DRAINAGE STUDY

For

Allenstown Community Center

8 Whitten Street
Allenstown, New Hampshire

March 18, 2015

Prepared For:

The Town of Allenstown,
New Hampshire

Prepared By:

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Allenstown Community Center
8 Whitten St.
Allenstown, New Hampshire

PROJECT DESCRIPTION

The proposed project is located at 8 Whitten Street in the Town of Allenstown, New Hampshire. The project is situated on lot 112-267 which has an area of 1.741 acres and is owned by the Town of Allenstown. The parcel is known as the "Whitten Street Park" and is the current site of the Boys & Girls Club of Suncook.

The existing Boys & Girls Club site is comprised of two manufactured buildings, paved tennis and basketball courts, and parking accessed by a narrow driveway. The west part of the site slopes steeply down to Reynolds Street and is partially retained by a boulder wall. The aged existing facilities will be demolished to provide space for the new project.

The project includes construction of a new 9,400 square-foot two story building, parking both on the upper portion of the site and on Reynolds Street, a 20 ft wide access drive, sidewalks, a basketball court and associated landscaping, lighting and drainage improvements. The building will be sited on the existing steep slope facing Reynolds Street to provide ground level access to the first floor from Reynolds Street and to the second floor from the upper parking lot. The new Allenstown Community Center building will have a dual function of serving both the Boys & Girls Club and a senior center.

The drainage design was completed based on the USDA NRCS Web Soil Survey, which shows that the soils on the site and surrounding watersheds are Hydrological Soil Group (HSG) A soils. HSG A soils which have low runoff potential and high infiltration rates. The soil type associated with the site and surrounding neighborhood was identified as 598B, Windsor-Urban land complex, with 0 to 8 percent slopes.

The site poses some unique challenges such as a shallow groundwater table and is located within a groundwater management zone (GMZ), as defined by New Hampshire Department of Environmental Services Permit # GMP-198400003-A-003. Groundwater within the GMZ may contain dissolved gasoline-related compounds at concentrations greater than the ambient groundwater quality standards. The gasoline-related compounds are attributable to a release that occurred at the Former Bob's Citgo (circa 1972) which was located at the intersection of Main Street and Ferry Streets.

A closed municipal drainage system runs through the site from east to west starting on Main Street and terminating at an outfall into the river. A "Design Point" located on Reynolds Street was chosen for the watershed analysis. Design Point 1 includes runoff from watersheds collected by the upstream closed system, including stormwater from the existing Boys & Girls Club site which ties in to the Design Point, a 10 inch clay pipe running along Reynolds Street. Refer to the *Existing Conditions Narrative* and *Proposed Conditions Narrative* sections of this study for a detailed explanation of the Design Point under pre- and post-development conditions.

This study examines the hydraulic and hydrologic characteristics associated with the development of the proposed project. An analysis of the drainage impacts due to the construction of the project was completed. As a result, the proposed stormwater management system has been designed to best utilize the existing hydrologic and hydraulic patterns, minimize impacts to surrounding areas, and provide best management practices for water quality treatment measures.

Based on FEMA flood insurance rate map for Merrimack County community panel number 33013C0564E dated April 19, 2010, the parcel is not located within a 100-year or 500-year flood zone.

REPORT METHODOLOGY

The runoff analysis is based on analyzes of the 2, 10, 25, and 50-year 24-hour design storms using the SCS TR-55 method with Type-III, 24-hour storms. All runoff from this development is accounted for in the analysis presented.

The summaries and calculations for the peak pre- and post-development rates of runoff, supporting calculations and maps for the proposed project are included in this study.

On-site subcatchments were delineated from completed survey and GIS mapping. SCS Runoff Curve Numbers (CN) were developed for each area of generally similar properties within each Subcatchment. The nature of flow, flow length, type of surface (e.g. ground cover) and slope were characterized for each Subcatchment and reach (swale or pipe) to determine the time of concentration and maximum outflow rate. Soil types and Hydrologic Soil Groups were determined from the USDA NRCS Web Soil Survey data. A copy of the soil report is included in Appendix A.

DRAINAGE ANALYSIS METHODOLOGY

Technical Release 20 (TR-20) by the Natural Resources Conservation Service was utilized for modeling the surface water hydrology of the site. The model begins with a rainfall amount uniformly imposed on the watershed over a specified time distribution, 24 hours in this analysis. The mass rainfall is converted to mass runoff by using a Runoff CN. The determination of the CN is based on assessments of soil characteristics, vegetation type and condition, amount of impervious areas, interception and surface storage. The calculated runoff is then transformed into a hydrograph by using unit hydrograph theory and routing procedures that depend on runoff travel time through the individual segments of the watershed. Typically, various storage configurations and volumes are analyzed to adjust detention times and the hydrograph so that the downstream peak discharge is reduced to equal or less than pre-development conditions.

The analysis utilized the computerized TR-20 software as included in the HydroCAD package. Tabular hydrographs were generated for the following:

- 2-year event/24-hour duration
- 10-year event /24-hour duration
- 25-year event /24-hour duration
- 50-year event/24-hour duration

Time of Concentration (T_c) for each sub-area was computed based on physical characteristics including surface type, Manning's Roughness Coefficient, flow length, 2-Year/24-Hour rainfall values, and gradients of the land.

TR-55 Analysis

The overall site pre- and post-development hydrographs were calculated utilizing the method detailed in Technical Release 55 (TR-55) "*Urban Hydrology for Small Watersheds*" as published by the United States Department of Agriculture Soil Conservation Service, "SCS", and revised in June of 1986. Tabular hydrographs were computed based on CN, T_C, T_t, area and precipitation input values. Rainfall precipitation data were also obtained from TR-55.

The SCS Method is based upon the SCS Runoff Equation:

$$Q = \frac{(P-Ia)^2}{(P-Ia) + S}$$

Where:

Q = Runoff in Inches
P = Rainfall in Inches
S = Potential Maximum Retention in Inches
Ia = Initial Abstraction in Inches

Note:

S = 1000/CN – 10
CN = Runoff Curve Number

Computations were executed using the "HydroCAD" release 9.10 for Windows computer software for storm sewer design and analysis from Applied Microcomputer System.

EXISTING CONDITIONS NARRATIVE

The 1.741-acre parcel is accessed by Whitten Street and has frontage along Reynolds Street along the western boundary. The northern boundary of the parcel generally abuts residential properties with frontage on Whitten Street. The southern boundary of the parcel generally abuts residential properties with frontage on Ferry Street. The eastern boundary abuts the Allenstown Fire Station located on Ferry Street as well as other residential properties. The existing site is currently located at 8 Whitten Street and contains two manufactured buildings each with a footprint of approximately 1,500 square feet. The site also has associated parking, tennis and basketball courts, as well as areas of grass, brush and tree cover.

Design Point 1 is the 10 inch clay drainage pipe on Reynolds Street, which outlets from the existing drain manhole adjacent to the site (DMH-2). DMH-2 appears to be an old sewer manhole of approximately 100 years old as evidenced by the brick invert and based upon discussions with Public Works personnel. This drainage study assumes that all upstream structures located on Reynolds Street tie in to this 10 inch clay main though some catch basin structures have obscured outlet pipes and are not specifically modeled in this analysis.

The 10 inch clay main receives existing flow from a closed municipal drainage system which serves a watershed area of approximately 10 acres. As the hydrologic model in this report predicts, this pipe is currently undersized for the 10 year, 24 hour storm but no known reports of backup in the system have been received by the Town.

The USDA NRCS Web Soil Survey determined that the existing on-site soils include Windsor-Urban land complex (Hydrologic Soil Group A). The existing ground cover includes impervious surfaces due to the existing building, parking lot, tennis and basketball courts, residential structures and pavement as well as some roadway drainage. A detailed and tabular summary of the flows associated with each existing Design Point can be found in the *Pre Development Analysis Criteria* section of this study.

A Pre-Development Watershed Map is included in Appendix D.

PRE-DEVELOPMENT ANALYSIS CRITERIA

The complete HydroCAD analysis for pre-development conditions is included in Appendix B. Rainfall precipitation data was obtained TR-55. The analysis criteria used for the SCS TR-20 hydraulic analysis of the pre-development conditions are as follows:

- Storm Event Frequency: 2, 10, 25, and 50 year, 24-hr storms

Storm (yr, 24-hr)	Rainfall Depth (inches)
2	2.90
10	4.40
25	5.00
50	5.50

- Runoff Coefficients (CN)

>75% grass cover, good, HSG A	= 39
2 acre lots, 12% impervious, HSG A	= 46
1 acre lots, 20% impervious, HSG A	= 51
½ acre lots, 25% impervious, HSG A	= 54
¼ acre lots, 38% impervious, HSG A	= 61
Pavement, roofs, parking lots	= 98

SCS TR-20 Analysis

The pre development peak discharge from the project area for 2, 10, 25, and 50-year 24-hour design storms frequencies of 24-hour duration is:

Analysis Point	Inflow Area	2-year Storm	10-year Storm	25-year Storm	50-year Storm
	Acres	Flow (cfs)	Flow (cfs)	Flow (cfs)	Flow (cfs)
Design Point 1	9.3	0.8	5.0	7.7	10.1

PROPOSED CONDITIONS NARRATIVE

The proposed Allenstown Community Center project will include the demolition of all existing impervious surfaces including buildings and parking lot, tennis and basketball courts and access drive. New impervious surfaces to be constructed include the proposed building, parking, an access drive and basketball court. A Post-Development Watershed Map is included in Appendix D.

Under proposed conditions, Design Point 1 contains generally the same overall watershed as the pre-development conditions but has improved stormwater routing on the site and on Reynolds Street.

All stormwater runoff from the site is captured within the closed municipal drainage system.

POST-DEVELOPMENT ANALYSIS CRITERIA

The complete HydroCAD analysis for post-development conditions is included in Appendix C. The analysis criteria used for the SCS TR-20 hydraulic analysis of the post-development conditions are as follows:

- Storm Event Frequency: 2, 10, 25, and 50 years.

- SCS Rainfall Distribution: Type III

Storm (yr, 24-hr)	Rainfall Depth (inches)
2	2.90
10	4.40
25	5.00
50	5.50

- Runoff Coefficients (CN):

>75% grass cover, good, HSG A	= 39
2 acre lots, 12% impervious, HSG A	= 46
1 acre lots, 20% impervious, HSG A	= 51
½ acre lots, 25% impervious, HSG A	= 54
¼ acre lots, 38% impervious, HSG A	= 61
Pavement, roofs, parking lots	= 98

SCS TR-20 Analysis

The post development peak discharges from the subject area for a 2-, 10-, 25-, 50-, and 100-year storm frequency of 24-hour duration are:

Analysis Point	Inflow Area	2-year Storm	10-year Storm	25-year Storm	50-year Storm
	Acres	Flow (cfs)	Flow (cfs)	Flow (cfs)	Flow (cfs)
Design Point 1	9.5	1.5	6.1	9.9	12.4

ANALYSIS SUMMARY

Water Quantity

The pre and post-development peak discharges from the study area for the 2, 10, 25 and 50 year storm frequencies of 24-hour duration for Design Point 1 are compared below:

24 hr Design Storm	Pre Development	Post Development	Difference
	Outflow (cfs)	Outflow (cfs)	Outflow (cfs)
2 yr	0.8	1.5	+0.7
10 yr	5.0	6.1	+1.1
25 yr	7.7	9.9	+2.2
50 yr	10.1	12.4	+2.3

As summarized in the above table, the post-development stormwater flows exceed pre-development flows. Flow attenuation performed through detention or infiltration is not practical at this site due to the shallow groundwater table and the concentrations of gasoline related compounds in the groundwater.

Water Quality Treatment

Stormwater treatment for the proposed site will be provided by deep sumps catch basins and treatment swales as detailed on the design plans.

Temporary Erosion Control

Temporary erosion control measures and their locations are shown on the enclosed Grading, Drainage and Erosion Control Plan and Detail Drawings, and will be included in the construction plans for implementation. Placement of various erosion control devices including silt fences and swales will handle temporary erosion control. Existing drainage structures will be protected with inlet sediment bags. Grass swales will be stabilized with seeding and/or jute mats with check dams employed to detain sediment and reduce velocity.

