Supplemental Engineering Data

For

West Acton Village Ecology
Acton, MA

August 26, 2009

Applicant: 531 Mass Ave LLC
541 Massachusetts Ave
Acton, MA 01720

Stamski And McNary, Inc.
Engineering - Planning – Surveying
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SM-3320 File: 3320supplement.doc

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3.6 Drainage Calculations

Project Narrative

Stormwater Management

The proposed project will construct a new multiuse facility at 525-543 Massachusetts Avenue in Acton, MA. The facility will host retail space, office space, restaurant space, and a theater. The project involves construction of a parking lot which will run underneath the building and connect Mass. Ave to the existing parking lot serving #543 Mass. Ave from Spruce Street. The portion of Mass. Ave in front of the facility will be improved to provide additional on-street parking. The existing parking area for the playground located across Mass. Ave from the site will also be improved with additional parking spaces.

According to the Natural Resources Conservation Service (N.R.C.S.) soil survey indicated the presences of Hinckley loamy sand, Merrimac-Urban land complex, Udorthents, and Urban Land. These soil groups rate as Hydrologic Groups A, A, B, and un-rated respectively.

Pre-Development

The entire site of the proposed project has previously been developed. The portion of the property containing #531 and #537 is presently being developed with a stormwater management system, parking area, and appurtenances under an Order of Conditions that was previously issued by the Acton Conservation Commission. The drainage analysis is herein conducted in a manner that evaluates the site prior to the construction of these improvements in order to fully address the new project. The Pre-Development Drainage Map shows the conditions as analyzed. #543-545 Mass. Ave. consists of an office building. This lot will not be altered during construction but it has been included in the drainage analysis because the building will share parking with the new facility and drains into the same drainage system. The existing parking lot, which will be connected to the new parking lot, sits between #543-545 Mass. Ave and #3 Spruce Street. The lot drains into a catch basin that flows into a diversion manhole which diverts runoof to a retention basin before overflowing to an infiltration basin located next to parking lot on the opposite side of #3 Spruce Street. This second parking lot it situated behind #3, #5-9, and #11 Spruce Street. It drains into catch basins and then directly into the infiltration basin. Overflow from the basin runs overland into the wetlands on the north side of the site.

The remaining portion of the site consists of developed lots at #525, #531, #537, and #541 Mass. Ave. Runoff from #541 is split on the roof with the west portion flowing into the parking lot of #543-545. Runoff from the eastern portion of the building and lawn flow to the wetlands. Runoff from #537 is divided by the slope of the roof with the front portion of the dwelling, yard, and driveway being directed into Mass. Ave. and the rear of the lot being directed to the wetlands. #531 contains two structures, a dwelling and a barn. The front sections of the structures as well as the entire gravel driveway of the barn flow into Mass. Ave. with runoff from the remaining part of the lot flowing uncontrolled into the wetlands. All runoff of #525 Mass. Ave. flows directly to the wetlands. This includes the dwelling with paved walkways and an extensive paved driveway. On the opposite side of Mass. Ave., where the new expanded playground parking will be installed, is the existing parking area, sidewalk, and lawn area. Rainfall will flow from this area into Mass. Ave.

Once within the roadway, runoff enters the town's drainage system. Water running off onto the east side of the highpoint in Mass. Ave. will enter the catch basins and flow eastward into Fort Pond Brook. Water on the west side of the high point will enter catch basins and be directed north along Spruce Street and then back east into the drainage system under Arlington Street before being discharged into Fort Pond Brook. The wetland system on the site is also associated with Fort Pond Brook. While runoff from the site initially flows in three separate directions, it ultimately reaches the same location in Fort Pond Brook, just south of Mass. Ave. As such, the analysis point is at this location.

Post-Development

The western end of the site will remain largely unaltered. #543 Mass. Ave. will not be changed and will have the same drainage pattern. The existing retention basin is being relocated in order to relocate a Historic Barn from #537 and construct a driveway to its lower level. The relocated bioretention area will have the same volume and is being constructed on the opposite side of the diversion manhole. This small building will be the only increase in impervious area draining to the existing infiltration basin. There will be no footprint change at # 541 and its drainage pattern will stay the same. The existing dwelling at #537 will be restructured to preserve the front end of the building while expanding the west side and eliminating the rear extension. Its gravel driveway will be removed for the new facility. Mass. Ave. will be widened in front of #537 for additional on street parking. The new sidewalk and walkways in this area will be porous pavement where possible to capture and treat runoff in front of the altered structure before it reaches Mass. Ave. Runoff from the back of the structure and the pavement will flow into a trench drain that ties into the drainage system. On the east end of the site, the parking area will have its entrance in roughly the same location as one of the existing curb cuts for the driveway of #525. A sediment forebay and rain garden will be constructed to capture runoff from the parking lot's eastern entrance and sidewalks. The remaining runoff from the exposed portion of parking will flow into a trench drain and then into the drainage system. The dwelling #525 will be moved and incorporated into the new building as will the the barn and dwelling of #531. Massachusetts Avenue will be widened in front of the new building to provide on street parking. Outside of the Buffer Zone, the main entrance will be a porous paved plaza. Rainfall will be captured and treated in this area without being discharged into the street. In Mass. Ave., three catch basins nearest the proposed facility will be redirected into the site's drainage system. This allows for the capture and treatment of additional stormwater from the road and the new parking area at the playground before it reaches Fort Pond Brook. This runoff is essentially untreated under existing conditions. The roof runoff from the new building will be directed to an infiltration basin on its north side. This infiltration basin is presently under construction. The east and west parking lots connect to the covered parking underneath the new building. Runoff from the uncovered parking will be collected by trench drains prior to entering the covered parking. An additional catch basin will collect water or snowmelt from cars under the covered parking. Runoff from the new raingarden, the redirected catch basins in Mass. Ave., and the trenches drain into a Stormceptor unit for additional water quality treatment before being discharged into the infiltration basin. The basin will provide treatment and peak runoff rate attenuation prior to discharge to a riprap pad and ultimately into the wetlands.

Compliance with MA DEP Stormwater Management Standards

The proposed project complies with the Stormwater Management Standards as follows:

Standard 1: No Untreated Discharges

No untreated discharges are proposed. A sediment forebay, rain garden, deep sump hooded catch basins, porous pavement, bioretention area, Stormceptor unit, and infiltration basins will treat runoff.

Standard 2: Peak Rate Attenuation

The post-development peak discharge rates must not be increased from pre-development rates for the 2-year and 10-year storm events. Also, offsite flood impact from the 100-year storm must not be increased. With a combination of infiltration and detention, the peak runoff rate has been decreased as summarized in the following table.

Discharge Summary Table

2-year Storm		10-year Storm		100-year Storm	
Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)	Pre (cfs)	Post (cfs)
4.47	4.37	7.86	7.07	13.68	13.56

Standard 3: Stormwater Recharge

A prescribed amount of water must be infiltrated to recharge groundwater due to the development. As the project will increase impervious area over NRCS Hydrologic Soil Type A, 0.6 inches of runoff over said area must be infiltrated. This recharge will occur in the infiltration basin and through porous pavement. The "Simply Dynamic" method was used with a Rawls Rate of 8.27 in/hr in sizing the required storage volume to infiltrate the recharging runoff. Calculations were performed to insure drawdown within 72 hours to provide storage for the next storm event. For the infiltration basin, that is in an area considered to have rapid infiltration, mounding analysis was performed which shows groundwater mounding will not break out of the surface or flood the infiltration basin. In addition to Standard 3, Acton requires an annual water budget to preserve the groundwater supply. Detailed calculations showing compliance with Standard 3 and Acton's groundwater supply requirement have been attached to this report.

Standard 4: Water Quality

With onsite infiltration greater than 2.4 in/hr, 1 inch of water over the impervious area must be treated for water quality prior to discharge offsite. This is also consistent with the Acton Zoning Bylaw requirements in the Groundwater Protection District Zone 3. Water is considered adequately treated with 80% TSS removal. For the small increased impervious area draining to the existing structures on the west end of the site, a catch basin and infiltration basin with a sediment forebay will treat runoff. In the area of the proposed building and parking lot, a sediment forebay, raingarden, catch basins, a proprietary Stormceptor unit, and an infiltration basin will remove more than the required TSS. In the front walkways and plaza area which are strictly foot traffic, porous pavement is considered full treatment prior to infiltration. Calculations showing treatment levels are attached.

Standard 5: Land Uses with Higher Potential Pollutant Loads

The site is will not contain "land uses with higher potential pollutant loads."

Standard 6: Critical Areas

The site does not discharge runoff to critical areas.

Standard 7: Redevelopment

While the proposed project is a mix of new development and redevelopment, stormwater management will meet the applicable requirements for new development which are more stringent than those required for redevelopment.

Standard 8: Construction Period Controls

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with supporting calculations has been attached to this report. Erosion controls will include haybale siltation barriers along the limit of work, a stabilized construction entrance, erosion controls mats, and slope stabilization. All disturbed areas will be loamed and seeded.

Standard 9: Operation and Maintenance Plan

An Operation and Maintenance Plan has been attached to this report.

Standard 10: Illicit Discharges to Drainage System

An Illicit Discharges Compliance Statement has been attached to this report. The Statement verifies that no illicit discharges will occur on the site.

Design Basis

1. The rational method (Q=CIA) was used as a basis for sizing pipes. Runoff Coefficients: C=0.15 for woos, 0.20 for grass/landscaped areas, 0.76 for gravel, and 0.9 for impervious surfaces.
2. The 100-year storm was used for sizing pipes. Rainfall intensity values were taken from the U.S. Weather Bureau Technical Paper 40.
3. The United States Department of Agriculture Natural Resource Conservation Service (N.R.C.S.) TR55 methodology was used to determine offsite rates of runoff.
4. The twenty-four hour rainfall, taken from N.R.C.S. publications, is 6.4 inches for the 100-year storm, 4.5 inches for the 10-year storm, and 3.1 inches for the 2-year storm event.
5. The hydrologic calculations were performed using the computer program: "Hydraflow Hydrographs 2007" by Intelisolve.
6. The soil types of the site were taken from the N.R.C.S. Soil Survey Map for Acton.
7. Soil conditions and estimated seasonal high groundwater table were based on on-site soil evaluations.
8. The Hantoush Method was used for Mouning analysis.

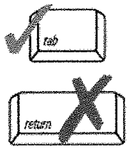
Checklist for Stormwater Report

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.

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[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.

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

COMMONWEALTH OF MASSACHUSETTS
JOSEPH
MARCH
CIVIL
#40472
REGISTERED
PROFESSIONAL ENGINEER

8/10/09
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 (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): Porous Pavement

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 (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 (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 (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 (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.

Pre-Development Hydrology

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.012	2	910	347	----	------	------	PRE Sub. 1
2	SCS Runoff	1.278	2	724	3,966	----	------	------	PRE Sub. 2
3	SCS Runoff	1.036	2	728	3,978	----	------	------	PRE Sub. 3
4	Reservoir	1.072	2	728	3,476	3	212.07	1,086	Existing Basin 3
5	Diversion1	0.002	2	728	641	4	------	------	PRE Basin 3 Infiltration
6	Diversion2	1.070	2	728	2,835	4	------	------	PRE Basin 3 Overflow
7	Combine	1.974	2	728	6,802	2, 6	------	------	PRE To Basin 2
8	Reservoir	2.037	2	728	6,798	7	209.60	397	Existing Basin 2
9	Diversion1	0.098	2	728	3,254	8	------	------	PRE Basin 2 Infiltration
10	Diversion2	1.939	2	728	3,544	8	------	------	PRE Basin 2 Overflow
11	SCS Runoff	1.906	2	726	6,600	----	------	------	PRE Sub. 4
12	SCS Runoff	0.703	2	728	2,589	----	------	------	PRE Sub. 5
13	Combine	4.470	2	728	13,079	1, 10, 11, 12	------	------	PRE TOTAL
14	Combine	0.101	2	728	3,895	5, 9,	------	------	PRE Infiltration

3320-WAV-C-PRE.gpw	Return Period: 2 Year	Tuesday, Jun 23, 2009

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	0.267	2	742	2,392	----	------	------	PRE Sub. 1
2	SCS Runoff	1.958	2	724	6,236	----	------	------	PRE Sub. 2
3	SCS Runoff	1.707	2	728	6,641	----	------	------	PRE Sub. 3
4	Reservoir	1.694	2	728	6,140	3	212.09	1,105	Existing Basin 3
5	Diversion1	0.002	2	728	651	4	------	------	PRE Basin 3 Infiltration
6	Diversion2	1.692	2	728	5,489	4	------	------	PRE Basin 3 Overflow
7	Combine	3.350	2	724	11,725	2, 6	------	------	PRE To Basin 2
8	Reservoir	3.359	2	726	11,721	7	209.63	422	Existing Basin 2
9	Diversion1	0.105	2	726	4,192	8	------	------	PRE Basin 2 Infiltration
10	Diversion2	3.254	2	726	7,529	8	------	------	PRE Basin 2 Overflow
11	SCS Runoff	3.014	2	726	10,666	----	------	------	PRE Sub. 4
12	SCS Runoff	1.525	2	726	5,286	----	------	------	PRE Sub. 5
13	Combine	7.855	2	726	25,873	1, 10, 11, 12	------	------	PRE TOTAL
14	Combine	0.107	2	726	4,843	5, 9,	------	------	PRE Infiltration

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	1.570	2	728	7,336	----	------	------	PRE Sub. 1
2	SCS Runoff	2.868	2	724	9,359	----	------	------	PRE Sub. 2
3	SCS Runoff	2.617	2	728	10,388	----	------	------	PRE Sub. 3
4	Reservoir	2.604	2	728	9,886	3	212.12	1,130	Existing Basin 3
5	Diversion1	0.002	2	728	663	4	------	------	PRE Basin 3 Infiltration
6	Diversion2	2.602	2	728	9,223	4	------	------	PRE Basin 3 Overflow
7	Combine	5.034	2	724	18,582	2, 6	------	------	PRE To Basin 2
8	Reservoir	5.046	2	726	18,578	7	209.68	451	Existing Basin 2
9	Diversion1	0.112	2	726	5,107	8	------	------	PRE Basin 2 Infiltration
10	Diversion2	4.934	2	726	13,471	8	------	------	PRE Basin 2 Overflow
11	SCS Runoff	4.503	2	726	16,311	----	------	------	PRE Sub. 4
12	SCS Runoff	2.777	2	726	9,484	----	------	------	PRE Sub. 5
13	Combine	13.68	2	726	46,602	1, 10, 11, 12	------	------	PRE TOTAL
14	Combine	0.115	2	726	5,769	5, 9,	------	------	PRE Infiltration

3320-WAV-C-PRE.gpw	Return Period: 100 Year	Tuesday, Jun 23, 2009

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ________ Date ________

Circle one: Present Developed Subcatchment 1

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
—	Impervious	98			0.23	22.54
655 B	Woods- Good Condition	58			0.26	15.08
655 B	Grass- Good Condition	61			0.01	0.61
626B A	Woods- Good Condition	32			0.43	13.76
626B A	Grass- Good Condition	39			0.40	15.60
253B A	Woods- Good Condition	32			0.25	8.00
253B A	Grass- Good Condition	39			0.31	12.09
					Totals = 1.89	87.68

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{87.68}{1.89} = 46.39;$$ Use CN = 46.4

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency....................................	yr	2	10	100
Rainfall, P (24-hour).......................	in	3.1	4.5	6.4
Runoff, Q..................................... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.05	0.35	1.07
Runoff, Q.....................................	cf	346	2392	7332

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 1

Circle one: Tc Tt through subarea

			Segment ID	A-B			
Sheet flow (Applicable to Tc only)							
1. Surface Description (table 3-1)				Woods			
2. Mannings roughness coeff., n (table 3-1)				0.4			
3. Flow length, L (total L <= 300 ft)		ft		50			
4. Two-yr 24-hr rainfall, P2		in		3.1			
5. Land Slope, s		ft/ft		0.08			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr		0.12			0.12

			Segment ID	B-C			
Shallow concentrated Flow							
7. Surface Description (paved or unpaved)				UNPAVED			
8. Flow Length, L		ft		27			
9. Watercourse slope, s		ft/ft		0.05			
10. Average Velocity, V (figure 3-1)		ft/s		3.61			
11. Tt = L / 3600V	Compute Tt	hr		0.00			0.00

			Segment ID				
Channel flow							
12. Cross sectional flow area, a		sf					
13. Wetted perimeter, pw		ft					
14. Hydraulic radius, r=a/wp	Compute r	ft					
15. Channel Slope, s		ft/ft					
16. Manning's roughness coeff., n							
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s					
18. Flow length, L		ft					
19. Tt = L / 3600V	Compute Tt	hr					0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.12 min 7.2

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 1

PRE Sub. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.012 cfs
Storm frequency	= 2 yrs	Time to peak	= 15.17 hrs
Time interval	= 2 min	Hyd. volume	= 347 cuft
Drainage area	= 1.890 ac	Curve number	= 46.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
14.63	0.012
14.67	0.012
14.70	0.012
14.73	0.012
14.77	0.012
14.80	0.012
14.83	0.012
14.87	0.012
14.90	0.012
14.93	0.012
14.97	0.012
15.00	0.012
15.03	0.012
15.07	0.012
15.10	0.012
15.13	0.012
15.17	0.012 <<
15.20	0.012
15.23	0.012
15.27	0.012
15.30	0.012
15.33	0.012
15.37	0.012
15.40	0.012
15.43	0.012
15.47	0.012
15.50	0.012
15.53	0.012
15.57	0.012
15.60	0.012
15.63	0.012
15.67	0.012
15.70	0.012
15.73	0.012
15.77	0.012

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 1

PRE Sub. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 0.267 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 347 cuft
Drainage area	= 1.890 ac	Curve number	= 46.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.30	0.263
12.33	0.267
12.37	0.267 <<
12.40	0.262

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 1

PRE Sub. 1

Hydrograph type	= SCS Runoff	Peak discharge	= 1.570 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 347 cuft
Drainage area	= 1.890 ac	Curve number	= 46.4
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.2 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.13	1.570 <<
12.17	1.542

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 2

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.44	43.12
655 B	Grass- Good Condition	61			0.03	1.83
626B A	Grass- Good Condition	39			0.02	0.78

1/ Use only one CN source per line. Totals = 0.49 45.73

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{45.73}{0.49} = 93.33$; Use CN = 93.3

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.38	3.74	5.62
Runoff, Q..................................	cf	4235	6657	9988

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 2

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Concrete			
2. Mannings roughness coeff., n (table 3-1)			0.011			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.02			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.01			0.01

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	185			
9. Watercourse slope, s		ft/ft	0.02			
10. Average Velocity, V (figure 3-1)		ft/s	2.87			
11. Tt = L / 3600V	Compute Tt	hr	0.02			0.02

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.10 min 6.0

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 2

PRE Sub. 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.278 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,966 cuft
Drainage area	= 0.490 ac	Curve number	= 93.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	1.278 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 2

PRE Sub. 2

Hydrograph type	= SCS Runoff	Peak discharge	= 1.958 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,966 cuft
Drainage area	= 0.490 ac	Curve number	= 93.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	1.958 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 2

PRE Sub. 2

Hydrograph type	= SCS Runoff	Peak discharge	= 2.868 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,966 cuft
Drainage area	= 0.490 ac	Curve number	= 93.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	2.868 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ________ Date ________

Circle one: Present Developed Subcatchment 3

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.46	45.08
626B A	Grass- Good Condition	39			0.08	3.12
602 A	Grass- Good Condition	39			0.01	0.39
				Totals =	0.55	48.59

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{48.59}{0.55} = 88.35$; Use CN = 88.3

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)....................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	1.94	3.23	5.05
Runoff, Q..................................	cf	3865	6449	10083

 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 3

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.01			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.18			0.18

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	94			
9. Watercourse slope, s		ft/ft	0.02			
10. Average Velocity, V (figure 3-1)		ft/s	2.87			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)		
	hr	0.19
	min	11.5

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 3

PRE Sub. 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.036 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,978 cuft
Drainage area	= 0.550 ac	Curve number	= 88.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.5 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	0.984
12.13	1.036 <<
12.17	1.023

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 3

PRE Sub. 3

Hydrograph type	= SCS Runoff	Peak discharge	= 1.707 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,978 cuft
Drainage area	= 0.550 ac	Curve number	= 88.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.5 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.10	1.631
12.13	1.707 <<
12.17	1.676

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 3

PRE Sub. 3

Hydrograph type	= SCS Runoff	Peak discharge	= 2.617 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,978 cuft
Drainage area	= 0.550 ac	Curve number	= 88.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.5 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	2.511
12.13	2.617 <<
12.17	2.560

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 4

Existing Basin 3

Hydrograph type	= Reservoir	Peak discharge	= 1.072 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,476 cuft
Inflow hyd. No.	= 3 - PRE Sub. 3	Reservoir name	= Basin 3
Max. Elevation	= 212.07 ft	Max. Storage	= 1,086 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	1.036 <<	212.06 <<	-----	-----	-----	-----	1.070	-----	-----	-----	0.002	1.072 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 4

Existing Basin 3

Hydrograph type	= Reservoir	Peak discharge	= 1.694 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,476 cuft
Inflow hyd. No.	= 3 - PRE Sub. 3	Reservoir name	= Basin 3
Max. Elevation	= 212.09 ft	Max. Storage	= 1,105 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	1.707 <<	212.09 <<	-----	-----	-----	-----	1.692	-----	-----	-----	0.002	1.694 <<
12.17	1.676	212.09	-----	-----	-----	-----	1.688	-----	-----	-----	0.002	1.690

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 4

Existing Basin 3

Hydrograph type	= Reservoir	Peak discharge	= 2.604 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,476 cuft
Inflow hyd. No.	= 3 - PRE Sub. 3	Reservoir name	= Basin 3
Max. Elevation	= 212.12 ft	Max. Storage	= 1,130 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	2.617 <<	212.12 <<	-----	-----	-----	-----	2.602	-----	-----	-----	0.002	2.604 <<
12.17	2.560	212.12	-----	-----	-----	-----	2.579	-----	-----	-----	0.002	2.582

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 5

PRE Basin 3 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.002 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 641 cuft
Inflow hydrograph	= 4 - Existing Basin 3	2nd diverted hyd.	= 6
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	0.002	0.000	0.002
12.10	0.814	0.811	0.002
12.13	1.072 <<	1.070 <<	0.002 <<
12.17	1.016	1.013	0.002
12.20	0.987	0.984	0.002
12.23	0.906	0.903	0.002
12.27	0.820	0.818	0.002
12.30	0.728	0.726	0.002
12.33	0.658	0.656	0.002
12.37	0.578	0.576	0.002
12.40	0.516	0.513	0.002
12.43	0.467	0.465	0.002
12.47	0.425	0.423	0.002
12.50	0.384	0.382	0.002
12.53	0.344	0.341	0.002
12.57	0.304	0.302	0.002
12.60	0.268	0.265	0.002
12.63	0.236	0.234	0.002
12.67	0.211	0.209	0.002
12.70	0.192	0.190	0.002
12.73	0.178	0.175	0.002
12.77	0.167	0.165	0.002
12.80	0.160	0.157	0.002
12.83	0.154	0.152	0.002
12.87	0.150	0.147	0.002
12.90	0.145	0.143	0.002
12.93	0.141	0.138	0.002
12.97	0.136	0.134	0.002
13.00	0.132	0.130	0.002
13.03	0.127	0.125	0.002
13.07	0.123	0.121	0.002
13.10	0.119	0.117	0.002
13.13	0.116	0.113	0.002
13.17	0.113	0.110	0.002
13.20	0.110	0.108	0.002
13.23	0.108	0.106	0.002
13.27	0.107	0.104	0.002
13.30	0.105	0.103	0.002
13.33	0.104	0.102	0.002
13.37	0.103	0.101	0.002
13.40	0.102	0.099	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
13.43	0.101	0.098	0.002
13.47	0.099	0.097	0.002
13.50	0.098	0.096	0.002
13.53	0.097	0.095	0.002
13.57	0.096	0.094	0.002
13.60	0.095	0.093	0.002
13.63	0.094	0.091	0.002
13.67	0.093	0.090	0.002
13.70	0.091	0.089	0.002
13.73	0.090	0.088	0.002
13.77	0.089	0.087	0.002
13.80	0.088	0.086	0.002
13.83	0.087	0.084	0.002
13.87	0.086	0.083	0.002
13.90	0.084	0.082	0.002
13.93	0.083	0.081	0.002
13.97	0.082	0.080	0.002
14.00	0.081	0.079	0.002
14.03	0.080	0.077	0.002
14.07	0.079	0.076	0.002
14.10	0.077	0.075	0.002
14.13	0.076	0.074	0.002
14.17	0.076	0.073	0.002
14.20	0.075	0.072	0.002
14.23	0.074	0.072	0.002
14.27	0.073	0.071	0.002
14.30	0.073	0.070	0.002
14.33	0.072	0.070	0.002
14.37	0.072	0.069	0.002
14.40	0.071	0.069	0.002
14.43	0.070	0.068	0.002
14.47	0.070	0.068	0.002
14.50	0.069	0.067	0.002
14.53	0.069	0.066	0.002
14.57	0.068	0.066	0.002
14.60	0.068	0.065	0.002
14.63	0.067	0.065	0.002
14.67	0.067	0.064	0.002
14.70	0.066	0.064	0.002
14.73	0.065	0.063	0.002
14.77	0.065	0.063	0.002
14.80	0.064	0.062	0.002
14.83	0.064	0.061	0.002
14.87	0.063	0.061	0.002
14.90	0.063	0.060	0.002
14.93	0.062	0.060	0.002
14.97	0.061	0.059	0.002
15.00	0.061	0.059	0.002
15.03	0.060	0.058	0.002
15.07	0.060	0.057	0.002
15.10	0.059	0.057	0.002
15.13	0.059	0.056	0.002
15.17	0.058	0.056	0.002
15.20	0.057	0.055	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
15.23	0.057	0.055	0.002
15.27	0.056	0.054	0.002
15.30	0.056	0.053	0.002
15.33	0.055	0.053	0.002
15.37	0.055	0.052	0.002
15.40	0.054	0.052	0.002
15.43	0.053	0.051	0.002
15.47	0.053	0.050	0.002
15.50	0.052	0.050	0.002
15.53	0.052	0.049	0.002
15.57	0.051	0.049	0.002
15.60	0.050	0.048	0.002
15.63	0.050	0.048	0.002
15.67	0.049	0.047	0.002
15.70	0.049	0.046	0.002
15.73	0.048	0.046	0.002
15.77	0.048	0.045	0.002
15.80	0.047	0.045	0.002
15.83	0.046	0.044	0.002
15.87	0.046	0.043	0.002
15.90	0.045	0.043	0.002
15.93	0.045	0.042	0.002
15.97	0.044	0.042	0.002
16.00	0.043	0.041	0.002
16.03	0.043	0.041	0.002
16.07	0.042	0.040	0.002
16.10	0.042	0.039	0.002
16.13	0.041	0.039	0.002
16.17	0.041	0.039	0.002
16.20	0.040	0.038	0.002
16.23	0.040	0.038	0.002
16.27	0.040	0.037	0.002
16.30	0.040	0.037	0.002
16.33	0.039	0.037	0.002
16.37	0.039	0.037	0.002
16.40	0.039	0.036	0.002
16.43	0.038	0.036	0.002
16.47	0.038	0.036	0.002
16.50	0.038	0.036	0.002
16.53	0.038	0.035	0.002
16.57	0.037	0.035	0.002
16.60	0.037	0.035	0.002
16.63	0.037	0.035	0.002
16.67	0.037	0.034	0.002
16.70	0.036	0.034	0.002
16.73	0.036	0.034	0.002
16.77	0.036	0.034	0.002
16.80	0.036	0.033	0.002
16.83	0.035	0.033	0.002
16.87	0.035	0.033	0.002
16.90	0.035	0.033	0.002
16.93	0.035	0.032	0.002
16.97	0.034	0.032	0.002
17.00	0.034	0.032	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
17.03	0.034	0.032	0.002
17.07	0.034	0.031	0.002
17.10	0.033	0.031	0.002
17.13	0.033	0.031	0.002
17.17	0.033	0.031	0.002
17.20	0.033	0.030	0.002
17.23	0.032	0.030	0.002
17.27	0.032	0.030	0.002
17.30	0.032	0.030	0.002
17.33	0.032	0.029	0.002
17.37	0.031	0.029	0.002
17.40	0.031	0.029	0.002
17.43	0.031	0.029	0.002
17.47	0.031	0.028	0.002
17.50	0.030	0.028	0.002
17.53	0.030	0.028	0.002
17.57	0.030	0.027	0.002
17.60	0.030	0.027	0.002
17.63	0.029	0.027	0.002
17.67	0.029	0.027	0.002
17.70	0.029	0.026	0.002
17.73	0.029	0.026	0.002
17.77	0.028	0.026	0.002
17.80	0.028	0.026	0.002
17.83	0.028	0.025	0.002
17.87	0.027	0.025	0.002
17.90	0.027	0.025	0.002
17.93	0.027	0.025	0.002
17.97	0.027	0.024	0.002
18.00	0.026	0.024	0.002
18.03	0.026	0.024	0.002
18.07	0.026	0.024	0.002
18.10	0.026	0.023	0.002
18.13	0.025	0.023	0.002
18.17	0.025	0.023	0.002
18.20	0.025	0.023	0.002
18.23	0.025	0.023	0.002
18.27	0.025	0.023	0.002
18.30	0.025	0.023	0.002
18.33	0.025	0.022	0.002
18.37	0.025	0.022	0.002
18.40	0.025	0.022	0.002
18.43	0.025	0.022	0.002
18.47	0.024	0.022	0.002
18.50	0.024	0.022	0.002
18.53	0.024	0.022	0.002
18.57	0.024	0.022	0.002
18.60	0.024	0.022	0.002
18.63	0.024	0.022	0.002
18.67	0.024	0.022	0.002
18.70	0.024	0.022	0.002
18.73	0.024	0.022	0.002
18.77	0.024	0.021	0.002
18.80	0.024	0.021	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
18.83	0.024	0.021	0.002
18.87	0.024	0.021	0.002
18.90	0.023	0.021	0.002
18.93	0.023	0.021	0.002
18.97	0.023	0.021	0.002
19.00	0.023	0.021	0.002
19.03	0.023	0.021	0.002
19.07	0.023	0.021	0.002
19.10	0.023	0.021	0.002
19.13	0.023	0.021	0.002
19.17	0.023	0.021	0.002
19.20	0.023	0.020	0.002
19.23	0.023	0.020	0.002
19.27	0.023	0.020	0.002
19.30	0.023	0.020	0.002
19.33	0.022	0.020	0.002
19.37	0.022	0.020	0.002
19.40	0.022	0.020	0.002
19.43	0.022	0.020	0.002
19.47	0.022	0.020	0.002
19.50	0.022	0.020	0.002
19.53	0.022	0.020	0.002
19.57	0.022	0.020	0.002
19.60	0.022	0.020	0.002
19.63	0.022	0.019	0.002
19.67	0.022	0.019	0.002
19.70	0.022	0.019	0.002
19.73	0.022	0.019	0.002
19.77	0.021	0.019	0.002
19.80	0.021	0.019	0.002
19.83	0.021	0.019	0.002
19.87	0.021	0.019	0.002
19.90	0.021	0.019	0.002
19.93	0.021	0.019	0.002
19.97	0.021	0.019	0.002
20.00	0.021	0.019	0.002
20.03	0.021	0.019	0.002
20.07	0.021	0.018	0.002
20.10	0.021	0.018	0.002
20.13	0.021	0.018	0.002
20.17	0.021	0.018	0.002
20.20	0.020	0.018	0.002
20.23	0.020	0.018	0.002
20.27	0.020	0.018	0.002
20.30	0.020	0.018	0.002
20.33	0.020	0.018	0.002
20.37	0.020	0.018	0.002
20.40	0.020	0.018	0.002
20.43	0.020	0.018	0.002
20.47	0.020	0.018	0.002
20.50	0.020	0.017	0.002
20.53	0.020	0.017	0.002
20.57	0.020	0.017	0.002
20.60	0.020	0.017	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
20.63	0.019	0.017	0.002
20.67	0.019	0.017	0.002
20.70	0.019	0.017	0.002
20.73	0.019	0.017	0.002
20.77	0.019	0.017	0.002
20.80	0.019	0.017	0.002
20.83	0.019	0.017	0.002
20.87	0.019	0.017	0.002
20.90	0.019	0.017	0.002
20.93	0.019	0.016	0.002
20.97	0.019	0.016	0.002
21.00	0.019	0.016	0.002
21.03	0.019	0.016	0.002
21.07	0.018	0.016	0.002
21.10	0.018	0.016	0.002
21.13	0.018	0.016	0.002
21.17	0.018	0.016	0.002
21.20	0.018	0.016	0.002
21.23	0.018	0.016	0.002
21.27	0.018	0.016	0.002
21.30	0.018	0.016	0.002
21.33	0.018	0.016	0.002
21.37	0.018	0.015	0.002
21.40	0.018	0.015	0.002
21.43	0.018	0.015	0.002
21.47	0.018	0.015	0.002
21.50	0.017	0.015	0.002
21.53	0.017	0.015	0.002
21.57	0.017	0.015	0.002
21.60	0.017	0.015	0.002
21.63	0.017	0.015	0.002
21.67	0.017	0.015	0.002
21.70	0.017	0.015	0.002
21.73	0.017	0.015	0.002
21.77	0.017	0.015	0.002
21.80	0.017	0.014	0.002
21.83	0.017	0.014	0.002
21.87	0.017	0.014	0.002
21.90	0.017	0.014	0.002
21.93	0.016	0.014	0.002
21.97	0.016	0.014	0.002
22.00	0.016	0.014	0.002
22.03	0.017	0.015	0.002
22.07	0.019	0.016	0.002
22.10	0.020	0.018	0.002
22.13	0.022	0.020	0.002
22.17	0.023	0.020	0.002
22.20	0.022	0.019	0.002
22.23	0.021	0.019	0.002
22.27	0.020	0.018	0.002
22.30	0.019	0.017	0.002
22.33	0.018	0.016	0.002
22.37	0.017	0.015	0.002
22.40	0.017	0.014	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
22.43	0.017	0.014	0.002
22.47	0.017	0.014	0.002
22.50	0.016	0.014	0.002
22.53	0.016	0.014	0.002
22.57	0.016	0.014	0.002
22.60	0.016	0.014	0.002
22.63	0.016	0.014	0.002
22.67	0.016	0.014	0.002
22.70	0.016	0.014	0.002
22.73	0.016	0.014	0.002
22.77	0.016	0.014	0.002
22.80	0.016	0.014	0.002
22.83	0.016	0.014	0.002
22.87	0.016	0.014	0.002
22.90	0.016	0.013	0.002
22.93	0.016	0.013	0.002
22.97	0.016	0.013	0.002
23.00	0.016	0.013	0.002
23.03	0.016	0.013	0.002
23.07	0.015	0.013	0.002
23.10	0.015	0.013	0.002
23.13	0.015	0.013	0.002
23.17	0.015	0.013	0.002
23.20	0.015	0.013	0.002
23.23	0.015	0.013	0.002
23.27	0.015	0.013	0.002
23.30	0.015	0.013	0.002
23.33	0.015	0.013	0.002
23.37	0.015	0.013	0.002
23.40	0.015	0.013	0.002
23.43	0.015	0.013	0.002
23.47	0.015	0.012	0.002
23.50	0.015	0.012	0.002
23.53	0.015	0.012	0.002
23.57	0.015	0.012	0.002
23.60	0.015	0.012	0.002
23.63	0.014	0.012	0.002
23.67	0.014	0.012	0.002
23.70	0.014	0.012	0.002
23.73	0.014	0.012	0.002
23.77	0.014	0.012	0.002
23.80	0.014	0.012	0.002
23.83	0.014	0.012	0.002
23.87	0.014	0.012	0.002
23.90	0.014	0.012	0.002
23.93	0.014	0.012	0.002
23.97	0.014	0.012	0.002
24.00	0.014	0.012	0.002
24.03	0.013	0.011	0.002
24.07	0.012	0.010	0.002
24.10	0.011	0.009	0.002
24.13	0.009	0.006	0.002
24.17	0.006	0.004	0.002
24.20	0.004	0.002	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
24.23	0.003	0.000	0.002
24.27	0.002	0.000	0.002
24.30	0.002	0.000	0.002
24.33	0.002	0.000	0.002
24.37	0.002	0.000	0.002
24.40	0.002	0.000	0.002
24.43	0.002	0.000	0.002
24.47	0.002	0.000	0.002
24.50	0.002	0.000	0.002
24.53	0.002	0.000	0.002
24.57	0.002	0.000	0.002
24.60	0.002	0.000	0.002
24.63	0.002	0.000	0.002
24.67	0.002	0.000	0.002
24.70	0.002	0.000	0.002
24.73	0.002	0.000	0.002
24.77	0.002	0.000	0.002
24.80	0.002	0.000	0.002
24.83	0.002	0.000	0.002
24.87	0.002	0.000	0.002
24.90	0.002	0.000	0.002
24.93	0.002	0.000	0.002
24.97	0.002	0.000	0.002
25.00	0.002	0.000	0.002
25.03	0.002	0.000	0.002
25.07	0.002	0.000	0.002
25.10	0.002	0.000	0.002
25.13	0.002	0.000	0.002
25.17	0.002	0.000	0.002
25.20	0.002	0.000	0.002
25.23	0.002	0.000	0.002
25.27	0.002	0.000	0.002
25.30	0.002	0.000	0.002
25.33	0.002	0.000	0.002
25.37	0.002	0.000	0.002
25.40	0.002	0.000	0.002
25.43	0.002	0.000	0.002
25.47	0.002	0.000	0.002
25.50	0.002	0.000	0.002
25.53	0.002	0.000	0.002
25.57	0.002	0.000	0.002
25.60	0.002	0.000	0.002
25.63	0.002	0.000	0.002
25.67	0.002	0.000	0.002
25.70	0.002	0.000	0.002
25.73	0.002	0.000	0.002
25.77	0.002	0.000	0.002
25.80	0.002	0.000	0.002
25.83	0.002	0.000	0.002
25.87	0.002	0.000	0.002
25.90	0.002	0.000	0.002
25.93	0.002	0.000	0.002
25.97	0.002	0.000	0.002
26.00	0.002	0.000	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
26.03	0.002	0.000	0.002
26.07	0.002	0.000	0.002
26.10	0.002	0.000	0.002
26.13	0.002	0.000	0.002
26.17	0.002	0.000	0.002
26.20	0.002	0.000	0.002
26.23	0.002	0.000	0.002
26.27	0.002	0.000	0.002
26.30	0.002	0.000	0.002
26.33	0.002	0.000	0.002
26.37	0.002	0.000	0.002
26.40	0.002	0.000	0.002
26.43	0.002	0.000	0.002
26.47	0.002	0.000	0.002
26.50	0.002	0.000	0.002
26.53	0.002	0.000	0.002
26.57	0.002	0.000	0.002
26.60	0.002	0.000	0.002
26.63	0.002	0.000	0.002
26.67	0.002	0.000	0.002
26.70	0.002	0.000	0.002
26.73	0.002	0.000	0.002
26.77	0.002	0.000	0.002
26.80	0.002	0.000	0.002
26.83	0.002	0.000	0.002
26.87	0.002	0.000	0.002
26.90	0.002	0.000	0.002
26.93	0.002	0.000	0.002
26.97	0.002	0.000	0.002
27.00	0.002	0.000	0.002
27.03	0.002	0.000	0.002
27.07	0.002	0.000	0.002
27.10	0.002	0.000	0.002
27.13	0.002	0.000	0.002
27.17	0.002	0.000	0.002
27.20	0.002	0.000	0.002
27.23	0.002	0.000	0.002
27.27	0.002	0.000	0.002
27.30	0.002	0.000	0.002
27.33	0.002	0.000	0.002
27.37	0.002	0.000	0.002

