FUSS & O'NEILL
1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445
www.fando.com

# Notice of Intent
# South Hadley Electric Light Department New Administration & Operations Center
## 65 Old Lyman Road, South Hadley, Massachusetts

**Prepared For:**

## South Hadley Electric Light Department
**South Hadley, Connecticut**

March 12, 2026

FUSS & O'NEILL
1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445
www.fando.com

March 12, 2026

Town of South Hadley Conservation Commission
116 Main Street
Room U6
South Hadley, MA 01075

RE: Notice of Intent
South Hadley Electric Light Department (SHELD) New Administration & Operations Center
65 Old Lyman Road, South Hadley, Massachusetts

Dear Members of the Conservation Commission:

On behalf of the South Hadley Electric Light Department (SHELD), Fuss & O'Neill is submitting this Notice of Intent (NOI) under the Massachusetts Wetlands Protection Act ("MAWPA": M.G.L. c 131 § 40) and Town of South Hadley Wetlands Protection Bylaw (Chapter 240) and associated regulations for the new SHELD Administration & Operations Center Project located at 65 Old Lyman Road in South Hadley, Massachusetts. The proposed project includes the development of a new SHELD headquarters complex including a main office, warehouse, garage space, and associated site features. The proposed project will occur within the 100-ft Buffer Zone of Bordering vegetated Wetland (BVW) and the 50-ft no-disturbance conservation zone which is protected under the MAWPA and South Hadley Wetlands Protection Bylaw.

The enclosed NOI application package includes the WPA Form 3 along with the supporting project narrative, figures, project plans, stormwater report, and abutter notice information. This project is being submitted to MassDEP through the online eDEP portal.

If you have any questions, please feel free to contact me at (413) 333-5883 / paul.fleming@fando.com. Thank you for your consideration of this NOI and we look forward to discussing this project at the April 1, 2026 Public Hearing.

Sincerely,

Paul Fleming
Senior Project Manager

Copy: MassDEP Division of Wetlands and Waterways Western Regional Office (WERO)
Sean Fitzgerald, South Hadley Electric Light Department

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# WPA Form 3 – Notice of Intent

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

# WPA Form 3 – Notice of Intent

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

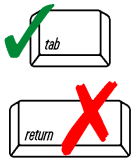
Provided by MassDEP:

MassDEP File Number

Document Transaction Number

South Hadley
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):

65 Old lyman Road — a. Street Address
South Hadley — b. City/Town
01075 — c. Zip Code

Latitude and Longitude:
42.22155 — d. Latitude
-72.56851 — e. Longitude

14 — f. Assessors Map/Plat Number
67 — g. Parcel /Lot Number

2. Applicant:

Sean — a. First Name
Fitzgerald — b. Last Name
South Hadley Electric Light Department — c. Organization
85 Main Street — d. Street Address
South Hadley — e. City/Town
MA — f. State
01075 — g. Zip Code
413-536-1050 — h. Phone Number
i. Fax Number
sfitzgerald@sheld.org — j. Email Address

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

Matt — a. First Name
Damour — b. Last Name
Big Y Foods Inc. — c. Organization
2145 Roosevelt Avenue — d. Street Address
Springfield — e. City/Town
MA — f. State
01104 — g. Zip Code
413-219-3594 — h. Phone Number
i. Fax Number
matt.damour@bigy.com — j. Email address

4. Representative (if any):

Paul — a. First Name
Fleming — b. Last Name
Fuss & O'Neill — c. Company
1550 Main Street, Suite 400 — d. Street Address
Springfield — e. City/Town
MA — f. State
01103 — g. Zip Code
413-333-5883 — h. Phone Number
i. Fax Number
paul.fleming@fando.com — j. Email address

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

N/A Municipal Project — a. Total Fee Paid
N/A Municipal Project — b. State Fee Paid
N/A Municipal Project — c. City/Town Fee Paid

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

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## A. General Information (continued)

6. General Project Description:

The proposed project includes the development of a new SHELD headquarters complex including a main office, warehouse, garage space, and associated site features.

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

1. ☐ Single Family Home
2. ☐ Residential Subdivision
3. ☐ Commercial/Industrial
4. ☐ Dock/Pier
5. ☐ Utilities
6. ☐ Coastal engineering Structure
7. ☐ Agriculture (e.g., cranberries, forestry)
8. ☐ Transportation
9. ■ 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 CMR10.24(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:

| a. County | b. Certificate # (if registered land) |
|---|---|
| Hampshire | |
| c. Book | d. Page Number |
| 12464 | 0112 |

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

1. ■ 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.
2. ☐ 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. ☐ Bank | 1. linear feet | 2. linear feet |
| b. ☐ Bordering Vegetated Wetland | 1. square feet | 2. square feet |
| c. ☐ Land Under Waterbodies and Waterways | 1. square feet<br>3. cubic yards dredged | 2. square feet |

| Resource Area | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| d. ☐ Bordering Land Subject to Flooding | 1. square feet | 2. square feet |
| | 3. cubic feet of flood storage lost | 4. cubic feet replaced |
| e. ☐ Isolated Land Subject to Flooding | 1. square feet | |
| | 2. cubic feet of flood storage lost | 3. cubic feet replaced |
| f. ☐ 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.

| Resource Area | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| a. ☐ Designated Port Areas | Indicate size under Land Under the Ocean, below | |
| b. ☐ Land Under the Ocean | 1. square feet<br>2. cubic yards dredged | |
| c. ☐ Barrier Beach | Indicate size under Coastal Beaches and/or Coastal Dunes below | |
| d. ☐ Coastal Beaches | 1. square feet | 2. cubic yards beach nourishment |
| e. ☐ Coastal Dunes | 1. square feet | 2. cubic yards dune nourishment |

| Resource Area | Size of Proposed Alteration | Proposed Replacement (if any) |
|---|---|---|
| f. ☐ Coastal Banks | 1. linear feet | |
| g. ☐ Rocky Intertidal Shores | 1. square feet | |
| h. ☐ Salt Marshes | 1. square feet | 2. sq ft restoration, rehab., creation |
| i. ☐ Land Under Salt Ponds | 1. square feet<br>2. cubic yards dredged | |
| j. ☐ Land Containing Shellfish | 1. square feet | |
| k. ☐ Fish Runs | Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above<br>1. cubic yards dredged | |
| l. ☐ 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

**Massachusetts Department of Environmental Protection**
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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**

   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/ma-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 - Bourne to Rhode Island border, and the Cape & Islands:

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

North Shore - Plymouth to New Hampshire border:

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).

**Massachusetts Department of Environmental Protection**
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Provided by MassDEP:
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Document Transaction Number
South Hadley
City/Town

## 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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City/Town

## 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.

SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT NEW ADMINISTRATION & OPERATIONS CENTER
a. Plan Title

Fuss & O'Neill
b. Prepared By

Dan DeLany
c. Signed and Stamped by

d. Final Revision Date

As noted
e. Scale

USGS Topographic Map (Figure 1)
f. Additional Plan or Document Title

2/25/2026
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:

2. Municipal Check Number

3. Check date

4. State Check Number

5. Check date

6. Payor name on check: First Name

7. Payor name on check: Last Name

**Massachusetts Department of Environmental Protection**
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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.

South Hadley Electric Light Dept. Adam St. Martin — 1. Signature of Applicant — 2. Date 3/12/26

Big Y Foods, Inc. by: — 3. Signature of Property Owner (if different) — 4. Date 3/11/26

Mathieu L. D'Amour, without certification — 5. Signature of Representative (if any) — 6. Date 3/12/2026

**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.



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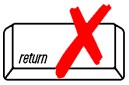
**Massachusetts Department of Environmental Protection**
Bureau of Resource Protection - Wetlands

# 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:

| a. Street Address | b. City/Town |
|---|---|
| 65 Old Lyman Road | South Hadley |
| c. Check number | d. Fee amount |
| | |

2. Applicant Mailing Address:

| a. First Name | b. Last Name |
|---|---|
| Sean | Fitzgerald |

c. Organization: South Hadley Electric Light Department

d. Mailing Address: 85 Main Street

| e. City/Town | f. State | g. Zip Code |
|---|---|---|
| South Hadley | MA | 01075 |

| h. Phone Number | i. Fax Number | j. Email Address |
|---|---|---|
| 413-536-1050 | | sfitzgerald@sheld.org |

3. Property Owner (if different):

| a. First Name | b. Last Name |
|---|---|
| Matt | Damour |

c. Organization: Big Y Foods Inc.

d. Mailing Address: 2145 Roosevelt Avenue

| e. City/Town | f. State | g. Zip Code |
|---|---|---|
| Springfield | MA | 01104 |

| h. Phone Number | i. Fax Number | j. Email Address |
|---|---|---|
| 413-219-3594 | | matt.damour@bigy.com |

## B. Fees

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

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.

