.88" for 100-Year event
Inflow =	21.7 cfs @ 12.07 hrs, Volume= 1.7 af
Outflow =	21.9 cfs @ 12.08 hrs, Volume= 1.6 af, Atten= 0%, Lag= 0.6 min
Discarded =	0.1 cfs @ 5.96 hrs, Volume= 0.3 af
Primary =	21.8 cfs @ 12.08 hrs, Volume= 1.3 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs  
Peak Elev= 159.20' @ 12.08 hrs Surf.Area= 0.1 ac Storage= 0.2 af

Plug-Flow detention time= 122.6 min calculated for 1.6 af (95% of inflow)  
Center-of-Mass det. time= 92.6 min ( 851.3 - 758.8 )

Volume	Invert	Avail.Storage	Storage Description
#1A	145.00'	0.1 af	<b>30.00'W x 130.60'L x 3.50'H Field A</b> 0.3 af Overall - 0.1 af Embedded = 0.2 af x 40.0% Voids
#2A	145.50'	0.1 af	<b>ADS_StormTech SC-740</b> x 108 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap Row Length Adjustment= +0.44' x 6.45 sf x 6 rows
#3	145.50'	0.0 af	<b>4.00'D x 7.00'H Vertical Cone/Cylinder</b>
		0.2 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	<b>15.0" Round Culvert</b> L= 50.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 145.00' / 144.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	148.00'	<b>4.0' long Sharp-Crested Rectangular Weir</b> 2 End Contraction(s)
#3	Discarded	145.00'	<b>1.020 in/hr Exfiltration over Surface area</b>

Discarded OutFlow Max=0.1 cfs @ 5.96 hrs HW=145.50' (Free Discharge)

↳3=Exfiltration (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=21.8 cfs @ 12.08 hrs HW=159.20' (Free Discharge)

↳1=Culvert (Inlet Controls 21.8 cfs @ 17.74 fps)

↳2=Sharp-Crested Rectangular Weir (Passes 21.8 cfs of 245.1 cfs potential flow)

**Summary for Link DP-1: 48" RCP Across Boston Post Road**

Inflow Area = 84.9 ac, 44.36% Impervious, Inflow Depth > 4.65" for 100-Year event  
Inflow = 110.2 cfs @ 12.08 hrs, Volume= 32.9 af  
Primary = 110.2 cfs @ 12.08 hrs, Volume= 32.9 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-2: Overland Flow to Boston Post Road**

Inflow Area = 0.1 ac, 0.00% Impervious, Inflow Depth = 3.91" for 100-Year event  
Inflow = 0.6 cfs @ 12.08 hrs, Volume= 0.0 af  
Primary = 0.6 cfs @ 12.08 hrs, Volume= 0.0 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs

**Summary for Link DP-3: Wetland at Northeast Corner**

Inflow Area = 0.7 ac, 0.00% Impervious, Inflow Depth = 3.91" for 100-Year event  
Inflow = 3.1 cfs @ 12.08 hrs, Volume= 0.2 af  
Primary = 3.1 cfs @ 12.08 hrs, Volume= 0.2 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs







# Appendix B

## Standard 3 Computations and Supporting Information

- Recharge Calculations
- NRCS Soil Evaluation and Analysis
- Supporting Geotechnical Information
  - Exploration Location Plan
  - Monitoring Well Logs
  - Groundwater Contour Plan
- TSS Removal Worksheets for Potential Treatment





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## Recharge Calculations

# Computations



Project:	Grocery Store at Meadow Walk	Project #	13125
Location:	Sudbury, MA	Sheet	1 of 1
Calculated by:	BMG	Date:	3/29/2016
Checked by:	KSS	Date:	3/29/2016
Title	Standard 3 - Required Recharge - Reduced Impervious Area		

<b>EXISTING CONDITIONS AND REQUIRED RECHARGE</b>		
<b>HSG Type A</b>	Required Recharge =	0.6 in
	Pervious Area =	3.7 acres
	Recharge Existing/Required =	<b>8000 cubic feet</b>
<b>HSG Type B</b>	Required Recharge =	0.35 in
	Pervious Area =	22.2 acres
	Recharge Existing/Required =	<b>28000 cubic feet</b>
<b>Total Recharge Existing/Required =</b>		<b>36000 cubic feet</b>

<b>PROPOSED CONDITIONS</b>		
<b>HSG Type A</b>	Required Recharge =	0.6 in
	Proposed Pervious Area =	3.7 acres
	Proposed Recharge =	<b>8000 cubic feet</b>
<b>HSG Type B</b>	Required Recharge =	0.35 in
	Proposed Pervious Area =	24.6 acres
	Proposed Recharge =	<b>31000 cubic feet</b>
<b>Total Proposed Recharge =</b>		<b>39000 cubic feet</b>

<b>Total Recharge Existing/Required =</b>	<b>36000 cubic feet</b>
<b>Total Proposed Recharge =</b>	<b>39000 cubic feet</b>
<b>Total Increase in Recharge =</b>	<b>3000 cubic feet</b>



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## Soil Evaluation and Analysis



Hydrologic Soil Group—Middlesex County, Massachusetts



Map Scale: 1:6,460 if printed on A portrait (8.5" x 11") sheet.