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 5

PRE Basin 3 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.002 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 641 cuft
Inflow hydrograph	= 4 - Existing Basin 3	2nd diverted hyd.	= 6
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
11.73	0.347	0.345	0.002
11.77	0.391	0.388	0.002
11.80	0.446	0.443	0.002
11.83	0.505	0.502	0.002
11.87	0.566	0.564	0.002
11.90	0.629	0.627	0.002
11.93	0.700	0.697	0.002
11.97	0.811	0.809	0.002
12.00	0.964	0.961	0.002
12.03	1.166	1.164	0.002
12.07	1.395	1.393	0.002
12.10	1.589	1.587	0.002
12.13	1.694 <<	1.692 <<	0.002 <<
12.17	1.690	1.688	0.002
12.20	1.604	1.601	0.002
12.23	1.474	1.471	0.002
12.27	1.326	1.323	0.002
12.30	1.171	1.169	0.002
12.33	1.023	1.020	0.002
12.37	0.897	0.894	0.002
12.40	0.800	0.798	0.002
12.43	0.727	0.724	0.002
12.47	0.674	0.672	0.002
12.50	0.608	0.606	0.002
12.53	0.543	0.541	0.002
12.57	0.480	0.477	0.002
12.60	0.422	0.420	0.002
12.63	0.372	0.370	0.002
12.67	0.332	0.330	0.002
12.70	0.302	0.299	0.002
12.73	0.279	0.277	0.002
12.77	0.262	0.260	0.002
12.80	0.250	0.248	0.002
12.83	0.242	0.239	0.002
12.87	0.234	0.232	0.002
12.90	0.227	0.225	0.002
12.93	0.220	0.218	0.002
12.97	0.213	0.211	0.002
13.00	0.206	0.204	0.002
13.03	0.199	0.197	0.002
13.07	0.193	0.190	0.002

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
13.10	0.186	0.184	0.002
13.13	0.181	0.178	0.002
13.17	0.176	0.174	0.002
13.20	0.172	0.170	0.002
13.23	0.169	0.167	0.002
13.27	0.166	0.164	0.002
13.30	0.164	0.162	0.002
13.33	0.162	0.160	0.002
13.37	0.160	0.158	0.002
13.40	0.158	0.156	0.002
13.43	0.157	0.154	0.002
13.47	0.155	0.152	0.002
13.50	0.153	0.151	0.002
13.53	0.151	0.149	0.002
13.57	0.149	0.147	0.002
13.60	0.147	0.145	0.002
13.63	0.146	0.143	0.002
13.67	0.144	0.142	0.002
13.70	0.142	0.140	0.002
13.73	0.140	0.138	0.002
13.77	0.138	0.136	0.002
13.80	0.136	0.134	0.002
13.83	0.135	0.132	0.002
13.87	0.133	0.130	0.002
13.90	0.131	0.129	0.002
13.93	0.129	0.127	0.002
13.97	0.127	0.125	0.002
14.00	0.125	0.123	0.002
14.03	0.124	0.121	0.002
14.07	0.122	0.119	0.002
14.10	0.120	0.118	0.002
14.13	0.118	0.116	0.002
14.17	0.117	0.115	0.002
14.20	0.116	0.113	0.002
14.23	0.115	0.112	0.002

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 5

PRE Basin 3 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.002 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 641 cuft
Inflow hydrograph	= 4 - Existing Basin 3	2nd diverted hyd.	= 6
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
11.73	0.553	0.551	0.002
11.77	0.632	0.630	0.002
11.80	0.718	0.716	0.002
11.83	0.833	0.830	0.002
11.87	0.925	0.922	0.002
11.90	1.024	1.021	0.002
11.93	1.133	1.131	0.002
11.97	1.283	1.281	0.002
12.00	1.508	1.506	0.002
12.03	1.817	1.814	0.002
12.07	2.169	2.166	0.002
12.10	2.470	2.468	0.002
12.13	2.604 <<	2.602 <<	0.002 <<
12.17	2.582	2.579	0.002
12.20	2.434	2.432	0.002
12.23	2.227	2.225	0.002
12.27	2.000	1.997	0.002
12.30	1.772	1.769	0.002
12.33	1.539	1.536	0.002
12.37	1.347	1.345	0.002
12.40	1.200	1.197	0.002
12.43	1.087	1.084	0.002
12.47	0.986	0.984	0.002
12.50	0.888	0.885	0.002
12.53	0.789	0.787	0.002
12.57	0.703	0.701	0.002
12.60	0.629	0.627	0.002
12.63	0.554	0.552	0.002

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 6

PRE Basin 3 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 1.070 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 2,835 cuft
Inflow hydrograph	= 4 - Existing Basin 3	2nd diverted hyd.	= 5
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	1.072 <<	0.002 <<	1.070 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 6

PRE Basin 3 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 1.692 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 2,835 cuft
Inflow hydrograph	= 4 - Existing Basin 3	2nd diverted hyd.	= 5
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	1.694 <<	0.002 <<	1.692 <<
12.17	1.690	0.002	1.688

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 6

PRE Basin 3 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 2.602 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 2,835 cuft
Inflow hydrograph	= 4 - Existing Basin 3	2nd diverted hyd.	= 5
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	2.604 <<	0.002 <<	2.602 <<
12.17	2.582	0.002	2.579

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 7

PRE To Basin 2

Hydrograph type	= Combine	Peak discharge	= 1.974 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 6,802 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 0.490 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 2 + (cfs)	Hyd. 6 = (cfs)	Outflow (cfs)
12.10	1.142	0.811	1.954
12.13	0.904	1.070 <<	1.974 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 7

PRE To Basin 2

Hydrograph type	= Combine	Peak discharge	= 3.350 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,802 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 0.490 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 2 + (cfs)	Hyd. 6 = (cfs)	Outflow (cfs)
12.07	1.958 <<	1.393	3.350 <<
12.10	1.744	1.587	3.331

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 7

PRE To Basin 2

Hydrograph type	= Combine	Peak discharge	= 5.034 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,802 cuft
Inflow hyds.	= 2, 6	Contrib. drain. area	= 0.490 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 2 + (cfs)	Hyd. 6 = (cfs)	Outflow (cfs)
12.07	2.868 <<	2.166	5.034 <<
12.10	2.548	2.468	5.016

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 8

Existing Basin 2

Hydrograph type	= Reservoir	Peak discharge	= 2.037 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 6,798 cuft
Inflow hyd. No.	= 7 - PRE To Basin 2	Reservoir name	= Basin 2
Max. Elevation	= 209.60 ft	Max. Storage	= 397 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	1.974 <<	209.59 <<	-----	-----	-----	-----	1.939	-----	-----	-----	0.098	2.037 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 8

Existing Basin 2

Hydrograph type	= Reservoir	Peak discharge	= 3.359 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 6,798 cuft
Inflow hyd. No.	= 7 - PRE To Basin 2	Reservoir name	= Basin 2
Max. Elevation	= 209.63 ft	Max. Storage	= 422 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.07	3.350 <<	209.63	-----	-----	-----	-----	3.203	-----	-----	-----	0.104	3.307
12.10	3.331	209.63 <<	-----	-----	-----	-----	3.254	-----	-----	-----	0.105	3.359 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 8

Existing Basin 2

Hydrograph type	= Reservoir	Peak discharge	= 5.046 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 6,798 cuft
Inflow hyd. No.	= 7 - PRE To Basin 2	Reservoir name	= Basin 2
Max. Elevation	= 209.68 ft	Max. Storage	= 451 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.07	5.034 <<	209.68	-----	-----	-----	-----	4.875	-----	-----	-----	0.112	4.987
12.10	5.016	209.68 <<	-----	-----	-----	-----	4.934	-----	-----	-----	0.112	5.046 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 9

PRE Basin 2 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.098 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,254 cuft
Inflow hydrograph	= 8 - Existing Basin 2	2nd diverted hyd.	= 10
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.10	1.720	1.624	0.096
12.13	2.037 <<	1.939 <<	0.098 <<
12.17	1.787	1.690	0.096
12.20	1.604	1.509	0.095
12.23	1.479	1.385	0.094

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Jun 23, 2009

Hyd. No. 9

PRE Basin 2 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.105 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,254 cuft
Inflow hydrograph	= 8 - Existing Basin 2	2nd diverted hyd.	= 10
Diversion method	= Pond -	Pond structure	= Exfiltration

(Printed values >= 95.00% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.00	2.324	2.224	0.100
12.03	2.954	2.851	0.103
12.07	3.307	3.203	0.104
12.10	3.359 <<	3.254 <<	0.105 <<
12.13	3.112	3.008	0.104
12.17	2.800	2.698	0.102
12.20	2.530	2.429	0.101
12.23	2.313	2.213	0.100

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 9

PRE Basin 2 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.112 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,254 cuft
Inflow hydrograph	= 8 - Existing Basin 2	2nd diverted hyd.	= 10
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.03	4.410	4.301	0.109
12.07	4.987	4.875	0.112
12.10	5.046 <<	4.934 <<	0.112 <<
12.13	4.684	4.574	0.110
12.17	4.198	4.089	0.108
12.20	3.788	3.682	0.107

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 10

PRE Basin 2 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 1.939 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,544 cuft
Inflow hydrograph	= 8 - Existing Basin 2	2nd diverted hyd.	= 9
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	2.037 <<	0.098 <<	1.939 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 10

PRE Basin 2 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 3.254 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,544 cuft
Inflow hydrograph	= 8 - Existing Basin 2	2nd diverted hyd.	= 9
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	3.307	0.104	3.203
12.10	3.359 <<	0.105 <<	3.254 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 10

PRE Basin 2 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 4.934 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,544 cuft
Inflow hydrograph	= 8 - Existing Basin 2	2nd diverted hyd.	= 9
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	4.987	0.112	4.875
12.10	5.046 <<	0.112 <<	4.934 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ________ Date ________

Circle one: Present Developed Subcatchment 4

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.74	72.52
626B A	Grass- Good Condition	39			0.09	3.51
602 A	Grass- Good Condition	39			0.01	0.39
				Totals =	0.84	76.42

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{76.42}{0.84} = 90.98$; Use CN = 91.0

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.16	3.50	5.35
Runoff, Q.................................	cf	6594	10659	16303

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/08

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 4

Circle one: Tc Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.05			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.10			0.10

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	243			
9. Watercourse slope, s		ft/ft	0.01			
10. Average Velocity, V (figure 3-1)		ft/s	2.03			
11. Tt = L / 3600V	Compute Tt	hr	0.03			0.03

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)	hr	0.13
	min	7.8

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 11

PRE Sub. 4

Hydrograph type	= SCS Runoff	Peak discharge	= 1.906 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 6,600 cuft
Drainage area	= 0.840 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.8 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	**Outflow cfs)**
12.10	1.906 <<
12.13	1.829

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 11

PRE Sub. 4

Hydrograph type	= SCS Runoff	Peak discharge	= 3.014 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 6,600 cuft
Drainage area	= 0.840 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.8 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.10	3.014 <<
12.13	2.879

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 11

PRE Sub. 4

Hydrograph type	= SCS Runoff	Peak discharge	= 4.503 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 6,600 cuft
Drainage area	= 0.840 ac	Curve number	= 91
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.8 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	4.280
12.10	4.503 <<
12.13	4.290

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 5

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.44	43.12
626B A	Grass- Good Condition	39			0.24	9.36
253B A	Grass- Good Condition	39			0.07	2.73
				Totals =	0.75	55.21

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{55.21}{0.75} = 73.61$; Use CN = 73.6

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)...................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.95	1.94	3.49
Runoff, Q..................................	cf	2591	5289	9488

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 3/27/09

Location: Acton, MA Checked ______ Date ______

Circle one: $\boxed{\text{Present}}$ Developed Subcatchment 5

Circle one: $\boxed{\text{Tc}}$ Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.04			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.11			0.11

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	152			
9. Watercourse slope, s		ft/ft	0.05			
10. Average Velocity, V (figure 3-1)		ft/s	4.55			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)		
	hr	0.11
	min	6.9

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 12

PRE Sub. 5

Hydrograph type	= SCS Runoff	Peak discharge	= 0.703 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 2,589 cuft
Drainage area	= 0.750 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.9 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	0.703
12.13	0.703 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 12

PRE Sub. 5

Hydrograph type	= SCS Runoff	Peak discharge	= 1.525 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 2,589 cuft
Drainage area	= 0.750 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.9 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	1.525 <<
12.13	1.496

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 12

PRE Sub. 5

Hydrograph type	= SCS Runoff	Peak discharge	= 2.777 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 2,589 cuft
Drainage area	= 0.750 ac	Curve number	= 73.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.9 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.10	2.777 <<
12.13	2.694

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 13

PRE TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.470 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 13,079 cuft
Inflow hyds.	= 1, 10, 11, 12	Contrib. drain. area	= 3.480 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 10 + (cfs)	Hyd. 11 + (cfs)	Hyd. 12 = (cfs)	Outflow (cfs)
12.13	0.000	1.939 <<	1.829	0.703 <<	4.470 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 13

PRE TOTAL

Hydrograph type	= Combine	Peak discharge	= 7.855 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 13,079 cuft
Inflow hyds.	= 1, 10, 11, 12	Contrib. drain. area	= 3.480 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 10 + (cfs)	Hyd. 11 + (cfs)	Hyd. 12 = (cfs)	Outflow (cfs)
12.07	0.022	3.203	2.856	1.401	7.482
12.10	0.061	3.254 <<	3.014 <<	1.525 <<	7.855 <<
12.13	0.115	3.008	2.879	1.496	7.498

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 13

PRE TOTAL

Hydrograph type	= Combine	Peak discharge	= 13.68 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 13,079 cuft
Inflow hyds.	= 1, 10, 11, 12	Contrib. drain. area	= 3.480 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 10 + (cfs)	Hyd. 11 + (cfs)	Hyd. 12 = (cfs)	Outflow (cfs)
12.10	1.464	4.934 <<	4.503 <<	2.777 <<	13.68 <<
12.13	1.570 <<	4.574	4.290	2.694	13.13

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 14

PRE Infiltration

Hydrograph type	= Combine	Peak discharge	= 0.101 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,895 cuft
Inflow hyds.	= 5, 9	Contrib. drain. area	= 0.000 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 5 + (cfs)	Hyd. 9 + (cfs)	Outflow (cfs)
12.10	0.002	0.096	0.098
12.13	0.002 <<	0.098 <<	0.101 <<
12.17	0.002	0.096	0.099
12.20	0.002	0.095	0.097
12.23	0.002	0.094	0.096

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 14

PRE Infiltration

Hydrograph type	= Combine	Peak discharge	= 0.107 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,895 cuft
Inflow hyds.	= 5, 9	Contrib. drain. area	= 0.000 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 5 + (cfs)	Hyd. 9 + (cfs)	Outflow (cfs)
12.00	0.002	0.100	0.102
12.03	0.002	0.103	0.105
12.07	0.002	0.104	0.107
12.10	0.002	0.105 <<	0.107 <<
12.13	0.002 <<	0.104	0.106
12.17	0.002	0.102	0.105
12.20	0.002	0.101	0.103
12.23	0.002	0.100	0.102

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 14

PRE Infiltration

Hydrograph type	= Combine	Peak discharge	= 0.115 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,895 cuft
Inflow hyds.	= 5, 9	Contrib. drain. area	= 0.000 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 5 + (cfs)	Hyd. 9 + (cfs)	Outflow (cfs)
12.03	0.002	0.109	0.112
12.07	0.002	0.112	0.114
12.10	0.002	0.112 <<	0.115 <<
12.13	0.002 <<	0.110	0.113
12.17	0.002	0.108	0.111
12.20	0.002	0.107	0.109

...End

Pond No. 5 - Basin 3

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 210.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	210.00	291	0	0
1.00	211.00	541	410	410
2.00	212.00	711	624	1,034
2.50	212.50	950	414	1,448

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 25.00	0.00	0.00	0.00
Crest El. (ft)	= 212.00	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.140 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	210.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	410	211.00	---	---	---	---	0.00	---	---	---	0.002	---	0.002
2.00	1,034	212.00	---	---	---	---	0.00	---	---	---	0.002	---	0.002
2.50	1,448	212.50	---	---	---	---	22.98	---	---	---	0.003	---	22.98

Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Pond No. 6 - Basin 2

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 209.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	209.00	488	0	0
1.00	210.00	865	667	667

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 25.00	0.00	0.00	0.00
Crest El. (ft)	= 209.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 8.270 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	209.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	667	210.00	---	---	---	---	22.98	---	---	---	0.166	---	23.15

Post-Development Hydrology

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	2.158	2	726	7,430	----	------	------	POST Sub. 1A
2	SCS Runoff	0.048	2	726	203	----	------	------	POST Sub. 1B
3	SCS Runoff	0.281	2	724	865	----	------	------	POST Sub. 1E
4	Reservoir	0.210	2	728	865	3	220.12	85.9	Sub. 1E Storage
5	Diversion1	0.210	2	728	865	4	------	------	Sub. 1E Infiltration
6	Diversion2	0.000	2	710	0	4	------	------	Sub. 1E Overflow
7	SCS Runoff	0.492	2	724	1,474	----	------	------	POST Sub. 1D
8	Combine	2.651	2	726	9,107	1, 2, 6, 7	------	------	POST To Basin 1A
9	Reservoir	0.417	2	758	9,102	8	209.93	3,699	POST Basin 1A
10	Diversion1	0.417	2	758	9,102	9	------	------	Basin 1A Infiltration
11	Diversion2	0.000	2	830	0	9	------	------	Basin 1A Overflow
12	SCS Runoff	0.002	2	1326	33	----	------	------	POST Sub. 1C
13	Combine	0.002	2	1326	33	11, 12	------	------	POST Sub. 1
14	SCS Runoff	1.278	2	724	3,966	----	------	------	POST Sub. 2A
15	SCS Runoff	1.091	2	728	4,193	----	------	------	POST Sub. 3A
16	Reservoir	1.085	2	730	3,691	15	211.66	959	POST Basin 3A
17	Diversion1	0.002	2	730	456	16	------	------	Basin 3A Infiltration
18	Diversion2	1.083	2	730	3,236	16	------	------	Basin 3A Overflow
19	Combine	2.136	2	724	7,202	14, 18	------	------	POST To Basin 2
20	Reservoir	2.148	2	726	7,198	19	209.60	400	POST Basin 2
21	Diversion1	0.099	2	726	3,309	20	------	------	Basin 2 Infiltration
22	Diversion2	2.049	2	726	3,889	20	------	------	Basin 2 Overflow
23	SCS Runoff	0.054	2	724	191	----	------	------	POST Sub. 4B
24	Reservoir	0.039	2	730	191	23	220.05	15.7	Sub. 4B Storage
25	Diversion1	0.039	2	730	191	24	------	------	Sub. 4B Infiltration
26	Diversion2	0.000	2	724	0	24	------	------	Sub. 4B Overflow
27	SCS Runoff	2.072	2	724	6,561	----	------	------	POST Sub. 4A
28	Combine	2.072	2	724	6,561	26, 27	------	------	POST Sub. 4 Total
29	SCS Runoff	0.358	2	728	1,328	----	------	------	POST Sub. 5A
30	Combine	4.367	2	724	11,811	13, 22, 28, 29	------	------	POST TOTAL
31	Combine	0.733	2	728	13,922	5, 10, 17, 21, 25,	------	------	POST Infiltration

3320-WAV-C-POST.gpw	Return Period: 2 Year	Tuesday, Jun 23, 2009

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	3.466	2	726	12,167	----	------	------	POST Sub. 1A
2	SCS Runoff	0.154	2	724	506	----	------	------	POST Sub. 1B
3	SCS Runoff	0.434	2	724	1,372	----	------	------	POST Sub. 1E
4	Reservoir	0.326	2	728	1,372	3	220.19	133	Sub. 1E Storage
5	Diversion1	0.326	2	728	1,372	4	------	------	Sub. 1E Infiltration
6	Diversion2	0.000	2	722	0	4	------	------	Sub. 1E Overflow
7	SCS Runoff	0.813	2	724	2,479	----	------	------	POST Sub. 1D
8	Combine	4.344	2	726	15,152	1, 2, 6, 7	------	------	POST To Basin 1A
9	Reservoir	1.611	2	742	15,147	8	210.76	5,625	POST Basin 1A
10	Diversion1	0.462	2	742	13,403	9	------	------	Basin 1A Infiltration
11	Diversion2	1.149	2	742	1,744	9	------	------	Basin 1A Overflow
12	SCS Runoff	0.040	2	748	596	----	------	------	POST Sub. 1C
13	Combine	1.183	2	742	2,340	11, 12	------	------	POST Sub. 1
14	SCS Runoff	1.958	2	724	6,236	----	------	------	POST Sub. 2A
15	SCS Runoff	1.787	2	728	6,967	----	------	------	POST Sub. 3A
16	Reservoir	1.771	2	730	6,465	15	211.72	992	POST Basin 3A
17	Diversion1	0.002	2	730	464	16	------	------	Basin 3A Infiltration
18	Diversion2	1.769	2	730	6,002	16	------	------	Basin 3A Overflow
19	Combine	3.388	2	726	12,238	14, 18	------	------	POST To Basin 2
20	Reservoir	3.408	2	726	12,234	19	209.64	422	POST Basin 2
21	Diversion1	0.105	2	726	4,242	20	------	------	Basin 2 Infiltration
22	Diversion2	3.303	2	726	7,992	20	------	------	Basin 2 Overflow
23	SCS Runoff	0.137	2	724	427	----	------	------	POST Sub. 4B
24	Reservoir	0.101	2	728	426	23	220.12	40.1	Sub. 4B Storage
25	Diversion1	0.101	2	728	426	24	------	------	Sub. 4B Infiltration
26	Diversion2	0.000	2	722	0	24	------	------	Sub. 4B Overflow
27	SCS Runoff	3.115	2	724	10,122	----	------	------	POST Sub. 4A
28	Combine	3.115	2	724	10,122	26, 27	------	------	POST Sub. 4 Total
29	SCS Runoff	0.789	2	726	2,741	----	------	------	POST Sub. 5A
30	Combine	7.066	2	724	23,196	13, 22, 28, 29	------	------	POST TOTAL
31	Combine	0.964	2	728	19,907	5, 10, 17, 21, 25,	------	------	POST Infiltration

3320-WAV-C-POST.gpw	Return Period: 10 Year	Tuesday, Jun 23, 2009

Hydrograph Summary Report

Hydraflow Hydrographs by Intelisolve v9.2

Hyd. No.	Hydrograph type (origin)	Peak flow (cfs)	Time interval (min)	Time to peak (min)	Hyd. volume (cuft)	Inflow hyd(s)	Maximum elevation (ft)	Total strge used (cuft)	Hydrograph description
1	SCS Runoff	5.228	2	726	18,776	----	------	------	POST Sub. 1A
2	SCS Runoff	0.337	2	724	1,027	----	------	------	POST Sub. 1B
3	SCS Runoff	0.639	2	724	2,071	----	------	------	POST Sub. 1E
4	Reservoir	0.354	2	730	2,070	3	220.33	234	Sub. 1E Storage
5	Diversion1	0.354	2	730	2,070	4	------	------	Sub. 1E Infiltration
6	Diversion2	0.000	2	718	0	4	------	------	Sub. 1E Overflow
7	SCS Runoff	1.251	2	724	3,897	----	------	------	POST Sub. 1D
8	Combine	6.659	2	726	23,700	1, 2, 6, 7	------	------	POST To Basin 1A
9	Reservoir	5.293	2	730	23,695	8	211.13	6,543	POST Basin 1A
10	Diversion1	0.483	2	730	16,941	9	------	------	Basin 1A Infiltration
11	Diversion2	4.810	2	730	6,755	9	------	------	Basin 1A Overflow
12	SCS Runoff	0.377	2	730	2,233	----	------	------	POST Sub. 1C
13	Combine	5.187	2	730	8,988	11, 12	------	------	POST Sub. 1
14	SCS Runoff	2.868	2	724	9,359	----	------	------	POST Sub. 2A
15	SCS Runoff	2.729	2	728	10,861	----	------	------	POST Sub. 3A
16	Reservoir	2.702	2	728	10,359	15	211.80	1,030	POST Basin 3A
17	Diversion1	0.002	2	728	472	16	------	------	Basin 3A Infiltration
18	Diversion2	2.700	2	728	9,887	16	------	------	Basin 3A Overflow
19	Combine	5.092	2	724	19,245	14, 18	------	------	POST To Basin 2
20	Reservoir	5.106	2	726	19,241	19	209.68	453	POST Basin 2
21	Diversion1	0.112	2	726	5,144	20	------	------	Basin 2 Infiltration
22	Diversion2	4.994	2	726	14,097	20	------	------	Basin 2 Overflow
23	SCS Runoff	0.270	2	724	811	----	------	------	POST Sub. 4B
24	Reservoir	0.165	2	730	811	23	220.27	87.6	Sub. 4B Storage
25	Diversion1	0.165	2	730	811	24	------	------	Sub. 4B Infiltration
26	Diversion2	0.000	2	720	0	24	------	------	Sub. 4B Overflow
27	SCS Runoff	4.514	2	724	14,994	----	------	------	POST Sub. 4A
28	Combine	4.514	2	724	14,994	26, 27	------	------	POST Sub. 4 Total
29	SCS Runoff	1.451	2	726	4,956	----	------	------	POST Sub. 5A
30	Combine	13.58	2	726	43,036	13, 22, 28, 29	------	------	POST TOTAL
31	Combine	1.113	2	730	25,438	5, 10, 17, 21, 25,	------	------	POST Infiltration

3320-WAV-C-POST.gpw	Return Period: 100 Year	Tuesday, Jun 23, 2009

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 1A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A)	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
—	Impervious	98			0.85	83.30
655 B	Grass- Good Condition	61			0.01	0.61
626B A	Grass- Good Condition	39			0.09	3.51
253B A	Grass- Good Condition	39			0.04	1.56
				Totals =	0.99	88.98

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{88.98}{0.99} = 89.88$; Use CN = $\boxed{89.9}$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency....................................	yr	2	10	100
Rainfall, P (24-hour)......................	in	3.1	4.5	6.4
Runoff, Q..................................... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.07	3.38	5.22
Runoff, Q.....................................	cf	7423	12159	18768

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 1A

Circle one: **Tc** Tt through subarea

Sheet flow (Applicable to Tc only)	Unit	Segment ID A-B			Total
1. Surface Description (table 3-1)		ense Gras			
2. Mannings roughness coeff., n (table 3-1)		0.24			
3. Flow length, L (total L <= 300 ft)	ft	50			
4. Two-yr 24-hr rainfall, P2	in	3.1			
5. Land Slope, s	ft/ft	0.04			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4) Compute Tt	hr	0.11			0.11

Shallow concentrated Flow	Unit	Segment ID B-C			Total
7. Surface Description (paved or unpaved)		PAVED			
8. Flow Length, L	ft	109			
9. Watercourse slope, s	ft/ft	0.04			
10. Average Velocity, V (figure 3-1)	ft/s	4.07			
11. Tt = L / 3600V Compute Tt	hr	0.01			0.01

Channel flow	Unit	Segment ID			Total
12. Cross sectional flow area, a	sf				
13. Wetted perimeter, pw	ft				
14. Hydraulic radius, r=a/wp Compute r	ft				
15. Channel Slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. V = 1.49 r^2/3 s^1/2 / n Compute V	ft/s				
18. Flow length, L	ft				
19. Tt = L / 3600V Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.11 / min 6.8

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 1

POST Sub. 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.158 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,430 cuft
Drainage area	= 0.990 ac	Curve number	= 89.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.8 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	2.158 <<
12.13	2.074

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 1

POST Sub. 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.466 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,430 cuft
Drainage area	= 0.990 ac	Curve number	= 89.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.8 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	3.466 <<
12.13	3.315

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 1

POST Sub. 1A

Hydrograph type	= SCS Runoff	Peak discharge	= 5.228 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,430 cuft
Drainage area	= 0.990 ac	Curve number	= 89.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.8 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	5.228 <<
12.13	4.985

...End

Worksheet 2: Runoff curve number and runoff SM-3320

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 1B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.05	4.90
253B A	Grass- Good Condition	39			0.07	2.73
				Totals =	0.12	7.63

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{7.63}{0.12} =$ 63.58 ; Use CN = 63.6

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.50	1.24	2.51
Runoff, Q..................................	cf	217	540	1095

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 1B

Circle one: **Tc** Tt through subarea ______

Sheet flow (Applicable to Tc only)			Segment ID	A-B			
1. Surface Description (table 3-1)				Dense Grass			
2. Mannings roughness coeff., n (table 3-1)				0.24			
3. Flow length, L (total L <= 300 ft)			ft	50			
4. Two-yr 24-hr rainfall, P2			in	3.1			
5. Land Slope, s			ft/ft	0.06			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt		hr	0.09			0.09

Shallow concentrated Flow			Segment ID	B-C			
7. Surface Description (paved or unpaved)				UNPAVED			
8. Flow Length, L			ft	151			
9. Watercourse slope, s			ft/ft	0.05			
10. Average Velocity, V (figure 3-1)			ft/s	3.61			
11. Tt = L / 3600V	Compute Tt		hr	0.01			0.01

Channel flow			Segment ID				
12. Cross sectional flow area, a			sf				
13. Wetted perimeter, pw			ft				
14. Hydraulic radius, r=a/wp	Compute r		ft				
15. Channel Slope, s			ft/ft				
16. Manning's roughness coeff., n							
17. V = 1.49 r^2/3 s^1/2 / n	Compute V		ft/s				
18. Flow length, L			ft				
19. Tt = L / 3600V	Compute Tt		hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.10 min 6.1

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 2

POST Sub. 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.048 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 203 cuft
Drainage area	= 0.120 ac	Curve number	= 63.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.1 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.047
12.10	0.048 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 2

POST Sub. 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.154 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 203 cuft
Drainage area	= 0.120 ac	Curve number	= 63.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.1 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.07	0.154 <<
12.10	0.148

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 2

POST Sub. 1B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.337 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 203 cuft
Drainage area	= 0.120 ac	Curve number	= 63.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.1 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.337 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ____ Date ____

Circle one: Present Developed Subcatchment 1E

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.10	9.80
626B A	Grass- Good Condition	39			0.01	0.39
				Totals =	0.11	10.19

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{10.19}{0.11} =$ 92.64 ; Use CN = 92.6

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.32	3.67	5.54
Runoff, Q.................................	cf	924	1465	2210

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **[Developed]** Subcatchment 1E
Circle one: **[Tc]** Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Concrete			
2. Mannings roughness coeff., n (table 3-1)			0.011			
3. Flow length, L (total L <= 300 ft)		ft	36			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.02			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.01			0.01

Shallow concentrated Flow		Segment ID				
7. Surface Description (paved or unpaved)						
8. Flow Length, L		ft				
9. Watercourse slope, s		ft/ft				
10. Average Velocity, V (figure 3-1)		ft/s				
11. Tt = L / 3600V	Compute Tt	hr				0.00