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# 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 |
|---|---|---|---|
| Municipal/Fee Exempt | | | |
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**Step 5/Total Project Fee:**

**Step 6/Fee Payments:**

Total Project Fee: $0 - Fee Exempt
a. Total Fee from Step 5

State share of filing Fee:
b. 1/2 Total Fee **less $**12.50

City/Town share of filling Fee: Exempt
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.)

# South Hadley Application for Conservation Permit

# Application for Conservation Permit (ACP)

South Hadley Wetlands Bylaw & Regulations

1. **Applicant:** Name Sean Fitzgerald - South Hadley Electric Light Department
Address 85 Main Street, South Hadley, MA 01075
Email sfitzgerald@sheld.org Phone 413-536-1050

2. **Project Location:** Street 65 Old Lyman Road

3. **This application is filed along with:**
____ Request for Determination of Applicability
_X_ Notice of Intent
____ Amendment to Order of Conditions
____ Certificate of Compliance (partial or total)
____ Other (e.g., ANRAD, ANOI, Emergency Certification)
____ Proposed work is outside state WPA jurisdiction; *bylaw only*

4. **Work is proposed in the following Resource Areas:**
____ Bank
____ Lake or Pond
____ Stream or River
____ 100-year Flood Zone
____ Freshwater Wetland
____ Water & Land under water
____ 200-foot Riverfront Area
____ Vernal Pool
_X_ 100-foot Buffer Zone

5. **Work is proposed in the 100' Buffer Zone only**
_X_ within 50 Foot Conservation Zone
_X_ between 50-100 feet of wetland boundary
_X_ WAIVER FORM COMPLETED *(if within 50' CZ)*

6. **Project Description:**
**Existing conditions where work will occur:**
____ Lawn or landscaped area
_X_ Wooded or natural area
____ Impervious (pavement)
____ Wetland Resource Area
____ Open undeveloped lot
____ Other: _____

**Proposed work:** The proposed project includes the development of a new SHELD headquarters complex including a main office, warehouse, garage space, and associated site features.

**Equipment to be used:** Dump trucks, backhoes, compactors, excavators, mini excavators and other heavy equipment that the contractor deems necessary for construction

**Erosion control to be used:** _____

Construction period erosion and sedimentation controls will include a construction entrance, tree protection fencing, soil stockpile areas, silt fence, erosion control blankets, compost filter sock, temporary sediment trap, and inlet protection. Additional erosion and sediment controls will be utilized as required. Perimeter sediment controls will be placed down-gradient of disturbed areas. Water will be applied to exposed soils to provide dust control as needed.

**7. Project Impact**

**Buffer Zone Setback:** If the project involves work in the buffer zone only, what is the shortest distance between project disturbance and the wetland resource area? 35 feet

**Tree Cutting:** Will trees be removed within Conservation jurisdiction? (Y/N) Yes

**Tree Cutting:** List number and approximate diameter of tree(s) to be removed:

113 trees with a diameter at breast height (DBH) ranging from 3"-24" will be removed

**Fill and Grading:** How much fill will be removed or brought in? 9,500 cu yds

**Fill and Grading:** How will site be stabilized during construction? _____

Erosion and sedimentation controls will be used to stabilize the site during construction. See "Erosion control to be used" above.

**Fill and Grading:** How will final grade differ from existing? _____

Post-construction drainage patterns will not differ from the pre-construction drainage patterns.

**8. Describe any exemptions in the WPA or bylaw that allows proposed activity:**

N/A

**9. Describe any mitigating measures proposed.** Use additional page(s) if necessary.

Perimeter sediment controls will be placed down-gradient of the disturbed areas to prevent material from migrating into the wetland area.

**10. Local Filing Fee*:** Fee exempt

____ $ _____ **Request for Determination of Applicability**

____ $ _____ **Other**

**This fee structure is detailed in the Bylaw Regulations. Make check payable to the Town of South Hadley.*

**11. Statement of Applicant: I hereby certify under the penalties of perjury that this application and all supporting plans and documents are true and complete to the best of my knowledge, and that these have been prepared in conformance with the requirements of the South Hadley Wetlands Bylaw and supporting regulations. I further certify that all abutters and other parties will be notified of this application as required by South Hadley Wetlands Bylaw Regulations. I understand that I may be asked to pay for a consultant to review my application for the Commission.**

South Hadley Electric Light Dept

**Signature:** _____ ADAM St. Martin **Date:** 3/12/26

Big Y Foods, Inc.,

**Landowner's Signature (if different):** by: _____

Mathieu L. D'Amour, without certification

# Request for Waiver of Local Conservation Permit

# Request for Waiver

## From South Hadley Wetlands Bylaw and Regulations

1. **Applicant** **Name** Sean Fitzgerald, South Hadley Electric Light Department **Phone:** 413-536-1050

   **Address** 85 Main Street, South Hadley, MA 01075

   **Email** sfitzgerald@sheld.org

2. **Owner** **Name** Matt Damour, Big Y Foods Inc. **Phone:** 413-219-3594

   **(if different)** **Address** 2145 Roosevelt Avenue, Springfield, MA 01104

   **Email** matt.damour@bigy.com

3. **Project Location Street address** 65 Old Lyman Road

4. **DEP File Number # 288-**_____

5. **I hereby request a waiver from the prohibition on alterations in the 50-foot Conservation Zone.**

6. **Reason(s) for the waiver request are:**

Due to site grading and required depth of the proposed basins, to ensure proper pitch within the outlet pipe, the outfall needs to be within the 50 foot buffer. Work will be completed in a manner as to ensure the installation of the pipe and outfall do not disturb the existing wetland. Areas disturbed to install the pipe will be restored to existing conditions.

7. **Proposed mitigation for the work within the Conservation Zone:**

Disturbance within the 50 foot will be restored to existing. Disturbance within the 50 to 100, will be loamed, seeded, and planted where possible. Tree's removed will be mitigated as best as possible within the limited work area.

Owner **Signature:** Big Y Foods, Inc.
by:
Mathieu L. D'Amour
without certification

**Date:** 3/11/26

Applicant Signature: South Hadley Electric Light Dept.
Adam St. Martin

3/12/26

# Narrative

# 1 Introduction

On behalf of South Hadley Electric Light Department, this Notice of Intent has been prepared for the South Hadley Electric Light Department (SHELD) New Administration & Operations Center in South Hadley, Massachusetts. A NOI is required as the proposed project will result in alterations to the 100-foot Buffer Zone of Bordering Vegetated Wetland (BVW).

## 1.1 Purpose and Need

The current SHELD headquarters located at 85 Main Street is within the 100-year floodplain of the Connecticut River. With expected increases in precipitation with climate change, this headquarters is in a vulnerable location. In addition, SHELD has been leasing a building on Ludlow Road for $72,000 a year due to the small size of their current headquarters at 82 Main Street. Lastly, the current SHELD headquarters also requires up to $8.5 million in repairs, renovations and code compliance[1]. These factors have necessitated SHELD move its headquarters to a location with increased resilience and operational capacity to support the essential services SHELD provides to the residents of South Hadley.

# 2 Existing Environment

## 2.1 Project Locus

The Project Locus, as defined in 310 CMR 10.04, includes the 9.4-acre, undeveloped property at 65 Old Lyman Road in South Hadley, MA identified as Parcel No. 14-67. This parcel is owned by Big Y Foods Inc. Land cover primarily consists of upland forest and forested wetlands. The Project Locus is depicted on the USGS Topographic Map included as *Figure 1* in this report.

The Project Locus is bounded to the north by an unnamed access road, to the south by private property, to the east by private property and Old Lyman Road and to the west by the Big Y parking lot.

### 2.1.1 Project Site

The Project Site (i.e., limits of work; further defined in 310 CMR 10.04) consists of undeveloped, mostly flat, forested property adjacent to the Big Y parking lot located at 44 Willimansett Street in South Hadley, MA. There is currently no stormwater management system located in the existing site development. The Project Locus includes the 100-foot Buffer Zone to BVW. Refer to the Permitting Plans in *Appendix A* for the locations of the Project Site.

## 2.2 Methodology of Resource Area Investigation

Wetland resource areas were delineated by LandTech on May 22 and June 4, 2024, in conformance with local, state, and federal regulations and guidelines including:

- Massachusetts Wetlands Protection Act ("MAWPA"; M.G.L. c. 131, § 40), its implementing regulations set forth at 310 CMR 10.00
- Massachusetts Department of Environmental Protection (MassDEP) Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act (September 2022)
- US Army Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1 (January 1987)

[1] South Hadley voters to weigh in on proposed SHELD headquarters - Daily Hampshire Gazette

- Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (January 2012)
- Town of South Hadley Wetland Regulations

An ANRAD was submitted to the South Hadley Conservation Commission on 06/28/2024 and was approved on 08/30/2024.

