# Stormwater Management Study

## CVS/pharmacy
## Washington Street and
## Swanton Street
## Winchester, Massachusetts

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# STORMWATER MANAGEMENT NARRATIVE

## 1.0 INTRODUCTION

R.J. O'Connell and Associates, Inc. (RJOC) has prepared this revised stormwater report on behalf of G.B. New England, LLC for the proposed redevelopment of a ±1.2 acre parcel located at the intersection of Washington Street and Swanton Street in Winchester, Massachusetts (refer to Figure 1, USGS Locus Map). The study has been revised based on additional soils information obtained from on-site soils testing performed by Ransom Consulting Engineers and Scientists on January 18 and 19, 2013 (see Section 5.0, Soils and Appendix B for Soils Information). The study uses the Natural Resources Conservation Service (NRCS), formerly the Soil Conservation Service (SCS) TR-20 Computer Program for Project Formulation Hydrology and the computer program HydroCad, version 10.0 for modeling existing and proposed hydrologic site conditions. The study presents a comparative analysis of pre-development, hydrologic conditions to post-redevelopment conditions and demonstrates that the proposed condition will represent a substantial improvement over the existing stormwater management conditions.

## 2.0 SITE LOCATION AND EXISTING CONDITIONS

The proposed project is located on a ±1.2 acre site located at the intersection of Washington Street and Swanton Street in Winchester, Massachusetts. Currently the site is occupied by a single story, 4,200 square foot automotive repair and sales facility, an 1,800 square foot dry cleaners and a 5,800 square foot building occupied by several small retail stores including a laundry mat, photoshop and nail salon. The remainder of the site consists of asphalt parking areas and small landscaped areas along the southern and western property lines.

The property is bounded on the north and west by private residences, on the east by Swanton Street and on the south by Washington Street. Site topography ranges from a high elevation of 53 along Washington Street to elevation 44 at the north corner of the property adjacent to Swanton Street.

Stormwater runoff from the site flows by sheet flow directly off-site to the adjacent property on the north or onto Swanton Street. A small portion of the site from the existing sidewalk flows onto Washington Street. No drainage system, stormwater detention facilities or water quality Best Management Practices (BMP's) exist on site.

## 3.0 PROPOSED PROJECT

The proposed redevelopment project includes demolishing the existing buildings and constructing a 11,955 square foot CVS/pharmacy and 63 paved parking spaces. A stormwater management system has been designed that will substantially improve upon current stormwater runoff conditions both in terms of peak flow control and water quality and is consistent with the objectives of the Massachusetts Stormwater Management Policy for a redevelopment site. Runoff control, water quality improvement and groundwater recharge will be accomplished by implementing certain drainage improvements currently not utilized on the site and include the following:

- Collect storm runoff in catch basins with deep sumps and inverted (hooded) outlets
- Route runoff through oil/particle separators for additional removal of Total Suspended Solids (TSS)
- Construction of a subsurface infiltration system designed to retain, treat and recharge runoff up to the 100 year storm event thereby reducing the hydraulic burden on the municipal drainage system.
- Implement a Construction Pollution Prevention Plan to control erosion, sedimentation and other construction related impacts in accordance with the requirements of the EPA's NPDES Construction General Permit for Discharges from Construction Activities.
- Implement an Operation and Maintenance Plan for the proposed stormwater management system that describes the various components of the system and identifies the inspections and maintenance tasks and a schedule to follow which will insure the proper, long-term performance of the system.
- Implement a Long Term Pollution Prevention Plan to prevent illicit discharges to the stormwater management system.

The proposed stormwater management measures described above will not have any adverse impact to the municipal drainage system. Runoff quantity will be significantly reduced and water quality considerably enhanced over existing conditions and will result in an overall benefit to the municipal drainage system.

## 4.0 COMPLIANCE WITH THE MASSACHUSETTS DEP STORMWATER HANDBOOK

This re-development program includes a comprehensive stormwater management system that will collect, pre-treat, treat and control stormwater runoff in conformance with DEP's Stormwater Management Policy. According to Standard 7 in the Massachusetts Stormwater Handbook, a redevelopment project is defined as follows:

- *Development, rehabilitation, expansion and phased projects on previously developed sites, provided the redevelopment results in no net increase in impervious area.*

As a redevelopment project, the site is required to meet Standards 2 through 6 to the maximum extent practicable and shall fully comply with Standards 1, 8, 9 and 10. This redevelopment program includes reasonable efforts to improve existing conditions onsite and downstream of the site.

***Standard 1: No new stormwater conveyances may discharge untreated directly to or cause erosion in wetlands or waters of the Commonwealth.***

Stormwater runoff from paved parking areas will be collected in deep sump catch basins with hoods and pass through an oil/particle separator for pretreatment prior to discharging to the subsurface infiltration system where it will be treated through infiltration into the ground. Runoff from the building roof will discharge directly into the subsurface infiltration system. The subsurface infiltration system has been sized to retain and infiltrate up to the 100 year storm event.

***Standard 2: Stormwater management systems shall be designed so that post-development peak***

***discharge rates do not exceed pre-development peak discharge rates.***

The proposed redevelopment decreases impervious area from 94% to 79% which results in a net decrease in peak rates of runoff discharged from the site. However, a subsurface infiltration system is included in the proposed stormwater management system which will retain and infiltrate nearly all runoff from the site up to the 100 year storm event.

***Standard 3: Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determine in accordance with the Massachusetts Stormwater Handbook.***

There is a net reduction in site impervious area from 94% to 79% and hence an increase in annual recharge under post-redevelopment conditions. However, the subsurface infiltration system included in the proposed stormwater management system is sized to retain and infiltrate site runoff up to the 100 year storm event.

***Standard 4: Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).***

Runoff from paved parking areas will be collected in catch basins with deep sumps and hooded outlets and will pass through oil/particle separators to attain 44% TSS removal prior to discharging into the subsurface infiltration system where runoff will be infiltrated into the ground achieving removal of more than 80% of the annual, post-construction TSS load. The subsurface infiltration system is sized to retain and infiltrate the site runoff from up to the 100 year storm event.

***Standard 5: For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable.***

A subsurface infiltration system is included as part of the stormwater management system and will retain and infiltrate nearly all storm runoff from the site up to the 100 year event.

***Standard 6: Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.***

Not Applicable

***Standard 7: A redevelopment project is required to meet the following Stormwater Management***

***Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.***

The site qualifies as a redevelopment. However, all applicable standards have been met.

***Standard 8: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentations, and pollution prevention plan) shall be developed and implemented.***

A Construction Period Pollution Prevention Plan (CPPPP) addressing erosion, sedimentation and other pollutant sources is included in Appendix A.

***Standard 9: A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.***

An Operation and Maintenance Plan has been developed that outlines inspection and maintenance requirements to ensure the proper, long-term operation of the stormwater management system. See Appendix A.

***Standard 10: All illicit discharges to the stormwater management system are prohibited.***

An illicit discharge compliance statement is included in the Operation and Maintenance Plan.

## 5.0 SOILS

The soil survey of Middlesex County, Massachusetts by the Natural Resources Conservation Service (NRCS) classified the majority of the underlying soils on the site as Merrimac – Urban land complex. Merrimac Urban land complex belongs to hydrologic soil group A.

The geotechnical investigation performed by Ransom Consultants, Inc., obtained on-site soil that supports a HSG-A classification. As indicated in the report, the material encountered represents a well graded fill, a discontinuous native silty sand/sandy silt layer and a native glacial till deposit.

Field saturated hydraulic conductivity rates were measured in the test pits using a Guelph Permeameter in accordance with Volume 3 of the Massachusetts Stormwater Handbook which yielded rates between 2.61 and 14.88 inches/hour. The field saturated hydraulic conductivity rate of 2.61 inches/hour was utilized and an exfiltration rate of 50% of the saturated hydraulic conductivity rate of 2.61 inches/hour (1.305 inches/hour) was used to conservatively size the subsurface infiltration system.

## 6.0 EXISTING DRAINAGE PATTERNS

The site was divided into three subcatchment areas based on topography, drainage networks and points of analysis (POA's). Due to the topography of the site, there is runoff from upstream/offsite areas that flow onto the site; therefore, the area of the watershed analyzed totals 1.19 acres. The three (3) subcatchment areas studied under pre-development conditions are described as follows:

Subcatchment EX-1: The 0.67 acre watershed is comprised primarily of the paved parking areas located behind the existing buildings. A portion of the automotive dealership building rooftop is also included in this watershed. Stormwater runoff sheet flows to the northwestern property line (POA-A) and discharges off-site onto the adjacent property.

Subcatchment EX-2: The 0.04 acre watershed is comprised of the concrete sidewalk adjacent to Washington Street. Runoff flows southeast via overland flow onto Washington Street (POA-B) and into the municipal drainage system.

Subcatchment EX-3: The 0.48 acre watershed is comprised paved parking areas and building rooftops. Runoff flows towards the northeast property line (POA-C) onto Swanton Street and into the municipal drainage system.

## 7.0 PROPOSED DRAINAGE PATTERNS

The site was divided into four subcatchment areas based on topography, the proposed drainage system and POA's. Similar to existing conditions, the effective study area (±1.19 acres) is identical. A total of four (4) subcatchments were analyzed under post-development conditions:

Subcatchment PR-1A: The 1.11 acre watershed is comprised of the rooftop and asphalt parking lot areas. Runoff from paved parking areas is captured in catch basins with deep sumps and hoods and passes through oil/particle separators prior to entering the subsurface infiltrations system. Runoff generated from the rooftop enters directly into the subsurface infiltration system where it is infiltrated into the ground. All runoff from this subcatchment is retained in the subsurface infiltration system and discharged into the ground by infiltration.

Subcatchment PR-1: The 0.05 acre watershed is comprised of the landscaped area in the western site corner. Stormwater runoff sheet flows to the northwestern property line (POA-A) and discharges off-site onto the adjacent property.

Subcatchment PR-2: The 0.02 acre watershed is comprised of a portion of the sidewalk area along Washington Street. Runoff sheet flows onto Washington Street and into the municipal drainage system (POA-B).

Subcatchment PR-3: The 0.01 acre watershed is comprised of the small landscaped area in the western corner of the site. Runoff flows onto Swanton Street (POA-C).

## 8.0 PROPOSED DRAINAGE SYSTEM

The proposed drainage conveyance system consisting of catch basins with deep sumps and hoods,

manholes and high density polyethylene (HDPE) pipe is sized to collect and convey runoff on site from a 100-year storm event. The hydraulic calculations for the 25-year and 100-year storm event are provided in Section IV. Additionally, the hydraulic calculations for the pipe network were analyzed when the basin reached the peak elevation (44.16') and at the peak runoff rate (8.9 inches/hour). The hydraulic grade line remains in the system in both instances.

Oil/particle separators are proposed at two locations and will provide additional pre-treatment of runoff prior to being discharged into the subsurface infiltration system to be constructed below the northern parking area. The subsurface infiltration system will retain and recharge both pre-treated pavement runoff and the runoff from the proposed building roof storms up to the 100 year storm event. Currently, runoff from the site drains directly off-site either onto adjacent properties or the adjacent streets and into the municipal drainage system.

## 9.0 PEAK FLOW RATE MITIGATION

Peak flow rates were determined under existing and proposed conditions for the 2-year, 10-year, 25-year and 100-year. The 24 hour duration storm precipitation amounts obtained from the "Atlas of Precipitation Extremes for Northeastern United States and Southeastern Canada" and used in the analysis were 3.2 inches, 4.9 inches, 6.2 inches and 8.9 inches respectively. The standard, 24 hour, Type III rainfall distribution was used in the analysis.

The site drains to three (3) points of analysis (POA). POA-A through C are listed and described below and shown on Figures 3 and 4.

| POINT OF ANALYSIS | DESCRIPTION |
|---|---|
| **POA-A** | The northwestern property line. Runoff flows toward the residential area. |
| **POA-B** | A portion of the site frontage along Washington Street. Runoff eventually flows onto Washington Street into the municipal drainage system in Swanton Street. |
| **POA-C** | The site frontage along Swanton Street. Runoff flows onto Swanton Street and eventually into the municipal drainage system in Swanton Street. |

The site was divided into subcatchment areas for the pre and post-development conditions, based on topography, drainage networks and POAs. A total of three (3) subcatchments (EX-1 through EX-3) were analyzed for the pre-development condition and four (4) subcatchments (PR-1 through PR-3) were analyzed for the post-development condition (refer to Figures 3 and 4).

Technical Release 20 (TR-20) methodology was utilized to determine weighted curve numbers (CNs) for each pre and post-development subcatchment areas. Weighted CNs were based on ground cover type and hydrologic soil group (HSG). The time of concentration (Tc's) for each of the existing and proposed watersheds were determined and had travel times of less than 6 minutes. Therefore, the

minimum travel time of 6 minutes was used in the analysis.

Subcatchment area, CN, Tc values and the 24 hour rainfall were then used to generate hydrographs using HydroCad 10.0; a computer program that develops a hydrograph based on the TR-20 methodology and computes peak discharges from rainfall runoff for urban and rural watersheds.

Table-1 below summarizes peak pre to post-redevelopment rates of discharge at each Point of Analysis.

**Table 1: Comparison of Peak Pre to Post-redevelopment Rates of Runoff from the site**

| Point of Analysis | 2-year storm event (3.2"/24-hr) | | 10-year storm event (4.9"/24-hr) | | 25-year storm event (6.2"/24-hr) | | 100-year storm event (8.9"/24-hr) | |
|---|---|---|---|---|---|---|---|---|
| | Pre (cfs) | Post (cfs) | Pre (cfs) | Post (cfs) | Pre (cfs) | Post (cfs) | Pre (cfs) | Post (cfs) |
| **POA-A** | 1.81 | ***0.00*** | 2.95 | ***0.00*** | 3.81 | ***0.01*** | 5.58 | ***0.07*** |
| **POA-B** | 0.12 | ***0.07*** | 0.18 | ***0.11*** | 0.23 | ***0.14*** | 0.33 | ***0.21*** |
| **POA-C** | 1.44 | ***0.00*** | 2.23 | ***0.00*** | 2.84 | ***0.00*** | 4.09 | ***0.01*** |

**Table 2: Volume Comparison**

| Point of Analysis | 2-year storm event (3.2"/24-hr) | | 10-year storm event (4.9"/24-hr) | | 25-year storm event (6.2"/24-hr) | | 100-year storm event (8.9"/24-hr) | |
|---|---|---|---|---|---|---|---|---|
| | Pre (acre-ft) | Post (acre-ft) | Pre (acre-ft) | Post (acre-ft) | Pre (acre-ft) | Post (acre-ft) | Pre (acre-ft) | Post (acre-ft) |
| **POA-A** | 0.136 | ***0.00*** | 0.228 | ***0.001*** | 0.299 | ***0.002*** | 0.448 | ***0.006*** |
| **POA-B** | 0.010 | ***0.005*** | 0.015 | ***0.009*** | 0.019 | ***0.011*** | 0.028 | ***0.017*** |
| **POA-C** | 0.114 | ***0.000*** | 0.182 | ***0.000*** | 0.234 | ***0.000*** | 0.342 | ***0.001*** |

## 10.0 WATER QUALITY

The redevelopment program includes suitable measures to pre-treat runoff from paved impervious

areas prior to discharging into the proposed subsurface infiltration system. New stormwater controls have been incorporated into the design which results in a significant reduction in annual stormwater pollutant loads from the site. Through the use of structural and non-structural best management practices (BMPs), the water quality volume from the catchment areas contributing to the proposed catch basins will undergo treatment to the maximum extent practicable. The following BMP's were selected to remove over 80% of the average annual post-construction load of Total Suspended Solids (TSS) from stormwater runoff. Refer to the TSS Removal Calculation Worksheet below.

- Street Sweeping
  Sweeping will be performed routinely within the parking lot and driveway areas to reduce sediments and trash before they can enter the catch basins.

- Deep Sump Hooded Catch Basins
  Stormwater runoff from proposed pavement areas will be directed via curbing and site grading to catch basins with deep sumps and hooded outlets. Catch basins will trap and remove sediment and larger particles from the stormwater and improve the performance of subsequent BMP's. The catch basin sumps will be a minimum of 4' in depth and a regular inspection and cleaning schedule will be followed to ensure optimal effectiveness. When properly constructed and maintained, catch basins with deep sumps and hooded outlets are quite effective in reducing the sediment and pollutant load in runoff.

- Oil/particle (Hydrodynamic) Separator (CDS System)
  Oil/particle (Hydrodynamic) Separators are designed to remove heavy particles, floating debris and hydrocarbons from stormwater. Stormwater enters the system where floatables and oils are separated prior to the clarified stormwater runoff discharging to an outlet pipe. See the product description sheets for the CDS system in the Appendix for additional information.

- Subsurface Infiltration System
  Pre-treated runoff from paved parking areas and runoff from building roof will be directed to the subsurface infiltration system which is sized to retain and percolate runoff into the underlying soil where 80% TSS removal efficiency is achieved.

**Table 3: TSS Removal Calculation Worksheet**

| TSS Removal Treatment Train<br>Sweeping - Catch Basins – Particle Separators – Infiltration System | | | | |
|---|---|---|---|---|
| **BMP (A)** | **TSS Removal Rate (B)** | **Starting TSS Load (C)** | **Amount Removed (BxC) (D)** | **Remaining Load (C-D) (E)** |
| Street Sweeping | 0.10 | 1.0 | 0.10 | 0.90 |
| Deep Sump CB's | 0.25 | 0.90 | 0.225 | 0.675 |
| Particle Separator | 0.25 | 0.675 | 0.17 | 0.505 |

| | | | | |
|---|---|---|---|---|
| Subsurface Infiltration System | 0.80 | 0.505 | 0.404 | 0.10 |
| **Total TSS Removal = Summation of (D) =** | | | **90%** | |

## 11.0 GROUNDWATER RECHARGE

The Stormwater Management Policy requires, at a minimum, the annual recharge from the post-development site approximate the annual recharge from pre-developed conditions. For a redevelopment project, the net increase in site impervious area must be infiltrated to approximate the annual recharge from the lost pervious area. On this site, there is a decrease in site impervious area from 1.12 acres to 0.93 acres, or a net reduction of 0.19 acres. As such, there is an increase in groundwater recharge simply by increasing the amount of pervious area on site. However, additional groundwater recharge volume will be provided by the subsurface infiltration system which has been sized to retain and infiltrate nearly all the storm runoff from the site up to the 100 year rainfall event.

Although there is no required groundwater recharge volume, the infiltration BMP must drain within 72 hours (drawdown time). The calculations provided below summarize the drawdown time for the Subsurface Infiltration System.

$$\text{Time}_{\text{drawdown}} = \frac{\text{Rv}}{(\text{K}) \times (\text{Bottom Area})}$$

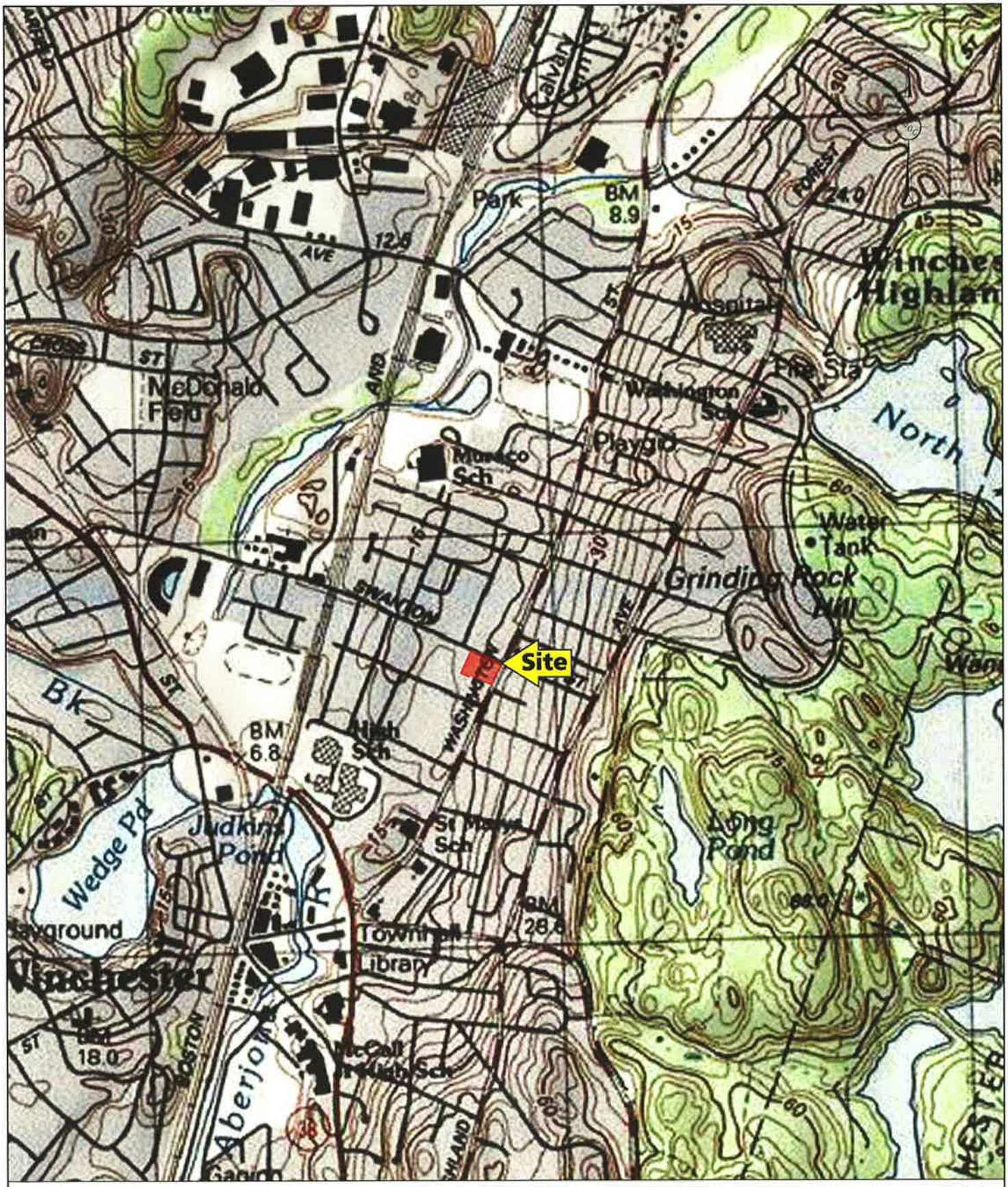
Rv = Storage Volume
K = Saturated Hydraulic Conductivity: =0.50 x 2.61 inches/hour = 1.305 inches/hour = 0.10875 ft/hour
Bottom Area = Bottom Area of Recharge Structure: 6,916.5 sf

| Storm Event | Rv (cf) | K (inches/hour) | Bottom Area (sf) | Time (hours) |
|---|---|---|---|---|
| 2 year | 3,307 | 1.305 | 6,916.5 | 4.4 |
| 10 year | 7,264 | 1.305 | 6,916.5 | 9.7 |
| 25 year | 10,857 | 1.305 | 6,916.5 | 14.4 |
| 100 year | 19,150 | 1.305 | 6,916.5 | 25.5 |

## 12.0 SUMMARY

The stormwater management system for the proposed redevelopment includes measures for

# II. LIST OF FIGURES

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| Designed by: | JWC |
| Drawn by: | JWC |
| Checked by: | MAW |
| Scale: | 1"=1,000' |
| Date: | 8/17/2012 |

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Project Name:
CVS/pharmacy
WINCHESTER, MA

Drawing Name:
USGS MAP

Drawing No.:
FIG. 1

Project No.: 11071

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Drawing name: G:\CVS\Projects\MA\Winchester\Washington Street and Swanton\Reports\Stormwater Report\USGS Map.dwg
Apr 25, 2013 – 10:54am

71° 8' 6"
71° 7' 29"
42° 27' 39"
42° 27' 40"
42° 27' 20"
42° 27' 21"
324480
324570
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324930
325020
325110
325200
325290
4703100
4703010
4702920
4702830
4702740
4702650
Olive St
Raymond Pl
Harvard St
Prince Ave
Columbus Rd
Florence St
Chester St
Emerson Ct
Quigley Ct
Swanton St
Lincoln St
Hillcrest Pkwy
Washington St
Governors Ave
6268
Park Ave
6290
Spruce St
Holland St
Oak St
Highland Ave
Nelson St
Park Rd
Shore Rd
6310
Hancock St
Westley St
Webster St
105E
Long Pond Brook
Map Scale: 1:4,120 if printed on A size (8.5" x 11") sheet.
N
Meters
0
50
100
200
300
Feet
0
200
400
800
1,200

## MAP LEGEND

**Area of Interest (AOI)**

Area of Interest (AOI)

**Soils**

Soil Map Units

**Soil Ratings**

A

A/D

B

B/D

C

C/D

D

Not rated or not available

**Political Features**

Cities

**Water Features**

Streams and Canals

**Transportation**

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

## MAP INFORMATION

Map Scale: 1:4,120 if printed on A size (8.5" × 11") sheet.

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

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 19N NAD83

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 12, Feb 26, 2010

Date(s) aerial images were photographed: 8/14/2003; 7/10/2003

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

# Hydrologic Soil Group

| Hydrologic Soil Group— Summary by Map Unit — Middlesex County, Massachusetts (MA017) | | | | |
|---|---|---|---|---|
| **Map unit symbol** | **Map unit name** | **Rating** | **Acres in AOI** | **Percent of AOI** |
| 105E | Rock outcrop-Hollis complex, 3 to 35 percent slopes | D | 0.0 | 0.0% |
| 603 | Urban land, wet substratum | | 0.2 | 0.4% |
| 626B | Merrimac-Urban land complex, 0 to 8 percent slopes | A | 30.0 | 52.1% |
| 629C | Canton-Charlton-Urban land complex, 3 to 15 percent slopes | B | 23.7 | 41.2% |
| 631C | Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky | B | 3.6 | 6.3% |
| **Totals for Area of Interest** | | | **57.5** | **100.0%** |

## Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

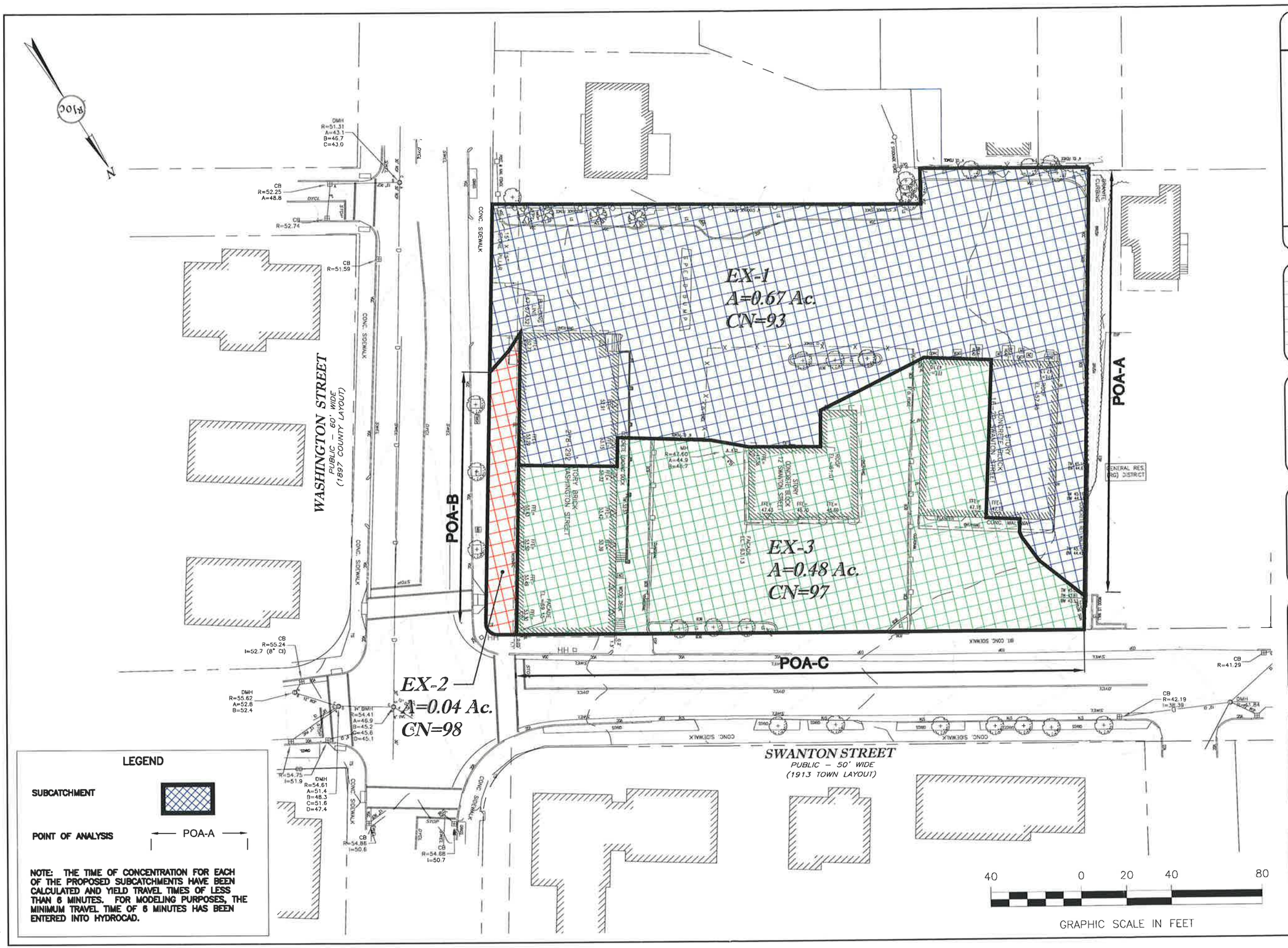
If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

## Rating Options

*Aggregation Method:* Dominant Condition

*Component Percent Cutoff:* *None Specified*

*Tie-break Rule:* Higher




| No. | Revision | Date |
|---|---|---|
| 1 | Revised per Town Engineer's Comments | 10/16/2012 |

| | |
|---|---|
| Designed by: | MJW |
| Drawn by: | KPM |
| Checked by: | MJW |
| Scale: | 1"=40' |
| Date: | 09/21/2012 |

DEVELOPER:

GBC
GERSHMAN BROWN CROWLEY INC.
14 BREAKNECK HILL RD
LINCOLN, RI 02865

Prepared By:

RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 MONTVALE AVE
STONEHAM, MA 02180
781-279-0180 FAX: 781-279-0173

Project Name:

CVS/pharmacy
WINCHESTER, MA

Drawing Name:

PRE-DEVELOPMENT WATERSHED PLAN

Drawing No.:

FIG. 3

Project No.: 11071

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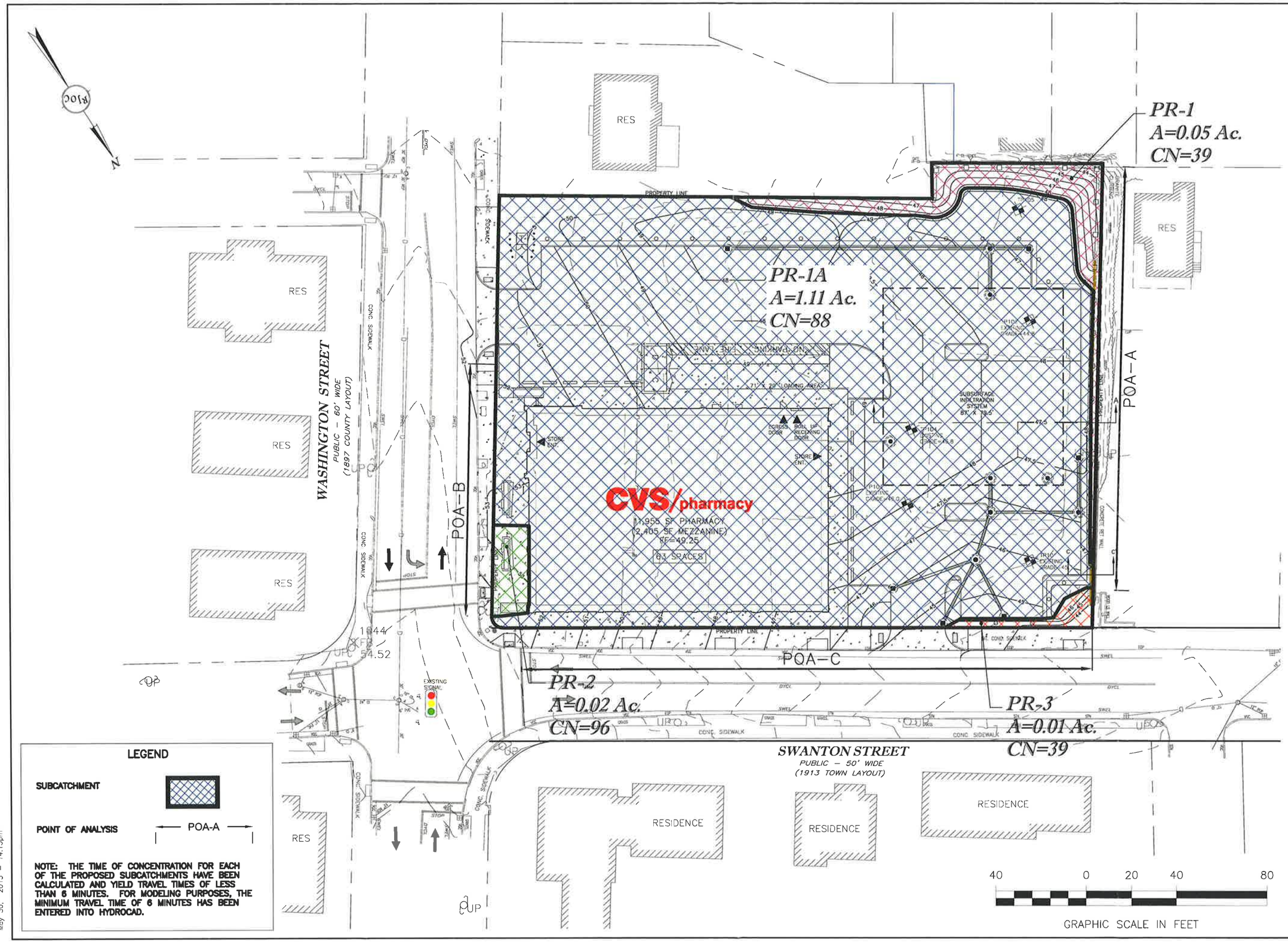
Drawing name: G:\CVS\Projects\MA\Winchester\Wasnington Street and Swanton\Engineer\Pre Development Watershed.dwg
Apr 22, 2013 - 13:05pm




## LEGEND

SUBCATCHMENT

POINT OF ANALYSIS — POA-A —

NOTE: THE TIME OF CONCENTRATION FOR EACH OF THE PROPOSED SUBCATCHMENTS HAVE BEEN CALCULATED AND YIELD TRAVEL TIMES OF LESS THAN 6 MINUTES. FOR MODELING PURPOSES, THE MINIMUM TRAVEL TIME OF 6 MINUTES HAS BEEN ENTERED INTO HYDROCAD.

| No. | Revision | Date |
|---|---|---|
| 4 | Revised per Town's Comments | 05/31/2013 |
| 3 | Revised per Town's Comments | 05/06/2013 |
| 2 | Revised per Town's Comments | 01/24/2013 |
| 1 | Revised per Town Engineer's Comments | 10/16/2012 |

| | |
|---|---|
| Designed by: | JWC |
| Drawn by: | KPM |
| Checked by: | MJW |
| Scale: | 1"=40' |
| Date: | 01/24/2013 |

DEVELOPER:

GBC
GERSHMAN BROWN CROWLEY INC.
14 BREAKNECK HILL RD
LINCOLN, RI 02865

Prepared By:

RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 MONTVALE AVE
STONEHAM, MA 02180
781-279-0180 FAX: 781-279-0173

Project Name:

CVS/pharmacy
WINCHESTER, MA

Drawing Name:

POST-DEVELOPMENT WATERSHED PLAN

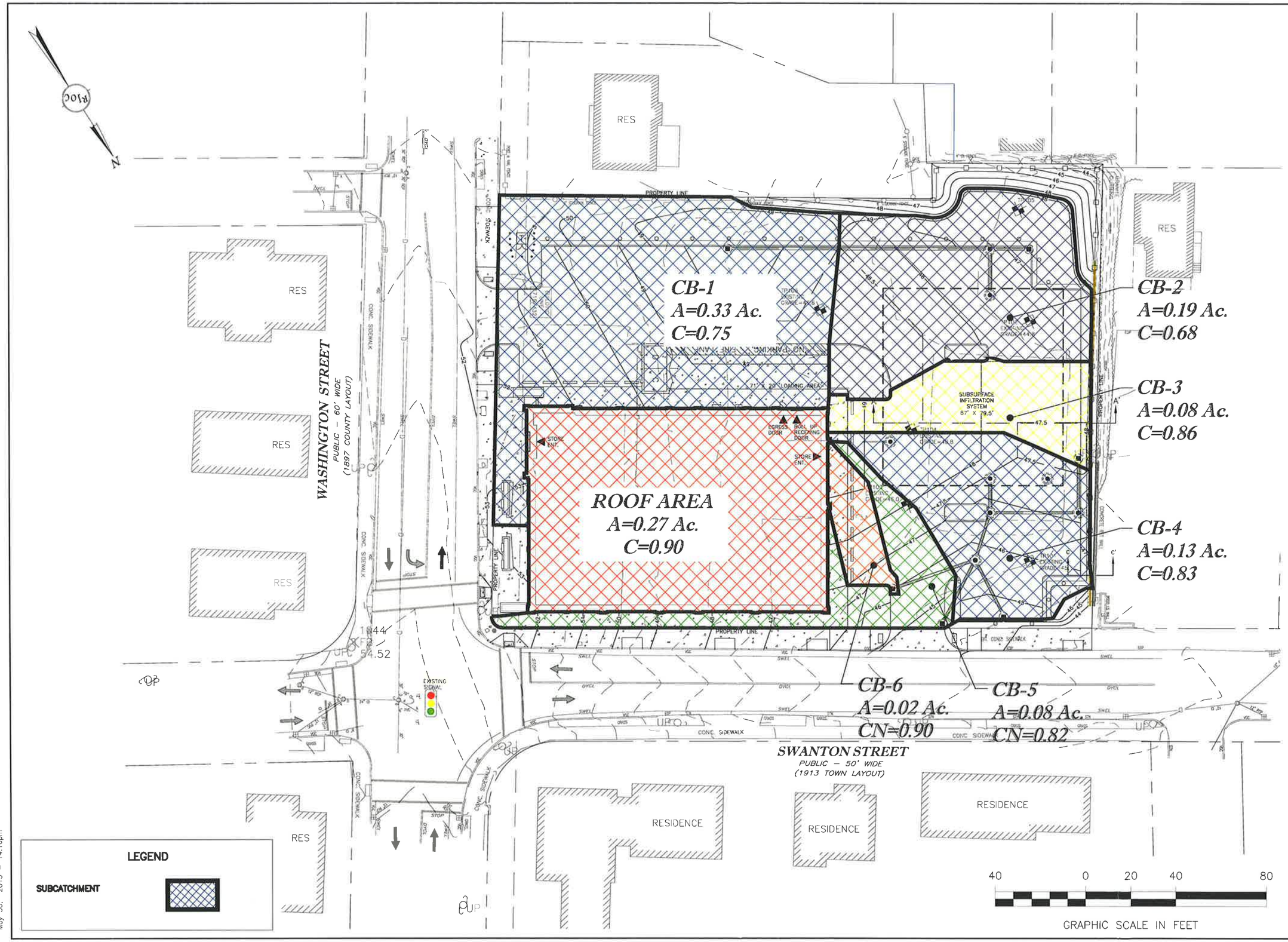
Drawing No.:

FIG. 4

Project No.: 11071

Copyright © 2012 by R.J. O'Connell & Associates, Inc.

Drawing name: G:\CVS\Projects\MA\Winchester\Washington Street and Swanton\Engineer\Post Development Watershed_5-22-2013.dwg
May 30, 2013 – 14:13pm




LEGEND

SUBCATCHMENT

| No | Revision | Date |
|---|---|---|
| 4 | Revised per Town's Comments | 05/31/2013 |
| 3 | Revised per Town's Comments | 05/06/2013 |
| 2 | Revised per Town's Comments | 01/24/2013 |
| 1 | Revised per Town Engineer's Comments | 10/16/2012 |

| | |
|---|---|
| Designed by: | JWC |
| Drawn by: | KPM |
| Checked by: | MJW |
| Scale: | 1"=40' |
| Date: | 01/24/2013 |

DEVELOPER:

GBC
GERSHMAN BROWN CROWLEY INC.
14 BREAKNECK HILL RD
LINCOLN, RI 02865

Prepared By:

RJO'CONNELL & ASSOCIATES, INC.
CIVIL ENGINEERS, SURVEYORS & LAND PLANNERS
80 MONTVALE AVE
STONEHAM, MA 02180
781-279-0180 FAX: 781-279-0173

Project Name:

CVS/pharmacy
WINCHESTER, MA

Drawing Name:

CATCHMENT WATERSHED PLAN

Drawing No.:

FIG. 5

Project No.: 11071

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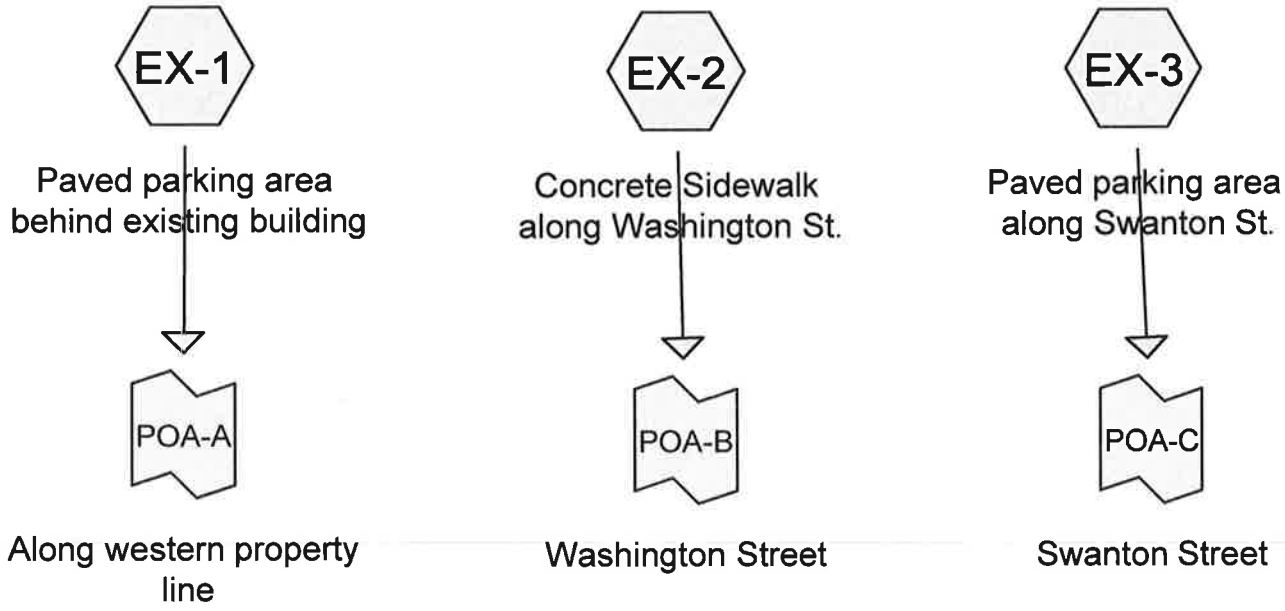
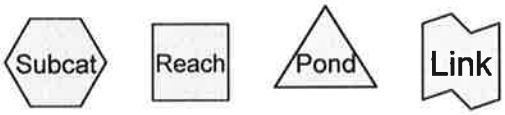
Drawing name: G:\CVS\Projects\MA\Winchester\Washington Street and Swanton\Engineer\Catchment Watershed_5-22-2013.dwg
May 30, 2013 – 14:16pm

# III. HYDROLOGICAL CALCULATIONS




**Routing Diagram for Predevelopment**
Prepared by {enter your company name here}, Printed 5/30/2013
HydroCAD® 10.00 s/n 04881 © 2011 HydroCAD Software Solutions LLC

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.068 | 39 | >75% Grass cover, Good, HSG A (EX-1, EX-3) |
| 1.080 | 98 | (EX-1, EX-3) |
| 0.039 | 98 | concrete sidewalk (EX-2) |
| **1.187** | **95** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0.068 | HSG A | EX-1, EX-3 |
| 0.000 | HSG B | |
| 0.000 | HSG C | |
| 0.000 | HSG D | |
| 1.118 | Other | EX-1, EX-2, EX-3 |
| **1.187** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.000 | 0.000 | 0.000 | 0.000 | 1.080 | 1.080 | | EX-1, EX-3 |
| 0.068 | 0.000 | 0.000 | 0.000 | 0.000 | 0.068 | >75% Grass cover, Good | EX-1, EX-3 |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.039 | 0.039 | concrete sidewalk | EX-2 |
| **0.068** | **0.000** | **0.000** | **0.000** | **1.118** | **1.187** | **TOTAL AREA** | |

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment EX-1: Paved parking area** Runoff Area=29,064 sf 90.95% Impervious Runoff Depth>2.44"
Tc=6.0 min CN=93 Runoff=1.81 cfs 0.136 af

**Subcatchment EX-2: Concrete Sidewalk** Runoff Area=1,681 sf 100.00% Impervious Runoff Depth>2.97"
Tc=6.0 min CN=98 Runoff=0.12 cfs 0.010 af

**Subcatchment EX-3: Paved parking area** Runoff Area=20,941 sf 98.33% Impervious Runoff Depth>2.85"
Tc=6.0 min CN=97 Runoff=1.44 cfs 0.114 af

**Link POA-A: Along western property line** Inflow=1.81 cfs 0.136 af
Primary=1.81 cfs 0.136 af

**Link POA-B: Washington Street** Inflow=0.12 cfs 0.010 af
Primary=0.12 cfs 0.010 af

**Link POA-C: Swanton Street** Inflow=1.44 cfs 0.114 af
Primary=1.44 cfs 0.114 af

**Total Runoff Area = 1.187 ac Runoff Volume = 0.260 af Average Runoff Depth = 2.63"**
**5.77% Pervious = 0.068 ac 94.23% Impervious = 1.118 ac**

## Summary for Subcatchment EX-1: Paved parking area behind existing building

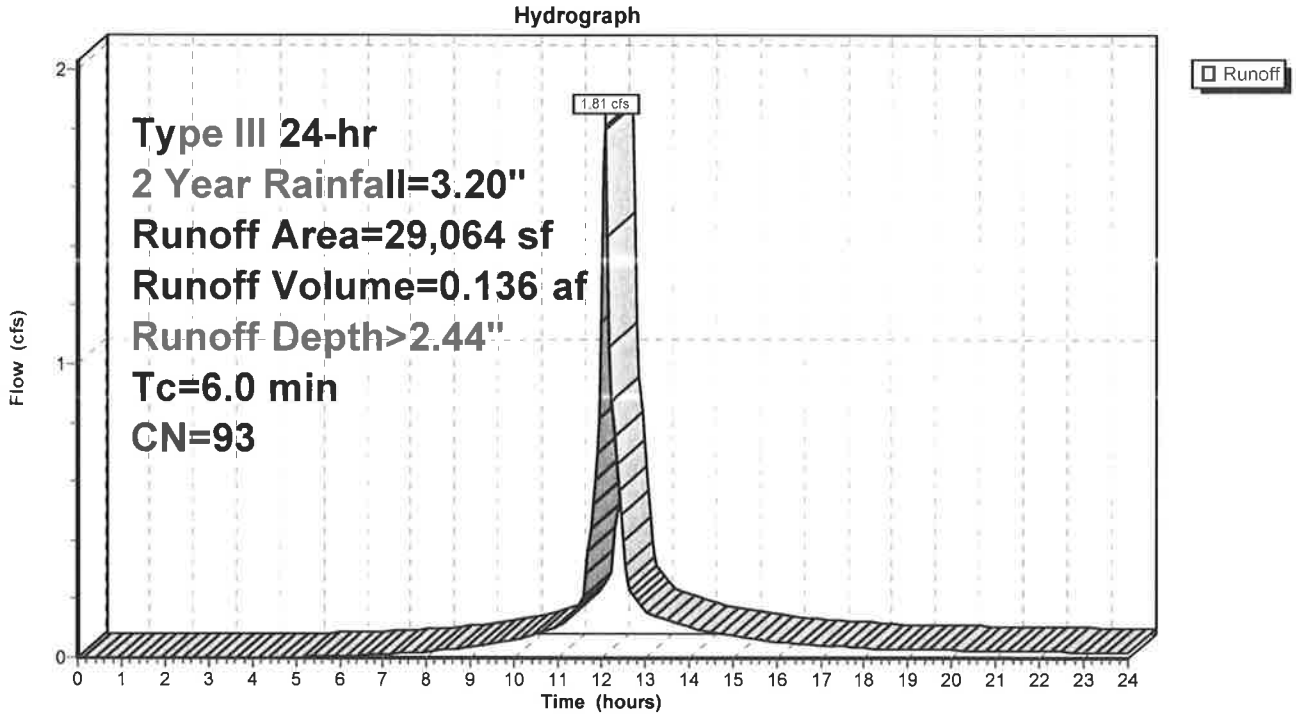
Runoff = 1.81 cfs @ 12.09 hrs, Volume= 0.136 af, Depth> 2.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 2,631 | 39 | >75% Grass cover, Good, HSG A |
| * | 26,433 | 98 | |
| | 29,064 | 93 | Weighted Average |
| | 2,631 | | 9.05% Pervious Area |
| | 26,433 | | 90.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-1: Paved parking area behind existing building



## Summary for Subcatchment EX-2: Concrete Sidewalk along Washington St.

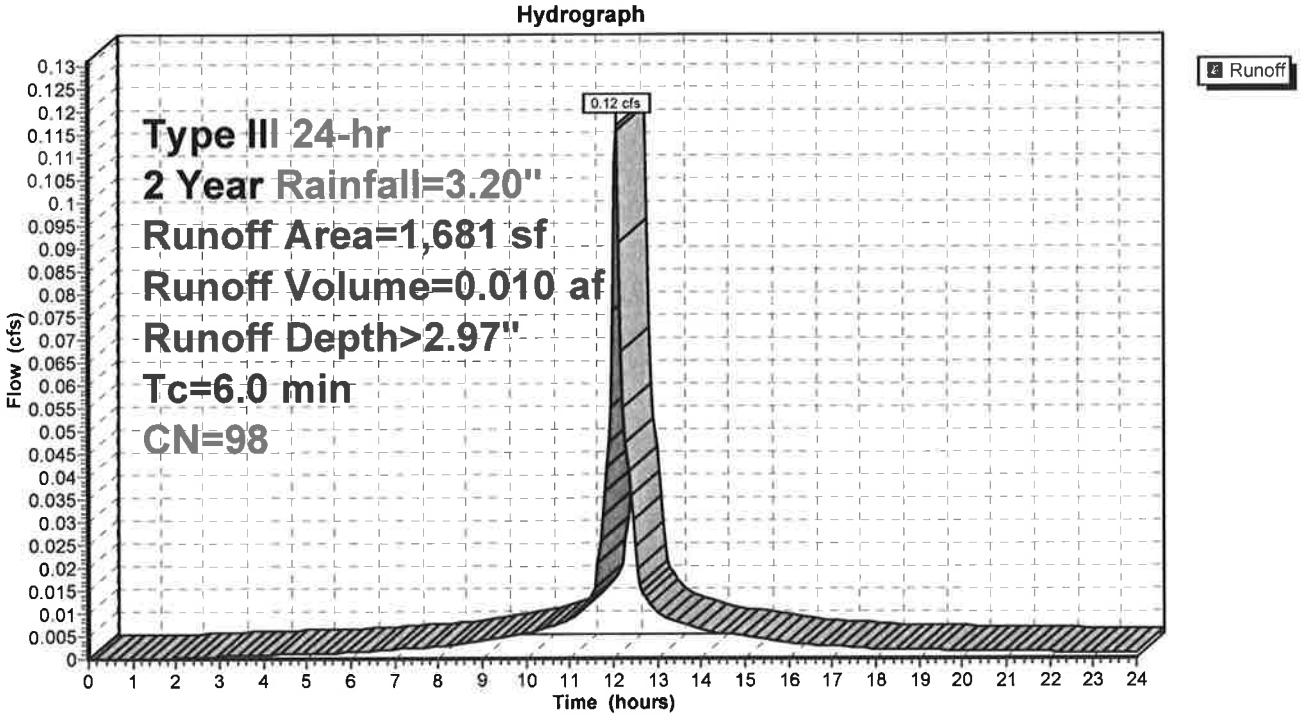
Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 1,681 | 98 | concrete sidewalk |
| | 1,681 | | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-2: Concrete Sidewalk along Washington St.



## Summary for Subcatchment EX-3: Paved parking area along Swanton St.

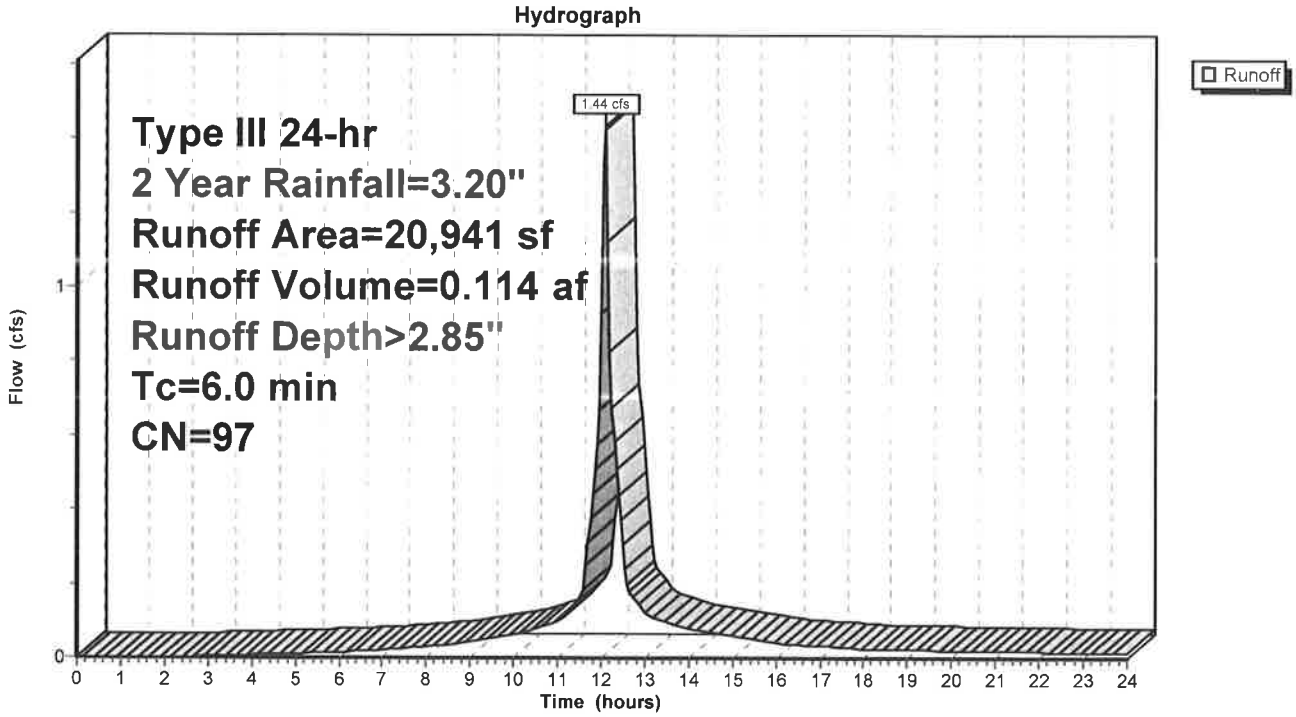
Runoff = 1.44 cfs @ 12.09 hrs, Volume= 0.114 af, Depth> 2.85"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 349 | 39 | >75% Grass cover, Good, HSG A |
| * | 20,592 | 98 | |
| | 20,941 | 97 | Weighted Average |
| | 349 | | 1.67% Pervious Area |
| | 20,592 | | 98.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-3: Paved parking area along Swanton St.

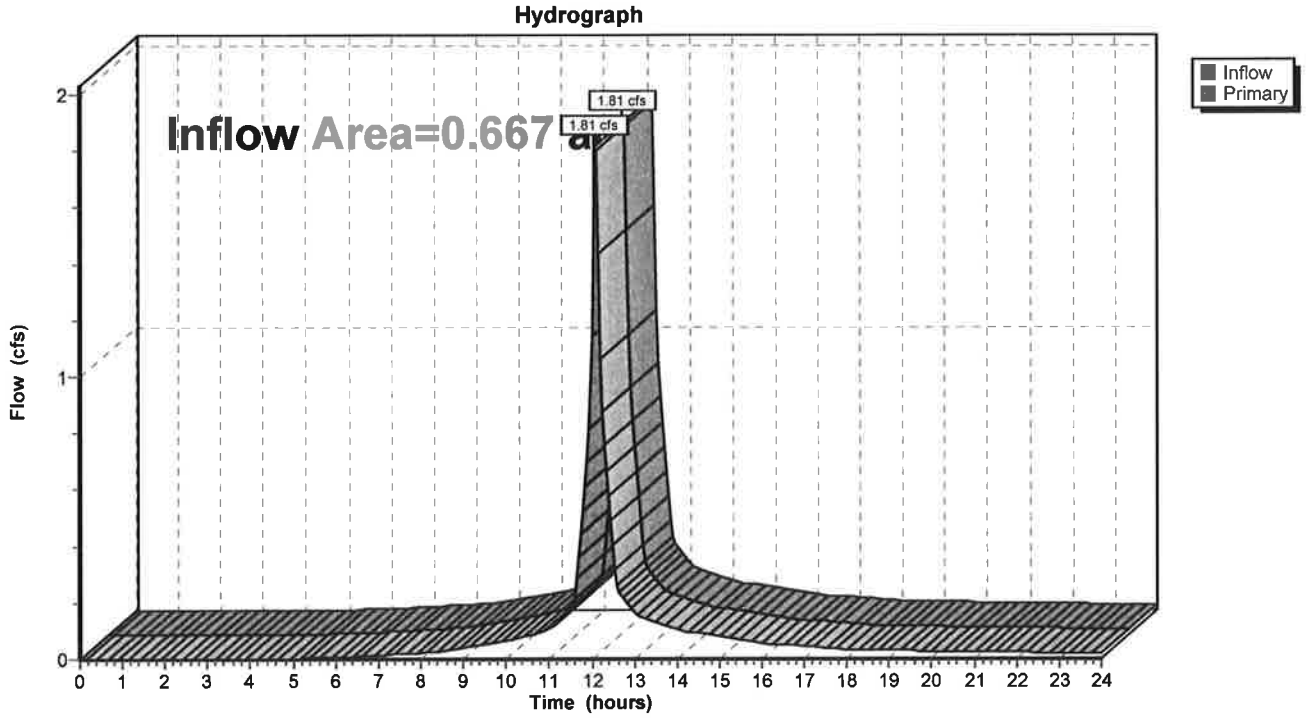


## Summary for Link POA-A: Along western property line

Inflow Area = 0.667 ac, 90.95% Impervious, Inflow Depth > 2.44" for 2 Year event
Inflow = 1.81 cfs @ 12.09 hrs, Volume= 0.136 af
Primary = 1.81 cfs @ 12.09 hrs, Volume= 0.136 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-A: Along western property line

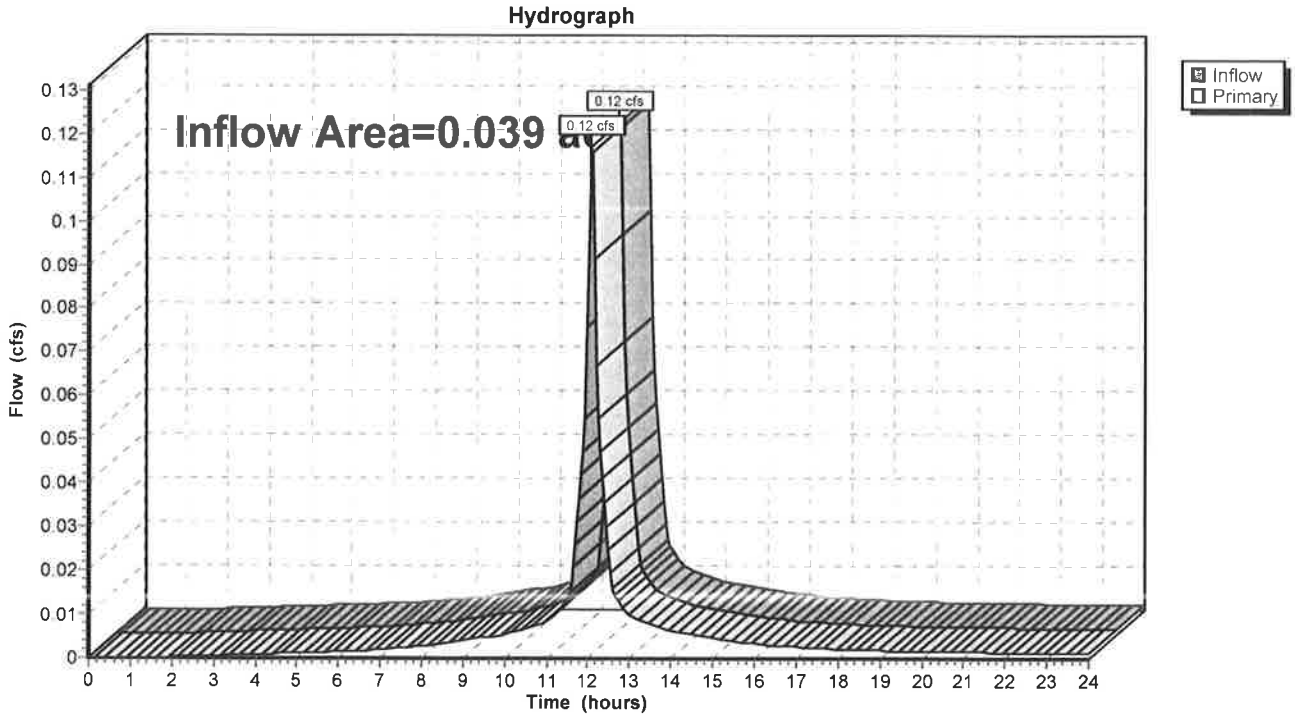


## Summary for Link POA-B: Washington Street

Inflow Area = 0.039 ac,100.00% Impervious, Inflow Depth > 2.97" for 2 Year event
Inflow = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af
Primary = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-B: Washington Street

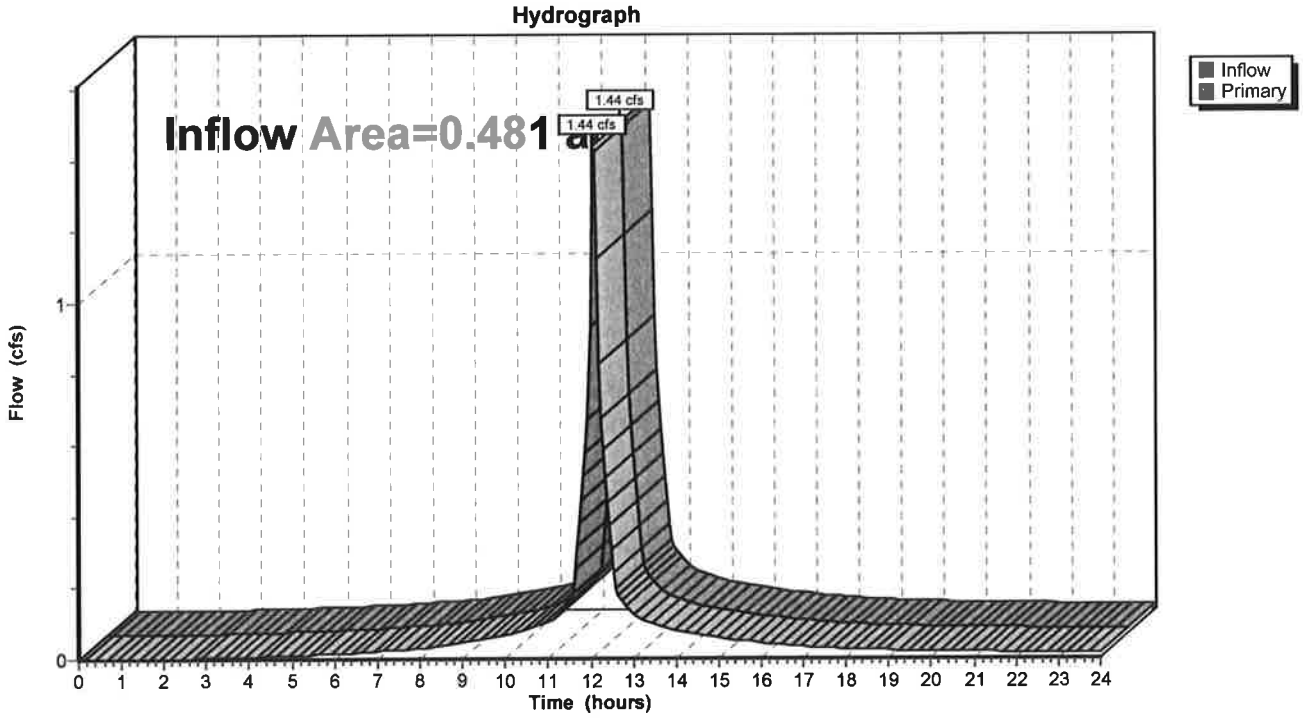


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.481 ac, 98.33% Impervious, Inflow Depth > 2.85" for 2 Year event
Inflow = 1.44 cfs @ 12.09 hrs, Volume= 0.114 af
Primary = 1.44 cfs @ 12.09 hrs, Volume= 0.114 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-C: Swanton Street



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment EX-1: Paved parking area** Runoff Area=29,064 sf 90.95% Impervious Runoff Depth>4.10"
Tc=6.0 min CN=93 Runoff=2.95 cfs 0.228 af

**Subcatchment EX-2: Concrete Sidewalk** Runoff Area=1,681 sf 100.00% Impervious Runoff Depth>4.66"
Tc=6.0 min CN=98 Runoff=0.18 cfs 0.015 af

**Subcatchment EX-3: Paved parking area** Runoff Area=20,941 sf 98.33% Impervious Runoff Depth>4.54"
Tc=6.0 min CN=97 Runoff=2.23 cfs 0.182 af

**Link POA-A: Along western property line** Inflow=2.95 cfs 0.228 af
Primary=2.95 cfs 0.228 af

**Link POA-B: Washington Street** Inflow=0.18 cfs 0.015 af
Primary=0.18 cfs 0.015 af

**Link POA-C: Swanton Street** Inflow=2.23 cfs 0.182 af
Primary=2.23 cfs 0.182 af

**Total Runoff Area = 1.187 ac Runoff Volume = 0.425 af Average Runoff Depth = 4.30"**
**5.77% Pervious = 0.068 ac 94.23% Impervious = 1.118 ac**

## Summary for Subcatchment EX-1: Paved parking area behind existing building

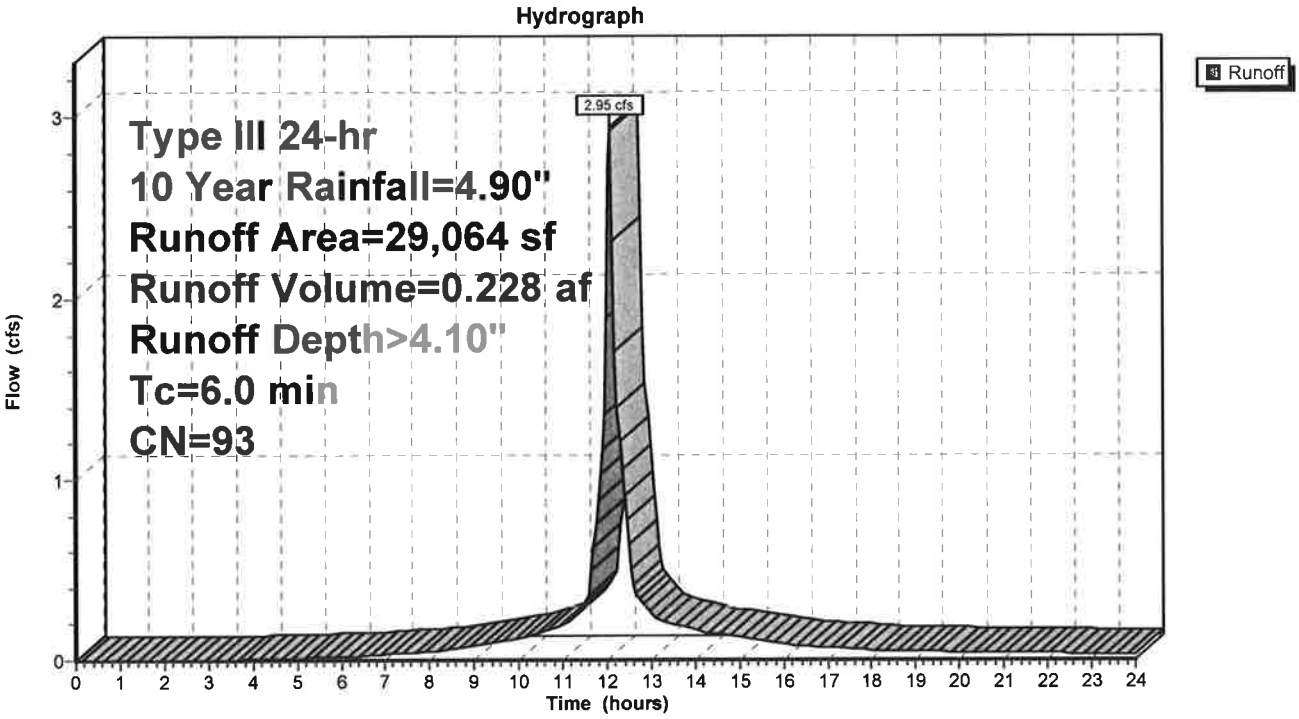
Runoff = 2.95 cfs @ 12.09 hrs, Volume= 0.228 af, Depth> 4.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 2,631 | 39 | >75% Grass cover, Good, HSG A |
| * | 26,433 | 98 | |
| | 29,064 | 93 | Weighted Average |
| | 2,631 | | 9.05% Pervious Area |
| | 26,433 | | 90.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-1: Paved parking area behind existing building



## Summary for Subcatchment EX-2: Concrete Sidewalk along Washington St.

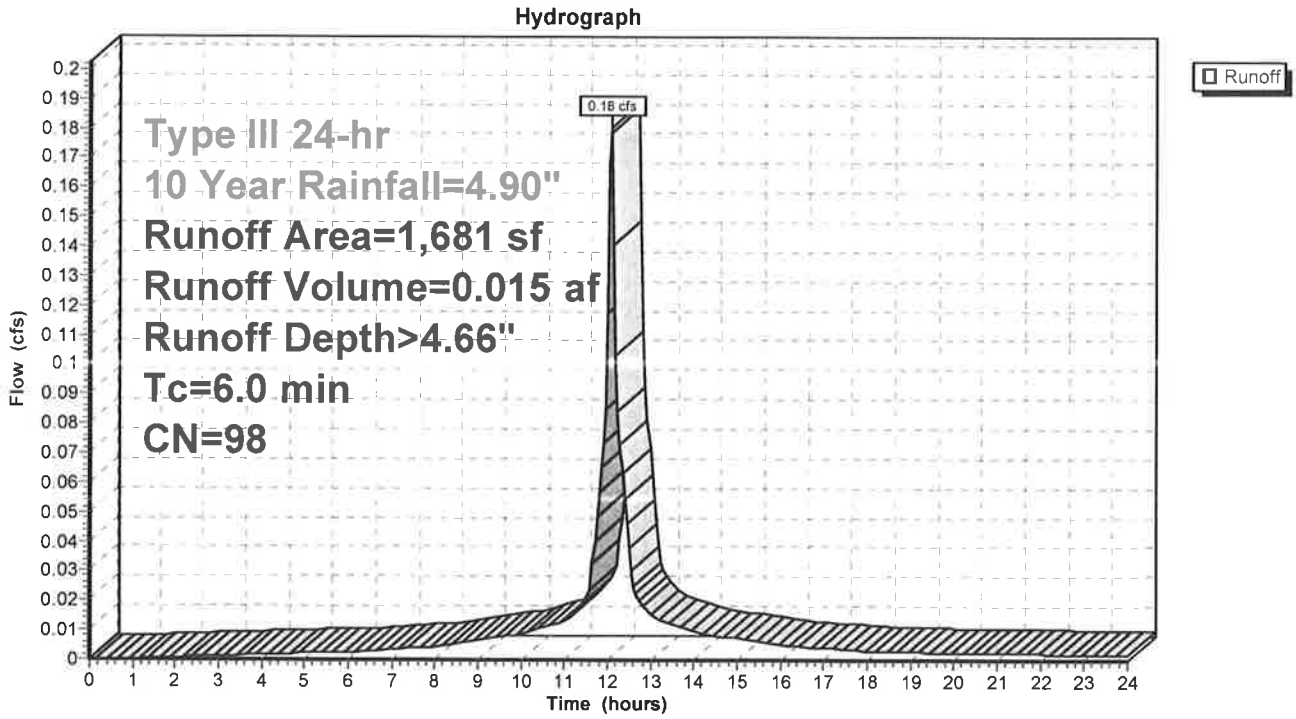
Runoff = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af, Depth> 4.66"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 1,681 | 98 | concrete sidewalk |
| | 1,681 | | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-2: Concrete Sidewalk along Washington St.



## Summary for Subcatchment EX-3: Paved parking area along Swanton St.

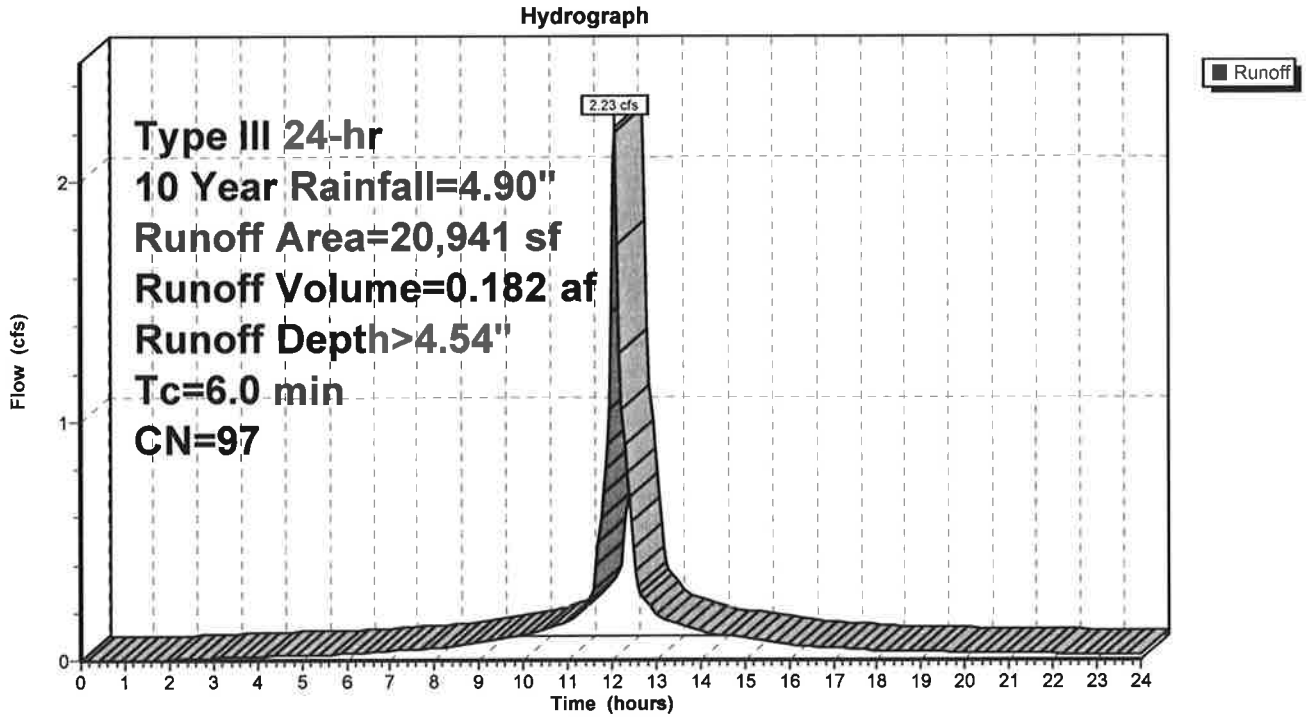
Runoff = 2.23 cfs @ 12.09 hrs, Volume= 0.182 af, Depth> 4.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 349 | 39 | >75% Grass cover, Good, HSG A |
| * | 20,592 | 98 | |
| | 20,941 | 97 | Weighted Average |
| | 349 | | 1.67% Pervious Area |
| | 20,592 | | 98.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-3: Paved parking area along Swanton St.