0 50 100 200 300 Meters

0 300 600 1200 1800 Feet

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

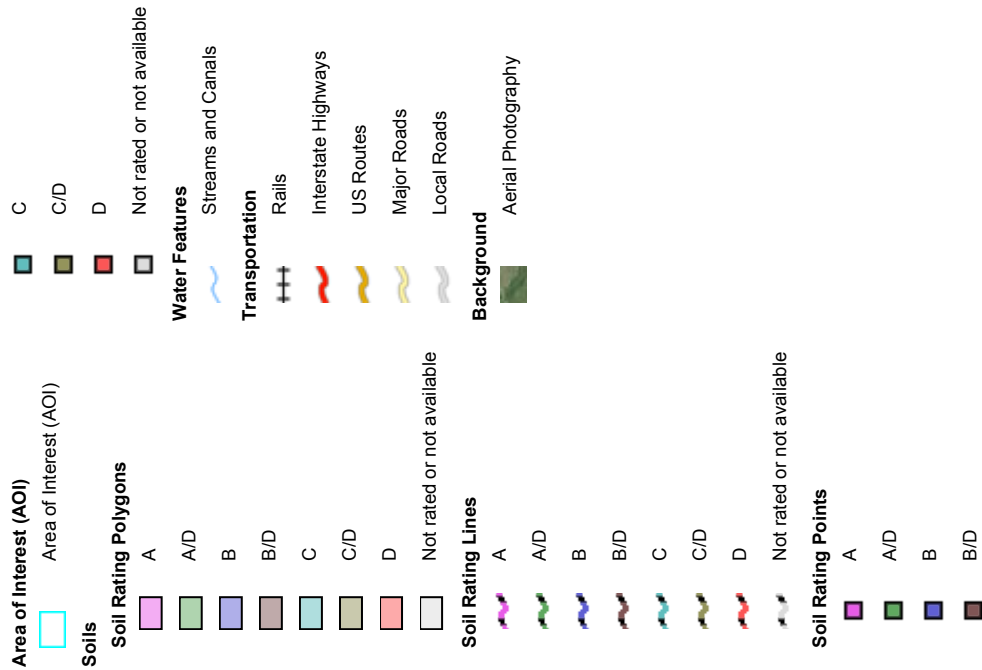


Natural Resources  
Conservation Service

Web Soil Survey  
National Cooperative Soil Survey

9/23/2015  
Page 1 of 4

## MAP LEGEND



## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

Source of Map: Natural Resources Conservation Service  
 Web Soil Survey URL: <http://websoilsurvey.nrcs.usda.gov>  
 Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Middlesex County, Massachusetts  
 Survey Area Data: Version 14, Sep 19, 2014

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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



## Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
30B	Raynham silt loam, 0 to 5 percent slopes	C/D	4.2	2.1%
32B	Wareham loamy fine sand, 0 to 5 percent slopes	A/D	5.0	2.5%
44A	Birdsall mucky silt loam, 0 to 1 percent slopes	C/D	8.5	4.2%
51A	Swansea muck, 0 to 1 percent slopes	B/D	1.5	0.8%
52A	Freetown muck, 0 to 1 percent slopes	A/D	12.5	6.2%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A	0.2	0.1%
253B	Hinckley loamy sand, 3 to 8 percent slopes	A	2.4	1.2%
255A	Windsor loamy sand, 0 to 3 percent slopes	A	60.8	30.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	6.5	3.2%
256A	Deerfield loamy sand, 0 to 3 percent slopes	B	10.2	5.1%
256B	Deerfield loamy sand, 3 to 8 percent slopes	B	4.9	2.4%
653	Udorthents, sandy		1.2	0.6%
656	Udorthents-Urban land complex		83.1	41.4%
<b>Totals for Area of Interest</b>			<b>200.9</b>	<b>100.0%</b>

## Description

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

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

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

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

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

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

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

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* None Specified

*Tie-break Rule:* Higher



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## Geotechnical Documents

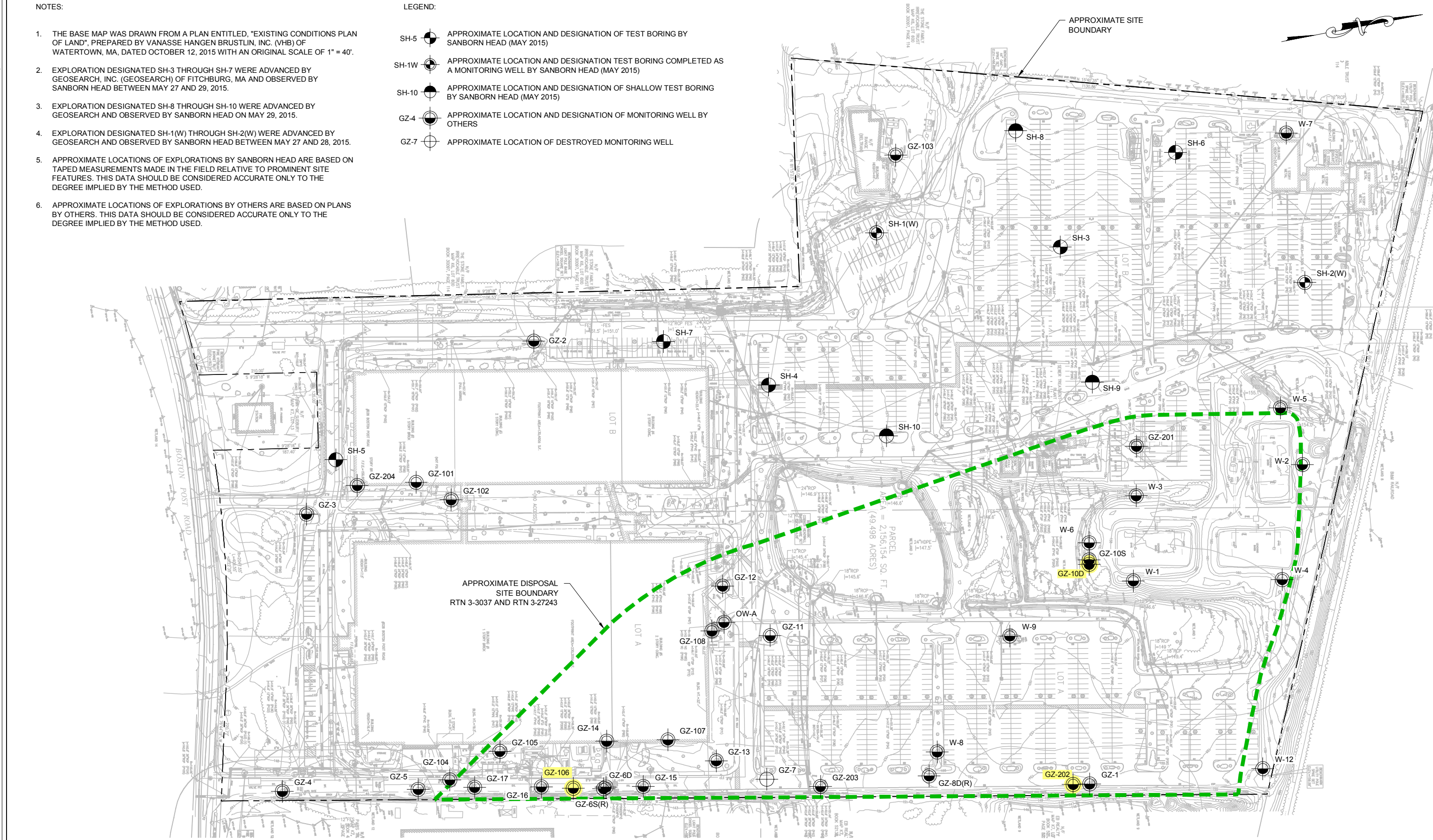
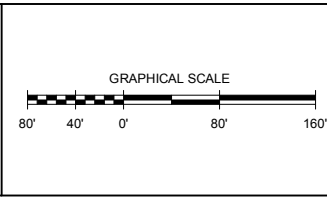


