

NOTICE OF PUBLIC HEARING SUDBURY CONSERVATION COMMISSION

The Sudbury Conservation Commission will hold a public hearing to review the Notice of Intent filing for tree removal and implementation of accessibility improvements within the 100-foot Buffer Zone, pursuant to the Wetlands Protection Act and Sudbury Wetlands Administration Bylaw, at 18 Wolbach Road, Sudbury MA. Lisa Vernegaard, Sudbury Valley Trustees, Applicant. The hearing will be held on Monday, August 23, 2021 at 6:45 pm, via remote participation.

Please see the Conservation Commission web page for further information.

<https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-august-23-2021/>.

SUDBURY CONSERVATION COMMISSION

August 9, 2021

WETLANDS NOTICE OF INTENT

for

PROPOSED PARKING LOT EXPANSION AND WALKWAY ACCESSIBILITY IMPROVEMENTS

Sudbury Valley Trustees
18 Wolbach Road
Sudbury, MA 01776

Prepared for:

Sudbury Valley Trustees
18 Wolbach Road
Sudbury, MA 01776

Prepared by:

DGT Associates – Project Civil Engineer
1071 Worcester Road
Framingham, MA 01701
508-879-0030

August 4, 2021

LIST OF INCLUDED DOCUMENTS

Notice of Intent Form (WPA Form 3) Signed

Sudbury Notice of Intent Checklist (next page)

ATTACHMENTS

1. Project Narrative

Includes: USGS Locus Map
NHESP Map
FEMA Firmette Map
Site Photos

2. Copy of Draft Abutter Notice and Lists of Abutters

3. Proposed Tree Removal at the Barn and Potting Shed (July, 2021)

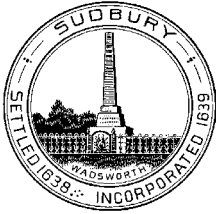
4. Stormwater Report (Under Separate Cover):

“Stormwater Management Design and Runoff
Calculations Report...” Dated July 27, 2021
by DGT Associates.

Includes Completed DEP Stormwater Management Checklist,
Narrative, Compliance Information, Hydrologic Calculations,
Operation and Maintenance Plan, and Soils Information.
See the document for complete list of included information

SITE PLANS:

“New Parking Facility and Accessibility Improvements for SVT Headquarters at
Wolbach Farm” Dated June 1, 2021, as revised June 16, 2021, by DGT
Associates (6 Sheets).



Town of Sudbury

Conservation Commission

Conservation Department
275 Old Lancaster Rd.
Sudbury MA 01776
978-440-5472
ConCom@sudbury.ma.us

Notice of Intent Submission Checklist

A complete application package (double-sided and collated) must be submitted by close of business a minimum of two weeks in advance of a scheduled meeting. The Commission generally meets every other Monday. A list of meetings and submission deadlines can be found on the Commission's webpage (<https://sudbury.ma.us/conservationcommission/>). Incomplete packages may be returned and/or cause delay of your project.

Supplemental information for continued hearings must be submitted by 3:30 pm at least 4 business days in advanced of the next scheduled Commission meeting.

REQUIRED DOCUMENTATION:

- ✓ 1. One original signature and one copy of completed Notice of Intent Application Form (WPA Form 3) signed by the Applicant and Property Owner.
- ✓ 2. One completed NOI Wetland Fee Transmittal Form Pages 1 & 2.
- ✓ 3. One copy of the following maps, all with the site clearly identified. (One can generate these maps be using the Town GIS at www.mapsonline.net/sudburyma/ or by using Oliver through MassGIS at: http://maps.massgis.state.ma.us/map_ol/oliver.php.)
 - ✓ - USGS
 - ✓ - FEMA
 - ✓ - NHESP
- ✓ 4. Two sets of full-sized stamped plans, including graphic scale (not more than 1 inch = 20 feet) and title block that shows proposed structures or modifications to existing structures, paving, drainage, or water control structures, and erosion controls. Be sure to include resource delineation, riverfront and/or buffer zones, and existing and proposed topography. GIS maps may be used for small projects at the discretion of the Conservation Commission.
 - Plan revisions shall be clearly noted and dated on the plans.
 - Colored plan shall be provided that clearly depict existing and proposed conditions with the following color scheme:

Color
plans not
provided

 - Existing conditions = Black
 - Proposed Construction = Red
 - Wetland boundaries = Blue
 - Buffer Zone = Yellow
 - Riverfront = Purple
 - Proposed Tree line = Green
 - Erosion Controls = Orange
- ✓ 5. One copy of the Abutter's list, Abutter Notification form, and proof of mailing. Notification can be either by hand or via certificate of mailing or certified mail. This certificate, return receipt green cards, copies of green cards, or proof of receipt of hand delivered mail, must be submitted prior to the hearing (scanned copies are OK).
- ✓ 6. Two copies of a narrative which should include the following information:

- ✓ - Description of work within regulated resource areas, the buffer zones, and any impacts to these areas.
- ✓ - Description of the project's compliance with the WPA performance standards. If work is proposed in the Riverfront Area, you must provide an alternatives analysis.
- ✓ - Description of the project's compliance with the Sudbury Administration Wetlands Bylaw.
 - ✓ - If work is proposed within Adjacent Upland Resource Area, you must provide an alternatives analysis.
 - ✓ - If work is located adjacent to a stream, you must provide the required evidence in accordance with Section 2.3 of the Sudbury Administration Wetlands Bylaw Regulations to determine whether the stream is intermittent or perennial.
- ✓ 7. Proposed mitigation for unavoidable project impacts to regulated areas. Provide the following information:
 - ✓ - Square footage of work proposed by type (i.e. disturbance, structures, impervious surface, etc.) within each regulated area, including the 100-foot Buffer Zone, 100-foot Adjacent Upland Resource Area, and 200-foot Riverfront Area (inner and outer riparian zones).
 - Square footage of proposed mitigation by type (i.e. native plantings, invasive species removal, impervious surface reduction, etc.) within each regulated area.
- ✓ 8. Description of wetland resource areas, date delineated, and name of wetland scientist that conducted the delineation
- ✓ 9. Photos of the site.
- ✓ 10. Applicable Filing Fees under the Wetlands Protection Act and the Sudbury Administrative Wetlands Bylaw Checks to the Town of Sudbury. See attached.

* Please note, a legal notice fee will be billed directly to the Applicant. The Applicant is responsible for the cost of the legal notice in accordance with the state Wetlands Protection Act [310 CMR 10.05(5)(a)] and Sudbury Administration Wetlands Bylaw.
- ✓ 11. If applicable, one completed, signed Stormwater Management Form, Appendix C, if applicable. This does not apply to projects on single-family lots.
- ✓ 12. If applicable, one signed copy of any Operation and Maintenance Plans associated with elements located or that discharge to resource areas.
- ✓ 13. All documentation also must be provided in electronic format, including any revised information.

DEP MAILING

- ✓ 1. Send check for state fee made out to the Commonwealth of Massachusetts and copy of NOI Wetland Fee Transmittal Form Pages 1 & 2 to: DEP, Box 4062, Boston, MA 02211.
- ✓ 2. Send one complete copy of the Notice of Intent application, including copies of all required maps, project plans, Wetland Fee Transmittal Form, list of abutters, Notification to Abutters Form, and a copy of the check for state and town fee payments to:
DEP-NERO, Wetlands Division 205 Lowell Street Wilmington, MA 01887.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands

Provided by MassDEP:

WPA Form 3 – Notice of Intent

Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

MassDEP File Number

Document Transaction Number

Sudbury

City/Town

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



Note:
Before completing this form consult your local Conservation Commission regarding any municipal bylaw or ordinance.

A. General Information

1. Project Location (**Note:** electronic filers will click on button to locate project site):

18 Wolbach Road

a. Street Address

Sudbury

b. City/Town

01776

c. Zip Code

Latitude and Longitude:

42.375095

d. Latitude

71.392822

e. Longitude

H11

f. Assessors Map/Plat Number

0100 and 0102

g. Parcel /Lot Number

2. Applicant:

Lisa

a. First Name

Vernegaard

b. Last Name

Sudbury Valley Trustees

c. Organization

18 Wolbach Road

d. Street Address

Sudbury

e. City/Town

MA

f. State

01776

g. Zip Code

978-443-5588

h. Phone Number

i. Fax Number

lvernegaard@svtweb.org

j. Email Address

3. Property owner (required if different from applicant): ☐ Check if more than one owner

SAME

a. First Name

b. Last Name

c. Organization

d. Street Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email address

4. Representative (if any):

Fredric

a. First Name

King

b. Last Name

DGT Associates

c. Company

1071 Worcester Road

d. Street Address

Framingham

e. City/Town

MA

f. State

01701

g. Zip Code

508-879-0030

h. Phone Number

i. Fax Number

fking@dgtassociates.com

j. Email address

5. Total WPA Fee Paid (from NOI Wetland Fee Transmittal Form):

\$610.00

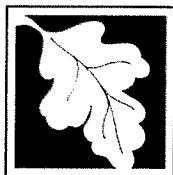
a. Total Fee Paid

\$292.50

b. State Fee Paid

\$317.50

c. City/Town Fee Paid



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A. General Information (continued)

6. General Project Description:

Within the Buffer Zone: Accessibility improvements of an existing paved walkway at the main building and removal of potentially dangerous trees near the Barn. Beyond the Buffer Zone: Reconfiguration and expansion of an existing 15 space gravel parking area to 25 spaces and stormwater management improvements.

7a. Project Type Checklist: (Limited Project Types see Section A. 7b.)

- | | |
|---|---|
| 1. <input type="checkbox"/> Single Family Home | 2. <input type="checkbox"/> Residential Subdivision |
| 3. <input checked="" type="checkbox"/> Commercial/Industrial | 4. <input type="checkbox"/> Dock/Pier |
| 5. <input type="checkbox"/> Utilities | 6. <input type="checkbox"/> Coastal engineering Structure |
| 7. <input type="checkbox"/> Agriculture (e.g., cranberries, forestry) | 8. <input type="checkbox"/> Transportation |
| 9. <input type="checkbox"/> Other | |

7b. Is any portion of the proposed activity eligible to be treated as a limited project (including Ecological Restoration Limited Project) subject to 310 CMR 10.24 (coastal) or 310 CMR 10.53 (inland)?

1. ☐ Yes ☒ No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)

2. Limited Project Type

If the proposed activity is eligible to be treated as an Ecological Restoration Limited Project (310 CMR 10.24(8), 310 CMR 10.53(4)), complete and attach Appendix A: Ecological Restoration Limited Project Checklist and Signed Certification.

8. Property recorded at the Registry of Deeds for:

Middlesex South

a. County

L.C. 782

c. Book

130544 and 228554

b. Certificate # (if registered land)

194

d. Page Number

B. Buffer Zone & Resource Area Impacts (temporary & permanent)

- ☒ Buffer Zone Only – Check if the project is located only in the Buffer Zone of a Bordering Vegetated Wetland, Inland Bank, or Coastal Resource Area.
- ☐ Inland Resource Areas (see 310 CMR 10.54-10.58; if not applicable, go to Section B.3, Coastal Resource Areas).

Check all that apply below. Attach narrative and any supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.



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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

For all projects affecting other Resource Areas, please attach a narrative explaining how the resource area was delineated.

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input type="checkbox"/> Bank	1. linear feet	2. linear feet
b. <input type="checkbox"/> Bordering Vegetated Wetland	1. square feet	2. square feet
c. <input type="checkbox"/> Land Under Waterbodies and Waterways	1. square feet 3. cubic yards dredged	2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. <input type="checkbox"/> Bordering Land Subject to Flooding	1. square feet 3. cubic feet of flood storage lost	2. square feet 4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input type="checkbox"/> Riverfront Area	1. Name of Waterway (if available) - specify coastal or inland	

2. Width of Riverfront Area (check one):

☐ 25 ft. - Designated Densely Developed Areas only

☐ 100 ft. - New agricultural projects only

☐ 200 ft. - All other projects

3. Total area of Riverfront Area on the site of the proposed project:

square feet

4. Proposed alteration of the Riverfront Area:

a. total square feet

b. square feet within 100 ft.

c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI?

☐ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996?

☐ Yes ☐ No

3. ☐ Coastal Resource Areas: (See 310 CMR 10.25-10.35)

Note: for coastal riverfront areas, please complete **Section B.2.f.** above.



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B. Buffer Zone & Resource Area Impacts (temporary & permanent) (cont'd)

Check all that apply below. Attach narrative and supporting documentation describing how the project will meet all performance standards for each of the resource areas altered, including standards requiring consideration of alternative project design or location.

Online Users:
Include your
document
transaction
number
(provided on your
receipt page)
with all
supplementary
information you
submit to the
Department.

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
----------------------	------------------------------------	--------------------------------------

a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
---	---	--

b. <input type="checkbox"/> Land Under the Ocean	<div>1. square feet</div> <div>2. cubic yards dredged</div>	
--	---	--

c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
---	--	--

d. <input type="checkbox"/> Coastal Beaches	1. square feet	2. cubic yards beach nourishment
---	----------------	----------------------------------

e. <input type="checkbox"/> Coastal Dunes	1. square feet	2. cubic yards dune nourishment
---	----------------	---------------------------------

	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
--	------------------------------------	--------------------------------------

f. <input type="checkbox"/> Coastal Banks	1. linear feet	
---	----------------	--

g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet	
---	----------------	--

h. <input type="checkbox"/> Salt Marshes	1. square feet	
--	----------------	--

i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet	2. sq ft restoration, rehab., creation
---	----------------	--

	2. cubic yards dredged	
--	------------------------	--

j. <input type="checkbox"/> Land Containing Shellfish	1. square feet	
---	----------------	--

k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
---------------------------------------	---	--

	1. cubic yards dredged	
--	------------------------	--

l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet	
---	----------------	--

4. ☐ Restoration/Enhancement

If the project is for the purpose of restoring or enhancing a wetland resource area in addition to the square footage that has been entered in Section B.2.b or B.3.h above, please enter the additional amount here.

a. square feet of BVW

b. square feet of Salt Marsh

5. ☐ Project Involves Stream Crossings

a. number of new stream crossings

b. number of replacement stream crossings



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C. Other Applicable Standards and Requirements

- ☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section C and complete Appendix A: Ecological Restoration Limited Project Checklists – Required Actions (310 CMR 10.11).

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

1. Is any portion of the proposed project located in **Estimated Habitat of Rare Wildlife** as indicated on the most recent Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)? To view habitat maps, see the *Massachusetts Natural Heritage Atlas* or go to http://maps.massgis.state.ma.us/PRI_EST_HAB/viewer.htm.

a. ☐ Yes ☒ No

If yes, include proof of mailing or hand delivery of NOI to:

Natural Heritage and Endangered Species Program
Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

Current Mass GIS

b. Date of map

If yes, the project is also subject to Massachusetts Endangered Species Act (MESA) review (321 CMR 10.18). To qualify for a streamlined, 30-day, MESA/Wetlands Protection Act review, please complete Section C.1.c, and include requested materials with this Notice of Intent (NOI); OR complete Section C.2.f, if applicable. *If MESA supplemental information is not included with the NOI, by completing Section 1 of this form, the NHESP will require a separate MESA filing which may take up to 90 days to review (unless noted exceptions in Section 2 apply, see below).*

c. Submit Supplemental Information for Endangered Species Review*

1. ☐ Percentage/acreage of property to be altered:
 - (a) within wetland Resource Area _____ percentage/acreage
 - (b) outside Resource Area _____ percentage/acreage
2. ☐ Assessor's Map or right-of-way plan of site
2. ☐ Project plans for entire project site, including wetland resource areas and areas outside of wetlands jurisdiction, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work **
 - (a) ☐ Project description (including description of impacts outside of wetland resource area & buffer zone)
 - (b) ☐ Photographs representative of the site

* Some projects **not** in Estimated Habitat may be located in Priority Habitat, and require NHESP review (see <https://www.mass.gov/mas-endangered-species-act-mesa-regulatory-review>).

Priority Habitat includes habitat for state-listed plants and strictly upland species not protected by the Wetlands Protection Act.

** MESA projects may not be segmented (321 CMR 10.16). The applicant must disclose full development plans even if such plans are not required as part of the Notice of Intent process.



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C. Other Applicable Standards and Requirements (cont'd)

- (c) ☐ MESA filing fee (fee information available at <https://www.mass.gov/how-to/how-to-file-for-a-mesa-project-review>).

Make check payable to "Commonwealth of Massachusetts - NHESP" and **mail to NHESP** at above address

Projects altering 10 or more acres of land, also submit:

- (d) ☐ Vegetation cover type map of site
- (e) ☐ Project plans showing Priority & Estimated Habitat boundaries
- (f) OR Check One of the Following

1. ☐ Project is exempt from MESA review.
Attach applicant letter indicating which MESA exemption applies. (See 321 CMR 10.14, <https://www.mass.gov/service-details/exemptions-from-review-for-projectsactivities-in-priority-habitat>; the NOI must still be sent to NHESP if the project is within estimated habitat pursuant to 310 CMR 10.37 and 10.59.)

2. ☐ Separate MESA review ongoing. a. NHESP Tracking # _____ b. Date submitted to NHESP _____

3. ☐ Separate MESA review completed.
Include copy of NHESP "no Take" determination or valid Conservation & Management Permit with approved plan.

3. For coastal projects only, is any portion of the proposed project located below the mean high water line or in a fish run?

- a. ☐ Not applicable – project is in inland resource area only b. ☐ Yes ☐ No

If yes, include proof of mailing, hand delivery, or electronic delivery of NOI to either:

South Shore - Cohasset to Rhode Island border, and the Cape & Islands:

North Shore - Hull to New Hampshire border:

Division of Marine Fisheries -
Southeast Marine Fisheries Station
Attn: Environmental Reviewer
836 South Rodney French Blvd.
New Bedford, MA 02744
Email: dmf.envreview-south@mass.gov

Division of Marine Fisheries -
North Shore Office
Attn: Environmental Reviewer
30 Emerson Avenue
Gloucester, MA 01930
Email: dmf.envreview-north@mass.gov

Also if yes, the project may require a Chapter 91 license. For coastal towns in the Northeast Region, please contact MassDEP's Boston Office. For coastal towns in the Southeast Region, please contact MassDEP's Southeast Regional Office.

- c. ☐ Is this an aquaculture project? d. ☐ Yes ☐ No

If yes, include a copy of the Division of Marine Fisheries Certification Letter (M.G.L. c. 130, § 57).



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C. Other Applicable Standards and Requirements (cont'd)

Online Users:
Include your document transaction number (provided on your receipt page) with all supplementary information you submit to the Department.

4. Is any portion of the proposed project within an Area of Critical Environmental Concern (ACEC)?
a. ☐ Yes ☒ No If yes, provide name of ACEC (see instructions to WPA Form 3 or MassDEP Website for ACEC locations). **Note:** electronic filers click on Website.
b. ACEC
5. Is any portion of the proposed project within an area designated as an Outstanding Resource Water (ORW) as designated in the Massachusetts Surface Water Quality Standards, 314 CMR 4.00?
a. ☐ Yes ☒ No
6. Is any portion of the site subject to a Wetlands Restriction Order under the Inland Wetlands Restriction Act (M.G.L. c. 131, § 40A) or the Coastal Wetlands Restriction Act (M.G.L. c. 130, § 105)?
a. ☐ Yes ☒ No
7. Is this project subject to provisions of the MassDEP Stormwater Management Standards?
a. ☒ Yes. Attach a copy of the Stormwater Report as required by the Stormwater Management Standards per 310 CMR 10.05(6)(k)-(q) and check if:
1. ☒ Applying for Low Impact Development (LID) site design credits (as described in Stormwater Management Handbook Vol. 2, Chapter 3)
2. ☒ A portion of the site constitutes redevelopment
3. ☐ Proprietary BMPs are included in the Stormwater Management System.
b. ☐ No. Check why the project is exempt:
1. ☐ Single-family house
2. ☐ Emergency road repair
3. ☐ Small Residential Subdivision (less than or equal to 4 single-family houses or less than or equal to 4 units in multi-family housing project) with no discharge to Critical Areas.

D. Additional Information

- ☐ This is a proposal for an Ecological Restoration Limited Project. Skip Section D and complete Appendix A: Ecological Restoration Notice of Intent – Minimum Required Documents (310 CMR 10.12).

Applicants must include the following with this Notice of Intent (NOI). See instructions for details.

Online Users: Attach the document transaction number (provided on your receipt page) for any of the following information you submit to the Department.

1. ☒ USGS or other map of the area (along with a narrative description, if necessary) containing sufficient information for the Conservation Commission and the Department to locate the site. (Electronic filers may omit this item.)
2. ☒ Plans identifying the location of proposed activities (including activities proposed to serve as a Bordering Vegetated Wetland [BVW] replication area or other mitigating measure) relative to the boundaries of each affected resource area.



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D. Additional Information (cont'd)

3. ☒ Identify the method for BVW and other resource area boundary delineations (MassDEP BVW Field Data Form(s), Determination of Applicability, Order of Resource Area Delineation, etc.), and attach documentation of the methodology.

4. ☒ List the titles and dates for all plans and other materials submitted with this NOI.

New Parking Facility and Accessibility Improvements for SVT Headquarters at Wolbach Farm

a. Plan Title

DGT Associates

Fredric W. King

b. Prepared By

c. Signed and Stamped by

July 22, 2021

1" = 20' and 1" = 10'

d. Final Revision Date

e. Scale

See Attached List of Documents

Various

f. Additional Plan or Document Title

g. Date

5. ☐ If there is more than one property owner, please attach a list of these property owners not listed on this form.
6. ☐ Attach proof of mailing for Natural Heritage and Endangered Species Program, if needed.
7. ☐ Attach proof of mailing for Massachusetts Division of Marine Fisheries, if needed.
8. ☒ Attach NOI Wetland Fee Transmittal Form
9. ☒ Attach Stormwater Report, if needed.

E. Fees

1. ☐ Fee Exempt: No filing fee shall be assessed for projects of any city, town, county, or district of the Commonwealth, federally recognized Indian tribe housing authority, municipal housing authority, or the Massachusetts Bay Transportation Authority.

Applicants must submit the following information (in addition to pages 1 and 2 of the NOI Wetland Fee Transmittal Form) to confirm fee payment:

3596

8/3/2021

2. Municipal Check Number

3. Check date

3578

8/3/2021

4. State Check Number

5. Check date

Lisa

Vernegaard

6. Payor name on check: First Name

7. Payor name on check: Last Name



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F. Signatures and Submittal Requirements

I hereby certify under the penalties of perjury that the foregoing Notice of Intent and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge. I understand that the Conservation Commission will place notification of this Notice in a local newspaper at the expense of the applicant in accordance with the wetlands regulations, 310 CMR 10.05(5)(a).

I further certify under penalties of perjury that all abutters were notified of this application, pursuant to the requirements of M.G.L. c. 131, § 40. Notice must be made by Certificate of Mailing or in writing by hand delivery or certified mail (return receipt requested) to all abutters within 100 feet of the property line of the project location.

[Signature]

1. Signature of Applicant

8.02.2021

2. Date

3. Signature of Property Owner (if different)

[Signature]

5. Signature of Representative (if any)

4. Date

8/2/2021

6. Date

For Conservation Commission:

Two copies of the completed Notice of Intent (Form 3), including supporting plans and documents, two copies of the NOI Wetland Fee Transmittal Form, and the city/town fee payment, to the Conservation Commission by certified mail or hand delivery.

For MassDEP:

One copy of the completed Notice of Intent (Form 3), including supporting plans and documents, one copy of the NOI Wetland Fee Transmittal Form, and a **copy** of the state fee payment to the MassDEP Regional Office (see Instructions) by certified mail or hand delivery.

Other:

If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

The original and copies must be sent simultaneously. Failure by the applicant to send copies in a timely manner may result in dismissal of the Notice of Intent.



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

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



A. Applicant Information

1. Location of Project:

18 Wolbach Road

a. Street Address

3578

c. Check number

Sudbury

b. City/Town

\$292.50

d. Fee amount

2. Applicant Mailing Address:

Lisa

a. First Name

Vernegaard

b. Last Name

Sudbury Valley Trustees

c. Organization

18 Wolbach Road

d. Mailing Address

Sudbury

e. City/Town

MA

f. State

01776

g. Zip Code

978-443-5588

h. Phone Number

i. Fax Number

lvernegaard@svtweb.org

j. Email Address

3. Property Owner (if different):

SAME

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

B. Fees

Fee should be calculated using the following process & worksheet. ***Please see Instructions before filling out worksheet.***

Step 1/Type of Activity: Describe each type of activity that will occur in wetland resource area and buffer zone.

Step 2/Number of Activities: Identify the number of each type of activity.

Step 3/Individual Activity Fee: Identify each activity fee from the six project categories listed in the instructions.

Step 4/Subtotal Activity Fee: Multiply the number of activities (identified in Step 2) times the fee per category (identified in Step 3) to reach a subtotal fee amount. Note: If any of these activities are in a Riverfront Area in addition to another Resource Area or the Buffer Zone, the fee per activity should be multiplied by 1.5 and then added to the subtotal amount.

Step 5/Total Project Fee: Determine the total project fee by adding the subtotal amounts from Step 4.

Step 6/Fee Payments: To calculate the state share of the fee, divide the total fee in half and subtract \$12.50. To calculate the city/town share of the fee, divide the total fee in half and add \$12.50.

To calculate filing fees, refer to the category fee list and examples in the instructions for filling out WPA Form 3 (Notice of Intent).



Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
NOI Wetland Fee Transmittal Form
Massachusetts Wetlands Protection Act M.G.L. c. 131, §40

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee
2.j. Other Activity in Buffer Zone	1	\$500	\$500
1.c. Removal of Vegetation (trees).	1	\$110	\$110

Step 5/Total Project Fee: \$610.00

Step 6/Fee Payments:

Total Project Fee:	\$610.00
	a. Total Fee from Step 5
State share of filing Fee:	\$292.50
	b. 1/2 Total Fee less \$12.50
City/Town share of filing Fee:	\$317.50
	c. 1/2 Total Fee plus \$12.50

C. Submittal Requirements

- a.) Complete pages 1 and 2 and send with a check or money order for the state share of the fee, payable to the Commonwealth of Massachusetts.

Department of Environmental Protection
Box 4062
Boston, MA 02211

- b.) **To the Conservation Commission:** Send the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and the city/town fee payment.

To MassDEP Regional Office (see Instructions): Send a copy of the Notice of Intent or Abbreviated Notice of Intent; a **copy** of this form; and a **copy** of the state fee payment. (E-filers of Notices of Intent may submit these electronically.)

ATTACHMENT 1

NOTICE OF INTENT Narrative and Summary

for

**Sudbury Valley Trustees
18 Wolbach Road
Sudbury, MA 01776**

PROJECT NARRATIVE

RE: – 18 Wolbach Road, Sudbury
Parking Lot Expansion, Accessibility Improvements and Tree Removal

The project includes the following elements:

- Modification and expansion of the existing gravel parking area from 15 car capacity to 25 car capacity.
- Reconstruction of the existing 4foot wide asphalt paved walkway at the front of the building for accessibility improvements to bring it into compliance with the Americans with Disabilities Act (ADA) and Mass. Architectural Barriers Board (MAAB) Regulations.
- Installation of a small, paved entry plaza at the walkway adjacent to the parking lot.
- Removal of eight tall trees in close proximity to the exiting barn and potting shed to avoid possible catastrophic damage to these historic structures.

1. Parking Lot Expansion: SVT has found that the current parking is inadequate to provide the parking for routine, day to day needs. The current parking is sufficient for staff and some minor visitor use. However, the parking is frequently inadequate for visitors, small gatherings, evening meetings with volunteers, etc. Capacity for an additional 10 spaces would greatly improve the routine needs at the site. Note that, on occasion, large groups are accommodated by parking on the grass field adjacent to the gravel parking area, however, that parking is very weather dependent and cannot be used on a frequent basis.

To keep with the historic character at the site and for cost considerations, the parking lot will continue to be a compacted gravel surface, the same as the existing. The area will be reshaped to be more efficient, and some granite cobblestone edging will be installed for a durable and rustic look on the side near the building and landscaping.

The location of the parking expansion is into the existing grass field to the north of the existing parking lot. The area between Wolbach Road and the parking area is well screened with dense trees and shrubs and is virtually not visible from the road except at the present entrance drive. See plans and photos attached.

None of the proposed improvements for the parking lot are within any wetland resource area nor the wetland buffer zone, however, the stormwater discharge drains to the wetlands to the east, so is included in this filing to demonstrate no impact to the wetlands.

Stormwater management improvements include the installation of a Bio-Retention Basin (Rain Garden) with sediment forebay for pre-treatment. This system will be located off the north end of the proposed parking area. The Rain Garden will be planted with native

PROJECT NARRATIVE

grasses and herbs for a natural vegetated appearance, while improving the quality of stormwater runoff and groundwater recharge at the site.

The stormwater system will bring the entire parking lot into compliance with the Mass. Stormwater Management Standards and the Sudbury Stormwater Management Bylaw. It provides water quality and recharge improvements while not increasing the rate and volume of runoff from the site. Complete information on the stormwater management is included in the Stormwater Management Report attached with this Notice of Intent.

2. Accessibility Improvements: The existing paved walkway from the parking lot to the building entrances is four feet wide and a wheelchair walk is provided to the main entrance door. However, the present slopes and grading of the walk do not meet the ADA and MAAB codes in many areas. SVT desires to make the grading adjustments to bring this walk into compliance with the standards to improve accessibility for persons with disabilities. The existing asphalt walkway will be removed, grades adjusted and then repaved with asphalt in the same location as the existing.

A small entry plaza with concrete (brick style) pavers is proposed at the walkway entry adjacent to the parking lot. The existing bulletin board (or a similar replacement) will be relocated to the plaza (see photo). This plaza will only increase the paved area by 175 sq. ft.

A portion of these walkway improvements are within the outer portion of the 100 foot Buffer Zone to the Bordering Vegetated Wetlands (BVW) located across Wolbach Road from the project area. The closest work is 83 feet from the BVW.

3. Tree Removal at the Barn and Potting Shed: Some of the trees in proximity of the Barn and Potting Shed are very tall and leaning toward the structures. Eight of the trees have been identified as being particularly susceptible for wind throw and breakage. SVT proposes to remove those trees to protect these structures. Seven of the trees are located within the outer 50 feet of the 100 foot Buffer Zone. Detailed information on the tree removal is included in Attachment 4.

Construction Period Pollution Prevention Plan

Prior to the construction of the parking lot and walkway improvements, erosion and sediment controls will be installed and maintained until all areas have been permanently stabilized. This is detailed on the site plan.

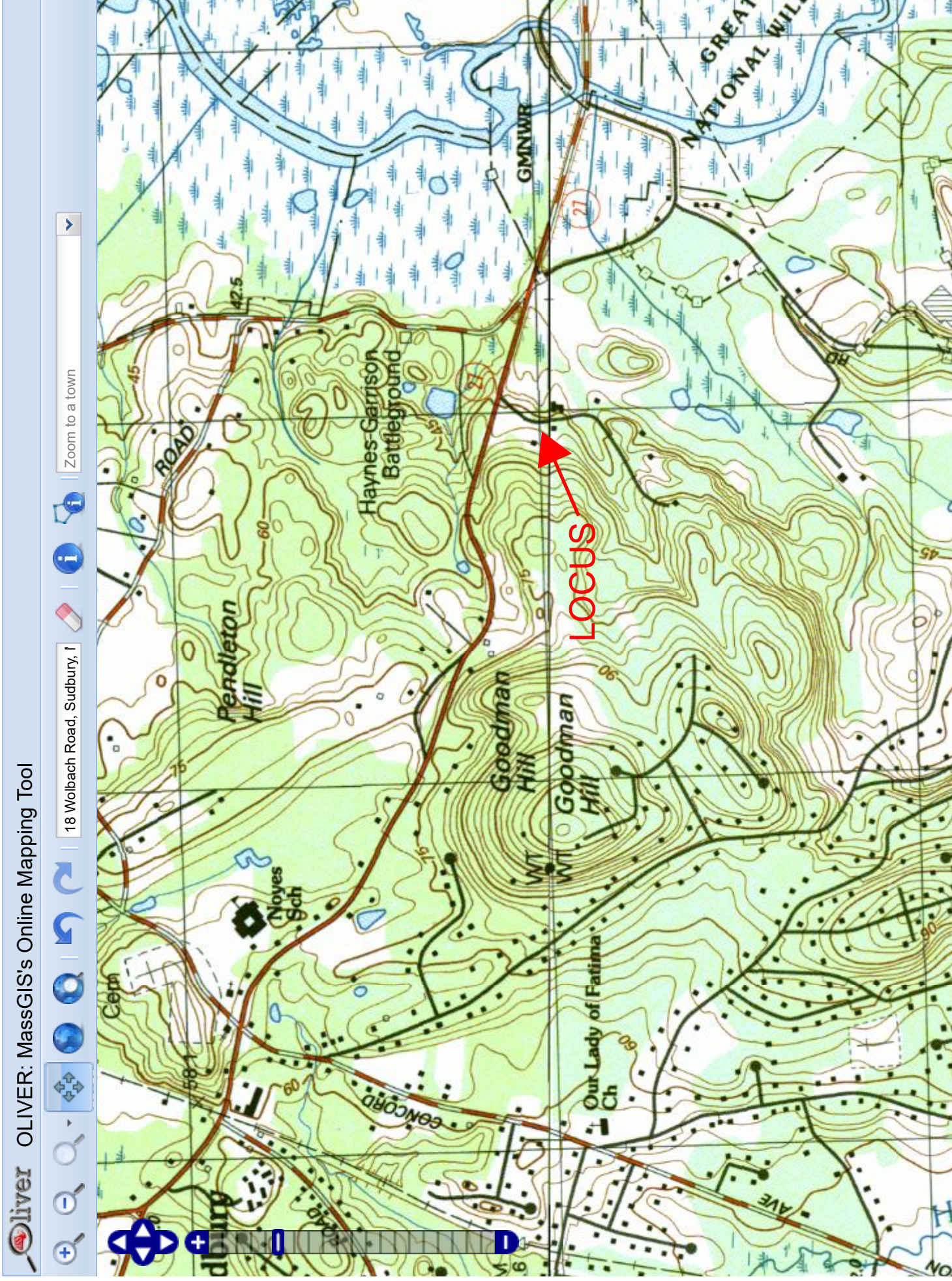
For the tree removal, no alteration of the ground is proposed as stumps will be cut flush and left in place.

PROJECT NARRATIVE

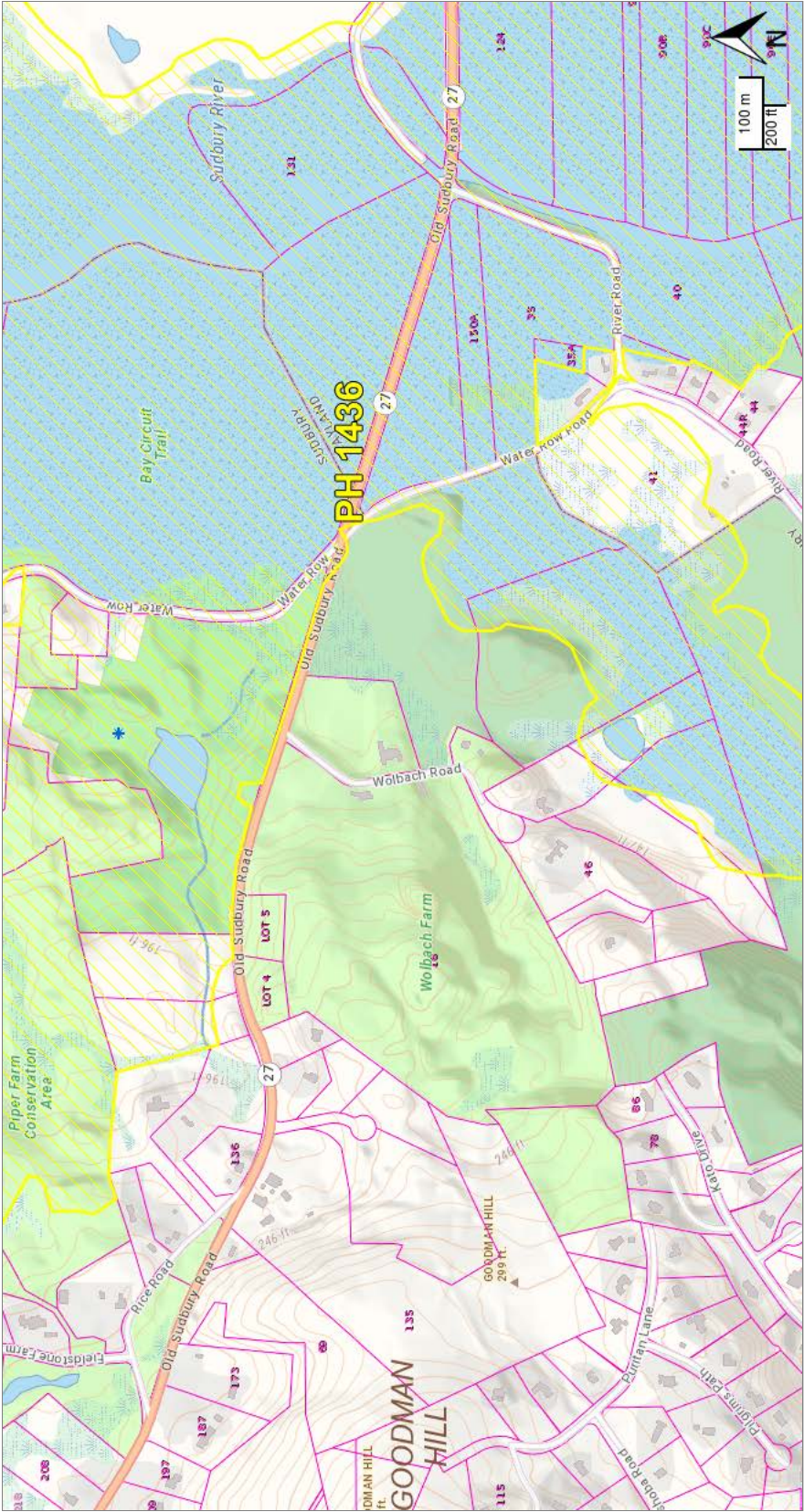
The total project area is approximately ½ acre, so the project is not subject to the NPDES Construction General Permit.

Mass. Natural Heritage Endangered Species Program (NHESP)

Attached at the end of this Narrative is a Mass. GIS Plan with the current NHESP data layers. The work site is not within or near any Priority or Estimated Habitat of Endangered Species. There are also no Certified or Potential Vernal Pools identified on the property. The nearest Priority or Estimated Habitat of Endangered Species is located approximately 670 feet to the southeast of the project area and is identified by the NHESP as PH 1395.



NHESP DATA LAYERS

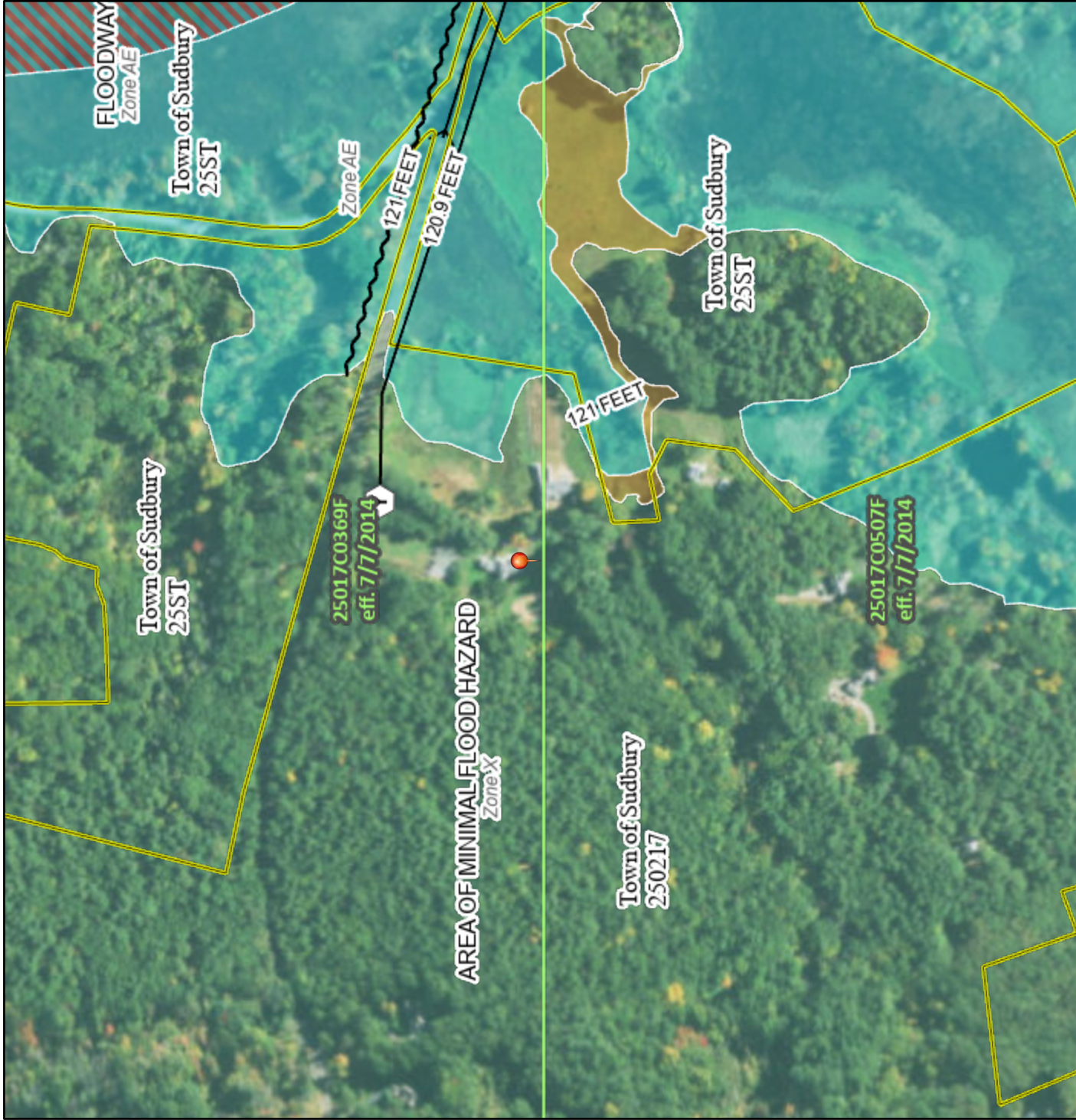


Potential Vernal Pools	MassGIS Subgrapher Basemap
NHESP Certified Vernal Pools	
NHESP Priority Habitats of Rare	
NHESP Estimated Habitats of Rare	
Tax Parcels for Query	
Detailed Features	
Tax Parcels for Display	
Structures	

National Flood Hazard Layer FIRMette



71°23'52"W 42°22'43"N



0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

Without Base Flood Elevation (BFE)
Zone A, V, A99

With BFE or Depth
Zone AE, AO, AH, VE, AR

Regulatory Floodway

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
Zone X

Future Conditions 1% Annual Chance Flood Hazard
Zone X

Area with Reduced Flood Risk due to Levee. See Notes.
Zone X

Area with Flood Risk due to Levee
Zone D

NO SCREEN

Area of Minimal Flood Hazard
Zone X

Effective LOMRs

Area of Undetermined Flood Hazard
Zone D

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

OTHER FEATURES

Digital Data Available

No Digital Data Available

Unmapped

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 8/4/2021 at 11:35 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

SITE PHOTOS



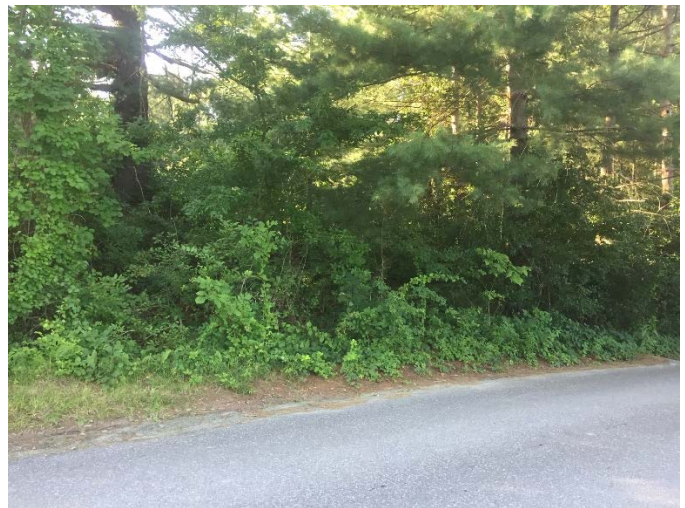
SVT Headquarters Building-Front Steps



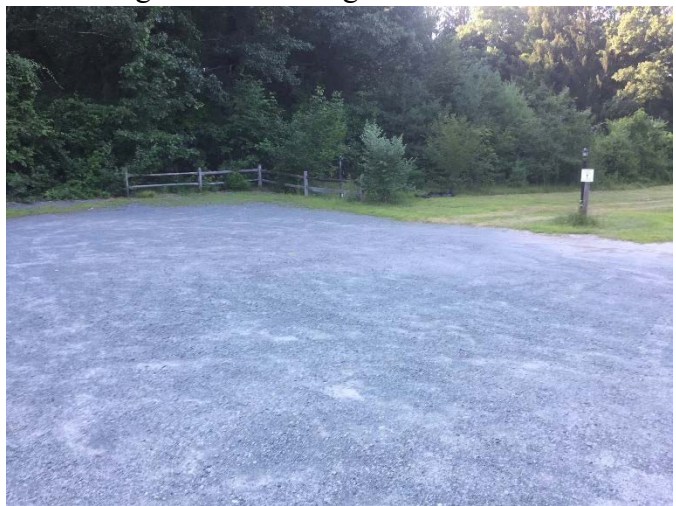
Existing Parking Lot Entrance -To Remain



Driveway looking toward parking lot



From Wolbach Road toward parking lot showing Dense vegetated screening.