CONCLUSION

Based on the unavoidable existing conditions of a site that is compromised due to gasoline concentrations in the groundwater, infiltration to the groundwater is not desirable. Groundwater beneath the Whitten Street Park is part of a Groundwater Management Zone described in New Hampshire Department of Environmental Protection Permit # GMP-1984-00003-A-003. Groundwater within this zone may contain dissolved volatile organic compounds at concentrations greater than the ambient water quality criteria. Numerous measures have been implemented to reduce the concentrations of VOCs in soil and groundwater. VOC concentrations in groundwater are decreasing and the size of the dissolved plume is shrinking as biodegradation and other natural attenuation processes occur. Recharge of stormwater on

the Whitten Street Park could influence groundwater resulting in undesirable migration of the plume. Stormwater recharge is also likely to be ineffective because groundwater at the site is close to ground surface, ranging from about 5 feet below ground surface on the eastern portion of the park to only a foot or two beneath the western portion of the park. Any recharge of stormwater would ultimately be captured by the French drain that must be designed to lower the groundwater elevation in the vicinity of the proposed building. There would be no net benefit of recharging storm water that would have to be removed by the French drain.

It is our recommendation that the minor increase in the 10 year storm is left undetained as it leaves the site, and it is our understanding that downstream drainage improvements to the direct receiving system will be made by the Town of Allenstown this year. All runoff from the site will be captured in the closed system and there will not be an increase in stormwater runoff to abutting properties. The new drainage system will replace old closed drainage piping and structures on the site that have been subject to groundwater infiltration. There should be no anticipated or significant downstream impacts expected to the drainage system after these improvements have been implemented.

APPENDIX A

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Merrimack and Belknap Counties, New Hampshire

March 10, 2015

Custom Soil Resource Report
Soil Map

Map Scale: 1:1,690 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Merrimack and Belknap Counties, New Hampshire
Survey Area Data: Version 19, Sep 17, 2014

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

Date(s) aerial images were photographed: Apr 8, 2011—May 1, 2011

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.

Map Unit Legend

Merrimack and Belknap Counties, New Hampshire (NH609)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
598B	Windsor-Urban land complex, 0 to 8 percent slopes	14.3	100.0%
Totals for Area of Interest		**14.3**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Merrimack and Belknap Counties, New Hampshire

598B—Windsor-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9dm2
Elevation: 200 to 1,970 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 45 to 52 degrees F
Frost-free period: 100 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 40 percent
Windsor and similar soils: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor

Setting

Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear

Typical profile

Oi - 0 to 1 inches: slightly decomposed plant material
H1 - 1 to 3 inches: loamy fine sand
H2 - 3 to 26 inches: loamy fine sand
H3 - 26 to 65 inches: fine sand

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3s
Hydrologic Soil Group: A

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear

Deerfield

Percent of map unit: 5 percent
Landform: Terraces
Down-slope shape: Linear
Across-slope shape: Linear

Mashpee

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Hydrologic Soil Group

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.

Custom Soil Resource Report
Map—Hydrologic Soil Group

Map Scale: 1:1,690 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 25 50 100 150

Feet
0 50 100 200 300

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

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Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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Soil Survey Area: Merrimack and Belknap Counties, New Hampshire
Survey Area Data: Version 19, Sep 17, 2014

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

Date(s) aerial images were photographed: Apr 8, 2011—May 1, 2011

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.

Table—Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Merrimack and Belknap Counties, New Hampshire (NH609)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
598B	Windsor-Urban land complex, 0 to 8 percent slopes	A	14.3	100.0%
Totals for Area of Interest			**14.3**	**100.0%**

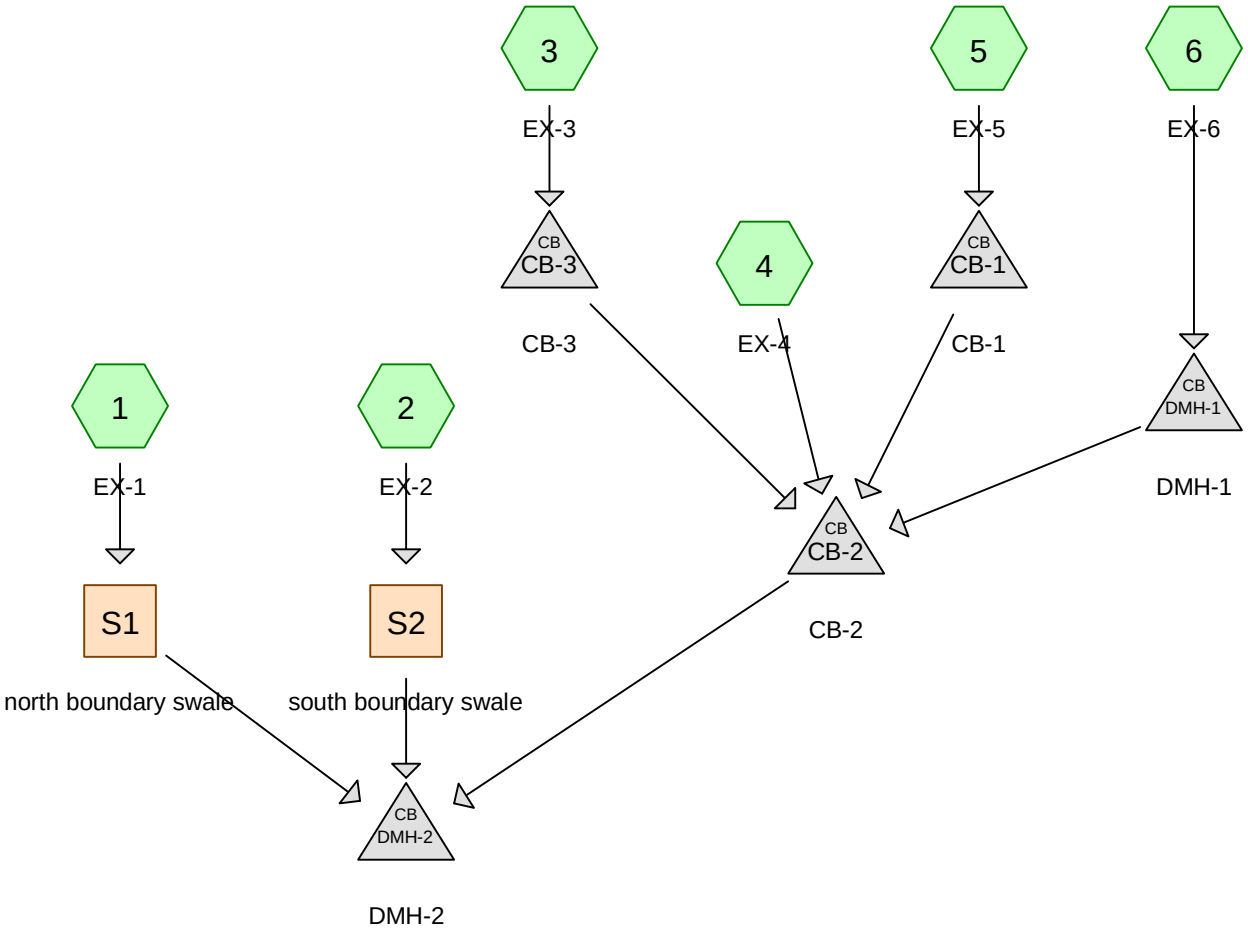
Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX B



Subcat Reach Pond Link

Drainage Diagram for 562801-Exist Allenstown Comm Center
Prepared by {enter your company name here}, Printed 3/16/2015
HydroCAD® 9.10 s/n 00471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.096	39	>75% Grass cover, Good, HSG A (1, 2, 3, 4, 5)
0.423	46	2 acre lots, 12% imp, HSG A (3)
1.096	51	1 acre lots, 20% imp, HSG A (1)
4.234	54	1/2 acre lots, 25% imp, HSG A (4, 5, 6)
1.614	61	1/4 acre lots, 38% imp, HSG A (1, 2)
0.475	98	Paved parking, HSG A (1, 2, 3)
0.144	98	Reynolds, Whitten Pavement (1)
0.069	98	Unconnected roofs, HSG A (2)
0.189	98	reynolds (2)
9.341		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
9.007	HSG A	1, 2, 3, 4, 5, 6
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.334	Other	1, 2
9.341		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	6	0.00	0.00	286.0	0.0400	0.013	8.0	0.0	0.0
2	CB-1	274.27	273.36	18.0	0.0506	0.010	8.0	0.0	0.0
3	CB-2	271.38	254.10	266.0	0.0650	0.025	8.0	0.0	0.0
4	CB-3	272.42	271.38	60.0	0.0173	0.025	8.0	0.0	0.0
5	DMH-1	275.43	271.48	136.0	0.0290	0.013	8.0	0.0	0.0
6	DMH-2	253.24	246.24	200.0	0.0350	0.013	10.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-1 Runoff Area=106,619 sf 31.99% Impervious Runoff Depth=0.24"
Flow Length=887' Tc=17.1 min CN=58 Runoff=0.23 cfs 0.049 af

Subcatchment 2: EX-2 Runoff Area=82,355 sf 43.90% Impervious Runoff Depth=0.46"
Flow Length=580' Slope=0.0460 '/' Tc=9.9 min CN=65 Runoff=0.61 cfs 0.073 af

Subcatchment 3: EX-3 Runoff Area=26,342 sf 24.56% Impervious Runoff Depth=0.13"
Flow Length=551' Tc=10.7 min CN=53 Runoff=0.02 cfs 0.006 af

Subcatchment 4: EX-4 Runoff Area=680 sf 11.65% Impervious Runoff Depth=0.02"
Flow Length=302' Slope=0.0500 '/' Tc=9.3 min CN=46 Runoff=0.00 cfs 0.000 af

Subcatchment 5: EX-5 Runoff Area=50,148 sf 21.62% Impervious Runoff Depth=0.11"
Flow Length=561' Slope=0.0600 '/' Tc=11.1 min CN=52 Runoff=0.02 cfs 0.010 af

Subcatchment 6: EX-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=0.15"
Flow Length=698' Tc=13.0 min CN=54 Runoff=0.12 cfs 0.040 af

Reach S1: north boundary swale Avg. Flow Depth=0.03' Max Vel=1.03 fps Inflow=0.23 cfs 0.049 af
n=0.035 L=280.0' S=0.0571 '/' Capacity=117.19 cfs Outflow=0.22 cfs 0.049 af

Reach S2: south boundary swale Avg. Flow Depth=0.04' Max Vel=1.33 fps Inflow=0.61 cfs 0.073 af
n=0.035 L=285.0' S=0.0702 '/' Capacity=403.00 cfs Outflow=0.58 cfs 0.073 af

Pond CB-1: CB-1 Peak Elev=274.34' Inflow=0.02 cfs 0.010 af
8.0" Round Culvert n=0.010 L=18.0' S=0.0506 '/' Outflow=0.02 cfs 0.010 af

Pond CB-2: CB-2 Peak Elev=271.59' Inflow=0.15 cfs 0.056 af
8.0" Round Culvert n=0.025 L=266.0' S=0.0650 '/' Outflow=0.15 cfs 0.056 af

Pond CB-3: CB-3 Peak Elev=272.51' Inflow=0.02 cfs 0.006 af
8.0" Round Culvert n=0.025 L=60.0' S=0.0173 '/' Outflow=0.02 cfs 0.006 af

Pond DMH-1: DMH-1 Peak Elev=275.62' Inflow=0.12 cfs 0.040 af
8.0" Round Culvert n=0.013 L=136.0' S=0.0290 '/' Outflow=0.12 cfs 0.040 af

Pond DMH-2: DMH-2 Peak Elev=253.72' Inflow=0.77 cfs 0.179 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0350 '/' Outflow=0.77 cfs 0.179 af

Total Runoff Area = 9.341 ac Runoff Volume = 0.179 af Average Runoff Depth = 0.23"
69.81% Pervious = 6.521 ac 30.19% Impervious = 2.820 ac

Summary for Subcatchment 1: EX-1

Runoff = 0.23 cfs @ 12.49 hrs, Volume= 0.049 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

	Area (sf)	CN	Description
	47,758	51	1 acre lots, 20% imp, HSG A
	28,151	61	1/4 acre lots, 38% imp, HSG A
	16,851	39	>75% Grass cover, Good, HSG A
	7,572	98	Paved parking, HSG A
*	6,287	98	Reynolds, Whitten Pavement
	106,619	58	Weighted Average
	72,511		68.01% Pervious Area
	34,108		31.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
10.4	763	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.1	24	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
17.1	887	Total			

Summary for Subcatchment 2: EX-2

Runoff = 0.61 cfs @ 12.18 hrs, Volume= 0.073 af, Depth= 0.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