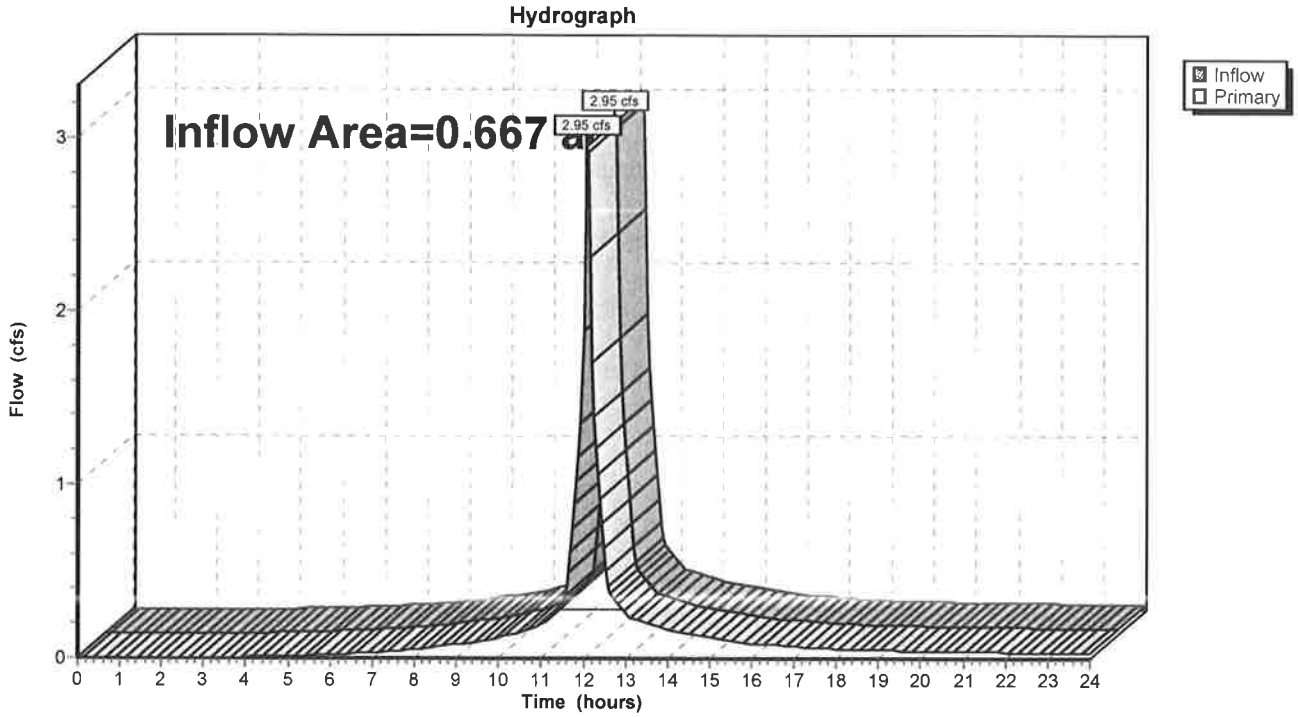


## Summary for Link POA-A: Along western property line

Inflow Area = 0.667 ac, 90.95% Impervious, Inflow Depth > 4.10" for 10 Year event
Inflow = 2.95 cfs @ 12.09 hrs, Volume= 0.228 af
Primary = 2.95 cfs @ 12.09 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link POA-A: Along western property line

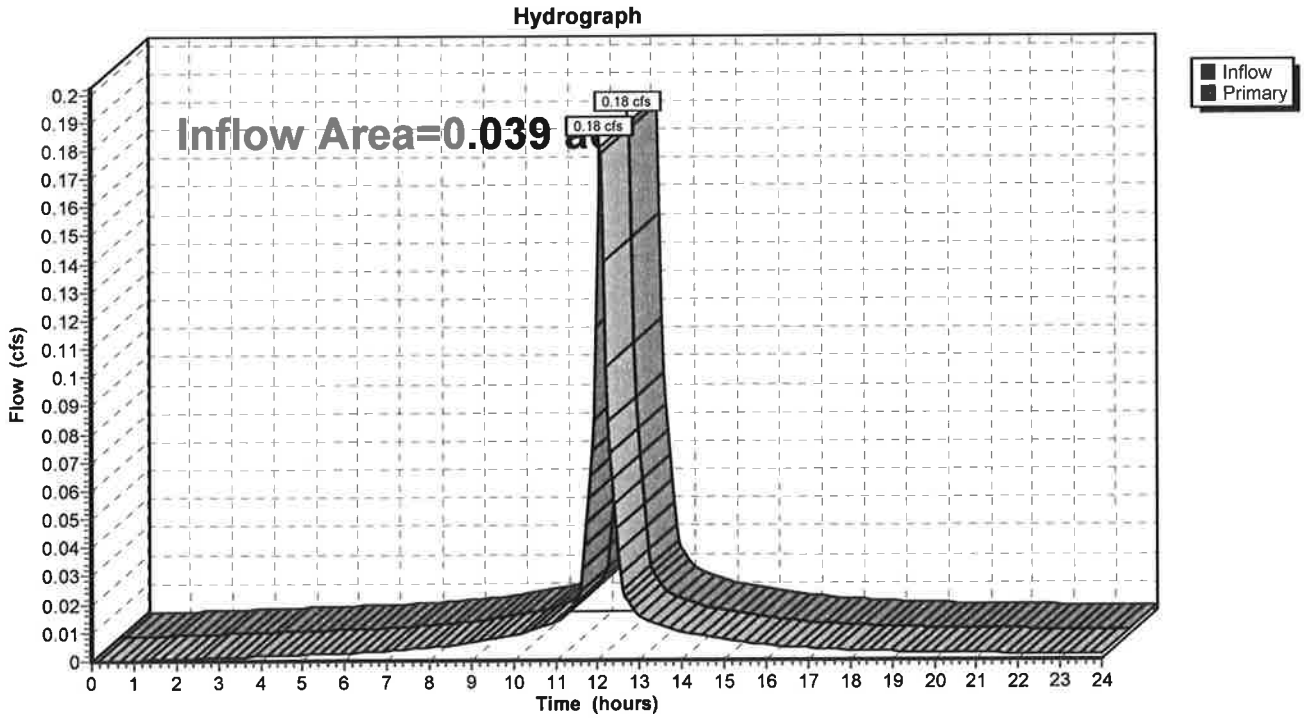


## Summary for Link POA-B: Washington Street

Inflow Area = 0.039 ac,100.00% Impervious, Inflow Depth > 4.66" for 10 Year event
Inflow = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af
Primary = 0.18 cfs @ 12.09 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-B: Washington Street

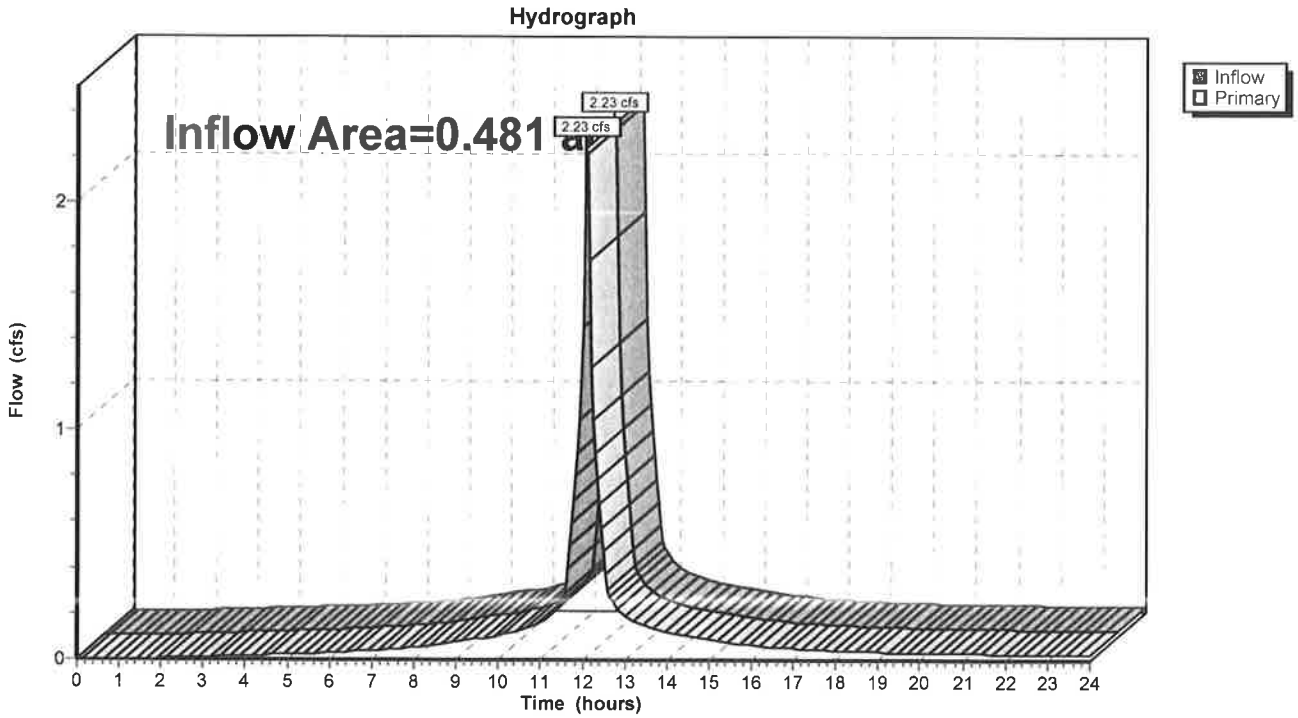


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.481 ac, 98.33% Impervious, Inflow Depth > 4.54" for 10 Year event
Inflow = 2.23 cfs @ 12.09 hrs, Volume= 0.182 af
Primary = 2.23 cfs @ 12.09 hrs, Volume= 0.182 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-C: Swanton Street



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment EX-1: Paved parking area** Runoff Area=29,064 sf 90.95% Impervious Runoff Depth>5.38"
Tc=6.0 min CN=93 Runoff=3.81 cfs 0.299 af

**Subcatchment EX-2: Concrete Sidewalk** Runoff Area=1,681 sf 100.00% Impervious Runoff Depth>5.96"
Tc=6.0 min CN=98 Runoff=0.23 cfs 0.019 af

**Subcatchment EX-3: Paved parking area** Runoff Area=20,941 sf 98.33% Impervious Runoff Depth>5.84"
Tc=6.0 min CN=97 Runoff=2.84 cfs 0.234 af

**Link POA-A: Along western property line** Inflow=3.81 cfs 0.299 af
Primary=3.81 cfs 0.299 af

**Link POA-B: Washington Street** Inflow=0.23 cfs 0.019 af
Primary=0.23 cfs 0.019 af

**Link POA-C: Swanton Street** Inflow=2.84 cfs 0.234 af
Primary=2.84 cfs 0.234 af

**Total Runoff Area = 1.187 ac Runoff Volume = 0.552 af Average Runoff Depth = 5.58"**
**5.77% Pervious = 0.068 ac 94.23% Impervious = 1.118 ac**

## Summary for Subcatchment EX-1: Paved parking area behind existing building

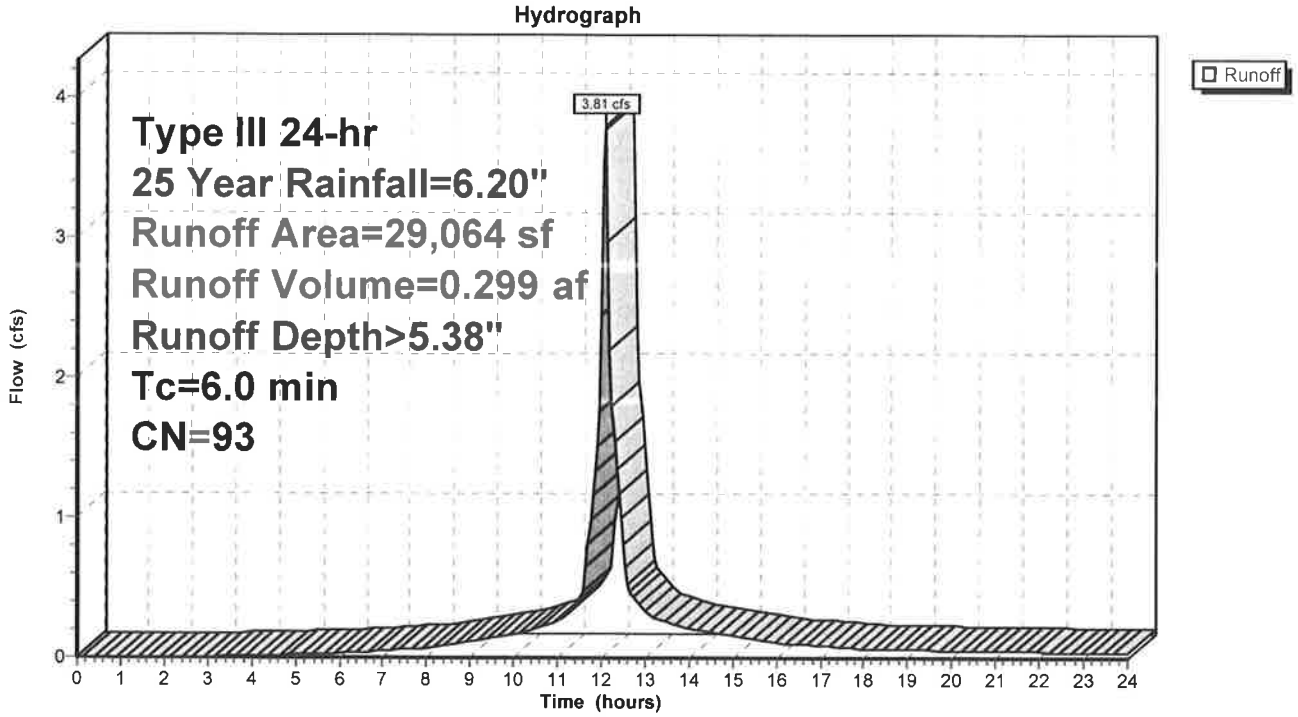
Runoff = 3.81 cfs @ 12.09 hrs, Volume= 0.299 af, Depth> 5.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 2,631 | 39 | >75% Grass cover, Good, HSG A |
| * | 26,433 | 98 | |
| | 29,064 | 93 | Weighted Average |
| | 2,631 | | 9.05% Pervious Area |
| | 26,433 | | 90.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-1: Paved parking area behind existing building



## Summary for Subcatchment EX-2: Concrete Sidewalk along Washington St.

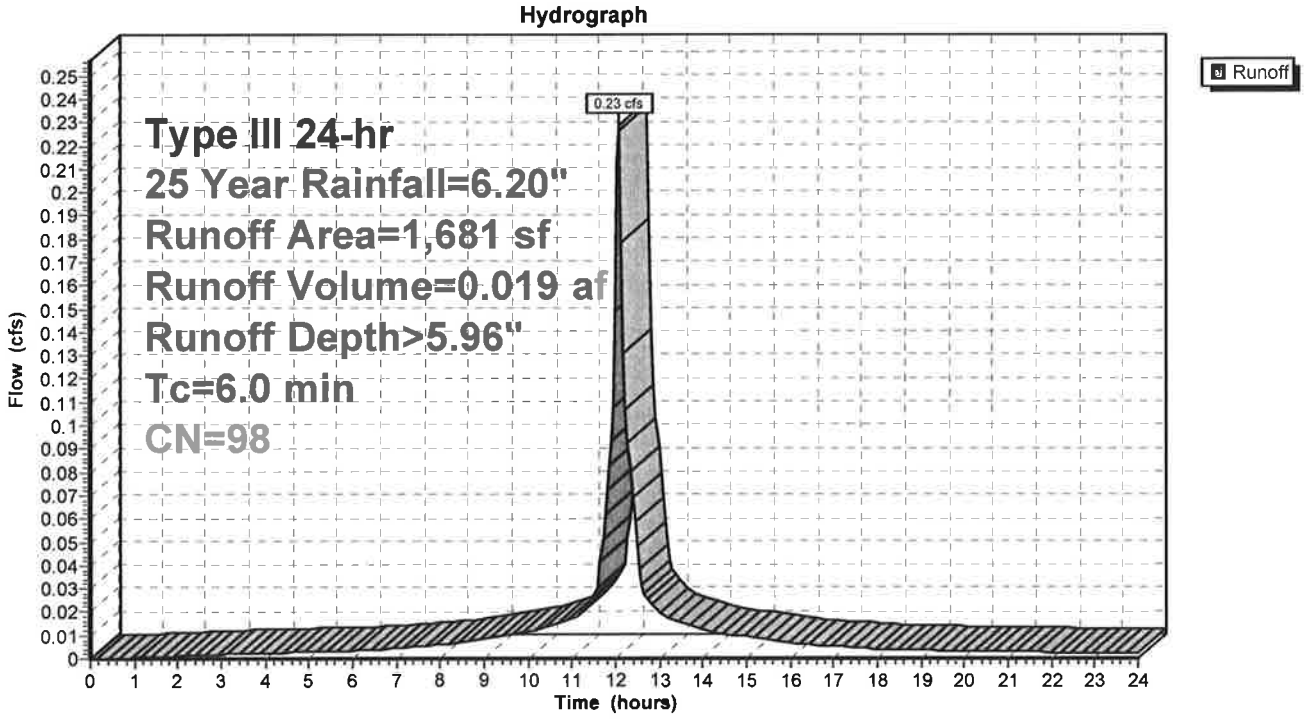
Runoff = 0.23 cfs @ 12.09 hrs, Volume= 0.019 af, Depth> 5.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 1,681 | 98 | concrete sidewalk |
| | 1,681 | | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-2: Concrete Sidewalk along Washington St.



## Summary for Subcatchment EX-3: Paved parking area along Swanton St.

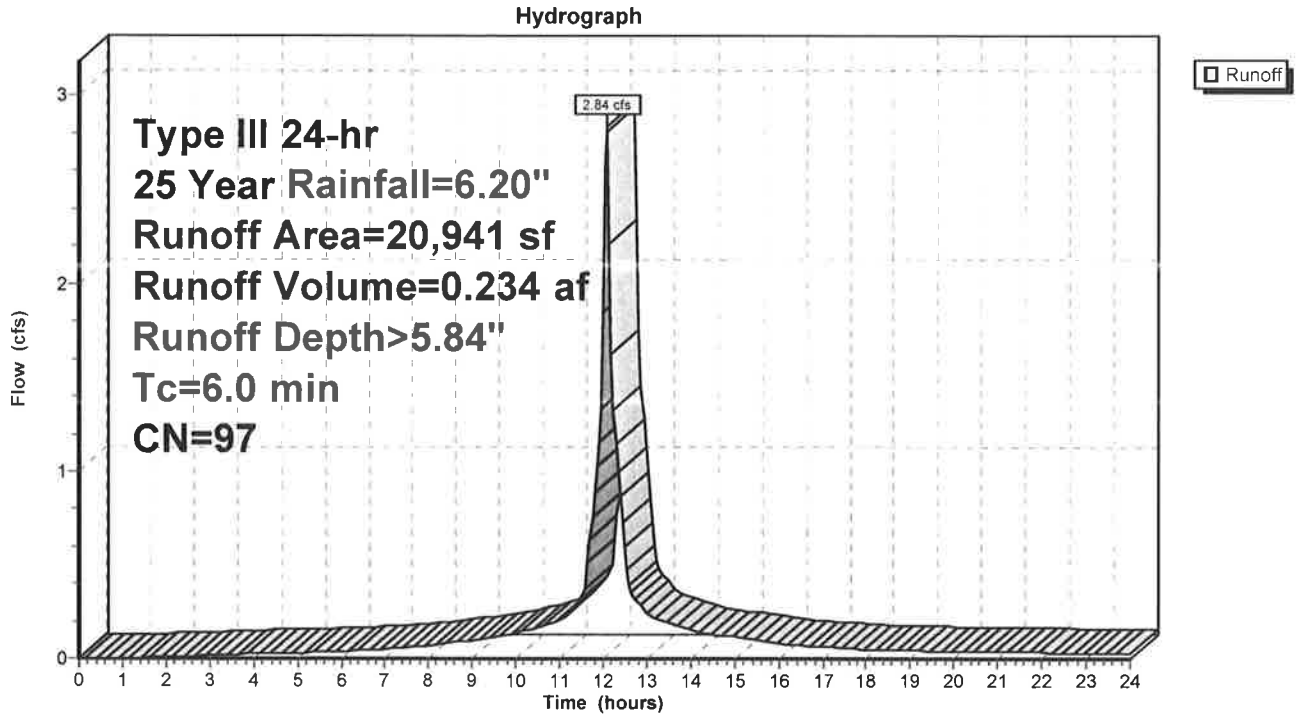
Runoff = 2.84 cfs @ 12.09 hrs, Volume= 0.234 af, Depth> 5.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 349 | 39 | >75% Grass cover, Good, HSG A |
| * | 20,592 | 98 | |
| | 20,941 | 97 | Weighted Average |
| | 349 | | 1.67% Pervious Area |
| | 20,592 | | 98.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-3: Paved parking area along Swanton St.

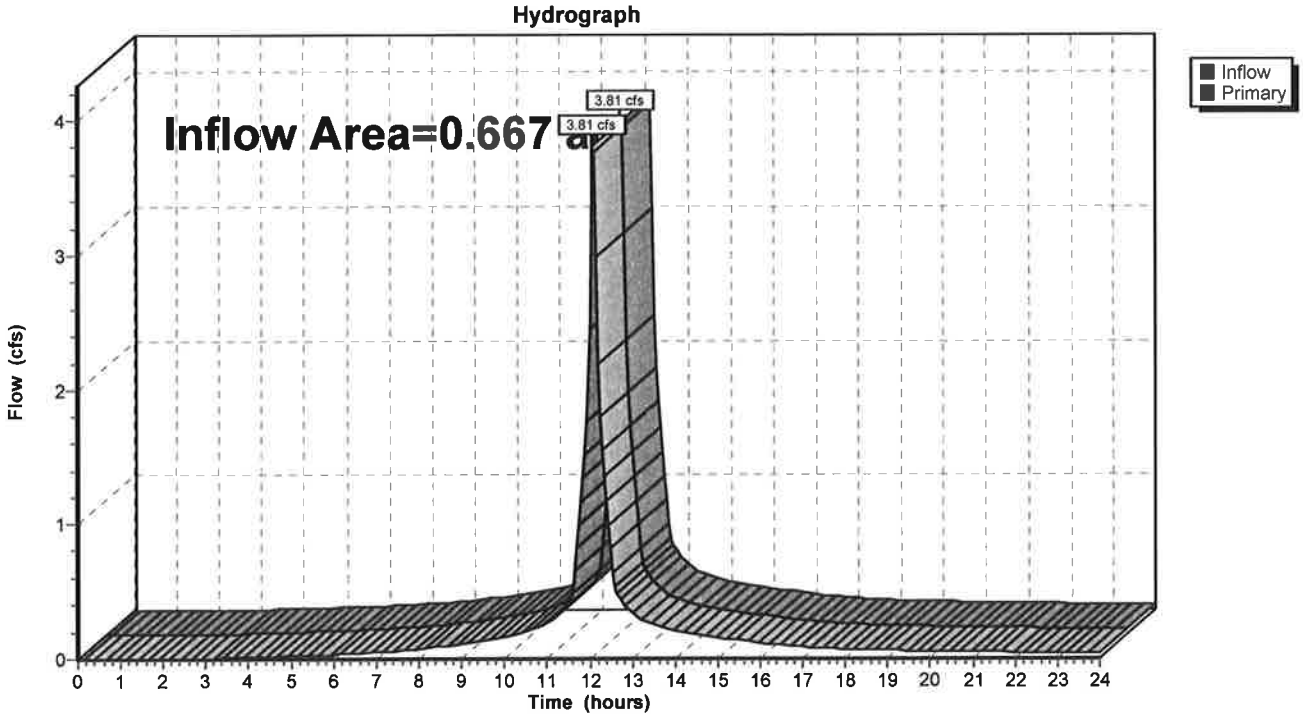


## Summary for Link POA-A: Along western property line

Inflow Area = 0.667 ac, 90.95% Impervious, Inflow Depth > 5.38" for 25 Year event
Inflow = 3.81 cfs @ 12.09 hrs, Volume= 0.299 af
Primary = 3.81 cfs @ 12.09 hrs, Volume= 0.299 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-A: Along western property line

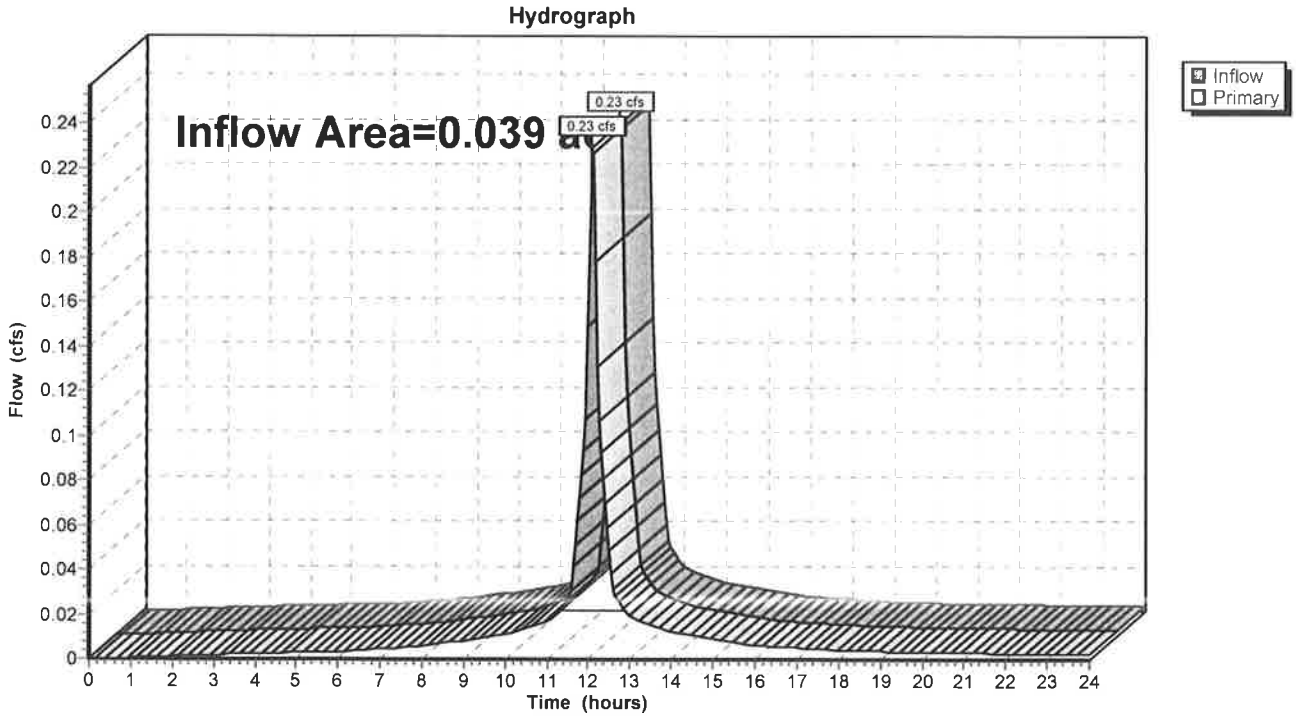


## Summary for Link POA-B: Washington Street

Inflow Area = 0.039 ac,100.00% Impervious, Inflow Depth > 5.96" for 25 Year event
Inflow = 0.23 cfs @ 12.09 hrs, Volume= 0.019 af
Primary = 0.23 cfs @ 12.09 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-B: Washington Street

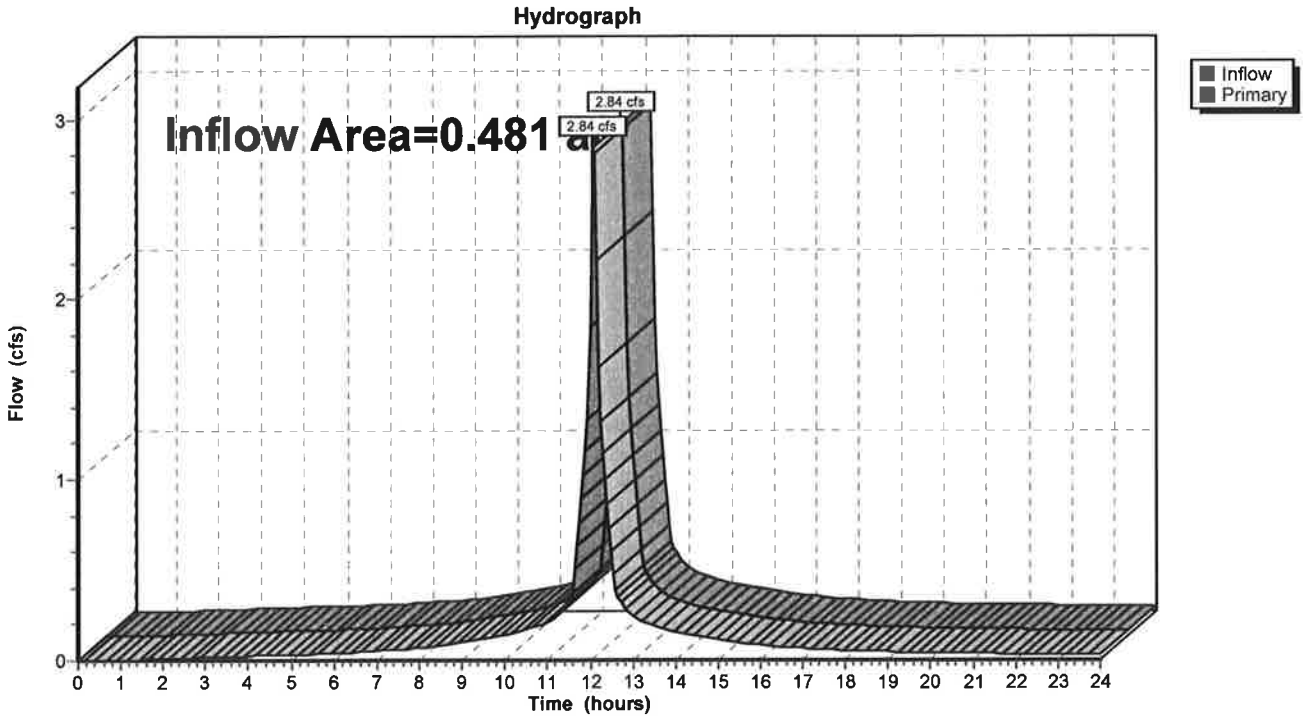


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.481 ac, 98.33% Impervious, Inflow Depth > 5.84" for 25 Year event
Inflow = 2.84 cfs @ 12.09 hrs, Volume= 0.234 af
Primary = 2.84 cfs @ 12.09 hrs, Volume= 0.234 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-C: Swanton Street



Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment EX-1: Paved parking area** Runoff Area=29,064 sf 90.95% Impervious Runoff Depth>8.05"
Tc=6.0 min CN=93 Runoff=5.58 cfs 0.448 af

**Subcatchment EX-2: Concrete Sidewalk** Runoff Area=1,681 sf 100.00% Impervious Runoff Depth>8.65"
Tc=6.0 min CN=98 Runoff=0.33 cfs 0.028 af

**Subcatchment EX-3: Paved parking area** Runoff Area=20,941 sf 98.33% Impervious Runoff Depth>8.53"
Tc=6.0 min CN=97 Runoff=4.09 cfs 0.342 af

**Link POA-A: Along western property line** Inflow=5.58 cfs 0.448 af
Primary=5.58 cfs 0.448 af

**Link POA-B: Washington Street** Inflow=0.33 cfs 0.028 af
Primary=0.33 cfs 0.028 af

**Link POA-C: Swanton Street** Inflow=4.09 cfs 0.342 af
Primary=4.09 cfs 0.342 af

**Total Runoff Area = 1.187 ac Runoff Volume = 0.817 af Average Runoff Depth = 8.27"**
**5.77% Pervious = 0.068 ac 94.23% Impervious = 1.118 ac**

## Summary for Subcatchment EX-1: Paved parking area behind existing building

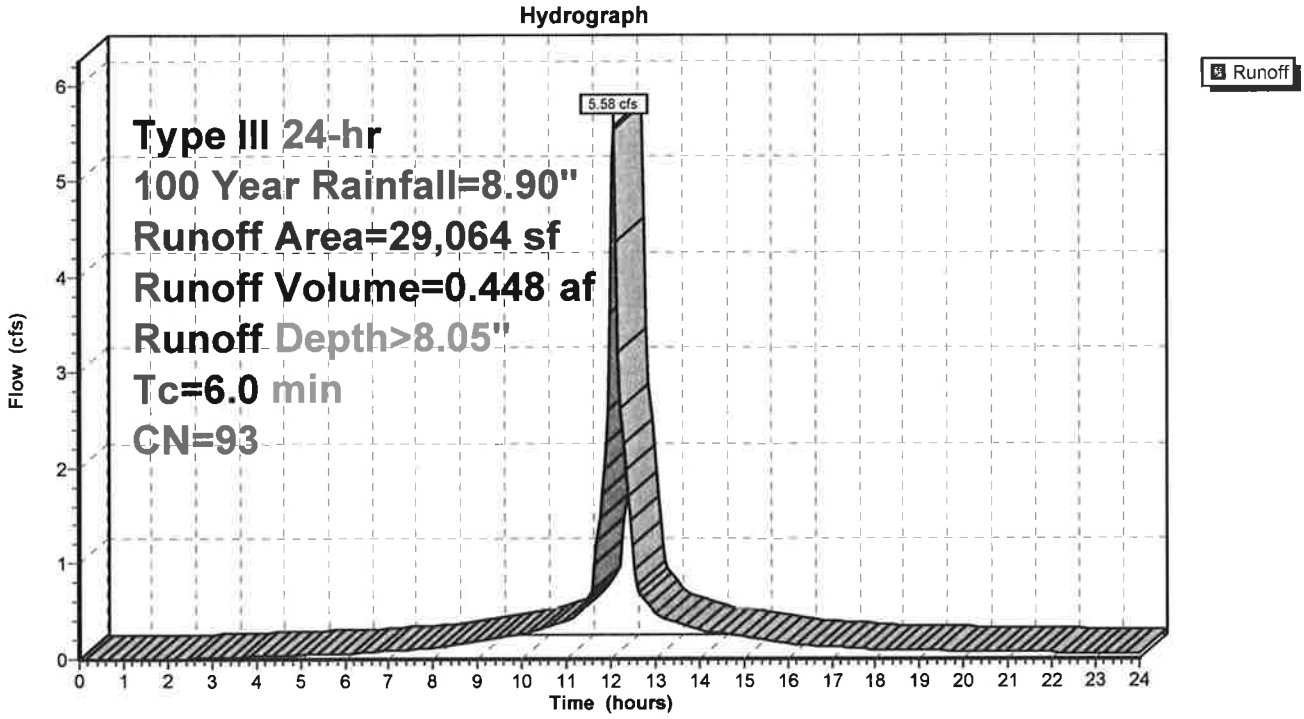
Runoff = 5.58 cfs @ 12.09 hrs, Volume= 0.448 af, Depth> 8.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 2,631 | 39 | >75% Grass cover, Good, HSG A |
| * | 26,433 | 98 | |
| | 29,064 | 93 | Weighted Average |
| | 2,631 | | 9.05% Pervious Area |
| | 26,433 | | 90.95% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-1: Paved parking area behind existing building



## Summary for Subcatchment EX-2: Concrete Sidewalk along Washington St.

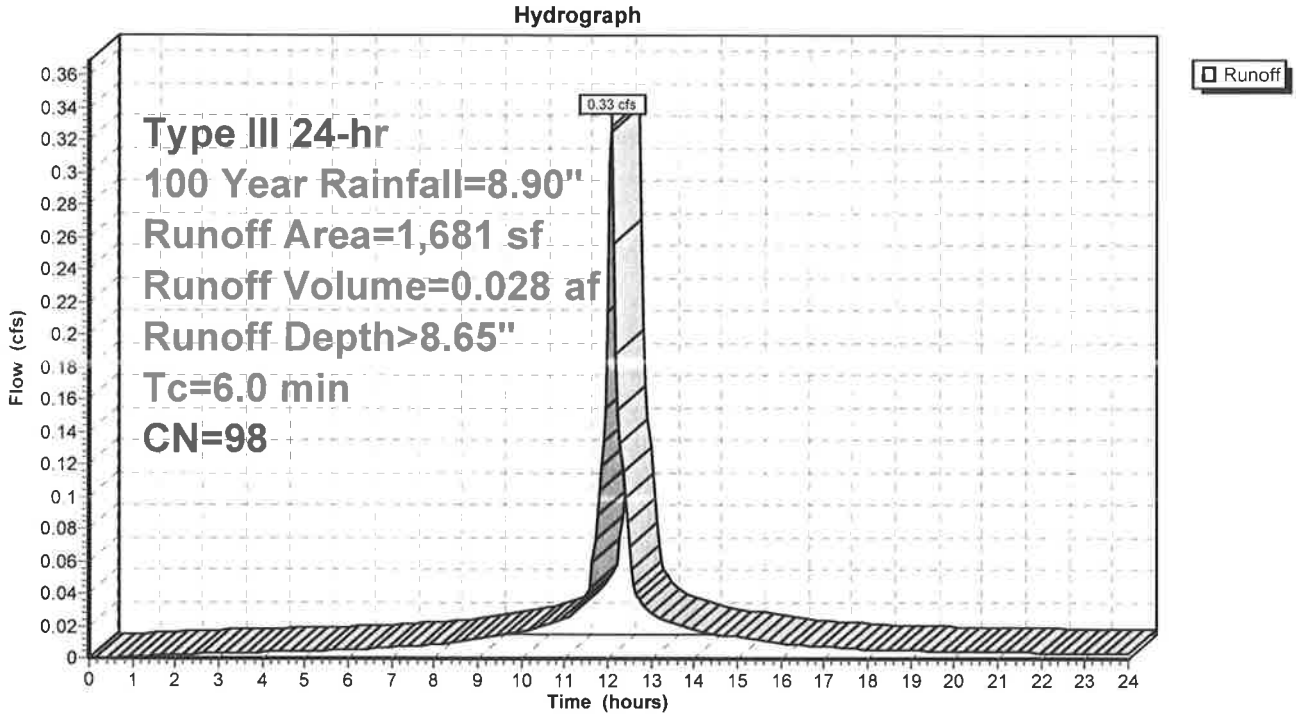
Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.028 af, Depth> 8.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| | Area (sf) | CN | Description |
|---|---|---|---|
| * | 1,681 | 98 | concrete sidewalk |
| | 1,681 | | 100.00% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-2: Concrete Sidewalk along Washington St.



## Summary for Subcatchment EX-3: Paved parking area along Swanton St.

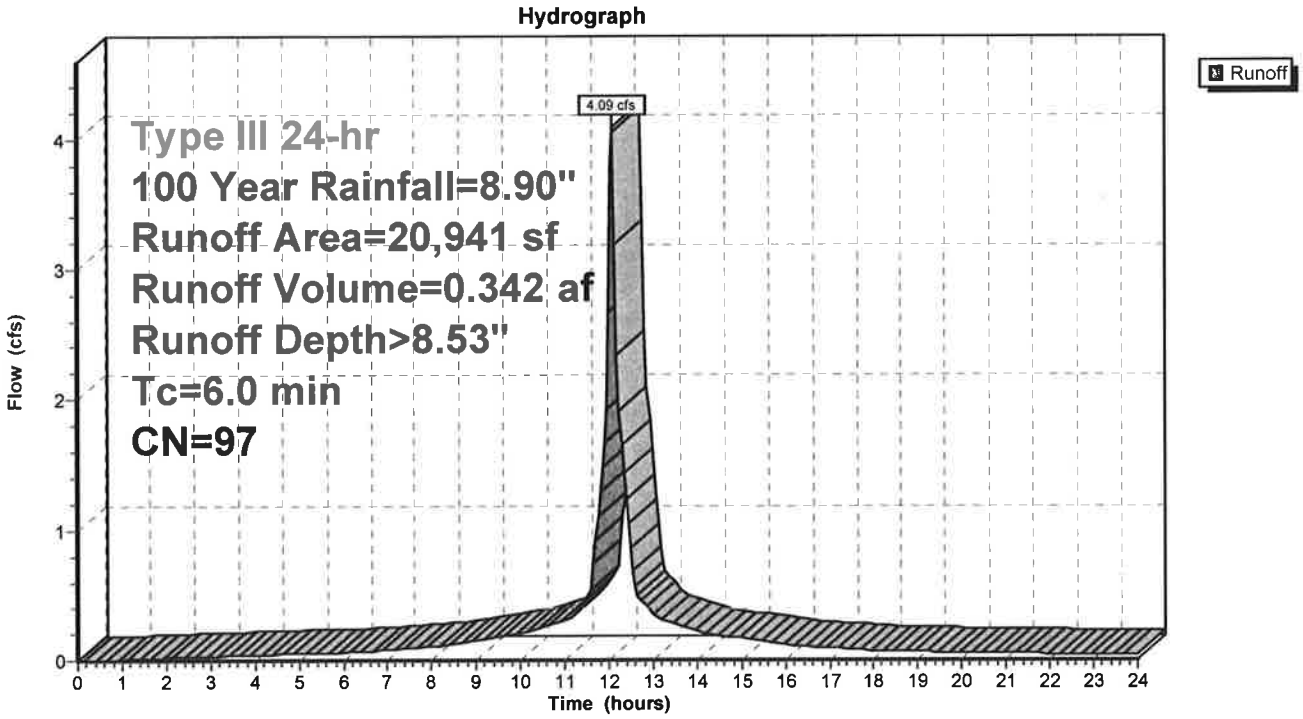
Runoff = 4.09 cfs @ 12.09 hrs, Volume= 0.342 af, Depth> 8.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| | Area (sf) | CN | Description |
|---|---|---|---|
| | 349 | 39 | >75% Grass cover, Good, HSG A |
| * | 20,592 | 98 | |
| | 20,941 | 97 | Weighted Average |
| | 349 | | 1.67% Pervious Area |
| | 20,592 | | 98.33% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment EX-3: Paved parking area along Swanton St.

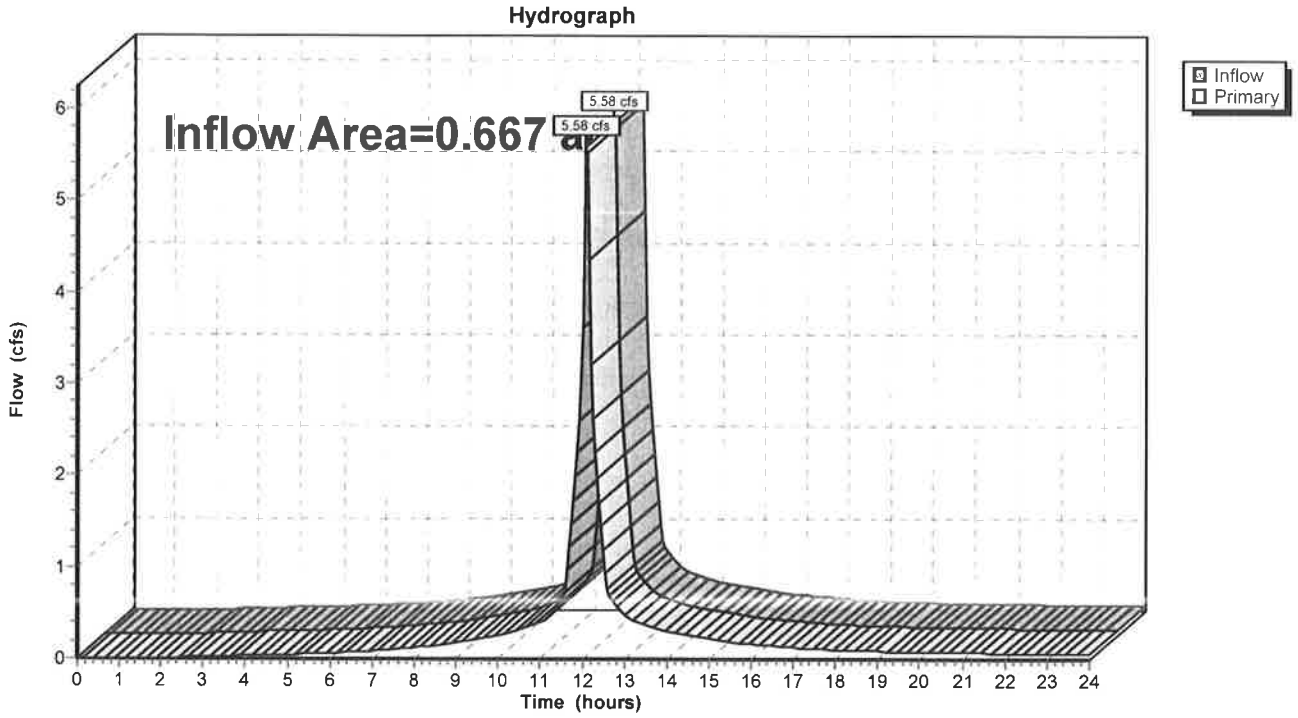


## Summary for Link POA-A: Along western property line

Inflow Area = 0.667 ac, 90.95% Impervious, Inflow Depth > 8.05" for 100 Year event
Inflow = 5.58 cfs @ 12.09 hrs, Volume= 0.448 af
Primary = 5.58 cfs @ 12.09 hrs, Volume= 0.448 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

## Link POA-A: Along western property line

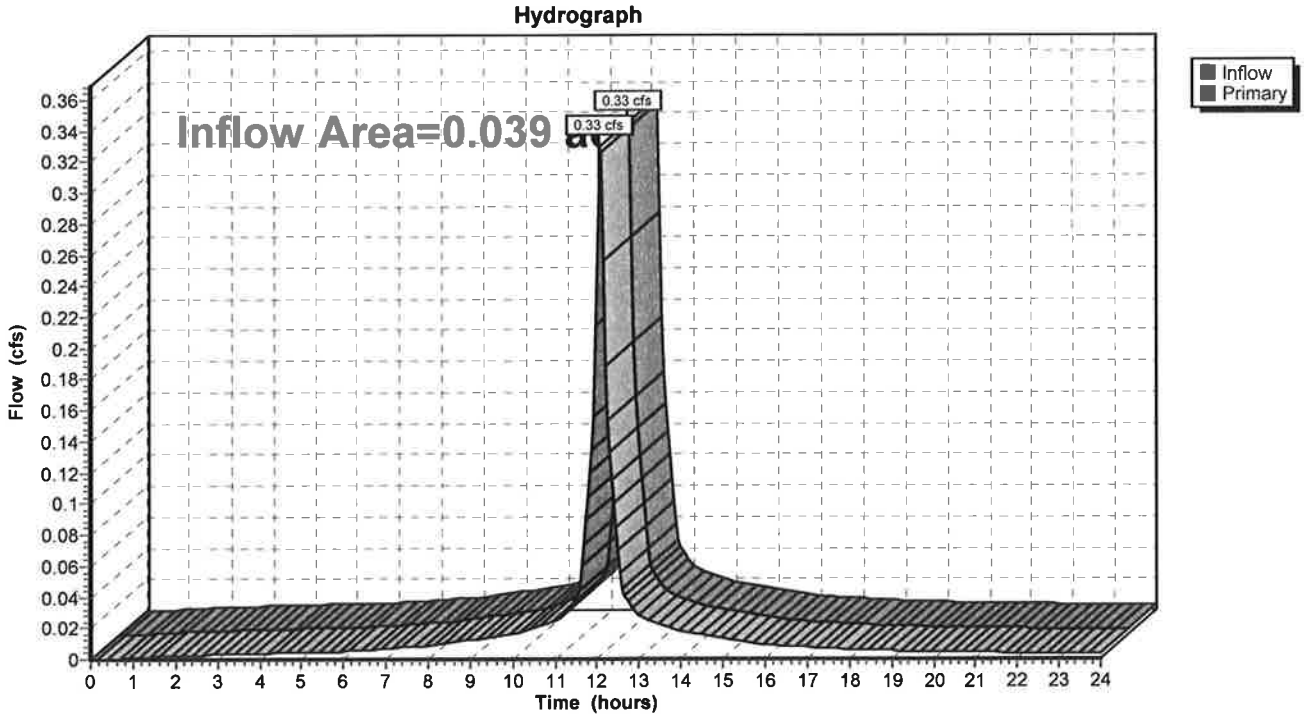


## Summary for Link POA-B: Washington Street

Inflow Area = 0.039 ac,100.00% Impervious, Inflow Depth > 8.65" for 100 Year event
Inflow = 0.33 cfs @ 12.09 hrs, Volume= 0.028 af
Primary = 0.33 cfs @ 12.09 hrs, Volume= 0.028 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-B: Washington Street

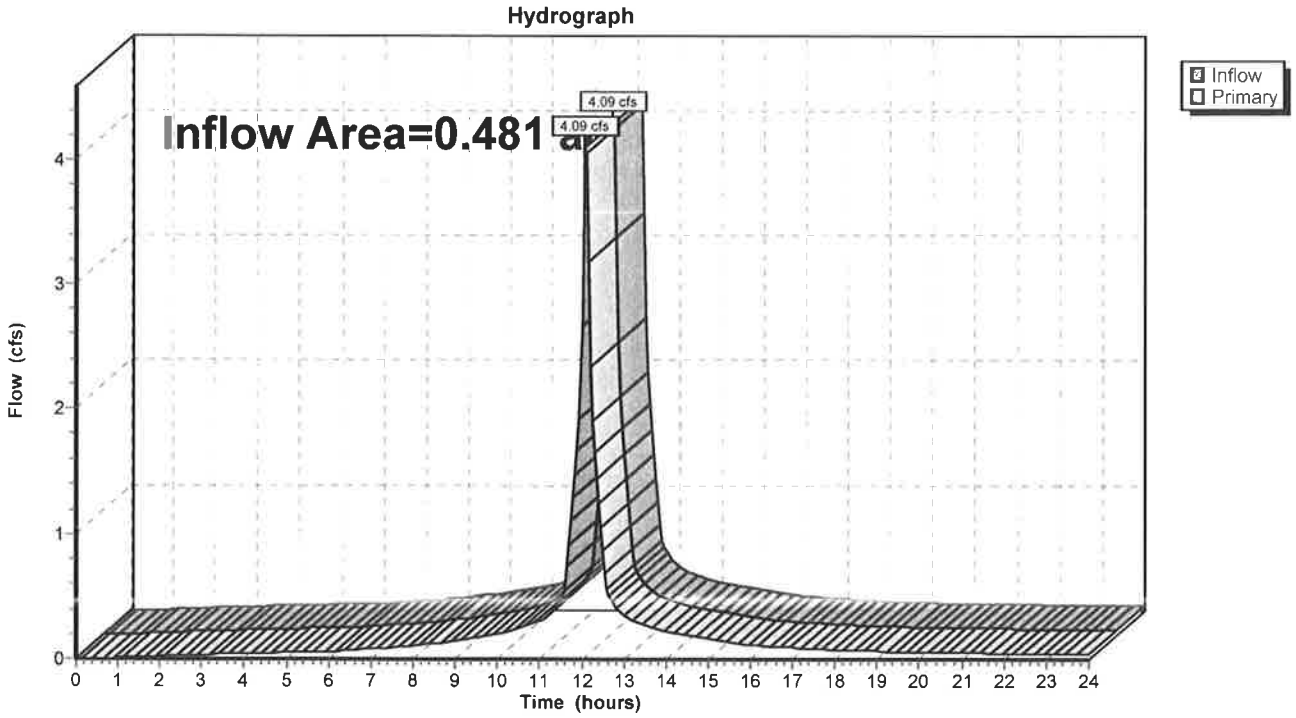


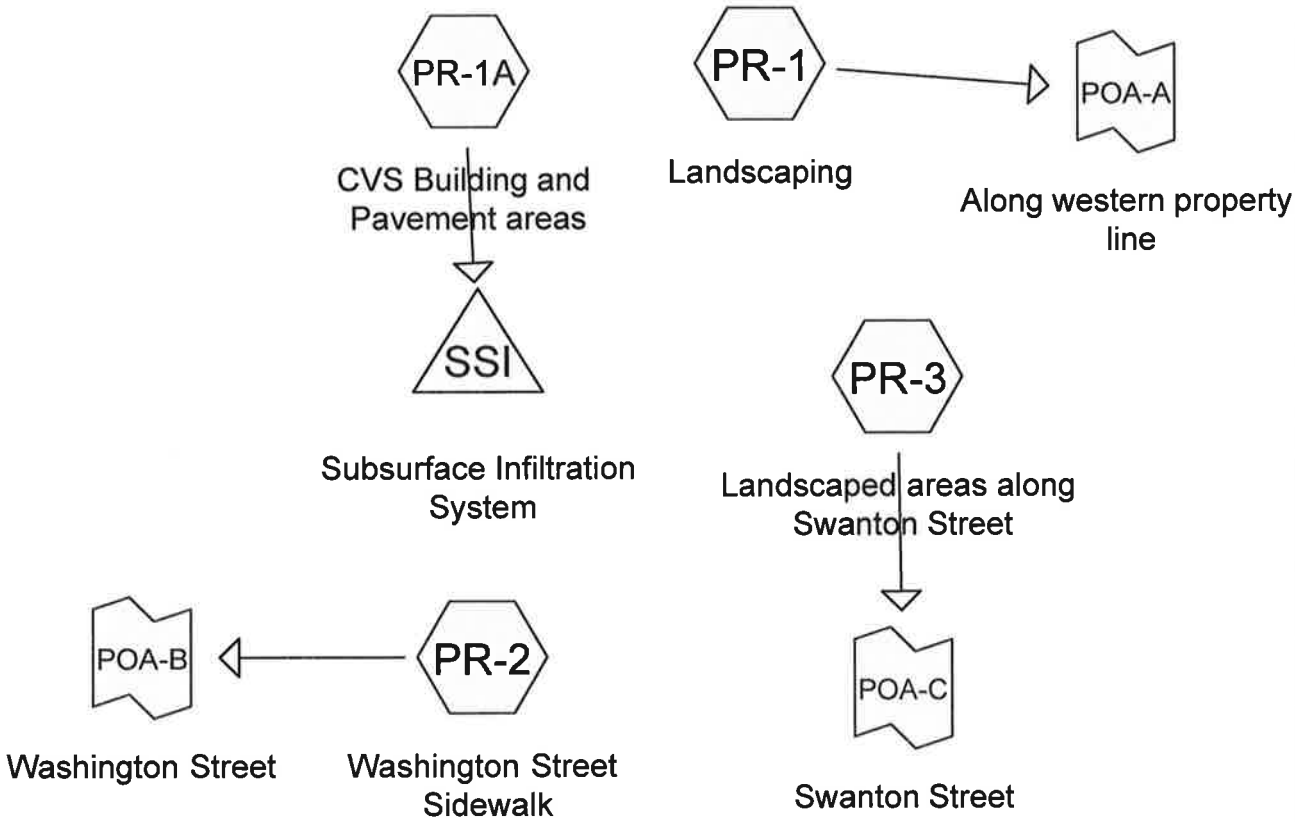
## Summary for Link POA-C: Swanton Street

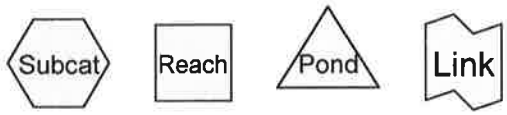
Inflow Area = 0.481 ac, 98.33% Impervious, Inflow Depth > 8.53" for 100 Year event
Inflow = 4.09 cfs @ 12.09 hrs, Volume= 0.342 af
Primary = 4.09 cfs @ 12.09 hrs, Volume= 0.342 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs

### Link POA-C: Swanton Street






**Routing Diagram for Post development**
Prepared by {enter your company name here}, Printed 5/30/2013
HydroCAD® 10.00 s/n 04881 © 2011 HydroCAD Software Solutions LLC

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.251 | 39 | >75% Grass cover, Good, HSG A (PR-1, PR-1A, PR-2, PR-3) |
| 0.023 | 98 | Pavement (PR-2) |
| 0.643 | 98 | pavement (PR-1A) |
| 0.274 | 98 | roof (PR-1A) |
| **1.191** | **86** | **TOTAL AREA** |

## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 0.251 | HSG A | PR-1, PR-1A, PR-2, PR-3 |
| 0.000 | HSG B | |
| 0.000 | HSG C | |
| 0.000 | HSG D | |
| 0.940 | Other | PR-1A, PR-2 |
| **1.191** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.251 | 0.000 | 0.000 | 0.000 | 0.000 | 0.251 | >75% Grass cover, Good | PR-1, PR-1A, PR-2, PR-3 |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.023 | 0.023 | Pavement | PR-2 |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.643 | 0.643 | pavement | PR-1A |
| 0.000 | 0.000 | 0.000 | 0.000 | 0.274 | 0.274 | roof | PR-1A |
| **0.251** | **0.000** | **0.000** | **0.000** | **0.940** | **1.191** | **TOTAL AREA** | |

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment PR-1: Landscaping** Runoff Area=0.050 ac 0.00% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Subcatchment PR-1A: CVS Building and** Runoff Area=1.107 ac 82.84% Impervious Runoff Depth>1.99"
Tc=6.0 min CN=88 Runoff=2.58 cfs 0.184 af

**Subcatchment PR-2: Washington Street** Runoff Area=0.024 ac 95.83% Impervious Runoff Depth>2.75"
Tc=6.0 min CN=96 Runoff=0.07 cfs 0.005 af

**Subcatchment PR-3: Landscaped areas** Runoff Area=0.010 ac 0.00% Impervious Runoff Depth>0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Pond SSI: Subsurface Infiltration System** Peak Elev=41.07' Storage=3,307 cf Inflow=2.58 cfs 0.184 af
Outflow=0.21 cfs 0.184 af

**Link POA-A: Along western property line** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Link POA-B: Washington Street** Inflow=0.07 cfs 0.005 af
Primary=0.07 cfs 0.005 af

**Link POA-C: Swanton Street** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Total Runoff Area = 1.191 ac Runoff Volume = 0.190 af Average Runoff Depth = 1.91"**
**21.07% Pervious = 0.251 ac 78.93% Impervious = 0.940 ac**

## Summary for Subcatchment PR-1: Landscaping

[73] Warning: Peak may fall outside time span

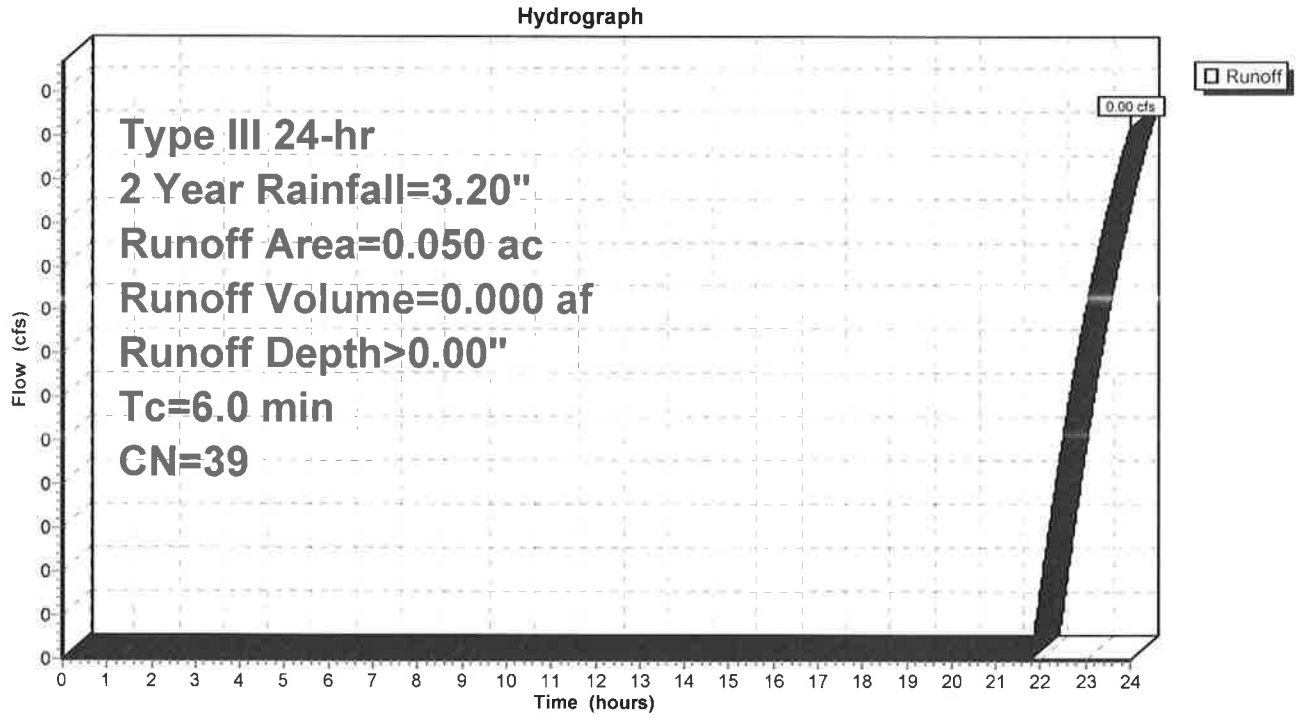
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| Area (ac) | CN | Description |
|---|---|---|
| 0.050 | 39 | >75% Grass cover, Good, HSG A |
| 0.050 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1: Landscaping



## Summary for Subcatchment PR-1A: CVS Building and Pavement areas

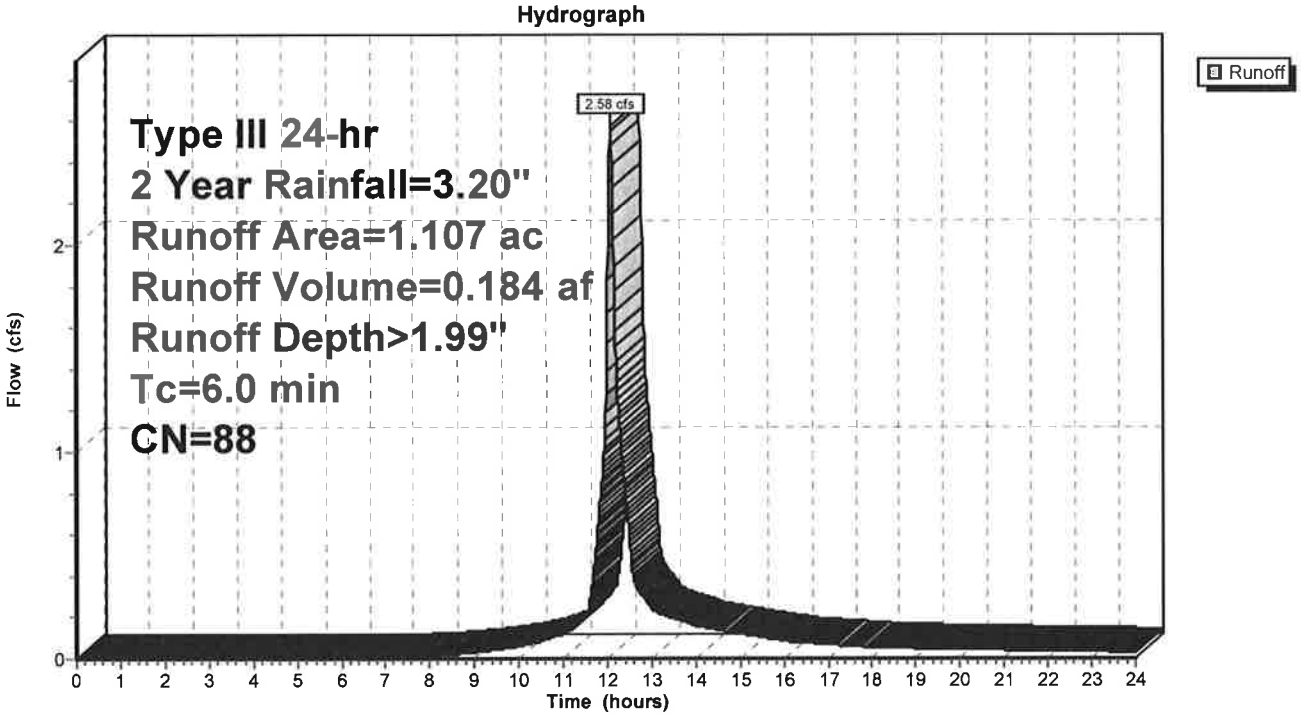
Runoff = 2.58 cfs @ 12.09 hrs, Volume= 0.184 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 0.643 | 98 | pavement |
| | 0.190 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.274 | 98 | roof |
| | 1.107 | 88 | Weighted Average |
| | 0.190 | | 17.16% Pervious Area |
| | 0.917 | | 82.84% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1A: CVS Building and Pavement areas



## Summary for Subcatchment PR-2: Washington Street Sidewalk

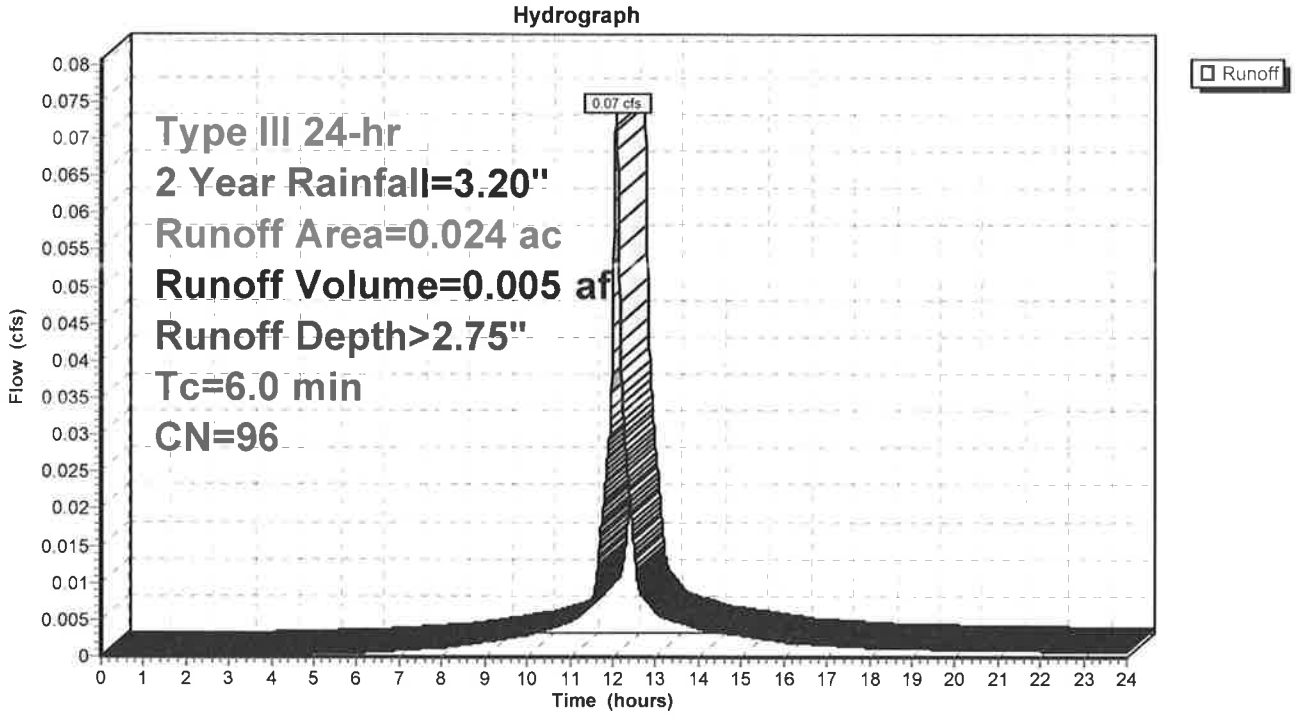
Runoff = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Depth> 2.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| | Area (ac) | CN | Description |
|---|---|---|---|
| | 0.001 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.023 | 98 | Pavement |
| | 0.024 | 96 | Weighted Average |
| | 0.001 | | 4.17% Pervious Area |
| | 0.023 | | 95.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-2: Washington Street Sidewalk



## Summary for Subcatchment PR-3: Landscaped areas along Swanton Street

[73] Warning: Peak may fall outside time span

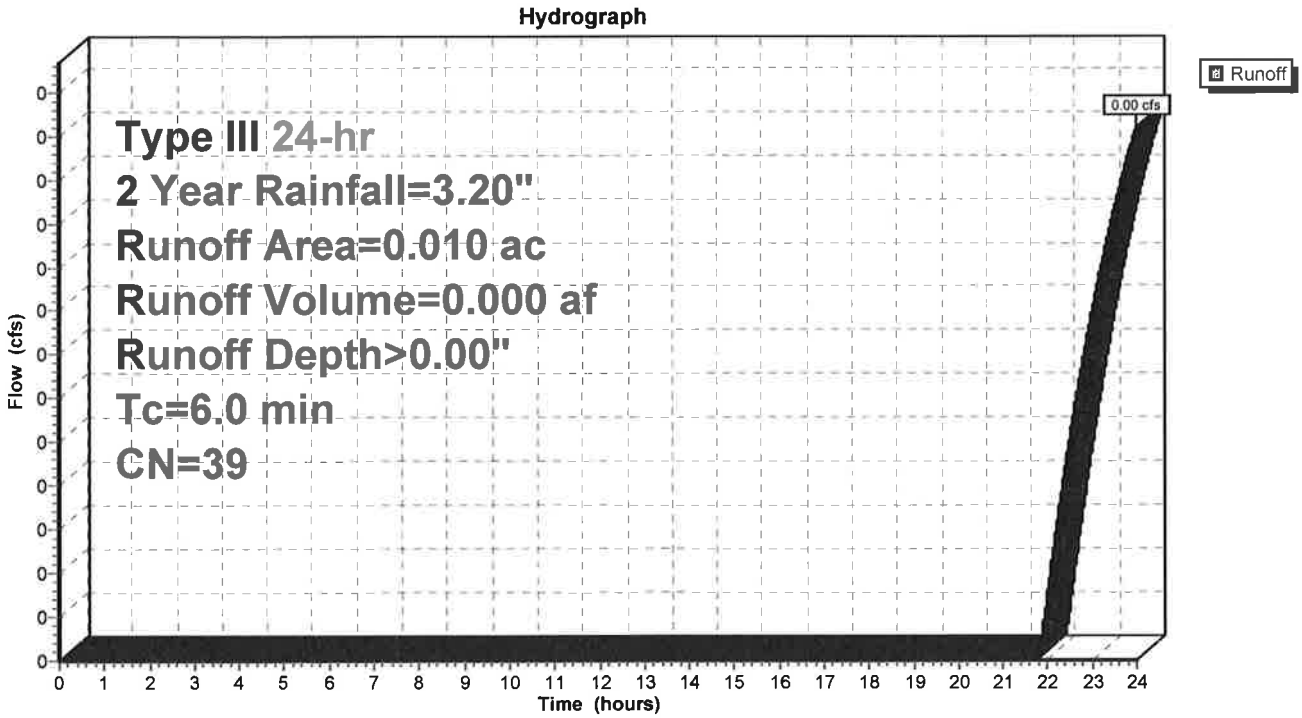
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth> 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

| Area (ac) | CN | Description |
|---|---|---|
| 0.010 | 39 | >75% Grass cover, Good, HSG A |
| 0.010 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-3: Landscaped areas along Swanton Street



## Summary for Pond SSI: Subsurface Infiltration System

Inflow Area = 1.107 ac, 82.84% Impervious, Inflow Depth > 1.99" for 2 Year event
Inflow = 2.58 cfs @ 12.09 hrs, Volume= 0.184 af
Outflow = 0.21 cfs @ 11.63 hrs, Volume= 0.184 af, Atten= 92%, Lag= 0.0 min
Discarded = 0.21 cfs @ 11.63 hrs, Volume= 0.184 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 41.07' @ 13.27 hrs Surf.Area= 6,917 sf Storage= 3,307 cf

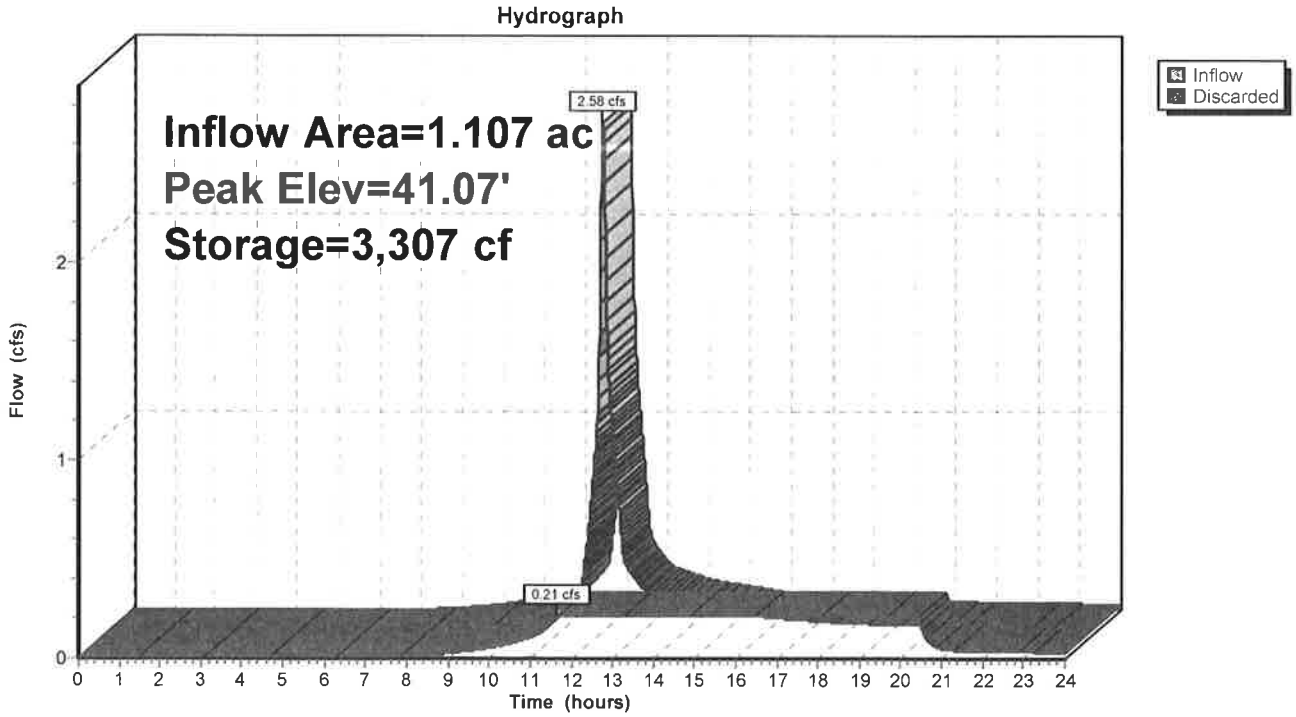
Plug-Flow detention time= 140.4 min calculated for 0.184 af (100% of inflow)
Center-of-Mass det. time= 138.9 min ( 953.3 - 814.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 40.00' | 8,305 cf | **79.50'W x 87.00'L x 6.00'H Prismatoid** |
| | | | 41,499 cf Overall - 17,770 cf Embedded = 23,729 cf x 35.0% Voids |
| #2 | 40.50' | 14,726 cf | **60.0" D x 75.0'L Pipe Storage** x 10 Inside #1 |
| #3 | 40.50' | 3,043 cf | **60.0" D x 77.5'L Pipe Storage** x 2 Inside #1 |
| | | 26,075 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 40.00' | **1.305 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.21 cfs @ 11.63 hrs HW=40.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

## Pond SSI: Subsurface Infiltration System

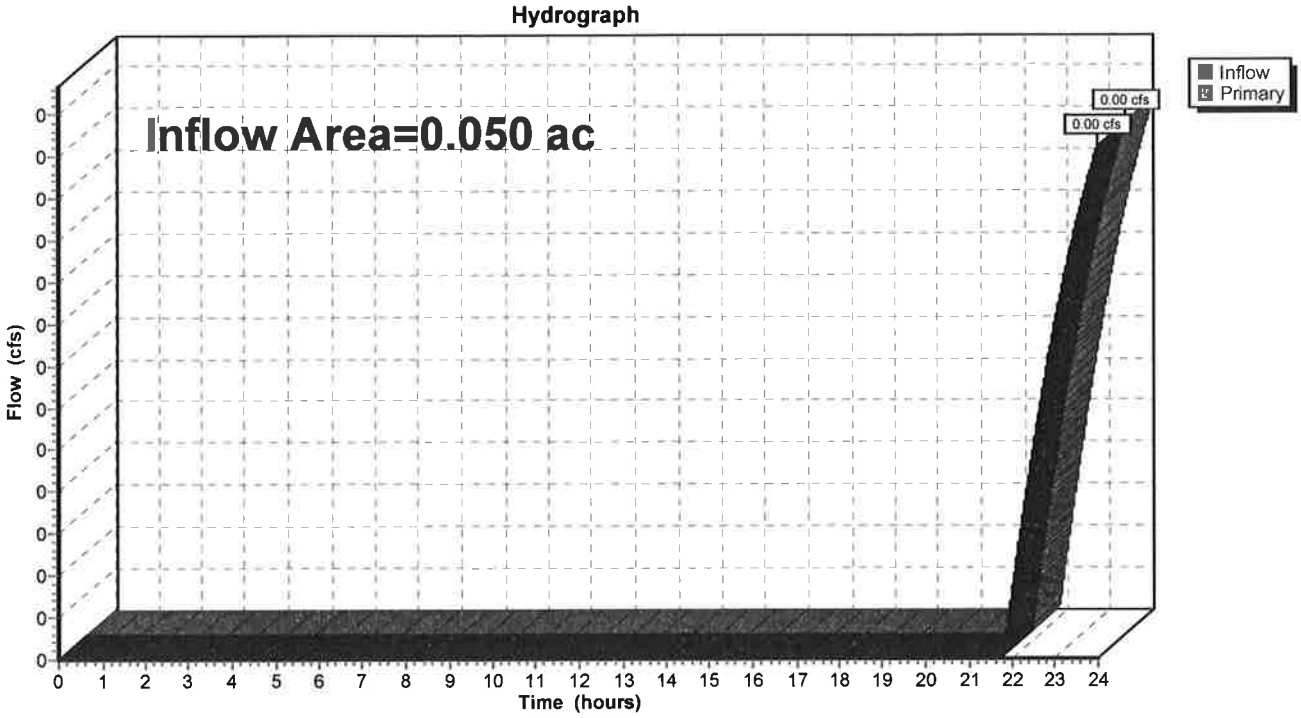


## Summary for Link POA-A: Along western property line

Inflow Area = 0.050 ac, 0.00% Impervious, Inflow Depth > 0.00" for 2 Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-A: Along western property line