Refer to *Appendix B* for the Wetland Delineation Report.

## 2.3 Description of Wetland Resources Areas

The following wetland resource areas subject to jurisdiction under MAWPA and the Town of South Hadley Wetland Regulations were identified within the Project Site or within 100 feet of the Project Site.

- Bordering Vegetated Wetlands (BVW)
- Inland Bank

### 2.3.1 Bordering Vegetated Wetlands

One BVW (Wetland A) was identified as a forested wetland in a slightly depressed area in the southeast portion of the site. Wetland A can best be described as a palustrine forested wetland (PFO). Common vegetation within Wetland A included northern highbush blueberry (*Vaccinium corymbosum*), glossy buckthorn (*Frangula alnus*), red maple (*Acer rubrum*), red oak (*Quercus rubra*), white pine (*Pinus strobus*), and black oak (*Quercus velutina*).

### 2.3.2 Inland Bank

Inland Bank (Bank 1) is associated with a body of water in the southeast corner of the Project Site and is contained within Wetland A. Common vegetation along the Bank included similar species to those found in Wetland A.

## 2.4 Rare Species

According to the MassMapper NHESP Atlas, 15th edition, effective August 2021, the Project Site is **not** located within the limits of mapped Estimated Habitats of Rare Wildlife or Priority Habitats of Rare Species.

# 3 Proposed Project

The proposed project includes the construction of a new headquarters for the South Hadley Electric. Additional improvements include parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping.

## 3.1 South Hadley Electric Light Department Headquarters Complex

The proposed South Hadley Electric Light Department New Administration & Operations Center Complex will include a 13,926 sf, one-floor, office building, a warehouse, covered storage area, and an uncovered storage area. The new headquarters will provide SHELD a more modern facility to facilitate utility services to South Hadley. Refer to *Appendix A* for a project overview and renderings.

#### *3.1.1.1 Associated Infrastructure*

In addition to the new building and storage areas, the project also includes the construction of the associated parking lots, stormwater infrastructure, fuel station, a transformer, utilities, and landscaping.

The fuel station is located adjacent to the covered storage area. This area was chosen so that SHELD vehicles have easier access to refuel their vehicles and to keep the fuel station outside the 100-ft Buffer Zone. All utilities (water, gas, electricity) will service the building from the mechanical room which is located in the northwestern corner of the building near the transformer.

The project will result in creating 45 new parking spaces. Fencing will be constructed along the southern and eastern side of the property. In addition to the site improvements mentioned above, the project also includes a new stormwater management system and utility services. The improvements are shown in more detail on the Permitting Plans included as *Appendix A*.

#### *3.1.1.2 Stormwater Management*

The proposed project does not propose to change the existing stormwater patterns. The proposed Stormwater Management system is composed of a stormwater collection system and two (2) stormwater infiltration basins. The stormwater system has been designed to provide reduction in peak stormwater discharge, and stormwater treatment is achieved. Infiltration basin 1 is located east of the proposed building and associated driveway and west of Old Lyman Street where it will provide treatment and recharge for the northern parking lot and the northern and eastern driveways and surrounding grassed areas. An outlet pipe leading from infiltration basin 1 will deposit treated stormwater southwest of the basin onto a riprap apron. The outlet pipe was installed within the 50-ft no-disturbance conservation zone due to the pre-existing grade. Infiltration basin 2 is located south of the proposed southern driveway area where it will provide treatment and recharge to the parking and driveways located east and south of the proposed buildings along with surrounding grassed areas. An outlet pipe leading from infiltration basin 2 will deposit treated stormwater directly east of the basin onto a riprap apron. The outlet pipe and riprap apron was installed within the 50-ft no-disturbance conservation zone due to the pre-existing grade.

The proposed BMPs have been sized to meet the Stormwater Standards and accommodate the 100-year design storm without overtopping. Outlet control structures in each infiltration system will manage the discharges from the site.

Additional information, including description and supporting calculations for the design of the stormwater system are further detailed in the Permitting Plans included as *Appendix A* and the Stormwater Report in *Appendix C.*

## 3.2 Construction Sequence

A detailed construction sequence is shown on the Permitting Plans included in *Appendix A.* This construction sequence is subject to change based on construction methods, weather, or due to other unforeseen circumstances. Any changes to the sequence of construction shall be addressed in the Stormwater Pollution Prevention Plan (SWPPP). This is prepared as required under the Environmental Protection Agency (EPA) National Pollutant Discharge Eliminate System (NPDES) General Permit for Discharge from Construction Activities.

## 3.3 Landscape Plan

Landscaping will include the planting of shrubs and shade, flowering and evergreen trees as well as putting down seed mixes such as wildflower seed mix, upland seed mix, and wetland basin sed mix. Specifically, 189 trees will be planted throughout the headquarters complex. As the 100-ft Buffer Zone within the Project Site will be moderately disturbed, tree plantings and seed mixes will be implemented as part of the restoration process to the maximum extent practicable. Specifically, 19 eastern red cedar (*Juniperis virginiana*), three (3) American hophornbeam (*Ostrya virginiana*), five (5) balsam fir (*Abies balsamea*), four (4) columnar pin oak (*Quercus palustris "Fastigiata")*, and one (1) bur oak (*Quercus macrocarpa*) will be planted and a wildflower seed mix, an upland seed mix and ground cover will be used to restore the 100-ft Buffer Zone. The remaining 157 trees will be installed outside of the 100-ft Buffer Zone

Please see Table 5-4 in *Section 5.4* for more details. The landscaping plan and additional information is further detailed in the permitting plans included in *Appendix A*.

## 3.4 Soil Erosion and Sedimentation Control

As described in the Stormwater Report in *Appendix C*, soil erosion and sedimentation control details and narratives for construction periods are provided on the site plans. Soil erosion and sedimentation control details and procedures are consistent with the "Massachusetts Erosion and Sediment Control Guideline for Urban and Suburban Areas."

Construction period erosion and sedimentation controls will include a construction entrance, tree protection fencing, soil stockpile areas, silt fence, erosion control blankets, compost filter sock, temporary sediment trap, and inlet protection. Additional erosion and sediment controls will be utilized as required. Perimeter sediment controls will be placed down-gradient of disturbed areas. Water will be applied to exposed soils to provide dust control as needed.

Soil disturbance, stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures shall be recorded and maintained as part of the Stormwater Pollution Prevention Plan (SWPPP). This is prepared as required under the EPA NPDES General Permit for Discharge from Construction Activities.

Waste materials generated from construction activities will include excavated soil, trees, brush, and stumps. All excavation debris and other waste will be transported to an approved disposal facility. If required, materials may be temporarily stockpiled within designated staging areas. Details and procedures are provided on the site plans and are included in the SWPPP.

Construction materials, including site and building materials, will be present on-site during various stages of construction. All materials will be temporarily stored within designated staging or lay-down areas and will be transported to the site as needed. Construction vehicle fueling will take place on site. Staging areas will be located within the limit of work, and drip lines of existing trees to remain.

# 4 Avoidance and Minimization Measures

*Table 4-1* below describes measures included in the design to avoid and minimize impacts to Buffer Zone.

**Table 4-1 Avoidance and Minimization Measures**

| **Avoidance Measures** | **Description** |
|---|---|
| Maintain work outside of Bank, BVW, and LUWW. | No work is proposed within Bank, BVW, or LUWW, which was delineated within the vicinity of the proposed project. |
| **Minimization Measures** | **Description** |
| Minimize impervious area within Buffer Zone to the maximum extent practicable. | While the Project will require an increase of approximately 9,292 sf of impervious surface area within the Buffer Zone, impacts have been reduced to the maximum extent practicable. Increases to impervious area within Buffer Zone has been minimized through the design process by shifting areas of parking and vehicle access on the south side of the complex to be as far away from the Buffer Zone as possible. |
| Minimize limits of work. | Limit area of disturbance only to areas necessary for construction and access. |
| Design limits of work to remain outside of the 100-foot Buffer Zone to the maximum extent practicable. | Most construction activities have been designed to occur outside the 100-ft Buffer Zone. The majority of the new administration and operations center will be constructed outside of the 100-ft Buffer Zone with only minor impacts to the 100-ft Buffer Zone due to the construction of an internal driveway and an outlet pipe with a riprap apron. |
| Minimize tree removal in Buffer Zone to maximum extent practicable. | Tree removal is only proposed where necessary for grading, construction and stormwater infrastructure. Where possible, trees are preserved. |
| Design stormwater management system in compliance with the MA Stormwater Handbook. | The proposed stormwater infiltration BMPs have been designed to provide storage in excess of the recharge volume required by Standard 3.<br>The proposed Stormwater filtration and infiltration BMPs provide an additional 5% removal of the average annual post-construction load of Total Suspended Solids (TSS) than what is required in Standard 4.<br>Peak run-off rates and volumes from the site will decrease when compared to pre-development conditions during the 2-, 10-, 25-, and 100-year storm events per Standard 2. |

*Table 4-1* below describes measures included in the design to avoid and minimize impacts to Buffer Zone.

