G - Stormwater Management Summary

Memorandum

To: Rachel Borgatti
Somerville Conservation Commission
Somerville City Hall
93 Highland Avenue
Somerville, MA 02143

Date: July 5, 2018

Project #: 14000.01

From: Peter Mara, P.E.

Re: Alta XMBLY, Notice of Intent
Supplemental Stormwater Memo
290 Revolution Drive
Somerville, Massachusetts

This memorandum summarizes the stormwater management system for the proposed Alta XMBLY (the "Project") as part of the master plan XMBLY Planned Unit Development (PUD) located at 290 Revolution Drive in the Assembly Square Mixed-Use District in Somerville, Massachusetts (the "Site"). Alta XMBLY focuses on Block 23 of the XMBLY PUD. See Figure 1 for a Site Locus Plan. XMBLY is a mixed-use development that recently received Planned Unit Development – Preliminary Master Plan approval by the City of Somerville on June 7, 2018.

The northeast corner of Alta XMBLY and adjacent Road L are to redevelop a parcel of land, subject to an Order of Conditions issued on May 8, 2009. This Order of Conditions was issued to the Assembly on Mystic Proposed 72-inch Storm Drain and Outfall Notice of Intent (NOI) dated November 21, 2008 submitted to the City of Somerville during the development of the neighboring Assembly Row development. The Project's proposed stormwater management system design remains generally consistent with the stormwater management plan outlined in the previous site plan filings with the City of Somerville Planning Board and Conservation Commission.

The portion of Site that falls under the area that was part of the November 21, 2008 NOI labeled as Drainage Area designated "S2", as shown on Figure 2, which contributes to the 72-inch outfall at the Mystic River, downstream of the Amelia Earhart Dam. Drainage Area "S2" is the only portion of the Site that is under the subject of the 2009 Order of Conditions. The memorandum focuses on the parts of the Site that contribute runoff to Drainage Area "S2", which includes the eastern half of Road L, sidewalk along Grand Union Boulevard and Road L, and part of the Alta XMBLY building footprint. The second drainage area, "P-23", consists of the remainder of the proposed Alta XMBLY building, sidewalk, planters, and permeable pavers, and does not fall under the jurisdiction of the November 2008 NOI. Both Drainage Areas contribute stormwater runoff to the existing 72-inch outfall in the existing conditions and propose to improve stormwater quality by reducing impervious surface parking area.

Hydrologic Analysis:

Existing Conditions

The Project is planned to be the first block developed at XMBLY. Under existing conditions, XMBLY has two drainage discharge points. The eastern half of the XMBLY development conveys the stormwater runoff to the existing stormwater infrastructure in Foley Street and Grand Union Boulevard, which flows East to the recently built 72-inch drainage outfall and ultimately discharging to the Mystic River downstream of the Amelia Earhart Dam. The western

101 Walnut Street
PO Box 9151
Watertown, MA 02472-4026
P 617.924.1770

half of XMBLY conveys the stormwater runoff to the existing stormwater infrastructure near the intersection of Foley Street and Middlesex Avenue, which flows North to the existing 84-inch drainage outfall and ultimately discharging in the Mystic River downstream of the Amelia Earhart Dam. See Figure 3 for XMBLY's existing drainage boundaries.

Figure 5 shows the existing portions of Drainage Area "S2", for the development of Alta XMBLY, which consists mostly of a paved surface parking lot, a grass slope in poor condition, gravel surface, sidewalk, and a temporary construction trailer. Much of the runoff flows towards an area drain next to the temporary construction trailer that conveys the stormwater runoff into the closed pipe network in Grand Union Boulevard, ultimately reaching the 72-inch outfall. Currently the stormwater runoff generated in Drainage Area "S2" does not receive any water quality treatment prior to the 72-inch outfall.

Drainage Area "P-23" consists primarily of paved surface parking lot with minimal landscape islands. The existing surface parking lot generates stormwater runoff that is collected by catch basins that convey the runoff to a closed pipe network that connects into the existing drainage infrastructure in Foley Street prior to discharging at the existing 72-inch outfall on the Mystic River. No water quality treatment is provided under existing conditions for the runoff collected in Drainage Area "P-23" currently. Table 1 below provides a summary of the existing conditions hydrologic data.

Table 1
Existing Conditions Hydrologic Data

Description (Drainage Area #)	*Discharge Location*	*Design Point*	*Area (acres)*	*Curve Number*	*Time of Concentration (min)*
S2	*Area Subject to NOI*	*DP-1*	*0.2*	*91*	*5.0*
S3	*Area Not Subject to NOI*	*DP-1*	*1.6*	*97*	*5.0*
		Total:	1.8		

According to the National Resources Conservation Service (NRCS), surface soils in the Site include Urban Land with a Wet Substratum and Udorthents. Based on the soil type identified by the NRCS, included in Attachment 2, the Project is not considered to be within an area of rapid infiltration (soils with a saturated hydraulic conductivity greater than 2.4 inches per hour).

Proposed Conditions

An overall goal of the XMBLY stormwater design is to provide a comprehensive stormwater management system designed to enhance the water resources both on the XMBLY Site and downstream of the master development. XMBLY will vastly improve the existing conditions on the Site and accomplish this goal by:

- Implementing an environmentally sensitive site design that creates additional open space areas and significantly reduces the amount of on-site paved surface parking areas thereby re-establishing components of a natural water cycle (evapotranspiration, groundwater recharge and runoff) on the Site.
- Improving the surface water and groundwater quality by implementing integrated stormwater controls throughout the Project area including the use of Low Impact Development (LID) techniques, where feasible, as well as traditional stormwater Best Management Practices (BMPs) combined with a thorough Operation and Maintenance Plan.
- The stormwater management system is designed to attenuate the peak rate and volume of runoff to meet existing conditions.

XMBLY, under proposed master plan conditions, maintains the existing hydrologic conditions and corresponding drainage boundaries (see Figure 4 for XMBLY's proposed drainage areas). The eastern half of XMBLY's Site will convey stormwater runoff to the 72-inch outfall and the western half will convey stormwater to the 84-inch outfall. Alta XMBLY at XMBLY proposes to maintain these master plan drainage patterns. The Project proposes to remove approximately 62,400 SF of impervious surface parking area. This removal of surface parking is an immediate improvement on the Site.

As shown in Figure 6, under proposed conditions, the Project is split into two drainage areas, "S2" and "P-23". The Project proposes an eight-story mixed-use building with retail and townhomes on the first floor and residential units on the upper floors. The proposed Alta XMBLY is flat, with sidewalks, planters, permeable pavers, and tree pits surrounding the building. Road L is a two-way roadway, with 12-foot southern lane and 15-foot northern lane and crowned 2% cross-slopes sloping down towards the six-inch vertical granite curb lines. Road L has a high point in the center of the road, aligned with the middle of the curb apron on the northern side of Alta XMBLY. The eastern half of the roadway grades to a series of catch basins and tree box filters, providing water quality treatment and 80% Total Suspended Solids (TSS) removal prior to conveying the stormwater runoff through a closed pipe network that connects into the existing 72-inch trunkline in Grand Union Boulevard. This runoff pattern is generally unchanged from the November 2008 NOI, thought he layout of the Assembly Row roadways has been revised slightly and the Partners Office project has been included instead of the IKEA project on Parcel 11A.

The two proposed drainage areas are the same under existing conditions. The stormwater runoff generated in Drainage Area "S2" falls under the jurisdiction of the November 2008 NOI and May 2009 Order of Conditions, thus subject to following the ten Massachusetts Department of Environmental Protection (MassDEP) Stormwater Standards. The stormwater runoff generated by Drainage Area "P-23" is not under the jurisdiction of an existing Order of Condition and does not fall within 100-feet of an environmentally sensitive area, thus is not required to follow the ten MassDEP Stormwater Standards.

Table 2 below provides a summary of the proposed conditions hydrologic data for the Project.

Table 2
Proposed Conditions Hydrologic Data

Description (Drainage Area #)	*Discharge Location*	*Design Point*	*Area (acres)*	*Curve Number*	*Time of Concentration (min)*
S2	*Road L - Area Subject to NOI*	*DP-1*	*0.1*	*98*	*5.0*
P-23	*Alta XMBLY - Area Not Subject to NOI*	*DP-1*	*1.7*	*96*	*5.0*
		Total:	1.8		

A revised hydrologic analysis was conducted for the site based on the input parameters described above. As in the previous submission, the rainfall-runoff response of the Site under existing and proposed conditions was evaluated for storm events with recurrence intervals of 2, 10, 25, and 100-years. Rainfall volumes used for this analysis were based on the Natural Resources Conservation Service (NRCS) Type III, 24-hour storm event for Middlesex County. Runoff coefficients for the existing and proposed conditions were determined using NRCS Technical Release 55 (TR-55) methodology as provided in HydroCAD.

Drainage areas used in the analyses are represented above and are depicted on the attached Figures 5 and 6. Table 3 presents a summary of the existing and proposed conditions peak discharge rates.

Table 3
Peak Discharge Rates (cubic feet per second)

Design Point DP-1 72-inch Outfall	*2-year*	*10-year*	*25-year*	*100-year*
Existing	*5.27*	*8.14*	*10.37*	*14.90*
Proposed	*5.29*	*8.17*	*10.40*	*14.93*

Water Quality

The stormwater management system provides the required treatment for a 1-inch water quality volume. Only the roadway areas tributary to Drainage Area "S2" will be subject to water quality. The rest of the Site is considered clean sidewalks and rooftops, neither of which are accessible to vehicular traffic.

The eastern half of the roadway grades to a series of catch basins and tree box filters, providing water quality treatment and 80% Total Suspended Solids (TSS) removal prior to conveying the stormwater runoff through a closed pipe network that connects into the existing 72-inch trunkline in Grand Union Boulevard. The pipe sizing and TSS removal calculations can be found in Attachment 3.

Water quality treatment for Alta XMBLY and Road L runoff consists of an operation and maintenance program for water quality measures and a construction phase spill prevention plan.

Operation and Maintenance (O&M) Program

A detailed Stormwater O&M program has been prepared for the Project. This plan includes detailed inspection criteria and identifies the responsible parties for implementing the program. In summary, The City of Somerville will be responsible for the maintenance and operation of the street drainage system, including street sweeping, catch basin and manhole cleaning, and maintenance of the street related structures. WP East Acquisitions, L.L.C. will be responsible for the maintenance and operation of the Alta XMBLY stormwater management systems including inspection, cleaning and maintenance of the drainage structure, and tree box filters on the site.

Spill Prevention

A spill prevention and control plan is an important Best Management Practice (BMP) to help minimize potential sources of pollution to ground and surface waters both during construction and as part of the long-term operation and maintenance measures of a development. Spill prevention is achieved with the proper storage and handling of hazardous materials. During construction, this is addressed in the Stormwater Pollution Prevention Plan (SWPPP) for Construction Activities to be prepared and implemented by the Site Contractor.

Tree Box Filters

The Filterra tree box filters (or approved equal) efficiently remove TSS from the stormwater runoff, including runoff generated by Road L and the sidewalks adjacent to Road L that fall under the Drainage Area "S2". These tree box filters provide the only water quality for the Project's proposed roadway pavement prior to discharging to the 72-inch outfall on the Mystic River.

The tree box filters will be inspected and cleaned twice a year. For the first year, the Supplier shall inspect and clean the units, and then the Owner will inspect and clean twice a year after that initial first year.

Compliance with Massachusetts Department of Environmental Protection (DEP) - Stormwater Management Standards

As demonstrated below, the proposed Project complies with the DEP Stormwater Management Standards to the maximum extent practicable.

Standard 1: No New Untreated Discharges or Erosion to Wetlands

The stormwater runoff generated within Drainage Area "S2" and tributary to the existing 72-inch outfall will receive water quality treatment in conformance with the Best Management Practices outlined in the Stormwater Management Performance Standards and Guidelines. The Alta XMBLY redevelopment and proposed Road L will result in improvements to the quality of stormwater discharged from the Project Site. These improvements will be achieved by reducing the overall amount of paved vehicular area; increasing the amount of pervious area; a combination of structural and non-structural BMPs implemented at the Project Site such as regular pavement sweeping and litter control program, installation of permeable pavers and tree box filters. During the Assembly Row development, outfall erosion protection sizing computations were provided in the November 2008 NOI.

Standard 2: Peak Rate Attenuation

The Project has been designed to comply with Standard 2 to the maximum extent practicable.

The construction of Road L and Alta XMBLY will result in an increase of approximately 6,300 square feet of impervious area. The decrease in pervious area on site minimally increases peak rates. The increase in peak rates are negligible. As presented in the approved XMBLY PUD-PMP submission, the overall master plan XMBLY project site decreases the total amount of impervious area. The only increase in impervious area within the limits of the XMBLY master plan development occurs within the project limits of Alta XMBLY.

The peak discharge rates for the 2, 10, 25, and 100-year storm events for Design Points 1 and 2 (DP-1 and DP-2) are included in Table 3 and the HydroCAD models can be found in Attachment 4.

Standard 3: Stormwater Recharge

The pre-development condition of the Project Site was almost completely impervious and little if any infiltration existed. Also, soil on the Project Site is contaminated, compacted fill material, or poor-quality material which makes it unsuitable for infiltration. Additionally, there are no drinking water supplies on or near the Project Site that require recharge. Finally, the Project is located at the terminus of the Mystic River and therefore any infiltration on the site is an insignificant portion of the flows that are supplying the river.

Standard 4: Water Quality

The Project Site is a dense ultra-urban redevelopment on a brownfield site. However, water quality treatment for runoff from the Project Site meets or exceeds the goal of 80% TSS Removal. TSS Removal worksheets are included in Attachment A of this memorandum. Due to the urban nature of the Project and the goal for maximizing dense development opportunities, water quality treatment techniques consistent with urban area constraints were selected.

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

The Project Site is a brownfield site which is a LUHPPL. Stormwater management BMP's have been selected and designed to comply with this standard. Under existing conditions infiltration is not currently significant at the Project Site and as described above infiltration is not recommended or proposed. Tree filter boxes and extensive operations and maintenance requirements address the concerns for LUHPPLs. No surface parking is included on the Project Site with the vehicle parking located in covered garages, therefore reducing the effect of the LUHPPL's impervious area to a level of typical roadways.

Standard 6: Critical Areas

The existing MWRA 84-inch SMC and the proposed 72-inch outfall will discharge to a "Prohibited" shellfish growing area. Stormwater discharging to this area is treated for 1-inch of runoff and will utilize the applicable stormwater management BMPs approved for critical areas.

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

The Project, while a redevelopment project as defined by the regulations, complies with the Stormwater Standards to the maximum extent practicable. The proposed stormwater management system improves water quality and reduces runoff volume to the existing 72-inch outfall. Refer directly to each Standard for applicable computations and supporting information demonstrating compliance with each.

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

The Project will disturb greater than one acre of land and is therefore required to obtain coverage under the Environmental Protection Agency (EPA) National Pollutant Discharge Elimination System (NPDES) Construction General Permit. As required under this permit, a Stormwater Pollution Prevention Plan (SWPPP) will be developed and submitted before land disturbance begins. Recommended construction period pollution prevention and erosion and sedimentation controls to be finalized in the SWPPP are included in Attachment 4.

Standard 9: Operation and Maintenance Plan

In compliance with Standard 9, a Post Construction Stormwater Operation and Maintenance (O&M) Plan has been developed for the Project. The O&M Plan is included in Attachment 5 as part of the Long-Term Pollution Prevention Plan.

Standard 10: Prohibition of Illicit Discharges

Sanitary sewer and storm drainage structures remaining from previous development which are part of the redevelopment area will be removed or will be incorporated into updated sanitary sewer and separate stormwater sewer systems. The design plans submitted with this report have been designed so that the components included therein are in full compliance with current standards. No statement is made regarding the drainage and sanitary sewer systems in portions of the site not included in the redevelopment project area. The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges.

Figures

- Figure 1 – Site Location Map
- Figure 2 – November 2008 NOI Proposed Conditions Drainage Figure
- Figure 3 – XMBLY Existing Conditions Drainage Figure
- Figure 4 – XMBLY Proposed Conditions Drainage Figure
- Figure 5 – Alta XMBLY Existing Conditions Drainage Figure
- Figure 6 – Alta XMBLY Proposed Conditions Drainage Figure
- Figure 7 – FEMA FIRMette

Attachments

- Attachment 1
    - DEP Checklist for Stormwater Report
- Attachment 2
    - NRCS Web Soil Survey
- Attachment 3
    - TSS Removal Calculations

  - Pipe Conduit Sizing Calculations
  - Existing Conditions HydroCAD Model
  - Proposed Conditions HydroCAD Model
- Attachment 4
  - Long Term Stormwater Pollution Prevention Plan Operations and Maintenance (O&M)
  - O&M Checklist
  - Filterra Tree Box Filter Owner's Manual
- Attachment 5
  - List of Recommended Construction Period Erosion and Sediment Control BMPs
  - Construction Period Erosion and Sediment Control BMPs Checklist

Attachment 1

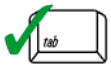
- DEP Checklist for Stormwater Report

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☒ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☒ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☒ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

☐ Site is comprised solely of C and D soils and/or bedrock at the land surface

☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000

☐ Solid Waste Landfill pursuant to 310 CMR 19.000

☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☒ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☒ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☒ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☒ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☒ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☐ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☐ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

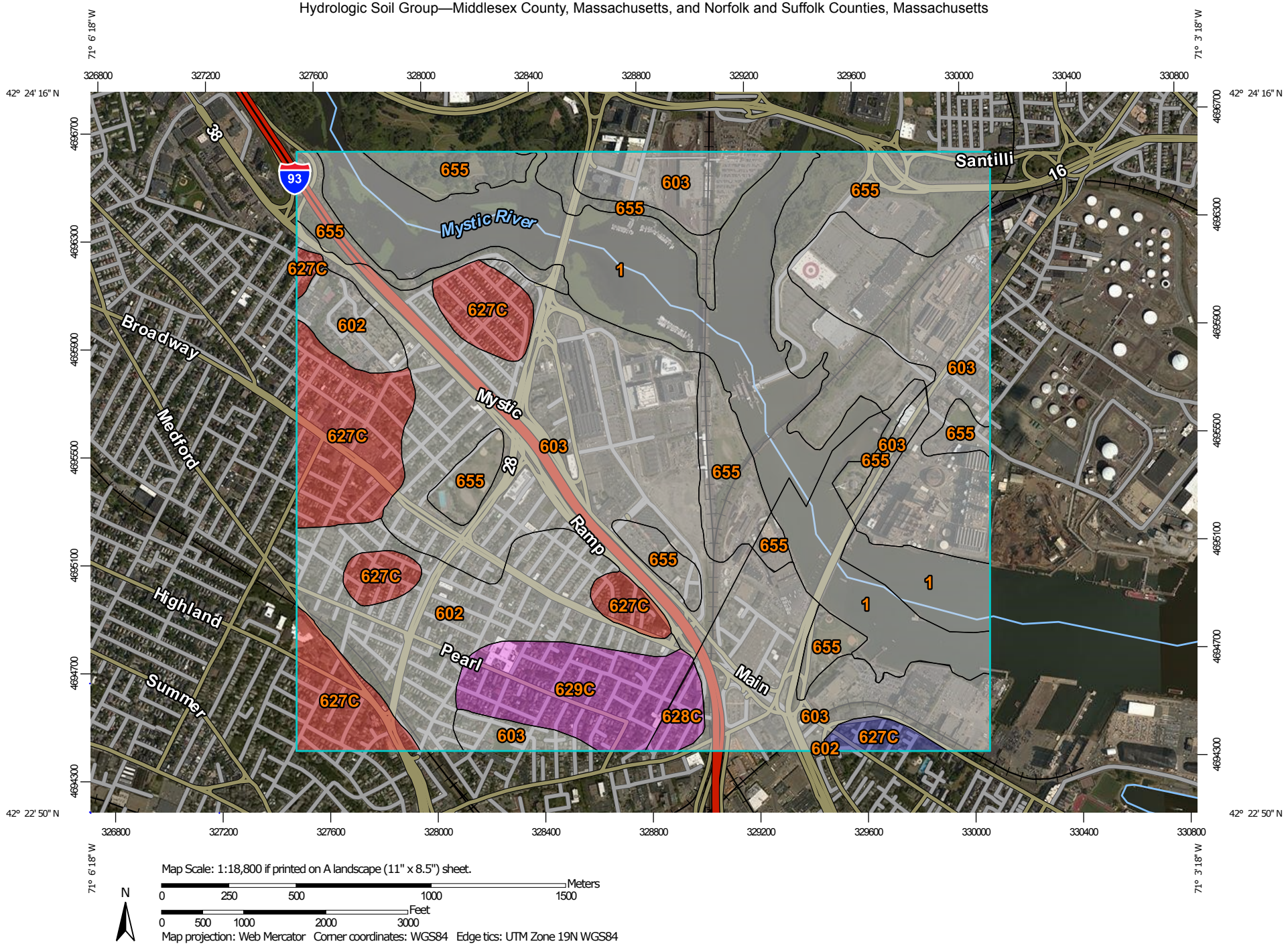
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Attachment 2

- NRCS Web Soil Survey



Map Scale: 1:18,800 if printed on A landscape (11" x 8.5") sheet.