	Area (sf)	CN	Description
	42,149	61	1/4 acre lots, 38% imp, HSG A
	18,083	39	>75% Grass cover, Good, HSG A
*	8,243	98	reynolds
	3,019	98	Unconnected roofs, HSG A
	8,876	98	Paved parking, HSG A
	1,985	39	>75% Grass cover, Good, HSG A
	82,355	65	Weighted Average
	46,200		56.10% Pervious Area
	36,155		43.90% Impervious Area
	3,019		8.35% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0460	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
2.5	480	0.0460	3.22		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
9.9	580	Total			

Summary for Subcatchment 3: EX-3

Runoff = 0.02 cfs @ 12.53 hrs, Volume= 0.006 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
18,409	46	2 acre lots, 12% imp, HSG A
3,673	39	>75% Grass cover, Good, HSG A
4,260	98	Paved parking, HSG A
26,342	53	Weighted Average
19,873		75.44% Pervious Area
6,469		24.56% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
3.8	387	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	64	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
10.7	551	Total			

Summary for Subcatchment 4: EX-4

Runoff = 0.00 cfs @ 16.91 hrs, Volume= 0.000 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
317	54	1/2 acre lots, 25% imp, HSG A
363	39	>75% Grass cover, Good, HSG A
680	46	Weighted Average
601		88.35% Pervious Area
79		11.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
2.2	202	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.3	302	Total			

Summary for Subcatchment 5: EX-5

Runoff = 0.02 cfs @ 12.92 hrs, Volume= 0.010 af, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
43,372	54	1/2 acre lots, 25% imp, HSG A
6,776	39	>75% Grass cover, Good, HSG A
50,148	52	Weighted Average
39,305		78.38% Pervious Area
10,843		21.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
4.5	461	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	561	Total			

Summary for Subcatchment 6: EX-6

Runoff = 0.12 cfs @ 12.53 hrs, Volume= 0.040 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
140,742	54	1/2 acre lots, 25% imp, HSG A
105,557		75.00% Pervious Area
35,186		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0380	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
4.3	312	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	286	0.0400	6.92	2.42	**Pipe Channel, Offsite Piped Flow from East** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Clay tile
13.0	698	Total			

Summary for Reach S1: north boundary swale

Inflow Area = 2.448 ac, 31.99% Impervious, Inflow Depth = 0.24" for 2-yr event
Inflow = 0.23 cfs @ 12.49 hrs, Volume= 0.049 af
Outflow = 0.22 cfs @ 12.54 hrs, Volume= 0.049 af, Atten= 2%, Lag= 3.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.03 fps, Min. Travel Time= 4.5 min
Avg. Velocity = 0.56 fps, Avg. Travel Time= 8.4 min

Peak Storage= 60 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.03'
Defined Flood Depth= 1.00', Capacity at Flood Depth= 117.19 cfs
Bank-Full Depth= 1.00', Capacity at Bank-Full= 117.19 cfs

6.00' x 1.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 26.00'
Length= 280.0' Slope= 0.0571 '/'
Inlet Invert= 276.00', Outlet Invert= 260.00'

‡

Summary for Reach S2: south boundary swale

Inflow Area = 1.891 ac, 43.90% Impervious, Inflow Depth = 0.46" for 2-yr event
Inflow = 0.61 cfs @ 12.18 hrs, Volume= 0.073 af
Outflow = 0.58 cfs @ 12.24 hrs, Volume= 0.073 af, Atten= 5%, Lag= 3.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.33 fps, Min. Travel Time= 3.6 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 6.7 min

Peak Storage= 124 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.04'
Defined Flood Depth= 1.50', Capacity at Flood Depth= 403.00 cfs

Bank-Full Depth= 1.50', Capacity at Bank-Full= 403.00 cfs

10.00' x 1.50' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 10.0 '/' Top Width= 40.00'
Length= 285.0' Slope= 0.0702 '/'
Inlet Invert= 280.00', Outlet Invert= 260.00'

‡

Summary for Pond CB-1: CB-1

Inflow Area = 1.151 ac, 21.62% Impervious, Inflow Depth = 0.11" for 2-yr event
Inflow = 0.02 cfs @ 12.92 hrs, Volume= 0.010 af
Outflow = 0.02 cfs @ 12.92 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 12.92 hrs, Volume= 0.010 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.34' @ 12.92 hrs
Flood Elev= 275.57'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.27'	**8.0" Round Culvert** L= 18.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 274.27' / 273.36' S= 0.0506 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.02 cfs @ 12.92 hrs HW=274.34' TW=271.56' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.02 cfs @ 0.90 fps)

Summary for Pond CB-2: CB-2

Inflow Area = 5.003 ac, 24.13% Impervious, Inflow Depth = 0.14" for 2-yr event
Inflow = 0.15 cfs @ 12.54 hrs, Volume= 0.056 af
Outflow = 0.15 cfs @ 12.54 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.54 hrs, Volume= 0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 271.59' @ 12.54 hrs
Flood Elev= 275.28'

Device	Routing	Invert	Outlet Devices
#1	Primary	271.38'	**8.0" Round Culvert** L= 266.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 271.38' / 254.10' S= 0.0650 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=0.15 cfs @ 12.54 hrs HW=271.59' TW=253.70' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.15 cfs @ 1.56 fps)

Summary for Pond CB-3: CB-3

Inflow Area = 0.605 ac, 24.56% Impervious, Inflow Depth = 0.13" for 2-yr event
Inflow = 0.02 cfs @ 12.53 hrs, Volume= 0.006 af
Outflow = 0.02 cfs @ 12.53 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.02 cfs @ 12.53 hrs, Volume= 0.006 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 272.51' @ 12.53 hrs
Flood Elev= 274.22'

Device	Routing	Invert	Outlet Devices
#1	Primary	272.42'	**8.0" Round Culvert** L= 60.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 272.42' / 271.38' S= 0.0173 '/' Cc= 0.900 n= 0.025 Corrugated metal

Primary OutFlow Max=0.02 cfs @ 12.53 hrs HW=272.51' TW=271.59' (Dynamic Tailwater)
1=Culvert (Outlet Controls 0.02 cfs @ 0.87 fps)

Summary for Pond DMH-1: DMH-1

Inflow Area = 3.231 ac, 25.00% Impervious, Inflow Depth = 0.15" for 2-yr event
Inflow = 0.12 cfs @ 12.53 hrs, Volume= 0.040 af
Outflow = 0.12 cfs @ 12.53 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.53 hrs, Volume= 0.040 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 275.62' @ 12.53 hrs
Flood Elev= 281.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	275.43'	**8.0" Round Culvert** L= 136.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 275.43' / 271.48' S= 0.0290 '/' Cc= 0.900 n= 0.013 Clay tile

Primary OutFlow Max=0.12 cfs @ 12.53 hrs HW=275.61' TW=271.59' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.12 cfs @ 1.46 fps)

Summary for Pond DMH-2: DMH-2

Inflow Area = 9.341 ac, 30.19% Impervious, Inflow Depth = 0.23" for 2-yr event
Inflow = 0.77 cfs @ 12.45 hrs, Volume= 0.179 af
Outflow = 0.77 cfs @ 12.45 hrs, Volume= 0.179 af, Atten= 0%, Lag= 0.0 min
Primary = 0.77 cfs @ 12.45 hrs, Volume= 0.179 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 253.72' @ 12.45 hrs
Flood Elev= 258.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.24'	**10.0" Round Culvert**

L= 200.0' RCP, sq.cut end projecting, Ke= 0.500
Inlet / Outlet Invert= 253.24' / 246.24' S= 0.0350 '/' Cc= 0.900
n= 0.013 Clay tile

Primary OutFlow Max=0.77 cfs @ 12.45 hrs HW=253.72' (Free Discharge)
1=Culvert (Inlet Controls 0.77 cfs @ 2.36 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-1 Runoff Area=106,619 sf 31.99% Impervious Runoff Depth=0.85"
Flow Length=887' Tc=17.1 min CN=58 Runoff=1.38 cfs 0.174 af

Subcatchment 2: EX-2 Runoff Area=82,355 sf 43.90% Impervious Runoff Depth=1.27"
Flow Length=580' Slope=0.0460 '/' Tc=9.9 min CN=65 Runoff=2.24 cfs 0.200 af

Subcatchment 3: EX-3 Runoff Area=26,342 sf 24.56% Impervious Runoff Depth=0.60"
Flow Length=551' Tc=10.7 min CN=53 Runoff=0.22 cfs 0.030 af

Subcatchment 4: EX-4 Runoff Area=680 sf 11.65% Impervious Runoff Depth=0.31"
Flow Length=302' Slope=0.0500 '/' Tc=9.3 min CN=46 Runoff=0.00 cfs 0.000 af

Subcatchment 5: EX-5 Runoff Area=50,148 sf 21.62% Impervious Runoff Depth=0.55"
Flow Length=561' Slope=0.0600 '/' Tc=11.1 min CN=52 Runoff=0.35 cfs 0.053 af

Subcatchment 6: EX-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=0.65"
Flow Length=698' Tc=13.0 min CN=54 Runoff=1.28 cfs 0.175 af

Reach S1: north boundary swale Avg. Flow Depth=0.10' Max Vel=1.98 fps Inflow=1.38 cfs 0.174 af
n=0.035 L=280.0' S=0.0571 '/' Capacity=117.19 cfs Outflow=1.37 cfs 0.174 af

Reach S2: south boundary swale Avg. Flow Depth=0.09' Max Vel=2.16 fps Inflow=2.24 cfs 0.200 af
n=0.035 L=285.0' S=0.0702 '/' Capacity=403.00 cfs Outflow=2.17 cfs 0.200 af

Pond CB-1: CB-1 Peak Elev=283.32' Inflow=0.35 cfs 0.053 af
8.0" Round Culvert n=0.010 L=18.0' S=0.0506 '/' Outflow=0.35 cfs 0.053 af

Pond CB-2: CB-2 Peak Elev=283.28' Inflow=1.85 cfs 0.258 af
8.0" Round Culvert n=0.025 L=266.0' S=0.0650 '/' Outflow=1.85 cfs 0.258 af

Pond CB-3: CB-3 Peak Elev=283.35' Inflow=0.22 cfs 0.030 af
8.0" Round Culvert n=0.025 L=60.0' S=0.0173 '/' Outflow=0.22 cfs 0.030 af

Pond DMH-1: DMH-1 Peak Elev=284.96' Inflow=1.28 cfs 0.175 af
8.0" Round Culvert n=0.013 L=136.0' S=0.0290 '/' Outflow=1.28 cfs 0.175 af

Pond DMH-2: DMH-2 Peak Elev=259.68' Inflow=5.04 cfs 0.632 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0350 '/' Outflow=5.04 cfs 0.632 af

Total Runoff Area = 9.341 ac Runoff Volume = 0.632 af Average Runoff Depth = 0.81"
69.81% Pervious = 6.521 ac 30.19% Impervious = 2.820 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-1 Runoff Area=106,619 sf 31.99% Impervious Runoff Depth=1.17"
Flow Length=887' Tc=17.1 min CN=58 Runoff=2.06 cfs 0.238 af

Subcatchment 2: EX-2 Runoff Area=82,355 sf 43.90% Impervious Runoff Depth=1.65"
Flow Length=580' Slope=0.0460 '/' Tc=9.9 min CN=65 Runoff=3.01 cfs 0.261 af

Subcatchment 3: EX-3 Runoff Area=26,342 sf 24.56% Impervious Runoff Depth=0.86"
Flow Length=551' Tc=10.7 min CN=53 Runoff=0.38 cfs 0.043 af

Subcatchment 4: EX-4 Runoff Area=680 sf 11.65% Impervious Runoff Depth=0.49"
Flow Length=302' Slope=0.0500 '/' Tc=9.3 min CN=46 Runoff=0.00 cfs 0.001 af

Subcatchment 5: EX-5 Runoff Area=50,148 sf 21.62% Impervious Runoff Depth=0.80"
Flow Length=561' Slope=0.0600 '/' Tc=11.1 min CN=52 Runoff=0.63 cfs 0.077 af

Subcatchment 6: EX-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=0.92"
Flow Length=698' Tc=13.0 min CN=54 Runoff=2.11 cfs 0.248 af

Reach S1: north boundary swale Avg. Flow Depth=0.12' Max Vel=2.27 fps Inflow=2.06 cfs 0.238 af
n=0.035 L=280.0' S=0.0571 '/' Capacity=117.19 cfs Outflow=2.04 cfs 0.238 af