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.10; min 6.0

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 3

POST Sub. 1E

Hydrograph type	= SCS Runoff	Peak discharge	= 0.281 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Drainage area	= 0.110 ac	Curve number	= 92.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.281 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 3

POST Sub. 1E

Hydrograph type	= SCS Runoff	Peak discharge	= 0.434 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Drainage area	= 0.110 ac	Curve number	= 92.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.434 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 3

POST Sub. 1E

Hydrograph type	= SCS Runoff	Peak discharge	= 0.639 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Drainage area	= 0.110 ac	Curve number	= 92.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.639 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 4

Sub. 1E Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.210 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Inflow hyd. No.	= 3 - POST Sub. 1E	Reservoir name	= Sub. 1E Storage
Max. Elevation	= 220.12 ft	Max. Storage	= 86 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.10	0.251	220.12	-----	-----	-----	-----	-----	-----	-----	-----	0.205	0.205
12.13	0.199	220.12 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.210	0.210 <<
12.17	0.155	220.12	-----	-----	-----	-----	-----	-----	-----	-----	0.202	0.202

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 4

Sub. 1E Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.326 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Inflow hyd. No.	= 3 - POST Sub. 1E	Reservoir name	= Sub. 1E Storage
Max. Elevation	= 220.19 ft	Max. Storage	= 133 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.10	0.387	220.18	-----	-----	-----	-----	-----	-----	-----	-----	0.318	0.318
12.13	0.305	220.19 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.326	0.326 <<
12.17	0.237	220.18	-----	-----	-----	-----	-----	-----	-----	-----	0.312	0.312

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 4

Sub. 1E Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.354 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Inflow hyd. No.	= 3 - POST Sub. 1E	Reservoir name	= Sub. 1E Storage
Max. Elevation	= 220.33 ft	Max. Storage	= 234 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.03	0.605	220.21	-----	-----	-----	-----	-----	-----	-----	-----	0.349	0.349
12.07	0.639 <<	220.25	-----	-----	-----	-----	-----	-----	-----	-----	0.351	0.351
12.10	0.568	220.29	-----	-----	-----	-----	-----	-----	-----	-----	0.352	0.352
12.13	0.447	220.32	-----	-----	-----	-----	-----	-----	-----	-----	0.353	0.353
12.17	0.346	220.33 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.354	0.354 <<
12.20	0.291	220.32	-----	-----	-----	-----	-----	-----	-----	-----	0.353	0.353
12.23	0.263	220.31	-----	-----	-----	-----	-----	-----	-----	-----	0.353	0.353
12.27	0.244	220.29	-----	-----	-----	-----	-----	-----	-----	-----	0.352	0.352
12.30	0.225	220.27	-----	-----	-----	-----	-----	-----	-----	-----	0.352	0.352
12.33	0.207	220.25	-----	-----	-----	-----	-----	-----	-----	-----	0.351	0.351
12.37	0.188	220.22	-----	-----	-----	-----	-----	-----	-----	-----	0.350	0.350
12.40	0.169	220.20	-----	-----	-----	-----	-----	-----	-----	-----	0.341	0.341

...End

Hydrograph Report

Hyd. No. 5

Sub. 1E Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.210 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Inflow hydrograph	= 4 - Sub. 1E Storage	2nd diverted hyd.	= 6
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.10	0.205	0.000	0.205
12.13	0.210 <<	0.000	0.210 <<
12.17	0.202	0.000	0.202

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 5

Sub. 1E Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.326 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Inflow hydrograph	= 4 - Sub. 1E Storage	2nd diverted hyd.	= 6
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.10	0.318	0.000	0.318
12.13	0.326 <<	0.000	0.326 <<
12.17	0.312	0.000	0.312

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 5

Sub. 1E Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.354 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 865 cuft
Inflow hydrograph	= 4 - Sub. 1E Storage	2nd diverted hyd.	= 6
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.03	0.349	0.000	0.349
12.07	0.351	0.000	0.351
12.10	0.352	0.000	0.352
12.13	0.353	0.000	0.353
12.17	0.354 <<	0.000	0.354 <<
12.20	0.353	0.000	0.353
12.23	0.353	0.000	0.353
12.27	0.352	0.000	0.352
12.30	0.352	0.000	0.352
12.33	0.351	0.000	0.351
12.37	0.350	0.000	0.350
12.40	0.341	0.000	0.341

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 6

Sub. 1E Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 11.83 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 4 - Sub. 1E Storage	2nd diverted hyd.	= 5
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
11.83	0.067	0.067	0.000 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 6

Sub. 1E Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 4 - Sub. 1E Storage	2nd diverted hyd.	= 5
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.03	0.241	0.241	0.000 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 6

Sub. 1E Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 11.97 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 4 - Sub. 1E Storage	2nd diverted hyd.	= 5
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
11.97	0.247	0.247	0.000 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 1D

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
—	Impervious	98			0.19	18.62
626B A	Grass- Good Condition	39			0.04	1.56
				Totals =	0.23	20.18

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{20.18}{0.23} =$ 87.74 ; Use CN = $\boxed{87.7}$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q................................ (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	1.89	3.17	4.98
Runoff, Q................................	cf	1575	2647	4160

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 1D

Circle one: **Tc** Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Concrete			
2. Mannings roughness coeff., n (table 3-1)			0.011			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.01			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.02			0.02

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	125			
9. Watercourse slope, s		ft/ft	0.05			
10. Average Velocity, V (figure 3-1)		ft/s	4.55			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)		
	hr	0.10
	min	6.0

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 7

POST Sub. 1D

Hydrograph type	= SCS Runoff	Peak discharge	= 0.492 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 1,474 cuft
Drainage area	= 0.230 ac	Curve number	= 87.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.492 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 7

POST Sub. 1D

Hydrograph type	= SCS Runoff	Peak discharge	= 0.813 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 1,474 cuft
Drainage area	= 0.230 ac	Curve number	= 87.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.813 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 7

POST Sub. 1D

Hydrograph type	= SCS Runoff	Peak discharge	= 1.251 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 1,474 cuft
Drainage area	= 0.230 ac	Curve number	= 87.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	1.251 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 8

POST To Basin 1A

Hydrograph type	= Combine	Peak discharge	= 2.651 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 9,107 cuft
Inflow hyds.	= 1, 2, 6, 7	Contrib. drain. area	= 1.340 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 2 + (cfs)	Hyd. 6 + (cfs)	Hyd. 7 = (cfs)	Outflow (cfs)
12.07	2.029	0.047	0.000	0.492 <<	2.567
12.10	2.158 <<	0.048 <<	0.000	0.445	2.651 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 8

POST To Basin 1A

Hydrograph type	= Combine	Peak discharge	= 4.344 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 9,107 cuft
Inflow hyds.	= 1, 2, 6, 7	Contrib. drain. area	= 1.340 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 2 + (cfs)	Hyd. 6 + (cfs)	Hyd. 7 = (cfs)	Outflow (cfs)
12.07	3.279	0.154 <<	0.000	0.813 <<	4.247
12.10	3.466 <<	0.148	0.000	0.731	4.344 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 8

POST To Basin 1A

Hydrograph type	= Combine	Peak discharge	= 6.659 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 9,107 cuft
Inflow hyds.	= 1, 2, 6, 7	Contrib. drain. area	= 1.340 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 1 + (cfs)	Hyd. 2 + (cfs)	Hyd. 6 + (cfs)	Hyd. 7 = (cfs)	Outflow (cfs)
12.07	4.965	0.337 <<	0.000	1.251 <<	6.552
12.10	5.228 <<	0.313	0.000	1.117	6.659 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Jun 23, 2009

Hyd. No. 9

POST Basin 1A

Hydrograph type	= Reservoir	Peak discharge	= 0.417 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Inflow hyd. No.	= 8 - POST To Basin 1A	Reservoir name	= Basin 1A
Max. Elevation	= 209.93 ft	Max. Storage	= 3,699 cuft

Storage Indication method used. Outflow includes exfiltration.

(Printed values >= 95.00% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.23	1.584	209.60	0.065	-----	-----	-----	-----	-----	-----	-----	0.399	0.399
12.27	1.381	209.66	0.065	-----	-----	-----	-----	-----	-----	-----	0.403	0.403
12.30	1.240	209.71	0.065	-----	-----	-----	-----	-----	-----	-----	0.406	0.406
12.33	1.138	209.76	0.065	-----	-----	-----	-----	-----	-----	-----	0.408	0.408
12.37	1.049	209.80	0.065	-----	-----	-----	-----	-----	-----	-----	0.410	0.410
12.40	0.957	209.83	0.065	-----	-----	-----	-----	-----	-----	-----	0.412	0.412
12.43	0.865	209.86	0.065	-----	-----	-----	-----	-----	-----	-----	0.413	0.413
12.47	0.771	209.88	0.065	-----	-----	-----	-----	-----	-----	-----	0.415	0.415
12.50	0.676	209.90	0.065	-----	-----	-----	-----	-----	-----	-----	0.416	0.416
12.53	0.585	209.91	0.065	-----	-----	-----	-----	-----	-----	-----	0.416	0.416
12.57	0.507	209.92	0.065	-----	-----	-----	-----	-----	-----	-----	0.417	0.417
12.60	0.449	209.93	0.065	-----	-----	-----	-----	-----	-----	-----	0.417	0.417
12.63	0.411	209.93 <<	0.065	-----	-----	-----	-----	-----	-----	-----	0.417	0.417 <<
12.67	0.385	209.93	0.065	-----	-----	-----	-----	-----	-----	-----	0.417	0.417
12.70	0.368	209.92	0.065	-----	-----	-----	-----	-----	-----	-----	0.417	0.417
12.73	0.357	209.92	0.065	-----	-----	-----	-----	-----	-----	-----	0.417	0.417
12.77	0.347	209.92	0.065	-----	-----	-----	-----	-----	-----	-----	0.416	0.416
12.80	0.337	209.91	0.065	-----	-----	-----	-----	-----	-----	-----	0.416	0.416
12.83	0.327	209.91	0.065	-----	-----	-----	-----	-----	-----	-----	0.416	0.416
12.87	0.317	209.90	0.065	-----	-----	-----	-----	-----	-----	-----	0.416	0.416
12.90	0.307	209.90	0.065	-----	-----	-----	-----	-----	-----	-----	0.415	0.415
12.93	0.297	209.89	0.065	-----	-----	-----	-----	-----	-----	-----	0.415	0.415
12.97	0.287	209.88	0.065	-----	-----	-----	-----	-----	-----	-----	0.415	0.415
13.00	0.277	209.87	0.065	-----	-----	-----	-----	-----	-----	-----	0.414	0.414
13.03	0.267	209.87	0.065	-----	-----	-----	-----	-----	-----	-----	0.414	0.414
13.07	0.259	209.86	0.065	-----	-----	-----	-----	-----	-----	-----	0.413	0.413
13.10	0.252	209.85	0.065	-----	-----	-----	-----	-----	-----	-----	0.413	0.413
13.13	0.247	209.84	0.065	-----	-----	-----	-----	-----	-----	-----	0.412	0.412
13.17	0.243	209.83	0.065	-----	-----	-----	-----	-----	-----	-----	0.412	0.412
13.20	0.240	209.82	0.065	-----	-----	-----	-----	-----	-----	-----	0.411	0.411
13.23	0.237	209.81	0.065	-----	-----	-----	-----	-----	-----	-----	0.411	0.411
13.27	0.235	209.80	0.065	-----	-----	-----	-----	-----	-----	-----	0.410	0.410
13.30	0.232	209.79	0.065	-----	-----	-----	-----	-----	-----	-----	0.410	0.410
13.33	0.230	209.78	0.065	-----	-----	-----	-----	-----	-----	-----	0.409	0.409
13.37	0.227	209.77	0.065	-----	-----	-----	-----	-----	-----	-----	0.409	0.409
13.40	0.224	209.76	0.065	-----	-----	-----	-----	-----	-----	-----	0.408	0.408
13.43	0.222	209.75	0.065	-----	-----	-----	-----	-----	-----	-----	0.407	0.407
13.47	0.219	209.73	0.065	-----	-----	-----	-----	-----	-----	-----	0.407	0.407
13.50	0.217	209.72	0.065	-----	-----	-----	-----	-----	-----	-----	0.406	0.406
13.53	0.214	209.71	0.065	-----	-----	-----	-----	-----	-----	-----	0.406	0.406
13.57	0.211	209.70	0.065	-----	-----	-----	-----	-----	-----	-----	0.405	0.405

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
13.60	0.209	209.69	0.065	-----	-----	-----	-----	-----	-----	-----	0.404	0.404
13.63	0.206	209.68	0.065	-----	-----	-----	-----	-----	-----	-----	0.404	0.404
13.67	0.204	209.67	0.065	-----	-----	-----	-----	-----	-----	-----	0.403	0.403
13.70	0.201	209.66	0.065	-----	-----	-----	-----	-----	-----	-----	0.403	0.403
13.73	0.198	209.64	0.065	-----	-----	-----	-----	-----	-----	-----	0.402	0.402
13.77	0.196	209.63	0.065	-----	-----	-----	-----	-----	-----	-----	0.401	0.401
13.80	0.193	209.62	0.065	-----	-----	-----	-----	-----	-----	-----	0.401	0.401
13.83	0.190	209.61	0.065	-----	-----	-----	-----	-----	-----	-----	0.400	0.400
13.87	0.188	209.60	0.065	-----	-----	-----	-----	-----	-----	-----	0.399	0.399
13.90	0.185	209.58	0.065	-----	-----	-----	-----	-----	-----	-----	0.399	0.399
13.93	0.182	209.57	0.065	-----	-----	-----	-----	-----	-----	-----	0.398	0.398
13.97	0.180	209.56	0.065	-----	-----	-----	-----	-----	-----	-----	0.397	0.397
14.00	0.177	209.54	0.065	-----	-----	-----	-----	-----	-----	-----	0.397	0.397
14.03	0.175	209.53	0.065	-----	-----	-----	-----	-----	-----	-----	0.396	0.396

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 9

POST Basin 1A

Hydrograph type	= Reservoir	Peak discharge	= 1.611 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Inflow hyd. No.	= 8 - POST To Basin 1A	Reservoir name	= Basin 1A
Max. Elevation	= 210.76 ft	Max. Storage	= 5,625 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.33	1.809	210.75	0.065	-----	-----	-----	-----	0.038	-----	1.061	0.462	1.562
12.37	1.663	210.76 <<	0.065	-----	-----	-----	-----	0.039	-----	1.109	0.462	1.611 <<
12.40	1.515	210.76	0.065	-----	-----	-----	-----	0.039	-----	1.103	0.462	1.605
12.43	1.366	210.75	0.065	-----	-----	-----	-----	0.038	-----	1.058	0.462	1.558

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 9

POST Basin 1A

Hydrograph type	= Reservoir	Peak discharge	= 5.293 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Inflow hyd. No.	= 8 - POST To Basin 1A	Reservoir name	= Basin 1A
Max. Elevation	= 211.13 ft	Max. Storage	= 6,543 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.17	5.309	211.13 <<	0.608	-----	-----	-----	0.478	0.121	-----	4.210	0.483	5.293 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 10

Basin 1A Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.417 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.63 hrs
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Inflow hydrograph	= 9 - POST Basin 1A	2nd diverted hyd.	= 11
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.23	0.399	0.000	0.399
12.27	0.403	0.000	0.403
12.30	0.406	0.000	0.406
12.33	0.408	0.000	0.408
12.37	0.410	0.000	0.410
12.40	0.412	0.000	0.412
12.43	0.413	0.000	0.413
12.47	0.415	0.000	0.415
12.50	0.416	0.000	0.416
12.53	0.416	0.000	0.416
12.57	0.417	0.000	0.417
12.60	0.417	0.000	0.417
12.63	0.417 <<	0.000	0.417 <<
12.67	0.417	0.000	0.417
12.70	0.417	0.000	0.417
12.73	0.417	0.000	0.417
12.77	0.416	0.000	0.416
12.80	0.416	0.000	0.416
12.83	0.416	0.000	0.416
12.87	0.416	0.000	0.416
12.90	0.415	0.000	0.415
12.93	0.415	0.000	0.415
12.97	0.415	0.000	0.415
13.00	0.414	0.000	0.414
13.03	0.414	0.000	0.414
13.07	0.413	0.000	0.413
13.10	0.413	0.000	0.413
13.13	0.412	0.000	0.412
13.17	0.412	0.000	0.412
13.20	0.411	0.000	0.411
13.23	0.411	0.000	0.411
13.27	0.410	0.000	0.410
13.30	0.410	0.000	0.410
13.33	0.409	0.000	0.409
13.37	0.409	0.000	0.409
13.40	0.408	0.000	0.408
13.43	0.407	0.000	0.407
13.47	0.407	0.000	0.407
13.50	0.406	0.000	0.406
13.53	0.406	0.000	0.406
13.57	0.405	0.000	0.405

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
13.60	0.404	0.000	0.404
13.63	0.404	0.000	0.404
13.67	0.403	0.000	0.403
13.70	0.403	0.000	0.403
13.73	0.402	0.000	0.402
13.77	0.401	0.000	0.401
13.80	0.401	0.000	0.401
13.83	0.400	0.000 <<	0.400
13.87	0.399	0.000	0.399
13.90	0.399	0.000	0.399
13.93	0.398	0.000	0.398
13.97	0.397	0.000	0.397
14.00	0.397	0.000	0.397
14.03	0.396	0.000	0.396

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 10

Basin 1A Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.462 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Inflow hydrograph	= 9 - POST Basin 1A	2nd diverted hyd.	= 11
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.17	0.446	0.004	0.441
12.20	0.498	0.049	0.449
12.23	0.841	0.386	0.455
12.27	1.187	0.729	0.459
12.30	1.431	0.970	0.461
12.33	1.562	1.100	0.462
12.37	1.611 <<	1.149 <<	0.462 <<
12.40	1.605	1.142	0.462
12.43	1.558	1.096	0.462
12.47	1.483	1.021	0.461
12.50	1.386	0.925	0.461
12.53	1.275	0.815	0.460
12.57	1.172	0.714	0.459
12.60	1.077	0.620	0.457
12.63	0.986	0.530	0.456
12.67	0.905	0.449	0.456
12.70	0.834	0.379	0.455
12.73	0.774	0.320	0.454
12.77	0.729	0.276	0.454
12.80	0.704	0.251	0.453
12.83	0.680	0.227	0.453
12.87	0.657	0.204	0.452
12.90	0.634	0.183	0.452
12.93	0.613	0.162	0.451
12.97	0.593	0.142	0.451
13.00	0.573	0.122	0.450
13.03	0.553	0.103	0.450
13.07	0.534	0.085	0.450
13.10	0.517	0.067	0.449
13.13	0.500	0.051	0.449
13.17	0.484	0.036	0.449
13.20	0.470	0.022	0.448
13.23	0.459	0.011	0.448
13.27	0.459	0.011	0.448
13.30	0.458	0.011	0.448
13.33	0.458	0.010	0.447
13.37	0.457	0.010	0.447
13.40	0.457	0.010	0.447
13.43	0.456	0.009	0.447
13.47	0.455	0.009	0.446
13.50	0.455	0.009	0.446

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
13.53	0.454	0.008	0.446
13.57	0.453	0.008	0.445
13.60	0.453	0.008	0.445
13.63	0.452	0.007	0.444
13.67	0.451	0.007	0.444
13.70	0.450	0.007	0.444
13.73	0.449	0.006	0.443
13.77	0.449	0.006	0.443
13.80	0.448	0.005	0.443
13.83	0.447	0.005	0.442
13.87	0.446	0.005	0.442
13.90	0.446	0.005	0.441
13.93	0.445	0.004	0.441
13.97	0.444	0.004	0.440
14.00	0.444	0.004	0.440
14.03	0.443	0.003	0.439

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 10

Basin 1A Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.483 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 9,102 cuft
Inflow hydrograph	= 9 - POST Basin 1A	2nd diverted hyd.	= 11
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	1.647	1.185	0.463
12.10	3.298	2.823	0.474
12.13	4.408	3.927	0.481
12.17	5.293 <<	4.810 <<	0.483 <<
12.20	5.015	4.532	0.483
12.23	4.433	3.952	0.481
12.27	4.125	3.646	0.479
12.30	3.774	3.297	0.477
12.33	3.441	2.966	0.475
12.37	3.138	2.665	0.473
12.40	2.865	2.393	0.472
12.43	2.612	2.142	0.470
12.47	2.390	1.921	0.468
12.50	2.166	1.699	0.467
12.53	1.942	1.477	0.465
12.57	1.747	1.283	0.464
12.60	1.570	1.108	0.462
12.63	1.411	0.950	0.461
12.67	1.276	0.816	0.460

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 11

Basin 1A Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 13.83 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 9 - POST Basin 1A	2nd diverted hyd.	= 10
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
13.83	0.400	0.400	0.000 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 11

Basin 1A Overflow

Hydrograph type	= Diversion2	Peak discharge	= 1.149 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 9 - POST Basin 1A	2nd diverted hyd.	= 10
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.33	1.562	0.462	1.100
12.37	1.611 <<	0.462 <<	1.149 <<
12.40	1.605	0.462	1.142
12.43	1.558	0.462	1.096

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 11

Basin 1A Overflow

Hydrograph type	= Diversion2	Peak discharge	= 4.810 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 9 - POST Basin 1A	2nd diverted hyd.	= 10
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.17	5.293 <<	0.483 <<	4.810 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 1C

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix A	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
655 B	Woods- Good Condition	58			0.22	12.76
655 B	Grass- Good Condition	61			0.04	2.44
626B A	Woods- Good Condition	32			0.11	3.52
626B A	Grass- Good Condition	39			0.07	2.73
253B A	Woods- Good Condition	32			0.22	7.04
253B A	Grass- Good Condition	39			0.11	4.29
					Totals = 0.77	32.78

1/ Use only one CN source per line.

$$CN\ (weighted) = \frac{total\ product}{total\ area} = \frac{32.78}{0.77} = 42.57;\quad Use\ CN = \boxed{42.6}$$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency....................................	yr	2	10	100
Rainfall, P (24-hour).....................	in	3.1	4.5	6.4
Runoff, Q.................................... (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.01	0.21	0.80
Runoff, Q....................................	cf	33	594	2228

 (210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 0 By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 1C

Circle one: **Tc** Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.03			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.12			0.12

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			UNPAVED			
8. Flow Length, L		ft	5			
9. Watercourse slope, s		ft/ft	0.03			
10. Average Velocity, V (figure 3-1)		ft/s	2.79			
11. Tt = L / 3600V	Compute Tt	hr	0.00			0.00

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.12; min 7.1

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 12

POST Sub. 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.002 cfs
Storm frequency	= 2 yrs	Time to peak	= 22.10 hrs
Time interval	= 2 min	Hyd. volume	= 33 cuft
Drainage area	= 0.770 ac	Curve number	= 42.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.1 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
22.10	0.002 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 12

POST Sub. 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.040 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.47 hrs
Time interval	= 2 min	Hyd. volume	= 33 cuft
Drainage area	= 0.770 ac	Curve number	= 42.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.1 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.43	0.040
12.47	0.040 <<
12.50	0.039

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 12

POST Sub. 1C

Hydrograph type	= SCS Runoff	Peak discharge	= 0.377 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 33 cuft
Drainage area	= 0.770 ac	Curve number	= 42.6
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 7.1 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.17	0.377 <<
12.20	0.373

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 13

POST Sub. 1

Hydrograph type	= Combine	Peak discharge	= 0.002 cfs
Storm frequency	= 2 yrs	Time to peak	= 22.10 hrs
Time interval	= 2 min	Hyd. volume	= 33 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.770 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 11 + (cfs)	Hyd. 12 = (cfs)	Outflow (cfs)
22.10	0.000	0.002 <<	0.002 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 13

POST Sub. 1

Hydrograph type	= Combine	Peak discharge	= 1.183 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.37 hrs
Time interval	= 2 min	Hyd. volume	= 33 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.770 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 11 + (cfs)	Hyd. 12 = (cfs)	Outflow (cfs)
12.33	1.100	0.028	1.128
12.37	1.149 <<	0.034	1.183 <<
12.40	1.142	0.038	1.181
12.43	1.096	0.040	1.136

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 13

POST Sub. 1

Hydrograph type	= Combine	Peak discharge	= 5.187 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 33 cuft
Inflow hyds.	= 11, 12	Contrib. drain. area	= 0.770 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 11 + (cfs)	Hyd. 12 = (cfs)	Outflow (cfs)
12.17	4.810 <<	0.377 <<	5.187 <<

...End

Worksheet 2: Runoff curve number and runoff SM-3320

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 2A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.44	43.12
655 B	Grass- Good Condition	61			0.03	1.83
626B A	Grass- Good Condition	39			0.02	0.78
				Totals =	0.49	45.73

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{45.73}{0.49} = 93.33$; Use CN = 93.3

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency.................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.38	3.74	5.62
Runoff, Q.................................	cf	4235	6657	9988

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 2A

Circle one: **Tc** Tt through subarea

Sheet flow (Applicable to Tc only)	Segment ID	A-B			
1. Surface Description (table 3-1)		Concrete			
2. Mannings roughness coeff., n (table 3-1)		0.011			
3. Flow length, L (total L <= 300 ft)	ft	50			
4. Two-yr 24-hr rainfall, P2	in	3.1			
5. Land Slope, s	ft/ft	0.02			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4) Compute Tt	hr	0.01			0.01
Shallow concentrated Flow	Segment ID	B-C			
7. Surface Description (paved or unpaved)		PAVED			
8. Flow Length, L	ft	185			
9. Watercourse slope, s	ft/ft	0.02			
10. Average Velocity, V (figure 3-1)	ft/s	2.87			
11. Tt = L / 3600V Compute Tt	hr	0.02			0.02
Channel flow	Segment ID				
12. Cross sectional flow area, a	sf				
13. Wetted perimeter, pw	ft				
14. Hydraulic radius, r=a/wp Compute r	ft				
15. Channel Slope, s	ft/ft				
16. Manning's roughness coeff., n					
17. V = 1.49 r^2/3 s^1/2 / n Compute V	ft/s				
18. Flow length, L	ft				
19. Tt = L / 3600V Compute Tt	hr				0.00
20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)	hr				0.10
	min				6.0

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Jun 23, 2009

Hyd. No. 14

POST Sub. 2A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.278 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,966 cuft
Drainage area	= 0.490 ac	Curve number	= 93.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	1.278 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 14

POST Sub. 2A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.958 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,966 cuft
Drainage area	= 0.490 ac	Curve number	= 93.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	1.958 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 14

POST Sub. 2A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.868 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 3,966 cuft
Drainage area	= 0.490 ac	Curve number	= 93.3
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	2.868 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ________ Date ________

Circle one: Present Developed Subcatchment 3A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
—	Impervious	98			0.48	47.04
626B A	Grass- Good Condition	39			0.08	3.12
602 A	Grass- Good Condition	39			0.01	0.39
				Totals =	0.57	50.55

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{50.55}{0.57} = 88.68$; Use CN = 88.7

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	1.96	3.26	5.09
Runoff, Q..................................	cf	4064	6753	10528

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt)   SM-3320

Project: 531-537 Mass. Ave.   By ECS   Date 4/6/09

Location: Acton, MA   Checked ______   Date ______

Circle one: Present **Developed**   Subcatchment 3A

Circle one: **Tc** Tt through subarea ______

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.01			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.18			0.18

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	94			
9. Watercourse slope, s		ft/ft	0.02			
10. Average Velocity, V (figure 3-1)		ft/s	2.87			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)		
	hr	0.19
	min	11.5

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 15

POST Sub. 3A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.091 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 4,193 cuft
Drainage area	= 0.570 ac	Curve number	= 88.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.5 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	1.038
12.13	1.091 <<
12.17	1.076

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 15

POST Sub. 3A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.787 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 4,193 cuft
Drainage area	= 0.570 ac	Curve number	= 88.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.5 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	1.709
12.13	1.787 <<
12.17	1.754

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 15

POST Sub. 3A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.729 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 4,193 cuft
Drainage area	= 0.570 ac	Curve number	= 88.7
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 11.5 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.10	2.620
12.13	2.729 <<
12.17	2.669

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Jun 23, 2009

Hyd. No. 16

POST Basin 3A

Hydrograph type	= Reservoir	Peak discharge	= 1.085 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 3,691 cuft
Inflow hyd. No.	= 15 - POST Sub. 3A	Reservoir name	= Basin 3A
Max. Elevation	= 211.66 ft	Max. Storage	= 959 cuft

Storage Indication method used. Outflow includes exfiltration.

(Printed values >= 95.00% of Qp.)

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	1.091 <<	211.66	-----	-----	-----	-----	1.068	-----	-----	-----	0.002	1.070
12.17	1.076	211.66 <<	-----	-----	-----	-----	1.083	-----	-----	-----	0.002	1.085 <<
12.20	1.015	211.65	-----	-----	-----	-----	1.041	-----	-----	-----	0.002	1.043

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 16

POST Basin 3A

Hydrograph type	= Reservoir	Peak discharge	= 1.771 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 3,691 cuft
Inflow hyd. No.	= 15 - POST Sub. 3A	Reservoir name	= Basin 3A
Max. Elevation	= 211.72 ft	Max. Storage	= 992 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	1.787 <<	211.72	-----	-----	-----	-----	1.766	-----	-----	-----	0.002	1.768
12.17	1.754	211.72 <<	-----	-----	-----	-----	1.769	-----	-----	-----	0.002	1.771 <<
12.20	1.646	211.72	-----	-----	-----	-----	1.684	-----	-----	-----	0.002	1.686

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 16

POST Basin 3A

Hydrograph type	= Reservoir	Peak discharge	= 2.702 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,691 cuft
Inflow hyd. No.	= 15 - POST Sub. 3A	Reservoir name	= Basin 3A
Max. Elevation	= 211.80 ft	Max. Storage	= 1,030 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	2.729 <<	211.80 <<	-----	-----	-----	-----	2.700	-----	-----	-----	0.002	2.702 <<
12.17	2.669	211.80	-----	-----	-----	-----	2.697	-----	-----	-----	0.002	2.699

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 17

Basin 3A Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.002 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 456 cuft
Inflow hydrograph	= 16 - POST Basin 3A	2nd diverted hyd.	= 18
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.00	0.182	0.180	0.002
12.03	0.598	0.596	0.002
12.07	0.860	0.858	0.002
12.10	0.986	0.984	0.002
12.13	1.070	1.068	0.002
12.17	1.085 <<	1.083 <<	0.002 <<
12.20	1.043	1.042	0.002
12.23	0.968	0.967	0.002
12.27	0.878	0.877	0.002
12.30	0.782	0.780	0.002
12.33	0.687	0.685	0.002
12.37	0.604	0.602	0.002
12.40	0.539	0.537	0.002
12.43	0.499	0.498	0.002
12.47	0.459	0.457	0.002
12.50	0.417	0.415	0.002
12.53	0.374	0.372	0.002
12.57	0.332	0.331	0.002
12.60	0.293	0.292	0.002
12.63	0.259	0.257	0.002
12.67	0.230	0.229	0.002
12.70	0.208	0.207	0.002
12.73	0.191	0.190	0.002
12.77	0.179	0.177	0.002
12.80	0.170	0.168	0.002
12.83	0.163	0.162	0.002
12.87	0.158	0.157	0.002
12.90	0.153	0.152	0.002
12.93	0.149	0.147	0.002
12.97	0.144	0.143	0.002
13.00	0.140	0.138	0.002
13.03	0.135	0.133	0.002
13.07	0.130	0.129	0.002
13.10	0.126	0.124	0.002
13.13	0.122	0.121	0.002
13.17	0.119	0.117	0.002
13.20	0.116	0.115	0.002
13.23	0.114	0.112	0.002
13.27	0.112	0.110	0.002
13.30	0.111	0.109	0.002
13.33	0.109	0.108	0.002

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
13.37	0.108	0.106	0.002
13.40	0.107	0.105	0.002
13.43	0.106	0.104	0.002
13.47	0.104	0.103	0.002
13.50	0.103	0.102	0.002
13.53	0.102	0.100	0.002
13.57	0.101	0.099	0.002
13.60	0.100	0.098	0.002
13.63	0.098	0.097	0.002
13.67	0.097	0.095	0.002
13.70	0.096	0.094	0.002
13.73	0.095	0.093	0.002
13.77	0.093	0.092	0.002
13.80	0.092	0.091	0.002
13.83	0.091	0.089	0.002
13.87	0.090	0.088	0.002
13.90	0.089	0.087	0.002
13.93	0.087	0.086	0.002
13.97	0.086	0.084	0.002
14.00	0.085	0.083	0.002
14.03	0.084	0.082	0.002
14.07	0.082	0.081	0.002
14.10	0.081	0.080	0.002
14.13	0.080	0.079	0.002
14.17	0.079	0.078	0.002
14.20	0.078	0.077	0.002
14.23	0.078	0.076	0.002
14.27	0.077	0.075	0.002
14.30	0.076	0.075	0.002
14.33	0.076	0.074	0.002
14.37	0.075	0.073	0.002
14.40	0.074	0.073	0.002
14.43	0.074	0.072	0.002
14.47	0.073	0.072	0.002
14.50	0.073	0.071	0.002
14.53	0.072	0.070	0.002
14.57	0.071	0.070	0.002
14.60	0.071	0.069	0.002
14.63	0.070	0.069	0.002
14.67	0.070	0.068	0.002
14.70	0.069	0.067	0.002
14.73	0.069	0.067	0.002
14.77	0.068	0.066	0.002
14.80	0.067	0.066	0.002
14.83	0.067	0.065	0.002
14.87	0.066	0.065	0.002
14.90	0.066	0.064	0.002
14.93	0.065	0.063	0.002
14.97	0.064	0.063	0.002
15.00	0.064	0.062	0.002
15.03	0.063	0.062	0.002
15.07	0.063	0.061	0.002
15.10	0.062	0.060	0.002
15.13	0.061	0.060	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
15.17	0.061	0.059	0.002
15.20	0.060	0.059	0.002
15.23	0.060	0.058	0.002
15.27	0.059	0.057	0.002
15.30	0.058	0.057	0.002
15.33	0.058	0.056	0.002
15.37	0.057	0.055	0.002
15.40	0.057	0.055	0.002
15.43	0.056	0.054	0.002
15.47	0.055	0.054	0.002
15.50	0.055	0.053	0.002
15.53	0.054	0.052	0.002
15.57	0.054	0.052	0.002
15.60	0.053	0.051	0.002
15.63	0.052	0.051	0.002
15.67	0.052	0.050	0.002
15.70	0.051	0.049	0.002
15.73	0.050	0.049	0.002
15.77	0.050	0.048	0.002
15.80	0.049	0.048	0.002
15.83	0.049	0.047	0.002
15.87	0.048	0.046	0.002
15.90	0.047	0.046	0.002
15.93	0.047	0.045	0.002
15.97	0.046	0.045	0.002
16.00	0.046	0.044	0.002
16.03	0.045	0.043	0.002
16.07	0.044	0.043	0.002
16.10	0.044	0.042	0.002
16.13	0.043	0.042	0.002
16.17	0.043	0.041	0.002
16.20	0.042	0.041	0.002
16.23	0.042	0.040	0.002
16.27	0.042	0.040	0.002
16.30	0.041	0.040	0.002
16.33	0.041	0.039	0.002
16.37	0.041	0.039	0.002
16.40	0.041	0.039	0.002
16.43	0.040	0.039	0.002
16.47	0.040	0.038	0.002
16.50	0.040	0.038	0.002
16.53	0.039	0.038	0.002
16.57	0.039	0.038	0.002
16.60	0.039	0.037	0.002
16.63	0.039	0.037	0.002
16.67	0.038	0.037	0.002
16.70	0.038	0.036	0.002
16.73	0.038	0.036	0.002
16.77	0.038	0.036	0.002
16.80	0.037	0.036	0.002
16.83	0.037	0.035	0.002
16.87	0.037	0.035	0.002
16.90	0.037	0.035	0.002
16.93	0.036	0.035	0.002