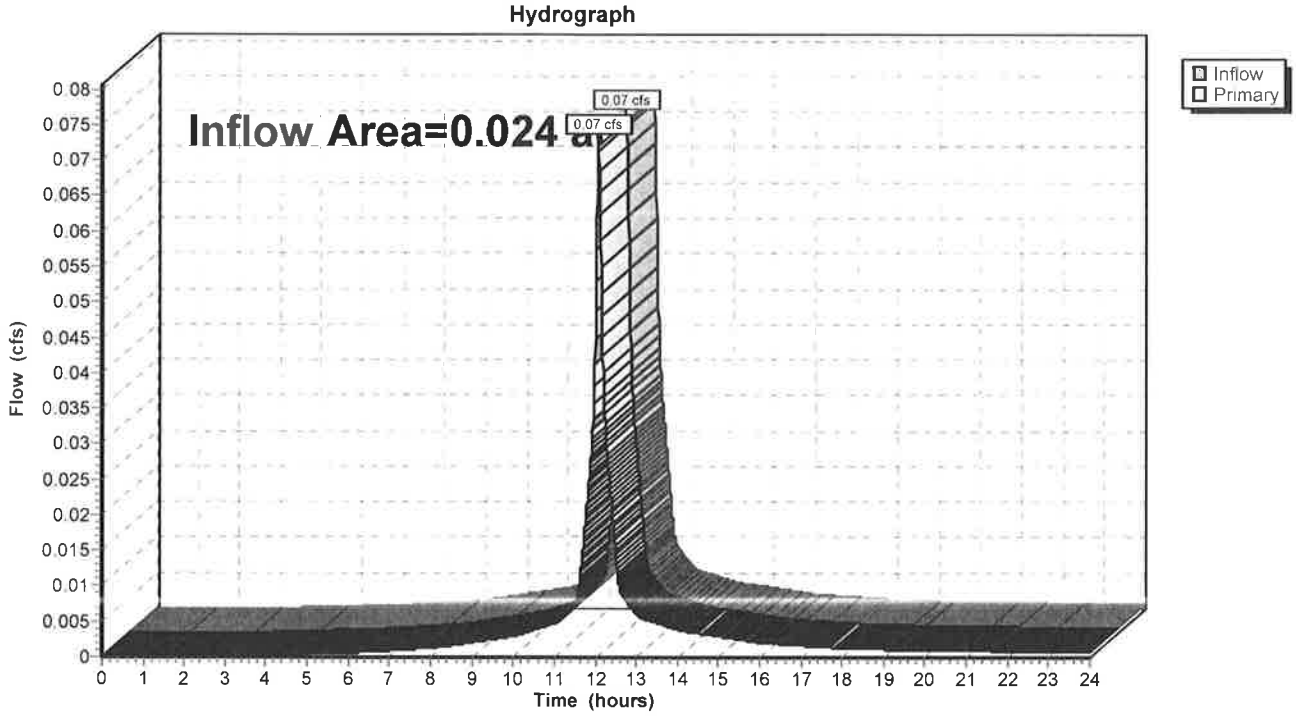


## Summary for Link POA-B: Washington Street

Inflow Area = 0.024 ac, 95.83% Impervious, Inflow Depth > 2.75" for 2 Year event
Inflow = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af
Primary = 0.07 cfs @ 12.08 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-B: Washington Street

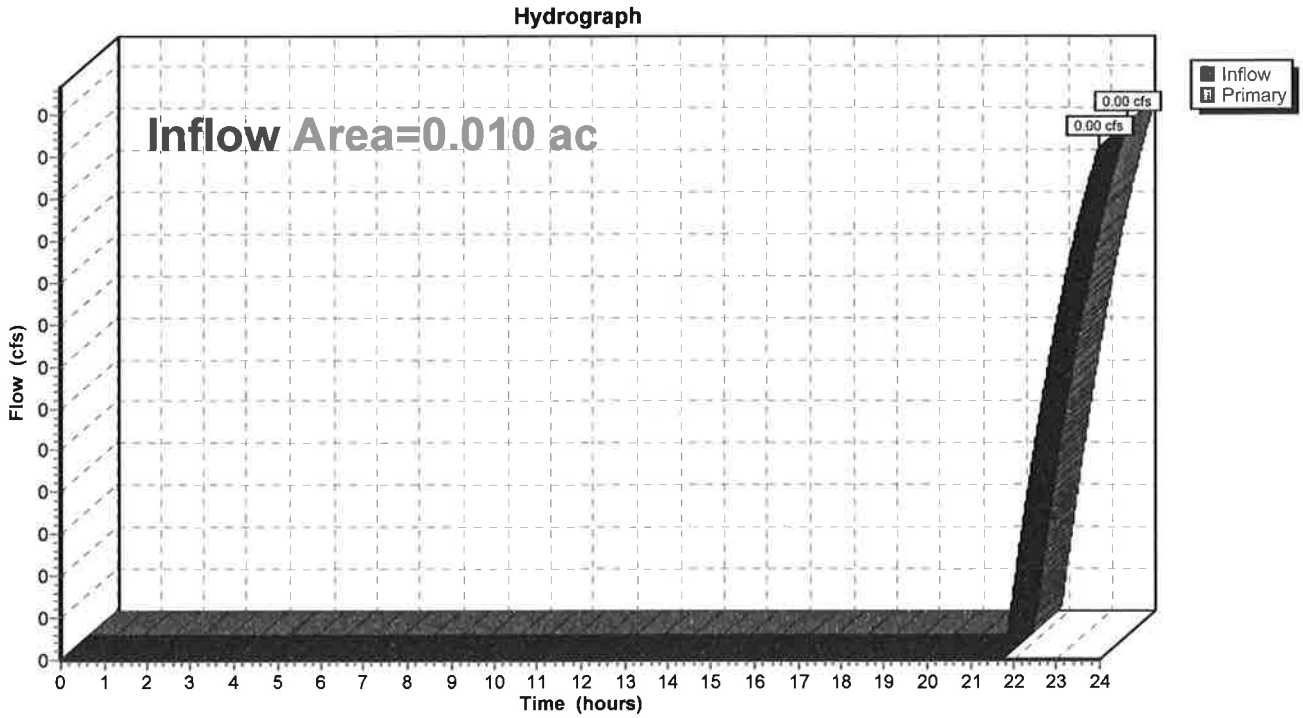


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth > 0.00" for 2 Year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-C: Swanton Street



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment PR-1: Landscaping** Runoff Area=0.050 ac 0.00% Impervious Runoff Depth>0.18"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.001 af

**Subcatchment PR-1A: CVS Building and** Runoff Area=1.107 ac 82.84% Impervious Runoff Depth>3.57"
Tc=6.0 min CN=88 Runoff=4.54 cfs 0.329 af

**Subcatchment PR-2: Washington Street** Runoff Area=0.024 ac 95.83% Impervious Runoff Depth>4.43"
Tc=6.0 min CN=96 Runoff=0.11 cfs 0.009 af

**Subcatchment PR-3: Landscaped areas** Runoff Area=0.010 ac 0.00% Impervious Runoff Depth>0.18"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Pond SSI: Subsurface Infiltration System** Peak Elev=41.90' Storage=7,264 cf Inflow=4.54 cfs 0.329 af
Outflow=0.21 cfs 0.255 af

**Link POA-A: Along western property line** Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

**Link POA-B: Washington Street** Inflow=0.11 cfs 0.009 af
Primary=0.11 cfs 0.009 af

**Link POA-C: Swanton Street** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Total Runoff Area = 1.191 ac Runoff Volume = 0.339 af Average Runoff Depth = 3.42"**
**21.07% Pervious = 0.251 ac 78.93% Impervious = 0.940 ac**

## Summary for Subcatchment PR-1: Landscaping

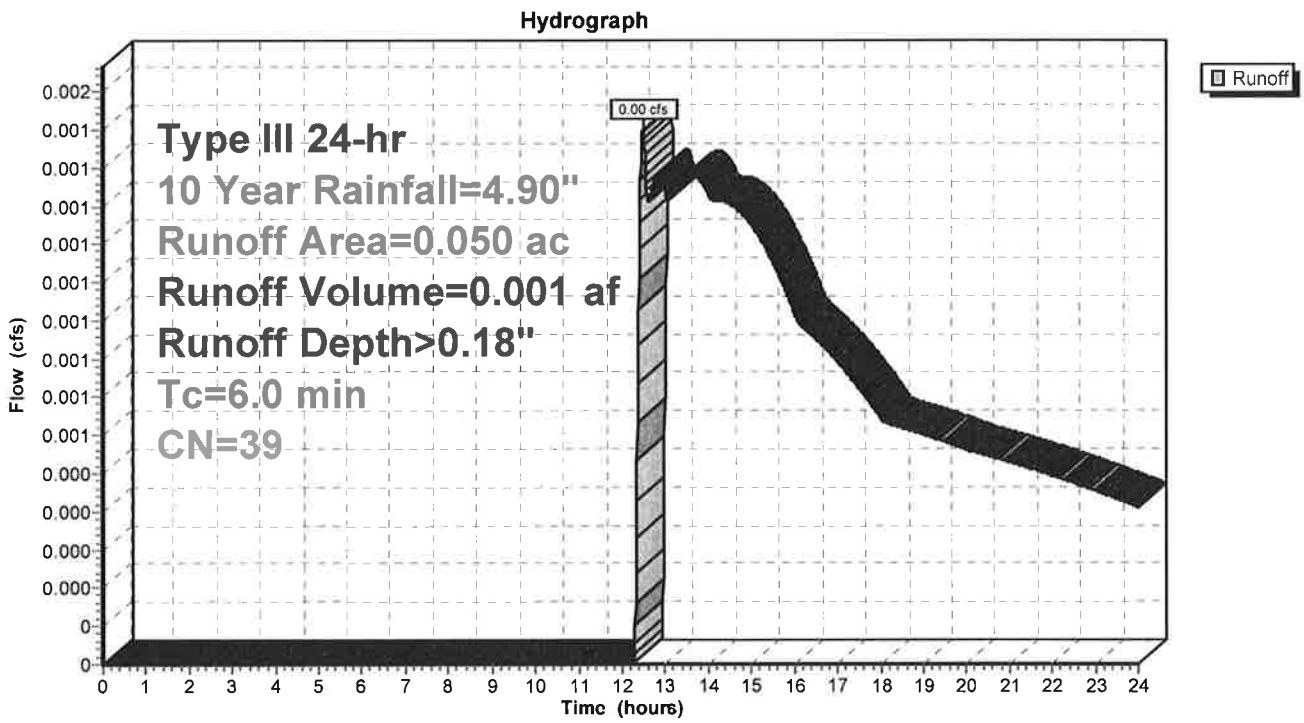
Runoff = 0.00 cfs @ 12.50 hrs, Volume= 0.001 af, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| Area (ac) | CN | Description |
|---|---|---|
| 0.050 | 39 | >75% Grass cover, Good, HSG A |
| 0.050 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1: Landscaping



## Summary for Subcatchment PR-1A: CVS Building and Pavement areas

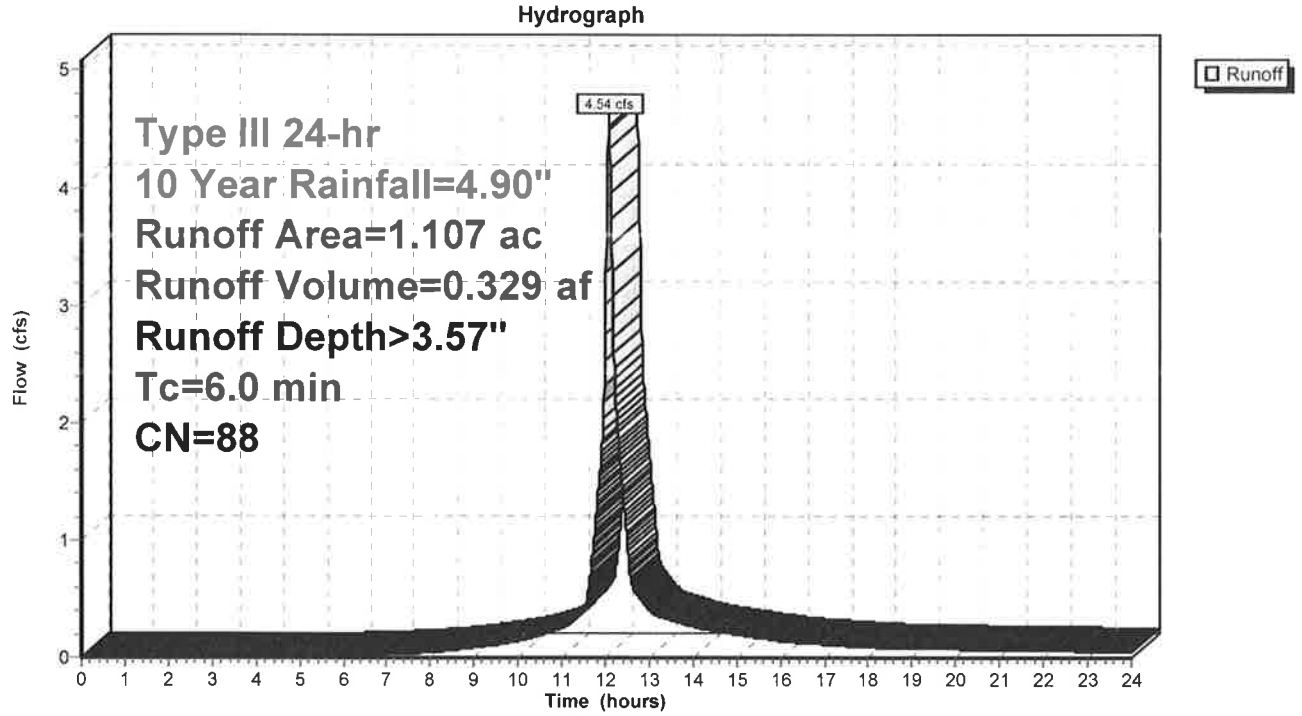
Runoff = 4.54 cfs @ 12.09 hrs, Volume= 0.329 af, Depth> 3.57"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 0.643 | 98 | pavement |
| | 0.190 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.274 | 98 | roof |
| | 1.107 | 88 | Weighted Average |
| | 0.190 | | 17.16% Pervious Area |
| | 0.917 | | 82.84% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1A: CVS Building and Pavement areas



## Summary for Subcatchment PR-2: Washington Street Sidewalk

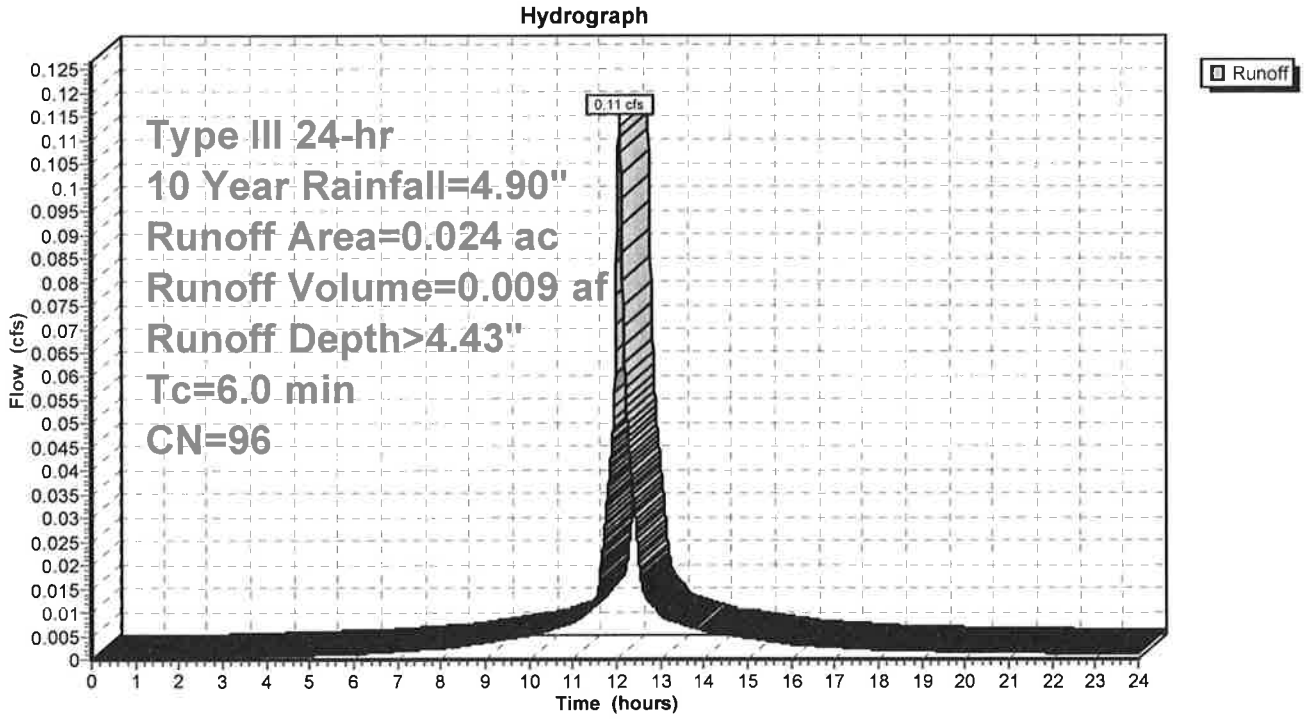
Runoff = 0.11 cfs @ 12.08 hrs, Volume= 0.009 af, Depth> 4.43"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| | Area (ac) | CN | Description |
|---|---|---|---|
| | 0.001 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.023 | 98 | Pavement |
| | 0.024 | 96 | Weighted Average |
| | 0.001 | | 4.17% Pervious Area |
| | 0.023 | | 95.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-2: Washington Street Sidewalk



## Summary for Subcatchment PR-3: Landscaped areas along Swanton Street

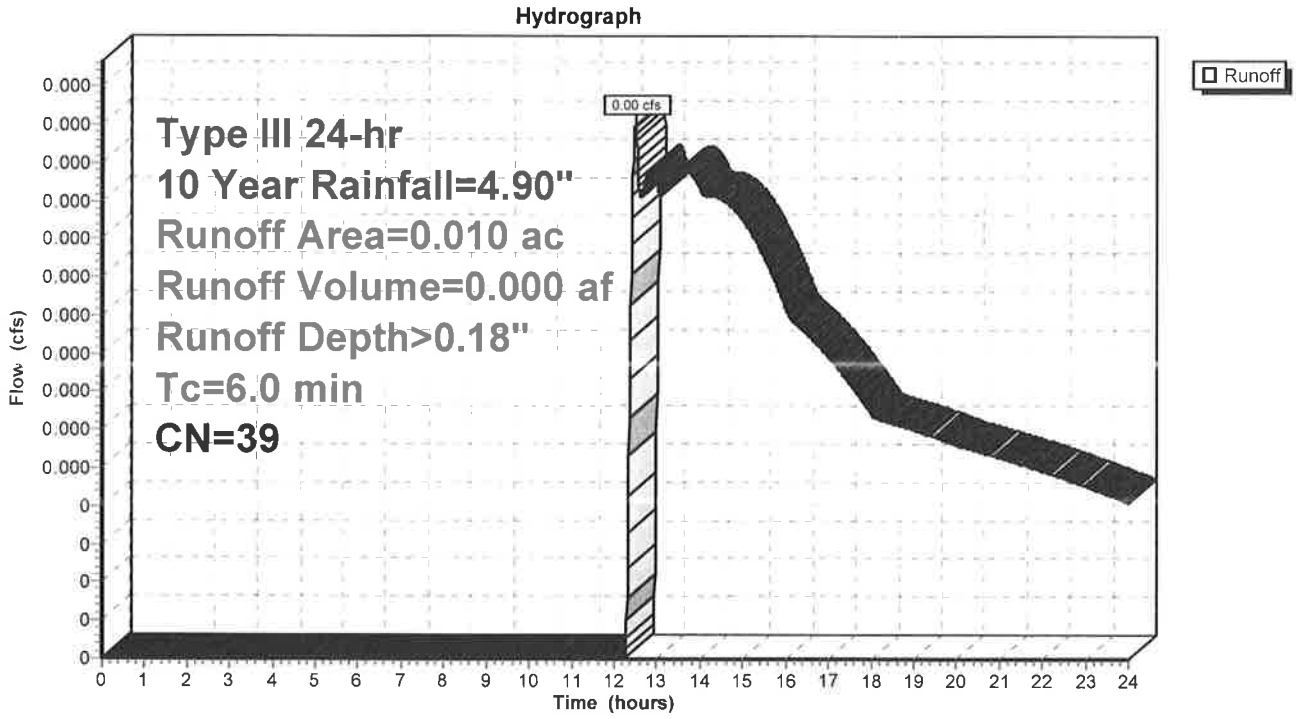
Runoff = 0.00 cfs @ 12.50 hrs, Volume= 0.000 af, Depth> 0.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.90"

| Area (ac) | CN | Description |
|---|---|---|
| 0.010 | 39 | >75% Grass cover, Good, HSG A |
| 0.010 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-3: Landscaped areas along Swanton Street



## Summary for Pond SSI: Subsurface Infiltration System

Inflow Area = 1.107 ac, 82.84% Impervious, Inflow Depth > 3.57" for 10 Year event
Inflow = 4.54 cfs @ 12.09 hrs, Volume= 0.329 af
Outflow = 0.21 cfs @ 10.86 hrs, Volume= 0.255 af, Atten= 95%, Lag= 0.0 min
Discarded = 0.21 cfs @ 10.86 hrs, Volume= 0.255 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 41.90' @ 14.79 hrs Surf.Area= 6,917 sf Storage= 7,264 cf

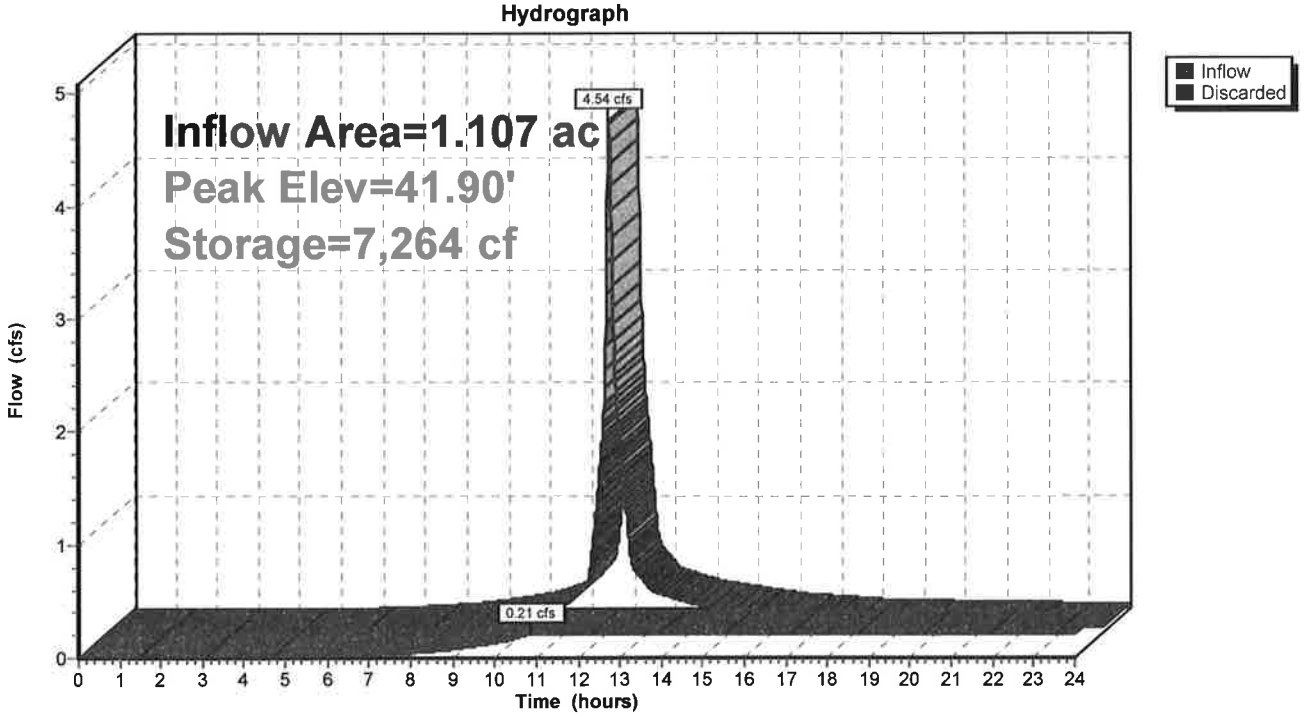
Plug-Flow detention time= 275.7 min calculated for 0.255 af (77% of inflow)
Center-of-Mass det. time= 195.3 min ( 993.3 - 798.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 40.00' | 8,305 cf | **79.50'W x 87.00'L x 6.00'H Prismatoid** |
| | | | 41,499 cf Overall - 17,770 cf Embedded = 23,729 cf x 35.0% Voids |
| #2 | 40.50' | 14,726 cf | **60.0" D x 75.0'L Pipe Storage** x 10 Inside #1 |
| #3 | 40.50' | 3,043 cf | **60.0" D x 77.5'L Pipe Storage** x 2 Inside #1 |
| | | 26,075 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 40.00' | **1.305 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.21 cfs @ 10.86 hrs HW=40.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

## Pond SSI: Subsurface Infiltration System

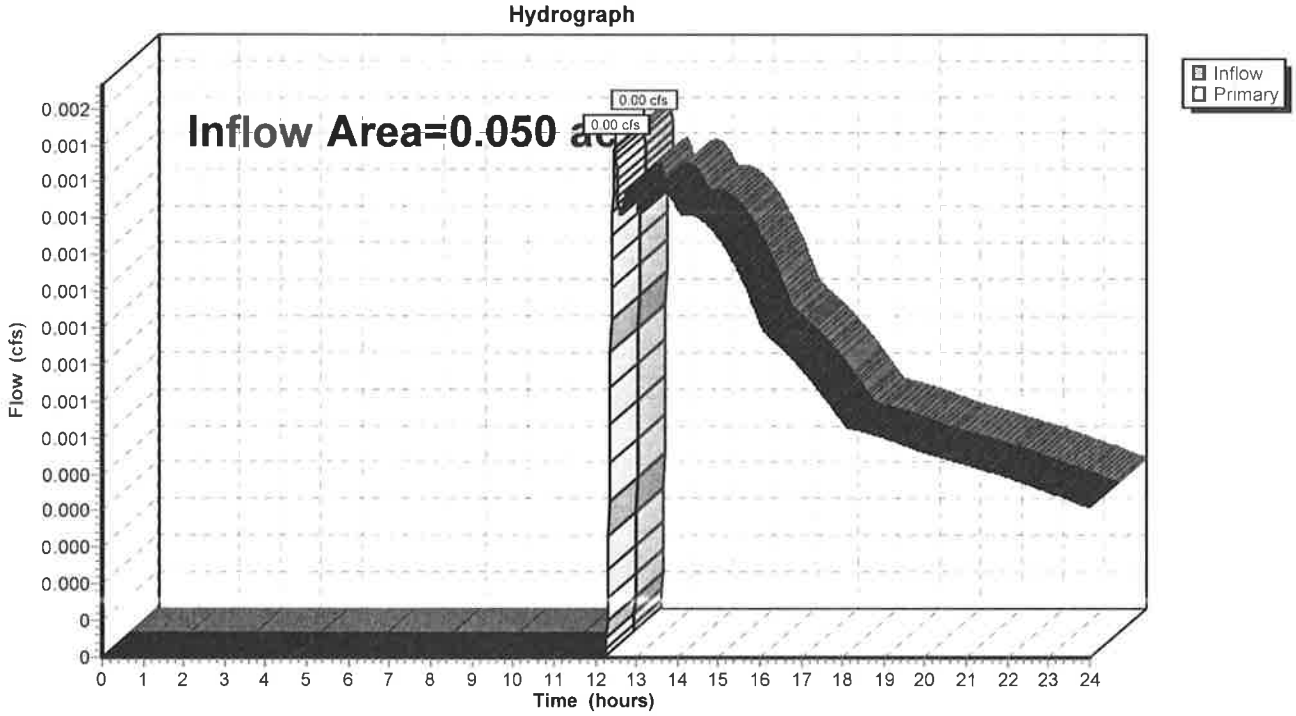


## Summary for Link POA-A: Along western property line

Inflow Area = 0.050 ac, 0.00% Impervious, Inflow Depth > 0.18" for 10 Year event
Inflow = 0.00 cfs @ 12.50 hrs, Volume= 0.001 af
Primary = 0.00 cfs @ 12.50 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-A: Along western property line

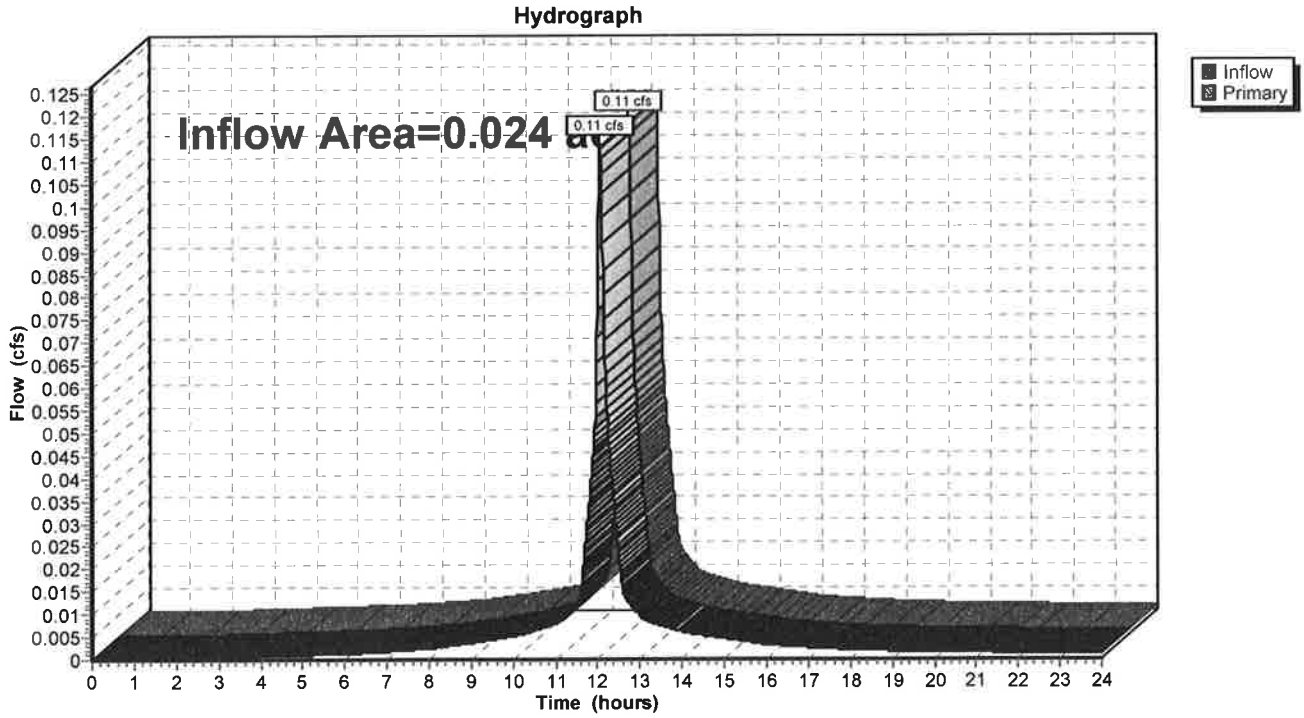


## Summary for Link POA-B: Washington Street

Inflow Area = 0.024 ac, 95.83% Impervious, Inflow Depth > 4.43" for 10 Year event
Inflow = 0.11 cfs @ 12.08 hrs, Volume= 0.009 af
Primary = 0.11 cfs @ 12.08 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-B: Washington Street

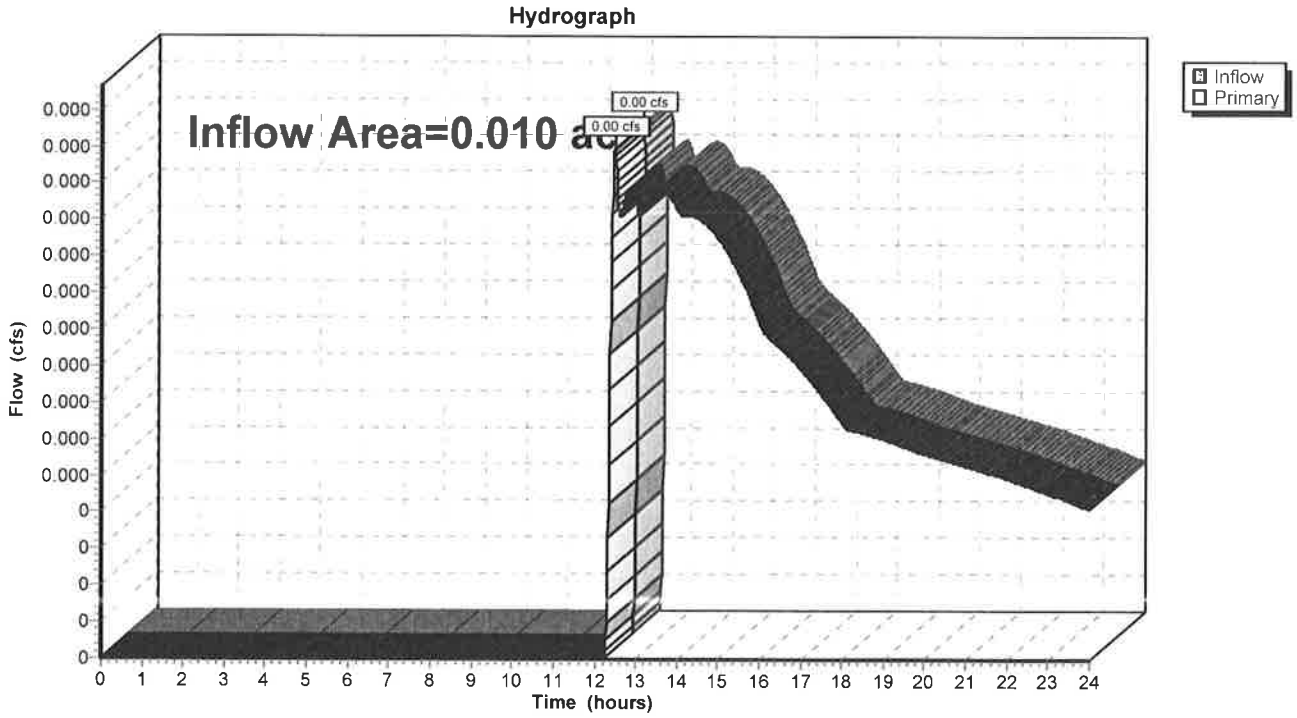


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth > 0.18" for 10 Year event
Inflow = 0.00 cfs @ 12.50 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.50 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-C: Swanton Street



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment PR-1: Landscaping** Runoff Area=0.050 ac 0.00% Impervious Runoff Depth>0.50"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.002 af

**Subcatchment PR-1A: CVS Building and** Runoff Area=1.107 ac 82.84% Impervious Runoff Depth>4.81"
Tc=6.0 min CN=88 Runoff=6.03 cfs 0.444 af

**Subcatchment PR-2: Washington Street** Runoff Area=0.024 ac 95.83% Impervious Runoff Depth>5.72"
Tc=6.0 min CN=96 Runoff=0.14 cfs 0.011 af

**Subcatchment PR-3: Landscaped areas** Runoff Area=0.010 ac 0.00% Impervious Runoff Depth>0.50"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

**Pond SSI: Subsurface Infiltration System** Peak Elev=42.59' Storage=10,857 cf Inflow=6.03 cfs 0.444 af
Outflow=0.21 cfs 0.270 af

**Link POA-A: Along western property line** Inflow=0.01 cfs 0.002 af
Primary=0.01 cfs 0.002 af

**Link POA-B: Washington Street** Inflow=0.14 cfs 0.011 af
Primary=0.14 cfs 0.011 af

**Link POA-C: Swanton Street** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Total Runoff Area = 1.191 ac Runoff Volume = 0.458 af Average Runoff Depth = 4.62"**
**21.07% Pervious = 0.251 ac 78.93% Impervious = 0.940 ac**

## Summary for Subcatchment PR-1: Landscaping

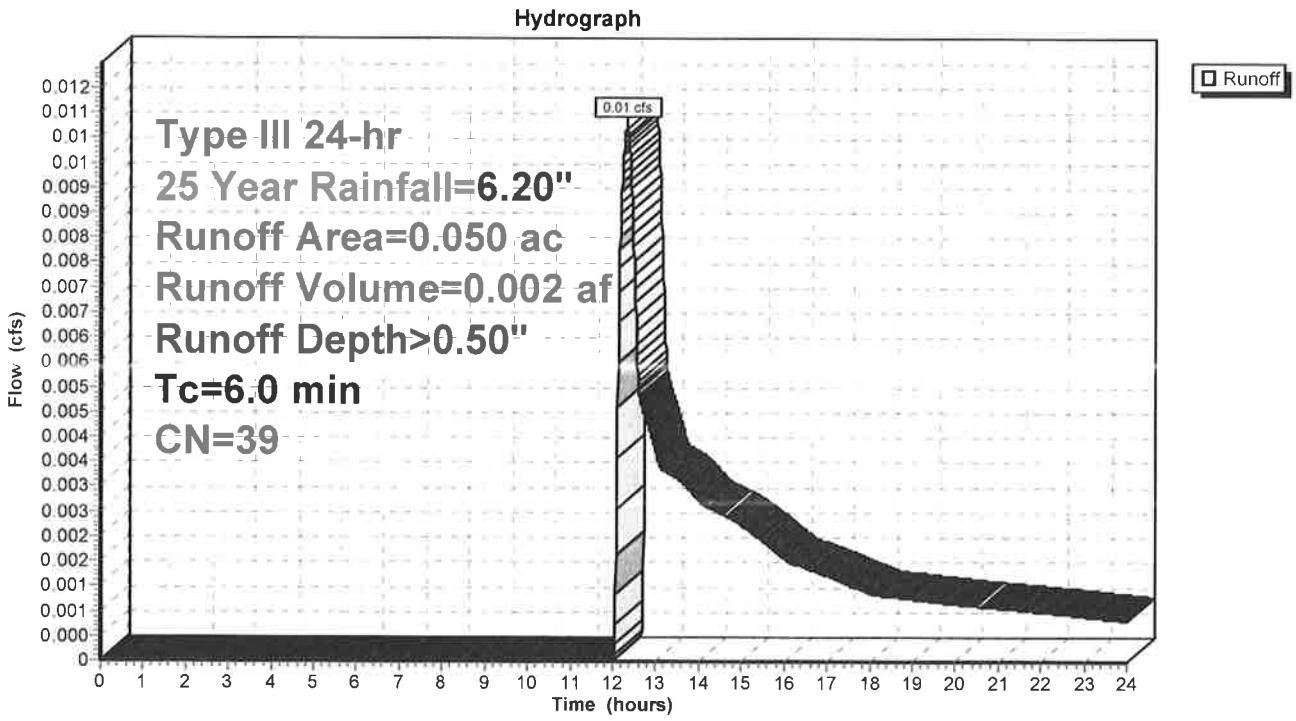
Runoff = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| Area (ac) | CN | Description |
|---|---|---|
| 0.050 | 39 | >75% Grass cover, Good, HSG A |
| 0.050 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1: Landscaping



## Summary for Subcatchment PR-1A: CVS Building and Pavement areas

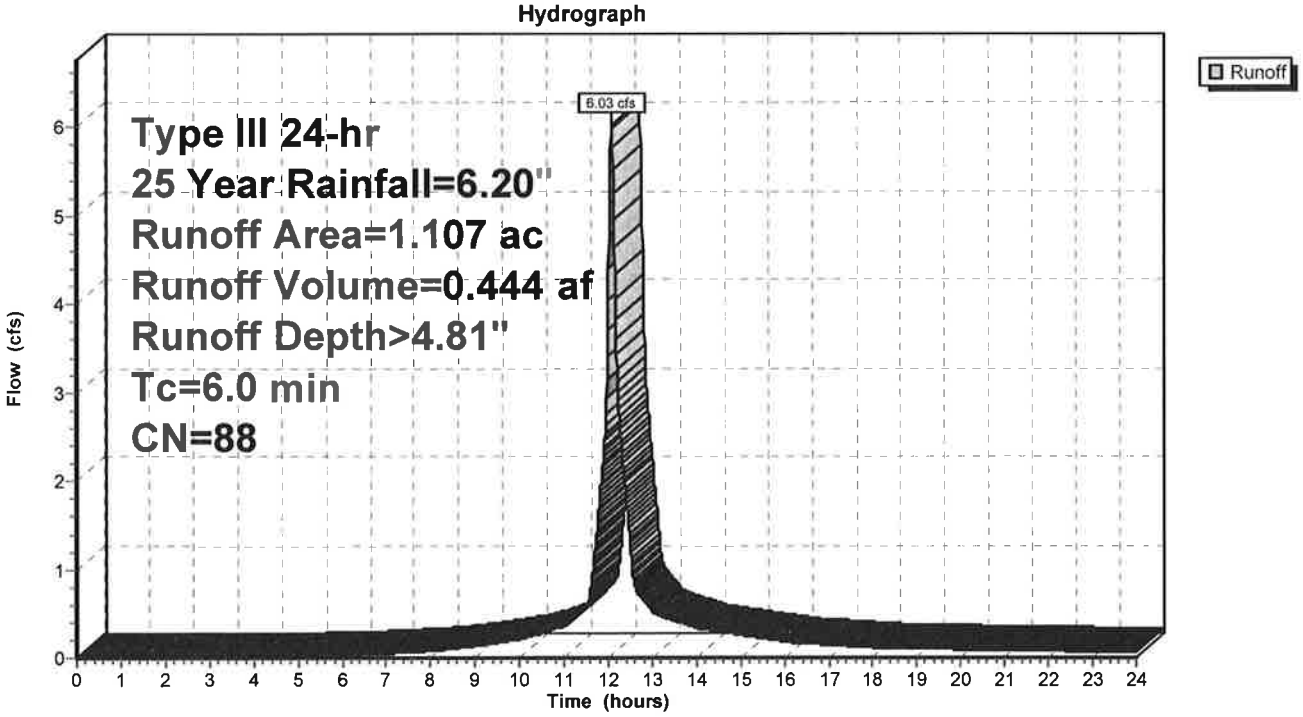
Runoff = 6.03 cfs @ 12.09 hrs, Volume= 0.444 af, Depth> 4.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 0.643 | 98 | pavement |
| | 0.190 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.274 | 98 | roof |
| | 1.107 | 88 | Weighted Average |
| | 0.190 | | 17.16% Pervious Area |
| | 0.917 | | 82.84% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1A: CVS Building and Pavement areas



## Summary for Subcatchment PR-2: Washington Street Sidewalk

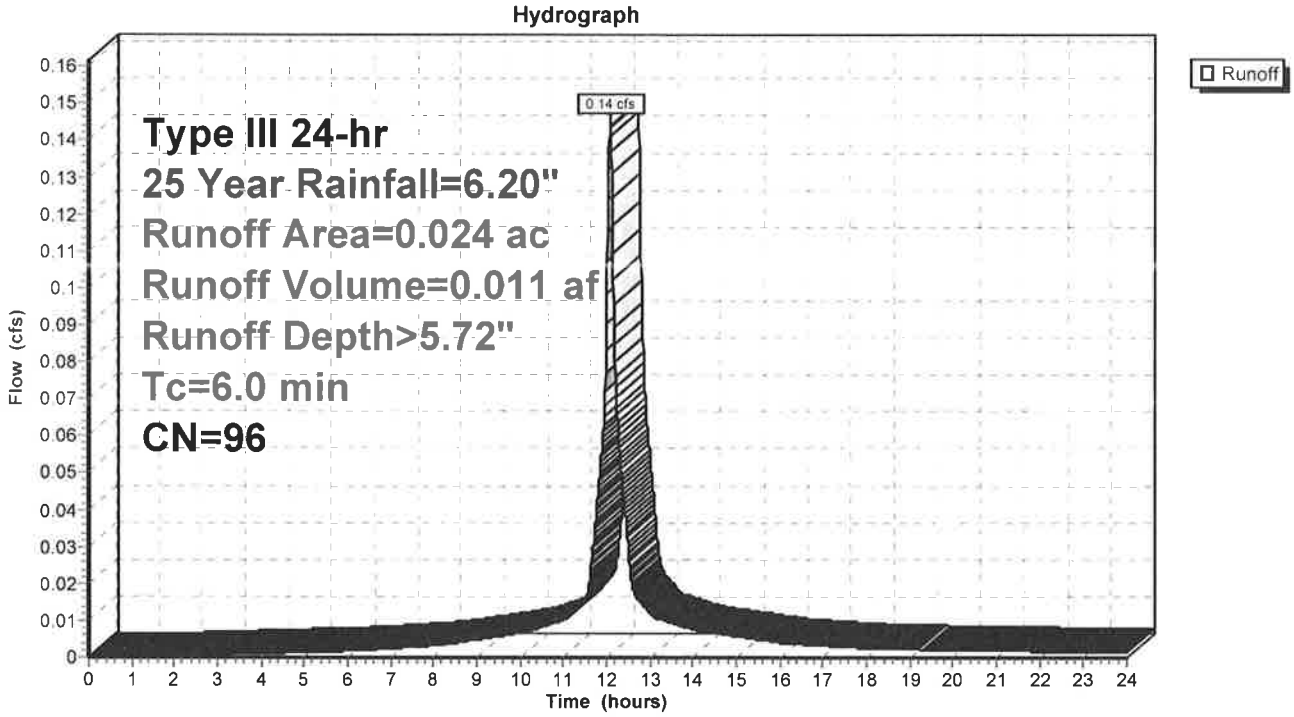
Runoff = 0.14 cfs @ 12.08 hrs, Volume= 0.011 af, Depth> 5.72"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| | Area (ac) | CN | Description |
|---|---|---|---|
| | 0.001 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.023 | 98 | Pavement |
| | 0.024 | 96 | Weighted Average |
| | 0.001 | | 4.17% Pervious Area |
| | 0.023 | | 95.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-2: Washington Street Sidewalk



## Summary for Subcatchment PR-3: Landscaped areas along Swanton Street

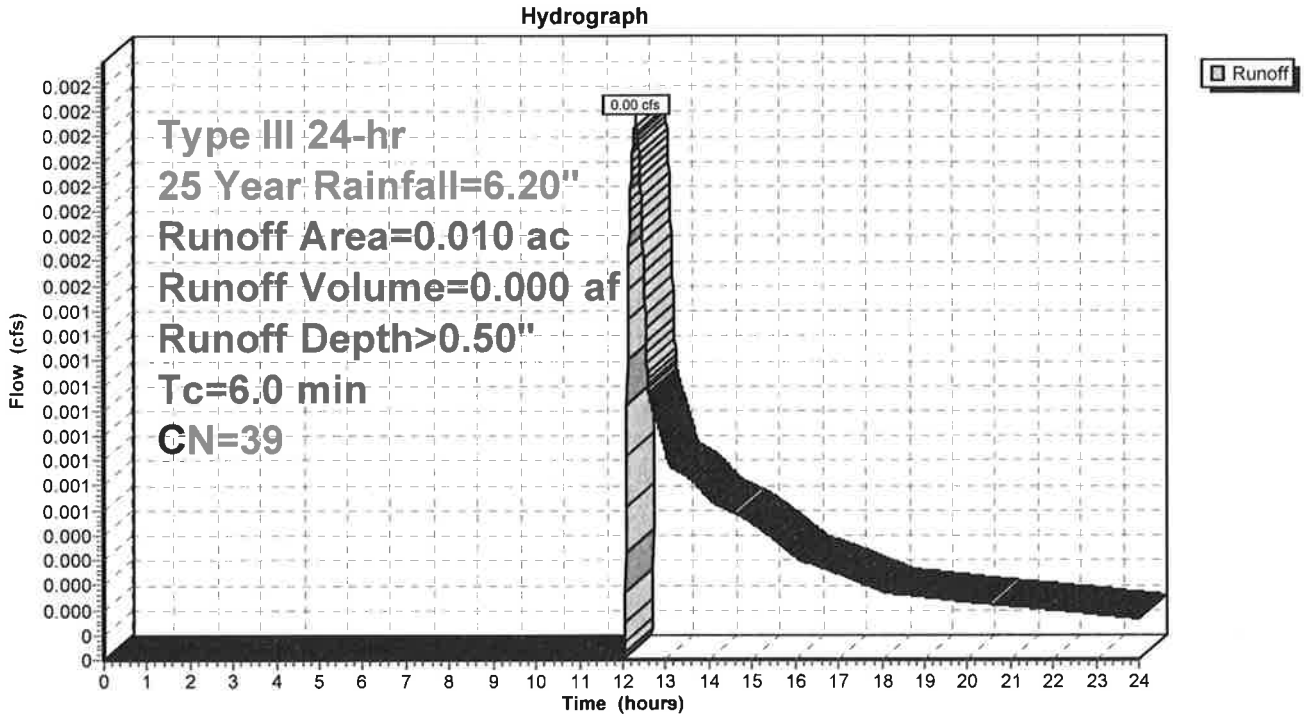
Runoff = 0.00 cfs @ 12.33 hrs, Volume= 0.000 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=6.20"

| Area (ac) | CN | Description |
|---|---|---|
| 0.010 | 39 | >75% Grass cover, Good, HSG A |
| 0.010 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-3: Landscaped areas along Swanton Street



## Summary for Pond SSI: Subsurface Infiltration System

| | | | | |
|---|---|---|---|---|
| Inflow Area = | 1.107 ac, 82.84% Impervious, Inflow Depth > 4.81" for 25 Year event | | | |
| Inflow = | 6.03 cfs @ 12.09 hrs, Volume= | 0.444 af | | |
| Outflow = | 0.21 cfs @ 10.19 hrs, Volume= | 0.270 af, Atten= 97%, Lag= 0.0 min | | |
| Discarded = | 0.21 cfs @ 10.19 hrs, Volume= | 0.270 af | | |

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 42.59' @ 15.61 hrs Surf.Area= 6,917 sf Storage= 10,857 cf

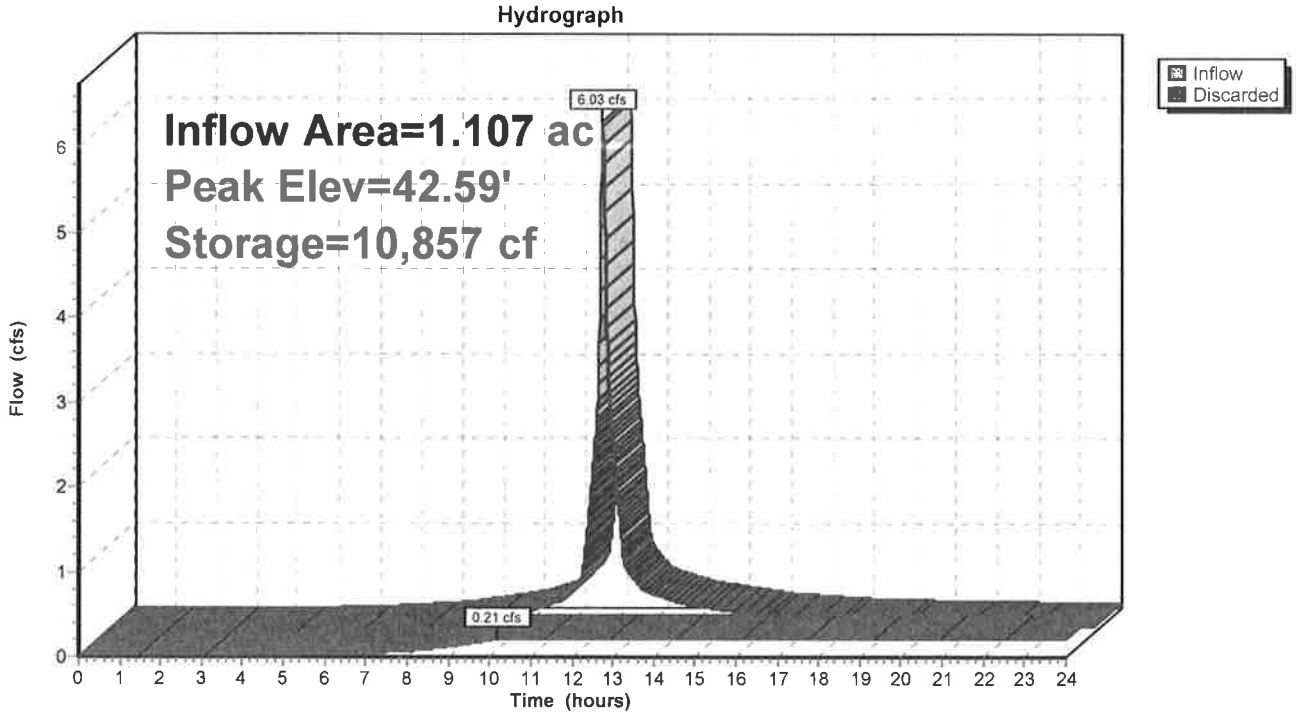
Plug-Flow detention time= 279.2 min calculated for 0.270 af (61% of inflow)
Center-of-Mass det. time= 177.4 min ( 967.1 - 789.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 40.00' | 8,305 cf | **79.50'W x 87.00'L x 6.00'H Prismatoid** |
| | | | 41,499 cf Overall - 17,770 cf Embedded = 23,729 cf x 35.0% Voids |
| #2 | 40.50' | 14,726 cf | **60.0" D x 75.0'L Pipe Storage** x 10 Inside #1 |
| #3 | 40.50' | 3,043 cf | **60.0" D x 77.5'L Pipe Storage** x 2 Inside #1 |
| | | 26,075 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 40.00' | **1.305 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.21 cfs @ 10.19 hrs HW=40.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

## Pond SSI: Subsurface Infiltration System

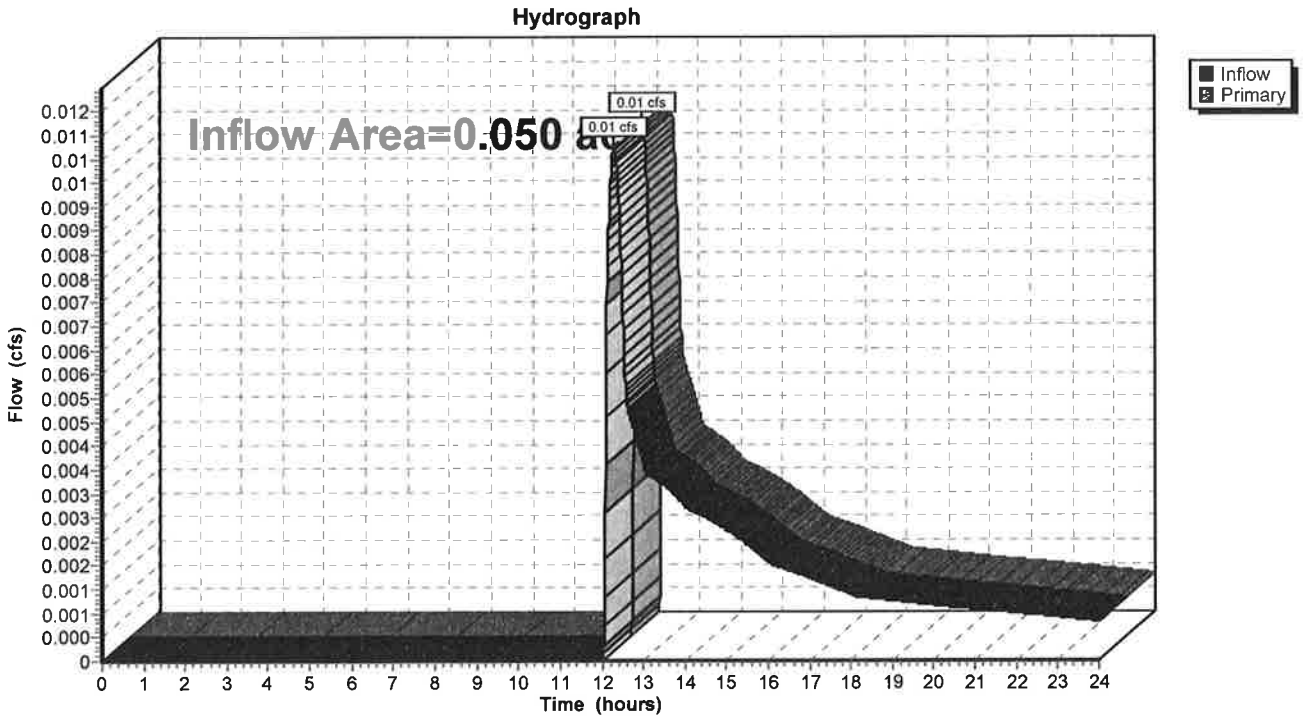


## Summary for Link POA-A: Along western property line

Inflow Area = 0.050 ac, 0.00% Impervious, Inflow Depth > 0.50" for 25 Year event
Inflow = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af
Primary = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

## Link POA-A: Along western property line

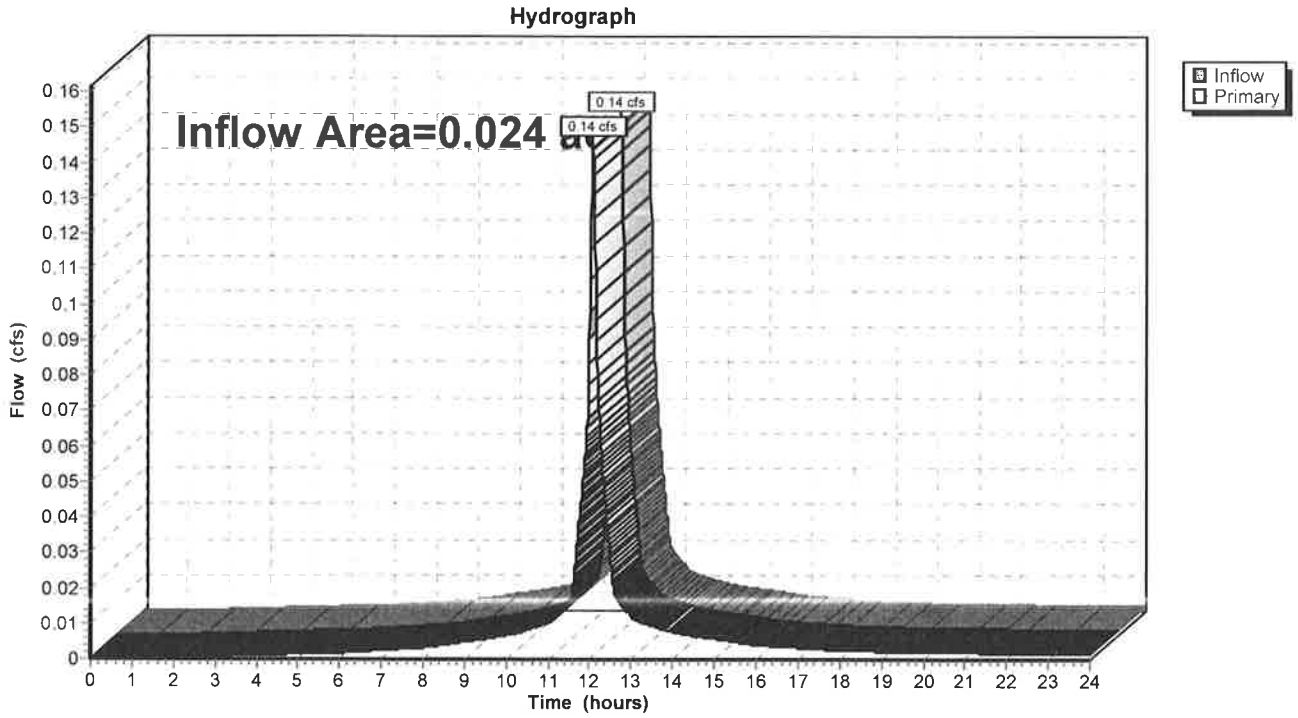


## Summary for Link POA-B: Washington Street

Inflow Area = 0.024 ac, 95.83% Impervious, Inflow Depth > 5.72" for 25 Year event
Inflow = 0.14 cfs @ 12.08 hrs, Volume= 0.011 af
Primary = 0.14 cfs @ 12.08 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

## Link POA-B: Washington Street

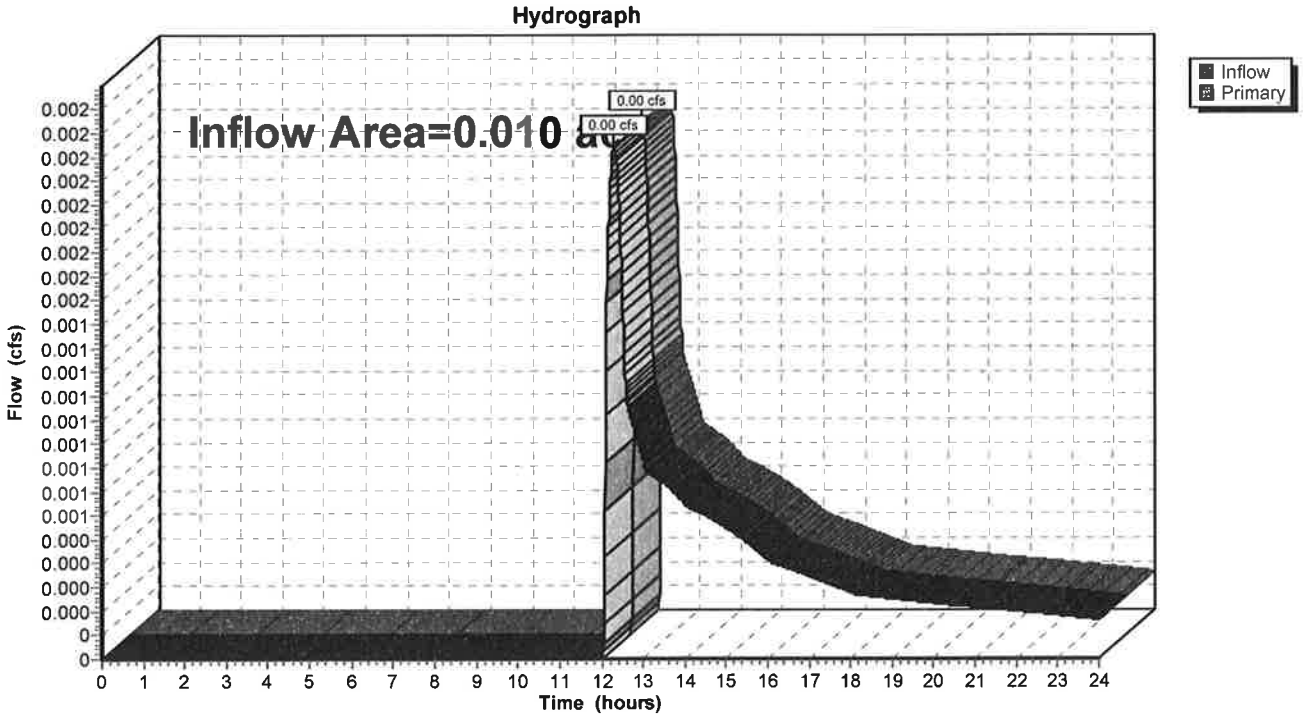


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth > 0.50" for 25 Year event
Inflow = 0.00 cfs @ 12.33 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 12.33 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-C: Swanton Street



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

**Subcatchment PR-1: Landscaping** Runoff Area=0.050 ac 0.00% Impervious Runoff Depth>1.55"
Tc=6.0 min CN=39 Runoff=0.07 cfs 0.006 af

**Subcatchment PR-1A: CVS Building and** Runoff Area=1.107 ac 82.84% Impervious Runoff Depth>7.44"
Tc=6.0 min CN=88 Runoff=9.10 cfs 0.687 af

**Subcatchment PR-2: Washington Street** Runoff Area=0.024 ac 95.83% Impervious Runoff Depth>8.41"
Tc=6.0 min CN=96 Runoff=0.21 cfs 0.017 af

**Subcatchment PR-3: Landscaped areas** Runoff Area=0.010 ac 0.00% Impervious Runoff Depth>1.55"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.001 af

**Pond SSI: Subsurface Infiltration System** Peak Elev=44.16' Storage=19,150 cf Inflow=9.10 cfs 0.687 af
Outflow=0.21 cfs 0.294 af

**Link POA-A: Along western property line** Inflow=0.07 cfs 0.006 af
Primary=0.07 cfs 0.006 af

**Link POA-B: Washington Street** Inflow=0.21 cfs 0.017 af
Primary=0.21 cfs 0.017 af

**Link POA-C: Swanton Street** Inflow=0.01 cfs 0.001 af
Primary=0.01 cfs 0.001 af

**Total Runoff Area = 1.191 ac Runoff Volume = 0.711 af Average Runoff Depth = 7.17"**
**21.07% Pervious = 0.251 ac 78.93% Impervious = 0.940 ac**

## Summary for Subcatchment PR-1: Landscaping

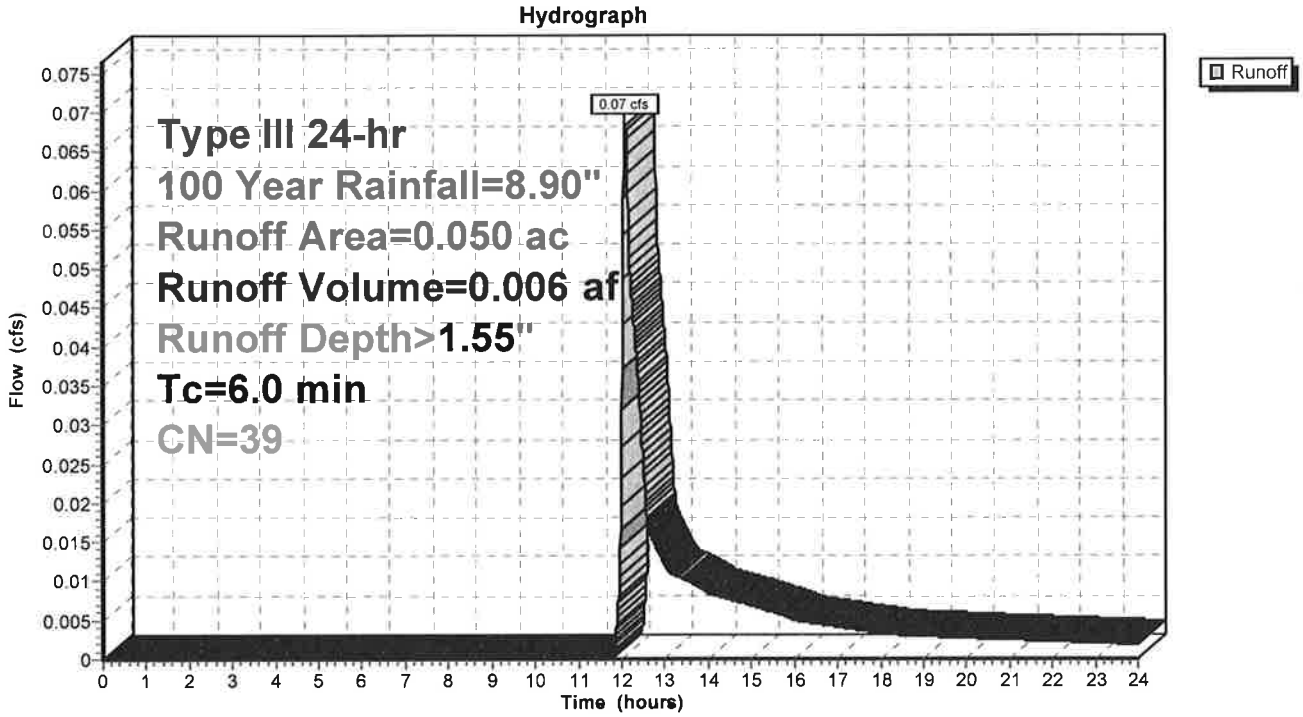
Runoff = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| Area (ac) | CN | Description |
|---|---|---|
| 0.050 | 39 | >75% Grass cover, Good, HSG A |
| 0.050 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1: Landscaping



## Summary for Subcatchment PR-1A: CVS Building and Pavement areas

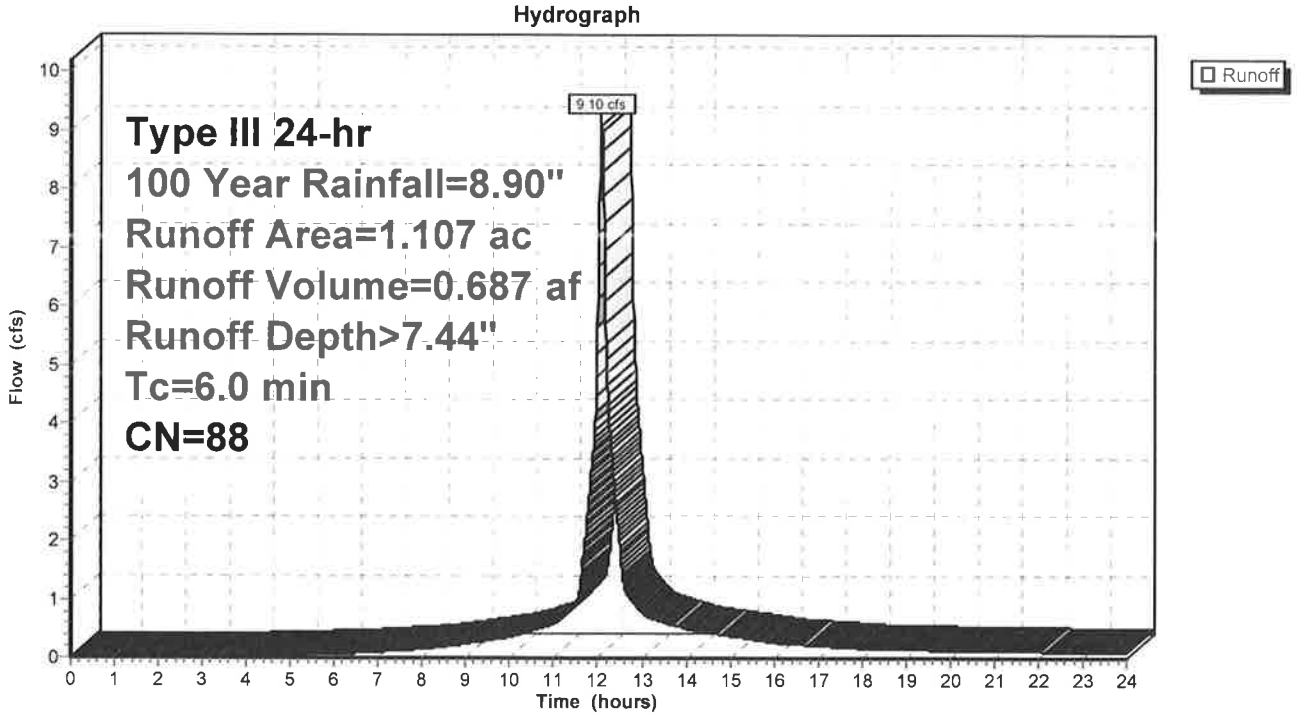
Runoff = 9.10 cfs @ 12.08 hrs, Volume= 0.687 af, Depth> 7.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| | Area (ac) | CN | Description |
|---|---|---|---|
| * | 0.643 | 98 | pavement |
| | 0.190 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.274 | 98 | roof |
| | 1.107 | 88 | Weighted Average |
| | 0.190 | | 17.16% Pervious Area |
| | 0.917 | | 82.84% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-1A: CVS Building and Pavement areas



## Summary for Subcatchment PR-2: Washington Street Sidewalk

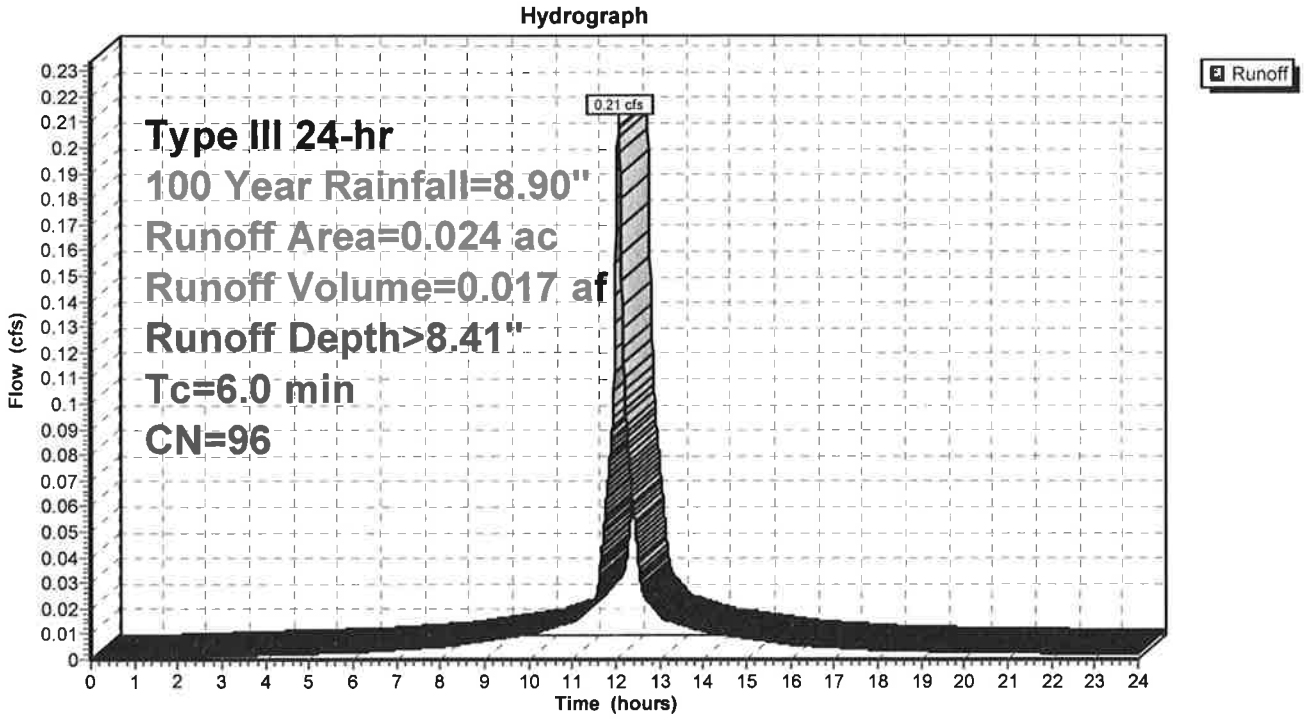
Runoff = 0.21 cfs @ 12.08 hrs, Volume= 0.017 af, Depth> 8.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| | Area (ac) | CN | Description |
|---|---|---|---|
| | 0.001 | 39 | >75% Grass cover, Good, HSG A |
| * | 0.023 | 98 | Pavement |
| | 0.024 | 96 | Weighted Average |
| | 0.001 | | 4.17% Pervious Area |
| | 0.023 | | 95.83% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-2: Washington Street Sidewalk



## Summary for Subcatchment PR-3: Landscaped areas along Swanton Street

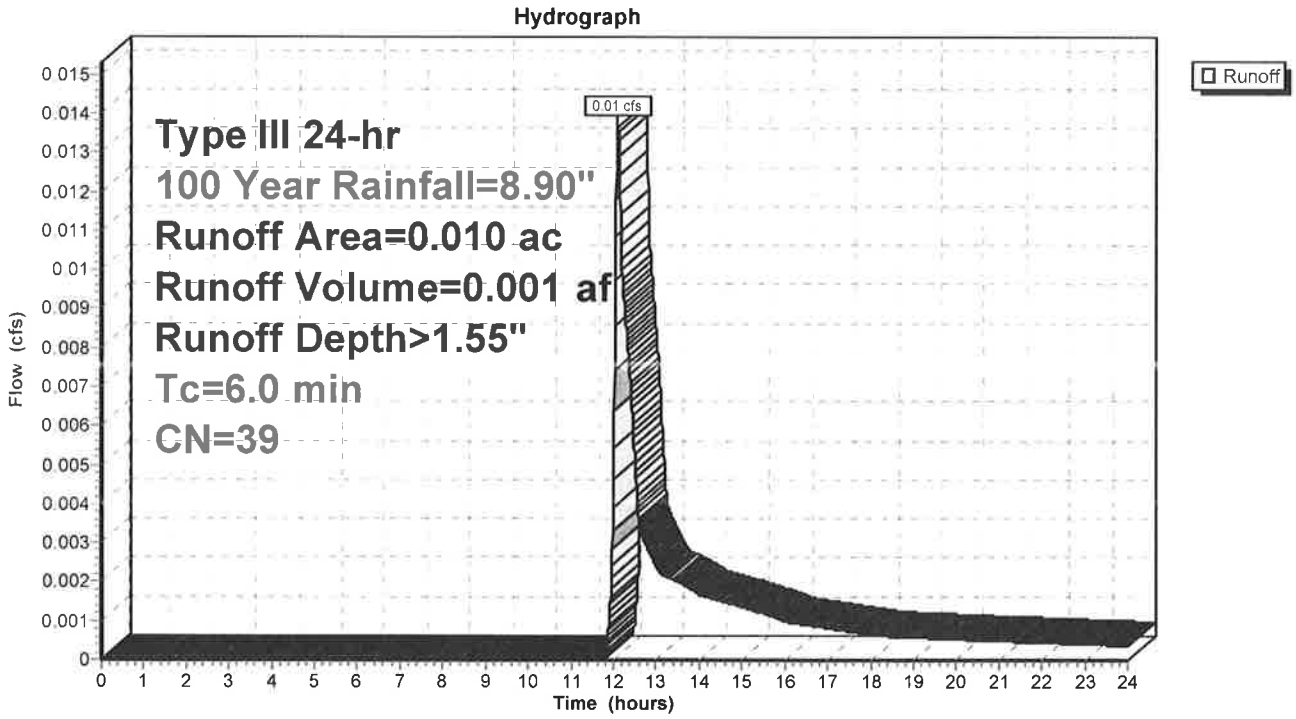
Runoff = 0.01 cfs @ 12.11 hrs, Volume= 0.001 af, Depth> 1.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 Year Rainfall=8.90"

| Area (ac) | CN | Description |
|---|---|---|
| 0.010 | 39 | >75% Grass cover, Good, HSG A |
| 0.010 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 6.0 | | | | | **Direct Entry,** |

## Subcatchment PR-3: Landscaped areas along Swanton Street



## Summary for Pond SSI: Subsurface Infiltration System

Inflow Area = 1.107 ac, 82.84% Impervious, Inflow Depth > 7.44" for 100 Year event
Inflow = 9.10 cfs @ 12.08 hrs, Volume= 0.687 af
Outflow = 0.21 cfs @ 8.89 hrs, Volume= 0.294 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.21 cfs @ 8.89 hrs, Volume= 0.294 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 44.16' @ 16.99 hrs Surf.Area= 6,917 sf Storage= 19,150 cf