Reach S2: south boundary swale Avg. Flow Depth=0.11' Max Vel=2.40 fps Inflow=3.01 cfs 0.261 af
n=0.035 L=285.0' S=0.0702 '/' Capacity=403.00 cfs Outflow=2.93 cfs 0.261 af

Pond CB-1: CB-1 Peak Elev=340.15' Inflow=0.63 cfs 0.077 af
8.0" Round Culvert n=0.010 L=18.0' S=0.0506 '/' Outflow=0.63 cfs 0.077 af

Pond CB-2: CB-2 Peak Elev=340.03' Inflow=3.12 cfs 0.369 af
8.0" Round Culvert n=0.025 L=266.0' S=0.0650 '/' Outflow=3.12 cfs 0.369 af

Pond CB-3: CB-3 Peak Elev=340.21' Inflow=0.38 cfs 0.043 af
8.0" Round Culvert n=0.025 L=60.0' S=0.0173 '/' Outflow=0.38 cfs 0.043 af

Pond DMH-1: DMH-1 Peak Elev=344.42' Inflow=2.11 cfs 0.248 af
8.0" Round Culvert n=0.013 L=136.0' S=0.0290 '/' Outflow=2.11 cfs 0.248 af

Pond DMH-2: DMH-2 Peak Elev=276.45' Inflow=7.70 cfs 0.868 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0350 '/' Outflow=7.70 cfs 0.868 af

Total Runoff Area = 9.341 ac Runoff Volume = 0.868 af Average Runoff Depth = 1.11"
69.81% Pervious = 6.521 ac 30.19% Impervious = 2.820 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1: EX-1 Runoff Area=106,619 sf 31.99% Impervious Runoff Depth=1.45"
Flow Length=887' Tc=17.1 min CN=58 Runoff=2.67 cfs 0.297 af

Subcatchment 2: EX-2 Runoff Area=82,355 sf 43.90% Impervious Runoff Depth=1.99"
Flow Length=580' Slope=0.0460 '/' Tc=9.9 min CN=65 Runoff=3.70 cfs 0.314 af

Subcatchment 3: EX-3 Runoff Area=26,342 sf 24.56% Impervious Runoff Depth=1.10"
Flow Length=551' Tc=10.7 min CN=53 Runoff=0.52 cfs 0.056 af

Subcatchment 4: EX-4 Runoff Area=680 sf 11.65% Impervious Runoff Depth=0.67"
Flow Length=302' Slope=0.0500 '/' Tc=9.3 min CN=46 Runoff=0.01 cfs 0.001 af

Subcatchment 5: EX-5 Runoff Area=50,148 sf 21.62% Impervious Runoff Depth=1.04"
Flow Length=561' Slope=0.0600 '/' Tc=11.1 min CN=52 Runoff=0.90 cfs 0.099 af

Subcatchment 6: EX-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=1.17"
Flow Length=698' Tc=13.0 min CN=54 Runoff=2.89 cfs 0.315 af

Reach S1: north boundary swale Avg. Flow Depth=0.14' Max Vel=2.47 fps Inflow=2.67 cfs 0.297 af
n=0.035 L=280.0' S=0.0571 '/' Capacity=117.19 cfs Outflow=2.64 cfs 0.297 af

Reach S2: south boundary swale Avg. Flow Depth=0.12' Max Vel=2.59 fps Inflow=3.70 cfs 0.314 af
n=0.035 L=285.0' S=0.0702 '/' Capacity=403.00 cfs Outflow=3.64 cfs 0.314 af

Pond CB-1: CB-1 Peak Elev=421.83' Inflow=0.90 cfs 0.099 af
8.0" Round Culvert n=0.010 L=18.0' S=0.0506 '/' Outflow=0.90 cfs 0.099 af

Pond CB-2: CB-2 Peak Elev=421.60' Inflow=4.31 cfs 0.471 af
8.0" Round Culvert n=0.025 L=266.0' S=0.0650 '/' Outflow=4.31 cfs 0.471 af

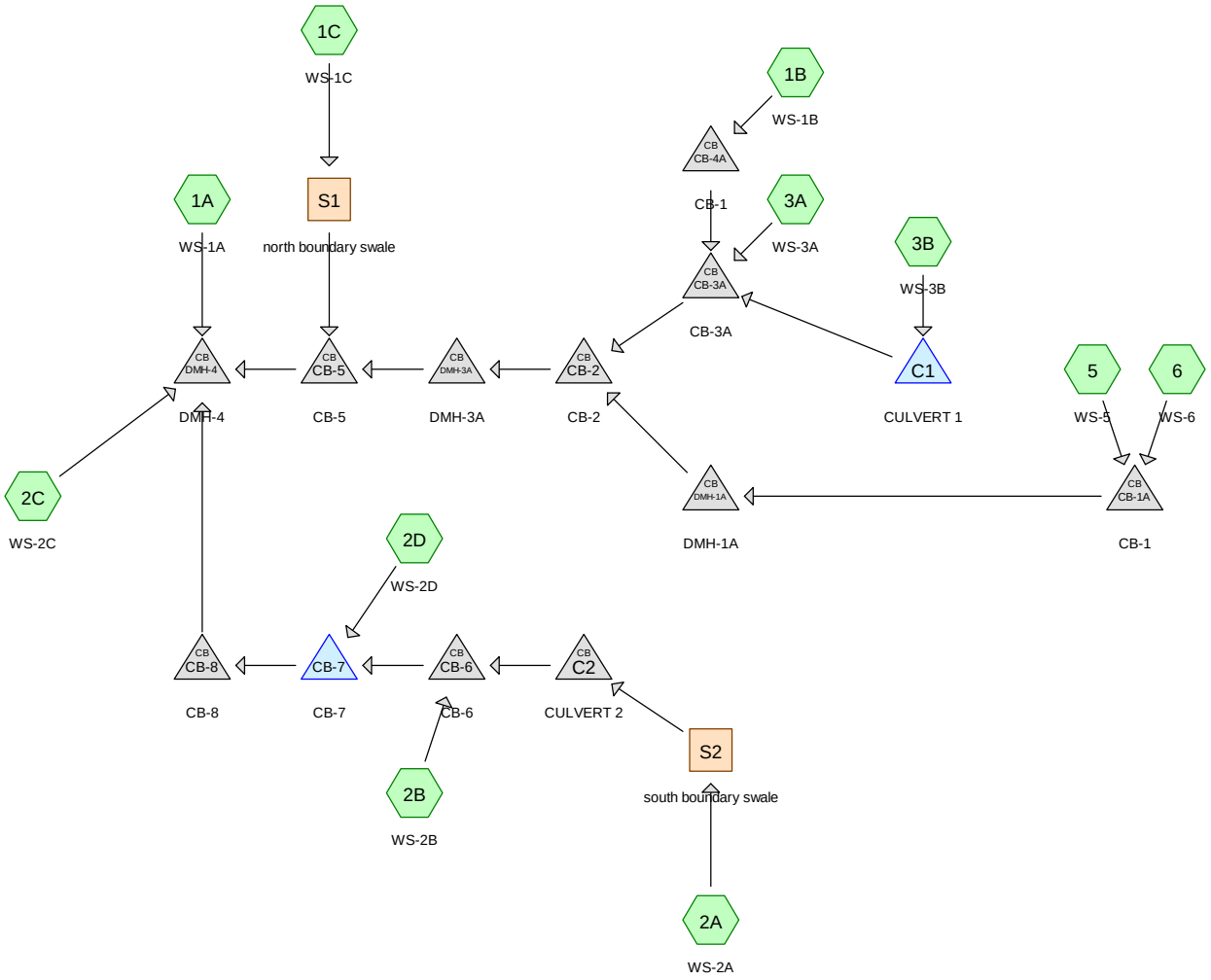
Pond CB-3: CB-3 Peak Elev=421.95' Inflow=0.52 cfs 0.056 af
8.0" Round Culvert n=0.025 L=60.0' S=0.0173 '/' Outflow=0.52 cfs 0.056 af

Pond DMH-1: DMH-1 Peak Elev=429.94' Inflow=2.89 cfs 0.315 af
8.0" Round Culvert n=0.013 L=136.0' S=0.0290 '/' Outflow=2.89 cfs 0.315 af

Pond DMH-2: DMH-2 Peak Elev=297.62' Inflow=10.09 cfs 1.082 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0350 '/' Outflow=10.09 cfs 1.082 af

Total Runoff Area = 9.341 ac Runoff Volume = 1.082 af Average Runoff Depth = 1.39"
69.81% Pervious = 6.521 ac 30.19% Impervious = 2.820 ac

APPENDIX C



Subcat Reach Pond Link

Drainage Diagram for 562801-Prop Allenstown Comm Center
Prepared by {enter your company name here}, Printed 3/16/2015
HydroCAD® 9.10 s/n 00471 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.874	39	>75% Grass cover, Good, HSG A (1A, 1B, 1C, 2A, 2B, 2D, 3B)
0.819	46	2 acre lots, 12% imp, HSG A (3B)
0.935	51	1 acre lots, 20% imp, HSG A (1B)
3.957	54	1/2 acre lots, 25% imp, HSG A (5, 6)
1.742	61	1/4 acre lots, 38% imp, HSG A (1A, 2A)
0.834	98	Paved parking, HSG A (1B, 1C, 2A, 2B, 2C, 3A, 3B)
0.290	98	Paved roads w/curbs & sewers, HSG A (1A)
0.038	98	Roofs, HSG A (1C)
9.490		**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
9.490	HSG A	1A, 1B, 1C, 2A, 2B, 2C, 2D, 3A, 3B, 5, 6
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
9.490		**TOTAL AREA**

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Fill (inches)
1	6	0.00	0.00	286.0	0.0400	0.013	8.0	0.0	0.0
2	C1	275.50	274.25	33.0	0.0379	0.010	18.0	0.0	0.0
3	C2	262.00	255.75	8.0	0.7813	0.010	18.0	0.0	0.0
4	CB-1A	275.75	274.53	122.0	0.0100	0.010	12.0	0.0	0.0
5	CB-2	270.90	265.48	175.0	0.0310	0.010	18.0	0.0	0.0
6	CB-3A	272.45	271.00	51.0	0.0284	0.010	18.0	0.0	0.0
7	CB-4A	273.75	272.55	119.5	0.0100	0.010	12.0	0.0	0.0
8	CB-5	253.65	253.25	18.0	0.0222	0.010	18.0	0.0	0.0
9	CB-6	255.65	255.16	49.0	0.0100	0.010	18.0	0.0	0.0
10	CB-7	255.06	254.24	82.0	0.0100	0.010	18.0	0.0	0.0
11	CB-8	253.24	253.00	42.0	0.0057	0.010	18.0	0.0	0.0
12	DMH-1A	274.06	273.89	17.5	0.0097	0.010	12.0	0.0	0.0
13	DMH-3A	270.90	253.75	82.0	0.2091	0.010	18.0	0.0	0.0
14	DMH-4	253.00	247.00	200.0	0.0300	0.013	10.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: WS-1A Runoff Area=45,731 sf 54.20% Impervious Runoff Depth=0.70"
Flow Length=508' Tc=9.6 min CN=71 Runoff=0.66 cfs 0.062 af

Subcatchment 1B: WS-1B Runoff Area=43,860 sf 24.41% Impervious Runoff Depth=0.15"
Flow Length=607' Tc=14.1 min CN=54 Runoff=0.04 cfs 0.012 af

Subcatchment 1C: WS-1C Runoff Area=27,533 sf 32.94% Impervious Runoff Depth=0.24"
Flow Length=351' Tc=9.0 min CN=58 Runoff=0.06 cfs 0.013 af

Subcatchment 2A: WS-2A Runoff Area=70,105 sf 48.25% Impervious Runoff Depth=0.54"
Flow Length=466' Slope=0.0460 '/' Tc=11.5 min CN=67 Runoff=0.64 cfs 0.072 af

Subcatchment 2B: WS-2B Runoff Area=2,611 sf 11.18% Impervious Runoff Depth=0.02"
Flow Length=132' Slope=0.0250 '/' Tc=9.9 min CN=46 Runoff=0.00 cfs 0.000 af

Subcatchment 2C: WS-2C Runoff Area=4,493 sf 100.00% Impervious Runoff Depth=2.67"
Flow Length=267' Tc=1.7 min CN=98 Runoff=0.31 cfs 0.023 af