Existing Gravel Parking Lot



Existing Field North of Parking Lot



Building and walkway from Parking Lot



Walkway to Building and Bulletin Board



Walkway to Building with typical post lamp



Walkway Looking North to Building

ATTACHMENT 2

**DRAFT ABUTTERS NOTICE
AND
ABUTTERS LIST
for**

**Sudbury Valley Trustees
18 Wolbach Road
Sudbury, MA 01776**

Notification to Abutters
Under the Massachusetts Wetlands Protection Act
and the Sudbury Wetlands Administrative Bylaw

In accordance with the second paragraph of Massachusetts General Laws Chapter 131,
Section 40, you are hereby notified of the following:

- A. The name of the **Applicant** is Sudbury Valley Trustees
- B. The Applicant has filed a Notice of Intent with the Sudbury Conservation Commission seeking permission to work in an Area Subject to Protection (Wetland Resource Area and/or Buffer Zone) under the Massachusetts Wetlands Protection Act (General Laws Chapter 131, Sec.40) and the Town of Sudbury Wetlands Administrative Bylaw.
- C. The **address** of the lot where the activity is proposed: 18 Wolbach Road, Sudbury, MA
- D. The **proposed activity** is: Accessibility improvements to an existing walkway, removal of hazardous trees and expansion of the existing gravel parking lot for 10 added parking spaces.
-
- E. A **Public Hearing** regarding this Notice of Intent will be held on:
Monday, August 23, 2021 at 6:30 PM.
- F. **Public Participation will be via Virtual Means Only** - In light of the ongoing COVID-19 coronavirus outbreak, Governor Baker issued an emergency Order on March 12, 2020, allowing public bodies greater flexibility in utilizing technology in the conduct of meetings under the Open Meeting Law. The Town of Sudbury Conservation Commission greatly values the participation of its citizens in the public meeting process, but given the current circumstances and recommendations at both the state and federal levels to limit or avoid public gatherings, including Governor Baker's ban on gatherings of more than 10 people, together with the present closure of Sudbury Town Hall and other public buildings to the public, the Town has decided to implement the "remote participation" procedures allowed under Governor Baker's emergency Order for all boards, committees, and commissions.
- G The public may participate in this meeting via Remote Participation:**
- From your computer, smart phone or tablet:
- http://us02web.zoom.us/j/98803339162
 - Meeting ID: 998 0333 9162
 - From your phone: **978-639-3366** or **470 250 9358**
- H Copies of the Notice of Intent may be examined by visiting this Website:
<https://sudbury.ma.us/conservationcommission/meetings/>
- I. Copies of the Notice of Intent may be obtained from either The Applicant, or the Applicant's representative DGT Associates, by calling this telephone number: 508-879-0030 between the hours of 8:00 am to 4:30 pm Monday - Friday

Note: Public Hearing Notice, including its date, time, and place, will be published at least 5 days in advance in either the Sudbury Crier or MetroWest newspapers (at the applicant's expense).

abutters_id_field	abutters_owner1	abutters_owner2	abutters_address	abutters_town	abutters_state	abutters_zip	abutters_bookpage	abutters_location
H10-0200	FAIRBANK WILLIAM TRS	REBECCA FAIRBANK LIVING TRUST	136 OLD SUDBURY RD	SUDBURY	MA	01776	56951-552	135 OLD SUDBURY RD
H10-0201	DINNO RAMZI SAAD & RAIED TRS	HARVEYS FARM TRUST	35 ARROWHEAD RD	WESTON	MA	02493-1706	48470-366	12 HARVEYS FARM LN
H10-0502	DINNO RAMZI SAAD & RAIED TRS	HARVEYS FARM TRUST	35 ARROWHEAD RD	WESTON	MA	02493-1706	48470-366	HARVEYS FARM LN
H11-0100	STEWARD CONNIE M TRUSTEE	STEWARD OLD SUDBURY ROAD	115 OLD SUDBURY ROAD	SUDBURY	MA	01776	76771-354	115 OLD SUDBURY RD
H11-0101	SUDBURY VALLEY TRUSTEES INC	US FISH & WILDLIFE, REALTY OFF	18 WOLBACH RD	SUDBURY	MA	01776	00P2515	18 WOLBACH RD
H11-0102	UNITED STATES OF AMERICA	US FISH & WILDLIFE, REALTY OFF	300 WESTGATE CTR DR	HADLEY	MA	01035	193536	WOLBACH RD
H11-0102	SUDBURY VALLEY TRUSTEES INC	CADOGAN CAROL	18 WOLBACH RD	SUDBURY	MA	01776	00P2515	WOLBACH RD
H11-0201	EISENSTEIN RONALD I & L	DEP OF ENV MGMT & DIV OF FISHER CONSERVATION	107 OLD SUDBURY ROAD	SUDBURY	MA	01776	62634-519	107 OLD SUDBURY RD
H11-0300	COMMONWEALTH OF MASSACHUSETTS	DEP OF ENV MGMT & DIV OF FISHER CONSERVATION	100 CAMBRIDGE ST 9TH FLOOR	BOSTON	MA	02114	18737-217	WATER ROW
J10-0200	TOWN OF SUDBURY	NEWTON JAMES W TRUSTEES OF THE	278 OLD SUDBURY ROAD	SUDBURY	MA	01776	21642-364	OLD SUDBURY RD
J10-0607	HWANG RAYMOND & EMILY	U.S. FISH & WILDLIFE	86 KATO DR	SUDBURY	MA	01776	76535-53	86 KATO DR
J11-0001	NEWTON FRANCIS C III &	NEWTON JAMES W TRUSTEES OF THE	132 SCLTUATE STREET	ARLINGTON	MA	02476	70343-490	50 WOLBACH RD
J11-0100	UNITED STATES OF AMERICA	U.S. FISH & WILDLIFE	300 WESTGATE CTR DRIVE	HADLEY	MA	01035	21649-271	91 RIVER RD
J11-0202	SUDBURY VALLEY TRUSTEES INC		18 WOLBACH RD	SUDBURY	MA	01776	00P2515	39 WOLBACH RD
J11-0300	WOOD DIANA W		46 WOLBACH RD	SUDBURY	MA	01776	29922-3	46 WOLBACH RD
J11-0301	NEWTON JAMES W		42 WOLBACH RD	SUDBURY	MA	01776	20366-249	42 WOLBACH RD
J11-0304	NEWTON FRANCIS C III &	NEWTON JAMES W TRUSTEES OF THE	132 SCLTUATE STREET	ARLINGTON	MA	02476	70343-490	WOLBACH RD
J11-0501	NEWTON FRANCIS C III &	NEWTON JAMES W TRUSTEES OF THE	132 SCLTUATE STREET	ARLINGTON	MA	02476	70343-490	WOLBACH RD
H11-0104	SUDBURY VALLEY TRUSTEES INC		18 WOLBACH RD	SUDBURY	MA	01776	00P2515	LOT 4 OLD SUDBURY RD
H11-0105	SUDBURY VALLEY TRUSTEES INC		18 WOLBACH RD	SUDBURY	MA	01776	00P2515	LOT 5 OLD SUDBURY RD

ATTACHMENT 3

TREE REMOVAL INFORMATION

for

**Sudbury Valley Trustees
18 Wolbach Road
Sudbury, MA 01776**

Sudbury Valley Trustees
Wolbach Farm
18 Wolbach Road, Sudbury, MA

Proposed Tree Removal at the Barn & Potting Shed
July, 2021

Project Narrative

Sudbury Valley Trustees (SVT) is seeking permission from the Sudbury Conservation Commission's and the Historic District Commission to remove 8 mature trees located adjacent to the barn and near the potting shed. All eight trees are within the 100' buffer zone to Winter Brook, an intermittent stream that runs perpendicular to Wolbach Road. All of the proposed trees to be removed are greater than 50' from the bordering vegetated wetlands (BVW). The BVW edge is based on a site survey performed by EcoTec on 11/11/2020.

Four white pine trees are located within 30' of the barn and are 100' tall or greater. Due to their trunk and limb structures, and bias towards the barn, these trees need to be removed to avoid catastrophic damage to the historic Wolbach barn if they were to fall.

Three spruce trees are located to the north side of Wolbach Road in close proximity to the potting shed and another is on the south side of Wolbach road, directly in front of the potting shed. These trees would cause complete destruction of the potting shed if they were to fall. Two of the trees show severe signs of distress and are clearly dying. Additionally, two other trees in front of the potting shed were topped during a recent storm, with 30' -40' of trunk remaining; these will also be removed.

The plan is to have a tree removal company cut the trees and remove all wood and branches from the site. Due to the size and location of the trees, a large capacity crane will be used to assist in their safe removal. All trunks will be cut near the ground with their stumps remaining undisturbed.

Attached Sketch and Pictures

The attached sketch of the Wolbach Farm shows the trees in the vicinity of the barn and potting shed. We are proposing to remove trees numbered 3, 4, 6 & 8 (near the barn) and trees 15, 16, 17 & 18 (near the potting shed).

Meeting Notes

Subject: Dangerous trees in vicinity of barn
Date: 26 February 2021
Attendees: Mark Caisse (Treescapes), Brandon

Mark was asked to look at the trees in the front and south side of the barn to assess their condition and to determine which trees are most likely to affect the barn if they were to fall.

Mark looked at branch structure, apparent insect damage, tree bias and distance to the barn to evaluate the trees. Trees reviewed included:

Refer to sketch below for area and tree locations.

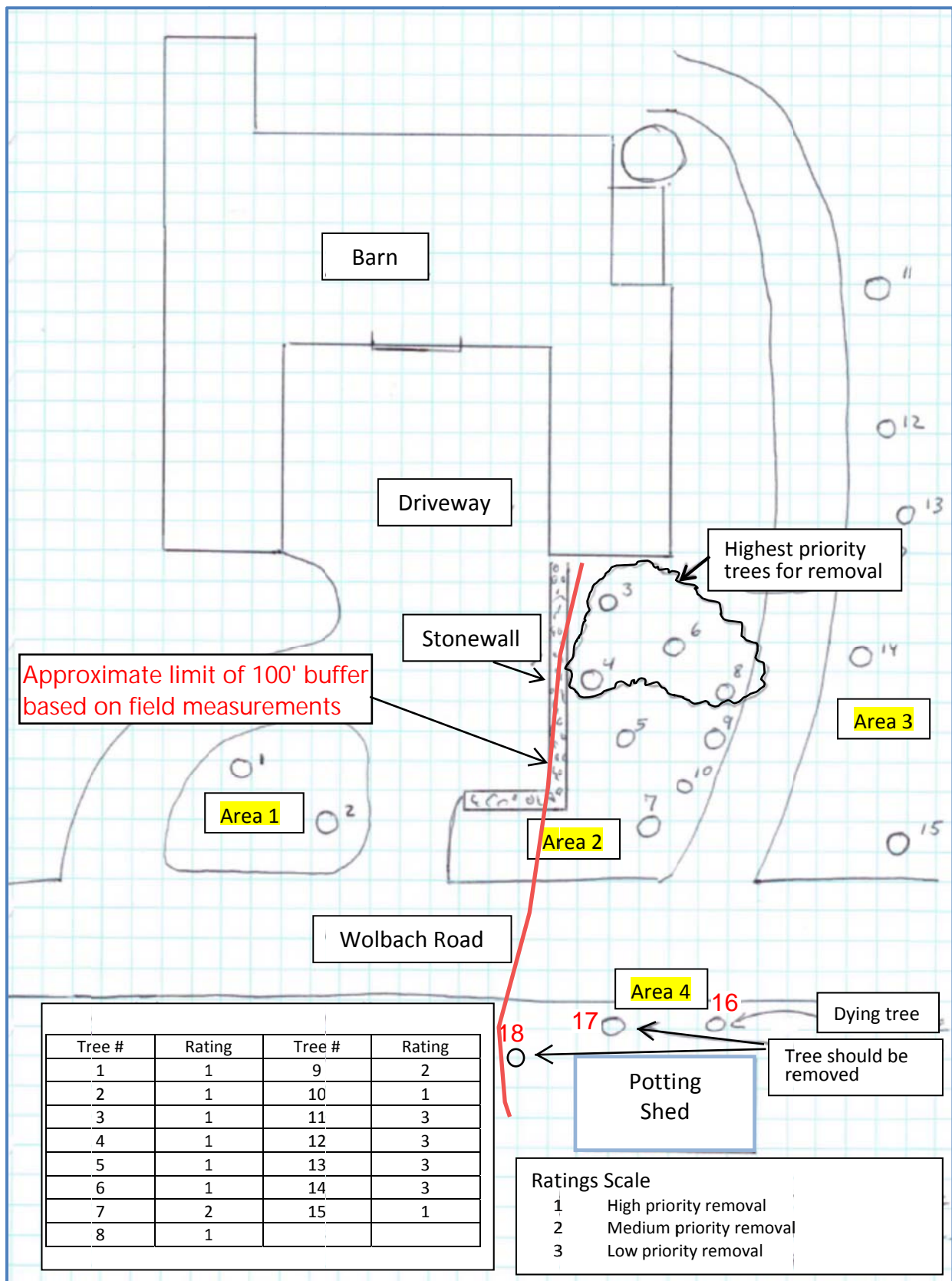
- (area 1) 2 pine trees in the driveway circle directly in the front of the barn
- (area 2) 8 pine trees to the south of the driveway's stone wall
- (area 3) 5 trees (1 maple, 3 spruce, 1 pine) to the south of the lower driveway
- (area 4) 2 fir trees across Wolbach Road, in front of the Potting Shed

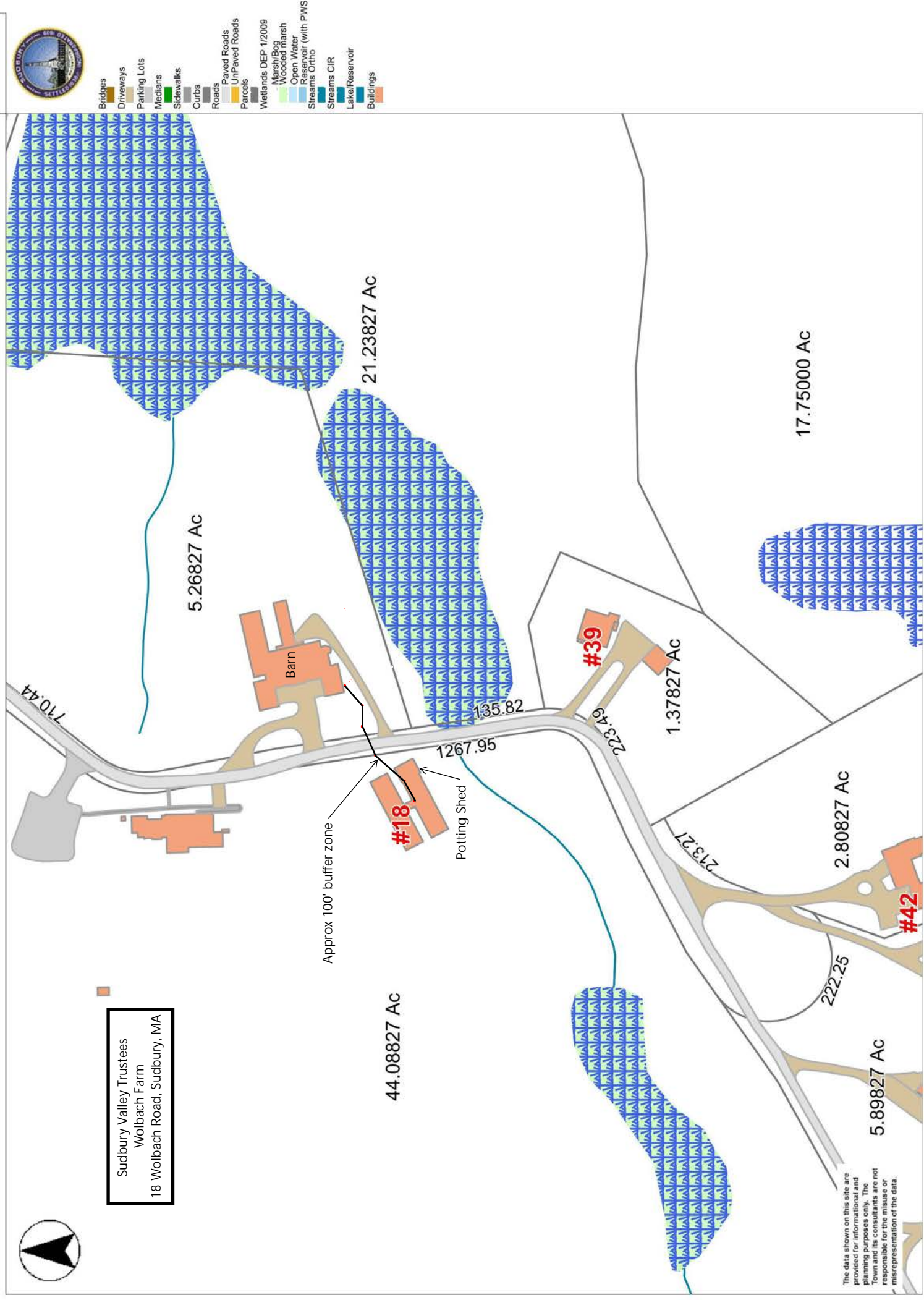
Mark's opinion is that all of the trees in areas 1 and 2 have the capability to damage the barn and should be removed. He mentioned that if only a few trees are removed, the remaining trees will be more impacted by wind storms and could fall/snap as a result. Trees in area 3, with the exception of the pine (#15) near the road, are probably safe to remain. One of the spruce trees (#12) should be pruned to reduce overhanging branches. The two trees in front of the Potting Shed (area 4), while not capable of impacting the barn, should be removed. One is dying and the other is leaning towards the Potting Shed; two large, adjacent trees were toppled during a recent storm.

If limited tree removal is desired, the 4 pines (#3,4,6,8) closest to the barn in area 2 should be targeted for removal, in Mark's opinion. These are the trees most likely to cause significant damage to the barn.

Rough Cost

The rough cost to remove all of the identified trees (13 trees) is approximately \$8k-10k. The cost to remove 4 trees closest to the barn is approximately \$5k. Due to tree size, proximity to barn and power lines, and small lay-down area, Mark would likely utilize a 60T-100T crane.





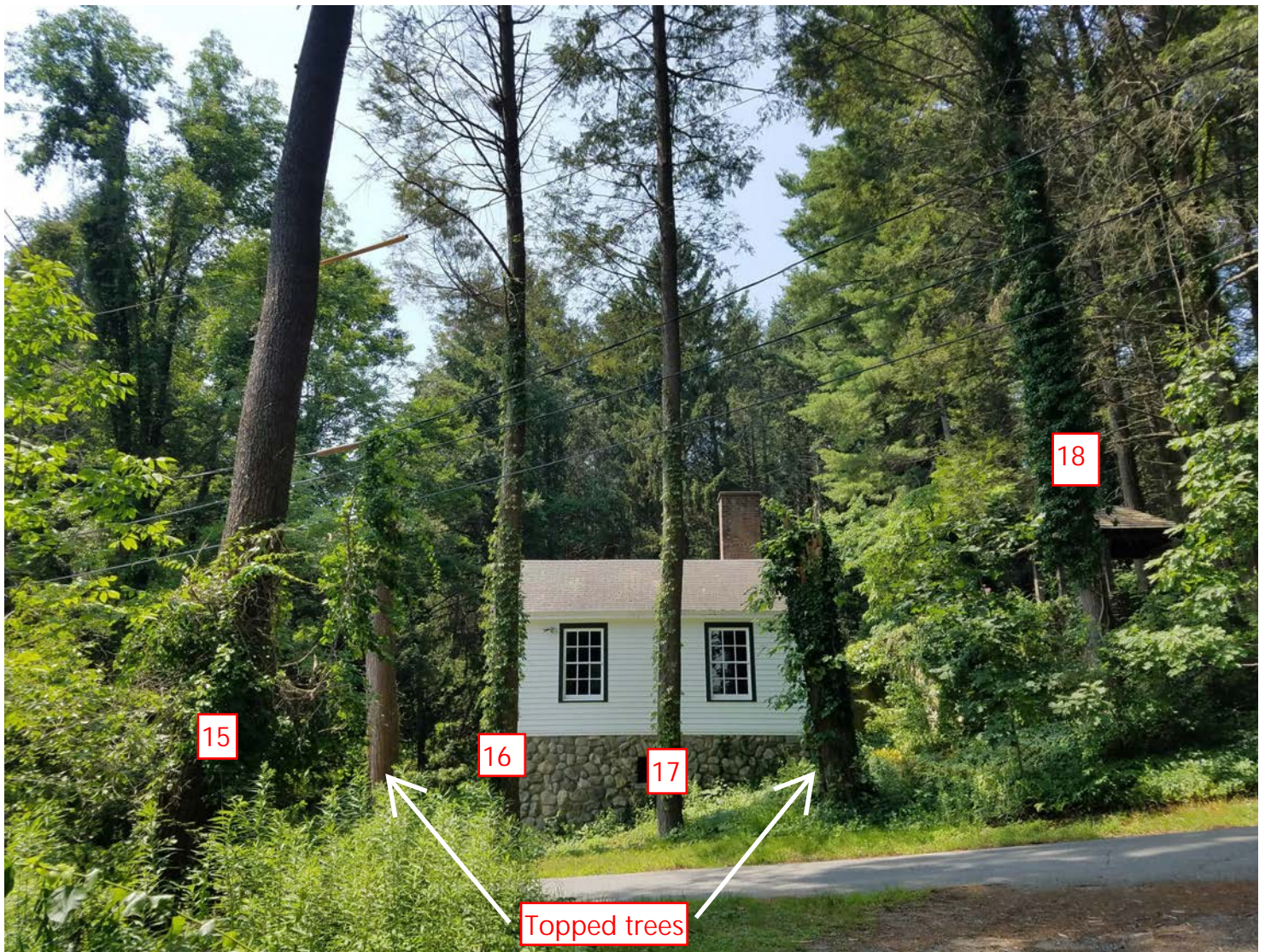
The data shown on this site are provided for informational and planning purposes only. The Town and its consultants are not responsible for the misuse or misrepresentation of the data.



Printed on 07/27/2021 at 10:02 AM



Looking north, with barn to the right.
Proposed tree removal - #3, 4, 6 & 8



Looking north across Wolbach Road, to front of potting shed.
Proposed tree removal - #15, 16, 17 & 18

1. THE CONTRACTOR SHALL INSTALL, ROUTINELY INSPECT AND MAINTAIN ALL SEDIMENT AND EROSION CONTROLS SUCH THAT THEY ARE IN PROPER WORKING ORDER AT ALL TIMES DURING THE CONSTRUCTION PROJECT UNTIL SUCH TIME AS ALL AREAS OF THE SITE TRIBUTARY TO THOSE EROSION CONTROLS ARE IN A PERMANENTLY STABILIZED CONDITION.
2. THE CONTRACTOR SHALL MANAGE THE SITE SUCH THAT EROSION AND SEDIMENT FROM RUNOFF OF A WIND BLOWN DUST ARE CONTROLLED AND MINIMIZED AT ALL TIMES. THE EROSION CONTROL SHOW OR THIS PLAN INCLUDE THE FINAL SETUP OF EROSION CONTROLS AND BASIC INFORMATION. TO MEET THE REQUIREMENT OF BEST MANAGEMENT PRACTICES, THE CONTRACTOR MUST MANAGE THE SITE PROPERLY WHICH MAY INCLUDE, BUT NOT BE LIMITED TO: MINIMIZING AREAS OF EXPOSED SOILS; INSTALLING TEMPORARY COVER; MAKE NECESSARY ADJUSTMENTS TO THE EROSION CONTROL INSTALLATIONS TO IMPROVE FUNCTION; INSTALL ADDITIONAL EROSION CONTROL WHERE APPROPRIATE.
3. THE EROSION CONTROL WORK SHOWN ON THIS PLAN MAY BE SUBJECT TO OTHER STATE AND LOCAL APPROVALS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH THE CONDITIONS AND REQUIREMENTS OF THOSE PERMITS.
4. DESIGN, INSTALLATION AND MAINTENANCE OF SEDIMENT AND EROSION CONTROLS SHALL BE IN ACCORDANCE WITH BEST MANAGEMENT PRACTICES FOLLOWING THE GUIDELINES INCLUDED IN THE FOLLOWING:
 - "STORMWATER MANAGEMENT FOR CONSTRUCTION ACTIVITIES, DEVELOPING POLLUTION PREVENTION PLANS, AND BEST MANAGEMENT PRACTICES" U.S. ENVIRONMENTAL PROTECTION AGENCY, OCTOBER 1992.
 - "MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS, A GUIDE FOR PLANNERS, DESIGNERS AND MUNICIPAL OFFICIALS" MASS. EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS, MAY 2003.
 - U.S.D.A. NATURAL RESOURCES AND CONSERVATION SERVICES (NRCS) GUIDELINES.

1. THIS PROJECT IS NOT SUBJECT TO THE FEDERAL CLEAN WATER ACT REQUIREMENTS FOR CONSTRUCTION SITES ADMINISTERED BY THE U.S. ENVIRONMENTAL PROTECTION AGENCY (EPA). THE PREPARATION OF A COMPLETE "STORMWATER POLLUTION PREVENTION PLAN" (SWPPP) AND FILING A NOTICE OF INTENT WITH THE EPA IS NOT REQUIRED PROVIDED THAT THE WORK REMAINS WITHIN THE LIMITS SHOWN ON THESE PLANS

1. PRIOR TO ANY DISBURSURE OR ALTERATIONS OF ANY AREA ON THE SITE, A SEDIMENT BARRIER SHALL BE INSTALLED AT THE LOCATION AS SHOWN ON THE PLAN.
2. INSTALL THE SEDIMENT BARRIER AS SHOWN ON THE PLAN, IN THOSE AREAS WHERE THE TOPOGRAPHY INDICATES THAT STORMWATER RUNOFF WILL BE CONCENTRATED (AT LOW POINTS), ADDITIONAL SEDIMENT BARRIER (SILT FENCE OR EQUAL) SHALL BE STAKED ON THE UPGRADE SIDE FOR ADDED FILTRATION AND PROTECTION. THE REQUIRED LOCATIONS FOR THE ADDITIONAL SEDIMENT BARRIER INSTALLATION WILL BE SEGREGATED BY THE ENGINEER AND/OR THE AUTHORIZED INSPECTOR UPON COMPLETION OF THE SEDIMENT BARRIER INSTALLATION. SEE DETAIL.
3. ONCE INSTALLED, THE SEDIMENT BARRIER SHALL BE MAINTAINED IN PLACE UNTIL ALL AREAS UPGRADEMENT FROM THE BARRIERS HAVE BEEN PERMANENTLY STABILIZED.
4. ALL DISTURBED AREAS NOT OTHERWISE DEVELOPED OR WHERE SPECIAL STABILIZATION MEASURES OR LANDSCAPE PLANTINGS ARE PROPOSED SHALL BE LOAMED AND SEEDED OR SODDED. SIX INCHES OF LOAM TOPSOIL (MIN. COMPACTED DEPTH) SHALL BE APPLIED UNLESS, OTHERWISE SPECIFIED. SEE LANDSCAPE PLAN AND OTHER PLAN AS APPLICABLE.
5. THE SEDIMENT BARRIER IS ALSO A LIMIT OF WORK. ALL AREAS OUTSIDE THE LIMIT ARE TO BE LEFT UNDISTURBED. DURING THE SITE WORK, ALL PERSONS AND EQUIPMENT SHALL STAY OUT OF THESE AREAS TO PRESERVE THE EXISTING VEGETATION AND SOIL COVER.

1. AT THE START OF SITE WORK, A STONE CONSTRUCTION ENTRANCE SHALL BE INSTALLED AT THE ACCESS TO THE SITE FROM THE ROADWAY TO CONTROL THE TRACKING OF MUD OFF THE SITE. THE ENTRANCE SHALL BE MAINTAINED UNTIL THE SITE IS IN A STABILIZED CONDITION WHEN THE POSSIBILITY OF VEHICLES TRACKING MUD OFF SITE HAS BEEN ELIMINATED.
2. THE CONTRACTOR SHALL RELOCATE THE CONSTRUCTION ENTRANCE AS THE LOCATION CHANGES THROUGHOUT THE DURATION OF CONSTRUCTION.
3. THE CONTRACTOR SHALL MAINTAIN THE ADJACENT ROADWAYS WHEN MUD, DUST, DIRT, DEBRIS, ETC. SHOWN SIGNS OF BUILDUP ON THE ROADWAYS AT THE ENTRANCE OF THE SITE. THE CONTRACTOR SHALL PAY PARTICULAR ATTENTION TO THIS MATTER AND IMMEDIATE ATTENTION IS ALWAYS REQUIRED.

1. DISCHARGE FROM Dewatering Pumps or Temporary Trench or Excavation Drains shall not be discharged directly to the on-site drainage system or wetland resource areas. Discharges shall be directed to a treatment system consisting of a sediment basin, straw bale sediment basin, filter bag system or other approved method to filter the discharge water and prevent erosion.
2. The pump discharge systems must be greater than 100 feet from wetland resources unless approved by the municipal conservation commission and in accordance with other applicable laws and regulations.
3. All dewatering drainage associated with construction activities must first obtain any applicable dewatering drainage permit. Such discharges shall comply with the municipal requirements, United States Environmental Protection Agency, Massachusetts DEP and other appropriate agencies.
4. Under no circumstance shall dewatering drainage be discharged into a sanitary sewer.

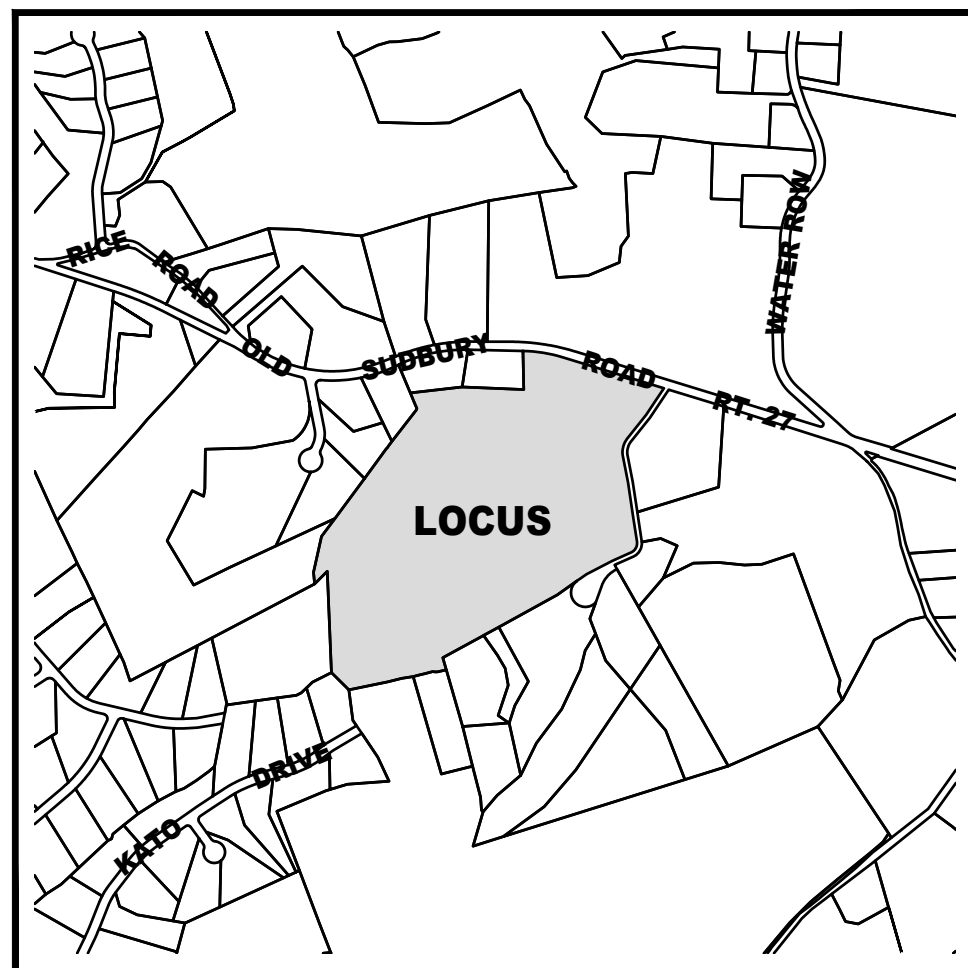
1. STOCKPILES OF SOIL MATERIALS SHALL BE PLACED WITHIN AREAS THAT ARE PROTECTED BY SEDIMENT BARRIER AS SHOWN ON THIS PLAN, OR SHALL BE SURROUNDED BY PROPER SILT FENCING, FIBER LOGS, OR STAKED STRAW BALES.
2. STOCKPILES THAT ARE TO BE IN PLACE FOR EXTENDED PERIODS OF TIME (MORE THAN 30 DAYS) SHALL BE COVERED OR OTHERWISE TEMPORARILY STABILIZED IN ACCORDANCE WITH BEST MANAGEMENT PRACTICES.

1. CATCH BASINS WITHIN THE WORK AREA OR THAT WILL RECEIVE RUNOFF FROM THE WORK AREA SHALL BE PROTECTED WITH A SILT SACK AND OR OTHER APPROVED INSTALLATION TO MINIMIZE THE SEDIMENT LOAD TO THE BASIN.

1. THE CONTRACTOR SHALL TAKE APPROPRIATE MEASURES DURING SITE WORK TO MINIMIZE WIND BLOWN DUST FROM EXPOSED SOIL SURFACES. MEASURES INCLUDE BUT ARE NOT LIMITED TO:

- SPRINKLING WATER ON EXPOSED SURFACES
- APPLICATION OF TEMPORARY COVER SUCH AS HYDRO MULCH AND TACIFIER, STRAW MATTING, JUTE NETTING ETC.

1. STORMWATER FROM THE DISTURBED CONSTRUCTION SITE SHALL NOT BE DISCHARGED INTO THE PROPOSED RAIN GARDEN UNTIL THE AREA BEING DRAINED IS FULLY STABILIZED AND CLEAN. UNTIL THEN, THE RAIN GARDEN SHALL REMAIN OFF-LINE AND PROTECTED. THE CONTRACTOR SHALL PROVIDE TEMPORARY BY-PASS SYSTEMS AS NECESSARY TO PREVENT CONSTRUCTION SITE RUNOFF FROM ENTERING THE RAIN GARDEN.



GENERAL NOTES

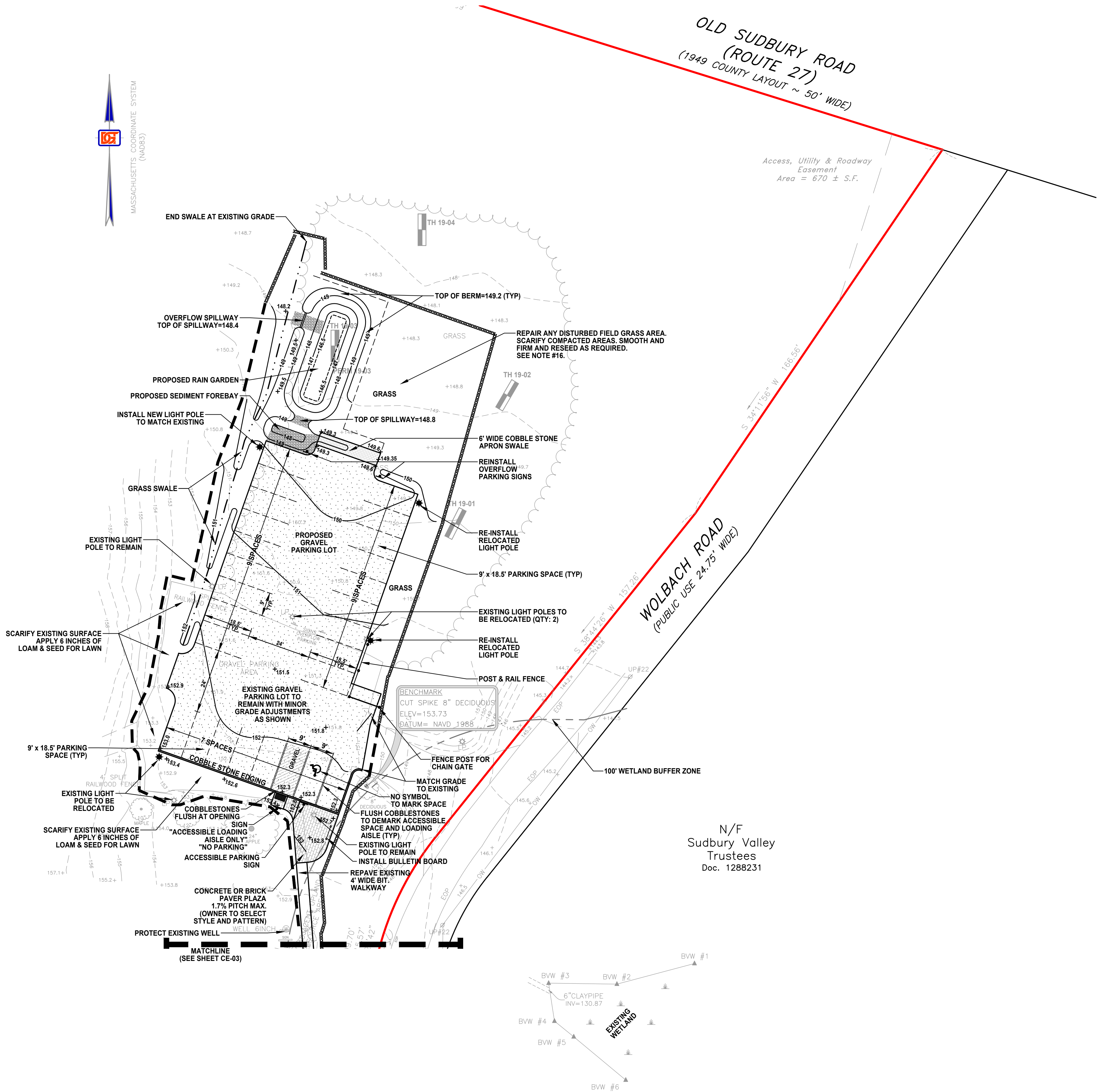
- ELEVATIONS SHOWN HEREON REFER TO NAVD 1988
- TOPOGRAPHIC INFORMATION SHOWN HEREON WAS OBTAINED FROM FIELD SURVEYS PERFORMED BY DGT ASSOCIATES ON MAY 21, 2019.
- THE CONTRACTOR SHALL VERIFY THE LOCATION AND RELATIVE ELEVATION OF BENCH MARKS PRIOR TO THE COMMENCEMENT OF ANY CONSTRUCTION. ANY DISCREPANCY SHALL BE REPORTED TO THE ENGINEER.
- IN CASES WHERE LEDGE, BURIED FOUNDATIONS OR BOULDERS ARE PRESENT, DGT ASSOCIATES SHALL NOT BE RESPONSIBLE FOR THE AMOUNT OF ROCK OR CONCRETE ENCOUNTERED
- DGT ASSOCIATES SHALL BE NOTIFIED OF ANY SIGNIFICANT DIFFERENCES IN THE EXISTING CONDITIONS OR UTILITIES THAT MAY AFFECT THE CONSTRUCTION SHOWN ON THIS PLAN FOR ANY NECESSARY PLAN REVISIONS.
- THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REPAIR AND/OR REPLACEMENT OF ANY EXISTING FEATURES DAMAGED DURING CONSTRUCTION THAT ARE NOT INTENDED FOR DEMOLITION AND/OR REMOVAL HEREON.
- SAFETY MEASURES, CONSTRUCTION METHODS AND CONTROL OF WORK SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

GRADING AND UTILITY PLAN NOTES

- LOCATIONS OF EXISTING UNDERGROUND UTILITIES SHOWN HEREON ARE APPROXIMATE ONLY. ALL UTILITIES, OBSTRUCTIONS AND/OR SYSTEMS MAY NOT BE SHOWN. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR FOR LOCATING AND PROTECTING ALL EXISTING UNDERGROUND UTILITIES AND/OR SYSTEMS WHETHER OR NOT SHOWN HEREON.
- UNLESS OTHERWISE SHOWN HEREON, ALL NEW UTILITIES SHALL BE UNDERGROUND.
- RIM ELEVATIONS SHOWN HEREON FOR NEW STRUCTURES ARE PROVIDED TO ASSIST THE CONTRACTOR WITH MATERIAL TAKEOFFS. FINAL RIM ELEVATIONS SHALL MATCH PAVEMENT, GRADING, LANDSCAPING, UNLESS SPECIFICALLY INDICATED OTHERWISE.
- WHERE CONNECTIONS AND STRUCTURES ARE TO BE INSTALLED AT EXISTING UTILITIES, THE CONTRACTOR SHALL CONFIRM THE LOCATION AND ELEVATION PRIOR TO INSTALLATION AND SHALL REPORT ANY SIGNIFICANT DISCREPANCY FROM THE PLAN INFORMATION TO THE ENGINEER.
- ACCESSIBLE PARKING SPACES AND ACCESS AISLES SHALL NOT EXCEED A SLOPE OF 1:50 (2%) IN ANY DIRECTION.
- WALKWAY GRADES SHALL NOT HAVE LONGITUDINAL SLOPES IN EXCESS OF 1:20 (5%) OR CROSS SLOPES IN EXCESS OF 1:50 (2%), UNLESS OTHERWISE NOTED.
- WALK GRADIENTS AND CROSS SLOPES SHOWN HEREON ARE WITHIN, OR LESS THAN, THE REQUIREMENTS OF THE MASSACHUSETTS ARCHITECTURAL ACCESS BOARD'S (MAAB) REGULATIONS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO CONSTRUCT THE WORK SO THAT IT IS COMPLIANT WITH ALL REQUIRED REGULATIONS. NOTE THAT THE MAXIMUM GRADIENTS WITHIN THE REGULATIONS DO NOT RECOGNIZE "CONSTRUCTION TOLERANCES." EXCEEDING THE MAXIMUM GRADIENTS IN THE REGULATIONS IS ENTIRELY AT THE CONTRACTOR'S RISK. THE CONTRACTOR SHALL VERIFY IN WRITING THAT ALL WALKS HAVE BEEN CONSTRUCTED IN COMPLIANCE WITH THE MAAB'S REGULATIONS.
- ALL ACCESSIBLE PARKING SPACES SHALL HAVE SIGNAGE AND MARKINGS COMPLIANT WITH THE MAAB REGULATIONS.
- CURB RADII AND DIMENSIONS SHOWN HEREON ARE AT THE FACE OF CURB.
- WHERE NEW PAVING MEETING EXISTING PAVING, MEET LINE AND GRADE OF EXISTING WITH NEW PAVING.
- PERIMETER EROSION CONTROLS SHOWN HEREON SHALL BE INSTALLED PRIOR TO ANY EARTH DISTURBANCE AND SHALL SERVE AS A LIMIT OF WORK, UNLESS OTHERWISE SHOWN.
- THE CONTRACTOR SHALL PROVIDE DUST CONTROL FOR CONSTRUCTION OPERATIONS AS APPROVED BY THE ENGINEER.
- ALL POINTS OF CONSTRUCTION EGRESS OR INGRESS SHALL BE MAINTAINED TO PREVENT THE TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADS. STRIPING ON THE GRAVEL PARKING AREA IS SHOWN FOR ILLUSTRATIVE PURPOSES. NO MARKINGS ARE PROPOSED EXCEPT FOR THE PAVED ACCESSIBLE PARKING AREA AND LOADING SPACE.
- SITE LIGHTING: EXTEND AND ADJUST ELECTRICAL LINES AND CONDUITS AS NECESSARY FOR THE RELOCATED AND NEW LIGHT POLES AND LIGHTING FOR THE NEW KIOSK. ELECTRICAL CONTRACTOR TO MAKE ADJUSTMENTS TO THE ELECTRICAL CONDUITS AS NECESSARY TO SUPPLY ADEQUATE POWER AND ADD REQUIRED SWITCHES AND ACCESSORIES.
- DISTURBED FIELD AREA OUTSIDE OF THE PARKING LOT IS TO BE REPAIRED TO ITS ORIGINAL CONDITION. SCARIFY OR TILL SOIL TO LOOSEN COMPACTION. SMOOTH AND FIRM THE SURFACE AND RESEED.