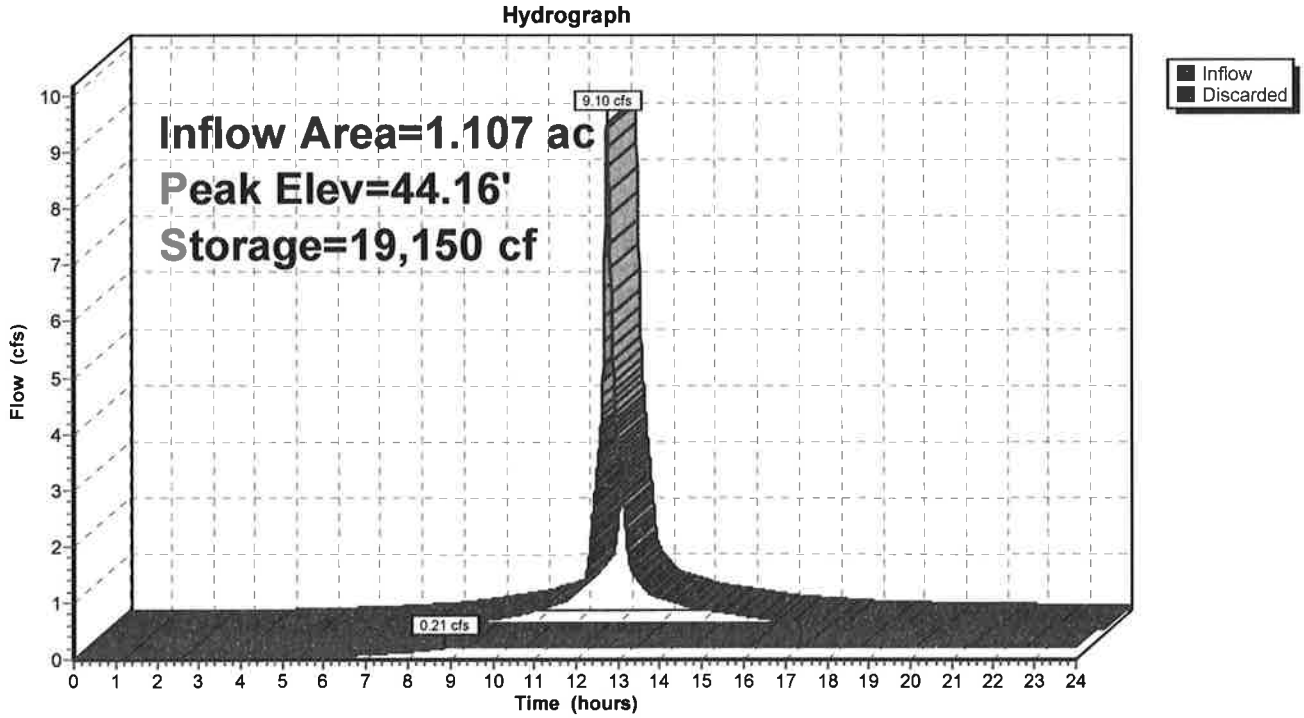
Plug-Flow detention time= 272.8 min calculated for 0.294 af (43% of inflow)
Center-of-Mass det. time= 146.6 min ( 924.8 - 778.2 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 40.00' | 8,305 cf | **79.50'W x 87.00'L x 6.00'H Prismatoid** |
| | | | 41,499 cf Overall - 17,770 cf Embedded = 23,729 cf x 35.0% Voids |
| #2 | 40.50' | 14,726 cf | **60.0" D x 75.0'L Pipe Storage** x 10 Inside #1 |
| #3 | 40.50' | 3,043 cf | **60.0" D x 77.5'L Pipe Storage** x 2 Inside #1 |
| | | 26,075 cf | Total Available Storage |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Discarded | 40.00' | **1.305 in/hr Exfiltration over Surface area** |

**Discarded OutFlow** Max=0.21 cfs @ 8.89 hrs HW=40.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.21 cfs)

## Pond SSI: Subsurface Infiltration System

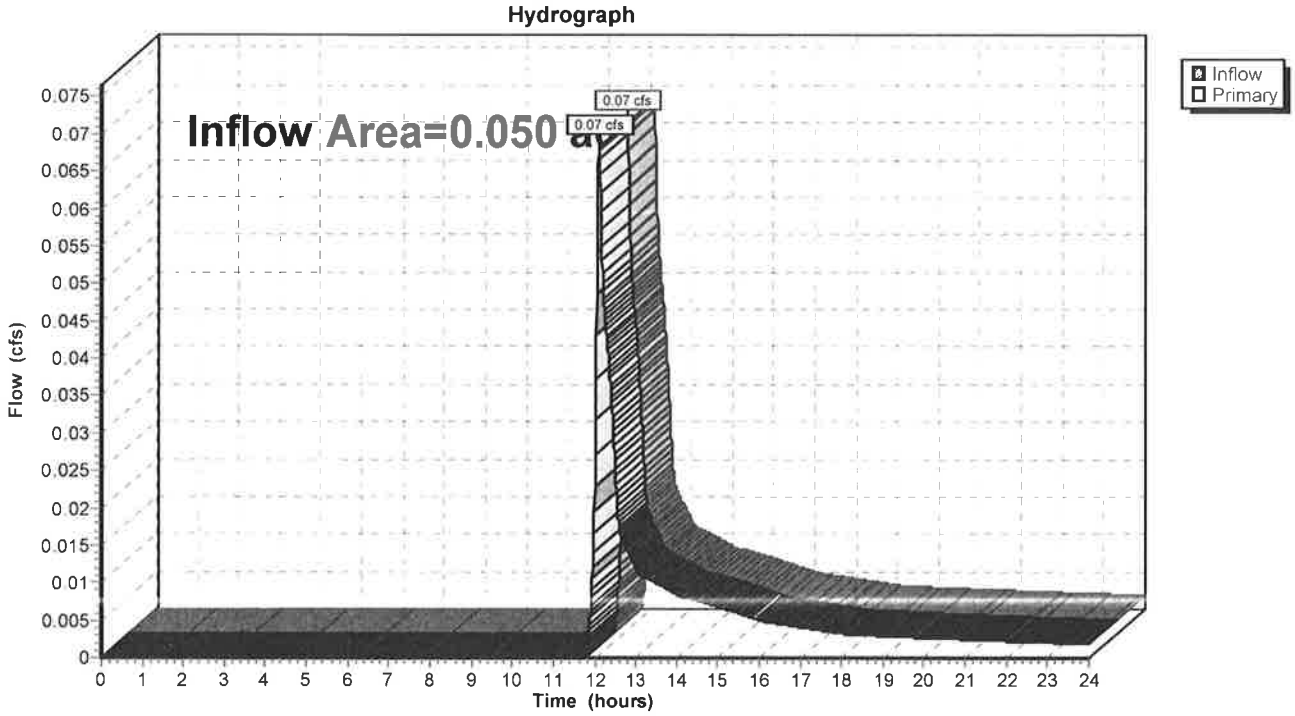


## Summary for Link POA-A: Along western property line

Inflow Area = 0.050 ac, 0.00% Impervious, Inflow Depth > 1.55" for 100 Year event
Inflow = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af
Primary = 0.07 cfs @ 12.11 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

## Link POA-A: Along western property line

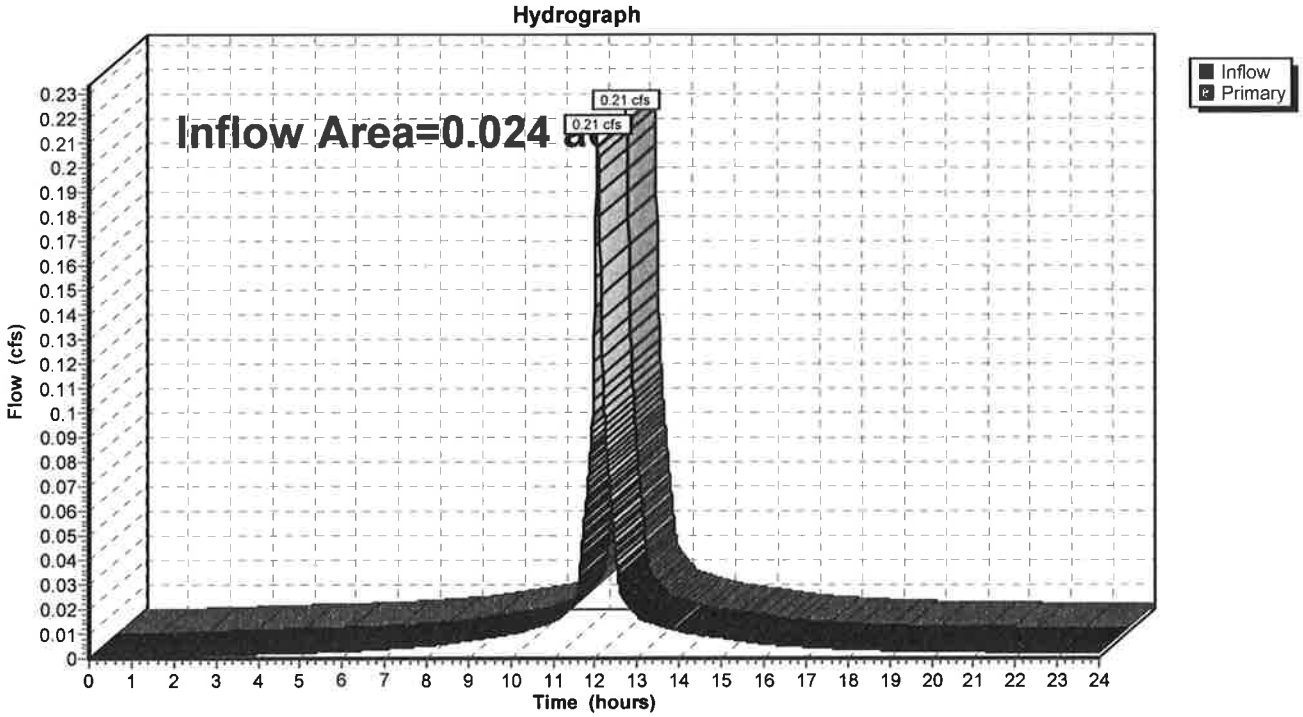


## Summary for Link POA-B: Washington Street

Inflow Area = 0.024 ac, 95.83% Impervious, Inflow Depth > 8.41" for 100 Year event
Inflow = 0.21 cfs @ 12.08 hrs, Volume= 0.017 af
Primary = 0.21 cfs @ 12.08 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

### Link POA-B: Washington Street

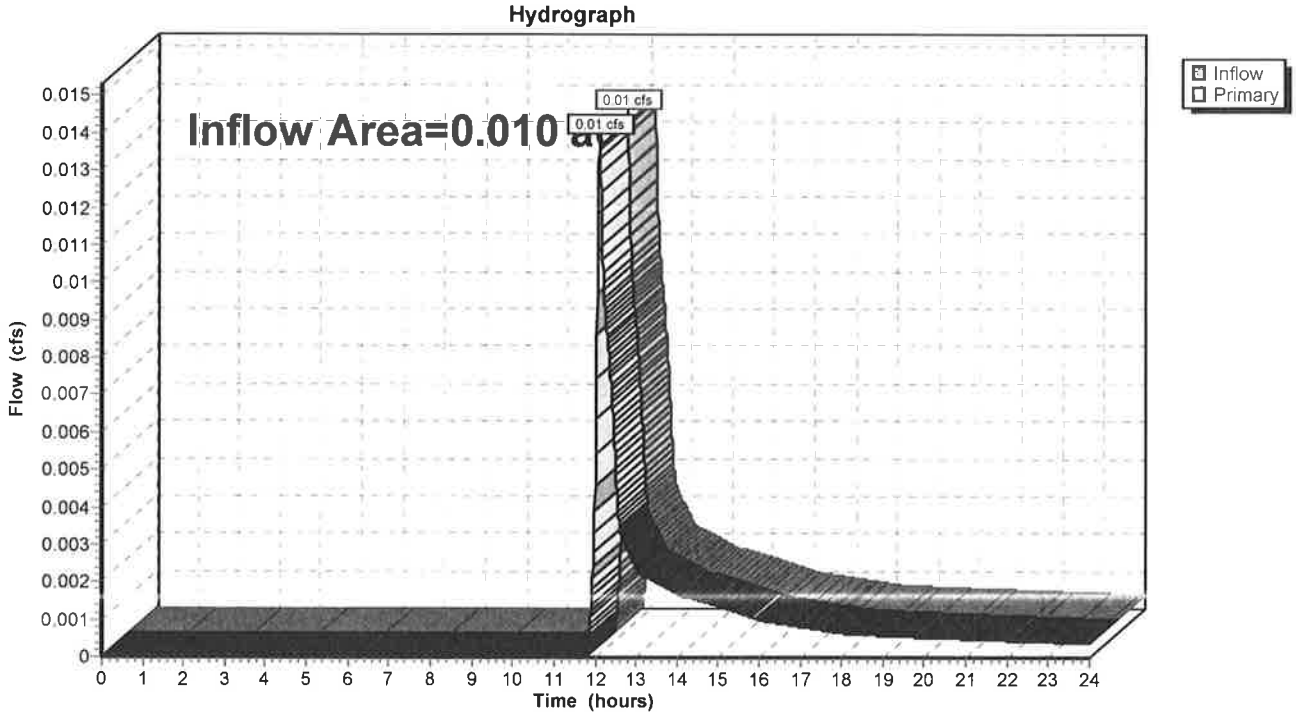


## Summary for Link POA-C: Swanton Street

Inflow Area = 0.010 ac, 0.00% Impervious, Inflow Depth > 1.55" for 100 Year event
Inflow = 0.01 cfs @ 12.11 hrs, Volume= 0.001 af
Primary = 0.01 cfs @ 12.11 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

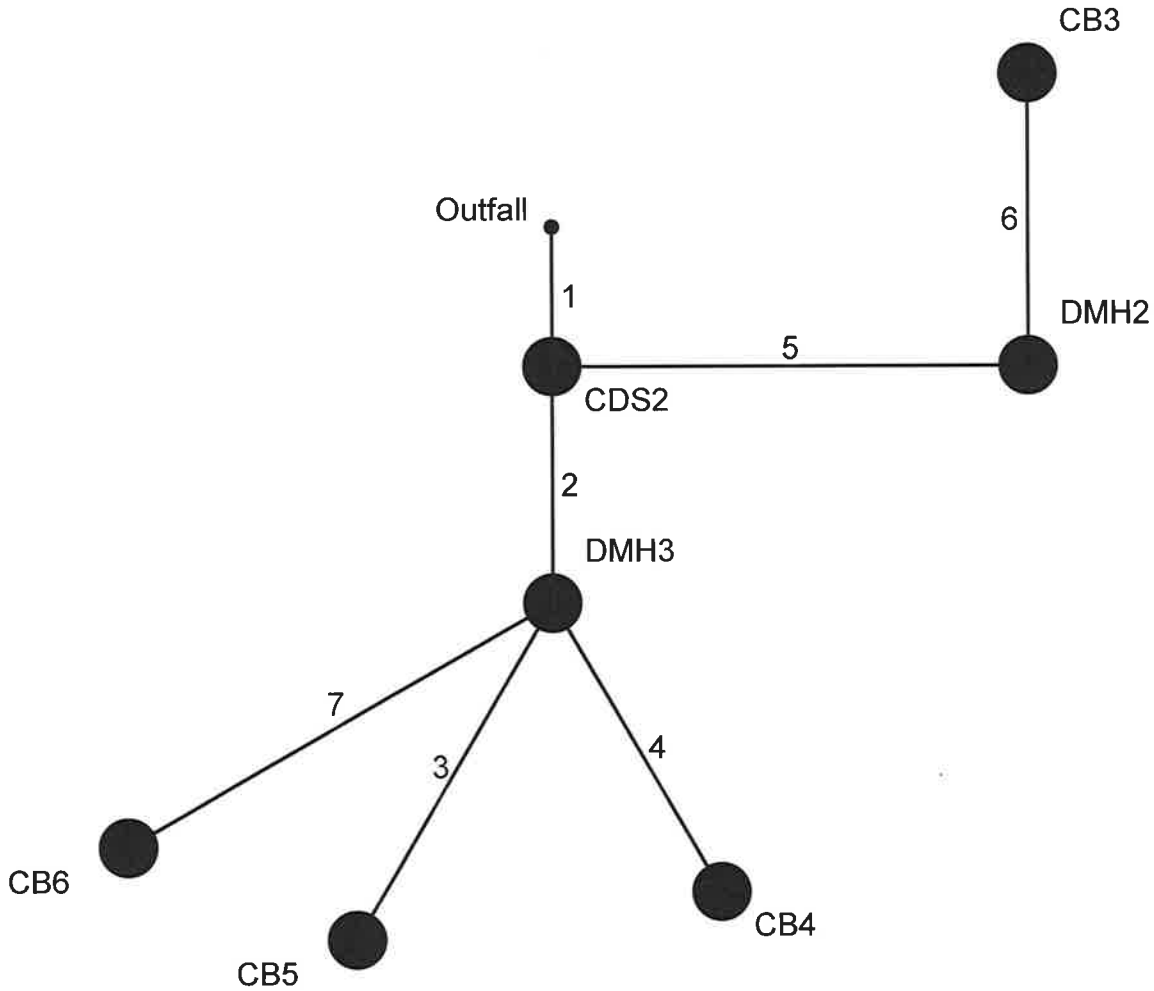
### Link POA-C: Swanton Street



# IV. HYDRAULIC CALCULATIONS

# 25-YEAR STORM PIPE SIZING

# Winchester CVS




| | | |
|---|---|---|
| Project File: Stormsewers CB1_2.stm | Number of lines: 7 | Date: 5/22/2013 |

Storm Sewers v10.00

# Storm Sewer Tabulation

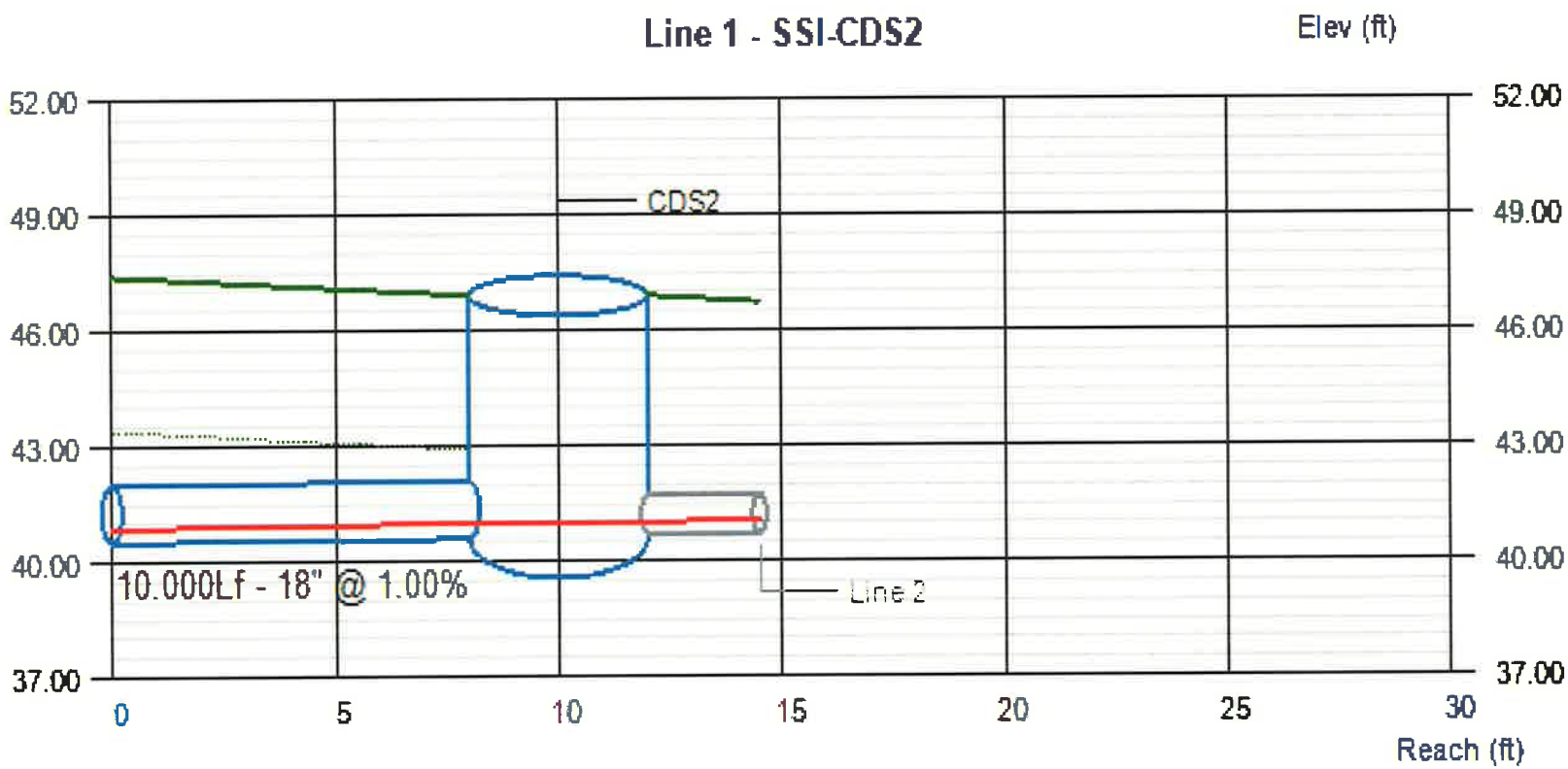
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 10.000 | 0.00 | 0.25 | 0.00 | 0.00 | 0.22 | 6.0 | 10.5 | 5.0 | 1.07 | 10.50 | 3.14 | 18 | 1.00 | 40.50 | 40.60 | 40.86 | 40.99 | 47.40 | 46.90 | SSI-CDS2 |
| 2 | 1 | 17.000 | 0.00 | 0.17 | 0.00 | 0.00 | 0.15 | 6.0 | 10.3 | 5.0 | 0.74 | 3.35 | 3.17 | 12 | 0.88 | 40.70 | 40.85 | 41.02 | 41.21 | 46.90 | 45.70 | DMH3-CDS2 |
| 3 | 2 | 28.000 | 0.02 | 0.02 | 0.90 | 0.02 | 0.02 | 6.0 | 6.0 | 5.9 | 0.11 | 3.69 | 1.19 | 12 | 1.07 | 40.95 | 41.25 | 41.21 | 41.38 | 45.70 | 44.45 | CB5-DMH3 |
| 4 | 2 | 24.000 | 0.13 | 0.13 | 0.86 | 0.11 | 0.11 | 6.0 | 6.0 | 5.9 | 0.66 | 3.63 | 3.17 | 12 | 1.04 | 40.95 | 41.20 | 41.24 | 41.54 | 45.70 | 44.50 | CB4-DMH3 |
| 5 | 1 | 34.000 | 0.00 | 0.08 | 0.00 | 0.00 | 0.07 | 6.0 | 6.7 | 5.8 | 0.40 | 5.11 | 2.29 | 12 | 2.06 | 40.70 | 41.40 | 40.99 | 41.66 | 46.90 | 47.10 | DMH2-CDS2 |
| 6 | 5 | 21.000 | 0.08 | 0.08 | 0.86 | 0.07 | 0.07 | 6.0 | 6.0 | 5.9 | 0.41 | 5.21 | 3.20 | 12 | 2.14 | 41.50 | 41.95 | 41.69 | 42.21 | 47.10 | 47.20 | CB3-DMH2 |
| 7 | 2 | 35.000 | 0.02 | 0.02 | 0.90 | 0.02 | 0.02 | 6.0 | 6.0 | 5.9 | 0.11 | 3.56 | 1.19 | 12 | 1.00 | 40.95 | 41.30 | 41.21 | 41.43 | 45.70 | 46.00 | CB6-DMH3 |

**Winchester CVS** | Number of lines: 7 | Run Date: 5/22/2013

NOTES:Intensity = 63.03 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

# Line Profile (Line 1) - SSI-CDS2



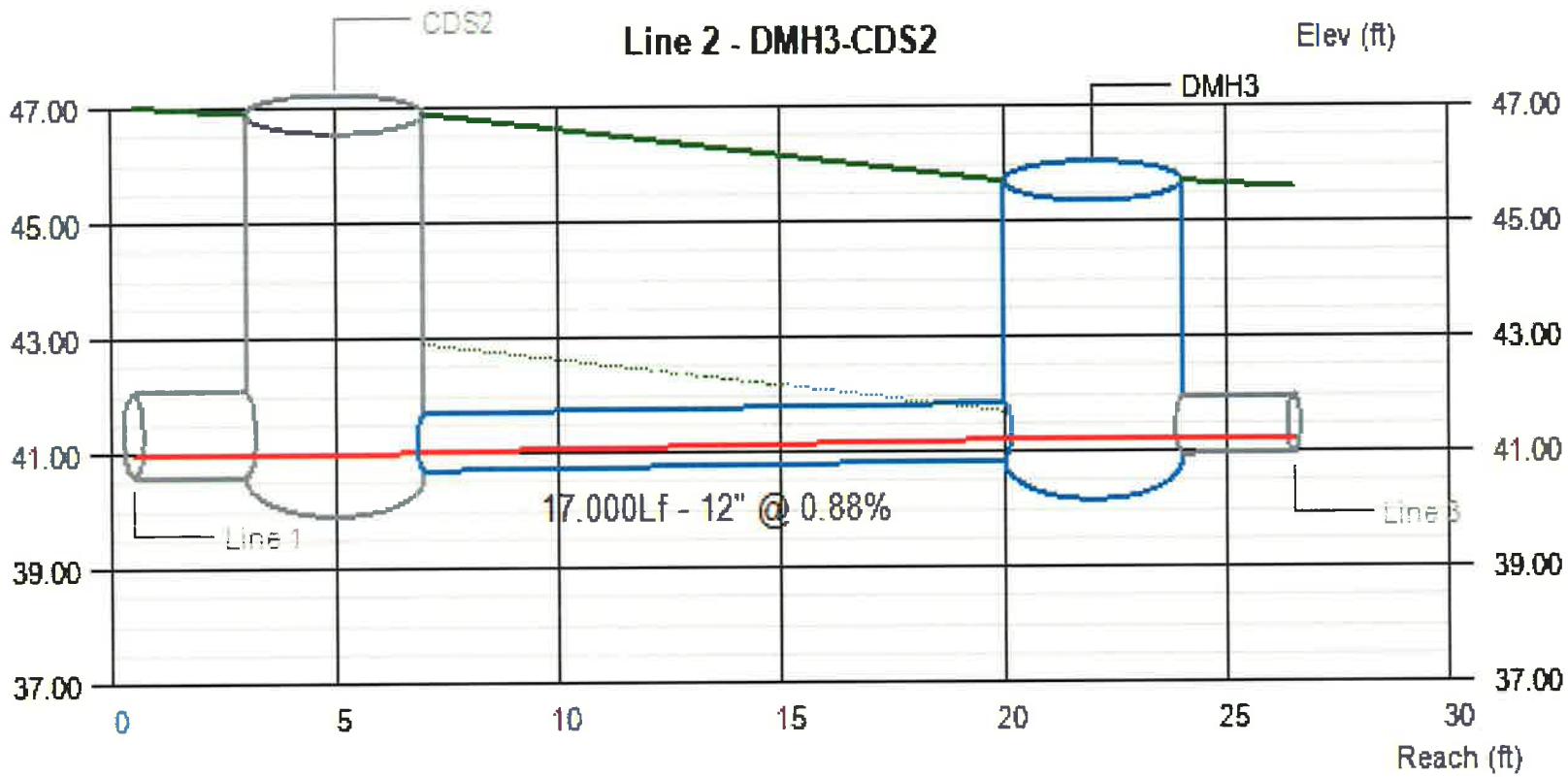



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 1.07 | 40.50 | 40.60 | 0.36 | 0.39 | 0.39 | 40.86 | 40.99 | 40.99 | 3.30 | 2.98 | 5.40 | 4.80 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 2) - DMH3-CDS2



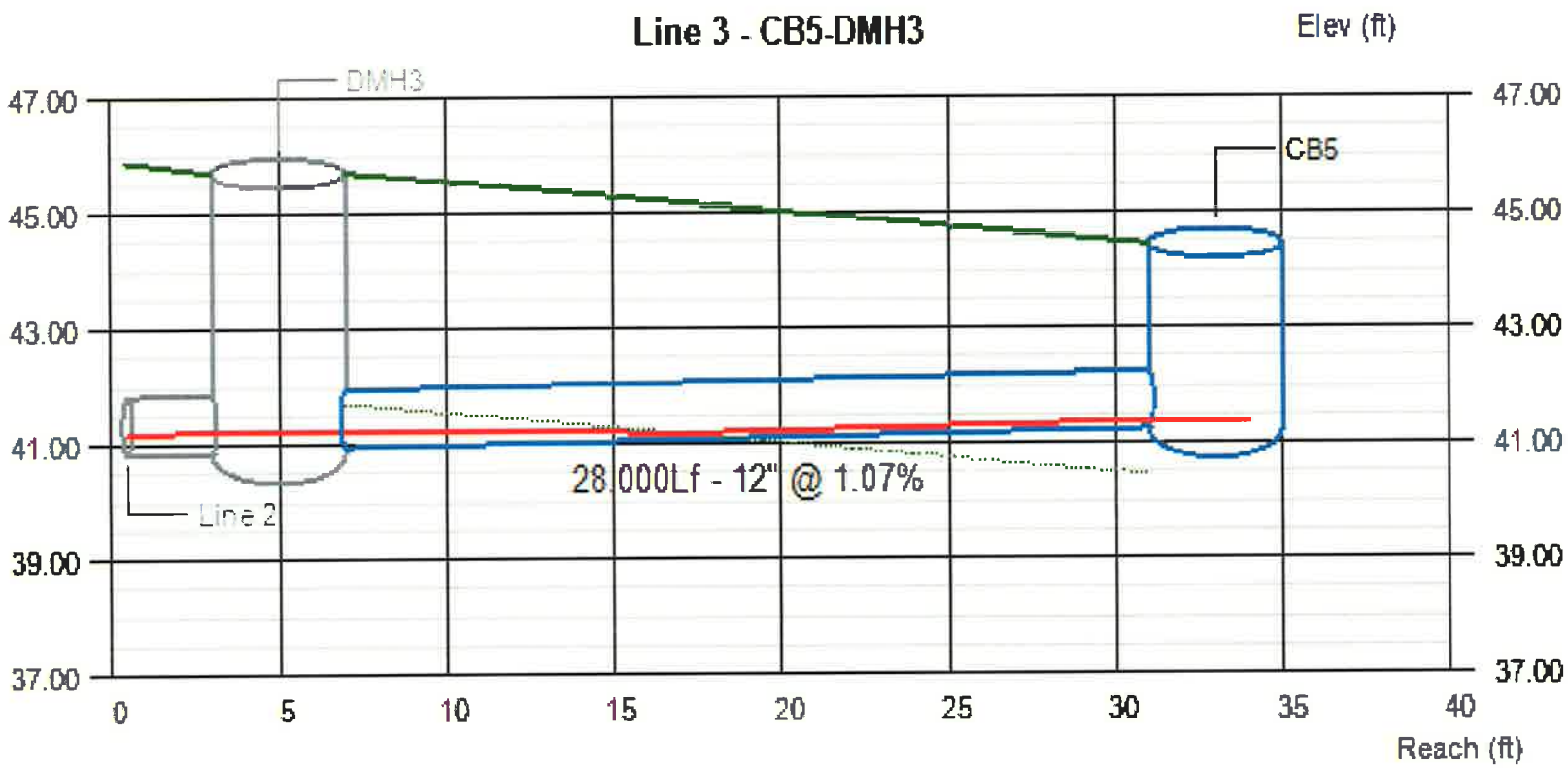



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 0.74 | 40.70 | 40.85 | 0.32 | 0.36 | 0.36 | 41.02 | 41.21 | 41.21 | 3.42 | 2.92 | 5.20 | 3.85 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 3) - CB5-DMH3



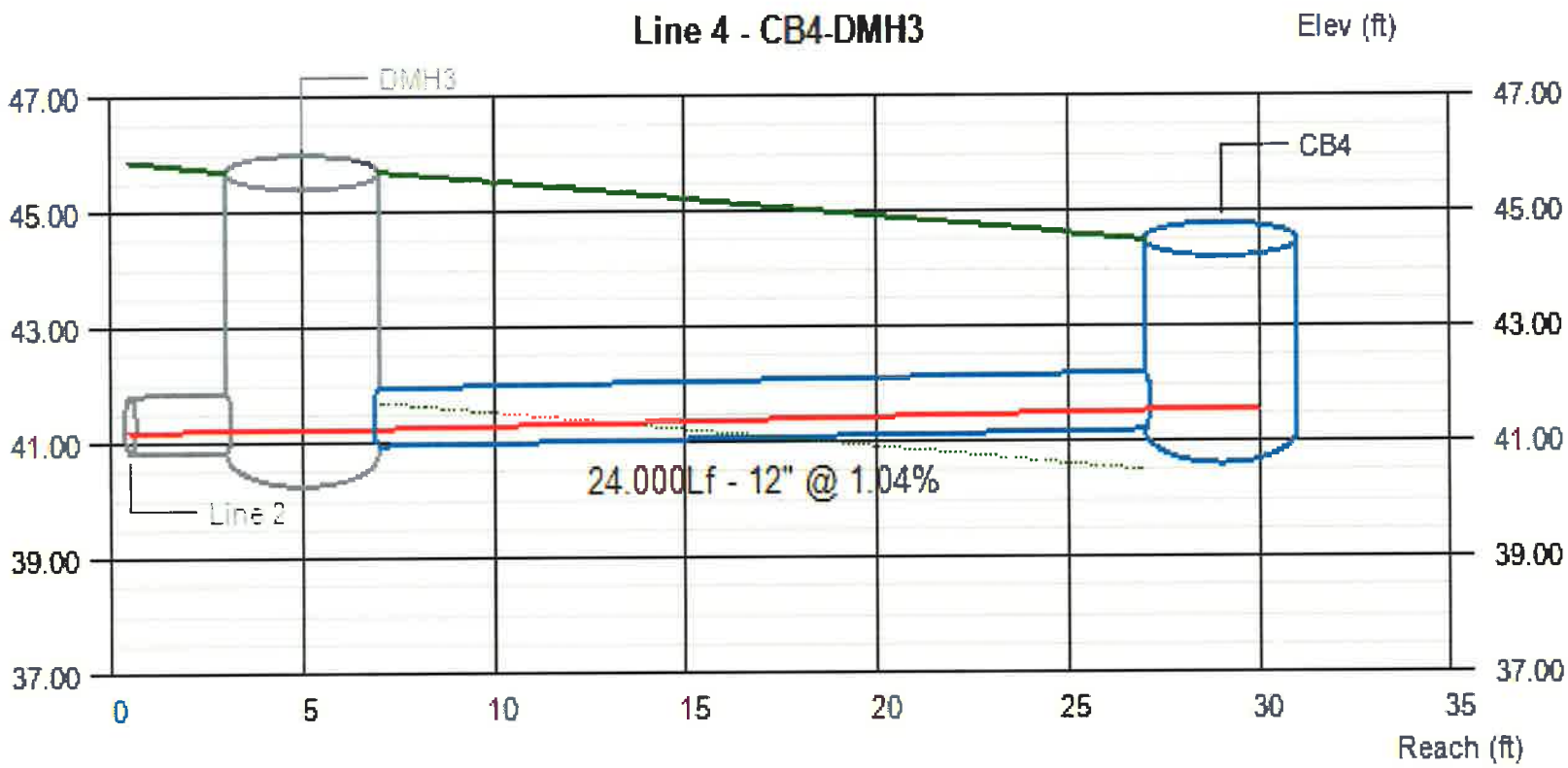



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.11 | 40.95 | 41.25 | 0.26 | 0.13 | 0.13 | 41.21 | 41.38 j | 41.38 | 0.66 | 1.72 | 3.75 | 2.20 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 4) - CB4-DMH3



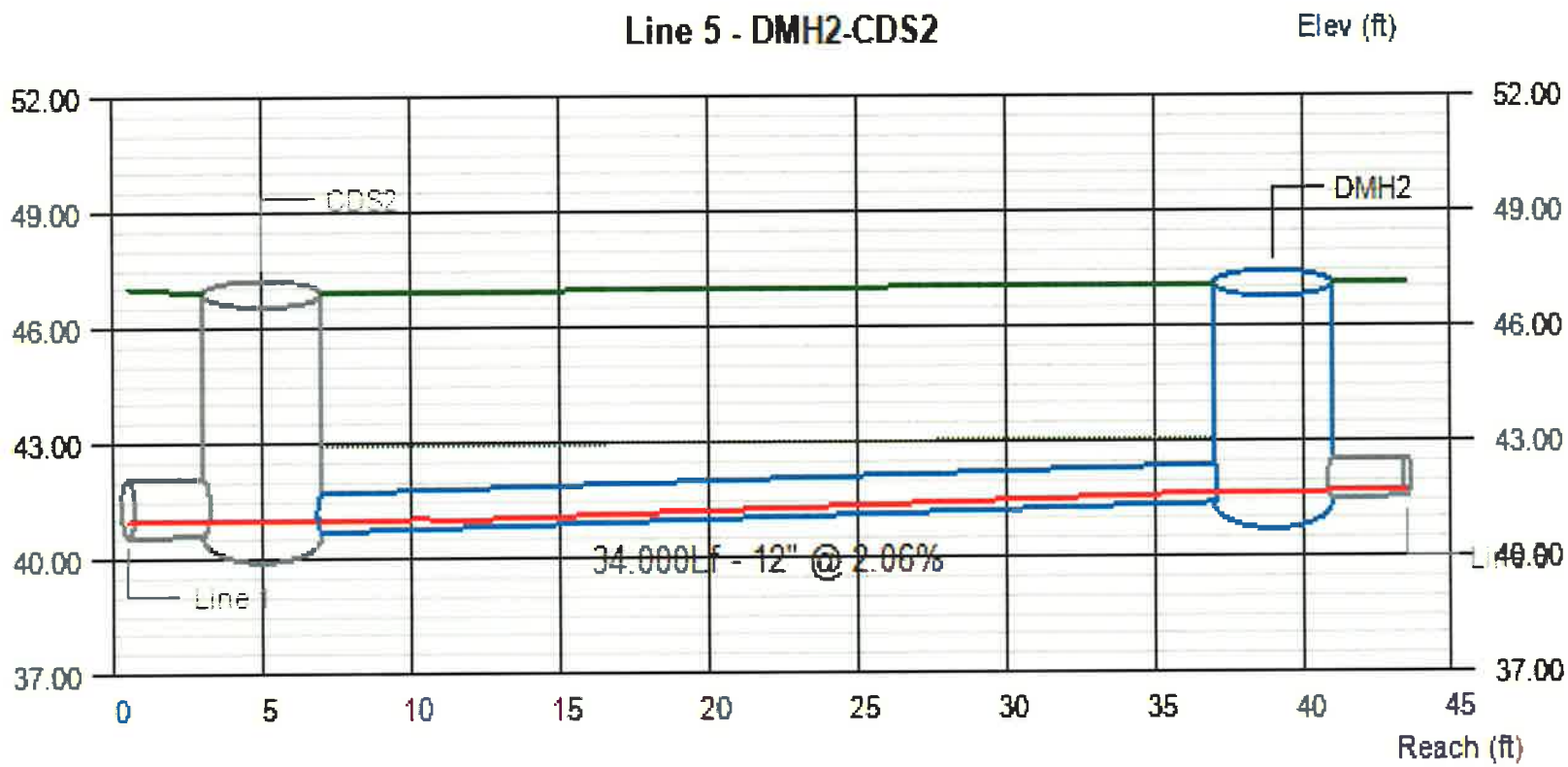



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 4 | 0.66 | 40.95 | 41.20 | 0.29 | 0.34 | 0.34 | 41.24 | 41.54 | 41.54 | 3.52 | 2.83 | 3.75 | 2.30 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 5) - DMH2-CDS2



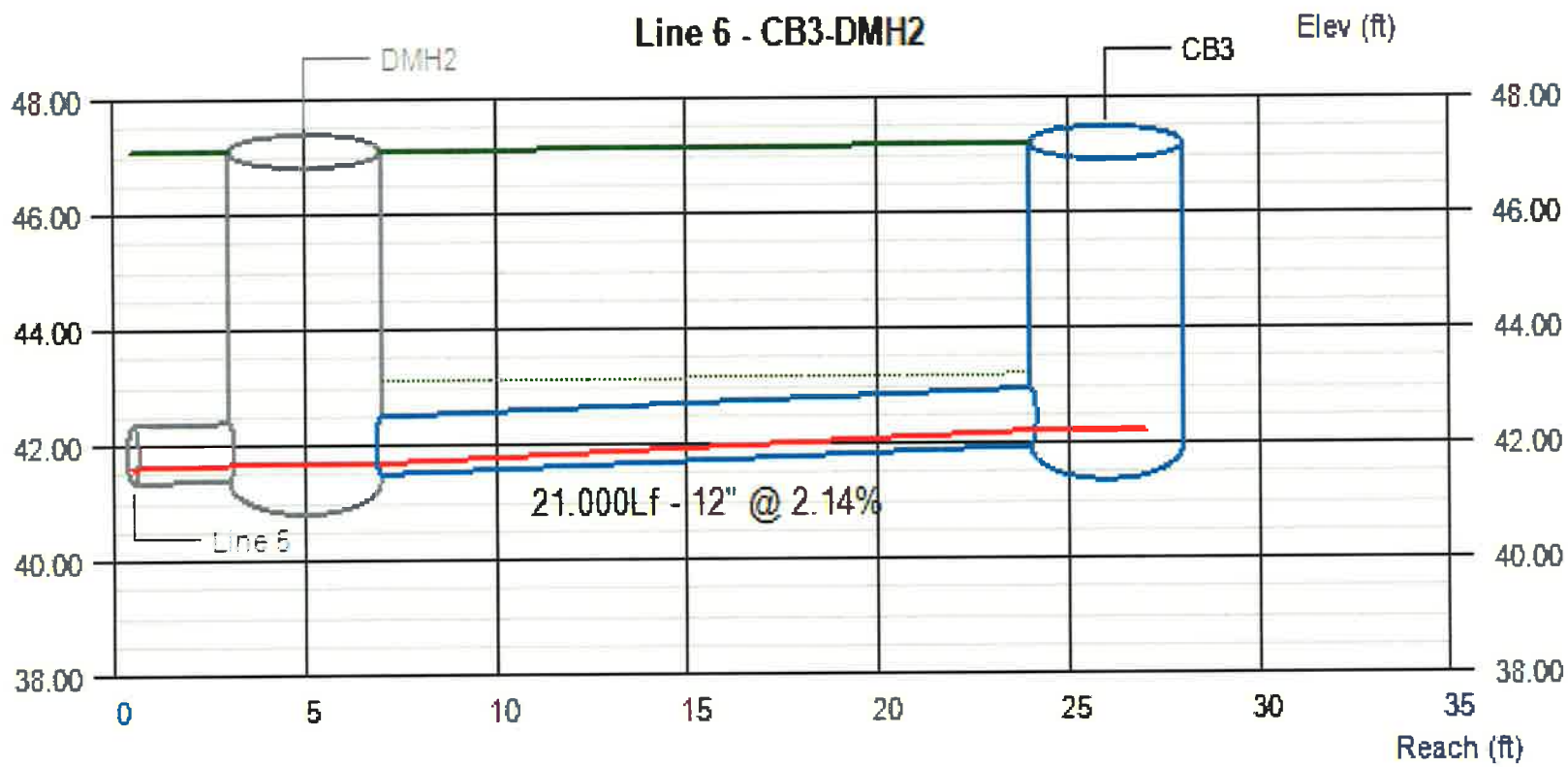



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 5 | 0.40 | 40.70 | 41.40 | 0.29 | 0.26 | 0.26 | 40.99 | 41.66 j | 41.66 | 2.13 | 2.44 | 5.20 | 4.70 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 6) - CB3-DMH2



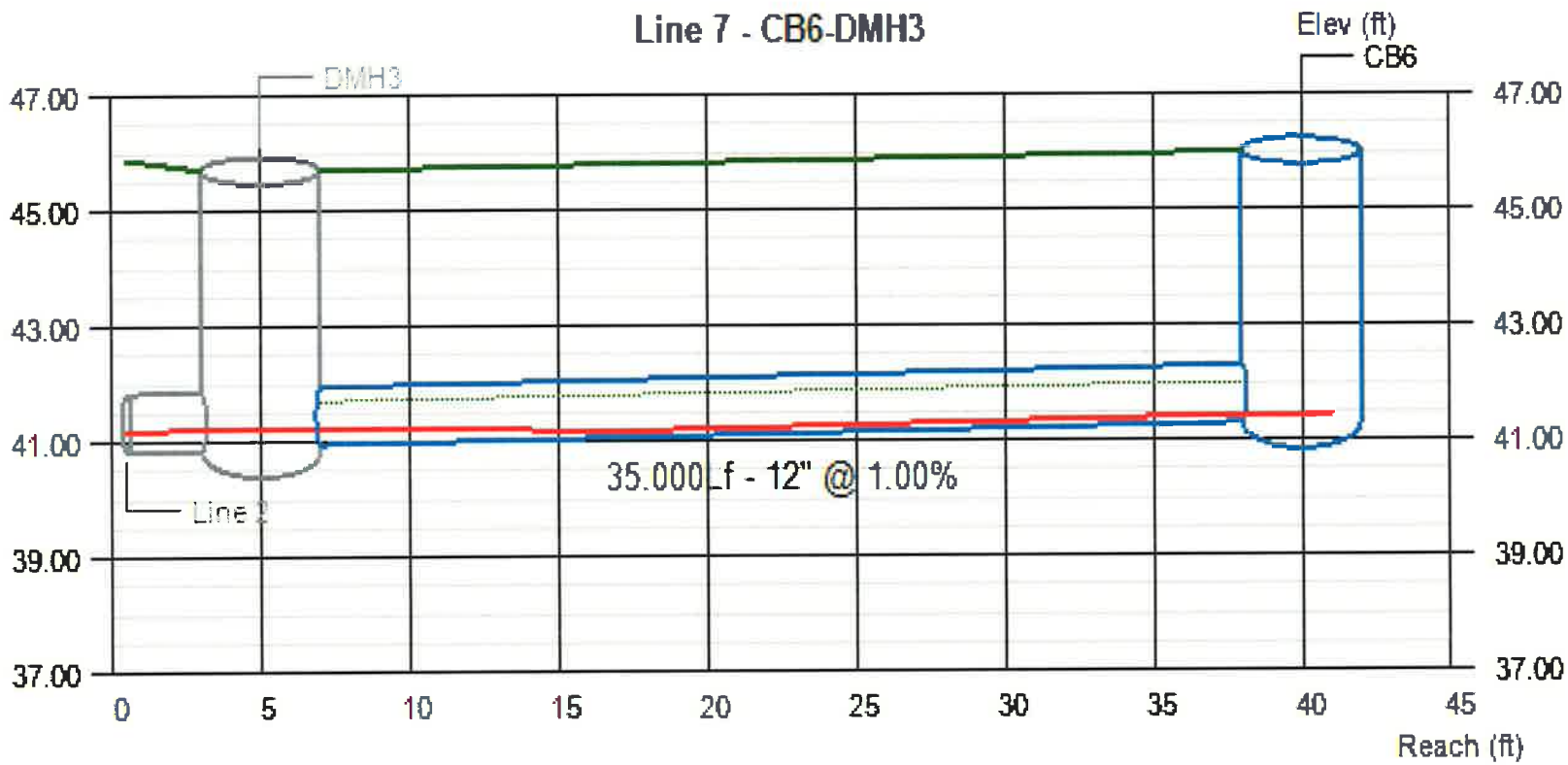



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 6 | 0.41 | 41.50 | 41.95 | 0.19 | 0.26 | 0.26 | 41.69 | 42.21 | 42.21 | 3.94 | 2.46 | 4.60 | 4.25 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 7) - CB6-DMH3

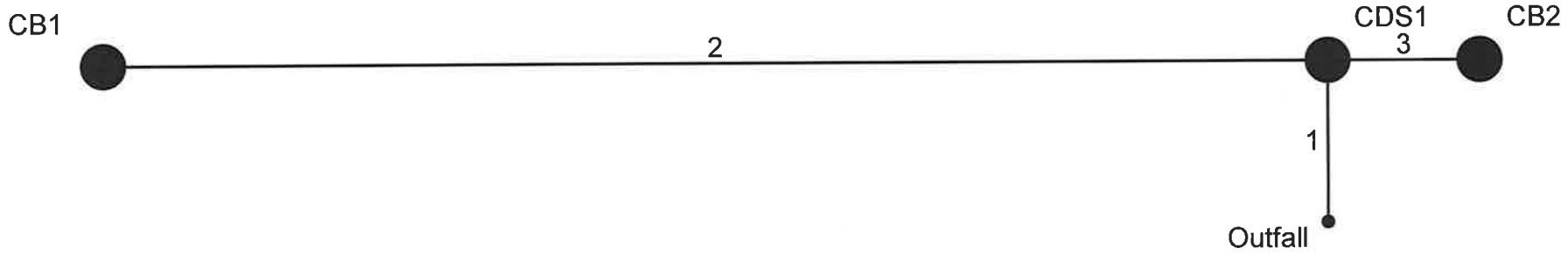





| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 7 | 0.11 | 40.95 | 41.30 | 0.26 | 0.13 | 0.13 | 41.21 | 41.43 j | 41.43 | 0.66 | 1.72 | 3.75 | 3.70 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Winchester CVS




| Project File: Stormsewers.stm | Number of lines: 3 | Date: 5/30/2013 |
|---|---|---|

Storm Sewers v10.00

# Storm Sewer Tabulation

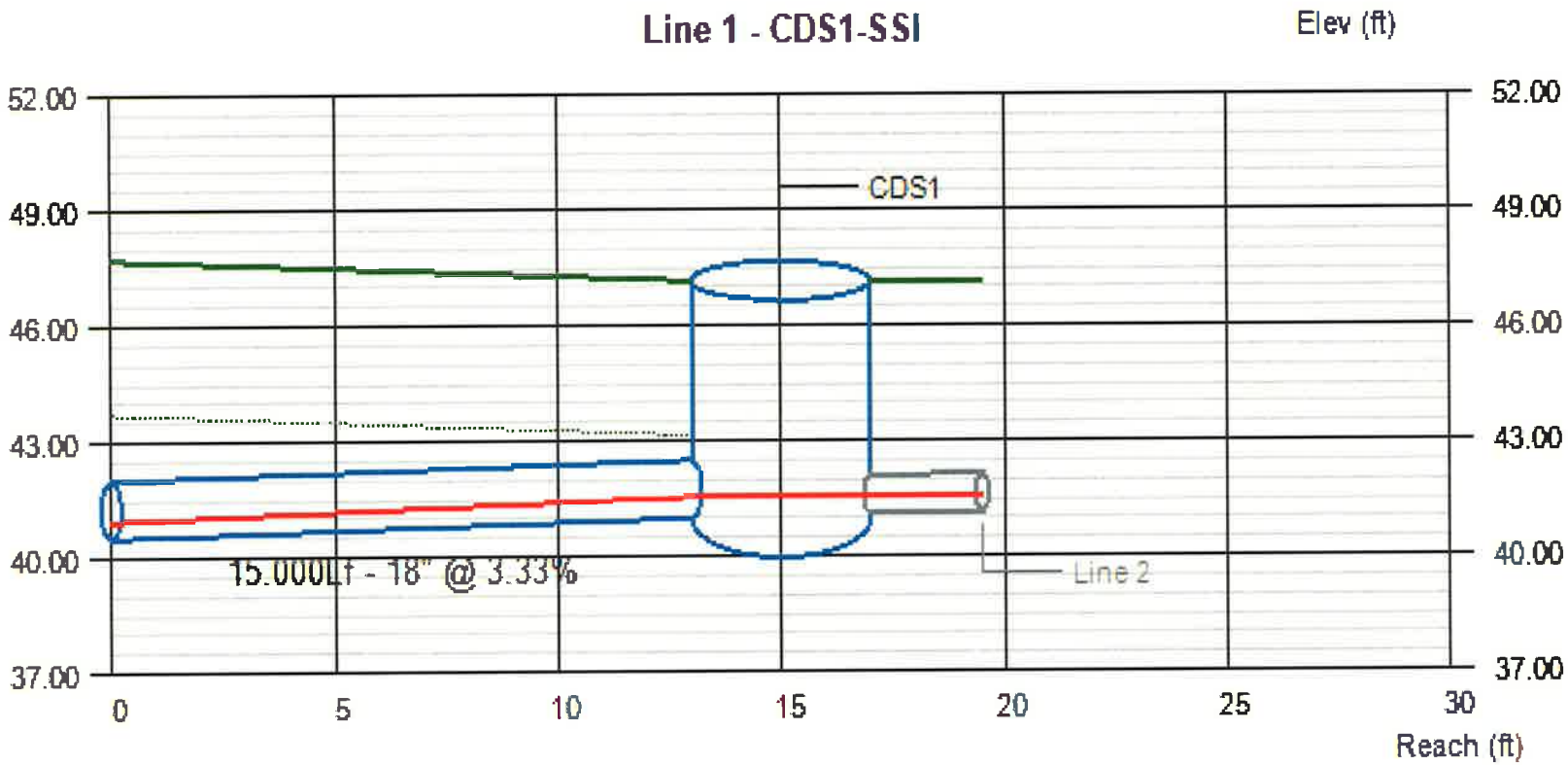
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 15.000 | 0.00 | 0.52 | 0.00 | 0.00 | 0.37 | 6.0 | 7.0 | 5.7 | 2.12 | 19.17 | 4.26 | 18 | 3.33 | 40.50 | 41.00 | 40.94 | 41.55 | 47.70 | 47.15 | CDS1-SSI |
| 2 | 1 | 113.000 | 0.33 | 0.33 | 0.75 | 0.25 | 0.25 | 6.0 | 6.0 | 5.9 | 1.47 | 5.08 | 3.96 | 12 | 2.04 | 41.10 | 43.40 | 41.55 | 43.91 | 47.15 | 47.50 | CB1-CDS1 |
| 3 | 1 | 14.000 | 0.19 | 0.19 | 0.66 | 0.13 | 0.13 | 6.0 | 6.0 | 5.9 | 0.74 | 4.26 | 2.55 | 12 | 1.43 | 41.10 | 41.30 | 41.55 | 41.66 | 47.15 | 46.75 | CB2-CDS1 |

**Winchester CVS** | Number of lines: 3 | Run Date: 5/30/2013

NOTES:Intensity = 63.03 / (Inlet time + 12.50) ^ 0.81 ; Return period =Yrs. 25 ; c = cir e = ellip b = box

# Line Profile (Line 1) - CDS1-SSI



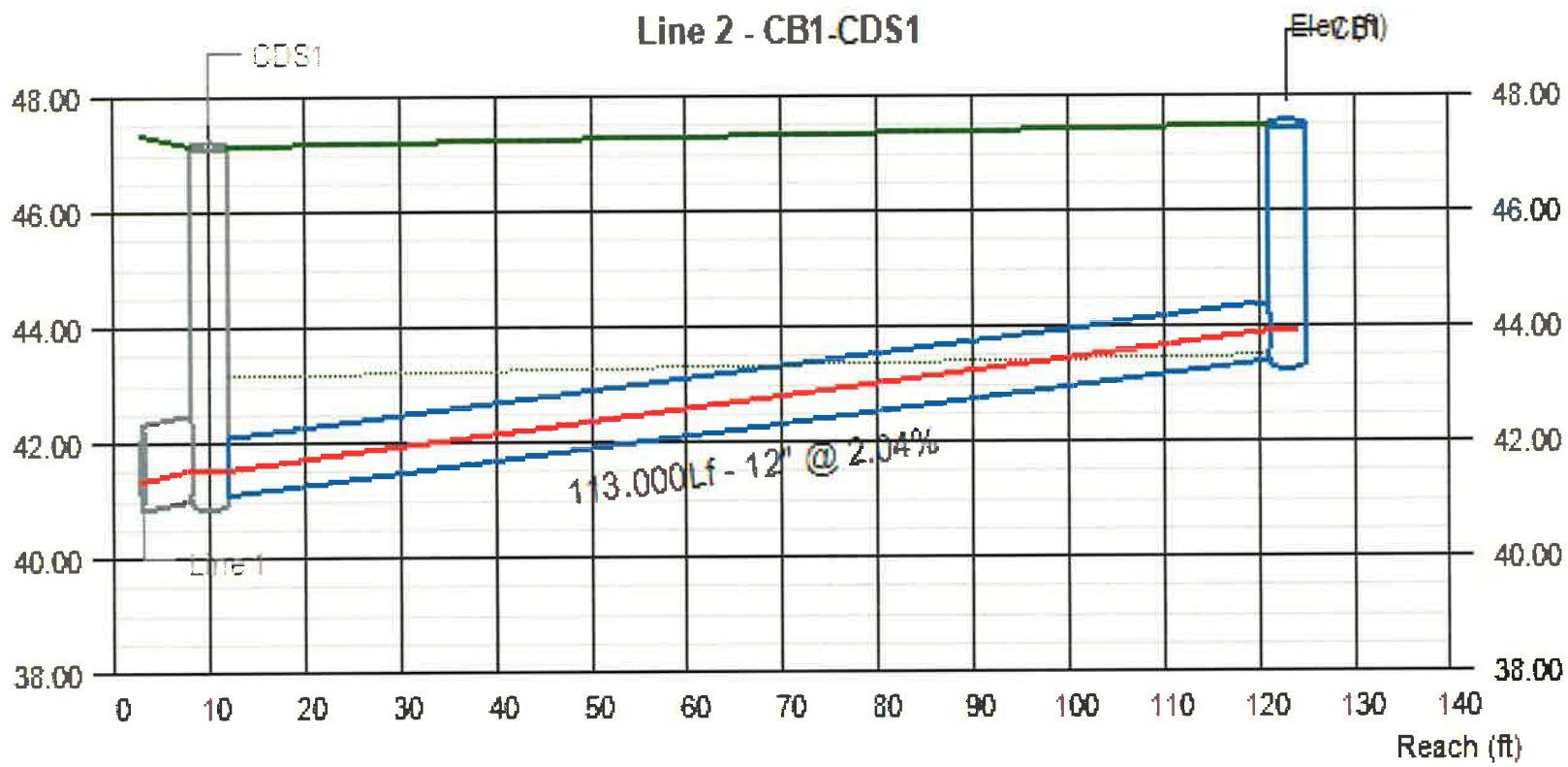



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 2.12 | 40.50 | 41.00 | 0.44 | 0.55 | 0.55 | 40.94 | 41.55 | 41.55 | 4.90 | 3.62 | 5.70 | 4.65 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 2) - CB1-CDS1



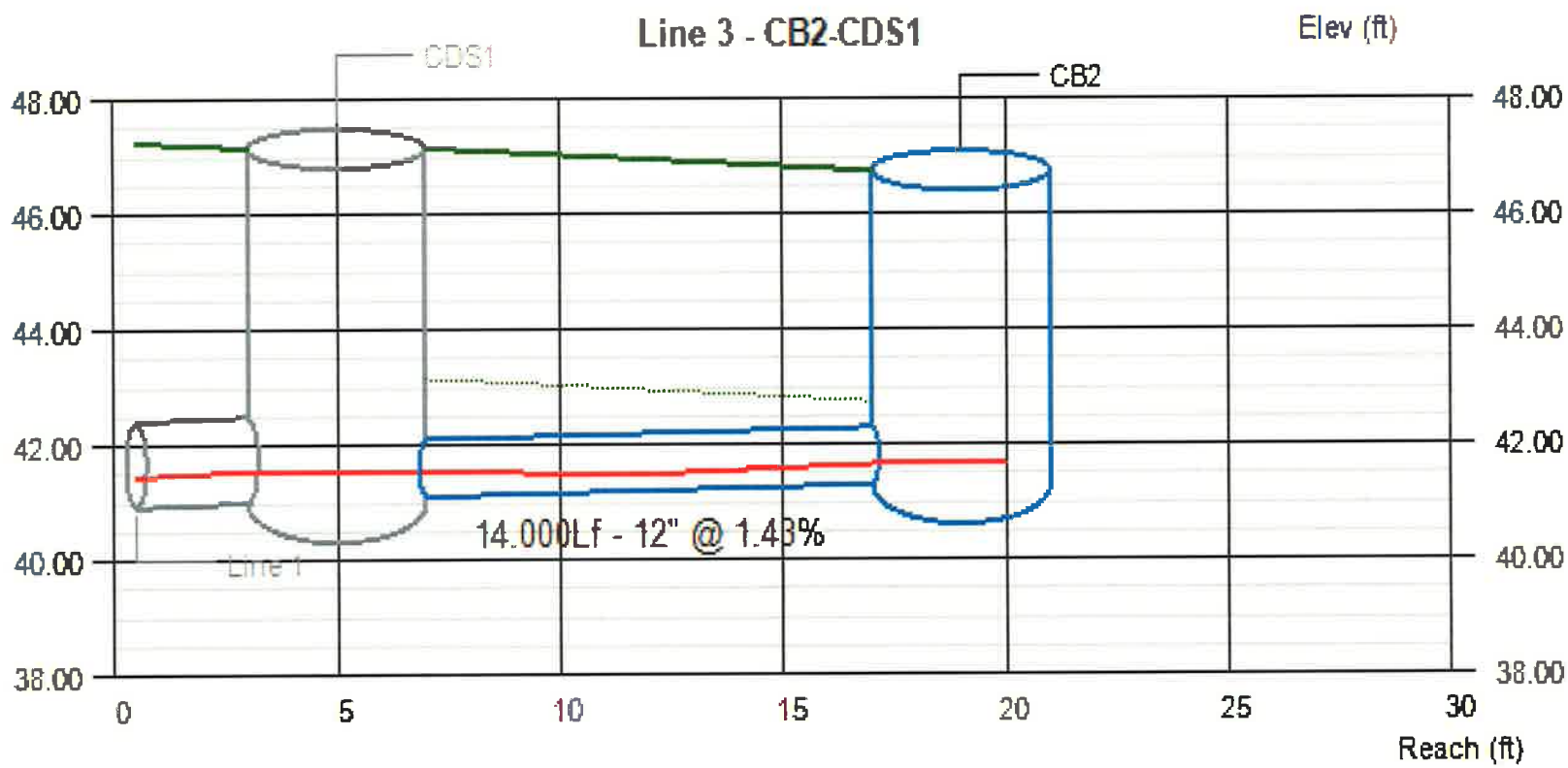



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 1.47 | 41.10 | 43.40 | 0.45 | 0.51 | 0.51 | 41.55 | 43.91 | 43.91 | 4.29 | 3.62 | 5.05 | 3.10 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 3) - CB2-CDS1



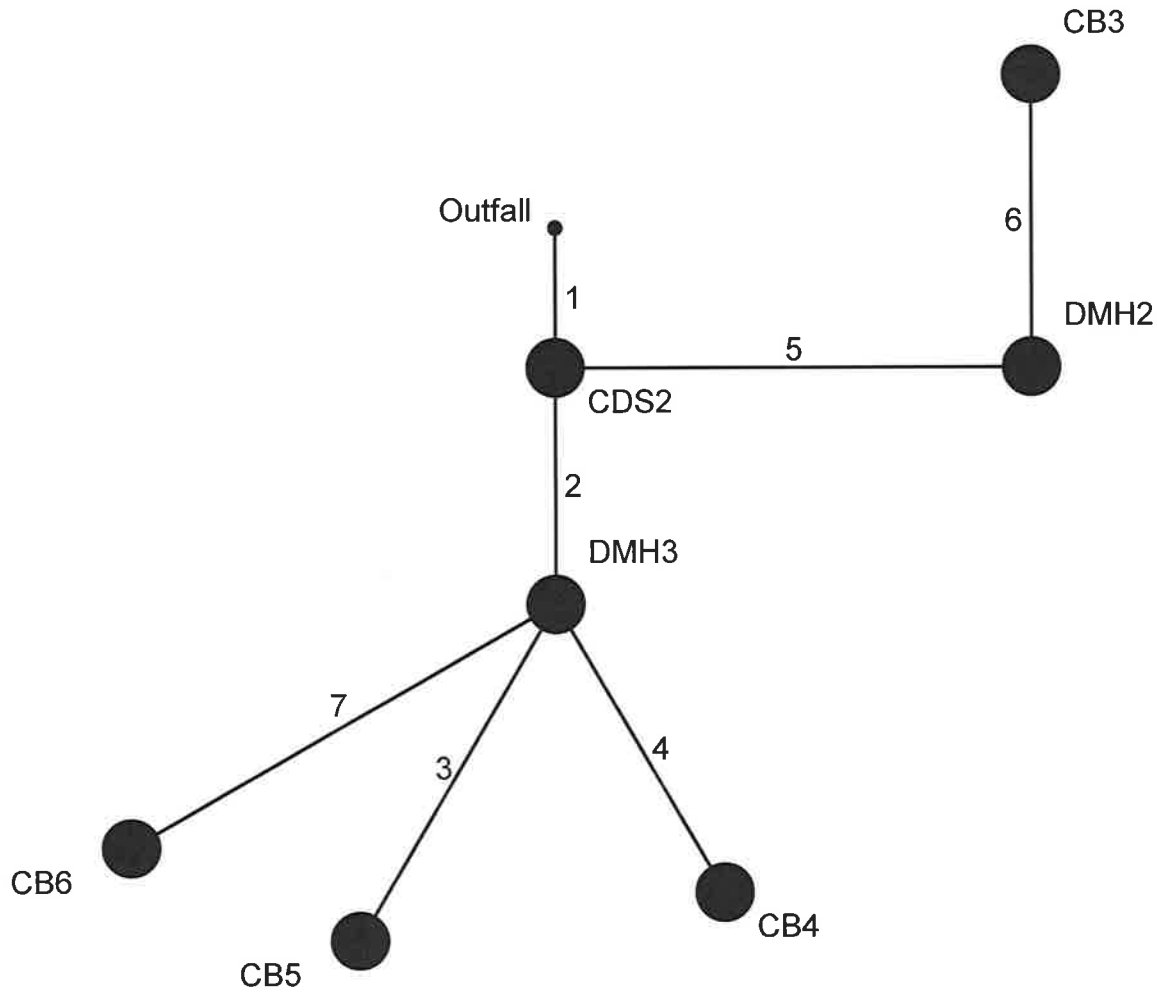



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.74 | 41.10 | 41.30 | 0.45 | 0.36 | 0.36 | 41.55 | 41.66 j | 41.66 | 2.18 | 2.92 | 5.05 | 4.45 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# 100-YEAR STORM PIPE SIZING

# Winchester CVS




| Project File: Stormsewers CB1_2.stm | Number of lines: 7 | Date: 5/22/2013 |
|---|---|---|

Storm Sewers v10.00

# Storm Sewer Tabulation

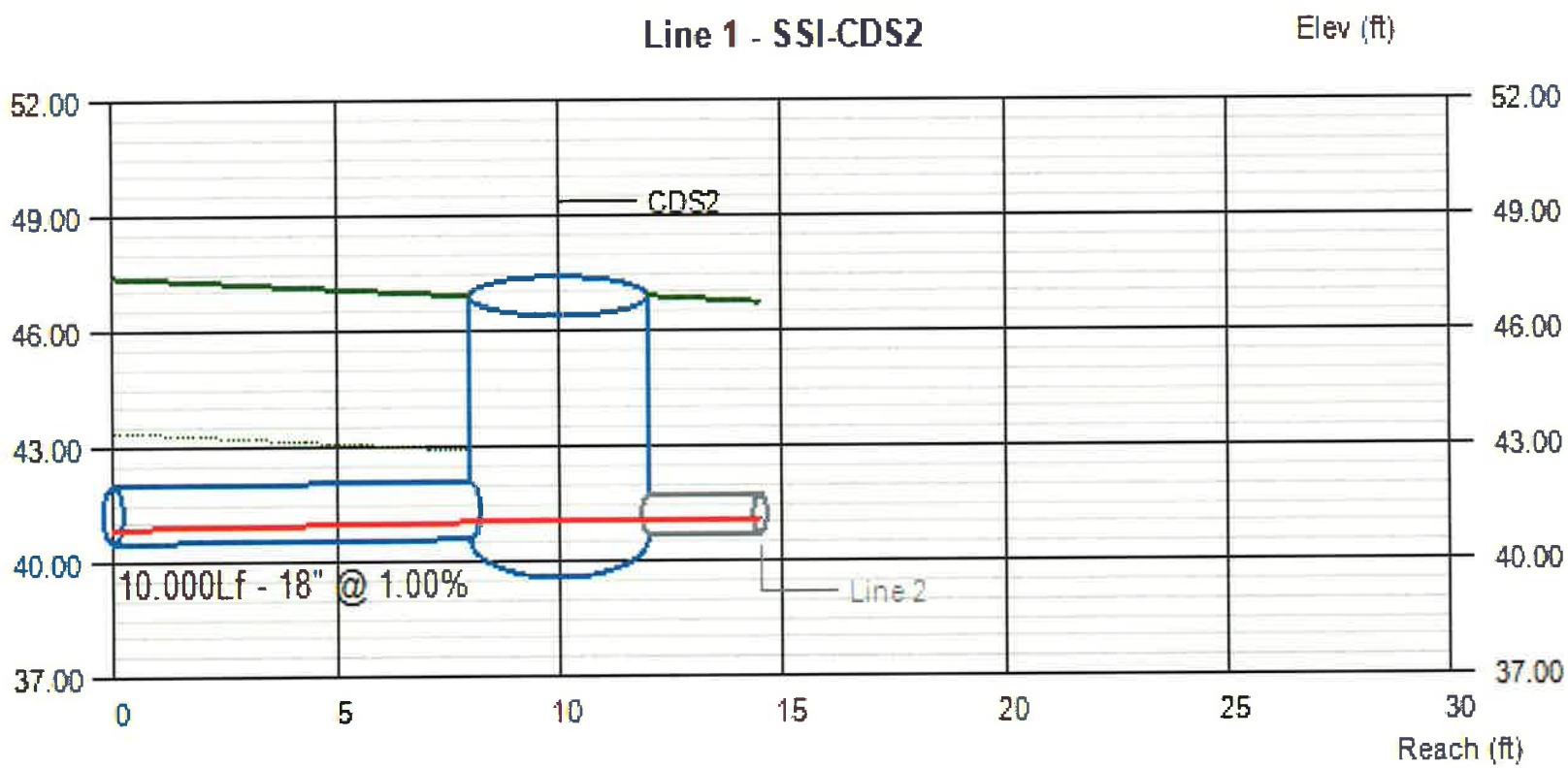
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 10.000 | 0.00 | 0.25 | 0.00 | 0.00 | 0.22 | 6.0 | 9.8 | 6.2 | 1.34 | 10.50 | 3.62 | 18 | 1.00 | 40.50 | 40.60 | 40.86 | 41.03 | 47.40 | 46.90 | SSI-CDS2 |
| 2 | 1 | 17.000 | 0.00 | 0.17 | 0.00 | 0.00 | 0.15 | 6.0 | 9.6 | 6.2 | 0.92 | 3.35 | 3.38 | 12 | 0.88 | 40.70 | 40.85 | 41.06 | 41.25 | 46.90 | 45.70 | DMH3-CDS2 |
| 3 | 2 | 28.000 | 0.02 | 0.02 | 0.90 | 0.02 | 0.02 | 6.0 | 6.0 | 7.1 | 0.13 | 3.69 | 1.22 | 12 | 1.07 | 40.95 | 41.25 | 41.25 | 41.40 | 45.70 | 44.45 | CB5-DMH3 |
| 4 | 2 | 24.000 | 0.13 | 0.13 | 0.86 | 0.11 | 0.11 | 6.0 | 6.0 | 7.1 | 0.80 | 3.63 | 3.35 | 12 | 1.04 | 40.95 | 41.20 | 41.27 | 41.57 | 45.70 | 44.50 | CB4-DMH3 |
| 5 | 1 | 34.000 | 0.00 | 0.08 | 0.00 | 0.00 | 0.07 | 6.0 | 6.6 | 7.0 | 0.48 | 5.11 | 2.33 | 12 | 2.06 | 40.70 | 41.40 | 41.03 | 41.69 | 46.90 | 47.10 | DMH2-CDS2 |
| 6 | 5 | 21.000 | 0.08 | 0.08 | 0.86 | 0.07 | 0.07 | 6.0 | 6.0 | 7.1 | 0.49 | 5.21 | 3.38 | 12 | 2.14 | 41.50 | 41.95 | 41.71 | 42.24 | 47.10 | 47.20 | CB3-DMH2 |
| 7 | 2 | 35.000 | 0.02 | 0.02 | 0.90 | 0.02 | 0.02 | 6.0 | 6.0 | 7.1 | 0.13 | 3.56 | 1.22 | 12 | 1.00 | 40.95 | 41.30 | 41.25 | 41.45 | 45.70 | 46.00 | CB6-DMH3 |

**Winchester CVS** | Number of lines: 7 | Run Date: 5/22/2013

NOTES:Intensity = 83.25 / (Inlet time + 14.10) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

# Line Profile (Line 1) - SSI-CDS2



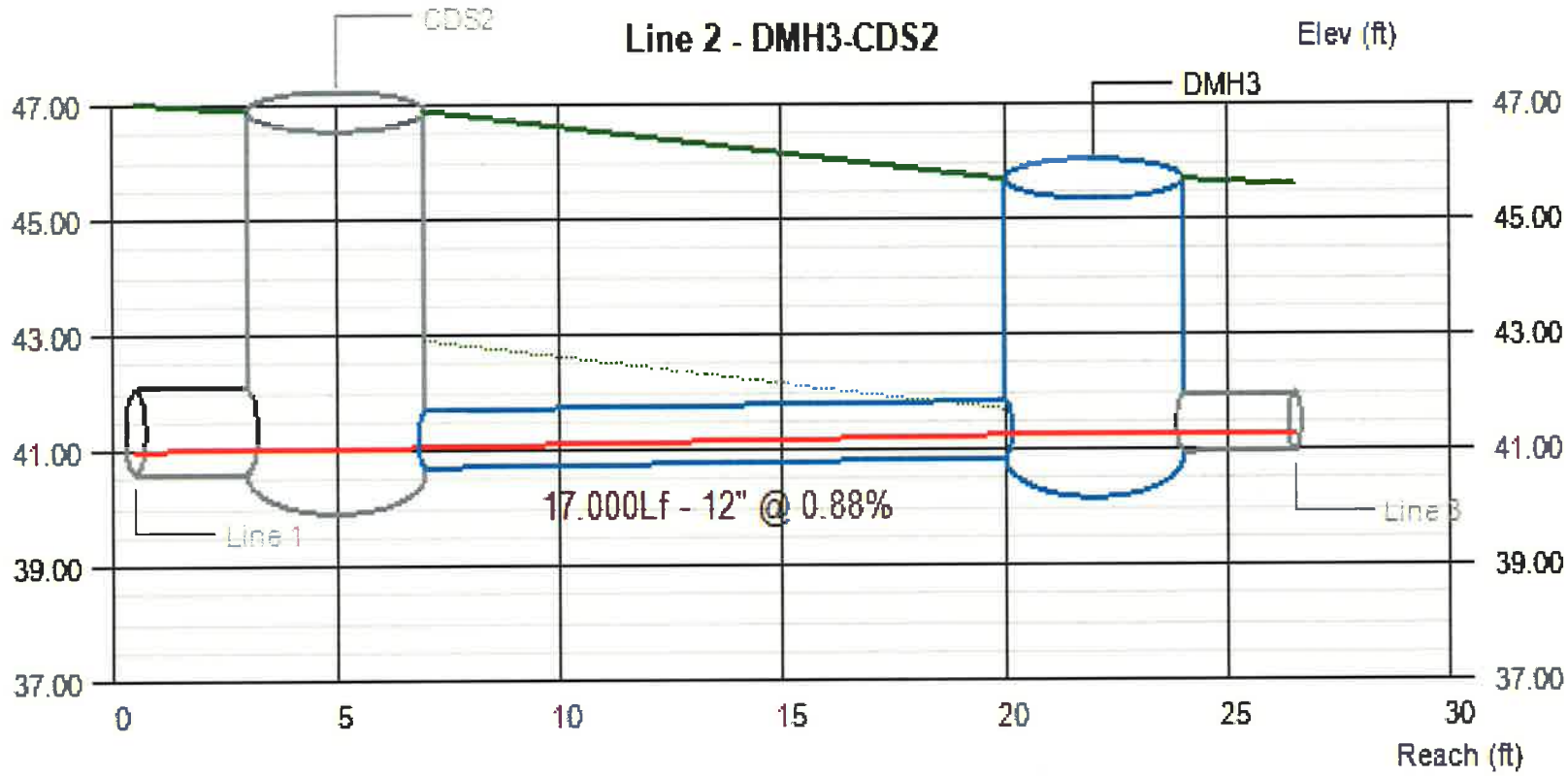



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 1.34 | 40.50 | 40.60 | 0.36 | 0.43 | 0.43 | 40.86 | 41.03 | 41.03 | 4.08 | 3.17 | 5.40 | 4.80 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 2) - DMH3-CDS2