**Table 4-1 Avoidance and Minimization Measures**

| | |
|---|---|
| Design stormwater system to reduce erosion especially within areas of steep slopes. | Stormwater best management practices (BMPs) have been implemented to mitigate increases in peak runoff rates and provide stormwater treatment. |
| Implement erosion and sediment control plan. | A comprehensive erosion and sediment control plan is proposed in the Permitting Plans in *Appendix A*. Refer to *Section 3.4* above for additional information. |

# 5 Impacts and Regulatory Compliance

## 5.1 Impacts

The proposed project will result in impacts to the 100-foot Buffer Zone and 50-ft no-disturbance conservation zone. No impacts are anticipated to BVW. Trees proposed for removal within the 100-foot Buffer Zone will be replaced to the maximum extent practicable. Impacts have been avoided and minimized to the maximum extent practicable as described in *Table 4-1* of this NOI.

### 5.1.1 Buffer Zone

26,274 sf of impacts to Buffer Zone result from the construction of an internal driveway, a covered storage area, an open storage area and an infiltration basin, of which includes 9,292 sf of impervious surface area. 262 sf of impacts to the 50-ft no-disturbance conservation zone result from the digging of a trench to install a reinforced concrete pipe and riprap apron leading from the infiltration basins on the southwest and eastern sides of the complex. Impacts have been avoided and minimized to the maximum extent practicable as described in *Table 4-1* of this NOI. SHELD is requesting permission to remove 109 trees with a Diameter at Breast Height (DBH) ranging from 3"-24" as described in Table 5-4 below. Of the 109 trees, 99 will be removed from the 100-ft Buffer Zone.

## 5.2 Regulatory Compliance

### 5.2.1 Local Wetland Bylaw

A portion of the proposed activities will occur within a resource area or other area (i.e., Buffer Zone) subject to jurisdiction under the Town of Hadley Wetlands Bylaw. § 305-28 C(2)a & b of the local wetland bylaw specifies criteria where proposed work may be allowed. The section below outlines the performance standards of Buffer Zone in italics font.

*(2) Work permitted in the one-hundred-foot Buffer Zone shall be in accordance with the following standards:*

*(a) Fifty-foot no-disturbance conservation zone. No activity is permitted within 50 feet of the edge of any freshwater wetland, bank, or the water column in and land under any creek, river, stream, brook, pond or lake, or vernal pool 10,000 square feet or greater in size.*

*(b) Twenty-five-foot no-disturbance conservation zone applies to vernal pools less than 10,000 square feet in size.*

As part of the stormwater infiltration basins being constructed on the southwest and eastern side of the SHELD administration and operations center, two outlet pipes and two riprap aprons will be installed within the 50-ft no disturbance conservation zone. As a result, SHELD is requesting a waiver of the performance standards outlined in § 305-28 C(2)a of the South Hadley Wetlands Protection Bylaw. Please see *Section 5.3* for more detail.

*(3) No-disturbance conservation zone demarcation. To maintain the integrity of the no-disturbance conservation zone and to ensure that there will be no encroachments into this zone by the applicant or future owners of the property, the Commission may require the no-disturbance conservation zone to be marked on the ground, at the applicant's expense, with permanent markers. These markers shall be of weather-resistant material, and the Commission will decide the type, number, size and locations.*

Performance Standards for buffer as outlined in the Town of South Hadley Wetland Bylaw will be adhered to the maximum extent practicable. Impacts to the 100 ft-Buffer Zone and 50-ft no-disturbance conservation zone have been minimized as described in *Table 4-1* of this NOI. Additionally, a fence will be installed along the 50-ft no-disturbance conservation zone boundary line closest to the wetland to reduce any encroachments on the property. No fencing will be installed within the 50-ft no-disturbance conservation zone to facilitate better access to the outlet pipe as needed.

### 5.2.2 Tree Removal and Replacement Performance Standards

Due to the removal of 109 trees within the 100-ft Buffer Zone, a total of 221 replacement trees are required per the Tree Removal and Replacement Performance Standards (§305-29). Due to the limited space on the property, trees proposed for removal will be replaced with 189 trees including shade, flowering, and evergreen trees in the same general vicinity as the existing trees as shown on the Permitting Plans in *Appendix A*. Of the 189 replacement trees, 32 are within the 100-ft Buffer Zone. In addition, 862 shrubs will also be planted on the property. As a result, we respectfully request the Commission accept the shrubs in-lieu of the 32 trees that cannot be replaced as specified by the South Hadley Wetlands Regulations under § 305-29. All shrubs and trees will be monitored for two growing seasons post-construction.

**Table 5-4**
**Proposed trees to be Removed**

| Number of Tress Removed | Diameter at Breast height (DBH) | Replacement Requirements |
|---|---|---|
| 13 | 3” | 2:1 Ratio |
| 10 | 3.5” | 2:1 Ratio |
| 17 | 4” | 2:1 Ratio |
| 5 | 4.5” | 2:1 Ratio |
| 12 | 5” | 2:1 Ratio |
| 1 | 5.5” | 2:1 Ratio |
| 20 | 6” | 2:1 Ratio |
| 4 | 6.5” | 2:1 Ratio |
| 6 | 7” | 2:1 Ratio |
| 5 | 8” | 2:1 Ratio |
| 3 | 9” | 2:1 Ratio |

| Number of Tress Removed | Diameter at Breast height (DBH) | Replacement Requirements |
|---|---|---|
| 1 | 10” | 2:1 Ratio |
| 2 | 11” | 2:1 Ratio |
| 3 | 12” | 2:1 Ratio |
| 1 | 13” | 2:1 Ratio |
| 2 | 15” | 2:1 Ratio |
| 1 | 18” | 2:1 Ratio |
| 3 | 24” | 3:1 Ratio |
| Total Trees: 109 | | |