REGULATORY NOTES

- THE LOCATION OF ALL UNDERGROUND UTILITIES SHOWN HEREON ARE BASED ON FIELD LOCATION OF VISIBLE STRUCTURES AND COMPILING INFORMATION FROM PLANS PROVIDED BY UTILITY COMPANIES AND GOVERNMENT AGENCIES. THE LOCATION SHOWN HEREON SHALL BE CONSIDERED APPROXIMATE. BEFORE ANY CONSTRUCTION, DEMOLITION OR SITE WORK, THE LOCATION OF ALL UNDERGROUND UTILITIES SHALL BE VERIFIED BY THE CONTRACTOR BY CONTACTING "DIG-SAFE" AT 811.
- THE CONTRACTOR SHALL MAKE HIMSELF AWARE OF ALL CONSTRUCTION REQUIREMENTS, CONDITIONS AND LIMITATIONS IMPOSED BY PERMITS AND APPROVALS ISSUED BY REGULATORY AUTHORITIES PRIOR TO THE COMMENCEMENT OF ANY WORK. CONTRACTOR SHALL COORDINATE AND OBTAIN ALL CONSTRUCTION PERMITS REQUIRED BY REGULATORY AUTHORITIES.
- CONSTRUCTION ACTIVITIES SHALL CONFORM TO THE RULES AND REGULATIONS OF THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA).



NO.	APP.	DATE	DESCRIPTION
1	FWK	6/16/2021	PER CLIENT REQUEST

DATE: JUNE 1, 2021

SCALE: 1" = 20'

DRAFTED: KMR/JJS CHECKED: FWK APPROVED: FWK

PROJECT TITLE:

**NEW PARKING
FACILITY AND
ACCESSIBILITY
IMPROVEMENTS FOR
SVT HEADQUARTERS
AT WOLBACH FARM**

18 WOLBACH ROAD
SUDBURY, MASSACHUSETTS 01776

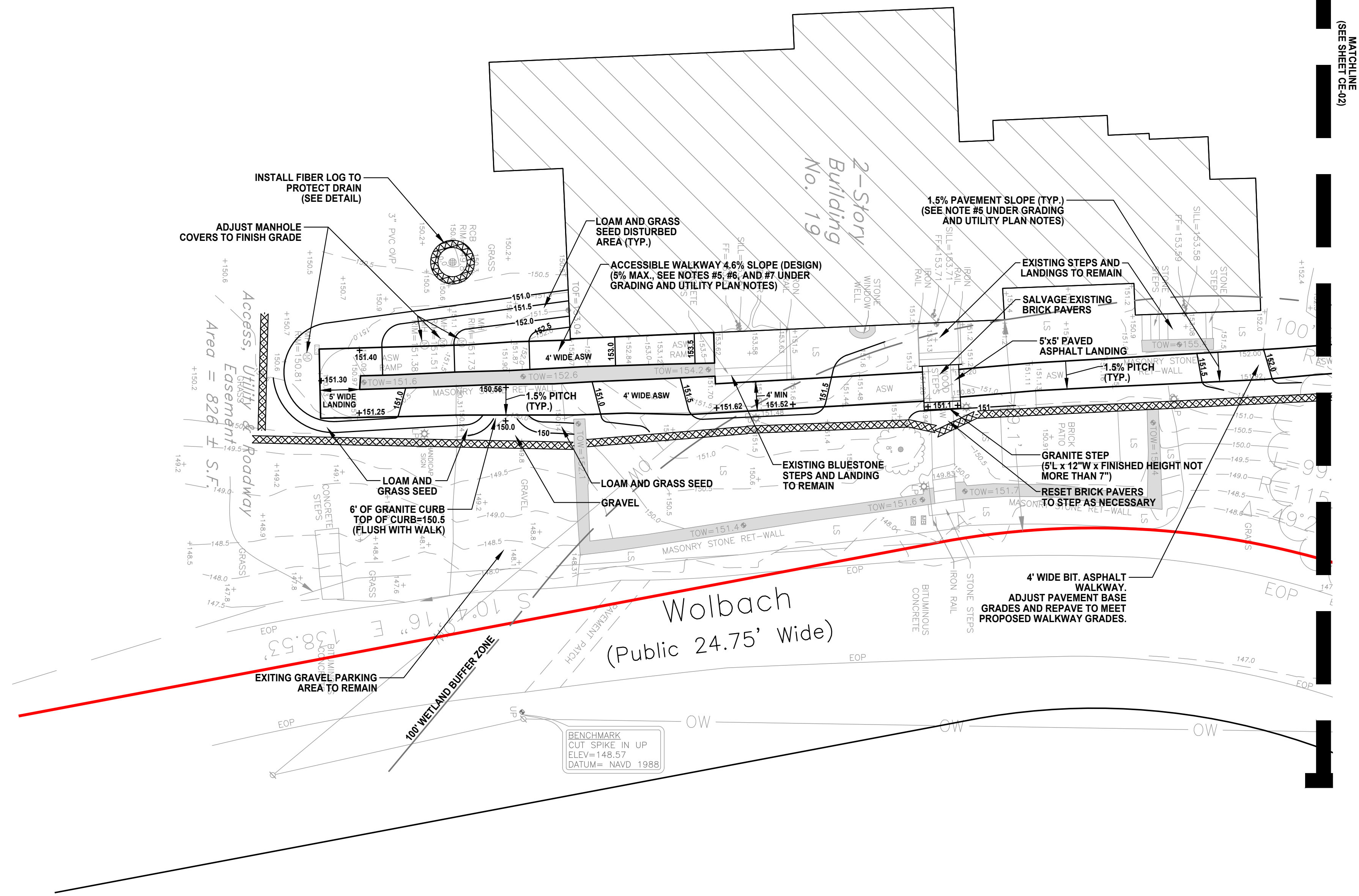
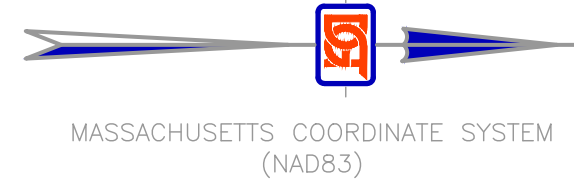
SHEET TITLE:

**PROPOSED
SITE PLAN #1**

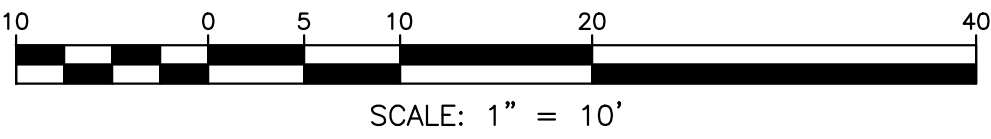
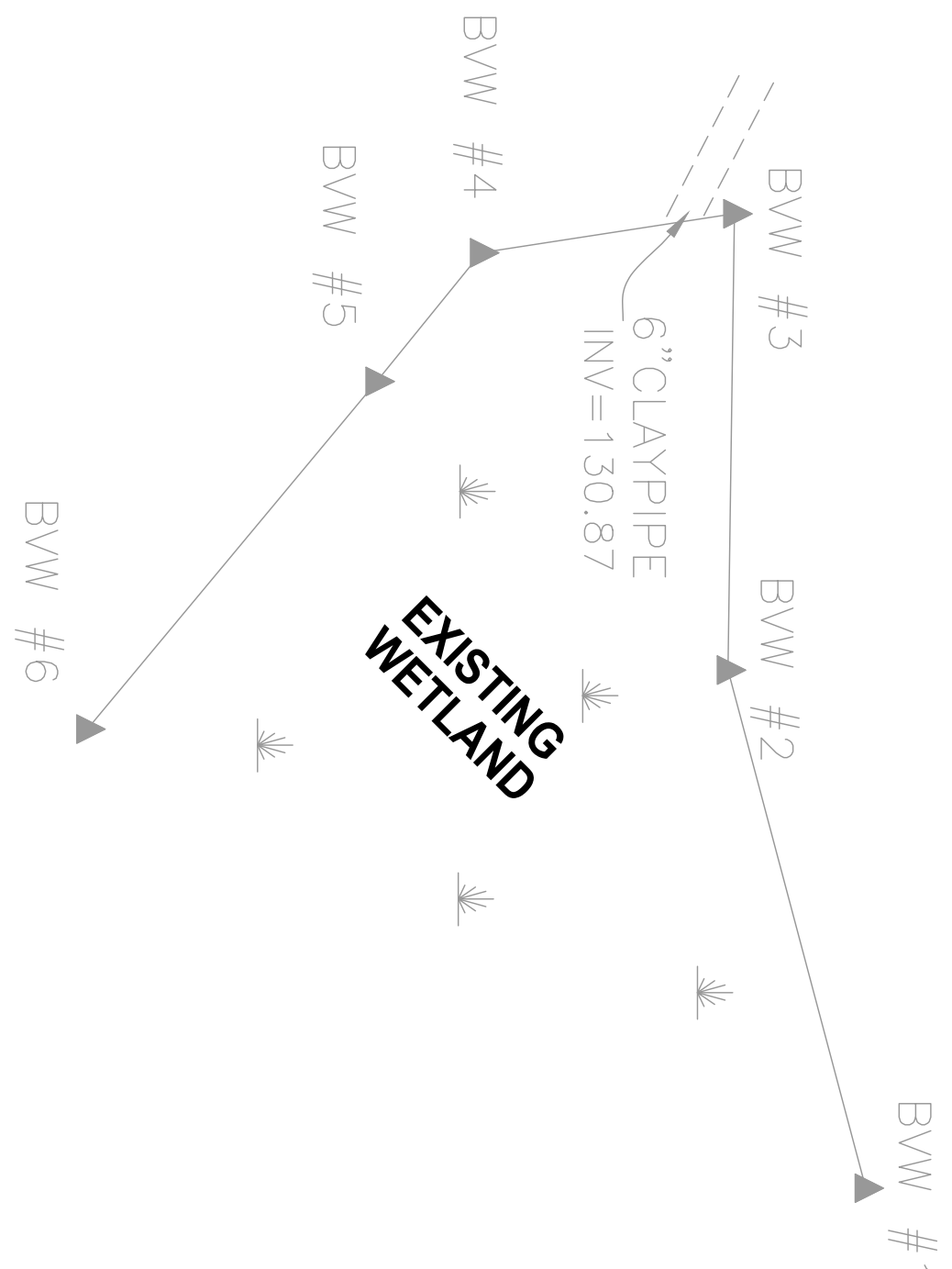
SHEET:
2 OF 6

PROJECT NO.:
25423

CE-02



- NOTES FOR WALKWAYS:
1. THE WALKWAY IMPROVEMENTS ARE DESIGNED TO MEET A.D.A. AND MAAB REQUIREMENTS AS AN "ACCESSIBLE ROUTE."
 2. SEE GRADING AND UTILITY NOTES #5, #6, AND #7 UNDER GRADING AND UTILITY PLAN NOTES ON SHEET CE-02 FOR ADDITIONAL REQUIREMENTS
 3. REMOVE EXISTING ASPHALT PAVEMENT, ADJUST BASE GRADES AS NECESSARY AND REPAVE TO MEET PROPOSED GRADES





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1	FWK	6/16/2021	PER CLIENT REQUEST
NO.	APP	DATE	DESCRIPTION
DATE: JUNE 1, 2021			
SCALE: 1"=10'			
DRAFTED: KMR/FJS	CHECKED: FWK	APPROVED: FWK	
PROJECT TITLE: NEW PARKING FACILITY AND ACCESSIBILITY IMPROVEMENTS FOR SVT HEADQUARTERS AT WOLBACH FARM 18 WOLBACH ROAD SUDBURY, MASSACHUSETTS 01776			
SHEET TITLE: PROPOSED SITE PLAN #2			
SHEET: 3 OF 6		CE-03	
PROJECT NO.: 25423			
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1	FWK	6/16/2021	PER CLIENT REQUEST
NO.	APP	DATE	DESCRIPTION

DATE: JUNE 1, 2021

SCALE: AS NOTED

DRAFTED:	CHECKED:	APPROVED:
KMR/FJS	FWK	FWK

PROJECT TITLE:

**NEW PARKING
FACILITY AND
ACCESSIBILITY
IMPROVEMENTS FOR
SVT HEADQUARTERS
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18 WOLBACH ROAD
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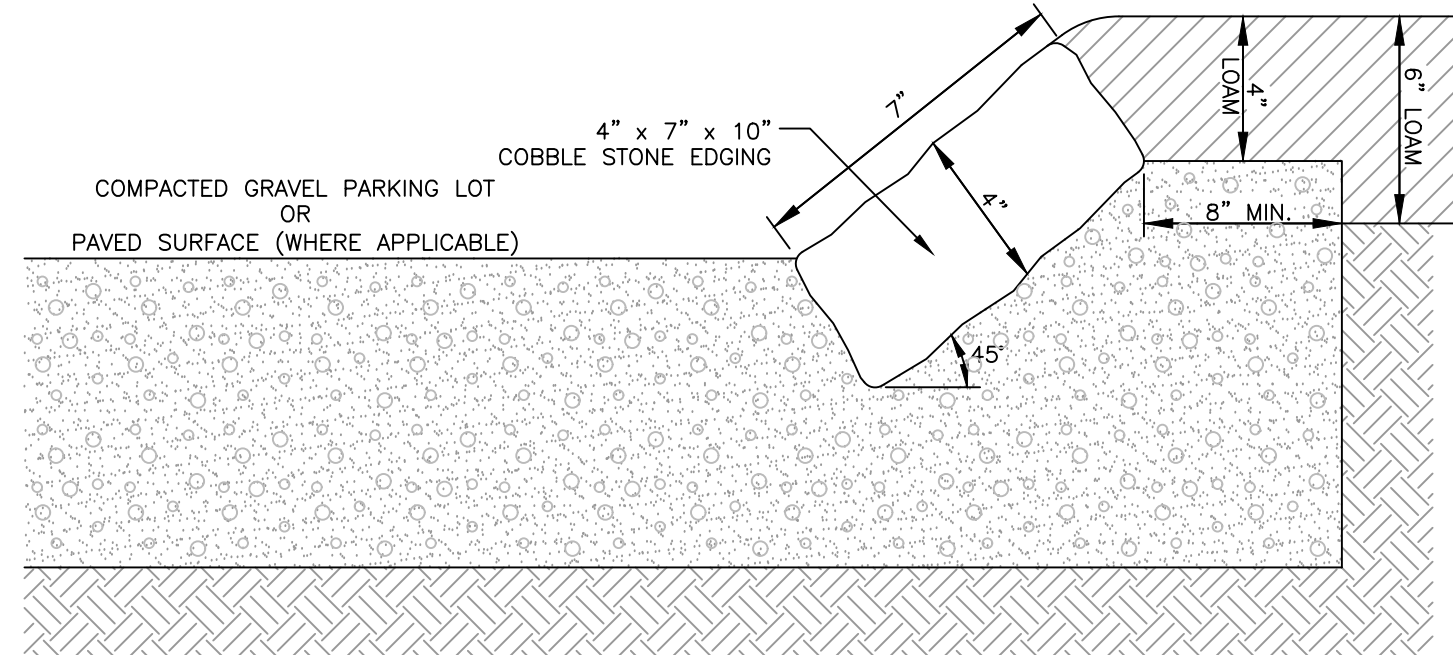
SHEET TITLE:

**SITEWORK
DETAILS #1**

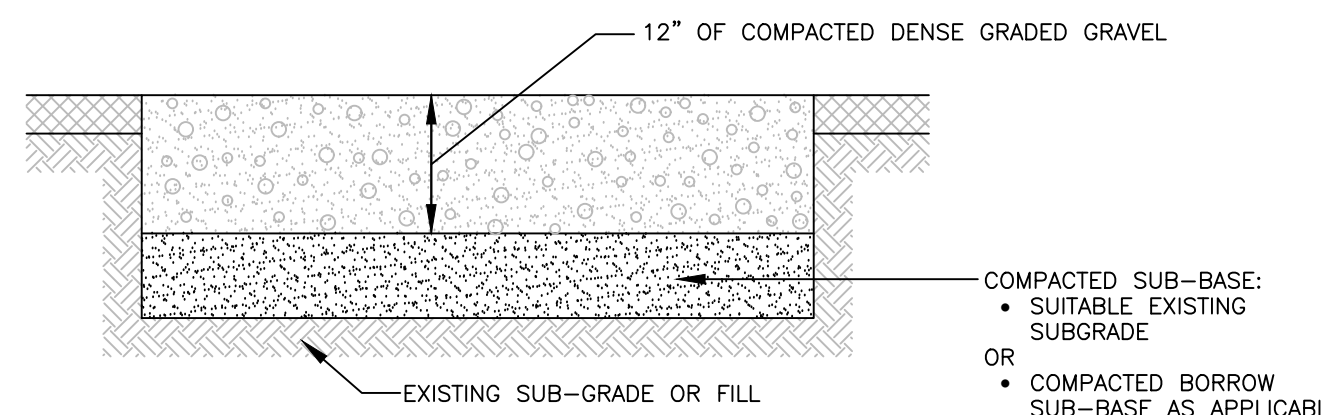
SHEET:
4 OF 6

PROJECT NO.:
25423

CE-04

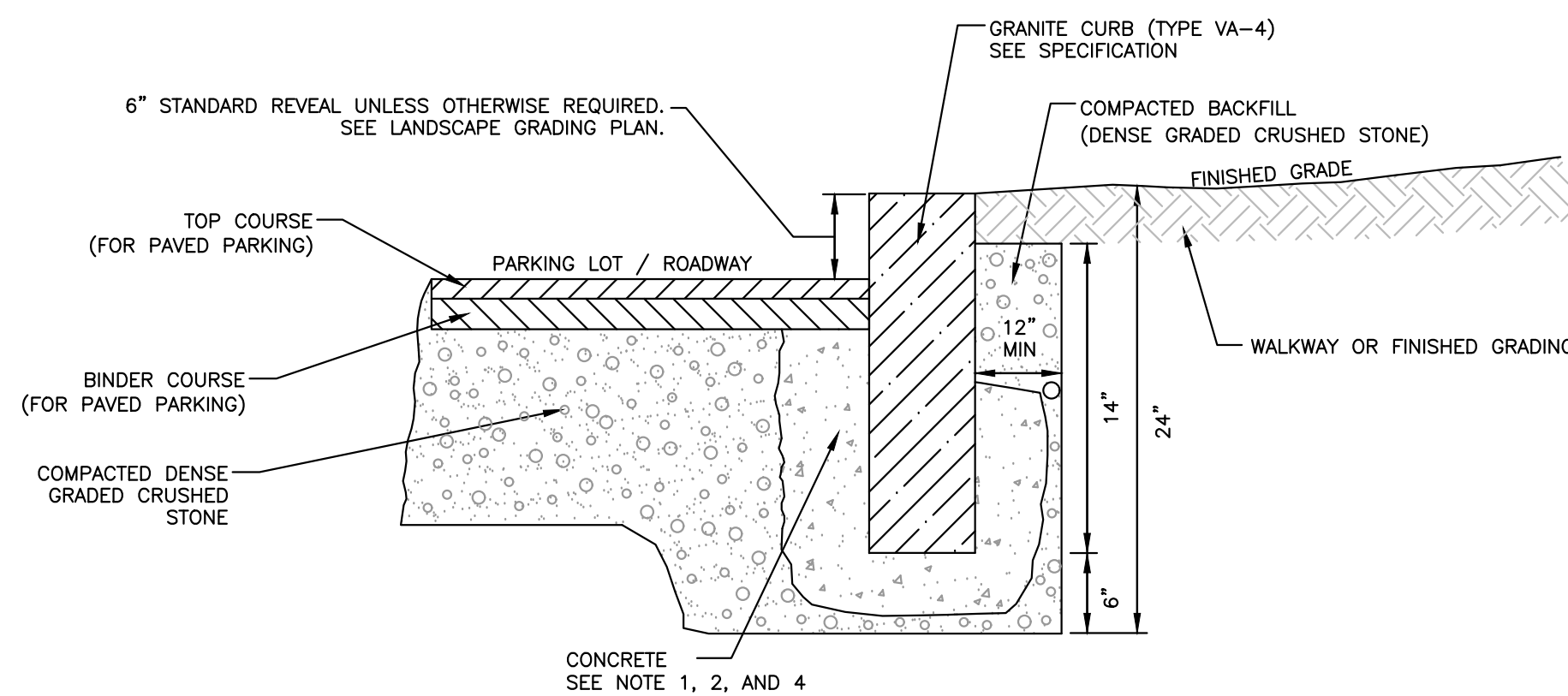


COBBLE STONE EDGING
(NO SCALE)



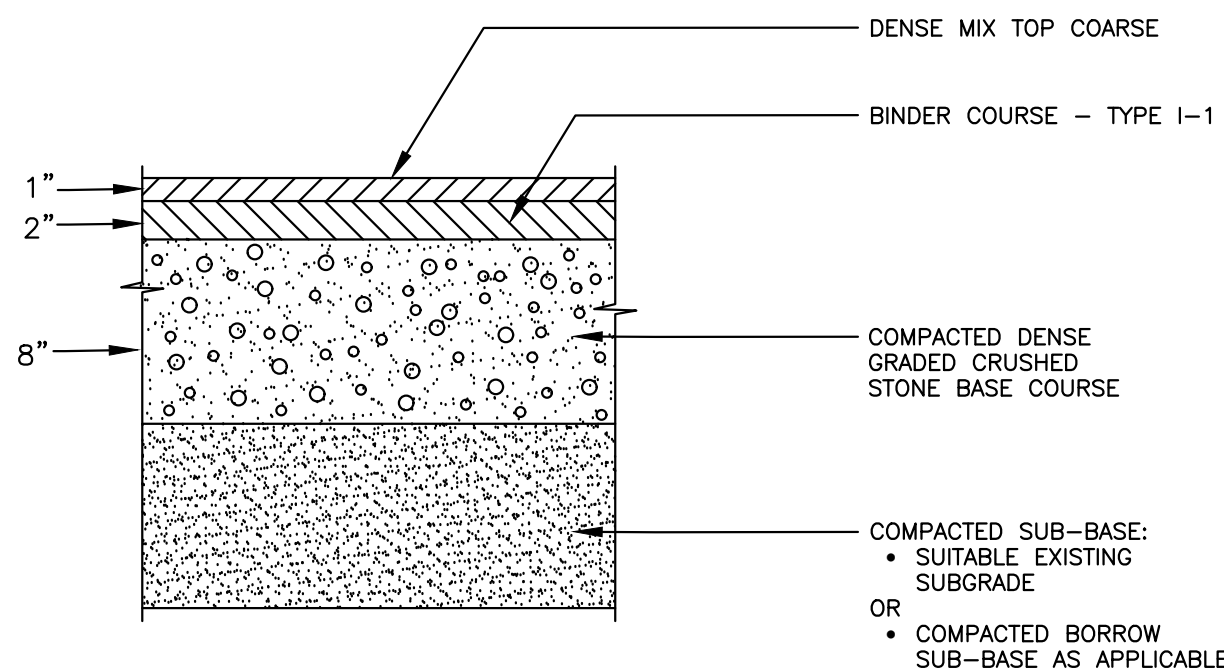
- NOTES:
- THIS DETAIL APPLIES TO THE NEW PARKING LOT AREA AT THE EXISTING FIELD OR LANDSCAPED AREAS. FOR AREA OF THE EXISTING PARKING LOT, THE EXISTING GRAVEL SURFACE IS TO REMAIN AND MINOR GRADE CHANGES SHALL BE MADE AS SHOWN ON THE PLAN.
 - DENSE GRADED GRAVEL SHALL CONSIST OF MATERIAL MEETING THE FOLLOWING:
 - DENSE GRADED CRUSHED STONE MEETING MASS DOT SPEC. M2.01.7.
 - PROCESSED (CRUSHER RUN) GRAVEL AND SAND MEETING THE SAME GRADATION AS ABOVE.
 - IN THE FIELD AND LANDSCAPED AREAS WITHIN THE LIMITS OF THE PROPOSED GRAVEL PARKING LOT, REMOVE ALL TOPSOIL AND SUBSOIL TO THE SUBGRADE ELEVATION. IF TOPSOIL OR UNSUITABLE MATERIALS EXTEND BELOW THE SUBGRADE ELEVATION, REMOVE THOSE MATERIALS, COMPACT THE SUBGRADE TO LEVEL TO FIRM AND STABLE. FILL TO THE SUBGRADE OF THE GRAVEL PARKING LOT WITH BORROW MEETING MASS DOT SPEC M1.01.0 (ORDINARY BORROW).

**GRAVEL PARKING LOT
TYPICAL SECTION**
(NO SCALE)



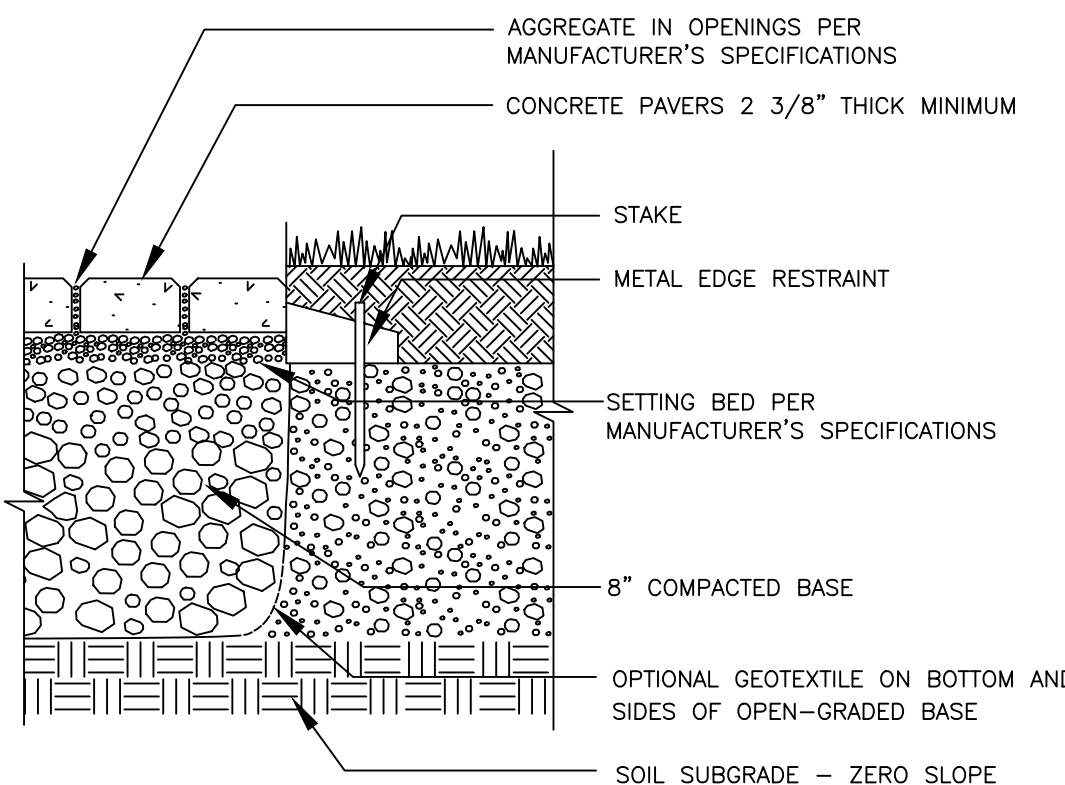
- NOTES:
- CURB INSTALLATION ALONG EXISTING ROAD PAVEMENT SHALL BE SAW CUT AND PATCHED WITH A 2" BITUMINOUS GRADE BINDER COURSE, AND TOPPED WITH A 1-1/2" WEAR COURSE OF TYPE 1". THE CUT JOINT SHALL BE THOROUGHLY SEALED WITH ASPHALT EMULSION AND SAND. TOP OF CURB SHALL BE 6" ABOVE GUTTER GRADE.
 - AT ALL LOCATIONS WHERE GRANITE CURBING IS PROPOSED, INCLUDING REPLACEMENT, THE CURB IS TO BE SET IN 6" THICK CONTINUOUS ZERO SLUMP CONCRETE.
 - GRANITE CURB INSTALLATION TO BE PER MHD SECTION 501 AND THE LATEST CITY STANDARDS.
 - CONCRETE TO BE AIR ENTRAINED CLASS D CONFORMING TO MHD M4.02.00.
 - GROUTING OF CURB JOINTS TO BE NON-SHRINK GROUTING CONFORMING TO ASTM C-827.

GRANITE CURB
(NO SCALE)



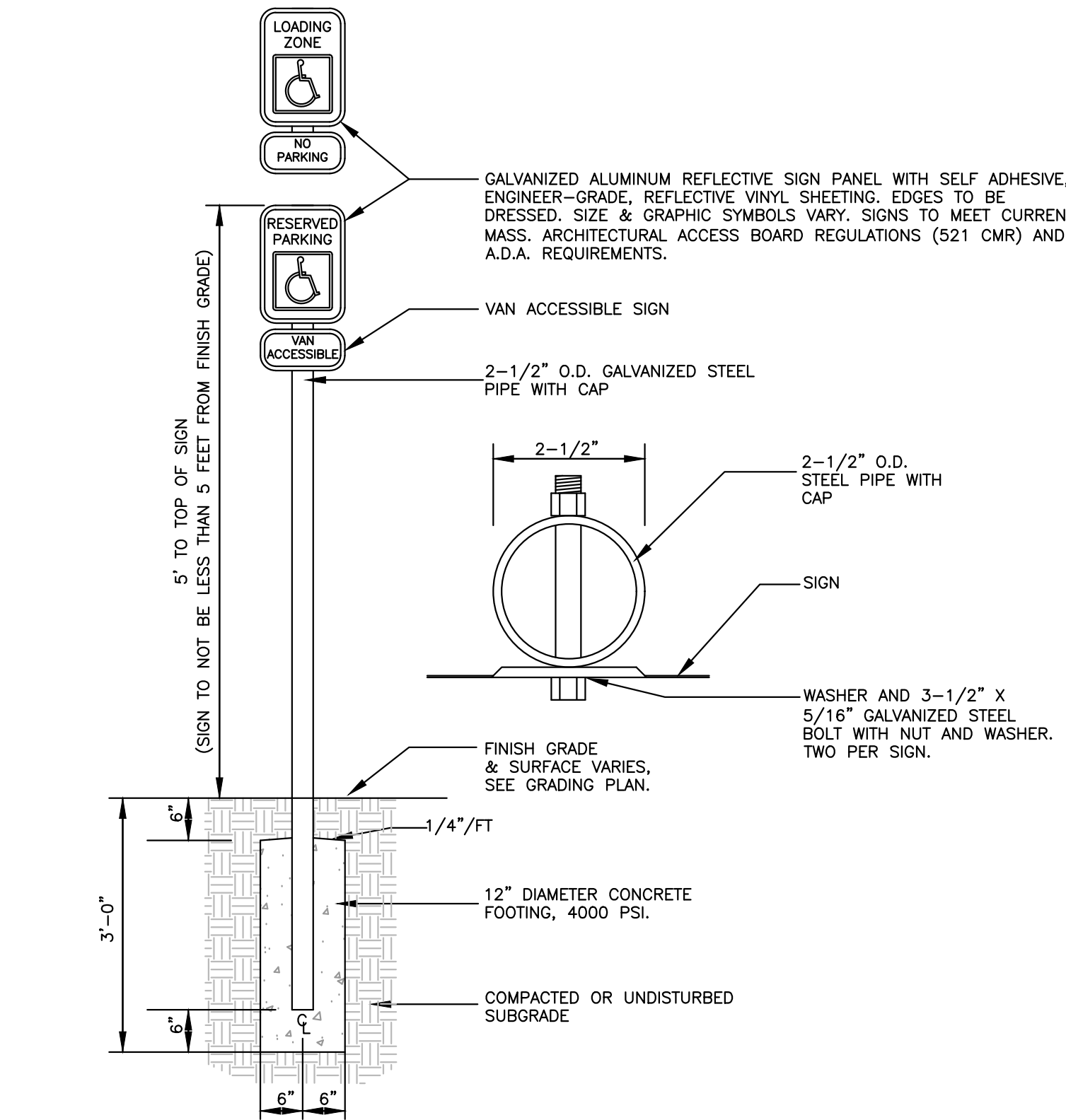
- NOTES:
- COMPACTED DENSE GRADED CRUSHED STONE BASE COURSE TO CONFORM TO MASS. HIGHWAY DEPT. SPEC. M 2.01.7 OR PROCESSED (CRUSHER RUN) GRAVEL AND SAND MEETING THE SAME GRADATION.
 - COMPACTED BORROW FOR SUB-BASE TO CONFORM TO MASS. HIGHWAY DEPT. SPEC. M 1.01.0 WITH NO STONES LARGER THAN 6 INCHES.
 - BITUMINOUS CONCRETE SHALL BE CLASS 1, TYPE 1-1.
 - AT AREAS OF LEDGE/BEDROCK, REMOVE LEDGE TO A DEPTH OF 18 INCHES MINIMUM BELOW PAVEMENT COURSE.
 - COMPACTED BASE TO EXTEND 6 INCHES MINIMUM BEYOND THE EDGE OF PAVEMENT.

**BITUMINOUS CONCRETE
PEDESTRIAN WALKWAY DETAIL**
(NO SCALE)

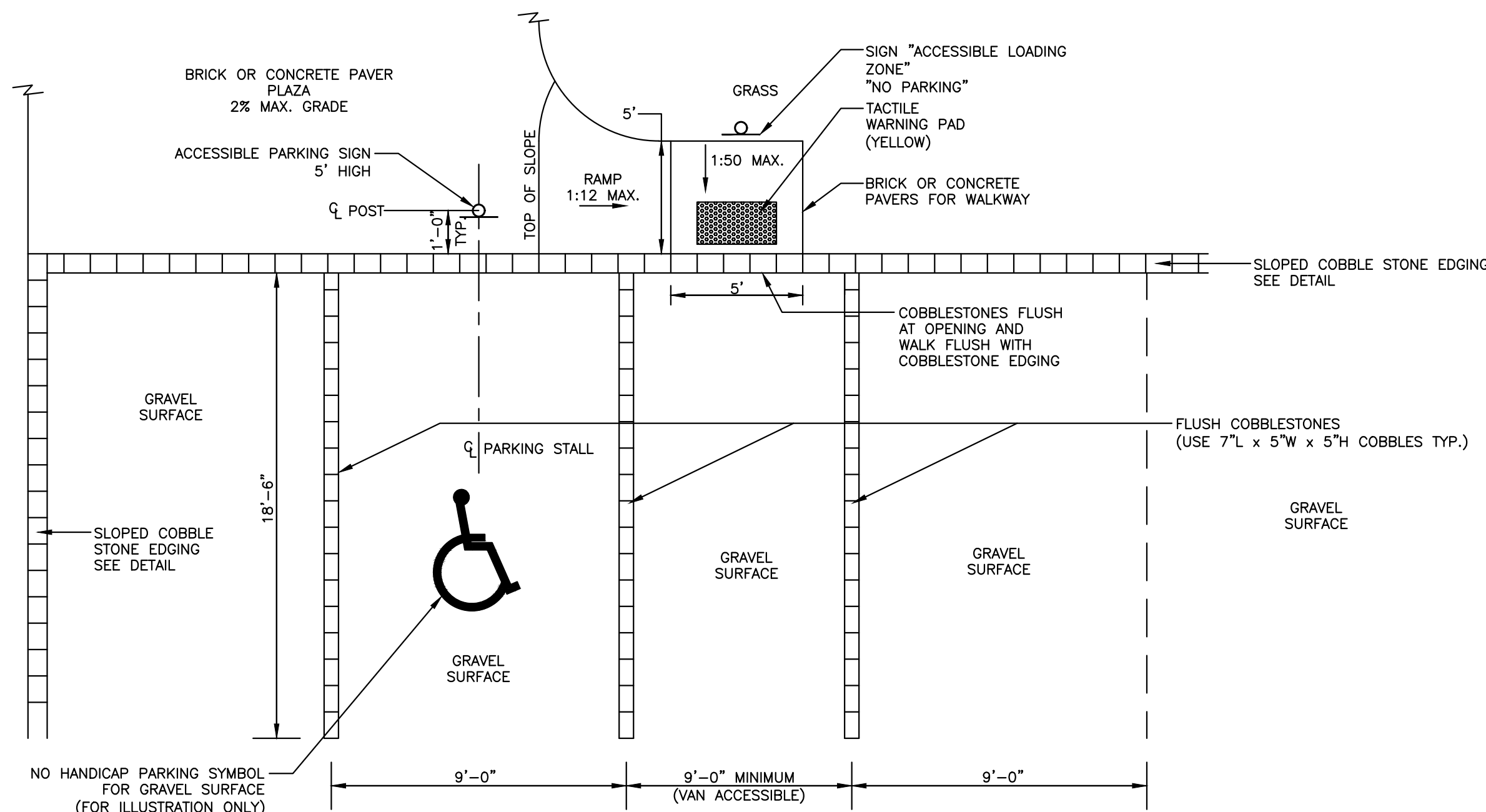


- NOTES:
- 2 3/8" (60 MM) THICK PAVERS MAY BE USED IN PEDESTRIAN APPLICATIONS.
 - OWNER TO SELECT STYLE OF PERMEABLE PAVERS
 - COMPACTED DENSE GRADED CRUSHED STONE BASE COURSE TO CONFORM TO MASS. HIGHWAY DEPT. SPEC. M 2.01.7 OR PROCESSED (CRUSHER RUN) GRAVEL AND SAND MEETING THE SAME GRADATION.
 - COMPACTED BORROW FOR SUB-BASE TO CONFORM TO MASS. HIGHWAY DEPT. SPEC. M 1.01.0 WITH NO STONES LARGER THAN 6 INCHES.
 - COMPACTED BASE TO EXTEND 6 INCHES MINIMUM BEYOND THE EDGE OF PAVEMENT.

CONCRETE OR BRICK PAVERS
(NO SCALE)

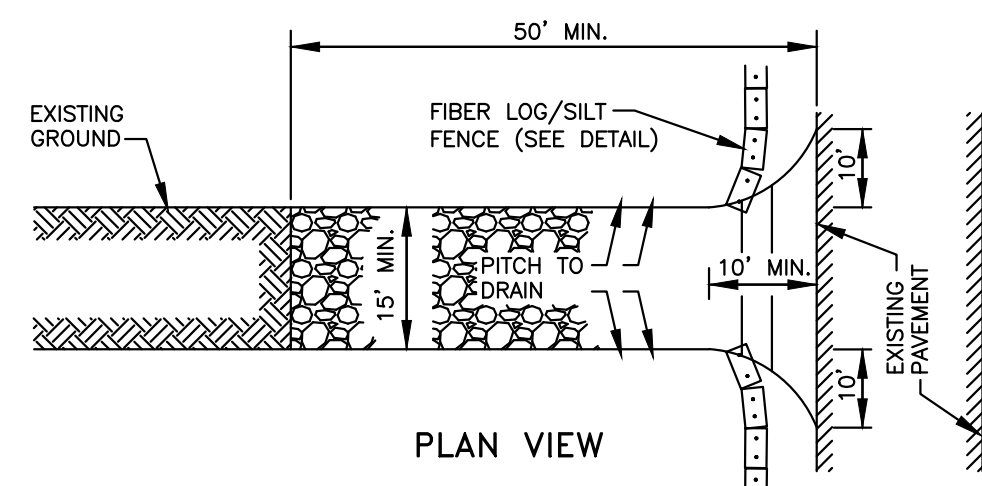


TYPICAL SIGN
(NO SCALE)

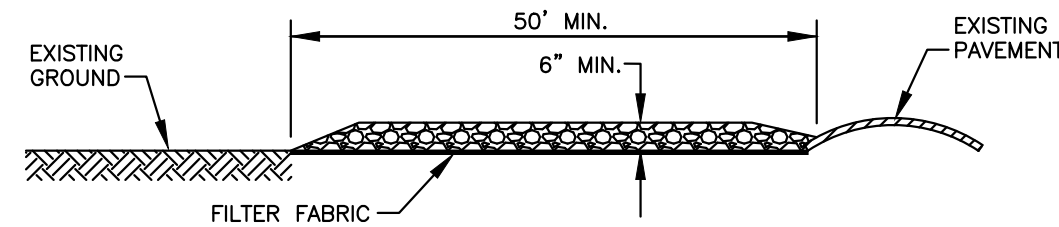


- NOTES:
- GRADES FOR PARKING SPACE AND AISLE TO MEET MAAB AND ADA REGULATIONS (MAX. 2% SLOPE IN ANY DIRECTION).