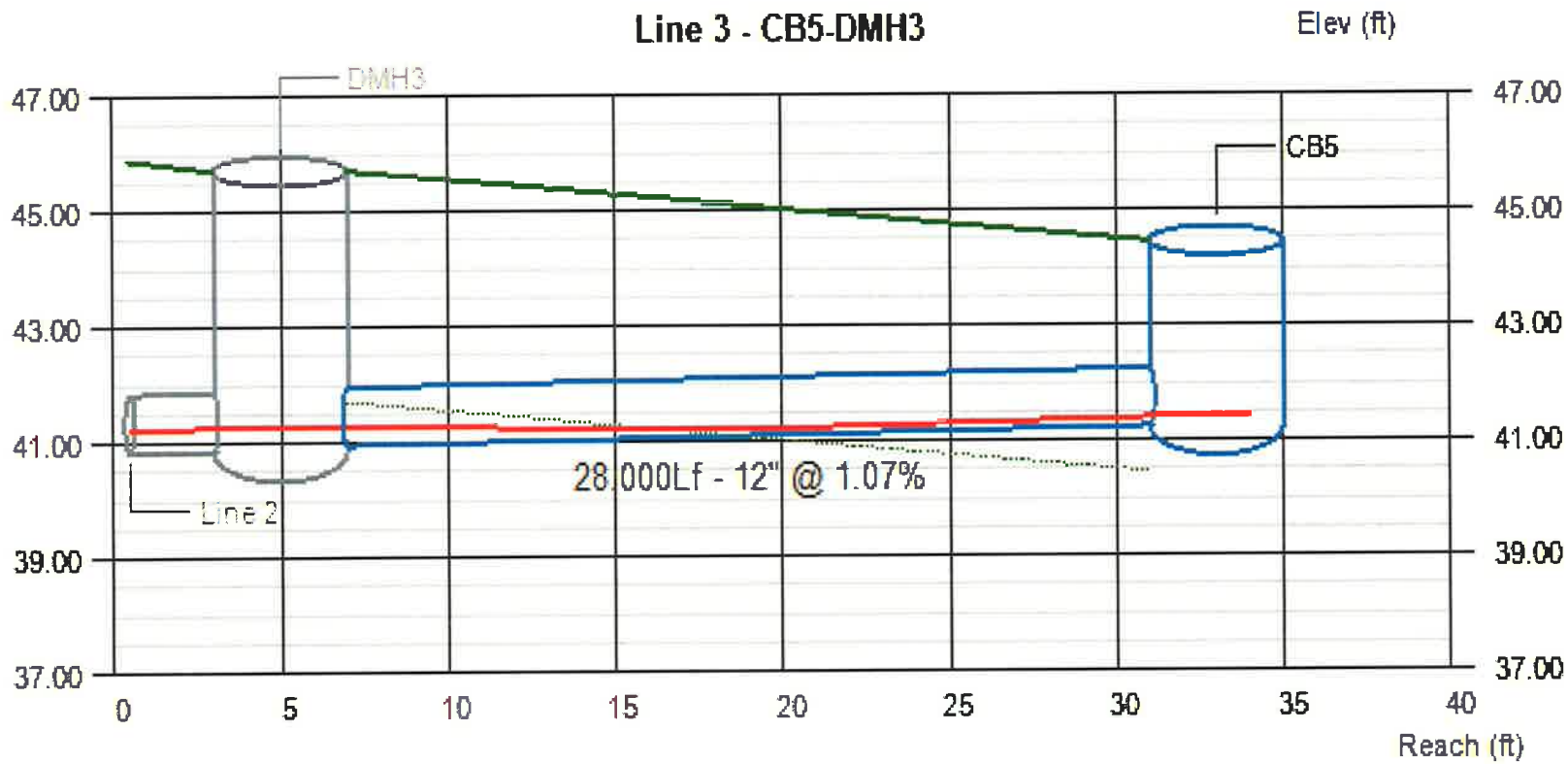



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 0.92 | 40.70 | 40.85 | 0.36 | 0.40 | 0.40 | 41.06 | 41.25 | 41.25 | 3.64 | 3.12 | 5.20 | 3.85 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 3) - CB5-DMH3



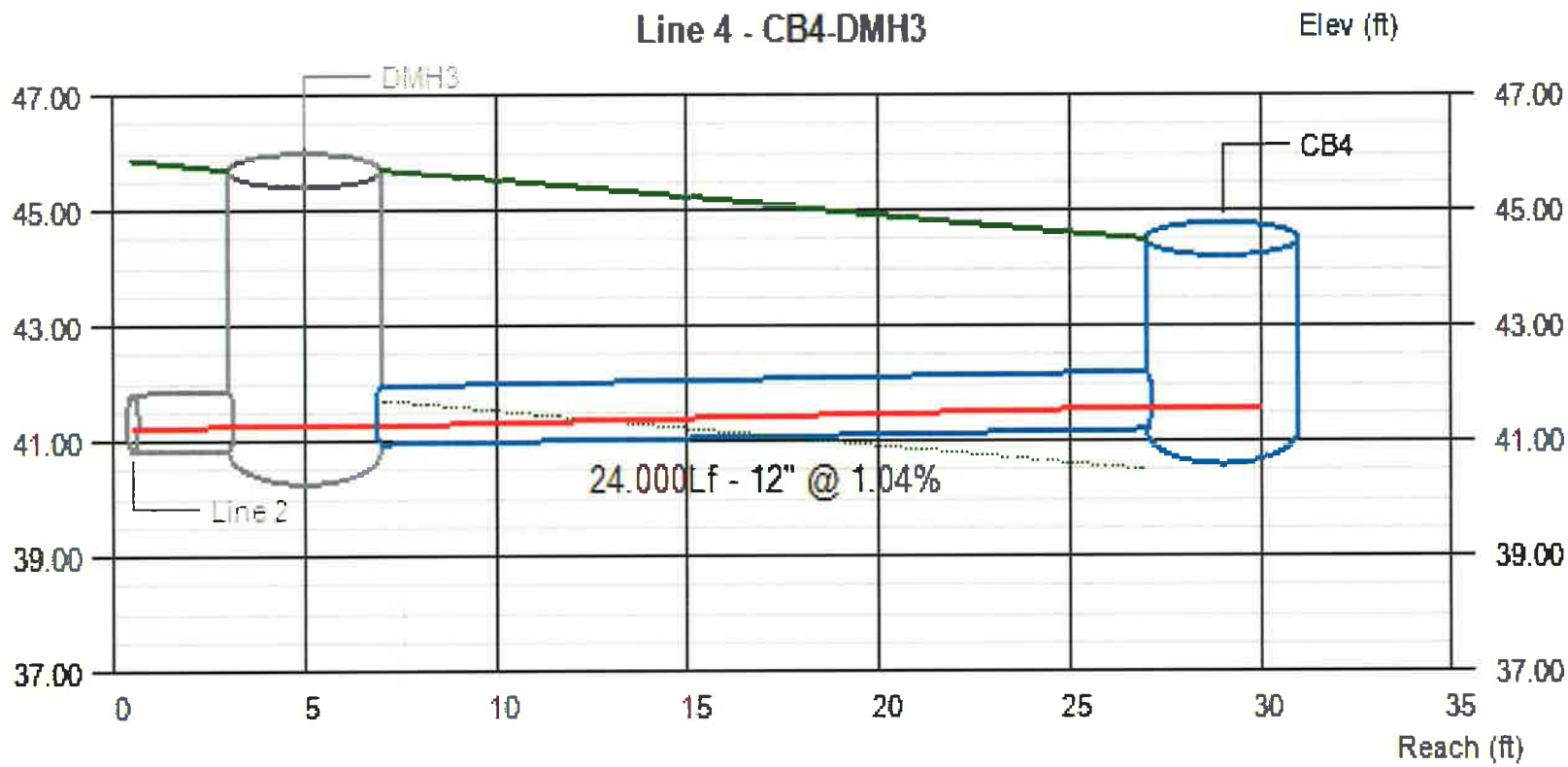



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.13 | 40.95 | 41.25 | 0.30 | 0.15 | 0.15 | 41.25 | 41.40 j | 41.40 | 0.64 | 1.80 | 3.75 | 2.20 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 4) - CB4-DMH3



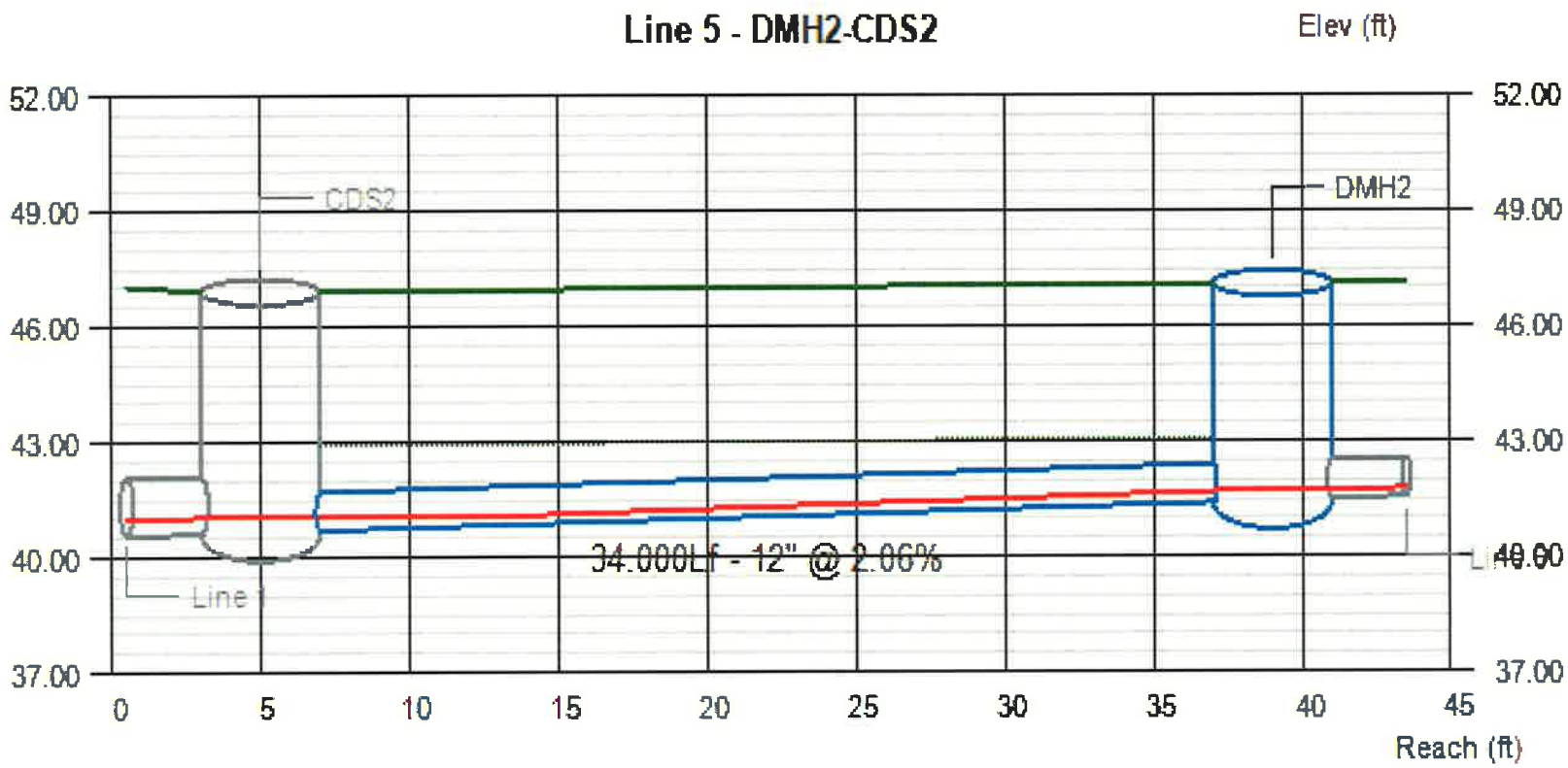



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 4 | 0.80 | 40.95 | 41.20 | 0.32 | 0.37 | 0.37 | 41.27 | 41.57 | 41.57 | 3.71 | 2.99 | 3.75 | 2.30 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 5) - DMH2-CDS2



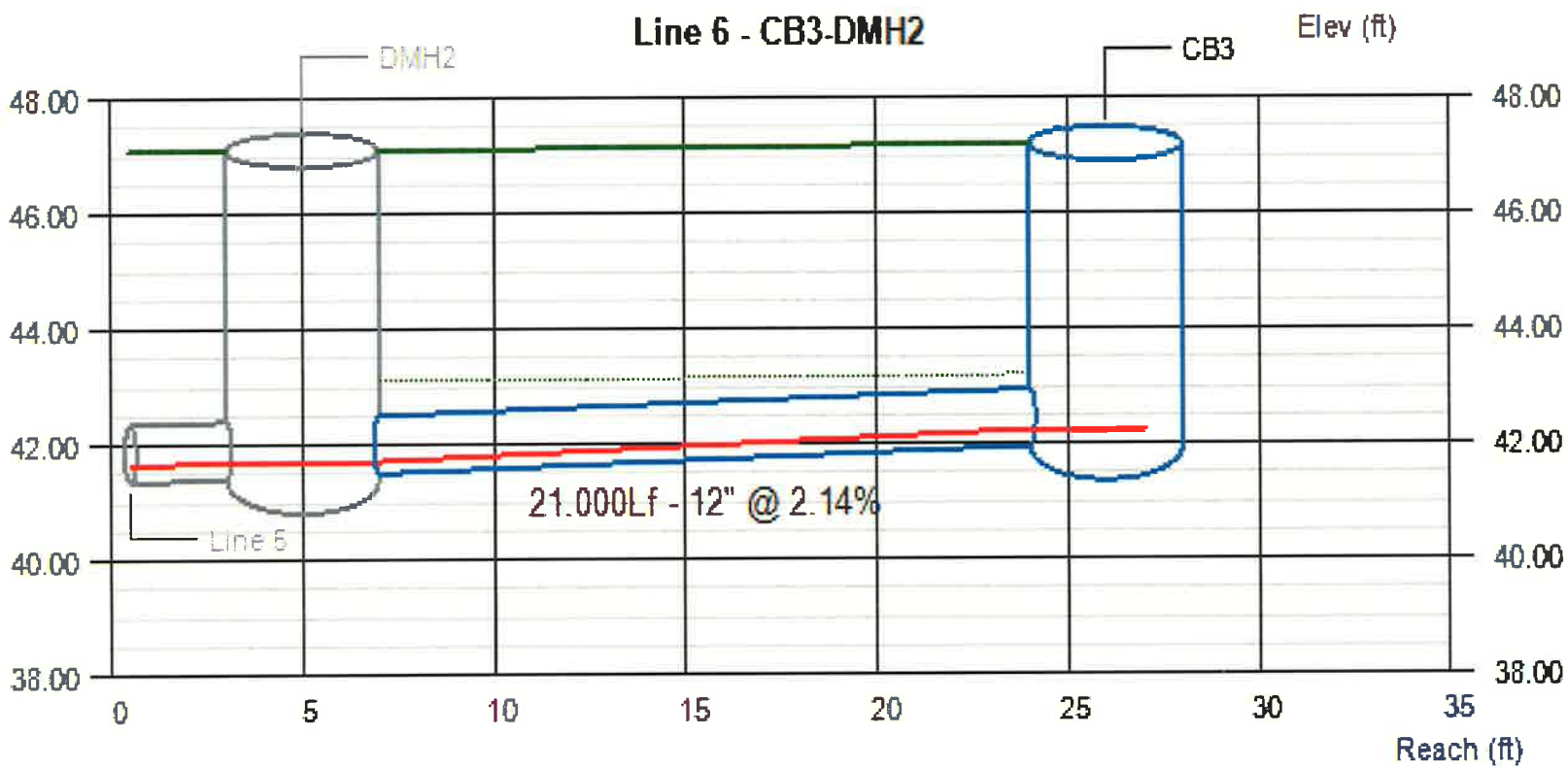



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 5 | 0.48 | 40.70 | 41.40 | 0.33 | 0.29 | 0.29 | 41.03 | 41.69 j | 41.69 | 2.09 | 2.58 | 5.20 | 4.70 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 6) - CB3-DMH2



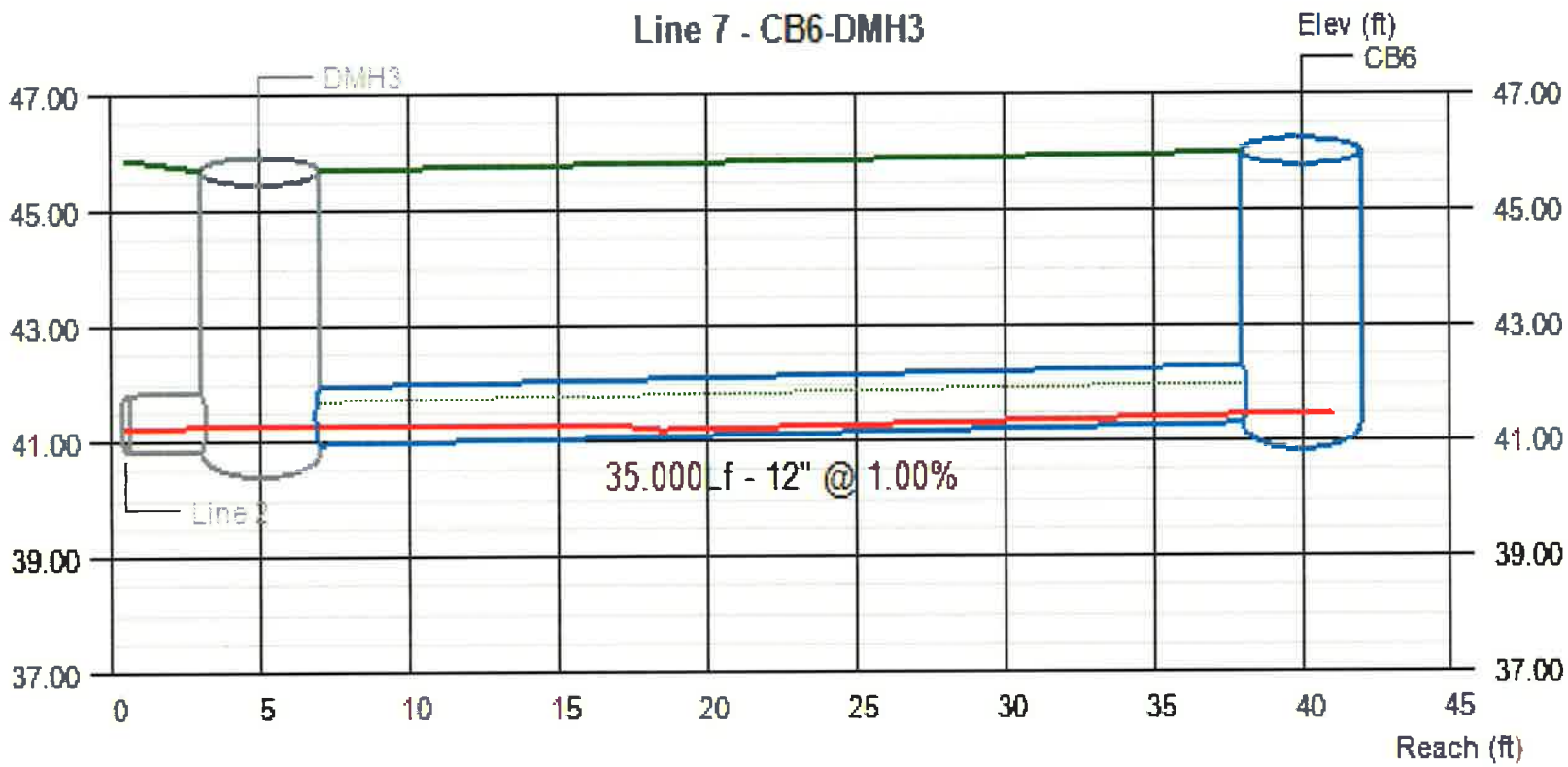



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 6 | 0.49 | 41.50 | 41.95 | 0.21 | 0.29 | 0.29 | 41.71 | 42.24 | 42.24 | 4.17 | 2.59 | 4.60 | 4.25 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Line Profile (Line 7) - CB6-DMH3

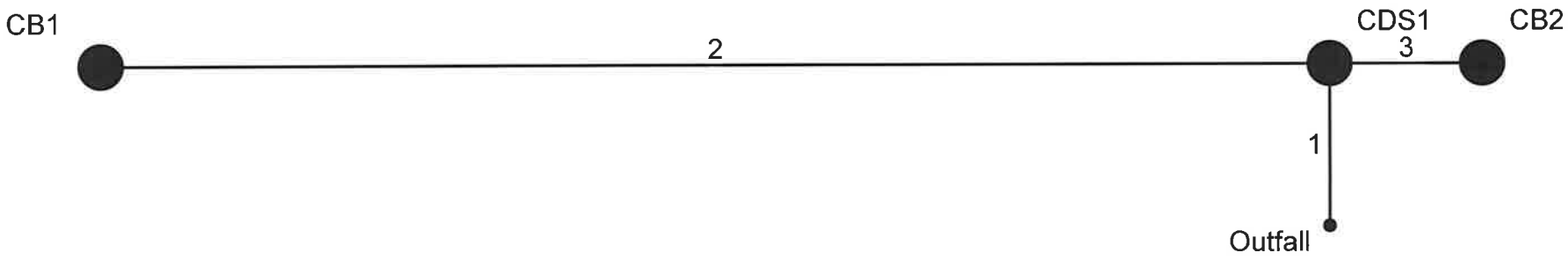





| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 7 | 0.13 | 40.95 | 41.30 | 0.30 | 0.15 | 0.15 | 41.25 | 41.45 j | 41.45 | 0.64 | 1.80 | 3.75 | 3.70 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/22/2013

# Winchester CVS




| | | |
|---|---|---|
| Project File: Stormsewers.stm | Number of lines: 3 | Date: 5/30/2013 |

Storm Sewers v10.00

# Storm Sewer Tabulation

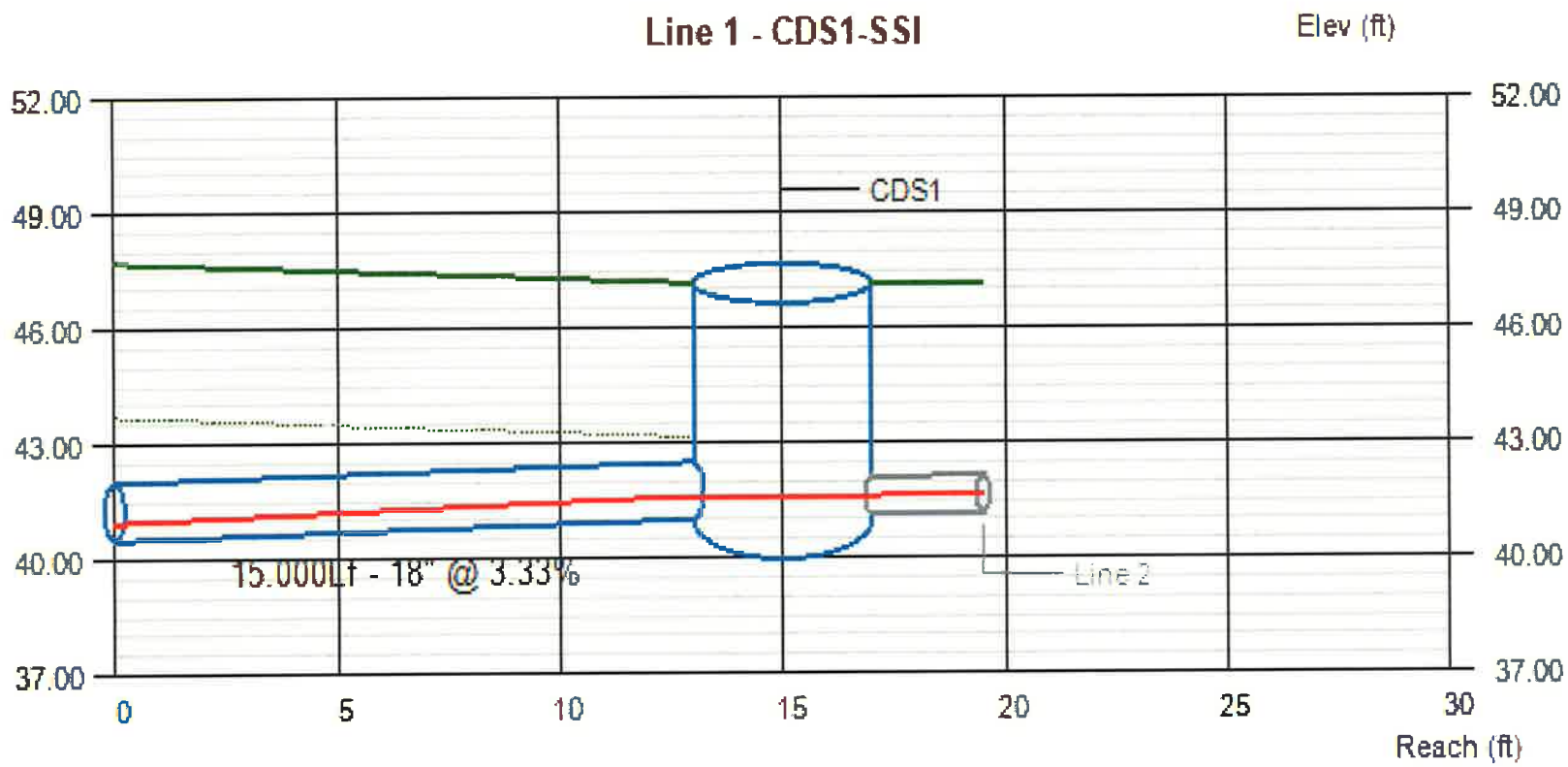
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 15.000 | 0.00 | 0.52 | 0.00 | 0.00 | 0.37 | 6.0 | 6.8 | 6.9 | 2.57 | 19.17 | 4.89 | 18 | 3.33 | 40.50 | 41.00 | 40.94 | 41.61 | 47.70 | 47.15 | CDS1-SSI |
| 2 | 1 | 113.000 | 0.33 | 0.33 | 0.75 | 0.25 | 0.25 | 6.0 | 6.0 | 7.1 | 1.77 | 5.08 | 4.14 | 12 | 2.04 | 41.10 | 43.40 | 41.61 | 43.96 | 47.15 | 47.50 | CB1-CDS1 |
| 3 | 1 | 14.000 | 0.19 | 0.19 | 0.66 | 0.13 | 0.13 | 6.0 | 6.0 | 7.1 | 0.89 | 4.26 | 2.66 | 12 | 1.43 | 41.10 | 41.30 | 41.61 | 41.70 | 47.15 | 46.75 | CB2-CDS1 |

**Winchester CVS** | Number of lines: 3 | Run Date: 5/30/2013

NOTES:Intensity = 83.25 / (Inlet time + 14.10) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

# Line Profile (Line 1) - CDS1-SSI



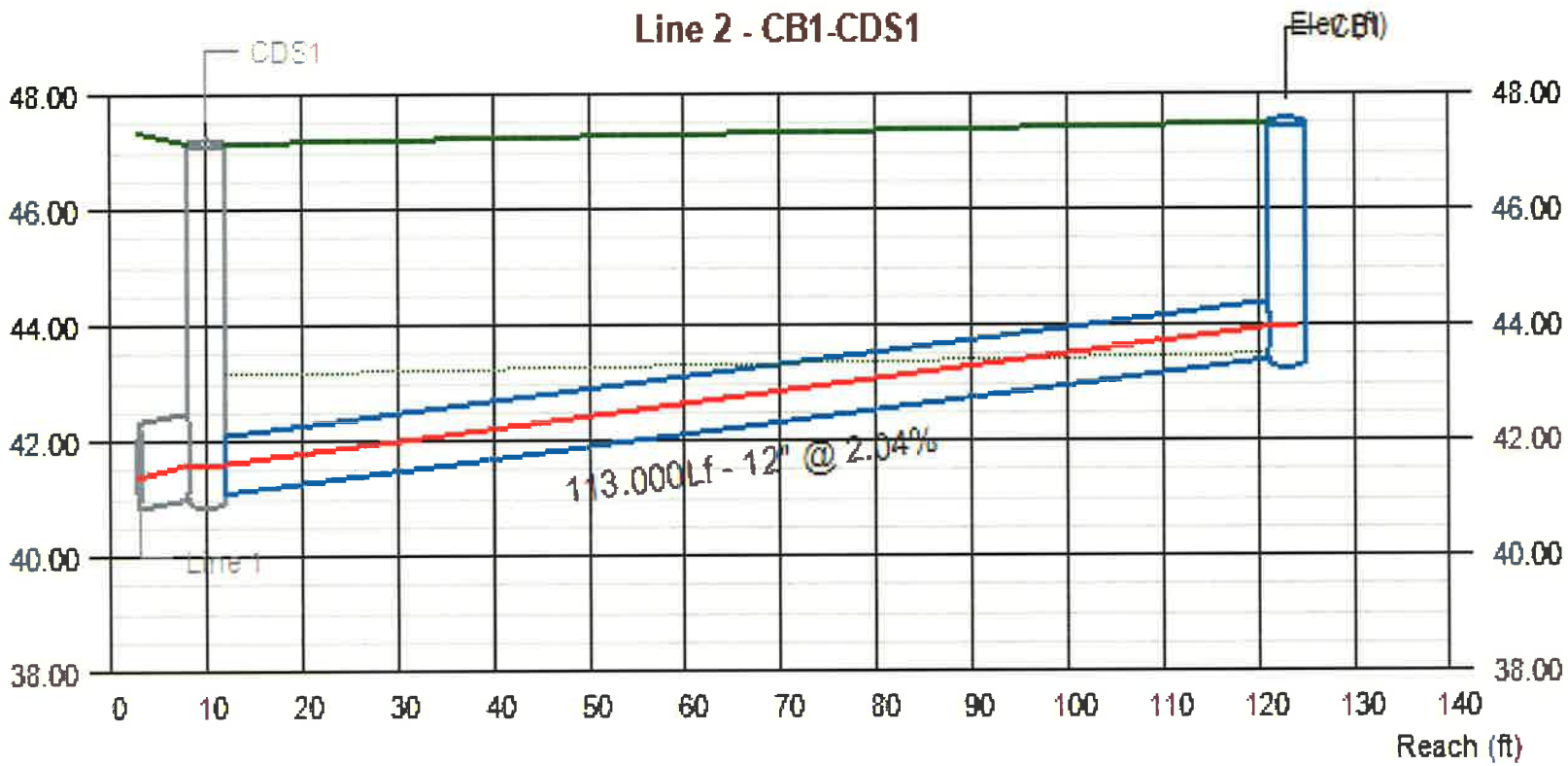



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 2.57 | 40.50 | 41.00 | 0.44 | 0.61 | 0.61 | 40.94 | 41.61 | 41.61 | 5.95 | 3.83 | 5.70 | 4.65 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 2) - CB1-CDS1



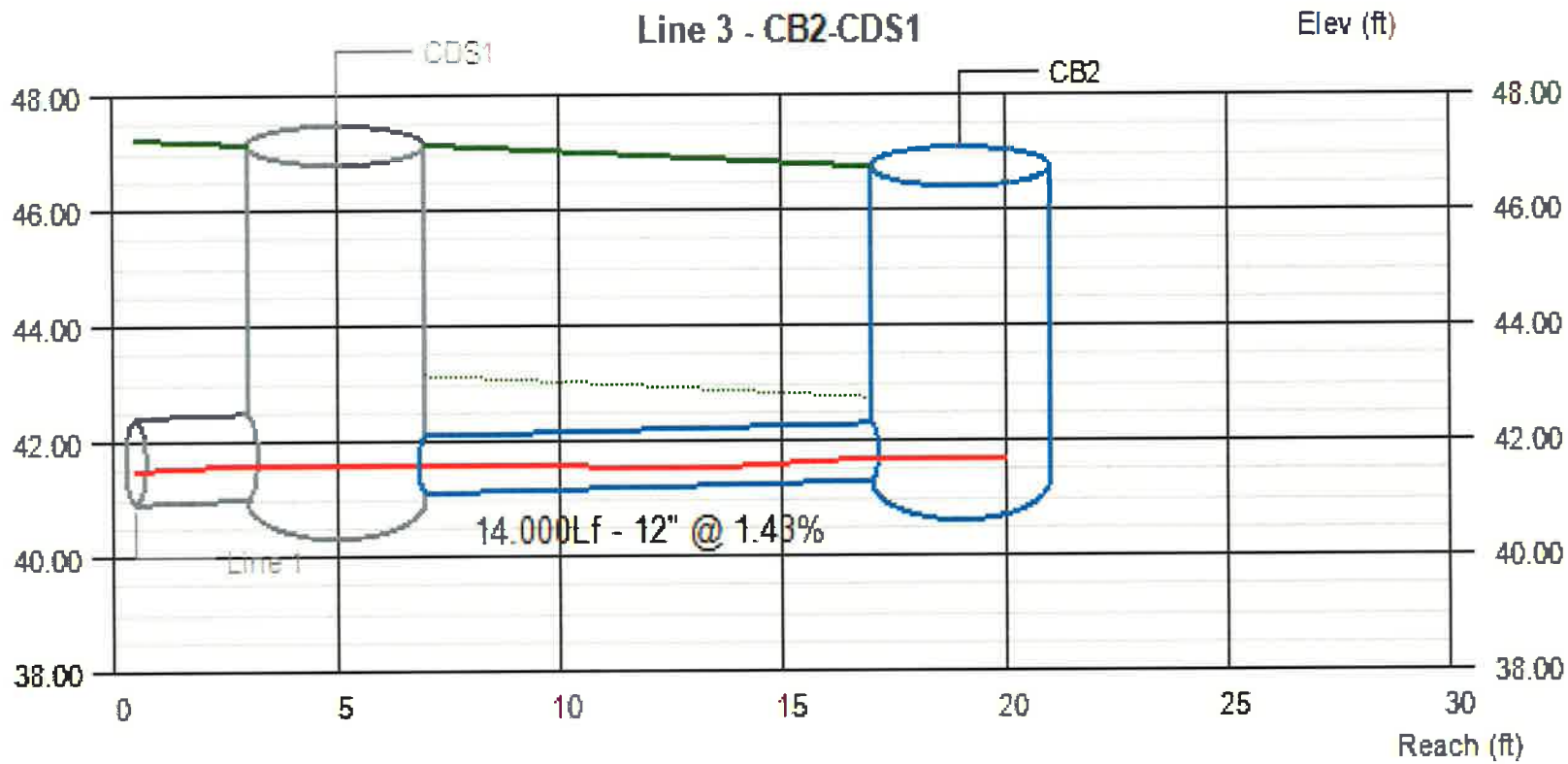



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 1.77 | 41.10 | 43.40 | 0.51 | 0.56 | 0.56 | 41.61 | 43.96 | 43.96 | 4.41 | 3.86 | 5.05 | 3.10 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 3) - CB2-CDS1



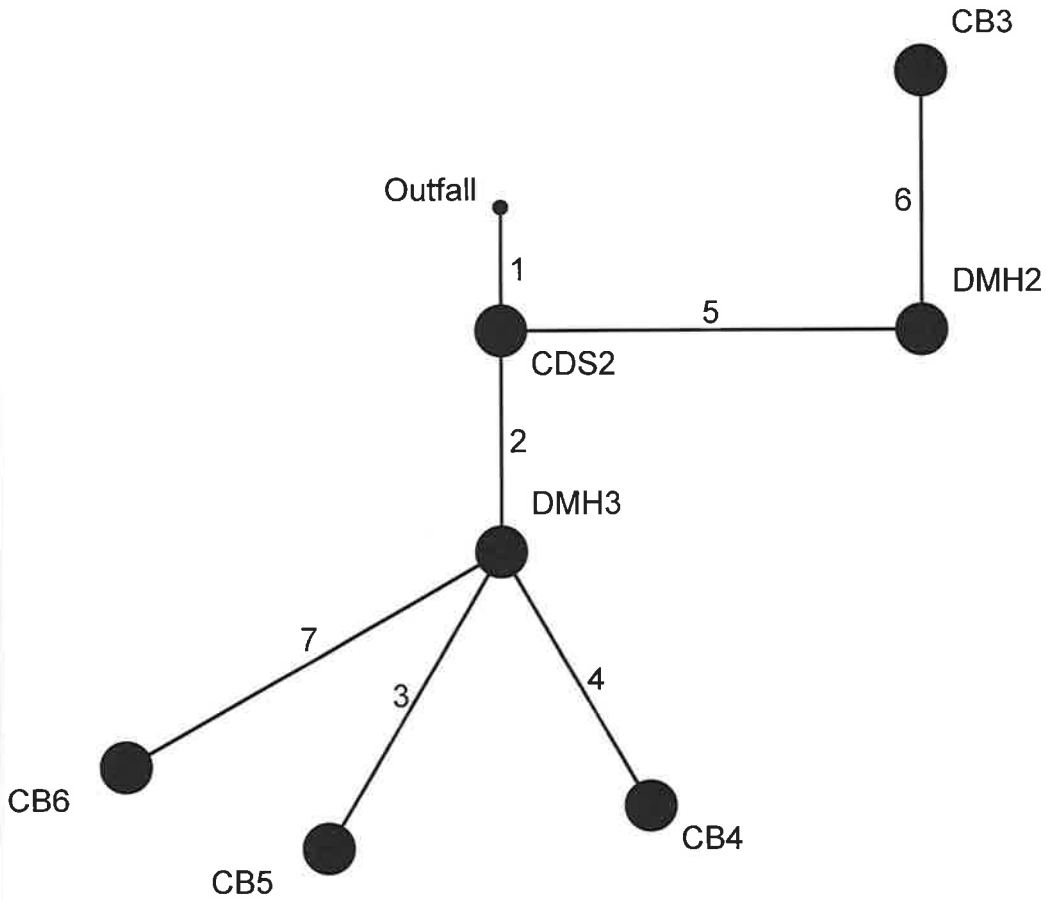



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.89 | 41.10 | 41.30 | 0.51 | 0.40 | 0.40 | 41.61 | 41.70 j | 41.70 | 2.24 | 3.09 | 5.05 | 4.45 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# 100-YEAR STORM PIPE SIZING AT PEAK BASIN ELEVATION

# Winchester CVS




| | | |
|---|---|---|
| Project File: Peak Elevation.stm | Number of lines: 7 | Date: 5/30/2013 |

Storm Sewers v10.00

# Storm Sewer Tabulation

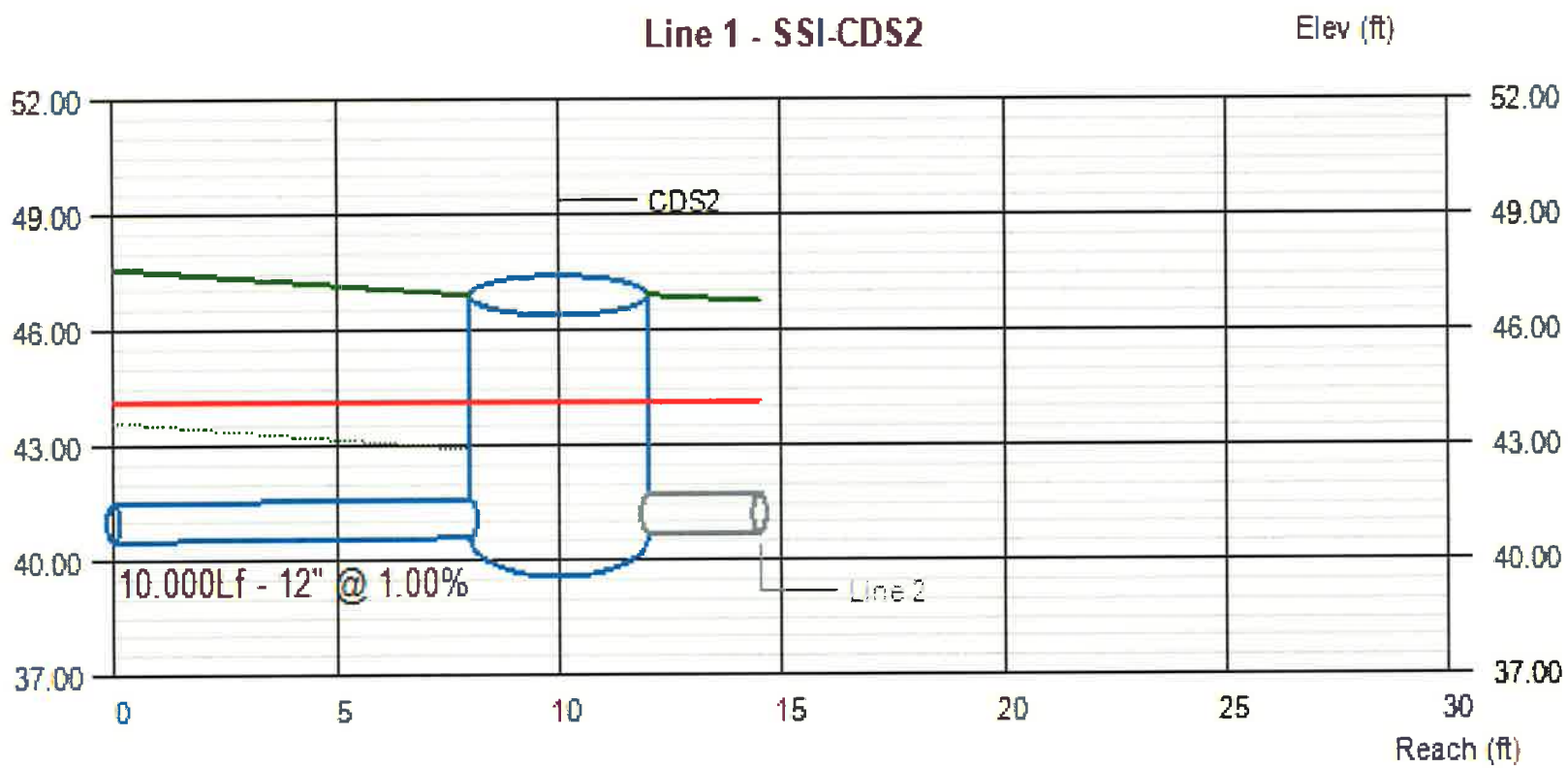
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 10.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 56.5 | 0.0 | 0.07 | 3.56 | 0.09 | 12 | 1.00 | 40.50 | 40.60 | 44.16 | 44.16 | 47.60 | 46.90 | SSI-CDS2 |
| 2 | 1 | 18.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 51.8 | 0.0 | 0.05 | 3.25 | 0.06 | 12 | 0.83 | 40.70 | 40.85 | 44.16 | 44.16 | 46.90 | 45.70 | DMH3-CDS2 |
| 3 | 2 | 28.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.02 | 3.69 | 0.03 | 12 | 1.07 | 40.95 | 41.25 | 44.16 | 44.16 | 45.70 | 44.45 | CB5-DMH3 |
| 4 | 2 | 24.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.02 | 3.63 | 0.03 | 12 | 1.04 | 40.95 | 41.20 | 44.16 | 44.16 | 45.70 | 44.50 | CB4-DMH3 |
| 5 | 1 | 34.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 19.7 | 0.0 | 0.02 | 5.11 | 0.03 | 12 | 2.06 | 40.70 | 41.40 | 44.16 | 44.16 | 46.90 | 47.30 | DMH2-CDS2 |
| 6 | 5 | 21.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.02 | 5.21 | 0.03 | 12 | 2.14 | 41.50 | 41.95 | 44.16 | 44.16 | 47.30 | 47.20 | CB3-DMH2 |
| 7 | 2 | 35.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.01 | 3.56 | 0.01 | 12 | 1.00 | 40.95 | 41.30 | 44.16 | 44.16 | 45.70 | 45.70 | CB6-DMH3 |

**Winchester CVS** | Number of lines: 7 | Run Date: 5/30/2013

NOTES:Intensity = 83.25 / (Inlet time + 14.10) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

# Line Profile (Line 1) - SSI-CDS2



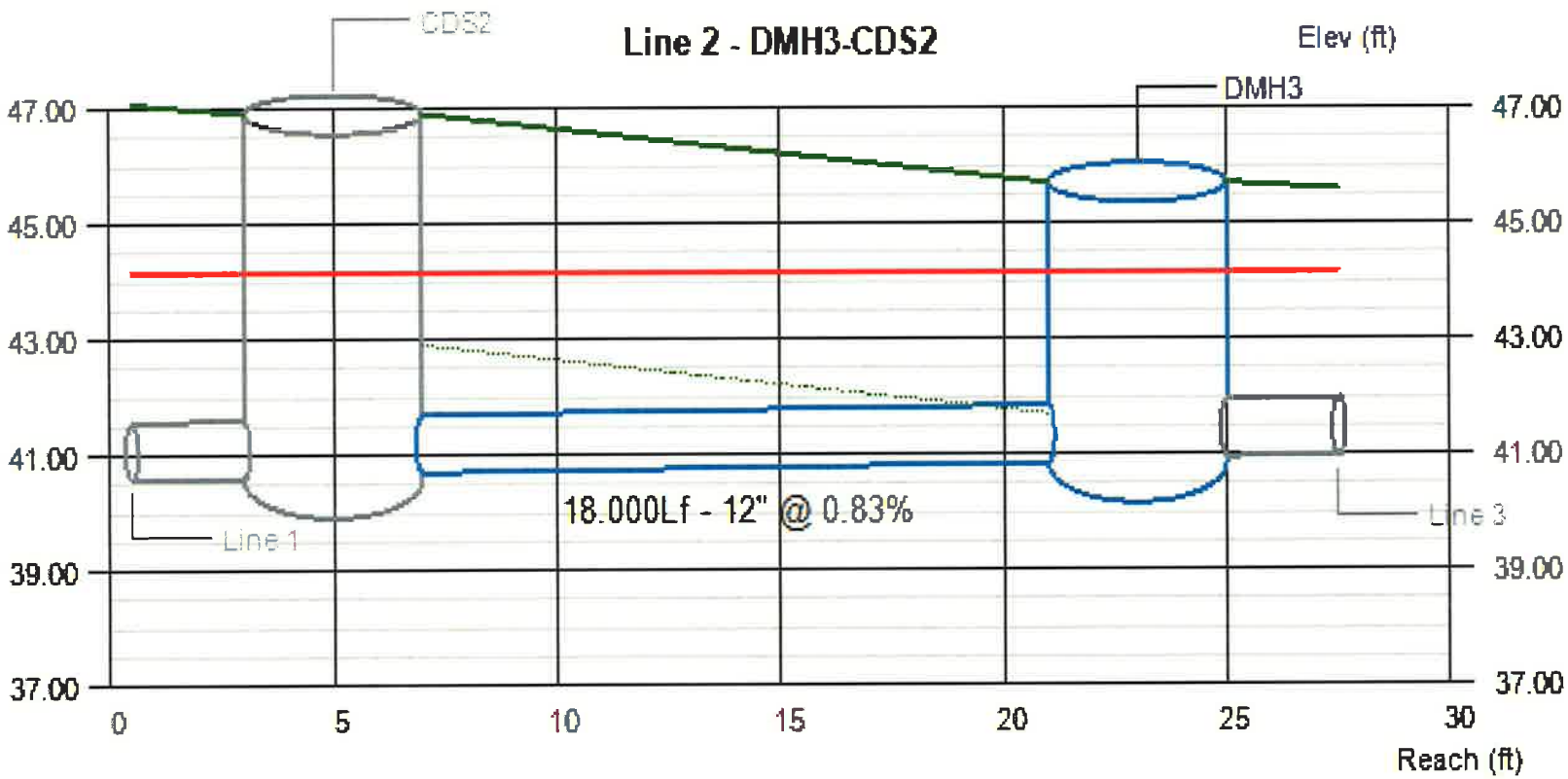



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 0.07 | 40.50 | 40.60 | 1.00 | 1.00 | 3.56 | 44.16 | 44.16 | 44.16 | 0.09 | 0.09 | 6.10 | 5.30 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 2) - DMH3-CDS2



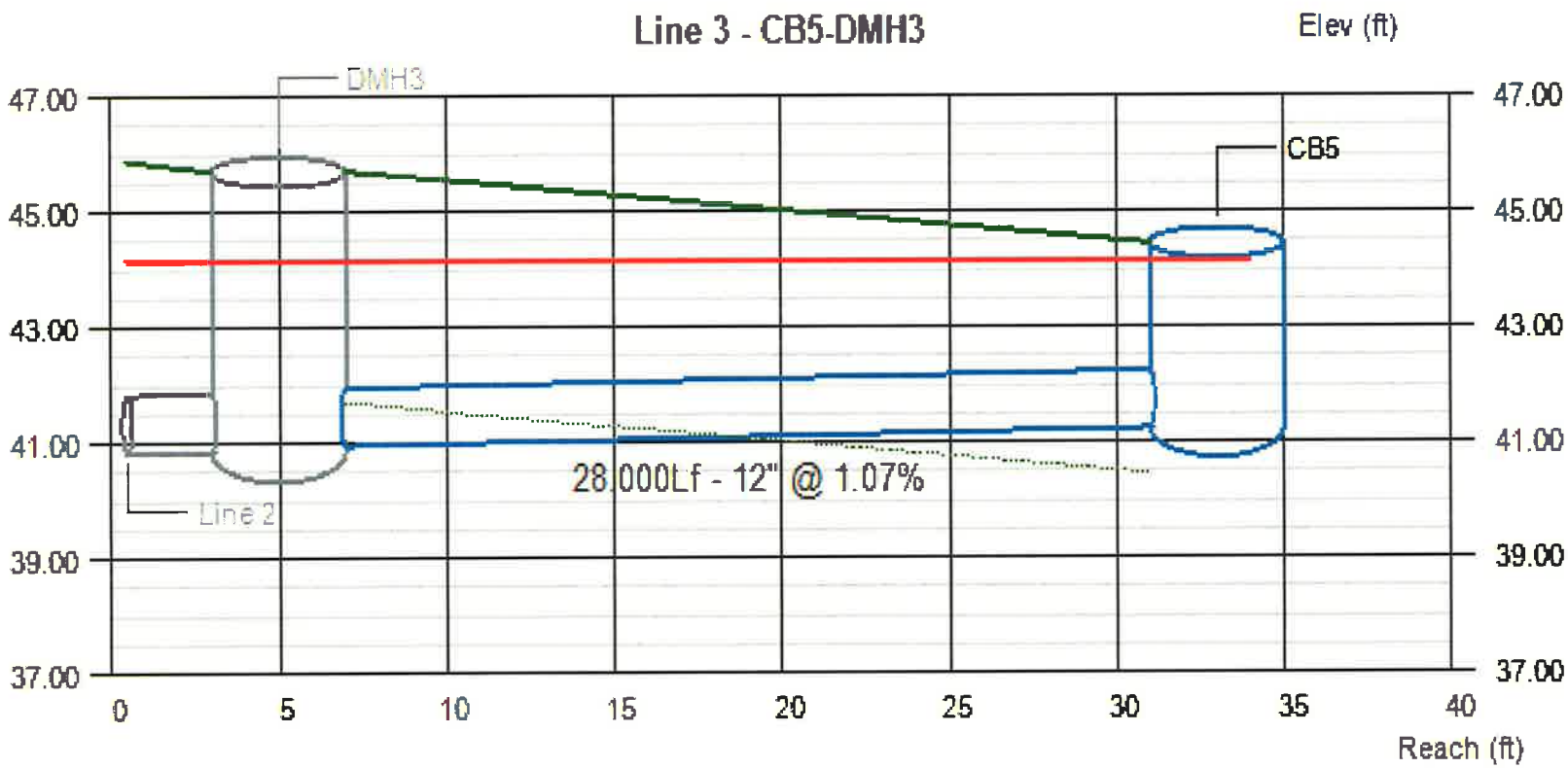



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 0.05 | 40.70 | 40.85 | 1.00 | 1.00 | 3.31 | 44.16 | 44.16 | 44.16 | 0.06 | 0.06 | 5.20 | 3.85 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 3) - CB5-DMH3



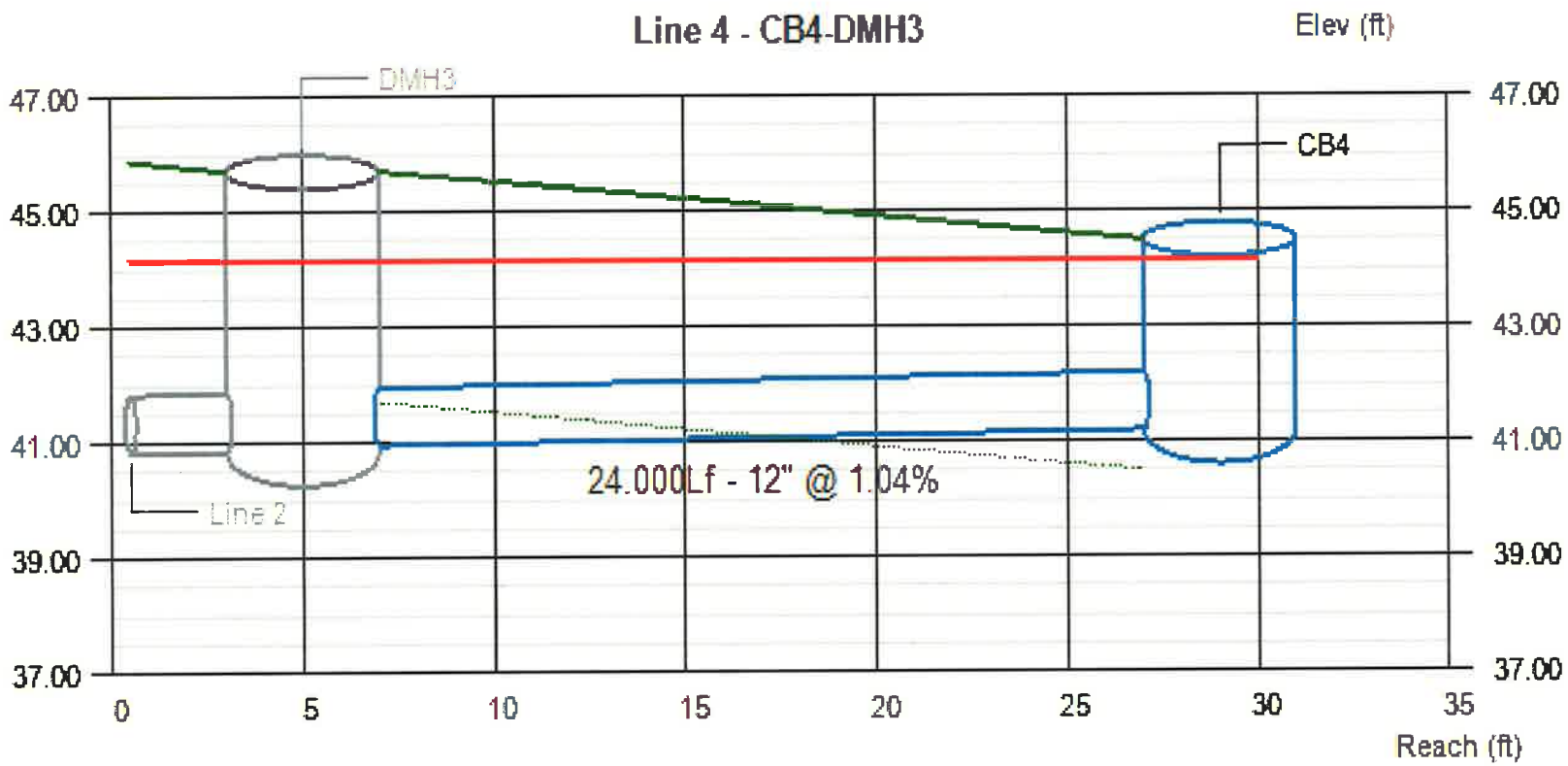



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.02 | 40.95 | 41.25 | 1.00 | 1.00 | 2.91 | 44.16 | 44.16 | 44.16 | 0.03 | 0.03 | 3.75 | 2.20 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 4) - CB4-DMH3



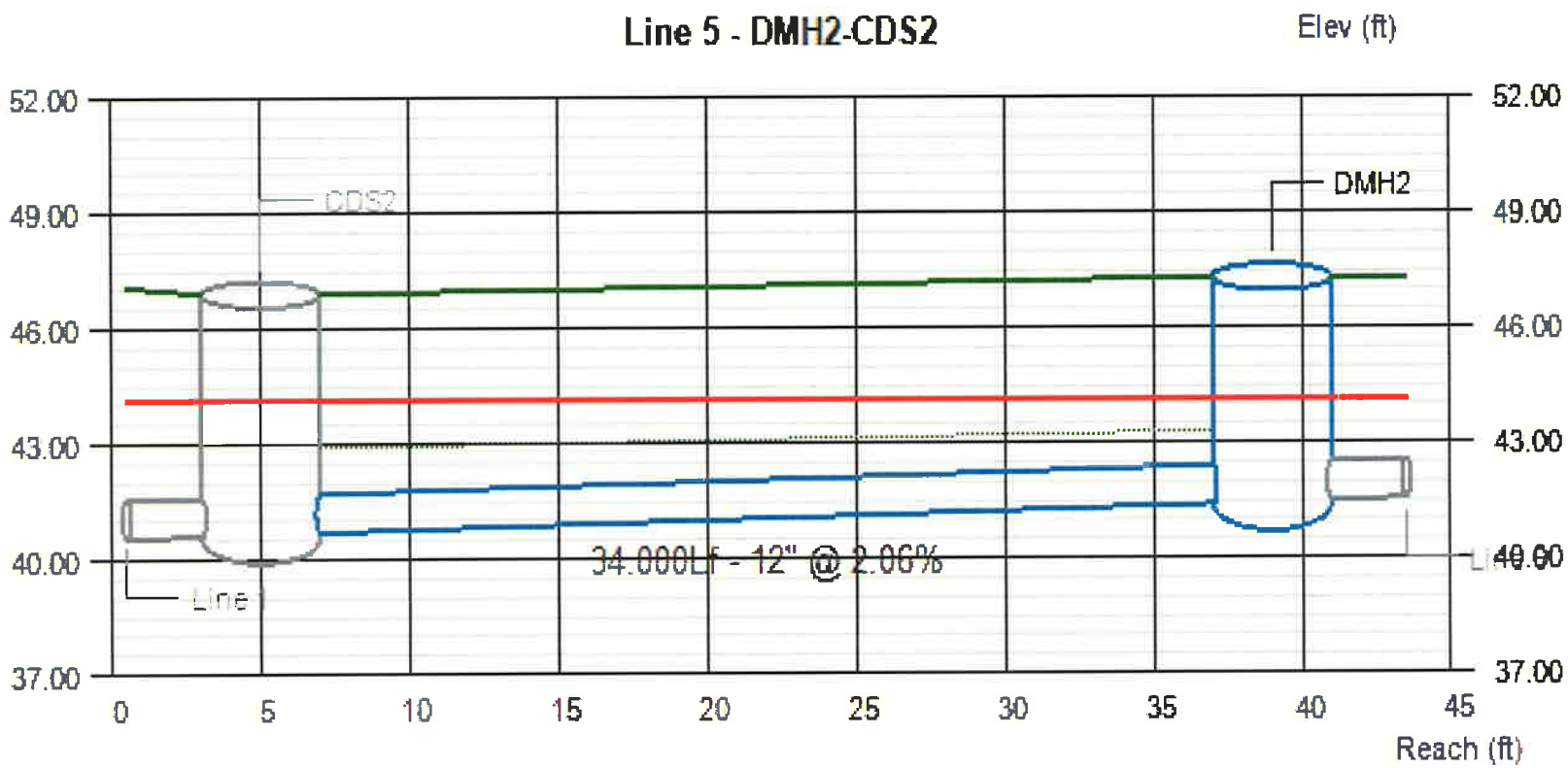



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 4 | 0.02 | 40.95 | 41.20 | 1.00 | 1.00 | 2.96 | 44.16 | 44.16 | 44.16 | 0.03 | 0.03 | 3.75 | 2.30 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 5) - DMH2-CDS2



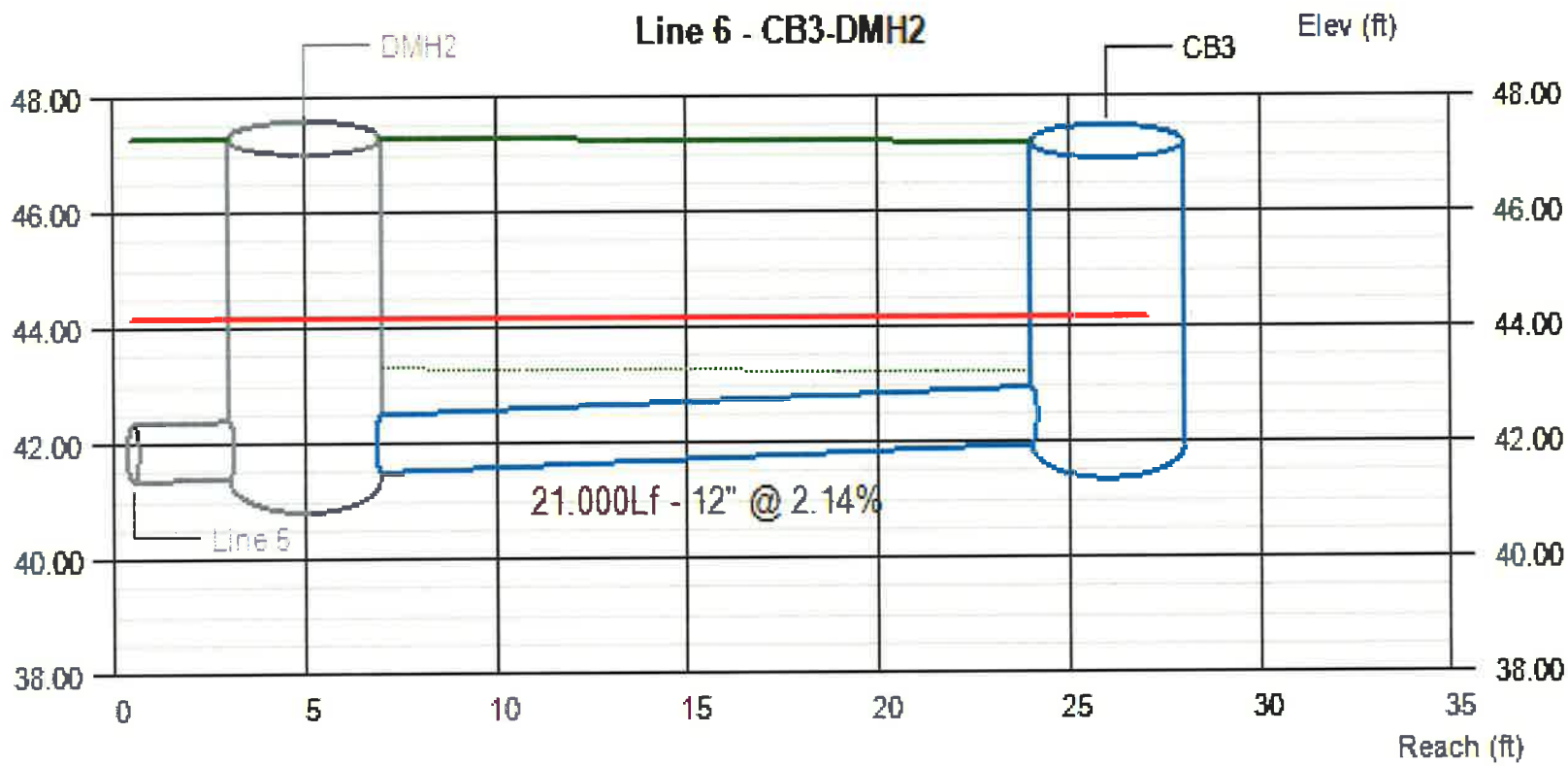



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 5 | 0.02 | 40.70 | 41.40 | 1.00 | 1.00 | 2.76 | 44.16 | 44.16 | 44.16 | 0.03 | 0.03 | 5.20 | 4.90 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 6) - CB3-DMH2



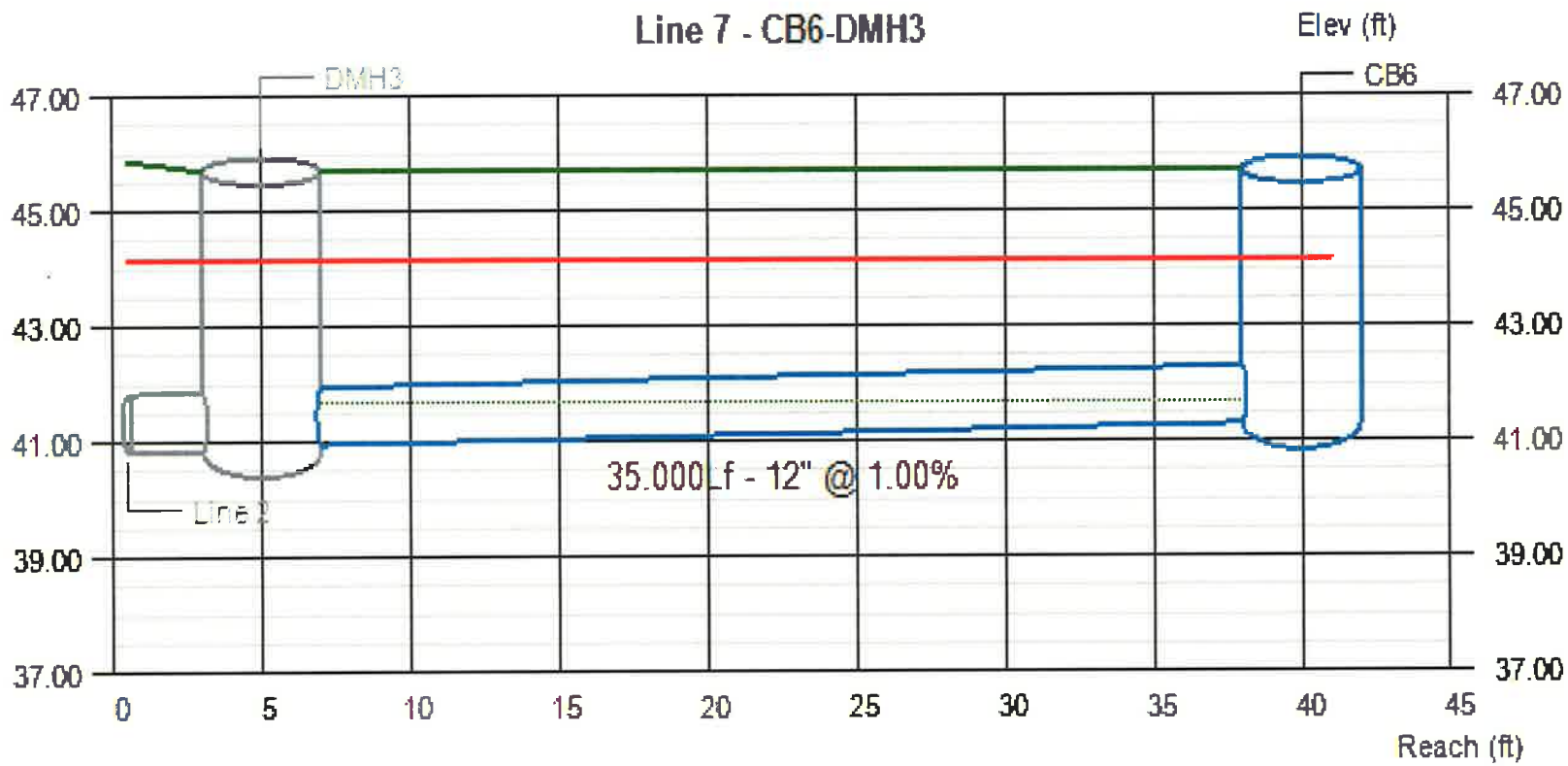



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 6 | 0.02 | 41.50 | 41.95 | 1.00 | 1.00 | 2.21 | 44.16 | 44.16 | 44.16 | 0.03 | 0.03 | 4.80 | 4.25 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 7) - CB6-DMH3

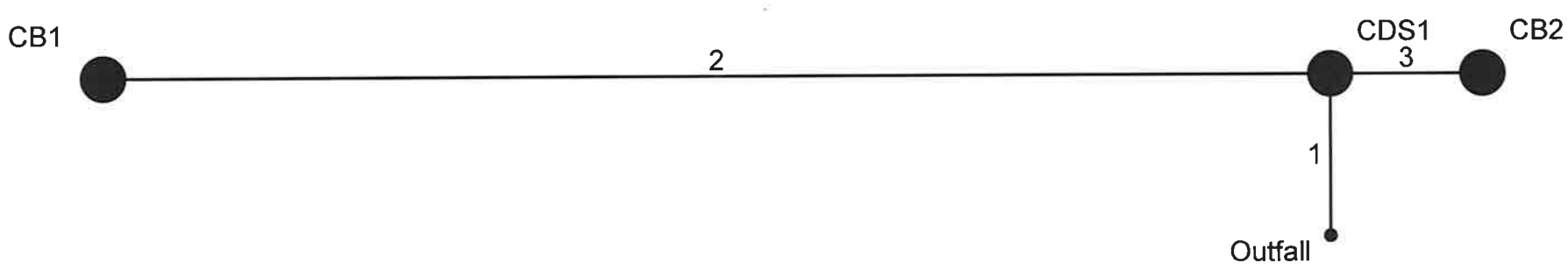





| Line # | Q (cfs) | Invert Elevation Dn (ft) | Invert Elevation Up (ft) | Depth of Flow Dn (ft) | Depth of Flow Up (ft) | Depth of Flow Hw (ft) | Hydraulic Grade Line Dn (ft) | Hydraulic Grade Line Up (ft) | Hydraulic Grade Line Jnct (ft) | Velocity Dn (ft/s) | Velocity Up (ft/s) | Cover Dn (ft) | Cover Up (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.01 | 40.95 | 41.30 | 1.00 | 1.00 | 2.86 | 44.16 | 44.16 | 44.16 | 0.01 | 0.01 | 3.75 | 3.40 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Winchester CVS




| | | |
|---|---|---|
| Project File: Peak Elevation CB1.stm | Number of lines: 3 | Date: 5/30/2013 |

Storm Sewers v10.00

# Storm Sewer Tabulation

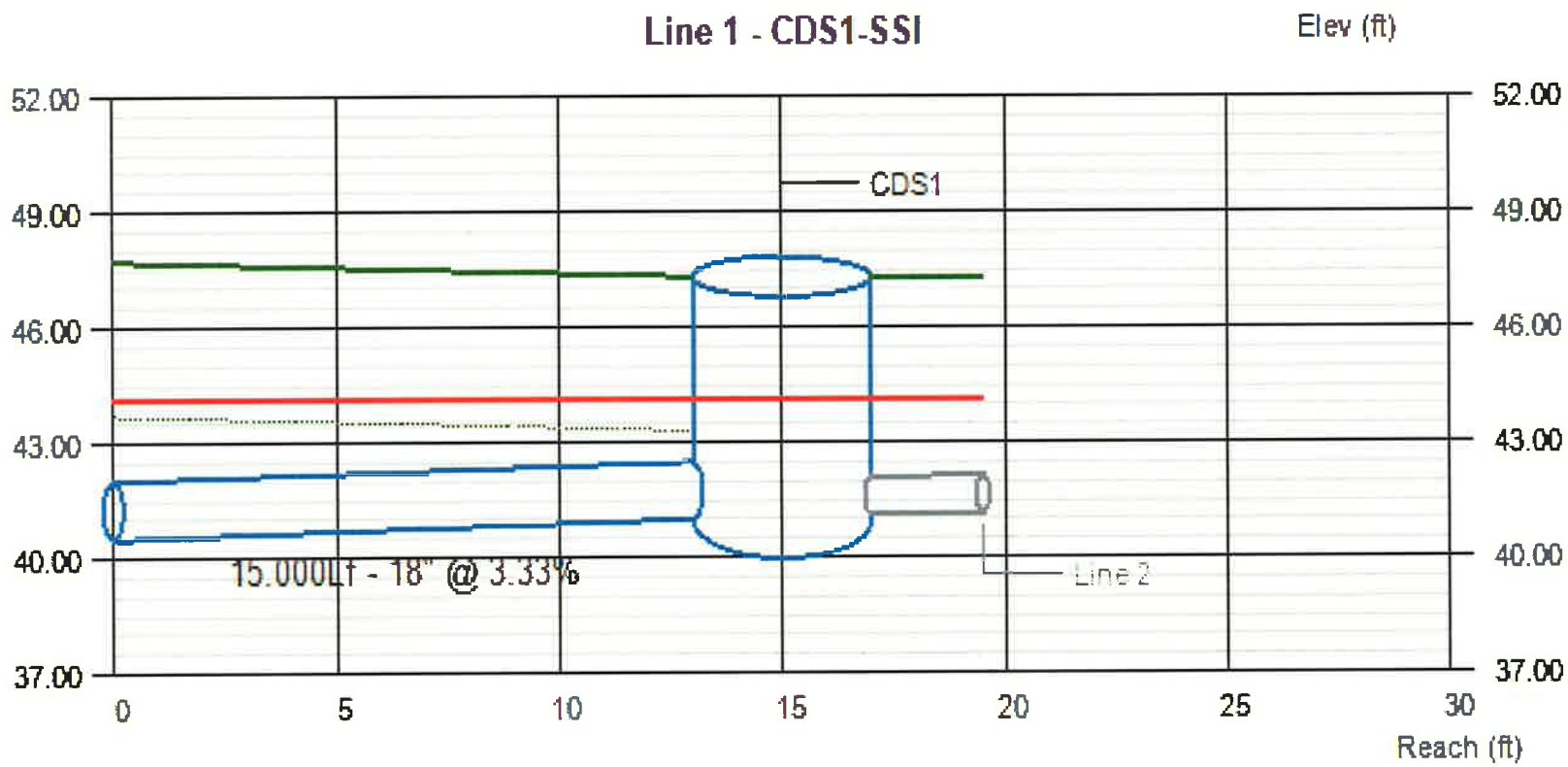
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 15.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 30.7 | 0.0 | 0.09 | 19.17 | 0.05 | 18 | 3.33 | 40.50 | 41.00 | 44.16 | 44.16 | 47.70 | 47.30 | CDS1-SSI |
| 2 | 1 | 113.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.06 | 5.08 | 0.09 | 12 | 2.04 | 41.10 | 43.40 | 44.16 | 44.16 | 47.30 | 47.50 | CB1-CDS1 |
| 3 | 1 | 14.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.03 | 4.26 | 0.04 | 12 | 1.43 | 41.10 | 41.30 | 44.16 | 44.16 | 47.30 | 46.75 | CB2-CDS1 |

**Winchester CVS** | Number of lines: 3 | Run Date: 5/30/2013

NOTES:Intensity = 83.25 / (Inlet time + 14.10) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

# Line Profile (Line 1) - CDS1-SSI



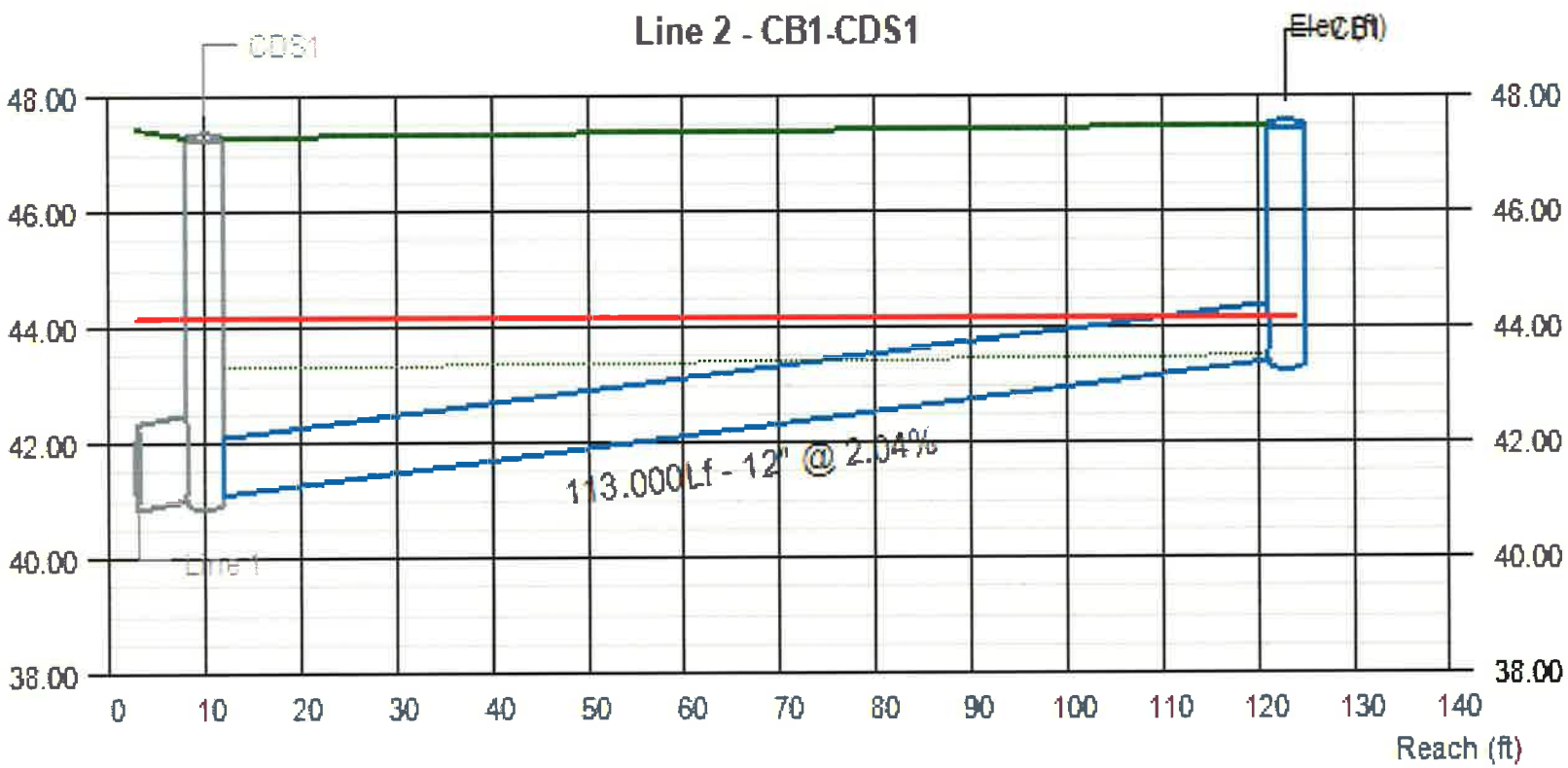



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 0.09 | 40.50 | 41.00 | 1.50 | 1.50 | 3.16 | 44.16 | 44.16 | 44.16 | 0.05 | 0.05 | 5.70 | 4.80 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 2) - CB1-CDS1