Subcatchment 2D: WS-2D Runoff Area=2,894 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=64' Slope=0.2000 '/' Tc=2.9 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 3A: WS-3A Runoff Area=3,800 sf 100.00% Impervious Runoff Depth=2.67"
Flow Length=181' Tc=1.7 min CN=98 Runoff=0.27 cfs 0.019 af

Subcatchment 3B: WS-3B Runoff Area=39,994 sf 12.31% Impervious Runoff Depth=0.02"
Flow Length=585' Tc=14.0 min CN=46 Runoff=0.00 cfs 0.002 af

Subcatchment 5: WS-5 Runoff Area=31,606 sf 25.00% Impervious Runoff Depth=0.15"
Flow Length=385' Tc=9.6 min CN=54 Runoff=0.03 cfs 0.009 af

Subcatchment 6: WS-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=0.15"
Flow Length=698' Tc=13.0 min CN=54 Runoff=0.12 cfs 0.040 af

Reach S1: north boundary swale Avg. Flow Depth=0.02' Max Vel=0.89 fps Inflow=0.06 cfs 0.013 af
n=0.030 L=256.0' S=0.0684 '/' Capacity=69.96 cfs Outflow=0.06 cfs 0.013 af

Reach S2: south boundary swale Avg. Flow Depth=0.07' Max Vel=2.01 fps Inflow=0.64 cfs 0.072 af
n=0.030 L=266.0' S=0.0583 '/' Capacity=64.60 cfs Outflow=0.63 cfs 0.072 af

Pond C1: CULVERT 1 Peak Elev=276.00' Storage=0 cf Inflow=0.00 cfs 0.002 af
18.0" Round Culvert n=0.010 L=33.0' S=0.0379 '/' Outflow=0.00 cfs 0.002 af

Pond C2: CULVERT 2 Peak Elev=262.35' Inflow=0.63 cfs 0.072 af
18.0" Round Culvert n=0.010 L=8.0' S=0.7813 '/' Outflow=0.63 cfs 0.072 af

Pond CB-1A: CB-1 Peak Elev=275.93' Inflow=0.14 cfs 0.049 af
12.0" Round Culvert n=0.010 L=122.0' S=0.0100 '/' Outflow=0.14 cfs 0.049 af

Pond CB-2: CB-2 Peak Elev=271.27' Inflow=0.27 cfs 0.082 af
18.0" Round Culvert n=0.010 L=175.0' S=0.0310 '/' Outflow=0.27 cfs 0.082 af

Pond CB-3A: CB-3A Peak Elev=272.67' Inflow=0.27 cfs 0.034 af
18.0" Round Culvert n=0.010 L=51.0' S=0.0284 '/' Outflow=0.27 cfs 0.034 af

Pond CB-4A: CB-1 Peak Elev=273.84' Inflow=0.04 cfs 0.012 af
12.0" Round Culvert n=0.010 L=119.5' S=0.0100 '/' Outflow=0.04 cfs 0.012 af

Pond CB-5: CB-5 Peak Elev=253.88' Inflow=0.27 cfs 0.095 af
18.0" Round Culvert n=0.010 L=18.0' S=0.0222 '/' Outflow=0.27 cfs 0.095 af

Pond CB-6: CB-6 Peak Elev=259.51' Inflow=0.63 cfs 0.072 af
18.0" Round Culvert n=0.010 L=49.0' S=0.0100 '/' Outflow=0.63 cfs 0.072 af

Pond CB-7: CB-7 Peak Elev=259.50' Storage=0 cf Inflow=0.63 cfs 0.072 af
18.0" Round Culvert n=0.010 L=82.0' S=0.0100 '/' Outflow=0.63 cfs 0.072 af

Pond CB-8: CB-8 Peak Elev=253.81' Inflow=0.63 cfs 0.072 af
18.0" Round Culvert n=0.010 L=42.0' S=0.0057 '/' Outflow=0.63 cfs 0.072 af

Pond DMH-1A: DMH-1A Peak Elev=274.24' Inflow=0.14 cfs 0.049 af
12.0" Round Culvert n=0.010 L=17.5' S=0.0097 '/' Outflow=0.14 cfs 0.049 af

Pond DMH-3A: DMH-3A Peak Elev=271.12' Inflow=0.27 cfs 0.082 af
18.0" Round Culvert n=0.010 L=82.0' S=0.2091 '/' Outflow=0.27 cfs 0.082 af

Pond DMH-4: DMH-4 Peak Elev=253.73' Inflow=1.48 cfs 0.251 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0300 '/' Outflow=1.48 cfs 0.251 af

Total Runoff Area = 9.490 ac Runoff Volume = 0.252 af Average Runoff Depth = 0.32"
67.35% Pervious = 6.391 ac 32.65% Impervious = 3.099 ac

Summary for Subcatchment 1A: WS-1A

Runoff = 0.66 cfs @ 12.16 hrs, Volume= 0.062 af, Depth= 0.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
31,245	61	1/4 acre lots, 38% imp, HSG A
12,634	98	Paved roads w/curbs & sewers, HSG A
738	61	1/4 acre lots, 38% imp, HSG A
1,114	39	>75% Grass cover, Good, HSG A
45,731	71	Weighted Average
20,943		45.80% Pervious Area
24,788		54.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	100	0.0700	0.27		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
3.0	331	0.0700	1.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	77	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
9.6	508	Total			

Summary for Subcatchment 1B: WS-1B

Runoff = 0.04 cfs @ 12.55 hrs, Volume= 0.012 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
40,745	51	1 acre lots, 20% imp, HSG A
558	39	>75% Grass cover, Good, HSG A
2,557	98	Paved parking, HSG A
43,860	54	Weighted Average
33,154		75.59% Pervious Area
10,706		24.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
6.6	445	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.4	62	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
14.1	607	Total			

Summary for Subcatchment 1C: WS-1C

Runoff = 0.06 cfs @ 12.37 hrs, Volume= 0.013 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
7,420	98	Paved parking, HSG A
1,648	98	Roofs, HSG A
18,465	39	>75% Grass cover, Good, HSG A
27,533	58	Weighted Average
18,465		67.06% Pervious Area
9,068		32.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
1.2	105	0.0400	1.40		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.6	146	0.0700	3.97		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
9.0	351	Total			

Summary for Subcatchment 2A: WS-2A

Runoff = 0.64 cfs @ 12.20 hrs, Volume= 0.072 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
43,883	61	1/4 acre lots, 38% imp, HSG A
17,148	98	Paved parking, HSG A
9,074	39	>75% Grass cover, Good, HSG A
70,105	67	Weighted Average
36,281		51.75% Pervious Area
33,824		48.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	100	0.0460	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
4.1	366	0.0460	1.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	466	Total			

Summary for Subcatchment 2B: WS-2B

Runoff = 0.00 cfs @ 16.93 hrs, Volume= 0.000 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
292	98	Paved parking, HSG A
2,319	39	>75% Grass cover, Good, HSG A
2,611	46	Weighted Average
2,319		88.82% Pervious Area
292		11.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	100	0.0250	0.18		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
0.5	32	0.0250	1.11		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.9	132	Total			

Summary for Subcatchment 2C: WS-2C

Runoff = 0.31 cfs @ 12.03 hrs, Volume= 0.023 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
4,493	98	Paved parking, HSG A
4,493		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0200	0.95		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.90"
1.3	247	0.0250	3.21		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.7	267	Total			

Summary for Subcatchment 2D: WS-2D

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

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
2,894	39	>75% Grass cover, Good, HSG A
2,894		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	64	0.2000	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"

Summary for Subcatchment 3A: WS-3A

Runoff = 0.27 cfs @ 12.03 hrs, Volume= 0.019 af, Depth= 2.67"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
3,800	98	Paved parking, HSG A
3,800		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	20	0.0200	0.95		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 2.90"
1.0	118	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.3	43	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.7	181	Total			

Summary for Subcatchment 3B: WS-3B

Runoff = 0.00 cfs @ 16.97 hrs, Volume= 0.002 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
35,687	46	2 acre lots, 12% imp, HSG A
3,667	39	>75% Grass cover, Good, HSG A
640	98	Paved parking, HSG A
39,994	46	Weighted Average
35,072		87.69% Pervious Area
4,922		12.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	100	0.0500	0.23		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
6.6	442	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.3	43	0.0200	2.12		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
14.0	585	Total			

Summary for Subcatchment 5: WS-5

Runoff = 0.03 cfs @ 12.48 hrs, Volume= 0.009 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
31,606	54	1/2 acre lots, 25% imp, HSG A
23,705		75.00% Pervious Area
7,902		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.6	100	0.0600	0.25		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
3.0	285	0.0500	1.57		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	385	Total			

Summary for Subcatchment 6: WS-6

Runoff = 0.12 cfs @ 12.53 hrs, Volume= 0.040 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=2.90"

Area (sf)	CN	Description
140,742	54	1/2 acre lots, 25% imp, HSG A
105,557		75.00% Pervious Area
35,186		25.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	100	0.0380	0.21		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.90"
4.3	312	0.0300	1.21		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.7	286	0.0400	6.92	2.42	**Pipe Channel, Offsite Piped Flow from East** 8.0" Round Area= 0.3 sf Perim= 2.1' r= 0.17' n= 0.013 Clay tile
13.0	698	Total			

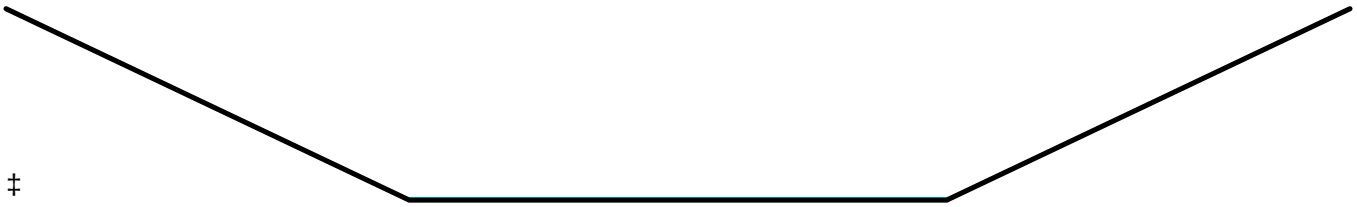
Summary for Reach S1: north boundary swale

Inflow Area = 0.632 ac, 32.94% Impervious, Inflow Depth = 0.24" for 2-yr event
Inflow = 0.06 cfs @ 12.37 hrs, Volume= 0.013 af
Outflow = 0.06 cfs @ 12.43 hrs, Volume= 0.013 af, Atten= 3%, Lag= 3.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 7.0 min

Peak Storage= 18 cf @ 12.43 hrs
Average Depth at Peak Storage= 0.02'
Defined Flood Depth= 1.50', Capacity at Flood Depth= 138.59 cfs
Bank-Full Depth= 1.00', Capacity at Bank-Full= 69.96 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 256.0' Slope= 0.0684 '/'
Inlet Invert= 277.00', Outlet Invert= 259.50'



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Summary for Reach S2: south boundary swale

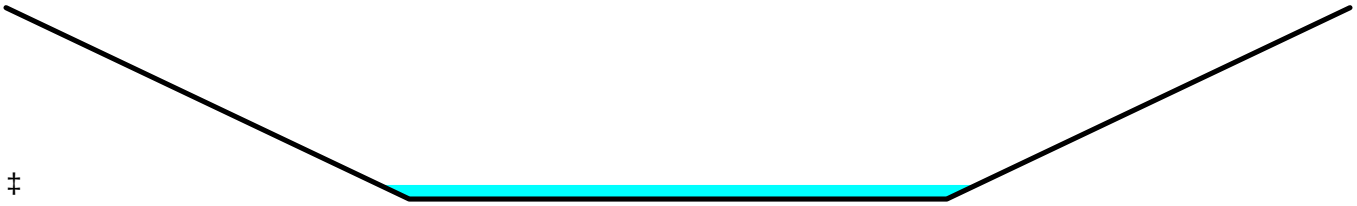
Inflow Area = 1.609 ac, 48.25% Impervious, Inflow Depth = 0.54" for 2-yr event
Inflow = 0.64 cfs @ 12.20 hrs, Volume= 0.072 af
Outflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af, Atten= 1%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.01 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.78 fps, Avg. Travel Time= 5.7 min

Peak Storage= 83 cf @ 12.22 hrs
Average Depth at Peak Storage= 0.07'
Defined Flood Depth= 1.50', Capacity at Flood Depth= 127.96 cfs