ACCESSIBLE PARKING STALL & CURB CUT
(NO SCALE)



PLAN VIEW

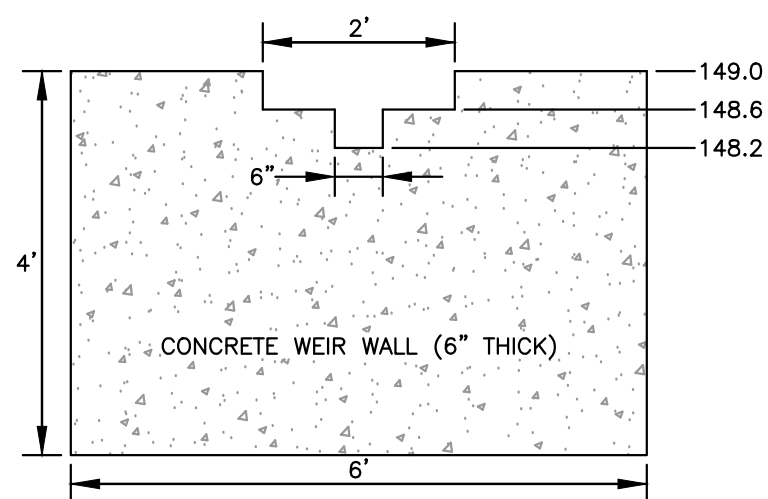


CROSS-SECTION

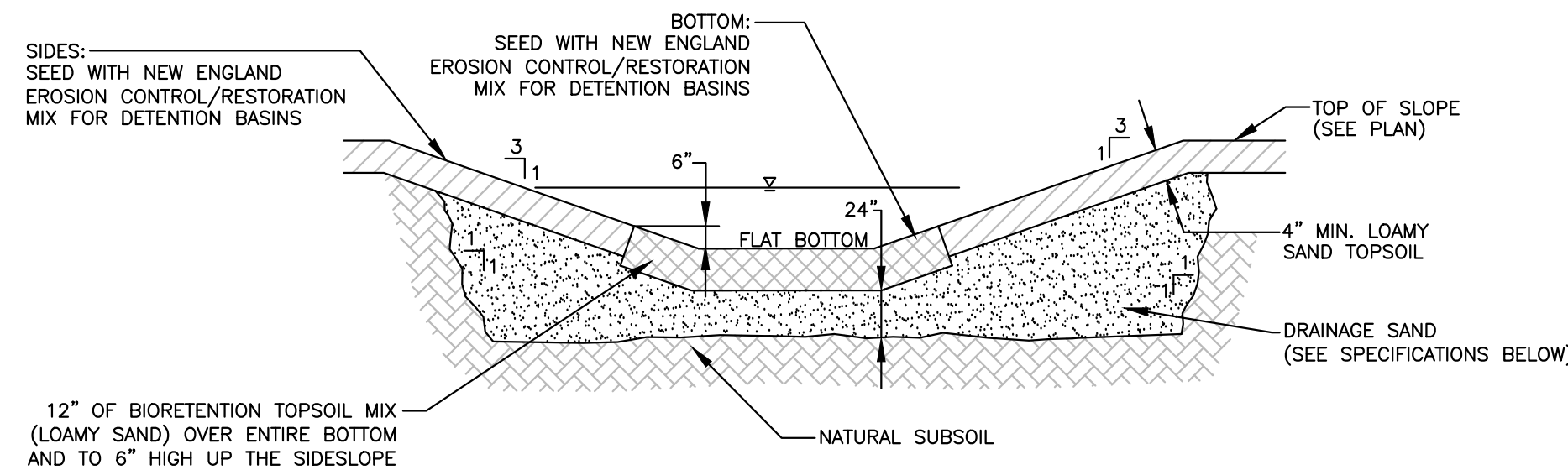
CONSTRUCTION SPECIFICATIONS:

1. STONE SIZE - USE 2" TO 4" WASHED, ANGULAR STONE
2. THICKNESS - NOT LESS THAN SIX (6) INCHES.
3. WIDTH - FIFTEEN (15) FEET MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
4. FILTER FABRIC - SHALL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
5. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH SHALL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF WAY MUST BE REMOVED IMMEDIATELY.
6. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED.

STABILIZED CONSTRUCTION ENTRANCE DETAIL
(NO SCALE)



OVERFLOW SPILLWAY WEIR WALL
(NO SCALE)

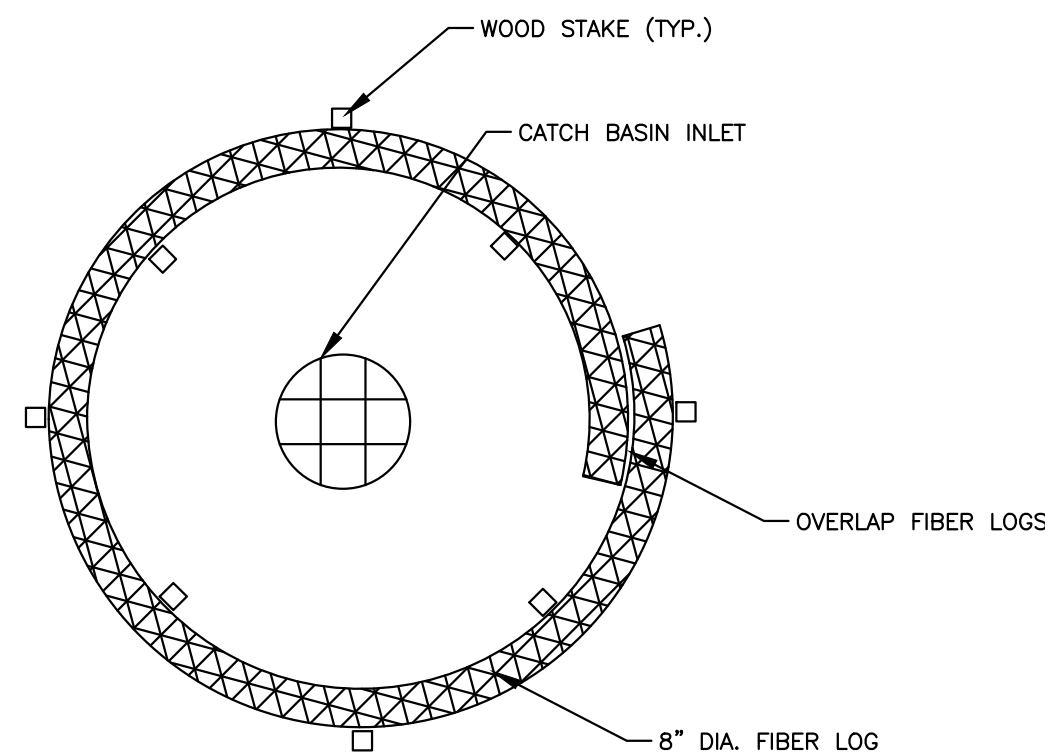


NOTES:

1. REMOVE EXISTING TOPSOIL AND SUBSOIL TO THE ELEVATION OF THE FINISHED SUBGRADE BELOW THE PROPOSED TOPSOIL. IF THE NATURAL MATERIAL MEETS THE REQUIREMENTS FOR "SAND" IN NOTE 2 BELOW, THE EXCAVATION IS NOT NECESSARY. OTHERWISE REMOVE THE UNSUITABLE SOIL TO THE DEPTHS SHOWN AND BACKFILL WITH THE MATERIAL PER NOTE 2.
2. DRAINAGE SAND SHALL CONSIST OF WELL DRAINING SOIL CONSISTING OF CLEAN SAND AND GRAVEL WITH LESS THAN 10% SILT AND CLAY WITH NOT MORE THAN 5 PERCENT CLAY. USDA TEXTURAL CLASS. ON-SITE SOIL MEETING THIS MAY BE USED.
3. BIORETENTION TOPSOIL MIX SHALL BE A MIXTURE OF SAND, TOPSOIL AND COMPOST AS FOLLOWS: 40% SAND, 20% TO 30% TOPSOIL, 30% TO 40% COMPOST (BY VOLUME).
4. OWNER MAY SELECT ADDITIONAL PLANTINGS TO BE INSTALLED WITHIN THE RAIN GARDEN.

RAIN GARDEN

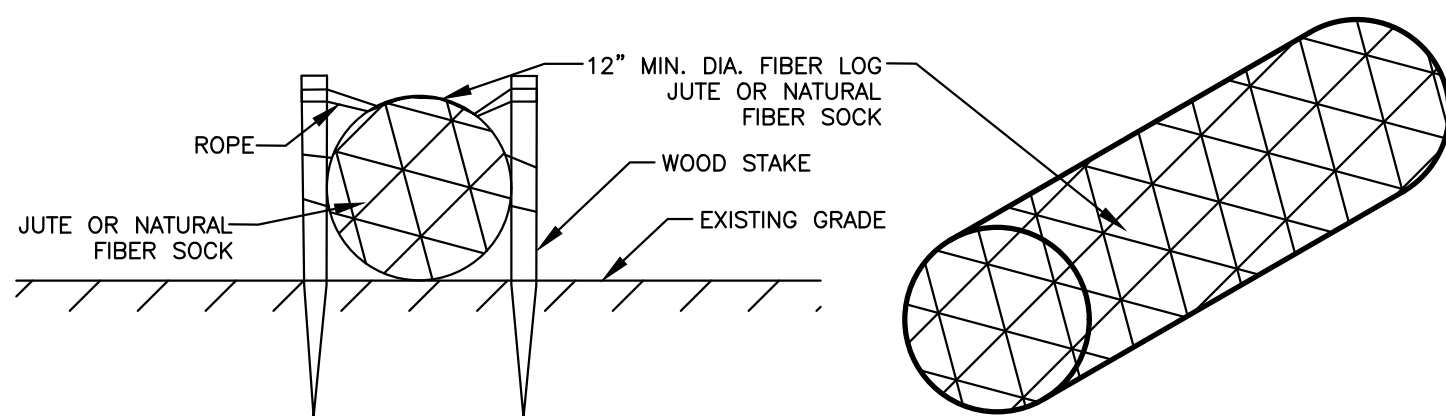
(NO SCALE)



INSTALLATION NOTES FOR FIBER LOGS:

1. SEE FIBER LOG DETAIL FOR SPECIFICATIONS

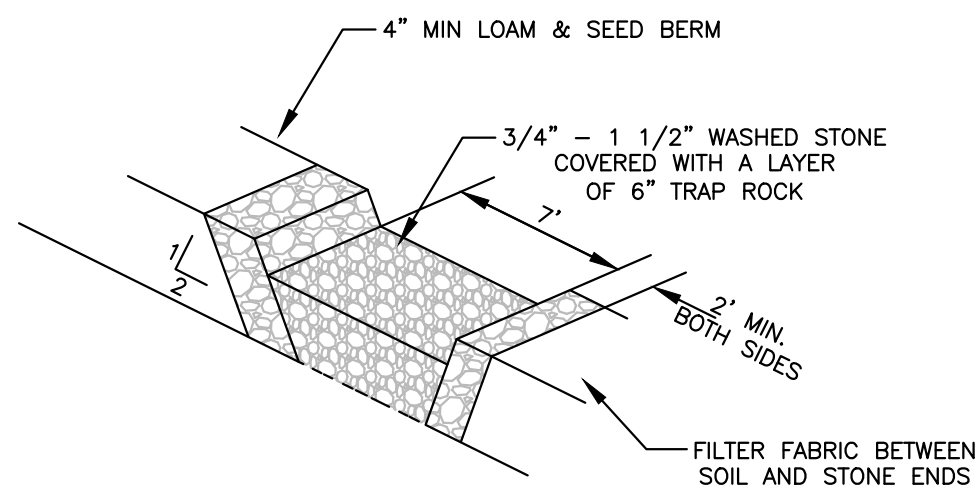
**CATCH BASIN INLET
PROTECTION WITH FIBER LOG DETAIL**
(NO SCALE)



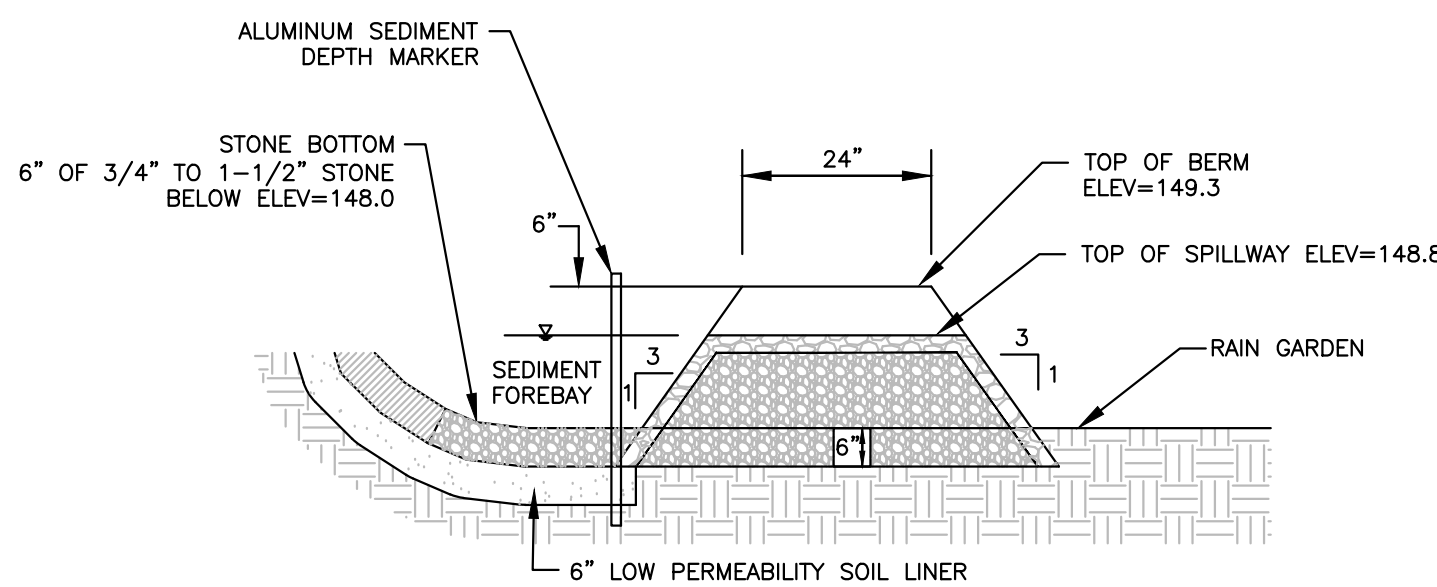
INSTALLATION NOTES FOR FIBER LOGS:

1. LAY THE FIBER LOG AT THE UPHILL BASE OF THE SILT FENCE. (WHERE APPLICABLE)
2. INSTALL APPROXIMATELY 4-6 WOOD STAKES THROUGH THE TWINE/NETTING ALONG THE FIBER LOG AS NEEDED TO HOLD THE LOG IN PLACE.
3. DRIVE THE STAKE INTO THE GROUND DEEP ENOUGH TO HOLD THE LOG.
4. IN PAVED AREAS, SECURE FIBER LOG WITH CONCRETE BLOCKS OR SAND BAGS.
5. THE FILLING OF THE FIBER LOG MAY BE SHREDDED STRAW, COIR, COMPOST OR OTHER APPROVED MATERIAL.
6. FIBER LOG SHALL BE 12 INCHES (MIN) IN DIAMETER UNLESS OTHERWISE NOTED ON THE PLANS.

FIBER LOG
(NO SCALE)



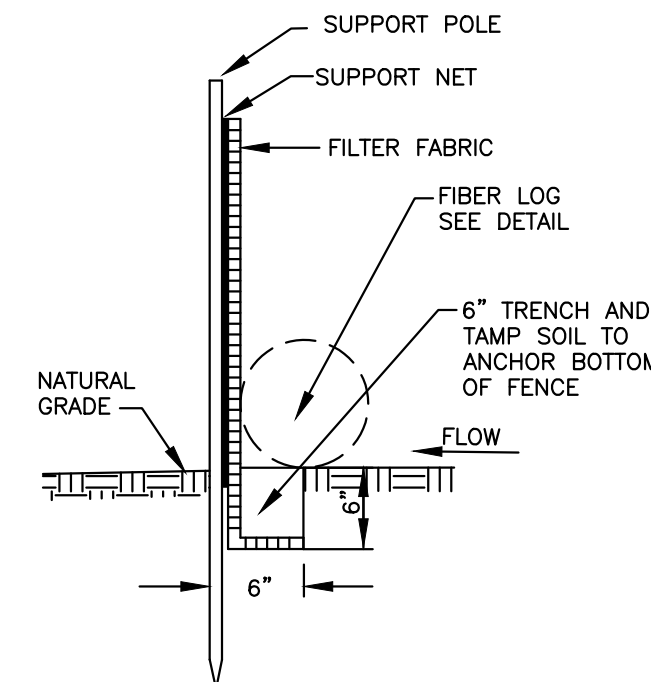
FILTER BERM OBLIQUE VIEW



NOTE: BANK OF FOREBAY AND FILTER BERM BEYOND THE LIMITS OF STONE SHALL BE LOAMED AND SEEDED.

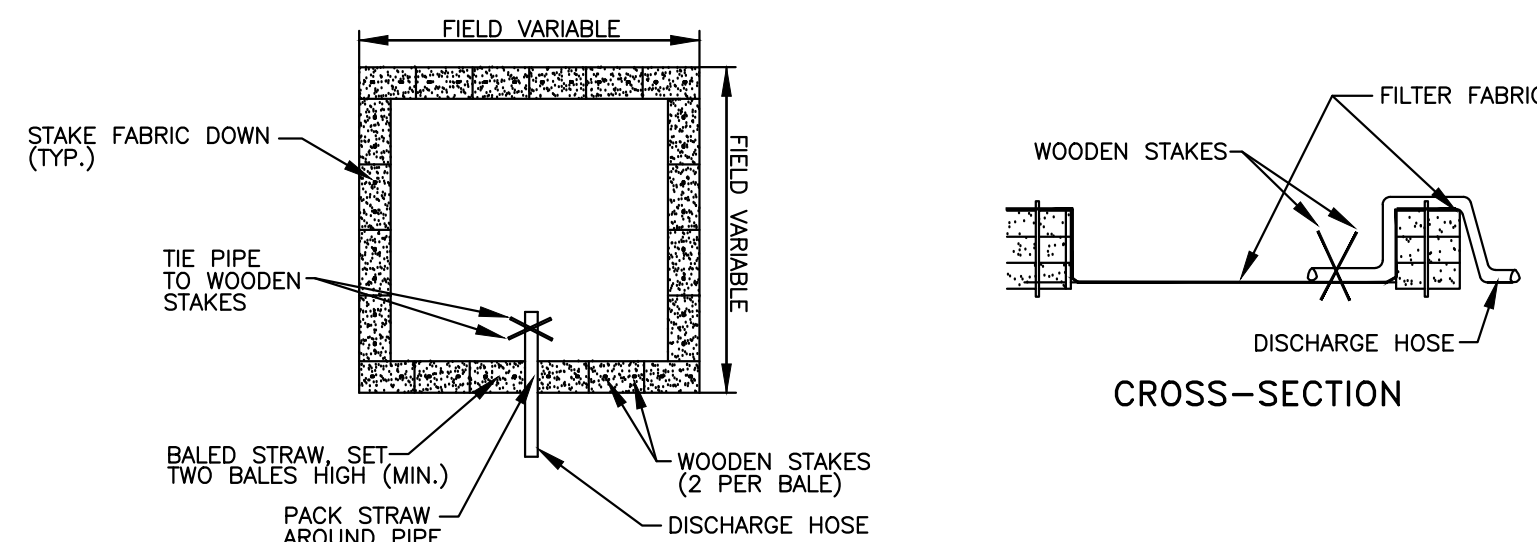
SEDIMENT FOREBAY AND FILTER BERM

(NO SCALE)



NOTE THAT SILT FENCE ONLY TO BE INSTALLED IN LOCATIONS WHERE THE STAKED FIBER LOG IS NOT SUFFICIENT TO INTERCEPT RUNOFF FLOWS.

SILT FENCE INSTALLATION
(NO SCALE)



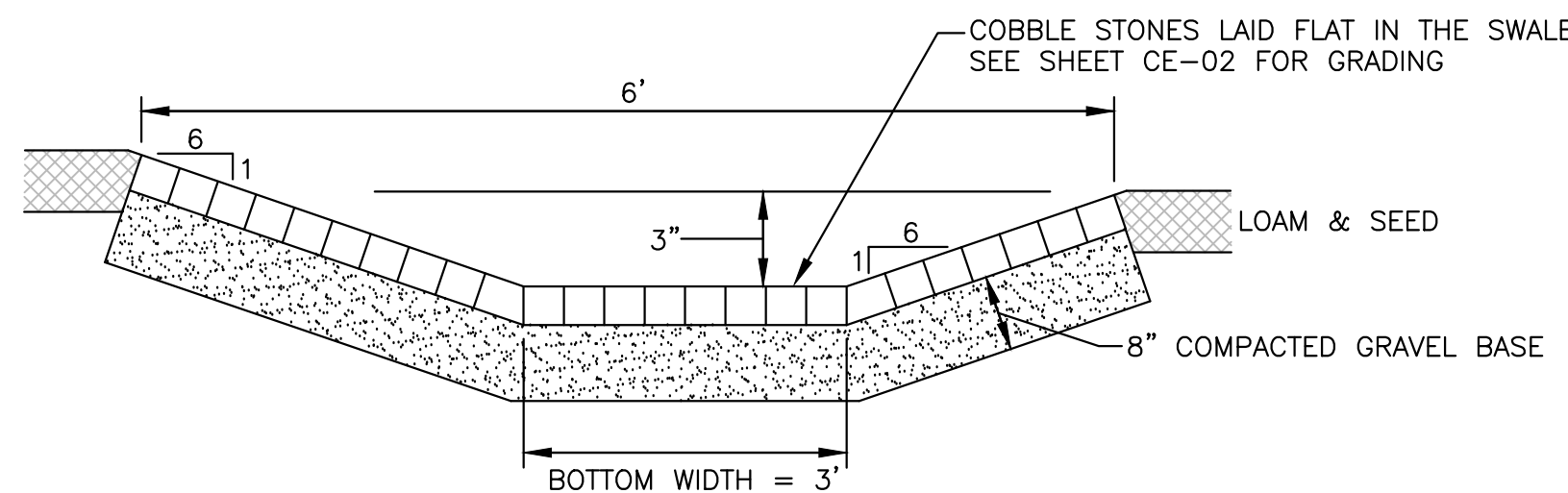
NOTE: NUMBER OF BALES MAY VARY DEPENDING ON SITE CONDITIONS

PLAN VIEW

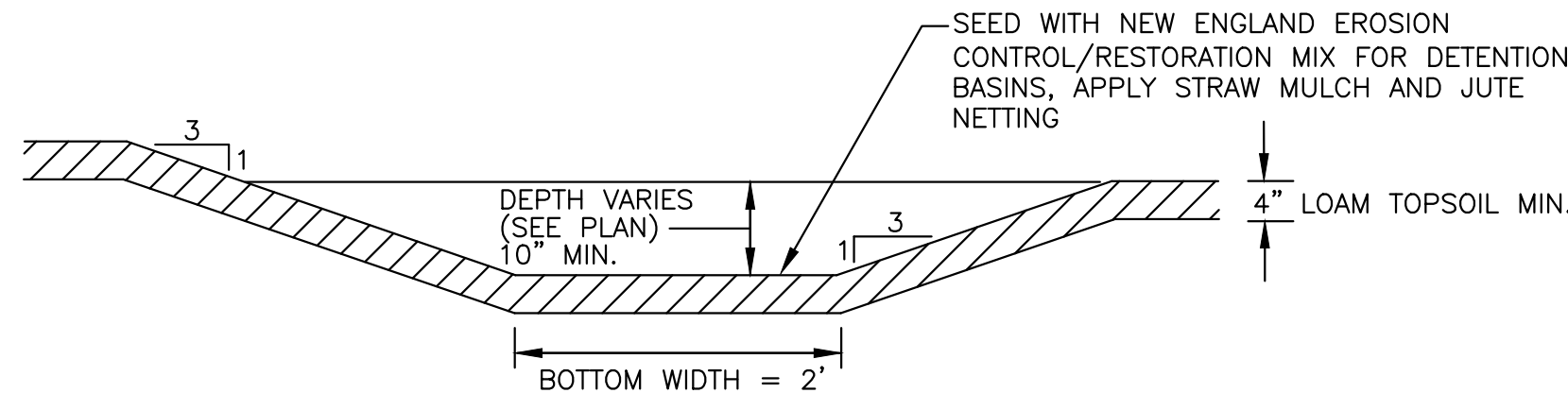
DEWATERING OF EXCAVATIONS NOTES:

1. DISCHARGE FROM DEWATERING PUMPS OR TEMPORARY TRENCH OR EXCAVATION DRAINS SHALL NOT DISCHARGE DIRECTLY TO WETLANDS OR STORM DRAIN SYSTEMS. THE DISCHARGES SHALL BE DIRECTED INTO A CONSTRUCTED SEDIMENT BASIN OR A STRAW BALE SETTLING BASIN, STILLING BASIN, FILTER BAG, FRAC TANK OR SIMILAR DEVICE.
2. SETTLING BASINS MUST BE A MINIMUM OF 100 FEET FROM THE WETLAND RESOURCE AREAS.

STRAW BALE SETTLING BASIN DETAIL
(NO SCALE)



COBBLE STONE APRON SWALE
(NO SCALE)



GRASS SWALE

(NO SCALE)



1	FWK	6/16/2021	PER CLIENT REQUEST
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DATE: JUNE 1, 2021

SCALE: AS NOTED

DRAFTED:	CHECKED:	APPROVED:
KMR/FJS	FWK	FWK

PROJECT TITLE:

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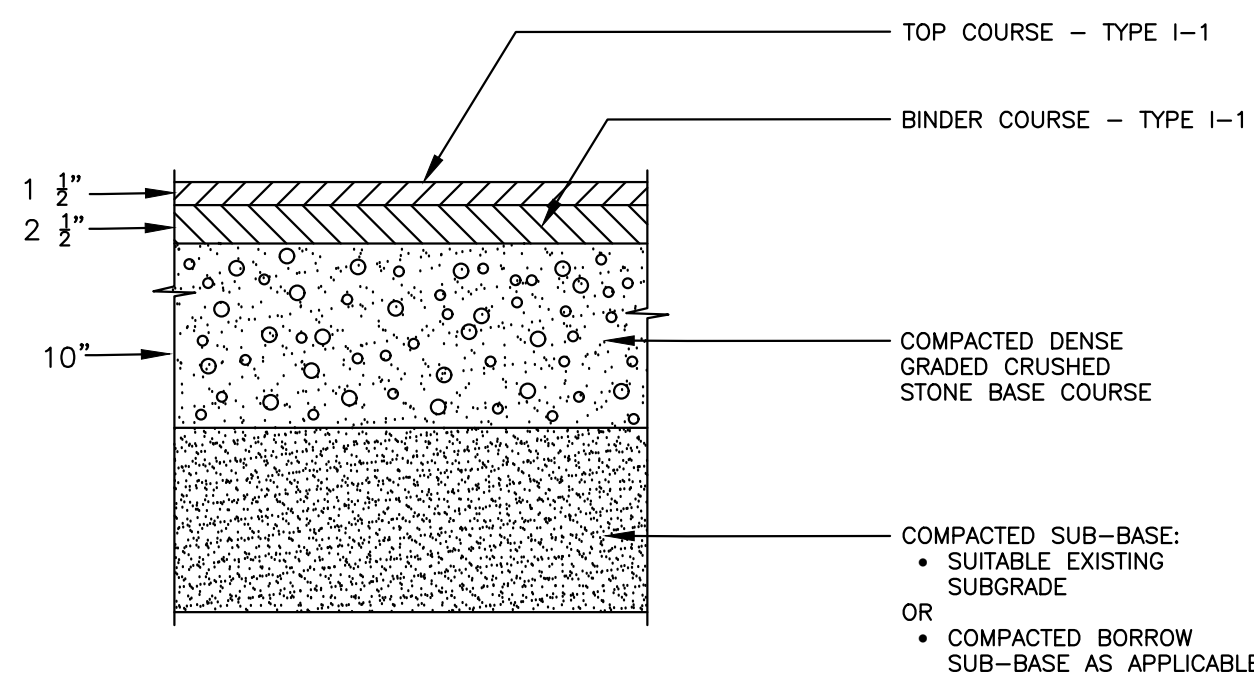
SHEET TITLE:

**SITEWORK
DETAILS #2**

SHEET:
5 OF 6

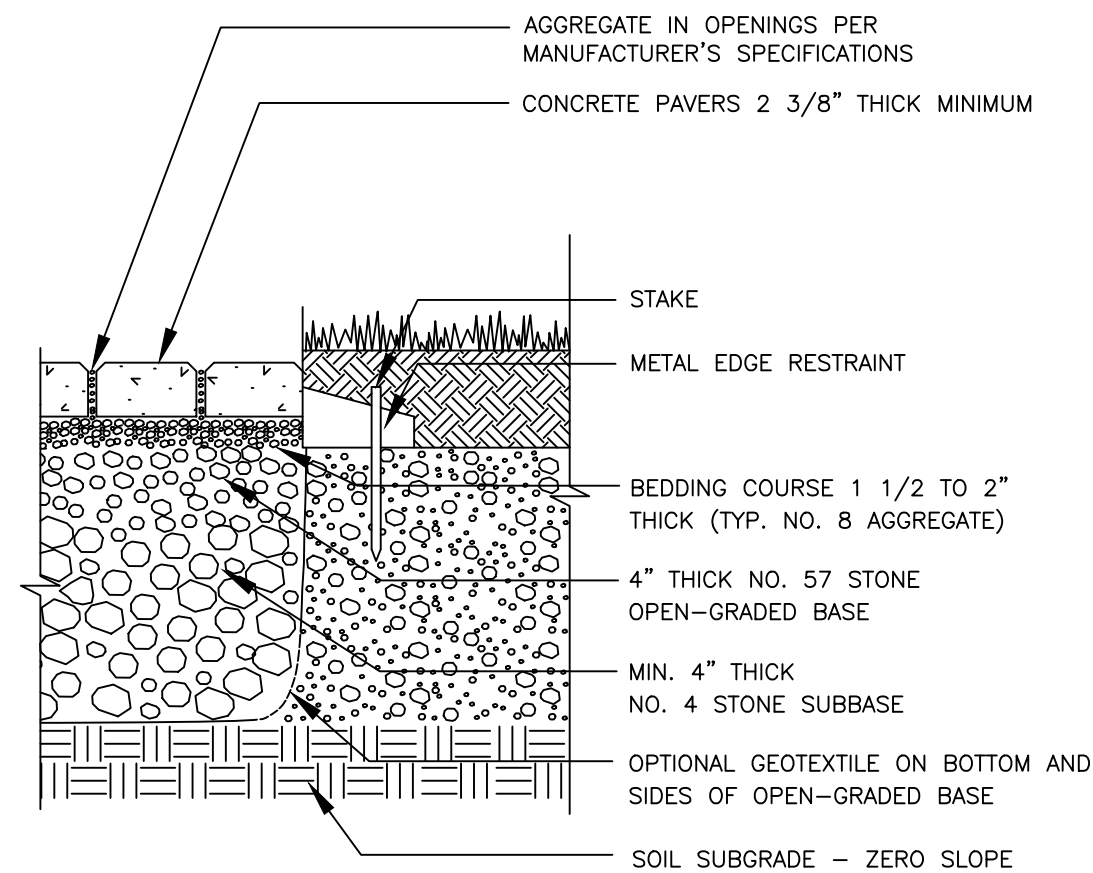
PROJECT NO.:
25423

CE-05



- NOTES:
1. COMPACTED DENSE GRADED CRUSHED STONE BASE COURSE TO CONFORM TO MASS. HIGHWAY DEPT. SPEC. M 2.01.7 OR PROCESSED (CRUSHER RUN) GRAVEL AND SAND MEETING THE SAME GRADATION.
 2. COMPACTED BORROW FOR SUB-BASE TO CONFORM TO MASS. HIGHWAY DEPT. SPEC. M 1.01.0 WITH NO STONES LARGER THAN 6 INCHES.
 3. BITUMINOUS CONCRETE SHALL BE CLASS 1, TYPE 1-1.
 4. AT AREAS OF LEDGE/BEDROCK, REMOVE LEDGE TO A DEPTH OF 18 INCHES MINIMUM BELOW PAVEMENT COURSE.
 5. COMPACTED BASE TO EXTEND 12 INCHES MINIMUM BEYOND THE EDGE OF PAVEMENT.

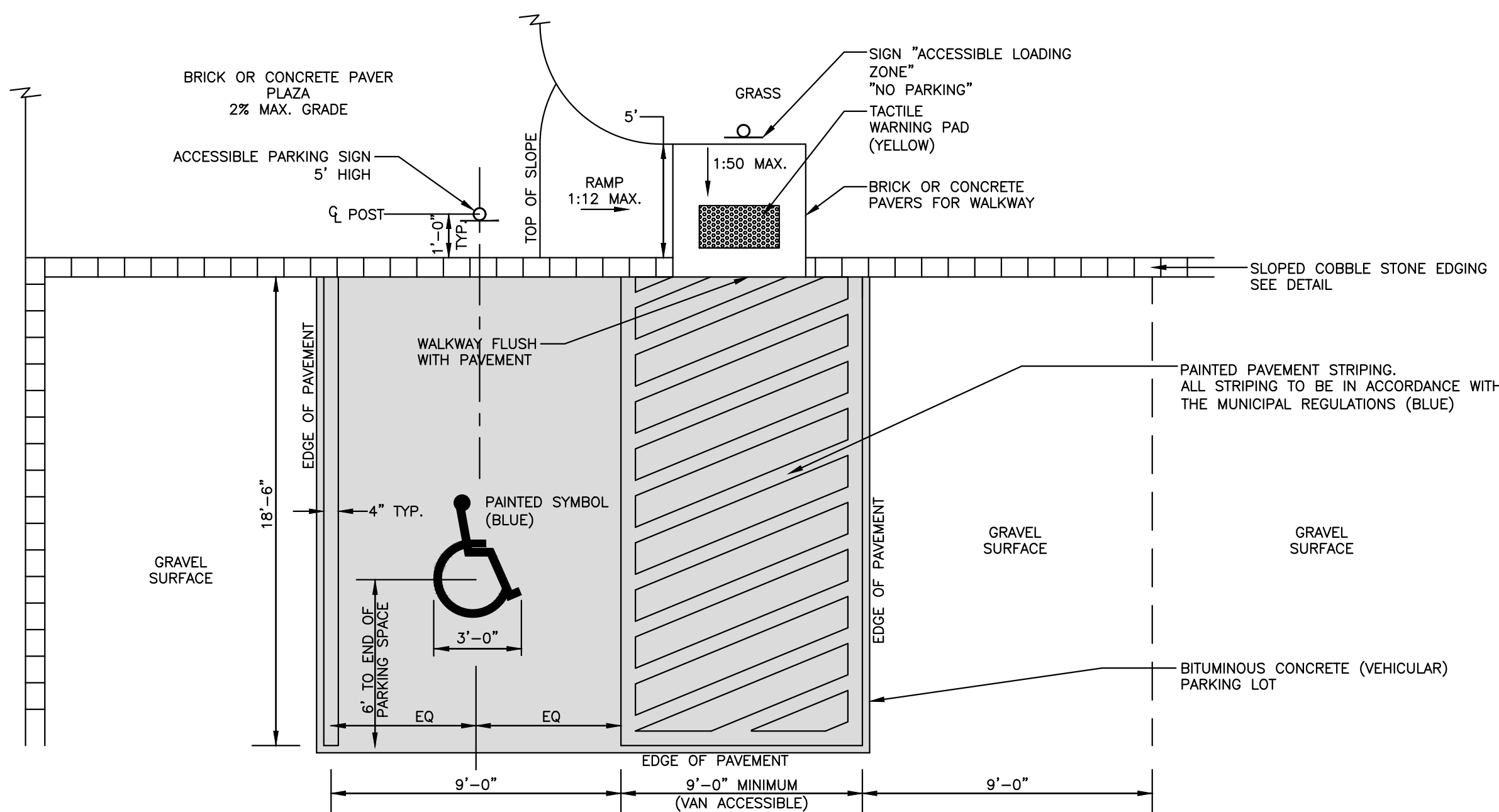
**BITUMINOUS CONCRETE
PAVEMENT DETAIL (VEHICULAR)**
(NO SCALE)
(FOR ALTERNATE 1)



- NOTES:
1. 2 3/8" (60 MM) THICK PAVERS MAY BE USED IN PEDESTRIAN APPLICATIONS.
 2. OWNER TO SELECT STYLE OF PERMEABLE PAVERS.

PERMEABLE PAVERS
(NO SCALE)
(FOR ALTERNATE 2)

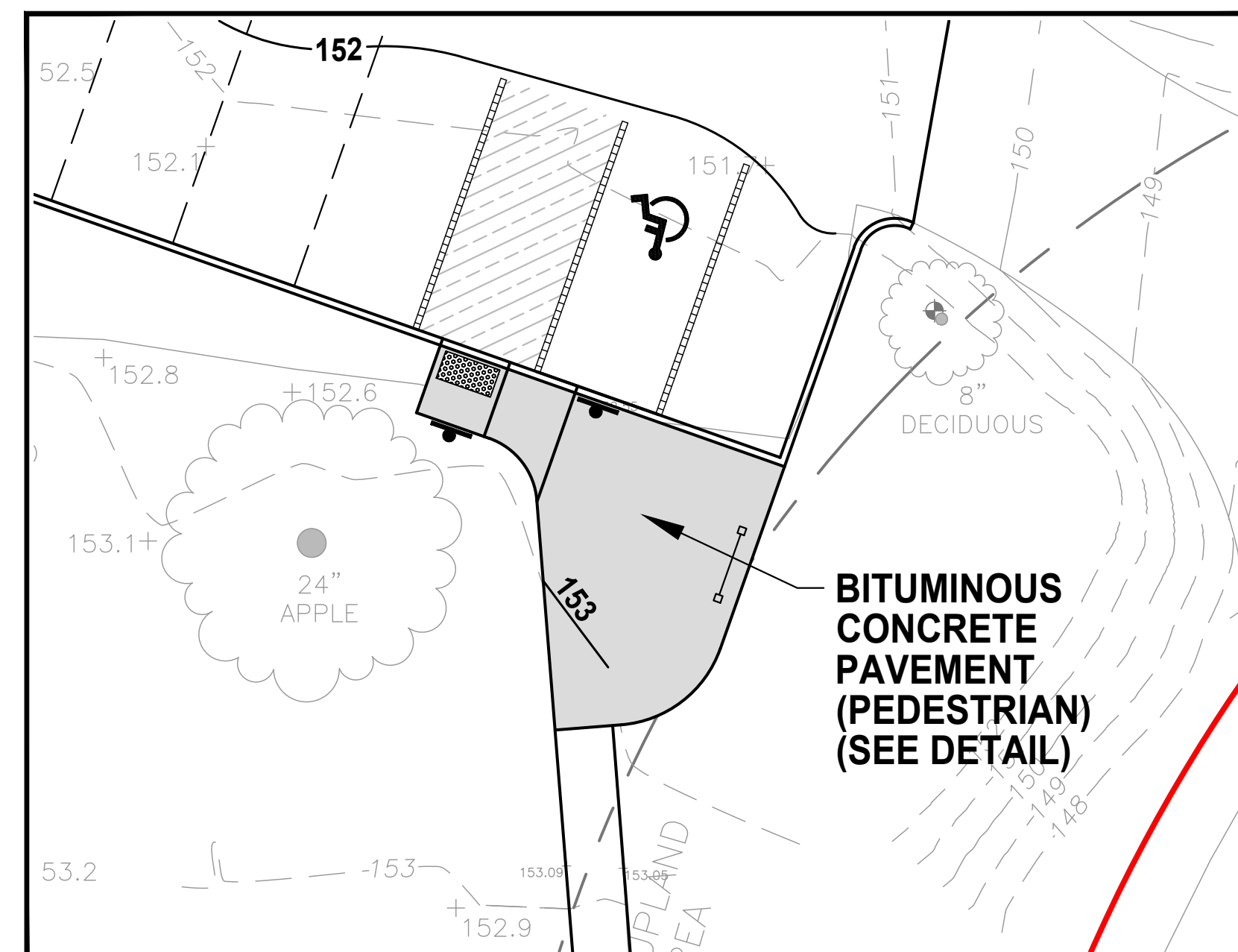
ALTERNATIVE 2 CONSISTS OF USING PERMEABLE PAVERS AND BASE FOR THE PLAZA PAVEMENT PER THIS DETAIL



- NOTES:
1. GRADES FOR PAVED PARKING SPACE TO MEET MAAB AND ADA REGULATIONS (MAX. 2% SLOPE IN ANY DIRECTION).

ACCESSIBLE PARKING STALL & CURB CUT
(NO SCALE)
(FOR ALTERNATE 1)

ALTERNATIVE 1 IS TO PAVE THE ACCESSIBLE PARKING SPACE AND LOADING ZONE WITH VEHICULAR BITUMINOUS CONCRETE PAVEMENT AND PROVIDE STRIPING PER THESE DETAILS



STORMWATER MANAGEMENT DESIGN AND RUNOFF CALCULATIONS REPORT

for

PROPOSED PARKING LOT EXPANSION AND ACCESSIBILITY IMPROVEMENTS

Sudbury Valley Trustees Headquarters
18 Wolbach Road
Sudbury, MA 01776

Report Prepared for:

Sudbury Valley Trustees
18 Wolbach Road
Sudbury, MA 01776

Report Prepared by:

DGT Associates – Project Civil Engineer
1071 Worcester Road
Framingham, MA 01701
508-879-0030



December 19, 2019
Revised July 27, 2021

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SECTION 1

Stormwater Management Report Narrative and Summary

for

Proposed Parking Expansion Project

18 Wolbach Road
Sudbury, MA 01776

SUDBURY VALLEY TRUSTEES PARKING EXPANSION STORMWATER MANAGEMENT NARRATIVE SUMMARY

This report contains the hydrologic computations and design information relative to the existing and proposed stormwater runoff conditions for the SVT Parking Expansion Project and associated site improvements at #18 Wolbach Road in Sudbury, MA. It includes information on the stormwater management system design, assessment of stormwater impacts and compliance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Regulations and the Town of Sudbury Stormwater Management Bylaw and Regulations for the proposed project.