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Basin 3A Infiltration

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
16.97	0.036	0.034	0.002
17.00	0.036	0.034	0.002
17.03	0.035	0.034	0.002
17.07	0.035	0.034	0.002
17.10	0.035	0.033	0.002
17.13	0.035	0.033	0.002
17.17	0.034	0.033	0.002
17.20	0.034	0.032	0.002
17.23	0.034	0.032	0.002
17.27	0.034	0.032	0.002
17.30	0.033	0.032	0.002
17.33	0.033	0.031	0.002
17.37	0.033	0.031	0.002
17.40	0.033	0.031	0.002
17.43	0.032	0.031	0.002
17.47	0.032	0.030	0.002
17.50	0.032	0.030	0.002
17.53	0.031	0.030	0.002
17.57	0.031	0.030	0.002
17.60	0.031	0.029	0.002
17.63	0.031	0.029	0.002
17.67	0.030	0.029	0.002
17.70	0.030	0.028	0.002
17.73	0.030	0.028	0.002
17.77	0.030	0.028	0.002
17.80	0.029	0.028	0.002
17.83	0.029	0.027	0.002
17.87	0.029	0.027	0.002
17.90	0.029	0.027	0.002
17.93	0.028	0.027	0.002
17.97	0.028	0.026	0.002
18.00	0.028	0.026	0.002
18.03	0.027	0.026	0.002
18.07	0.027	0.026	0.002
18.10	0.027	0.025	0.002
18.13	0.027	0.025	0.002
18.17	0.026	0.025	0.002
18.20	0.026	0.025	0.002
18.23	0.026	0.025	0.002
18.27	0.026	0.024	0.002
18.30	0.026	0.024	0.002
18.33	0.026	0.024	0.002
18.37	0.026	0.024	0.002
18.40	0.026	0.024	0.002
18.43	0.026	0.024	0.002
18.47	0.026	0.024	0.002
18.50	0.025	0.024	0.002
18.53	0.025	0.024	0.002
18.57	0.025	0.024	0.002
18.60	0.025	0.024	0.002
18.63	0.025	0.024	0.002
18.67	0.025	0.023	0.002
18.70	0.025	0.023	0.002
18.73	0.025	0.023	0.002

Basin 3A Infiltration

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
18.77	0.025	0.023	0.002
18.80	0.025	0.023	0.002
18.83	0.025	0.023	0.002
18.87	0.025	0.023	0.002
18.90	0.025	0.023	0.002
18.93	0.024	0.023	0.002
18.97	0.024	0.023	0.002
19.00	0.024	0.023	0.002
19.03	0.024	0.023	0.002
19.07	0.024	0.022	0.002
19.10	0.024	0.022	0.002
19.13	0.024	0.022	0.002
19.17	0.024	0.022	0.002
19.20	0.024	0.022	0.002
19.23	0.024	0.022	0.002
19.27	0.024	0.022	0.002
19.30	0.024	0.022	0.002
19.33	0.023	0.022	0.002
19.37	0.023	0.022	0.002
19.40	0.023	0.022	0.002
19.43	0.023	0.022	0.002
19.47	0.023	0.022	0.002
19.50	0.023	0.021	0.002
19.53	0.023	0.021	0.002
19.57	0.023	0.021	0.002
19.60	0.023	0.021	0.002
19.63	0.023	0.021	0.002
19.67	0.023	0.021	0.002
19.70	0.023	0.021	0.002
19.73	0.023	0.021	0.002
19.77	0.022	0.021	0.002
19.80	0.022	0.021	0.002
19.83	0.022	0.021	0.002
19.87	0.022	0.021	0.002
19.90	0.022	0.020	0.002
19.93	0.022	0.020	0.002
19.97	0.022	0.020	0.002
20.00	0.022	0.020	0.002
20.03	0.022	0.020	0.002
20.07	0.022	0.020	0.002
20.10	0.022	0.020	0.002
20.13	0.022	0.020	0.002
20.17	0.021	0.020	0.002
20.20	0.021	0.020	0.002
20.23	0.021	0.020	0.002
20.27	0.021	0.020	0.002
20.30	0.021	0.019	0.002
20.33	0.021	0.019	0.002
20.37	0.021	0.019	0.002
20.40	0.021	0.019	0.002
20.43	0.021	0.019	0.002
20.47	0.021	0.019	0.002
20.50	0.021	0.019	0.002
20.53	0.021	0.019	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
20.57	0.020	0.019	0.002
20.60	0.020	0.019	0.002
20.63	0.020	0.019	0.002
20.67	0.020	0.019	0.002
20.70	0.020	0.019	0.002
20.73	0.020	0.018	0.002
20.77	0.020	0.018	0.002
20.80	0.020	0.018	0.002
20.83	0.020	0.018	0.002
20.87	0.020	0.018	0.002
20.90	0.020	0.018	0.002
20.93	0.020	0.018	0.002
20.97	0.020	0.018	0.002
21.00	0.019	0.018	0.002
21.03	0.019	0.018	0.002
21.07	0.019	0.018	0.002
21.10	0.019	0.018	0.002
21.13	0.019	0.017	0.002
21.17	0.019	0.017	0.002
21.20	0.019	0.017	0.002
21.23	0.019	0.017	0.002
21.27	0.019	0.017	0.002
21.30	0.019	0.017	0.002
21.33	0.019	0.017	0.002
21.37	0.019	0.017	0.002
21.40	0.018	0.017	0.002
21.43	0.018	0.017	0.002
21.47	0.018	0.017	0.002
21.50	0.018	0.017	0.002
21.53	0.018	0.016	0.002
21.57	0.018	0.016	0.002
21.60	0.018	0.016	0.002
21.63	0.018	0.016	0.002
21.67	0.018	0.016	0.002
21.70	0.018	0.016	0.002
21.73	0.018	0.016	0.002
21.77	0.018	0.016	0.002
21.80	0.017	0.016	0.002
21.83	0.017	0.016	0.002
21.87	0.017	0.016	0.002
21.90	0.017	0.016	0.002
21.93	0.017	0.016	0.002
21.97	0.017	0.015	0.002
22.00	0.017	0.015	0.002
22.03	0.018	0.016	0.002
22.07	0.019	0.017	0.002
22.10	0.021	0.019	0.002
22.13	0.022	0.021	0.002
22.17	0.023	0.022	0.002
22.20	0.023	0.021	0.002
22.23	0.022	0.020	0.002
22.27	0.021	0.019	0.002
22.30	0.020	0.019	0.002
22.33	0.019	0.018	0.002

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
22.37	0.018	0.017	0.002
22.40	0.018	0.016	0.002
22.43	0.017	0.016	0.002
22.47	0.017	0.016	0.002
22.50	0.017	0.016	0.002
22.53	0.017	0.016	0.002
22.57	0.017	0.015	0.002
22.60	0.017	0.015	0.002
22.63	0.017	0.015	0.002
22.67	0.017	0.015	0.002
22.70	0.017	0.015	0.002
22.73	0.017	0.015	0.002
22.77	0.017	0.015	0.002
22.80	0.017	0.015	0.002
22.83	0.017	0.015	0.002
22.87	0.017	0.015	0.002
22.90	0.016	0.015	0.002
22.93	0.016	0.015	0.002
22.97	0.016	0.015	0.002
23.00	0.016	0.015	0.002
23.03	0.016	0.015	0.002
23.07	0.016	0.015	0.002
23.10	0.016	0.014	0.002
23.13	0.016	0.014	0.002
23.17	0.016	0.014	0.002
23.20	0.016	0.014	0.002
23.23	0.016	0.014	0.002
23.27	0.016	0.014	0.002
23.30	0.016	0.014	0.002
23.33	0.016	0.014	0.002
23.37	0.016	0.014	0.002
23.40	0.016	0.014	0.002
23.43	0.015	0.014	0.002
23.47	0.015	0.014	0.002
23.50	0.015	0.014	0.002
23.53	0.015	0.014	0.002
23.57	0.015	0.014	0.002
23.60	0.015	0.014	0.002
23.63	0.015	0.013	0.002
23.67	0.015	0.013	0.002
23.70	0.015	0.013	0.002
23.73	0.015	0.013	0.002
23.77	0.015	0.013	0.002
23.80	0.015	0.013	0.002
23.83	0.015	0.013	0.002
23.87	0.015	0.013	0.002
23.90	0.015	0.013	0.002
23.93	0.015	0.013	0.002
23.97	0.015	0.013	0.002
24.00	0.014	0.013	0.002
24.03	0.014	0.012	0.002
24.07	0.013	0.012	0.002
24.10	0.012	0.010	0.002
24.13	0.010	0.008	0.002

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
24.17	0.007	0.006	0.002
24.20	0.005	0.004	0.002
24.23	0.003	0.002	0.002
24.27	0.002	0.000	0.002
24.30	0.002	0.000	0.002
24.33	0.002	0.000	0.002
24.37	0.002	0.000	0.002
24.40	0.002	0.000	0.002
24.43	0.002	0.000	0.002
24.47	0.002	0.000	0.002
24.50	0.002	0.000	0.002
24.53	0.002	0.000	0.002
24.57	0.002	0.000	0.002
24.60	0.002	0.000	0.002
24.63	0.002	0.000	0.002
24.67	0.002	0.000	0.002
24.70	0.002	0.000	0.002
24.73	0.002	0.000	0.002
24.77	0.002	0.000	0.002
24.80	0.002	0.000	0.002
24.83	0.002	0.000	0.002
24.87	0.002	0.000	0.002
24.90	0.002	0.000	0.002
24.93	0.002	0.000	0.002
24.97	0.002	0.000	0.002
25.00	0.002	0.000	0.002
25.03	0.002	0.000	0.002
25.07	0.002	0.000	0.002
25.10	0.002	0.000	0.002
25.13	0.002	0.000	0.002
25.17	0.002	0.000	0.002
25.20	0.002	0.000	0.002
25.23	0.002	0.000	0.002
25.27	0.002	0.000	0.002
25.30	0.002	0.000	0.002
25.33	0.002	0.000	0.002
25.37	0.002	0.000	0.002
25.40	0.002	0.000	0.002
25.43	0.002	0.000	0.002
25.47	0.002	0.000	0.002
25.50	0.002	0.000	0.002
25.53	0.002	0.000	0.002
25.57	0.002	0.000	0.002
25.60	0.002	0.000	0.002
25.63	0.002	0.000	0.002
25.67	0.002	0.000	0.002
25.70	0.002	0.000	0.002
25.73	0.002	0.000	0.002
25.77	0.002	0.000	0.002
25.80	0.002	0.000	0.002
25.83	0.002	0.000	0.002
25.87	0.002	0.000	0.002
25.90	0.002	0.000	0.002
25.93	0.002	0.000	0.002

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Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
25.97	0.002	0.000	0.002
26.00	0.002	0.000	0.002
26.03	0.002	0.000	0.002
26.07	0.002	0.000	0.002
26.10	0.002	0.000	0.002
26.13	0.002	0.000	0.002
26.17	0.002	0.000	0.002
26.20	0.002	0.000	0.002
26.23	0.002	0.000	0.002
26.27	0.002	0.000	0.002
26.30	0.002	0.000	0.002
26.33	0.002	0.000	0.002
26.37	0.002	0.000	0.002

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 17

Basin 3A Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.002 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 456 cuft
Inflow hydrograph	= 16 - POST Basin 3A	2nd diverted hyd.	= 18
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
11.57	0.204	0.203	0.002
11.60	0.218	0.216	0.002
11.63	0.237	0.236	0.002
11.67	0.265	0.263	0.002
11.70	0.301	0.300	0.002
11.73	0.345	0.343	0.002
11.77	0.395	0.394	0.002
11.80	0.451	0.450	0.002
11.83	0.512	0.510	0.002
11.87	0.593	0.591	0.002
11.90	0.665	0.663	0.002
11.93	0.739	0.737	0.002
11.97	0.837	0.835	0.002
12.00	0.982	0.981	0.002
12.03	1.185	1.183	0.002
12.07	1.419	1.418	0.002
12.10	1.646	1.644	0.002
12.13	1.768	1.766	0.002
12.17	1.771 <<	1.769 <<	0.002 <<
12.20	1.686	1.684	0.002
12.23	1.553	1.551	0.002
12.27	1.408	1.407	0.002
12.30	1.253	1.252	0.002
12.33	1.096	1.094	0.002
12.37	0.960	0.958	0.002
12.40	0.853	0.852	0.002
12.43	0.771	0.770	0.002
12.47	0.701	0.699	0.002
12.50	0.632	0.631	0.002
12.53	0.564	0.562	0.002
12.57	0.507	0.505	0.002
12.60	0.457	0.455	0.002
12.63	0.405	0.404	0.002
12.67	0.361	0.359	0.002
12.70	0.326	0.324	0.002
12.73	0.300	0.298	0.002
12.77	0.280	0.278	0.002
12.80	0.266	0.264	0.002
12.83	0.255	0.254	0.002
12.87	0.247	0.245	0.002
12.90	0.239	0.238	0.002

Continues on next page...

Hydrograph Discharge Table

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.93	0.232	0.230	0.002
12.97	0.225	0.223	0.002
13.00	0.217	0.216	0.002
13.03	0.210	0.208	0.002
13.07	0.203	0.201	0.002

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 17

Basin 3A Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.002 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 456 cuft
Inflow hydrograph	= 16 - POST Basin 3A	2nd diverted hyd.	= 18
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
11.77	0.666	0.665	0.002
11.80	0.756	0.754	0.002
11.83	0.852	0.850	0.002
11.87	0.951	0.949	0.002
11.90	1.053	1.051	0.002
11.93	1.165	1.163	0.002
11.97	1.313	1.311	0.002
12.00	1.538	1.536	0.002
12.03	1.874	1.872	0.002
12.07	2.225	2.224	0.002
12.10	2.533	2.531	0.002
12.13	2.702 <<	2.700 <<	0.002 <<
12.17	2.699	2.697	0.002
12.20	2.562	2.560	0.002
12.23	2.352	2.350	0.002
12.27	2.112	2.111	0.002
12.30	1.862	1.861	0.002
12.33	1.622	1.620	0.002
12.37	1.425	1.424	0.002
12.40	1.277	1.275	0.002
12.43	1.152	1.150	0.002
12.47	1.045	1.043	0.002
12.50	0.942	0.940	0.002
12.53	0.840	0.838	0.002
12.57	0.741	0.739	0.002
12.60	0.651	0.649	0.002

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 18

Basin 3A Overflow

Hydrograph type	= Diversion2	Peak discharge	= 1.083 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 3,236 cuft
Inflow hydrograph	= 16 - POST Basin 3A	2nd diverted hyd.	= 17
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	1.070	0.002	1.068
12.17	1.085 <<	0.002 <<	1.083 <<
12.20	1.043	0.002	1.042

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 18

Basin 3A Overflow

Hydrograph type	= Diversion2	Peak discharge	= 1.769 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 3,236 cuft
Inflow hydrograph	= 16 - POST Basin 3A	2nd diverted hyd.	= 17
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	1.768	0.002	1.766
12.17	1.771 <<	0.002 <<	1.769 <<
12.20	1.686	0.002	1.684

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 18

Basin 3A Overflow

Hydrograph type	= Diversion2	Peak discharge	= 2.700 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 3,236 cuft
Inflow hydrograph	= 16 - POST Basin 3A	2nd diverted hyd.	= 17
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	2.702 <<	0.002 <<	2.700 <<
12.17	2.699	0.002	2.697

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 19

POST To Basin 2

Hydrograph type	= Combine	Peak discharge	= 2.136 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 7,202 cuft
Inflow hyds.	= 14, 18	Contrib. drain. area	= 0.490 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 14 + (cfs)	Hyd. 18 = (cfs)	Outflow (cfs)
12.07	1.278 <<	0.858	2.136 <<
12.10	1.142	0.984	2.127

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 19

POST To Basin 2

Hydrograph type	= Combine	Peak discharge	= 3.388 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,202 cuft
Inflow hyds.	= 14, 18	Contrib. drain. area	= 0.490 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 14 + (cfs)	Hyd. 18 = (cfs)	Outflow (cfs)
12.07	1.958 <<	1.418	3.375
12.10	1.744	1.644	3.388 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 19

POST To Basin 2

Hydrograph type	= Combine	Peak discharge	= 5.092 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 7,202 cuft
Inflow hyds.	= 14, 18	Contrib. drain. area	= 0.490 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 14 + (cfs)	Hyd. 18 = (cfs)	Outflow (cfs)
12.07	2.868 <<	2.224	5.092 <<
12.10	2.548	2.531	5.080

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 20

POST Basin 2

Hydrograph type	= Reservoir	Peak discharge	= 2.148 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,198 cuft
Inflow hyd. No.	= 19 - POST To Basin 2	Reservoir name	= Basin 2
Max. Elevation	= 209.60 ft	Max. Storage	= 400 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.07	2.136 <<	209.60	-----	-----	-----	-----	1.977	-----	-----	-----	0.099	2.075
12.10	2.127	209.60 <<	-----	-----	-----	-----	2.049	-----	-----	-----	0.099	2.148 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 20

POST Basin 2

Hydrograph type	= Reservoir	Peak discharge	= 3.408 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,198 cuft
Inflow hyd. No.	= 19 - POST To Basin 2	Reservoir name	= Basin 2
Max. Elevation	= 209.64 ft	Max. Storage	= 422 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.07	3.375	209.63	-----	-----	-----	-----	3.228	-----	-----	-----	0.105	3.332
12.10	3.388 <<	209.63 <<	-----	-----	-----	-----	3.304	-----	-----	-----	0.105	3.408 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 20

POST Basin 2

Hydrograph type	= Reservoir	Peak discharge	= 5.106 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 7,198 cuft
Inflow hyd. No.	= 19 - POST To Basin 2	Reservoir name	= Basin 2
Max. Elevation	= 209.68 ft	Max. Storage	= 453 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.07	5.092 <<	209.68	-----	-----	-----	-----	4.936	-----	-----	-----	0.112	5.048
12.10	5.080	209.68 <<	-----	-----	-----	-----	4.994	-----	-----	-----	0.112	5.106 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 21

Basin 2 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.099 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,309 cuft
Inflow hydrograph	= 20 - POST Basin 2	2nd diverted hyd.	= 22
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.03	1.610	1.515	0.095
12.07	2.075	1.977	0.099
12.10	2.148 <<	2.049 <<	0.099 <<
12.13	2.019	1.921	0.098
12.17	1.836	1.739	0.097
12.20	1.671	1.576	0.095
12.23	1.537	1.442	0.094

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 21

Basin 2 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.105 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,309 cuft
Inflow hydrograph	= 20 - POST Basin 2	2nd diverted hyd.	= 22
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.00	2.348	2.248	0.100
12.03	2.971	2.868	0.103
12.07	3.332	3.228	0.105
12.10	3.408 <<	3.303 <<	0.105 <<
12.13	3.186	3.082	0.104
12.17	2.880	2.777	0.103
12.20	2.613	2.512	0.101
12.23	2.393	2.292	0.100

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 21

Basin 2 Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.112 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,309 cuft
Inflow hydrograph	= 20 - POST Basin 2	2nd diverted hyd.	= 22
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.03	4.462	4.353	0.109
12.07	5.048	4.936	0.112
12.10	5.106 <<	4.994 <<	0.112 <<
12.13	4.776	4.665	0.111
12.17	4.314	4.206	0.109
12.20	3.915	3.808	0.107

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 22

Basin 2 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 2.049 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,889 cuft
Inflow hydrograph	= 20 - POST Basin 2	2nd diverted hyd.	= 21
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	2.075	0.099	1.977
12.10	2.148 <<	0.099 <<	2.049 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 22

Basin 2 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 3.303 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,889 cuft
Inflow hydrograph	= 20 - POST Basin 2	2nd diverted hyd.	= 21
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	3.332	0.105	3.228
12.10	3.408 <<	0.105 <<	3.303 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 22

Basin 2 Overflow

Hydrograph type	= Diversion2	Peak discharge	= 4.994 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 3,889 cuft
Inflow hydrograph	= 20 - POST Basin 2	2nd diverted hyd.	= 21
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	5.048	0.112	4.936
12.10	5.106 <<	0.112 <<	4.994 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present Developed Subcatchment 4B

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.04	3.92
626B A	Grass- Good Condition	39			0.04	1.56
				Totals =	0.08	5.48

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{5.48}{0.08} = 68.50$; Use CN = 68.5

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.70	1.57	2.98
Runoff, Q..................................	cf	204	455	865

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) 0

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **[Developed]** Subcatchment 4B

Circle one: **[Tc]** Tt through subarea

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	26			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.03			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.07			0.07

Shallow concentrated Flow		Segment ID				
7. Surface Description (paved or unpaved)						
8. Flow Length, L		ft				
9. Watercourse slope, s		ft/ft				
10. Average Velocity, V (figure 3-1)		ft/s				
11. Tt = L / 3600V	Compute Tt	hr				0.00

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19)	hr	0.10
	min	6.0

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 23

POST Sub. 4B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.054 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Drainage area	= 0.080 ac	Curve number	= 68.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.07	0.054 <<
12.10	0.053

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 23

POST Sub. 4B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.137 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Drainage area	= 0.080 ac	Curve number	= 68.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.137 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 23

POST Sub. 4B

Hydrograph type	= SCS Runoff	Peak discharge	= 0.270 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Drainage area	= 0.080 ac	Curve number	= 68.5
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	0.270 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 24

Sub. 4B Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.039 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Inflow hyd. No.	= 23 - POST Sub. 4B	Reservoir name	= Sub. 4B Storage
Max. Elevation	= 220.05 ft	Max. Storage	= 16 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	0.045	220.05	-----	-----	-----	-----	-----	-----	-----	-----	0.039	0.039
12.17	0.037	220.05 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.039	0.039 <<
12.20	0.033	220.05	-----	-----	-----	-----	-----	-----	-----	-----	0.038	0.038

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 24

Sub. 4B Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.101 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Inflow hyd. No.	= 23 - POST Sub. 4B	Reservoir name	= Sub. 4B Storage
Max. Elevation	= 220.12 ft	Max. Storage	= 40 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.13	0.106	220.12 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.101	0.101 <<
12.17	0.085	220.12	-----	-----	-----	-----	-----	-----	-----	-----	0.099	0.099

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 24

Sub. 4B Storage

Hydrograph type	= Reservoir	Peak discharge	= 0.165 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Inflow hyd. No.	= 23 - POST Sub. 4B	Reservoir name	= Sub. 4B Storage
Max. Elevation	= 220.27 ft	Max. Storage	= 88 cuft

Storage Indication method used. Outflow includes exfiltration.

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	Outflow cfs
12.07	0.270 <<	220.21	-----	-----	-----	-----	-----	-----	-----	-----	0.163	0.163
12.10	0.248	220.24	-----	-----	-----	-----	-----	-----	-----	-----	0.164	0.164
12.13	0.201	220.26	-----	-----	-----	-----	-----	-----	-----	-----	0.165	0.165
12.17	0.160	220.27 <<	-----	-----	-----	-----	-----	-----	-----	-----	0.165	0.165 <<
12.20	0.137	220.26	-----	-----	-----	-----	-----	-----	-----	-----	0.165	0.165
12.23	0.125	220.25	-----	-----	-----	-----	-----	-----	-----	-----	0.165	0.165
12.27	0.118	220.24	-----	-----	-----	-----	-----	-----	-----	-----	0.164	0.164
12.30	0.110	220.22	-----	-----	-----	-----	-----	-----	-----	-----	0.163	0.163
12.33	0.101	220.20	-----	-----	-----	-----	-----	-----	-----	-----	0.160	0.160

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Hyd. No. 25

Sub. 4B Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.039 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Inflow hydrograph	= 24 - Sub. 4B Storage	2nd diverted hyd.	= 26
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	0.039	0.000	0.039
12.17	0.039 <<	0.000	0.039 <<
12.20	0.038	0.000	0.038

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 25

Sub. 4B Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.101 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Inflow hydrograph	= 24 - Sub. 4B Storage	2nd diverted hyd.	= 26
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.13	0.101 <<	0.000	0.101 <<
12.17	0.099	0.000	0.099

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 25

Sub. 4B Infiltration

Hydrograph type	= Diversion1	Peak discharge	= 0.165 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 191 cuft
Inflow hydrograph	= 24 - Sub. 4B Storage	2nd diverted hyd.	= 26
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	0.163	0.000	0.163
12.10	0.164	0.000	0.164
12.13	0.165	0.000	0.165
12.17	0.165 <<	0.000	0.165 <<
12.20	0.165	0.000	0.165
12.23	0.165	0.000	0.165
12.27	0.164	0.000	0.164
12.30	0.163	0.000	0.163
12.33	0.160	0.000	0.160

...End

Hydrograph Report

Hyd. No. 26

Sub. 4B Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 24 - Sub. 4B Storage	2nd diverted hyd.	= 25
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.07	0.029	0.029	0.000 <<
12.37	0.030	0.030	0.000 <<
12.43	0.026	0.026	0.000 <<
12.50	0.022	0.022	0.000 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 26

Sub. 4B Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.03 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 24 - Sub. 4B Storage	2nd diverted hyd.	= 25
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.03	0.064	0.064	0.000 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 26

Sub. 4B Overflow

Hydrograph type	= Diversion2	Peak discharge	= 0.000 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.00 hrs
Time interval	= 2 min	Hyd. volume	= 0 cuft
Inflow hydrograph	= 24 - Sub. 4B Storage	2nd diverted hyd.	= 25
Diversion method	= Pond -	Pond structure	= Exfiltration

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Inflow cfs	2nd Diverted cfs	Outflow cfs
12.00	0.106	0.106	0.000 <<
12.47	0.104	0.104	0.000 <<

...End

Worksheet 2: Runoff curve number and runoff **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ________ Date ________

Circle one: Present Developed Subcatchment 4A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/ Table 2-2	CN 1/ Fig. 2-3	CN 1/ Fig. 2-4	Area Acres	Product of CN x Area
—	Impervious	98			0.72	70.56
626B A	Grass- Good Condition	39			0.03	1.17
602 A	Grass- Good Condition	39			0.01	0.39
				Totals =	0.76	72.12

1/ Use only one CN source per line.

CN (weighted) = $\frac{\text{total product}}{\text{total area}} = \frac{72.12}{0.76} = 94.89$; Use CN = 94.9

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q................................ (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	2.54	3.91	5.80
Runoff, Q................................	cf	6997	10795	15992

(210-VI-TR-55, Second Ed., June 1986)

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 4A

Circle one: **Tc** Tt through subarea ______

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			Concrete			
2. Mannings roughness coeff., n (table 3-1)			0.011			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.02			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.01			0.01

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	259			
9. Watercourse slope, s		ft/ft	0.01			
10. Average Velocity, V (figure 3-1)		ft/s	2.03			
11. Tt = L / 3600V	Compute Tt	hr	0.04			0.04

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.10 min 6.0

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 27

POST Sub. 4A

Hydrograph type	= SCS Runoff	Peak discharge	= 2.072 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,561 cuft
Drainage area	= 0.760 ac	Curve number	= 94.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.07	2.072 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 27

POST Sub. 4A

Hydrograph type	= SCS Runoff	Peak discharge	= 3.115 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,561 cuft
Drainage area	= 0.760 ac	Curve number	= 94.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.07	3.115 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 27

POST Sub. 4A

Hydrograph type	= SCS Runoff	Peak discharge	= 4.514 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,561 cuft
Drainage area	= 0.760 ac	Curve number	= 94.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.0 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- Outflow (hrs	cfs)
12.07	4.514 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 28

POST Sub. 4 Total

Hydrograph type	= Combine	Peak discharge	= 2.072 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,561 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.760 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 26 + (cfs)	Hyd. 27 = (cfs)	Outflow (cfs)
12.07	0.000 <<	2.072 <<	2.072 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 28

POST Sub. 4 Total

Hydrograph type	= Combine	Peak discharge	= 3.115 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,561 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.760 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 26 + (cfs)	Hyd. 27 = (cfs)	Outflow (cfs)
12.07	0.000	3.115 <<	3.115 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 28

POST Sub. 4 Total

Hydrograph type	= Combine	Peak discharge	= 4.514 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 6,561 cuft
Inflow hyds.	= 26, 27	Contrib. drain. area	= 0.760 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 26 + (cfs)	Hyd. 27 = (cfs)	Outflow (cfs)
12.07	0.000	4.514 <<	4.514 <<

...End

Worksheet 2: Runoff curve number and runoff SM-3320

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ________ Date ________

Circle one: Present Developed Subcatchment 5A

1. Runoff curve number (CN)

Soil name and hydrologic group (appendix	Cover description (cover type, treatment, and hydrologic condition: percent impervious: unconnected/connected impervious area ratio)	CN 1/			Area	Product of CN x Area
		Table 2-2	Fig. 2-3	Fig. 2-4	Acres	
—	Impervious	98			0.23	22.54
626B A	Grass- Good Condition	39			0.10	3.90
253B A	Grass- Good Condition	39			0.07	2.73
				Totals =	0.40	29.17

1/ Use only one CN source per line.

$$\text{CN (weighted)} = \frac{\text{total product}}{\text{total area}} = \frac{29.17}{0.40} = 72.93; \quad \text{Use CN} = 72.9$$

2. Runoff

		Storm #1	Storm #2	Storm #3
Frequency..................................	yr	2	10	100
Rainfall, P (24-hour)..................	in	3.1	4.5	6.4
Runoff, Q.................................. (Use P and CN with table 2-1, fig. 2-1,) or eqs. 2-3 and 2-4.)	in	0.92	1.89	3.42
Runoff, Q..................................	cf	1329	2744	4960

Worksheet 3: Time of Concentration (Tc) or travel time (Tt) **SM-3320**

Project: 531-537 Mass. Ave. By ECS Date 4/6/09

Location: Acton, MA Checked ______ Date ______

Circle one: Present **Developed** Subcatchment 5A

Circle one: **Tc** Tt through subarea ______

Sheet flow (Applicable to Tc only)		Segment ID	A-B			
1. Surface Description (table 3-1)			ense Gras			
2. Mannings roughness coeff., n (table 3-1)			0.24			
3. Flow length, L (total L <= 300 ft)		ft	50			
4. Two-yr 24-hr rainfall, P2		in	3.1			
5. Land Slope, s		ft/ft	0.04			
6. Tt = 0.007 (nL)^0.8 / (P2^0.5 s^0.4)	Compute Tt	hr	0.11			0.11

Shallow concentrated Flow		Segment ID	B-C			
7. Surface Description (paved or unpaved)			PAVED			
8. Flow Length, L		ft	152			
9. Watercourse slope, s		ft/ft	0.05			
10. Average Velocity, V (figure 3-1)		ft/s	4.55			
11. Tt = L / 3600V	Compute Tt	hr	0.01			0.01

Channel flow		Segment ID				
12. Cross sectional flow area, a		sf				
13. Wetted perimeter, pw		ft				
14. Hydraulic radius, r=a/wp	Compute r	ft				
15. Channel Slope, s		ft/ft				
16. Manning's roughness coeff., n						
17. V = 1.49 r^2/3 s^1/2 / n	Compute V	ft/s				
18. Flow length, L		ft				
19. Tt = L / 3600V	Compute Tt	hr				0.00

20. Watershed or subarea Tc or Tt (add Tt in steps 6, 11, and 19) hr 0.11 min 6.9

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 29

POST Sub. 5A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.358 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 1,328 cuft
Drainage area	= 0.400 ac	Curve number	= 72.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.9 min
Total precip.	= 3.10 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	**Outflow cfs)**
12.10	0.356
12.13	0.358 <<

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 29

POST Sub. 5A

Hydrograph type	= SCS Runoff	Peak discharge	= 0.789 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 1,328 cuft
Drainage area	= 0.400 ac	Curve number	= 72.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.9 min
Total precip.	= 4.50 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	0.789 <<
12.13	0.775

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 | Tuesday, Jun 23, 2009

Hyd. No. 29

POST Sub. 5A

Hydrograph type	= SCS Runoff	Peak discharge	= 1.451 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 1,328 cuft
Drainage area	= 0.400 ac	Curve number	= 72.9
Basin Slope	= 0.0 %	Hydraulic length	= 0 ft
Tc method	= USER	Time of conc. (Tc)	= 6.9 min
Total precip.	= 6.40 in	Distribution	= Type III
Storm duration	= 24 hrs	Shape factor	= 484

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time -- (hrs	Outflow cfs)
12.10	1.451 <<
12.13	1.409

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 30

POST TOTAL

Hydrograph type	= Combine	Peak discharge	= 4.367 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 11,811 cuft
Inflow hyds.	= 13, 22, 28, 29	Contrib. drain. area	= 0.400 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 13 + (cfs)	Hyd. 22 + (cfs)	Hyd. 28 + (cfs)	Hyd. 29 = (cfs)	Outflow (cfs)
12.07	0.000	1.977	2.072 <<	0.319	4.367 <<
12.10	0.000	2.049 <<	1.846	0.356	4.252

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 30

POST TOTAL

Hydrograph type	= Combine	Peak discharge	= 7.066 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.07 hrs
Time interval	= 2 min	Hyd. volume	= 11,811 cuft
Inflow hyds.	= 13, 22, 28, 29	Contrib. drain. area	= 0.400 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 13 + (cfs)	Hyd. 22 + (cfs)	Hyd. 28 + (cfs)	Hyd. 29 = (cfs)	Outflow (cfs)
12.07	0.000	3.228	3.115 <<	0.723	7.066 <<
12.10	0.000	3.303 <<	2.769	0.789 <<	6.861

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 30

POST TOTAL

Hydrograph type	= Combine	Peak discharge	= 13.58 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.10 hrs
Time interval	= 2 min	Hyd. volume	= 11,811 cuft
Inflow hyds.	= 13, 22, 28, 29	Contrib. drain. area	= 0.400 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 13 + (cfs)	Hyd. 22 + (cfs)	Hyd. 28 + (cfs)	Hyd. 29 = (cfs)	Outflow (cfs)
12.10	3.127	4.994 <<	4.006	1.451 <<	13.58 <<
12.13	4.285	4.665	3.149	1.409	13.51
12.17	5.187 <<	4.206	2.435	1.270	13.10

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 31

POST Infiltration

Hydrograph type	= Combine	Peak discharge	= 0.733 cfs
Storm frequency	= 2 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 13,922 cuft
Inflow hyds.	= 5, 10, 17, 21, 25	Contrib. drain. area	= 0.000 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 5 + (cfs)	Hyd. 10 + (cfs)	Hyd. 17 + (cfs)	Hyd. 21 + (cfs)	Hyd. 25 + (cfs)	Outflow (cfs)
12.10	0.205	0.378	0.002	0.099 <<	0.035	0.719
12.13	0.210 <<	0.385	0.002	0.098	0.039	0.733 <<
12.17	0.202	0.390	0.002 <<	0.097	0.039 <<	0.730
12.20	0.187	0.395	0.002	0.095	0.038	0.717
12.23	0.171	0.399	0.002	0.094	0.037	0.703

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 31

POST Infiltration

Hydrograph type	= Combine	Peak discharge	= 0.964 cfs
Storm frequency	= 10 yrs	Time to peak	= 12.13 hrs
Time interval	= 2 min	Hyd. volume	= 13,922 cuft
Inflow hyds.	= 5, 10, 17, 21, 25	Contrib. drain. area	= 0.000 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 5 + (cfs)	Hyd. 10 + (cfs)	Hyd. 17 + (cfs)	Hyd. 21 + (cfs)	Hyd. 25 + (cfs)	Outflow (cfs)
12.10	0.318	0.421	0.002	0.105 <<	0.095	0.941
12.13	0.326 <<	0.432	0.002	0.104	0.101 <<	0.964 <<
12.17	0.312	0.441	0.002 <<	0.103	0.099	0.957
12.20	0.288	0.449	0.002	0.101	0.094	0.934

...End

Hydrograph Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Hyd. No. 31

POST Infiltration

Hydrograph type	= Combine	Peak discharge	= 1.113 cfs
Storm frequency	= 100 yrs	Time to peak	= 12.17 hrs
Time interval	= 2 min	Hyd. volume	= 13,922 cuft
Inflow hyds.	= 5, 10, 17, 21, 25	Contrib. drain. area	= 0.000 ac

Hydrograph Discharge Table

(Printed values >= 95.00% of Qp.)