Bank-Full Depth= 1.00', Capacity at Bank-Full= 64.60 cfs

4.00' x 1.00' deep channel, n= 0.030 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 10.00'
Length= 266.0' Slope= 0.0583 '/'
Inlet Invert= 279.00', Outlet Invert= 263.50'



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Summary for Pond C1: CULVERT 1

Inflow Area = 0.918 ac, 12.31% Impervious, Inflow Depth = 0.02" for 2-yr event
Inflow = 0.00 cfs @ 16.97 hrs, Volume= 0.002 af
Outflow = 0.00 cfs @ 16.97 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min
Primary = 0.00 cfs @ 16.97 hrs, Volume= 0.002 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 276.00' @ 0.00 hrs Surf.Area= 25 sf Storage= 0 cf
Flood Elev= 278.00' Surf.Area= 502 sf Storage= 527 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (1,157.4 - 1,157.4)

Volume	Invert	Avail.Storage	Storage Description
#1	276.00'	527 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
276.00	25	0	0
278.00	502	527	527

Device	Routing	Invert	Outlet Devices
#1	Primary	275.50'	**18.0" Round Culvert** L= 33.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 275.50' / 274.25' S= 0.0379 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.00 cfs @ 16.97 hrs HW=276.00' TW=272.51' (Dynamic Tailwater)
1=Culvert (Passes 0.00 cfs of 1.24 cfs potential flow)

Summary for Pond C2: CULVERT 2

Inflow Area = 1.609 ac, 48.25% Impervious, Inflow Depth = 0.54" for 2-yr event
Inflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af
Outflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 262.35' @ 12.22 hrs
Flood Elev= 264.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	262.00'	**18.0" Round Culvert** L= 8.0' RCP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 262.00' / 255.75' S= 0.7813 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.62 cfs @ 12.22 hrs HW=262.35' TW=259.51' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.62 cfs @ 2.00 fps)

Summary for Pond CB-1A: CB-1

Inflow Area = 3.957 ac, 25.00% Impervious, Inflow Depth = 0.15" for 2-yr event
Inflow = 0.14 cfs @ 12.52 hrs, Volume= 0.049 af
Outflow = 0.14 cfs @ 12.52 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 12.52 hrs, Volume= 0.049 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 275.93' @ 12.52 hrs
Flood Elev= 281.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	275.75'	**12.0" Round Culvert** L= 122.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 275.75' / 274.53' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.14 cfs @ 12.52 hrs HW=275.93' TW=274.24' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.14 cfs @ 1.45 fps)

Summary for Pond CB-2: CB-2

Inflow Area = 5.969 ac, 24.04% Impervious, Inflow Depth = 0.17" for 2-yr event
Inflow = 0.27 cfs @ 12.03 hrs, Volume= 0.082 af
Outflow = 0.27 cfs @ 12.03 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.03 hrs, Volume= 0.082 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 271.27' @ 12.04 hrs
Flood Elev= 276.75'

Device	Routing	Invert	Outlet Devices
#1	Primary	270.90'	**18.0" Round Culvert** L= 175.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 270.90' / 265.48' S= 0.0310 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.24 cfs @ 12.03 hrs HW=271.26' TW=271.12' (Dynamic Tailwater)
↑**1=Culvert** (Outlet Controls 0.24 cfs @ 1.11 fps)

Summary for Pond CB-3A: CB-3A

Inflow Area = 2.012 ac, 22.16% Impervious, Inflow Depth = 0.20" for 2-yr event
Inflow = 0.27 cfs @ 12.03 hrs, Volume= 0.034 af
Outflow = 0.27 cfs @ 12.03 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.03 hrs, Volume= 0.034 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 272.67' @ 12.03 hrs
Flood Elev= 277.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	272.45'	**18.0" Round Culvert** L= 51.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 272.45' / 271.00' S= 0.0284 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.25 cfs @ 12.03 hrs HW=272.67' TW=271.26' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.25 cfs @ 1.59 fps)

Summary for Pond CB-4A: CB-1

Inflow Area = 1.007 ac, 24.41% Impervious, Inflow Depth = 0.15" for 2-yr event
Inflow = 0.04 cfs @ 12.55 hrs, Volume= 0.012 af
Outflow = 0.04 cfs @ 12.55 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min
Primary = 0.04 cfs @ 12.55 hrs, Volume= 0.012 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 273.84' @ 12.55 hrs
Flood Elev= 279.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	273.75'	**12.0" Round Culvert** L= 119.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 273.75' / 272.55' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.04 cfs @ 12.55 hrs HW=273.84' TW=272.56' (Dynamic Tailwater)
↑**1=Culvert** (Inlet Controls 0.04 cfs @ 1.02 fps)

Summary for Pond CB-5: CB-5

Inflow Area = 6.601 ac, 24.90% Impervious, Inflow Depth = 0.17" for 2-yr event
Inflow = 0.27 cfs @ 12.48 hrs, Volume= 0.095 af
Outflow = 0.27 cfs @ 12.48 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.48 hrs, Volume= 0.095 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 253.88' @ 12.48 hrs
Flood Elev= 259.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.65'	**18.0" Round Culvert** L= 18.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 253.65' / 253.25' S= 0.0222 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.27 cfs @ 12.48 hrs HW=253.88' TW=253.58' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.27 cfs @ 1.62 fps)

Summary for Pond CB-6: CB-6

Inflow Area = 1.669 ac, 46.92% Impervious, Inflow Depth = 0.52" for 2-yr event
Inflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af
Outflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 259.51' @ 12.22 hrs
Flood Elev= 261.50'

Device	Routing	Invert	Outlet Devices
#1	Primary	255.65'	**18.0" Round Culvert** L= 49.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 255.65' / 255.16' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.62 cfs @ 12.22 hrs HW=259.51' TW=259.50' (Dynamic Tailwater)
1=Culvert (Inlet Controls 0.62 cfs @ 0.35 fps)

Summary for Pond CB-7: CB-7

Inflow Area = 1.736 ac, 45.12% Impervious, Inflow Depth = 0.50" for 2-yr event
Inflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af
Outflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 259.50' @ 0.00 hrs Surf.Area= 15 sf Storage= 0 cf
Flood Elev= 260.00' Surf.Area= 318 sf Storage= 83 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (906.5 - 906.5)

Volume	Invert	Avail.Storage	Storage Description
#1	259.50'	83 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
259.50	15	0	0
260.00	318	83	83

Device	Routing	Invert	Outlet Devices
#1	Primary	255.06'	**18.0" Round Culvert** L= 82.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 255.06' / 254.24' S= 0.0100 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.00 cfs @ 12.22 hrs HW=259.50' TW=253.80' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 16.34 cfs potential flow)

Summary for Pond CB-8: CB-8

Inflow Area = 1.736 ac, 45.12% Impervious, Inflow Depth = 0.50" for 2-yr event
Inflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af
Outflow = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.22 hrs, Volume= 0.072 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 253.81' @ 12.24 hrs
Flood Elev= 258.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.24'	**18.0" Round Culvert** L= 42.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 253.24' / 253.00' S= 0.0057 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.64 cfs @ 12.22 hrs HW=253.80' TW=253.72' (Dynamic Tailwater)
└**1=Culvert** (Outlet Controls 0.64 cfs @ 1.55 fps)

Summary for Pond DMH-1A: DMH-1A

Inflow Area = 3.957 ac, 25.00% Impervious, Inflow Depth = 0.15" for 2-yr event
Inflow = 0.14 cfs @ 12.52 hrs, Volume= 0.049 af
Outflow = 0.14 cfs @ 12.52 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min
Primary = 0.14 cfs @ 12.52 hrs, Volume= 0.049 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 274.24' @ 12.52 hrs
Flood Elev= 277.25'

Device	Routing	Invert	Outlet Devices
#1	Primary	274.06'	**12.0" Round Culvert** L= 17.5' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 274.06' / 273.89' S= 0.0097 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.14 cfs @ 12.52 hrs HW=274.24' TW=271.24' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 0.14 cfs @ 2.20 fps)

Summary for Pond DMH-3A: DMH-3A

Inflow Area = 5.969 ac, 24.04% Impervious, Inflow Depth = 0.17" for 2-yr event
Inflow = 0.27 cfs @ 12.03 hrs, Volume= 0.082 af
Outflow = 0.27 cfs @ 12.03 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.03 hrs, Volume= 0.082 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 271.12' @ 12.03 hrs
Flood Elev= 271.23'

Device	Routing	Invert	Outlet Devices
#1	Primary	270.90'	**18.0" Round Culvert** L= 82.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 270.90' / 253.75' S= 0.2091 '/' Cc= 0.900 n= 0.010 PVC, smooth interior

Primary OutFlow Max=0.25 cfs @ 12.03 hrs HW=271.12' TW=253.87' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 0.25 cfs @ 1.59 fps)

Summary for Pond DMH-4: DMH-4

Inflow Area = 9.490 ac, 32.65% Impervious, Inflow Depth = 0.32" for 2-yr event
Inflow = 1.48 cfs @ 12.20 hrs, Volume= 0.251 af
Outflow = 1.48 cfs @ 12.20 hrs, Volume= 0.251 af, Atten= 0%, Lag= 0.0 min
Primary = 1.48 cfs @ 12.20 hrs, Volume= 0.251 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 253.73' @ 12.20 hrs
Flood Elev= 259.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	253.00'	**10.0" Round Culvert** L= 200.0' RCP, sq.cut end projecting, Ke= 0.500 Inlet / Outlet Invert= 253.00' / 247.00' S= 0.0300 '/' Cc= 0.900 n= 0.013 Clay tile

Primary OutFlow Max=1.47 cfs @ 12.20 hrs HW=253.73' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.47 cfs @ 2.91 fps)

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: WS-1A Runoff Area=45,731 sf 54.20% Impervious Runoff Depth=1.67"
Flow Length=508' Tc=9.6 min CN=71 Runoff=1.75 cfs 0.146 af

Subcatchment 1B: WS-1B Runoff Area=43,860 sf 24.41% Impervious Runoff Depth=0.65"
Flow Length=607' Tc=14.1 min CN=54 Runoff=0.39 cfs 0.054 af

Subcatchment 1C: WS-1C Runoff Area=27,533 sf 32.94% Impervious Runoff Depth=0.85"
Flow Length=351' Tc=9.0 min CN=58 Runoff=0.45 cfs 0.045 af

Subcatchment 2A: WS-2A Runoff Area=70,105 sf 48.25% Impervious Runoff Depth=1.40"
Flow Length=466' Slope=0.0460 '/' Tc=11.5 min CN=67 Runoff=2.05 cfs 0.188 af

Subcatchment 2B: WS-2B Runoff Area=2,611 sf 11.18% Impervious Runoff Depth=0.31"
Flow Length=132' Slope=0.0250 '/' Tc=9.9 min CN=46 Runoff=0.01 cfs 0.002 af

Subcatchment 2C: WS-2C Runoff Area=4,493 sf 100.00% Impervious Runoff Depth=4.16"
Flow Length=267' Tc=1.7 min CN=98 Runoff=0.48 cfs 0.036 af

Subcatchment 2D: WS-2D Runoff Area=2,894 sf 0.00% Impervious Runoff Depth=0.10"
Flow Length=64' Slope=0.2000 '/' Tc=2.9 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 3A: WS-3A Runoff Area=3,800 sf 100.00% Impervious Runoff Depth=4.16"
Flow Length=181' Tc=1.7 min CN=98 Runoff=0.41 cfs 0.030 af

Subcatchment 3B: WS-3B Runoff Area=39,994 sf 12.31% Impervious Runoff Depth=0.31"
Flow Length=585' Tc=14.0 min CN=46 Runoff=0.10 cfs 0.023 af

Subcatchment 5: WS-5 Runoff Area=31,606 sf 25.00% Impervious Runoff Depth=0.65"
Flow Length=385' Tc=9.6 min CN=54 Runoff=0.31 cfs 0.039 af

Subcatchment 6: WS-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=0.65"
Flow Length=698' Tc=13.0 min CN=54 Runoff=1.28 cfs 0.175 af

Reach S1: north boundary swale Avg. Flow Depth=0.06' Max Vel=1.85 fps Inflow=0.45 cfs 0.045 af
n=0.030 L=256.0' S=0.0684 '/' Capacity=69.96 cfs Outflow=0.43 cfs 0.045 af