N

0 250 500 1000 1500 Meters

0 500 1000 2000 3000 Feet

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 17, Oct 6, 2017

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 13, Oct 6, 2017

Your area of interest (AOI) includes more than one soil survey area. These survey areas may have been mapped at different scales, with a different land use in mind, at different times, or at different levels of detail. This may result in map unit symbols, soil properties, and interpretations that do not completely agree across soil survey area boundaries.

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

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 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

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		220.2	15.5%
602	Urban land		149.6	10.5%
603	Urban land, wet substratum		417.2	29.4%
627C	Newport-Urban land complex, 3 to 15 percent slopes	D	141.8	10.0%
629C	Canton-Charlton-Urban land complex, 3 to 15 percent slopes	A	63.2	4.5%
655	Udorthents, wet substratum		217.3	15.3%
Subtotals for Soil Survey Area			**1,209.5**	**85.1%**
Totals for Area of Interest			**1,420.8**	**100.0%**

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
1	Water		59.0	4.2%
602	Urban land, 0 to 15 percent slopes		0.1	0.0%
603	Urban land, wet substratum, 0 to 3 percent slopes		111.3	7.8%
627C	Newport-Urban land complex, 3 to 15 percent slopes	B	9.9	0.7%
628C	Canton-Urban land complex, 3 to 15 percent slopes	A	9.4	0.7%
655	Udorthents, wet substratum		21.4	1.5%
Subtotals for Soil Survey Area			**211.3**	**14.9%**
Totals for Area of Interest			**1,420.8**	**100.0%**

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

Attachment 3

- TSS Removal Calculations
- Pipe Conduit Sizing Calculations
- Existing Conditions HydroCAD Model
- Proposed Conditions HydroCAD Model

TSS Removal Calculation Worksheet

VHB, Inc..
101 Walnut Street
Post Office Box 9151
Watertown, MA 02471
P 617.924.1770

Project Name:	**Alta XMBLY**	Sheet:	**1 of 1**
Project Number:	**14000.01**	Date:	**July 2018**
Location:	**Somerville, MA**	Computed by:	**DRM**
Discharge Point:	**DP-1**	Checked by:	**PTM**
Drainage Area(s):	**S2**		

A	B	C	D	E
BMP*	TSS Removal Rate*	Starting TSS Load**	Amount Removed (C*D)	Remaining Load (D-E)
Treebox Filter	**80%**	**1.00**	**0.80**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**
	0%	**0.20**	**0.00**	**0.20**

* BMP and TSS Removal Rate Values from the MassDEP Stormwater Handbook Vol. 1.

** Equals remaining load from previous BMP (E)

Treatment Train TSS Removal = **80%**

101 Walnut Street
Post Office Box 9151
Watertown, MA 02471
P 617.924.1770

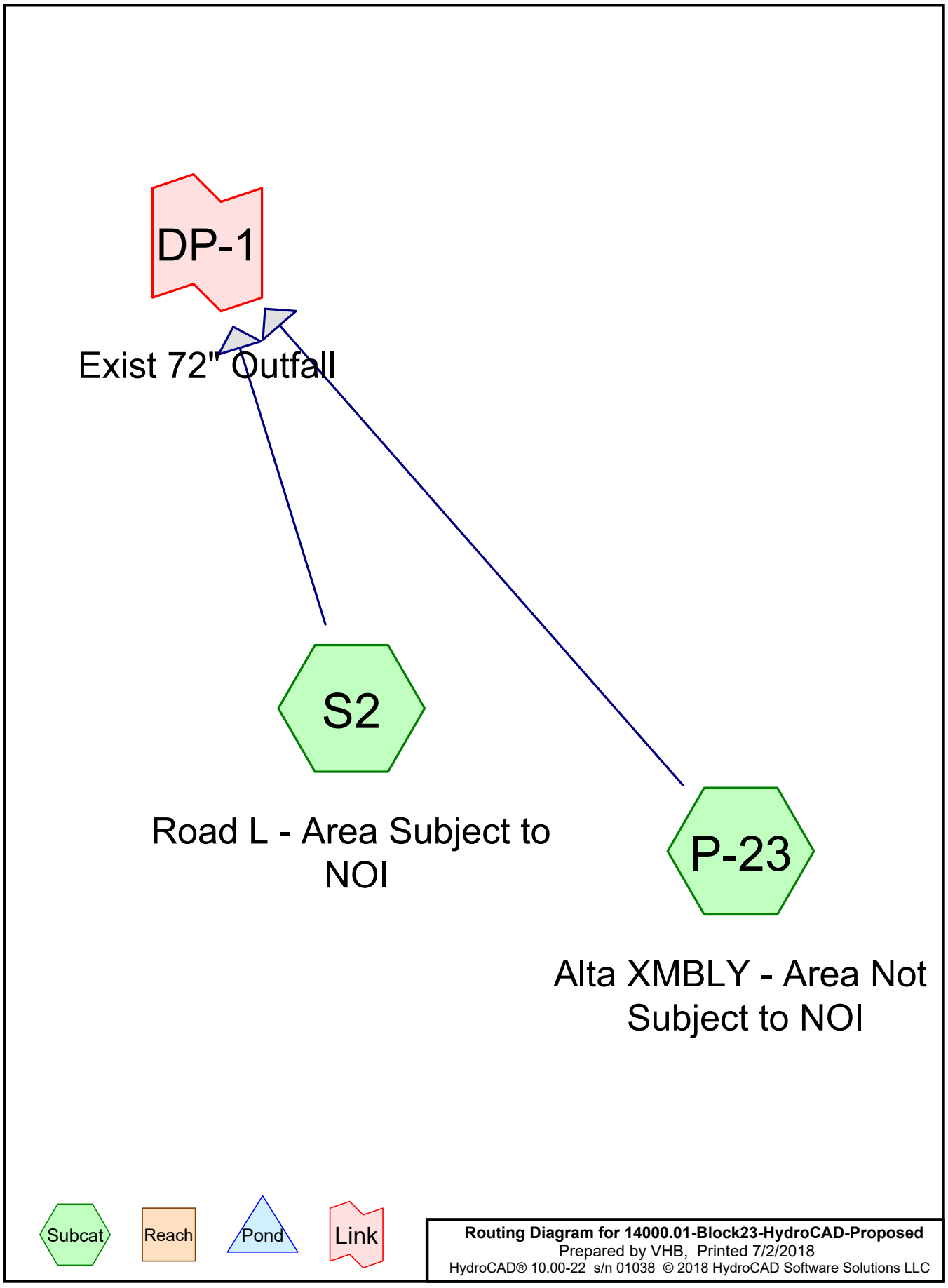
Storm Drainage Computations

Name: Alta XMBLY
Somerville, MA
Client: Wood Partners

Proj. No.: **14000.01**
Date: **7/5/2018**
Computed by: **DRM**
Checked by: **PTM**

Design Parameters:
25 **Year Storm** Boston, MA
k_e= **0.5**

DESCRIPTION	LOCATION		AREA	C	C x A	SUM	FLOW TIME (MIN)		i*	DESIGN					CAPACITY		PROFILE						
	FROM	TO	(AC.)			C x A	PIPE	CONC TIME		Q cfs	V fps	n	PIPE SIZE	SLOPE	Q full ft^3/s	V full ft/s	LENGTH ft	FALL ft	RIM	INV UPPER	INV LOWER	W.S.E. ft	Freeboard ft
	CB-12	DMH-16	0.04	0.90	0.04	0.04	0.07	5.0	6.0	0.2	2.0	0.012	12	0.0127	4.3	5.5	8	0.10	12.3	8.3	8.1	8.3	4.0
	CB-13	DMH-16	0.03	0.90	0.03	0.03	0.13	5.0	6.0	0.2	1.8	0.012	12	0.0105	4.0	5.0	14	0.15	12.2	8.2	8.0	8.2	4.0
	DMH-16	DMH-23	---	---	---	0.06	0.10	5.0	6.0	0.4	2.6	0.012	12	0.0126	4.3	5.5	16	0.20	12.4	8.0	7.7	7.9	4.5
	DMH-23	EX-DMH	---	---	---	0.06	0.70	5.0	6.0	0.4	2.2	0.012	18	0.0108	11.8	6.7	92	1.00	12.5	4.9	3.9	4.8	7.7



Routing Diagram for 14000.01-Block23-HydroCAD-Proposed
Prepared by VHB, Printed 7/2/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.170	80	>75% Grass cover, Good, HSG D (P-23, S2)
0.032	80	Permeable Pavers, HSG D (P-23)
0.012	80	Synthetic Turf (P-23)
1.604	98	Unconnected pavement, HSG D (P-23, S2)
1.818	**96**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

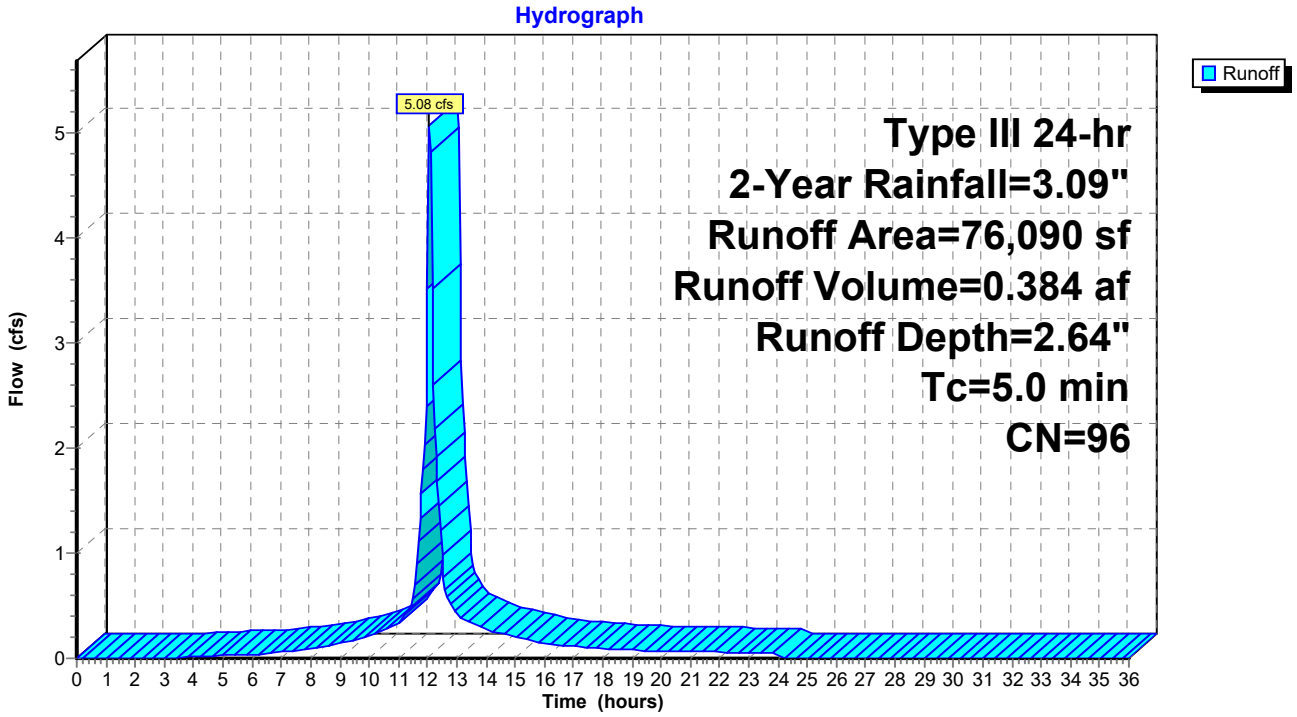
Subcatchment P-23: Alta XMBLY - Area Runoff Area=76,090 sf 87.78% Impervious Runoff Depth=2.64"
Tc=5.0 min CN=96 Runoff=5.08 cfs 0.384 af

Subcatchment S2: Road L - Area Subject to Runoff Area=3,121 sf 98.27% Impervious Runoff Depth=2.86"
Tc=5.0 min CN=98 Runoff=0.22 cfs 0.017 af

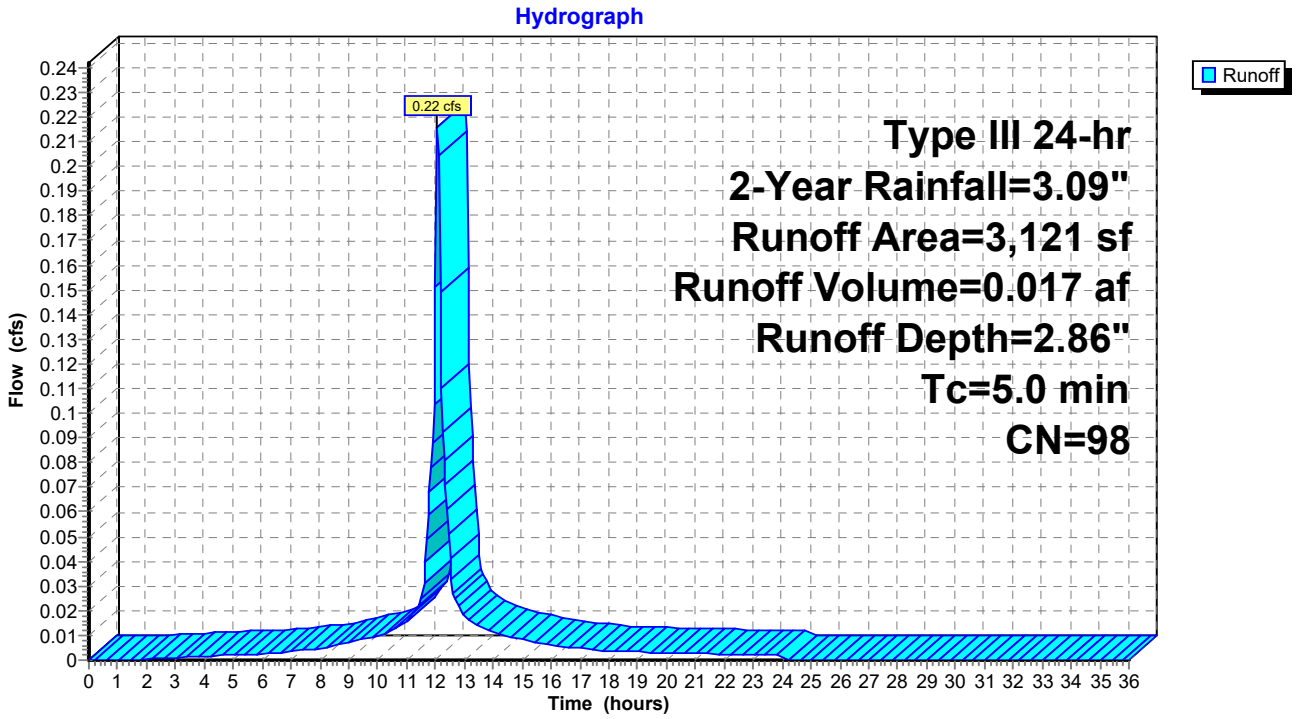
Link DP-1: Exist 72" Outfall Inflow=5.29 cfs 0.401 af
Primary=5.29 cfs 0.401 af

Total Runoff Area = 1.818 ac Runoff Volume = 0.401 af Average Runoff Depth = 2.65"
11.81% Pervious = 0.215 ac 88.19% Impervious = 1.604 ac

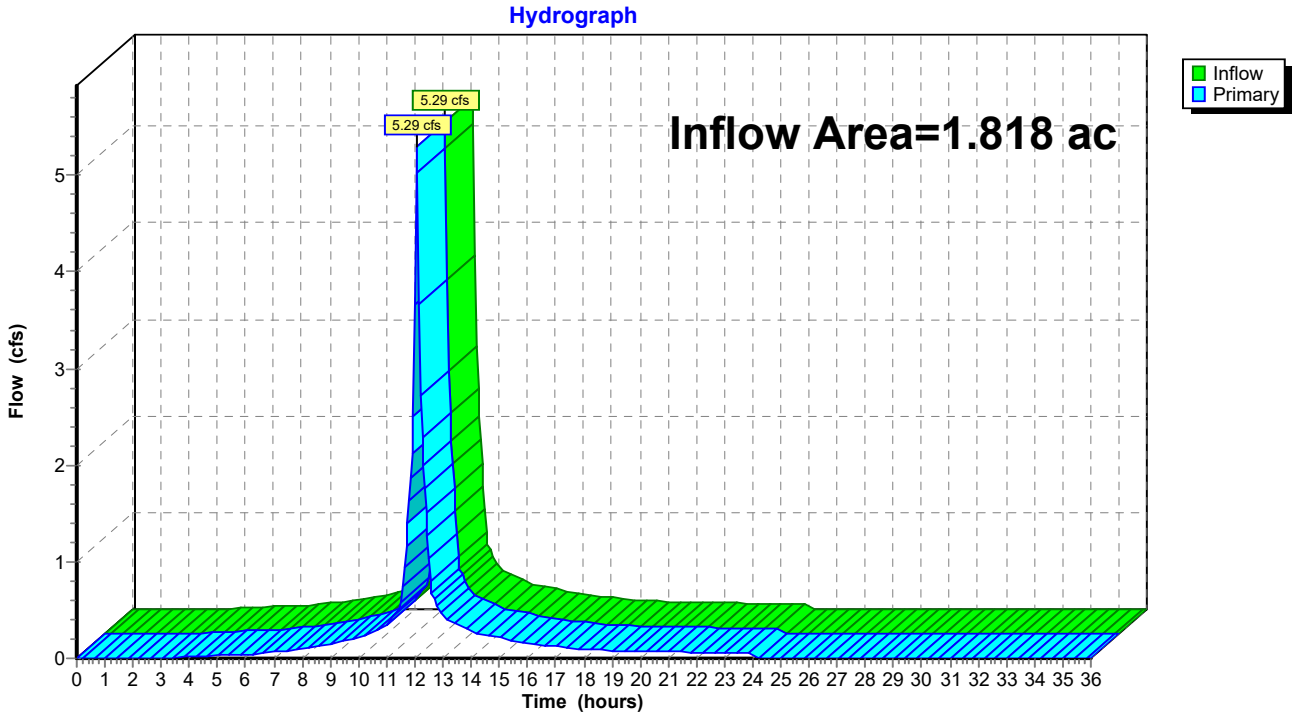
Subcatchment P-23: Alta XMBLY - Area Not Subject to NOI