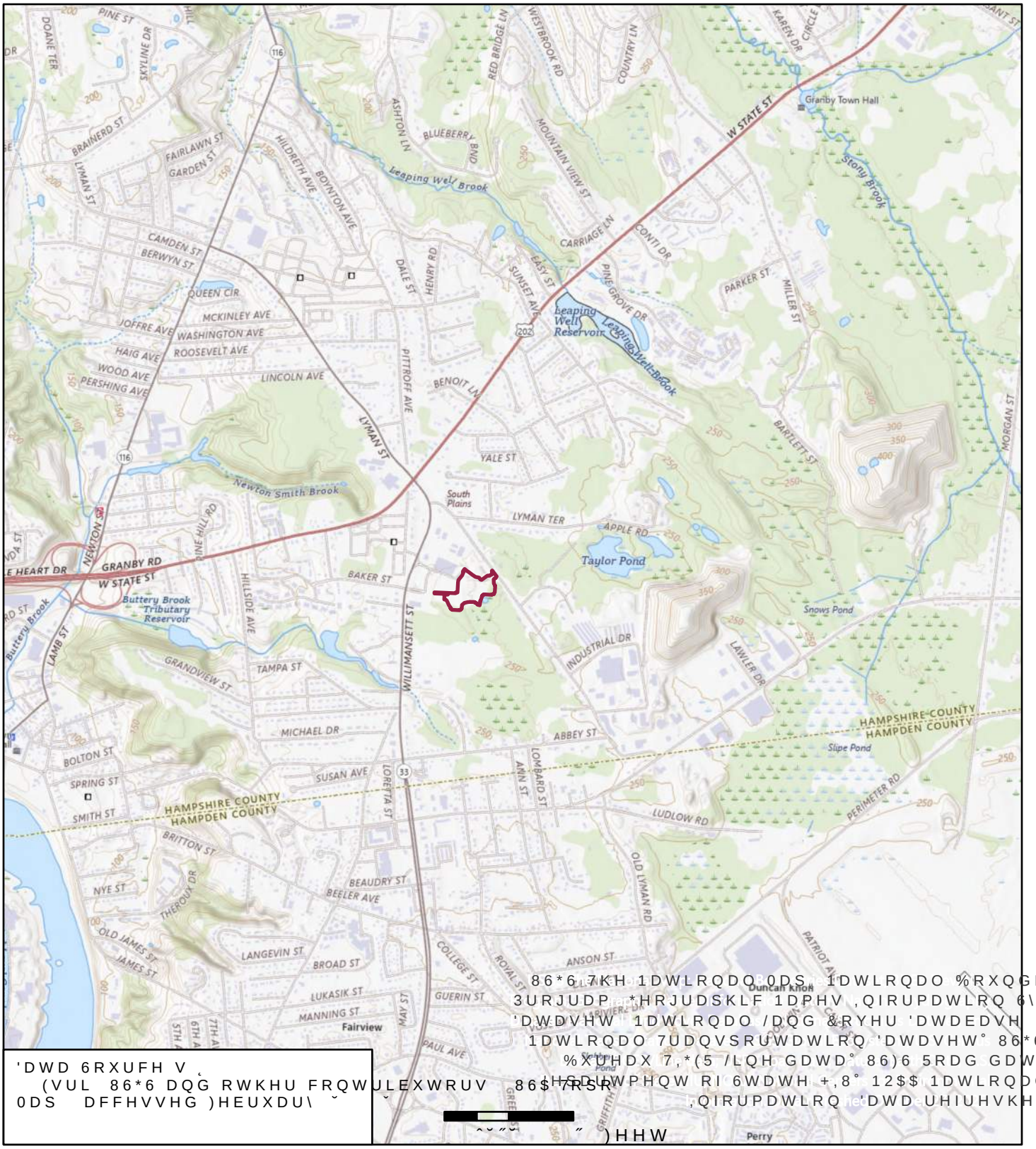
### 5.2.3 Waiver Request

Due to the installation of two (2) reinforced concrete pipes and two (2) riprap aprons within the 50-ft no-disturbance conservation zone, SHELD is requesting a waiver of the performance standards outlined in § 305-28 C(2)a of the South Hadley Wetlands Protection Bylaw. A Request for Waiver has been included in this application.

## 5.3 Abutter Notification

In accordance with the MAWPA and South Hadley Non-Zoning Wetland Bylaw, 100-foot abutters will be notified via certified mail at least seven (7) days prior to the Public Hearing. Refer to *Appendix D* for the certified list of abutters, a copy of the abutter notification and the return receipt.

## Figures

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# Appendix A

## Permitting Plans

# SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT
# NEW ADMINISTRATION & OPERATIONS CENTER

65 OLD LYMAN ROAD · SOUTH HADLEY · MASSACHUSETTS

**PERMIT SET**

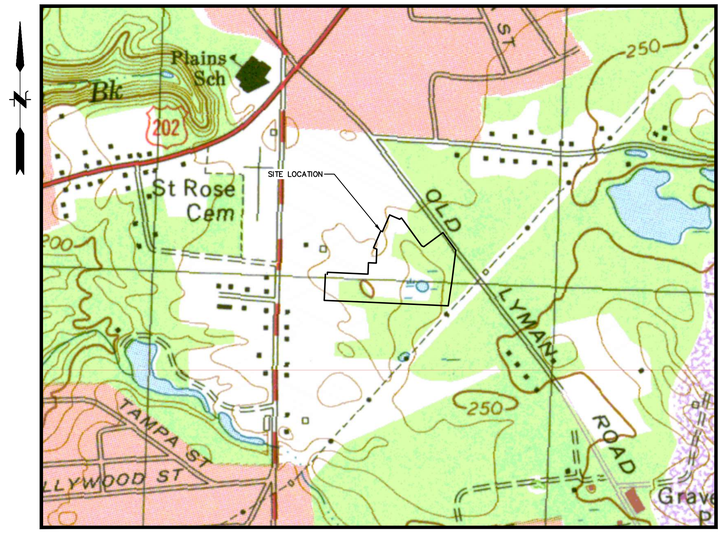
MARCH 11, 2026

**PROJECT TEAM**


TECTON ARCHITECTS
34 SEQUASSEN STREET, SUITE 200
HARTFORD, CT 06106
860.548.0802


**SHEET INDEX**


| Sheet no. | Sheet Title |
|---|---|
| GI-001 | COVER SHEET |
| CN-002 | GENERAL NOTES |
| RC-101 | EXISTING CONDITIONS PLAN |
| CP-101 | SITE PREPARATION PLAN |
| CE-101 | EROSION AND SEDIMENT CONTROL PLAN |
| CS-101 | SITE PLAN |
| CG-101 | GRADING AND DRAINAGE PLAN |
| CU-101 | UTILITY PLAN |
| LA1.01 | PLANTING PLAN |
| CD-501-507 | CONSTRUCTION DETAILS |
| A2.01 | FIRST FLOOR OVERALL PLAN |
| A2.03 | ROOF OVERALL PLAN |
| A2.04 | 3D AERIAL VIEW |
| A2.05 | 3D AERIAL VIEW |
| A4.10 | EXTERIOR ELEVATIONS |


LOCATION MAP
SCALE: 1" = 500'

**PREPARED BY**


FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com


**PREPARED FOR**

**SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT**
85 MAIN STREET
SOUTH HADLEY, MA 01075

DANIEL F. DELANY
CIVIL
NO. 49477
REGISTERED
PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
3/11/26

PROJ. No.: 20250806.A10
DATE: 03/11/2026

GI-001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MAP REFERENCE

1. EXISTING CONDITIONS DEPICTED ON THIS PLAN ARE BASED ON,
   - PLAN TITLED "GENERAL LOCATION PLAN," PREPARED BY F.A. HESKETH & ASSOCIATES, INC.,DATED 11-13-2025
   - CAD FILE TITLED "19187 BIG Y WETLANDS 2024-07-31," PROVIDED BY TECTON VIA EMAIL ON 08-18-2025.
   - CAD FILE TITLED "LOT LINE RECONFIGURATION 2 - NP," PROVIDED BY F.A. HESKETH & ASSOCIATES INC. VIA EMAIL ON 02-04-2026.
2. TOPOGRAPHIC ELEVATIONS ARE BASED ON NAVD88 DATUM.
3. GEOTECHNICAL DATA INCLUDING TEST PIT AND BORING LOCATIONS AND ELEVATIONS WERE OBTAINED FROM O'REILLY, TALBOT, & OKUN ENGINEERING ASSOCIATED, FEBRUARY 14, 2025.
4. WETLANDS WERE DELINEATED BY LANTECH ON JANUARY 7, 2020.

GENERAL NOTES

1. SYMBOLS AND LEGENDS OF PROJECT FEATURES ARE GRAPHIC REPRESENTATIONS AND ARE NOT NECESSARILY SHOWN ON THE DRAWINGS TO SCALE OR TO THEIR ACTUAL DIMENSION OR LOCATION. COORDINATE DETAIL SHEET DIMENSIONS, MANUFACTURERS' LITERATURE, SHOP DRAWINGS AND FIELD MEASUREMENTS OF SUPPLIED PRODUCTS FOR LAYOUT OF THE PROJECT FEATURES.
2. DO NOT RELY SOLELY ON ELECTRONIC VERSIONS OF DRAWINGS, SPECIFICATIONS, AND DATA FILES THAT ARE PROVIDED BY THE ENGINEER. FIELD VERIFY LOCATION OF PROJECT FEATURES.
3. PERFORM NECESSARY CONSTRUCTION NOTIFICATIONS, APPLY FOR AND OBTAIN NECESSARY PERMITS, PAY FEES, AND POST BONDS ASSOCIATED WITH THE WORK AS REQUIRED BY THE CONTRACT DOCUMENTS.
4. SEE ARCHITECTURAL DRAWINGS FOR DIMENSIONS OF BUILDINGS AND ADJACENT SITE ELEMENTS INCLUDING SIDEWALKS, RAMPS, BUILDING ENTRANCES, STAIRWAYS, UTILITY PENETRATIONS, CONCRETE DOOR PADS, COMPACTOR PAD, LOADING DOCKS, BOLLARDS, ETC.
5. LOCATION OF UTILITIES SHOWN HEREON ARE THE RESULT OF SURFACE EVIDENCE AS LOCATED BY FIELD SURVEY, PLANS OF RECORD, INFORMATION FURNISHED BY THE RESPECTIVE UTILITY COMPANIES, AND OTHER AVAILABLE SOURCES. THIS PLAN DOES NOT NECESSARILY DEPICT THE EXACT LOCATION OF ALL UTILITIES WHICH MAY EXIST AT THIS TIME WITHIN THE PREMISES SURVEYED. LOCATIONS SHOULD BE VERIFIED BY THE RESPECTIVE UTILITY COMPANY BEFORE BEING RELIED UPON. ALL FIELD CHANGES MUST BE APPROVED BY THE ENGINEER.
   5.1. LOCATION AND INVERTS OF EXISTING UTILITIES SHALL BE VERIFIED WITH THE ENGINEER PRIOR TO CONSTRUCTION. ALL FIELD CHANGES MUST BE APPROVED BY THE ENGINEER.
   5.2. FUSS & O'NEILL MAKES NO GUARANTEES THAT THE UNDERGROUND UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA. FUSS & O'NEILL FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. FUSS & O'NEILL HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES. BEFORE CONSTRUCTION, CALL DIG SAFE SYSTEMS FOR CLEARANCE.