Reach S2: south boundary swale Avg. Flow Depth=0.15' Max Vel=3.11 fps Inflow=2.05 cfs 0.188 af
n=0.030 L=266.0' S=0.0583 '/' Capacity=64.60 cfs Outflow=2.03 cfs 0.188 af

Pond C1: CULVERT 1 Peak Elev=276.00' Storage=0 cf Inflow=0.10 cfs 0.023 af
18.0" Round Culvert n=0.010 L=33.0' S=0.0379 '/' Outflow=0.10 cfs 0.023 af

Pond C2: CULVERT 2 Peak Elev=266.19' Inflow=2.03 cfs 0.188 af
18.0" Round Culvert n=0.010 L=8.0' S=0.7813 '/' Outflow=2.03 cfs 0.188 af

Pond CB-1A: CB-1 Peak Elev=276.42' Inflow=1.57 cfs 0.214 af
12.0" Round Culvert n=0.010 L=122.0' S=0.0100 '/' Outflow=1.57 cfs 0.214 af

Pond CB-2: CB-2 Peak Elev=271.89' Inflow=2.13 cfs 0.322 af
18.0" Round Culvert n=0.010 L=175.0' S=0.0310 '/' Outflow=2.13 cfs 0.322 af

Pond CB-3A: CB-3A Peak Elev=272.78' Inflow=0.57 cfs 0.108 af
18.0" Round Culvert n=0.010 L=51.0' S=0.0284 '/' Outflow=0.57 cfs 0.108 af

Pond CB-4A: CB-1 Peak Elev=274.06' Inflow=0.39 cfs 0.054 af
12.0" Round Culvert n=0.010 L=119.5' S=0.0100 '/' Outflow=0.39 cfs 0.054 af

Pond CB-5: CB-5 Peak Elev=266.44' Inflow=2.53 cfs 0.367 af
18.0" Round Culvert n=0.010 L=18.0' S=0.0222 '/' Outflow=2.53 cfs 0.367 af

Pond CB-6: CB-6 Peak Elev=266.46' Inflow=2.03 cfs 0.189 af
18.0" Round Culvert n=0.010 L=49.0' S=0.0100 '/' Outflow=2.03 cfs 0.189 af

Pond CB-7: CB-7 Peak Elev=266.42' Storage=83 cf Inflow=2.03 cfs 0.190 af
18.0" Round Culvert n=0.010 L=82.0' S=0.0100 '/' Outflow=2.03 cfs 0.191 af

Pond CB-8: CB-8 Peak Elev=266.38' Inflow=2.03 cfs 0.191 af
18.0" Round Culvert n=0.010 L=42.0' S=0.0057 '/' Outflow=2.03 cfs 0.191 af

Pond DMH-1A: DMH-1A Peak Elev=274.79' Inflow=1.57 cfs 0.214 af
12.0" Round Culvert n=0.010 L=17.5' S=0.0097 '/' Outflow=1.57 cfs 0.214 af

Pond DMH-3A: DMH-3A Peak Elev=271.57' Inflow=2.13 cfs 0.322 af
18.0" Round Culvert n=0.010 L=82.0' S=0.2091 '/' Outflow=2.13 cfs 0.322 af

Pond DMH-4: DMH-4 Peak Elev=266.35' Inflow=6.12 cfs 0.740 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0300 '/' Outflow=6.12 cfs 0.740 af

Total Runoff Area = 9.490 ac Runoff Volume = 0.739 af Average Runoff Depth = 0.93"
67.35% Pervious = 6.391 ac 32.65% Impervious = 3.099 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: WS-1A Runoff Area=45,731 sf 54.20% Impervious Runoff Depth=2.12"
Flow Length=508' Tc=9.6 min CN=71 Runoff=2.24 cfs 0.185 af

Subcatchment 1B: WS-1B Runoff Area=43,860 sf 24.41% Impervious Runoff Depth=0.92"
Flow Length=607' Tc=14.1 min CN=54 Runoff=0.64 cfs 0.077 af

Subcatchment 1C: WS-1C Runoff Area=27,533 sf 32.94% Impervious Runoff Depth=1.17"
Flow Length=351' Tc=9.0 min CN=58 Runoff=0.66 cfs 0.062 af

Subcatchment 2A: WS-2A Runoff Area=70,105 sf 48.25% Impervious Runoff Depth=1.80"
Flow Length=466' Slope=0.0460 '/' Tc=11.5 min CN=67 Runoff=2.71 cfs 0.242 af

Subcatchment 2B: WS-2B Runoff Area=2,611 sf 11.18% Impervious Runoff Depth=0.49"
Flow Length=132' Slope=0.0250 '/' Tc=9.9 min CN=46 Runoff=0.01 cfs 0.002 af

Subcatchment 2C: WS-2C Runoff Area=4,493 sf 100.00% Impervious Runoff Depth=4.76"
Flow Length=267' Tc=1.7 min CN=98 Runoff=0.55 cfs 0.041 af

Subcatchment 2D: WS-2D Runoff Area=2,894 sf 0.00% Impervious Runoff Depth=0.20"
Flow Length=64' Slope=0.2000 '/' Tc=2.9 min CN=39 Runoff=0.00 cfs 0.001 af

Subcatchment 3A: WS-3A Runoff Area=3,800 sf 100.00% Impervious Runoff Depth=4.76"
Flow Length=181' Tc=1.7 min CN=98 Runoff=0.46 cfs 0.035 af

Subcatchment 3B: WS-3B Runoff Area=39,994 sf 12.31% Impervious Runoff Depth=0.49"
Flow Length=585' Tc=14.0 min CN=46 Runoff=0.20 cfs 0.037 af

Subcatchment 5: WS-5 Runoff Area=31,606 sf 25.00% Impervious Runoff Depth=0.92"
Flow Length=385' Tc=9.6 min CN=54 Runoff=0.53 cfs 0.056 af

Subcatchment 6: WS-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=0.92"
Flow Length=698' Tc=13.0 min CN=54 Runoff=2.11 cfs 0.248 af

Reach S1: north boundary swale Avg. Flow Depth=0.07' Max Vel=2.14 fps Inflow=0.66 cfs 0.062 af
n=0.030 L=256.0' S=0.0684 '/' Capacity=69.96 cfs Outflow=0.65 cfs 0.062 af

Reach S2: south boundary swale Avg. Flow Depth=0.17' Max Vel=3.42 fps Inflow=2.71 cfs 0.242 af
n=0.030 L=266.0' S=0.0583 '/' Capacity=64.60 cfs Outflow=2.68 cfs 0.242 af

Pond C1: CULVERT 1 Peak Elev=276.59' Storage=56 cf Inflow=0.20 cfs 0.037 af
18.0" Round Culvert n=0.010 L=33.0' S=0.0379 '/' Outflow=0.98 cfs 0.039 af

Pond C2: CULVERT 2 Peak Elev=296.61' Inflow=2.68 cfs 0.242 af
18.0" Round Culvert n=0.010 L=8.0' S=0.7813 '/' Outflow=2.68 cfs 0.242 af

Pond CB-1A: CB-1 Peak Elev=297.50' Inflow=2.60 cfs 0.303 af
12.0" Round Culvert n=0.010 L=122.0' S=0.0100 '/' Outflow=2.60 cfs 0.303 af

Pond CB-2: CB-2 Peak Elev=296.90' Inflow=3.54 cfs 0.454 af
18.0" Round Culvert n=0.010 L=175.0' S=0.0310 '/' Outflow=3.54 cfs 0.454 af

Pond CB-3A: CB-3A Peak Elev=296.90' Inflow=1.49 cfs 0.151 af
18.0" Round Culvert n=0.010 L=51.0' S=0.0284 '/' Outflow=1.49 cfs 0.151 af

Pond CB-4A: CB-1 Peak Elev=296.93' Inflow=0.64 cfs 0.077 af
12.0" Round Culvert n=0.010 L=119.5' S=0.0100 '/' Outflow=0.64 cfs 0.077 af

Pond CB-5: CB-5 Peak Elev=296.59' Inflow=4.15 cfs 0.516 af
18.0" Round Culvert n=0.010 L=18.0' S=0.0222 '/' Outflow=4.15 cfs 0.516 af

Pond CB-6: CB-6 Peak Elev=296.57' Inflow=2.69 cfs 0.244 af
18.0" Round Culvert n=0.010 L=49.0' S=0.0100 '/' Outflow=2.66 cfs 0.244 af

Pond CB-7: CB-7 Peak Elev=296.52' Storage=83 cf Inflow=2.66 cfs 0.245 af
18.0" Round Culvert n=0.010 L=82.0' S=0.0100 '/' Outflow=3.57 cfs 0.249 af

Pond CB-8: CB-8 Peak Elev=296.40' Inflow=3.57 cfs 0.249 af
18.0" Round Culvert n=0.010 L=42.0' S=0.0057 '/' Outflow=3.57 cfs 0.249 af

Pond DMH-1A: DMH-1A Peak Elev=297.18' Inflow=2.60 cfs 0.303 af
12.0" Round Culvert n=0.010 L=17.5' S=0.0097 '/' Outflow=2.60 cfs 0.303 af

Pond DMH-3A: DMH-3A Peak Elev=296.74' Inflow=3.54 cfs 0.454 af
18.0" Round Culvert n=0.010 L=82.0' S=0.2091 '/' Outflow=3.54 cfs 0.454 af

Pond DMH-4: DMH-4 Peak Elev=296.37' Inflow=9.89 cfs 0.991 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0300 '/' Outflow=9.89 cfs 0.991 af

Total Runoff Area = 9.490 ac Runoff Volume = 0.985 af Average Runoff Depth = 1.25"
67.35% Pervious = 6.391 ac 32.65% Impervious = 3.099 ac

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1A: WS-1A Runoff Area=45,731 sf 54.20% Impervious Runoff Depth=2.50"
Flow Length=508' Tc=9.6 min CN=71 Runoff=2.66 cfs 0.219 af

Subcatchment 1B: WS-1B Runoff Area=43,860 sf 24.41% Impervious Runoff Depth=1.17"
Flow Length=607' Tc=14.1 min CN=54 Runoff=0.87 cfs 0.098 af

Subcatchment 1C: WS-1C Runoff Area=27,533 sf 32.94% Impervious Runoff Depth=1.45"
Flow Length=351' Tc=9.0 min CN=58 Runoff=0.86 cfs 0.077 af

Subcatchment 2A: WS-2A Runoff Area=70,105 sf 48.25% Impervious Runoff Depth=2.16"
Flow Length=466' Slope=0.0460 '/' Tc=11.5 min CN=67 Runoff=3.29 cfs 0.290 af

Subcatchment 2B: WS-2B Runoff Area=2,611 sf 11.18% Impervious Runoff Depth=0.67"
Flow Length=132' Slope=0.0250 '/' Tc=9.9 min CN=46 Runoff=0.02 cfs 0.003 af

Subcatchment 2C: WS-2C Runoff Area=4,493 sf 100.00% Impervious Runoff Depth=5.26"
Flow Length=267' Tc=1.7 min CN=98 Runoff=0.60 cfs 0.045 af

Subcatchment 2D: WS-2D Runoff Area=2,894 sf 0.00% Impervious Runoff Depth=0.31"
Flow Length=64' Slope=0.2000 '/' Tc=2.9 min CN=39 Runoff=0.01 cfs 0.002 af

Subcatchment 3A: WS-3A Runoff Area=3,800 sf 100.00% Impervious Runoff Depth=5.26"
Flow Length=181' Tc=1.7 min CN=98 Runoff=0.51 cfs 0.038 af

Subcatchment 3B: WS-3B Runoff Area=39,994 sf 12.31% Impervious Runoff Depth=0.67"
Flow Length=585' Tc=14.0 min CN=46 Runoff=0.31 cfs 0.051 af

Subcatchment 5: WS-5 Runoff Area=31,606 sf 25.00% Impervious Runoff Depth=1.17"
Flow Length=385' Tc=9.6 min CN=54 Runoff=0.72 cfs 0.071 af

Subcatchment 6: WS-6 Runoff Area=140,742 sf 25.00% Impervious Runoff Depth=1.17"
Flow Length=698' Tc=13.0 min CN=54 Runoff=2.89 cfs 0.315 af

Reach S1: north boundary swale Avg. Flow Depth=0.08' Max Vel=2.37 fps Inflow=0.86 cfs 0.077 af
n=0.030 L=256.0' S=0.0684 '/' Capacity=69.96 cfs Outflow=0.85 cfs 0.077 af