Existing Property Description

The subject property is a 54 acre property known as Wolbach Farm that includes the Headquarters Buildings for the Sudbury Valley Trustees. The property is located on Wolbach Road and abuts Old Sudbury Road (Rt. 27) in the eastern portion of Sudbury. Approximately 1.7 acres of the site is developed that includes the headquarters building with a barn, sheds, driveways and parking facilities. The remainder of the property is protected open space.

The portion of the site that is the subject of this project is the existing main parking lot for the facility located just north of the headquarters building and the paved walkway at the front of the building. The parking lot has a gravel surface and has the capacity for 15 cars. No accessible parking spaces meeting the ADA standards are at this lot. There is no stormwater management facilities for the parking lot. The majority of the Stormwater runoff simply drains into a grass field to the north of the parking area and into the wooded area beyond and ultimately to Route 27. The short existing gravel drive to the parking area drains to Wolbach Road. The runoff from these two areas flows to the fields east of Wolbach Road and to the wetland area bordering on the Sudbury River.

Soils and Groundwater

The NRCS classifies the soils at the site as being in the Charleton-Hollis-Rock Outcrop Complex soil series. In the watershed tributary to the subject project area, there are only a few small areas with rock outcrops. Charleton Hollis soils are well drained. These soils fall within Hydrologic Soil Group (HSG) B.

Soil testing was conducted in the grass field area for this project. The testing consisted of 4 deep hole tests and a permeability test at the location of the proposed stormwater Rain Garden. The estimated seasonal high groundwater (ESHGW) was determined at each of the test holes. Depth to ledge was relatively shallow in the eastern portion of the field, but was deeper in the western portion where a Rain Garden is proposed and had sufficient depth to groundwater. The soils in this area were found to be suitable for this type of Stormwater Best Management Practice (BMP).

The complete soils report with NRCS information and test logs is contained in Appendix 1 of this report.

Project Description

The project is the expansion of the existing gravel parking lot from 15 car capacity to 25 cars. The existing gravel parking lot will be reconfigured to be more efficient and expanded north into the existing grass field to achieve the 25 car capacity.

Runoff from the parking area will be collected to drain to a sediment forebay for pre-treatment and then to a Bio-Retention Area (Rain Garden). This system is a Limited Impact Development (LID) technique that provides treatment for removal of suspended solids, removal of phosphorus, recharge to ground water and helps control the rate of stormwater discharge. There will be no increase in either the rate or volume of runoff from the site.

The project also includes upgrading the existing paved walkway from the parking area to the building to make the walkway fully compliant with the Federal ADA and Mass Architectural Barriers Board (MAAB) standards. The parking space nearest the building is also designed to be handicapped accessible. A small entry plaza with a bulletin board / kiosk is included at the end of the walk abutting the parking lot. The walkway improvements involve grading adjustments required to meet accessibility requirements and repaving in the same location with no changes in impervious surfaces, so no additional stormwater management is proposed for that area.

The parking area surface will be the same compacted gravel as the existing surface, with the possible exception of paving the accessible parking space and loading area to better conform to Federal ADA and State MAAB codes. That paving is included on the plans as an Alternate and the Stormwater calculations in this report include that pavement. The parking area will expand from 4,611 sq. ft. to 7,793 sq. ft. in area.

The entry plaza will cover approximately 175 sq. ft. and will be constructed with Pavers that meet accessibility requirements.

Stormwater Management Objectives

For organizational purposes, the descriptions and calculations and compliance information for the various components of the stormwater management system are contained in Section 2 of this report. The hydrologic and flood routing computer modeling calculations for the existing and proposed conditions are included in Section 3 and Section 4 of this report, respectively. The watershed modeling was performed using computer software “HydroCAD” version 10.0 by Applied Microcomputer Systems.

The intent of the design is to provide stormwater management improvements that will meet the requirements of the Sudbury Stormwater Management Bylaw and Regulations and Mass. Stormwater management Regulations. Per the requirements, the design of the Best Management Practices (BMP) are in accordance with the Mass. Stormwater Management Handbook.

The general existing drainage patterns for the watershed for this project are maintained. The main watershed that drains the parking lot, discharges at one location at the north end of the grass field. The hydrologic model includes this as the single design (analysis) point (DP-1) to compare the existing conditions to proposed conditions discharges from the area. The results of the hydrologic analysis for the existing and proposed conditions have been computed for the 1 inch, and the 2, 10, 25 and 100-year storm events as required by the regulations.

A second Design Point is evaluated for the runoff to Wolbach Road. This is small area that drains to Wolbach Road that includes the driveway entrance, the walkway the small entry plaza. There is a very small increase in impervious surface draining to Walbach Road. A separate subcatchment for this area is computed under existing and proposed conditions and demonstrates that the change is runoff is de minimis.

Runoff from the two design points both drain to the same field area draining to the Sudbury River wetlands to the east. We have combined the two hydrographs as DP-2 to show the total flows to the wetland area and it shows there will be no increase in runoff rate and volume due to the project. The summary Tables are included at the end of this narrative.

Stormwater Performance Standards

The following describes how the project meets the Design and Performance Criteria per Section 8.0 A.3. of the Stormwater Bylaw Regulations. The paraphrased text of the Bylaw Regs is included in Italics for context:

8.0 A.3.a. *The design shall, to the maximum extent feasible, employ environmentally sensitive site design as outlined in the DEP Handbook and shall attempt to reproduce the natural hydrologic conditions with respect to ground and surface waters:*

RESPONSE: The design includes the following features that address this criteria:

- The parking lot will continue to use a gravel surface. This surface is a graded gravel that is low in fine silt that provides a durable surface that allows some infiltration. This reduces runoff from standard paved surface. The relatively flat grade of the parking lot makes this a good choice as runoff velocities are low and the surface is not susceptible to significant erosion.
- The main BMP for the parking lot project includes a Bio-Retention Basin (Rain Garden) with a Sediment Forebay for pre-treatment. This is classified as an LID technique.
- As detailed further below, the results of the hydrologic model show that the project will virtually match existing peak rates of runoff and will results in less runoff volume at all storm events due to the increased groundwater recharge being provided.
- The minimum required recharge per the DEP Stormwater Handbook in order to reproduce non-developed groundwater recharge conditions is 0.35 inches for HSG B soils. In this case, the minimum recharge provided is 1.0 inch to meet the Water Quality Volume per the Bylaw regulations.
- Under the Mass. Stormwater Management Regulations, this project would be classified as a partial re-development and partial new development, which would allow some

reductions in meeting the standards. However, for the parking lot expansion, this project has not utilized those reductions and the entire parking area meets the full standards for new construction as it is practicable in this case.

- The walkway improvements do not increase impervious area. Therefore, due the small scope, no additional stormwater improvements are proposed. The walk will simply drain via sheet flow to the existing vegetated area as it does today.

8.0 A.3.b. *Evaluation of Low Impact Development practices is required and implementation of such practices is required to the maximum extent practicable.....*

RESPONSE: The bio-retention system is a substantial LID stormwater management improvement that has been incorporated into the project. The use of a permeable paver system for the small plaza area was also considered, but was not selected due to significant cost considerations for this small project item.

8.0 A.3.c. *The Stormwater Management Plan shall incorporate source controls of contaminants and employ BMPs to minimize stormwater pollution.*

RESPONSE: An Operation and Maintenance plan for the stormwater management system components is included in Appendix 2 of this report to keep the BMPs in good operating condition. Also being a gravel parking lot, street sweeping is not required, but SVT's facilities at this site have always been kept neat and clean at all time regarding trash and debris policing, and landscape maintenance. This expanded facility will continue to be kept in similar conditions.

8.0 A.3.d. *The Water Quality Volume for Sizing BMPs shall be based on 1 inch of runoff....*

RESPONSE: The Rain Garden is designed on 1 inch minimum of runoff. See Section 2 calculations.

8.0 A.3.e. *Hydrologic analyses using TR55/TR20 methodology shall be performed for the entire project site including any off-site areas that drain to or through the project site.*

RESPONSE: This has been done for the main watershed for the parking lot and includes the uphill area draining through the site. See the Watershed maps in Sections 3 and 4 for the existing and proposed drainage areas. TR55/TR20 has been utilized and is explained in the Watershed Modeling section below in this narrative.

8.0 A.3.f. *The analysis shall be for the 1 inch, 2, 10, 25 and 100 year design storms under pre-development and post-development conditions. (The 24 hour rainfall amounts to be used are specified in this section).*

RESPONSE: We have performed the analysis using the specified storms and the rainfall amounts as required. We have rounded the results to the nearest one tenth inch as

required. The following is the tabulated results for the flows at the design point (DP1), Wolbach Road and the Combined total flow (DP-2).

Design Point #1 – North End of Field

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
1 inch	1 inch	0.0	0.0	0.0	0.0
2 Year	3.2 in	0.4	0.3	0.073	0.052
10 Year	4.8 in	1.7	1.7	0.219	0.193
25 Year	6.0 in	3.1	3.1	0.346	0.319
100 Year	8.6 in	7.1	7.1	0.724	0.694

Design Point – Wolbach Road

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
1 inch	1 inch	0.0	0.0	0.002	0.002
2 Year	3.2 in	0.1	0.1	0.009	0.010
10 Year	4.8 in	0.2	0.2	0.015	0.016
25 Year	6.0 in	0.3	0.3	0.019	0.021
100 Year	8.6 in	0.4	0.4	0.029	0.031

Design Point #2 – Combined Flow

Storm Event	24 hr Rainfall	Peak Flow (cfs)		Volume (acre feet)	
		Existing	Proposed	Existing	Proposed
1 inch	1 inch	0.0	0.0	0.002	0.002
2 Year	3.2 in	0.5	0.3	0.082	0.062
10 Year	4.8 in	1.9	1.9	0.233	0.209
25 Year	6.0 in	3.3	3.3	0.365	0.339
100 Year	8.6 in	7.4	7.3	0.753	0.725

8.0 A.3.g. *The analysis is to be performed on a pre-and post-watershed basis with designated control points at each location where water leaves the site.*

RESPONSE: Analysis Points are DP-1 for the main sub-catchment. A second one is for the flows from the project area to Wolbach Road, and the third (DP-2) is for the combined flow to the wetlands from the project.

8.0 A.3.h. *The same land area shall be used in the analysis to facilitate comparison of existing and proposed conditions.*

RESPONSE: The existing and proposed watershed areas are the same.

8.0 A.3.i. The total volume of discharge as well as peak rate shall be evaluated at each control point.

RESPONSE: This has been done and summarized in the Table above and detailed calculations are included in Sections 3 and 4.

8.0 A.3.j. Redevelopment Standards:...

RESPONSE: As explained earlier in this narrative, Redevelopment Standards were not utilized for the parking lot as the project was designed to meet the standards for new construction. The walkway improvements are a small re-development and no new stormwater facilities are included for that work.

Watershed Modeling and Best Management Practices Design

The hydrologic analysis of the existing conditions and proposed watershed is based on the nationally recognized watershed modeling techniques developed by the USDA, Soil Conservation Service (SCS). The techniques and runoff models are described in the following SCS publications:

- “Urban Hydrology for Small Watersheds, Technical Release Number 55”, 1986 and Technical Release 20.
- National Engineering Handbook, Hydrology, Section 4, 1972.
- “A Method for Estimating Volume and Rate of Runoff in Small Watersheds, Technical Release No. 149” 1973.
- “Hydrology Handbook for Conservation Commissions” March 2002, Mass. DEP.
- The watershed modeling was performed using computer software “HydroCAD” version 10.0 by Applied Microcomputer Systems, which is based on the publications referenced above.
- Best Management Practices were designed based on the guidance provided in the DEP “Stormwater Management Standards Handbook”, February, 2008.

Erosion and Sediment Control During Construction

Included with the plans for this filing are Erosion and Sediment Control Plans and Details that show the practices to be implemented to protect downstream stormwater systems and wetland resources, abutting properties, and public roadways.

This project is not subject to the U.S. EPA’s Construction General Permit under the NPDES Program. Therefore, a Stormwater Pollution Prevention Plan (SWPPP) and a Notice of Intent filing with the EPA are not required. The Erosion and Sediment Control Plans show the initial erosion controls, general BMPs and detailed information as to the responsibilities of the Contractor.

SECTION 2

COMPLIANCE CALCULATIONS

Stormwater Standards Compliance Summary
MassDEP "Checklist for Stormwater Report"
Illicit Discharge Statement
Standard 3 – Recharge Calculations / Drawdown Time
Standard 4 – Water Quality & TSS Removal Calculations
Grass Swale Capacity Calculations

for

SVT HEADQUARTERS

18 Wolbach Road
Sudbury, MA 01776

STORMWATER STANDARDS COMPLIANCE SUMMARY
MASS. STORMWATER MANAGEMENT REGULATIONS
AND
SUDBURY STORMWATER BYLAW

SVT HEADQUARTERS
SUDBURY, MA

Standard 1: (Untreated Discharges)

There are no new stormwater conveyances proposed that discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. Prior to discharge, stormwater runoff is directed to pretreatment and treatment BMPs as required.

The stormwater will discharge to the same location as the existing conditions at the same rates and less volume. The receiving area for the parking lot runoff is a well stabilized grass field with no erosion issues. The walkway that drains to the adjacent landscape and to Wolbach Road is also stable, As such, there will be no impacts at the discharge locations.

Standard 2: (Peak Rate Control and Flood Protection)

In looking at the total amount of runoff leaving the subject property site, there will be no increase in peak rate of discharge and volumes for all storms up to and including the 100-year storm event.

The computations have been made for the 1 inch, 2, 10, 25, and 100-year storms. The computations for the peak rates of runoff and volumes are contained in Section 3 and Section 4 of this report and a summary table is included in Section 1 Narrative

Standard 3: (Recharge to Groundwater)

To meet the current DEP Stormwater Regulations, Standard 3 requires that a minimum 0.35 inches of runoff from the impervious surfaces must be recharged to the ground for hydrologic soil groups (HSG) B for the subject site. This is the minimum amount required for impervious surfaces to maintain the natural recharge hydrology of the area.

Under the Bylaw, gravel parking lots are classified as impervious. With the exception of the small entry driveway, the parking lot runoff is routed to a Bio-Retention Basin (Rain Garden) that provides recharge.

Per the Sudbury Regulations, the basin will capture and recharge a minimum of one inch of runoff to meet the WQV standard, which is 2.8 times the minimum required recharge for the parking lot portion of the project.

There is also a small paved plaza at the entry area. This is to be constructed of pavers. The added impervious for the walkway is 175 sq. feet. The bio-retention basin more than compensates for this area.

The project as designed meets this standard. Detailed calculations demonstrating compliance with this standard are included at the end of this section.

Standard 4: (80% TSS Removal)

This project incorporates stormwater pretreatment and treatment BMP's. Runoff from paved (gravel) surface is routed through a pretreatment BMP (Sediment Forebay) which discharges to a Bio-Retention Basin.

Per the MassDEP Stormwater Regulations, the Water Quality Volume (WQV) is 0.5 inches for the subject project site.

Per the Town of Sudbury Stormwater Management Bylaw Regulations, the water quality volume (WQV) must be 1.0 inch. The Bio-Retention Basin is designed to capture and infiltrate a minimum of this amount. Calculations demonstrating compliance with this Standard are included in this section.

Design calculations for each treatment train and TSS Removal Calculation Worksheets are included in this section.

In compliance with Standard 4, a long-term Stormwater Operation and Maintenance Plan is included in Appendix 2.

Standard 5: (Land Use with Higher Potential Pollutant Load)

This parking lot is not a use with a higher potential pollutant load.

Standard 6: (Critical Areas)

Not applicable. Stormwater does not discharge near or to a Critical Area (such as a Zone II, Interim Wellhead Protection Areas, Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Reservoir Waters or Cold-Water Fisheries).

Standard 7: (Redevelopment)

This project is considered a partial redevelopment and partial new construction project. The project proposes to bring all of the Gravel Parking Lot into full compliance to meet the standards for new construction. These detailed calculations are included in this section. The redevelopment of the walkway to meet ADA and MAAB standards is very small with no new impervious surface. The new paver plaza is only adds 175 sq. ft. of impervious which is more than compensated by the parking lot bio-retention basin.

Standard 8: (Erosion, Sediment Control)

Erosion and sediment control BMPs are included in the Erosion and Sediment Control Plan contained in the plan set. This plan is prepared for the initial project setup and includes detailed information regarding the responsibilities for the Contractor in managing the site in compliance with applicable permits.

This project will alter less than one acre so it is not subject to the NPDES Phase II requirements for construction sites. Coverage under the NPDES Construction General Permit and preparation of a full Stormwater Pollution Prevention Plan are not required.

Standard 9: (Operation & Maintenance)

An Operation and Maintenance Plan for the stormwater system is included in Appendix 2 to meet this Standard.

Standard 10: (Illicit Discharges)

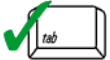
There are no illicit discharges designed or proposed for this project. No illicit discharges are known to exist. An Illicit Discharge Statement is included in this Section 2.



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 8²
- 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.



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.

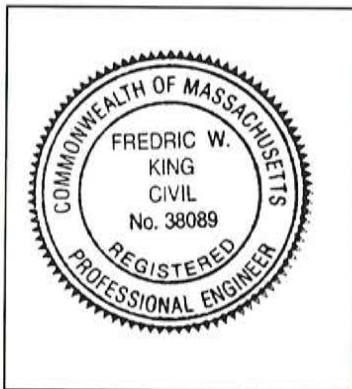
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Fredric W. King 2/27/2021
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 Field¹
- ☒ 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.

July 27, 2021

25423

Sudbury Planning & Community Development
278 Old Sudbury Road
Sudbury, MA 01776

RE: Illicit Discharge Compliance Statement

In accordance with Standard 10 of the Massachusetts Stormwater Regulations, the following statement is made regarding the proposed Parking Lot Expansion Project at the SVT Headquarters Site at 18 Wolbach Road in Sudbury, MA:

- There are no know existing illicit discharges at the subject site and none are designed or proposed.

Please feel free to contact me if you have any questions.

Sincerely yours,
DGT Associates

Fredric W. King

Fredric W. King, P.E.
Senior Engineer

Standard 3

Recharge Calculations / Drawdown Time Calculations

and

Standard 4

Water Quality & TSS Removal Calculations

Stormwater Calculations – Recharge – Standard 3

SVT Headquarters Parking Expansion, Sudbury, MA

Note that these calculations are made as if the project were new construction. No credit is being requested for Redevelopment.

Proposed Impervious Area (Gravel Parking)	= 7,793 sf
Proposed Added Impervious Area (Paver Plaza)	= 175 sf (not captured in Bio-basin)
Total Impervious Area	= 7,968 sf

Soils HSG: B → Recharge = 0.35 inches of runoff

Minimum Required Recharge:
 $(7,968 \text{ sf})(0.35 \text{ in} \div 12) = 233 \text{ ft}^3$

- All recharge facilities are designed for at least 1.0 inch capture volume to meet the Water Quality Volume (WQV) requirements, in accordance with the Massachusetts Stormwater Regulations.

Bio-Retention Basin capture volume (Static Method) design for 1 inch capture.
 $(7,793 \text{ sf})(1.0 \text{ in.} / 12) = 649 \text{ cf min. required}$
Computed Design Capture Volume = 673 cf OK (see next page).

Minimum Required Recharge =	233 cf for recharge.
Provided Recharge =	673 cf = 3 times the minimum OK.

STANDARD 4 CALCULATIONS

Stormwater Calculations – Drawdown Time

Bio-Retention Basin:

Contributing Impervious Area = 7,793 ft²

Basin Bottom Area at elevation 147.0 = 306 ft²

Water Quality Volume = Computed Capture Volume = 673 cf (from previous section)

$\text{Time}_{\text{drawdown}} = R_v \div (2.41 \text{ in. / hr})(\text{Bottom Area})$

$\text{Time}_{\text{drawdown}} = 673 \text{ ft}^3 \div (2.41 \text{ in/hr})(306 \text{ ft}^2)(1 \text{ ft} / 12 \text{ in.})$

$\text{Time}_{\text{drawdown}} = 11.0 \text{ hours}$

11.0 hours < 72 hours ← okay

Stormwater Calculations – Water Quality Volume Capacity

Note that these calculations are demonstrated in the previous section for Standard 3.

INSTRUCTIONS:

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Parking Lot Stormwater System

TSS Removal
Calculation Worksheet

B BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Sediment Forebay	0.25	1.00	0.25	0.75
Rain Garden	0.90	0.75	0.68	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08
	0.00	0.08	0.00	0.08

Total TSS Removal =

93%

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

Project: SVT Parking Lot
Prepared By: Fred King
Date: 12/19/2019

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

52423 SVT Stormwater Proposed

Prepared by Schofield Brothers LLC

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Type III 24-hr 100 year Rainfall=8.60"

Printed 12/19/2019

Check 7/27/2021

Summary for Reach 1R: Swale*CAPACITY*

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 3.20" for 100 year event
Inflow = 4.15 cfs @ 12.22 hrs, Volume= 0.410 af
Outflow = 4.14 cfs @ 12.25 hrs, Volume= 0.410 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.21 fps, Min. Travel Time= 0.8 min ← *MAX VELOCITY NON-EROSIVE*

Avg. Velocity = 1.20 fps, Avg. Travel Time= 2.2 min

Peak Storage= 206 cf @ 12.23 hrs

Average Depth at Peak Storage= 0.40' ←

Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 26.45 cfs

*FLOW DEPTH AT 100 YR STORM
≈ 5"*

2.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding

Side Slope Z-value= 3.0 ' Top Width= 8.00'

Length= 160.0' Slope= 0.0225 ' / '

Inlet Invert= 152.00', Outlet Invert= 148.40'



SECTION 3

**Existing Conditions Stormwater Model
showing Stormwater Flows and Flood Routing
Computations using HydroCAD version 10.00**

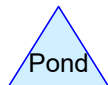
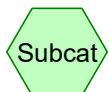
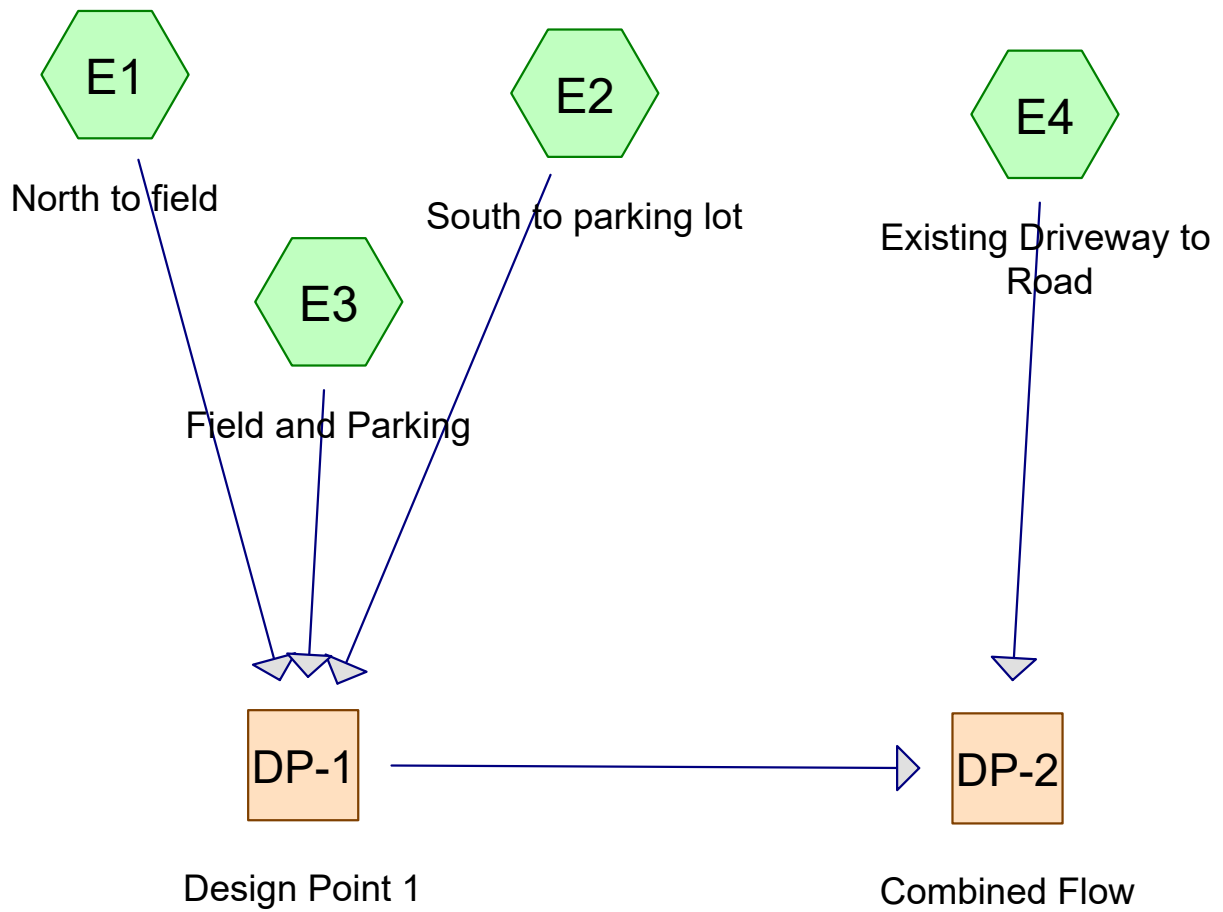
Existing Conditions Watershed Maps:

- Watershed Map for E1 and E2
- Watershed Map WSD-EX

for

SVT Headquarters Parking Expansion

18 Wolbach Road
Sudbury, MA 01776



52423 SVT Stormwater Existing

Prepared by {enter your company name here}

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Printed 7/29/2021

Page 1

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.381	61	>75% Grass cover, Good, HSG B (E2, E3, E4)
0.144	96	Gravel surface, HSG B (E3, E4)
0.002	98	Paved parking, HSG B (E4)
1.977	55	Woods, Good, HSG B (E1, E2)
2.504	58	TOTAL AREA

52423 SVT Stormwater Existing

Type III 24-hr 100 year Rainfall=8.60"

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Page 2

Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE1: North to field

Runoff Area=67,000 sf 0.00% Impervious Runoff Depth=3.20"
Flow Length=750' Tc=15.6 min CN=55 Runoff=4.15 cfs 0.410 af

SubcatchmentE2: South to parking lot

Runoff Area=21,660 sf 0.00% Impervious Runoff Depth=3.32"
Flow Length=370' Tc=8.5 min CN=56 Runoff=1.73 cfs 0.138 af

SubcatchmentE3: Field and Parking

Runoff Area=18,448 sf 0.00% Impervious Runoff Depth=4.98"
Flow Length=240' Tc=5.0 min CN=70 Runoff=2.57 cfs 0.176 af

SubcatchmentE4: Existing Driveway to Road

Runoff Area=1,978 sf 4.35% Impervious Runoff Depth=7.64"
Tc=6.0 min CN=92 Runoff=0.37 cfs 0.029 af

Reach DP-1: Design Point 1

Inflow=7.06 cfs 0.724 af
Outflow=7.06 cfs 0.724 af

Reach DP-2: Combined Flow

Inflow=7.37 cfs 0.753 af
Outflow=7.37 cfs 0.753 af

Total Runoff Area = 2.504 ac Runoff Volume = 0.753 af Average Runoff Depth = 3.61"
99.92% Pervious = 2.502 ac 0.08% Impervious = 0.002 ac

52423 SVT Stormwater Existing

Type III 24-hr 100 year Rainfall=8.60"

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Page 3

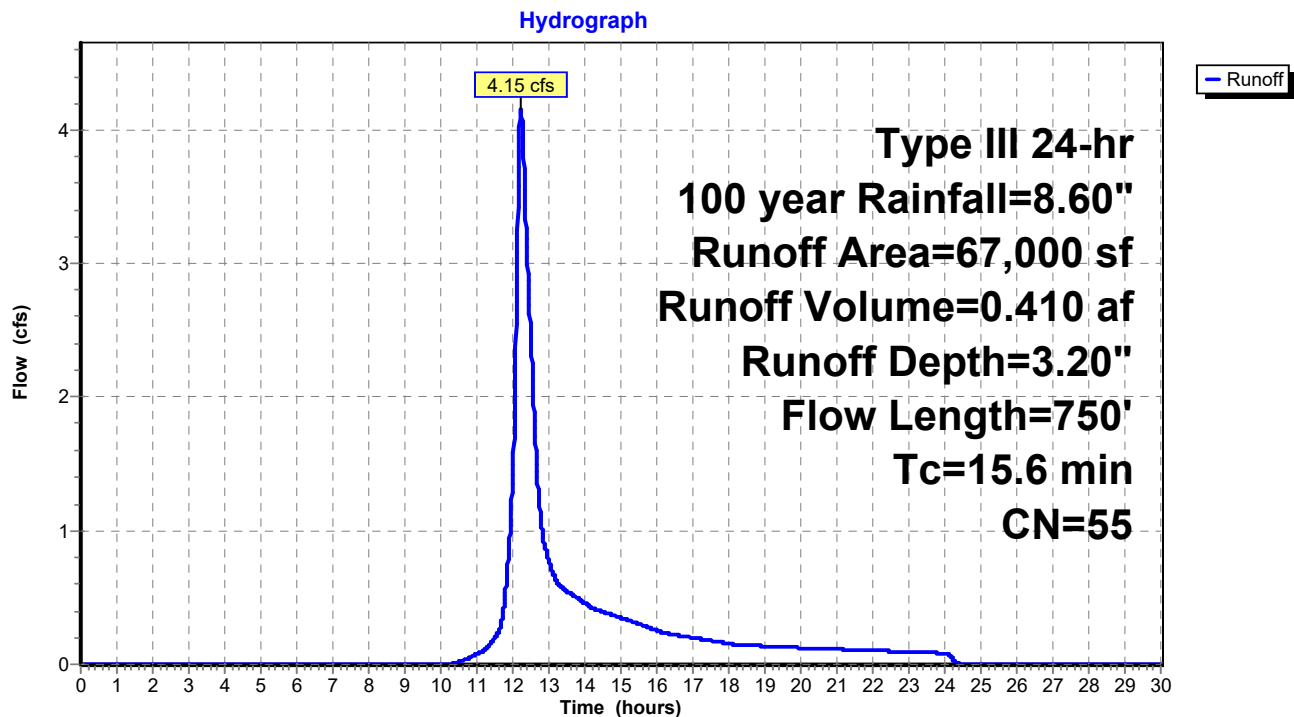
Summary for Subcatchment E1: North to field

Runoff = 4.15 cfs @ 12.22 hrs, Volume= 0.410 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Subcatchment E1: North to field

52423 SVT Stormwater Existing

Type III 24-hr 100 year Rainfall=8.60"

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Page 4

Summary for Subcatchment E2: South to parking lot

Runoff = 1.73 cfs @ 12.13 hrs, Volume= 0.138 af, Depth= 3.32"

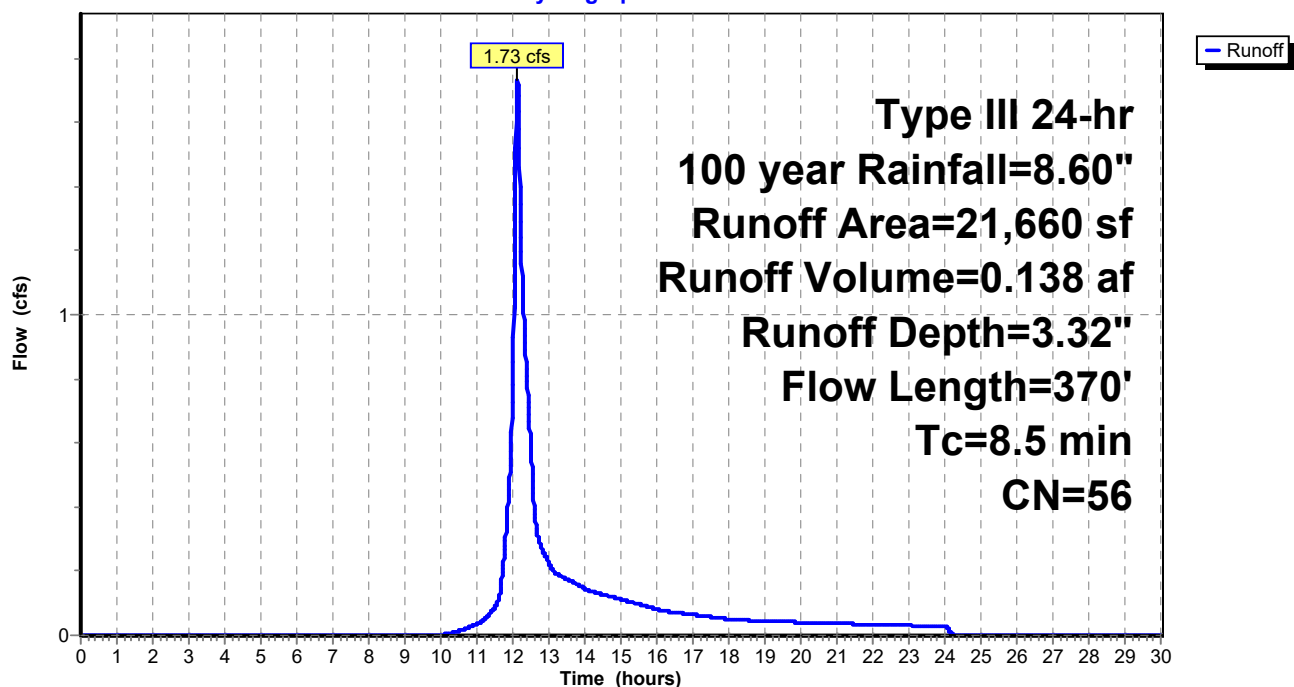
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Subcatchment E2: South to parking lot

Hydrograph



52423 SVT Stormwater Existing

Type III 24-hr 100 year Rainfall=8.60"

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Summary for Subcatchment E3: Field and Parking

Runoff = 2.57 cfs @ 12.07 hrs, Volume= 0.176 af, Depth= 4.98"

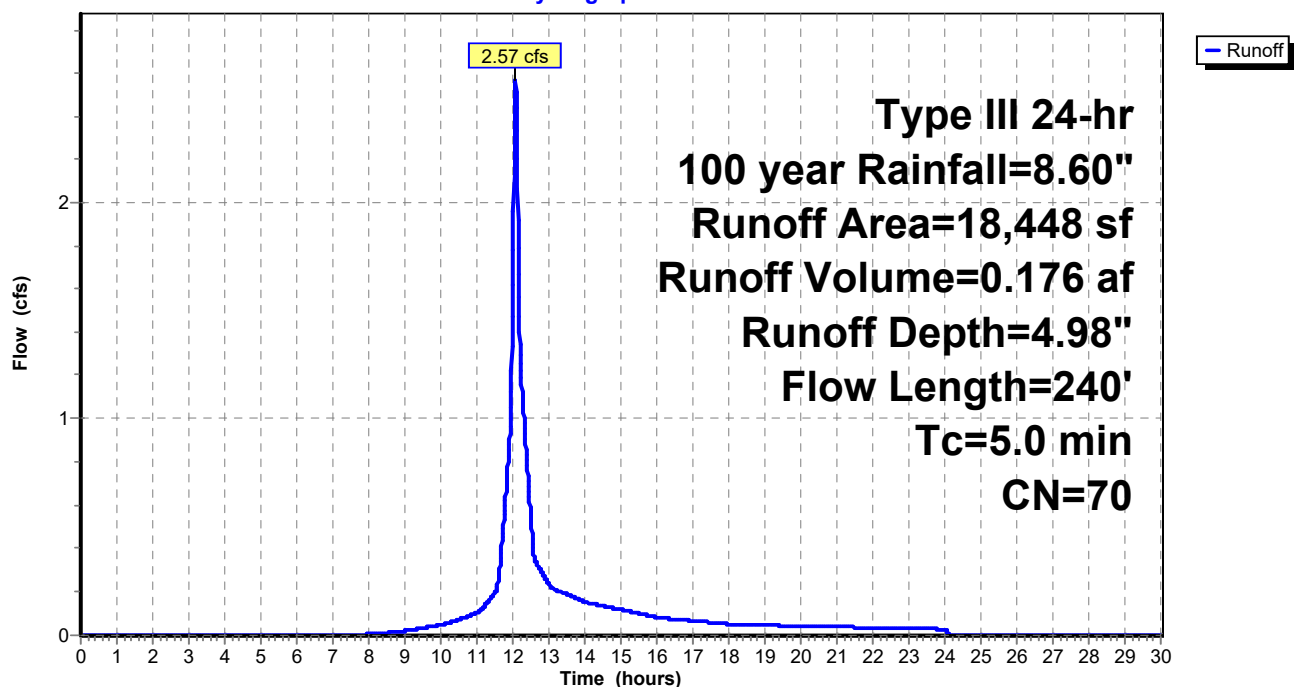
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
13,837	61	>75% Grass cover, Good, HSG B
4,611	96	Gravel surface, HSG B
18,448	70	Weighted Average
18,448		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0260	1.33		Sheet Flow, Seg 1 Smooth surfaces n= 0.011 P2= 3.20"
0.2	25	0.0200	2.28		Shallow Concentrated Flow, Seg 2 Unpaved Kv= 16.1 fps
2.6	165	0.0220	1.04		Shallow Concentrated Flow, Seg 3 Short Grass Pasture Kv= 7.0 fps
3.4	240	Total, Increased to minimum Tc = 5.0 min			

Subcatchment E3: Field and Parking

Hydrograph



52423 SVT Stormwater Existing

Type III 24-hr 100 year Rainfall=8.60"

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Summary for Subcatchment E4: Existing Driveway to Road

Runoff = 0.37 cfs @ 12.08 hrs, Volume= 0.029 af, Depth= 7.64"

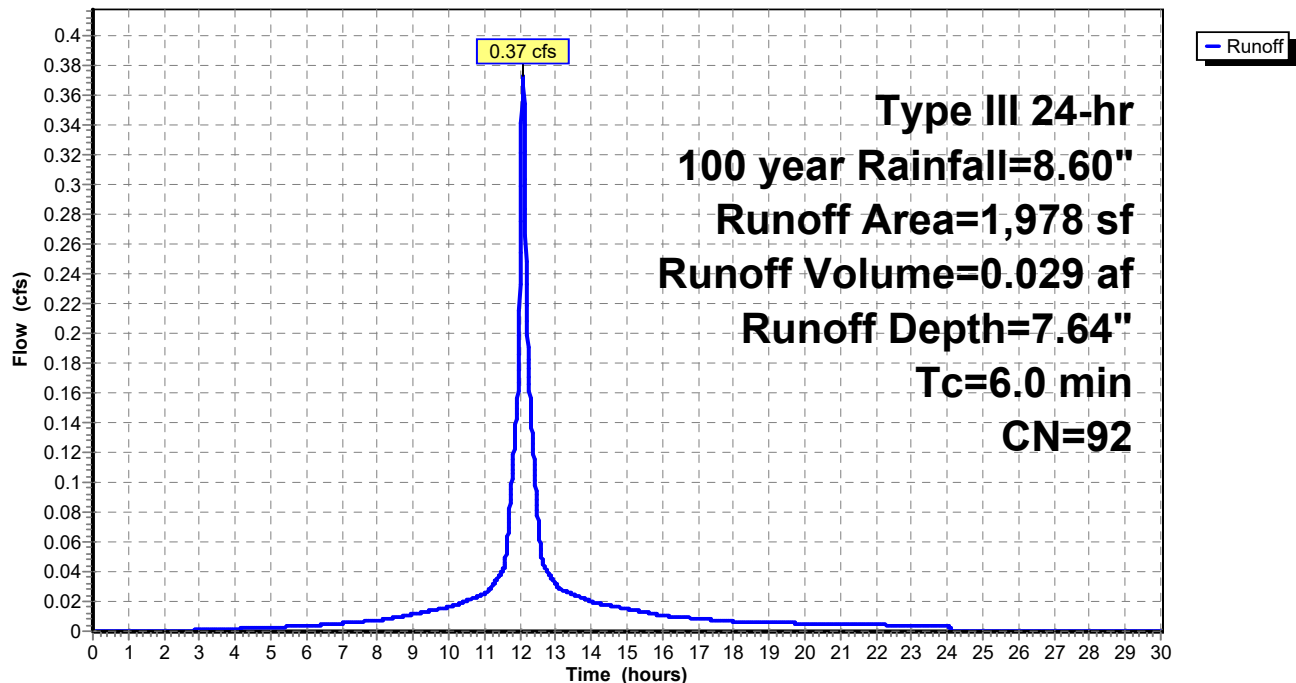
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
1,654	96	Gravel surface, HSG B
86	98	Paved parking, HSG B
238	61	>75% Grass cover, Good, HSG B
1,978	92	Weighted Average
1,892		95.65% Pervious Area
86		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

Subcatchment E4: Existing Driveway to Road

Hydrograph



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Type III 24-hr 100 year Rainfall=8.60"

Printed 7/29/2021

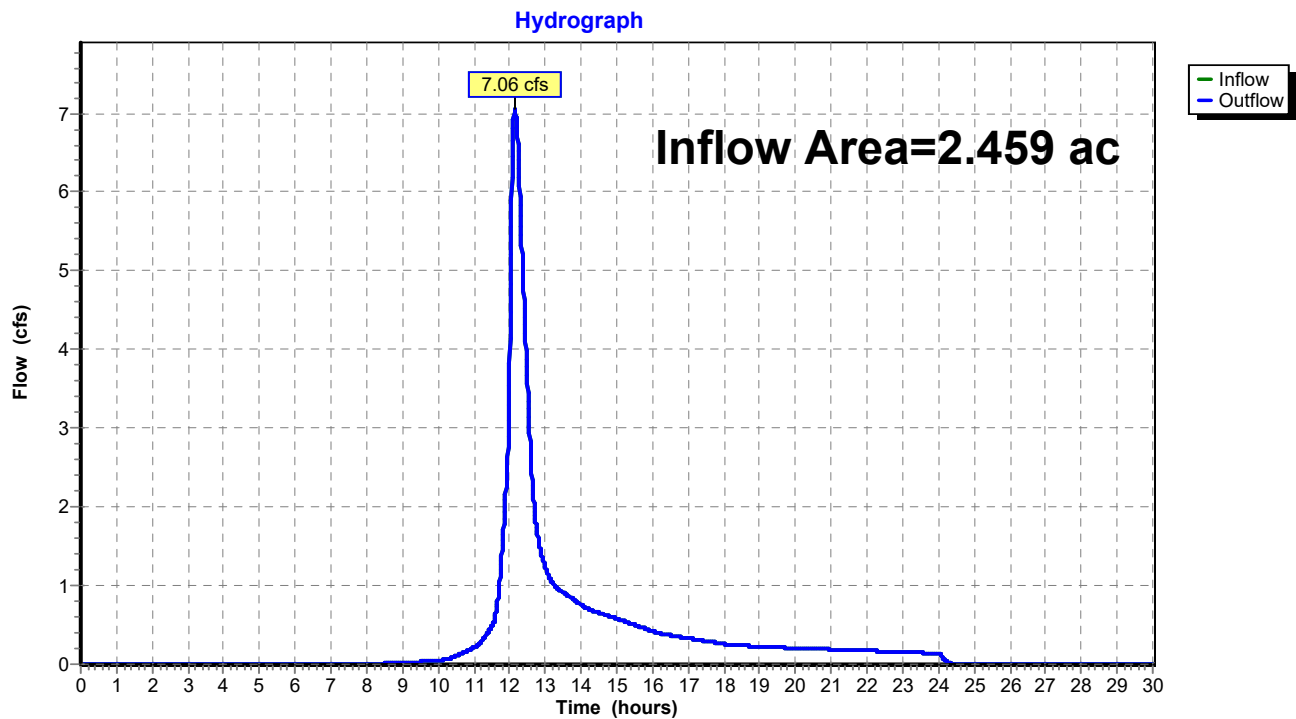
Page 7

Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.00% Impervious, Inflow Depth = 3.53" for 100 year event
Inflow = 7.06 cfs @ 12.14 hrs, Volume= 0.724 af
Outflow = 7.06 cfs @ 12.14 hrs, Volume= 0.724 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