NOTES:

1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "EXISTING CONDITIONS PLAN OF LAND", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, DATED OCTOBER 12, 2015 WITH AN ORIGINAL SCALE OF 1" = 40'.
2. EXPLORATION DESIGNATED SH-3 THROUGH SH-7 WERE ADVANCED BY GEOSearch, INC. (GEOSearch) OF FITCHBURG, MA AND OBSERVED BY SANBORN HEAD BETWEEN MAY 27 AND 29, 2015.
3. EXPLORATION DESIGNATED SH-8 THROUGH SH-10 WERE ADVANCED BY GEOSearch AND OBSERVED BY SANBORN HEAD ON MAY 29, 2015.
4. EXPLORATION DESIGNATED SH-1(W) THROUGH SH-2(W) WERE ADVANCED BY GEOSearch AND OBSERVED BY SANBORN HEAD BETWEEN MAY 27 AND 28, 2015.
5. APPROXIMATE LOCATIONS OF EXPLORATIONS BY SANBORN HEAD ARE BASED ON TAPED MEASUREMENTS MADE IN THE FIELD RELATIVE TO PROMINENT SITE FEATURES. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
6. APPROXIMATE LOCATIONS OF EXPLORATIONS BY OTHERS ARE BASED ON PLANS BY OTHERS. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

LEGEND:

- SH-5 APPROXIMATE LOCATION AND DESIGNATION OF TEST BORING BY SANBORN HEAD (MAY 2015)
- SH-1W APPROXIMATE LOCATION AND DESIGNATION TEST BORING COMPLETED AS A MONITORING WELL BY SANBORN HEAD (MAY 2015)
- SH-10 APPROXIMATE LOCATION AND DESIGNATION OF SHALLOW TEST BORING BY SANBORN HEAD (MAY 2015)
- GZ-4 APPROXIMATE LOCATION AND DESIGNATION OF MONITORING WELL BY OTHERS
- GZ-7 APPROXIMATE LOCATION OF DESTROYED MONITORING WELL

NO.	DATE	DESCRIPTION	BY

DRAWN BY: C.GREEN  
 DESIGNED BY: L.NORTON  
 REVIEWED BY: P.PINTO  
 PROJECT MGR: L.NORTON  
 PIC: P.PINTO  
 DATE: FEBRUARY 2016

ENVIRONMENTAL CONSULTING SERVICES  
 528 BOSTON POST ROAD  
 SUDBURY, MASSACHUSETTS  
**EXPLORATION LOCATION PLAN**

PROJECT NUMBER:  
 3888.02  
 SHEET NUMBER:  
 1

FILE: P:\PROJECTS\528BOSTONPOSTROAD\528BOSTONPOSTROAD.dwg  
 LAYOUT: 528BOSTONPOSTROAD\_LAYOUT.dwg  
 DATE: 2/16/16 2:30 PM





Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Monitoring Well SH-1

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4 1/4" I.D. Hollow Stem Augers

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

### Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/27/15	09:00	4'	Ground Surface	15'	17'	Upon Completion
06/01/15	09:10	3.3'	Top of PVC			

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/28/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\3800S\3888.00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT, 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Well Diagram	Well Description
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/Rec (in)	Field Testing Data	Log	Description			
0								(0 to 0.3'): ASPHALT.		2" Dia. Flushmounted Road Box Set in Concrete (0 to 1')
0.5 - 1	S-1	0.5 - 1		---	PID: ND			S-1 (0.5 to 1'): Light brown, fine to coarse SAND, little Gravel, little Silt. Moist. FILL.		TPVC (0.3')
1 - 4	S-2	1 - 4		---	PID: ND			S-2 (1 to 4'): Light brown, fine to coarse SAND, little Silt, trace Gravel. Moist.		2" Dia. Sch. 40 PVC Riser (0.3 to 5')
4 - 5	S-3	4 - 5		---	PID: ND			S-3 (4 to 5'): Light brown, fine SAND, little Silt, trace Gravel. Wet.		Concrete (0 to 1')
5 - 7	S-4	5 - 7	8 7 9 9	24/8	PID: ND			S-4 (5 to 7'): Medium dense, light brown, fine SAND, some Silt. Wet.		Bentonite Chips (1 to 3')
10 - 12	S-5	10 - 12	9 8 9 12	24/11	PID: ND		SAND	S-5 (10 to 12'): Medium dense, light brown, fine SAND, some Silt. Wet.		2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (5 to 15')
15 - 17	S-6	15 - 17	10 15 20 19	24/13	PID: ND			S-6 (15 to 17'): Dense, light brown, fine SAND, some Silt. Wet.		Filter Sand (3 to 17')
17 - 18								Boring terminated at 17 feet. No refusal encountered.		
<p>NOTES:</p> <p>1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs.</p> <p>2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 5 feet. Samples were collected using a handheld auger.</p>										



Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Monitoring Well SH-2

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4 1/4" I.D. Hollow Stem Augers

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

### Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/28/15	08:00	4'	Ground Surface	20'	22'	Upon Completion
06/01/15	12:30	4.7'	Top of PVC			

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/28/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\3888\00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT, 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Well Diagram	Well Description
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/Rec (in)	Field Testing Data	Log	Description			
0							ASPHALT	(0 to 0.3'): ASPHALT.		2" Dia. Flushmounted Road Box Set in Concrete (0 to 1')
0.5 - 2	S-1	0.5 - 2			PID: ND		FILL	S-1 (0.5 to 2'): Light brown, fine to coarse SAND, little Gravel, little Silt. Moist. FILL.		TPVC (0.3')
2	S-2	2 - 4			PID: ND			S-2 (2 to 4'): Light brown, fine SAND, little Gravel, little Silt. Moist.		2" Dia. Sch. 40 PVC Riser (0.3 to 5')
4	S-3	4 - 6	2 4 4 5	24/12	PID: ND			S-3 (4 to 6'): Loose, light brown, fine SAND, little Silt. Wet.		Concrete (0 to 1')
6	S-4	6 - 8	5 5 4 5	24/14	PID: ND			S-4 (6 to 8'): Medium dense, light brown, fine SAND, little Silt. Wet.		Bentonite Chips (1 to 3')
10	S-5	10 - 12	2 3 4 5	24/10	PID: ND			S-5 (10 to 12'): Loose, light brown, fine SAND, little Silt. Wet.		2" Dia. Sch. 40 PVC Well Screen (0.010" Slots) (5 to 15')
12							SAND			Filter Sand (3 to 22')
15 - 17	S-6	15 - 17	3 3 3 3	24/13	PID: ND			S-6 (15 to 17'): Loose, light brown, fine SAND, some Silt. Wet.		
20 - 22	S-7	20 - 22	2 3 4 5	24/10	PID: ND			S-7 (20 to 22'): Loose, light brown, fine SAND, some Silt. Wet.		
22								Boring terminated at 22 feet. No refusal encountered.		
<p>NOTES:</p> <p>1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs.</p> <p>2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 5 feet. Samples were collected using a handheld auger.</p>										





Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Boring SH-3

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4" I.D. Casing Drive and Wash

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

### Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/28/15	13:00	5'	Ground Surface	21'	21'	Upon Completion

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/28/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\38800S\3888.00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT, 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/Rec (in)	Field Testing Data	Log	Description		
0							0' ASPHALT	(0 to 0.3'): ASPHALT.	<p>1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs.</p> <p>2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 4 feet. Samples were collected using a handheld auger.</p>
0.5	S-1	0.5 - 2		---	PID: ND		FILL	S-1 (0.5 to 2'): Light brown, fine to coarse SAND, little Gravel, little Silt. Moist. FILL.	
2	S-2	2 - 3		---	PID: ND			S-2 (2 to 3'): Light brown, fine SAND, little Silt. Moist.	
3	S-3	3 - 4		---	PID: ND			S-3 (3 to 4'): Light brown, fine SAND, little Silt. Moist.	
5	S-4	5 - 7	6 6 10 10	24/9	PID: ND			S-4 (5 to 7'): Medium dense, light brown, fine SAND, little Silt. Wet.	
10	S-5	10 - 12	5 6 6 9	24/10	PID: ND		SAND	S-5 (10 to 12'): Medium dense, light brown, fine SAND, some Silt. Wet.	
15	S-6	15 - 17	4 6 4 3	24/13	PID: ND			S-6 (15 to 17'): Medium dense, light brown, fine SAND and Silt. Wet.	
20	S-7	20 - 20	100/0"	0/0				S-7 (20 to 20'): No Recovery.	
21								Boring terminated at 21 feet due to roller bit refusal.	



Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Boring SH-4

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4" I.D. Casing Drive and Wash

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

**Groundwater Readings**

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/29/15	08:00	4'	Ground Surface	24'	26'	Upon Completion

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/29/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\38800S\3888.00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/Rec (in)	Field Testing Data	Log	Description		
0							ASPHALT	(0 to 0.3'): ASPHALT.	<p>1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs.</p> <p>2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 4 feet. Samples were collected using a handheld auger.</p>
0.5 - 2	S-1	0.5 - 2			PID: ND			S-1 (0.5 to 2'): Brown, fine to coarse SAND, some Silt, trace Gravel. Moist. FILL.	
2	S-2	2 - 4			PID: ND			S-2 (2 to 4'): Brown, fine to coarse SAND, some Silt, trace Gravel. Moist. FILL.	
4	S-3	4 - 6	2 2 4 3	24/8	PID: ND		FILL	S-3 (4 to 6'): Loose, brown, fine to coarse SAND, little Silt, trace Gravel, slight Organic odor. Wet. FILL.	
6	S-4	6 - 8	2 2 8 13	24/9	PID: ND			S-4A (6 to 7.8'): Medium dense, brown, fine to coarse SAND, little Silt, trace Gravel, slight Organic odor. Wet. FILL.	
8					PID: ND		7.8'	S-4B (7.8 to 8'): Medium dense, brown, fine SAND and Silt. Wet.	
9 - 11	S-5	9 - 11	9 11 9 9	24/12	PID: ND			S-5 (9 to 11'): Medium dense, light brown, fine SAND, some Silt. Wet.	
11 - 13	S-6	11 - 13	12 12 13 14	24/10	PID: ND			S-6 (11 to 13'): Medium dense, light brown, fine SAND, some Silt. Wet.	
14 - 16	S-7	14 - 16	7 7 7 7	24/10	PID: ND			S-7 (14 to 16'): Medium dense, light brown, fine SAND and Silt. Wet.	
16							SAND		
19 - 21	S-8	19 - 21	9 6 4 4	24/9	PID: ND			S-8 (19 to 21'): Medium dense, brown/gray, fine SAND, some Silt. Wet.	
24 - 26	S-9	24 - 26	20 24 80 100	24/14	PID: ND		24' GLACIAL TILL	S-9 (24 to 26'): Very dense, gray, fine to coarse SAND, little Gravel, little Silt. Wet. GLACIAL TILL.	
26							26'	Boring terminated at 26 feet. No refusal encountered.	



Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Boring SH-5

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4" I.D. Casing Drive and Wash

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

**Groundwater Readings**

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/27/15	13:00	3.5'	Ground Surface	21'	23'	Upon Completion

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/29/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\38800S\3888.00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/ Rec (in)	Field Testing Data	Log	Description		
0							ASPHALT	(0 to 0.3'): ASPHALT.	<p>1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs.</p> <p>2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 4 feet. Samples were collected using a handheld auger.</p>
0.3	S-1	1 - 2		---	PID: ND		FILL	S-1 (1 to 2'): Brown, fine to coarse SAND, little Silt, little Gravel. Moist. FILL.	
2	S-2	2 - 4		---	PID: ND			S-2 (2 to 4'): Brown, fine to coarse SAND, some Silt, trace Gravel. Moist.	
4	S-3	4 - 6	6	24/8	PID: ND			S-3 (4 to 6'): Medium dense, light brown, fine SAND, some Silt. Wet.	
6	S-4	6 - 8	7	24/16	PID: ND		SAND	S-4 (6 to 8'): Medium dense, light brown, fine SAND, some Silt. Wet.	
8			6						
8			4						
8			4						
8			8						
9	S-5	9 - 11	5	24/18	PID: ND			S-5 (9 to 11'): Loose, light brown, SILT, some Sand. Wet.	
10			5						
10			5						
10			4						
10			5						
12									
14	S-6	14 - 16	3	24/13	PID: ND		SILT	S-6 (14 to 16'): Loose, light brown, SILT, some Sand. Wet.	
16	S-7	16 - 18	2	24/15	PID: ND			S-7 (16 to 18'): Very loose, light brown, SILT, some Sand. Wet.	
18			2						
18			1						
18			2						
18			1						
19	S-8	19 - 21	3	24/9	PID: ND			S-8 (19 to 21'): Very loose, light brown, fine SAND and Silt. Wet.	
20			1						
20			2						
20			3						
21	S-9	21 - 23	2	24/13	PID: ND		SAND & SILT	S-9 (21 to 23'): Loose, light brown, fine SAND and Silt. Wet.	
22			2						
22			2						
22			3						
22			3						
23								Boring terminated at 23 feet. No refusal encountered.	
24									
26									
28									
30									
32									
34									



Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Boring SH-6

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4" I.D. Casing Drive and Wash

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

**Groundwater Readings**

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/29/15	12:00	5'	Ground Surface	15'	17'	Upon Completion

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/29/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\38800S\3888.00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT, 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/Rec (in)	Field Testing Data	Log	Description		
0	S-1	0.5 - 2		---	PID: ND	ASPHALT	FILL	(0 to 0.3'): ASPHALT.	1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs. 2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 4 feet. Samples were collected using a handheld auger.
2								S-2	
4	S-3	5 - 7	7 7 7 9	24/9	PID: ND		S-3 (5 to 7'): Medium dense, light brown, fine SAND, some Silt. Wet.		
6									
10	S-4	10 - 12	7 10 12 15	24/10	PID: ND	SAND	S-4 (10 to 12'): Medium dense, light brown, fine SAND, some Silt. Wet.		
12									
14									
16	S-5	15 - 17	7 8 10 9	24/12	PID: ND		S-5 (15 to 17'): Medium dense, light brown, fine SAND, some Silt. Wet.		
18								Boring terminated at 17 feet. No refusal encountered.	
20									
22									
24									
26									
28									
30									
32									
34									



Project: Raytheon Company  
 Location: Sudbury, MA  
 Project No.: 3888.00

# Log of Boring SH-7

Ground Elevation: Not Available

Sanborn, Head & Associates, Inc.

Drilling Method: 4/4" I.D. Hollow Stem Augers

Sampling Method: 2" O.D. Split Spoon, Automatic Hammer

### Groundwater Readings

Date	Time	Depth to Water	Ref. Pt.	Depth of Casing	Depth of Hole	Stab. Time
05/27/15	13:00	4.5'	Ground Surface	12'	14'	Upon Completion

Drilling Company: Geosearch, Inc.

Foreman: R. Gerard-Maillet

Date Started: 05/27/15

Date Finished: 05/29/15

Logged By: J. Findon-Henry

Checked By: K. Stetson

BORING LOG P:\3800S\3888.00\WORK\LOGS\3888.00 LOGS.GPJ, 2010 SANBORN HEAD V1.GLB, 2010 SANBORN HEAD V1.GDT, 8/17/15

Depth (ft)	Sample Information					Stratum		Geologic Description	Remarks
	Sample No.	Depth (ft)	Spoon Blows per 6 in	Pen/Rec (in)	Field Testing Data	Log	Description		
0							ASPHALT	(0 to 0.3'): ASPHALT.	<p>1. Soil samples were screened for volatile organic compounds (VOCs) using a Photovac Model 2020 Photoionization Detector (PID) with a 10.6 eV lamp, calibrated to a 100 parts per million by volume (ppmv) isobutylene-in-air standard using a response factor of 1.0. Results are presented in ppmv; the typical detection limit is 1 ppmv. ND indicates not detected. NA indicates not available. The PID measures relative levels of VOCs. Although PID screening cannot be used directly to quantify VOC concentrations or identify individual compounds, the results can serve as a relative indicator for the presence of VOCs.</p> <p>2. Test boring was advanced by hand excavation and vacuum extraction methods between approximately 1 to 4.5 feet. Samples were collected using a handheld auger. An approximately 2-inch thick layer of asphalt was observed at approximately 1.5 feet.</p>
0.5 - 1.5	S-1	0.5 - 1.5			PID: ND			S-1 (0.5 to 1.5'): Brown, fine to coarse SAND, some Gravel, little Silt, trace Cobbles. Moist. FILL.	
2	S-2	2 - 4.5			PID: ND			S-2 (2 to 4.5'): Brown, fine to coarse SAND, little Silt, trace Gravel. Moist. FILL.	
4							FILL		
5 - 7	S-3	5 - 7	3 4 6 10	24/10	PID: ND			S-3 (5 to 7'): Medium dense, brown/gray, fine to coarse SAND, trace Silt, trace Gravel, slight Organic odor. Wet. FILL.	
7 - 9	S-4	7 - 9	5 9 10 12	24/12	PID: ND			S-4 (7 to 9'): Medium dense, brown/gray, fine to coarse SAND, little Silt, trace Gravel. Wet.	
10 - 12	S-5	10 - 12	3 4 3 7	24/14	PID: ND		SAND	S-5 (10 to 12'): Loose, brown/gray, fine to coarse SAND, little Silt. Wet.	
12 - 14	S-6	12 - 14	6 7 7 9	24/0				S-6 (12 to 14'): No Recovery.	
14								Boring terminated at 14 feet. No refusal encountered.	