REGULATORY REQUIREMENTS

1. AN APPROVED SET OF PLANS PLANS SHALL BE KEPT ON SITE AT ALL TIMES.
2. WITHIN LOCAL RIGHTS-OF-WAY, PERFORM THE WORK IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS.
3. WITHIN STATE RIGHTS-OF-WAY, PERFORM THE WORK IN ACCORDANCE WITH THE MASS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS.
4. BE RESPONSIBLE FOR SITE SECURITY AND JOB SAFETY. PERFORM CONSTRUCTION ACTIVITIES IN ACCORDANCE WITH OSHA STANDARDS AND LOCAL REQUIREMENTS.
5. DISPOSE OF DEMOLITION DEBRIS IN ACCORDANCE WITH APPLICABLE FEDERAL, STATE AND LOCAL REGULATIONS, ORDINANCES AND STATUTES.
6. THIS PROJECT DISTURBS MORE THAN ONE ACRE OF LAND OR IS A PHASE OF A LARGER PROJECT THAT DISTURBS MORE THAN AN ACRE AND REQUIRES THE COMPLETION OF A STORMWATER POLLUTION PREVENTION PLAN (SWPPP) AND THE FILING OF A CONSTRUCTION GENERAL PERMIT (CGP). THE SWPPP SHALL REMAIN ON SITE AT ALL TIMES. PRIOR TO THE START OF CONSTRUCITON, SUBMIT A NOTICE OF INTENT TO OBTAIN COVERAGE UNDER THE CGP.
7. COMPLY WITH THE CONDITIONS OF THE FOLLOWING TOWN OF SOUTH HADLEY PERMITS, ASSIST THE ENGINEER TO OBTAIN PERMIT CLOSEOUT DOCUMENTATION.
   7.1. "WPA FORM 5 - ORDER OF CONDITIONS; MASSDEP FILE # XXX-XXXX" DATED XXXXXX FROM THE TOWN OF SOUTH HADLEY CONSERVATION COMMISSION.
   7.2. "[INSERT APPROVAL NAME]" DATED DATED XXXXXX FROM THE TOWN OF SOUTH HADLEY PLANNING BOARD
8. NOTIFY TOWN OF SOUTH HADLEY PLANNING BOARD AND CONSERVATION COMMISSION IN WRITING A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTION.
11. ALLOW AGENTS OR MEMBERS REPRESENTING THE TOWN OF SOUTH HADLEY OR OTHER LOCAL, STATE, OR FEDERAL AUTHORITIES TO ENTER AND INSPECT THE SITE.

EARTHWORK

1. CALL DIG-SAFE 811 OR 1-888-DIG-SAFE A MINIMUM OF 72 HOURS PRIOR TO CONSTRUCTION.
2. STOP WORK IN THE VICINITY OF SUSPECTED CONTAMINATED SOIL, GROUNDWATER OR OTHER MEDIA. IMMEDIATELY NOTIFY THE OWNER SO THAT APPROPRIATE TESTING AND SUBSEQUENT ACTION CAN BE TAKEN. RESUME WORK IN THE IMMEDIATE VICINITY ONLY UPON DIRECTION BY THE OWNER.
3. WITHIN THE LIMITS OF THE BUILDING FOOTPRINT, PERFORM EARTHWORK OPERATIONS TO SUBGRADE ELEVATIONS. SEE DRAWINGS BY OTHERS FOR WORK ABOVE SUBGRADE.
4. PROTECT ALL SLOPES, VEGETATION, PAVING, WALKS, AND IMPROVEMENTS OUTSIDE THE AREAS TO BE AFFECTED BY THE CONSTRUCTION OF THIS PROJECT.
5. CATCH BASINS WITHIN THE WORK AREA OR DOWN STREAM OF DRAINAGE FLOW SHALL BE PROTECTED WITH CATCH BASIN SILT SACKS.
6. WATER AND CALCIUM CHLORIDE MUST BE AVAILABLE AT ALL TIMES FOR DUST CONTROL.

DEMOLITION

1. REMOVE AND DISPOSE OF EXISTING UTILITIES, FOUNDATIONS AND UNSUITABLE MATERIAL BENEATH AND FOR A DISTANCE OF 10 FEET BEYOND THE PROPOSED BUILDING FOOTPRINT INCLUDING EXTERIOR COLUMNS, UNLESS OTHERWISE NOTED.
2. THE DEMOLITION PLAN IS PROVIDED FOR INFORMATION ONLY AND MAY NOT INDICATE ALL ITEMS REQUIRED TO BE DEMOLISHED. PERFORM A PRE-BID SITE INSPECTION. COORDINATE DEMOLITION OF UNIDENTIFIED UTILITIES OR STRUCTURES WITH OWNER. DEMOLISH STRUCTURES, SITE IMPROVEMENTS, UTILITIES, ETC. AS REQUIRED TO CONSTRUCT PROPOSED FACILITY AND UTILITY SERVICES.
3. TREES, BRUSH AND STUMPS REMOVED BY CLEARING & GRUBBING OPERATIONS SHALL BE TRANSPORTED OFF THE PROJECT SITE TO AN APPROVED DISPOSAL LOCATION.
4. ITEMS TO BE STOCKPILED ON-SITE FOR REUSE OR TO BE RELOCATED SHALL BE PROTECTED FROM CONSTRUCTION OPERATIONS. IF DAMAGED DURING CONSTRUCTION THEY SHALL BE REPLACED IN-KIND AT NO ADDITIONAL COST TO THE OWNER.

WORK RESTRICTIONS

1. DO NOT CLOSE OR OBSTRUCT ROADWAYS, SIDEWALKS, FIRE HYDRANTS, AND UTILITIES WITHOUT APPROPRIATE PERMITS.
2. WORK IS RESTRICTED TO THE HOURS OF 7:00 AM TO 5:00 PM, MONDAY THROUGH FRIDAY EXCLUDING HOLIDAYS UNLESS OTHERWISE APPROVED BY THE OWNER AND THE TOWN OF SOUTH HADLEY.

CONSTRUCTION LAYOUT

1. PROVIDE PROPER TRANSITIONS BETWEEN EXISTING AND PROPOSED SITE IMPROVEMENTS. FIELD VERIFY EXISTING PAVEMENT AND GROUND ELEVATIONS AT THE INTERFACE WITH PROPOSED PAVEMENTS AND DRAINAGE STRUCTURES BEFORE START OF CONSTRUCTION.
2. PRIOR TO ORDERING MATERIALS AND BEGINNING CONSTRUCTION, FIELD VERIFY PROPOSED UTILITY ROUTES AND IDENTIFY ANY INTERFERENCES OR OBSTRUCTIONS WITH EXISTING UTILITIES OR PUBLIC RIGHTS-OF-WAY.
3. DIMENSIONS ARE FROM FACE OF CURB, FACE OF BUILDING, FACE OF WALL, AND CENTER LINE OF PAVEMENT MARKINGS, UNLESS NOTED OTHERWISE.
4. BOUNDS OR MONUMENTATION DISTURBED DURING CONSTRUCTION SHALL BE SET OR RESET BY A PROFESSIONAL LICENSED SURVEYOR.
5. BE RESPONSIBLE FOR THE MAINTENANCE AND SAFETY OF TRAFFIC ON THE PUBLIC AND PRIVATE WAYS AFFECTED BY THE CONSTRUCTION OF THIS PROJECT.
6. CONSTRUCT ACCESSIBLE ROUTES, PARKING SPACES, RAMPS, SIDEWALKS AND WALKWAYS IN CONFORMANCE WITH THE FEDERAL AMERICANS WITH DISABILITIES ACT AND WITH MASSACHUSETTS ARCHITECTURAL ACCESS BOARD AND LOCAL LAWS AND REGULATIONS (WHICHEVER ARE MORE STRINGENT).