Time (hrs)	Hyd. 5 + (cfs)	Hyd. 10 + (cfs)	Hyd. 17 + (cfs)	Hyd. 21 + (cfs)	Hyd. 25 + (cfs)	Outflow (cfs)
12.07	0.351	0.463	0.002	0.112	0.163	1.090
12.10	0.352	0.474	0.002	0.112 <<	0.164	1.105
12.13	0.353	0.481	0.002 <<	0.111	0.165	1.112
12.17	0.354 <<	0.483 <<	0.002	0.109	0.165 <<	1.113 <<
12.20	0.353	0.483	0.002	0.107	0.165	1.110
12.23	0.353	0.481	0.002	0.106	0.165	1.106
12.27	0.352	0.479	0.002	0.104	0.164	1.102
12.30	0.352	0.477	0.002	0.103	0.163	1.097
12.33	0.351	0.475	0.002	0.101	0.160	1.089
12.37	0.350	0.473	0.002	0.100	0.143	1.068

...End

Pond Report

Hydraflow Hydrographs by Intelisolve v9.2

Tuesday, Jun 23, 2009

Pond No. 7 - Sub. 1E Storage

Pond Data

Trapezoid - Bottom L x W = 70.0 x 25.5 ft, Side slope = 0.0:1, Bottom elev. = 220.00 ft, Depth = 2.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	220.00	1,785	0	0
0.20	220.20	1,785	143	143
0.40	220.40	1,785	143	286
0.60	220.60	1,785	143	428
0.80	220.80	1,785	143	571
1.00	221.00	1,785	143	714
1.20	221.20	1,785	143	857
1.40	221.40	1,785	143	1,000
1.60	221.60	1,785	143	1,142
1.80	221.80	1,785	143	1,285
2.00	222.00	1,785	143	1,428

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 70.00	0.00	0.00	0.00
Crest El. (ft)	= 221.80	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.270 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	220.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.20	143	220.20	---	---	---	---	0.00	---	---	---	0.349	---	0.349
0.40	286	220.40	---	---	---	---	0.00	---	---	---	0.356	---	0.356
0.60	428	220.60	---	---	---	---	0.00	---	---	---	0.364	---	0.364
0.80	571	220.80	---	---	---	---	0.00	---	---	---	0.371	---	0.371
1.00	714	221.00	---	---	---	---	0.00	---	---	---	0.378	---	0.378
1.20	857	221.20	---	---	---	---	0.00	---	---	---	0.386	---	0.386
1.40	1,000	221.40	---	---	---	---	0.00	---	---	---	0.393	---	0.393
1.60	1,142	221.60	---	---	---	---	0.00	---	---	---	0.400	---	0.400
1.80	1,285	221.80	---	---	---	---	0.00	---	---	---	0.408	---	0.408
2.00	1,428	222.00	---	---	---	---	16.28	---	---	---	0.415	---	16.69

Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Pond No. 1 - Basin 1A

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 208.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	208.00	1,664	0	0
1.00	209.00	1,923	1,792	1,792
2.00	210.00	2,198	2,059	3,851
3.00	211.00	2,485	2,340	6,190
4.00	212.00	2,784	2,633	8,823

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	0.00	0.00	0.00
Span (in)	= 24.00	0.00	0.00	0.00
No. Barrels	= 1	0	0	0
Invert El. (ft)	= 207.90	0.00	0.00	0.00
Length (ft)	= 30.00	0.00	0.00	0.00
Slope (%)	= 3.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 13.40	0.00	Inactive	2.50
Crest El. (ft)	= 211.10	210.10	211.50	210.50
Weir Coeff.	= 3.33	0.11	3.33	3.33
Weir Type	= Riser	5 ddegV	Ciplti	Rect
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 8.270 (by Contour)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	208.00	0.00	---	---	---	0.00	---	0.00	0.00	0.000	---	0.000
1.00	1,792	209.00	0.07 ic	---	---	---	0.00	---	0.00	0.00	0.368	---	0.368
2.00	3,851	210.00	0.07 ic	---	---	---	0.00	---	0.00	0.00	0.421	---	0.421
3.00	6,190	211.00	0.09 ic	---	---	---	0.00	0.09	0.00	2.94	0.476	---	3.504
4.00	8,823	212.00	25.65 ic	---	---	---	25.37 s	0.28 s	0.00	15.29	0.533	---	41.48

Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Pond No. 3 - Basin 3A

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 209.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	209.00	205	0	0
1.00	210.00	309	255	255
2.00	211.00	436	371	626
3.00	212.00	582	507	1,133

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 5.00	0.00	0.00	0.00
Crest El. (ft)	= 211.50	0.00	0.00	0.00
Weir Coeff.	= 3.33	0.80	3.33	3.33
Weir Type	= Ciplti	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 0.140 (by Contour)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	209.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	255	210.00	---	---	---	---	0.00	---	---	---	0.001	---	0.001
2.00	626	211.00	---	---	---	---	0.00	---	---	---	0.001	---	0.001
3.00	1,133	212.00	---	---	---	---	5.89	---	---	---	0.002	---	5.889

Pond Report

Hydraflow Hydrographs by Intelisolve v9.2 — Tuesday, Jun 23, 2009

Pond No. 6 - Basin 2

Pond Data

Contours - User-defined contour areas. Conic method used for volume calculation. Begining Elevation = 209.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	209.00	488	0	0
1.00	210.00	865	667	667

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 25.00	0.00	0.00	0.00
Crest El. (ft)	= 209.50	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(in/hr)	= 8.270 (by Contour)			
TW Elev. (ft)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	209.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
1.00	667	210.00	---	---	---	---	22.98	---	---	---	0.166	---	23.15

Hydraflow Hydrographs by Intelisolve v9.2 Tuesday, Jun 23, 2009

Pond No. 8 - Sub. 4B Storage

Pond Data

Trapezoid - Bottom L x W = 90.0 x 9.0 ft, Side slope = 0.0:1, Bottom elev. = 220.00 ft, Depth = 2.00 ft, Voids = 40.00%

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	220.00	810	0	0
0.20	220.20	810	65	65
0.40	220.40	810	65	130
0.60	220.60	810	65	194
0.80	220.80	810	65	259
1.00	221.00	810	65	324
1.20	221.20	810	65	389
1.40	221.40	810	65	454
1.60	221.60	810	65	518
1.80	221.80	810	65	583
2.00	222.00	810	65	648

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 0.00	0.00	0.00	0.00
Span (in)	= 0.00	0.00	0.00	0.00
No. Barrels	= 0	0	0	0
Invert El. (ft)	= 0.00	0.00	0.00	0.00
Length (ft)	= 0.00	0.00	0.00	0.00
Slope (%)	= 0.00	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 90.00	0.00	0.00	0.00
Crest El. (ft)	= 221.90	0.00	0.00	0.00
Weir Coeff.	= 2.60	3.33	3.33	3.33
Weir Type	= Broad	---	---	---
Multi-Stage	= No	No	No	No

Exfil.(in/hr) = 8.270 (by Wet area)
TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	220.00	---	---	---	---	0.00	---	---	---	0.000	---	0.000
0.20	65	220.20	---	---	---	---	0.00	---	---	---	0.163	---	0.163
0.40	130	220.40	---	---	---	---	0.00	---	---	---	0.170	---	0.170
0.60	194	220.60	---	---	---	---	0.00	---	---	---	0.178	---	0.178
0.80	259	220.80	---	---	---	---	0.00	---	---	---	0.185	---	0.185
1.00	324	221.00	---	---	---	---	0.00	---	---	---	0.193	---	0.193
1.20	389	221.20	---	---	---	---	0.00	---	---	---	0.201	---	0.201
1.40	454	221.40	---	---	---	---	0.00	---	---	---	0.208	---	0.208
1.60	518	221.60	---	---	---	---	0.00	---	---	---	0.216	---	0.216
1.80	583	221.80	---	---	---	---	0.00	---	---	---	0.223	---	0.223
2.00	648	222.00	---	---	---	---	7.40	---	---	---	0.231	---	7.631

Storm Sewer Design

GRATE CAPACITY CALCULATIONS

Job: SM-3320

Calculated by: ECS
Date: 6/19/09

INLET GRATE CAPACITY CHECK

LEBARON LF 246

Single grate:	Q = (CA SQRT(2*g*h))*f		
Low Points	LP Q =	2.85	CFS
On Slope	OS Q =	2.04	CFS
Double grate:	Q = (CA SQRT(2*g*h))*f		
Low Points	LP Q =	5.70	CFS
On Slope	OS Q =	4.09	CFS

Single grate
PASS AREA = 225 IN^2 1.56

Double grate
PASS AREA = 450 IN^2 3.12

C = ORIFICE COEFFICIENT
C = 0.6 SQUARE EDGES

A = NET INLET AREA
A = 1.56 S.F.

g = GRAVITATIONAL CONSTANT
g = 32.2 FT PER SEC^2

h = HEAD ON INLET
h = 0.33 FT (low points)
0.17 FT (on slope)

f = CLOGGING FACTOR
f = 0.66

TABLE VALUES TAKEN FROM PIPE SIZING CALCULATIONS
OUTLET CAPACITY FROM STORM SEWER DESIGN TABLE (CAPACITY FULL cfs)

	low point on slope	TRIBUTARY AREA (AC)	TIME OF CONC.	100 YR INTENSITY	C	Q100	OUTLET CAPACITY	grate required
CB-1	os	0.07	10	7.6	0.90	0.48	2.72	single grate
CB-2	os	0.10	10	7.6	0.69	0.52	2.78	single grate
CB-3	os	0.16	10	7.6	0.73	0.89	2.77	single grate
CB-4	os	0.00	10	7.6	0.00	0.00	8.61	single grate

DESIGN STORM: 100 YEAR
DATE: 6/19/09
DONE BY: ECS
FILE: 3320-WAV-C-Rational Method.wb3

STORM SEWER DESIGN

(ADS N-12)"n"= 0.010 4"-10"
(ADS N-12)"n"= 0.012 12"-36"
(ADS N-12)"n"= 0.013 42"-60"
(Cast Iron)"n"= 0.011

PROJECT: SM-3320
LOCATION: Acton, MA

FROM	TO	LENGTH (FT)	TRIBUTARY AREA INCR. (ACRES)	TRIBUTARY AREA TOTAL (ACRES)	TIME OF FLOW TO UPPER END (MIN)	TIME OF FLOW TIME IN SECTION (MIN)	RUNOFF COEFF. "C"	RAINFALL INTENSITY (IN/HR)	"Q" TOTAL RUNOFF (CFS)	SLOPE of PIPE (FT/FT)	DIAM (IN)	MANN. "n"	CAPACITY FULL (CFS)	VELOCITY FULL (FPS)	DESIGN FLOW VELOCITY (FPS)	DESIGN FLOW VELOCITY HEAD (FT)	DESIGN FLOW DEPTH OF FLOW (FT)	DESIGN FLOW TOTAL ENERGY HEAD (FT)	MANHOLE INVERT DROP (FT)	FALL IN PIPE (FT)	DRAIN INV. ELEVATION UPPER END	DRAIN INV. ELEVATION LOWER END	GROUND SURFACE UPPER END	GROUND SURFACE LOWER END	COVER - TOP OF PIPE TO RIM UPPER END	COVER - TOP OF PIPE TO RIM LOWER END
DI-1	ID-1	31		0.12	10	0.20	0.49	7.6	0.45	0.005	12	0.012	2.68	3.41	2.54	0.10	0.28	0.38		0.15	210.68	210.53	213.25	213.50	1.74	2.14
ID-1	DMH-1	51		0.12	10	0.32	0.49	7.6	0.45	0.005	12	0.012	2.80	3.57	2.62	0.11	0.27	0.38		0.27	210.53	210.26	213.50	216.70	2.14	5.61
CB-1	DMH-1	12		0.07	10	0.08	0.90	7.6	0.48	0.005	12	0.012	2.72	3.47	2.61	0.11	0.28	0.39		0.06	211.82	211.76	216.42	216.70	3.77	4.11
CB-2	CB-3	23		0.10	10	0.14	0.69	7.6	0.52	0.005	12	0.012	2.78	3.54	2.72	0.11	0.29	0.41		0.12	221.53	221.41	224.74	225.06	2.38	2.82
CB-3	DMH-2	29		0.16	10	0.15	0.73	7.6	0.88	0.005	12	0.012	2.77	3.53	3.13	0.15	0.39	0.54		0.15	221.31	221.16	225.06	223.80	2.92	1.81
DMH-1	DMH-2	140		0.19	10	0.74	0.64	7.6	0.93	0.005	12	0.012	2.72	3.47	3.14	0.15	0.40	0.56		0.70	210.16	209.46	216.70	223.80	5.71	13.51
DMH-2	DMH-4	50		0.35	10	0.22	0.68	7.6	1.81	0.005	12	0.012	2.77	3.52	3.76	0.22	0.59	0.81		0.26	209.36	209.10	223.80	219.50	13.61	9.57
TD-1	DMH-3	28		0.28	10	0.04	0.85	7.6	1.81	0.088	12	0.012	11.46	14.60	10.66	1.76	0.27	2.03		2.46	212.10	209.64	214.60	214.35	1.67	3.88
CB-4	DMH-3	4		0.00	10	0.02	0.00	7.6	0.00	0.050	12	0.012	8.61	10.97	4.21	0.28	0.09	0.37		0.19	211.80	211.61	214.30	214.35	1.67	1.91
DMH-4	DMH-3	46		0.35	10	0.20	0.68	7.6	1.81	0.005	12	0.012	2.85	3.63	3.84	0.23	0.58	0.81		0.25	209.13	208.88	219.50	214.35	9.54	4.64
DMH-3	SC-1	69		0.63	10	0.26	0.76	7.6	3.62	0.005	18	0.012	7.88	4.46	4.37	0.30	0.71	1.01		0.33	208.78	208.45	214.35	215.20	4.24	5.42
TD-2	SC-1	46		0.23	10	0.08	0.78	7.6	1.36	0.080	12	0.012	10.90	13.88	9.47	1.39	0.24	1.63		3.68	213.40	209.72	215.90	215.20	1.67	4.65
SC-1	FE-1	40		0.86	10	0.14	0.76	7.6	4.98	0.005	18	0.012	8.07	4.57	4.80	0.36	0.85	1.21		0.20	208.20	208.00	215.20	208.00	5.67	-1.33

Project: West Acton Village Ecology By ECS Date 6/19/09

Location: Acton, MA Checked ______ Date ______

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

DI-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.05	0.90	0.045
lands/grass	0.07	0.20	0.014
woods	0.00	0.15	0.000
sum =	0.12	sum =	0.059

C = 0.49 = total product / total area

ID-1

Surface Cover	A (ac)	C	Product A x C
DI-1	0.12	0.49	0.059
sum =	0.12	sum =	0.059

C = 0.49 = total product / total area

CB-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.07	0.90	0.063
lands/grass	0.00	0.20	0.000
woods	0.00	0.15	0.000
sum =	0.07	sum =	0.063

C = 0.90 = total product / total area

Project:	West Acton Village Ecology	By ECS	Date 6/19/09
Location:	Acton, MA	Checked	Date

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious
C = 0.20 landscaped / grass
C = 0.15 woods

DMH-1

Surface Cover	A (ac)	C	Product A x C
ID-1	0.12	0.49	0.059
CB-1	0.07	0.90	0.063
sum =	0.19	sum =	0.122

C = $\boxed{0.64}$ = total product / total area

CB-2

Surface Cover	A (ac)	C	Product A x C
impervious	0.07	0.90	0.063
lands/grass	0.03	0.20	0.006
woods	0.00	0.15	0.000
sum =	0.10	sum =	0.069

C = $\boxed{0.69}$ = total product / total area

CB-3

Surface Cover	A (ac)	C	Product A x C
impervious	0.05	0.90	0.045
lands/grass	0.01	0.20	0.002
woods	0.00	0.15	0.000
CB-2	0.10	0.69	0.069
sum =	0.16	sum =	0.116

C = $\boxed{0.73}$ = total product / total area

Project:	West Acton Village Ecology	By	ECS	Date	6/19/09
Location:	Acton, MA	Checked		Date	

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

DMH-2

Surface Cover	A (ac)	C	Product A x C
CB-3	0.16	0.73	0.116
DMH-1	0.19	0.64	0.122
sum =	0.35	sum =	0.238

C = 0.68 = total product / total area

DMH-4

Surface Cover	A (ac)	C	Product A x C
DMH-2	0.35	0.68	0.238
sum =	0.35	sum =	0.238

C = 0.68 = total product / total area

TD-1

Surface Cover	A (ac)	C	Product A x C
impervious	0.26	0.90	0.234
lands/grass	0.02	0.20	0.004
woods	0.00	0.15	0.000
sum =	0.28	sum =	0.238

C = 0.85 = total product / total area

Project: West Acton Village Ecology By ECS Date 6/19/09

Location: Acton, MA Checked Date

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious

C = 0.20 landscaped / grass

C = 0.15 woods

CB-4

Surface Cover	A (ac)	C	Product A x C
impervious	0.00	0.90	0.000
lands/grass	0.00	0.20	0.000
woods	0.00	0.15	0.000
sum =	0.00	sum =	0.000

C = 0.00 = total product / total area

*CB-4: Under covered parking area, minimal flow

DMH-3

Surface Cover	A (ac)	C	Product A x C
CB-4	0.00	0.00	0.000
DMH-4	0.35	0.68	0.238
TD-1	0.28	0.85	0.238
sum =	0.63	sum =	0.476

C = 0.76 = total product / total area

TD-2

Surface Cover	A (ac)	C	Product A x C
impervious	0.19	0.90	0.171
lands/grass	0.04	0.20	0.008
woods	0.00	0.15	0.000
sum =	0.23	sum =	0.179

C = 0.78 = total product / total area

Project:	West Acton Village Ecology	By ECS	Date 6/19/09
Location:	Acton, MA	Checked	Date

Rational Method

Q = peak flow rate, (cfs)

i = rainfall intensity inches/hour

C = runoff coefficient,

A = area (ac)

C = 0.90 impervious
C = 0.20 landscaped / grass
C = 0.15 woods

SC-1

Surface Cover	A (ac)	C	Product A x C
DMH-3	0.63	0.76	0.476
TD-2	0.23	0.78	0.179
sum =	0.86	sum =	0.655

C = $\boxed{0.76}$ = total product / total area

Water Quality Volume Calculations

STAMSKI AND McNARY, INC.
80 Harris Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB 3320
SHEET NO. ______ OF ______
CALCULATED BY ECS DATE 6/19/09
CHECKED BY ______ DATE ______
SCALE ______

WATER QUALITY TREATMENT VOLUMES:

$$V_{WQ} = \frac{D_{WQ}}{12} \times A_{IMP}$$

INFILTRATION BASIN 1A: $V_{WQ} = 1/12 \times 1.09(43560)$
$V_{WQ} = 3957$ CF

DEAD STORAGE BELOW OUTLET = 4050 CF > 3957 CF OK✓

SUBCATCHMENT 1E: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$V_{WQ} = 1/12 \times 0.1(43560)$
$V_{WQ} = 363$ CF

AVAILABLE DEAD STORAGE = 740 CF > 363 CF OK✓

SUBCATCHMENT 4B: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$V_{WQ} = 1/12 \times 0.04(43560)$
$V_{WQ} = 145$ CF

AVAILABLE DEAD STORAGE = 324 CF > 145 CF OK✓

STORMCEPTOR: SEE ATTACHED STORMCEPTOR CALCULATIONS

Groundwater Recharge Calculations

STAMSKI AND McNARY, INC.
80 Harris Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB 3320
SHEET NO. ______ OF ______
CALCULATED BY ECS DATE 6/19/09
CHECKED BY ______ DATE ______
SCALE ______

REQUIRED RECHARGE VOLUME:

R_V = F x IMPERVIOUS AREA

INFILTRATION BASIN 1A: $R_V = \left(\frac{0.6}{12}\right) \times 1.09(43560)$
R_V = 2374 CF

DEAD STORAGE BELOW OUTLET = 4050 CF > 2374 CF OK✓

SUBCATCHMENT 1E: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$R_V = \left(\frac{0.6}{12}\right) \times 0.1(43560)$
R_V = 218 CF

AVAILABLE DEAD STORAGE = 740 CF > 218 CF OK✓

SUBCATCHMENT 4B: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$R_V = \left(\frac{0.6}{12}\right) \times 0.04(43560)$
R_V = 87 CF

AVAILABLE DEAD STORAGE = 324 CF > 87 CF OK✓

STAMSKI AND McNARY, INC.
80 Harris Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB 3320
SHEET NO. ______ OF ______
CALCULATED BY ECS DATE 6/19/09
CHECKED BY ______ DATE ______
SCALE ______

REQUIRED STORAGE VOLUME:

SIMPLE DYNAMIC METHOD: $A = \frac{Rv}{(D + KT)}$
$V = A \times D$

INFILTRATION BASIN 1A:

$A = \frac{2374}{(4 + \frac{8.27}{12} \times 2)}$

$A = 441$ SF

$V = 441 \times 4$

$V = 1764$ CF

DEAD STORAGE BELOW OUTLET = 4050 CF > 1764 CF OK✓

SUBCATCHMENT 1E: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$A = \frac{218}{(0.40 \times 1 + \frac{8.27}{12} \times 2)}$

$A = 123$ SF

$V = 123 \times (0.40 \times 1)$

$V = 49$ CF

AVAILABLE DEAD STORAGE = 740 CF > 49 CF OK✓

SUBCATCHMENT 4B: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$A = \frac{87}{(0.40 \times 1 + \frac{8.27}{12} \times 2)}$

$A = 49$ SF

$V = 49 \times (0.40 \times 1)$

$V = 20$ CF

AVAILABLE DEAD STORAGE = 324 CF > 20 CF OK✓

STAMSKI AND McNARY, INC.
80 Harris Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB 3320
SHEET NO. ______ OF ______
CALCULATED BY ECS DATE 6/19/09
CHECKED BY ______ DATE ______
SCALE ______

DRAWDOWN: $T = \frac{Rv}{(K)(\text{BOTTOM AREA})}$

INFILTRATION BASIN 1A:

$$T = \frac{2374}{\frac{8.27}{12} \times 1664}$$

$T = 2.1$ HR

2.1 HR < 72 HR OK✓

SUBCATCHMENT 1F: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$$T = \frac{218}{\frac{8.27}{12} \times 1850}$$

$T = 0.2$ HR

0.2 HR < 72 HR OK✓

SUBCATCHMENT 4B: POROUS PAVEMENT OUTSIDE OF BUFFER ZONE

$$T = \frac{87}{\frac{8.27}{12} \times 840}$$

$T = 0.2$ HR

0.2 HR < 72 HR OK✓

TSS Removal Calculations

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: SUBCATCHMENT 1A - PRETREATMENT

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
STORM CEPTOR STC-900	84%	1.00	0.84	0.16
SEDIMENT FOREBAY	25%	0.16	0.04	0.12

Total TSS Removal = 88%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: SM-3320
Prepared By: ECS
Date: 6/18/09

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: SUBCATCHMENT 1A

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
STORMCEPTOR STC-900	84%	1.00	0.84	0.16
INFILTRATION BASIN w/ SEDIMENT FOREBAY	80%	0.16	0.13	0.03

Total TSS Removal = 97%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: SM-3320
Prepared By: ECS
Date: 6/18/09

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

Location: SUBCATCHMENT 1B- PRETREATMENT

TSS Removal Calculation Worksheet

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SEDIMENT FOREBAY	25%	1.00	0.25	0.75
STORMCEPTOR STC-900	84%	0.75	0.63	0.12
SEDIMENT FOREBAY	25%	0.12	0.03	0.09

Total TSS Removal = 91%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: SM-3320
Prepared By: ECS
Date: 6/18/09

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

INSTRUCTIONS:
1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: SUBCATCHMENT 1B

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
SEDIMENT FOREBAY	25%	1.00	0.25	0.75
STORMCEPTOR STC-900	84%	0.75	0.63	0.12
INFILTRATION BASIN w/ SEDIMENT FOREBAY	80%	0.12	0.10	0.02

Total TSS Removal = 98%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: SM-3320
Prepared By: ECS
Date: 6/18/09

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: SUBCATCHMENT IE

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
POROUS PAVEMENT	80%	1.00	0.80	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: SM-3320
Prepared By: ECS
Date: 6/18/09

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

1. Sheet is nonautomated. Print sheet and complete using hand calculations. Column A and B: See MassDEP Structural BMP Table
2. The calculations must be completed using the Column Headings specified in Chart and Not the Excel Column Headings
3. To complete Chart Column D, multiple Column B value within Row x Column C value within Row
4. To complete Chart Column E value, subtract Column D value within Row from Column C within Row
5. Total TSS Removal = Sum All Values in Column D

TSS Removal Calculation Worksheet

Location: SUBCATCHMENT 4B

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
POROUS PAVEMENT	80%	1.00	0.80	0.20

Total TSS Removal = 80%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: SM-3320
Prepared By: ECS
Date: 6/18/09

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

Mass. Dept. of Environmental Protection

Stormceptor Calculations

Stormceptor®

Stormceptor Sizing Detailed Report

PCSWMM for Stormceptor

Project Information

Date	2/9/2009
Project Name	531-537 Mass. Ave
Project Number	3320
Location	Acton

Stormwater Quality Objective

This report outlines how Stormceptor System can achieve a defined water quality objective through the removal of total suspended solids (TSS). Attached to this report is the Stormceptor Sizing Summary.

Stormceptor System Recommendation

The Stormceptor System model STC 900 achieves the water quality objective removing 84% TSS for a Fine (organics, silts and sand) particle size distribution.

The Stormceptor System

The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for all rainfall events, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.

Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Stormceptor is the only oil and sediment separator on the market sized to remove TSS for a wide range of particle sizes, including fine sediments (clays and silts), that are often overlooked in the design of other stormwater treatment devices.

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Small storms dominate hydrologic activity, US EPA reports

"*Early efforts in stormwater management focused on flood events ranging from the 2-yr to the 100-yr storm. Increasingly stormwater professionals have come to realize that small storms (i.e. < 1 in. rainfall) dominate watershed hydrologic parameters typically associated with water quality management issues and BMP design. These small storms are responsible for most annual urban runoff and groundwater recharge. Likewise, with the exception of eroded sediment, they are responsible for most pollutant washoff from urban surfaces. Therefore, the small storms are of most concern for the stormwater management objectives of ground water recharge, water quality resource protection and thermal impacts control.*"

"*Most rainfall events are much smaller than design storms used for urban drainage models. In any given area, most frequently recurrent rainfall events are small (less than 1 in. of daily rainfall).*"

"*Continuous simulation offers possibilities for designing and managing BMPs on an individual site-by-site basis that are not provided by other widely used simpler analysis methods. Therefore its application and use should be encouraged.*"

– US EPA Stormwater Best Management Practice Design Guide, Volume 1 – General Considerations, 2004

Design Methodology

Each Stormceptor system is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology from up-to-date local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective.

The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing (summary of analysis presented in Appendix 2):

- Site parameters
- Continuous historical rainfall, including duration, distribution, peaks (Figure 1)
- Interevent periods
- Particle size distribution
- Particle settling velocities (Stokes Law, corrected for drag)
- TSS load (Figure 2)
- Detention time of the system

The Stormceptor System maintains continuous positive TSS removal for all influent flow rates. Figure 3 illustrates the continuous treatment by Stormceptor throughout the full range of storm events analyzed. It is clear that large events do not significantly impact the average annual TSS removal. There is no decline in cumulative TSS removal, indicating scour does not occur as the flow rate increases.

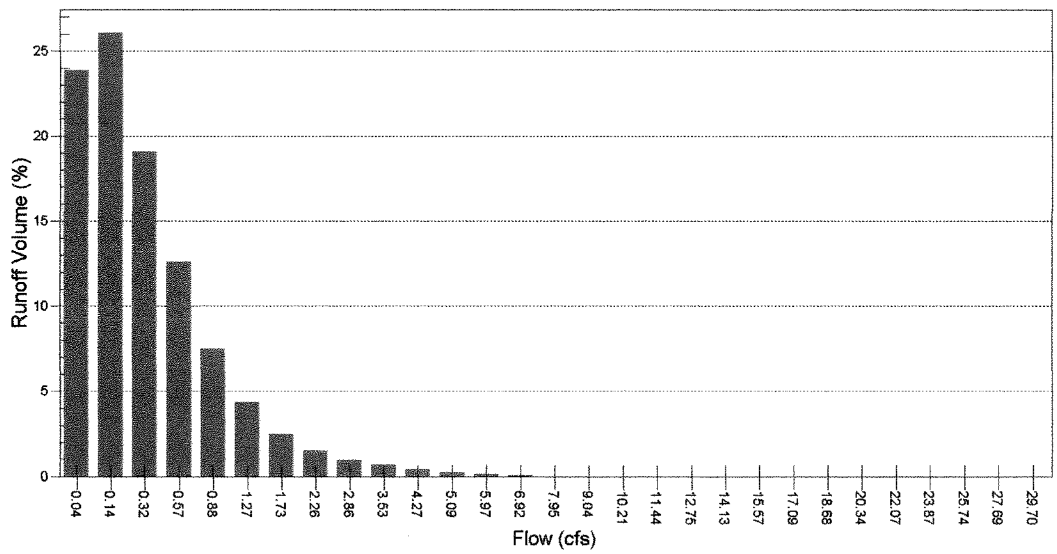


Figure 1. Runoff Volume by Flow Rate for STERLING 2 NNW – MA 8159, 1948 to 1972 for 1.34 ac, 81% impervious. Small frequent storm events represent the majority of annual rainfall volume. Large infrequent events have little impact on the average annual TSS removal, as they represent a small percentage of the total annual volume of runoff.

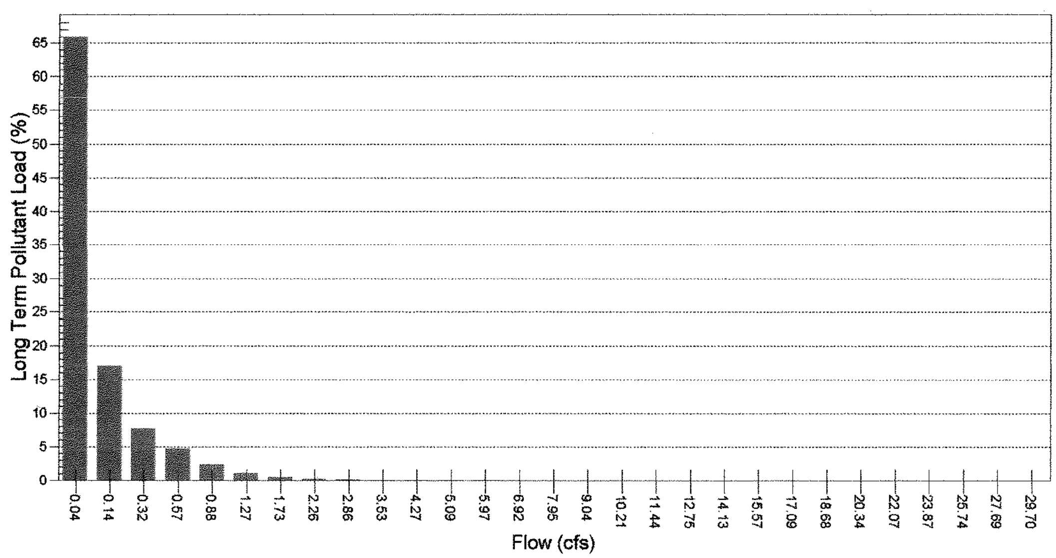
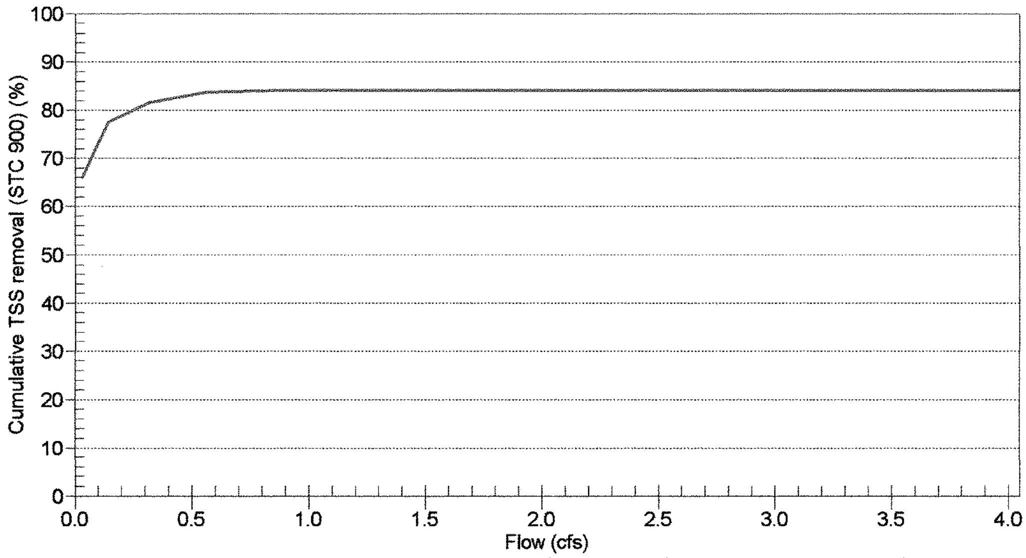


Figure 2. Long Term Pollutant Load by Flow Rate for STERLING 2 NNW – 8159, 1948 to 1972 for 1.34 ac, 81% impervious. The majority of the annual pollutant load is transported by small frequent storm

events. Conversely, large infrequent events carry an insignificant percentage of the total annual pollutant load.



Stormceptor Model	STC 900	Drainage Area (ac)	1.34
TSS Removal (%)	84	Impervious (%)	81

Figure 3. Cumulative TSS Removal by Flow Rate for STERLING 2 NNW – 8159, 1948 to 1972. Stormceptor continuously removes TSS throughout the full range of storm events analyzed. Note that large events do not significantly impact the average annual TSS removal. Therefore no decline in cumulative TSS removal indicates scour does not occur as the flow rate increases.