NOTES:

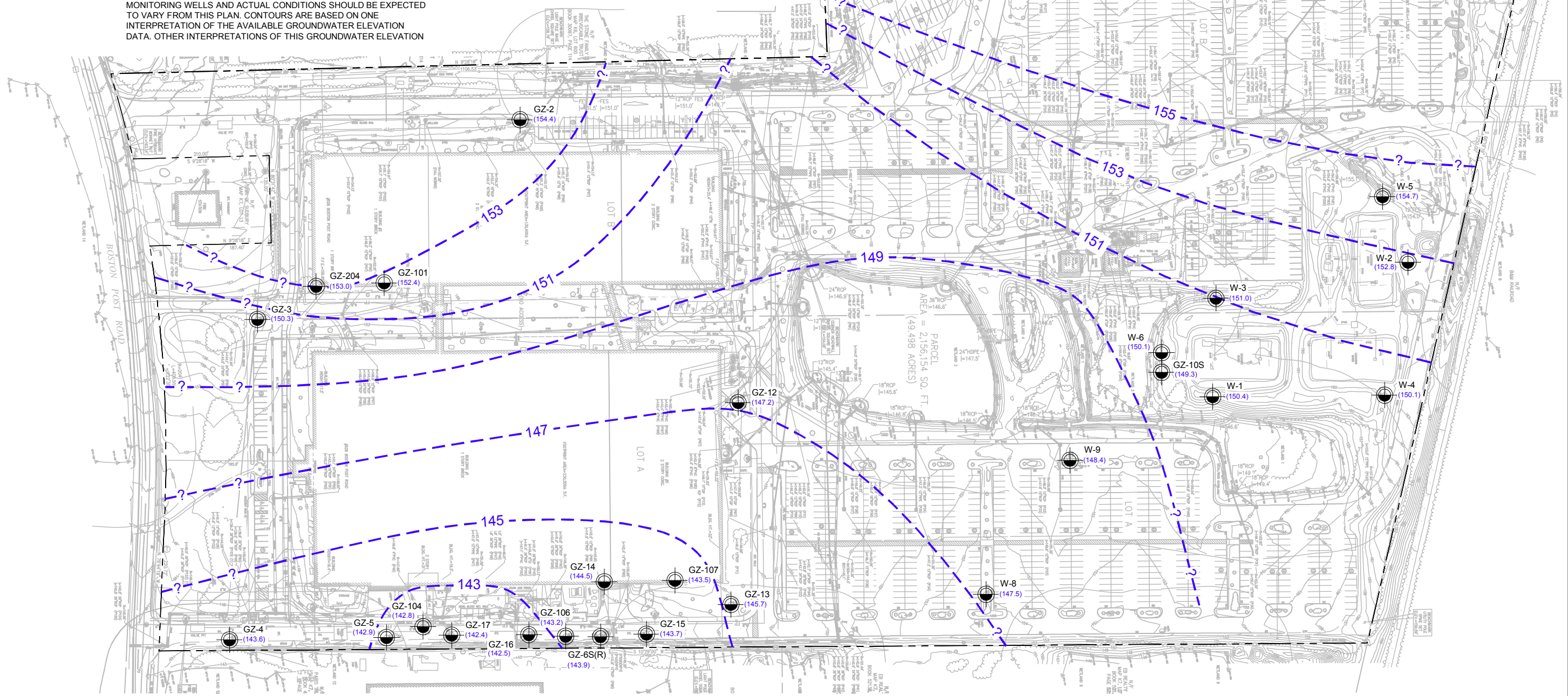
1. THE BASE MAP WAS DRAWN FROM A PLAN ENTITLED, "EXISTING CONDITIONS PLAN OF LAND", PREPARED BY VANASSE HANGEN BRUSTLIN, INC. (VHB) OF WATERTOWN, MA, DATED OCTOBER 12, 2015 WITH AN ORIGINAL SCALE OF 1" = 40'.
2. APPROXIMATE LOCATIONS OF EXPLORATIONS ARE BASED ON PLANS BY OTHERS. THIS DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.
3. APPROXIMATE ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATIONS WERE CALCULATED FROM MARCH 19, 2015 GROUNDWATER DATA, COLLECTED BY GZA GEOENVIRONMENTAL, INC. (GZA), WITH AN ADDITIONAL 1.51 FEET ADDED IN ACCORDANCE WITH USGS FRIMPTER METHOD. ONLY THE EXPLORATIONS WITH GROUNDWATER DATA USED TO DEVELOP THE APPROXIMATE GROUNDWATER CONTOURS ARE SHOWN.
4. APPROXIMATE SEASONAL HIGH SURFACE WATER ELEVATIONS WERE ESTIMATED TO BE APPROXIMATELY 1 FOOT ABOVE NORMAL OBSERVED WATER LEVELS.
5. APPROXIMATE GROUNDWATER ELEVATION CONTOURS ARE INTENDED TO SHOW GENERAL TRENDS IN GROUNDWATER ELEVATION. THE CONTOURS ARE BASED ON A NETWORK OF WIDELY SPACED MONITORING WELLS AND ACTUAL CONDITIONS SHOULD BE EXPECTED TO VARY FROM THIS PLAN. CONTOURS ARE BASED ON ONE INTERPRETATION OF THE AVAILABLE GROUNDWATER ELEVATION DATA. OTHER INTERPRETATIONS OF THIS GROUNDWATER ELEVATION

DATA ARE POSSIBLE. GROUNDWATER ELEVATIONS WILL VARY SEASONALLY BASED ON PRECIPITATION, TOPOGRAPHY AND OTHER SITE FEATURES.