UTILITIES

1. TERMINATE EXISTING UTILITIES IN CONFORMANCE WITH LOCAL, STATE AND INDIVIDUAL UTILITY COMPANY STANDARD SPECIFICATIONS AND DETAILS. COORDINATE UTILITY SERVICE DISCONNECTS WITH UTILITY REPRESENTATIVES.
2. THE TYPE, SIZE AND LOCATION OF DEPICTED UNDERGROUND UTILITIES ARE APPROXIMATE REPRESENTATIONS OF INFORMATION OBTAINED FROM FIELD LOCATIONS OF VISIBLE FEATURES, EXISTING MAPS AND PLANS OF RECORD, UTILITY MAPPING, AND OTHER SOURCES OF INFORMATION OBTAINED BY THE ENGINEER. ASSUME NO GUARANTEE AS TO THE COMPLETENESS, SERVICEABILITY, EXISTENCE, OR ACCURACY OF UNDERGROUND FACILITIES. FIELD VERIFY THE EXACT LOCATIONS, SIZES, AND ELEVATIONS OF THE POINTS OF CONNECTIONS TO EXISTING UTILITIES.
3. IMMEDIATELY INFORM THE ENGINEER IN WRITING IF EXISTING UTILITY CONDITIONS CONFLICT OR DIFFER FROM THOSE INDICATED AND IF THE WORK CANNOT BE COMPLETED AS INDICATED.
4. PAY ALL FEES AND COSTS ASSOCIATED WITH UTILITY MODIFICATIONS AND CONNECTIONS, REGARDLESS OF THE ENTITY THAT PERFORMS THE WORK.
5. COORDINATE THE WORK AND WORK SCHEDULE WITH UTILITY COMPANIES. PROVIDE ADEQUATE NOTICE TO UTILITIES TO PREVENT DELAYS IN CONSTRUCTION.
6. INSTALL PROPOSED PRIVATE UTILITY SERVICES ACCORDING TO THE REQUIREMENTS PROVIDED BY, AND APPROVED BY THE AUTHORITY HAVING JURISDICTION (WATER, SEWER, GAS, TELEPHONE, ELECTRIC, FIRE ALARM, ETC.). COORDINATE FINAL DESIGN LOADS AND LOCATIONS WITH OWNER AND ARCHITECT.
7. COORDINATE WITH UTILITY COMPANIES FOR THE REMOVAL/RELOCATION OF OVERHEAD WIRE AND POLES.
8. THE PLUMBING CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF DRAINAGE AND UTILITIES WITHIN 10 FEET OF BUILDING FOOTPRINT.
9. NOTIFY ABUTTING PROPERTY OWNERS AND THE TOWN OF SOUTH HADLEY A MINIMUM OF 5 BUSINESS DAYS PRIOR TO DISRUPTION OF UTILITY SERVICE.
10. ALL WATER SERVICE AND SEWER SERVICE CONNECTIONS SHALL BE COORDINATED WITH THE TOWN OF SOUTH HADLEY DEPARTMENT OF PUBLIC WORKS AND WATER DEPARTMENT.

EROSION AND SEDIMENT CONTROL

1. DISTURBANCE OF SOIL SURFACES IS REGULATED BY STATE LAW AND LOCAL ORDINANCE. WORK SHALL COMPLY WITH THE FOLLOWING CRITERIA TO PREVENT OR MINIMIZE SOIL EROSION.
2. PRIOR TO THE COMMENCEMENT OF CONSTRUCTION ACTIVITIES, INSTALL EROSION AND SEDIMENT CONTROL DEVICES AS SHOWN ON THE PLAN. MAINTAIN EROSION CONTROL DEVICES IN EFFECTIVE CONDITION DURING CONSTRUCTION.
3. INSTALL, INSPECT, MAINTAIN, AND/OR REPLACE TEMPORARY AND PERMANENT EROSION CONTROL DEVICES TO ENSURE PROPER OPERATION IN A TIMELY MANNER THROUGHOUT THE LIFE OF THE PROJECT. MAINTAIN PERMANENT MEASURES UNTIL CONSTRUCTION OF THE PROJECT IS COMPLETED OR UNTIL IT IS ACCEPTED BY THE OWNER. DISPOSE OF SEDIMENT IN AN UPLAND AREA.
   3.1. STABILIZE DISTURBED AREAS WITHIN 30 FEET OF RESOURCE AREAS WITHIN 7 DAYS OF ACHIEVING FINAL GRADES. AREAS THAT HAVE NOT ACHIEVED FINAL GRADES BUT WILL REMAIN INACTIVE FOR 7 DAYS SHALL BE TEMPORARY STABILIZED.
4. INSPECT EROSION AND SEDIMENT CONTROLS DAILY AND REMOVE ACCUMULATED SEDIMENTS AS NEEDED. REPAIR OR CORRECT ANY ISSUES, AND NOTIFY THE CONSERVATION COMMISSION IMMEDIATELY.
5. MAINTAIN A STOCKPILE OF ADDITIONAL EROSION AND SEDIMENT CONTROL DEVICES ON SITE AT ALL TIMES. AT A MINIMUM, MAINTAIN A STOCKPILE OF AT LEAST 100 FEET OR 10% OF THE TOTAL AMOUNT OF DEVICES CURRENTLY DEPLOYED AT THE SITE, WHICHEVER IS GREATER.
6. CLEAN ROADS, CONTROL DUST, AND TAKE NECESSARY MEASURES TO ENSURE THAT THE SITE AND ALL ROADS BE MAINTAINED IN A MUD- AND DUST-FREE CONDITION AT ALL TIMES THROUGHOUT THE LIFE OF THE CONTRACT. DUST CONTROL SHALL INCLUDE, BUT IS NOT LIMITED TO, WATER AND/OR CRUSHED STONE OR COARSE GRAVEL, SUBJECT TO THE APPROVAL OF THE ENGINEER.
7. VEHICLE TRAFFIC ENTERING OR EXITING THE PROJECT SITE SHALL PASS OVER CONSTRUCTION ENTRANCE(S). MAINTAIN THE CONSTRUCTION ENTRANCE(S) IN A CONDITION THAT WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO THE SURROUNDING ROADWAYS. THIS WILL REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE OR ADDITIONAL LENGTH AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED, OR TRACKED ONTO THE SURROUNDING ROADWAYS MUST BE REMOVED IMMEDIATELY.
8. INSTALL PERIMETER SEDIMENT CONTROL BARRIERS AS SHOWN ON THE SITE PLANS OR AS MAY BE REQUIRED TO PREVENT SEDIMENT FLOW TO STORM DRAINS OR SURFACE WATERS. A ROW OF STAKED HAYBALES OR A SILT FENCE SHALL ALSO BE INSTALLED AROUND ANY SOIL STOCKPILE AREAS. CLEANOUT OF ACCUMATED SEDIMENT BEHIND PERIMETER SEDIMENT CONTROL BARRIER IS NECESSARY IF ONE-HALF THE ORIGINAL HEIGHT OF THE BARRIER BECOMES FILLED WITH SEDIMENT. REPLACE BARRIER IMMEDIATELY IF BARRIER DECOMPOSED OR BECOMES INEFFECTIVE.
9. PERFORM CONSTRUCTION SEQUENCING IN SUCH A MANNER TO CONTROL EROSION AND TO MINIMIZE THE TIME THAT EARTH MATERIALS ARE EXPOSED BEFORE THEY ARE COVERED, SEEDED, OR OTHERWISE STABILIZED.
10. IF FINAL GRADING IS TO BE DELAYED FOR MORE THAN THIRTY (30) DAYS AFTER LAND DISTURBANCES CEASE, TEMPORARY VEGETATION OR MULCH SHALL BE USED TO STABILIZE SOILS. OUTSIDE OF THE GROWING SEASON, ONLY WOOD MULCH SHALL BE USED.
11. PERMANENT VEGETATIVE COVER SHALL BE APPLIED TO ALL DISTURBED AREAS THAT HAVE REACHED FINISHED GRADE AS SOON AS POSSIBLE, BUT NOT MORE THAN FOURTEEN (14) DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT AREA HAS PERMANENTLY CEASED. THE RECOMMENDED PERMANENT SEEDING DATES ARE APRIL 1 TO JUNE 15 AND AUGUST 15 TO SEPTEMBER 30.