Reach S2: south boundary swale Avg. Flow Depth=0.19' Max Vel=3.66 fps Inflow=3.29 cfs 0.290 af
n=0.030 L=266.0' S=0.0583 '/' Capacity=64.60 cfs Outflow=3.25 cfs 0.290 af

Pond C1: CULVERT 1 Peak Elev=277.39' Storage=265 cf Inflow=0.31 cfs 0.051 af
18.0" Round Culvert n=0.010 L=33.0' S=0.0379 '/' Outflow=2.90 cfs 0.056 af

Pond C2: CULVERT 2 Peak Elev=324.46' Inflow=3.25 cfs 0.290 af
18.0" Round Culvert n=0.010 L=8.0' S=0.7813 '/' Outflow=3.25 cfs 0.290 af

Pond CB-1A: CB-1 Peak Elev=326.05' Inflow=3.56 cfs 0.386 af
12.0" Round Culvert n=0.010 L=122.0' S=0.0100 '/' Outflow=3.56 cfs 0.386 af

Pond CB-2: CB-2 Peak Elev=325.03' Inflow=4.93 cfs 0.578 af
18.0" Round Culvert n=0.010 L=175.0' S=0.0310 '/' Outflow=4.93 cfs 0.578 af

Pond CB-3A: CB-3A Peak Elev=325.04' Inflow=3.38 cfs 0.193 af
18.0" Round Culvert n=0.010 L=51.0' S=0.0284 '/' Outflow=3.38 cfs 0.193 af

Pond CB-4A: CB-1 Peak Elev=325.08' Inflow=0.87 cfs 0.098 af
12.0" Round Culvert n=0.010 L=119.5' S=0.0100 '/' Outflow=0.87 cfs 0.098 af

Pond CB-5: CB-5 Peak Elev=324.53' Inflow=5.68 cfs 0.655 af
18.0" Round Culvert n=0.010 L=18.0' S=0.0222 '/' Outflow=5.68 cfs 0.655 af

Pond CB-6: CB-6 Peak Elev=324.41' Inflow=3.27 cfs 0.293 af
18.0" Round Culvert n=0.010 L=49.0' S=0.0100 '/' Outflow=3.24 cfs 0.293 af

Pond CB-7: CB-7 Peak Elev=324.34' Storage=83 cf Inflow=3.25 cfs 0.295 af
18.0" Round Culvert n=0.010 L=82.0' S=0.0100 '/' Outflow=4.15 cfs 0.298 af

Pond CB-8: CB-8 Peak Elev=324.18' Inflow=4.15 cfs 0.298 af
18.0" Round Culvert n=0.010 L=42.0' S=0.0057 '/' Outflow=4.15 cfs 0.298 af

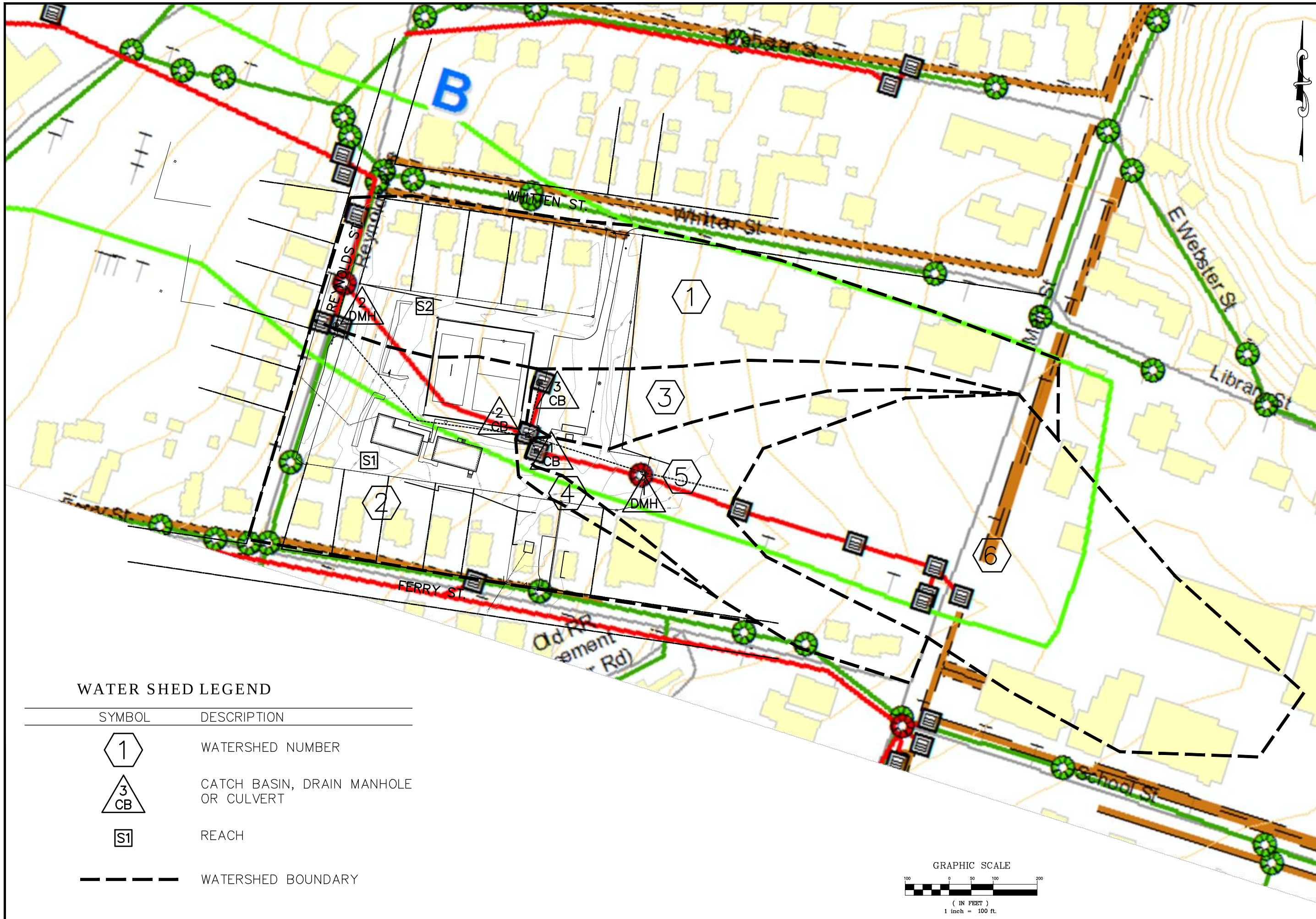
Pond DMH-1A: DMH-1A Peak Elev=325.52' Inflow=3.56 cfs 0.386 af
12.0" Round Culvert n=0.010 L=17.5' S=0.0097 '/' Outflow=3.56 cfs 0.386 af

Pond DMH-3A: DMH-3A Peak Elev=324.80' Inflow=4.93 cfs 0.578 af
18.0" Round Culvert n=0.010 L=82.0' S=0.2091 '/' Outflow=4.93 cfs 0.578 af

Pond DMH-4: DMH-4 Peak Elev=324.12' Inflow=12.40 cfs 1.217 af
10.0" Round Culvert n=0.013 L=200.0' S=0.0300 '/' Outflow=12.40 cfs 1.217 af

Total Runoff Area = 9.490 ac Runoff Volume = 1.209 af Average Runoff Depth = 1.53"
67.35% Pervious = 6.391 ac 32.65% Impervious = 3.099 ac

APPENDIX D



WATER SHED LEGEND

SYMBOL	DESCRIPTION
1	WATERSHED NUMBER
3 CB	CATCH BASIN, DRAIN MANHOLE OR CULVERT
S1	REACH
— — —	WATERSHED BOUNDARY

ENGINEER

REV.	REVISION DESCRIPTION	DATE

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DESIGNED BY MAD | DRAWN BY MAD | CHECKED BY WRD

DATE: MARCH 18, 2015

SCALE: 1" = 100'

CLIENT
TOWN OF ALLENSTOWN
16 SCHOOL STREET
ALLENSTOWN, NH 03275

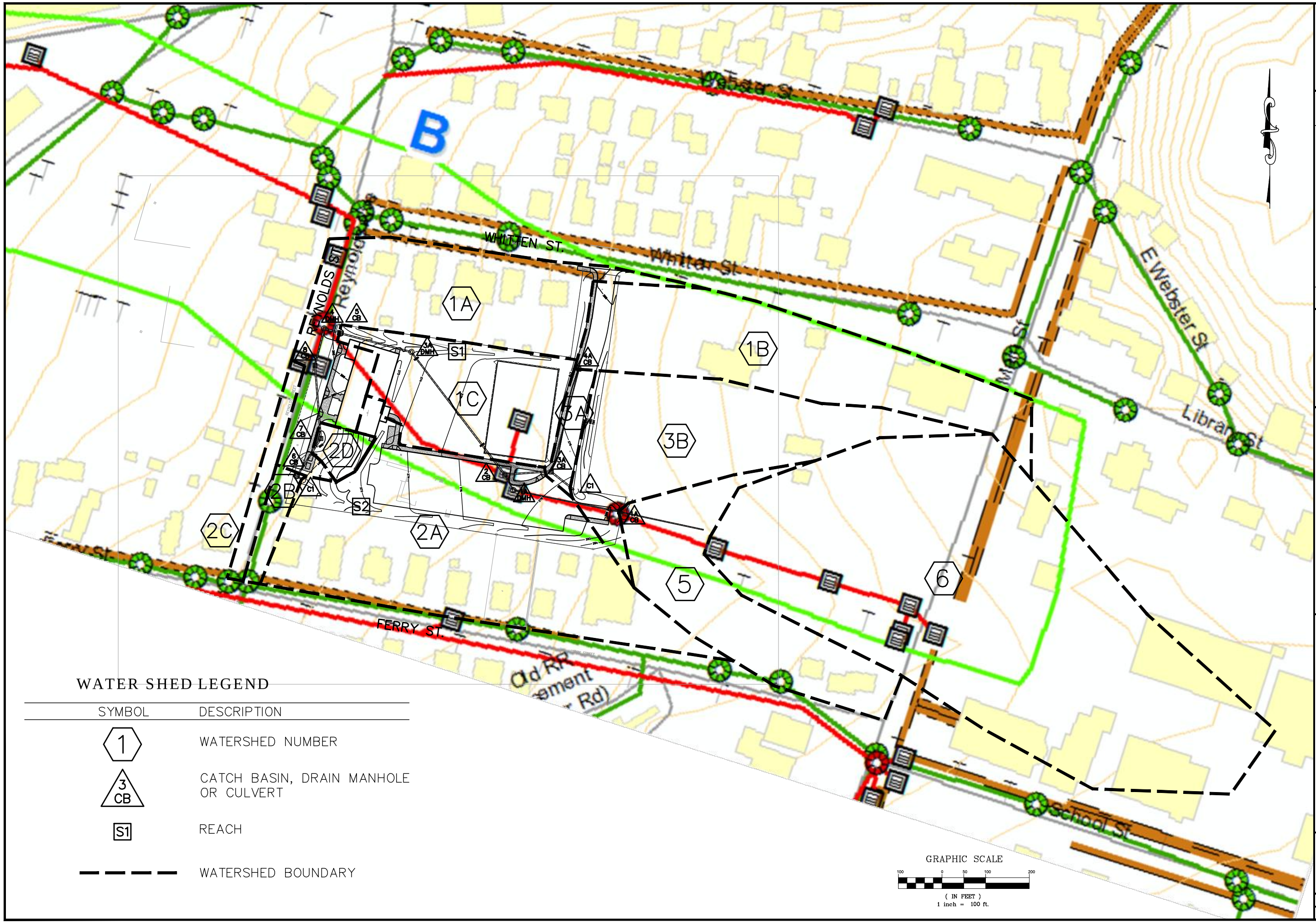
PROJECT
ALLENSTOWN COMMUNITY CENTER
SITE PLAN
ALLENSTOWN, NH

PRE-DEVELOPMENT WATERSHED MAP

WS-1

PROJECT NO. 562801

SHEET 1 OF 2



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SCALE: 1" = 100'

DATE: MARCH 18, 2015

CLIENT
TOWN OF ALLENSTOWN
16 SCHOOL STREET
ALLENSTOWN, NH 03275

PROJECT
ALLENSTOWN COMMUNITY CENTER
SITE PLAN
ALLENSTOWN, NH

POST-DEVELOPMENT WATERSHED MAP

WS-2

PROJECT NO. 562801

SHEET 2 OF 2