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Type III 24-hr 100 year Rainfall=8.60"

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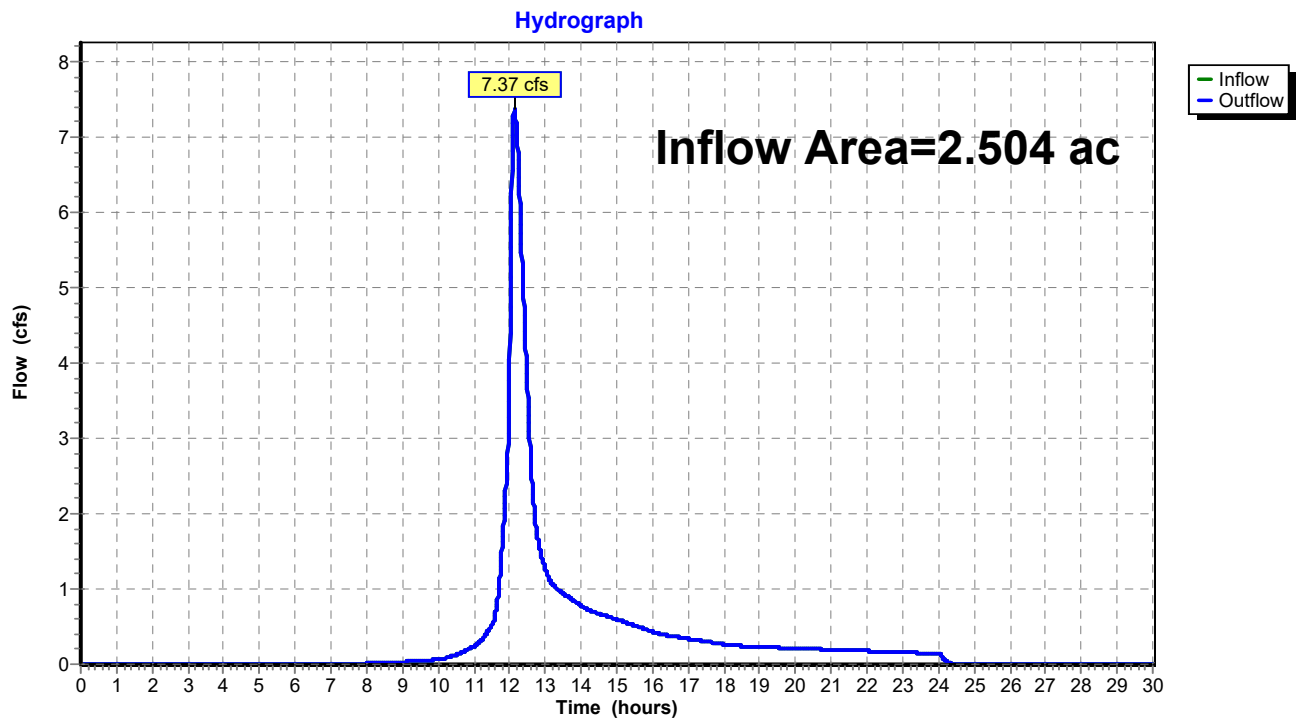
Page 8

Summary for Reach DP-2: Combined Flow

Inflow Area = 2.504 ac, 0.08% Impervious, Inflow Depth = 3.61" for 100 year event
Inflow = 7.37 cfs @ 12.13 hrs, Volume= 0.753 af
Outflow = 7.37 cfs @ 12.13 hrs, Volume= 0.753 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-2: Combined Flow



52423 SVT Stormwater Existing

Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Subcatchment E1: North to field

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment E3: Field and Parking

Runoff = 0.00 cfs @ 21.35 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

52423 SVT Stormwater Existing

Type III 24-hr 1 inch Rainfall=1.00"

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Area (sf)	CN	Description
13,837	61	>75% Grass cover, Good, HSG B
4,611	96	Gravel surface, HSG B
18,448	70	Weighted Average
18,448		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0260	1.33		Sheet Flow, Seg 1 Smooth surfaces n= 0.011 P2= 3.20"
0.2	25	0.0200	2.28		Shallow Concentrated Flow, Seg 2 Unpaved Kv= 16.1 fps
2.6	165	0.0220	1.04		Shallow Concentrated Flow, Seg 3 Short Grass Pasture Kv= 7.0 fps
3.4	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment E4: Existing Driveway to Road

Runoff = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
1,654	96	Gravel surface, HSG B
86	98	Paved parking, HSG B
238	61	>75% Grass cover, Good, HSG B
1,978	92	Weighted Average
1,892		95.65% Pervious Area
86		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1 inch event
 Inflow = 0.00 cfs @ 21.35 hrs, Volume= 0.000 af
 Outflow = 0.00 cfs @ 21.35 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined Flow

Inflow Area = 2.504 ac, 0.08% Impervious, Inflow Depth = 0.01" for 1 inch event
 Inflow = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af
 Outflow = 0.02 cfs @ 12.09 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

52423 SVT Stormwater Existing*Type III 24-hr 1 inch Rainfall=1.00"*

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Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

52423 SVT Stormwater Existing

Type III 24-hr 2 Year Rainfall=3.20"

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Summary for Subcatchment E1: North to field

Runoff = 0.14 cfs @ 12.48 hrs, Volume= 0.032 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

Runoff = 0.06 cfs @ 12.35 hrs, Volume= 0.012 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment E3: Field and Parking

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.029 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

52423 SVT Stormwater Existing

Type III 24-hr 2 Year Rainfall=3.20"

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Area (sf)	CN	Description
13,837	61	>75% Grass cover, Good, HSG B
4,611	96	Gravel surface, HSG B
18,448	70	Weighted Average
18,448		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0260	1.33		Sheet Flow, Seg 1 Smooth surfaces n= 0.011 P2= 3.20"
0.2	25	0.0200	2.28		Shallow Concentrated Flow, Seg 2 Unpaved Kv= 16.1 fps
2.6	165	0.0220	1.04		Shallow Concentrated Flow, Seg 3 Short Grass Pasture Kv= 7.0 fps
3.4	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment E4: Existing Driveway to Road

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.009 af, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
1,654	96	Gravel surface, HSG B
86	98	Paved parking, HSG B
238	61	>75% Grass cover, Good, HSG B
1,978	92	Weighted Average
1,892		95.65% Pervious Area
86		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.00% Impervious, Inflow Depth = 0.36" for 2 Year event
 Inflow = 0.40 cfs @ 12.09 hrs, Volume= 0.073 af
 Outflow = 0.40 cfs @ 12.09 hrs, Volume= 0.073 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined Flow

Inflow Area = 2.504 ac, 0.08% Impervious, Inflow Depth = 0.39" for 2 Year event
 Inflow = 0.52 cfs @ 12.09 hrs, Volume= 0.082 af
 Outflow = 0.52 cfs @ 12.09 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

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Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10 Year Rainfall=4.80"

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Summary for Subcatchment E1: North to field

Runoff = 0.90 cfs @ 12.26 hrs, Volume= 0.113 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

Runoff = 0.40 cfs @ 12.14 hrs, Volume= 0.039 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment E3: Field and Parking

Runoff = 0.95 cfs @ 12.08 hrs, Volume= 0.067 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

52423 SVT Stormwater Existing

Type III 24-hr 10 Year Rainfall=4.80"

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Area (sf)	CN	Description
13,837	61	>75% Grass cover, Good, HSG B
4,611	96	Gravel surface, HSG B
18,448	70	Weighted Average
18,448		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0260	1.33		Sheet Flow, Seg 1 Smooth surfaces n= 0.011 P2= 3.20"
0.2	25	0.0200	2.28		Shallow Concentrated Flow, Seg 2 Unpaved Kv= 16.1 fps
2.6	165	0.0220	1.04		Shallow Concentrated Flow, Seg 3 Short Grass Pasture Kv= 7.0 fps
3.4	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment E4: Existing Driveway to Road

Runoff = 0.20 cfs @ 12.08 hrs, Volume= 0.015 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
1,654	96	Gravel surface, HSG B
86	98	Paved parking, HSG B
238	61	>75% Grass cover, Good, HSG B
1,978	92	Weighted Average
1,892		95.65% Pervious Area
86		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.00% Impervious, Inflow Depth = 1.07" for 10 Year event
 Inflow = 1.74 cfs @ 12.14 hrs, Volume= 0.219 af
 Outflow = 1.74 cfs @ 12.14 hrs, Volume= 0.219 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined Flow

Inflow Area = 2.504 ac, 0.08% Impervious, Inflow Depth = 1.12" for 10 Year event
 Inflow = 1.91 cfs @ 12.12 hrs, Volume= 0.233 af
 Outflow = 1.91 cfs @ 12.12 hrs, Volume= 0.233 af, Atten= 0%, Lag= 0.0 min

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Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

52423 SVT Stormwater Existing

Type III 24-hr 25 Year Rainfall=5.89"

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Summary for Subcatchment E1: North to field

Runoff = 1.70 cfs @ 12.25 hrs, Volume= 0.186 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

Runoff = 0.73 cfs @ 12.13 hrs, Volume= 0.063 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment E3: Field and Parking

Runoff = 1.39 cfs @ 12.08 hrs, Volume= 0.096 af, Depth= 2.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

52423 SVT Stormwater Existing

Type III 24-hr 25 Year Rainfall=5.89"

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Area (sf)	CN	Description
13,837	61	>75% Grass cover, Good, HSG B
4,611	96	Gravel surface, HSG B
18,448	70	Weighted Average
18,448		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0260	1.33		Sheet Flow, Seg 1 Smooth surfaces n= 0.011 P2= 3.20"
0.2	25	0.0200	2.28		Shallow Concentrated Flow, Seg 2 Unpaved Kv= 16.1 fps
2.6	165	0.0220	1.04		Shallow Concentrated Flow, Seg 3 Short Grass Pasture Kv= 7.0 fps
3.4	240	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment E4: Existing Driveway to Road

Runoff = 0.25 cfs @ 12.08 hrs, Volume= 0.019 af, Depth= 4.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
1,654	96	Gravel surface, HSG B
86	98	Paved parking, HSG B
238	61	>75% Grass cover, Good, HSG B
1,978	92	Weighted Average
1,892		95.65% Pervious Area
86		4.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.00% Impervious, Inflow Depth = 1.69" for 25 Year event
 Inflow = 3.09 cfs @ 12.14 hrs, Volume= 0.346 af
 Outflow = 3.09 cfs @ 12.14 hrs, Volume= 0.346 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined Flow

Inflow Area = 2.504 ac, 0.08% Impervious, Inflow Depth = 1.75" for 25 Year event
 Inflow = 3.30 cfs @ 12.13 hrs, Volume= 0.365 af
 Outflow = 3.30 cfs @ 12.13 hrs, Volume= 0.365 af, Atten= 0%, Lag= 0.0 min

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Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

- Intermediate Contour
- Parcels
- Wetlands Town 2000
- Open Water
- Deep Marsh
- Shallow Marsh
- Bog
- Shrub Swamp
- Wooded Swamp
- Wooded Swamp
- Wooded Swamp
- Streams Orthographic
- Streams CIR
- Lake/Reservoir
- Buildings
- MA Highways Interstate
- US Highway Numbered
- Town Boundary
- Streets

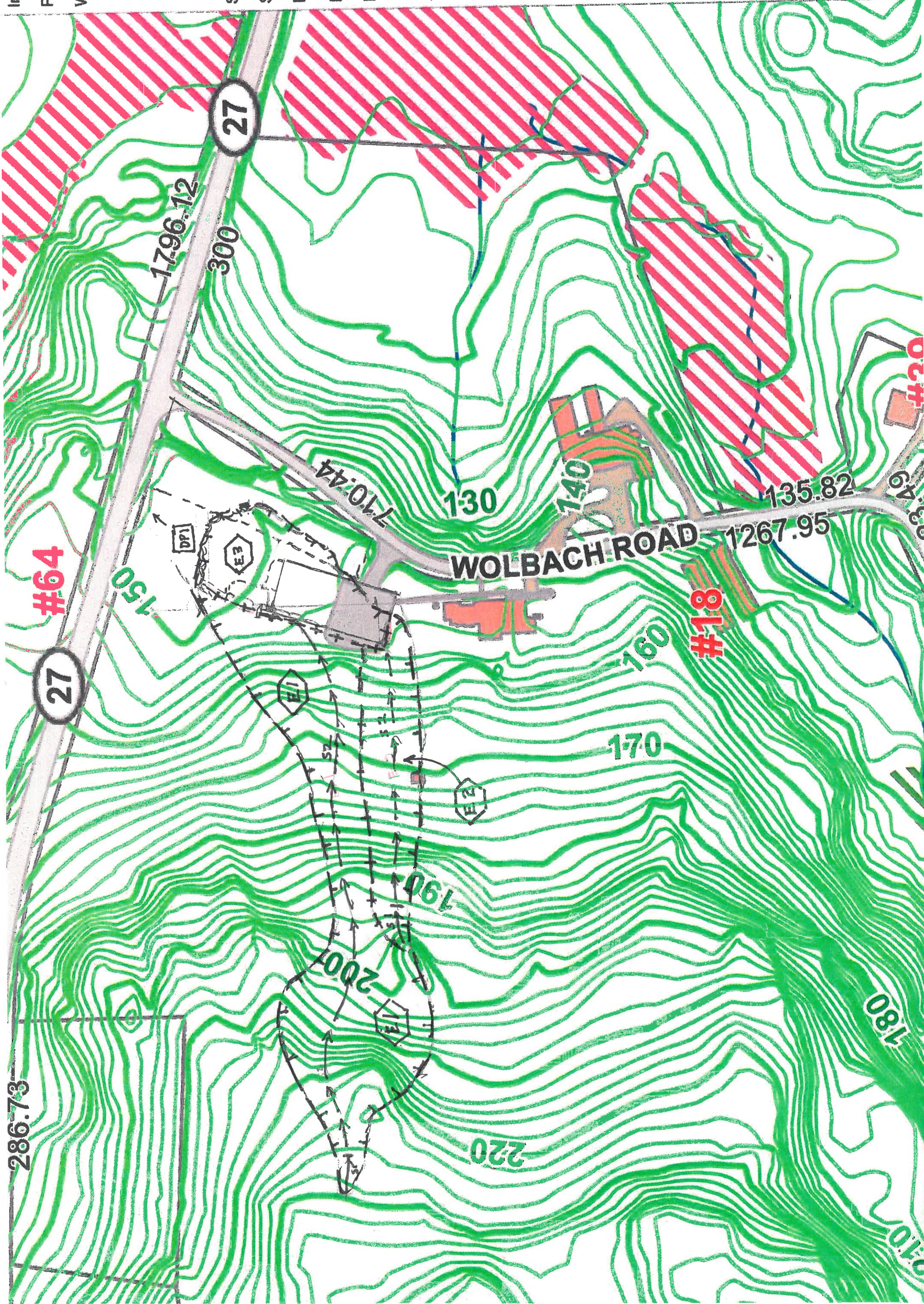
WATERSHED MAP FOR E1 + E2

source: subvry GIS

SCALE

200'

400'



DGT Associates

Surveying & Engineering

Framingham

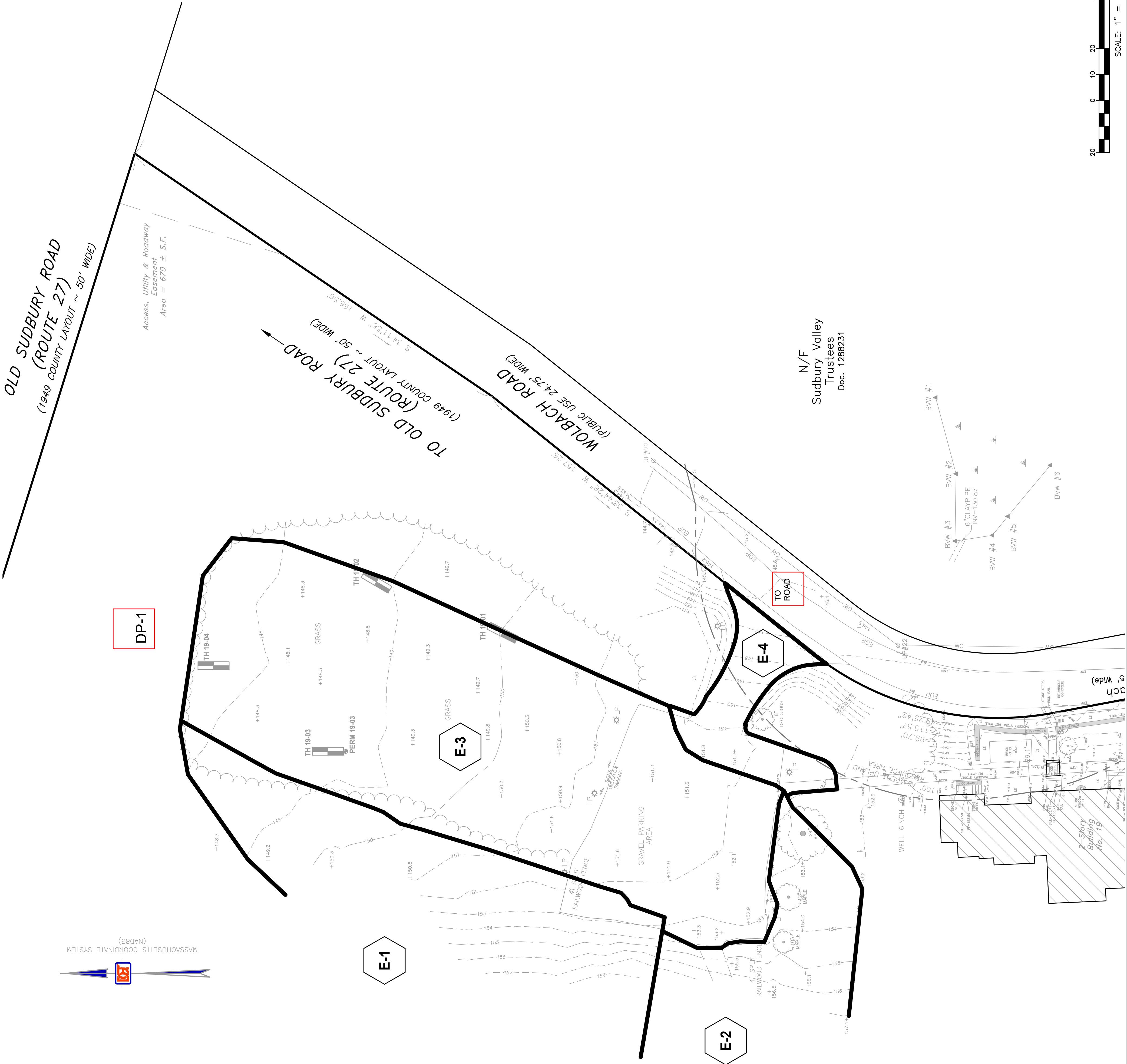
Boston • Worcester

1071 Worcester Road

Framingham, MA 01701

508-879-0030

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1	FWK	7/22/2021	ADDED E-4
NO.	APP	DATE	DESCRIPTION
DATE:	DECEMBER 13, 2019		
SCALE:	1" = 20'		
DRAFTED:	KMR	CHECKED:	FWK
PROJECT TITLE:			

NEW PARKING FACILITY FOR SVT HEADQUARTERS AT WOLBACH FARM

18 WOLBACH ROAD
SUDBURY, MASSACHUSETTS 01716

SHEET TITLE:

EXISTING CONDITIONS WATERSHED MAP

SHEET: 1 OF 1

PROJECT NO.: 25423

WSD-EX

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SECTION 4

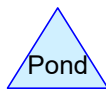
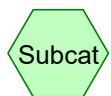
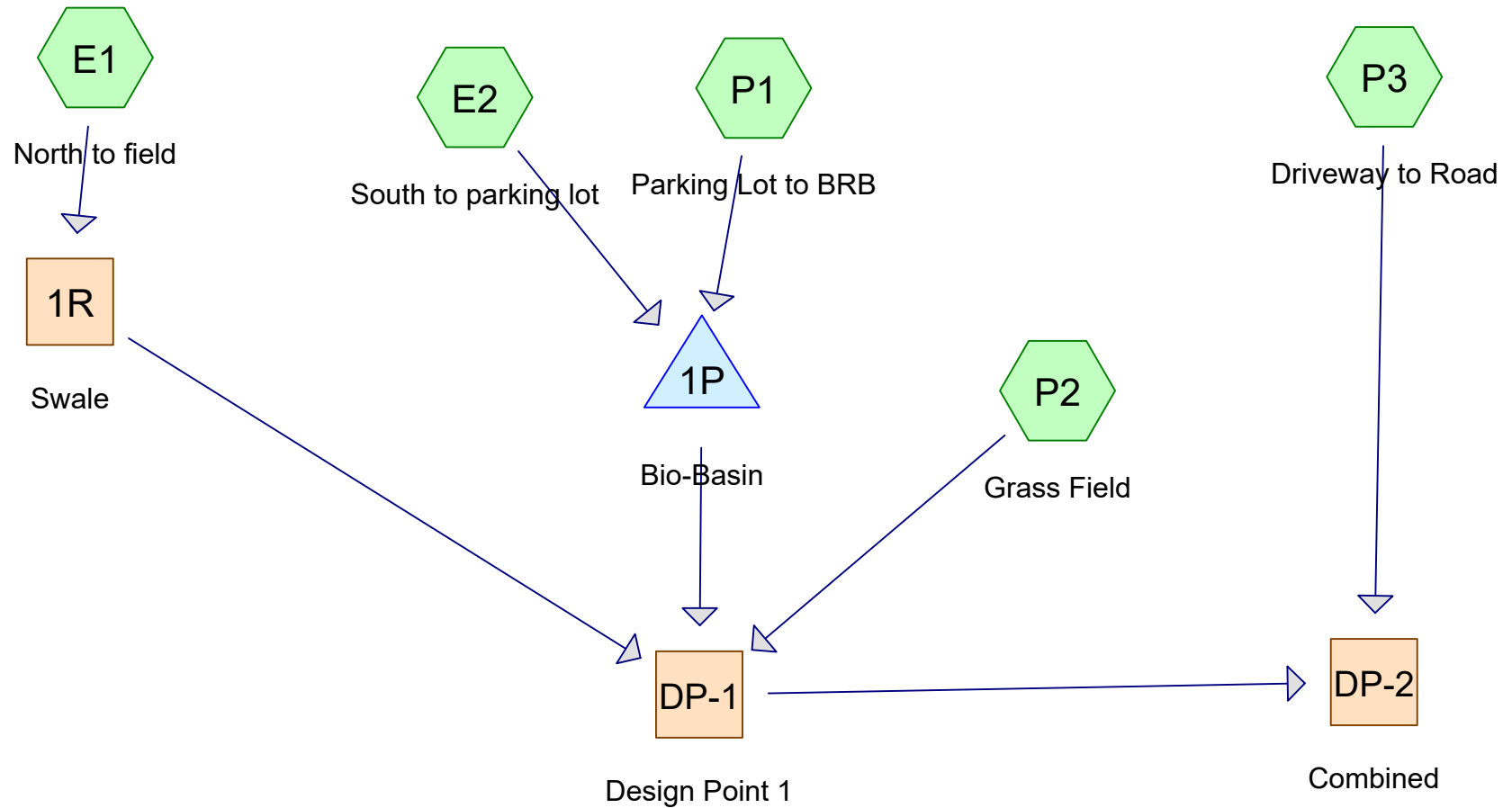
**Proposed Conditions Stormwater Model
showing Stormwater Flows and Flood Routing
Computations using HydroCAD version 10.00**

Existing Conditions Watershed Map: WSD-PR

for

SVT Headquarters Parking Expansion

18 Wolbach Road
Sudbury, MA 01776



Routing Diagram for 52423 SVT Stormwater Proposed
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52423 SVT Stormwater Proposed

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Page 1

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.303	61	>75% Grass cover, Good, HSG B (E2, P1, P2)
0.209	96	Gravel surface, HSG B (P1, P3)
0.015	98	Paved parking, HSG B (P1, P3)
1.977	55	Woods, Good, HSG B (E1, E2)
2.504	59	TOTAL AREA

52423 SVT Stormwater Proposed

Type III 24-hr 100 year Rainfall=8.60"

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Time span=0.00-30.00 hrs, dt=0.01 hrs, 3001 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE1: North to field

Runoff Area=67,000 sf 0.00% Impervious Runoff Depth=3.20"
Flow Length=750' Tc=15.6 min CN=55 Runoff=4.15 cfs 0.410 af

SubcatchmentE2: South to parking lot

Runoff Area=21,660 sf 0.00% Impervious Runoff Depth=3.32"
Flow Length=370' Tc=8.5 min CN=56 Runoff=1.73 cfs 0.138 af

SubcatchmentP1: Parking Lot to BRB

Runoff Area=10,762 sf 2.47% Impervious Runoff Depth=6.91"
Flow Length=155' Tc=5.0 min CN=86 Runoff=1.98 cfs 0.142 af

SubcatchmentP2: Grass Field

Runoff Area=7,686 sf 0.00% Impervious Runoff Depth=3.91"
Tc=5.0 min CN=61 Runoff=0.83 cfs 0.057 af

SubcatchmentP3: Driveway to Road

Runoff Area=1,978 sf 20.42% Impervious Runoff Depth=8.12"
Tc=6.0 min CN=96 Runoff=0.38 cfs 0.031 af

Reach 1R: Swale

Avg. Flow Depth=0.40' Max Vel=3.21 fps Inflow=4.15 cfs 0.410 af
n=0.030 L=160.0' S=0.0225 '/' Capacity=26.45 cfs Outflow=4.14 cfs 0.410 af

Reach DP-1: Design Point 1

Inflow=7.06 cfs 0.694 af
Outflow=7.06 cfs 0.694 af

Reach DP-2: Combined

Inflow=7.30 cfs 0.725 af
Outflow=7.30 cfs 0.725 af

Pond 1P: Bio-Basin

Peak Elev=149.00' Storage=1,373 cf Inflow=3.52 cfs 0.280 af
Discarded=0.05 cfs 0.047 af Primary=3.28 cfs 0.226 af Outflow=3.33 cfs 0.273 af

Total Runoff Area = 2.504 ac Runoff Volume = 0.778 af Average Runoff Depth = 3.73"
99.39% Pervious = 2.489 ac 0.61% Impervious = 0.015 ac

52423 SVT Stormwater Proposed

Type III 24-hr 100 year Rainfall=8.60"

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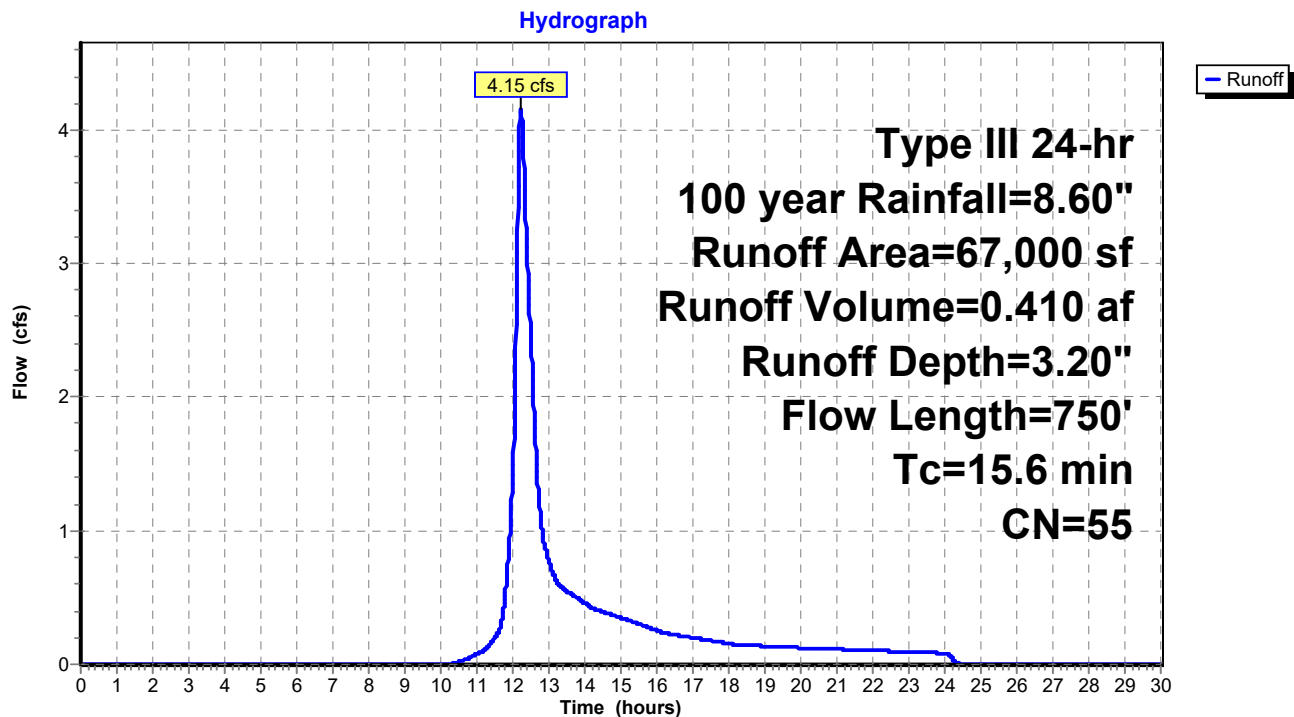
Summary for Subcatchment E1: North to field

Runoff = 4.15 cfs @ 12.22 hrs, Volume= 0.410 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Subcatchment E1: North to field

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Type III 24-hr 100 year Rainfall=8.60"

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Summary for Subcatchment E2: South to parking lot

Runoff = 1.73 cfs @ 12.13 hrs, Volume= 0.138 af, Depth= 3.32"

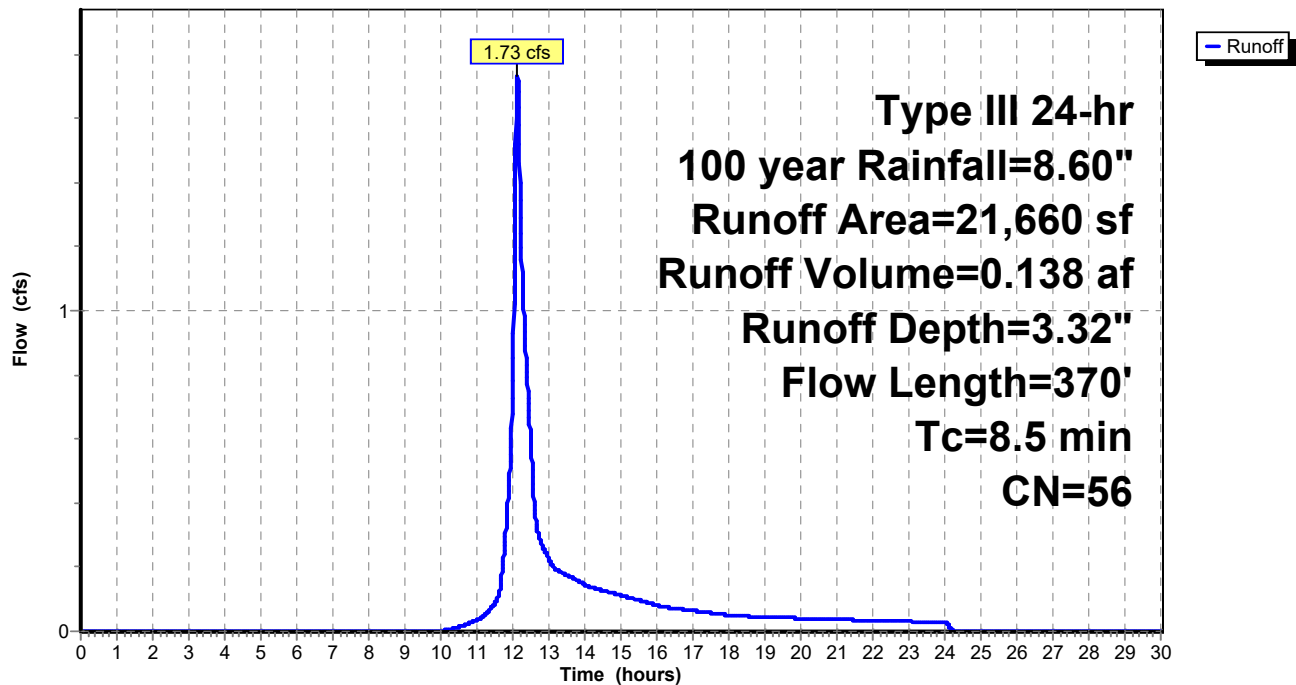
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Subcatchment E2: South to parking lot

Hydrograph



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Type III 24-hr 100 year Rainfall=8.60"

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Summary for Subcatchment P1: Parking Lot to BRB

Runoff = 1.98 cfs @ 12.07 hrs, Volume= 0.142 af, Depth= 6.91"

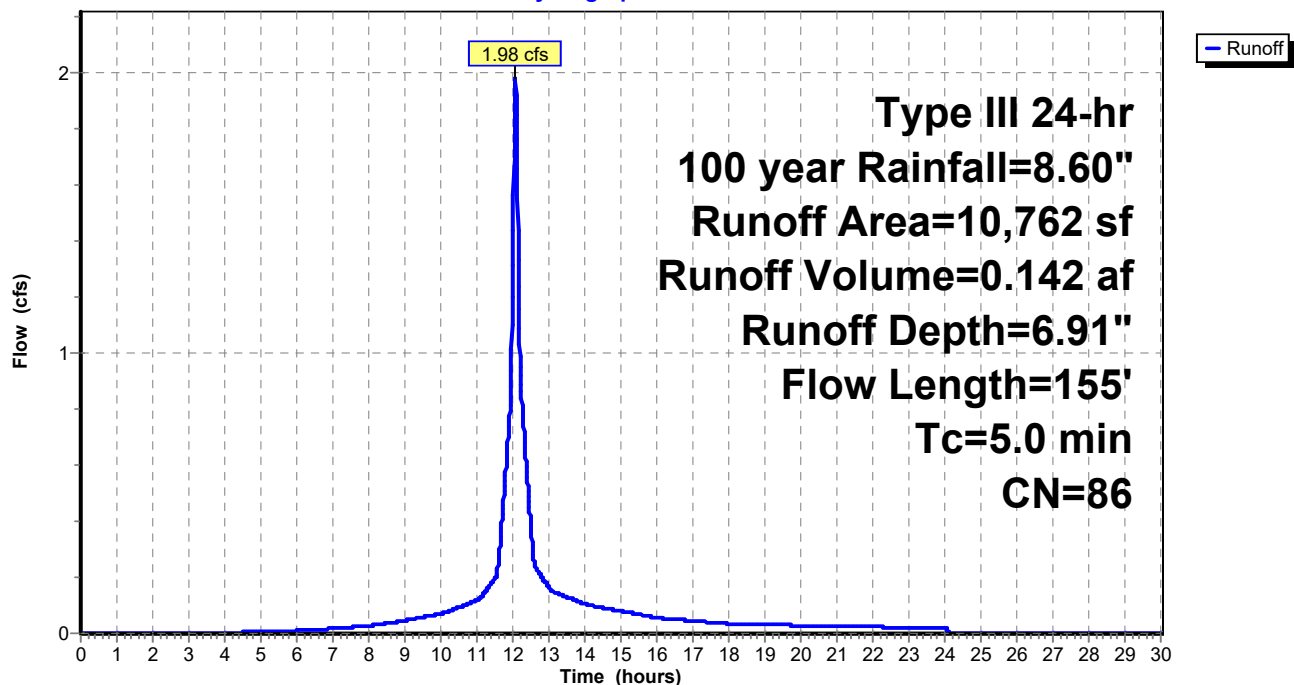
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
7,527	96	Gravel surface, HSG B
2,969	61	>75% Grass cover, Good, HSG B
266	98	Paved parking, HSG B
10,762	86	Weighted Average
10,496		97.53% Pervious Area
266		2.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0400	0.16		Sheet Flow, Seg 1
					Grass: Short n= 0.150 P2= 3.20"
0.9	135	0.0260	2.60		Shallow Concentrated Flow, Seg 2
					Unpaved Kv= 16.1 fps
2.9	155	Total, Increased to minimum Tc = 5.0 min			

Subcatchment P1: Parking Lot to BRB

Hydrograph



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Type III 24-hr 100 year Rainfall=8.60"

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Summary for Subcatchment P2: Grass Field

Runoff = 0.83 cfs @ 12.08 hrs, Volume= 0.057 af, Depth= 3.91"

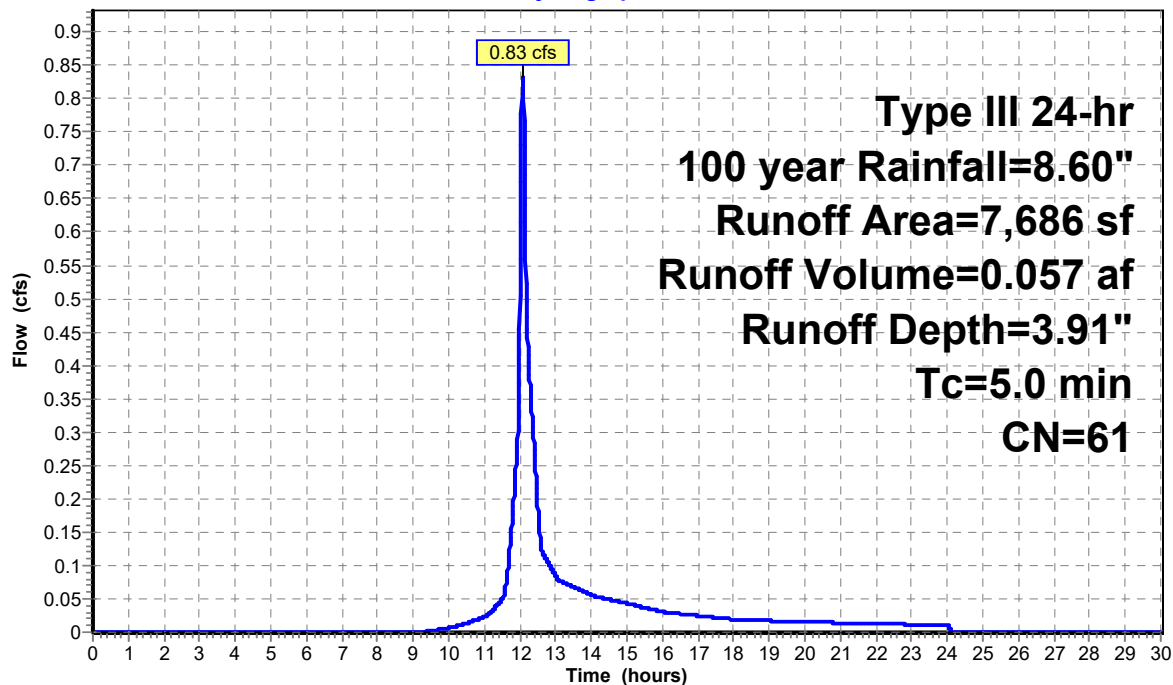
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
7,686	61	>75% Grass cover, Good, HSG B
7,686		100.00% Pervious Area

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

Subcatchment P2: Grass Field

Hydrograph



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Type III 24-hr 100 year Rainfall=8.60"

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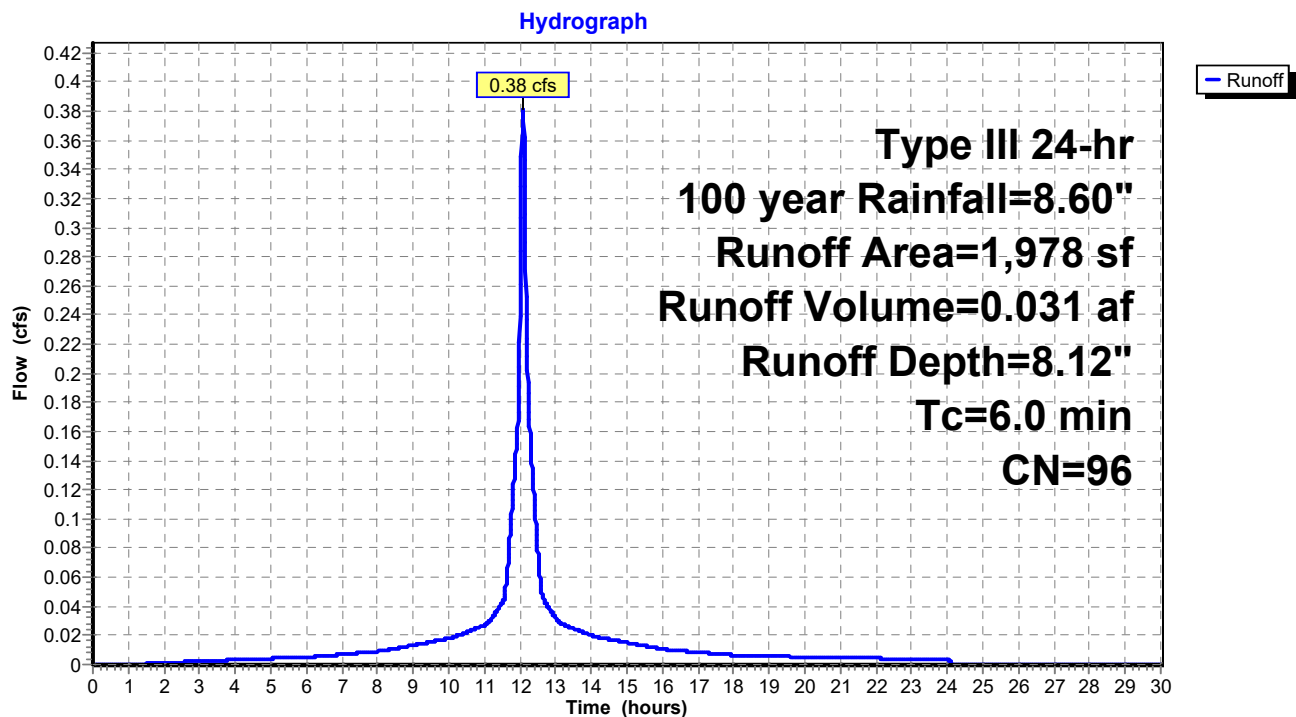
Summary for Subcatchment P3: Driveway to Road