Subcatchment S2: Road L - Area Subject to NOI



Link DP-1: Exist 72" Outfall



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

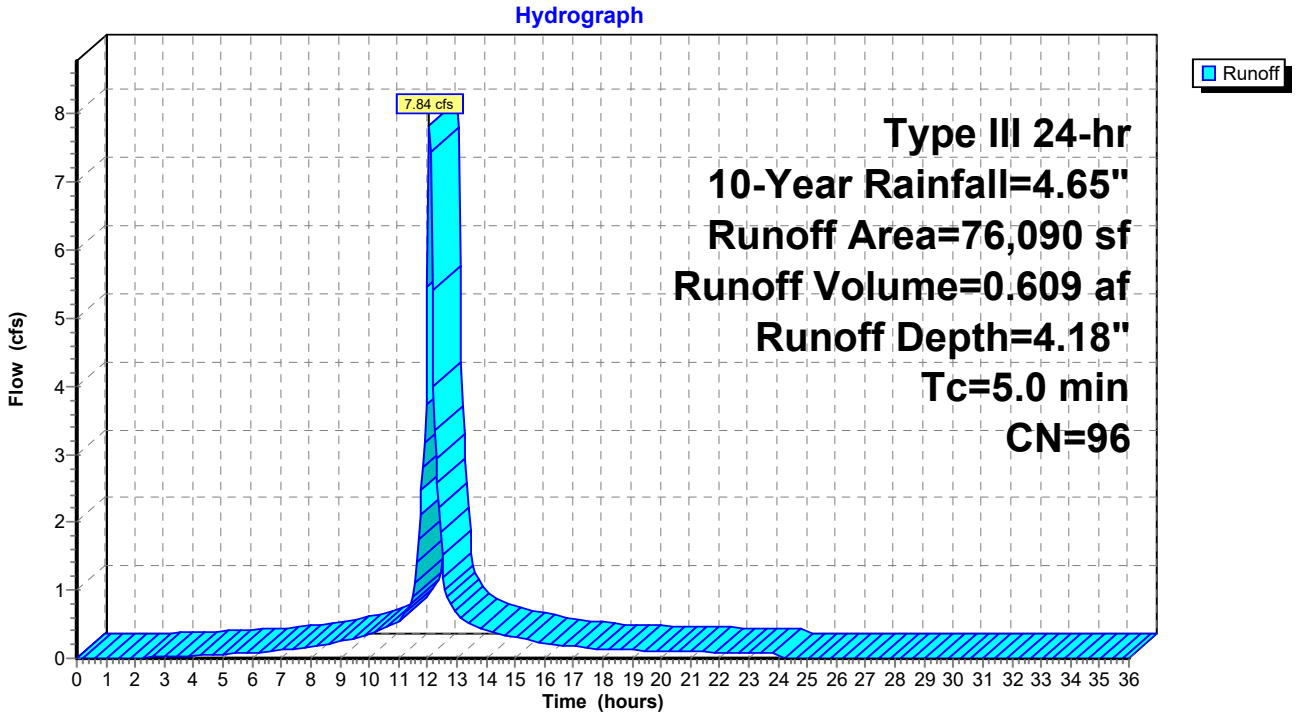
Subcatchment P-23: Alta XMBLY - Area Runoff Area=76,090 sf 87.78% Impervious Runoff Depth=4.18"
Tc=5.0 min CN=96 Runoff=7.84 cfs 0.609 af

Subcatchment S2: Road L - Area Subject to Runoff Area=3,121 sf 98.27% Impervious Runoff Depth=4.41"
Tc=5.0 min CN=98 Runoff=0.33 cfs 0.026 af

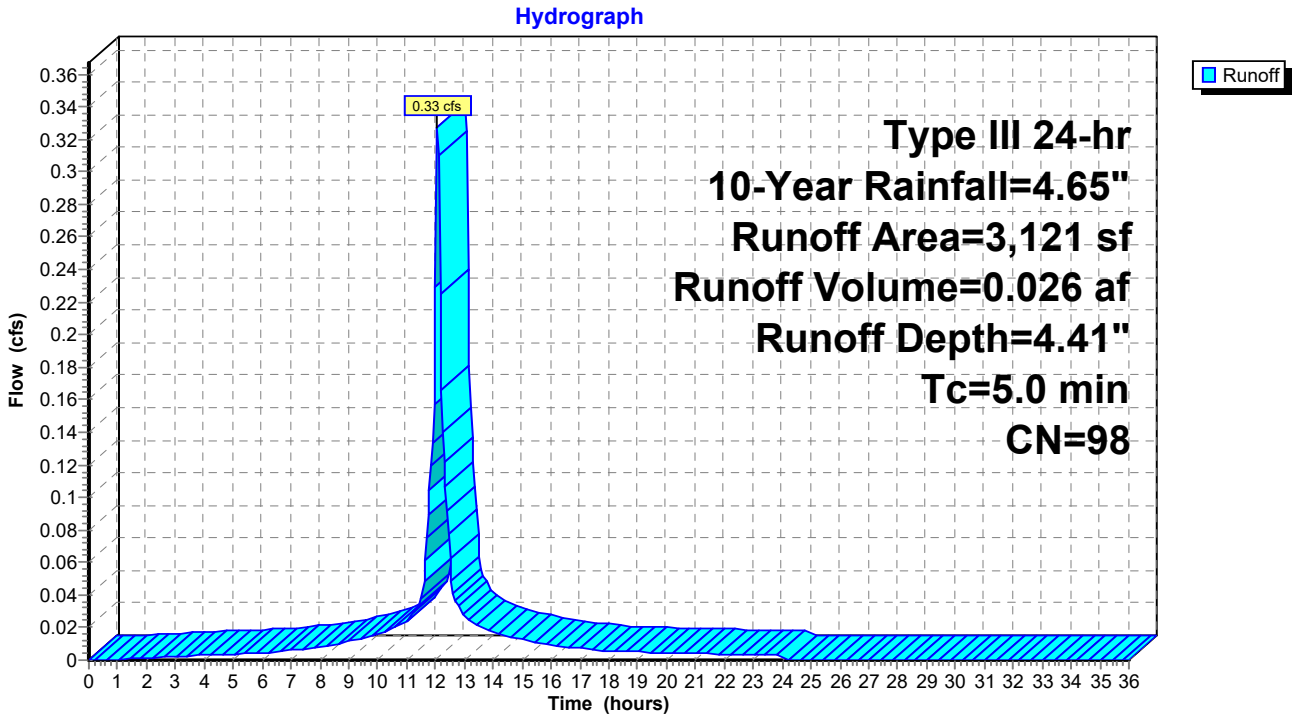
Link DP-1: Exist 72" Outfall Inflow=8.17 cfs 0.636 af
Primary=8.17 cfs 0.636 af

Total Runoff Area = 1.818 ac Runoff Volume = 0.636 af Average Runoff Depth = 4.19"
11.81% Pervious = 0.215 ac 88.19% Impervious = 1.604 ac

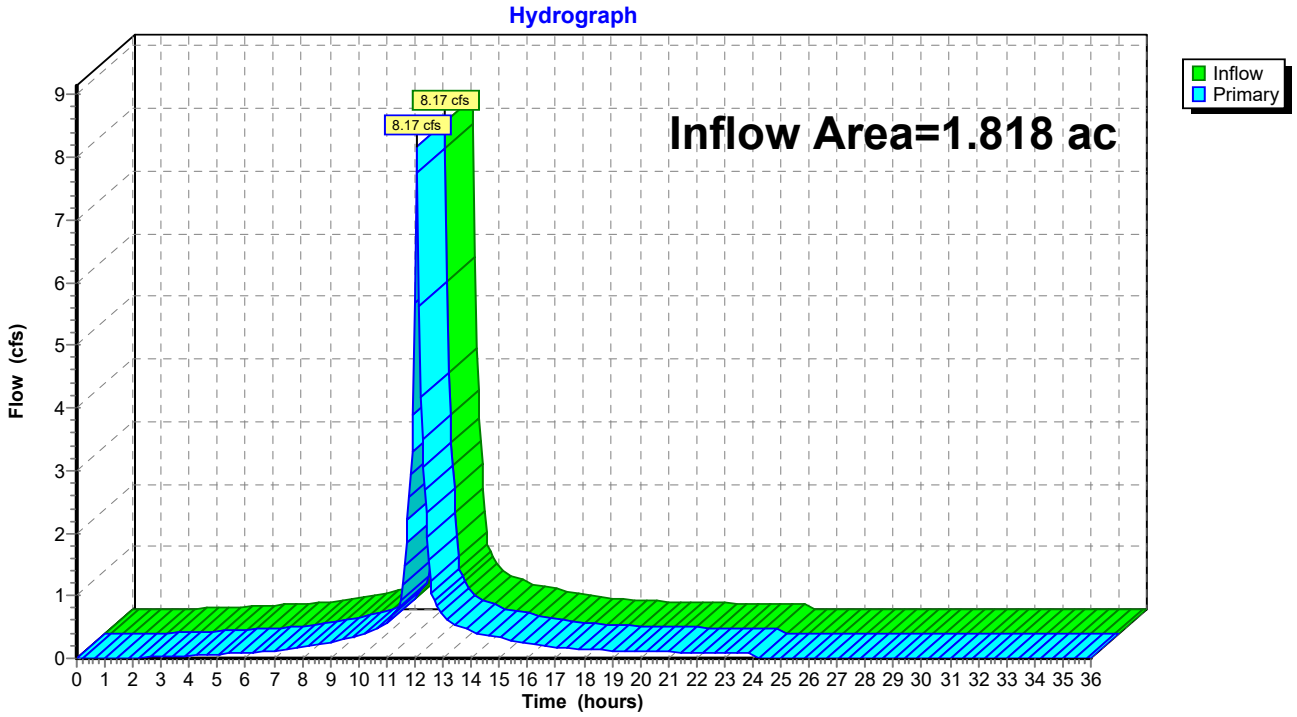
Subcatchment P-23: Alta XMBLY - Area Not Subject to NOI



Subcatchment S2: Road L - Area Subject to NOI



Link DP-1: Exist 72" Outfall



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

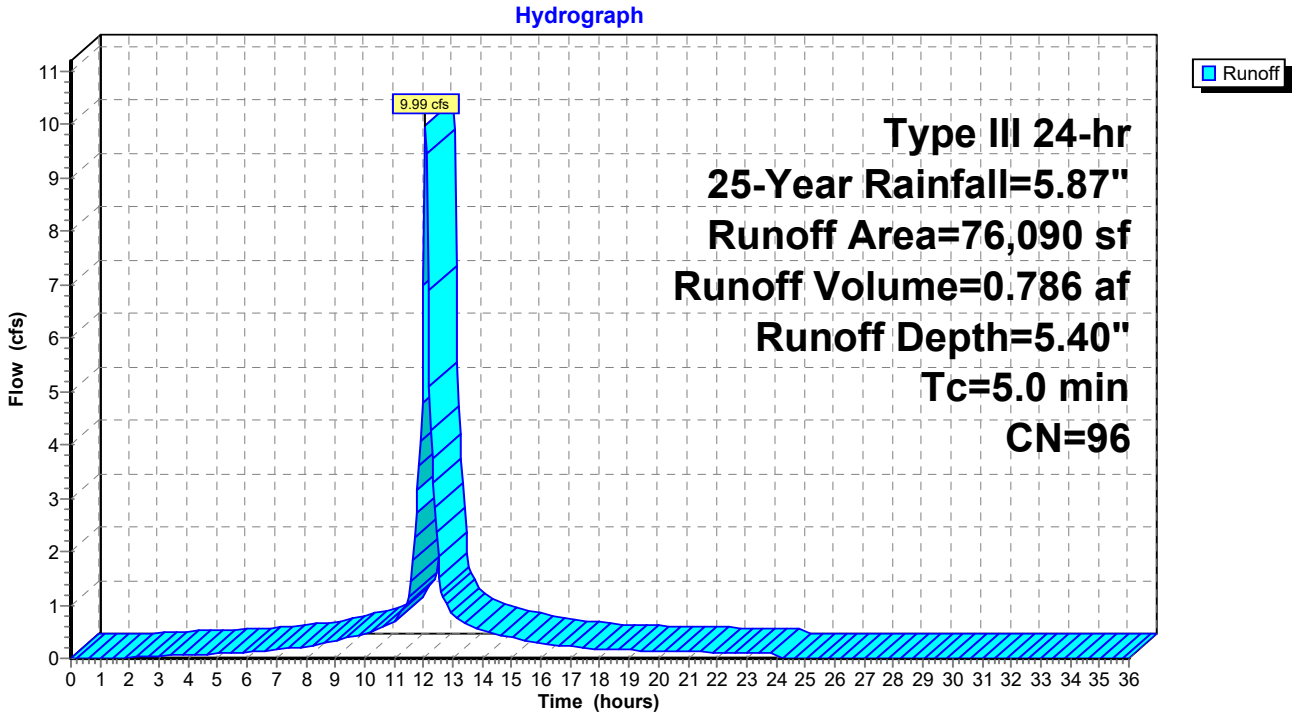
Subcatchment P-23: Alta XMBLY - Area Runoff Area=76,090 sf 87.78% Impervious Runoff Depth=5.40"
Tc=5.0 min CN=96 Runoff=9.99 cfs 0.786 af

Subcatchment S2: Road L - Area Subject to Runoff Area=3,121 sf 98.27% Impervious Runoff Depth=5.63"
Tc=5.0 min CN=98 Runoff=0.41 cfs 0.034 af

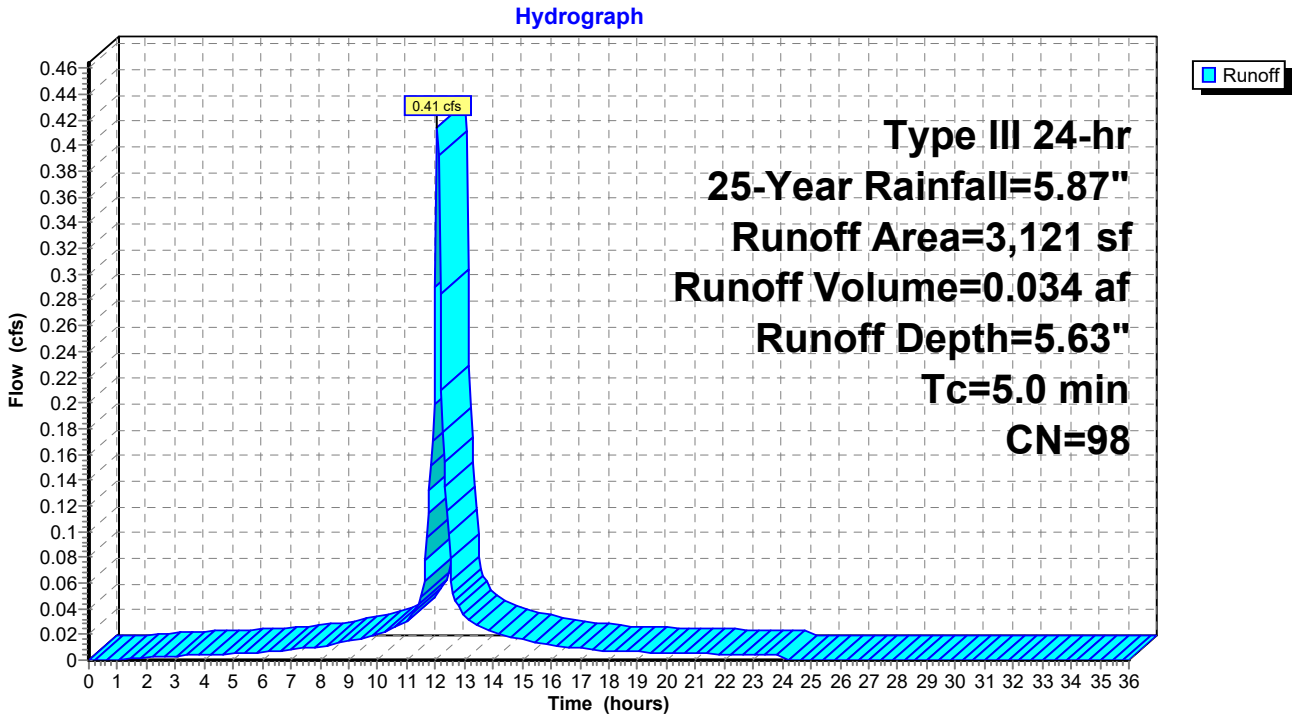
Link DP-1: Exist 72" Outfall Inflow=10.40 cfs 0.819 af
Primary=10.40 cfs 0.819 af

Total Runoff Area = 1.818 ac Runoff Volume = 0.819 af Average Runoff Depth = 5.41"
11.81% Pervious = 0.215 ac 88.19% Impervious = 1.604 ac