Stormceptor®

Appendix 1
Stormceptor Design Summary

Project Information

Date	2/9/2009
Project Name	531-537 Mass. Ave
Project Number	3320
Location	Acton

Designer Information

Company	Stamski & McNary, Inc.
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ac)	1.34
Imperviousness (%)	81

The Stormceptor System model STC 900 achieves the water quality objective removing 84% TSS for a Fine (organics, silts and sand) particle size distribution.

Rainfall

Name	STERLING 2 NNW
State	MA
ID	8159
Years of Records	1948 to 1972
Latitude	42°27'0"N
Longitude	71°48'0"W

Water Quality Objective

TSS Removal (%)	80

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	76
STC 900	84
STC 1200	84
STC 1800	84
STC 2400	88
STC 3600	88
STC 4800	91
STC 6000	91
STC 7200	93
STC 11000	95
STC 13000	95
STC 16000	96

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Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

Fine (organics, silts and sand)								
Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

Stormceptor®

Appendix 2
Summary of Design Assumptions

SITE DETAILS

Site Drainage Area

Total Area (ac)	1.34	Imperviousness (%)	81

Surface Characteristics

Width (ft)	483
Slope (%)	2
Impervious Depression Storage (in.)	0.02
Pervious Depression Storage (in.)	0.2
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Sediment build-up reduces the storage volume for sedimentation. Frequency of maintenance is assumed for TSS removal calculations.

Maintenance Frequency (months)	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (in/hr)	2.44
Min. Infiltration Rate (in/hr)	0.4
Decay Rate (s^{-1})	0.00055
Regeneration Rate (s^{-1})	0.01

Evaporation

Daily Evaporation Rate (inches/day)	0.1

Dry Weather Flow

Dry Weather Flow (cfs)	No

Upstream Attenuation

Stage-storage and stage-discharge relationship used to model attenuation upstream of the Stormceptor System is identified in the table below.

Storage ac-ft	Discharge cfs
0	0

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PARTICLE SIZE DISTRIBUTION

Particle Size Distribution

Removing fine particles from runoff ensures the majority of pollutants, such as heavy metals, hydrocarbons, free oils and nutrients are not discharged into natural water resources. The table below identifies the particle size distribution selected to define TSS removal for the design of the Stormceptor System.

Fine (organics, silts and sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
20	20	1.3	0.0013					
60	20	1.8	0.0051					
150	20	2.2	0.0354					
400	20	2.65	0.2123					
2000	20	2.65	0.9417					

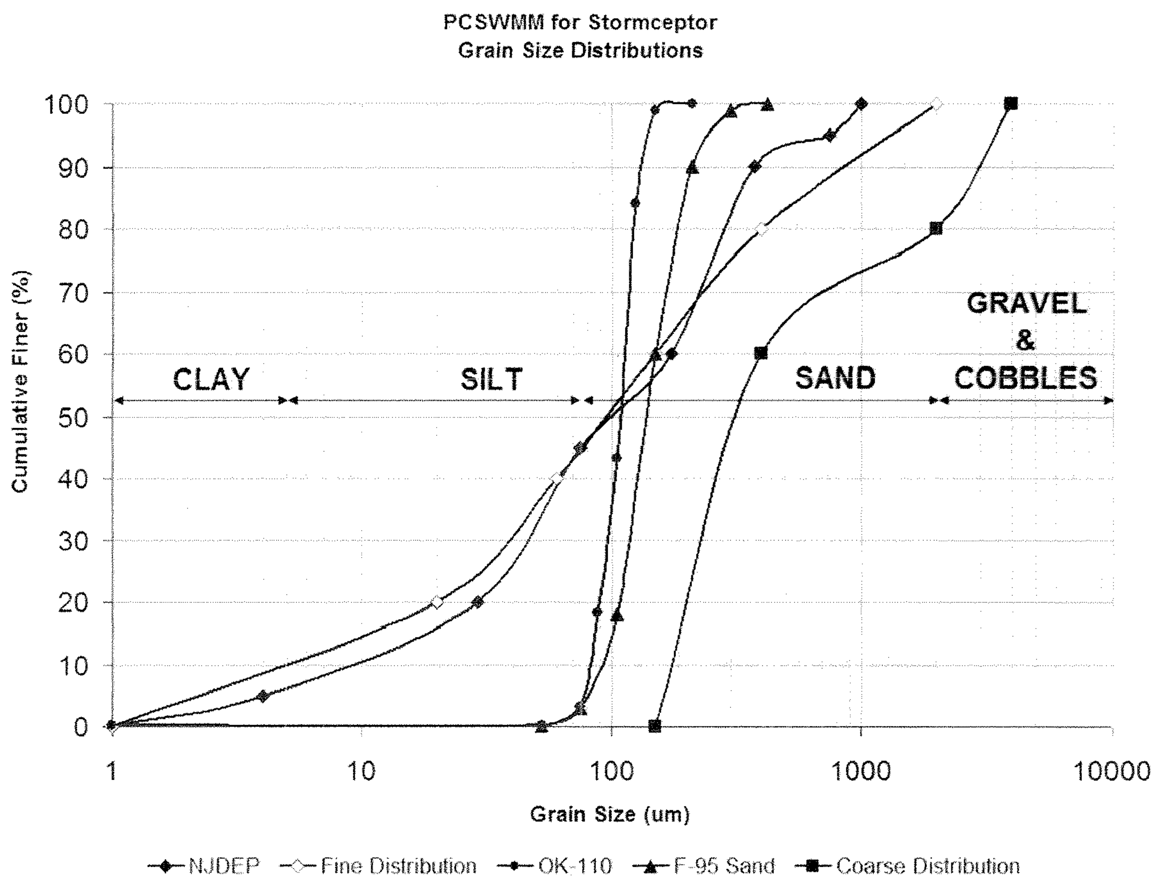

Figure 1. PCSWMM for Stormceptor standard design grain size distributions.

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TSS LOADING

TSS Loading Parameters

TSS Loading Function	Buildup / Washoff

Parameters

Target Event Mean Concentration (EMC) (mg/L)	125
Exponential Buildup Power	0.4
Exponential Washoff Exponential	0.2

HYDROLOGY ANALYSIS

PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of the Stormceptor System are based on the average annual removal of TSS for the selected site parameters. The Stormceptor System is engineered to capture fine particles (silts and sands) by focusing on average annual runoff volume ensuring positive removal efficiency is maintained during all rainfall events, while preventing the opportunity for negative removal efficiency (scour).

Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station

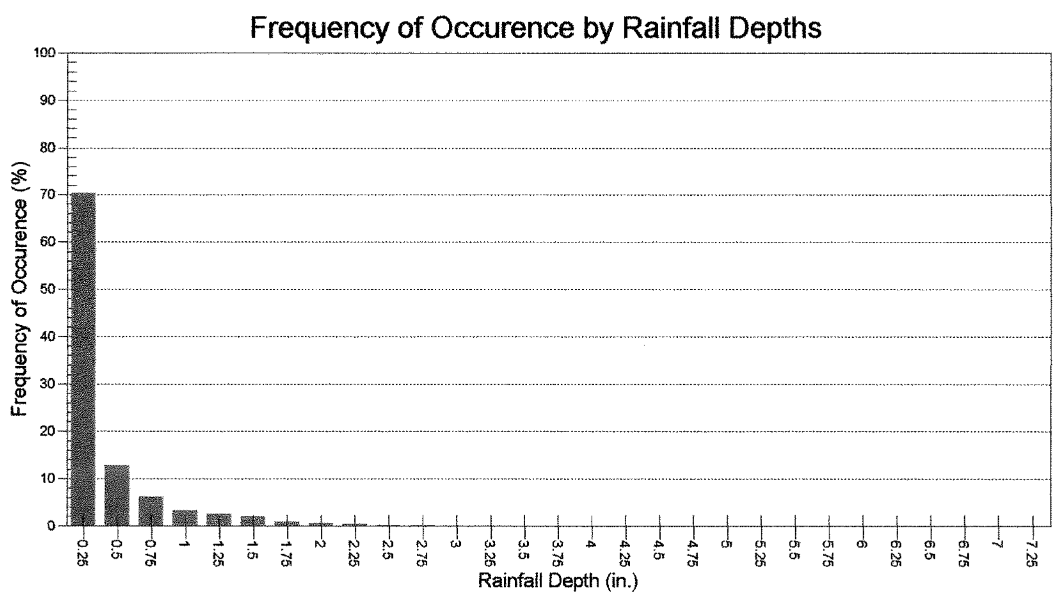
Rainfall Station	STERLING 2 NNW		
Rainfall File Name	MA8159.NDC	Total Number of Events	3228
Latitude	42°27'0"N	Total Rainfall (in.)	926.8
Longitude	71°48'0"W	Average Annual Rainfall (in.)	37.1
Elevation (ft)		Total Evaporation (in.)	72.9
Rainfall Period of Record (y)	25	Total Infiltration (in.)	173.1
Total Rainfall Period (y)	25	Percentage of Rainfall that is Runoff (%)	76.0

Rinker MATERIALS™

Stormceptor®

Rainfall Event Analysis

Rainfall Depth in.	No. of Events	Percentage of Total Events %	Total Volume in.	Percentage of Annual Volume %
0.25	2272	70.4	170	18.3
0.50	412	12.8	152	16.4
0.75	201	6.2	124	13.4
1.00	108	3.3	94	10.1
1.25	82	2.5	93	10.0
1.50	63	2.0	86	9.3
1.75	29	0.9	47	5.0
2.00	19	0.6	36	3.9
2.25	14	0.4	30	3.2
2.50	7	0.2	17	1.8
2.75	6	0.2	16	1.7
3.00	3	0.1	9	0.9
3.25	3	0.1	9	1.0
3.50	0	0.0	0	0.0
3.75	1	0.0	4	0.4
4.00	0	0.0	0	0.0
4.25	1	0.0	4	0.4
4.50	1	0.0	4	0.5
4.75	2	0.1	9	1.0
5.00	1	0.0	5	0.5
5.25	1	0.0	5	0.6
5.50	0	0.0	0	0.0
5.75	0	0.0	0	0.0
6.00	0	0.0	0	0.0
6.25	0	0.0	0	0.0
6.50	1	0.0	6	0.7
6.75	0	0.0	0	0.0
7.00	1	0.0	7	0.7
7.25	0	0.0	0	0.0
7.50	0	0.0	0	0.0
7.75	0	0.0	0	0.0
8.00	0	0.0	0	0.0
8.25	0	0.0	0	0.0
>8.25	0	0.0	0	0.0

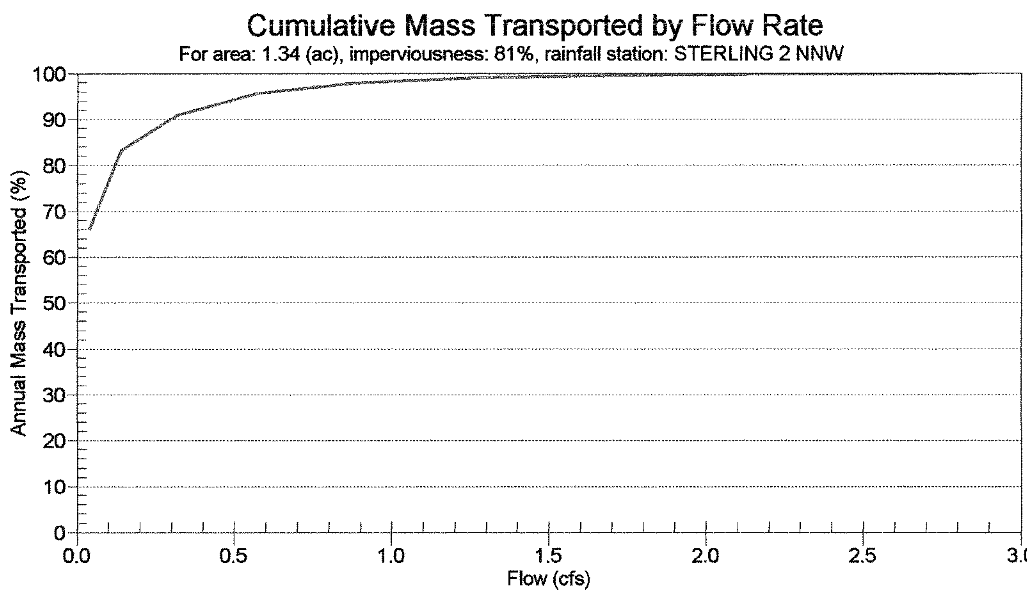


Rinker MATERIALS™

Stormceptor®

Pollutograph

Flow Rate cfs	Cumulative Mass %
0.035	66.1
0.141	83.1
0.318	90.9
0.565	95.6
0.883	97.9
1.271	99.0
1.73	99.5
2.26	99.8
2.86	99.9
3.531	100.0
4.273	100.0
5.085	100.0
5.968	100.0
6.922	100.0
7.946	100.0
9.041	100.0
10.206	100.0
11.442	100.0
12.749	100.0
14.126	100.0
15.574	100.0
17.092	100.0
18.681	100.0
20.341	100.0
22.072	100.0
23.873	100.0
25.744	100.0
27.687	100.0
29.7	100.0
31.783	100.0



Rinker MATERIALS™

Rip Rap Pad Sizing Calculations

SCOUR CALCULATIONS

Job: SM-3320 Calculated by: GD

Date: 06/18/09

Rip Rap Pad at outlet of Infiltration Basin 1A

Q= 1.49/n x Rh^2/3 x S^1/2 x A

Q=	1.15	cfs (10 year storm)
n =	0.04	Rip Rap
Rh=	A/(L+2H)	
S=	0.005	
A=	1.351	sf
L=	7	ft
H=	0.19	ft

V=Q/A= 0.85 ft/s

ALLOWABLE VELOCITY FOR SPARSE GRASS = 2.5 ft/s OK

The references that follow include several different computational methods and permissible velocity tables that are acceptable.

Channel Slope	Lining [1]	Permissible Velocity (feet/second)
0 - 5%	Tall fescue Kentucky bluegrass	5
	Grass-legume mixture	4
	Red fescue Redtop Sericea lespedeza Annual lespedeza Small grains	2.5
5 - 10%	Tall fescue Kentucky bluegrass	4
	Grass-legume mixture	3
Greater Than 10%	Tall fescue Kentucky bluegrass	3

Table 2.3.1: Example of Permissible Velocity Table, Modified from Soil and Water Conservation Engineering, 1992, Schwab et al, John Wiley and Sons

REFERENCES FOR STANDARD 1

Fletcher, B.P. and Grace, J.L., Jr., 1974, Practical Guidance for Design of Lined Channel Expansions at Culvert Outlets, Technical Report H-74-9, U.S. Army Engineer Experiment Station, Vicksburg, MS., page A12 (specifies methods for sizing riprap blanket dimensions from discharges from circular, square, rectangular and other shaped outlets)

Fangmeier, D.A., Elliot, W.J., Workman, S.R., Huffman, R.L., and Schwab, G.O., 2006, Soil and Water Conservation Engineering, 5th Edition, Thomson – Delmar Learning, Clifton Park, NY (permissible velocity table – page 119)

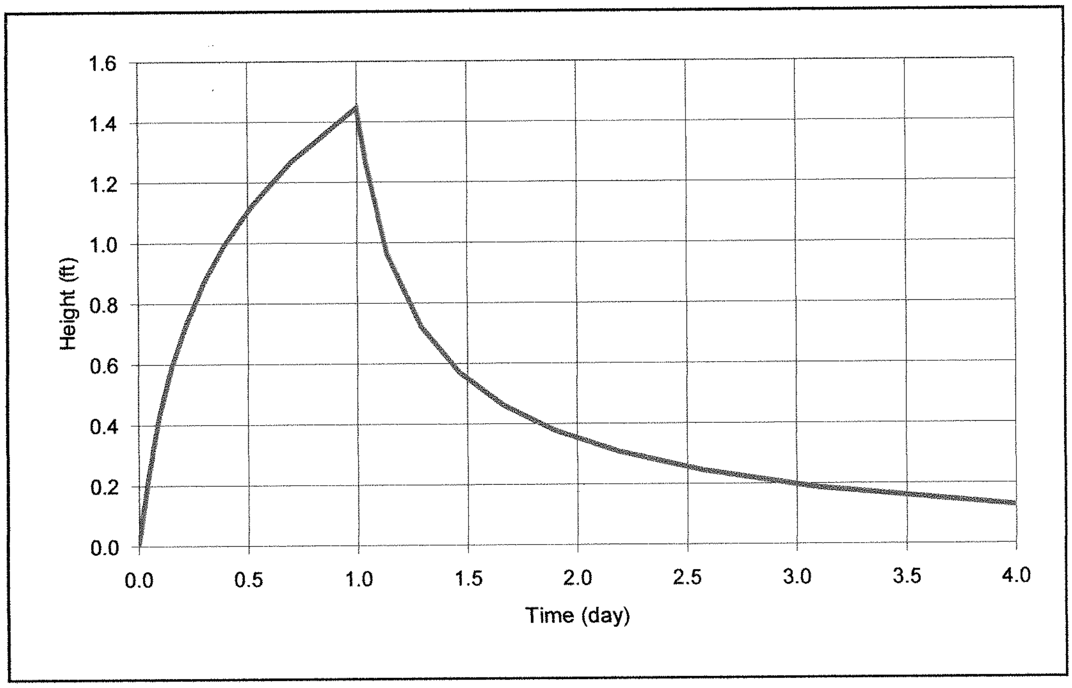
Gribbon, John E., 1997, Hydraulics and Hydrology for Stormwater Management, Chapter 5.5, Storm Sewer Outfalls, Delmar Publishers, Albany, NY (computation methods)

Lindeburg, Michael R., 2005, Civil Engineering Reference Manual for the PE Exam, 10th Edition (general reference, computational methods)

[1] Before selecting a vegetated lining, consult the list of plants banned for sale, trade, purchase, or distribution in Massachusetts by the Department of Agricultural Resources, pursuant to M.G.L. Chapter 128 Section 2 and Sections 16 through 31A. See http://www.mass.gov/agr/farmproducts/proposed_prohibited_plant_list_v12-12-05.htm

Mounding Analysis

Groundwater Mounding Analysis (Hantush's Method using Glover's Solution)



COMPANY: Stamski and McNary

PROJECT: WAVE-BASIN 1A

ANALYST: ECS

DATE: 6/23/2009 TIME: 2:47:21 PM

INPUT PARAMETERS

Application rate: 1.839 c.ft/day/sq. ft
Duration of application: 1 day
Total simulation time: 4 day
Fillable porosity: 0.35
Hydraulic conductivity: 28 ft/day
Initial saturated thickness: 25 ft
Length of application area: 61 ft
Width of application area: 42 ft
Constant head boundary used at: 115 ft
Groundwater mounding @
X coordinate: 0 ft
Y coordinate: 0 ft
Total volume applied: 4711.518 cft

MODEL RESULTS

Time (day)	Mound Height (ft)
0	0
0	0.07
0	0.23
0.1	0.43
0.2	0.59
0.2	0.74
0.3	0.87
0.4	1
0.5	1.13
0.7	1.27
1	1.45
1	1.26
1.1	0.96
1.3	0.72
1.5	0.57
1.7	0.46
1.9	0.38
2.2	0.31
2.6	0.24
3.1	0.19
4	0.13

Soil Testing

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: ______

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 1/21/09 (Date) 11:00 (Time) CLEAR (Weather)

1. Deep Observation Hole Logs

Deep Hole Number TP-09-3 Ground Elevation at Surface of Hole ______

Location (Identify on Plan) SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) — (Surface Stones) 2-5% (Slope (%))

EDGE OF TREES (Vegetation) ______ (Landform) TOP SLOPE (Position on landscape (attach sheet))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area >50 feet

Property Line >10 feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

Estimated Depth to High Groundwater: >11'6" (inches) ______ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

537 MASS AVE. (Site Address or Map/Lot Number)

Deep Observation Hole A: Deep Hole Number: TP-09-3

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-48"	FILL										
48"-54"	A	10YR 3/2	—	—	—	LOAMY SAND	—	—	MASSIVE	FRIABLE	
54"-60"	B	10YR 4/6	—	—	—	LOAMY SAND	—	—	MASSIVE	FRIABLE	
60"-11'6"	C	2.5Y 4/3	—	—	—	SAND	—	—	SG	LOOSE	

Additional Notes: CAVING IN

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number

C. On-Site Review
(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 1/21/09 (Date) 11:?0 (Time) CLEAR (Weather)

1. Deep Observation Hole Logs

Deep Hole Number TP-09-4 Ground Elevation at Surface of Hole ______

Location (Identify on Plan) SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) — (Surface Stones) 0-5% (Slope (%))

GRASS (Vegetation) ______ (Landform) ______ (Position on landscape (attach sheet))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area 750 feet

Property Line 716 feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

Estimated Depth to High Groundwater: >12' (inches) ______ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

537 MASS AVE
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-09-4

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume: Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-8"	A	10YR 3/2	—	—	—	LOAMY SAND	—	—	MASSIVE	FRIABLE	
8"-18"	B	10YR 4/6	—	—	—	LOAMY SAND	—	—	MASSIVE	FRIABLE	
18"-12'	C	2.5Y 4/3	—	—	—	FINE SAND	2%	—	SG	LOOSE	

Additional Notes ______

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: ______

C. On-Site Review (minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: Date 1/21/09 Time 12:00 Weather CLEAR

1. Deep Observation Hole Logs
   Deep Hole Number TP-09-5 Ground Elevation at Surface of Hole ______
   Location (Identify on Plan) SEE ATTACHED SHEET
2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones — Slope (%) 0-5%
   Vegetation GRASS Landform ______ Position on landscape (attach sheet) ______
3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area 250' feet
   Property Line 710 feet Drinking Water Well ______ feet Other ______
4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐
5. Groundwater Observed: Yes ☐ No ☒
   If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —
   Estimated Depth to High Groundwater: 710' inches ______ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: 537 MASS AVE.

Deep Observation Hole A: Deep Hole Number: TP-09-5

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-30"	Fill		—	—	—						
30"-66"	C1	2.5Y 5/4	—	—	—	COARSE SAND	—	—	SG	LOOSE	
66"-120"	C2	2.5Y 4/3	—	—	—	FINE SAND	—	—	SG	LOOSE	

Additional Notes: CAVING IN STRATIFIED SANDS

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

ROSENFELD
Owner Name

537 MASS AVE
Street Address or Lot #

ACTON	MA	01720
City/Town	State	Zip Code

Contact Person (if different from Owner)	Telephone Number

B. Test Results

Date / Time	1/21/09 11:30	1/21/09 11:45
Observation Hole #	PT-C	PT-D
Depth of Perc	75'	73'
Start Pre-Soak		
End Pre-Soak		
Time at 12"		
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate (Min./Inch)	<2 MPI	<2 MPI
Test Passed:	☒	☒
Test Failed:	☐	☐

STAMSKI AND MCNARY, INC. (BENJAMIN EWING)
Test Performed By:

ACTON BOARD OF HEALTH (JUSTIN SNAIR)
Witnessed By:

Comments:

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

ROSENFELD
Owner Name

637 MASS AVE
Street Address or Lot #

ACTON — MA — 01720
City/Town — State — Zip Code

Contact Person (if different from Owner) — Telephone Number

B. Test Results

	Date	Time	Date	Time
	1/21/09	12:15		
Observation Hole #	PT-E			
Depth of Perc	76'			
Start Pre-Soak				
End Pre-Soak				
Time at 12"				
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	<2 MPI			

Test Passed: ☒ Test Failed: ☐ — Test Passed: ☐ Test Failed: ☐

STAMSKI AND MCNARY, INC. (BENJAMIN EWING)
Test Performed By:

ACTON BOARD OF HEALTH (JUSTIN SNAIR)
Witnessed By:

Comments:

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

☒ Depth observed standing water in observation hole	A. ____ inches	B. ____ inches
☒ Depth weeping from side of observation hole	A. See attached inches	B. Soil Logs inches
☒ Depth to soil redoximorphic features (mottles)	A. ____ inches	B. ____ inches
☐ Groundwater adjustment (USGS methodology)	A. ____ inches	B. ____ inches

2. ____ Index Well Number ____ Reading Date ____ Index Well Level

____ Adjustment Factor ____ Adjusted Groundwater Level

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed? Upper boundary: See attached inches Lower boundary: Soil Logs inches

Commonwealth of Massachusetts
City/Town of Acton
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

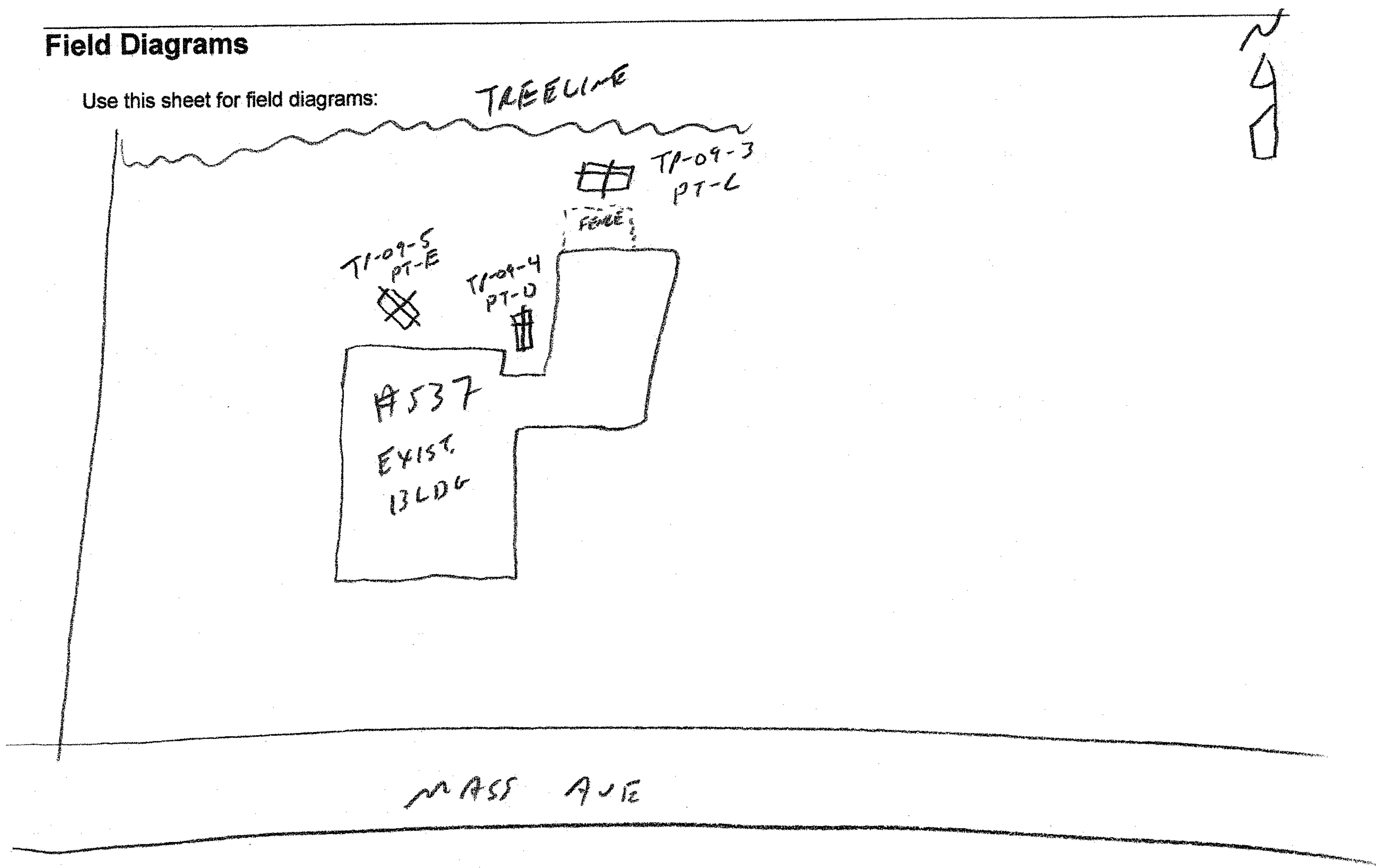
Signature of Soil Evaluator	1/21/09 Date
Benjamin Ewing SE2985 Typed or Printed Name of Soil Evaluator / License #	12/24/05 Date of Soil Evaluator Exam
Justin Snair Name of Board of Health Witness	Acton Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of Acton
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:



Commonwealth of Massachusetts
City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

Rosenfeld
Owner Name

525 Massachusetts Ave. — Street Address
F-2A / 104 — Map/Lot #

Acton — City
MA — State
01720 — Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Published Soil Survey Available? ☒ Yes ☐ No
   If yes: Nesoil.com (Year Published) 1:25,000 (Publication Scale) 253B (Soil Map Unit)
   Hinckley Loamy Sand (Soil Name)
   Filtering Capacity (Soil Limitations)

3. Surficial Geological Report Available? ☒ Yes ☐ No
   If yes: MassGIS (Year Published) ____ (Publication Scale) ____ (Map Unit)
   Sand and gravel (Geologic Material)
   ____ (Landform)

4. Flood Rate Insurance Map
   Above the 500-year flood boundary? ☒ Yes ☐ No
   Within the 100-year flood boundary? ☐ Yes ☒ No
   Within the 500-year flood boundary? ☐ Yes ☒ No
   Within a velocity zone? ☐ Yes ☒ No

5. Wetland Area:
   National Wetland Inventory Map — Scale 1:12,000 (Map Unit) DEPWetlands (Name)
   Wetlands Conservancy Program Map — ____ (Map Unit) ____ (Name)

USGS GROUNDWATER CONDITIONS DEC 2008 RANGE ABOVE NORMAL

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: ____

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: Date: 1/21/09 Time: 9:00 Weather: CLEAR

1. Deep Observation Hole Logs
   Deep Hole Number: TP-09-1 Ground Elevation at Surface of Hole ____
   Location (Identify on Plan): SEE ATTACHED SHEET
2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones: — Slope (%): 0-5%
   Vegetation: GRASS Landform: ____ Position on landscape (attach sheet): ____
3. Distances from: Open Water Body ____ feet Drainage Way ____ feet Possible Wet Area 750 feet
   Property Line 710 feet Drinking Water Well ____ feet Other ____
4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐
5. Groundwater Observed: Yes ☒ No ☐
   If Yes: Depth Weeping from Pit 96" Depth Standing Water in Hole 120"
   Estimated Depth to High Groundwater: 96" inches ____ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: 525 MASS AVE.

Deep Observation Hole A: Deep Hole Number: TP-09-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-60"	FILL										
60"-72"	C1	2.5Y	—	—	—	FINE SAND	2%	—	SG	LOOSE	
72"-11'	C2	2.5Y5/3	—	—	—	COARSE SAND	5%	5%	SG	LOOSE	

Additional Notes ____

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: ______

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: Date: 1/21/08 Time: 8:30 Weather: CLEAR

1. Deep Observation Hole Logs

   Deep Hole Number: TP-09-2 Ground Elevation at Surface of Hole: ______

   Location (Identify on Plan): SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones: — Slope (%): 2-10%

   Vegetation: SHRUBS Landform: ______ Position on landscape (attach sheet): ______

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area 150 feet

   Property Line 210 feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐

   If Yes: Depth Weeping from Pit 7 1/2' Depth Standing Water in Hole 10'

   Estimated Depth to High Groundwater: 96' inches ______ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number: 525 MASS AVE

Deep Observation Hole A: Deep Hole Number: TP-09-2

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-52"	FILL										
52"-58"	B	2.5Y 5/6	—	—	—	LOAMY SAND	2%	-	MASSIVE	FRIABLE	
58"-126"	C	2.5Y 5/3	96"	7.5YR 4/4 7.5YR 6/?	5%	SAND	5%	12%	SG	FRIABLE/LOOSE	

Additional Notes: LARGE STONES @ 8'

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

Owner Name:

Street Address or Lot #: 525 MASS AVE.