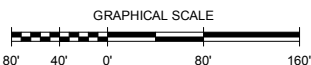
6. ELEVATIONS SHOWN REFERENCE THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88).

LEGEND:

- GZ-4  APPROXIMATE LOCATION AND DESIGNATION OF MONITORING WELL BY OTHERS
- (143.6)  ESTIMATED SEASONAL HIGH GROUNDWATER ELEVATION DATA (REFERENCING NAVD 88)
- - - - ESTIMATED SEASONAL HIGH GROUNDWATER CONTOUR LINES
- ? - ? - INFERRED SEASONAL HIGH GROUNDWATER CONTOUR LINES



**SANBORN HEAD**



NO.	DATE	DESCRIPTION	BY

DRAWN BY: C.GREEN  
 DESIGNED BY: T.ORSZULAK/D.VOLPE  
 REVIEWED BY: M.HEIL  
 PROJECT MGR: L.NORTON  
 PIC: K.STETSON  
 DATE: NOVEMBER 2015

GEOTECHNICAL CONSULTING SERVICES  
 528 BOSTON POST ROAD  
 SUDBURY, MASSACHUSETTS

**GROUNDWATER CONTOUR PLAN**  
 (BASED ON GROUNDWATER DATA COLLECTED 3/19/15)

PROJECT NUMBER:  
 3888.02

SHEET NUMBER:  
 1

0115 SANBORN HEAD ANIMATED, INC.  
 MADE IN MASSACHUSETTS  
 11/15/15 10:30 AM  
 FILE: P:\PROJECTS\528 BOSTON POST RD\GWT\GWT\_CONTOUR.dwg  
 LAYOUT: 11/15/15 10:30 AM  
 PLOT DATE: 11/15/15 10:30 AM







---

## TSS Removal Worksheets for Potential Treatment



101 Walnut Street  
 Post Office Box 9151  
 Watertown, MA 02471  
 P 617.924.1770

## TSS Removal Calculation Worksheet

Project Name:  
 Project Number:  
 Location:  
 Discharge Point:  
 Drainage Area(s):

**Meadowalk Sudbury**  
**13125.00**  
**Sudbury, MA**  
**Potential BMP Train**  
**EXAMPLE USE ONLY**

Sheet:  
 Date:  
 Computed by:  
 Checked by:

**1 of 2**  
**5-Apr-2016**  
**KEJ**  
**KFS**

### 1. Pre-Treatment prior to Infiltration

BMP*
Deep Sump and Hooded Catch Basin
Isolator Row

TSS Removal Rate*
25%
25%
0%

Starting TSS Load**
100%
75%
56%

Amount Removed (C*D)
25%
19%
0%

Remaining Load (D-E)
75%
56%
56%
44%

**Pre-Treatment TSS Removal =**

### 2. Total TSS Removal including Pretreatment 1.

BMP*
Deep Sump and Hooded Catch Basin
Subsurface Infiltration Structure

TSS Removal Rate*
25%
80%
0%
0%

Starting TSS Load**
100%
75%
15%
15%

Amount Removed (C*D)
25%
60%
0%
0%

Remaining Load (D-E)
75%
15%
15%
15%

\* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.  
 \*\* Equals remaining load from previous BMP (E)

**Treatment Train  
 TSS Removal =**

<b>85%</b>
------------



101 Walnut Street  
 Post Office Box 9151  
 Watertown, MA 02471  
 P 617.924.1770

## TSS Removal Calculation Worksheet

Project Name: **Meadowalk Sudbury**  
 Project Number: **13125.00**  
 Location: **Sudbury, MA**  
 Discharge Point: **Potential BMP Train**  
 Drainage Area(s): **EXAMPLE USE ONLY**

Sheet: **2 of 2**  
 Date: **5-Apr-2016**  
 Computed by: **KEJ**  
 Checked by: **KFS**

### 1. Pre-Treatment prior to Infiltration

BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	25%	100%	25%	75%
Sediment Forebay	25%	75%	19%	56%
	0%	56%	0%	56%
			<b>Pre-Treatment TSS Removal =</b>	
			<b>44%</b>	

### 2. Total TSS Removal including Pretreatment 1.

BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	25%	100%	25%	75%
Bioretention Area	90%	75%	68%	8%
	0%	8%	0%	8%
	0%	8%	0%	8%
			<b>Treatment Train TSS Removal =</b>	
			<b>93%</b>	

\* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.

\*\* Equals remaining load from previous BMP (E)