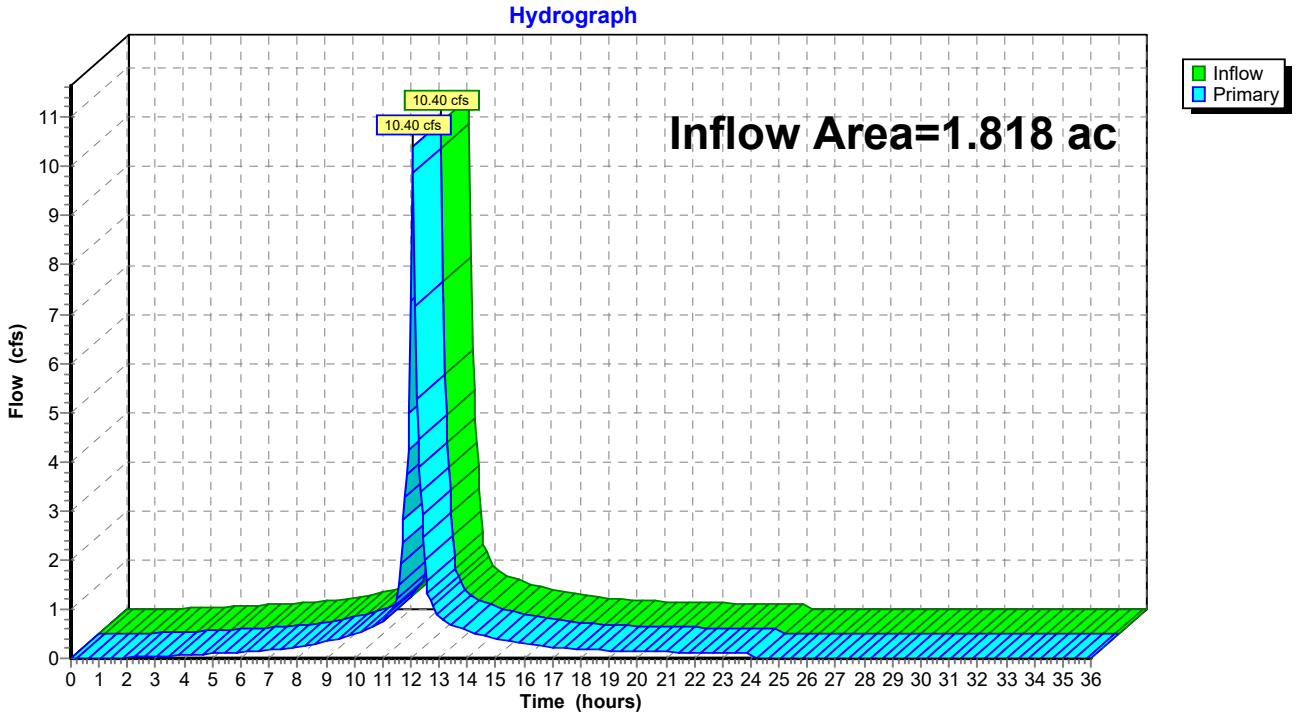
Subcatchment P-23: Alta XMBLY - Area Not Subject to NOI



Subcatchment S2: Road L - Area Subject to NOI



Link DP-1: Exist 72" Outfall



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

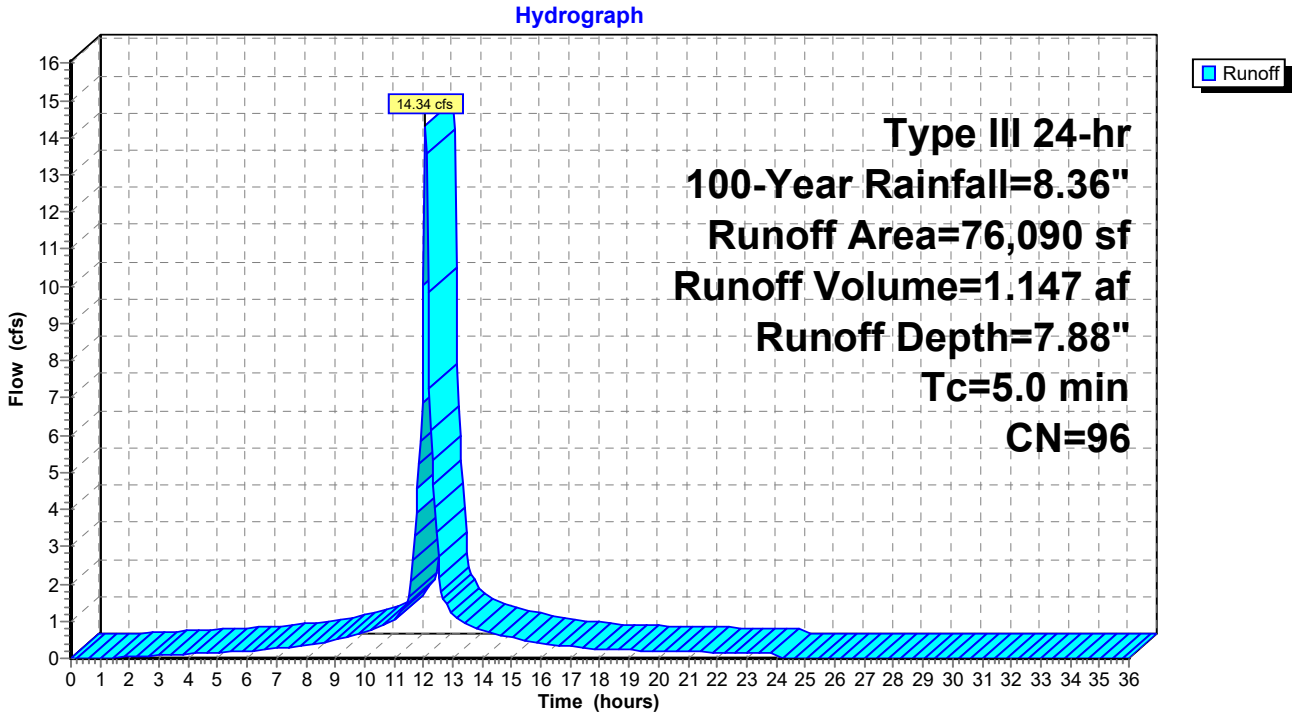
Subcatchment P-23: Alta XMBLY - Area Runoff Area=76,090 sf 87.78% Impervious Runoff Depth=7.88"
Tc=5.0 min CN=96 Runoff=14.34 cfs 1.147 af

Subcatchment S2: Road L - Area Subject to Runoff Area=3,121 sf 98.27% Impervious Runoff Depth=8.12"
Tc=5.0 min CN=98 Runoff=0.59 cfs 0.048 af

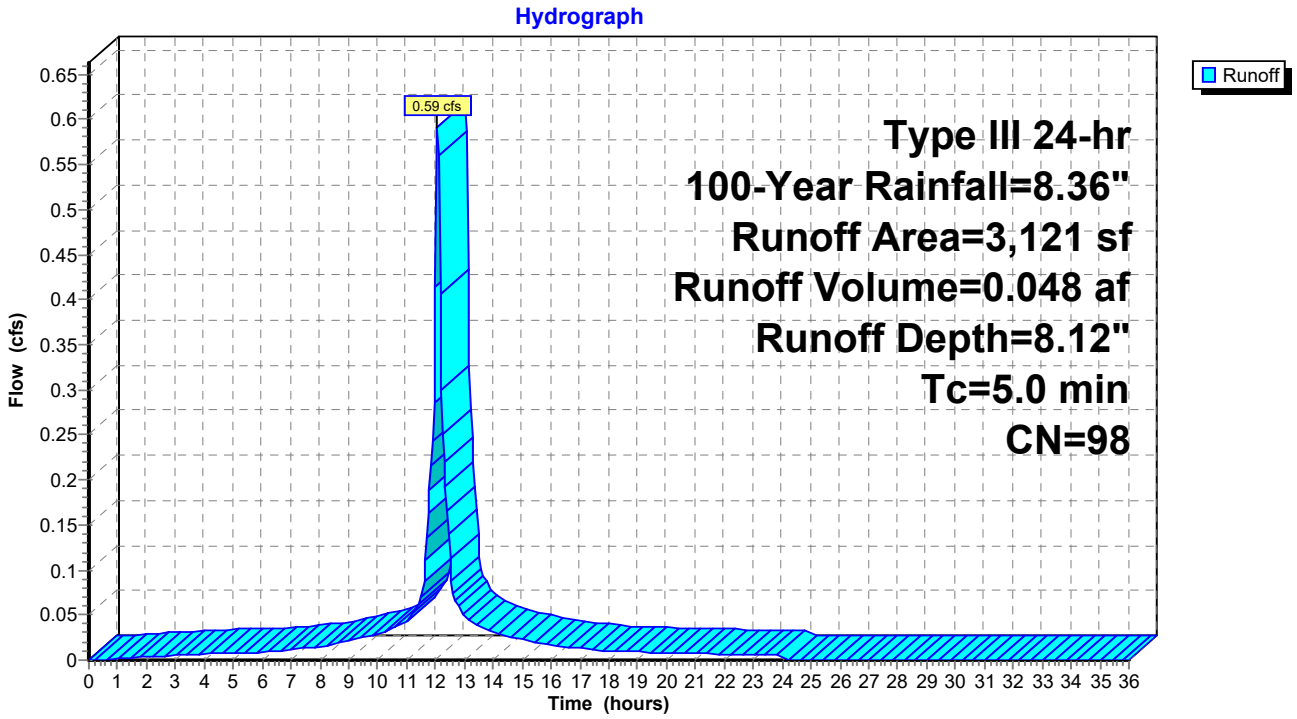
Link DP-1: Exist 72" Outfall Inflow=14.93 cfs 1.196 af
Primary=14.93 cfs 1.196 af

Total Runoff Area = 1.818 ac Runoff Volume = 1.196 af Average Runoff Depth = 7.89"
11.81% Pervious = 0.215 ac 88.19% Impervious = 1.604 ac

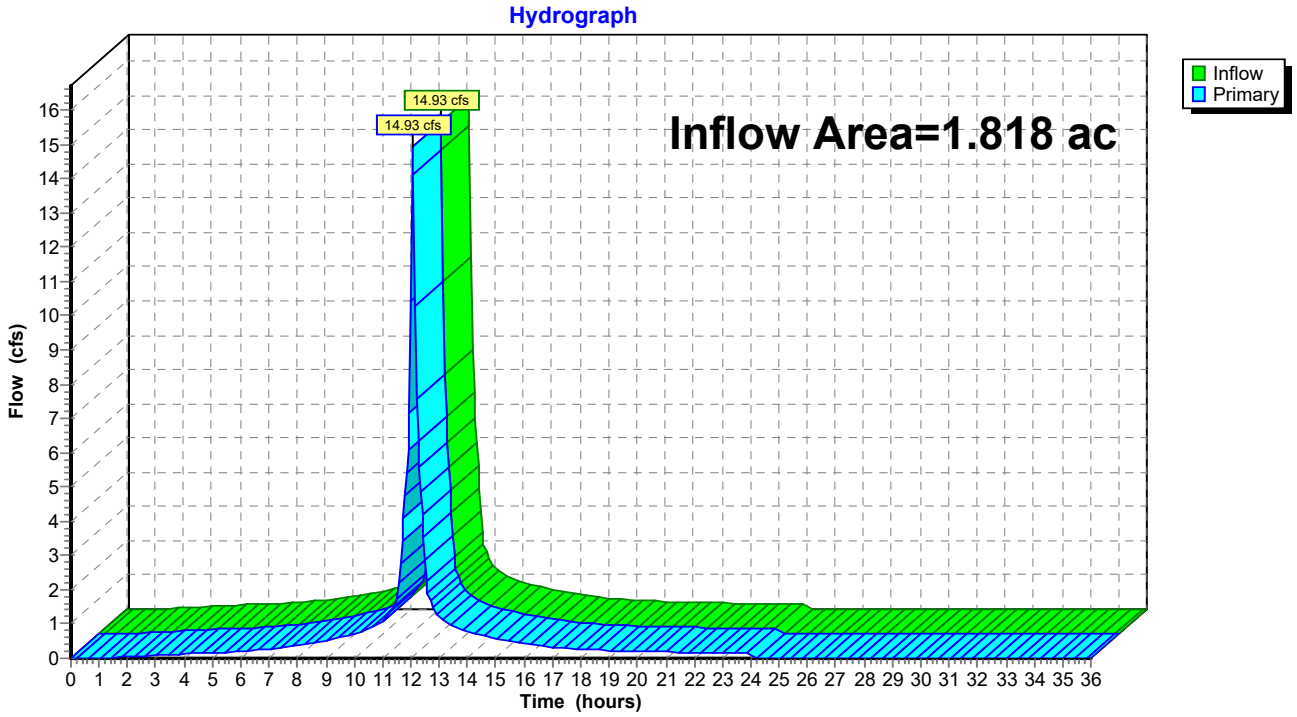
Subcatchment P-23: Alta XMBLY - Area Not Subject to NOI

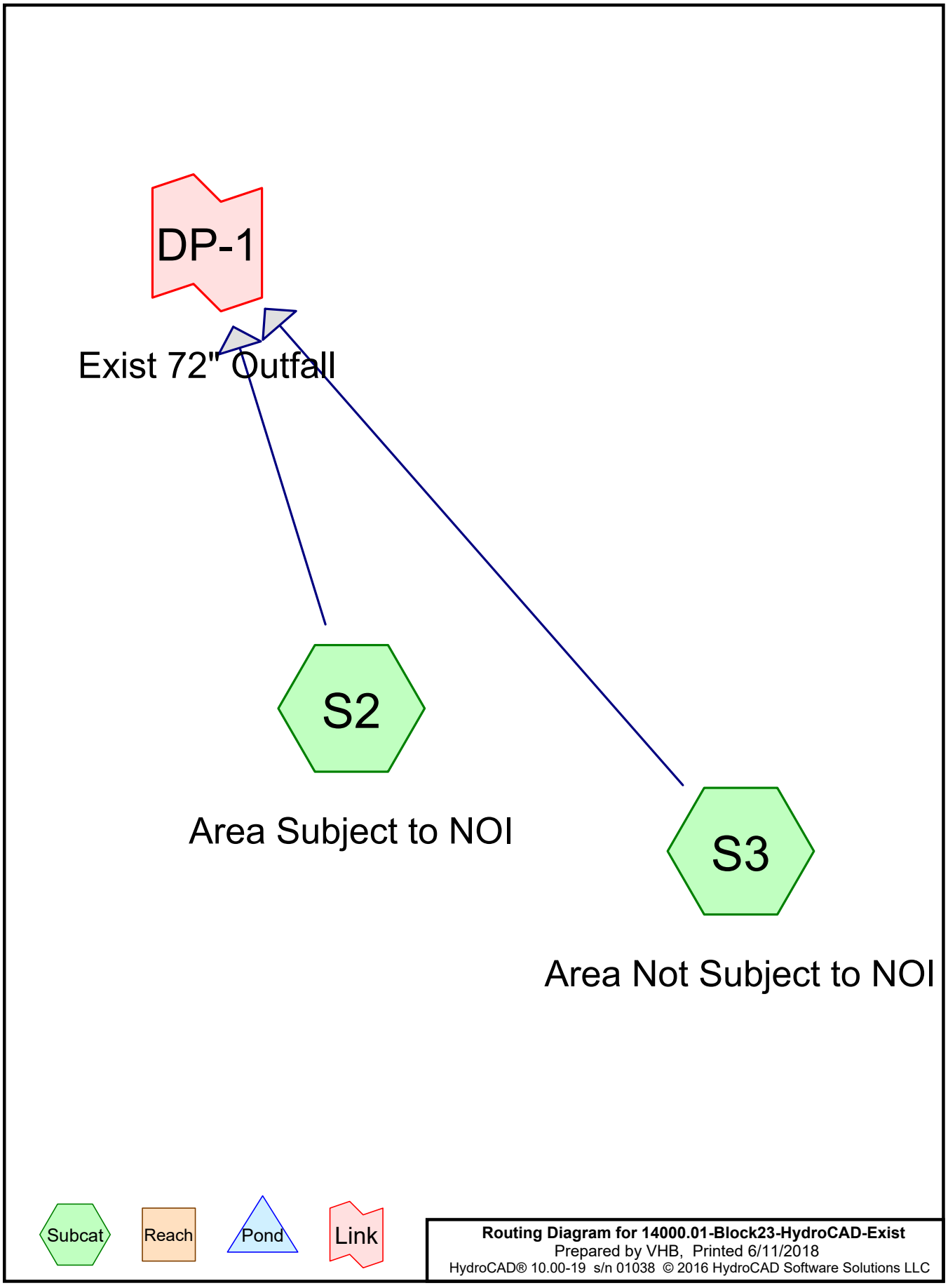


Subcatchment S2: Road L - Area Subject to NOI



Link DP-1: Exist 72" Outfall





Routing Diagram for 14000.01-Block23-HydroCAD-Exist
Prepared by VHB, Printed 6/11/2018

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.358	89	<50% Grass cover, Poor, HSG D (S2, S3)
1.413	98	Paved parking, HSG D (S3)
0.048	98	Unconnected pavement, HSG D (S2)
1.818	**96**	**TOTAL AREA**

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

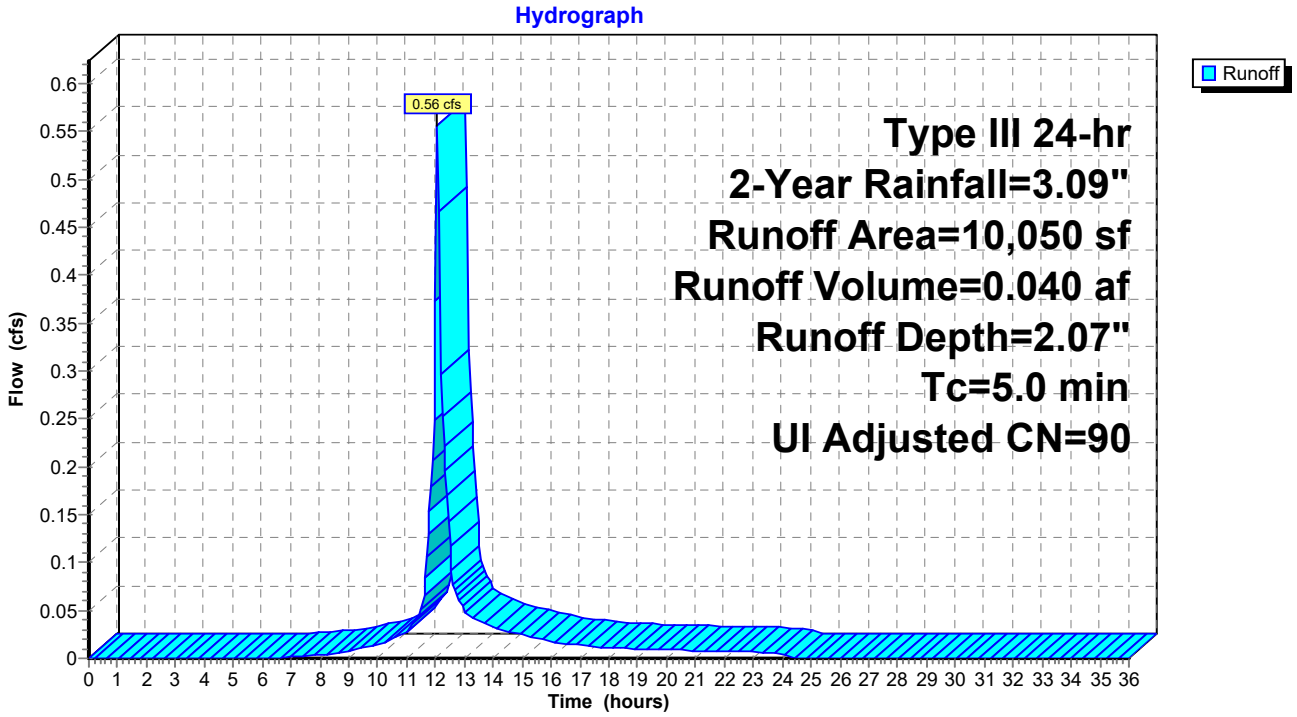
Subcatchment S2: Area Subject to NOI Runoff Area=10,050 sf 20.66% Impervious Runoff Depth=2.07"
Tc=5.0 min UI Adjusted CN=90 Runoff=0.56 cfs 0.040 af