City/Town: ACTON

State: MA

Zip Code: 01720

Contact Person (if different from Owner):

Telephone Number:

B. Test Results

Date / Time	1/21/09 9:00	1/21/09 9:15
Observation Hole #	PT-A	PT-B
Depth of Perc	> 6'	> 6'
Start Pre-Soak		
End Pre-Soak		
Time at 12"		
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate (Min./Inch)	< 2 MPI	< 2 MPI
Test Passed:	☒	☒
Test Failed:	☐	☐

Test Performed By: STAMSKI AND McNARY INC. (BENJAMIN EWING)

Witnessed By: ACTON BOARD OF HEALTH (JUSTIN SNAIR)

Comments:

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

☒ Depth observed standing water in observation hole	A. ____ inches	B. ____ inches
☒ Depth weeping from side of observation hole	A. See attached inches	B. Soil Logs inches
☒ Depth to soil redoximorphic features (mottles)	A. ____ inches	B. ____ inches
☐ Groundwater adjustment (USGS methodology)	A. ____ inches	B. ____ inches

2. Index Well Number ____ Reading Date ____ Index Well Level ____

Adjustment Factor ____ Adjusted Groundwater Level ____

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

☒ Yes ☐ No

b. If yes, at what depth was it observed? Upper boundary: See attached inches Lower boundary: Soil Logs inches

Commonwealth of Massachusetts
City/Town of Acton
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Benjamin E	1/21/09
Signature of Soil Evaluator	Date
Benjamin Ewing SE2985	12/24/05
Typed or Printed Name of Soil Evaluator / License #	Date of Soil Evaluator Exam
Justin Snair	Acton
Name of Board of Health Witness	Board of Health

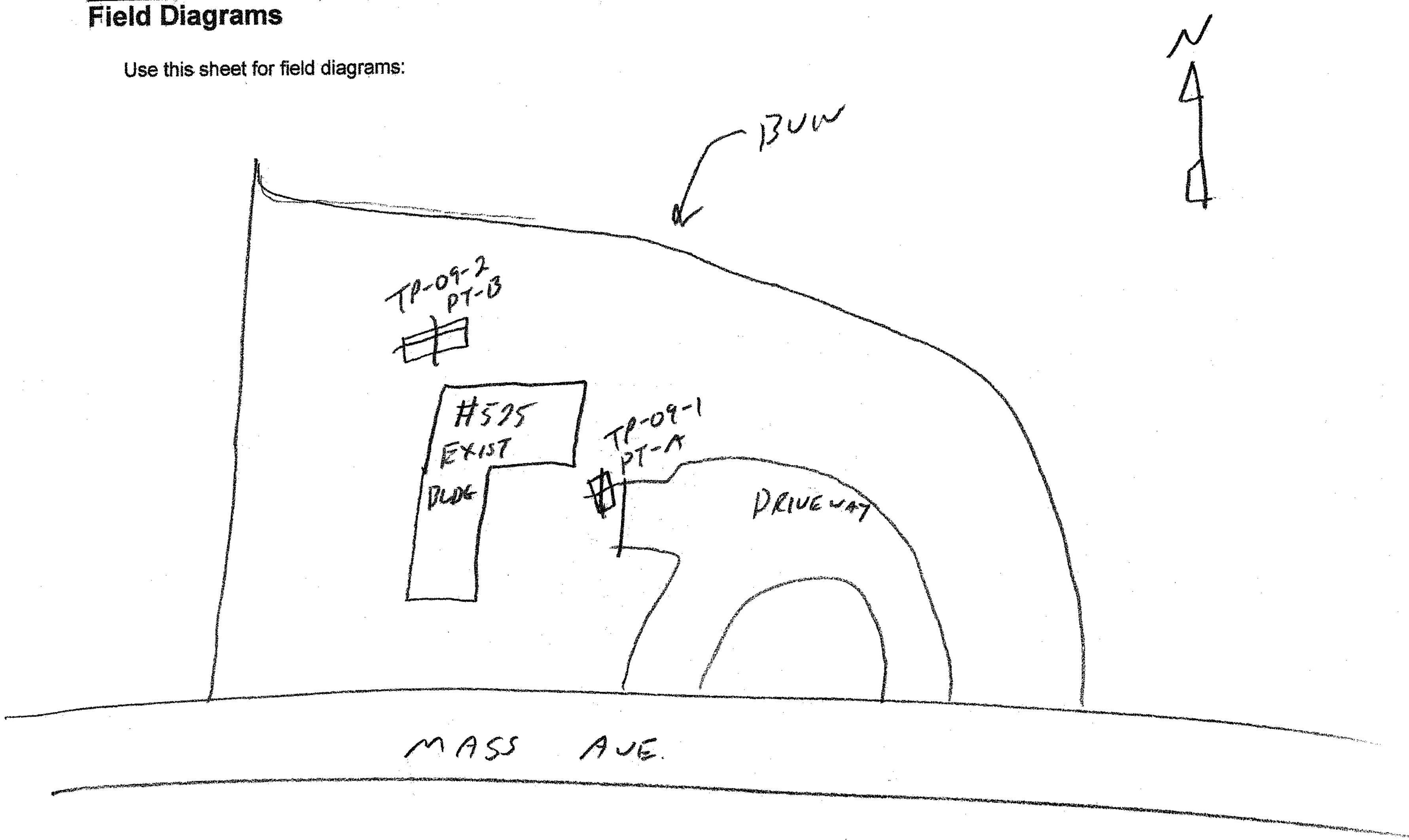
Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Field Diagrams

Use this sheet for field diagrams:



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

DEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

1. Facility Information

Owner Name: BEAUDOIN

Street Address: 525 MASSACHUSETTS AVE. Map/Lot: F-2A / 104

City/Town: ACTON State: MA Zip Code: 01720

B. Site Information

1. (Check one) New Construction ☒ Upgrade ☐ Repair ☐

2. Published Soil Survey available? Yes ☒ No ☐ If yes: NESOILS.COM (Year Published) 1:25 000 (Publication Scale) 253B (Soil Map Unit)

HINCKLEY LOAMY SAND (Soil Name) FILTERING CAPACITY (Soil limitations)

3. Surficial Geological Report available? Yes ☒ No ☐ If yes: MASS GIS (Year Published) ____ (Publication Scale) ____ (Map Unit)

SAND AND GRAVEL (Geologic Material) ____ (Landform)

4. Flood Rate Insurance Map:

Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒

Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map SCALE 1:12,000 (Map Unit) DEP WETLANDS (Name) WOODED SWAMP DECIDUOUS TO N&NE

Wetlands Conservancy Program Map ____ (Map Unit) ____ (Name)

6. CURRENT WATER RESOURCE CONDITIONS (USGS) FEB 07 RANGE NORMAL

Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 3/9/07 (Date) 10:30 (Time) SONNY (Weather)

1. Deep Observation Hole Logs
   Deep Hole Number TP-1 Ground Elevation at Surface of Hole ______
   Location (Identify on Plan) SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.)
   Surface Stones —
   Slope (%) 0-5%
   Vegetation GRASS
   Landform ______
   Position on landscape (attach sheet) BACKSLOPE

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area ______ feet
   Property Line ______ feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐
   If Yes: Depth Weeping from Pit 14' Depth Standing Water in Hole 14'
   Estimated Depth to High Groundwater: 14' inches ______ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

525 MASS AVE.
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-12'	FILL										
12'-16'	C1	2.5Y 4/2				SAND COARSE	20%	20%	SG	LOOSE	
16-17	C2	2.5Y 6/2	16'	10YR 5/6 2.5Y 6/2	100%	FINE SANDY LOAM	—	—	MASSIVE	FIRM IN PLACE	

Additional Notes ______

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 3/9/07 (Date) 11:30 (Time) SUNNY (Weather)

1. Deep Observation Hole Logs

Deep Hole Number TP-2 Ground Elevation at Surface of Hole ______

Location (Identify on Plan) SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) — (Surface Stones) 0-5% (Slope (%))

GRASS (Vegetation) ______ (Landform) BACKSLOPE (Position on landscape (attach sheet))

3. Distances from: Open Water Body ____ feet Drainage Way ____ feet Possible Wet Area ____ feet

Property Line ____ feet Drinking Water Well ____ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

Estimated Depth to High Groundwater: 13 (Inches) ______ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

525 MASS AVE
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-2

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-9'	FILL										
9-13'	C	2.5Y5/3	—	—	—	SAND	20%	20%	SG	LOOSE	

Additional Notes CAVE IN @ 13'

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 3/9/07 (Date) 12:30 (Time) SUNNY (Weather)

1. Deep Observation Hole Logs

Deep Hole Number TP-3 Ground Elevation at Surface of Hole ______

Location (Identify on Plan) SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) — (Surface Stones) 5-10% (Slope (%))

GRASS (Vegetation) ______ (Landform) ______ (Position on landscape (attach sheet))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area ______ feet

Property Line ______ feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒

If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐

If Yes: Depth Weeping from Pit 14' Depth Standing Water in Hole 14'6"

Estimated Depth to High Groundwater: 14' (inches) ______ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

525 MASS AVE. (Site Address or Map/Lot Number)

Deep Observation Hole A: Deep Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-14'	FILL										
14-15'	C	2.5Y 4/1	—	—	—	FINE SAND	10%	10%			

Additional Notes COULD NOT CONTINUE w/ BOULDERS AND CAVE IN

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 3/9/07 (Date) 1:30 (Time) SUNNY (Weather)

1. Deep Observation Hole Logs
   Deep Hole Number TP-4 Ground Elevation at Surface of Hole ______
   Location (identify on Plan) SEE ATTACHED SHEET

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones — Slope (%) 0-5%
   Vegetation GRASS Landform ______ Position on landscape (attach sheet) SHOULDER

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area ______ feet
   Property Line ______ feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☒ No ☐
   If Yes: Depth Weeping from Pit 14' Depth Standing Water in Hole 14'
   Estimated Depth to High Groundwater: 14' inches ______ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

525 MASS AVE.
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-4

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-11'	FILL										
11'-15'6"	C	2.5Y 4/1	—	—	—	FINE SAND	5%	5%	SG	LOOSE	

Additional Notes ______

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

BEAUDOIN
Owner Name

525 MASS AVE.
Street Address or Lot #

ACTON — MA — 01720
City/Town — State — Zip Code

Contact Person (if different from Owner) — Telephone Number

B. Test Results

	Date	Time	Date	Time
	3/9/07	2:00	3/9/07	2:00
Observation Hole #		PT-1		PT-2
Depth of Perc		7 12'		7 9'
Start Pre-Soak				
End Pre-Soak				
Time at 12"				
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)		<2 MPI		<2 MPI

Test Passed: ☒ Test Failed: ☐ — Test Passed: ☒ Test Failed: ☐

STAMSKI AND McNALY INC (BENJAMIN EWING)
Test Performed By:

ACTON BOARD OF HEALTH (BRENT REAGOR)
Witnessed By:

Comments:
ASSUMED <2 MPI DUE TO DEPTH TO PERC.
AND SAND MATERIAL

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

Owner Name: BEAUDOIN

Street Address or Lot #: 525 MASS AVE.

City/Town: ACTON

State: MA

Zip Code: 01720

Contact Person (if different from Owner):

Telephone Number:

B. Test Results

	Date: 3/9/07	Time: 2:00	Date:	Time:
Observation Hole #		PT-3		
Depth of Perc		7 14'		
Start Pre-Soak				
End Pre-Soak				
Time at 12"				
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)		< 2 MPI		

Test Passed: ☒
Test Failed: ☐

Test Passed: ☐
Test Failed: ☐

Test Performed By: STAMSKI AND McNARY INC. (BENJAMIN EWING)

Witnessed By: ACTON BOARD OF HEALTH

Comments:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:
   - ☐ Depth observed standing water in observation hole A. ______ inches B. ______ inches
   - ☒ Depth weeping from side of observation hole A. ______ inches B. ______ inches SEE ATTACHED SOIL LOGS
   - ☐ Depth to soil redoximorphic features (mottles) A. ______ inches B. ______ inches
   - ☐ Groundwater adjustment (USGS methodology) A. ______ inches B. ______ inches

2. Index Well Number ______ Reading Date ______ Index Well Level ______

   Adjustment Factor ______ Adjusted Groundwater Level ______

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

   a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

   b. If yes, at what depth was it observed? Upper boundary: SEE ATTACHED LOGS inches Lower boundary: ______ inches

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Benjamin Ewing
Signature of Soil Evaluator

3/9/07
Date

BENJAMIN EWING
Typed or Printed Name of Soil Evaluator

OCT. 24 2005
*Date of Soil Evaluator Exam

BRENT REAGOR
Name of Board of Health Witness

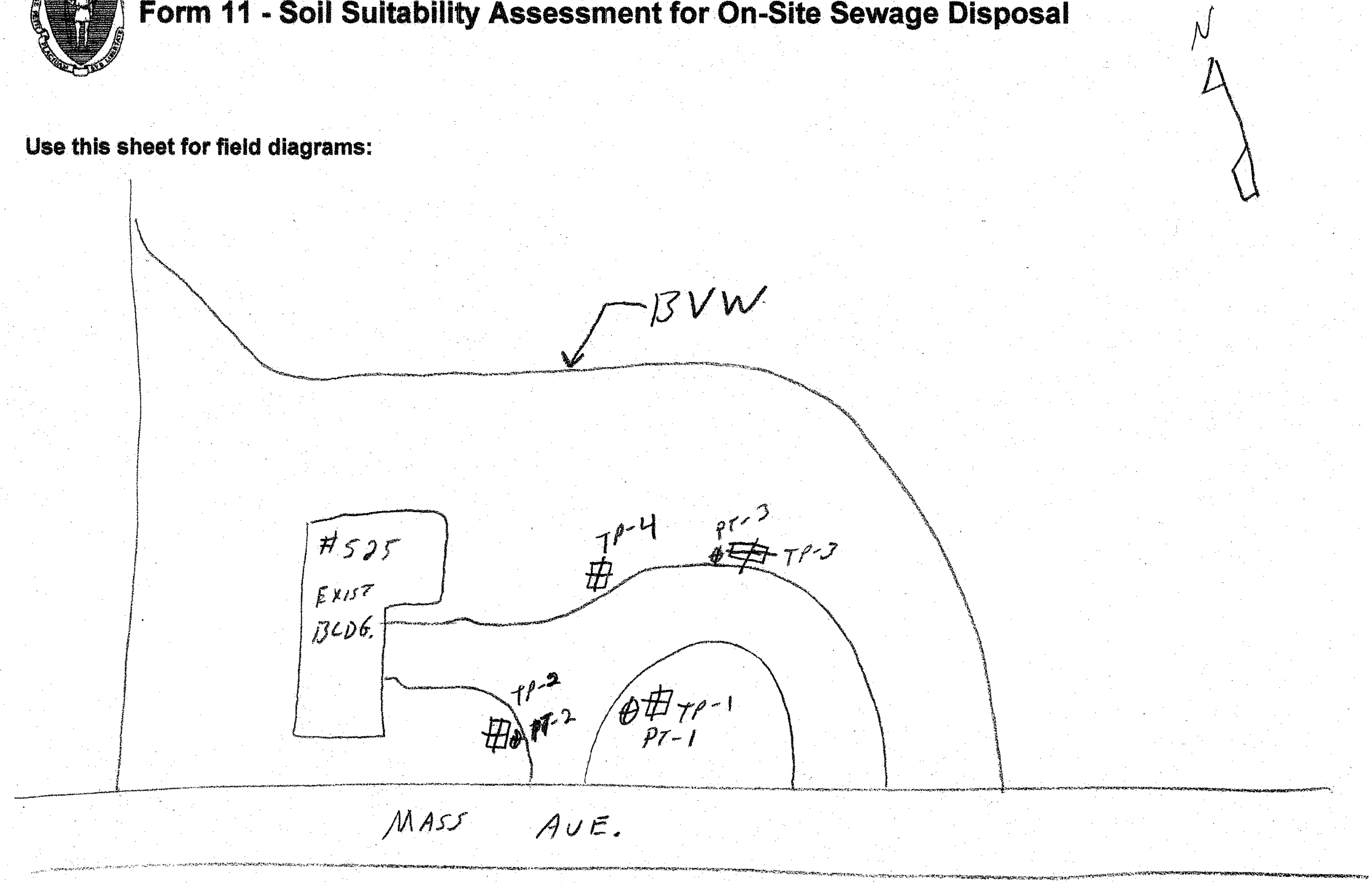
ACTON
Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Use this sheet for field diagrams:



Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

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A. Facility Information

1. Facility Information

Owner Name: ROSENFIELD

Street Address: 531-537 MASS AVE. Map/Lot: F-2A / 103

City/Town: ACTON State: MA Zip Code: 01720

B. Site Information

1. (Check one) New Construction ☒ Upgrade ☐ Repair ☐
2. Published Soil Survey available? Yes ☐ No ☐ If yes: NESOIL.COM (Year Published) 1:25,000 (Publication Scale) 253B (Soil Map Unit)

   HINCKLEY LOAMY SAND (Soil Name) FILTERING CAPACITY (Soil limitations)

3. Surficial Geological Report available? Yes ☒ No ☐ If yes: MASS GIS (Year Published) ____ (Publication Scale) ____ (Map Unit)

   SAND AND GRAVEL (Geologic Material) ____ (Landform)

4. Flood Rate Insurance Map:

   Above the 500 year flood boundary? Yes ☒ No ☐ Within the 100 year flood boundary? Yes ☐ No ☒

   Within the 500 year flood boundary? Yes ☐ No ☒ Within a Velocity Zone? Yes ☐ No ☒

5. Wetland Area: National Wetland Inventory Map SCALE 1:12,000 (Map Unit) DEP WETLANDS (Name)

   Wetlands Conservancy Program Map ____ (Map Unit) ____ (Name)

6. CURRENT WATER RESOURCE CONDITIONS MARCH 07 RANGE NORMAL

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 3/30/07 (Date) 8:15 (Time) SUNNY (Weather)

1. Deep Observation Hole Logs
   Deep Hole Number TP-5 Ground Elevation at Surface of Hole ______
   Location (Identify on Plan) ______
2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) — (Surface Stones) ______ (Slope (%))
   GRASS (Vegetation) ______ (Landform) SHOULDER (Position on landscape (attach sheet))
3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area ______ feet
   Property Line ______ feet Drinking Water Well ______ feet Other ______
4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐
5. Groundwater Observed: Yes ☐ No ☒
   If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —
   Estimated Depth to High Groundwater: 10' inches ______ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

531 MASS AVE. (Site Address or Map/Lot Number)

Deep Observation Hole A: Deep Hole Number: TP-5

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6"	A	10YR 3/2	–	–	–	SANDY LOAM	–	–	MASSIVE	FRIABLE	
6-13"	B	10YR 4/6	–	–	–	LOAMY SAND	5%	–	MASSIVE	FRIABLE	
13"-10'	C	2.5Y 4/2	–	–	–	LOAMY SAND	5%	5%	SG	FIRM IN PLACE	

Additional Notes: TIGHT, STONES @ 8'

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole A: 3/9/07 (Date) 9:00 (Time) SUNNY (Weather)

1. Deep Observation Hole Logs
   Deep Hole Number TP-6 Ground Elevation at Surface of Hole ________
   Location (Identify on Plan) ________

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) Surface Stones — Slope (%) ________
   GRASS (Vegetation) ________ (Landform) ________ Position on landscape (attach sheet)

3. Distances from: Open Water Body ____ feet Drainage Way ____ feet Possible Wet Area ____ feet
   Property Line ____ feet Drinking Water Well ____ feet Other ________

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒
   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒
   If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —
   Estimated Depth to High Groundwater: 10' (inches) ________ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

531 MASS AVE.
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-6

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-12"	A	10YR 3/2	–	–	–	LOAMY SAND	–	–	MASSIVE	FRIABLE	
12"-21"	B	10YR 4/6	–	–	–	SANDY LOAM	5%	–	MASSIVE	FRIABLE	
21"-10'	C	2.5Y 4/2	–	–	–	LOAMY SAND	10%	10%	MASSIVE	FIRM IN PLACE	

Additional Notes TIGHT STONES @ 7 1/2'

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review

(minimum of two holes required at every proposed disposal area)

Deep Observation Hole A: 3/9/07 (Date) ______ (Time) SUNNY (Weather)

1. Deep Observation Hole Logs

   Deep Hole Number TP-7 Ground Elevation at Surface of Hole ______

   Location (Identify on Plan) ______

2. Land Use: YARD (e.g. woodland, agricultural field, vacant lot, etc.) — (Surface Stones) ______ (Slope (%))

   GRASS (Vegetation) ______ (Landform) ______ (Position on landscape (attach sheet))

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area ______ feet

   Property Line ______ feet Drinking Water Well ______ feet Other ______

4. Parent Material: GLACIAL OUTWASH Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

   If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

   Estimated Depth to High Groundwater: 10' (inches) ______ (elevation)

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

537 MASS AVE.
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-7

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-10"	A	10YR 3/2	—	—	—	SANDY LOAM	—	—	MASSIVE	FRIABLE	
10"-19"	B	10YR 4/6	—	—	—	LOAMY SAND	—	—	MASSIVE	FRIABLE	
19"-10'	C	2.5Y 7/2	—	—	—	SAND	—	—	SG	LOOSE	

Additional Notes ______

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Site Address or Map/Lot Number ____________

C. On-Site Review *(minimum of two holes required at every proposed disposal area)*

Deep Observation Hole A: ____________ Date ____________ Time ____________ Weather

1. Deep Observation Hole Logs

   Deep Hole Number ________ Ground Elevation at Surface of Hole ________

   Location (identify on Plan) ____________

2. Land Use: ____________ (e.g. woodland, agricultural field, vacant lot, etc.) ____________ Surface Stones ____________ Slope (%)

   ____________ Vegetation ____________ Landform ____________ Position on landscape (attach sheet)

3. Distances from: Open Water Body ______ feet Drainage Way ______ feet Possible Wet Area ______ feet

   Property Line ______ feet Drinking Water Well ______ feet Other ______

4. Parent Material: ____________ Unsuitable Materials Present: Yes ☐ No ☒

   If Yes: Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock ☐

5. Groundwater Observed: Yes ☐ No ☒

   If Yes: Depth Weeping from Pit — Depth Standing Water in Hole —

   Estimated Depth to High Groundwater: 11'6" inches ______ elevation

Massachusetts Department of Environmental Protection
Bureau of Resource Protection – Wastewater Permitting Program

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

537 MASS AVE.
Site Address or Map/Lot Number

Deep Observation Hole A: Deep Hole Number: TP-8

Depth (In.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles) Depth	Color	Percent	Soil Texture (USDA)	Coarse Fragments % by Volume Gravel	Cobbles & Stones	Soil Structure	Soil Consistence (Moist)	Other
0-5'	FILL										
5'-68"	A	10YR 7/2	—	—	—	LOAMY SAND	—	—	MASSIVE		
68"-78"	B	10YR 4/6	—	—	—	LOAMY SAND	—	—	MASSIVE		
78"-11'6"	C	2.5Y	—	—	—	SAND	—	—	SG		

Additional Notes ____________

Commonwealth of Massachusetts
City/Town of
Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

Owner Name:

Street Address or Lot #: 531 MASS AVE.

City/Town: ACTON State: MA Zip Code: 01920

Contact Person (if different from Owner): Telephone Number:

B. Test Results

Date / Time	3/30/07 9:45	3/30/07 1100
Observation Hole #	PT-A	PT-B
Depth of Perc	54"	46"
Start Pre-Soak	9:55	11:04
End Pre-Soak	10:10	11:19
Time at 12"	10:10	11:19
Time at 9"	10:14	11:41
Time at 6"	10:20	12:12
Time (9"-6")	6 MIN	53 MIN.
Rate (Min./Inch)	2 MPI	18 MPI
	Test Passed: ☒ Test Failed: ☐	Test Passed: ☒ Test Failed: ☐

Test Performed By: STAMSKI AND McNARY, INC (BENJAMIN EWING)

Witnessed By: ACTON BOH (BRENT REAGOR)

Comments:

Commonwealth of Massachusetts
City/Town of

Percolation Test
Form 12

Percolation test results must be submitted with the Soil Suitability Assessment for On-site Sewage Disposal. DEP has provided this form for use by local Boards of Health. Other forms may be used, but the information must be substantially the same as that provided here. Before using this form, check with the local Board of Health to determine the form they use.

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

A. Site Information

Owner Name

Street Address or Lot #

City/Town | State | Zip Code

Contact Person (if different from Owner) | Telephone Number

B. Test Results

	Date	Time	Date	Time
	3/30/07	10:30		
Observation Hole #	P7-C			
Depth of Perc	45"			
Start Pre-Soak	10:30			
End Pre-Soak	UNABLE TO			
Time at 12"	SATURATE			
Time at 9"				
Time at 6"				
Time (9"-6")				
Rate (Min./Inch)	<2 MPI			

Test Passed: ☒ Test Failed: ☐ | Test Passed: ☐ Test Failed: ☐

Test Performed By:

Witnessed By:

Comments:

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method used:

- [x] Depth observed standing water in observation hole A. ______ inches B. ______ inches SEE ATTACHED SOIL LOGS
- [ ] Depth weeping from side of observation hole A. ______ inches B. ______ inches
- [ ] Depth to soil redoximorphic features (mottles) A. ______ inches B. ______ inches
- [ ] Groundwater adjustment (USGS methodology) A. ______ inches B. ______ inches

2. Index Well Number ______ Reading Date ______ Index Well Level ______

Adjustment Factor ______ Adjusted Groundwater Level ______

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? Yes ☒ No ☐

b. If yes, at what depth was it observed? Upper boundary: SEE ATTACHED SOIL LOGS inches Lower boundary: ______ inches

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Benjamin Ewing
Signature of Soil Evaluator

4/6/07
Date

BENJAMIN EWING
Typed or Printed Name of Soil Evaluator/License Number

10/24/05
*Date of Soil Evaluator Exam

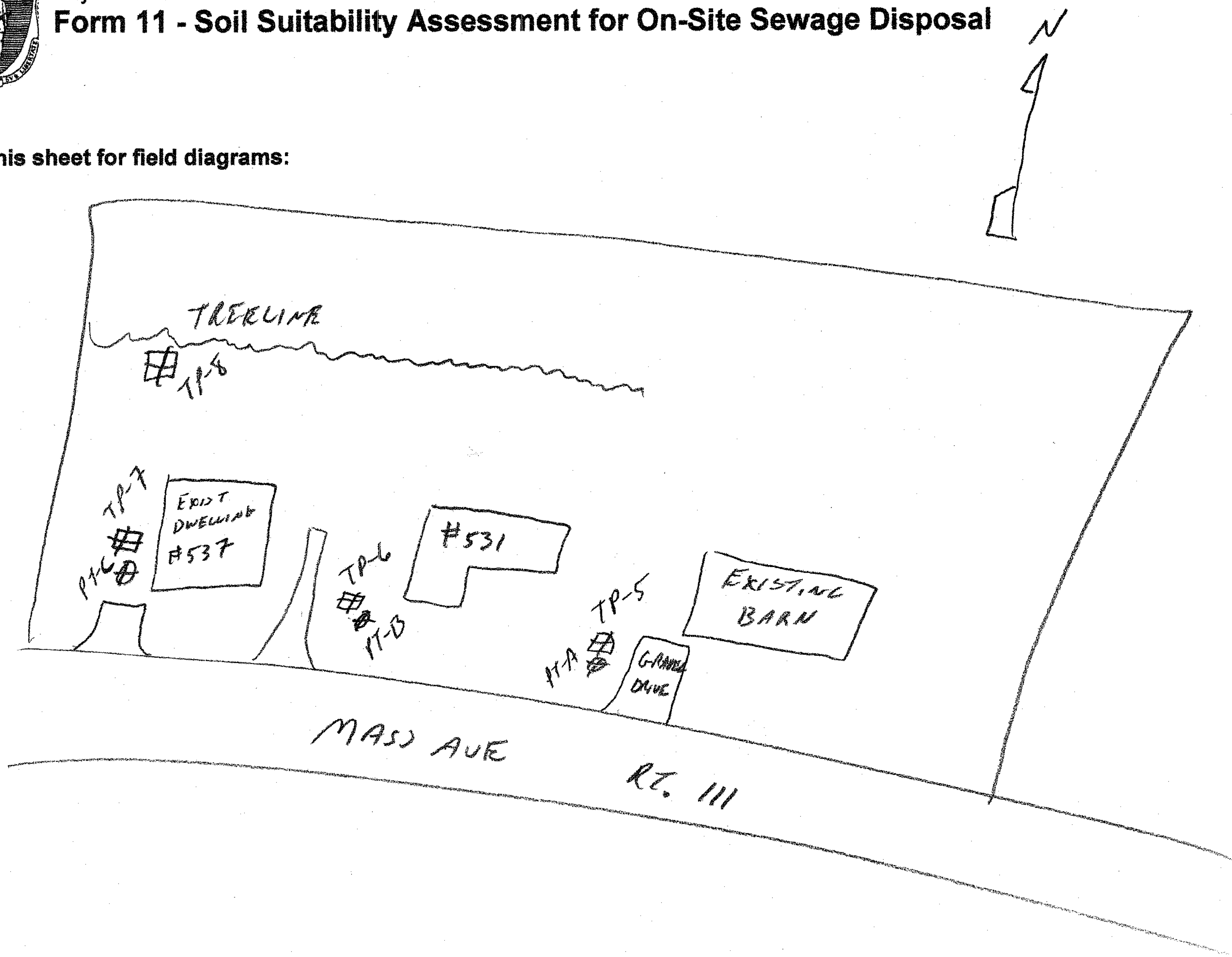
BRENT REAGOR
Name of Board of Health Witness

ACTON
Board of Health

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with Percolation Test Form 12.

Commonwealth of Massachusetts
City/Town of
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

Use this sheet for field diagrams:



Commonwealth of Massachusetts
City/Town of Acton

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

MassDEP has provided this form for use by on-site professionals and local Boards of Health. Other forms may be used, but the information must be substantially the same as provided here. Before using this form, check with your local Board of Health to determine the form they use.

A. Facility Information

Rosenfeld
Owner Name

537 Massachusetts Ave.
Street Address

F-2A / 103
Map/Lot #

Acton
City

MA
State

01720
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Published Soil Survey Available? ☒ Yes ☐ No If yes: Nesoil.com (Year Published) 1:25,000 (Publication Scale) 253B (Soil Map Unit)

   Hinckley Loamy Sand (Soil Name) Filtering Capacity (Soil Limitations)

3. Surficial Geological Report Available? ☒ Yes ☐ No If yes: MassGIS (Year Published) ____ (Publication Scale) ____ (Map Unit)

   Sand and gravel (Geologic Material) ____ (Landform)

4. Flood Rate Insurance Map

   Above the 500-year flood boundary? ☒ Yes ☐ No Within the 100-year flood boundary? ☐ Yes ☒ No

   Within the 500-year flood boundary? ☐ Yes ☒ No Within a velocity zone? ☐ Yes ☒ No

5. Wetland Area: National Wetland Inventory Map Scale 1:12,000 (Map Unit) DEPWetlands (Name)

   Wetlands Conservancy Program Map ____ (Map Unit) ____ (Name)

USGS GROUNDWATER CONDITIONS DEC 2009 RANGE ABOVE NORMAL

No. 3320

Date: 6/17/03

Commonwealth of Massachusetts
Acton, Massachusetts

Soil Suitability Assessment for On-site Sewage Disposal

Performed By: GEORGE DIMAKARAKOS / STAMSKI & MCNARY INC Date: 6/17/03
Witnessed By: BRENT REAGOR

Location Address or Lot #	531 MASS AVE	Owner's Name, Address, and Telephone #	MICHAEL ROSENFENFELD 543 MASS AVE ACTON, MA 01720
New Construction ☒ Repair ☒			

Office Review

Published Soil Survey Available: No ☐ Yes ☒

Year Published Publication Scale Soil Map Unit

Drainage Class Soil Limitations

Surficial Geologic Report Available: No ☒ Yes ☐

Year Published Publication Scale

Geologic Material (Map Unit)

Landform

Flood Insurance Rate Map:

Above 500 year flood boundary No ☐ Yes ☒

Within 500 year flood boundary No ☒ Yes ☐

Within 100 year flood boundary No ☒ Yes ☐

Wetland Area:

National Wetland Inventory Map (map unit)

Wetlands Conservancy Program Map (map unit)

Current Water Resource Conditions (USGS): Month JUNE, 2003

Range: Above Normal ☒ Normal ☐ Below Normal ☐

Other References Reviewed:

Location Address or Lot No. 531 MASS AVE

On-site Review

Deep Hole Number 603-1 Date: 6/17/03 Time: 8:30 Weather M.S. 60's

Location (identify on site plan)

Land Use WOODS Slope (%) 5-8 Surface Stones –

Vegetation WOODS

Landform

Position on landscape (sketch on the back) ON SLOPE

Distances from:

Open Water Body feet Drainage way feet

Possible Wet Area feet Property Line feet

Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0-8"	FILL				M.F.
8"-14"	A	S.L.	10YR3/3		M. Vy F.
14"-24"	B	L.S.	10YR5/6		LOOSE SINGLE GRAIN MED - COARSE
24"-120"	C	SAND	10YR5/4		

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) I.C.O.W. Depth to Bedrock: –

Depth to Groundwater: Standing Water in the Hole: – Weeping from Pit Face: –

Estimated Seasonal High Ground Water: >10'

Location Address or Lot No. 531 MASS AVE

On-site Review

Deep Hole Number 603-2 Date: 6/17/03 Time: 9:00 AM Weather MS 60's

Location (Identify on site plan) Slope (%) 3-5 Surface Stones —

Land Use WOODS

Vegetation WOODS

Landform

Position on landscape (sketch on the back)

Distances from:

Open Water Body feet Drainage way feet

Possible Wet Area feet Property Line feet

Drinking Water Well feet Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 - 6"	A	SL	10YR3/3		M. F.
6" - 18"	B	LS	10YR5/6		M. V.F.
18" - 84"	C1	SAND	10YR5/4		LOOSE SINGLE GRAIN MED-COARSE
84" - 120"	C2	SAND	2.5Y6/2	—	LOOSE SINGLE GRAIN FINE

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) I.C.O.W. Depth to Bedrock: —

Weeping from Pit Face: —

Depth to Groundwater: Standing Water in the Hole: > 10'

Estimated Seasonal High Ground Water:

Location Address or Lot No. 531 MAIN ST

COMMONWEALTH OF MASSACHUSETTS

, Massachusetts

Percolation Test*

Date:	Time:	
Observation Hole #	603-1	603-2
Depth of Perc	60"	66"
Start Pre-soak		
End Pre-soak		
Time at 12"		
Time at 9"		
Time at 6"		
Time (9"-6")		
Rate Min./Inch	<2	<2

* Minimum of 1 percolation test must be performed in both the primary area AND reserve area.

Site Passed ☒ Site Failed ☐

Performed By: ______

Witnessed By: ______

Comments: ......

Location Address or Lot No. 531 MASS AVE

Determination for Seasonal High Water Table

Method Used:

- [x] Depth observed standing in observation hole .... inches
- [ ] Depth weeping from side of observation hole .... inches
- [ ] Depth to soil mottles inches
- [ ] Ground water adjustment .... feet

Index Well Number .... Reading Date .... Index well level ....

Adjustment factor .... Adjusted ground water level ....

Depth of Naturally Occurring Pervious Material

Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system? YES

If not, what is the depth of naturally occurring pervious material? ______

Certification

I certify that on 7/26/95 (date) I have passed the soil evaluator examination approved by the Department of Environmental Protection and that the above analysis was performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017.

Signature [signature] Date 6/17/03

Location Address or Lot No. 531 MASS AVE

On-site Review

Deep Hole Number OH-1 Date: 6/17/03 Time: 9:30 Weather M.S. 60's
Location (Identify on site plan) Slope (%) 1-3 Surface Stones —
Land Use WOODS
Vegetation WOODS
Landform
Position on landscape (sketch on the back)
Distances from:
Open Water Body feet
Possible Wet Area feet
Drinking Water Well feet
Drainage way feet
Property Line feet
Other

DEEP OBSERVATION HOLE LOG*

Depth from Surface (Inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 - 6"	A	SL	10YR3/3		M.F.
6"-24"	B	LS	10YR5/6		M. VyF.
24"-72"+	C	SAND	10YR5/4	COMMON ~~HIGH~~ LOW CHROMA 42"	LOOSE SINGLE GRAIN MEDIUM

* MINIMUM OF 2 HOLES REQUIRED AT EVERY PROPOSED DISPOSAL AREA

Parent Material (geologic) I.C.O.W. Depth to Bedrock: —
Depth to Groundwater: Standing Water in the Hole: BOTTOM Weeping from Pit Face: 4'
Estimated Seasonal High Ground Water:

Drainage Maps

Pocket

Plan

3.7 Earth Removal Calculations

West Acton Village Ecology
Cut and Fill Calculations

Job: SM-3320
Done by: ECS
Checked by:
Date: 6/19/09
Plan Reference: *West Acton Village Ecology Site Plan* by Stamski and McNary, Inc.

Site Volume Table: Unadjusted

Cut Yards	Fill Yards	Net	Method
6,697	2,347	4,351 (C)	Grid
6,707	2,365	4,343 (C)	Composite
6,714	2,464	4,250 (C)	Prismoidal

Avg. fill = (4,351+4,343+4,250) / 3 = 4,315 c.y. cut

Cut Adjustment: Due to Construction Materials

Proposed Buildings: Volume of the proposed building was calculated by Auto-CAD and is reflected in the table above.

Pavement (Road): Average depth of pavement with associated gravel is 21.5".
Total paved area: 19,642 s.f.
19,642 s.f. x 21.5" x (1 ft./12") x (1 c.y./27 c.f.) = 1,302 c.y. of mat'l removed as cut.

Sidewalk: Average depth of concrete pavement with associated gravel is 11.5".
Total Sidewalk area: 4,106 s.f.
4,106 s.f. x 11.5" x (1 ft. / 12") x (1 c.y. / 27 c.f.) = 146 c.y. of mat'l removed as cut.

Porous Pavement: Average depth to bottom of reservoir course is 3.92 ft.
Total Porous Pavment area: 2,691 s.f.
2,691 s.f. x 3.92 ft x (1 c.y. / 27 c.f.) = 391 c.y. of mat'l removed as cut.

Final Adjustment:

4,315 c.y. + 1,302 c.y. + 146 c.y. + 391 = **6,154 c.y. total material removed***
*Parking and drainage behind #531 Mass. Ave currently under construction.

METHODOLOGY

Cut and Fill Calculations:

The cut and fill calculations were performed with the use of Autocad Release 2000i, Civil Design2i module. The existing contours were used as the base elevations, and the proposed contours for the site were overlaid. Three methods were used to calculate the cut and fill volumes: grid, composite, and prismoidal. The average value for these calculations was used. The average cut value was adjusted for the cut necessary for pavement and sidewalk installation.