# Appendix C

## FEMA Flood Insurance Rate Map

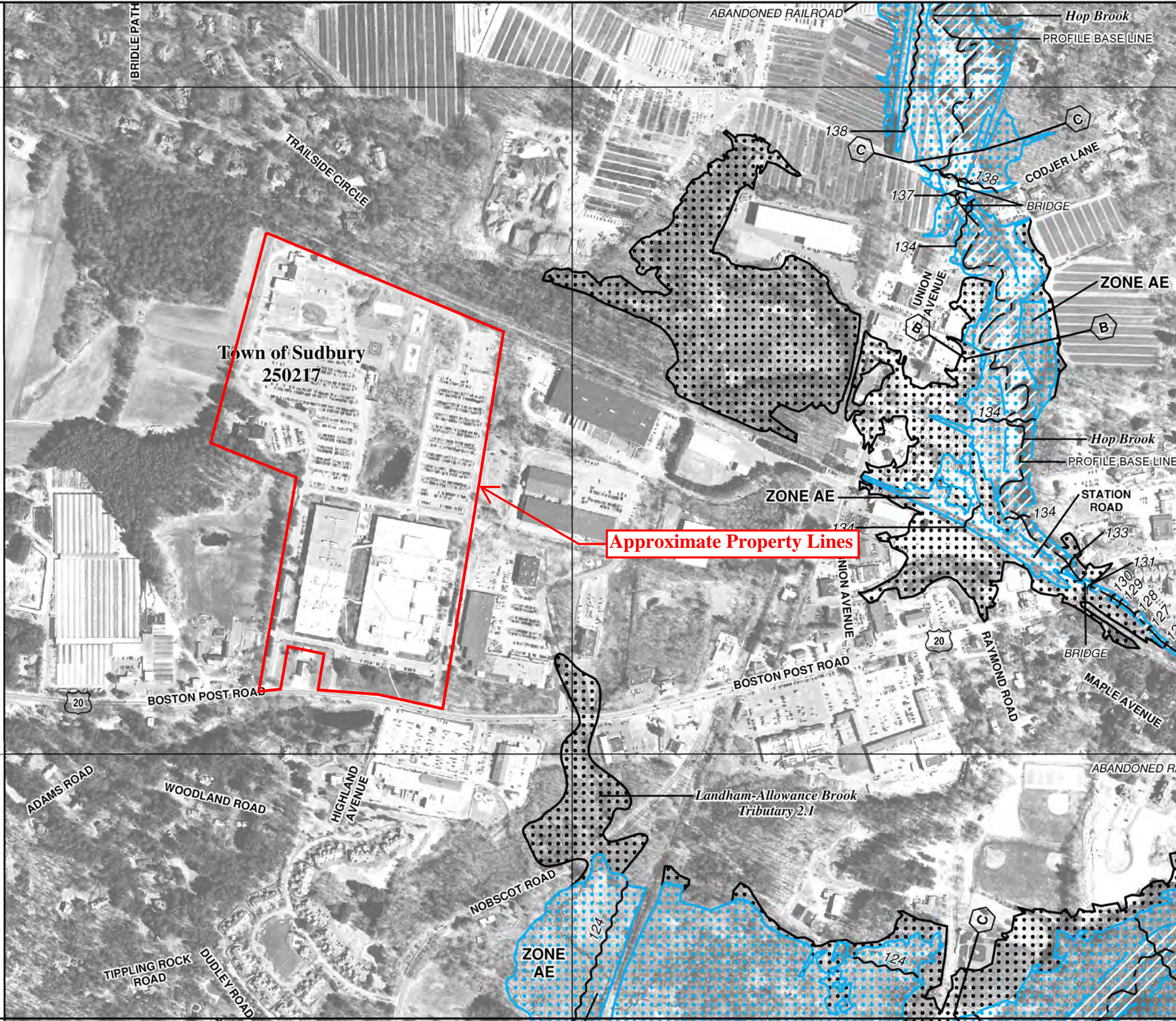
- ▶ FEMA Flood Insurance Rate Map Number: 25017C0506F dated July 7, 2014



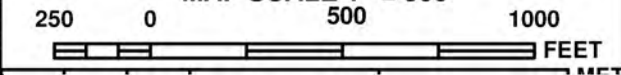
902000 M

901000 M

JOINS PANEL 0502



MAP SCALE 1" = 500'



PANEL 0506F

**FIRM**  
 FLOOD INSURANCE RATE MAP  
 MIDDLESEX COUNTY,  
 MASSACHUSETTS  
 (ALL JURISDICTIONS)

PANEL 506 OF 656  
 (SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
FRAMINGHAM, TOWN OF	250193	0506	F
SUDBURY, TOWN OF	250217	0506	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER  
 25017C0506F  
 MAP REVISED  
 JULY 7, 2014

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)



# LEGEND



## SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

**ZONE A** No Base Flood Elevations determined.

**ZONE AE** Base Flood Elevations determined.

**ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

**ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

**ZONE AR** Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

**ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

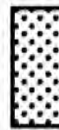
**ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

**ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.



## FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.



## OTHER FLOOD AREAS

**ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.



## OTHER AREAS

**ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.

**ZONE D** Areas in which flood hazards are undetermined, but possible.



MAP SCALE 1" = 500'

500

0

250

1000

FEET

METERS



PANEL 0506F

## FIRM FLOOD INSURANCE RATE MAP MIDDLESEX COUNTY, MASSACHUSETTS (ALL JURISDICTIONS)

PANEL 506 OF 656  
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

### CONTAINS:

COMMUNITY	TOWN OF	NUMBER	PANEL	SUFFIX
FRAMINGHAM	TOWN OF	25018D	0506	F
SUBURBY	TOWN OF	25021T	0506	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.



MAP NUMBER  
25017C0506F  
MAP REVISED  
JULY 7, 2014  
Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at [www.msc.fema.gov](http://www.msc.fema.gov)







# Appendix D

## Nobscot Watershed Overview



## Nobscot Watershed

### Overview

The Nobscot watershed is located on the southern border of the Town of Sudbury. It spans an area north from the Framingham town line, south including the Raytheon property and behind 1776 Plaza, east from the summit of Nobscot Hill and the Weisblatt conservation land, and west including the confluence of Allowance and Hop brooks and the un-named pond on Warren Road. The watershed continues to the south into the Town of Framingham. Allowance Brook enters Sudbury flowing north from Framingham and is the drainage point of this watershed where it joins with Hop Brook. Pond NS2 also known as Nupsee or Nupsi Pond is a large vernal pool in the main part of the Nobscot Scout Reservation and has no stream outlet. Pond NS11 (the largest in this watershed) on Warren Road drains via NSe north into Allowance Brook, the northeast side of Nobscot Hill drains via NSf to Allowance with several un-named ponds and vernal pools along the way, and the area north and south of Route 20 at Raytheon drains via NSd to Allowance also with several small ponds. There are two Town Wells, one on the abandoned Conrail bed and one on Raymond Road. Conservation land in the watershed includes: the Nobscot Scout Reservation, the Conrail bed, the SVT Lyons-Cutler Reservation and several Sudbury Conservation properties.