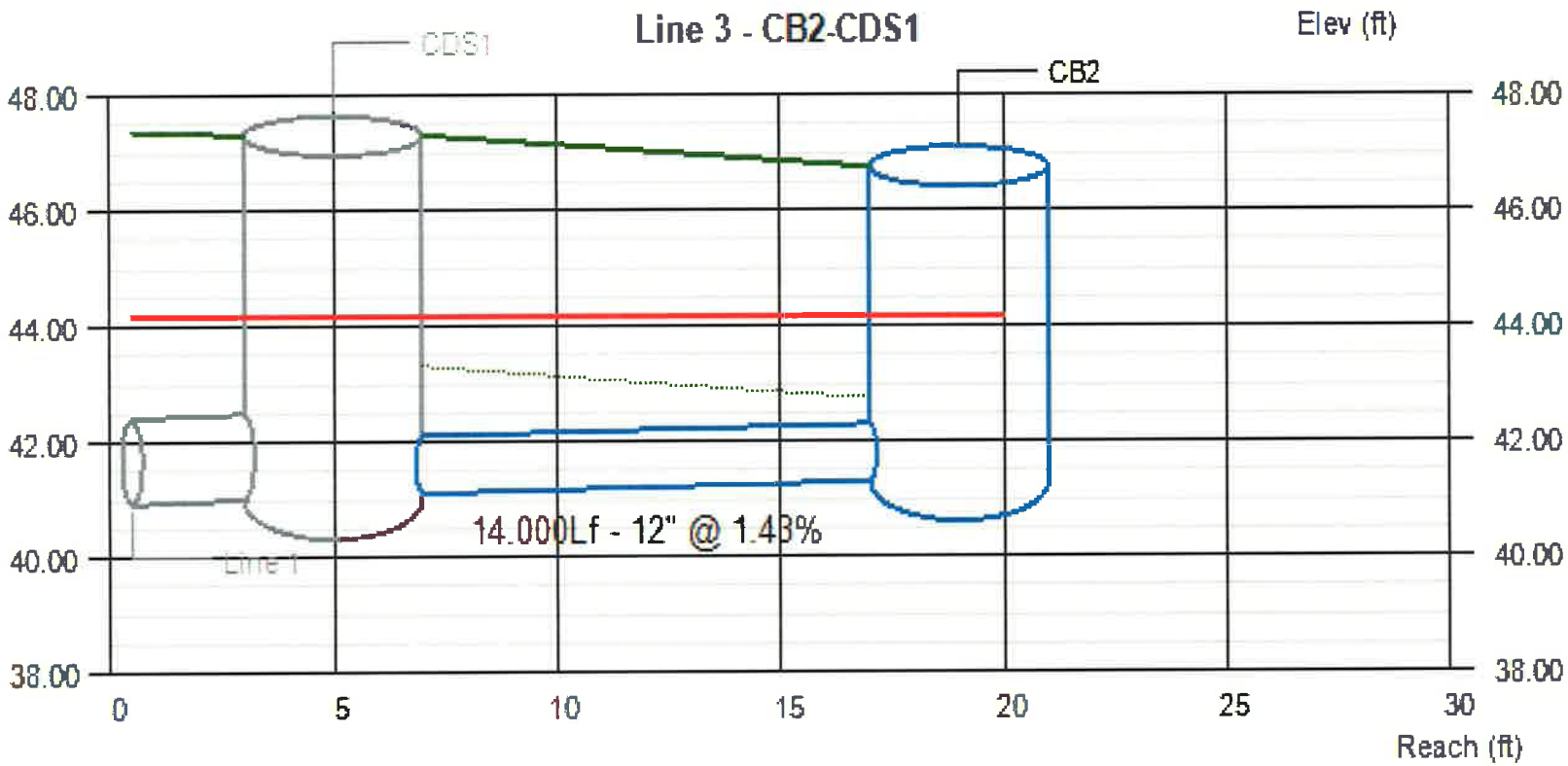



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 0.06 | 41.10 | 43.40 | 1.00 | 0.76 | 0.76 | 44.16 | 44.16 | 44.16 | 0.08 | 0.09 | 5.20 | 3.10 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 3) - CB2-CDS1



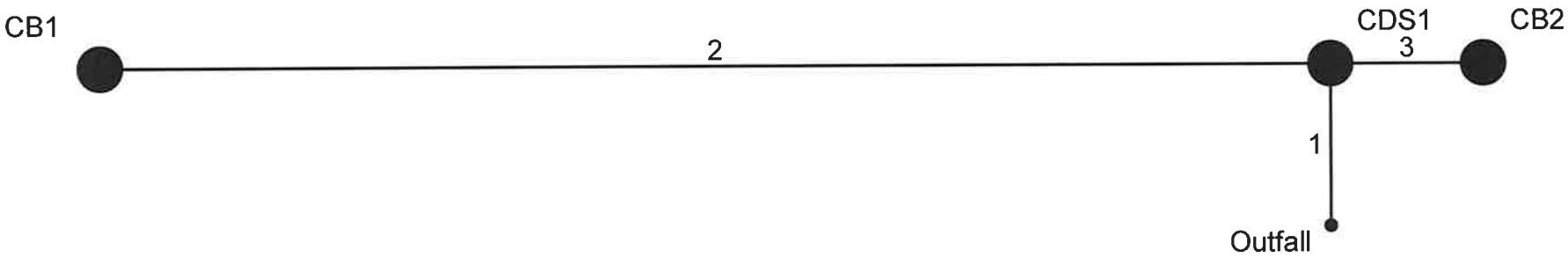



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.03 | 41.10 | 41.30 | 1.00 | 1.00 | 2.86 | 44.16 | 44.16 | 44.16 | 0.04 | 0.04 | 5.20 | 4.45 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# 100-YEAR STORM PIPE SIZING AT PEAK RUNOFF RATE

# Winchester CVS




| | | |
|---|---|---|
| Project File: Peak Inflow CB1.stm | Number of lines: 3 | Date: 5/30/2013 |

Storm Sewers v10.00

# Storm Sewer Tabulation

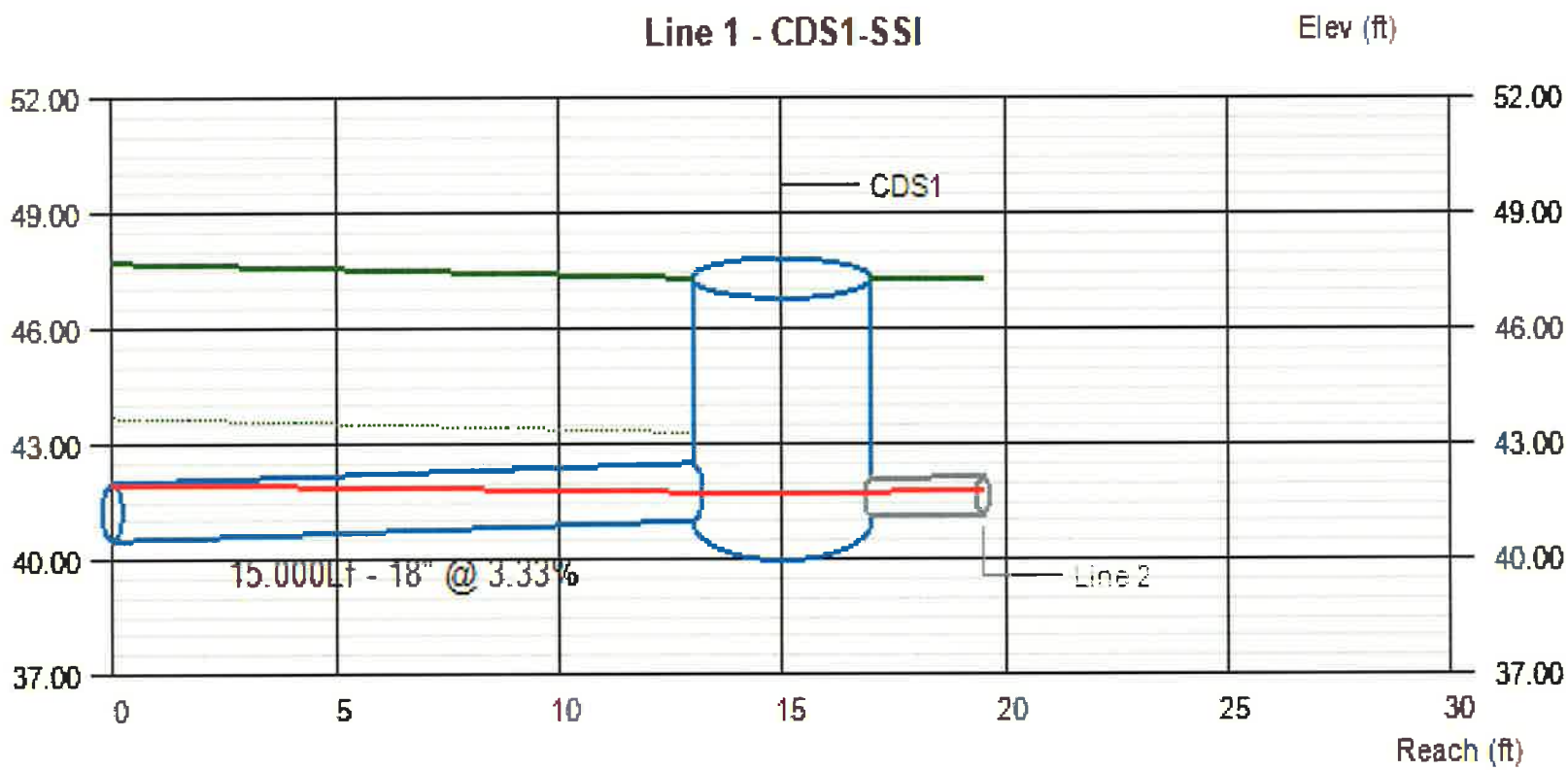
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 15.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.6 | 0.0 | 3.88 | 19.17 | 3.29 | 18 | 3.33 | 40.50 | 41.00 | 41.98 | 41.75 | 47.70 | 47.30 | CDS1-SSI |
| 2 | 1 | 113.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 2.56 | 5.08 | 4.59 | 12 | 2.04 | 41.10 | 43.40 | 41.75 | 44.09 | 47.30 | 47.50 | CB1-CDS1 |
| 3 | 1 | 14.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 1.32 | 4.26 | 2.96 | 12 | 1.43 | 41.10 | 41.30 | 41.75 | 41.79 | 47.30 | 46.75 | CB2-CDS1 |

**Winchester CVS** | Number of lines: 3 | Run Date: 5/30/2013

NOTES:Intensity = 83.25 / (Inlet time + 14.10) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

# Line Profile (Line 1) - CDS1-SSI



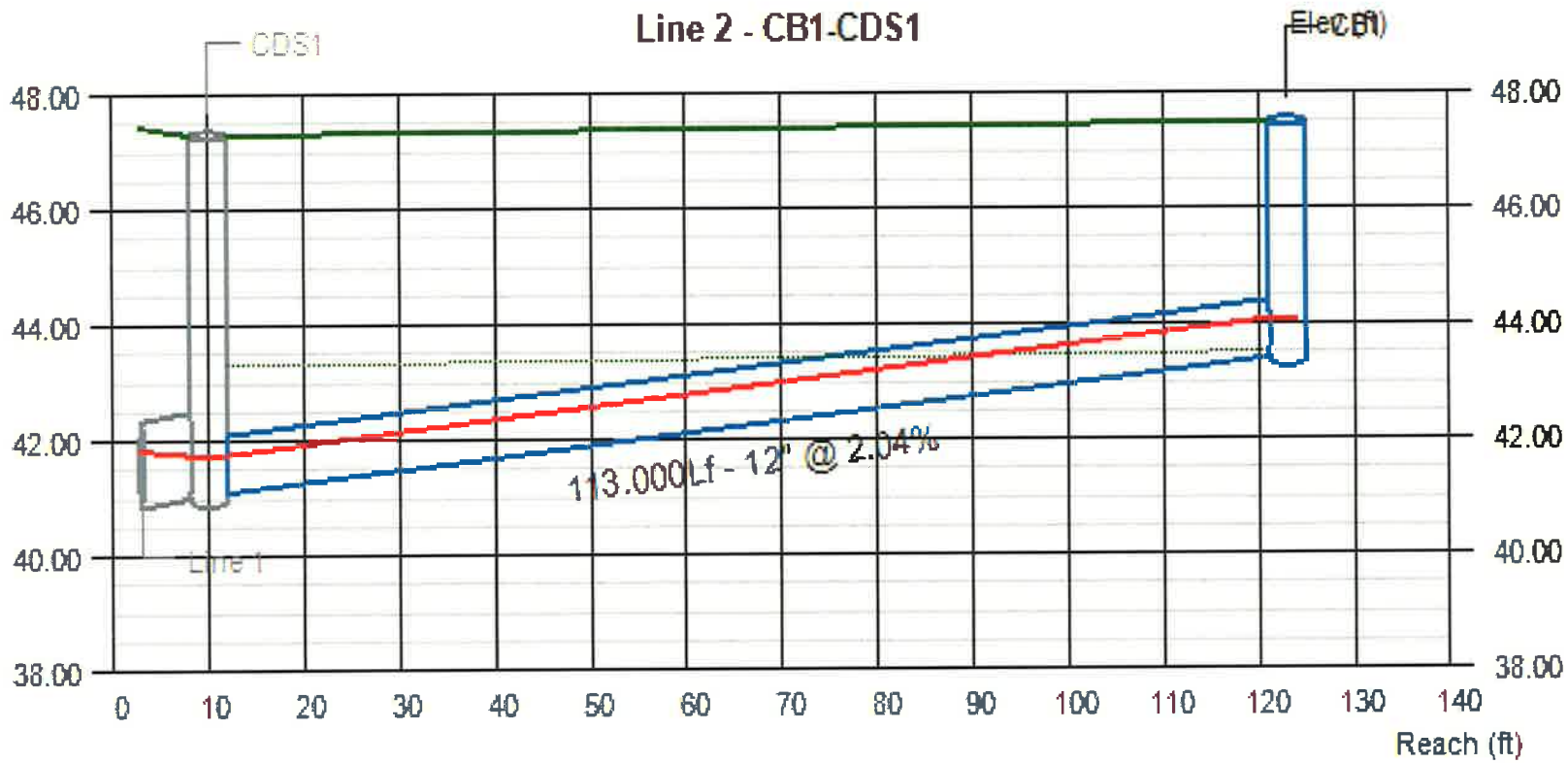



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 3.88 | 40.50 | 41.00 | 1.48 | 0.75 | 0.75 | 41.98 | 41.75 | 41.75 | 2.20 | 4.37 | 5.70 | 4.80 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 2) - CB1-CDS1



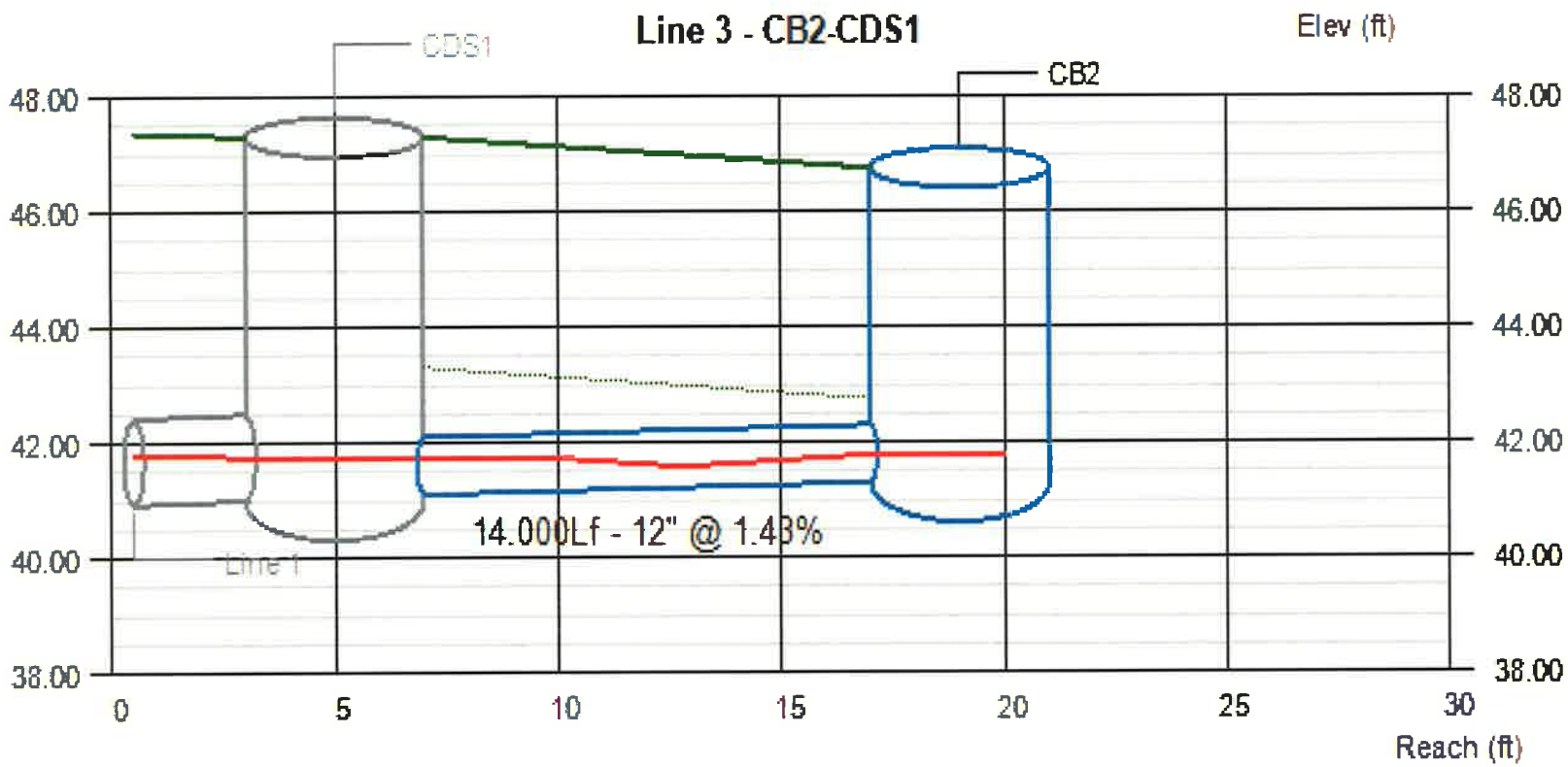



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 2.56 | 41.10 | 43.40 | 0.65 | 0.69 | 0.69 | 41.75 | 44.09 | 44.09 | 4.71 | 4.46 | 5.20 | 3.10 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Line Profile (Line 3) - CB2-CDS1

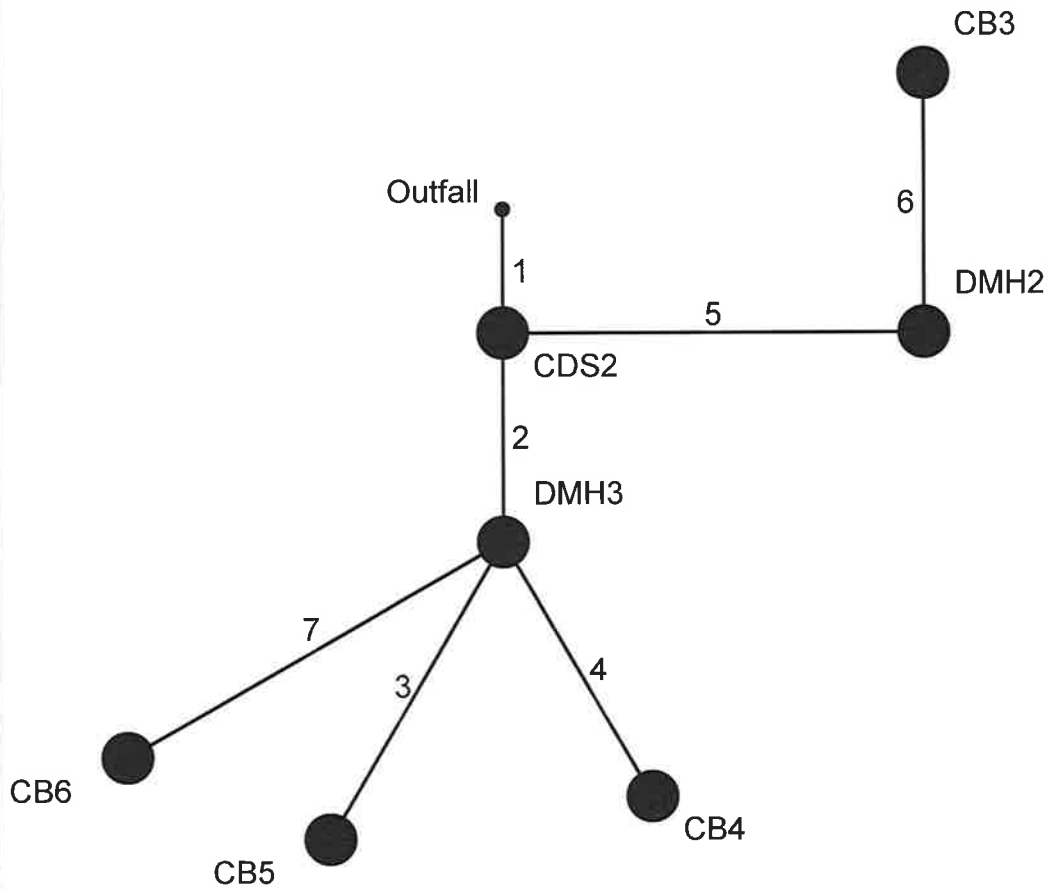





| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 1.32 | 41.10 | 41.30 | 0.65 | 0.49 | 0.49 | 41.75 | 41.79 j | 41.79 | 2.43 | 3.49 | 5.20 | 4.45 |

**Winchester CVS** | No. Lines: 3 | Run Date: 5/30/2013

# Winchester CVS




| | | |
|---|---|---|
| Project File: Peak Inflow.stm | Number of lines: 7 | Date: 5/30/2013 |

Storm Sewers v10.00

# Storm Sewer Tabulation

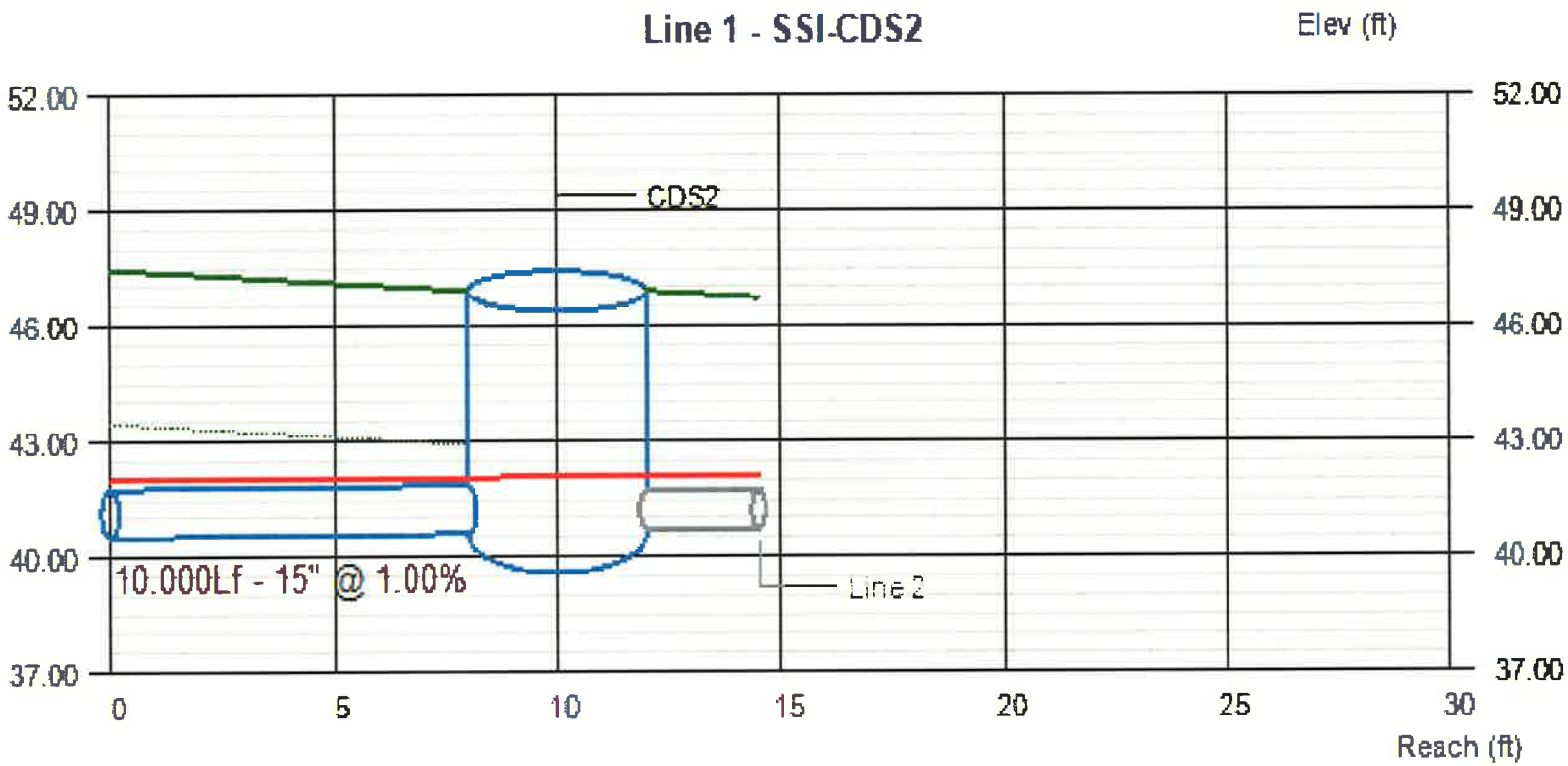
| Station | | Len | Drng Area | | Rnoff coeff | Area x C | | Tc | | Rain (I) | Total flow | Cap full | Vel | Pipe | | Invert Elev | | HGL Elev | | Grnd / Rim Elev | | Line ID |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Line | To Line | (ft) | Incr (ac) | Total (ac) | (C) | Incr | Total | Inlet (min) | Syst (min) | (in/hr) | (cfs) | (cfs) | (ft/s) | Size (in) | Slope (%) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | |
| 1 | End | 10.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 8.2 | 0.0 | 2.69 | 6.46 | 2.19 | 15 | 1.00 | 40.50 | 40.60 | 41.98 | 42.00 | 47.45 | 46.90 | SSI-CDS2 |
| 2 | 1 | 17.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 8.1 | 0.0 | 2.00 | 3.35 | 2.55 | 12 | 0.88 | 40.70 | 40.85 | 42.07 | 42.13 | 46.90 | 45.70 | DMH3-CDS2 |
| 3 | 2 | 28.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.67 | 3.69 | 0.86 | 12 | 1.07 | 40.95 | 41.25 | 42.22 | 42.22 | 45.70 | 44.45 | CB5-DMH3 |
| 4 | 2 | 24.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 1.11 | 3.63 | 1.41 | 12 | 1.04 | 40.95 | 41.20 | 42.22 | 42.24 | 45.70 | 44.50 | CB4-DMH3 |
| 5 | 1 | 34.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.4 | 0.0 | 0.69 | 5.46 | 1.18 | 12 | 2.35 | 40.70 | 41.50 | 42.07 | 42.07 | 46.90 | 47.10 | DMH2-CDS2 |
| 6 | 5 | 21.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.69 | 5.21 | 2.12 | 12 | 2.14 | 41.50 | 41.95 | 42.11 | 42.30 | 47.10 | 47.20 | CB3-DMH2 |
| 7 | 2 | 35.000 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 6.0 | 6.0 | 0.0 | 0.22 | 3.56 | 0.29 | 12 | 1.00 | 40.95 | 41.30 | 42.22 | 42.22 | 45.70 | 46.00 | CB6-DMH3 |

**Winchester CVS** | Number of lines: 7 | Run Date: 5/30/2013

NOTES:Intensity = 83.25 / (Inlet time + 14.10) ^ 0.82 ; Return period =Yrs. 100 ; c = cir e = ellip b = box

# Line Profile (Line 1) - SSI-CDS2



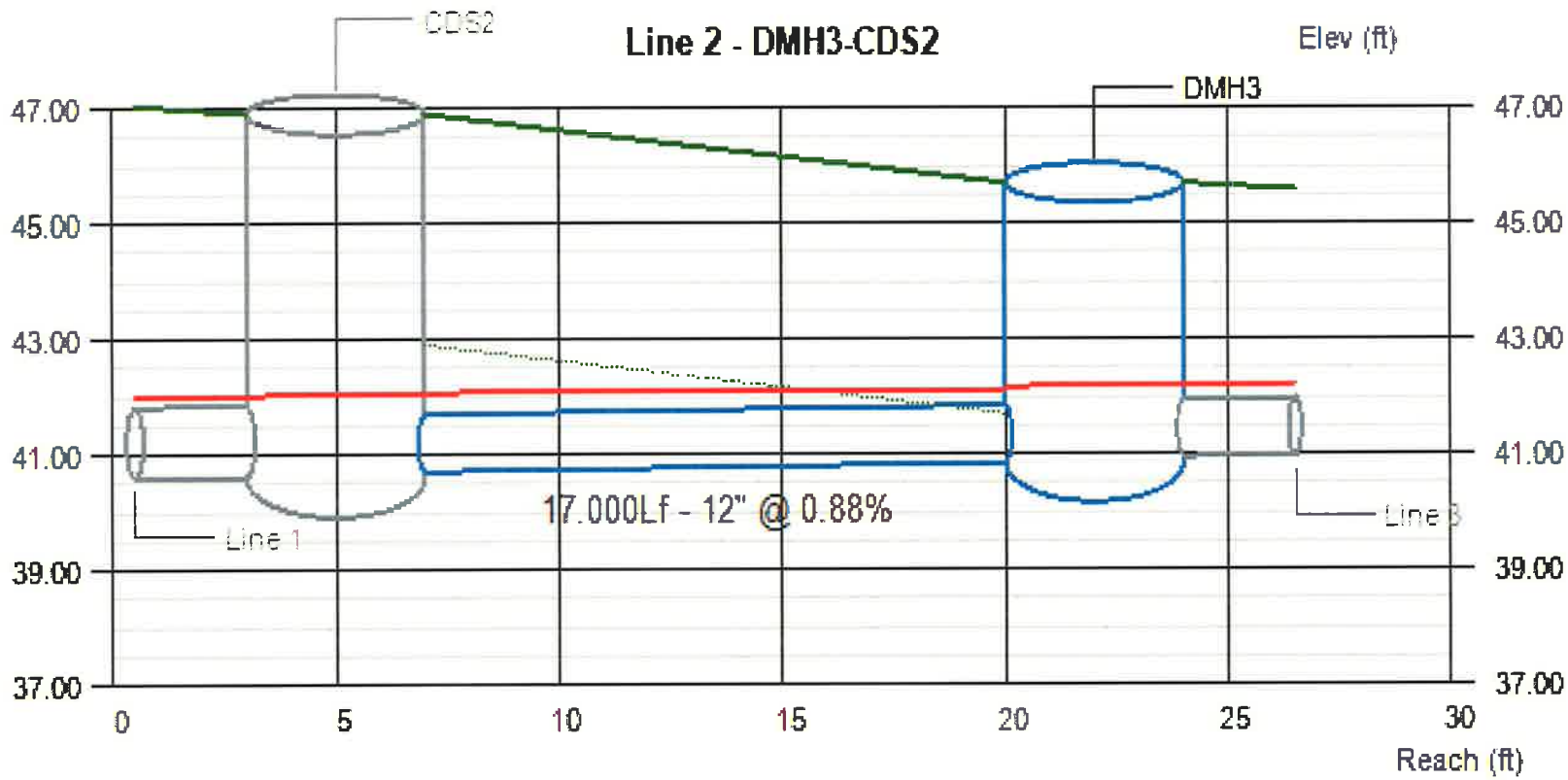



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 1 | 2.69 | 40.50 | 40.60 | 1.25 | 1.25 | 1.47 | 41.98 | 42.00 | 42.07 | 2.19 | 2.19 | 5.70 | 5.05 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 2) - DMH3-CDS2



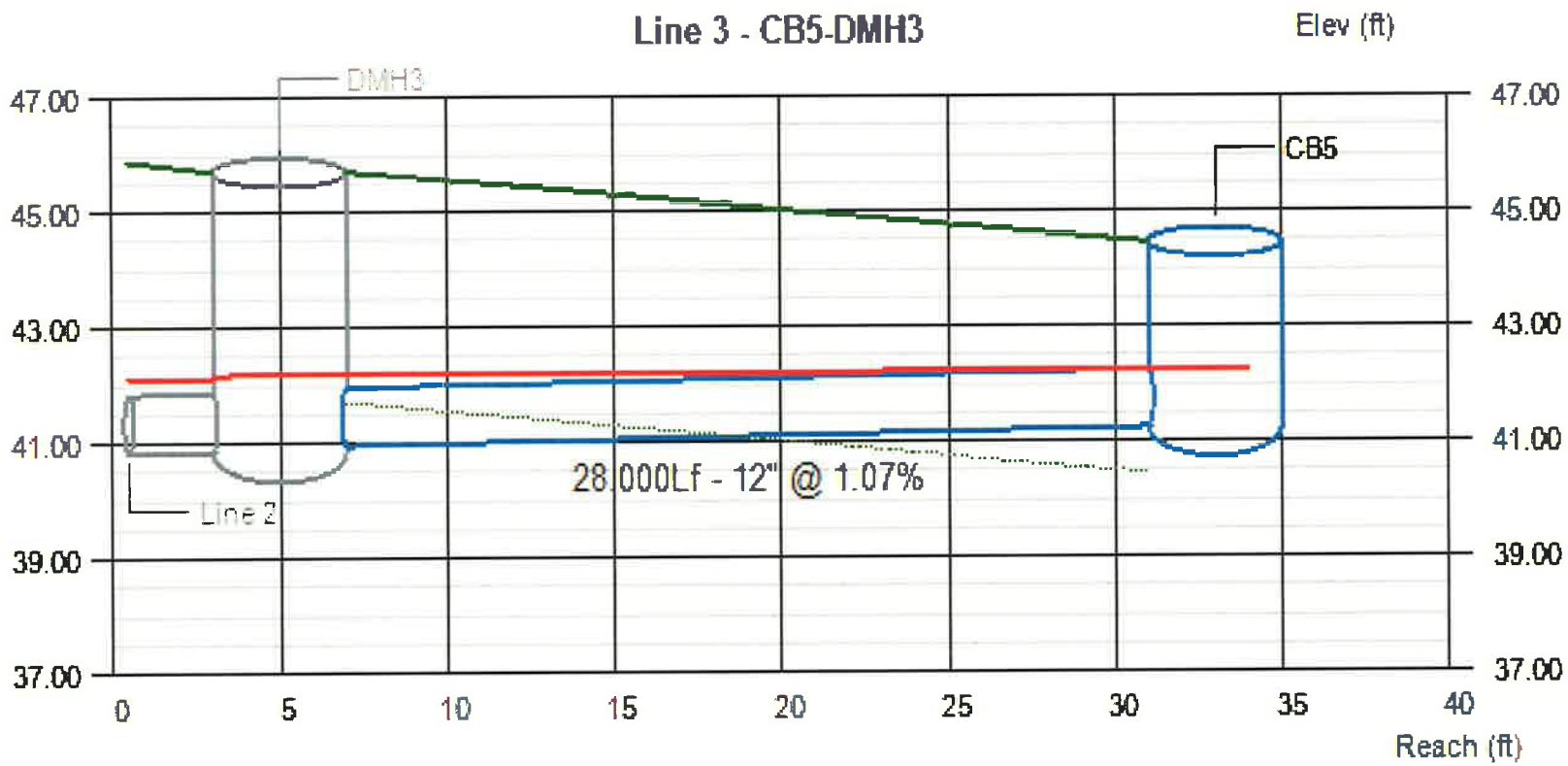



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 2 | 2.00 | 40.70 | 40.85 | 1.00 | 1.00 | 1.37 | 42.07 | 42.13 | 42.22 | 2.55 | 2.55 | 5.20 | 3.85 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 3) - CB5-DMH3



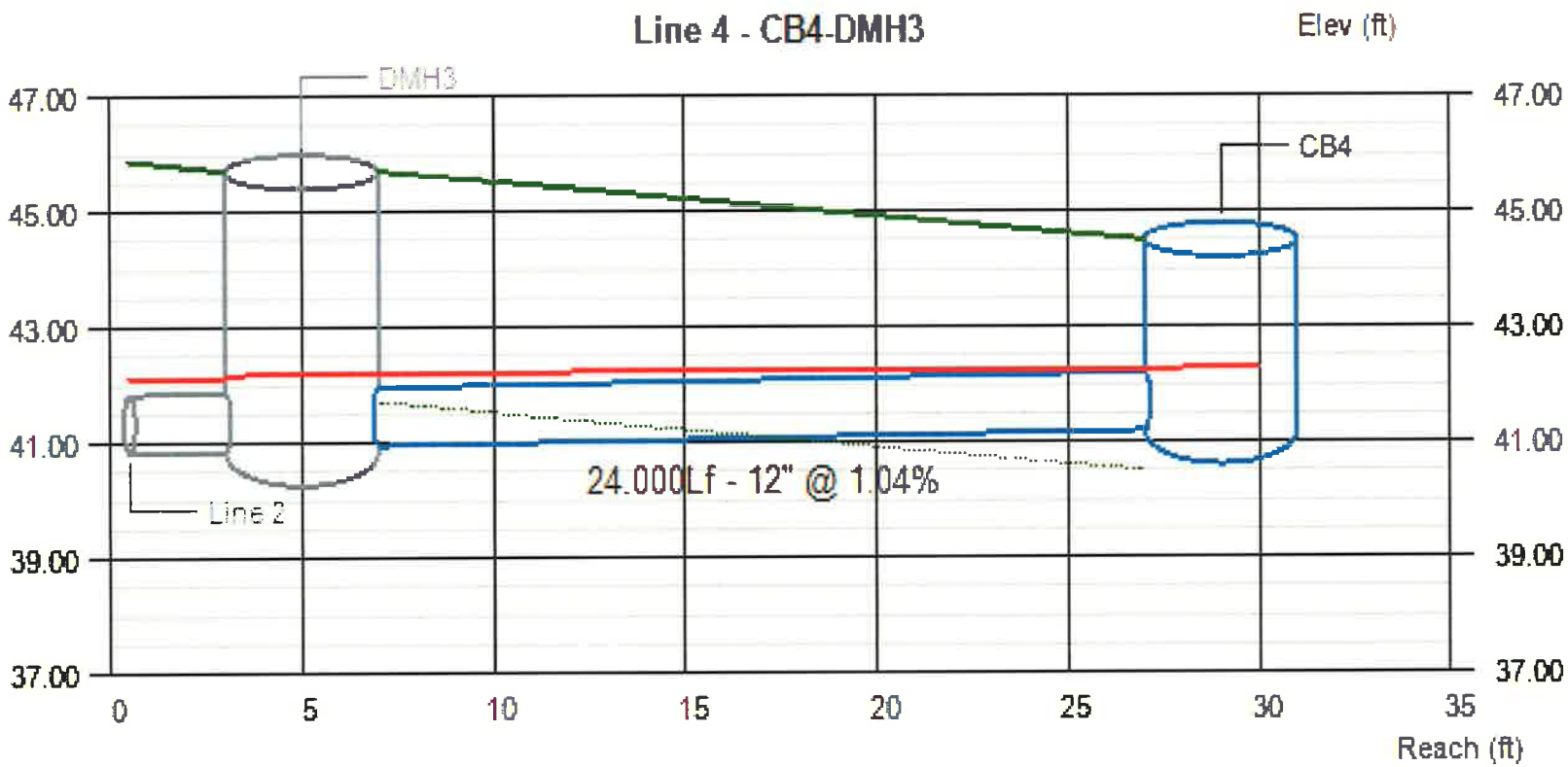



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 3 | 0.67 | 40.95 | 41.25 | 1.00 | 0.97 | 0.99 | 42.22 | 42.22 | 42.24 | 0.85 | 0.86 | 3.75 | 2.20 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 4) - CB4-DMH3



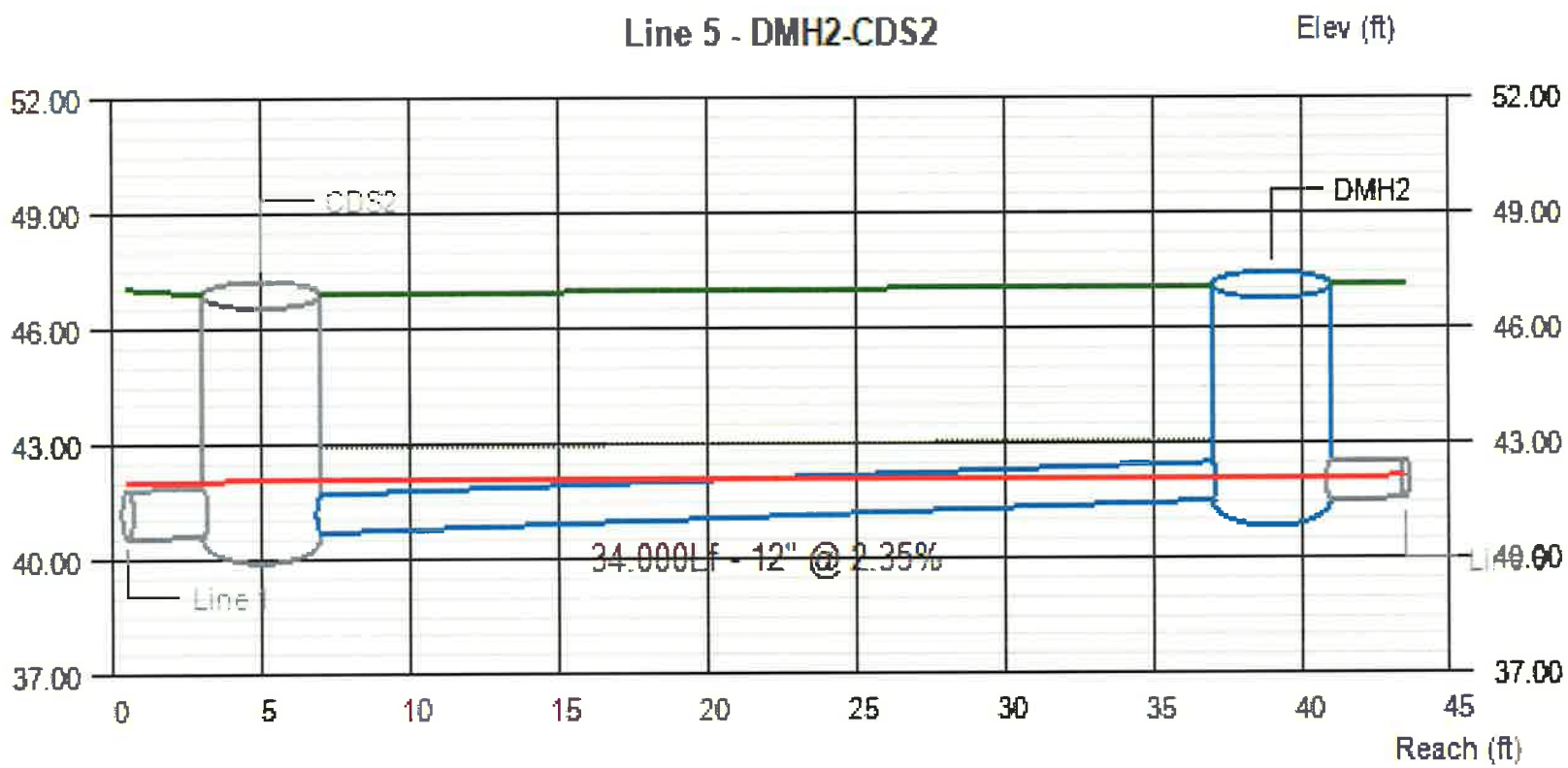



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 4 | 1.11 | 40.95 | 41.20 | 1.00 | 1.00 | 1.07 | 42.22 | 42.24 | 42.27 | 1.41 | 1.41 | 3.75 | 2.30 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 5) - DMH2-CDS2



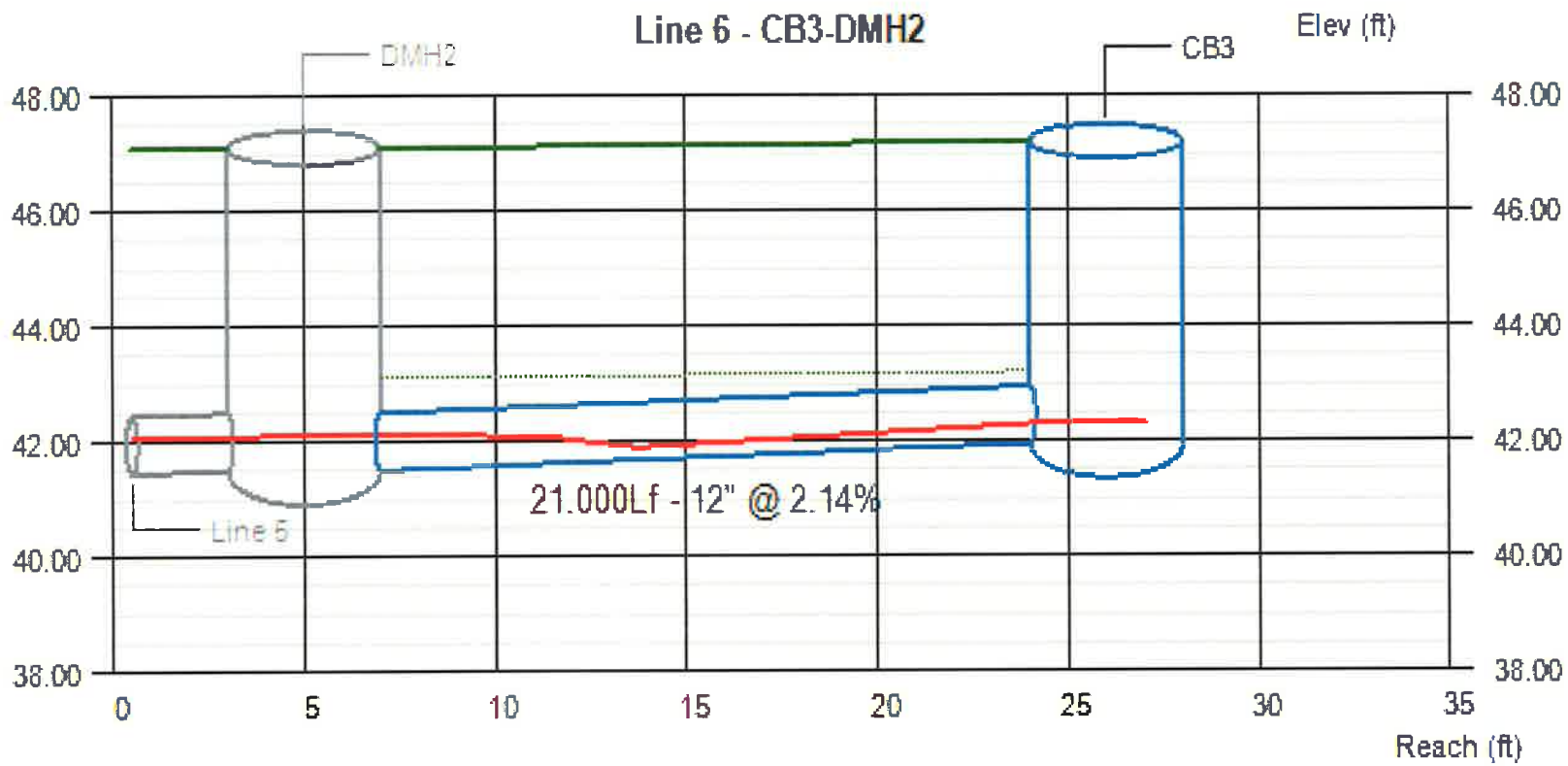



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 5 | 0.69 | 40.70 | 41.50 | 1.00 | 0.57 | 0.61 | 42.07 | 42.07 | 42.11 | 0.88 | 1.48 | 5.20 | 4.60 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 6) - CB3-DMH2



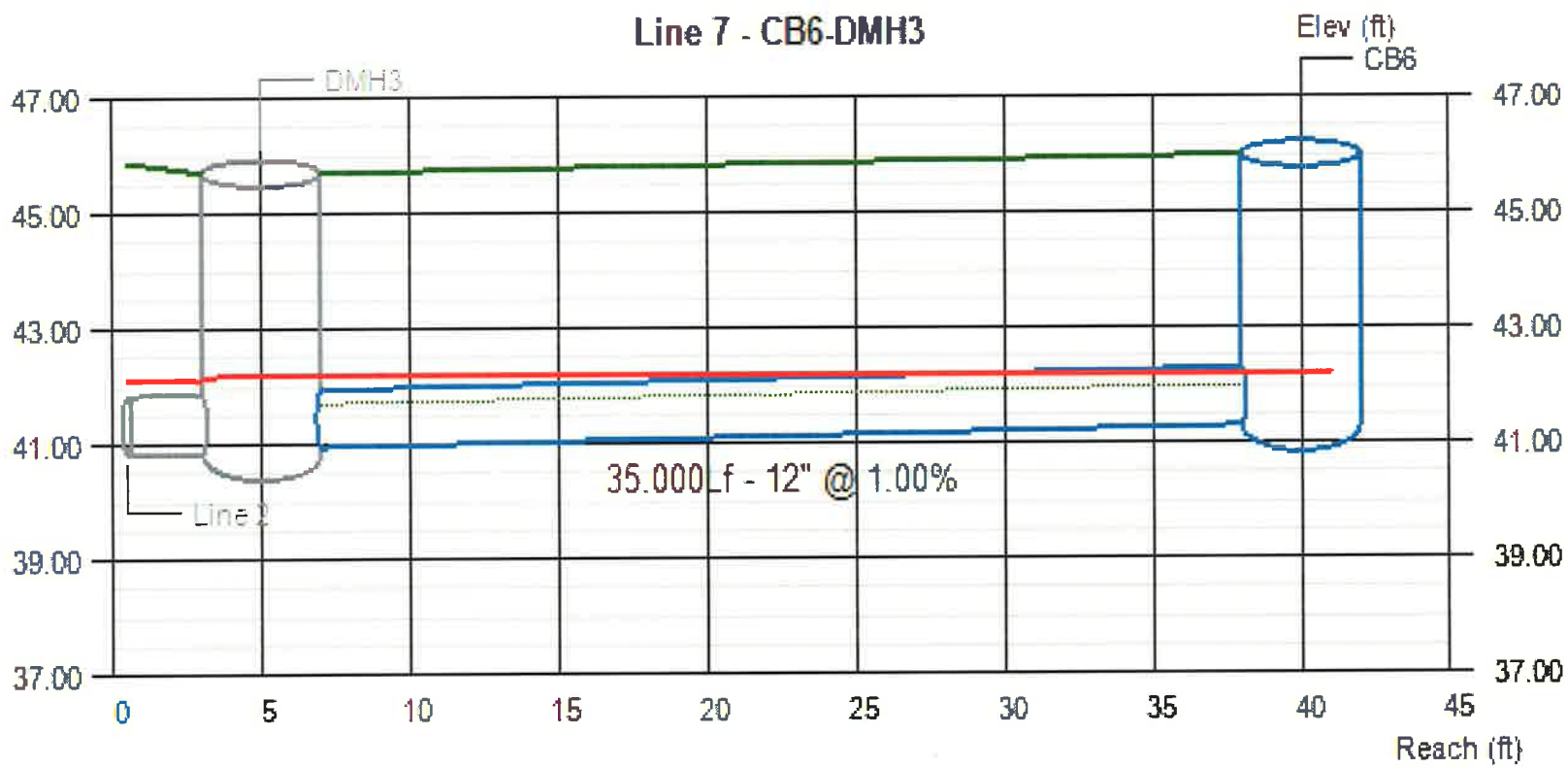



| Line # | Q (cfs) | Invert Elevation | | Depth of Flow | | | Hydraulic Grade Line | | | Velocity | | Cover | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Dn (ft) | Up (ft) | Dn (ft) | Up (ft) | Hw (ft) | Dn (ft) | Up (ft) | Jnct (ft) | Dn (ft/s) | Up (ft/s) | Dn (ft) | Up (ft) |
| 6 | 0.69 | 41.50 | 41.95 | 0.61 | 0.35 | 0.35 | 42.11 | 42.30 j | 42.30 | 1.38 | 2.86 | 4.60 | 4.25 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# Line Profile (Line 7) - CB6-DMH3






| Line # | Q (cfs) | Invert Elevation Dn (ft) | Invert Elevation Up (ft) | Depth of Flow Dn (ft) | Depth of Flow Up (ft) | Depth of Flow Hw (ft) | Hydraulic Grade Line Dn (ft) | Hydraulic Grade Line Up (ft) | Hydraulic Grade Line Jnct (ft) | Velocity Dn (ft/s) | Velocity Up (ft/s) | Cover Dn (ft) | Cover Up (ft) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 0.22 | 40.95 | 41.30 | 1.00 | 0.92 | 0.92 | 42.22 | 42.22 | 42.22 | 0.28 | 0.29 | 3.75 | 3.70 |

**Winchester CVS** | No. Lines: 7 | Run Date: 5/30/2013

# V. MASSACHUSETTS STORMWATER REPORT CHECKLIST

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

# Checklist for Stormwater Report

## A. Introduction

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

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

The Stormwater Report must include:

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

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

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

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

---

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

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

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

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

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

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

## Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
BRIAN P. DUNDON
CIVIL
No. 41505
REGISTERED PROFESSIONAL ENGINEER

5-31-13

Signature and Date

## Checklist

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

☐ New development

☒ Redevelopment

☐ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

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

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☒ Reduced Impervious Area (Redevelopment Only)
- ☒ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

**Standard 1: No New Untreated Discharges**

- ☒ No new untreated discharges
- ☐ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☐ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 2: Peak Rate Attenuation**

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

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

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

**Standard 3: Recharge**

☐ Soil Analysis provided.

☐ Required Recharge Volume calculation provided.

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

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

☐ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☒ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

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

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

**Standard 4: Water Quality**

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 4: Water Quality** (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

**Standard 6: Critical Areas**

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

**Standard 9: Operation and Maintenance Plan**

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

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

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

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

**Standard 10: Prohibition of Illicit Discharges**

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

☒ An Illicit Discharge Compliance Statement is attached;

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

# Construction Period Pollution Prevention Plan (CPPPP)

## CVS/pharmacy
## Washington Street and Swanton Street
## Winchester, Massachusetts

**Prepared for:**

**G.B. NEW ENGLAND 2, LLC**
**C/O GERSHMAN BROWN CROWLEY, INC.**
**14 Breakneck Hill Road, Suite 101**
**Lincoln, RI 02865**

**Prepared by:**

**R.J. O'CONNELL AND ASSOCIATES, INC.**
**80 Montvale Ave, Suite 201**
**Stoneham, MA 02180**

**Date: September 21, 2012**
**Revised: October 16, 2012**
**Revised: January 24, 2013**
**Revised: May 6, 2013**

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# SECTION 1: SITE EVALUATION, ASSESSMENT, AND PLANNING

## *1.1 Project/Site Information*

Project/Site Name: CVS/pharmacy

Project Street/Location: 278 Washington Street

City: Winchester State: MA ZIP Code: 01890

County or Similar Subdivision: Middlesex County

Latitude/Longitude (Use **one** of three possible formats, and specify method)

| Latitude: | Longitude: |
|---|---|
| 1. 42 ° 27' 31' N (degrees, minutes, seconds) | 1. 71 ° 07' 48" W (degrees, minutes, seconds) |
| 2. _ _ ° _ _. _ _' N (degrees, minutes, decimal) | 2. _ _ ° _ _. _ _' W (degrees, minutes, decimal) |
| 3. _ _ . _ _ _ _ ° N (decimal) | 3. _ _ . _ _ _ _ ° W (decimal) |

Method for determining latitude/longitude:

☐ USGS topographic map (specify scale: _____) ☐ EPA Web site ☐ GPS

☒ Other (please specify): Google Earth

Is the project located in Indian country? ☐ Yes ☒ No

If yes, name of Reservation, or if not part of a Reservation, indicate "not applicable."_____

Is this project considered a federal facility? ☐ Yes ☒ No

NPDES project or permit tracking number*: TBD

**(This is the unique identifying number assigned to your project by your permitting authority after you have applied for coverage under the appropriate National Pollutant Discharge Elimination System (NPDES) construction general permit.)*

## *1.2 Contact Information/ Responsable Parties*

**Operator:**

Gershman Brown Crowley
14 Breakneck Hill Road, Suite 101
Lincoln, RI 02865
Phone: 401-721-1600

**This Plan was Prepared by:**

R.J. O'Connell & Associates, Inc.
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Stoneham, MA 02180
Phone: 781-279-0180 ext. 129
Email: marissa.walker@rjoconnell.com

**Environmental Consultants:**

Ransom Consulting, Inc.
Pease International Tradeport
112 Corporate Drive
Portsmouth, New Hampshire
Phone: 603-436-1490
Attn: David Brogan, P.E.

### 1.3 Nature and Sequence of Construction Activity

**General Scope:**
The redevelopment program includes demolishing the existing buildings and constructing a 11,995 square foot CVS/pharmacy with 63 parking spaces and landscaping enhancements.

What is the function of the construction activity?
☐ Residential ☒ Commercial ☐ Industrial ☐ Road Construction ☐ Linear Utility
☐ Other (please specify):
Estimated Project Start Date: Fall 2013
Estimated Project Completion Date: Spring 2014

### *1.4 Construction Site Estimates*

**Total site area:** 1.2 acres
**Construction site area to be disturbed:** 1.2 acres
**Percentage impervious area before construction:** 94%
**Percentage impervious area after construction:** 78%

### *1.5 Potential Sources of Pollution*

Sediment arising from construction activities will be contained on-site by one or more of the following erosion control measures: wattles, silt fence, filter bags installed in catch basins and temporary sediment basins. Silt fencing and wattles will be installed around the perimeter of the proposed work areas prior to construction activities and will be maintained until stabilization and completion of all site work activities. All erosion control measures will be routinely inspected on a weekly basis (once every 7 days), cleaned and repaired or replaced as necessary throughout all phases of construction. In addition, inspections shall take place after each rainfall event of 0.25-inch or greater. The Contractor shall strictly adhere to the Construction Pollution Prevention Plan during construction operations. Upon completion of all site work construction, the Site Contractor shall inspect all on-site catch basins, forebays, detention basins, etc. and remove all sediment and trash debris that has accumulated within each BMP during the course of construction.

### *1.6 Endangered Species Certification*

Are endangered or threatened species and critical habitats on or near the project area?

☐ Yes ☒ No

### *1.7 Historic Preservation*

Are there any historic sites on or near the construction site?

☐ Yes ☒ No

### *1.8 Maps and Figures*

See Appendix A – Figures for Site Locus Plan, and FEMA Map (Flood Insurance Rate Map). See Appendix B under separate cover for site development plans.

## SECTION 2: EROSION AND SEDIMENT CONTROL BMPS

### *2.1 Minimize Disturbed Area and Protect Natural Features and Soil*

Contractor staging areas, stockpile areas, refueling areas, concrete wash-out areas, etc. will be located outside the 100-foot wetland buffer zones and the 200-foot Riverfront area.

### *2.2 Erosion & Sediment Control During Construction Activities*

The following erosion control measures shall be implemented prior to and during construction or on as needed basis.

- Prior to any construction activity, silt fencing and wattles shall be installed at the limits of the work area as shown on the plans. The silt fence may be installed in stages, but must be in place prior to disturbance of soils within the area draining to the silt fence.
- Stabilized construction entrances shall be installed at the site entrances as shown on the drawings. The construction entrance locations shall be adjusted as necessary as construction proceeds.
- Install filter bags in all existing catch basins within the construction area until the structures are abandoned or the area has received permanent stabilization treatment.

- Erosion controls must remain in place during demolition, clearing and grubbing activities and the preliminary cut and fill operations. Cuts and fills shall be performed in such a manner that runoff will continue to be directed toward erosion and sediment controls measures installed on-site.

- The Contractor shall minimize the area of disturbed soil and efforts shall be made to limit the time of exposure of disturbed areas.

- Erosion control measures shall be routinely inspected and cleaned, repaired or replaced as necessary. The Owner and/or Owner's representative will monitor the measures for proper maintenance and operation throughout the construction period. Documentation will be maintained and kept up-to-date by the Contractor on all inspections and repairs performed in accordance with the NPDES General Construction Permit and this Construction Pollution Prevention Plan requirements. Copies of all inspection reports must be kept on file at the on-site construction office.

- Where construction activities have permanently ceased or have temporarily been suspended for more than seven days, or when final grades are reached in any portion of the site, stabilization practices shall be implemented within three days. Areas which remain disturbed but inactive for at least thirty days shall receive temporary seeding in accordance with the DEP Erosion and Sedimentation Control Guidelines, May 2003, the EPA Erosion and Sediment Control Inventory of Current Practices, April 1990 and all local municipal regulations.

- Stockpiled soil shall be surrounded on their perimeters with wattles and/or siltation fences to prevent and/or control siltation and erosion. Tops of stockpiles shall be covered in such a manner that stormwater does not infiltrate the materials and thereby render the same unsuitable for fill use.

- Any dewatering activities in which water will be released to a resource area as defined under M.G.L. Chapter 131 Section 40 or to a storm drain shall use a settling pond or similar device to remove sediment before water is released.

- Haybale dikes shall be constructed at all existing & proposed catch basins located in areas subject to stormwater run-off from proposed fill areas during construction, or as directed by the Owner/Owner's Represenative. No sediments shall enter the on-site drainage system at any time.

- Dust control shall be employed during site grading operations. Dust control methods shall consist of dampening the ground with water, or an emulsion soil stabilizer if water does not provide adequate dust control.

**Structural Practices:**

Structural practices which will be used on this site to divert stormwater runoff away from exposed soils, store stormwater runoff, and discharge stormwater from the site include but are not limited to the following; silt fences, wattles, drainage swales, sediment traps, check dams, catch basins, temporary sediment basins, outlet control structure, permanent seeding and landscaping treatments (including permanent mulches, as applicable), and structural surfaces such as pavements. The site work drawings show and detail the locations of these structural practices.

## *2.3 Control Stormwater Flowing onto and through the Project*

| ***BMP Description*: *Temporary diversion ditches*** | |
|---|---|
| ***Installation Schedule*:** | At commencement of earthwork activities and relocate as needed during earthwork activities |
| ***Maintenance and Inspection*:** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater |
| ***Responsible Staff*:** | CPPPP Contact and /or their responsible designee |

| ***BMP Description: Sedimentation filter bag*** | |
|---|---|
| ***Installation Schedule:*** | At commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. Sediment to be removed when bag is half full |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## *2.4 Stabilize Soils*

| ***BMP Description: Mulch, hay or seeding for temporary vegetation of disturbed or exposed Areas*** | |
|---|---|
| ***Installation Schedule:*** | As needed. No areas shall be left disturbed for longer than necessary to complete the work associated with that area |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## 2.5 Protect Storm Drain Inlets

| ***BMP Description: Temporary sedimentation basin*** | |
|---|---|
| ***Installation Schedule:*** | At commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. Sediment to be removed when traps are half full with sediment |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

| ***BMP Description: Sedimentation filter bag*** | |
|---|---|
| ***Installation Schedule:*** | At commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. Sediment to be removed when bag is half full. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## 2.6 Establish Perimeter Controls and Sediment Barriers

| ***BMP Description: Silt fence and wattle barrier*** | |
|---|---|
| ***Installation Schedule:*** | Prior to any construction activity |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## 2.7 Retain Sediment On-Site

| ***BMP Description: Sedimentation filter bag*** | |
|---|---|
| ***Installation Schedule:*** | At commencement of construction activities |
| ***Maintenance and Inspection:*** | Inspect daily and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. Sediment bag to be removed and replaced when bag is half full. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

### *2.8 Establish Stabilized Construction Exits*

| ***BMP Description: Construction entrance vehicle tracing pads*** | |
|---|---|
| ***Installation Schedule:*** | Prior to the commencement of any earthwork operations |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. Replace crushed stone or remove sediment when voids are full. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## SECTION 3: GOOD HOUSEKEEPING BMPS

### *3.1 Material Handling and Waste Management*

| ***BMP Description: Solid waste containers / dumpsters.*** | |
|---|---|
| ***Installation Schedule:*** | At commencement of construction activities |
| ***Maintenance and Inspection:*** | Trash to be picked up on a daily basis, dumpsters emptied when full. Cover to be put on dumpster when full to prevent trash from blowing throughout site. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

### *3.2 Establish Proper Building Material Staging Areas*

| ***BMP Description: Silt fences and haybales at all stockpile areas of construction and excavated material*** | |
|---|---|
| ***Installation Schedule:*** | At the commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## *3.3 Designate Washout Areas*

| ***BMP Description: Equipment washing shall occur only within drainage areas with temporary sedimentation basins.*** | |
|---|---|
| ***Installation Schedule:*** | At the commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater. Washout spoil to be disposed of in on-site containers on a daily basis. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## *3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices*

| ***BMP Description: Fueling operations, including the service and storage of equipment associated with fueling, shall not occur within drainage areas with temporary sedimentation basins.*** | |
|---|---|
| ***Installation Schedule:*** | At the commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## *3.5 Control Equipment/Vehicle Washing*

| ***BMP Description: Vehicle washing shall occur only within drainage areas with temporary sedimentation basins.*** | |
|---|---|
| ***Installation Schedule:*** | At the commencement of construction activities |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## *3.6 Spill Prevention and Control Plan*

A spill contingency plan will be implemented during construction, including the following provisions:

- Equipment necessary to quickly attend to inadvertent spills will be stored on-site in a secure but accessible location. Such equipment will include:

  1. safety goggles
  2. chemically resistant gloves and overshoe boots
  3. water and chemical fire extinguishers
  4. sand and shovels
  5. suitable absorbent materials
  6. storage containers
  7. first aid equipment

- Spills or leaks will be treated properly in accordance with material type, volume of spillage and location of the spill. Mitigation will include:

  1. preventing further spillage
  2. containing the spilled material to the smallest practical area
  3. removing spilled material immediately in a safe and environmentally sound manner and in accordance with all applicable codes
  4. mitigating any damage to the environment

- For spills of less than 5 gallons of material, proceed with source control and containment and clean up with absorbent materials or other applicable means, unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional response contractor.

- Spills of toxic or hazardous materials of any type will be reported to the appropriate federal, state and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed reportable quantities of certain substances specifically mentioned in federal regulations 40 CFR 110, 40 CFR 117 and 40 CFR 302 must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802.

## *3.7 Any Additional BMPs*

| ***BMP Description: Adequate sanitation facilities for on-site construction crews*** | |
|---|---|
| ***Installation Schedule:*** | At the commencement of construction activities |
| ***Maintenance and Inspection:*** | As required. Portable facilities shall be emptied and cleaned on a weekly basis. |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

| ***BMP Description: Dust control through watering*** | |
|---|---|
| ***Installation Schedule:*** | As required throughout earthwork operations |
| ***Maintenance and Inspection:*** | As required |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

## *3.8 Allowable Non-Stormwater Discharge Management*

| ***BMP Description: All measures used to mitigate sedimentation shall be used to control water associated with dust control activities*** | |
|---|---|
| ***Installation Schedule:*** | As outlined in above measures |
| ***Maintenance and Inspection:*** | Once weekly and within 24 hours of the end of a rainfall event that is 0.25 inches or greater |
| ***Responsible Staff:*** | CPPPP Contact and /or their responsible designee |

# SECTION 4: CONSTRUCTION PERIOD POLLUTION PREVENTION AND SEDIMENTATION PLAN FORMS AND LOGS

# APPENDICES:

***Appendix A – Figures***

***Figure 1*** ***USGS Site Locus Plan***

***Appendix B – Site Plans***

***Site Plans entitled "Site Plan for CVS/pharmacy, Washington Street and Swanton Street, Winchester , MA " – Under Separate Cover***

# Construction Period Pollution Prevention and Sedimentation Plan Inspection and Maintenance Report Form

To be completed every seven days and within 24 hours of a rainfall event of 0.25 inches or more

**Project Name: CVS/pharmacy**
**CPPPP Contact:**

**Inspector:** _____ **Date:** _____
**Days since last rainfall:**_____ **Amount of last rainfall:** _____**inches**

**Current Site Status:**

| *Site Area* | *Current Activities* | *Current Condition* |
|---|---|---|
| | | |
| | | |
| | | |
| | | |

**Control Measures:** (If you answer no to any of the following questions, corrective actions may be required)

☐Yes ☐No ☐NA Siltation barriers in good condition?
☐Yes ☐No ☐NA Drainage diverted away from disturbed areas?
☐Yes ☐No ☐NA Temporary stabilization in place where appropriate/required?
☐Yes ☐No ☐NA No reportable quantity releases (spills) since last inspection?
☐Yes ☐No ☐NA Catch basins/detention facilities without excess accumulated solids?
☐Yes ☐No ☐NA Infiltration facilities functioning properly?
☐Yes ☐No ☐NA Velocity/erosion control measures at outfalls operating properly?
☐Yes ☐No ☐NA Minimal sediment tracked onto road?

**Other Observations:**

_____

_____

**Corrective Actions Required:**

_____

_____

# Corrective Action Log

**Project Name: CVS/pharmacy**
**CPPPP Contact:**

| Inspection Date | Inspector Name(s) | Description of BMP Deficiency | Corrective Action Needed (including planned date/responsible person) | Date Action Taken/Responsible person |
|---|---|---|---|---|
| | | | | |
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# Construction Period Pollution Prevention and Sedimentation Plan Amendment Log

**Project Name: CVS/pharmacy**
**CPPPP Contact:**

| Amendment No. | Description of the Amendment | Date of Amendment | Amendment Prepared by [Name(s) and Title] |
|---|---|---|---|
| | | | |
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# Subcontractor Certifications/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 the 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: _____

# Grading and Stabilization Activities Log

**Project Name: CVS/pharmacy**
**CPPPP Contact:**

| 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 |
|---|---|---|---|---|
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# CPPPP Training Log

## Stormwater Pollution Prevention Training Log

Project Name: **CVS/pharmacy**

Project Location: **Washington Street and Swanton Street, Winchester, Ma**

Instructor's Name(s):

Instructor's Title(s):

Course Location: _____ Date: _____

Course Length (hours): _____

Stormwater Training Topic: *(check as appropriate)*

- ❑ **Erosion Control BMPs**
- ❑ **Emergency Procedures**
- ❑ **Sediment Control BMPs**
- ❑ **Good Housekeeping BMPs**
- ❑ **Non-Stormwater BMPs**

Specific Training Objective:_____

_____

Attendee Roster: *(attach additional pages as necessary)*

| No. | Name of Attendee | Company |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |

# Delegation of Authority Form

## Delegation of Authority

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 _____ 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 a designation as set forth in _____ (Reference State Permit), and that the designee above meets the definition of a "duly authorized representative" as set forth in _____ (Reference State Permit).

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.

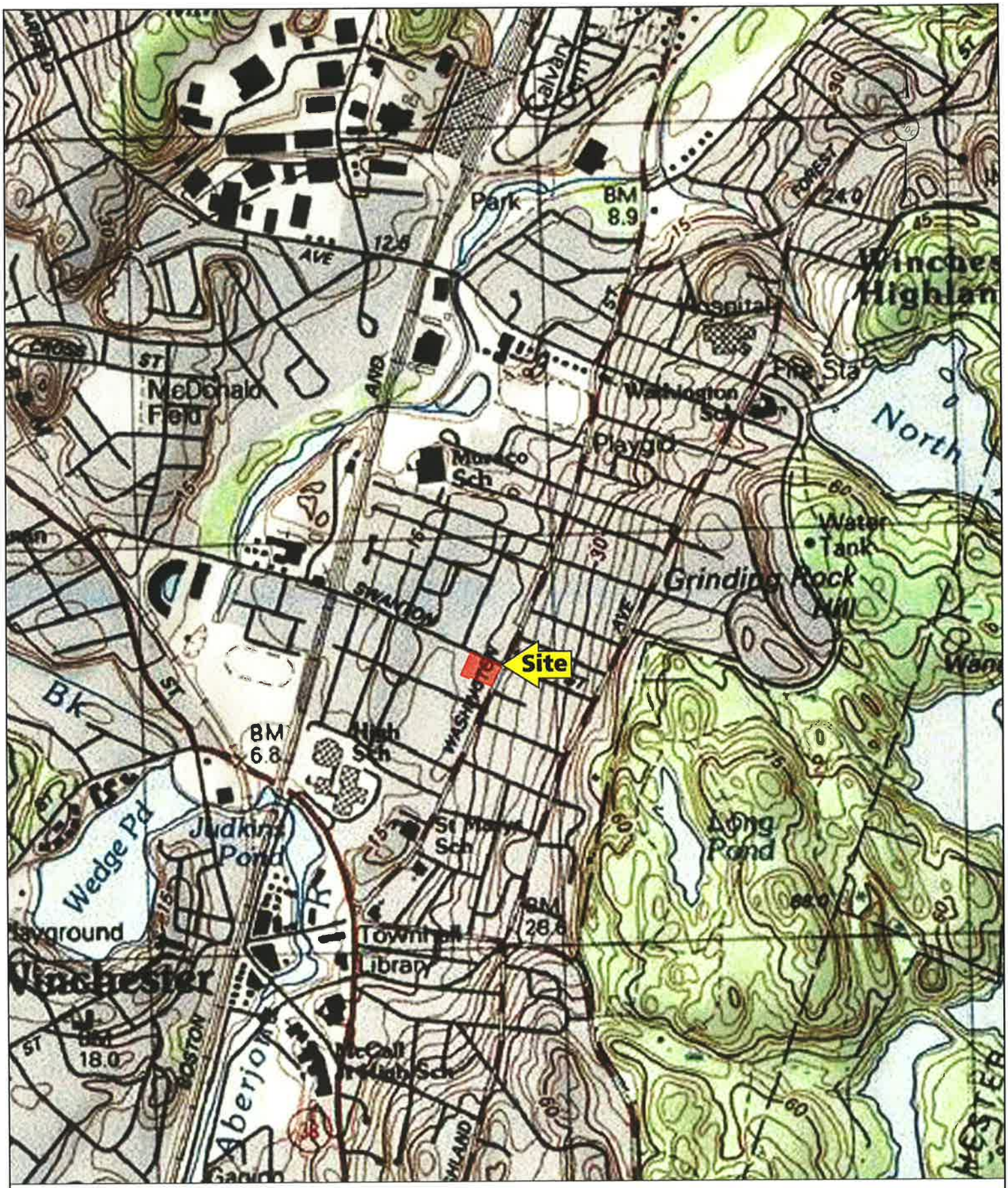
**Name:** _____

**Company:** _____

**Title:** _____

**Signature:** _____

**Date:** _____




| No. | Revision | Date |
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| Designed by: | JBC |
| Drawn by: | JBC |
| Checked by: | MJW |
| Scale: | 1"=1,000' |
| Date: | 8/17/2012 |

Prepared by:

RJO'Connell & Associates, Inc.
Civil Engineers, Surveyors & Land Planners
83 Montvale Ave
Stoneham, MA 02180
781-279-0160 FAX: 781-279-0173

Project Name:
CVS/pharmacy
WINCHESTER, MA

Drawing Name:
USGS MAP

Drawing No.:
FIG. 1

Project No.: 11071

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Drawing name: G:\CVS\Projects\MA\Winchester\Washington Street and Swanton\Reports\Stormwater Report\USGS Map.dwg
Apr 25, 2013 – 10:54am

# Appendix A – Figures

# Appendix B – Site Plans Under Separate Cover

# Operations and Maintenance Plan

## CVS/pharmacy
## 278 Washington Street
## Winchester, Massachusetts

**Prepared for:**

**G.B. New England 2 LLC**
**C/O GERSHMAN BROWN CROWLEY, INC.**
**14 Breakneck Hill Road, Suite 101**
**Lincoln, RI 02865**

**Prepared by:**

**R.J. O'CONNELL AND ASSOCIATES, INC.**
**80 Montvale Ave, Suite 201**
**Stoneham, MA 02180**

**Date: September 21, 2012**
**Revised: October 16, 2012**
**Revised: January 24, 2013**
**Revised: May 6, 2013**

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# Operations and Maintenance Plan

## INTRODUCTION

This Operations and Maintenance Plan has been prepared to ensure that the stormwater management system implemented for the CVS/pharmacy functions as designed and to develop and carry out suitable practices for source control and pollution prevention. It consists of six sections:

Section 1 - Stormwater Management System-Operations and Maintenance, which describes the various components of the stormwater management system, identifies the inspection and maintenance tasks to be undertaken after construction is complete and a schedule for implementing these tasks to insure the proper, long-term operation of the system.

Section 2 - Long Term Pollution Prevention Plan which identifies and implements suitable measures, practices and procedures for source control and pollution prevention.

Section 3- Illicit Discharge Statement.

Section 4- Snow Management and Disposal Plan which describes how snow removal will be managed and deicing operations performed.

Section 5- Public Safety Features which lists features of the stormwater management system to insure the safety of the public.

## SECTION 1 – STORMWATER MANAGEMENT SYSTEM- OPERATION AND MAINTENANCE

The objectives of the stormwater management system are to effectively control and treat stormwater runoff from the site in accordance with the Massachusetts Stormwater Management Standards. To accomplish this objective, the following Best Management Practices (BMP's) are included in CVS/pharmacy's stormwater management system:

Pre-treatment BMP's

- Sweeping of paved surface areas to remove solids and reduce suspended solids in surface runoff.
- Maintaining the existing catch basins to reduce the discharge of sediment and pollutants.
- Maintaining CDS unit oil/particle separators for removal of Total Suspended Solids (TSS), oil and grease

Treatment BMP's

- Maintaining the subsurface infiltration system to recharge groundwater, reduce peak rates of runoff from the site and remove suspended solids from stormwater runoff through infiltration into the ground.

To insure the ongoing and proper functioning of the on-site stormwater management/BMP facilities, this Operations and Maintenance Plan has been developed.

In consideration of the foregoing, it is the ongoing responsibility of the Landowner, his successors and assignees to adequately maintain the on-site stormwater management/BMP facilities. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions.

Based on this, the Landowner, his successors and assignees are required to create a Pollution Prevention Team (PPT) that will be responsible for implementing the Operations and Maintenance Plan.
Upon transfer of ownership of the property, the Landowner is required to notify the new owner of the presence of the stormwater management system and the requirements of this Operations and Maintenance Plan.

Property Information

Address: 278 Washington Street
Winchester, MA 01890
Map 10 Lots 138, 139, 140

Landowner and Pollution Prevention Team Leader

Owner's Name: Fashion Real Estate Trust, Bossis Realty Trust, Y.D. Realty Trust
Team Leader: TBD
Title: Owner
Office Phone: TBD
Email: TBD

Responsibilities: Coordinate all aspects of the Operations and Maintenance Plan, coordinate and hire the other Pollution Prevention team members in order to conduct inspections, keep all records, coordinate with contractors for maintenance and repairs of the stormwater management system.

Spill Prevention & Control Contractor
The following contacts shall be notified only in those instances identified within MA DEP-310 CMR 40-subpart C, attached herewith.