Runoff = 0.38 cfs @ 12.08 hrs, Volume= 0.031 af, Depth= 8.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 year Rainfall=8.60"

Area (sf)	CN	Description
404	98	Paved parking, HSG B
1,574	96	Gravel surface, HSG B
1,978	96	Weighted Average
1,574		79.58% Pervious Area
404		20.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

Subcatchment P3: Driveway to Road

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Type III 24-hr 100 year Rainfall=8.60"

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Summary for Reach 1R: Swale

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 3.20" for 100 year event
Inflow = 4.15 cfs @ 12.22 hrs, Volume= 0.410 af
Outflow = 4.14 cfs @ 12.25 hrs, Volume= 0.410 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Max. Velocity= 3.21 fps, Min. Travel Time= 0.8 min

Avg. Velocity = 1.20 fps, Avg. Travel Time= 2.2 min

Peak Storage= 206 cf @ 12.23 hrs

Average Depth at Peak Storage= 0.40'

Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 26.45 cfs

2.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding

Side Slope Z-value= 3.0 ' ' Top Width= 8.00'

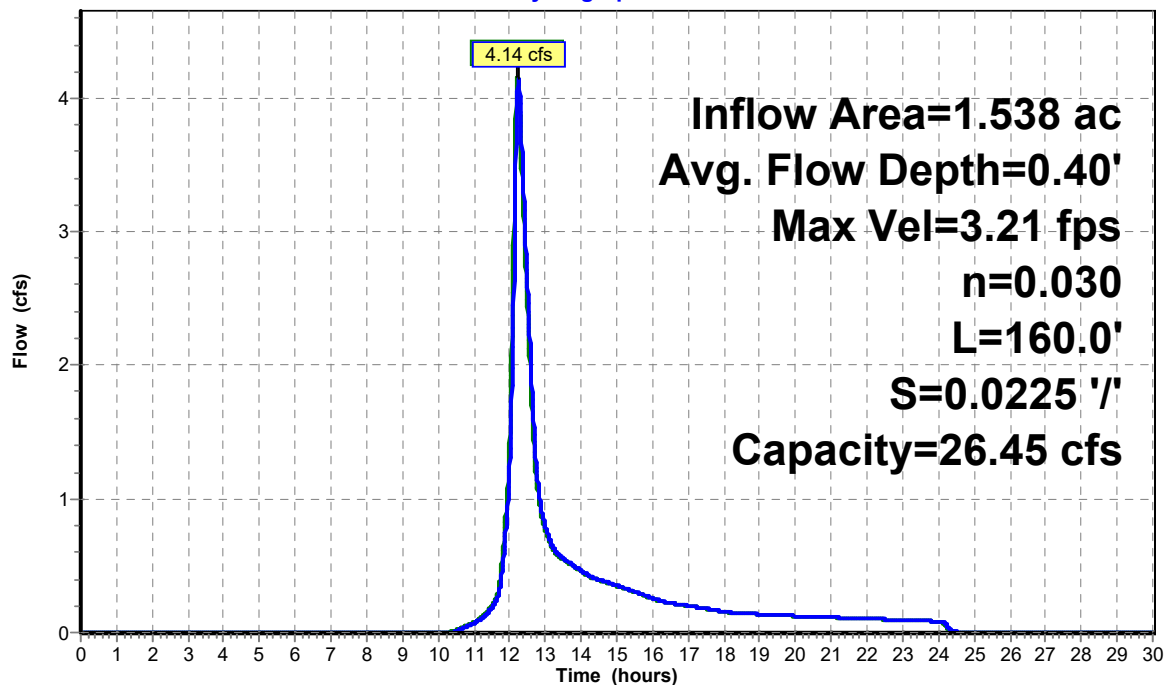
Length= 160.0' Slope= 0.0225 ' '

Inlet Invert= 152.00', Outlet Invert= 148.40'



Reach 1R: Swale

Hydrograph



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Type III 24-hr 100 year Rainfall=8.60"

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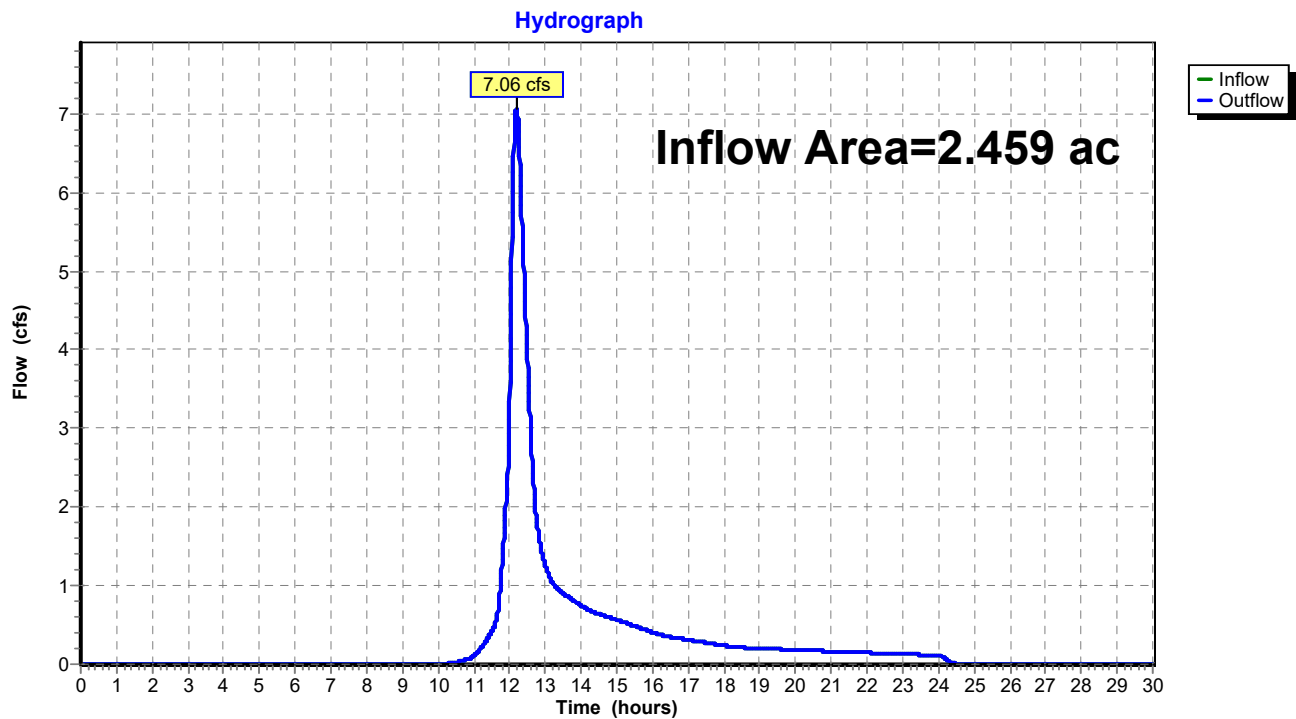
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Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.25% Impervious, Inflow Depth = 3.39" for 100 year event
Inflow = 7.06 cfs @ 12.19 hrs, Volume= 0.694 af
Outflow = 7.06 cfs @ 12.19 hrs, Volume= 0.694 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



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Type III 24-hr 100 year Rainfall=8.60"

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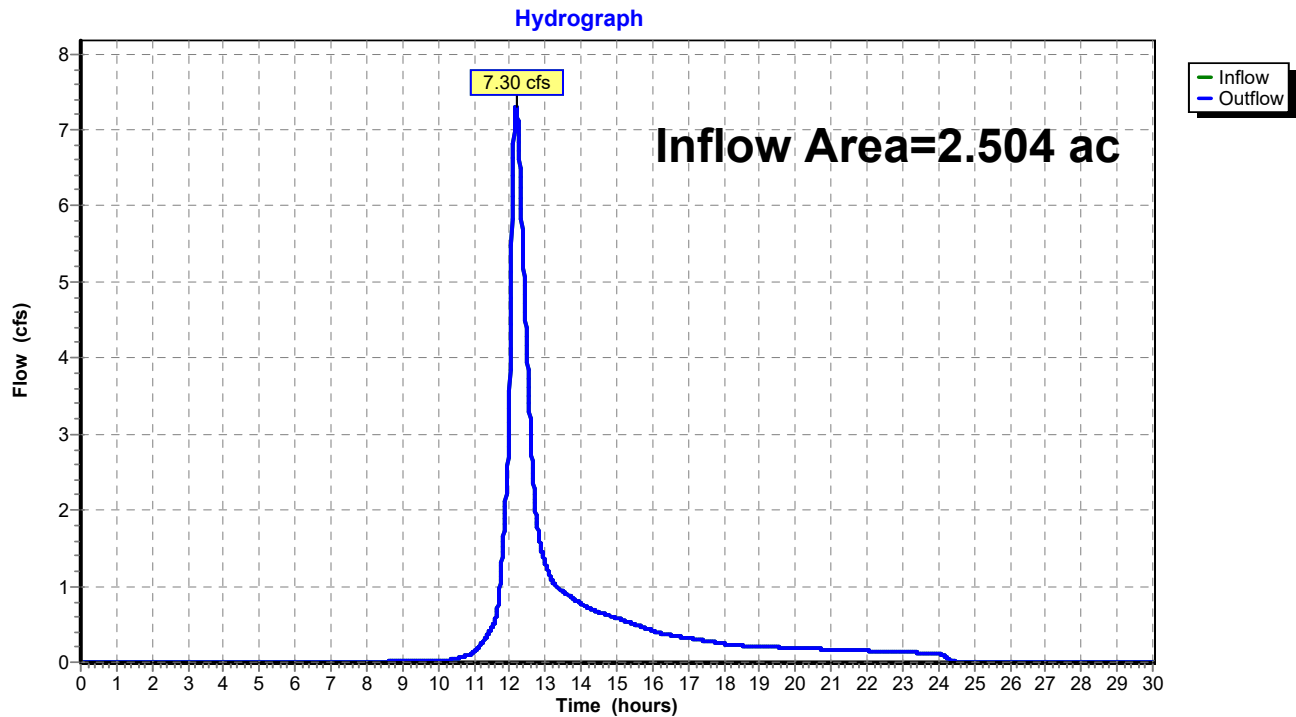
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Summary for Reach DP-2: Combined

Inflow Area = 2.504 ac, 0.61% Impervious, Inflow Depth = 3.47" for 100 year event
Inflow = 7.30 cfs @ 12.18 hrs, Volume= 0.725 af
Outflow = 7.30 cfs @ 12.18 hrs, Volume= 0.725 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Reach DP-2: Combined



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Type III 24-hr 100 year Rainfall=8.60"

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Summary for Pond 1P: Bio-Basin

Inflow Area = 0.744 ac, 0.82% Impervious, Inflow Depth = 4.51" for 100 year event
 Inflow = 3.52 cfs @ 12.09 hrs, Volume= 0.280 af
 Outflow = 3.33 cfs @ 12.13 hrs, Volume= 0.273 af, Atten= 5%, Lag= 1.9 min
 Discarded = 0.05 cfs @ 12.13 hrs, Volume= 0.047 af
 Primary = 3.28 cfs @ 12.13 hrs, Volume= 0.226 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
 Peak Elev= 149.00' @ 12.13 hrs Surf.Area= 1,118 sf Storage= 1,373 cf

Plug-Flow detention time= 63.3 min calculated for 0.273 af (97% of inflow)
 Center-of-Mass det. time= 48.3 min (866.7 - 818.4)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	1,376 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.50	198	78.0	0	0	198
147.00	306	86.0	125	125	310
148.00	560	106.0	427	552	630
149.00	1,120	183.0	824	1,376	2,407

Device	Routing	Invert	Outlet Devices
#1	Discarded	146.50'	2.410 in/hr Exfiltration over Surface area above 146.50' Excluded Surface area = 198 sf
#2	Primary	148.20'	0.5' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	148.50'	2.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.05 cfs @ 12.13 hrs HW=149.00' (Free Discharge)

↑ **1=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=3.27 cfs @ 12.13 hrs HW=149.00' (Free Discharge)

↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 1.17 cfs @ 2.94 fps)

↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 2.10 cfs @ 2.11 fps)

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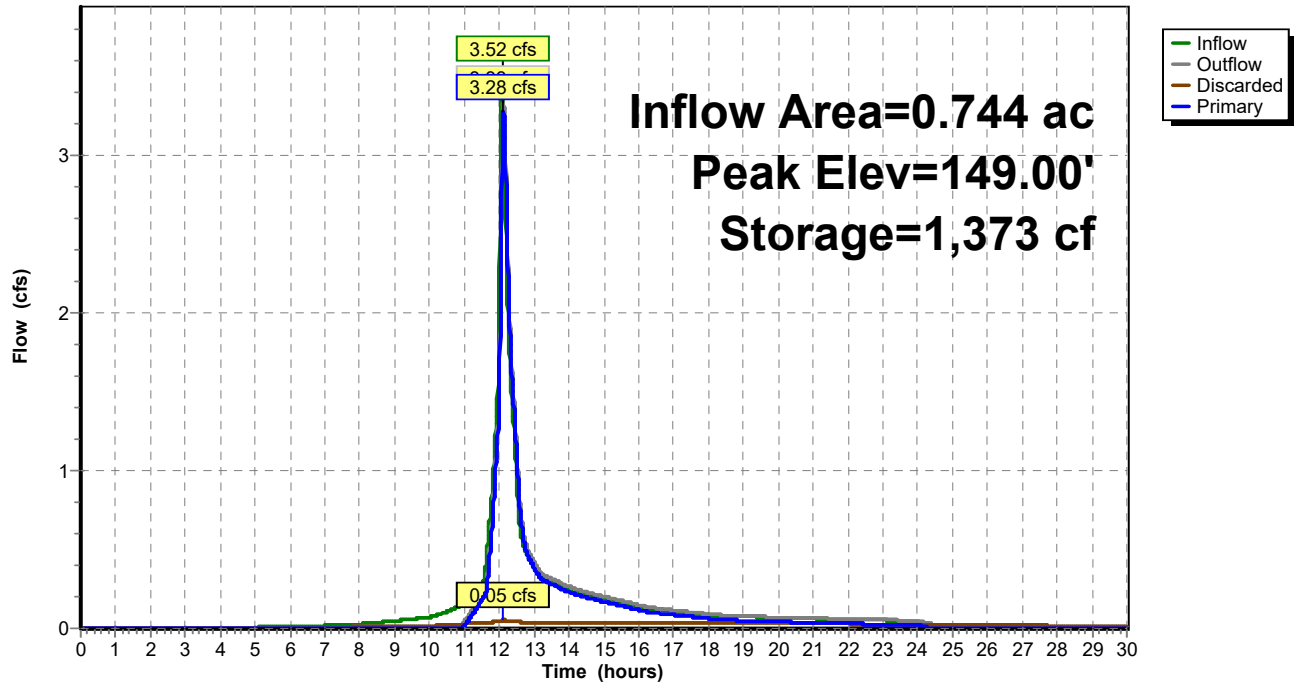
Type III 24-hr 100 year Rainfall=8.60"

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Pond 1P: Bio-Basin

Hydrograph



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Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Subcatchment E1: North to field

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment P1: Parking Lot to BRB

Runoff = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

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Type III 24-hr 1 inch Rainfall=1.00"

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Area (sf)	CN	Description
7,527	96	Gravel surface, HSG B
2,969	61	>75% Grass cover, Good, HSG B
266	98	Paved parking, HSG B
10,762	86	Weighted Average
10,496		97.53% Pervious Area
266		2.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0400	0.16		Sheet Flow, Seg 1
					Grass: Short n= 0.150 P2= 3.20"
0.9	135	0.0260	2.60		Shallow Concentrated Flow, Seg 2
					Unpaved Kv= 16.1 fps
2.9	155	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment P2: Grass Field

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

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
7,686	61	>75% Grass cover, Good, HSG B
7,686		100.00% Pervious Area

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

Summary for Subcatchment P3: Driveway to Road

Runoff = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Depth= 0.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 1 inch Rainfall=1.00"

Area (sf)	CN	Description
404	98	Paved parking, HSG B
1,574	96	Gravel surface, HSG B
1,978	96	Weighted Average
1,574		79.58% Pervious Area
404		20.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

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Type III 24-hr 1 inch Rainfall=1.00"

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Summary for Reach 1R: Swale

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 0.00" for 1 inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 26.45 cfs

2.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 ' Top Width= 8.00'
Length= 160.0' Slope= 0.0225 '
Inlet Invert= 152.00', Outlet Invert= 148.40'



Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.25% Impervious, Inflow Depth = 0.00" for 1 inch event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined

Inflow Area = 2.504 ac, 0.61% Impervious, Inflow Depth = 0.01" for 1 inch event
Inflow = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af
Outflow = 0.03 cfs @ 12.09 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: Bio-Basin

Inflow Area = 0.744 ac, 0.82% Impervious, Inflow Depth = 0.07" for 1 inch event
Inflow = 0.05 cfs @ 12.09 hrs, Volume= 0.004 af
Outflow = 0.00 cfs @ 15.15 hrs, Volume= 0.004 af, Atten= 92%, Lag= 183.4 min
Discarded = 0.00 cfs @ 15.15 hrs, Volume= 0.004 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 1 inch Rainfall=1.00"

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Peak Elev= 146.84' @ 15.15 hrs Surf.Area= 269 sf Storage= 79 cf

Plug-Flow detention time= 291.1 min calculated for 0.004 af (93% of inflow)

Center-of-Mass det. time= 254.3 min (1,145.5 - 891.2)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	1,376 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.50	198	78.0	0	0	198
147.00	306	86.0	125	125	310
148.00	560	106.0	427	552	630
149.00	1,120	183.0	824	1,376	2,407

Device	Routing	Invert	Outlet Devices
#1	Discarded	146.50'	2.410 in/hr Exfiltration over Surface area above 146.50' Excluded Surface area = 198 sf
#2	Primary	148.20'	0.5' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	148.50'	2.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.00 cfs @ 15.15 hrs HW=146.84' (Free Discharge)↑**1=Exfiltration** (Exfiltration Controls 0.00 cfs)**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=146.50' (Free Discharge)↑**2=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)↑**3=Broad-Crested Rectangular Weir**(Controls 0.00 cfs)

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Type III 24-hr 2 Year Rainfall=3.20"

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Summary for Subcatchment E1: North to field

Runoff = 0.14 cfs @ 12.48 hrs, Volume= 0.032 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

Runoff = 0.06 cfs @ 12.35 hrs, Volume= 0.012 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment P1: Parking Lot to BRB

Runoff = 0.55 cfs @ 12.07 hrs, Volume= 0.038 af, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

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Type III 24-hr 2 Year Rainfall=3.20"

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Area (sf)	CN	Description
7,527	96	Gravel surface, HSG B
2,969	61	>75% Grass cover, Good, HSG B
266	98	Paved parking, HSG B
10,762	86	Weighted Average
10,496		97.53% Pervious Area
266		2.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0400	0.16		Sheet Flow, Seg 1
					Grass: Short n= 0.150 P2= 3.20"
0.9	135	0.0260	2.60		Shallow Concentrated Flow, Seg 2
					Unpaved Kv= 16.1 fps
2.9	155	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment P2: Grass Field

Runoff = 0.06 cfs @ 12.11 hrs, Volume= 0.007 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
7,686	61	>75% Grass cover, Good, HSG B
7,686		100.00% Pervious Area

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

Summary for Subcatchment P3: Driveway to Road

Runoff = 0.14 cfs @ 12.08 hrs, Volume= 0.010 af, Depth= 2.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year Rainfall=3.20"

Area (sf)	CN	Description
404	98	Paved parking, HSG B
1,574	96	Gravel surface, HSG B
1,978	96	Weighted Average
1,574		79.58% Pervious Area
404		20.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

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Type III 24-hr 2 Year Rainfall=3.20"

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Summary for Reach 1R: Swale

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 0.25" for 2 Year event
Inflow = 0.14 cfs @ 12.48 hrs, Volume= 0.032 af
Outflow = 0.14 cfs @ 12.55 hrs, Volume= 0.032 af, Atten= 1%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.08 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.58 fps, Avg. Travel Time= 4.6 min

Peak Storage= 21 cf @ 12.51 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 26.45 cfs

2.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 ' Top Width= 8.00'
Length= 160.0' Slope= 0.0225 '
Inlet Invert= 152.00', Outlet Invert= 148.40'



Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.25% Impervious, Inflow Depth = 0.25" for 2 Year event
Inflow = 0.29 cfs @ 12.51 hrs, Volume= 0.052 af
Outflow = 0.29 cfs @ 12.51 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined

Inflow Area = 2.504 ac, 0.61% Impervious, Inflow Depth = 0.30" for 2 Year event
Inflow = 0.32 cfs @ 12.49 hrs, Volume= 0.062 af
Outflow = 0.32 cfs @ 12.49 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: Bio-Basin

Inflow Area = 0.744 ac, 0.82% Impervious, Inflow Depth = 0.80" for 2 Year event
Inflow = 0.56 cfs @ 12.08 hrs, Volume= 0.049 af
Outflow = 0.16 cfs @ 12.51 hrs, Volume= 0.045 af, Atten= 71%, Lag= 25.9 min
Discarded = 0.03 cfs @ 12.51 hrs, Volume= 0.032 af
Primary = 0.13 cfs @ 12.51 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 2 Year Rainfall=3.20"

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Peak Elev= 148.40' @ 12.51 hrs Surf.Area= 763 sf Storage= 817 cf

Plug-Flow detention time= 254.7 min calculated for 0.045 af (90% of inflow)

Center-of-Mass det. time= 206.3 min (1,058.0 - 851.6)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	1,376 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.50	198	78.0	0	0	198
147.00	306	86.0	125	125	310
148.00	560	106.0	427	552	630
149.00	1,120	183.0	824	1,376	2,407

Device	Routing	Invert	Outlet Devices
#1	Discarded	146.50'	2.410 in/hr Exfiltration over Surface area above 146.50' Excluded Surface area = 198 sf
#2	Primary	148.20'	0.5' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	148.50'	2.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.03 cfs @ 12.51 hrs HW=148.40' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.03 cfs)**Primary OutFlow** Max=0.13 cfs @ 12.51 hrs HW=148.40' (Free Discharge)↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 0.13 cfs @ 1.26 fps)↑ **3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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Type III 24-hr 10 Year Rainfall=4.80"

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Summary for Subcatchment E1: North to field

Runoff = 0.90 cfs @ 12.26 hrs, Volume= 0.113 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

Runoff = 0.40 cfs @ 12.14 hrs, Volume= 0.039 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment P1: Parking Lot to BRB

Runoff = 0.97 cfs @ 12.07 hrs, Volume= 0.068 af, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

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Type III 24-hr 10 Year Rainfall=4.80"

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Area (sf)	CN	Description
7,527	96	Gravel surface, HSG B
2,969	61	>75% Grass cover, Good, HSG B
266	98	Paved parking, HSG B
10,762	86	Weighted Average
10,496		97.53% Pervious Area
266		2.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0400	0.16		Sheet Flow, Seg 1
					Grass: Short n= 0.150 P2= 3.20"
0.9	135	0.0260	2.60		Shallow Concentrated Flow, Seg 2
					Unpaved Kv= 16.1 fps
2.9	155	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment P2: Grass Field

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
7,686	61	>75% Grass cover, Good, HSG B
7,686		100.00% Pervious Area

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

Summary for Subcatchment P3: Driveway to Road

Runoff = 0.21 cfs @ 12.08 hrs, Volume= 0.016 af, Depth= 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year Rainfall=4.80"

Area (sf)	CN	Description
404	98	Paved parking, HSG B
1,574	96	Gravel surface, HSG B
1,978	96	Weighted Average
1,574		79.58% Pervious Area
404		20.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

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Type III 24-hr 10 Year Rainfall=4.80"

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Summary for Reach 1R: Swale

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 0.88" for 10 Year event
Inflow = 0.90 cfs @ 12.26 hrs, Volume= 0.113 af
Outflow = 0.90 cfs @ 12.30 hrs, Volume= 0.113 af, Atten= 0%, Lag= 2.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.03 fps, Min. Travel Time= 1.3 min
Avg. Velocity= 0.84 fps, Avg. Travel Time= 3.2 min

Peak Storage= 71 cf @ 12.28 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 26.45 cfs

2.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 ' Top Width= 8.00'
Length= 160.0' Slope= 0.0225 '
Inlet Invert= 152.00', Outlet Invert= 148.40'



Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.25% Impervious, Inflow Depth = 0.94" for 10 Year event
Inflow = 1.79 cfs @ 12.24 hrs, Volume= 0.193 af
Outflow = 1.79 cfs @ 12.24 hrs, Volume= 0.193 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined

Inflow Area = 2.504 ac, 0.61% Impervious, Inflow Depth = 1.00" for 10 Year event
Inflow = 1.89 cfs @ 12.23 hrs, Volume= 0.209 af
Outflow = 1.89 cfs @ 12.23 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: Bio-Basin

Inflow Area = 0.744 ac, 0.82% Impervious, Inflow Depth = 1.72" for 10 Year event
Inflow = 1.28 cfs @ 12.09 hrs, Volume= 0.107 af
Outflow = 1.03 cfs @ 12.16 hrs, Volume= 0.100 af, Atten= 19%, Lag= 4.1 min
Discarded = 0.04 cfs @ 12.16 hrs, Volume= 0.039 af
Primary = 0.99 cfs @ 12.16 hrs, Volume= 0.061 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10 Year Rainfall=4.80"

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Peak Elev= 148.69' @ 12.16 hrs Surf.Area= 927 sf Storage= 1,062 cf

Plug-Flow detention time= 136.7 min calculated for 0.100 af (94% of inflow)

Center-of-Mass det. time= 103.6 min (941.6 - 838.0)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	1,376 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.50	198	78.0	0	0	198
147.00	306	86.0	125	125	310
148.00	560	106.0	427	552	630
149.00	1,120	183.0	824	1,376	2,407

Device	Routing	Invert	Outlet Devices
#1	Discarded	146.50'	2.410 in/hr Exfiltration over Surface area above 146.50' Excluded Surface area = 198 sf
#2	Primary	148.20'	0.5' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	148.50'	2.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 12.16 hrs HW=148.69' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)**Primary OutFlow** Max=0.99 cfs @ 12.16 hrs HW=148.69' (Free Discharge)↑ **2=Broad-Crested Rectangular Weir** (Weir Controls 0.52 cfs @ 2.10 fps)↑ **3=Broad-Crested Rectangular Weir** (Weir Controls 0.47 cfs @ 1.23 fps)

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Type III 24-hr 25 Year Rainfall=5.89"

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Summary for Subcatchment E1: North to field

Runoff = 1.70 cfs @ 12.25 hrs, Volume= 0.186 af, Depth= 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
67,000	55	Woods, Good, HSG B
67,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.5	50	0.0500	0.10		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
7.1	700	0.1080	1.64		Shallow Concentrated Flow, Seg 2
					Woodland Kv= 5.0 fps
15.6	750	Total			

Summary for Subcatchment E2: South to parking lot

Runoff = 0.73 cfs @ 12.13 hrs, Volume= 0.063 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
19,120	55	Woods, Good, HSG B
2,540	61	>75% Grass cover, Good, HSG B
21,660	56	Weighted Average
21,660		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.4	50	0.1600	0.16		Sheet Flow, Seg 1
					Woods: Light underbrush n= 0.400 P2= 3.20"
2.4	245	0.1190	1.72		Shallow Concentrated Flow, SEG 2
					Woodland Kv= 5.0 fps
0.7	75	0.0660	1.80		Shallow Concentrated Flow, Seg 3
					Short Grass Pasture Kv= 7.0 fps
8.5	370	Total			

Summary for Subcatchment P1: Parking Lot to BRB

Runoff = 1.26 cfs @ 12.07 hrs, Volume= 0.089 af, Depth= 4.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

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Type III 24-hr 25 Year Rainfall=5.89"

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Area (sf)	CN	Description
7,527	96	Gravel surface, HSG B
2,969	61	>75% Grass cover, Good, HSG B
266	98	Paved parking, HSG B
10,762	86	Weighted Average
10,496		97.53% Pervious Area
266		2.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.0	20	0.0400	0.16		Sheet Flow, Seg 1
					Grass: Short n= 0.150 P2= 3.20"
0.9	135	0.0260	2.60		Shallow Concentrated Flow, Seg 2
					Unpaved Kv= 16.1 fps
2.9	155	Total, Increased to minimum Tc = 5.0 min			

Summary for Subcatchment P2: Grass Field

Runoff = 0.39 cfs @ 12.08 hrs, Volume= 0.028 af, Depth= 1.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
7,686	61	>75% Grass cover, Good, HSG B
7,686		100.00% Pervious Area

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

Summary for Subcatchment P3: Driveway to Road

Runoff = 0.26 cfs @ 12.08 hrs, Volume= 0.021 af, Depth= 5.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year Rainfall=5.89"

Area (sf)	CN	Description
404	98	Paved parking, HSG B
1,574	96	Gravel surface, HSG B
1,978	96	Weighted Average
1,574		79.58% Pervious Area
404		20.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry, Min TC

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Type III 24-hr 25 Year Rainfall=5.89"

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Summary for Reach 1R: Swale

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 1.45" for 25 Year event
Inflow = 1.70 cfs @ 12.25 hrs, Volume= 0.186 af
Outflow = 1.70 cfs @ 12.27 hrs, Volume= 0.186 af, Atten= 0%, Lag= 1.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.47 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.97 fps, Avg. Travel Time= 2.7 min

Peak Storage= 110 cf @ 12.26 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 26.45 cfs

2.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 ' Top Width= 8.00'
Length= 160.0' Slope= 0.0225 '
Inlet Invert= 152.00', Outlet Invert= 148.40'



Summary for Reach DP-1: Design Point 1

Inflow Area = 2.459 ac, 0.25% Impervious, Inflow Depth = 1.56" for 25 Year event
Inflow = 3.14 cfs @ 12.20 hrs, Volume= 0.319 af
Outflow = 3.14 cfs @ 12.20 hrs, Volume= 0.319 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Combined

Inflow Area = 2.504 ac, 0.61% Impervious, Inflow Depth = 1.63" for 25 Year event
Inflow = 3.28 cfs @ 12.19 hrs, Volume= 0.339 af
Outflow = 3.28 cfs @ 12.19 hrs, Volume= 0.339 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: Bio-Basin

Inflow Area = 0.744 ac, 0.82% Impervious, Inflow Depth = 2.45" for 25 Year event
Inflow = 1.88 cfs @ 12.09 hrs, Volume= 0.152 af
Outflow = 1.72 cfs @ 12.13 hrs, Volume= 0.145 af, Atten= 8%, Lag= 2.4 min
Discarded = 0.04 cfs @ 12.13 hrs, Volume= 0.041 af
Primary = 1.68 cfs @ 12.13 hrs, Volume= 0.104 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.01 hrs

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Type III 24-hr 25 Year Rainfall=5.89"

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Peak Elev= 148.80' @ 12.13 hrs Surf.Area= 994 sf Storage= 1,167 cf

Plug-Flow detention time= 101.8 min calculated for 0.145 af (95% of inflow)

Center-of-Mass det. time= 76.6 min (907.5 - 831.0)

Volume	Invert	Avail.Storage	Storage Description
#1	146.50'	1,376 cf	Custom Stage Data (Irregular) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
146.50	198	78.0	0	0	198
147.00	306	86.0	125	125	310
148.00	560	106.0	427	552	630
149.00	1,120	183.0	824	1,376	2,407

Device	Routing	Invert	Outlet Devices
#1	Discarded	146.50'	2.410 in/hr Exfiltration over Surface area above 146.50' Excluded Surface area = 198 sf
#2	Primary	148.20'	0.5' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Primary	148.50'	2.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.04 cfs @ 12.13 hrs HW=148.80' (Free Discharge)↑ **1=Exfiltration** (Exfiltration Controls 0.04 cfs)**Primary OutFlow** Max=1.67 cfs @ 12.13 hrs HW=148.80' (Free Discharge)↑ **2=Broad-Crested Rectangular Weir**(Weir Controls 0.72 cfs @ 2.39 fps)↑ **3=Broad-Crested Rectangular Weir**(Weir Controls 0.95 cfs @ 1.57 fps)

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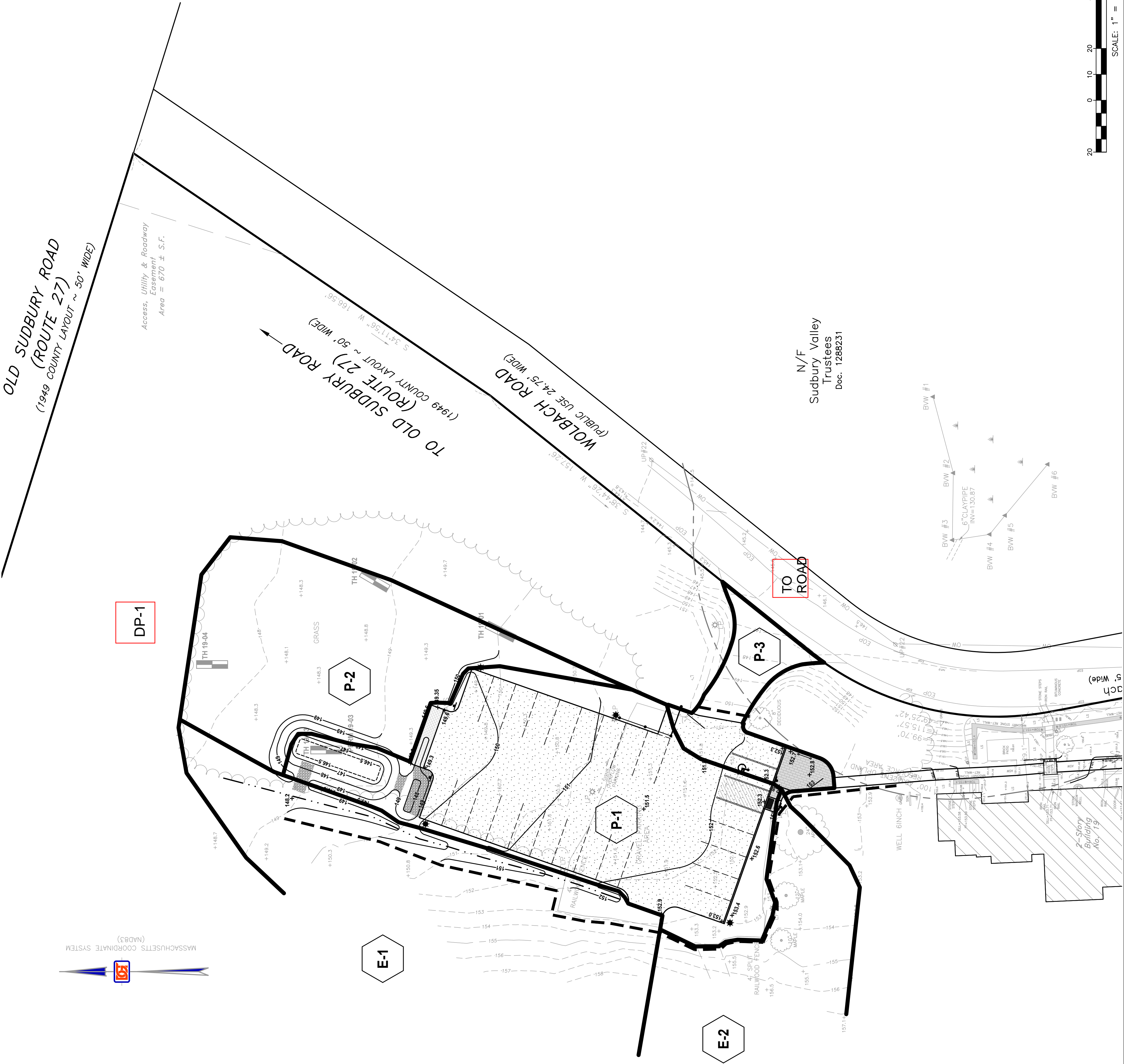
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www.DGTassociates.com



1

FWK

7/22/2021

ADDED P-3

NO.

APP

DATE

DESCRIPTION

DATE:

DECEMBER 13, 2019

SCALE:

1" = 20'

DRAFTED:

KMR

CHECKED:

FWK

APPROVED:

FWK

PROJECT TITLE:

NEW PARKING FACILITY FOR SVT HEADQUARTERS AT WOLBACH FARM

SHEET TITLE:

18 WOLBACH ROAD SUDBURY, MASSACHUSETTS 01716

SHEET:

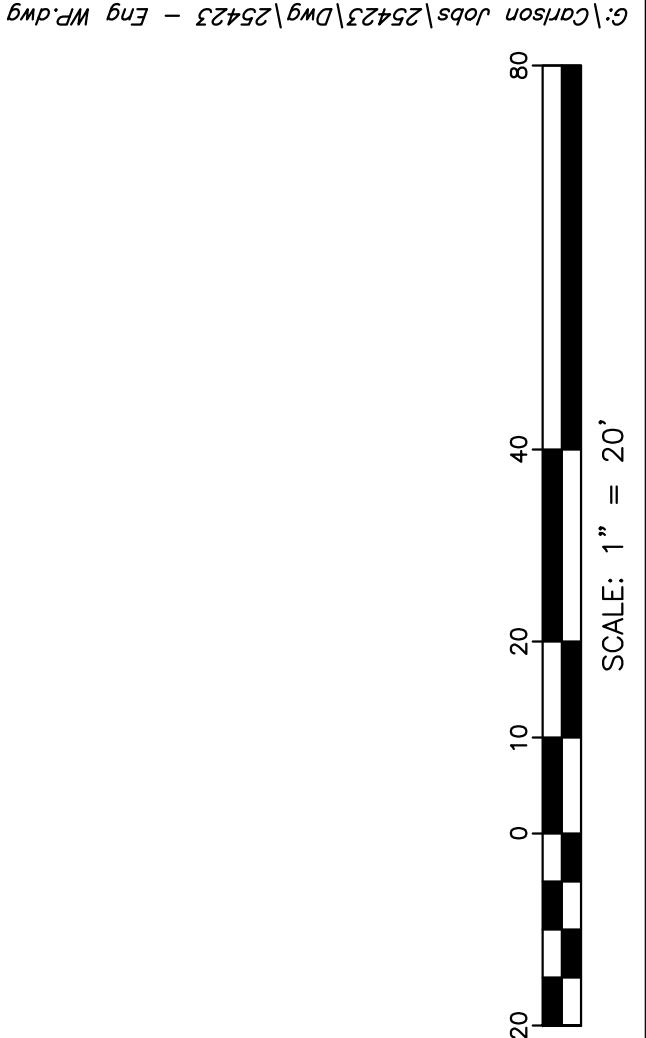
1 OF 1

PROJECT NO.:

25423

WSD-PR

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APPENDIX 1

Soils Data

Soils Summary by DGT Associates

Natural Resource Conservation Service Soils Information

On-Site Soil Testing

for

SVT Headquarters

18 Wolbach Road
Sudbury, MA 01776

May 31, 2019

Job: 25423

Sudbury Valley Trustees
Attn: Laura Mattei
18 Wolbach Road
Sudbury, MA 01776

RE: 18 Wolbach Road, Sudbury, MA 01776 – Wolbach Farm

Dear Ms. Mattei:

This report contains the results of the on-site soil testing conducted by DGT Associates on May 21, 2019 at the Wolbach Farm property in Sudbury, Massachusetts. The testing consisted of four (4) deep test pits and one (1) permeability test hole.

The purpose of the testing was to determine the character of the soils at the site, estimated seasonal high groundwater (ESHGWT) depths and to assess the suitability of the soils for stormwater management design purposes for a proposed project. Testing was performed by Massachusetts Licensed Soil Evaluators (Fredric W. King, P.E. and Joseph A. Losanno, EIT) of DGT. DJ Morris Excavation Co. Inc. provided the excavation services.

According to the NRCS Soils Mapping, the soil in the area of testing is Charlton-Hollis-Rock outcrop complex. The testing generally confirmed this data. Attachment 1 contains the NRCS Map for the site and descriptions of the soil type.

Generally throughout the area of testing the soils observed consisted of a topsoil, over a loamy sand or fine to coarse sand, over a silt loam or ledge. For more detailed information see the test logs contained in Attachment 2. The locations of the test pits, are included On the Soil Test Hole Location Plan in Attachment 4.

The ESHGWT was determined by redoximorphic features, when present, or observed weeping / standing groundwater. The ESHGWT was observed between 34" – 54" below grade. Weeping / standing groundwater was observed in TH 19-02, 19-03 and 19-04 between 36" – 61".

Ledge was observed at relatively shallow depths in TH 19-01 and 19-02, therefore our stormwater management design will avoid the area surrounding these test pits.

A permeability test utilizing the US Army Corps of Engineers method "In-situ Permeability Testing in the Vadose Zone" was performed in the substratum (C₁ – Layer) of test pit 19-03. The resulting permeability rate was 4.7 inches per hour. The tabulation of this test is included in Attachment 3. This confirmed the soils are relatively permeable and suitable for infiltration purposes where sufficient depth is available.

Please contact me if you have any questions regarding this report.