Subcatchment S3: Area Not Subject to NOI Runoff Area=69,162 sf 88.97% Impervious Runoff Depth=2.75"
Tc=5.0 min CN=97 Runoff=4.71 cfs 0.364 af

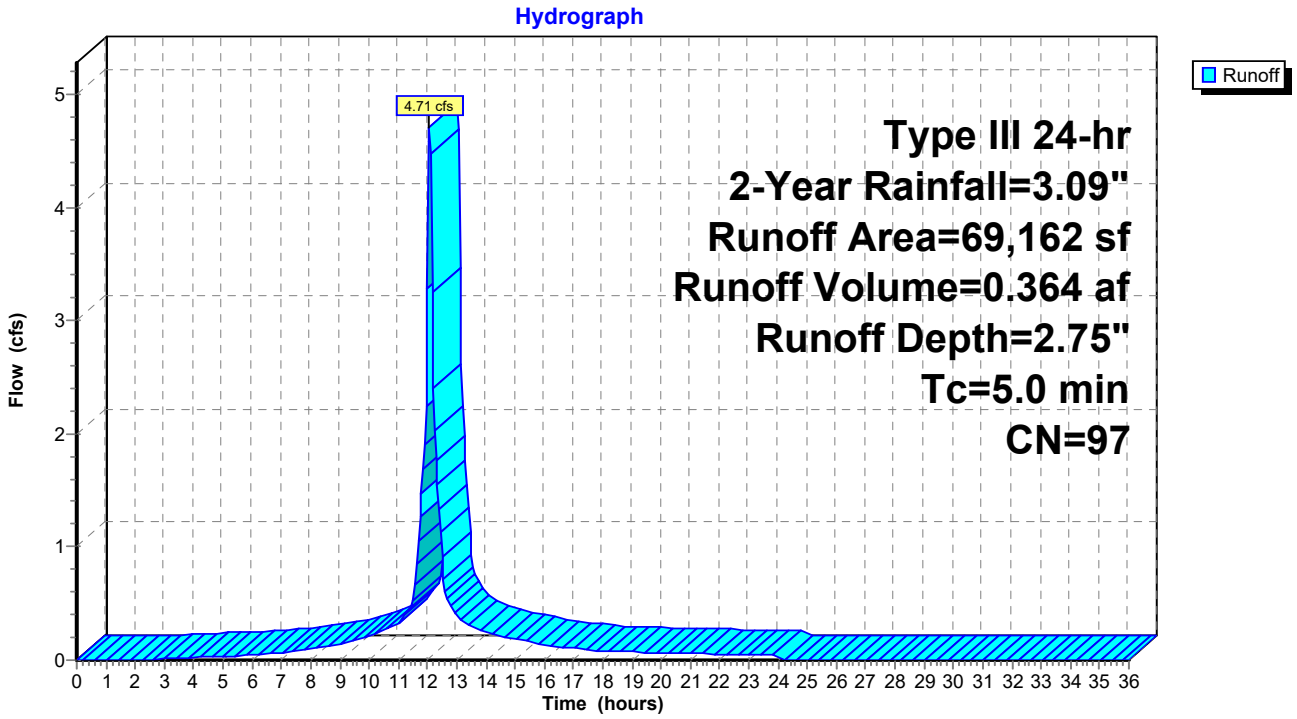
Link DP-1: Exist 72" Outfall Inflow=5.27 cfs 0.403 af
Primary=5.27 cfs 0.403 af

Total Runoff Area = 1.818 ac Runoff Volume = 0.403 af Average Runoff Depth = 2.66"
19.70% Pervious = 0.358 ac 80.30% Impervious = 1.460 ac

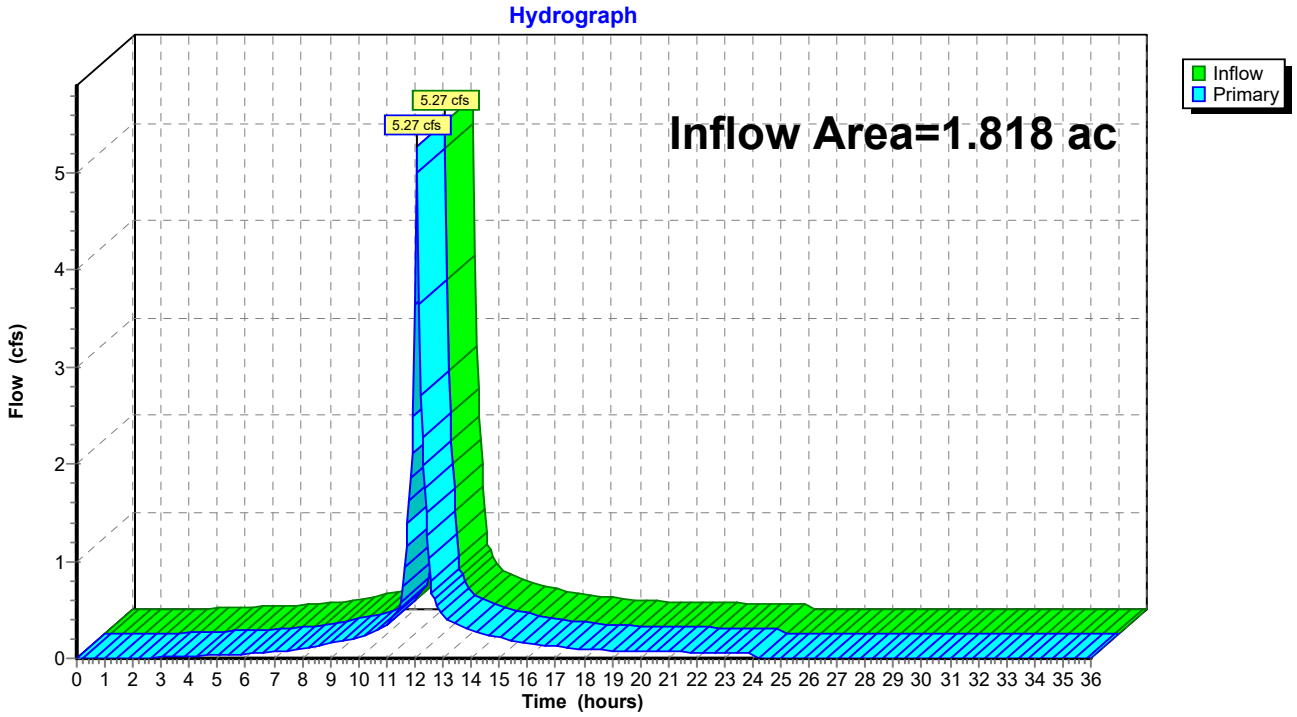
Subcatchment S2: Area Subject to NOI



Subcatchment S3: Area Not Subject to NOI



Link DP-1: Exist 72" Outfall



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

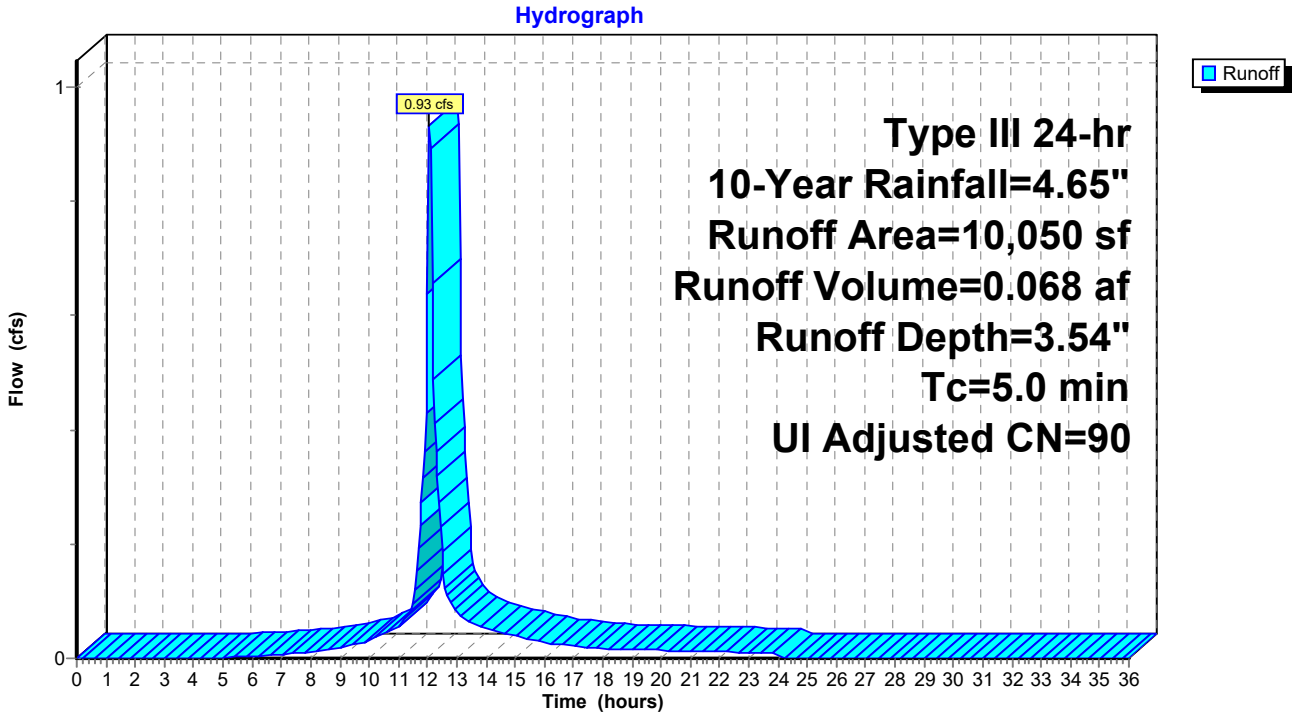
Subcatchment S2: Area Subject to NOI Runoff Area=10,050 sf 20.66% Impervious Runoff Depth=3.54"
Tc=5.0 min UI Adjusted CN=90 Runoff=0.93 cfs 0.068 af

Subcatchment S3: Area Not Subject to NOI Runoff Area=69,162 sf 88.97% Impervious Runoff Depth=4.30"
Tc=5.0 min CN=97 Runoff=7.21 cfs 0.569 af

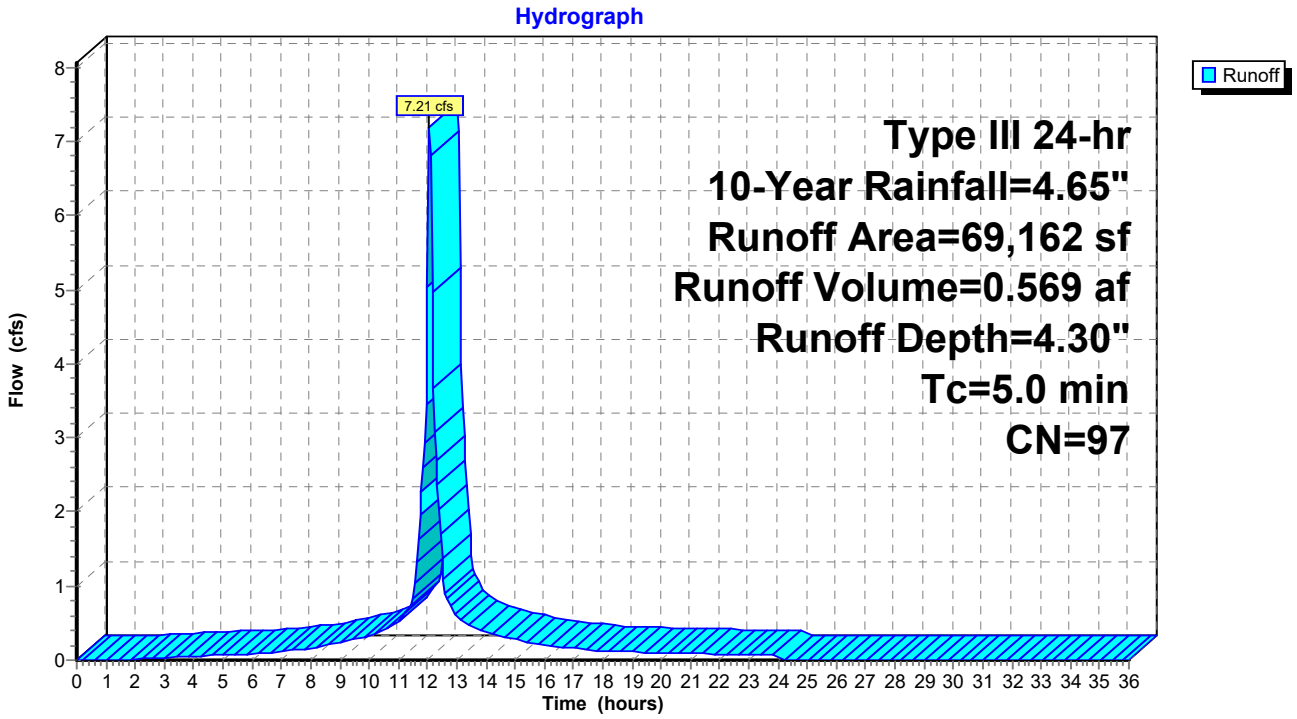
Link DP-1: Exist 72" Outfall Inflow=8.14 cfs 0.637 af
Primary=8.14 cfs 0.637 af

Total Runoff Area = 1.818 ac Runoff Volume = 0.637 af Average Runoff Depth = 4.20"
19.70% Pervious = 0.358 ac 80.30% Impervious = 1.460 ac

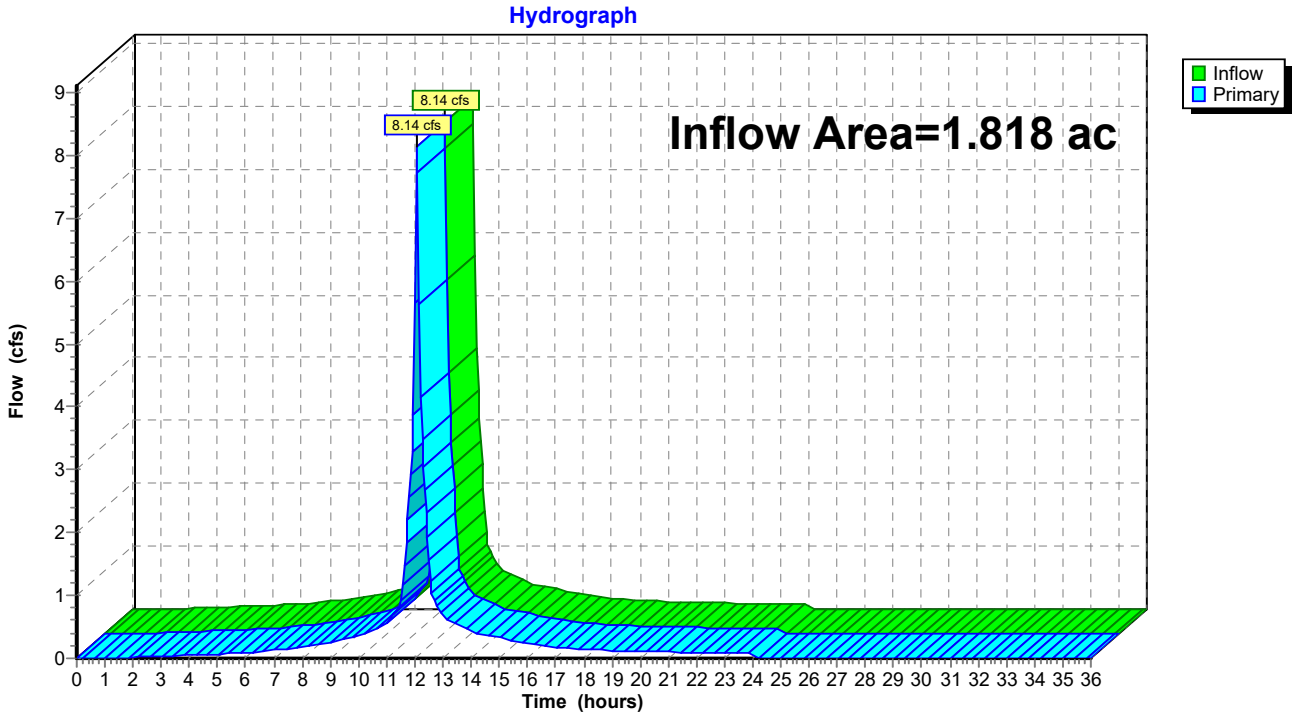
Subcatchment S2: Area Subject to NOI



Subcatchment S3: Area Not Subject to NOI



Link DP-1: Exist 72" Outfall



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

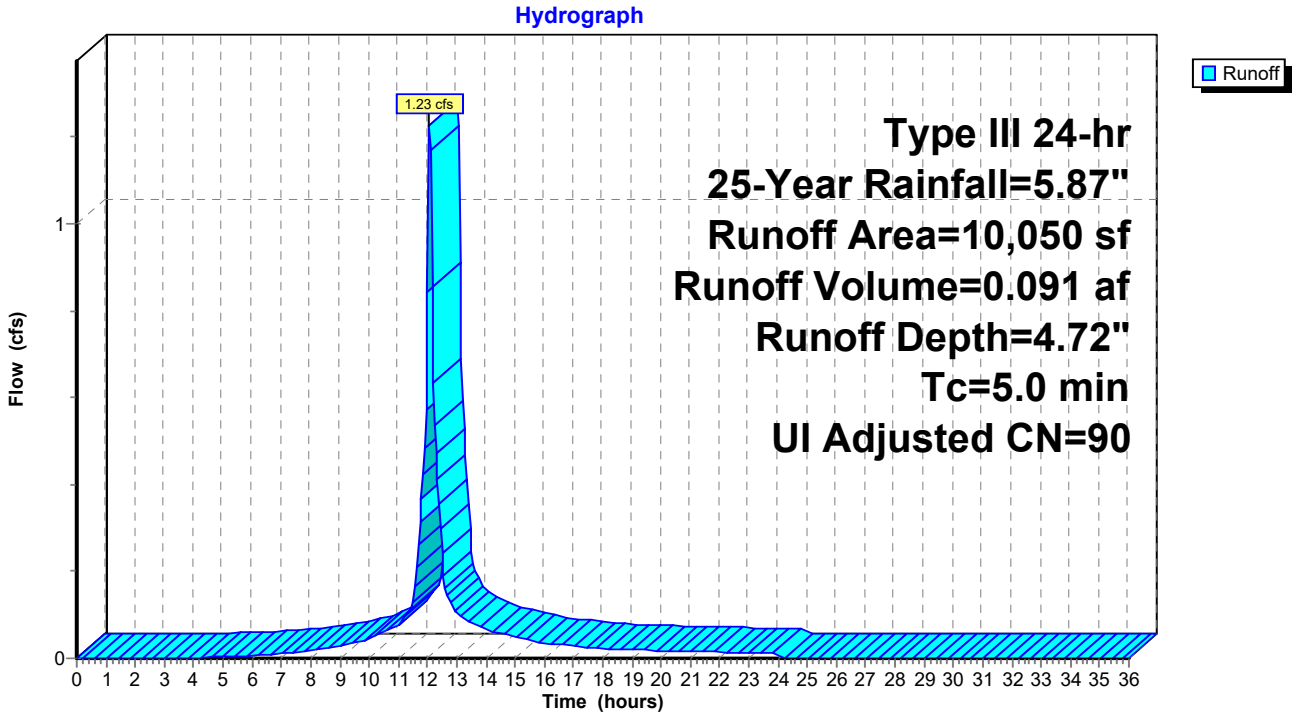
Subcatchment S2: Area Subject to NOI Runoff Area=10,050 sf 20.66% Impervious Runoff Depth=4.72"
Tc=5.0 min UI Adjusted CN=90 Runoff=1.23 cfs 0.091 af