Primary Contact: TBD
Office Phone: TBD

Emergency Contact:
Company Name: TBD
Contact Name: TBD
Emergency Phone: TBD

Consultant Contact:
Company Name: TBD
Contact Name: TBD
Phone: TBD

Department of Environmental Protection (DEP) Contact
Spill Emergency Coordinator
Contact Name: TBD
Phone: TBD
Municipal Contacts
Contact Name: Town of Winchester Engineer, Beth Rudolph, PE
Phone: 781-721-7120
Contact Name: Jay Gill, DPW Director
Phone: 781-721-7100

Other Pollution Prevention Team Members

Member: Qualified Engineering and/or Environmental Consulting Firm(s)
Responsibilities: Conduct scheduled inspections, maintain records, advise the Team Leader of maintenance needs, ensure inspection maintenance and repairs are completed, keep and maintain all records and inspection reports and submit inspection reports to the Winchester Conservation Commission.
Company Name(s): TBD
Address:
Office Phone:

Team Member Training

The Pollution Prevention Team Leader will coordinate an annual in-house training session with the qualified Engineering and/or Environmental Consulting Firm to discuss the Operations and Maintenance Plan, ongoing inspection and maintenance and preventative maintenance procedures.

Annual training session will generally include the following:

- Discuss the Operations and Maintenance Plan
    - What it is- identify potential sources of stormwater pollution and methods of reducing or eliminating that pollution
    - What it contains- emphasize good housekeeping measures and location of potential pollution sources.

- Pollution Prevention Team- introduce the team and responsibilities, explain that the operations of the Center is to continually monitor the stormwater management system and encourage input and assistance from all.

- Review and explain the storm drainage system, how it works and its components, note the receiving resource area in which the storm drainage system discharges into and the role each one of these areas play.
- Emphasize the importance of maintaining current and up-to-date inspection reports and maintenance records of BMP's. Documentation shall include any changes to the O&M Plan's procedures to accommodate changes and revisions to BMP's.

The components of the stormwater management system must be inspected, monitored and maintained in accordance with the following in order to ensure that the on-site stormwater management/BMP facilities for the CVS/pharmacy are functioning as designed. Routine inspection and proper maintenance of these individual components is essential to providing the long-term enhancement of both the quality and quantity of the runoff from the Center.

Catch Basins:

Stormwater runoff from pavement areas is directed to the existing catch basins via curbing and site grading. To ensure proper functioning of catch basins, each on-site catch basin will be inspected and maintained as follows:

Inspection: Quarterly and after major storm events (3.1 inches or more in a 24 hour period). Structural damage and other malfunctions to be noted and reported.

Maintenance: Cleaned four times a year or when the sump is half full by a licensed contractor. Sediment and hydrocarbons will be properly handled and legally disposed of off site in accordance with local, state, and federal guidelines and regulations. Any structural damage to catch basins and/or castings will be repaired upon discovery.

Sweeping and Site Clean-Up

Routine sweeping of paved areas is an effective method to provide important nonpoint source pollution control and will be performed by mechanical sweepers. Most stormwater pollutants travel with the suspended solids contained in the stormwater runoff and regular sweeping will help reduce a portion of this load. Sweeping, especially during the period immediately following winter snowmelt (March/April) when road sand and other debris has accumulated on the pavement, will capture a peak sediment load before spring rains wash residual sand from winter applications into nearby resource areas.

Inspection: Paved areas will be inspected for litter on a weekly basis and picked up and disposed of immediately.

Maintenance: All parking areas, sidewalks, driveways and other impervious surfaces (except roofs) will be swept clean of sand, litter, trash, etc. on a weekly basis. A log of land/lot sweeping and cleanup will be kept. Housekeeping concerns noted by store leadership, PPT members, guests and others will be noted and acted upon. Separate cleanup services will be conducted at least twice a year, once between November 14 and December 15 (after leaf fall) and once during the month of April (after snow melt). Additional cleanup services will be conducted as necessary.

Oil/Particle Separators (CDS Unit)

The Continuous Deflective Separator (CDS) unit separates and traps debris, sediment and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material. There are two CDS units on site designed to treat stormwater runoff prior to discharging into the subsurface infiltration system.

Inspection: Quarterly

Maintenance: Jet/vacuumed by a licensed contractor at least twice per year. Accumulated sediment and hydrocarbons will be disposed of in accordance with applicable local, state and federal guidelines and regulations.

Subsurface Infiltration System

The subsurface infiltration system is located beneath the north parking area. The system consists of 5 foot diameter, perforated, corrugated metal pipes surrounded in crushed stone. The system is designed to temporarily retain storm runoff and percolate it into the underlying soil.

Inspection: Inlets to be inspected twice a year.

Maintenance: Clean when there is a build-up of visible sediment at the inlet. Sediment to be removed by jet vacuum and disposed of legally in accordance with local, state and federal guidelines and regulations.

**Please refer to Appendix A for the Inspection Forms and the CDS Guide for Operation, Design, Performance and Maintenance; which are to be used by the Pollution Prevention Team member responsible for conducting the scheduled inspections.**

## SECTION 2 – LONG TERM POLLUTION PREVENTION PLAN (LTPPP)

### A. MATERIALS COVERED

The following materials or substances are expected to be present onsite after construction:

| | |
|---|---|
| Cleaning solvents | Petroleum based products |
| Detergents | Pesticides/Insecticides |
| Paints/Solvents | Fertilizers/Herbicides |
| Acids | Pet waste |
| Solid Waste | Contaminated Soil |

### B. MATERIALS MANAGEMENT PRACTICES

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff. The Pollution Prevention Team Leader will be responsible for ensuring that these procedures are followed:

1. Good Housekeeping

   The following good housekeeping practices will be followed onsite after construction:

   a) An effort will be made to store only enough products required to do the job.
   b) All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or in a containment area. At a minimum, all containers will be stored with their lids on when not in use. Drip pans shall be provided under all dispensers.
   c) Products will be kept in their original containers with the original manufacturer's label in legible condition.
   d) Substances will not be mixed with one another unless recommended by the manufacturer.
   e) Whenever possible, all of a product will be used up before disposing of the container.
   f) Manufacturer's recommendations for proper use and disposal will be followed.
   g) A Pollution Prevention Team Member will be responsible for daily inspections to ensure proper use and disposal of materials.

2. Hazardous Substances

   These practices will be used to reduce the risks associated with Hazardous Substances. Material Safety Data Sheets (MSDS's) for each product with

hazardous properties that is used at the Project will be obtained and used for the proper management of potential wastes that may result from these products. An MSDS will be posted in the immediate area where such product is stored and/or used and another copy of each MSDS will be maintained on-site, in the management office. Each employee who must handle a Hazardous Substance will be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product he/she is using, particularly regarding spill control techniques.

a) Products will be kept in original containers with the original labels in legible condition.
b) Original labels and MSDS's will be procured and used for each product.
c) If surplus product must be disposed of, the manufacturer's and local/state/federal required methods for proper disposal must be followed.

3. Hazardous Waste

It is imperative that all Hazardous Waste be properly identified and handled in accordance with all applicable Hazardous Waste Standards, including the storage, transport and disposal of the Hazardous Wastes. There are significant penalties for the improper handling of Hazardous Wastes. It is important that the Pollution Prevention Team Leader seeks appropriate assistance in making the determination of whether a substance or material is a Hazardous Waste. For example, Hazardous Waste may include certain Hazardous Substances, as well as pesticides, paints, paint solvents, cleaning solvents, contaminated soils, and other materials, substances or chemicals that have been discarded (or are to be discarded) as being out-of-date, contaminated, or otherwise unusable. The Pollution Prevention Team Leader is responsible for ensuring that all Pollution Prevention Team Members are instructed as to these Hazardous Waste requirements and also that the requirements for handling and disposal are being followed.

4. Product Specific Practices

The following product specific practices will be followed on the job site:

a) Petroleum Products

Petroleum products will be stored in tightly sealed containers which are clearly labeled. Petroleum storage tanks shall be located a minimum of 100 linear feet from wetland resource areas, drainage ways, inlets and surface waters unless stored within a building. Any petroleum storage tanks stored onsite will be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Drip pans shall be provided for

all dispensers. Any asphalt substances used onsite will be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas must be identified on the Erosion Control Plan by the Contractor once the locations have been determined.

b) Fertilizers, Herbicides, Pesticides, and Insecticides

Fertilizers, herbicides, pesticides, insecticides and/or pool chemicals will be applied only in the minimum amounts recommended by the manufacturer. Once applied, they will be worked so as to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags or containers will be transferred to a sealable plastic bin to avoid spills.

c) Paints, Paint Solvents, and Cleaning Solvents

All containers will be tightly sealed and stored when not in use. Excess paint and solvents will not be discharged to the storm sewer system but will be properly disposed of according to manufacturer's instructions or state and federal regulations.

5. Solid Waste

All waste materials will be collected and stored in an appropriately covered container and/or securely contained metal dumpster rented from a local waste management company which must be a licensed solid waste management company. The dumpster will comply with all local and state solid waste management regulations.

All trash and debris from the site will be deposited in dumpsters. The dumpsters will be emptied a minimum of once per week or more often if necessary. All personnel will be instructed regarding the correct procedures for waste disposal.

All waste dumpsters and roll-off containers will be located in an area where the likelihood of the containers contributing to storm water discharges is negligible. No debris, refuse or other materials, including but not limited to landscaping debris, leaves, shrubs and tree trimmings, logs, bricks stone or trash shall be deposited within the vegetated wetland or within 100 feet of the vegetated wetland.

6. Contaminated Soils

Any contaminated soils (resulting from spills of Hazardous Substances or Oil) will be contained and cleaned up immediately in accordance with the procedures given in the Materials Management Plan and in accordance with applicable state and federal regulations. If there is a release, it should be reported as a spill, if it otherwise meets the requirements for a reportable spill.

7. Pet Waste

The site will be inspected weekly for pet waste. Pet waste will be collected, placed in a closed, tied trash bag and disposed of in accordance with applicable code requirements.

## C. SPILL PREVENTION AND RESPONSE PROCEDURES

The Pollution Prevention Team Leader will train all personnel in the proper handling and cleanup of spilled Hazardous Substances or Oil. No spilled Hazardous Substances or Oil will be allowed to come in contact with storm water discharges. If such contact occurs, the storm water discharge will be contained on site until appropriate measures in compliance with state and federal regulations are taken to dispose of such contaminated storm water. It shall be the responsibility of the Pollution Prevention Team Leader to be properly trained, and to train all personnel in spill prevention and clean up procedures.

1. In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil to come into contact with storm water, the following steps will be implemented:

   a) All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.
   b) The minimum practical quantity of all such materials will be kept on site.
   c) A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.
   d) Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.
   e) It is the Pollution Prevention Team Leader's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The Pollution Prevention Team Leader is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authority.

2. In the event of a spill of Hazardous Substances or Oil, the following procedures must be followed:

   a) All measures must be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to storm water or off-site. (The

spill area must be kept well ventilated and personnel must wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

b) For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

c) For spills greater than five (5) gallons of material immediately contact the MA DEP Hazardous Waste Incident Response Group at (617) 792-7653 and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired.

d) If there is a Reportable Quantity (RQ) release, then the National Response Center will be notified immediately at (800) 424-8802; within 14 days a report will be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan must be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

3. The Pollution Prevention Team Leader will be the spill prevention and response coordinator. He/she will designate the individuals who will receive spill prevention and response training. These individuals will each become responsible for a particular phase of prevention and response. The names of these personnel will be posted in the material storage area and in the management office.

## SECTION 3 - ILLICIT DISCHARGE STATEMENT

Certain types of discharges are allowable under the U.S. Environmental Protection Agency Construction General Permit, and it is the intent of this LTPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Illicit discharges, if they exist currently, will be contained and eliminated in the manner specified by local, state and federal regulations, and will be prohibited in the proposed development.

_____

Doug Murray for Gershman Brown Crowley, Inc.

## SECTION 4 - SNOW MANAGEMENT AND DISPOSAL PLAN

Snow management will be overseen by a full-time Property Manager who will implement this plan and be authorized to utilize additional resources should unusual events occur. The Snow Management Contractor (SMC) shall be responsible for maintaining all roads, driveways, parking lots, sidewalks and pedestrian access areas for clear and safe travel. The SMC shall report directly to the Property Manager and maintain communication via cell phones 24 hours per day, 7 days per week. All roads, drives, entrances and exits are the first priority. During extreme events, the first priority will be to clear and maintain proper access for residents and public safety vehicles. The next priority is parking areas, sidewalks, fire hydrants, and delivery areas. Snow will not be piled around light bases and handicap parking areas shall be cleared frequently.

The anti-icing operations typically precede snow plowing and will be provided when conditions warrant. Within 12 months of concrete walks, pads, or other features being poured, no salt shall be placed on those surfaces. After the materials have cured for 12 months, a combination of salt (Halite or Rock Salt) and sand ("washed", fine to medium grade) shall be utilized. Parking areas shall receive spot treatment only when and where needed in a similar manner. No de-icing chemicals shall be used on any paved surface located within the 100-foot wetland buffer zone, except without the prior written permission from the Town of Winchester.

Snow plowing shall commence upon accumulation of two inches ("2") or more. Snow shall be deposited in areas as approved by the Planning Board. The SMC shall keep existing catch basins open for drainage or water resulting from melting. See plan C-2, enclosed within, for approximate snow piling locations.

Once the storm is over, the SMC shall monitor all areas on-site for icy spots and snowdrifts. If needed, an application of sand and salt will be applied to all streets and roads so that the riding surface remains drivable. When the ambient temperature drops below 25 degrees F, all major areas will receive an application of pre-wetted salt with calcium chloride to maintain melting action and an ice-free surface for as long as possible. Salt loses its effectiveness at temperatures drop below 25 degrees F.

Deicing chemicals will be kept in original containers with the original product label in legible condition. When not in use, deicing materials will be stored in a neat, orderly manner under cover with their container lids on.

## SECTION 5 - PUBLIC SAFETY FEATURES

The following measures have been incorporated into the stormwater management system to insure the safety of the public:

- Storm drain manholes and catch basins provided with heavy duty covers and/or grates and designed to withstand H20 loading.

- Control and collection of stormwater runoff through positive drainage and curbing directing it toward drainage inlet structures.

- Treatment of stormwater runoff from paved surfaces to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

- Reduction in peak rates of runoff from the site under post-redevelopment conditions as compared to pre-developed conditions.

- Development and implementation of an Operations and Maintenance Plan to insure the proper functioning of the stormwater management system and a Long Term Pollution Prevention Plan identifying potential pollution sources and suitable practices to control and prevent them from impacting the environment and/or the public's health and safety.

# Appendix A
# CVS/pharmacy
# Maintenance and Inspection Forms

# CVS/pharmacy
# Operation and Maintenance Plan
# Activity Guide

The table below is a list of the minimum inspection and maintenance activities the Pollution Prevention Team needs to conduct for the Stormwater Operations and Management Plan and who is responsible for the activity. The Activity Guide is provided to assist the Pollution Prevention Team Leader and ensure that the activities are being conducted as scheduled.

| Timing | Activity | Responsible Party |
|---|---|---|
| Weekly | Inspect Lot/Land<br>Pet Waste Management<br>Parking Lot Sweeping | PPT<br>PPT<br>PPT Contractor |
| Quarterly | Inspect and clean catch basins<br>Inspect CDS Units | PPT/Contractor<br>PPT/Contractor |
| Semi-Annually | Clean CDS Unit<br>Inspect subsurface infiltration system | PPT/Contractor<br>PPT |
| Annually | Pollution Prevention Team training<br>Comprehensive annual stormwater evaluation and inspection report | PPT Leader<br>PPT Leader |
| April | Spring clean-up, | PPT/Contractor |
| Between November 14 and December 15 | Fall clean-up | PPT/Contractor |

**CVS/pharmacy**
**Operations and Maintenance Plan**
**Comprehensive Annual Evaluation and Inspection Report**

Once a year, the Pollution Prevention Team Leader must inspect and evaluate all aspects and provisions of the Opeations and Maintenance Plan, complete the following report and keep a copy on file at the site.

**Inspector/Reviewers:**_____

**Date of Inspection/Review**: _____

Note any changes to the Plan in the space below and in the appropriate section of the Plan.

1. Review the Pollution Prevention Team list and update if necessary. Does the Pollution Prevention Team list need updating:
   (circle one) Yes No

2. Review the Operations and Maintenance Plan (O&M Plan). Are there sections of the O&M Plan that need updating?
   (circle one) Yes No

3. Review Monthly and Weekly Checklists. Update these as necessary

   - Are there any updates needed to Spill and Leak History and/or the checklists?
   (circle one) Yes No

4. Review site drawings and update if necessary
   - Are there updates needed to any of the drawings? (circle one) Yes No
   -

**Requested Changes** (attach revisions)

# CVS/PHARMACY
# OPPERATIONS AND MAINTEANCE PLAN
# ANNUAL TRAINING SIGNOFF SHEET

For each Operations and Maintenance Plan training session, the Team Leader should keep records of all attending Team Members using the signoff sheet below, as well as the training agenda, notes, etc.

| **Training Date**: _____ | **Topic**: |
|---|---|
| **Trainer**: _____ | |
| **Team Member Name** | **Team Member Signature** |
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# CVS/pharmacy
# Operations & Maintenance Plan
# Weekly Inspection Checklist

The site will be checked each week for trash and debris by a member of the Pollution Prevention Team. If any trash or debris is observed in the specified area, write "yes" in the 2nd column and note the problem and corrective measures taken in the appropriate space. Make a new copy of this checklist each week.

**Date:** _____ **Checklist completed by:** _____

| GROUNDS AREA TO CHECK | TRASH OR DEBRIS PRESENT? | DESCRIPTION OF PROBLEM | CORRECTIVE MEASURES TAKEN |
|---|---|---|---|
| Parking Lot & Roadways | | | |
| Landscaped Areas | | | |
| Compactor/Dumpster & Loading Dock Areas | | | |
| Perimeter of Property | | | |

# CVS/pharmacy
# Operations & Maintenance Plan
# Quarterly Inspection Checklist

The following will be checked each quarter for sources of pollutants by a member of the Pollution Prevention Team. If the condition in the "check for" column is observed, note the problem and corrective measures taken in the appropriate space. Make a new copy of the checklist each month.

**Date**: _____ **Checklist completed by**: _____

| GROUNDS AREA TO CHECK | CHECK FOR... | DESCRIPTION OF PROBLEM (IF PRESENT) | CORRECTIVE MEASURES TAKEN |
|---|---|---|---|
| Catch Basins | Trash, oil sheen, hood (securely fastened) excessive sediment | | |
| CDS Unit | Trash, excessive sediment | | |

# CVS/pharmacy
# Operations & Maintenance Plan
# Semi-Annually Inspection Checklist

The following will be checked each quarter for sources of pollutants by a member of the Pollution Prevention Team. If the condition in the "check for" column is observed, note the problem and corrective measures taken in the appropriate space. Make a new copy of the checklist each month.

**Date:** _____ **Checklist completed by:** _____

| GROUNDS AREA TO CHECK | CLEAN AND REMOVE... | DESCRIPTION OF PROBLEM (IF PRESENT) | CORRECTIVE MEASURES TAKEN |
|---|---|---|---|
| Subsurface Infiltration System | Trash, excessive sediment at inlets | | |
| CDS Unit | Trash, excessive sediment | | |

**CVS/pharmacy**
**Long Term Pollution Prevention Plan**
**Spill and Leak History**
**(____ to _____)**

| Date | Spill | Leak | Location | Description | | | | Response Procedures | Measures to Prevent Reoccurrence | Reporting Pollution Prevention Team Member |
|---|---|---|---|---|---|---|---|---|---|---|
| *(MM/DD/YY)* | *(check one)* | | *(as indicated on Site Map)* | *Type of Material* | *Quantity* | *Source, if known* | *Reason* | | | |
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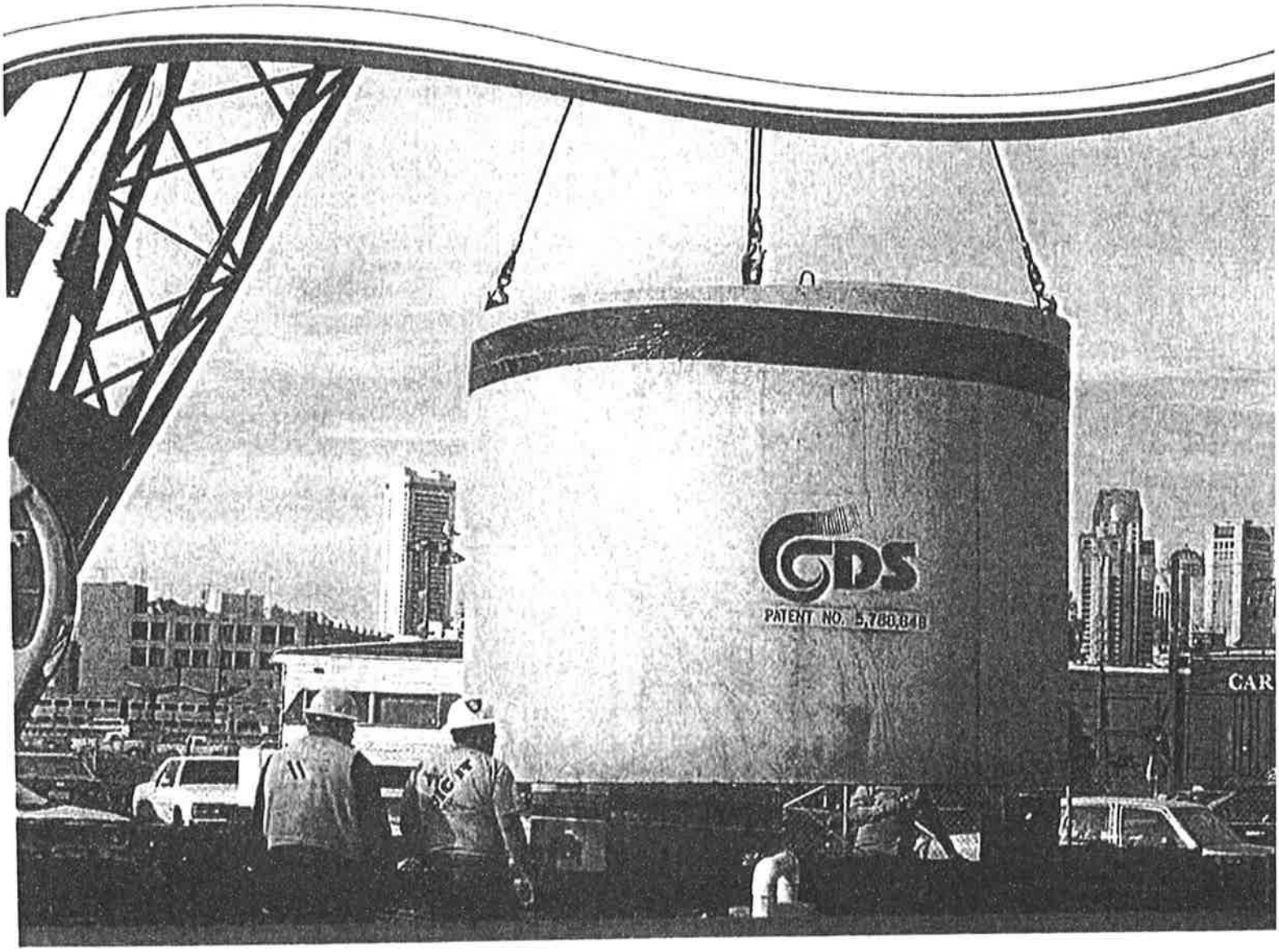
CONTECH®
CONSTRUCTION PRODUCTS INC.

# CDS Guide
## Operation, Design, Performance and Maintenance



## CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs. Available precast or cast-in-place offline units can treat flows from 1 to 300 cfs. The pollutant removal capacity of the CDS system has been proven in lab and field testing.

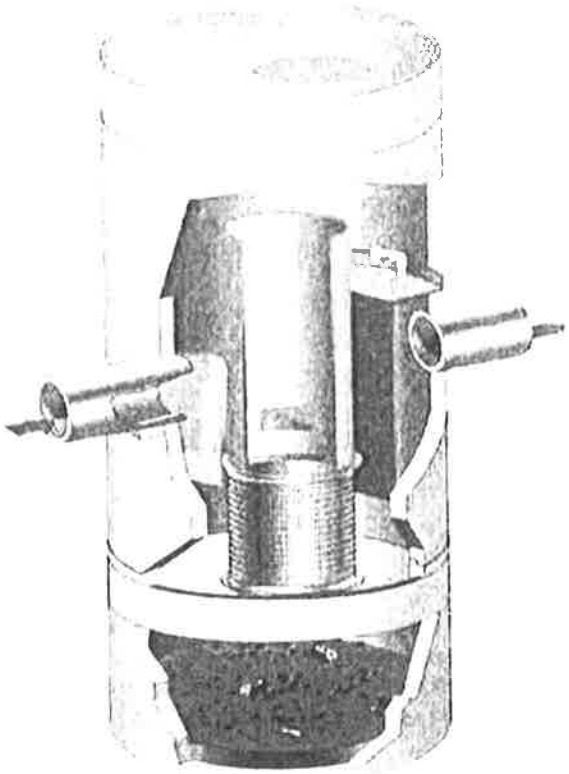
## Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



## Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ and Probabalistic Method are used when a specific removal efficiency of the net annual sediment load is required.

Typically in the United States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm).

### Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the treatment flow rate around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer.

### Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long term performance of any stormwater treatment system. The Rational Rainfall Method combines site specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1 mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to

calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

### Probabalistic Rational Method

The Probabalistic Rational Method is a sizing program CONTECH developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic rational method is an extension of the rational method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (i.e.: 2-year storm event). Under this method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

### Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

### Hydraulic Capacity

CDS hydraulic capacity is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. As needed, the crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulics.

## Performance

### Full-Scale Laboratory Test Results

A full-scale CDS unit (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This full-scale CDS unit was evaluated under controlled laboratory conditions of pumped influent and the controlled addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSD) of the test materials were analyzed using standard method "Gradation ASTM D-422 with Hydrometer" by a certified laboratory. UF Sediment is a mixture of three different U.S. Silica Sand products referred as: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 $\mu$m) covering a wide size range (uniform coefficient Cu averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 $\mu$m) (NJDEP, 2003). The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

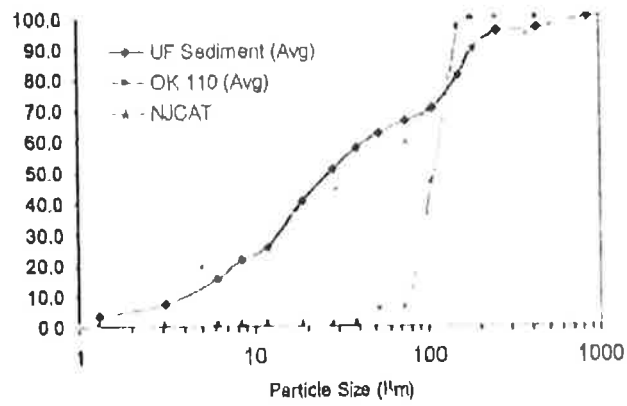



Figure 1. Particle size distributions for the test materials, as compared to the NJCAT/NJDEP theoretical distribution.

Tests were conducted to quantify the CDS unit (1.1 cfs (31.3-L/s) design capacity) performance at various flow rates, ranging from 1% up to 125% of the design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC – ASTM Standard Method D3977-97) and particle size distribution analysis.

## Results and Modeling

Based on the testing data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve for the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect to SSC removal for any particle size gradation assuming sandy-silt type of inorganic components of SSC. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand).

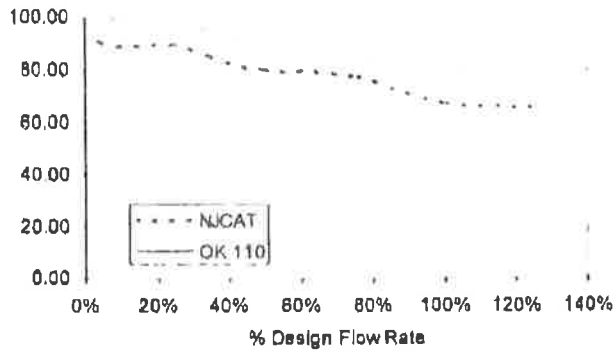



Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (WADOE, 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). Supported by the laboratory data, the model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at 100% of design flow rate, for this particle size distribution (d50 = 125 $\mu$m).

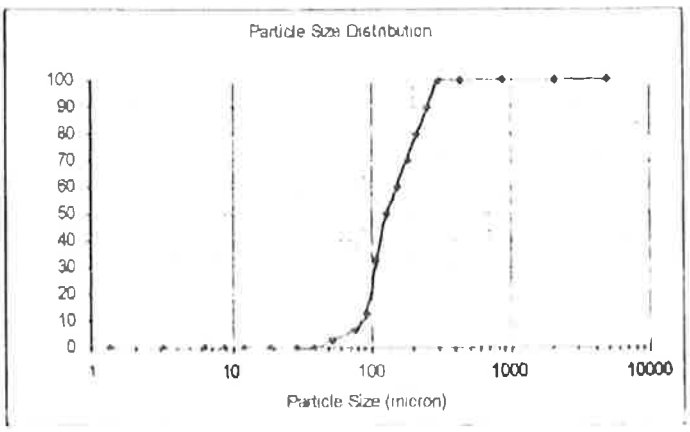



Figure 3. PSD with d50 = 125 microns, used to model performance for Ecology submittal.

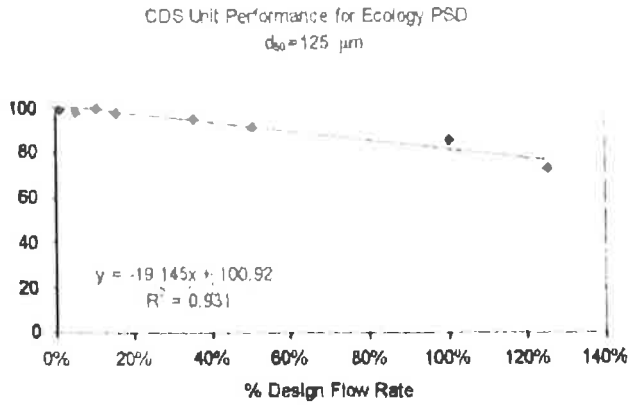



Figure 4. Modeled performance for CDS unit with 2400 microns screen, using Ecology PSD.

## Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit, e.g., unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

## Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport may vary from year to year and regular inspections will help insure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (i.e. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Additionally, installations should be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions to inlet and/or separation screen. The inspection should also identify evidence of vector infestation and accumulations of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If sorbent material is used for enhanced removal of hydrocarbons then the level of discoloration of the sorbent material should also

be identified during inspection. It is useful and often required as part of a permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (screen/cylinder) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained behind the screen. For units possessing a sizable depth below grade (depth to pipe), a single manhole access point would allow both sump cleanout and access behind the screen.

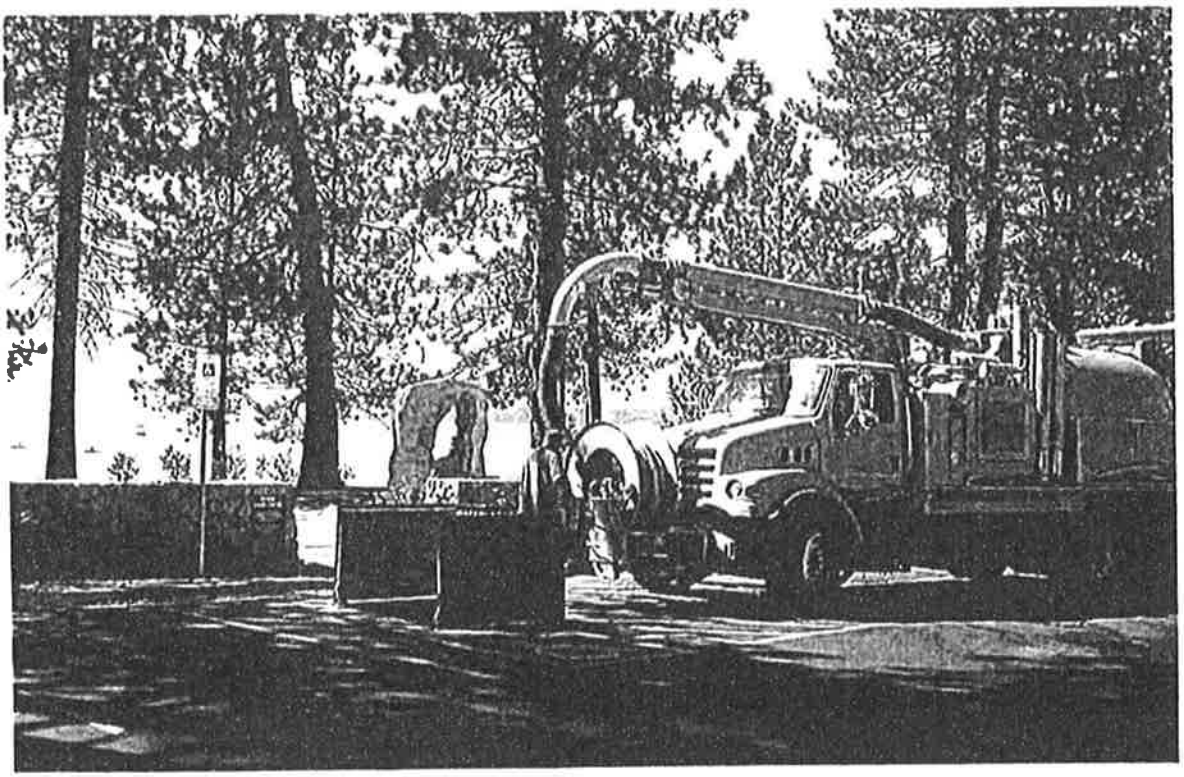
The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump and/or when an appreciable level of hydrocarbons and trash has accumulated. If sorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Finer, silty particles at the top of the pile typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine if the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

## Cleaning

Cleaning of the CDS systems should be done during dry weather conditions when no flow is entering the system. Cleanout of the CDS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should be pumped out also if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use adsorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash can be netted out if you wish to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

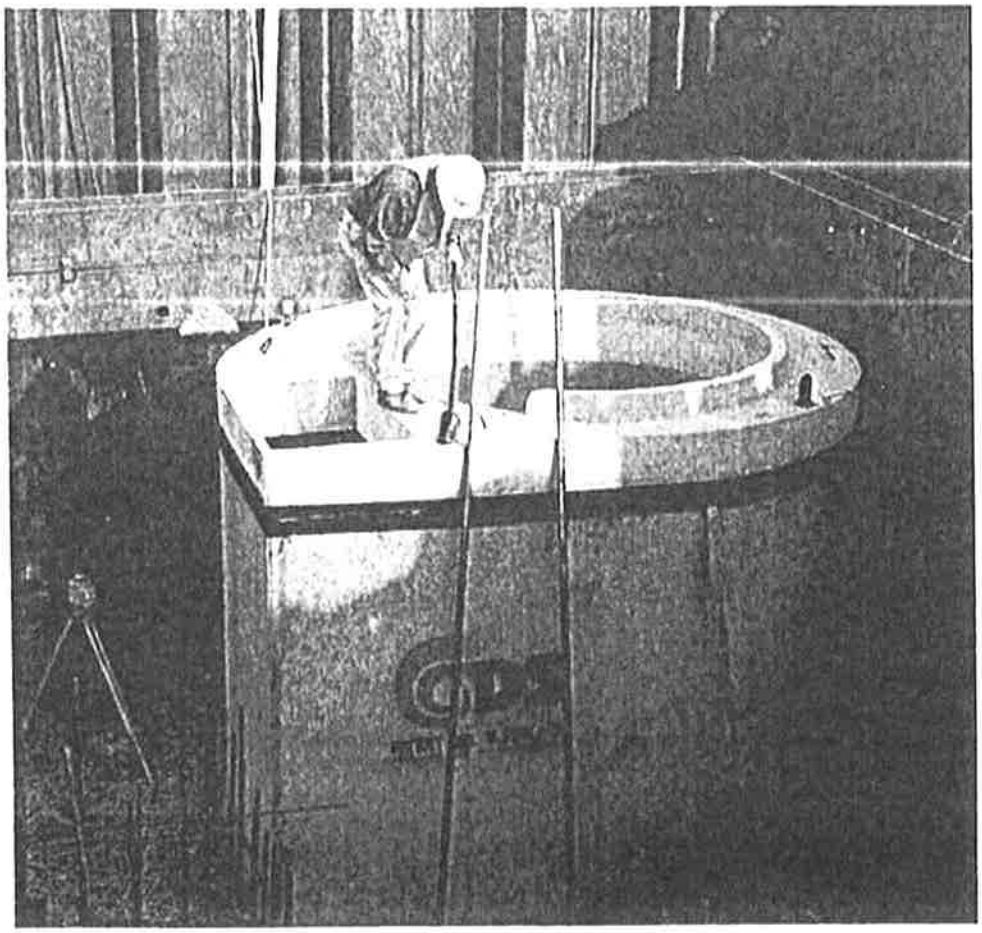
Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. Confined Space Entry procedures need to be followed. Disposal of all material removed from the CDS system should be done is accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.



| CDS Model | Diameter | | Distance from Water Surface to Top of Sediment Pile | | Sediment Storage Capacity | |
|---|---|---|---|---|---|---|
| | ft | m | ft | m | yd3 | m3 |
| CDS2015-4 | 4 | 1.2 | 3.0 | 0.9 | 0.5 | 0.4 |
| **CDS2015** | **5** | **1.5** | **3.0** | **0.9** | **1.3** | **1.0** |
| CDS2020 | 5 | 1.5 | 3.5 | 1.1 | 1.3 | 1.0 |
| **CDS2025** | **5** | **1.5** | **4.0** | **1.2** | **1.3** | **1.0** |
| CDS3020 | 6 | 1.8 | 4.0 | 1.2 | 2.1 | 1.6 |
| **CDS3030** | **6** | **1.8** | **4.6** | **1.4** | **2.1** | **1.6** |
| CDS3035 | 6 | 1.8 | 5.0 | 1.5 | 2.1 | 1.6 |
| **CDS4030** | **8** | **2.4** | **4.6** | **1.4** | **5.6** | **4.3** |
| CDS4040 | 8 | 2.4 | 5.7 | 1.7 | 5.6 | 4.3 |
| **CDS4045** | **8** | **2.4** | **6.2** | **1.9** | **5.6** | **4.3** |

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



# CDS Inspection & Maintenance Log

**CDS Model:** _____ **Location:** _____

| Date | Water depth to sediment[1] | Floatable Layer Thickness[2] | Describe Maintenance Performed | Maintenance Personnel | Comments |
|---|---|---|---|---|---|
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1 The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. **Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2 For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.


7

## Support

- Drawings and specifications are available at www.contechstormwater.com
- Site-specific design support is available from our engineers.

CONTECH CONSTRUCTION PRODUCTS INC.

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contechstormwater.com

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cds manual 10/08 3M

RECYCLED PAPER

# Appendix B
# 310 CMR 40.00 Massachusetts Contingency Plan
# Subpart C

# 310 CMR 40.0000: Massachusetts Contingency Plan
# SUBPART C: NOTIFICATION OF RELEASES AND THREATS OF RELEASE OF OIL AND HAZARDOUS MATERIAL; IDENTIFICATION AND LISTING OF OIL AND HAZARDOUS MATERIAL

This copy of the Massachusetts Contingency Plan, 310 CMR 40, is not an "Official Version" of the regulations. In particular, it lacks page numbers and the effective dates at the bottom of each page. Other unexpected differences may also be present. This HTML version is offered as a convenience to our users and DEP believes that the body of the text is a faithful copy of the regulations. If you REALLY, ABSOLUTELY, MUST know that the version you have is correct and up-to-date, then you must purchase the document through the State Bookstore (at http:/mass.gov/sec/spr/spridx.htm). The official versions of all state statutes and regulations are only available through the State Bookstore.

**40.0300: Notification of Releases and Threats of Release of Oil and Hazardous Material; Identification and Listing of Oil and Hazardous Material**

310 CMR 40.0301 through 40.0399, cited collectively as 310 CMR 40.0300, contain requirements and procedures for notifying the Department of releases and threats of release of oil and/or hazardous material.

**40.0301: Purpose and Scope**

(1) The purpose of 310 CMR 40.0300 is to identify oil and hazardous material which are subject to the provisions of this Contingency Plan, to identify those releases and threats of release of such oil and hazardous material that require notification to the Department, to set forth the time periods and procedures for notification, and to set forth provisions to allow limited removal of such oil and hazardous material under certain circumstances.

(2) Nothing in 310 CMR 40.0300 shall relieve any person described in M.G.L. c. 21E, s. 5(a)(1) through (5) from any liability which that person would otherwise possess in connection with a release or threat of release of any oil or hazardous material that is listed at 310 CMR 40.1600, identified by characteristic in 310 CMR 40.0347 or otherwise meets either the definition of oil or the definition of hazardous material, which are set forth in 310 CMR 40.0006.

(3) The Department may take response actions, seek any reimbursement or compensation to which the Commonwealth is entitled, and/or pursue enforcement actions in connection with any release or threat of release of oil and/or hazardous material, provided, however, that the Department shall not seek penalties for failure to provide notification to the Department of any release or threat of release:

(a) unless notification is required pursuant to the provisions of 310 CMR 40.0300, or

(b) for which notification is exempted pursuant to the provisions of 310 CMR 40.0317.

**40.0302: Applicability**

(1) The provisions of 310 CMR 40.0300 shall apply to all releases and threats of release of oil and/or hazardous material to the environment, except as set forth in 310 CMR 40.0302(2).

(2) The notification requirements set forth in 310 CMR 40.0300 shall only apply to:

(a) releases and threats of release that commence on or after October 1, 1993; and

(b) releases and threats of release of which knowledge is possessed or obtained on or after October 1, 1993, by any person listed at 310 CMR 40.0331.

Notwithstanding any other provision hereof, the applicable "2 Hour", "72 Hour" and "120 Day" notification time periods which arise solely as a result of 310 CMR 40.0300 shall commence no earlier than October 1, 1993.

**40.0303: Role of Licensed Site Professional**

Persons required to provide oral and/or written notification to the Department of releases and threats of release of oil and/or hazardous material to the environment pursuant to the provisions of 310 CMR 40.0300 may wish to retain the services of competent individuals, time permitting, or as circumstances require, to investigate, evaluate, and/or otherwise facilitate the fulfillment of that requirement, but shall not be obligated to use a Licensed Site Professional for that purpose.

**40.0310: Releases and Threats of Release Which Require Notification**

**40.0311: Releases Which Require Notification Within Two Hours**

Except as provided in 310 CMR 40.0317 or 310 CMR 40.0332(1) or (7), persons required to notify under 310 CMR 40.0331 shall notify the Department as soon as possible but not more than two hours after obtaining knowledge that a release meets one or more of the following sets of criteria:

(1) a sudden, continuous or intermittent release to the environment of any hazardous material that is listed at 310 CMR 40.1600 or that exhibits one or more of the characteristics described in 310 CMR 40.0347, when:

(a) the quantity of the release is equal to or greater than the applicable Reportable Quantity specified at 310 CMR 40.0352 or 40.1600; and

(b) it is likely that the release occurred within any period of 24 consecutive hours or less;

(2) a sudden, continuous or intermittent release to the environment of any hazardous material that is listed at 310 CMR 40.1600 or that exhibits one or more of the characteristics described in 310 CMR 40.0347, when:

(a) the quantity of the release is unknown;

(b) it is likely that the quantity of the release is equal to or greater than the applicable Reportable Quantity specified at 310 CMR 40.0352 or 40.1600; and

(c) it is likely that the release occurred within any period of 24 consecutive hours or less;

(3) a sudden, continuous or intermittent release to the environment of oil that is listed at 310 CMR 40.1600 when:

(a) the quantity of the release is equal to or greater than the applicable Reportable Quantity specified at 310 CMR 40.0351 or 310 CMR 40.1600; and

(b) it is likely that the release occurred within any period of 24 consecutive hours or less;

(4) a sudden, continuous or intermittent release to the environment of oil that is listed at 310 CMR 40.1600, when:

(a) the quantity of the release is unknown;

(b) it is likely that the quantity of the release is equal to or greater than the applicable Reportable Quantity specified at 40.1600; and

(c) it is likely that the release occurred within any period of 24 consecutive hours or less;

(5) a sudden, continuous or intermittent release to the environment of any quantity of oil or waste oil that is listed at 310 CMR 40.1600 that results in the appearance of a sheen on surface water;

(6) a release to the environment indicated by the measurement of oil and/or hazardous material in a private drinking water supply well at concentrations equal to or greater than a Category RCGW-1 Reportable Concentration, as described in 310 CMR 40.0360 through 40.0369 and listed at 40.1600;

(7) any release of any oil and/or hazardous material, in any quantity or concentration, that poses or could pose an Imminent Hazard, as described in 310 CMR 40.0321 and 40.0950;

(8) any release of oil and/or hazardous material described in 310 CMR 40.0311(1) through (4) or 310 CMR 40.0311(7) that is indirectly discharged to the environment by means of discharge to a stormwater drainage system;

(9) any release of oil and/or hazardous material described in 310 CMR 40.0311(7) that is indirectly discharged into the environment by means of discharge to a sanitary sewerage system.

**40.0312: Threats of Release Which Require Notification Within Two Hours**

Except as provided in 310 CMR 40.0317 or 310 CMR 40.0332(1) or (7), persons required to notify under 310 CMR 40.0331 shall notify the Department as soon as possible but not more than two hours after obtaining knowledge that a threat of release meets one or more of the following sets of criteria:

(1) a threat of release to the environment of oil and/or hazardous material that is listed at 310 CMR 40.1600 or that exhibits one or more of the characteristics described in 310 CMR 40.0347, when:

(a) it is likely that the release threatened is about to occur; and

(b) it is likely that the quantity of the release, if it occurred, would be equal to or greater than the applicable Reportable Quantity specified at 310 CMR 40.0351, 40.0352 or 40.1600; or

(2) a threat of release to the environment of oil and/or hazardous material that is listed at 310 CMR 40.1600 or that exhibits one or more of the characteristics described in 310 CMR 40.0347, which poses or could pose an Imminent Hazard, as described in 310 CMR 40.0321, irrespective of the quantity likely to be released.

**40.0313: Releases Which Require Notification Within 72 Hours**

Except as provided in 310 CMR 40.0317 or 40.0332(7), persons required to notify under 310 CMR 40.0331 shall notify the Department not more than 72 hours after obtaining knowledge that a release of oil and/or hazardous material(s) meets one or more of the following sets of criteria:

(1) a release to the environment indicated by the presence of a subsurface Non-Aqueous Phase Liquid (NAPL) having a measured thickness equal to or greater than 1/2 inch;

(2) a release to the environment indicated by the presence of oil and/or hazardous material within ten feet of the exterior wall of an underground storage tank, as established by measurement of equal to or greater than 100 parts-per-million (ppm) by volume of total organic vapors "as benzene" in the headspace of a soil or groundwater sample using a headspace screening method, and where such sample was obtained:

(a) greater than two feet below the ground surface; and

(b) as part of a closure assessment required pursuant to 527 CMR 9.00 and 40 CFR Parts 280 and 281, or in connection with the removal or closure of an underground storage tank otherwise regulated by M.G.L. c. 148 or 527 CMR 9.00;

(3) a release to the environment indicated by the measurement of oil and/or hazardous material in the groundwater at concentrations equal to or greater than a Category RCGW-1 Reportable Concentration, as described in 310 CMR 40.0360 through 40.0369 and listed at 40.1600, within:

(a) the Zone I of a public water supply well; or

(b) 500 feet of a private water supply well; or

(4) a release to the environment indicated by measurement within the groundwater of equal to or greater than five milligrams per liter of total volatile organic compounds at any point located within 30 feet of a school or occupied residential structure, where the groundwater table is less than 15 feet below the surface of the ground; or

(5) a Condition of Substantial Release Migration, where such condition is associated with a release for which notification otherwise is or has at any time in the past been required in accordance with 310 CMR 40.0300.

**40.0314: Threats of Release Which Require Notification Within 72 Hours**

Except as provided in 310 CMR 40.0317, persons required to notify under 310 CMR 40.0331 shall notify the Department not more than 72 hours after obtaining knowledge of a threat of release of oil and/or hazardous material to the environment from an Underground Storage Tank, as established by a test conducted in conformance with the methodology prescribed for that test which indicates there is a substantial likelihood of a leak equal to or greater than 0.05 gallons per hour:

(1) in a single walled Underground Storage Tank;

(2) in the inner wall of a doubleâ€'walled Underground Storage Tank; or

(3) in the outer wall of a doubleâ€'walled Underground Storage Tank.

**40.0315: Releases Which Require Notification Within 120 Days**

Except as provided in 310 CMR 40.0317 or 40.0318, persons required to notify under 310 CMR 40.0331 shall notify the Department not more than 120 days after obtaining knowledge that a release meets one or more of the following sets of criteria:

(1) a release to the environment indicated by the measurement of one or more hazardous materials in soil or groundwater in an amount equal to or greater than the applicable Reportable Concentration described in 310 CMR 40.0360 through 40.0369 and listed at 40.1600;

(2) a release to the environment indicated by the measurement of oil and/or waste oil in soil in an amount equal to or greater than the applicable Reportable Concentration described in 310 CMR 40.0360 through 40.0369 and listed at 40.1600, where the total contiguous volume of the oil and/or waste oil contaminated soil is equal to or greater than two cubic yards;

(3) a release to the environment indicated by the measurement of oil in groundwater in an amount equal to or greater than the applicable Reportable Concentration described in 310 CMR 40.0360 through 40.0369 and listed at 40.01600; or

(4) a release to the environment indicated by the presence of a subsurface Non-Aqueous Phase Liquid (NAPL) having a measured thickness equal to or greater than 1/8 inch and less than 1/2 inch.

**40.0317: Releases and Threats of Release Which Do Not Require Notification**

Notwithstanding the provisions of 310 CMR 40.0311 through 40.0315, the following releases and threats of release of oil and/or hazardous material are exempt from the notification requirements set forth in 310 CMR 40.0300:

(1) releases of oil that occur during normal handling and transfer operations at an oil facility, if the releases are completely captured by a properly functioning oil/water separator; provided, however, that releases of oil which exceed the capacity of the oil/water separator, and that releases of oil from the oil/water separator, itself, in excess of its discharge permit limits, shall be subject to the notification requirements set forth in 310 CMR 40.0300;

(2) releases or threats of release of gasoline or diesel fuel that result from the rupture of the fuel tank of a passenger vehicle as a result of an accident involving that vehicle;

(3) releases of oil and/or hazardous material that are discharged or emitted from an outfall, stack or other point source, or as fugitive emissions, any of which are regulated under and have received a valid permit, license, or approval, or which are operating under a valid registration, order or guideline issued under a federal or state statute or regulation, unless the release:

(a) exceeds the amount allowed by the permit, license, approval, registration, order or guideline; and

(b) represents an Imminent Hazard to health, safety, public welfare or the environment. This provision shall not relieve any person from any other duty to notify which may exist under any other statute or regulation, nor shall it in any way limit the authority of any other agency, political subdivision or authority of the federal or state government or of any office or division of the Department to enforce or otherwise carry out the duties assigned to it by law;

(4) releases of radionuclides regulated by EPA under 42 USC s. 9602, 33 USC s.s. 1321 and 1361, and 40 CFR Part 302 et seq.;

(5) releases of forbidden, Class A or Class B explosives, as defined in 49 CFR s.s. 173.50, 173.53 and 173.88 respectively, if the explosives are under military transport or supervision and the U.S. Army Explosive Ordnance responds to the release;

(6) releases of methane, propane, and other component compounds associated with a release of natural gas, natural gas liquids and liquified natural gas;

(7) sheens:

(a) resulting from emissions or discharges from outboard motors in recreational use; or

(b) associated with normal surface water runoff from roadways, driveways, and parking lots;

(8) releases of hazardous material indicated by residues in the environment:

(a) emanating from a point of original application of lead-based paint;

(b) resulting from emissions from the exhaust of an engine; or

(c) resulting from the application of pesticides in a manner consistent with their labelling;

(9) releases of oil and/or hazardous material related to coal, coal ash, or wood ash, excluding wood ash resulting from the combustion of lumber or wood products that have been treated with chemical preservatives;

(10) releases of oil and/or hazardous material resulting from the land application, reuse, or disposal of wastewater residuals and/or dredged spoils conducted in accordance with an approval, permit or certification issued by the Department under the authority of 310 CMR 32.00, 314 CMR 9.00, M.G.L. c. 21, s.s. 26 through 53, M.G.L. c. 111, s. 17, M.G.L. c. 83, s. 6 and 7 and c. 21A, s. 14 and any regulations promulgated thereunder;

(11) releases of oil and/or hazardous material in groundwater detected by sampling conducted by Public Water Supply owners or operators under 310 CMR 22.00 as indicated by the presence of oil and/or hazardous material in a public water supply source;

(12) releases of oil and/or hazardous material resulting or emanating from:

(a) the asphalt binder in bituminous pavement;

(b) piers, pilings and building foundation structures;

(c) landscaping timbers in use;

(d) utility poles in use; or

(e) building materials that are in good repair and still serving their original intended use;

(13) releases indicated solely by the presence of oil and/or hazardous material in soils that are treated, recycled, reused or disposed of at a facility licensed, permitted or approved by the Department, provided that:

(a) the soil has been excavated and transported from a disposal site in compliance with 310 CMR 40.0000; and

(b) the facility is operated in a manner consistent with the terms and conditions of its license, permit or approval;

(14) releases of oil and/or hazardous material that require notification solely because an RP, PRP or Other Person obtains knowledge of media concentrations and/or site conditions that meet one or more of the sets of criteria set forth in 310 CMR 40.0311 through 310 CMR 40.0315, when such media concentration value(s) and/or knowledge of site conditions resulted from a sampling, analytical or observational error, as established by a preponderance of the evidence and/or as verified by additional sampling, analyses, and/or observation, within the applicable time period for notification;

(15) releases of oil and/or hazardous material that require notification solely because an RP, PRP or Other Person obtains knowledge of soil concentrations equal to or greater than one or more applicable Reportable Concentrations, as specified in 310 CMR 40.0315, where a Limited Removal Action conducted under the provisions of 310 CMR 40.0318 has reduced soil concentrations of oil and/or hazardous material at the disposal site to an amount less than the Reportable Concentration(s), within the allowable time period for notification;

(16) releases indicated by the presence of oil and/or hazardous material in concentrations or quantities which would otherwise meet one or more of the sets of criteria set forth in 310 CMR 40.0313 through 310 CMR 40.0315 at a disposal site where:

(a) a response action is being undertaken in compliance with the provisions of 310 CMR 40.0000 to address such release;

(b) a release notification was previously provided to the Department for the disposal site on which the release has been observed or documented; and

(c) such presence of oil and/or hazardous material is consistent with the types, nature, exposure potential and quantities of oil and/or hazardous material for which that notification was provided to the Department;

(17) releases indicated by the presence of oil and/or hazardous material at disposal sites for which a determination or statement as specified in 310 CMR 40.0317(17)(a) through (e) has been provided, in concentrations that would otherwise meet one or more of the sets of criteria set forth in 310 CMR 40.0313 or 40.0315, unless the presence of such oil and/or hazardous material would negate or change such determinations or statements were that presence taken into account in the preparation thereof, or changes in activities, uses, and/or exposures at the disposal site require notification to the Department pursuant to the provisions of 310 CMR 40.0020. In this context, determinations or statements include:

(a) a disposal site where a Response Action Outcome Statement has been submitted to the Department in compliance with the provisions of 310 CMR 40.1000,

(b) a disposal site where a No Further Action Letter has been submitted to the Department in compliance with the provisions of 310 CMR 40.0600,

(c) a disposal site where the Department has made a written determination that no further actions are required,

(d) a disposal site where an LSP Evaluation Opinion has been submitted to the Department in compliance with 310 CMR 40.0600 stating either that the site is not a disposal site for which notification is required pursuant to 310 CMR 40.0300 and no further response actions are required or that completed response actions meet the requirements of a Response Action Outcome, or

(e) a disposal site where a Waiver Completion Statement has been submitted to the Department in compliance with the provisions of 310 CMR 40.537 and/or 310 CMR 40.0630.

(18) threats of release indicated by the outcome of tank tests specified in 310 CMR 40.0314, where a tank test outcome has resulted from a testing error, as documented within the allowable time period for notification by an additional test conducted on identical and unrepaired underground storage tank system elements;

(19) releases of oil and/or hazardous material to:

(a) an underground utility vault if such releases are completely contained within the vault; or

(b) the interior of a building, provided such releases are completely contained within the building;

(20) releases of chloroform in groundwater attributable to naturally-occurring ecological processes and/or leakage or discharges from a public water supply system;

(21) releases of oil or waste oil of less than a Reportable Quantity that result in a sheen on a surface water, provided that:

(a) federal officials receive notice of such release pursuant to the Federal Water Pollution Control Act as amended;

(b) a response occurs as directed by those federal officials and according to other federal, state or local requirements applicable to such a release and response;

(c) the sheen does not persist for more than 24 consecutive hours; and

(d) the sheen does not recur at the same location within any 30 day period; and

(22) arsenic, beryllium or nickel in Boston Blue Clay or arsenic in an area documented by the U.S. Geological Survey or in other scientific literature as an area of elevated arsenic measured in soil or groundwater that

(a) is consistently present in the environment at and in the vicinity of the sampling location;

(b) is solely attributable to natural geologic or ecologic conditions; and

(c) has not been mobilized or transferred to another environmental medium or increased in concentration in an environmental medium as a result of anthropogenic activities.

**40.0318: Limited Removal Actions**

(1) Limited Removal Actions may be undertaken by RPs, PRPs or Other Persons prior to notification to the Department of those "120 Day Notification" releases described in 310 CMR 40.0315.

(2) Limited Removal Actions shall not be initiated or continued:

(a) after obtaining knowledge that a release or threat of release requires notification under the "2 Hour" or "72 Hour" notification provisions of 310 CMR 40.0311 through 40.0314, whether or not notification has been made to the Department;

(b) following notification to the Department by any person listed at 310 CMR 40.0331 of any release or threat of release of oil and/or hazardous material at the disposal site which requires notification under 310 CMR 40.0315; or

(c) at any Location to Be Investigated or disposal site subject to the provisions of 310 CMR 40.0600.

(3) RPs, PRPs or Other Persons who undertake Limited Removal Actions shall conform to the Response Action Performance Standard specified in 310 CMR 40.0191.

(4) Limited Removal Actions shall be restricted to the excavation and off-site recycling, reuse, treatment, and/or disposal of not more than the following cumulative volumes of soil removed from a disposal site with measured concentrations of oil or hazardous material equal to or greater than an applicable Reportable Concentration:

(a) not more than 100 cubic yards of soil contaminated solely by a release of oil or waste oil; and

(b) not more than 20 cubic yards of soil contaminated by a release of hazardous material or a mixture of oil or waste oil and hazardous material.

(5) All excavation activities conducted by an RP, PRP or Other Person as a Limited Removal Action shall occur within 120 days of obtaining knowledge of a release described in 310 CMR 40.0315.

(6) All contaminated soil generated as a result of a Limited Removal Action shall be stockpiled, stored, characterized, transported, and recycled, reused, treated, or disposed of as set forth in 310 CMR 40.0030.

(7) Records documenting:

(a) the concentrations of oil and/or hazardous material in soil at the disposal site following a Limited Removal Action; and

(b) the chemical characterization and volume of soil removed from a disposal site as part of a Limited Removal Action, shall be maintained by the RP, PRP or Other Person undertaking the Limited Removal Action for a minimum of five years or for so long as is required under 310 CMR 40.0014, whichever is longer.

(8) Limited Removal Actions conducted in compliance with the provisions of 310 CMR 40.0318 shall not require oversight by a Licensed Site Professional, except for Limited Removal Actions that involve the use of the Bill of Lading soil management process described in 310 CMR 40.0030.

(9) In those cases where volumes of contaminated soil encountered unexpectedly exceed initial estimates and the volumetric excavation limits specified in 310 CMR 40.0318(4), persons required to notify under 310 CMR 30.0331 shall notify the Department of the release at the disposal site within the allowable time period for notification, and the person conducting the Limited Removal Action shall either:

(a) cease remedial actions; or

(b) continue removal actions at the disposal site as a Release Abatement Measure, as specified in 310 CMR 40.0443.

**40.0320: Releases and Threats of Release that Pose Imminent Hazards**

**40.0321: Reporting of Releases and Threats of Release that Pose or Could Pose an Imminent Hazard**

(1) For the purpose of fulfilling the "Two Hour" release notification obligations of 310 CMR 40.0311(7), the following releases shall be deemed to pose an Imminent Hazard to health, safety, public welfare and/or the environment:

(a) a release to the environment which results in the presence of oil and/or hazardous material vapors within buildings, structures, or underground utility conduits at a concentration equal to or greater than 10% of the Lower Explosive Limit;

(b) a release to the environment of reactive or explosive hazardous material, as described in 310 CMR 40.0347, which threatens human health or safety;

(c) a release to a roadway that endangers public safety;

(d) a release to the environment of oil and/or hazardous material which poses a significant risk to human health when present for even a short period of time, as specified in 310 CMR 40.0950;

(e) a release to the environment of oil and/or hazardous material which produces immediate or acute adverse impacts to freshwater or saltwater fish populations; or

(f) a release to the environment which produces readily apparent effects to human health, including respiratory distress or dermal irritation.

(2) For the purpose of fulfilling the "Two Hour" release notification obligations of 310 CMR 40.0311(7), the following releases could pose an Imminent Hazard to human health:

(a) a release to the environment indicated by the measurement of oil and/or hazardous material in a private drinking water supply well at a concentration equal to or greater than ten times the Category RCGW-1 Reportable Concentration, as described in 310 CMR 40.0360 through 40.0369 and listed at 310 CMR 40.1600; or

(b) a release to the environment indicated by the measurement of concentrations of hazardous material, equal to or greater than any of the following concentrations at the ground surface or within a depth of twelve inches below the ground surface, at any location within 500 feet of a residential dwelling, school, playground, recreation area or park, unless access by children is controlled or prevented by means of bituminous pavement, concrete, fence, or other physical barrier

| Hazardous Material | CAS number | Concentration (ug/g dry wt) |
|---|---|---|
| Arsenic (total) | 7440382 | 40 |
| Cadmium (total) | 7440439 | 60 |
| Chromium (VI) (or Total Chromium in the absence of CrVI data) | 18540299 | 200 |
| Cyanide (available) | 57125 | 100 |
| Mercury (total) | 7439976 | 300 |
| Methyl Mercury | 22967926 | 10 |
| PCB (total) | 1336363 | 10 |

or

(c) a release to the environment for which estimated long-term risk levels associated with current exposures are greater than ten times the Cumulative Receptor Risk Limits in 310 CMR 40.0993(6). Past exposures may be included in such evaluations to the extent that it is reasonable to quantify those exposures.

(3) For the purpose of fulfilling the notification obligations of 310 CMR 40.0312(2), threats of release which pose or could pose an Imminent Hazard to health, safety, public welfare and/or the environment shall consist of any threat of release where, if the release were to occur, it is likely that that release would meet any of the criteria described in 310 CMR 40.0321(1) or 40.0321(2).

(4) Notwithstanding the provisions of 310 CMR 40.0321(2) and 40.0321(3), a person required to notify under 310 CMR 40.0331 may demonstrate to the Department by a preponderance of the evidence that release or site conditions specified in 310 CMR 40.0321(2) and/or 40.0321(3) do not constitute an actual Imminent Hazard to human health, in conformance with the Imminent Hazard Evaluation process described in 310 CMR 40.0426, and in consideration of the site-specific factors and the risk assessment and risk management criteria contained in 310 CMR 40.0950. No such demonstration, however, shall relieve any person of the obligation to notify the Department of a release or threat of release under the provisions of 310 CMR 40.0311 or 40.0312.

(5) No provision contained in 310 CMR 40.0321 shall limit the Department's authority to determine that an Imminent Hazard exists at any site, consistent with the provisions of 310 CMR 40.0950, nor shall any such provision limit the Department's authority to undertake response actions, seek any reimbursement or compensation due to the Commonwealth, or pursue enforcement actions in accordance with any such determination.

**40.0322: Response Actions to Prevent or Abate Imminent Hazards**

(1) An Immediate Response Action, as described in 310 CMR 40.0400, shall be taken to prevent, eliminate, or abate all Imminent Hazards.

(2) Immediate Response Actions shall not be delayed or deferred at sites where continued inaction would likely result in the development of an Imminent Hazard condition.

**40.0330: Notification Requirements and Procedures**

**40.0331: Who Shall Notify**

(1) The following persons shall notify the Department in accordance with 310 CMR 40.0300 of a release or threat of release of oil or hazardous material:

(a) the owner or operator of a vessel or a site from or at which there is or has been a release or threat of release of oil and/or hazardous material;

(b) any person who at the time of storage or disposal of any hazardous material owned or operated any site at or upon which such hazardous material was stored or disposed of and from which there is or has been a release or threat of release of hazardous material;

(c) any person who by contract, agreement, or otherwise, directly or indirectly, arranged for the transport, disposal, storage or treatment of hazardous material to or in a site or vessel from or at which there is or has been a release or threat of release of hazardous material;

(d) any person who, directly or indirectly, transported any hazardous material to transport, disposal, storage or treatment vessels or sites from or at which there is or has been a release or threat of release of such material;

(e) any person who otherwise caused or is legally responsible for a release or threat of release of oil and/or hazardous material from a site or vessel;

(f) any fiduciary who holds title to or possession of a site or vessel from or at which there is or has been a release or threat of release of oil and/or hazardous material;

(g) any secured lender who holds title to or possession of a site or vessel from or at which there is or has been a release or threat of release of oil and/or hazardous material;

(h) any agency of the Commonwealth or any public utility company that owns a right of way that is a site from or at which there is or has been a release or threat of release of oil and/or hazardous material; and

(i) any person otherwise required to notify the Department of a release or threat of release pursuant to M.G.L. c. 21E.

(2) If a release to the environment has occurred or a threat of release to the environment exists at any site or vessel and there is a substantial likelihood that such release or threat of release includes or would include oil and/or hazardous material which appears at 310 CMR 40.1600 or exhibits any of the characteristics described in 310 CMR 40.0347, then any owner, operator, or fiduciary or secured lender who holds title to or possession of such site or vessel, shall determine whether such is the case, and whether any such release or threat of release requires notification to the Department under 310 CMR 40.0300.

**40.0332: Timing of Notifications**

(1) Two Hour Notifications. Notification to the Department of any release or threat of release specified in 310 CMR 40.0311 and 40.0312 shall be made as soon as possible but not more than two hours after obtaining knowledge that the release or threat of release meets one or more of the sets of notification criteria, unless the person responsible for notifying establishes, by a preponderance of the evidence, that extenuating circumstances prevented notification within said two hour time period. In that event, notification to the Department shall be made as soon as possible thereafter, taking into account the extenuating circumstances. Extenuating circumstances shall include, without limitation, the following:

(a) a lack of reasonably available communication equipment at the site of the release or threat of release;

(b) a need to take actions prior to notification in order to mitigate or prevent an Imminent Hazard and/or threat to public safety; and/or

(c) a physical injury to the person responsible for notifying caused by or associated with the release or threat of release, when the injury reasonably prevents that person from notifying.

(2) 72 Hour Notifications. Notification to the Department of any release or threat of release specified in 310 CMR 40.0313 and 40.0314 shall be made not more than 72 hours after obtaining knowledge that the release or threat of release meets one or more of the sets of notification criteria.

(3) 120 Day Notifications. Notification to the Department of any release specified in 310 CMR 40.0315 shall be made not more than 120 days after obtaining knowledge that the release meets one or more of the sets of notification criteria, and prior to the commencement of any remedial actions at the site, with the exception of Limited Removal Actions, as set forth in 310 CMR 40.0318.

(4) If a release or threat of release is subject to more than one notification time period, the shorter time period shall apply.

(5) No provision of 310 CMR 40.0332 shall be construed to prevent a person responsible for notifying from implementing a response action necessary to mitigate or prevent an Imminent Hazard.

(6) No provision of 310 CMR 40.0332 shall be construed to allow an unreasonable delay in notification of the Department after obtaining knowledge of a release or threat of release that meets one or more of the sets of notification criteria specified in 310 CMR 40.0311 or 40.0312.

(7) The notification timelines specified in 310 CMR 40.0332 shall commence at the time that the person required to notify obtains knowledge, or at the time that a person who has knowledge obtains the status of a person required to notify, whichever is later.

**40.0333: How to Notify**

(1) Two Hour and Seventy-Two Hour Notifications. Persons described in 310 CMR 40.0331(l) shall:

(a) notify the Department of a release or threat of release specified in 310 CMR 40.0311 through 40.0314, by calling a telephone number published by the Department and designated for that purpose and orally providing to the Department the information specified in 310 CMR 40.0334; and

(b) within 60 days thereafter, submit a completed Release Notification Form, as described in 310 CMR 40.0371, to the Department office located in the DEP region in which the release or threat of release occurred. Where appropriate, the Release Notification Form may be accompanied by a Response Action Outcome Statement, as described in 310 CMR 40.1000.

(2) 120 Day Notifications. Persons described in 310 CMR 40.0331(1) shall notify the Department of a release specified in 310 CMR 40.0315 by submitting a completed Release Notification Form, as described in 310 CMR 40.0371, to the Department office located in the DEP region in which the release occurred. Where appropriate, the Release Notification Form may be accompanied by a Response Action Outcome Statement, as described in 310 CMR 40.1000.

**40.0334: Content of the Notification**

Oral notification to the Department pursuant to 310 CMR 40.0333(1)(a) shall consist of the following information to the extent known to the person responsible for providing the notification:

(a) the name and telephone number of the caller;

(b) the location of the release or threat of release, including, where applicable:

1. the address [street name and number, city or town, and zip code]; and

2. a narrative description of the location (e.g., location aid such as mile marker, business type/name);

(c) the date and time the release occurred;

(d) the set(s) of notification criteria that is the basis for notification;

(e) the name of the oil and/or hazardous material(s) released or of which there is a threat of release;

(f) the approximate quantity of the oil and/or hazardous material(s) which has been released or of which there is a threat of release;

(g) the source of the release or threat of release;

(h) a brief description of the release or threat of release;

(i) the name and telephone number of the owner/operator of the site or vessel where the release has occurred or at which there is a threat of release;

(j) the name and telephone number of a contact person at the site or vessel where the release has occurred or at which there is a threat of release;

(k) a description of Immediate Response Actions taken or proposed to be taken in response to the release or threat of release, as specified in 310 CMR 40.0420;

(l) the names of other federal, state or local government agencies that have been notified of and/or have responded to the release or threat of release; and

(m) any other information, including without limitation, potential environmental impacts, that is relevant to assessing the degree of hazard posed by the release or threat of release.

**40.0335: Retracting a Notification**

(1) A notification of a release or threat of release of oil and/or hazardous material made by a person described in 310 CMR 40.0331(1) may be retracted in those cases where additional information obtained subsequent to such notification substantiates that:

(a) in the case of a reported release, no release actually occurred;

(b) in the case of a reported threat of release, conditions posing a threat of release did not actually exist; or

(c) the subject release or threat of release did not meet one or more of the sets of notification criteria specified in 310 CMR 40.0300. Retractions of this nature shall only be made by the person described at 310 CMR 40.0331(1) who originally provided notification to the Department of such release or threat of release, or, in cases where notification was made on behalf of a corporate entity, by another authorized employee or agent of that corporation.

(2) All retractions pursuant to 310 CMR 40.0335 shall be in writing and shall include, at a minimum, the following:

(a) the address of the location at which the release or threat of release was initially reported;

(b) the Release Tracking Number assigned by the Department for the reported release or threat of release;

(c) an explanation of the events and site conditions that resulted in the original notification;

(d) a summation of facts, data, and/or other relevant information that demonstrates that the release did not actually occur or the conditions posing the threat of release did not actually exist, or that the release or threat of release did not meet one or more sets or reporting criteria; and

(e) the signature of the person retracting the notification, attesting to the accuracy and completeness of the information contained in the retraction submittal, as specified at 310 CMR 40.0009.

(3) Except as provided in 310 CMR 40.0335(7), all retractions pursuant to 310 CMR 40.0335 must be received by the Department no later than 60 days after the person providing the retraction first notified the Department of the subject release or threat of release.

(4) All retractions pursuant to 310 CMR 40.0335 shall be submitted to the Department using a transmittal form established by the Department for such purposes.

(5) Submission of a notification retraction in conformance with the provisions of 310 CMR 40.0335 shall terminate all future response action requirements and submittals that would otherwise be necessitated by the reporting of said release or threat of release, unless written notice to the contrary is provided by the Department within 21 days of the Department's receipt of such retraction.

(6) Nothing in 310 CMR 40.0335 shall limit the Department's authority to initiate, oversee, or order the performance of any response action deemed necessary by the Department to protect health, safety, public welfare, or the environment.

(7) The deadline for retracting notifications established by 310 CMR 40.0335(3) shall be extended to the date that is 90 days after the effective date of the first revision to the definition of the term "Potentially Productive Aquifer" in 310 CMR 40.0006 and to 310 CMR 40.0932(5)(b) promulgated after December 15, 1995, provided that the following conditions are met:

(a) the groundwater at such disposal site at the time of notification is defined as Category RCGW-1 solely pursuant to 310 CMR 40.0362(1)(a)3. (i.e., such groundwater is defined as RCGW-1 solely because the groundwater is within a Potentially Productive Aquifer); and/or

(b) the soil is defined as Category RCS-1 solely pursuant to 310 CMR 40.0361(1)(a)2. (i.e., the soil is defined as RCS-1 solely due to its location above groundwater that meets the requirements of 310 CMR 40.0362(1)(a), and such groundwater is defined as Category RCGW-1 solely pursuant to the requirements of 310 CMR 40.0362(1)(a)3.).

**40.0336: Notification Requirements for Persons that Receive a Notice of Responsibility**

(1) Except as provided in 310 CMR 40.0336(2), persons who have not previously notified the Department of a release or threat of release in accordance with 310 CMR 40.0300, and who receive a Notice of Responsibility from the Department requiring submittal of a Release Notification Form for a release or threat of release, shall submit such Release Notification Form to the appropriate Department Regional Office within 60 days of receipt of such Notice of Responsibility.

(2) Persons who received a Notice of Responsibility pursuant to 310 CMR 40.0336(1) who believe:

(a) they are not a person described at 310 CMR 40.0331(1);

(b) a release of oil or hazardous material did not actually occur;

(c) conditions posing a threat or release did not actually exist; or

(d) a release or threat of release which did occur did not meet one or more sets of notification criteria set forth in 310 CMR 40.0300, shall submit notice of the same to the Department within 60 days of receipt of such Notice of Responsibility.

**40.0340: Identification Of Oil and Hazardous Material**

**40.0341: Purpose and Scope**

310 CMR 40.0340 through 40.0347, cited collectively as 40.0340:

(1) identify and otherwise describe those oils and hazardous materials which are subject to 310 CMR 40.0000;

(2) set forth the criteria used by the Department to list certain oils and hazardous materials at 310 CMR 40.1600 and to identify the characteristics of unlisted hazardous materials as set forth in 310 CMR 40.0347; and

(3) set forth the procedures for adding and deleting oil or hazardous material to or from 310 CMR 40.1600.

**40.0342: Methods of Identification of Oil and Hazardous Material**

(1) The Department employs three methods to identify or otherwise describe those oils and hazardous materials which are subject to M.G.L. c. 21E and 310 CMR 40.0000. These methods are:

(a) identification of those substances which meet the definitions of oil or hazardous material set forth in 310 CMR 40.0006;

(b) listing of specific oils and hazardous materials; and

(c) identification of the characteristics of a material which make it hazardous.

(2) Accordingly, a substance is an oil or hazardous material if:

(a) the substance meets any of the definitions of oil or hazardous material set forth in 310 CMR 40.0006;

(b) the substance is listed at 310 CMR 40.1600; or

(c) the substance exhibits any of the characteristics of a hazardous material identified in 310 CMR 40.0347(1) through (5).

**40.0343: Criteria for Listing Oil and Hazardous Material**

In determining whether to list a substance as an oil or hazardous material, the Department shall consider whether or not the substance meets the statutory definition of oil or hazardous material. This determination by the Department shall include, but not be limited to, a consideration of the following factors:

(1) whether or not other state or federal agencies with expertise in the regulation and management of such substances have identified or characterized that substance as hazardous to health, safety, public welfare, or to the environment;

(2) the extent to which the substance exhibits the characteristics of acute toxicity, chronic toxicity, carcinogenicity, mutagenicity, ignitability, corrosivity, reactivity, infectivity or radioactivity; and

(3) any substantial and relevant scientific data submitted by any person in support of adding any substance to or deleting any substance from 310 CMR 40.1600.

**40.0344: Adding and Deleting Substances to or from the Massachusetts Oil and Hazardous Material List**

(1) The Department shall review the Massachusetts Oil and Hazardous Material List, which appears at 310 CMR 40.1600, at least once every five years for the purposes of adding or deleting oil and/or hazardous material.

(2) Substances may be added to or deleted from 310 CMR 40.1600 at any time in accordance with the following procedures:

(a) The Department may, in accordance with the procedures set forth in M.G.L. c. 30A and other applicable laws for adopting, amending or repealing regulations:

1. add substances to 310 CMR 40.1600 that meet any of the criteria set forth in 310 CMR 40.0343; or

2. delete substances from 310 CMR 40.1600 that do not meet the criteria set forth in 310 CMR 40.0343.

(b) Any person may petition the Commissioner to add a substance to or delete a substance from 310 CMR 40.1600. Any such petition shall include scientific evidence that a material does or does not meet the criteria set forth in 310 CMR 40.0343.

(3) Any substance that is added to or deleted from either the CERCLA List of Hazardous Substances set out at 40 CFR Part 302.4 or the List of Extremely Hazardous Substances set out at 40 CFR Part 355, Appendix A after the date of promulgation of 310 CMR 40.0300 shall be evaluated by the Department pursuant to the criteria set forth in 310 CMR 40.0343 to determine if that substance should be added to or deleted from 310 CMR 40.1600.

**40.0345: The Massachusetts Oil and Hazardous Material List**

The oils and hazardous materials listed at 310 CMR 40.1600 are subject to the requirements of 310 CMR 40.0000 unless specifically excluded from regulation thereunder. The Reportable Quantities and Reportable Concentrations which appear beside listed oils and hazardous materials represent those levels which, upon their release or threat of release, invoke the notification requirements of 310 CMR 40.0300.