Sincerely,

DGT Associates



Joseph A. Losanno, EIT (SE 13870)

Project Engineer

Attachments:

1. NRCS Soils Map and Information
2. Deep Hole Logs
3. Permeability Test Logs
4. Soil Test Hole Location Plan
5. USGS Surficial Geology Map and Explanatory Text

Soil Map—Middlesex County, Massachusetts



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



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




























Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

5/20/2019
Page 1 of 3

MAP LEGEND

 Area of Interest (AOI)	 Spoil Area
 Soils	 Stony Spot
 Soil Map Unit Polygons	 Very Stony Spot
 Soil Map Unit Lines	 Wet Spot
 Soil Map Unit Points	 Other
 Special Point Features	 Special Line Features
 Blowout	 Water Features
 Borrow Pit	 Streams and Canals
 Clay Spot	 Transportation
 Closed Depression	 Rails
 Gravel Pit	 Interstate Highways
 Gravelly Spot	 US Routes
 Landfill	 Major Roads
 Lava Flow	 Local Roads
 Marsh or swamp	 Background
 Mine or Quarry	 Aerial Photography
 Miscellaneous Water	
 Perennial Water	
 Rock Outcrop	
 Saline Spot	
 Sandy Spot	
 Severely Eroded Spot	
 Sinkhole	
 Slide or Slip	
 Sodic Spot	

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 18, Sep 7, 2018

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
30B	Raynham silt loam, 0 to 5 percent slopes	1.4	1.9%
32B	Wareham loamy fine sand, 0 to 5 percent slopes	1.9	2.7%
52A	Freetown muck, 0 to 1 percent slopes	0.4	0.6%
53A	Freetown muck, ponded, 0 to 1 percent slopes	0.6	0.8%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	8.2	11.5%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	6.5	9.1%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	30.3	42.5%
103D	Charlton-Hollis-Rock outcrop complex, 15 to 25 percent slopes	6.4	9.0%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	11.6	16.3%
105E	Rock outcrop-Hollis complex, 3 to 35 percent slopes	0.2	0.3%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	2.2	3.1%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	1.1	1.5%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	0.4	0.6%
Totals for Area of Interest		71.2	100.0%

Middlesex County, Massachusetts

103C—Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2wzp1
Elevation: 0 to 1,390 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Charlton, extremely stony, and similar soils: 50 percent
Hollis, extremely stony, and similar soils: 20 percent
Rock outcrop: 10 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton, Extremely Stony

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Convex
Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 4 inches: fine sandy loam
Bw - 4 to 27 inches: gravelly fine sandy loam
C - 27 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat):
Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Moderate (about 8.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: B

Hydric soil rating: No

Description of Hollis, Extremely Stony

Setting

Landform: Ridges, hills

Landform position (two-dimensional): Backslope, shoulder, summit

Landform position (three-dimensional): Crest, side slope, nose slope

Down-slope shape: Convex

Across-slope shape: Linear, convex

Parent material: Coarse-loamy melt-out till derived from granite, gneiss, and/or schist

Typical profile

Oi - 0 to 2 inches: slightly decomposed plant material

A - 2 to 7 inches: gravelly fine sandy loam

Bw - 7 to 16 inches: gravelly fine sandy loam

2R - 16 to 26 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent

Percent of area covered with surface fragments: 9.0 percent

Depth to restrictive feature: 8 to 23 inches to lithic bedrock

Natural drainage class: Somewhat excessively drained

Runoff class: Very high

Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water storage in profile: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 7s

Hydrologic Soil Group: D

Hydric soil rating: No

Description of Rock Outcrop

Setting

Landform: Ridges, hills

Parent material: Igneous and metamorphic rock

Typical profile

R - 0 to 79 inches: bedrock

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: 0 inches to lithic bedrock
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water storage in profile: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge, extremely stony

Percent of map unit: 8 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Canton, extremely stony

Percent of map unit: 5 percent
Landform: Moraines, hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Chatfield, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, hills
Landform position (two-dimensional): Backslope, shoulder, summit
Landform position (three-dimensional): Crest, side slope, nose slope
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 2 percent
Landform: Hills, drainageways, drumlins, depressions, ground moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts

Survey Area Data: Version 18, Sep 7, 2018

Location Address or Lot No. 18 Wolbach Road, Sudbury, MA 01776 – Wolbach Farm**TEST HOLE LOG**Deep Hole Number 19-01 Date: 05/21/19 Time: A.M. Weather 60°, sunnyLocation (identify on site plan) see attached sketchLand Use Lawn Landscaping – Overflow Parking Lot Slope (%) 0-3 Surface Stones NoneVegetation Lawn LandscapingLandform Foothill of Ridges

Position on landscape (see sketch)

Distances from:

Open Water Body see sketch Feet Drainageway see sketch FeetPossible Wet Area see sketch Feet Property Line see sketch FeetDrinking Water Well see sketch Feet Other _____**DEEP OBSERVATION HOLE LOG**

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 8"	A	Sandy Loam (Fine)	10 YR 3/2	None Observed	Massive-Friable
8 – 18" / 28"	B _w	Sandy Loam (Fine)	10 YR 5/6	None Observed	Massive-Friable
18" / 28"	R	Ledge / Bedrock			18" on North side 28" on South side

Parent Material (geologic) Coarse-loamy melt out till Depth to Bedrock: @ 18 – 28"Depth to Groundwater: Standing Water in the Hole: None Observed Weeping from Pit Face: None ObservedEstimated Seasonal High Ground Water: None Observed

Location Address or Lot No. 18 Wolbach Road, Sudbury, MA 01776 – Wolbach Farm**TEST HOLE LOG**Deep Hole Number 19-02 Date: 05/21/19 Time: A.M. Weather 60°, sunnyLocation (identify on site plan) see attached sketchLand Use Lawn Landscaping – Overflow Parking lot Slope (%) 0-3 Surface Stones NoneVegetation Lawn LandscapingLandform Foothill of ridges

Position on landscape (see sketch)

Distances from:

Open Water Body see sketch Feet Drainageway see sketch FeetPossible Wet Area see sketch Feet Property Line see sketch FeetDrinking Water Well see sketch Feet Other _____**DEEP OBSERVATION HOLE LOG**

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 9"	A	Sandy Loam (Fine)	10 YR 3/2	None Observed	Massive-Friable
9 – 18"	C ₁	Sand (Fine – Coarse)	10 YR 5/6	None Observed	Loose-Single Grained, gravelly w/ stones, cobbles & lenses of Loamy Sand
18 – 34"	C ₂	Loamy Sand	2.5 Y 4/3	>5% @ 34"	Massive-Friable, gravelly
34 – 50" / 61"	C ₃	Sand (Medium – Coarse)	2.5 Y 5/2		Loose, Single Grain, very gravelly, w/ stones & cobbles
50" / 61"	R	Ledge / Bedrock			50" on North side 61" on South side

Parent Material (geologic) Coarse-loamy melt out till Depth to Bedrock: @ 50 – 61"Depth to Groundwater: Standing Water in the Hole: @ 61" Weeping from Pit Face: @ 61"Estimated Seasonal High Ground Water: @ 34" based on Soil Morphology

Location Address or Lot No. 18 Wolbach Road, Sudbury, MA 01776 – Wolbach Farm**TEST HOLE LOG**Deep Hole Number 19-03 Date: 05/21/19 Time: A.M. Weather 60°, sunnyLocation (identify on site plan) see attached sketchLand Use Lawn Landscaping – Overflow Parking lot Slope (%) 0-3 Surface Stones NoneVegetation Lawn LandscapingLandform Foothill of ridges

Position on landscape (see sketch)

Distances from:

Open Water Body see sketch Feet Drainageway see sketch FeetPossible Wet Area see sketch Feet Property Line see sketch FeetDrinking Water Well see sketch Feet Other _____**DEEP OBSERVATION HOLE LOG**

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 15"	A	Sandy Loam (Fine)	10 YR 3/2	None Observed	Massive-Friable
15 – 52"	C ₁	Loamy Sand (Fine)	2.5 Y 4/3	None Observed	Massive-Friable, gravelly, w/ some stones & cobbles
52 – 72"	C ₂	Silt Loam	10 YR 6/3	None Observed Note; Soil was very saturated. Field drain was observed in test pit. TOP 24" below grade	Massive-Friable

Parent Material (geologic) Coarse-loamy melt out till Depth to Bedrock: None ObservedDepth to Groundwater: Standing Water in the Hole: @ 54" Weeping from Pit Face: @ 54"Estimated Seasonal High Ground Water: @ 54" based on standing / weeping groundwater elevation

Location Address or Lot No. 18 Wolbach Road, Sudbury, MA 01776 – Wolbach Farm**TEST HOLE LOG**Deep Hole Number 19-04 Date: 05/21/19 Time: A.M. Weather 60°, sunnyLocation (identify on site plan) see attached sketchLand Use Lawn Landscaping – Overflow Parking lot Slope (%) 0-3 Surface Stones NoneVegetation Lawn LandscapingLandform Foothill of ridges

Position on landscape (see sketch)

Distances from:

Open Water Body see sketch Feet Drainageway see sketch FeetPossible Wet Area see sketch Feet Property Line see sketch FeetDrinking Water Well see sketch Feet Other _____**DEEP OBSERVATION HOLE LOG**

Depth from Surface (inches)	Soil Horizon	Soil Texture (USDA)	Soil Color (Munsell)	Soil Mottling	Other (Structure, Stones, Boulders, Consistency, % Gravel)
0 – 13"	A	Sandy Loam (Fine)	10 YR 3/2	None Observed	Massive-Friable
13 – 45"	C ₁	Sand (Fine – Coarse)	2.5 Y 4/3	> 5% @ 36" Con 10YR 6/8 Dep 10 YR 6/1	Massive-Friable, gravelly, w/ stones, cobbles & lenses of Loamy Sand
45 – 63"	C ₂	Silt Loam	10 YR 6/3		Massive-Friable

Parent Material (geologic) Coarse-loamy melt out till Depth to Bedrock: None ObservedDepth to Groundwater: Standing Water in the Hole: @ 58" Weeping from Pit Face: @ 36"Estimated Seasonal High Ground Water: @ 36" based on Soil Morphology

Permeability Test Pit TH 19-03

Date Performed: 21-May-19
 Soil Horizon of Perm Test: C₁
 Depth to water level = 18"
 Depth to bottom of tube = 29"
 Start Soak: 8:56 A.M.
 Start Test: 9:11 A.M.

	Time Interval (Minutes)	Incremental Volume(L)
Test 1:	2	1.000
Test 2:	2	0.500
Test 3:	2	0.500
Test 4:	2	0.750
Test 5:	2	0.500
Test 6:	2	0.750
Test 3:	2	0.500
Test 4:	2	0.750
Test 5:	2	0.500
Test 6:	2	0.500
Cumulative Time/Volume	20	6.250

$Q = \text{Cumulative Volume cm}^3 / \text{Total time in seconds}$
 $Q = 5.208 \text{ cm}^3/\text{sec}$

Computation of Permeability(k)

$$k = Q / 5.5 r H_w =$$

k=coefficient of permeability (cm/sec)

r=inside radius of pipe in centimeters=

10.16 (8" DIA.)

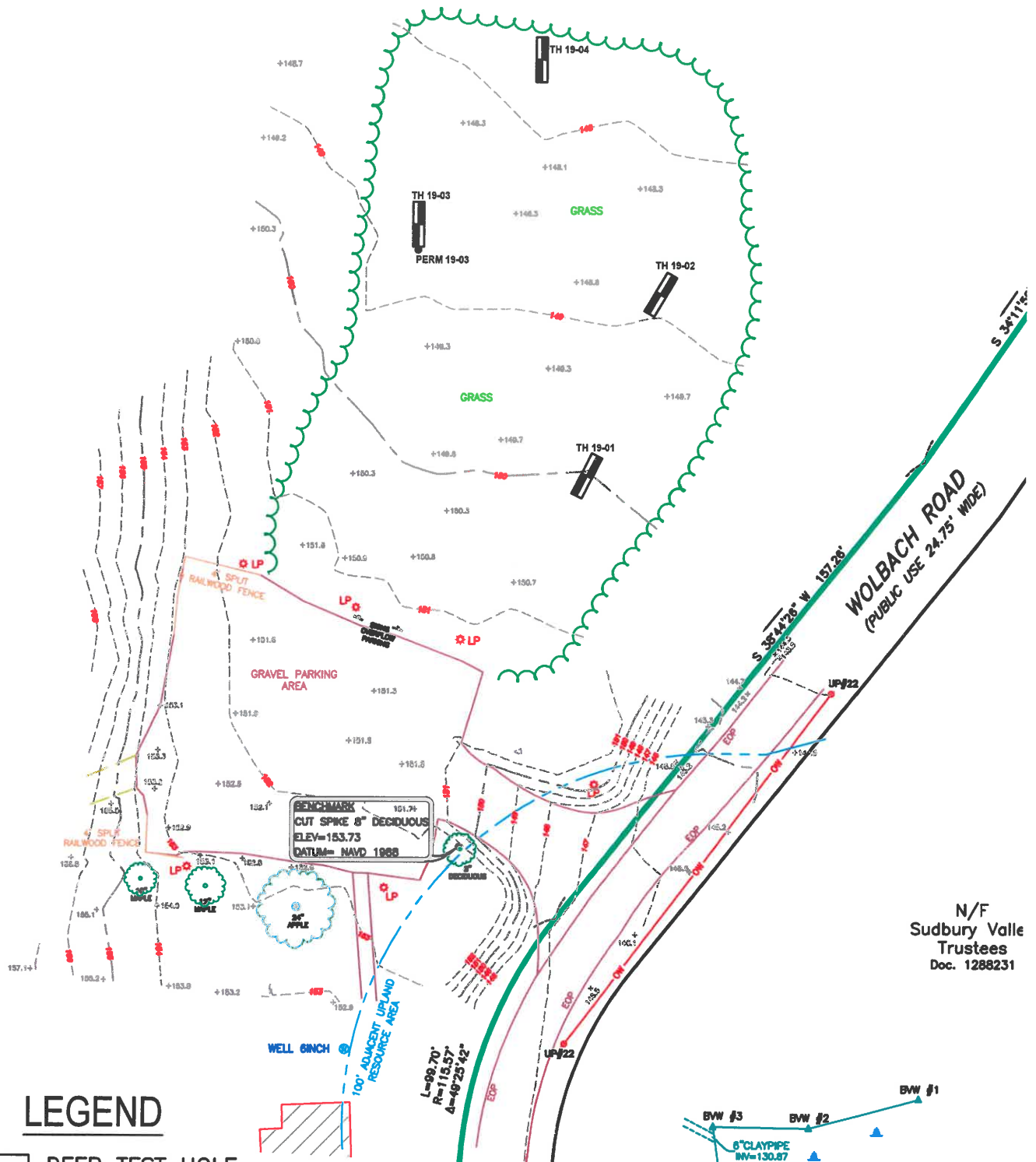
H_w=applied head in centimeters=

28 cm (11 inches)

Q=Computed flow rate in CC/sec=

5.208 cm³/sec

$$k = Q / 5.5 r H_w = \boxed{0.00333 \text{ cm/sec}} \quad 4.718 \text{ IN/HR}$$



LEGEND



DEEP TEST HOLE



PERMEABILITY TEST HOLE



SCALE: 1"=40'

ATTACHMENT 4: SOIL TEST HOLE LOCATION PLAN AT 18 WOLBACH ROAD IN SUDBURY, MA 01776



DGT Associates
1071 Worcester Road
Framingham, MA 01701
508-879-0030

www.DGTassociates.com

© 2019 BY DGT ASSOCIATES

DATE: MAY 31, 2019

DRAWN BY: JAL

SCALE: 1" = 40'

ST-1

25423

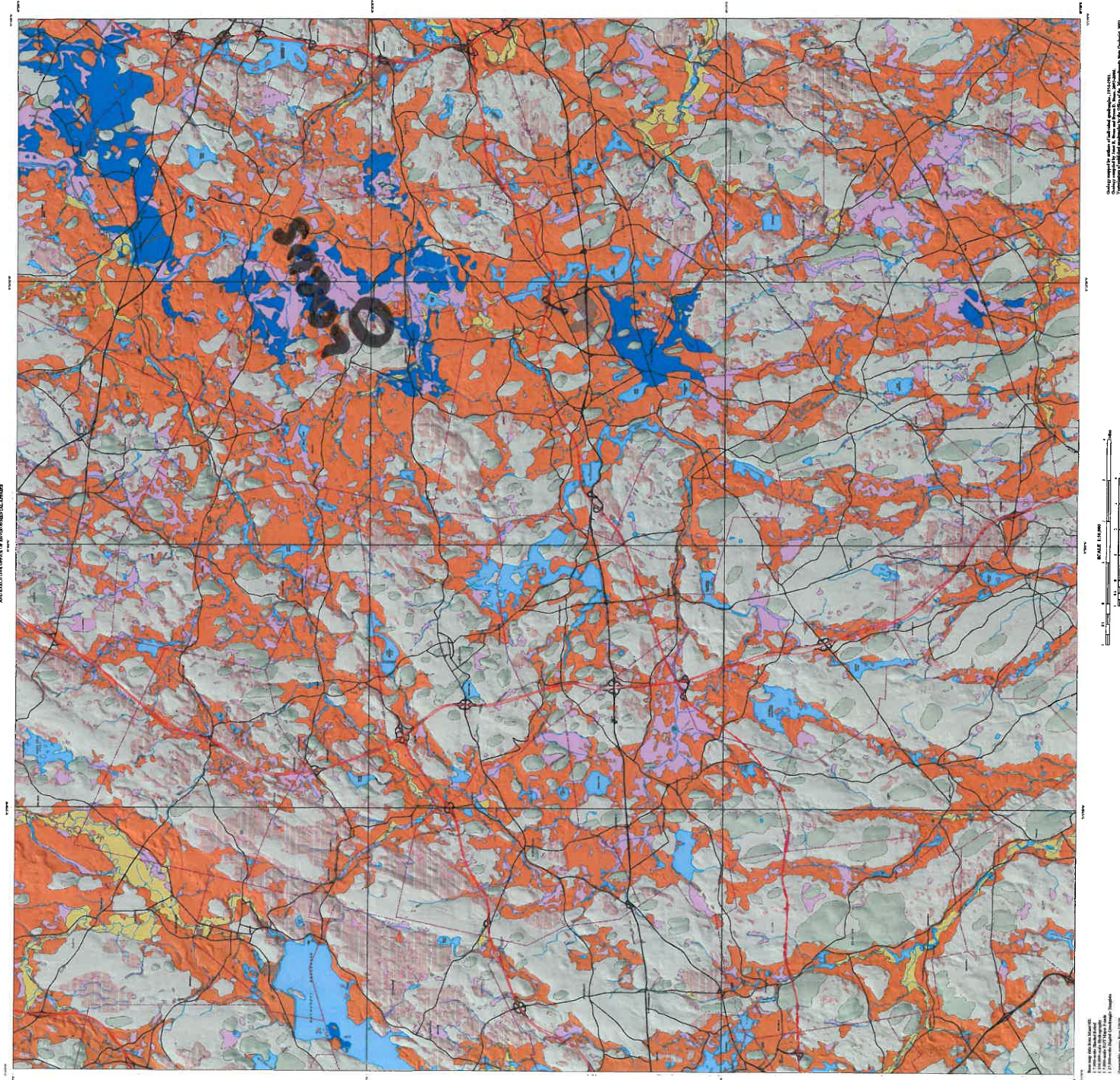
SURFICIAL GEOLOGIC MAP OF THE CLINTON-CONCORD-CRAFTON-MEDFIELD 12-QUADRANGLE AREA IN EAST CENTRAL MASSACHUSETTS

Compiled by Janet R. Stone and Byron D. Stone

2006

DESCRIPTION OF MAP UNITS

- PORTLANDIAN DEPOSITS**
 - Artisanal (Mudflat) deposits and associated sediments that form the base of the Portlandian sequence. These deposits are composed of fine-grained sand and silt, and are typically found in the coastal plain area.
 - Artisanal (Mudflat) deposits and associated sediments that form the base of the Portlandian sequence. These deposits are composed of fine-grained sand and silt, and are typically found in the coastal plain area.
- CLAYTON DEPOSITS**
 - Artisanal (Mudflat) deposits and associated sediments that form the base of the Clayton sequence. These deposits are composed of fine-grained sand and silt, and are typically found in the coastal plain area.
 - Artisanal (Mudflat) deposits and associated sediments that form the base of the Clayton sequence. These deposits are composed of fine-grained sand and silt, and are typically found in the coastal plain area.
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 - Artisanal (Mudflat) deposits and associated sediments that form the base of the Clayton sequence. These deposits are composed of fine-grained sand and silt, and are typically found in the coastal plain area.



Map scale: 1 inch = 1 mile
Map scale: 1:62,500
Map scale: 1:62,500



Map scale: 1 inch = 1 mile
Map scale: 1:62,500
Map scale: 1:62,500



APPENDIX 2

Stormwater Operations and Maintenance Plan

Operation and Maintenance Manual
Inspection Forms
Stormwater System Maintenance Record

for

SVT Headquarters at Wolbach Farm

18 Wolbach Street
Sudbury, MA 01776

STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

**SVT Headquarters at Wolbach Farm
18 Wolbach Street in Sudbury, MA
July 27, 2021**

INTRODUCTION

The Stormwater Management System for the proposed parking lot improvements at 18 Wolbach Street in Sudbury, MA contains “Stormwater Best Management Practices” (BMP’s) that have been designed to protect the environment from stormwater related impacts to surface waters and groundwater. Stormwater Best Management Practices are defined as structural devices that temporarily store, treat and convey urban stormwater runoff to reduce flooding, remove pollutants, and provide other amenities for the protection of surface and groundwater resources and the general environment.

As with any treatment system, it must be inspected and maintained on a regular basis in order for the system to function properly as designed. Good maintenance practices help ensure that the stormwater BMP’s are in proper working order when they are needed to perform under storm conditions and will maximize the useful life of the structures. BMP’s that are not properly maintained soon become less effective and may lead to costly repairs to bring the BMP’s back to a good condition. Proper maintenance also helps avoid failures of the systems and resulting environmental damage or long-term degradation of valuable natural resource areas.

This manual has been prepared for the operation and maintenance of the stormwater management system at 18 Wolbach Street in Sudbury, MA. At the completion of the project, the responsibility for the maintenance and operation of the system will be as follows:

**Land Stewardship Division
Sudbury Valley Trustees
18 Wolbach Road, Sudbury, MA 01776**

Routine inspections and some of the routine maintenance tasks may be performed by the owner. Outside contractors may be hired for some items such as the removal of trapped sediment in the sediment forebay or rain garden, or for some non-routine repairs.

This manual is intended to be used as the management document for the system. It contains specific plans of the components of the stormwater management system, descriptions of the purpose and function of each component, inspection and maintenance requirements and check lists and report forms for record keeping. The manual also contains background information, descriptions of environmental concerns and information necessary for an understanding of the reasons for the proper management of the stormwater management system.

The first step in the process of implementing the operation and maintenance requirements needs to include the following:

1. Formalization of the agreements and understandings between the Town of Sudbury and the proponent.
2. Training of Personnel
3. Administration Tasks: Budget Planning, Resource Allocation, etc.
4. Preparation of an as-built plan or site map that shows the location of all the stormwater BMP's for inclusion in this manual.

TOWN OF SUDBURY REQUIREMENTS

Note that the Town of Sudbury Planning Board or its designee shall be allowed to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. A copy of this O&M Manual shall remain on file with the Planning Board.

A copy of the regular inspection reports shall be submitted to and maintained by the Planning Board or its designated Reviewing Agent for all stormwater management systems as may be required in the Stormwater Management Permit for the site.

The owner of the stormwater management system must notify the Planning Board or its designated Reviewing Agent of any changes in ownership or assignment of financial responsibility.

MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS

Following construction of the Stormwater Management System, the Operation and Maintenance Plan must be implemented for the system to remain in compliance with the Stormwater Management Standards and Town of Sudbury requirements.

STORMWATER BEST MANAGEMENT PRACTICES (BMP's)

The Stormwater BMP's designed into the project include the following:

<u>STORMWATER BMP's</u>	<u># Units</u>
Sediment Forebay	1
Rain Garden (Bioretention)	1
Grass Swale	1

The following pages describe the inspection, routine maintenance and non routine maintenance which are required for each BMP. The inspection and maintenance requirements are based on the recommendations from the Stormwater Management Standards Handbook, Volume 1, 2, 3, February 2008, MassDEP.

The details of the operation and maintenance for each BMP are contained in Part 2 of this Manual. The design plans should be referred to for the layout of the Stormwater Management System.

STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE

The stormwater management system designed for 18 Wolbach Street in Sudbury, MA is a passive system that does not require any operational procedures to be followed during a storm event to operate as intended. There are no valves to turn, weirs to set, pumps to be turned on, or other manual activity required. What is necessary to assure that the system functions properly are the performance of regular inspections and maintenance tasks. The Operation and Maintenance requirements for this system involve the following:

- | | |
|----------------|--|
| Inspections | A process by which you can evaluate if the BMP's are in acceptable condition and are still effective. |
| Maintenance | Tasks required for the upkeep and repair of the BMP's to keep them in good working order. This is broken down into routine maintenance tasks, and non-routine maintenance and repairs. |
| Record Keeping | Documentation of the Inspections and Maintenance that has been performed. This is important and useful for:
<ol style="list-style-type: none">1.) Proving that the tasks are performed.2.) Use in scheduling and planning of repairs and maintenance.3.) Documenting possible future problems and recommending corrective measures.4.) Planning manpower and equipment needs and for O&M Budget Preparation.5.) Making adjustments to the O&M Plan where warranted for the stormwater system to function as intended. |

The inspection and maintenance requirements for each stormwater BMP are based on the recommendations contained in the MassDEP Stormwater Management Handbook, Volume Two, Chapter 2, Structural BMP Specifications; February 2008. It is recommended that the procedures described for each BMP be followed strictly for the first two years of operation. During that initial two-year period, the observations and experience gained from monitoring this stormwater management system will provide the information necessary to adjust the O&M procedures for the most efficient management of the system. Adjustment of the Operation and Maintenance Procedures will require the approval from the Town of Sudbury.

Note that the descriptions of the maintenance requirements include the basic items needed or required for the tasks. The inspectors and maintenance personnel must also be made aware of other work-related safety precautions and regulations such as OSHA confined space rules, traffic safety, protective clothing, and safety equipment that must be utilized in the performance of the prescribed tasks.

STORMWATER SYSTEM MAINTENANCE BUDGET (PRELIMINARY)

The following is the budget for the first two years after the completion of the project. The cost assumes contracting only certain the services to provide routine maintenance. In house maintenance staff will perform most of the work.

Stormwater System structures to be inspected and maintained:

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|---------|--|
| Item #1 | Sediment Forebays, Bio-Retention Basin |
| Item #2 | Grass Swale |

ROUTINE MAINTENANCE:

Item #1 will require a pump truck remove sediment and debris from the sediment forebay features. This is to be done a minimum of 2 times per year.

1 Pump Truck x 2 Times/Year x \$1,000 = **\$ 2,000/year for pumping service.**

1 Mowing x 2 Times = **In house personnel and equipment.**

Item #2 will require removing sediment and debris, and maintaining vegetation.

By in-house personal and equipment.

Total Estimated Yearly Budget (First Year) = \$ 2,000/year for Routine Maintenance

ROUTINE INSPECTIONS:

The routine inspections shall be performed by the on-site maintenance personnel. All BMPs will be inspected at the same time. This is generally quarterly fir detailed inspections and also routine observations by staff. This would be no additional cost to the owner.

INSPECTION AND MAINTENANCE REQUIREMENTS FOR BMP's

SEDIMENT FOREBAY

DESCRIPTION AND FUNCTION

A sediment forebay is a pretreatment device designed to slow incoming stormwater flow and provide sediment removal prior to discharge to a subsequent primary BMP. The volume of the forebay generally contains the runoff storage volume equal of 0.1 inch of runoff from the contributing watershed area or 400 cubic feet per acre of impervious surface tributary to the forebay. This volume provides enhanced settlement of suspended sediment to protect the downstream Stormwater BMP.

Under normal conditions, the Forebays act as pre-treatment to filter out sediment and control flow to their respective Primary BMP.

INSPECTIONS

Sediment forebays should be inspected monthly and following large storm events (greater than 2 inches). Inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gas, it should be removed immediately, and the source of the hydrocarbons investigated for further removal at upstream BMPs. Measure the amount of sediment that has collected. Pipe inlets and outlet (Filter Berm) should be clear of debris. Filter berm should be intact, clear of debris and functional (not ponding water in the forebay for more than a couple of days).

ROUTINE MAINTENANCE

The forebays should be cleaned twice per year and additionally or less as necessary based on the results of the monthly inspection. Cleaning consists of the removal of floating hydrocarbons (oil or gasoline) and accumulated sediment, trash and debris, and clearing the outlet (filter berm). The forebay should be cleaned of sediment if the sediment is over 6 inches in depth. A hazardous waste disposal contractor must perform the removal of hydrocarbons if present.

The side slopes of the forebays should be mown at least once per year to control woody growth.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Repairing the inlet stone area
- Repairing erosion from outlet of forebay.
- Replacing or repair of stone lining.

MAINTENANCE EQUIPMENT

Hand tools for cleaning trash and sediment

Mowing equipment for the side slopes.

Measuring stick for sediment depth.

Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)

Vacuum pumping truck or backhoe or removal by hand shovel (as alternatives for sediment removal)

RAIN GARDEN (BIO-RETENTION)

DESCRIPTION AND FUNCTION

Bioretention is a technique that uses soils, plants, and microbes to treat stormwater before it is infiltrated and/or discharged. Bio-retention cells are shallow depressions filled with a sandy subsoil topped with a layer of an organic rich sandy planting media and planted with dense native vegetation. The runoff percolates through the soil media that acts as a filter and plants uptake nutrients in the runoff.

There are two types of bioretention cells: those that are designed solely as organic filter filtering bioretention areas and those configured to recharge groundwater in addition to acting as a filter exfiltrating bioretention area. The facility at this site is the latter type.

INSPECTIONS

Bioretention areas require careful attention while plants are being established and seasonal landscaping maintenance thereafter. Inspect pretreatment devices and bioretention cells regularly for sediment build-up, structural damage, and standing water. Initially for the first two years, the bio-retention area should be observed monthly with detailed inspections (with reports) quarterly. The areas should be inspected for trash and debris, vegetative health, stability, and soil erosion. Based on experience with the performance of the system, the frequency of inspections can be adjusted as necessary.

ROUTINE MAINTENANCE

Remove and replace dead vegetation semi-annually or as needed based on the results of the inspections. Removal of trash and light debris should take place when observed. Replacement or loosening of the topsoil media may be necessary if ponding in the basin is more than 72 hours. Prune the shrubs and mow the groundcover portions 1-2 times per year. Mowing must not be shorter than 4 inches. Clippings must be removed from the basin. Other tasks include fertilizing (only when necessary), liming, watering, pruning, and weed and pest control if necessary, to maintain the health of the vegetated cover. Clear the outlet control structure (weir) of any clogging.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Major repairs to vegetation
- Replace the soil media and vegetation when necessary (3-5 years).
- Repair any erosion of areas creating an improperly functioning BMP
- Aeration or Rototilling of the surface to break up surface compaction and replanting

MAINTENANCE EQUIPMENT

- Typical lawn and vegetation maintenance equipment (mower, rakes, pruners, etc.)
- Shovels, trash bags, and wheelbarrow for removal of sediment.

GRASS SWALE

DESCRIPTION AND FUNCTION

The Grass Swale is a stormwater conveyance facility used to collect and convey runoff safely to a discharge point. This swale is designed to convey a certain design flow of runoff and the dense vegetation secures the channel from erosion. In this case it is designed to divert water from coming onto the parking lot stormwater BMPs from the adjacent wooded hillside.

INSPECTIONS

This swale should be inspected semi-annually with additional inspections during the first few months to insure that the vegetation becomes adequately established. The swale should be inspected for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding and sedimentation. Repairs and reseeded should be done as needed. The swale should drain freely with no long term ponding of water.

ROUTINE MAINTENANCE

Repairs and reseeded may be needed during the first few months until the vegetation becomes secure. The swales should be mowed twice per year with one in the mid-summer and the grass clippings should be removed. Trees and shrubs must not be allowed to grow in the swale. The grass should not be cut shorter than four inches. Sediment and debris should be removed at least once a year in late spring if found to be present. Other tasks include fertilizing and/or liming, if necessary for the health of the vegetation.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Major repairs of slope

- Bottom restoration - If it is found that significant ponding or erosion is occurring, the bottom may need to be regraded or soil loosened to promote drainage.

MAINTENANCE EQUIPMENT

- Grounds equipment
(mower, rakes, etc.)

STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

**SVT Headquarters at Wolbach Farm
18 Wolbach Street in Sudbury, MA
July 27, 2021**

INTRODUCTION

The Stormwater Management System for the proposed parking lot improvements at 18 Wolbach Street in Sudbury, MA contains “Stormwater Best Management Practices” (BMP’s) that have been designed to protect the environment from stormwater related impacts to surface waters and groundwater. Stormwater Best Management Practices are defined as structural devices that temporarily store, treat and convey urban stormwater runoff to reduce flooding, remove pollutants, and provide other amenities for the protection of surface and groundwater resources and the general environment.

As with any treatment system, it must be inspected and maintained on a regular basis in order for the system to function properly as designed. Good maintenance practices help ensure that the stormwater BMP’s are in proper working order when they are needed to perform under storm conditions and will maximize the useful life of the structures. BMP’s that are not properly maintained soon become less effective and may lead to costly repairs to bring the BMP’s back to a good condition. Proper maintenance also helps avoid failures of the systems and resulting environmental damage or long-term degradation of valuable natural resource areas.

This manual has been prepared for the operation and maintenance of the stormwater management system at 18 Wolbach Street in Sudbury, MA. At the completion of the project, the responsibility for the maintenance and operation of the system will be as follows:

**Land Stewardship Division
Sudbury Valley Trustees
18 Wolbach Road, Sudbury, MA 01776**

Routine inspections and some of the routine maintenance tasks may be performed by the owner. Outside contractors may be hired for some items such as the removal of trapped sediment in the sediment forebay or rain garden, or for some non-routine repairs.

This manual is intended to be used as the management document for the system. It contains specific plans of the components of the stormwater management system, descriptions of the purpose and function of each component, inspection and maintenance requirements and check lists and report forms for record keeping. The manual also contains background information, descriptions of environmental concerns and information necessary for an understanding of the reasons for the proper management of the stormwater management system.

The first step in the process of implementing the operation and maintenance requirements needs to include the following:

1. Formalization of the agreements and understandings between the Town of Sudbury and the proponent.
2. Training of Personnel
3. Administration Tasks: Budget Planning, Resource Allocation, etc.
4. Preparation of an as-built plan or site map that shows the location of all the stormwater BMP's for inclusion in this manual.

TOWN OF SUDBURY REQUIREMENTS

Note that the Town of Sudbury Planning Board or its designee shall be allowed to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. A copy of this O&M Manual shall remain on file with the Planning Board.

A copy of the regular inspection reports shall be submitted to and maintained by the Planning Board or its designated Reviewing Agent for all stormwater management systems as may be required in the Stormwater Management Permit for the site.

The owner of the stormwater management system must notify the Planning Board or its designated Reviewing Agent of any changes in ownership or assignment of financial responsibility.

MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS

Following construction of the Stormwater Management System, the Operation and Maintenance Plan must be implemented for the system to remain in compliance with the Stormwater Management Standards and Town of Sudbury requirements.

STORMWATER BEST MANAGEMENT PRACTICES (BMP's)

The Stormwater BMP's designed into the project include the following:

<u>STORMWATER BMP's</u>	<u># Units</u>
Sediment Forebay	1
Rain Garden (Bioretention)	1
Grass Swale	1

The following pages describe the inspection, routine maintenance and non routine maintenance which are required for each BMP. The inspection and maintenance requirements are based on the recommendations from the Stormwater Management Standards Handbook, Volume 1, 2, 3, February 2008, MassDEP.

The details of the operation and maintenance for each BMP are contained in Part 2 of this Manual. The design plans should be referred to for the layout of the Stormwater Management System.

STORMWATER MANAGEMENT SYSTEM OPERATION & MAINTENANCE

The stormwater management system designed for 18 Wolbach Street in Sudbury, MA is a passive system that does not require any operational procedures to be followed during a storm event to operate as intended. There are no valves to turn, weirs to set, pumps to be turned on, or other manual activity required. What is necessary to assure that the system functions properly are the performance of regular inspections and maintenance tasks. The Operation and Maintenance requirements for this system involve the following:

- | | |
|----------------|--|
| Inspections | A process by which you can evaluate if the BMP's are in acceptable condition and are still effective. |
| Maintenance | Tasks required for the upkeep and repair of the BMP's to keep them in good working order. This is broken down into routine maintenance tasks, and non-routine maintenance and repairs. |
| Record Keeping | Documentation of the Inspections and Maintenance that has been performed. This is important and useful for:
<ol style="list-style-type: none">1.) Proving that the tasks are performed.2.) Use in scheduling and planning of repairs and maintenance.3.) Documenting possible future problems and recommending corrective measures.4.) Planning manpower and equipment needs and for O&M Budget Preparation.5.) Making adjustments to the O&M Plan where warranted for the stormwater system to function as intended. |

The inspection and maintenance requirements for each stormwater BMP are based on the recommendations contained in the MassDEP Stormwater Management Handbook, Volume Two, Chapter 2, Structural BMP Specifications; February 2008. It is recommended that the procedures described for each BMP be followed strictly for the first two years of operation. During that initial two-year period, the observations and experience gained from monitoring this stormwater management system will provide the information necessary to adjust the O&M procedures for the most efficient management of the system. Adjustment of the Operation and Maintenance Procedures will require the approval from the Town of Sudbury.

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STORMWATER SYSTEM MAINTENANCE BUDGET (PRELIMINARY)

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| Item #2 | Grass Swale |

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1 Pump Truck x 2 Times/Year x \$1,000 = **\$ 2,000/year for pumping service.**

1 Mowing x 2 Times = **In house personnel and equipment.**

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By in-house personal and equipment.

Total Estimated Yearly Budget (First Year) = \$ 2,000/year for Routine Maintenance

ROUTINE INSPECTIONS:

The routine inspections shall be performed by the on-site maintenance personnel. All BMPs will be inspected at the same time. This is generally quarterly fir detailed inspections and also routine observations by staff. This would be no additional cost to the owner.

INSPECTION AND MAINTENANCE REQUIREMENTS FOR BMP's

SEDIMENT FOREBAY

DESCRIPTION AND FUNCTION

A sediment forebay is a pretreatment device designed to slow incoming stormwater flow and provide sediment removal prior to discharge to a subsequent primary BMP. The volume of the forebay generally contains the runoff storage volume equal of 0.1 inch of runoff from the contributing watershed area or 400 cubic feet per acre of impervious surface tributary to the forebay. This volume provides enhanced settlement of suspended sediment to protect the downstream Stormwater BMP.

Under normal conditions, the Forebays act as pre-treatment to filter out sediment and control flow to their respective Primary BMP.

INSPECTIONS

Sediment forebays should be inspected monthly and following large storm events (greater than 2 inches). Inspect the general condition of the unit including the amount of floating debris and the presence of hydrocarbons if any. If the inspection finds a large presence of hydrocarbons, such as a layer of floating oil or a strong odor of gas, it should be removed immediately, and the source of the hydrocarbons investigated for further removal at upstream BMPs. Measure the amount of sediment that has collected. Pipe inlets and outlet (Filter Berm) should be clear of debris. Filter berm should be intact, clear of debris and functional (not ponding water in the forebay for more than a couple of days).

ROUTINE MAINTENANCE

The forebays should be cleaned twice per year and additionally or less as necessary based on the results of the monthly inspection. Cleaning consists of the removal of floating hydrocarbons (oil or gasoline) and accumulated sediment, trash and debris, and clearing the outlet (filter berm). The forebay should be cleaned of sediment if the sediment is over 6 inches in depth. A hazardous waste disposal contractor must perform the removal of hydrocarbons if present.

The side slopes of the forebays should be mown at least once per year to control woody growth.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Repairing the inlet stone area
- Repairing erosion from outlet of forebay.
- Replacing or repair of stone lining.

MAINTENANCE EQUIPMENT

Hand tools for cleaning trash and sediment

Mowing equipment for the side slopes.

Measuring stick for sediment depth.

Vacuum pumping truck (haz-mat contractor for hydrocarbon removal)

Vacuum pumping truck or backhoe or removal by hand shovel (as alternatives for sediment removal)

RAIN GARDEN (BIO-RETENTION)

DESCRIPTION AND FUNCTION

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There are two types of bioretention cells: those that are designed solely as organic filter filtering bioretention areas and those configured to recharge groundwater in addition to acting as a filter exfiltrating bioretention area. The facility at this site is the latter type.

INSPECTIONS

Bioretention areas require careful attention while plants are being established and seasonal landscaping maintenance thereafter. Inspect pretreatment devices and bioretention cells regularly for sediment build-up, structural damage, and standing water. Initially for the first two years, the bio-retention area should be observed monthly with detailed inspections (with reports) quarterly. The areas should be inspected for trash and debris, vegetative health, stability, and soil erosion. Based on experience with the performance of the system, the frequency of inspections can be adjusted as necessary.

ROUTINE MAINTENANCE

Remove and replace dead vegetation semi-annually or as needed based on the results of the inspections. Removal of trash and light debris should take place when observed. Replacement or loosening of the topsoil media may be necessary if ponding in the basin is more than 72 hours. Prune the shrubs and mow the groundcover portions 1-2 times per year. Mowing must not be shorter than 4 inches. Clippings must be removed from the basin. Other tasks include fertilizing (only when necessary), liming, watering, pruning, and weed and pest control if necessary, to maintain the health of the vegetated cover. Clear the outlet control structure (weir) of any clogging.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Major repairs to vegetation
- Replace the soil media and vegetation when necessary (3-5 years).
- Repair any erosion of areas creating an improperly functioning BMP
- Aeration or Rototilling of the surface to break up surface compaction and replanting

MAINTENANCE EQUIPMENT

- Typical lawn and vegetation maintenance equipment (mower, rakes, pruners, etc.)
- Shovels, trash bags, and wheelbarrow for removal of sediment.

GRASS SWALE

DESCRIPTION AND FUNCTION

The Grass Swale is a stormwater conveyance facility used to collect and convey runoff safely to a discharge point. This swale is designed to convey a certain design flow of runoff and the dense vegetation secures the channel from erosion. In this case it is designed to divert water from coming onto the parking lot stormwater BMPs from the adjacent wooded hillside.

INSPECTIONS

This swale should be inspected semi-annually with additional inspections during the first few months to insure that the vegetation becomes adequately established. The swale should be inspected for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding and sedimentation. Repairs and reseeded should be done as needed. The swale should drain freely with no long term ponding of water.

ROUTINE MAINTENANCE

Repairs and reseeded may be needed during the first few months until the vegetation becomes secure. The swales should be mowed twice per year with one in the mid-summer and the grass clippings should be removed. Trees and shrubs must not be allowed to grow in the swale. The grass should not be cut shorter than four inches. Sediment and debris should be removed at least once a year in late spring if found to be present. Other tasks include fertilizing and/or liming, if necessary for the health of the vegetation.

NON-ROUTINE MAINTENANCE

These are structural repairs and replacement of system components. Typical items for this BMP may include:

- Major repairs of slope

- Bottom restoration - If it is found that significant ponding or erosion is occurring, the bottom may need to be regraded or soil loosened to promote drainage.

MAINTENANCE EQUIPMENT

- Grounds equipment
(mower, rakes, etc.

INSPECTION AND MAINTENANCE REQUIREMENTS FOR BMP's

SEDIMENT FOREBAY

DESCRIPTION AND FUNCTION

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MAINTENANCE EQUIPMENT

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ROUTINE MAINTENANCE

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MAINTENANCE EQUIPMENT

- Grounds equipment
(mower, rakes, etc.

STORMWATER MANAGEMENT SYSTEM

INSPECTION AND MAINTENANCE FORMS

CONTENTS:

INSPECTION FORMS

- Sediment Forebay
- Rain Garden (Bioretention)
- Grass Swale

MAINTENANCE / REPAIR RECORD FORM

**SEDIMENT FOREBAY
Routine Inspection Checklist**

	Inspections - Quarterly				Date	
	Inlet Stone	Sediment Depth	Hydrocarbons*	Structural Integrity	Filter Berm	Comments
<u>Sediment Forebay #1</u>						

* Presence of hydrocarbons is a clearly visible layer of oil, gasoline, grease, hydraulic fluid, etc., floating on the surface or a strong odor of gas or oil

GRASS SWALE
Routine Inspection Checklist

<u>Grass Swale</u>	- Inspected Semi-Annually			Date	
	Ponding	Sediment Depth	Vegetation	Debris	Comments
	Erosion	Outlet Area			

Rain Gardens (Bioretention)
Routine Inspection Checklist

checklist	- Inspection Quarterly				Date	
	Slope Integrity	Sediment Depth	Vegetation	Erosion	Ponding	Outlet

Rain Garden #1