Subcatchment S3: Area Not Subject to NOI Runoff Area=69,162 sf 88.97% Impervious Runoff Depth=5.51"
Tc=5.0 min CN=97 Runoff=9.14 cfs 0.730 af

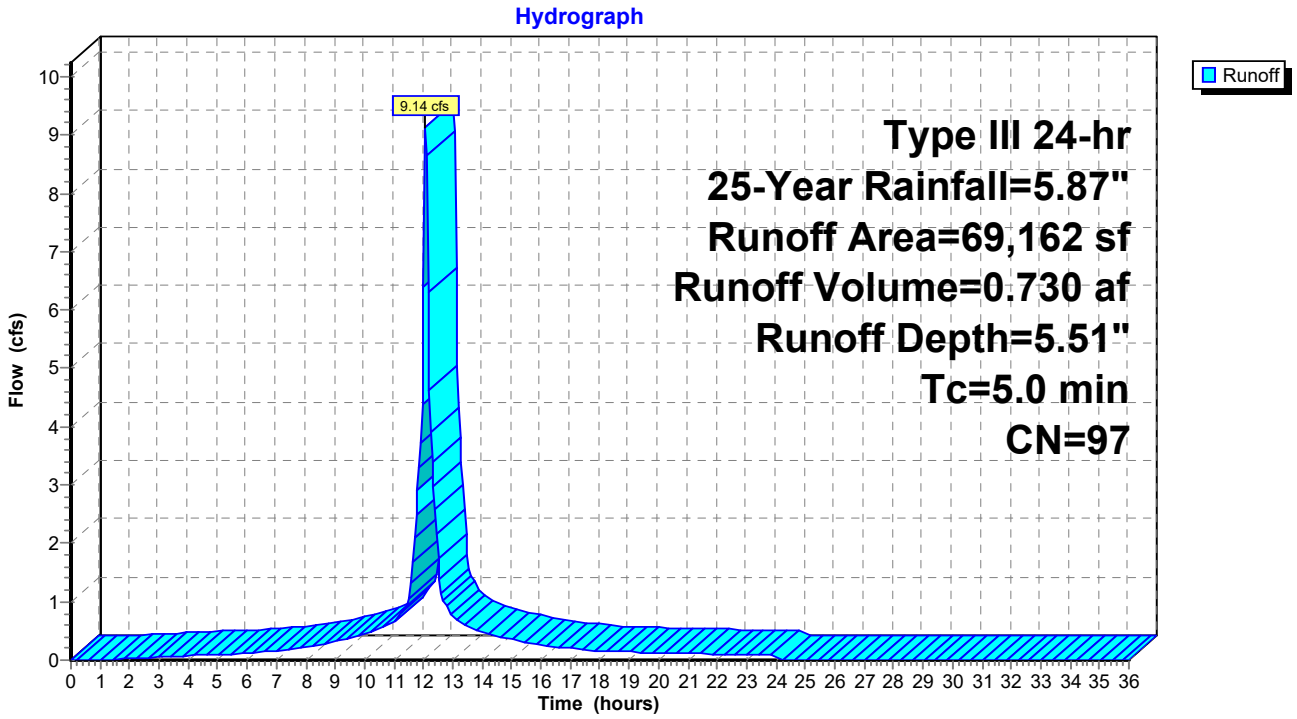
Link DP-1: Exist 72" Outfall Inflow=10.37 cfs 0.820 af
Primary=10.37 cfs 0.820 af

Total Runoff Area = 1.818 ac Runoff Volume = 0.820 af Average Runoff Depth = 5.41"
19.70% Pervious = 0.358 ac 80.30% Impervious = 1.460 ac

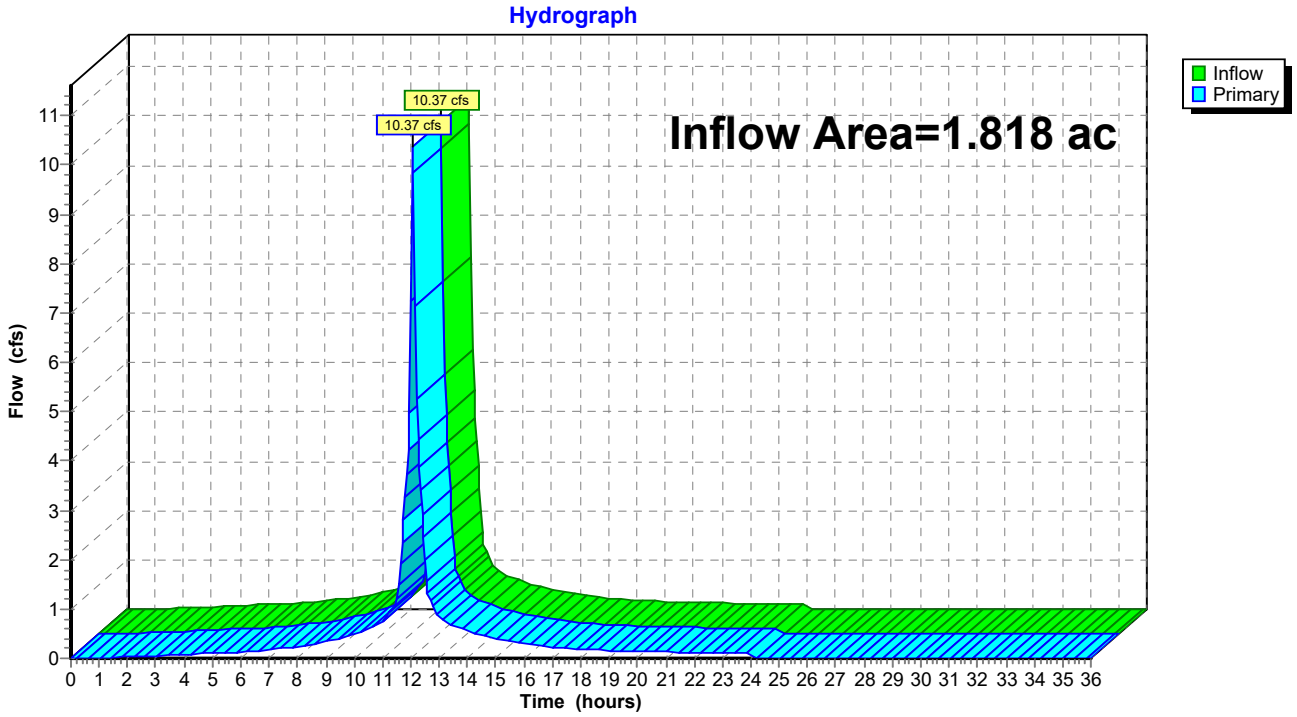
Subcatchment S2: Area Subject to NOI



Subcatchment S3: Area Not Subject to NOI



Link DP-1: Exist 72" Outfall



Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

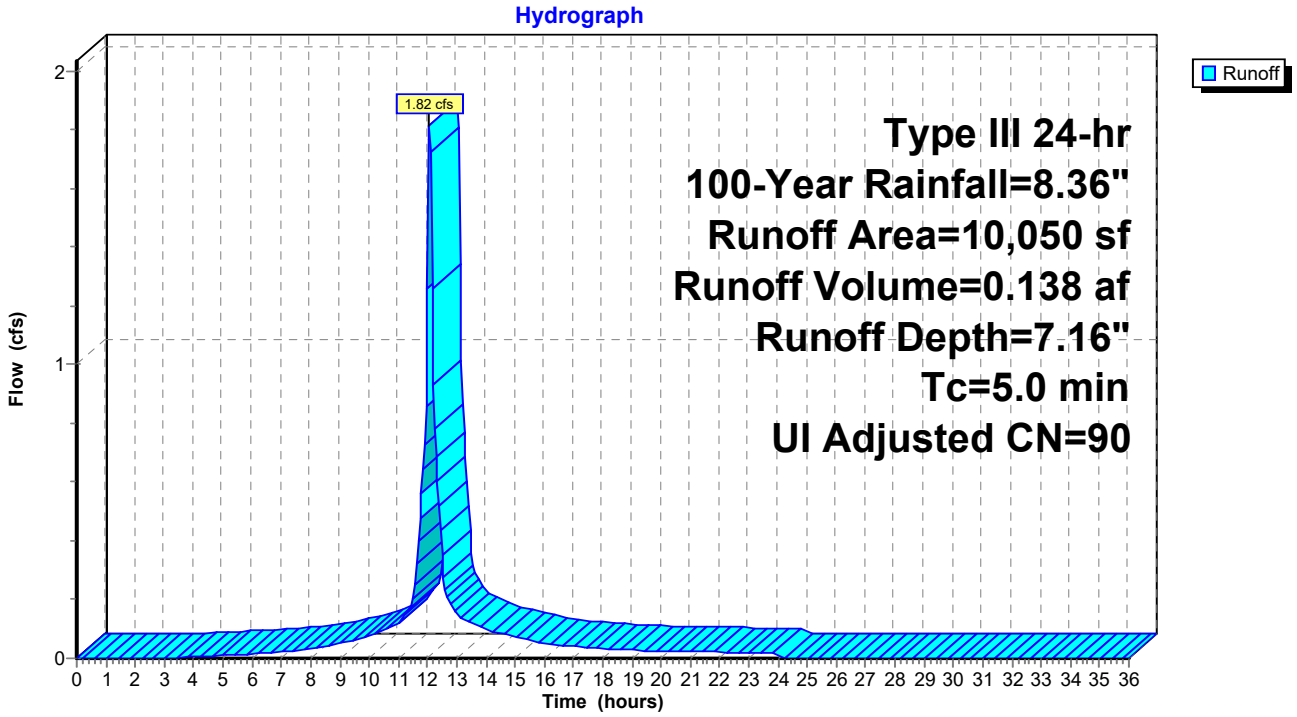
Subcatchment S2: Area Subject to NOI Runoff Area=10,050 sf 20.66% Impervious Runoff Depth=7.16"
Tc=5.0 min UI Adjusted CN=90 Runoff=1.82 cfs 0.138 af

Subcatchment S3: Area Not Subject to NOI Runoff Area=69,162 sf 88.97% Impervious Runoff Depth=8.00"
Tc=5.0 min CN=97 Runoff=13.08 cfs 1.058 af

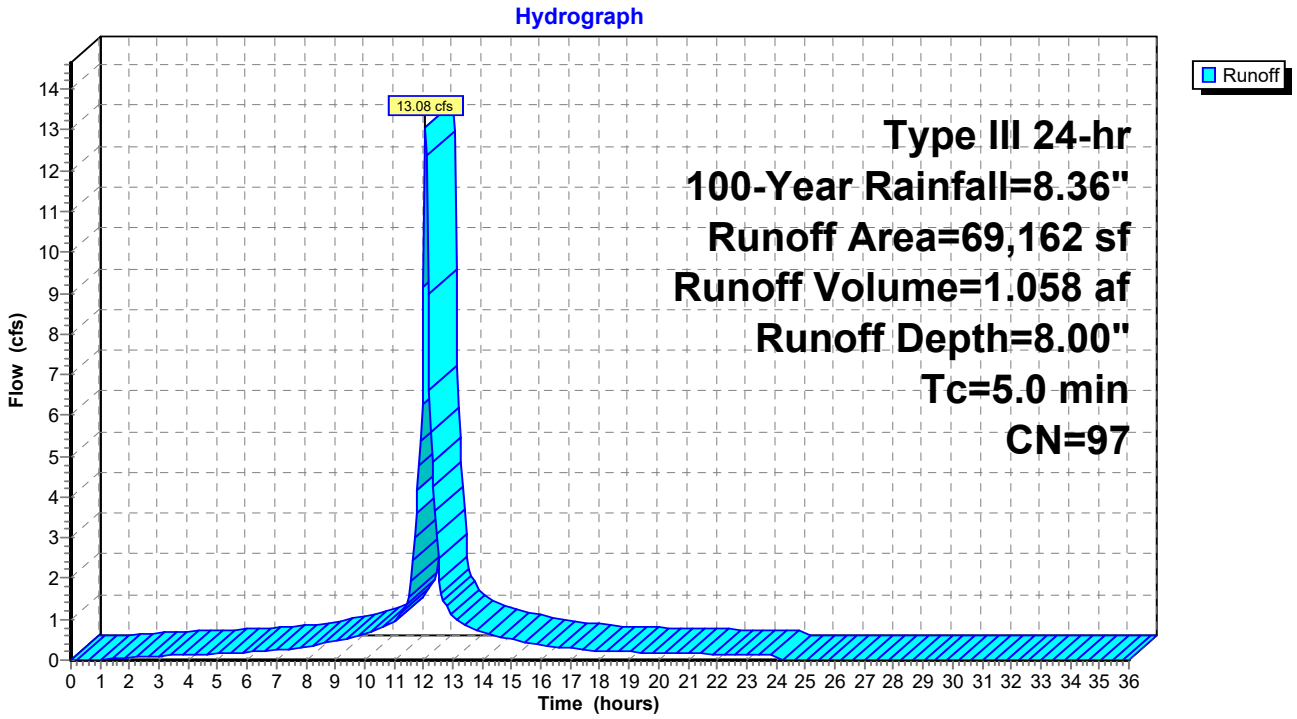
Link DP-1: Exist 72" Outfall Inflow=14.90 cfs 1.196 af
Primary=14.90 cfs 1.196 af

Total Runoff Area = 1.818 ac Runoff Volume = 1.196 af Average Runoff Depth = 7.89"
19.70% Pervious = 0.358 ac 80.30% Impervious = 1.460 ac

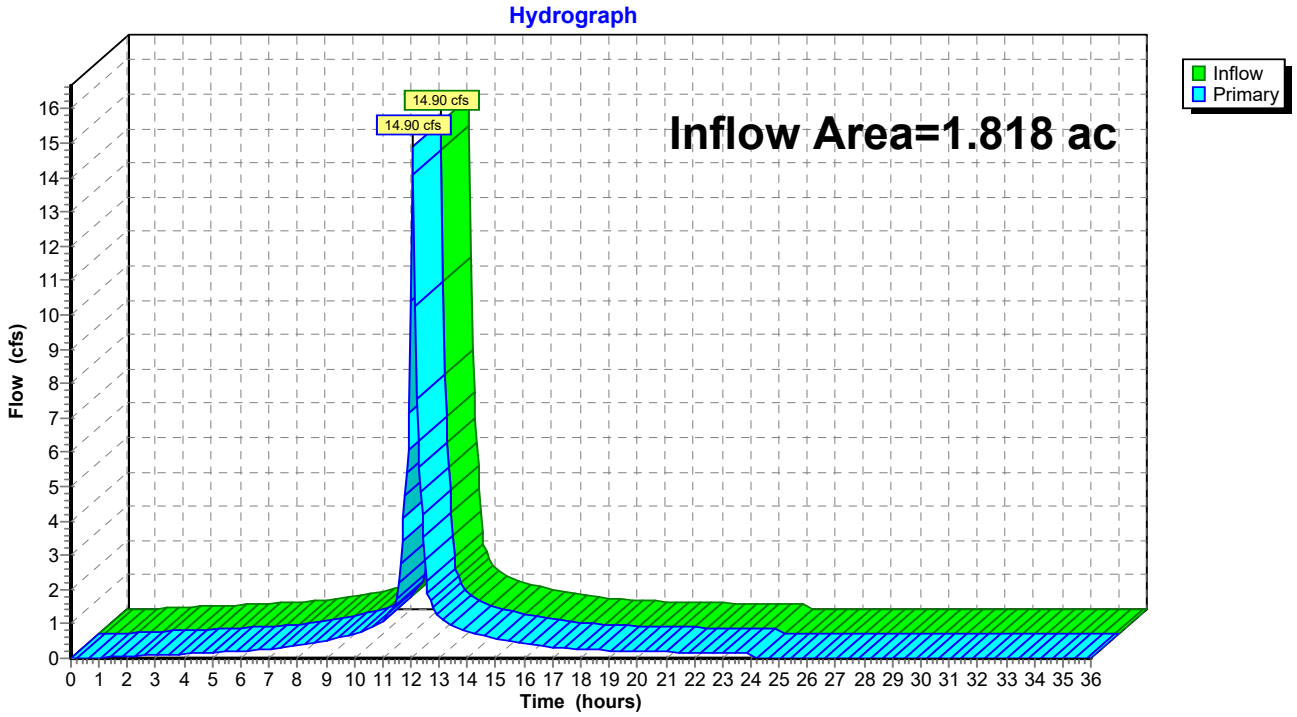
Subcatchment S2: Area Subject to NOI



Subcatchment S3: Area Not Subject to NOI



Link DP-1: Exist 72" Outfall



Attachment 4

- Long Term Stormwater Pollution Prevention Plan Operations and Maintenance (O&M)
- O&M Checklist
- Filterra Tree Box Filter Owner's Manual

Long-Term Pollution Prevention Plan

This Long-Term Pollution Prevention Plan has been developed to establish site management practices that improve the quality of stormwater discharges from Alta XMBLY at the XMBLY Master Plan Development (the "Project").

Description of Pollutant Sources

The proposed Project and the adjacent Road L located at 290 Revolution Drive in Somerville, Massachusetts (the "Site") is a pollutant source that will generate stormwater runoff that may collect pollutants such as oil, grease, trash, and sediments. The management and maintenance of this potential pollutant source is further described in this section.

Pollutant Control Approach

Maintenance of Pavement Systems

Standard Asphalt Pavement

Regular maintenance of pavement surfaces will prevent pollutants such as oil and grease, trash, and sediments from entering the stormwater management system. The following practices should be performed:

- Sweep or vacuum asphalt pavement areas bi-annually with a commercial cleaning unit and dispose of removed material.
- Routinely pick up and remove litter from the roadways, sidewalks, and landscaping.