**40.0346: Criteria for Determining the Characteristics of Hazardous Material**

In determining whether a substance should be identified as a hazardous material by characteristic, the Department shall first determine that the characteristic can be either:

(1) measured by an available standardized test method that is within the capability of independent laboratories that are available to the public; or

(2) reasonably detected by persons handling hazardous material through their knowledge of those materials.

**40.0347: Characteristics of Hazardous Material**

310 CMR 40.0347 describes the characteristics of materials that are hazardous materials but that may not be listed at 310 CMR 40.1600. Any material that exhibits one or more of the following characteristics is subject to 310 CMR 40.0000, unless it is specifically excluded from regulation thereunder.

(1) Ignitability:

(a) A substance is a hazardous material if a representative sample exhibits any of the following properties:

1. it is a liquid and has a flash point of less than 60Â° C [approximately 140Â° F]. However, an aqueous solution of ethyl alcohol which contains less than 24% alcohol by volume is not considered ignitable under 310 CMR 40.0000;

2. it is not a liquid and is capable under standard temperature and pressure of catching fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard;

3. it is a compressed gas and ignitable; or

4. it is an oxidizer;

(b) The flash point of liquids shall be determined by any of the following methods:

1. a Penskyâ€'Martens Closed Cup Tester, using the test method specified in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods";

2. a Setaflash Closed Cup Tester, using the test method specified in 310 CMR 30.152(1)(a); or

3. an equivalent test method approved by the Department;

(c) Compressed gas shall be characterized as ignitable if any of the following occurs when the gas is subjected to any of the following tests:

1. either a mixture of 13% or less (by volume) with air forms a flammable mixture or the flammable range is wider than 12% regardless of the lower limit. These limits shall be determined at atmospheric temperature and pressure using sampling methods and test procedures acceptable to the U.S. Bureau of Explosives;

2. using the Flame Projection Apparatus of the U.S. Bureau of Explosives, the flame projects more than 18 inches beyond the ignition source with the valve opened fully, or the flame flashes back and burns at the valve with any degree of valve opening;

3. using the Open Drum Apparatus of the U.S. Bureau of Explosives, there is any significant propagation of flame away from the ignition source; or

4. using the Closed Drum Apparatus of the U.S. Bureau of Explosives, there is any explosion of the vaporâ€'air mixture in the drum.

(2) Corrosivity:

(a) A material is a hazardous material if a representative sample exhibits any of the following properties:

1. it is aqueous and has a pH equal to or less than 2.0 or equal to or greater than 12.5;

2. it is a liquid and corrodes steel (Type SAE 1020) at a rate greater than 6.35 mm per year at a test temperature of 55Â° C; or

3. it is a liquid or solid that causes visible destruction or irreversible alterations in mammalian skin tissue at the site of contact.

(b) pH shall be determined by a pH meter using either method 5.2 in the "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" or by an equivalent test method approved by the Department.

(c) The rate of corrosion of steel shall be determined by the test method specified by the National Association of Corrosion Engineers, standard TMâ€'01â€'60, as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" or by an equivalent test method approved by the Administrator of EPA or by the Department.

(3) Reactivity. A material is a hazardous material if a representative sample exhibits any of the following properties:

(a) it is normally unstable and readily undergoes violent changes without detonating;

(b) it reacts violently with water;

(c) it forms potentially explosive mixtures with water;

(d) when mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to health, safety, public welfare, or the environment;

(e) it is a cyanide or sulfideâ€'bearing material which, when exposed to a pH of between 2.0 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to health, safety, public welfare, or the environment;

(f) it is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement;

(g) it is readily capable of detonation or explosive decomposition or reaction at a standard temperature and pressure; or

(h) it is a forbidden explosive, a Class A or Class B explosive, as defined in 49 CFR s.s. 173.50, 173.53 and 173.88, respectively.

(4) Toxicity. A material is a hazardous material if it exhibits the characteristic of toxicity described at 310 CMR 30.125B, unless specifically excluded.

(5) Infectious Material. Infectious materials are those materials, that, because of their infectious characteristics may:

(a) cause, or significantly contribute to an increase in mortality or an increase in serious irreversible or incapacitating reversible illness; or

(b) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. Infectious materials include but are not limited to those infectious wastes described in 105 CMR 130.360. Infectious materials are hazardous materials subject to 310 CMR 40.0000, unless specifically excluded from regulation thereunder.

**40.0350: Reportable Quantities For Oil and Hazardous Material**

(1) The Reportable Quantities for the following substances are established in 310 CMR 40.0351 and 40.0352:

(a) oils and hazardous materials that are listed at 310 CMR 40.1600; and (b) hazardous materials that exhibit one or more of the characteristics set forth in 310 CMR 40.0347(1) through (5).

(2) All releases into the environment of the same oil or hazardous material from a single facility in a 24 hour period shall be aggregated to determine if a Reportable Quantity for the respective oil or hazardous material has been reached or exceeded.

**40.0351: Reportable Quantities for Oil**

Reportable Quantities for oils appear at 310 CMR 40.1600.

**40.0352: Reportable Quantities for Hazardous Material**

(1) Listed Hazardous Material:

(a) Reportable Quantities for listed hazardous material appear at 310 CMR 40.1600; and

(b) the applicable Reportable Quantity for a hazardous material that is listed at 310 CMR 40.1600 and that also exhibits one or more of the characteristics described at 310 CMR 40.0347(1) through (5) shall be the Reportable Quantity listed at 310 CMR 40.1600 for that particular hazardous material.

(2) Unlisted Hazardous Materials Identified by Characteristic. The Reportable Quantity for hazardous materials that are not listed at 310 CMR 40.1600 but that exhibit one or more of the characteristics of ignitability, corrosivity or reactivity described at 310 CMR 40.0347(1) through 40.0347(3) or that are infectious materials as described in 310 CMR 40.0347(5) is ten pounds.

(3) Unlisted Hazardous Materials which are Hazardous Material Because They Exhibit the Characteristic of Toxicity:

(a) The Reportable Quantity for unlisted hazardous materials that exhibit the characteristic of toxicity under the provisions of 310 CMR 30.125B shall be the Reportable Quantity listed at 310 CMR 40.1600 for the hazardous material on which the characteristic of toxicity is based. The Reportable Quantity applies to the entire amount of the unlisted hazardous material and not merely to the listed component hazardous material. If an unlisted hazardous material exhibits the characteristic of toxicity on the basis of more than one of its component hazardous materials, the Reportable Quantity for the entire amount of the unlisted hazardous material shall be the Reportable Quantity for that component hazardous material which has the lowest Reportable Quantity in 310 CMR 40.1600.

(b) If an unlisted hazardous material exhibits the characteristic of toxicity, as described in 310 CMR 30.125B, and one or more of the other characteristics described in 310 CMR 40.0347(1) through (3), or in 310 CMR 40.0347(5), the Reportable Quantity for the entire amount of the unlisted hazardous material shall be the lowest of the applicable Reportable Quantities.

(4) Mixtures or solutions:

(a) When a mixture or solution contains one or more component materials that are hazardous materials which appear at 310 CMR 40.1600 or that exhibit one or more of the characteristics of ignitability, corrosivity, or reactivity described at 310 40.0347(1) through (3), releases or threats of release to the environment of the mixture shall be reported to the Department under 310 CMR 40.0311 through 40.0312, when any of the following conditions exist:

1. the concentrations of the component hazardous materials are known and the quantity of any of the component hazardous materials released or threatening to be released is equal to or greater than the Reportable Quantities for those component hazardous materials;

2. the mixture or solution contains at least two component hazardous materials, the concentrations of the component hazardous materials are known and the quantity of any of the component hazardous materials released or threatened to be released does not exceed their respective Reportable Quantity but the total quantity of the hazardous material in the mixture or solution released or threatened to be released is equal to or greater than 50 pounds; or

3. the concentrations of the component hazardous materials are not known, and the total quantity of the mixture or solution released or threatened to be released is equal to or greater than the Reportable Quantity for that component hazardous material which has the lowest Reportable Quantity in 310 CMR 40.1600.

(b) The Reportable Quantity for mixtures which are hazardous material because they exhibit the characteristic of toxicity, as described in 310 CMR 30.125B, shall be determined according to 310 CMR 40.0352(3).

(c) The Reportable Quantity provisions of 310 CMR 40.0352(4) do not apply to soils, sediments, residuals, surface waters and groundwaters that are being managed otherwise in compliance with all federal, state and local laws, regulations, and ordinances.

(5) Materials Containing Polychlorinated Biphenyls:

(a) Releases or threats of release to the environment of materials that contain polychlorinated biphenyls shall be reported to the Department pursuant to 310 CMR 40.0300, if:

1. the concentration of polychlorinated biphenyls in a material is either unknown or known to be less than 500 ppm, and the release or threat of release of such material is equal to or greater than ten gallons; or

2. the concentration of polychlorinated biphenyls in a material is known or likely to be equal to or greater than 500 ppm, and the release or threat of release of such material is equal to or greater than one gallon.

(b) The Reportable Quantity provisions of 310 CMR 40.0352(5) do not apply to soils, sediments, residuals, surface waters and groundwaters that are being managed otherwise in compliance with all federal, state and local laws, regulations, and ordinances.

**40.0360: Reportable Concentrations for Oil and Hazardous Material**

(1) A release indicated by the measurement of oil and/or hazardous material in soil and/or groundwater requires notification to the Department under the provisions of 310 CMR 40.0315 if the measured concentration of one or more listed substance in 310 CMR 40.1600 in any soil or groundwater sample is equal to or greater than the media and category-specific Reportable Concentration value listed at 310 CMR 40.1600 in effect on the date of the sample analysis.

(2) Except for gasoline, kerosene, and aviation fuel, the Reportable Concentration for the oils listed at 310 CMR 40.1600 shall be the Reportable Concentration established in 310 CMR 40.1600 for Total Petroleum Hydrocarbons (TPH) or the Reportable

Concentrations established in 310 CMR 40.1600 for the Aliphatic Hydrocarbon Fractions and/or Aromatic Hydrocarbon Fractions which comprise these products. Notification shall not be required for sites solely on the basis of a measurement of TPH equal to or greater than an applicable Reportable Concentration if data exists demonstrating that concentrations of the Aliphatic and Aromatic Hydrocarbon Fractions comprising the TPH are less than the applicable Reportable Concentrations established in 310 CMR 40.1600.

(3) The Reportable Concentration for gasoline, kerosene, and aviation fuel shall be the Reportable Concentrations established in 310 CMR 40.1600 for the Aliphatic and Aromatic Hydrocarbon Fractions which comprise these products.

(4) The Reportable Concentration for Chromium shall be the Reportable Concentration established in 310 CMR 40.1600 for Chromium or the Reportable Concentrations established in 310 CMR 40.1600 for the specific species of chromium. Notification shall not be required for sites solely on the basis of a measurement of Total (unspeciated) Chromium equal to or greater than the Reportable Concentration for Chromium if data exists demonstrating that the concentrations of Hexavalent Chromium (Cr VI) and Trivalent Chromium (Cr III) are both less than the applicable Reportable Concentrations established in 310 CMR 40.1600.

(5) The Reportable Concentration values for the hazardous materials listed at 310 CMR 40.1600, including hazardous materials that may be components of oil or waste oil, shall be compared to concentrations of hazardous material in soil or groundwater that have been measured by the analytical procedures detailed in EPA Publication SW-846, "Test Methods for Evaluating Solid Waste", or any other appropriate analytical procedure, as described in 310 CMR 40.0017, and where there is greater than a 95% probability that the reported analyte is present at or above the Reportable Concentration.

(6) The techniques utilized for obtaining soil and groundwater samples for comparison to the Reportable Concentration values listed at 310 CMR 40.1600 shall be in conformance with generally accepted practices and procedures, consistent with the Response Action Performance Standard described in 310 CMR 40.0191, and shall not involve measures or steps that are undertaken to cause or promote the dilution of analyte values for the sole purpose of avoiding reporting obligations imposed in 310 CMR 40.0315.

(7) Persons notifying the Department of a release under the provisions of 310 CMR 40.0315 and 40.0360 through 40.0369 shall specify whether the measured concentration of one or more of the listed substances in 310 CMR 40.1600 constitutes a release of oil, hazardous material, or both oil and hazardous material. Such a determination shall be based upon:

(a) factual evidence relating to the source and mechanism of the release;

(b) factual evidence relating to the storage, use and disposal of oil and hazardous material at the site of the release; and/or

(c) analytical characterization of the release.

**40.0361: Reportable Concentrations of Oil and Hazardous Material in Soil**

(1) For the purpose of determining whether a notification obligation exists under 310 CMR 40.0315, measured concentrations of any oil or hazardous material listed at 310 CMR 40.1600 shall be compared to the Reportable Concentration value in the reporting category that best characterizes the current use of the site under evaluation, as described below:

(a) Reporting Category RCS-1. Reporting category RCS-1 shall be applied to all soil samples obtained:

1. at or within 500 feet of a residential dwelling, a residentially-zoned property, school, playground, recreational area or park; or

2. within the geographic boundaries of a groundwater resource area categorized as RCGW-1 in 310 CMR 40.0362(1)(a).

(b) Reporting Category RCS-2. Reporting category RCS-2 shall be applied to all soil samples that are not obtained from category RCS-1 areas.

(2) Reporting category RCS-1 shall be selected whenever and wherever reasonable doubts exist over the selection of the appropriate soil Reportable Concentration category.

**40.0362: Reportable Concentrations of Oil and Hazardous Material in Groundwater**

(1) For the purpose of determining whether a notification obligation exists under 310 CMR 40.0315, measured dissolved concentrations of any oil or hazardous material listed at 310 CMR 40.1600 shall be compared to the Reportable Concentration value in the reporting category that best characterizes the site under evaluation, as described below:

(a) Reporting Category RCGW-1. Reporting category RCGW-1 shall be applied to all groundwater samples obtained:

1. within a Current Drinking Water Source Area; or

2. within a Potential Drinking Water Source Area.

(b) Reporting Category RCGW-2. Reporting category RCGW-2 shall be applied to all groundwater samples that are not obtained from category RCGW-1 areas.

(2) Reporting category RCGW-1 shall be selected whenever and wherever reasonable doubts exist over the selection of the appropriate groundwater Reportable Concentration category.

**40.0370: Requirements for Releases of Oil and/or Hazardous Material That Do Not Require Notification**

(1) Response actions shall be undertaken for releases or threats of release of oil and/or hazardous material that do not require notification under 310 CMR 40.0300 if the releases or threats of release pose a significant risk to health, safety, public welfare, or the environment, as described in 310 CMR 40.0900.

(2) Persons undertaking response actions for releases or threats of release of oil and/or hazardous material that do not require notification under 310 CMR 40.0300, unless otherwise notified by the Department, are not subject to the submittal requirements, approvals, or fees specified in 310 CMR 40.0000. All such response actions shall conform to all applicable federal, state or local laws, regulations, or ordinances.

**40.0371: Release Notification Form**

(1) Written notification of releases and threats of release required under 310 CMR 40.0333 shall be submitted to the Department on a form established by the Department for such purposes and shall include, without limitation, the following:

(a) the location and address where the release or threat of release occurred;

1. the street number, city or town, and zip code, where applicable; and

2. the Universal Transverse Mercator coordinates (Northing and Easting in meters using North American Datum 83);

(b) the time and date when the release or threat of release occurred;

(c) the time(s) and date(s) when the person(s) required to provide the notification to the Department pursuant to 310 CMR 40.0331 obtained knowledge that the release or threat of release met one or more sets of notification criteria established in 310 CMR 40.0311 through 40.0315;

(d) the time(s) and date(s) when oral notification of the release or threat of release was made to the Department, if applicable;

(e) the set(s) of notification criteria met, as specified at 310 CMR 40.0311 through 40.0315;

(f) the names and amounts of oil and/or hazardous material released or threatened to be released;

(g) the names and mailing addresses of the owners of all properties impacted by the release or threat of release;

(h) the name(s) and address(es) of the person(s) providing the notification of the release or threat of release;

(i) the affiliation of the person(s) making the notification to the site of the release or threat of release, as described in 310 CMR 40.0331;

(j) a signed and dated certification statement from the person(s) reporting the release or threat of release attesting to the truth and accuracy of the information provided, as specified at 310 CMR 40.0009; and

(k) such other information as the Department may from time to time determine is necessary and useful in the fulfillment of its statutory obligations under M.G.L. c. 21E and 310 CMR 40.0300.

(2) Persons required to notify of releases or threats of release to the Department under 310 CMR 40.0300 shall make reasonable efforts to obtain and preserve the information required in the Release Notification Form described in 310 CMR 40.0371(1), in order to furnish same to the Department.

(3) Persons providing notification of a release(s) or threat(s) of release(s) shall also provide a copy of the Release Notification Form to the Chief Municipal Officer and the Board of Health in accordance with 310 CMR 40.1403(3)(h).

# APPENDIX B

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Consulting Engineers and Scientists

# TEST PIT LOG

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project #: 111.01095 |
| **TEST PIT IDENTIFICATION**: TP-101 | |
| Location: Winchester, MA | Ground Elevation: NA |
| Client: Gershman Brown Crowley, Inc. | Datum: NA |
| Contractor: Cyn Environmental | Operator: Steve |
| Equipment: Backhoe | Samples Collected __√__Yes __No |
| Capacity/Reach: | Time Started: Time Completed: |
| Weather: Sun, 80° F | |
| Logged by: J. Johonnett | Date: 8/8/12 |
| Checked by: DRB | Date: 8/29/12 |

**TEST PIT INFORMATION**

| Depth of Stratum Change Feet | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-2" | | | Asphalt pavement. |
| 2"-4" | | | Gray-brown, medium to coarse SAND, some Gravel, moist. |
| 4" -1' | | | Brown, fine to coarse SAND, little gravel, moist (10YR 4/3 Loamy Sand). |
| 1"-1'2" | | | Light brown, coarse SAND, moist (2.5Y 6/3 Sand). |
| 1'2"-1'9" | | | Brown-orange, fine to medium SAND, trace gravel, moist (7.5YR 4/6 Sandy Loam). |
| 1'9"-2'9" | | | Brown, fine to medium SAND, trace gravel, moist (2.5Y 5/3 Loamy Sand). FILL |
| 2'9"-7'2" | | | Gray, fine to coarse SAND, little gravel, cobbles, moist (2.5Y 4/4 Loamy Sand). GLACIAL TILL<br>Ended test pit at 7'2" bgs; large cobbles, difficult excavating. |
| | | | |

| | |
|---|---|
| Pit Dimensions (Ft.)<br>Length:<br>Width:<br>Depth: 7'2" | Remarks:<br>1. Test pit backfilled with native material. |

RANSOM Consulting, Inc.

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# TEST PIT LOG

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project #: 111.01095 |
| **TEST PIT IDENTIFICATION**: TP-102 | |
| Location: Winchester, MA | Ground Elevation: NA |
| Client: Gershman Brown Crowley, Inc. | Datum: NA |
| Contractor: Cyn Environmental | Operator: Steve |
| Equipment: Backhoe | Samples Collected _√Yes __No |
| Capacity/Reach: | Time Started: Time Completed: |
| Weather: Sun, 80° F | |
| Logged by: J. Johonnett | Date: 8/8/12 |
| Checked by: DRB | Date: 8/29/12 |

**TEST PIT INFORMATION**

| Depth of Stratum Change Feet | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-2" | | | Asphalt. |
| 2"-6" | | | Gray, gravelly SAND, some Gravel, medium to coarse Sand, moist. |
| 6" -2.8' | S1-Grab | | Brown, fine to coarse SAND, some Silt, trace gravel, trace clay, brick fragments, moist (7.5YR 2.5/1 Sandy Loam). |
| 2'8"-3'11" | S2-Grab | | Brown, fine to coarse SAND, some Silt, little gravel, moist (7.5YR 4/4 Sandy Loam). FILL |
| 3'11"-9'3" | S3-Grab | | Gray, fine to coarse SAND, little gravel, cobbles approximately 2"-10" diameter, little silt, trace clay, moist (2.5Y 5/2 Loamy Sand). GLACIAL TILL |
| | | | Bottom of test pit 9'3" bgs. |

| | |
|---|---|
| Pit Dimensions (Ft.)<br>Length:<br>Width:<br>Depth: 9'3" | Remarks:<br>1. Test pit backfilled with native material.<br>2. Grab samples submitted for laboratory analysis. |

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# TEST PIT LOG

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project #: 111.01095 |
| **TEST PIT IDENTIFICATION**: TP-101 | |
| Location: Winchester, MA | Ground Elevation: NA |
| Client: Gershman Brown Crowley, Inc. | Datum: NA |
| Contractor: Cyn Environmental | Operator: Steve |
| Equipment: Backhoe | Samples Collected _√_Yes __No |
| Capacity/Reach: | Time Started: Time Completed: |
| Weather: Sun, 80° F | |
| Logged by: J. Johonnett | Date: 8/8/12 |
| Checked by: DRB | Date: 8/29/12 |

**TEST PIT INFORMATION**

| Depth of Stratum Change Feet | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-2" | | | Asphalt pavement. |
| 2"-4" | | | Gray-brown, medium to coarse SAND, some Gravel, moist. |
| 4" -1' | | | Brown, fine to coarse SAND, little gravel, moist (10YR 4/3 Loamy Sand). |
| 1"-1'2" | | | Light brown, coarse SAND, moist (2.5Y 6/3 Sand). |
| 1'2"-1'9" | | | Brown-orange, fine to medium SAND, trace gravel, moist (7.5YR 4/6 Sandy Loam). |
| 1'9"-2'9" | | | Brown, fine to medium SAND, trace gravel, moist (2.5Y 5/3 Loamy Sand). FILL |
| 2'9"-7'2" | | | Gray, fine to coarse SAND, little gravel, cobbles, moist (2.5Y 4/4 Loamy Sand). GLACIAL TILL<br>Ended test pit at 7'2" bgs; large cobbles, difficult excavating. |
| | | | |

| | |
|---|---|
| Pit Dimensions (Ft.)<br>Length:<br>Width:<br>Depth: 7'2" | Remarks:<br>1. Test pit backfilled with native material. |

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# TEST PIT LOG

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project #: 111.01095 |
| **TEST PIT IDENTIFICATION**: TP-102 | |
| Location: Winchester, MA | Ground Elevation: NA |
| Client: Gershman Brown Crowley, Inc. | Datum: NA |
| Contractor: Cyn Environmental | Operator: Steve |
| Equipment: Backhoe | Samples Collected __√Yes __No |
| Capacity/Reach: | Time Started: Time Completed: |
| Weather: Sun, 80° F | |
| Logged by: J. Johonnett | Date: 8/8/12 |
| Checked by: DRB | Date: 8/29/12 |

**TEST PIT INFORMATION**

| Depth of Stratum Change Feet | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-2" | | | Asphalt. |
| 2"-6" | | | Gray, gravelly SAND, some Gravel, medium to coarse Sand, moist. |
| 6" -2.8' | S1-Grab | | Brown, fine to coarse SAND, some Silt, trace gravel, trace clay, brick fragments, moist (7.5YR 2.5/1 Sandy Loam). |
| 2'8"-3'11" | S2-Grab | | Brown, fine to coarse SAND, some Silt, little gravel, moist (7.5YR 4/4 Sandy Loam). FILL |
| 3'11"-9'3" | S3-Grab | | Gray, fine to coarse SAND, little gravel, cobbles approximately 2"-10" diameter, little silt, trace clay, moist (2.5Y 5/2 Loamy Sand). GLACIAL TILL |
| | | | Bottom of test pit 9'3" bgs. |

| | |
|---|---|
| Pit Dimensions (Ft.)<br>Length:<br>Width:<br>Depth: 9'3" | Remarks:<br>1. Test pit backfilled with native material.<br>2. Grab samples submitted for laboratory analysis. |

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**TEST PIT LOG: TP103**

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project No.: 111.01095 |
| Location: 10 – 12 Swanton Street, Winchester, MA | Ground Elevation: 46.13' |
| Client: Gershman Brown Crowley, Inc. | Datum: NE corner of concrete sidewalk in front of dry cleaner building, El 46.85' |
| Contractor: Cyn Environmental Services | Operator: David |
| Equipment: Excavator | Samples Collected _x_Yes __No |
| Capacity/Reach: | Time Started: AM Time Completed: PM |
| Weather: Sun, windy, 25-35°F | |
| Logged by: BAB | Date: 1/19/13 |
| Checked by: DRB | Date: 1/23/13 |

**TEST PIT INFORMATION**

| Depth of Stratum Change | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-4" | | | Asphalt |
| 4"-1'0" | | | Sub base material |
| 1"-1'6" | | | Brown, fine to medium SAND, little fine to coarse gravel, little cobbles, little silt, moist (10YR 4/3, Loamy Sand). FILL |
| 1'6"-2'0" | | | Dark brown, fine to medium SAND, little silt, trace fine to medium gravel, trace glass, moist (5Y 3/1, Loam). FILL |
| 2'-3' | | | Orange-brown, fine to medium SAND, little silt, trace fine gravel, moist (7.5YR 4/4, Sandy Loam). FILL |
| 3'-4'2" | | | Gray, fine SAND and SILT, red –brown mottles, moist (2.5Y 6/2 Silt Loam, 7.5YR 5/6mottles associated with fill material not seasonal high groundwater) FILL |
| 4'2"-4'9" | | | Brown, fine to coarse SAND, little fine gravel, trace silt, moist (10YR 4/3, Sand). FILL |
| 4'9"-12' | TP103, S1, grab | 10'-11' | Gray-brown, fine to coarse SAND, little fine to coarse gravel, little cobbles, little silt, moist (10YR 5/3, becoming 10YR 4/3 at 12', Loamy Sand). NATIVE GLACIAL TILL |

| | |
|---|---|
| Test Pit Dimensions (ft)<br>Length = 16<br>Width = 8<br>Depth = 12<br>Depth to Groundwater (ft) = Not Encountered | Remarks:<br>1) Sample submitted for laboratory testing.<br>2) Test pit backfilled with excavated material.<br>3) Ground elevation measured with level and stadia rod relative to Site bench mark of 46.85'. |

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**TEST PIT LOG: TP104**

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project No.: 111.01095 |
| Location: 10 – 12 Swanton Street, Winchester, MA | Ground Elevation: 46.66' |
| Client: Gershman Brown Crowley, Inc. | Datum: NE corner of concrete sidewalk in front of dry cleaner building, El 46.85' |
| Contractor: Cyn Environmental Services | Operator: David |
| Equipment: Excavator | Samples Collected _x_ Yes __No |
| Capacity/Reach: | Time Started: PM Time Completed: PM |
| Weather: Sun, windy, 25-35°F | |
| Logged by: BAB | Date: 1/19/13 |
| Checked by: DRB | Date: 1/23/13 |

**TEST PIT INFORMATION**

| Depth of Stratum Change | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-4" | | | Asphalt |
| 4"- 1'8" | | | Sub base material |
| 1'8"-2'3" | | | Dark brown, fine to medium SAND, little silt, trace fine to medium gravel, moist (7.5YR 3/1, Loam). FILL |
| 2'3"-3'3" | | | Red-brown, fine to medium SAND, little fine to medium gravel, trace silt, moist (10YR 4/6, Sand). FILL |
| 3'3"-4'8" | | | Brown fine to coarse SAND, little fine to coarse gravel, little cobbles, trace silt, moist (10YR 5/6, Sand). FILL |
| 4'8"-5'4" | | | Gray-brown, fine SAND, some Silt, trace fine gravel, moist (2.5Y 5/2, Sandy Loam). FILL |
| 5'4"-10' | | | Gray-brown, fine to medium SAND, some fine to coarse Gravel, little cobble, little to trace silt, moist (10YR 5/3, Loamy Sand). NATIVE GLACIAL TILL |
| 10'-11' | TP104, S1, grab | 10'-11' | Brown, fine to coarse SAND, some fine to coarse Gravel, little cobble, little silt, moist (10YR 4/4, Loamy Sand). 6" lens of gray-brown fine SAND, little silt noted at varying depths, generally 10'6"-11'. NATIVE GLACIAL TILL |
| 11'-12' | | | Brown to gray-brown, fine to medium SAND, some fine to coarse Gravel, little cobble, little to trace silt, brown and red mottles (2.5Y 3/2) observed on eastern side wall, moist (10YR 4/3, 10YR 5/3, Loamy Sand). NATIVE GLACIAL TILL |

| | |
|---|---|
| Test Pit Dimensions (ft)<br>Length = 16<br>Width = 8<br>Depth = 12<br>Depth to Groundwater (ft) = Not Encountered | Remarks:<br>1) Sample submitted for laboratory testing.<br>2) Test pit backfilled with excavated material.<br>3) Ground elevation measured with level and stadia rod relative to Site bench mark of 46.85'. |

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**TEST PIT LOG: TP105**

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project No.: 111.01095 |
| Location: 10 – 12 Swanton Street, Winchester, MA | Ground Elevation: 44.81' |
| Client: Gershman Brown Crowley, Inc. | Datum: NE corner of concrete sidewalk in front of dry cleaner building, El 46.85' |
| Contractor: Cyn Environmental Services | Operator: David |
| Equipment: Excavator | Samples Collected _x_ Yes __No |
| Capacity/Reach: | Time Started: PM Time Completed: PM |
| Weather: Sun, cold, windy, 15-20°F | |
| Logged by: BAB | Date: 1/18/13 |
| Checked by: DRB | Date: 1/23/13 |

**TEST PIT INFORMATION**

| Depth of Stratum Change | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-4" | | | Asphalt |
| 4"-3'6" | | | Brown, fine to medium SAND, little to some fine to coarse gravel , trace silt, little metal, trace organics (roots), (2.5Y 5/3, Sandy Loam). FILL |
| 3'6"-4'2" | | | Asphalt; over brown former top soil material, little brick, glass, clay pipe, metal (Sandy Loam). |
| 4'2"-5' | | | Brown, fine to medium SAND, little fine to medium gravel, little to trace silt, moist (Loamy Sand). FILL |
| 5'-6' | | | Brown, fine to medium SAND, little fine to coarse gravel, little cobbles, trace silt, moist (2.5Y 5/4, Loamy Sand). NATIVE GLACIAL TILL |
| 6'-12'6" | TP105, S1, grab | 10'-11' | Gray-brown, fine to corse SAND, some to little fine to coarse gravel, some to little cobbles, little silt, trace boulder, mosist (5Y 5/3, Loamy Sand). NATIVE GLACIAL TILL |

| | |
|---|---|
| Test Pit Dimensions (ft)<br>Length = 16<br>Width = 8<br>Depth = 12.5<br>Depth to Groundwater (ft) = Not Encountered | Remarks:<br>1) Sample submitted for laboratory testing.<br>2) Test pit backfilled with excavated material.<br>3) Ground elevation measured with level and stadia rod relative to Site bench mark of 46.85'. |

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**TEST PIT LOG: TP106**

| | |
|---|---|
| Project: Proposed CVS Pharmacy/Store No. 10129 | Project No.: 111.01095 |
| Location: 10 – 12 Swanton Street, Winchester, MA | Ground Elevation: 46.17' |
| Client: Gershman Brown Crowley, Inc. | Datum: NE corner of concrete sidewalk in front of dry cleaner building, El 46.85' |
| Contractor: Cyn Environmental Services | Operator: David |
| Equipment: Excavator | Samples Collected _x_Yes __No |
| Capacity/Reach: | Time Started: AM Time Completed: PM |
| Weather: Sun, cold, windy, 15-20°F | |
| Logged by: BAB | Date: 1/18/13 |
| Checked by: DRB | Date: 1/23/13 |

**TEST PIT INFORMATION**

| Depth of Stratum Change | Sample No. and Type | Sample Depth Feet | Soil Description |
|---|---|---|---|
| 0"-4" | | | Asphalt |
| 4"-1' | | | Dark brown sub base material |
| 1'-2' | | | Red-brown, fine to medium SAND, little fine to medium gravel, trace silt, moist (10YR 4/6, Sand). FILL |
| 2'-4' | | | Gray-brown, fine to medium SAND, little fine to coarse gravel, little cobbles, trace silt, moist (2.5Y 4/3, Loamy Sand). FILL |
| 4'-10'-6" | | | Gray-brown, fine to coarse SAND, some fine to coarse Gravel, some cobbles, little silt, trace boulder, moist (2.5Y 4/2, Loamy Sand). NATIVE GLACIAL TILL |
| 10'-6"-12' | TP106, S1, grab | 10'6"-11'6" | Gray-brown, fine to coarse GRAVEL and fine to coarse SAND, some cobbles, little silt, moist (2.5Y 4/2, Loamy Sand). NATIVE GLACIAL TILL |
| 12' | | | Brown-red, fine to coarse SAND and fine to coarse GRAVEL, some Cobbles, weathered rock, wet (10YR5/4, Loamy Sand). NATIVE GLACIAL TILL |

| | |
|---|---|
| Test Pit Dimensions (ft)<br>Length = 16<br>Width = 8<br>Depth = 12<br>Depth to Groundwater (ft) = 12 | Remarks:<br>1) Sample submitted for laboratory testing.<br>2) Test pit backfilled with excavated material.<br>3) Ground elevation measured with level and stadia rod relative to Site bench mark of 46.85'. |

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# BORING LOG: SB101

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By: | MED | Total Depth: | 10 Feet | Logged By: | TRM |
| Date Reviewed: | 7-19-12 | Boring Diameter: | 8 Inches | Date Drilled: | 7/6/12 to 7/6/12 |
| GW Observed at: | 10 Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | Top - 4 to 5" asphalt over 6 to 7" Gravel. | | | | | | | |
| | S1 (1'-3') Top 6" - medium-dense, gray-brown, fine SAND and SILT, some fine to medium Gravel, Dry. Bottom 8" - loose, brown, fine SAND and SILT, trace fine Gravel, Dry. | | S1 | 10-6-3-3 | 24/14 | <1 | | |
| | S2 (3'-5') Loose, brown, fine SAND and SILT, Dry. | | S2 | 4-3-4-4 | 24/8 | <1 | | |
| 5 | S3 (5'-7') Top 15" - dense, tan, fine SAND and SILT, trace fine Gravel, Moist. Bottom 2" - very dense, tan, fine SAND and SILT, some fine to coarse Gravel, Moist. | | S3 | 5-14-20-21 | 24/17 | <1 | | 5 |
| | S4 (7'-9') Very dense, gray/brown, fine to medium SAND, some fine to coarse Gravel, Moist (glacial till). | | S4 | 60-100/5" | 11/8 | <1 | | |
| | S5 (9'-10') Similar to S4, Wet. | | S5 | 40-100/4" | 10/7 | <1 | | |
| 10 | Bottom of boring 10'. | | | | | | | 10 |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Groundwater encountered at ~10 feet bgs.
4. NA = not applicable; NM = not measured.

CLIENT:
Gershman Brown

SITE:
Proposed CVS
10-12 Swanton St.
Winchester, Massachusetts

Project No.:111.01095

RANSOM Consulting Engineers and Scientists

# BORING LOG: SB102

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By | | Total Depth: | 11.5 Feet | Logged By: | TRM |
| Date Reviewed: | | Boring Diameter: | 8 Inches | Date Drilled: | 7/6/12 to 7/6/12 |
| GW Observed at: | NA Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | Top - 4 to 5" asphalt over 7 to 8" Gravel. | | | | | | | |
| | S1 (1'-3') Top 4" - medium-dense, gray, fine to medium SAND and fine to medium GRAVEL, Dry. Bottom 5" - loose, tan, fine SAND and SILT, trace fine Gravel, Dry. | | S1 | 10-9-5-5 | 24/9 | <1 | | |
| | S2 (3'-5') Similar to bottom 5" of S1. | | S2 | 4-4-3-4 | 24/2 | <1 | | |
| 5 | S3 (5'-7') Top 14" - similar to S2. Bottom 2" - gray/brown, fine to medium SAND and SILT, some fine to coarse Gravel, Moist (glacial till) | | S3 | 3-7-10-19 | 24/16 | <1 | | 5 |
| | S4 (8'-9') Similar to bottom 2" of S3, some mottling | | S4 | 44-100/5" | 11/11 | 12.1 | | |
| | Advance boring to 10'. | | | | | | | |
| 10 | S5 (10'-11') Similar to S4. | | S5 | 90-100/3" | 9/4 | <1 | | 10 |
| | Refusal, bottom of boring 11.5'. | | | | | | | |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Groundwater not observed.
4. NA = not applicable; NM = not measured.

CLIENT:
Gershman Brown

SITE:
Proposed CVS
10-12 Swanton St.
Winchester, Massachusetts

Project No.:111.01095

RANSOM Consulting Engineers and Scientists

# BORING LOG: SB103

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By: | [illegible] | Total Depth: | 9 Feet | Logged By: | TRM |
| Date Reviewed: | 7-19-12 | Boring Diameter: | 8 Inches | Date Drilled: | 7/6/12 to 7/6/12 |
| GW Observed at: | 7.5 Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | Top - 6" asphalt over 6" Gravel. | | | | | | | |
| | S1 (1'-3') Top 2" - dense, black, fine SAND, some fine to coarse Gravel, Dry. Bottom 9" - medium-dense, brown, fine SAND and SILT, some fine to medium Gravel, Dry. | | S1 | 12-17-11-7 | 24/11 | <1 | | |
| | S2 (3'-5') Loose, brown, SILT, little fine Sand and fine to medium Gravel, Moist. | | S2 | 4-3-3-7 | 24/19 | <1 | | |
| 5 | S3 (5'-7') Top 6" - medium-dense, brown, fine to medium SAND, Dry. Bottom 10" - very dense, gray/brown, fine SAND and SILT, some fine to coarse Gravel, Moist (glacial till). | | S3 | 6-9-28-39 | 24/16 | <1 | | 5 |
| | S4 (7'-9') Similar to bottom 10" of S3, Wet at ~7.5' | | S4 | 67-60-70-69 | 24/21 | <1 | | |
| | Bottom of boring 9'. | | | | | | | |
| 10 | | | | | | | | 10 |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Groundwater encountered at ~7.5 feet bgs.
4. NA = not applicable; NM = not measured.

CLIENT:
Gershman Brown

SITE:
Proposed CVS
10-12 Swanton St.
Winchester, Massachusetts

Project No.:111.01095

RANSOM Consulting Engineers and Scientists

# BORING AND MONITORING WELL LOG: SB104/TW101

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: | | Total Depth: | 15 Feet | Logged By: | TRM |
| Date Reviewed | | Boring Diameter: | 8 Inches | Date Drilled: | 7/6/12 to 7/6/12 |
| GW Observed at: | 8 Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) |
|---|---|---|---|---|---|---|
| | Top - 6" asphalt over 6" Gravel | | | | | |
| | S1 (1'-3') Dense, brown, fine SAND, SILT, and fine to medium Gravel, Dry, slight petroleum odor. | | S1 | 22-17-6-4 | 24/12 | 21.2 |
| | S2 (3'-5') Top 2" similar to S1. Bottom 11" - loose, brown, fine SAND and SILT, trace fine Gravel, Dry. | | S2 | 3-3-6-10 | 24/13 | 1.2 |
| 5 | S3 (5-7') Top 6" - medium-dense, brown, fine to medium SAND, Dry. Bottom 15" - dense, gray/brown, fine SAND and SILT, some fine to coarse Gravel, Moist (glacial till) | | S3 | 7-8-33-42 | 24/21 | <1 |
| | S4 (7'-9') Similar to bottom 15" of S3, Wet. | | S4 | 45-46-45-48 | 24/17 | 3.2 |
| 10 | S5 (9'-10.5') Similar to S4, Wet. | | S5 | 58-62-100/5" | 17/11 | 1.1 |
| | Auger to 15' and set temporary well. | | | | | |
| 15 | Refusal, bottom of boring 15'. | | | | | |

DEPTH

WELL CONSTRUCTION

LEGEND: Filter Sand, Native Fill, Bentonite, Bentonite Grout, Concrete, PVC Screen, Solid PVC Riser

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques
2. Sample designated with solid fill submitted for laboratory analysis.
3. Temporary well installed.
4. Groundwater encountered at ~8 feet bgs.
4. NA = not applicable; NM = not measured.

CLIENT:
Gershman Brown

SITE:
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Winchester, Massachusetts

Project No.: 111.01095 Page: 1

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# BORING AND MONITORING WELL LOG: SB105/TW102

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: | HED | Total Depth: | 14 Feet | Logged By: | TRM |
| Date Reviewed: | 7-19-12 | Boring Diameter: | 8 Inches | Date Drilled: | 7/9/12 to 7/9/12 |
| GW Observed at: | NA Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) |
|---|---|---|---|---|---|---|
| | Top - 5" asphalt over 7" Gravel. S1 (1'-3') Loose, brown, fine SAND, some fine to medium Gravel and Silt, Dry. | | S1 | 4-3-2-2 | 24/9 | <1 |
| | S2 (3'-5') Top 3" Dense, fine SAND and SILT, some fine to coarse Gravel, Moist. Bottom 7" - medium-dense, tan, fine SAND, some fine to coarse Gravel, trace Silt, Dry. | | S2 | 3-10-18-13 | 24/10 | <1 |
| 5 | S3 (5'-7') Very dense, gray/brown, fine SAND and SILT, some fine to coarse Gravel, Moist to Wet (glacial till). | | S3 | 15-62-100/5" | 17/13 | <1 |
| | S4 (7'-8.5') Similar to S3 | | S4 | 22-74-100/3" | 15/12 | <1 |
| 10 | Auger to 14' and set temporary well. | | | | | |
| | Refusal, bottom of boring 14'. | | | | | |
| 15 | | | | | | |

DEPTH: 5, 10, 15

WELL CONSTRUCTION

LEGEND: Filter Sand; Native Fill; Bentonite; Bentonite Grout; Concrete; PVC Screen; Solid PVC Riser

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Temporary well installed.
4. Groundwater not encountered.
4. NA = not applicable; NM = not measured.

CLIENT: Gershman Brown

SITE: Proposed CVS, 10-12 Swanton St., Winchester, Massachusetts

Project No.: 111.01095 | Page: 1

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# BORING LOG: SB106

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By | | Total Depth: | 9 Feet | Logged By: | TRM |
| Date Reviewed | | Boring Diameter | 8 Inches | Date Drilled | 7/9/12 to 7/9/12 |
| GW Observed at: | NA Feet | Well Stickup | NA | Driller | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | OFXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | Top 5" asphalt over 7' Gravel. | | | | | | | |
| | S1 (1'-3') Top 8" - medium-dense, gray, fine to medium SAND, some fine to medium Gravel. Dry. Bottom 1" - dense, tan, fine SAND and SILT, trace fine Gravel. Dry. | | S1 | 10-12-8-4 | 24/9 | <1 | | |
| | S2 (3'-5') Loose, tan, fine SAND, some fine to coarse Gravel, little SILT, Dry. | | S2 | 4-4-2-6 | 24/8 | <1 | | |
| 5 | S3 (5'-7') Top 9" - loose, orange-brown, fine to medium SAND, trace fine Gravel, Dry. Bottom 9" - tan, fine SAND, some fine Gravel, trace Silt, Moist. | | S3 | 6-6-3-6 | 24/18 | <1 | | 5 |
| | S4 (7'-9') Very dense, gray, fine SAND and SILT, trace fine Gravel, Moist to Wet. | | S4 | 5-20-32-70 | 24/13 | <1 | | |
| | Refusal, bottom of boring 9'. | | | | | | | |
| 10 | | | | | | | | 10 |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Groundwater not encountered.
4. NA = not applicable; NM = not measured.

CLIENT:
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Project No.:111.01095 | Page: 1

**RANSOM** Consulting Engineers and Scientists

# BORING LOG: SB107

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By: | MAD | Total Depth: | 16 Feet | Logged By: | TRM |
| Date Reviewed: | 7-19-12 | Boring Diameter: | 8 Inches | Date Drilled: | 7/9/12 to 7/9/12 |
| GW Observed at: | NA Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | Top - 4 to 5" asphalt over 7" Gravel. | | | | | | | |
| | S1 (1'-3') Medium-dense, dark brown, fine SAND and SILT, little fine to medium Gravel, Dry. | | S1 | 9-14-8-6 | 24/8 | <1 | | |
| | S2 (3'-5') Top 3" - similar to S1. Bottom 13" - medium-dense, tan, fine SAND and SILT, trace fine Gravel, Moist. | | S2 | 5-7-4-11 | 24/16 | <1 | | |
| 5 | S3 (5'-7') Very dense, gray, fine SAND and SILT, some fine to coarse Gravel, Moist (glacial till). | | S3 | 26-50-71-73 | 24/17 | <1 | | 5 |
| | S4 (7'-9') Similar to S3. | | S4 | 69-55-64-58 | 24/19 | <1 | | |
| | S5 (9'-9.5') Very dense, gray, fine SAND and SILT and weathered rock, Moist. | | S5 | 100/6" | 6/4 | <1 | | |
| 10 | Auger through rock. | | | | | | | 10 |
| | Auger to 15'. | | | | | | | |
| 15 | S6 (15'-16') Similar to S5, slight petroleum odor. | | S6 | 100/4" | 4/4 | 17.9 | | 15 |
| | Refusal, bottom of boring 16'. | | | | | | | |

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Groundwater not encountered.
4. NA = not applicable; NM = not measured.

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# BORING LOG: SB108

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By: | | Total Depth: | 9.5 Feet | Logged By | TRM |
| Date Reviewed: | | Boring Diameter: | 8 Inches | Date Drilled: | 7/9/12 to 7/9/12 |
| GW Observed at: | NA Feet | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | Top 4 to 5" asphalt over 7" Gravel. | | | | | | | |
| | S1 (1'-3') Top 11" - medium-dense, brown, fine SAND and SILT, some fine to coarse Gravel, Dry. Bottom 1" - loose, brown, fine SAND and SILT, trace fine Gravel, Moist. | | S1 | 17-12-6-4 | 24/12 | <1 | | |
| | S2 (3'-5') Similar to bottom 1" of S1. | | S2 | 4-4-5-7 | 24/10 | <1 | | |
| 5 | S3 (5'-7') Very dense, gray, fine SAND and SILT, some fine to coarse Gravel, Dry (glacial till) | | S3 | 27-44-100/5" | 17/14 | <1 | | 5 |
| | S4 (7'-8') Very dense, gray, fine SAND and SILT and weathered rock. Moist | | S4 | 37-10/2" | 8/4 | <1 | | |
| | Auger to 9.5'. | | | | | | | |
| 10 | Refusal, bottom of boring 9.5'. | | | | | | | 10 |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using Acker 82 rig hollow-stem auger techniques.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Groundwater not encountered.
4. NA = not applicable; NM = not measured.

CLIENT:
Gershman Brown

SITE:
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10-12 Swanton St.
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Project No.:111.01095

RANSOM Consulting Engineers and Scientists

# BORING AND MONITORING WELL LOG: B201

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | Total Depth: | 7.5 Feet | Logged By: | DFM | |
| Date Reviewed: 8/23/12 | Boring Diameter: | 4 Inches | Date Drilled: | 8/8/12 to 8/8/12 | |
| Surface Elevation (ft.): NA | Well Stickup: | NA | Driller: | Soil Exploration | |

| DEPTH | DESCRIPTION<br>Based on USCS and modified Burmister Soil Classification System | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" CONCRETE.<br>S1 (0.5-4') 2" CONCRETE, over 13" brown, fine SAND, some Silt, over 8" brown SILT, dry. | Fill | | S1 | NA | NA | 48/23 | <1 | |
| 5 | S2 (4-7.5') 14" Brown, fine SAND, some Silt, trace fine gravel, over 12" light brown, fine SAND and SILT, some fine to coarse Gravel, dry.<br>NOTE: Based on Geoprobe resistance, native soils appear to be present at 5'. | Native | | S2 | NA | NA | 48/26 | <1 | |
| | Refusal at 7.5'. | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

WATER LEVELS:

During Drilling: NE | End of Boring: | Date:

WELL LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using Geoprobe.
2. NA = Not applicable; NE = not encountered.

**CLIENT:**
Gershman Brown Crowley, Inc.

**SITE:**
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Washington St. & Swanton St.
Winchester, MA

Project No.: 111.01095 | Page: 1

RANSOM Consulting Engineers and Scientists

# BORING AND MONITORING WELL LOG: B202

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | | Total Depth: | 8 Feet | Logged By: | DFM |
| Date Reviewed: 8/23/12 | | Boring Diameter: | 4 Inches | Date Drilled: | 8/8/12 to 8/8/12 |
| Surface Elevation (ft.): | NA | Well Stickup | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION<br>Based on USCS and modified Burmister Soil Classification System | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" CONCRETE.<br>S1 (0.5-4') 4" Crushed CONCRETE, over 6" brown, fine SAND, some medium to coarse Gravel, over 4" brown SAND and SILT, dry. | Fill | | S1 | NA | NA | 48/14 | <1 | |
| 5 | S2 (4-8') 10" Brown, fine to medium SAND, some medium to coarse Gravel, dry, over 8" light brown, fine to coarse SAND, some Silt, trace fine gravel, over 10" brown SILT, trace fine sand, trace gravel, moist.<br>NOTE: Based on Geoprobe resistance, native soils appear to be present at 5'. | Native | | S2 | NA | NA | 48/28 | <1 | |
| | Refusal at 8'. | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE | End of Boring: | Date:

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using Geoprobe.
2. NA = Not applicable; NE = not encountered.

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B204/MW204

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | Total Depth: | 15.5 Feet | Logged By: | ARM | |
| Date Reviewed: 8/23/12 | Boring Diameter: | 8 Inches | Date Drilled: | 8/6/12 to 8/6/12 | |
| Surface Elevation (ft.): NA | Well Stickup: | NA | Driller: | Soil Exploration | |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT. | | | | | | | | |
| | S1 (0.5-2.5') Loose, brown, fine to coarse SAND, dry. | Fill | | S1 | 3-4-4-5 | 8 | 24/13 | <1 | |
| | S2 (2.5-4.5') Loose, brown, fine to medium SAND, some Silt, trace fine to coarse gravel, moist, petroleum odor. | | | S2 | 4-5-5-12 | 10 | 24/13 | 23 | |
| 5 | S3 (5-7') Very dense, gray, fine to coarse SAND, some Silt, little gravel, moist, petroleum odor. | Native | | S3 | 16-32-45-40 | 77 | 24/17 | 186 | |
| | S4 (7-8.1') Gray, fine to coarse SAND, some Silt, trace gravel, moist, petroleum odor. | | | S4 | 9-40-50/1 | NA | 13/13 | 42.3 | |
| 10 | S5 (9-11') Very dense, gray, fine to coarse SAND, little gravel, trace silt, with cobbles, moist, petroleum odor. | | | S5 | 20-35-30-45 | 65 | 24/15 | 125 | |
| 15 | S6 (15-15.1') Similar to above, wet. | | | S6 | 50/1 | NA | 1/1 | 63.2 | |
| | Auger refusal at 15.5'. | | | | | | | | |

**WATER LEVELS:**

| During Drilling | End of Boring | Date: |
|---|---|---|
| ~14' | ~'13.7 | 8/8/12 |

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.
4. Sample designated with solid fill submitted for laboratory analysis.

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B205

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | Total Depth: | 11 Feet | Logged By: | ARM | |
| Date Reviewed: 8/23/12 | Boring Diameter: | 8 Inches | Date Drilled: | 8/6/12 to 8/6/12 | |
| Surface Elevation (ft.): NA | Well Stickup: | NA | Driller: | Soil Exploration | |

| DEPTH | DESCRIPTION<br>Based on USCS and modified Burmister Soil Classification System | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSil (ppm) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT | | | | | | | | |
| | S1 (0.5-2.5') Loose, brown, fine to coarse SAND, some Gravel, little silt, dry | Fill | | S1 | 5-4-3-3 | 7 | 24/10 | <1 | |
| | S2 (2.5-4.5') 6" Similar to above, over 2" light brown, fine to medium SAND, dry | | | S2 | 2-1-3-5 | 4 | 24/8 | 3.8 | |
| 5 | S3A (5-5.8') Similar to above. | | | | | | | | |
| | S3B (5.8-7') Medium dense, gray, fine SAND and SILT, dry. | Native | | S3 | 6-5-12-13 | 17 | 24/16 | <1 | |
| | S4 (7-9') 12" Similar to above, over 6" very dense, gray, fine to coarse SAND, little gravel, trace silt, with cobbles, moist, petroleum odor. | | | S4 | 13-15-40-30 | 55 | 24/18 | <1 | |
| 10 | | | | | | | | | |
| | Auger Refusal at 11'. | | | | | | | | |
| 15 | | | | | | | | | |

WATER LEVELS:

| During Drilling | End of Boring | Date |
|---|---|---|
| NE | | |

WELL LEGEND: Filter Sand, Native Fill, Bentonite, Bentonite Grout, Concrete, PVC Screen, PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.
4. Sample designated with solid fill submitted for laboratory analysis

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B206

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRS | Total Depth: | 9 Feet | Logged By: | LDH | |
| Date Reviewed: 8/23/12 | Boring Diameter: | 8 Inches | Date Drilled: | 8/8/12 to 8/8/12 | |
| Surface Elevation (ft.): NA | Well Stickup: | NA | Driller: | Soil Exploration | |

| DEPTH | DESCRIPTION<br>Based on USCS and modified Burmister Soil Classification System | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | **4" ASPHALT.** | | | | | | | | |
| | S1 (0.5-2.5') 8" Loose, light brown, fine to medium SAND, dry, over 2" reddish-brown, fine SAND, some Silt, trace brick, moist. | Fill | | S1 | 5-4-4-4 | 8 | 24/10 | <1 | |
| | S2 (2.5-4.5') Loose, reddish-brown SILT and fine SAND, trace gravel, trace asphalt, dry. | | | S2 | 3-3-5-8 | 8 | 24/5 | 1.1 | |
| 5 | S3 (5-7') Dense, light brown, fine to medium SAND, little silt, trace gravel, dry. | Native | | S3 | 18-22-24-26 | 46 | 24/10 | <1 | |
| | S4 (7-9') Very dense, light brown, fine to medium SAND, little gravel, trace silt, dry. | | | S4 | 33-40-40-45 | 80 | 24/18 | <1 | |
| | **End of boring 9'.** | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE | End of Boring: | Date:

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.
4. Sample designated with solid fill submitted for laboratory analysis.

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B207

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | | Total Depth: | 9 Feet | Logged By: | ARM |
| Date Reviewed: 8/23/12 | | Boring Diameter: | 8 Inches | Date Drilled: | 8/7/12 to 8/7/12 |
| Surface Elevation (ft.): | NA | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT. | | | | | | | | |
| | S1 (0.5-2.5') Medium dense dark brown to brown, fine to medium SAND, some Silt, little gravel, dry. | Fill | | S1 | 7-11-11-13 | 22 | 24/12 | 2.2 | |
| | S2 (2.5-4.5') Brown, fine to coarse SAND, little silt, little gravel, dry. | | | S2 | 13-20-50/5 | NA | 17/17 | 2.5 | |
| 5 | S3 (5-5.9') Similar to above, trace silt. | Native | | S3 | 41-50/5 | NA | 9/9 | 3.2 | |
| | S4 (7-7.6') Similar to above | | | S4 | 17/50-1 | NA | 7/7 | 4.8 | |
| | Auger refusal at 9'. | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE | End of Boring: | Date:

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers
2. SPTs conducted with automatic trip hammer
3. NA = Not applicable; NE = not encountered.

**CLIENT:**
Gershman Brown Crowley, Inc.

**SITE:**
Proposed CVS Pharmacy/Store No. 10129
Washington St. & Swanton St.
Winchester, MA

Project No.: 111.01095 | Page: 1

RANSOM Consulting Engineers and Scientists

# BORING AND MONITORING WELL LOG: B208

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | Total Depth: | 9 Feet | Logged By: | DFM | |
| Date Reviewed: 8/23/12 | Boring Diameter: | 8 Inches | Date Drilled: | 8/8/12 to 8/8/12 | |
| Surface Elevation (ft.): NA | Well Stickup: | NA | Driller: | Soil Exploration | |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT. | | | | | | | | |
| | S1 (0.5-2.5') Loose, brown, fine to coarse SAND, some Silt, trace fine gravel, moist. | Fill | | S1 | 3-3-2-2 | 5 | 24/14 | <1 | |
| | S2 (2.5-4.5') Similar to above. | | | S2 | 2-2-2-3 | 4 | 24/6 | 1.2 | |
| 5 | S3 (5-7') 6" Similar to above, over 5" brown SILT, dry. | | | S3 | 3-3-3-5 | 6 | 24/11 | 1.1 | |
| | S4 (7-8.4') 5" Dark brown SAND and SILT, over 9" brown, fine to medium SAND, some fine to coarse Gravel, trace silt, dry. | Native | | S4 | 27-31-120/5" | NA | 17/14 | <1 | |
| | Split-spoon refusal at 8.4'. | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE | End of Boring: | Date:

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

**NOTES:**

1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.

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# BORING AND MONITORING WELL LOG: B210

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | | Total Depth: | 8.3 Feet | Logged By: | ARM |
| Date Reviewed 8/23/12 | | Boring Diameter: | 8 Inches | Date Drilled: | 8/6/12 to 8/6/12 |
| Surface Elevation (ft.): | NA | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT | | | | | | | | |
| | S1 (0.5-2.5') Medium dense, brown, fine to medium SAND, little silt and fine to coarse Gravel, dry | Fill | | S1 | 8-12-12-14 | 24 | 24/13 | <1 | |
| | S2 (2.5-4.5') Medium dense, brown, coarse to fine SAND, little fine to coarse gravel, trace silt, dry | | | S2 | 9-12-16-20 | 28 | 24/16 | <1 | |
| 5 | S3 (5-7') Gray, fine SAND, little gravel, trace silt, moist. | Native | | S3 | 10-20-23-34 | 43 | 24/20 | <1 | |
| | S4 (7-8.3') Similar to above. | | | S4 | 37-46-50/3 | NA | 15/5 | <1 | |
| | Split-spoon refusal at 8.3' | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

| During Drilling | End of Boring | Date |
|---|---|---|
| NE | | |

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable, NE = not encountered.
4. Sample designated with solid fill submitted for laboratory analysis

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B211

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | | Total Depth: | 9 Feet | Logged By: | DFM |
| Date Reviewed: 8/23/12 | | Boring Diameter: | 8 Inches | Date Drilled: | 8/8/12 to 8/8/12 |
| Surface Elevation (ft.): | NA | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION<br>Based on USCS and modified Burmister Soil Classification System | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT. | | | | | | | | |
| | S1 (0.5-2.5') Medium dense GRAVEL. | Fill | | S1 | 8-8-9-9 | 17 | 24/1 | -- | |
| | S2 (2.5-4.5') 4" Brown, fine SAND and GRAVEL, over 6" brown SILT, dry, over 2" crushed COBBLE. | | | S2 | 4-4-4-5 | 8 | 24/12 | <1 | |
| 5 | S3 (5-7') Very dense, brown, fine to coarse SAND, some Silt, trace gravel, moist. | Native | | S3 | 15-41-46-58 | 87 | 24/19 | <1 | |
| | S4 (7-9') 12" Similar to above, over 1" brown, coarse SAND. | | | S4 | 31-47-51-67 | 98 | 24/13 | 4.7 | |
| | End of boring 9'. | | | | | | | | |
| 10 | | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE  End of Boring:  Date:

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

**NOTES:**

1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B212

| | | | |
|---|---|---|---|
| Reviewed by: DRB | Total Depth: 12 Feet | Logged By: ARM | |
| Date Reviewed: 8/23/12 | Boring Diameter: 8 Inches | Date Drilled: 8/6/12 to 8/6/12 | |
| Surface Elevation (ft.): NA | Well Stickup: NA | Driller: Soil Exploration | |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT. | | | | | | | | |
| | S1 (0.5-2.5') Loose, brown, fine to coarse SAND, some Silt, little gravel, dry. | Fill | | S1 | 3-3-4-3 | 7 | 24/11 | 1.5 | |
| | S2 (2.5-4.5') Similar to above. | | | S2 | 3-3-3-15 | 6 | 24/9 | 3.8 | |
| 5 | S3 (5-7') Dense, gray, fine to coarse SAND, little silt, little gravel, moist, fill. | Native | | S3 | 11-25-36-33 | 41 | 24/18 | <1 | |
| | S4 (7-7.9') Similar to above. | | | S4 | 40-50/5 | NA | 11/11 | 4.1 | |
| | S5 (9-9.8') Gray GRAVEL, some fine to coarse Sand, trace silt, moist. | | | S5 | 50-50/4 | NA | 9/9 | <1 | |
| 10 | | | | | | | | | |
| | Auger refusal at 12'. | | | | | | | | |
| 15 | | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE | End of Boring: | Date:

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer
3. NA = Not applicable; NE = not encountered.

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# BORING AND MONITORING WELL LOG: B213/MW213

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRS | | Total Depth: | 17 Feet | Logged By: | ARM |
| Date Reviewed: 8/23/12 | | Boring Diameter: | 8 Inches | Date Drilled: | 8/6/12 to 8/6/12 |
| Surface Elevation (ft.): | NA | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | **6" ASPHALT.** | | | | | | | | |
| | S1 (0.5-2.5') Brown, fine to medium SAND, some Silt, trace fine to coarse gravel, dry. | Fill | | S1 | 7-6-7-4 | 13 | 24/18 | <1 | |
| | S2 (2.5-4.5') Loose, light brown, fine to medium SAND, trace silt, trace gravel, moist. | | | S2 | 3-4-4-26 | 8 | 24/17 | <1 | |
| 5 | S3 (5-5.8') Brown, fine to medium SAND, some Silt, trace gravel, moist. | Native | | S3 | 45-50/3 | NA | 9/4 | 2.7 | |
| | S4 (8-10') Dense, brown, fine to medium SAND, some Silt, some fine to coarse Gravel, moist. | | | S4 | 12-15-15-17 | 30 | 24/15 | <1 | |
| 10 | S5 (10-12') Very dense, brown, fine to medium SAND, some Gravel, little silt, moist. | | | S5 | 28-34-32-37 | 66 | 24/16 | 2.4 | |
| | S6 (12-14') Similar to above with cobbles. | | | S6 | 34-38-33-27 | 71 | 24/24 | <1 | |
| 15 | S7 (14-16') Similar to above, medium dense, wet. | | | S7 | 13-10-16-12 | 26 | 24/13 | <1 | |
| | **Auger refusal at 17'.** | | | | | | | | |

**WATER LEVELS:**

During Drilling ~15' | End of Boring | Date: ~14.9' 8/8/12

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.

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# BORING AND MONITORING WELL LOG: B214/MW214

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | | Total Depth: | 14.5 Feet | Logged By: | ARM |
| Date Reviewed: 5/23/12 | | Boring Diameter: | 8 Inches | Date Drilled: | 8/7/12 to 8/7/12 |
| Surface Elevation (ft.): | NA | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT | | | | | | | | |
| | S1 (0.5-2.5') Dark brown to brown, fine to medium SAND, trace silt and fine to coarse gravel, dry | Fill | | S1 | 3-3-4-5 | 7 | 24/14 | 1.3 | |
| | S2 (2.5-4.5') Dense, gray, fine to coarse SAND, little silt, trace fine gravel. | Native | | S2 | 9-13-18-20 | 31 | 24/16 | <1 | |
| 5 | S3 (5-7') Very dense, gray, fine to coarse SAND, some fine to coarse Gravel, trace silt, moist. | | | S3 | 20-35-41-50/5 | 76 | 24/19 | <1 | |
| | S4 (8-8.9') Similar to above, little fine to coarse gravel. | | | S4 | 20-50/5 | NA | 10/10 | <1 | |
| 10 | S5 (10-11.5') Light brown, fine to coarse SAND, some fine to coarse Gravel, little silt, moist. | | | S5 | 33-40-50/5 | NA | 17/17 | 1.4 | |
| | S6 (13-14.5') Similar to above. | | | S6 | 10-20-50/4 | NA | 16/14 | <1 | |
| 15 | Split-spoon refusal at 14.5' | | | | | | | | |

**WATER LEVELS:**

| During Drilling | End of Boring | Date |
|---|---|---|
| NE | | NE 8/8/12 |

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers
2. SPTs conducted with automatic trip hammer
3. NA = Not applicable; NE = not encountered.

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# BORING AND MONITORING WELL LOG: B215/MW215

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | Total Depth: | 17 Feet | Logged By: | ARM | |
| Date Reviewed: 8/23/12 | Boring Diameter: | 8 Inches | Date Drilled: | 8/7/12 to 8/7/12 | |
| Surface Elevation (ft.): NA | Well Stickup: | NA | Driller: | Soil Exploration | |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DEXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | **6" ASPHALT.** | | | | | | | | |
| | S1 (0.5-2.5') Loose, dark brown to brown, fine to medium SAND, some Silt, trace fine to coarse gravel, contains brick, dry. | Fill | | S1 | 6-5-4-4 | 9 | 24/13 | <1 | |
| | S2 (2.5-4.5') Similar to above. | | | S2 | 2-3-3-3 | 6 | 24/4 | <1 | |
| 5 | S3 (5-7') Loose, brown to tan, fine SAND, some Silt, trace fine to coarse Gravel, moist. | | | S3 | 4-4-6-6 | 10 | 24/10 | <1 | |
| | S4 (7-9') Dense, gray, fine to coarse SAND, little Silt, little fine to coarse gravel, moist. | Native | | S4 | 8-12-24-30 | 36 | 24/18 | <1 | |
| 10 | S5 (10-10.8') Grayish brown, similar to above. | | | S5 | 21-50/4 | NA | 10/10 | <1 | |
| | Boulder 11-13'. | | | | | | | | |
| | S6 (13-14.3') Similar to above. | | | S6 | 16-40-50/4 | NA | 16/15 | <1 | |
| 15 | S7 (15-15.4') Similar to above, moist. | | | S7 | 50/5 | NA | 5/5 | <1 | |
| | **Auger refusal at 17'.** | | | | | | | | |

**WATER LEVELS:**

During Drilling: NE | End of Boring: | Date: NE 8/8/12

**WELL LEGEND:**

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.

**CLIENT:**
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# BORING AND MONITORING WELL LOG: B216/MW216

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: DRB | | Total Depth: | 15.2 Feet | Logged By: | ARM |
| Date Reviewed: 8/23/12 | | Boring Diameter: | 8 Inches | Date Drilled: | 8/7/12 to 8/7/12 |
| Surface Elevation (ft.): | NA | Well Stickup: | NA | Driller: | Soil Exploration |

| DEPTH | DESCRIPTION (Based on USCS and modified Burmister Soil Classification System) | SOIL PROFILE | SAMPLE | SAMPLE NUMBER | BLOWS (per 6") | SPT-N Value | PENETRATION/ RECOVERY | OVM (ppm) / DRXSIL (ppm) | WELL CONSTRUCTIO |
|---|---|---|---|---|---|---|---|---|---|
| | 6" ASPHALT. | | | | | | | | |
| | S1 (0.5-2.5') Loose, dark brown to brown, fine to medium SAND, some Silt, trace fine to coarse gravel, moist. | Fill | | S1 | 4-3-2-2 | 5 | 24/10 | <1 | |
| | S2 (2.5-4.5') Loose, olive-gray SILT and fine SAND with mottling, moist. | | | S2 | 3-4-4-5 | 8 | 24/18 | <1 | |
| 5 | S3 (5-7') 12" Similar to above, over 8" gray, fine to coarse SAND, little silt and fine to coarse Gravel, moist. | Native | | S3 | 15-25-21-31 | 46 | 24/20 | <1 | |
| | S4 (7-9') Similar to above, very dense | | | S4 | 18-25-26-35 | 51 | 24/14 | <1 | |
| 10 | S5 (10-11.9') Similar to above with mottled layers | | | S5 | 28-41-41-50/5 | 82 | 23/20 | 1.5 | |
| | S6 (13-14.3') Gray, fine to coarse SAND and fine to coarse GRAVEL, some Silt, wet, petroleum odor. | | | S6 | 27-36-50/3 | NA | 15/15 | 5,000 | |
| 15 | S7 (15-15.2') Similar to above. Split-spoon refusal at 15.2'. | | | S7 | 50/2 | NA | 2/2 | 1,455 | |

**WATER LEVELS:**

| During Drilling | End of Boring | Date |
|---|---|---|
| ~14' | | ~11.9' 8/8/12 |

**WELL LEGEND:** Filter Sand, Native Fill, Bentonite, Bentonite Grout, Concrete, PVC Screen, PVC Riser

NOTES:
1. Boring advanced using 4 1/4" hollow-stem augers.
2. SPTs conducted with automatic trip hammer.
3. NA = Not applicable; NE = not encountered.

**CLIENT:**
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# BORING AND MONITORING WELL LOG: SB301/MW301

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: | HED | Total Depth: | 14.75 feet | Logged By: | BAB |
| Date Reviewed: | 1/17/13 | Boring Diameter: | 4.25 Inches | Date Drilled: | 11/30/12 to 11/30/12 |
| GW Observed at: | NO | Well Stickup: | Flush | Driller: | GWTB |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) |
|---|---|---|---|---|---|---|
| | 6" Asphalt. | | | | | |
| | S1 (1'-3') Top 3" - Concrete/GRAVEL. Bottom 11" - Brown, fine to medium SAND, little fine to medium Gravel, trace Silt, Brick (fill). | | S1 | 12-10-10-7 | 24/14 | |
| | S2 (3'-5') Brown, fine to medium SAND, little fine to medium Gravel, trace Silt, Brick (fill). | | S2 | 4-5-5-3 | 24/12 | 3 |
| 5 | S3 (5'-7') Brown, fine to medium SAND, little fine to medium Gravel, trace Silt, Brick (fill). | | S3 | 3-3-5-6 | 24/10 | 1 |
| | S4 (7'-9') Top 2" - Brown, fine to medium SAND, little fine to medium Gravel, trace Silt, Brick (fill). Bottom 10" - Gray brown, fine to medium SAND, trace fine to medium Gravel, trace Silt, Moist. | | S4 | 5-4-3-5 | 24/12 | 1 |
| 10 | S5 (10'-10.6') Gray-brown, fine to medium SAND, trace fine to medium Gravel, trace Silt, Moist. | | S5 | 20-50/1 | 7/7 | 1 |
| | Augered through Cobbles and Sand. | | | | | |
| | S6 (13'-14.75') Gray-brown, fine to medium SAND, trace fine to medium Gravel, trace Silt with brown-red mottles, petroleum odor. | | S6 | 1-10-14-50/3 | 21/8 | 13 |
| 15 | Auger refusal, bottom of boring 14'9". | | | | | |

WELL CONSTRUCTION

LEGEND: Filter Sand, Native Fill, Bentonite, Bentonite Grout, Concrete, PVC Screen, Solid PVC Riser

NOTES:
1. Boring advanced using hollow-stem auger methodology.
2. Sample designated with solid fill submitted for laboratory analysis.
3. Well finished with a locking, flush-mounted roadbox, cemented into ground.
4. NA = not applicable; NO = not observed.

CLIENT:
Gerschman Brown Crowley, Inc.

SITE:
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# BORING LOG: SB302

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By: | | Total Depth | 10.5 feet | Logged By: | BAB |
| Date Reviewed: | | Boring Diameter | 4.25 Inches | Date Drilled | 11/30/12 to 11/30/12 |
| GW Observed at: | NO | Well Stickup | NA | Driller: | CWTB |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | 6" Asphalt | | | | | | | |
| | Augered to 5' | | | | | | | |
| 5 | S1 (5'-6.83') Gray, brown, fine to medium SAND, little fine to medium Gravel, Brick at 6.5', Moist. | X | S1 | 6-27-32-50/4 | 24/18 | 1 | NA | 5 |
| | Augered to 10' | | | | | | | |
| 10 | S2 (10'-10.5') Gray-brown, fine to medium SAND, trace Silt, little fine to medium Gravel, Moist. Auger refusal, bottom of boring 10.5'. | X | S2 | 50/5 1/2 | 5/5 | 2 | NA | 10 |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using hollow-stem auger methodology
2. NA = not applicable; NO = not observed.

CLIENT:
Gerschman Brown Crowley, Inc.

SITE:
Proposed CVS Pharmacy/Store 10129
Washington & Swanton Streets
Winchester, MA

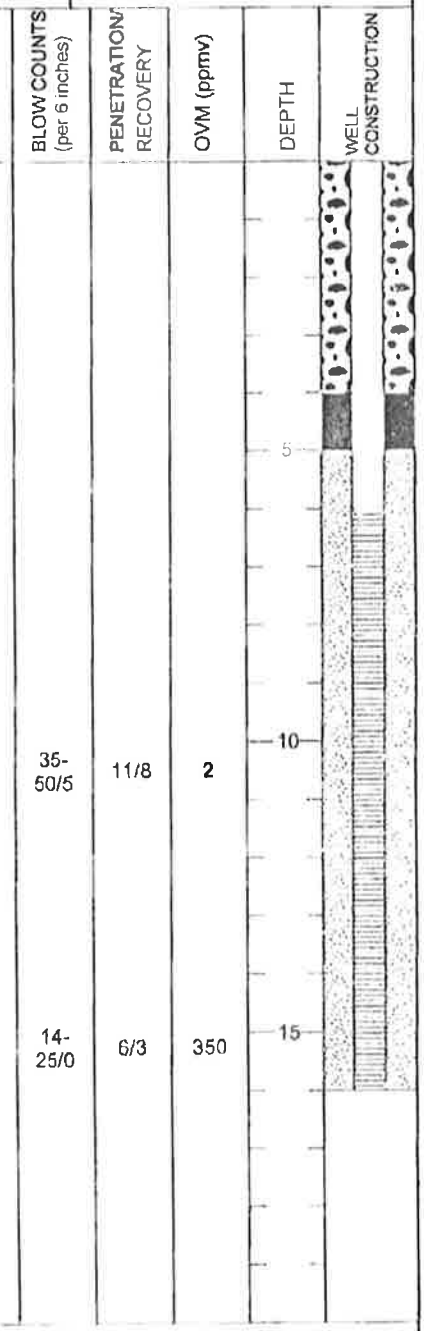
Project No.:111.01095

# BORING AND MONITORING WELL LOG: SB302B/MW302

RANSOM Consulting Engineers and Scientists

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: | RED | Total Depth: | 16 feet | Logged By: | BAB |
| Date Reviewed: | 1/17/13 | Boring Diameter: | 4.25 Inches | Date Drilled: | 11/30/12 to 11/30/12 |
| GW Observed at: | 15 feet | Well Stickup: | Flush | Driller: | GWTB |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) |
|---|---|---|---|---|---|---|
| | 6" Asphalt. | | | | | |
| | Augered to 10' | | | | | |
| 5 | | | | | | |
| 10 | S1 (10'-10.92') Gray-brown, fine to medium SAND, little fine to medium Gravel, trace Silt, Moist. | | S1 | 35-50/5 | 11/8 | 2 |
| | Augered to 15' - Cobbles. | | | | | |
| 15 | S2 (15'-15.5') Gray, fine to medium SAND, little Silt, Wet. | | S2 | 14-25/0 | 6/3 | 350 |
| | Auger refusal, bottom of boring 15.5'. | | | | | |




LEGEND: Filter Sand, Native Fill, Bentonite, Bentonite Grout, Concrete, PVC Screen, Solid PVC Riser

NOTES:
1. Boring advanced using hollow-stem auger methodology.
2. Well finished with a locking, flush-mounted roadbox, cemented into ground.
3. Groundwater encountered at 15 feet bgs.
4. NA = Not applicable.

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Winchester, MA

Project No.: 111.01095 | Page: 1

RANSOM Consulting Engineers and Scientists

# BORING LOG: SB303B

| | | | | | |
|---|---|---|---|---|---|
| Reviewed By: | HED | Total Depth: | 13.5 feet | Logged By: | BAB |
| Date Reviewed: | 1/17/13 | Boring Diameter: | 4.25 Inches | Date Drilled: | 11/30/12 to 11/30/12 |
| GW Observed at: | NO | Well Stickup: | NA | Driller: | GWTB |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEXSIL (ppm) | DEPTH |
|---|---|---|---|---|---|---|---|---|
| | 6" Asphalt. | | | | | | | |
| | Augered to 10' | | | | | | | |
| 5 | | | | | | | | 5 |
| 10 | S1 (10'-12') Top 9" - Gray-brown, fine to medium SAND, little fine to medium Gravel, trace Silt. Bottom 10" - Gray-brown, fine to medium SAND, little fine to medium Gravel, trace Silt, weathered rock and red-brown mottles, Moist. | | S1 | 15-24-34-46 | 24/19 | 1 | NA | 10 |
| | Augered to refusal, petroleum odor from cuttings. | | | | | | | |
| | Auger refusal, bottom of boring 13.5'. | | | | | | | |
| 15 | | | | | | | | 15 |

NOTES:
1. Boring advanced using hollow-stem auger methodology.
2. NA = not applicable; NO = not observed.

CLIENT:
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SITE:
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Washington & Swanton Streets
Winchester, MA

Project No.:111.01095

RANSOM
Consulting Engineers and Scientists

# BORING AND MONITORING WELL LOG: SB304/MW304

| | | | | | |
|---|---|---|---|---|---|
| Reviewed by: | [illegible] | Total Depth: | 14 feet | Logged By: | BAB |
| Date Reviewed: | 1/12/13 | Boring Diameter: | 4.25 Inches | Date Drilled: | 11/30/12 to 11/30/12 |
| GW Observed at: | NO | Well Stickup: | Flush | Driller: | GWTB |

| DEPTH | DESCRIPTION (Based on a modified Burmeister Soil Classification System) | SAMPLE | SAMPLE NUMBER | BLOW COUNTS (per 6 inches) | PENETRATION/ RECOVERY | OVM (ppmv) | DEPTH | WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|---|
| | 6" Asphalt | | | | | | | |
| | Augered to 10' | | | | | | | |
| 5 | | | | | | | 5 | |
| 10 | S1 (10'-11.5') - Top 8" - Gray, fine to medium SAND, trace fine to medium Gravel, trace Silt. Bottom 7" - Gray-brown, fine to medium SAND, some fine to medium Gravel, trace Silt with red-brown mottles, Moist. | | S1 | 18-24-50/6 | 18/15 | 65 | 10 | |
| | Augered to refusal - Cobbles. | | | | | | | |
| | Auger refusal, bottom of boring 14'. | | | | | | | |
| 15 | | | | | | | 15 | |

LEGEND:

Filter Sand | Native Fill | Bentonite | Bentonite Grout | Concrete | PVC Screen | Solid PVC Riser

NOTES:
1. Boring advanced using hollow-stem auger methodology.
2. Well finished with a locking, flush-mounted roadbox, cemented into ground.
3. NA = not applicable; NO = not observed.

CLIENT:
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Project No.: 111.01095