3.8 Water Balance Calculations

Water Balance Calculations

SM-3320

Project: West Acton Village Ecology — By ECS — Date 6/19/09

Location: Acton, MA — Checked ______ — Date ______

Pre-development recharge

CN=	69.4										
From Figure 1, infiltration=	17.70	in./year									
Drainage Area=	196,891	s.f.	(includes offsite area for simplicicty)								
Recharge=	196,891	x	17.70	/12 in/ft =	290,415	c.f./year					

Existing Septic Flow

#525 Mass. Ave.	450	gpd									
#531 Mass. Ave.	550	gpd									
# 537 Mass. Ave.	550	gpd									
	1,550	gpd	x	365	days/year	x	0.134	cf/gal	=	75,635	cf/year
									PRE TOTAL =	366,050	cf/year

Post-development recharge

CN=	80.3										
From Figure 1, infiltration=	15.30	in./year									
Drainage Area=	196,891	s.f.									
Recharge=	196,891	x	15.30	/12 in/ft =	251,036	c.f./year					

Proposed Septic Flow

Total Design Flow	4,370	gpd									
	4,370	gpd	x	365	days/year	x	0.134	cf/gal	=	213,242	cf/year

Stormwater Recharge — from calculations = 67,725 cf/year

POST TOTAL = 532,003 cf/year

532,003 cf/year	**>**	**366,050 cf/year**	**OK**

Overall CN Calculations

SM-3320

Project: West Acton Village Ecology | By ECS | Date 6/19/09

Location: Acton, MA | Checked ______ | Date ______

Pre-development CN

subcatchment	Area (acres)	CN	Product
1	1.89	46.4	87.696
2	0.49	93.3	45.717
3	0.55	88.3	48.565
4	0.84	91.0	76.44
5	0.75	73.6	55.2
	4.52		313.62

Overall CN: 69.4

Post-development CN

subcatchment	Area (acres)	CN	PRODUCT
1A	0.99	89.9	89.001
1B	0.12	63.6	7.632
1C	0.77	42.6	32.802
1D	0.23	87.7	20.171
1E	0.11	92.6	10.186
2A	0.49	93.3	45.717
3A	0.57	88.7	50.559
4A	0.76	94.9	72.124
4B	0.08	68.5	5.48
5A	0.40	72.9	29.16
	4.52		362.832

Overall CN: 80.3

Project:	West Acton Village Ecology	By	ECS	Date	6/19/09
Location:	Acton, MA	Checked		Date	

INFILTRATION:

INFILTRATION BASIN 1:			
Subcatchement Area:	58,370	sf	
Subcatchement CN:	87.2		
Infiltration volume for 1 year storm (2.6 in):	7,042	cf	(from Hydrology)
Depth of runoff over drainage area:	1.45	in	
Rainfall to generate Runoff:	2.63	in	(TR55)
% of Annual rainfall Infiltrated:	99	%	(figure 2)
From Graph 1, Annual runoff :	12.5	in/year	
Annual Runoff x %infiltrated x Area =	60,194	cf/year	
Subcatchment 1E (POROUS PAVEMENT):			
Subcatchement Area:	4,792	sf	
Subcatchement CN:	92.6		
Infiltration volume for 1 year storm (2.6 in):	688	cf	(from Hydrology)
Depth of runoff over drainage area:	1.72	in	
Rainfall to generate Runoff:	2.46	in	(TR55)
% of Annual runoff Infiltrated:	95	%	(figure 2)
From Graph 1, Annual runoff :	17.5	in/year	
Annual Runoff x %infiltrated x Area =	6,638	cf/year	
Subcatchment 4B (POROUS PAVEMENT):			
Subcatchement Area:	3,485	sf	
Subcatchement CN:	68.5		
Infiltration volume for 1 year storm (2.6 in):	122	cf	(from Hydrology)
Depth of runoff over drainage area:	0.42	in	
Rainfall to generate Runoff:	2.52	in	(TR55)
% of Annual runoff Infiltrated:	96	%	(figure 2)
From Graph 1, Annual runoff :	3.2	in/year	
Annual Runoff x %infiltrated x Area =	892	cf/year	
Annual Infiltration of Stormwater:	67,725	cf/year	

STAMSKI AND McNARY, INC.
80 Harris Street
ACTON, MASSACHUSETTS 01720
TEL (978) 263-8585
FAX (978) 263-9883

JOB

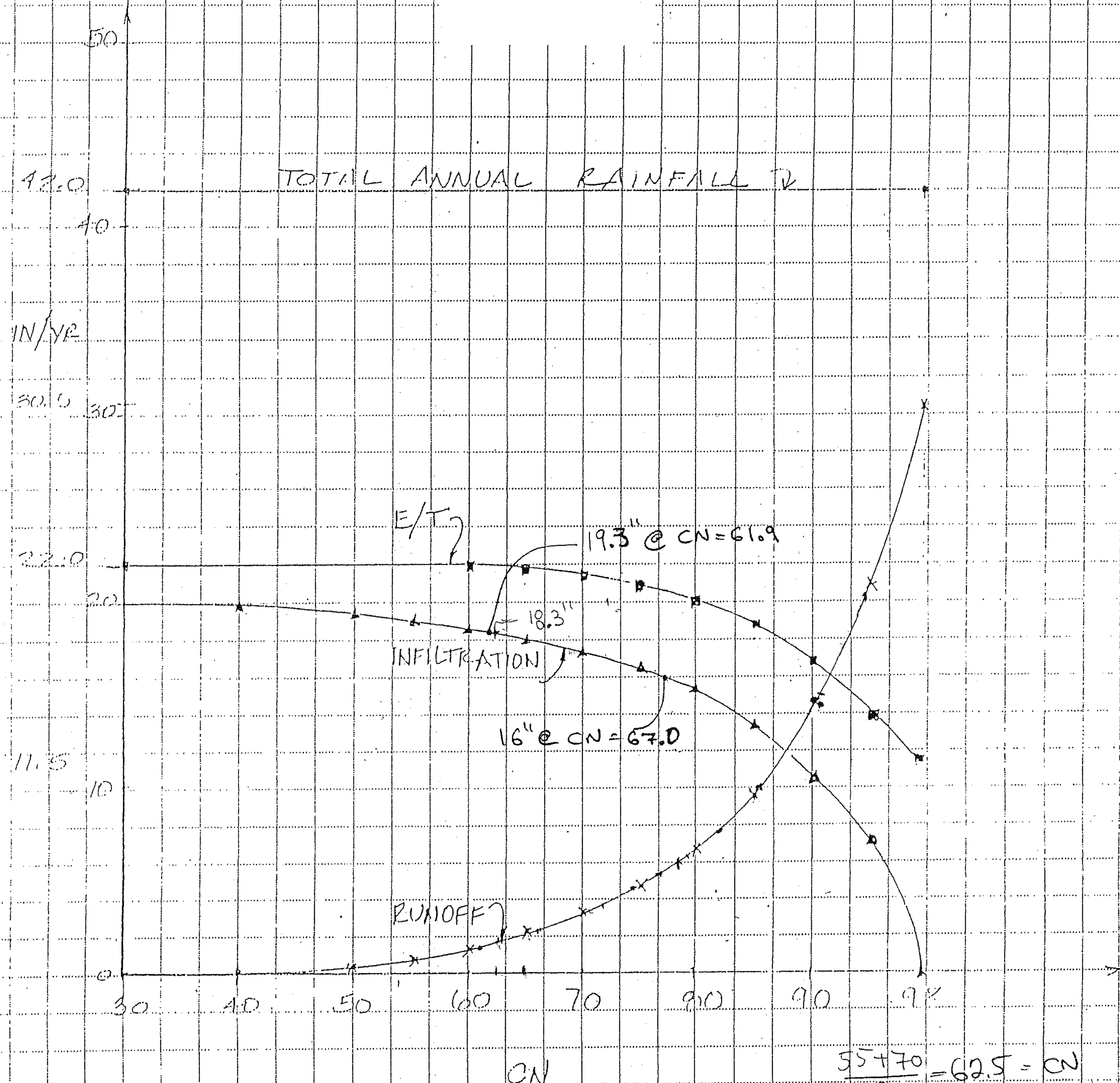
SHEET NO. OF

CALCULATED BY DATE

CHECKED BY DATE

SCALE

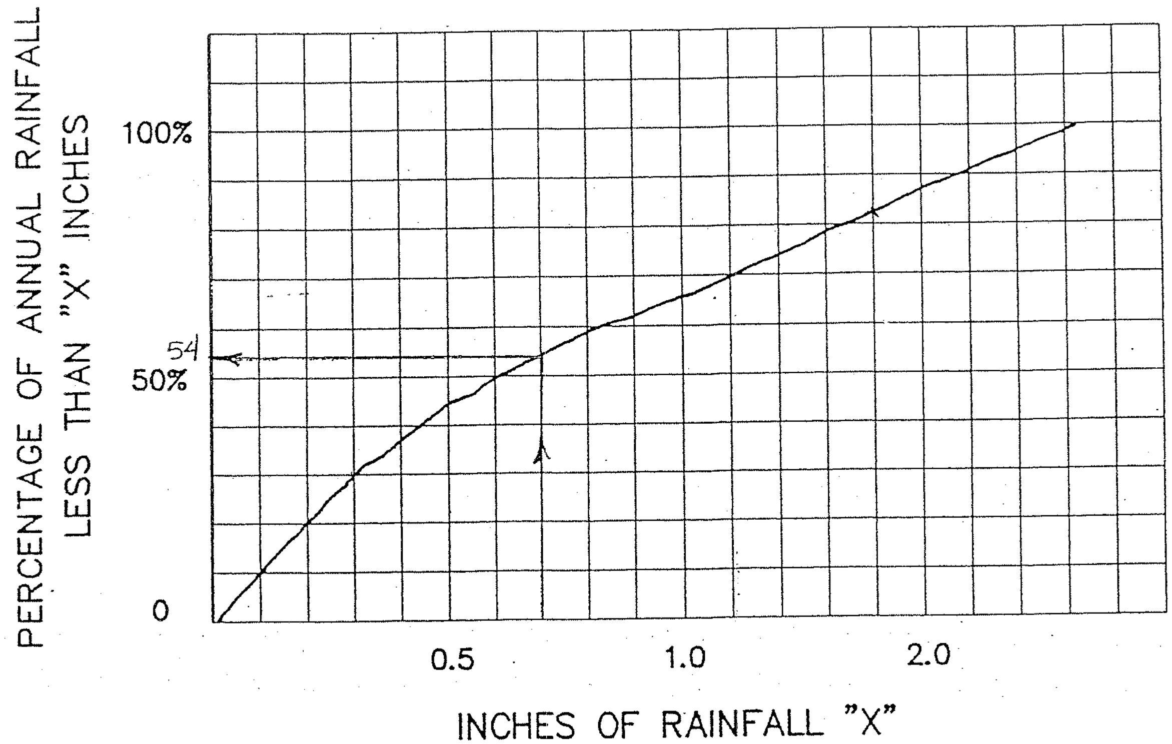
Figure 1



$\frac{55+70}{2} = 62.5 = CN$

NOTE: GRAPH COMPILED FROM DATA PUBLISHED BY NOAA (1954-1985)
(SEE REPORT FROM STAMSKI & MCNARY INC. SUBMITTED W/ TOWN OF ACTON ENG. DEPT.)

Figure 2



Compiled data published by the Nationlal Oceanic and Atmospheric Administration (N.O.A.A.) for 1984 through 1988)

Table 2-1 Runoff depth for selected CN's and rainfall amounts 1/

Rainfall	Runoff depth for curve number of—												
	40	45	50	55	60	65	70	75	80	85	90	95	98
	inches												
1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.08	0.17	0.32	0.56	0.79
1.2	.00	.00	.00	.00	.00	.00	.03	.07	.15	.27	.46	.74	.99
1.4	.00	.00	.00	.00	.00	.02	.06	.13	.24	.39	.61	.92	1.18
1.6	.00	.00	.00	.00	.01	.05	.11	.20	.34	.52	.76	1.11	1.38
1.8	.00	.00	.00	.00	.03	.09	.17	.29	.44	.65	.93	1.29	1.58
2.0	.00	.00	.00	.02	.06	.14	.24	.38	.56	.80	1.09	1.48	1.77
2.5	.00	.00	.02	.08	.17	.30	.46	.65	.89	1.18	1.53	1.96	2.27
3.0	.00	.02	.09	.19	.33	.51	.71	.96	1.25	1.59	1.98	2.45	2.77
3.5	.02	.08	.20	.35	.53	.75	1.01	1.30	1.64	2.02	2.45	2.94	3.27
4.0	.06	.18	.33	.53	.76	1.03	1.33	1.67	2.04	2.46	2.92	3.43	3.77
4.5	.14	.30	.50	.74	1.02	1.33	1.67	2.05	2.46	2.91	3.40	3.92	4.26
5.0	.24	.44	.69	.98	1.30	1.65	2.04	2.45	2.89	3.37	3.88	4.42	4.76
6.0	.50	.80	1.14	1.52	1.92	2.35	2.81	3.28	3.78	4.30	4.85	5.41	5.76
7.0	.84	1.24	1.68	2.12	2.60	3.10	3.62	4.15	4.69	5.25	5.82	6.41	6.76
8.0	1.25	1.74	2.25	2.78	3.33	3.89	4.46	5.04	5.63	6.21	6.81	7.40	7.76
9.0	1.71	2.29	2.88	3.49	4.10	4.72	5.33	5.95	6.57	7.18	7.79	8.40	8.76
10.0	2.23	2.89	3.56	4.23	4.90	5.56	6.22	6.88	7.52	8.16	8.78	9.40	9.76
11.0	2.78	3.52	4.26	5.00	5.72	6.43	7.13	7.81	8.48	9.13	9.77	10.39	10.76
12.0	3.38	4.19	5.00	5.79	6.56	7.32	8.05	8.76	9.45	10.11	10.76	11.39	11.76
13.0	4.00	4.89	5.76	6.61	7.42	8.21	8.98	9.71	10.42	11.10	11.76	12.39	12.76
14.0	4.65	5.62	6.55	7.44	8.30	9.12	9.91	10.67	11.39	12.08	12.75	13.39	13.76
15.0	5.33	6.36	7.35	8.29	9.19	10.04	10.85	11.63	12.37	13.07	13.74	14.39	14.76

1/ Interpolate the values shown to obtain runoff depths for CN's or rainfall amounts not shown.

Draft Stormwater Pollution Prevention Plan

Table of Contents

1.0 Narrative

Narrative

Section 1.1: Site Evaluation, Assessment, and Planning

The proposed project name is West Acton Village Ecology (WAVE). The site is located at #525-541 Massachusetts Ave. and 5-7 Spruce Street in Acton, Massachusetts. At the time of development of the Stormwater Pollution Prevention Plan (SWPPP), the Operator and SWPPP Contact is 531 Mass Ave LLC. Any Delegations of Authority shall be recorded in this SWPPP.

Pre and post development drainage maps have been included in Section 4. These maps indicate soil types, slopes, vegetation, and drainage patterns. Stormwater runoff from the site reaches either wetlands associated with Fort Pond Brook or directly to Fort Pond Brook via Acton's drainage system.

An up to date record of Potential Sources of Pollution on site shall be maintained in this SWPPP. No endangered or threatened species or critical habitats exist on or near the site.

Section 1.2: Erosion and Sediment Control BMPs

A Stormwater Pollution Prevention Plan Site Plan has been developed for WAVE and is attached in Section 3 of this SWPPP. The plan illustrates the placement of haybale siltation barriers at the limit of work and around installed catch basin and other inlets. The plan also contains notes describing other aspects of erosion and sediment control which include establishing a stabilized construction site exit and loaming and seeding exposed soils with erosion control mats where appropriate.

Section 1.3: Good Housekeeping BMPs

The operator shall be responsible for maintaining and updating the SWPPP Site Plan, Supplementary Information and Activity Logs as outlined in Section 3 of this SWPPP as well as Section 4 of the NPDES General Permit. The SWPPP shall be updated as necessary to reflect current site conditions and construction methods. Good housekeeping BMPs to be determined onsite include material handling and waste management, proper building material staging areas, designated washout areas, equipment and vehicle fueling and maintenance practices, allowable non-stormwater discharges, spill prevention, and any other potential pollutant controls.

Section 1.4: Selecting Post-Construction BMPs

A detailed description of the post-construction BMPs can be found in the attached Stormwater Management Standards Summary.

Section 1.5: Inspections

It shall be the responsibility of the operator to assign site inspections of erosion and pollutant controls as scheduled on the SWPPP Site Plan found in Section 3. If Delegation of Authority occurs, it shall be recorded on the attached forms and kept as part of this SWPPP document. A Corrective Action Log is provided in Section 3 to be maintained by the operator.

Section 1.6: Recordkeeping and Training

This SWPPP will be kept onsite and available at all time for inspection. A copy of the construction general permit (CGP) is attached in Section 5. A copy of the signed and certified NOI is attached in Section 2. Activity logs, including inspection reports, shall be maintained and filed in Section 3. Subcontractor Certifications/Agreements and Delegation of Authority Forms shall be maintained and kept in Section 8(C).

Section 1.7: Final Stabilization.

The Grading and Stabilization Activities Log shall be continually updated throughout construction. Areas of final stabilization shall be at the discretion of the operator and recorded in this activity log.

Section 1.8: Certification and Notification

A signed copy of the Notice of Intent is attached to this SWPPP under Section 2. A Delegation of Authority Form is included in Section 8(C).

2.0 Notice of Intent for Storm Water Discharges Associated with Construction Activity Under an NPDES General Permit

This Form Replaces Form 3510-9 (8-98)
Refer to the Following Pages for Instructions

Form Approved OMB Nos. 2040-0188 and 2040-0211

NPDES FORM

EPA

United States Environmental Protection Agency
Washington, DC 20460

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity Under an NPDES General Permit

Submission of this Notice of Intent (NOI) constitutes notice that the party identified in Section II of this form requests authorization to discharge pursuant to the NPDES Construction General Permit (CGP) permit number identified in Section I of this form. Submission of this NOI also constitutes notice that the party identified in Section II of this form meets the eligibility requirements of the CGP for the project identified in Section III of this form. Permit coverage is required prior to commencement of construction activity until you are eligible to terminate coverage as detailed in the CGP. To obtain authorization, you must submit a complete and accurate NOI form. Refer to the instructions at the end of this form.

I. Permit Number

MAR100000

II. Operator Information

Name: 531 Mass Ave LLC

IRS Employer Identification Number (EIN): ___ – _______

Mailing Address:

Street: 543 Massachusetts Ave.

City: Acton State: MA Zip Code: 01720 - ____

Phone: 978 - 264 - 0160 Fax (optional): 978 - 266 - 1650

E-mail:

III. Project/Site Information

Project/Site Name: West Acton Village Ecology

Project Street/Location: 525-541 Massachusetts Ave.

City: Acton State: MA Zip Code: 01720 - ____

County or similar government subdivision: Middlesex

Latitude/Longitude (Use one of three possible formats, and specify method)

Latitude 1. 42° 23′ 34″ N (degrees, minutes, seconds)
2. ___° ___. ___′ N (degrees, minutes, decimal)
3. ___. ___ ___° N (degrees decimal)

Longitude 1. 071° 28′ 16″ W (degrees, minutes, seconds)
2. ____° ___. ___′ W (degrees, minutes, decimal)
3. ____. ___ ___° W (degrees decimal)

Method: ☑ U.S.G.S. topographic map ☐ EPA web site ☐ GPS ☐ Other:

If you used a U.S.G.S. topographic map, what was the scale? 1:25000

Project located in Indian Country? ☐ YES ☑ NO

If yes, name of reservation, or if not part of a reservation, put "Not Applicable:" Not Applicable

Estimated Project Start Date: 08 / 01 / 2009 (Month Day Year)

Estimated Project Completion Date: 08 / 01 / 2012 (Month Day Year)

Estimated Area to be Disturbed (to the nearest quarter acre): 1.50

IV. SWPPP Information

Has the SWPPP been prepared in advance of filing this NOI? ☑ YES ☐ NO

Location of SWPP for Viewing: ☑ Address in Section II ☐ Address in Section III ☐ Other

If other:

SWPPP Street:

City: State: Zip Code: -

SWPPP Contact Information (if different than that in Section II):

Name:

Phone: - - Fax (optional): - -

E-mail:

V. Discharge Information

Identify the name(s) of waterbodies to which you discharge. Fort Pond Brook

Is this discharge consistent with the assumptions and requirements of applicable EPA approved or established TMDL(s)? ☑ YES ☐ NO

VI. Endangered Species Protection

Under which criterion of the permit have you satisfied your ESA eligibility obligations?

☑ A ☐ B ☐ C ☐ D ☐ E ☐ F

If you select criterion F, provide permit tracking number of operator under which you are certifying eligibility:

VII. Certification Information

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Print Name:

Title:

Signature: Date:

E-mail:

NOI Preparer (Complete if NOI was prepared by someone other than the certifier)

Prepared by: George Dimakarakos

Organization: Stamski and McNary, Inc.

Phone: 978-263-8585 Ext. 212 E-mail: gd@stamskiandmcnary.com

Instructions for Completing EPA Form 3510-9

Notice of Intent (NOI) for Storm Water Discharges Associated with Construction Activity Under an NPDES General Permit

NPDES Form Date This Form Replaces Form 3510-9 (8/98) Form Approved OMB Nos. 2040-0188 and 2040-0211

Who Must File an NOI Form
Under the provisions of the Clean Water Act, as amended (33 U.S.C. 1251 et. seq.; the Act), federal law prohibits storm water discharges from certain construction activities to waters of the U.S. unless that discharge is covered under a National Pollutant Discharge Elimination System (NPDES) Permit. Operator(s) of construction sites where one or more acres are disturbed, smaller sites that are part of a larger common plan of development or sale where there is a cumulative disturbance of at least one acre, or any other site specifically designated by the Director, must submit an NOI to obtain coverage under an NPDES general permit. Each person, firm, public organization, or any other entity that meets either of the following criteria must file this form: (1) they have operational control over construction plans and specifications, including the ability to make modifications to those plans and specifications; or (2) they have day-to-day operational control of those activities at the project necessary to ensure compliance with SWPPP requirements or other permit conditions. If you have questions about whether you need an NPDES storm water permit, or if you need information to determine whether EPA or your state agency is the permitting authority, refer to www.epa.gov/npdes/stormwater/cgp or telephone the Storm Water Notice Processing Center at (866) 352-7755.

Where to File NOI Form
See the applicable CGP for information on where to send your completed NOI form.

Completing the Form
Obtain and read a copy of the appropriate EPA Storm Water Construction General Permit for your area. To complete this form, type or print uppercase letters, in the appropriate areas only. Please place each character between the marks (abbreviate if necessary to stay within the number of characters allowed for each item). Use one space for breaks between words, but not for punctuation marks unless they are needed to clarify your response. If you have any questions on this form, refer to www.epa.gov/npdes/stormwater/cgp or telephone the Storm Water Notice Processing Center at (866) 352-7755. Please submit original document with signature in ink . do not send a photocopied signature.

Section I. Permit Number
Provide the number of the permit under which you are applying for coverage (see Appendix B of the general permit for the list of eligible permit numbers).

Section II. Operator Information
Provide the legal name of the person, firm, public organization, or any other entity that operates the project described in this application. An operator of a project is a legal entity that controls at least a portion of site operations and is not necessarily the site manager. Provide the employer identification number (EIN from the Internal Revenue Service; IRS), also commonly referred to as your taxpayer ID. If the applicant does not have an EIN enter "NA" in the space provided. Also provide the operator's mailing address, telephone number, fax number (optional) and e-mail address (to be notified via e-mail of NOI approval when available). Correspondence for the NOI will be sent to this address.

Section III. Project/Site Information
Enter the official or legal name and complete street address, including city, state, zip code, and county or similar government subdivision of the project or site. If the project or site lacks a street address, indicate the general location of the site (e.g., Intersection of State Highways 61 and 34). Complete site information must be provided for permit coverage to be granted.

The applicant must also provide the latitude and longitude of the facility either in degrees, minutes, seconds; degrees, minutes, decimal; or decimal format. The latitude and longitude of your facility can be determined in several different ways, including through the use of global positioning system (GPS) receivers, U.S. Geological Survey (U.S.G.S.) topographic or quadrangle maps, and EPA's web-based siting tools, among others. Refer to www.epa.gov/npdes/stormwater/cgp for further guidance on the use of these methodologies. For consistency, EPA requests that measurements be taken from the approximate center of the construction site. Applicants must specify which method they used to determine latitude and longitude. If a U.S.G.S. topographic map is used, applicants are required to specify the scale of the map used.

Indicate whether the project is in Indian country, and if so, provide the name of the Reservation. If the project is in Indian Country Lands that are not part of a Reservation, indicate "not applicable" in the space provided.

Enter the estimated construction start and completion dates using four digits for the year (i.e., 05/27/1998). Enter the estimated area to be disturbed including but not limited to: grubbing, excavation, grading, and utilities and infrastructure installation. Indicate to the nearest quarter acre. Note: 1 acre = 43,560 sq. ft.

Section IV. SWPPP Information
Indicate whether or not the SWPPP was prepared in advance of filing the NOI form. Check the appropriate box for the location where the SWPPP may be viewed. Provide the name, fax number (optional), and e-mail address of the contact person if different than that listed in Section II of the NOI form.

Section V. Discharge Information
Enter the name(s) of receiving waterbodies to which the project's storm water will discharge. These should be the first bodies of water that the discharge will reach. (Note: If you discharge to more than one waterbody, please indicate all such waters in the space provided and attach a separate sheet if necessary.) For example, if the discharge leaves your

site and travels through a roadside swale or a storm sewer and then enters a stream that flows to a river, the stream would be the receiving waterbody. Waters of the U.S. include lakes, streams, creeks, rivers, wetlands, impoundments, estuaries, bays, oceans, and other surface bodies of water within the confines of the U.S. and U.S. coastal waters. Waters of the U.S. do not include man-made structures created solely for the purpose of wastewater treatment. U.S. Geological Survey topographical maps may be used to make this determination. If the map does not provide a name, use a format such as "unnamed tributary to Cross Creek". If you discharge into a municipal separate storm sewer system (MS4), you must identify the waterbody into which that portion of the storm sewer discharges. That information should be readily available from the operator of the MS4.

Indicate whether your storm water discharges from construction activities will be consistent with the assumptions and requirements of applicable EPA approved or established TMDL(s). To answer this question, refer to www.epa.gov/npdes/stormwater/cgp for state- and regional-specific TMDL information related to the construction general permit. You may also have to contact your EPA regional office or state agency. If there are no applicable TMDLs or no related requirements, please check the "yes" box in the NOI form.

Section VI. Endangered Species Information
Indicate for which criterion (i.e., A, B, C, D, E, or F) of the permit the applicant is eligible with regard to protection of federally listed endangered and threatened species, and designated critical habitat. See Part 1.3.C.6 and Appendix C of the permit. If you select criterion F, provide the permit tracking number of the operator under which you are certifying eligibility. The permit tracking number is the number assigned to the operator by the Storm Water Notice Processing Center after EPA acceptance of a complete NOI.

Section VII. Certification Information
All applications, including NOIs, must be signed as follows: *For a corporation:* By a responsible corporate officer. For the purpose of this Section, a responsible corporate officer means:

(i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation, or (ii) the manager of one or more manufacturing, production, or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

For a partnership or sole proprietorship: By a general partner or the proprietor, respectively; or

For a municipality, state, federal, or other public agency: By either a principal executive officer or ranking elected official. For purposes of this Part, a principal executive officer of a federal agency includes (i) the chief executive officer of the agency, or (ii) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrator of EPA).

Include the name, title, and email address of the person signing the form and the date of signing. An unsigned or undated NOI form will not be considered eligible for permit coverage. If the NOI was prepared by someone other than the certifier (for example, if the NOI was prepared by the facility SWPPP contact or a consultant for the certifier's signature), include the name, organization, phone number and email address of the NOI preparer.

Paperwork Reduction Act Notice
Public reporting burden for this application is estimated to average 3.7 hours. This estimate includes time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB control number. Send comments regarding the burden estimate, any other aspect of the collection of information, or suggestions for improving this form, including any suggestions which may increase or reduce this burden to: Chief, Information Policy Branch 2136, U.S. Environmental Protection, Agency, 1200 Pennsylvania Avenue, NW, Washington, D.C. 20460. Include the OMB control number on any correspondence. Do not send the completed form to this address.

Visit this website for mailing instructions:
www.epa.gov/npdes/stormwater/mail

Visit this website for instructions on how to submit electronically:
www.epa.gov/npdes/stormwater/enoi

3.0 Stormwater Pollution Prevention Plan Site Plan and Activity Logs

Supplementary Information to be completed by Operator

- Areas within the site to remain undisturbed shall be protected throughout all phases of the construction process. The Operator is responsible for making all subcontractors aware of these locations.
- As phasing of the project is further developed and defined, phasing lines shall be shown on the Stormwater Pollution Prevention Plan Site Plan of this packet for increased clarity.
- During the construction process the SWPPP Site Plan shall continually be marked up to indicate locations of the following:
    - Portable toilets
    - Material storage areas
    - Vehicle and equipment fueling and maintenance areas
    - Concrete washouts
    - Paint and stucco washouts (if necessary)
    - Dumpsters or other trash and debris containers
    - Spill Kits
    - Stockpiles
    - Any other non-structural non-stormwater management BMP's
    - Any temporarily removed structural BMP's
    - Any Changes to the Structural BMP's

- Potential Sources of Pollution table shall be maintained (attached)
- Corrective Action Log shall be maintained to track areas prone to deficiency (attached)
- SWPPP Amendment Log shall be maintained (attached)
- Grading and Stabilization Activities Log shall be maintained throughout all phases of construction (attached)

Corrective Action Log

Inspection Date	Inspector Name	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/ Responsible person

SWPPP Amendment Log

Amendment No.	Decription of the Amendment	Date of Amendment	Amendment Prepared by [Name(s) and Title]

Grading and Stabilization Activities Log

Date Grading Activity Initiated	Description of Grading Activity	Date Grading Activity Ceased (Indicate Temporary or Permanent)	Date When Stabilization Measures are Initiated	Description of Stabilization Measure and Location

4.0 Pre & Post Development Drainage Maps

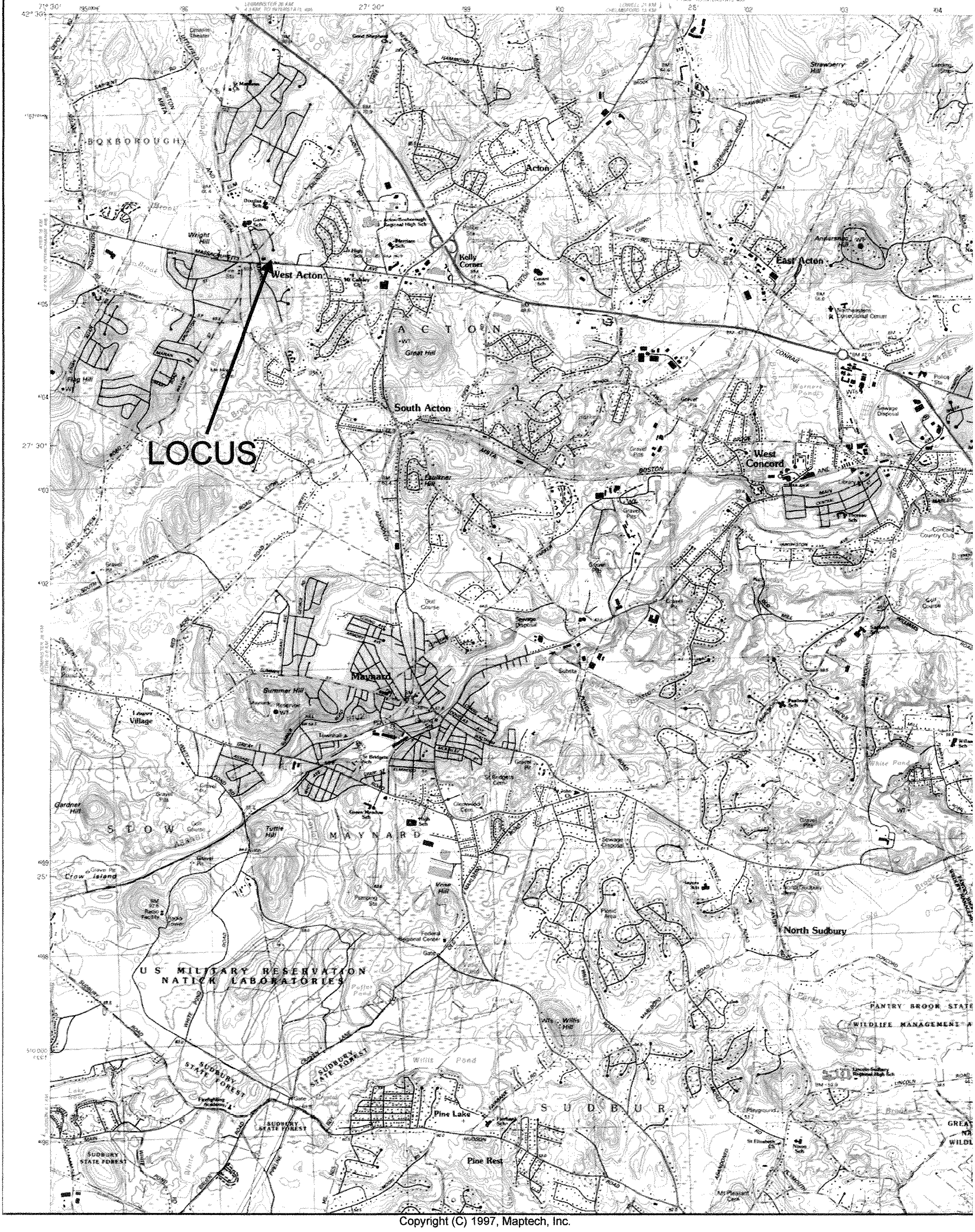
OMITTED
IN
THIS DRAFT

5.0 NPDES General Permit for Stormwater Discharges From Construction Activities

OMITTED
IN
THIS DRAFT

6.0 U.S.G.S. Locus Map

MAYNARD, MASSACHUSETTS MIDDLESEX COUNTY



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7.0 Details Sheets

OMITTED

IN

THIS DRAFT

8.0 Attachments

A. Order of Conditions

OMITTED

IN

THIS DRAFT

B. Stormwater Management Standards Summary

OMITTED

IN

THIS DRAFT

C. Subcontractor Certifications/Agreements and Delegation of Authority Form

West Acton Village Ecology
Massachusetts Avenue
Acton, MA 01720

West Acton Village Ecology Delegation of Authority Form

I,____________________ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the ____**West Acton Village Ecology**____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

______________________________(name of person or position)

______________________________(company)

______________________________(address)

______________________________(city, state, zip)

______________________________(phone)

By signing this authorization, I confirm that I meet the requirements to make such designation as set forth in Appendix G, Subsection 11.A of EPA's Construction Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix G, Subsection 11.B (1-3).

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: ______________________________

Company: ______________________________

Title: ______________________________

Signature: ______________________________

Date: ______________________________

West Acton Village Ecology
Massachusetts Avenue
Acton, MA 01720

West Acton Village Ecology Subcontractor Certification/Agreements

Subcontractor Certification
Stormwater Pollution Prevention Plan

Project Number:____

Project Title:____

Operator(s):____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company:____

Address:____

Telephone Number:______________________________________

Type of construction service to be provided:____________________

____

____

Signature: ____________________________

Title: ____________________________

Date: ____________________________