Permeable Pavers

The primary maintenance requirement for permeable pavers is to clean the surface drainage voids. Fine debris and dirt accumulate in the drainage openings and reduce the pavement's flow capacity. Even though some irreplaceable loss in permeability should be expected over the paver's lifetime, one can increase the longevity of the system by following the maintenance schedule for vacuum

sweeping and high-pressure washing, restricting the area's use by heavy vehicles, limiting the use of de-icing chemicals and sand, and implementing a stringent sediment control plan.

Preventing Clogging of Permeable Paver Surface Areas

- Patio areas and/or other areas with permeable pavers shall be cleaned annually with vacuums or washed with high pressure washers.
- Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surfaces.
- Maintain vegetated areas adjacent to areas with permeable pavers to prevent washout of soil onto surface.
- Do not apply any type of sealant to permeable pavers.

Inspecting the System

- Inspect areas paved with permeable pavers monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts.
- Inspect areas paved with permeable pavers annually after initial three month period. Annual inspections should take place after large storms, when puddles will make any clogging obvious.

Maintenance of Vegetated Areas

Proper maintenance of vegetated areas can prevent the pollution of stormwater runoff by controlling the source of pollutants such as suspended sediments, excess nutrients, and chemicals from landscape care products. Practices that should be followed under the regular maintenance of the vegetated landscape include:

- Inspect planted areas on a semi-annual basis and remove any litter.
- Maintain planted areas adjacent to pavement to prevent soil washout.
- Immediately clean any soil deposited on pavement.
- Re-seed bare areas; install appropriate erosion control measures when native soil is exposed or erosion channels are forming.
- Plant alternative mixture of grass species in the event of unsuccessful establishment.
- The grass vegetation should be cut to a height between three and four inches.
- Pesticide/Herbicide Usage – No pesticides are to be used unless a single spot treatment is required for a specific control application.
- Fertilizer usage should be avoided. If deemed necessary, slow release fertilizer should be used. Fertilizer may be used to begin the establishment of vegetation in bare or damaged areas, but should not be applied on a regular basis unless necessary.

- Pet waste provision if applicable.

Management of Snow and Ice

Storage and Disposal

Snow shall be stockpiled on standard pavement surfaces so sand and salt may be swept in the spring or removed as snow melts and drains through the stormwater management system. Recommended locations for snow storage are shown on the attached Snow Storage Plan. Key practices for the safe storage and disposal of snow include:

- Under no circumstances shall snow be disposed or stored in wetland resource areas.
- Under no circumstances shall snow be disposed or stored in stormwater basins, ponds, rain gardens, swales, channels, or trenches.
- Do not stockpile snow on permeable pavement surfaces. Sand and grit in snow will clog pavement.
- Plow parking areas paved with permeable asphalt pavement carefully. Plow blades should be set approximately 1" higher than usual to avoid scarring the pavement and loosening material that could potentially clog surface pores.
- Do not apply abrasives such as sand or grit on or adjacent to permeable asphalt pavement.
- Monitor application rates of deicing materials on permeable pavement areas and reduce application rate accordingly. Permeable pavements tend to require less deicer per unit area because the water is not required to remain liquid over the entire parking surface area before discharge.
- Do not apply abrasives such as sand or grit on or adjacent to permeable pavers.
- Avoid plowing of areas with permeable pavers.

Salt and Deicing Chemicals

The amount of salt and deicing chemicals to be used on the site shall be reduced to the minimum amount needed to provide safe pedestrian and vehicle travel. The following practices should be followed to control the amount of salt and deicing materials that come into contact with stormwater runoff:

- Devices used for spreading salt and deicing chemicals should be capable of varying the rate of application based on the site specific conditions.
- Sand and salt should be stockpiled under covered storage facilities that prevent precipitation and adjacent runoff from coming in contact with the deicing materials.

- Sodium Chloride (NaCl) will not be used for deicing.
- The snow removal contractor will incorporate anti-icing strategies to reduce total materials applications. This may include strategies such as the application of calcium brines to prevent icing and facilitate snow removal.
- Calcium Magnesium Acetate (CMA) blends are recommended for walkways and small areas where hand-applications are anticipated.
- A 4:1 sand to calcium ratio should be used.

Spill Prevention and Response Plan

Spill prevention equipment and training will be provided by the property management company.

Initial Notification

In the event of a spill the facility and/or construction manager or supervisor will be notified immediately.

FACILITY MANAGER

Name:	TBD	Home Phone:	TBD
Phone:	TBD	E-mail:	TBD

CONSTRUCTION MANAGER

Name:	TBD	Home Phone:	TBD
Phone:	TBD	E-mail:	TBD

The supervisor will first contact the Fire Department and then notify the Police Department, the Public Health Commission and the Conservation Commission. The Fire Department is ultimately responsible for matters of public health and safety and should be notified immediately.

Further Notification

Based on the assessment from the Fire Chief, additional notification to a cleanup contractor may be made. The Massachusetts Department of Environmental Protection (MassDEP) and the EPA may be notified depending upon the nature and severity of the spill. The Fire Chief will be responsible for determining the level of cleanup and notification required. The attached list of emergency phone numbers shall be posted in the main construction/facility office and readily accessible to all employees. A hazardous waste spill report shall be completed as necessary using the attached form.

Emergency Notification Phone Numbers

1. FACILITY MANAGER

Name: TBD Home Phone: TBD

Phone: TBD E-mail: TBD

ALTERENATE

Name: TBD Home Phone: TBD

Phone: TBD E-mail: TBD

2. FIRE DEPARTMENT

Emergency: **911**

Business: (617) 623-8866

POLICE DEPARTMENT

Emergency: **911**

Business: (617) 625-1600

3. CLEANUP CONTRACTOR:

Address: TBD

Phone: TBD

4. MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

Emergency: (617) 292-5500

Northeast Region – Wilmington Office: (978) 694-3200

5. NATIONAL RESPONSE CENTER

Phone: (800) 424-8802

ALTERNATE: U.S. ENVIRONMENTAL PROTECTION AGENCY

Emergency: 1-800-424-8802

Business: (888) 372-7341

6. SOMERVILLE CONSERVATION COMMISSION

Contact: Vanessa Boukili

Phone: (617) 625-6600 ext 2516

SOMERVILLE BOARD OF HEALTH

Contact: Doug Kress

Phone: (617) 625-6600 ext 4300

Hazardous Waste / Oil Spill Report

Date _____ Time _____ AM / PM

Exact location (Transformer #) _____

Type of equipment _____ Make _____ Size _____

S / N _____ Weather Conditions _____

On or near Water ☐ Yes If Yes, name of body of Water: _____

☐ No _____

Type of chemical/oil spilled _____

Amount of chemical/oil spilled _____

Cause of Spill _____

Measures taken to contain or clean up spill _____

Amount of chemical/oil recovered _____ Method _____

Material collected as a result of cleanup:

_____ Drums containing _____

_____ Drums containing _____

_____ Drums containing _____

Location and method of debris disposal

_____

Name and address of any person, firm, or corporation suffering damages:

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring:

_____

Spill reported to General Office by _____ Time _____ AM / PM

Spill reported to DEP / National Response Center by _____

DEP Date _____ Time _____ AM / PM Inspector _____

NRC Date _____ Time _____ AM / PM Inspector _____

Additional comments: _____

Assessment - Initial Containment

The supervisor or manager will assess the incident and initiate containment control measures with the appropriate spill containment equipment included in the spill kit kept on-site. A list of recommended spill equipment to be kept on site is included on the following page.

Fire / Police Department	911
Somerville Health Department	(617) 625-6600 ext 4300
Somerville Conservation Commission:	(617) 625-6600 ext 2516

Emergency Response Equipment

The following equipment and materials shall be maintained at all times and stored in a secure area for long-term emergency response need.

Supplies		***Recommended Suppliers***
SORBENT PILLOWS/"PIGS"	**2**	http://www.newpig.com Item # KIT276 — mobile container with two pigs, 26 feet of sock, 50 pads, and five pounds of absorbent (or equivalent) http://www.forestry-suppliers.com Item # 43210 — Manhole cover pick (or equivalent) Item # 33934 — Shovel (or equivalent) Item # 90926 — Gloves (or equivalent) *Item # 23334 — Goggles (or equivalent)*
SORBENT BOOM/SOCK	**25 FEET**	
SORBENT PADS	**50**	
LITE-DRI® ABSORBENT	**5 POUNDS**	
SHOVEL	**1**	
PRY BAR	**1**	
GOGGLES	**1 PAIR**	
GLOVES – HEAVY	**1 PAIR**	

Stormwater Operation and Maintenance Plan

Project Information

Site

Alta XMBLY
290 Revolution Drive
Somerville, MA 02145

Owner

Wood Partners
91 Hartwell Avenue
Lexington, MA 02421
Phone: (781) 541-5821

Site Supervisor

TBD
Site Manager Address
Site Manager City, State Zip
Site Manager Phone Number

Name: _____

Telephone: _____

Cell phone: _____

Email: _____

Description of Stormwater Maintenance Measures

The following Operation and Maintenance (O&M) program is proposed to ensure the continued effectiveness of the stormwater management system. Attached to this plan are a Stormwater Best Management Practices Checklist and Maintenance Figure for use during the long term operation and maintenance of the stormwater management system.

Catch Basins

- All catch basins shall be inspected and cleaned a minimum of at least once per year.
- Sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations.
- Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary
- During colder periods, the catch basin grates must be kept free of snow and ice.
- During warmer periods, the catch basin grates must be kept free of leaves, litter, sand, and debris.

Roof Drain Leaders

- Perform routine roof inspections quarterly.
- Keep roofs clean and free of debris.
- Keep roof drainage systems clear.
- Keep roof access limited to authorized personnel.
- Clean inlets draining to the subsurface bed twice per year as necessary.

Tree Box Filters

- For a minimum of one year the Supplier shall inspect and maintain the tree box filters twice a year. The Supplier shall determine the start and end dates of obligated scheduled inspections at the time of the system's activation.
- All foreign debris, silt, mulch, and trash shall be removed.
- Plant evaluation and pruning or replacement shall occur when necessary and mulch shall be replaced.
- Any damage to the plants shall be reported to the Supplier of the filters.
- Filter media shall be evaluated and recharged as necessary.

Alta XMBLY, 290 Revolution Drive, Somerville, Massachusetts
Long Term Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency (unless otherwise stated in Order of Conditions)	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by
Deep Sump and Hooded Catch Basins	**At Least Four Times per Year**			• Accumulated sand and sediment (if more than six inches deep) and/or floatable pollutants shall be pumped from the basin and disposed of at an approved offsite facility in accordance with all applicable regulations. • Any structural damage or other indication of malfunction will be reported to the site manager and repaired as necessary. • During colder periods, the catch basin grates must be kept free of snow and ice. • During warmer periods, the catch basin grates shall be kept free of leaves, litter, sand, and debris.	☐**yes** ☐**no**		
Permeable Pavers	**Annually**			• Patio areas and/or other areas with permeable pavers shall be cleaned annually with vacuums or washed with high pressure washers. • Do not allow construction staging, soil/mulch storage, etc. on unprotected pavement surfaces. • Maintain vegetated areas adjacent to areas with permeable pavers to prevent washout of soil onto surface. • Do not apply any type of sealant to permeable pavers. • Inspect areas paved with permeable pavers monthly for the first three months after construction to ensure proper functioning and correct any areas that have settled or experienced washouts. • Inspect areas paved with permeable pavers annually after initial three-month period. Annual inspections should take place after large storms, when puddles will make any clogging obvious.	☐**yes** ☐**no**		
Tree Box Filter (Filterra or Approved Equal)	**Bi-Annually**			• For a minimum of one year the Supplier shall inspect and maintain the tree box filters twice during that first year after activating the system. • All foreign debris, silt, mulch, and trash shall be removed. • Plant evaluation and pruning or replacement shall occur when necessary and mulch shall be replaced. • Any damage to the plants shall be reported to the Supplier of the filters. • Filter media shall be evaluated and recharged as necessary. • Keep official records of maintenance and inspections. • Owner is responsible for irrigating the plants.	☐**yes** ☐**no**		
Street Sweeping	**N/A**			• Complete four times per year	☐**yes** ☐**no**		

Notes on Stormwater / Drainage Issues:

_____

_____

_____

_____

Stormwater Control Manager _____

Filterra® Maintenance Steps

1. Inspection of Filterra and surrounding area

2. Removal of tree grate and erosion control stones

3. Removal of debris, trash and mulch

4. Mulch replacement

5. Clean area around Filterra

6. Complete paperwork and record plant height and width

Contech has created a network of Certified Maintenance Providers (CCMP's) to provide maintenance on Filterra systems. To find a CCMP in your area please visit www.conteches.com/maintenance

Filterra Owner's Manual

filterra®

Bioretention Systems

CONTECH®

ENGINEERED SOLUTIONS

filterra®
Bioretention Systems

Table of Contents

Enclosed

Local Area Filterra Plant List

CONTECH®
ENGINEERED SOLUTIONS

Introduction

Thank you for your purchase of the Filterra® Bioretention System. Filterra is a specially engineered stormwater treatment system incorporating high performance biofiltration media to remove pollutants from stormwater runoff. The system's biota (vegetation and soil microorganisms) then further breakdown and absorb captured pollutants. All components of the system work together to provide a sustainable long-term solution for treating stormwater runoff.

The Filterra system has been delivered to you with protection in place to resist intrusion of construction related sediment which can contaminate the biofiltration media and result in inadequate system performance. These protection devices are intended as a best practice and cannot fully prevent contamination. It is the purchaser's responsibility to provide adequate measures to prevent construction related runoff from entering the Filterra system.

Included with your purchase is Activation of the Filterra system by the manufacturer as well as a 1-year warranty from delivery of the system and 1-year of routine maintenance (mulch replacement, debris removal, and pruning of vegetation) up to twice during the first year after activation.

Design and Installation

Each project presents different scopes for the use of Filterra systems. Information and help may be provided to the design engineer during the planning process. Correct Filterra box sizing (by rainfall region) is essential to predict pollutant removal rates for a given area. The engineer shall submit calculations for approval by the local jurisdiction. The contractor is responsible for the correct installation of Filterra units as shown in approved plans. A comprehensive installation manual is available at www.ContechES.com.

Activation Overview

Activation of the Filterra system is a procedure completed by the manufacturer to place the system into working condition. This involves the following items:

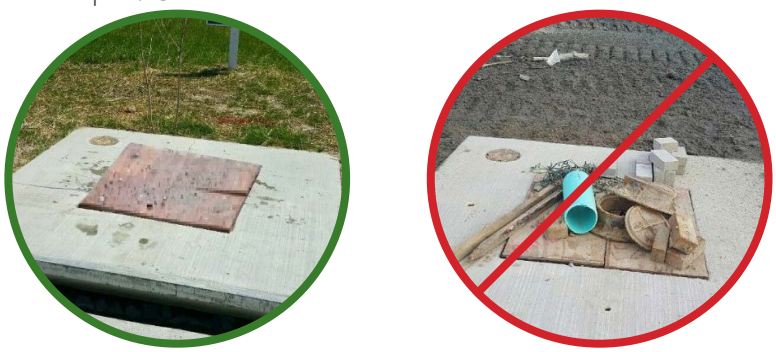
- Removal of construction runoff protection devices
- Planting of the system's vegetation
- Placement of pretreatment mulch layer using mulch certified for use in Filterra systems.

Activation MUST be provided by the manufacturer to ensure proper site conditions are met for Activation, proper installation of the vegetation, and use of pretreatment mulch certified for use in Filterra systems.

Minimum Requirements

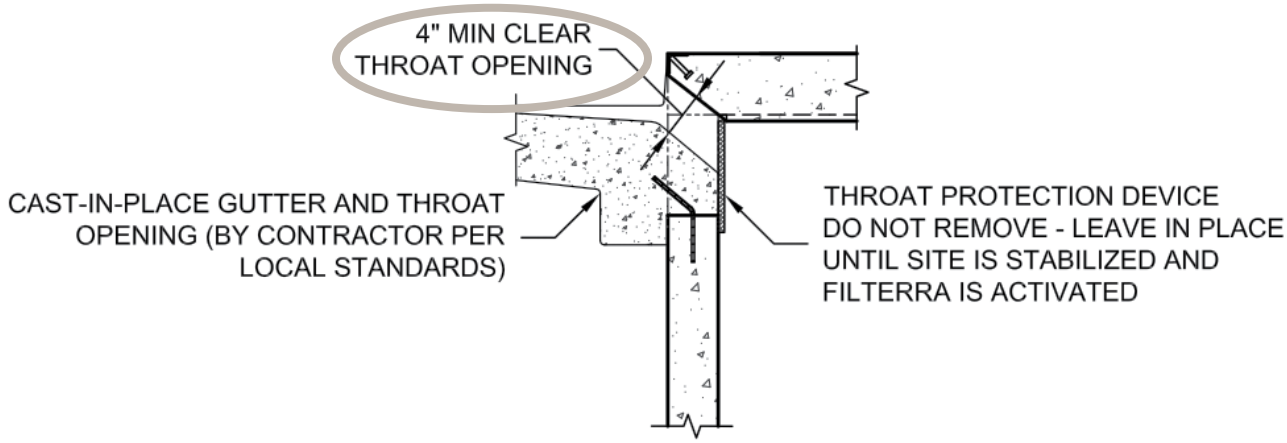
The minimum requirements for Filterra Activation are as follows:

1. The site landscaping must be fully stabilized, i.e. full landscaping installed and some grass cover (not just straw and seed) is required to reduce sediment transport. Construction debris and materials should be removed from surrounding area.



2. Final paving must be completed. Final paving ensures that paving materials will not enter and contaminate the Filterra system during the paving process, and that the plant will receive runoff from the drainage area, assisting with plant survival for the Filterra system.

3. Filterra throat opening should be at least 4" in order to ensure adequate capacity for inflow and debris.



An Activation Checklist is included on page 12 to ensure proper conditions are met for Contech to perform the Activation services. A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation.

Filterra Plant Selection Overview

A Plant List has been enclosed with this packet highlighting recommended plants for Filterra systems in your area. Keep in mind that plants are subject to availability due to seasonality and required minimum size for the Filterra system. Plants installed in the Filterra system are container plants (max 15 gallon) from nursery stock and will be immature in height and spread at Activation.

It is the responsibility of the owner to provide adequate irrigation when necessary to the plant of the Filterra system.

The "Planting Requirements for Filterra Systems" document is included as an appendix and discusses proper selection and care of the plants within Filterra systems.

Warranty Overview

Refer to the Contech Engineered Solutions LLC Stormwater Treatment System LIMITED WARRANTY for further information. The following conditions may void the Filterra system's warranty and waive the manufacturer provided Activation and Maintenance services:

- Unauthorized activation or performance of any of the items listed in the activation overview
- Any tampering, modifications or damage to the Filterra system or runoff protection devices
- Removal of any Filterra system components
- Failure to prevent construction related runoff from entering the Filterra system
- Failure to properly store and protect any Filterra components (including media and underdrain stone) that may be shipped separately from the vault

Routine Maintenance Guidelines

With proper routine maintenance, the biofiltration media within the Filterra system should last as long as traditional bioretention media. Routine maintenance is included by the manufacturer on all Filterra systems for the first year after activation. This includes a maximum of 2 visits to remove debris, replace pretreatment mulch, and prune the vegetation. More information is provided in the Operations and Maintenance Guidelines. Some Filterra systems also contain pretreatment or outlet bays. Depending on site pollutant loading, these bays may require periodic removal of debris, however this is not included in the first year of maintenance, and would likely not be required within the first year of operation.

These services, as well as routine maintenance outside of the included first year, can be provided by certified maintenance providers listed on the Contech website. Training can also be provided to other stormwater maintenance or landscape providers.

Why Maintain?

All stormwater treatment systems require maintenance for effective operation. This necessity is often incorporated in your property's permitting process as a legally binding BMP maintenance agreement. Other reasons to maintain are:

- Avoiding legal challenges from your jurisdiction's maintenance enforcement program.
- Prolonging the expected lifespan of your Filterra media.
- Avoiding more costly media replacement.
- Helping reduce pollutant loads leaving your property.

Simple maintenance of the Filterra is required to continue effective pollutant removal from stormwater runoff before discharge into downstream waters. This procedure will also extend the longevity of the living biofilter system. The unit will recycle and accumulate pollutants within the biomass, but is also subjected to other materials entering the inlet. This may include trash, silt and leaves etc. which will be contained above the mulch layer. Too much silt may inhibit the Filterra's flow rate, which is the reason for site stabilization before activation. Regular replacement of the mulch stops accumulation of such sediment.

When to Maintain?

Contech includes a 1-year maintenance plan with each system purchase. Annual included maintenance consists of a maximum of two (2) scheduled visits. Additional maintenance may be necessary depending on sediment and trash loading (by Owner or at additional cost). The start of the maintenance plan begins when the system is activated.

Maintenance visits are scheduled seasonally; the spring visit aims to clean up after winter loads including salts and sands while the fall visit helps the system by removing excessive leaf litter.

It has been found that in regions which receive between 30-50 inches of annual rainfall, (2) two visits are generally required; regions with less rainfall often only require (1) one visit per annum. Varying land uses can affect maintenance frequency; e.g. some fast food restaurants require more frequent trash removal. Contributing drainage areas which are subject to new development wherein the recommended erosion and sediment control measures have not been implemented may require additional maintenance visits.

Some sites may be subjected to extreme sediment or trash loads, requiring more frequent maintenance visits. This is the reason for detailed notes of maintenance actions per unit, helping the Supplier and Owner predict future maintenance frequencies, reflecting individual site conditions.

Owners must promptly notify the (maintenance) Supplier of any damage to the plant(s), which constitute(s) an integral part of the bioretention technology. Owners should also advise other landscape or maintenance contractors to leave all maintenance to the Supplier (i.e. no pruning or fertilizing) during the first year.

Exclusion of Services

Clean up due to major contamination such as oils, chemicals, toxic spills, etc. will result in additional costs and are not covered under the Supplier maintenance contract. Should a major contamination event occur the Owner must block off the outlet pipe of the Filterra (where the cleaned runoff drains to, such as drop inlet) and block off the throat of the Filterra. The Supplier should be informed immediately.

Maintenance Visit Summary

Each maintenance visit consists of the following simple tasks (detailed instructions below).

1. Inspection of Filterra and surrounding area
2. Removal of tree grate and erosion control stones
3. Removal of debris, trash and mulch
4. Mulch replacement
5. Plant health evaluation and pruning or replacement as necessary
6. Clean area around Filterra
7. Complete paperwork

Maintenance Tools, Safety Equipment and Supplies

Ideal tools include: camera, bucket, shovel, broom, pruners, hoe/rake, and tape measure. Appropriate Personal Protective Equipment (PPE) should be used in accordance with local or company procedures. This may include impervious gloves where the type of trash is unknown, high visibility clothing and barricades when working in close proximity to traffic and also safety hats and shoes. A T-Bar or crowbar should be used for moving the tree grates (up to 170 lbs ea.). Most visits require minor trash removal and a full replacement of mulch. See below for actual number of bagged mulch that is required in each media bay size. Mulch should be a double shredded, hardwood variety. Some visits may require additional Filterra engineered soil media available from the Supplier.

Box Length	Box Width	Filter Surface Area (ft^2)	Volume at 3" (ft^3)	# of 2 ft^3 Mulch Bags
4	4	4	4	2
6	4	6	6	3
8	4	8	8	4
6	6	9	9	5
8	6	12	12	6
10	6	15	15	8
12	6	18	18	9
13	7	23	23	12

Maintenance Visit Procedure

Keep sufficient documentation of maintenance actions to predict location specific maintenance frequencies and needs. An example Maintenance Report is included in this manual.

1. Inspection of Filterra and surrounding area

- Record individual unit before maintenance with photograph (numbered). Record on Maintenance Report (see example in this document) the following:

Record on Maintenance Report the following:

Standing Water	yes | no
Damage to Box Structure	yes | no
Damage to Grate	yes | no
Is Bypass Clear	yes | no

If yes answered to any of these observations, record with close-up photograph (numbered).

2. Removal of tree grate and erosion control stones

- Remove cast iron grates for access into Filterra box.
- Dig out silt (if any) and mulch and remove trash & foreign items.

3. Removal of debris, trash and mulch

Record on Maintenance Report the following:

Silt/Clay	yes | no
Cups/ Bags	yes | no
Leaves	yes | no
Buckets Removed	_____

- After removal of mulch and debris, measure distance from the top of the Filterra engineered media soil to the top of the top slab. Compare the measured distance to the distance shown on the approved Contract Drawings for the system. Add Filterra media (not top soil or other) to bring media up as needed to distance indicated on drawings.

Record on Maintenance Report the following:

Distance to Top of Top Slab (inches)	_____
Inches of Media Added	_____

4. Mulch replacement

- Add double shredded mulch evenly across the entire unit to a depth of 3".
- Refer to Filterra Mulch Specifications for information on acceptable sources.
- Ensure correct repositioning of erosion control stones by the Filterra inlet to allow for entry of trash during a storm event.
- Replace Filterra grates correctly using appropriate lifting or moving tools, taking care not to damage the plant.

5. Plant health evaluation and pruning or replacement as necessary

- Examine the plant's health and replace if necessary.
- Prune as necessary to encourage growth in the correct directions

Record on Maintenance Report the following:

Height above Grate	_____ (ft)
Width at Widest Point	_____ (ft)
Health	healthy | unhealthy
Damage to Plant	yes | no
Plant Replaced	yes | no

6. Clean area around Filterra

- Clean area around unit and remove all refuse to be disposed of appropriately.

7. Complete paperwork

- Deliver Maintenance Report and photographs to appropriate location (normally Contech during maintenance contract period).
- Some jurisdictions may require submission of maintenance reports in accordance with approvals. It is the responsibility of the Owner to comply with local regulations.

Maintenance Checklist

Drainage System Failure	Problem	Conditions to Check	Condition that Should Exist	Actions
Inlet	Excessive sediment or trash accumulation.	Accumulated sediments or trash impair free flow of water into Filterra.	Inlet should be free of obstructions allowing free distributed flow of water into Filterra.	Sediments and/or trash should be removed.
Mulch Cover	Trash and floatable debris accumulation.	Excessive trash and/or debris accumulation.	Minimal trash or other debris on mulch cover.	Trash and debris should be removed and mulch cover raked level. Ensure bark nugget mulch is not used.
Mulch Cover	"Ponding" of water on mulch cover.	"Ponding" in unit could be indicative of clogging due to excessive fine sediment accumulation or spill of petroleum oils.	Stormwater should drain freely and evenly through mulch cover.	Recommend contact manufacturer and replace mulch as a minimum.
Vegetation	Plants not growing or in poor condition.	Soil/mulch too wet, evidence of spill. Incorrect plant selection. Pest infestation. Vandalism to plants.	Plants should be healthy and pest free.	Contact manufacturer for advice.
Vegetation	Plant growth excessive.	Plants should be appropriate to the species and location of Filterra.		Trim/prune plants in accordance with typical landscaping and safety needs.
Structure	Structure has visible cracks.	Cracks wider than 1/2 inch or evidence of soil particles entering the structure through the cracks.		Vault should be repaired.
Maintenance is ideally to be performed twice annually.				

Filterra Inspection & Maintenance Log

Filterra System Size/Model:_____ **Location:** _____

Date	Mulch & Debris Removed	Depth of Mulch Added	Mulch Brand	Height of Vegetation Above Grate	Vegetation Species	Issues with System	Comments
1/1/17	*5 – 5 gal Buckets*	*3″*	*Lowe's Premium Brown Mulch*	*4′*	*Galaxy Magnolia*	*- Standing water in downstream structure*	*- Removed blockage in downstream structure*

Appendix 1 – Filterra® Activation Checklist

Project Name:______________________________ Company:______________________________

Site Contact Name: ______________________________ Site Contact Phone/Email: ______________________

Site Owner/End User Name:____________________ Site Owner/End User Phone/Email: ______________________

Preferred Activation Date: ___________________________ (provide 2 weeks minimum from date this form is submitted)

Site Designation	System Size	Final Pavement / Top Coat Complete	Landscaping Complete / Grass Emerging	Construction materials / Piles / Debris Removed	Throat Opening Measures 4" Min. Height	Plant Species Requested
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	
		☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	☐ Yes ☐ No	

Attach additional sheets as necessary.

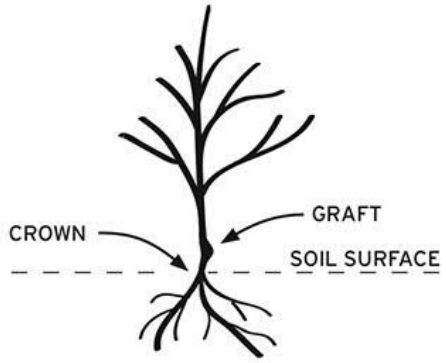
NOTE: A charge of $500.00 will be invoiced for each Activation visit requested by Customer where Contech determines that the site does not meet the conditions required for Activation. ONLY Contech authorized representatives can perform Activation of Filterra systems; unauthorized Activations will void the system warranty and waive manufacturer supplied Activation and 1st Year Maintenance.

____ ________________________

Signature Date

Appendix 2 – Planting Requirements for Filterra® Systems

Plant Material Selection



- Select plant(s) as specified in the engineering plans and specifications.
- Select plant(s) with full root development but not to the point where root bound.
- Use local nursery container plants only. Ball and burlapped plants are not permitted.
- For precast Filterra systems with a tree grate, plant(s) must not have scaffold limbs at least 14 inches from the crown due to spacing between the top of the mulch and the tree grate. Lower branches can be pruned away provided there are sufficient scaffold branches for tree or shrub development.
- For precast Filterra systems with a tree grate, at the time of installation, it is required that plant(s) must be at least 6" above the tree grate opening at installation for all Filterra configurations. This DOES NOT apply to Full Grate Cover designs.
- Plant(s) shall not have a mature height greater than 25 feet.
- For standard 21" media depth, a 7 – 15 gallon container size shall be used. Media less than 21" (Filterra boxes only) will require smaller container plants.
- For precast Filterra systems, plant(s) should have a single trunk at installation, and pruning may be necessary at activation and maintenance for some of the faster growing species, or species known to produce basal sprouts.

Plant Installation

- During transport protect the plant leaves from wind and excessive jostling.
- Prior to removing the plant(s) from the container, ensure the soil moisture is sufficient to maintain the integrity of the root ball. If needed, pre-wet the container plant.
- Cut away any roots which are growing out of the container drain holes. Plants with excessive root growth from the drain holes should be rejected.
- Plant(s) should be carefully removed from the pot by gently pounding on the sides of the container with the fist to loosen root ball. Then carefully slide out. Do not lift plant(s) by trunk as this can break roots and cause soil to fall off. Extract the root ball in a horizontal position and support it to prevent it from breaking apart. Alternatively the pot can be cut away to minimize root ball disturbance.
- Remove any excess soil from above the root flare after removing plant(s) from container.
- Excavate a hole with a diameter 4" greater than the root ball, gently place the plant(s).
- If plant(s) have any circling roots from being pot bound, gently tease them loose without breaking them.
- If root ball has a root mat on the bottom, it should be shaved off with a knife just above the mat line.
- Plant the tree/shrub/grass with the top of the root ball 1" above surrounding media to allow for settling.
- All plants should have the main stem centered in the tree grate (where applicable) upon completion of installation.
- With all trees/shrubs, remove dead, diseased, crossed/rubbing, sharply crotched branches or branches growing excessively long or in wrong direction compared to majority of branches.
- To prevent transplant shock (especially if planting takes place in the hot season), it may be necessary to prune some of the foliage to compensate for reduced root uptake capacity. This is accomplished by pruning away some of the smaller secondary branches or a main scaffold branch if there are too many. Too much foliage relative to the root ball can dehydrate and damage the plant.
- Plant staking may be required.

Mulch Installation

- Only mulch that has been meeting Contech Engineered Solutions' mulch specifications can be used in the Filterra system.
- Mulch must be applied to a depth of 3" evenly over the surface of the media.

Irrigation Requirements

- Each Filterra system must receive adequate irrigation to ensure survival of the living system during periods of drier weather.
- Irrigation sources include rainfall runoff from downspouts and/or gutter flow, applied water through the tree grate or in some cases from an irrigation system with emitters installed during construction.
- At Activation: Apply about one (cool climates) to two (warm climates) gallons of water per inch of trunk diameter over the root ball.
- During Establishment: In common with all plants, each Filterra plant will require more frequent watering during the establishment period. One inch of applied water per week for the first three months is recommended for cooler climates (2 to 3 inches for warmer climates). If the system is receiving rainfall runoff from the drainage area, then irrigation may not be needed. Inspection of the soil moisture content can be evaluated by gently brushing aside the mulch layer and feeling the soil. Be sure to replace the mulch when the assessment is complete. Irrigate as needed**.
- Established Plants: Established plants have fully developed root systems and can access the entire water column in the media. Therefore irrigation is less frequent but requires more applied water when performed. For a mature system assume 3.5 inches of available water within the media matrix. Irrigation demand can be estimated as 1" of irrigation demand per week. Therefore if dry periods exceed 3 weeks, irrigation may be required. It is also important to recognize that plants which are exposed to windy areas and reflected heat from paved surfaces may need more frequent irrigation. Long term care should develop a history which is more site specific.

** Five gallons per square yard approximates 1 inch of water Therefore for a 6' by 6' Filterra approximately 20-60 gallons of water is needed. To ensure even distribution of water it needs to be evenly sprinkled over the entire surface of the filter bed, with special attention to make sure the root ball is completely wetted. NOTE: if needed, measure the time it takes to fill a five gallon bucket to estimate the applied water flow rate then calculate the time needed to irrigate the Filterra. For example, if the flow rate of the sprinkler is 5 gallons/minute then it would take 12 minutes to irrigate a 6' by 6' filter.

Notes

filterra®
Bioretention Systems

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9025 Centre Pointe Drive, Suite 400
West Chester, OH 45069
info@conteches.com | 800-338-1122
www.ContechES.com

Attachment 5

- List of Recommended Construction Period Erosion and Sediment Control BMPs
- Construction Period Erosion and Sediment Control BMPs Checklist

Recommended Construction Period Pollution Prevention and Erosion and Sedimentation Control Measures

The following erosion and sedimentation controls are for use during the earthwork and construction phases of the project. The following controls are provided as recommendations for the site contractor and do not constitute or replace the final Stormwater Pollution Prevention Plan that must be fully implemented by the Contractor and owner in Compliance with EPA NPDES regulations.

Catch Basin Protection

Newly constructed catch basins will be protected with silt sacks throughout construction. During construction catch basins shall be cleaned on an as-needed basis, but in no case less frequently than every six months.

Diversion Channels

Diversion channels will be used to collect runoff from construction areas and discharge to either sedimentation basins or protected catch basin inlets.

Temporary Sediment Basins

Temporary sediment basins will be designed either as excavations or bermed stormwater detention structures (depending on grading) that will retain runoff for a sufficient period of time to allow suspended soil particles to settle out prior to discharge. These temporary basins will be located based on construction needs as determined by the contractor and outlet devices will be designed to control velocity and sediment. Points of discharge from sediment basins will be stabilized to minimize erosion.

Vegetative Slope Stabilization

Stabilization of open soil surfaces will be implemented within 14 days after grading or construction activities have temporarily or permanently ceased, unless there is sufficient snow cover to prohibit implementation. Vegetative slope stabilization will be used to minimize erosion on slopes of 3:1 or flatter. Annual grasses, such as annual rye, will be used to ensure rapid germination and production of root mass. Permanent stabilization will be completed with the planting of perennial grasses or legumes. Establishment of temporary and permanent vegetative cover may be established by

hydro-seeding or sodding. A suitable topsoil, good seedbed preparation, and adequate lime, fertilizer and water will be provided for effective establishment of these vegetative stabilization methods. Mulch will also be used after permanent seeding to protect soil from the impact of falling rain and to increase the capacity of the soil to absorb water.

Maintenance

VHB recommends that the following maintenance procedures be followed:

- The on-site contractor will inspect all sediment and erosion control structures periodically and after each rainfall event. Records of the inspections will be prepared and maintained on-site by the contractor.
- Silt shall be removed from behind barriers if greater than 6-inches deep or as needed.
- Damaged or deteriorated items will be repaired immediately after identification.
- The underside of compost filter tubes should be kept in close contact with the earth and reset as necessary.
- Sediment that is collected in structures shall be disposed of properly and covered if stored on-site.
- Erosion control structures shall remain in place until all disturbed earth has been securely stabilized. After removal of structures, disturbed areas shall be regraded and stabilized as necessary.

The sedimentation and erosion control measures are included in the construction plans & details. Temporary erosion and sedimentation control measures, not limited to those previously described, may be required to be implemented to protect discharge areas throughout the construction process. These potential temporary measures are not reflected on the plans.

Construction Best Management Practices – Maintenance/Evaluation Checklist

A reduced version of the Erosion Control Maintenance measures as described above is included in the following checklist for quick reference.

Alta XMBLY, 290 Revolution Drive, Somerville, Massachusetts
Construction Best Management Practices – Maintenance/ Evaluation Checklist

Best Management Practice	Inspection Frequency	Date Inspected	Inspector	Minimum Maintenance and Key Items to Check	Cleaning/Repair Needed ☐yes ☐no (List Items)	Date of Cleaning/Repair	Performed by:
Erosion Control Barrier	**Weekly or bi-weekly and after storm events of ¼ inch or greater**			• Accumulated sediment • Separation of silt socks or silt fences with the earth and each other • Damaged or broken silt socks or silt fences	☐**yes** ☐**no**		
Catch Basin Protection	**Weekly or bi-weekly and after storm events of ¼ inch or greater**			• Accumulated sediment within silt sacks • Rips or torn silt sacks	☐**yes** ☐**no**		

Stormwater Control Manager _____