    LIMESTONE AND FERTILIZER SHALL BE APPLIED ACCORDING TO SOIL TEST RECOMMENDATIONS OFFERED BY THE UNIVERSITY OF MASSACHUSETTS SOIL TESTING LABORATORY. IF SOIL TESTING IS NOT FEASIBLE ON SMALL OR VARIABLE SITES, OR WHERE TIMING IS CRITICAL, FERTILIZER MAY BE APPLIED AT THE RATE OF 500 POUNDS PER ACRE OR 11.5 POUNDS PER 1,000 SQUARE FEET OF 10-20-20 OR EQUIVALENT. APPLY LIMESTONE EQUIVALENT TO 50 PERCENT CALCIUM PLUS MAGNESIUM OXIDE) AS FOLLOWS: 4 TONS PER ACRE (OR 180 POUNDS PER 1,000 SQUARE FEET) FOR CLAY, CLAY LOAM AND HIGH ORGANIC SOIL; 3 TONS PER ACRE (OR 135 POUNDS PER 1,000 SQUARE FEET) FOR SANDY LOAM, LOAM, OR SILT LOAM; AND 2 TONS PER ACRE (OR 90 POUNDS PER 1,000 SQUARE FEET) LOAMY SAND OR SAND.
12. EXISTING OR PROPOSED STORMWATER DRAINAGE STRUCTURES THAT MAY BE SUBJECT TO SEDIMENTATION SHALL BE PROTECTED WITH STAKED HAYBALES, SILT FENCE, SILT SACKS, OR OTHER APPROVED MEASURES THROUGHOUT THE ENTIRE CONSTRUCTION PERIOD.
13. WASTE DISPOSAL: MATERIALS WHICH COULD BE A POTENTIAL SOURCE OF STORMWATER POLLUTION SUCH AS GASOLINE, DIESEL FUEL, HYDRAULIC OIL, ETC., SHALL BE STORED AT THE END OF EACH DAY IN A STORAGE TRAILER OR COVERED LOCATION AND TAKEN OFF-SITE AND PROPERLY DISPOSED OF. ALL TYPES OF WASTE GENERATED AT THIS SITE SHALL BE DISPOSED OF IN A MANNER CONSISTENT WITH STATE LAW AND/OR REGULATIONS.
14. CONTROL OF ALLOWABLE NON-STORMWATER DISCHARGES: IF ALLOWABLE NON-STORM WATER DISCHARGES ARE OCCURRING AT THE SITE, SUCH DISCHARGES SHALL BE VISUALLY OBSERVED AND RECORDED. THE LIST OF EXPECTED SOURCES OF ALLOWABLE NON-STORM WATER DISCHARGES FOR THIS PROJECT ARE AS FOLLOWS: (1) DISCHARGE FROM VEHICLE WASHDOWN WHERE NO DETERGENTS ARE USED, (2) EXTERNAL BUILDING WASHDOWN WHERE NO DETERGENTS ARE USED, (3) THE USE OF WATER TO CONTROL DUST, (4) FIRE HYDRANT FLUSHINGS, (5) LAWN WATERING, (6) POTABLE WATER SOURCES INCLUDING WATERLINE FLUSHINGS, (7) IRRIGATION DRAINAGE, (8) PAVEMENT WASHWATERS WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAVE NOT OCCURRED (UNLESS ALL SPILLED MATERIALS HAVE BEEN REMOVED) AND WHERE NO DETERGENTS ARE USED, AND (9) FOUNDATION OR FOOTING DRAINS WHERE FLOWS ARE NOT CONTAMINATED WITH PROCESS SUCH AS SOLVENTS OR CONTAMINATED BY CONTACT WITH SOILS WHERE SPILLS OR LEAKS OF TOXIC OR HAZARDOUS MATERIALS HAS OCCURRED.
15. GOOD HOUSEKEEPING: THE PROJECT SITE SHALL PROVIDE FOR THE MINIMIZATION OF EXPOSURE OF CONSTRUCTION DEBRIS (INCLUDING, BUT NOT LIMITED TO, INSULATION, WIRING, PAINTS AND PAINT CANS, SOLVENTS, WALL BOARD, ETC.) TO PRECIPITATION BY MEANS OF DISPOSAL AND/OR PROPER SHELTER OR COVER. CONSTRUCTION WASTE MUST BE PROPERLY DISPOSED OF IN ORDER TO AVOID EXPOSURE TO PRECIPITATION AT THE END OF EACH WORKING DAY.
16. UPON COMPLETION OF CONSTRUCTION AND ESTABLISHMENT OF PERMANENT GROUND COVER, REMOVE AND DISPOSE OF TEMPORARY EROSION CONTROL MEASURES. CLEAN SEDIMENT AND DEBRIS FROM TEMPORARY MEASURES AND FROM PERMANENT STORM DRAIN AND SANITARY SEWER SYSTEMS.

PLANTING NOTES

1. PLANTING MATERIAL SHALL BE NURSERY GROWN STOCK SUBJECT TO A.A.N. STANDARDS.
2. SUPPLY PLANTS IN QUANTITIES SUFFICIENT TO COMPLETE THE WORK SHOWN ON THE DRAWINGS AND LISTED IN THE PLANT LIST. IN THE EVENT OF A DISCREPANCY BETWEEN QUANTITIES SHOWN IN THE PLANT LIST AND THOSE REQUIRED BY THE DRAWINGS, THE LARGER NUMBER SHALL APPLY.
3. PLANTS SHALL BE APPROVED PRIOR TO INSTALLATION AND SHALL BE LOCATED ON SITE FOR THE APPROVAL OF THE LANDSCAPE ARCHITECT. INSTALLATIONS WHICH WERE NOT APPROVED BY THE LANDSCAPE ARCHITECT AND WHICH ARE SUBSEQUENTLY REQUESTED TO BE MOVED SHALL BE DONE AT NO ADDITIONAL COST TO THE OWNER.
4. PRECISE LOCATION OF ITEMS NOT DIMENSIONED ON THE PLAN ARE TO BE FIELD STAKED AND SHALL BE SUBJECT TO THE REQUIREMENTS SPECIFIED IN THE PREVIOUS NOTE.
5. SHRUB MASSINGS AND TREE PITS SHALL BE MULCHED TO A DEPTH OF 3" WITH SHREDDED PINE BARK MULCH.
6. TREES SHALL NOT BE STAKED UNLESS OTHERWISE NOTED.
7. BE RESPONSIBLE FOR DAMAGED VEGETATION AND REPLACE OR REPAIR DAMAGED MATERIAL, AT NO ADDITIONAL COST TO THE OWNER.
8. SHRUB AND GROUNDCOVER PLANTING AREAS SHALL HAVE CONTINUOUS BEDS OF TOPSOIL 12" DEEP. SOD AND HYDROSEED AREAS SHALL HAVE A MINIMUM TOPSOIL BED OF 6".
9. BE RESPONSIBLE FOR LOCATING UTILITIES IN THE FIELD. WHERE PLANT MATERIAL MAY INTERFERE WITH UTILITIES, NOTIFY THE LANDSCAPE ARCHITECT TO COORDINATE THEIR INSTALLATION.
10. FOR PLANTING SOIL MIX, SEE SPECIFICATIONS OR PLANTING DETAILS.
11. EXISTING RILL, GULLY OR CHANNEL EROSION SHALL BE FILLED WITH APPROPRIATE BACKFILL MATERIAL, FINE RAKED, SCARIFIED AND STABILIZED WITH APPROPRIATE VEGETATIVE MATERIAL AND / OR APPROPRIATE SEDIMENTATION AND EROSION CONTROL MEASURES.
12. ADJUSTMENTS IN THE LOCATION OF THE PROPOSED PLANT MATERIAL AS A RESULT OF EXISTING VEGETATION TO REMAIN SHALL BE APPROVED BY THE LANDSCAPE ARCHITECT PRIOR TO INSTALLATION.
13. BE RESPONSIBLE FOR MAINTENANCE REPAIR AND REPLACEMENT OF PLANT MATERIAL, AS REQUIRED, FOR THE DURATION OF THE PROJECT AND SUBSEQUENT WARRANTY PERIOD.
14. PLANTINGS INSTALLED IN THE DRY SUMMER MONTHS AND / OR LAWN SEEDED OUT OF SPRING OR FALL PERIODS, IF ALLOWED BY OWNER, WILL REQUIRE AGGRESSIVE IRRIGATION PROGRAMS AT NO ADDITIONAL COST, UNLESS OTHERWISE DIRECTED BY THE OWNER.
15. UPON COMPLETION OF PLANTING, REMOVE FROM SITE EXCESS SOIL, MULCH, AND MATERIALS AND DEBRIS RESULTING FROM WORK OPERATIONS. CLEAN UP SHOULD BE COMPLETED AT THE END OF EACH WORKING DAY. RESTORE TO ORIGINAL CONDITIONS DAMAGED PAVEMENTS, PLANTING AREAS, STRUCTURES AND LAWN AREAS RESULTING FROM LANDSCAPING OPERATIONS.
16. SURVEY, LOCATE, AND PROTECT TREES WITHIN AREAS SHOWN AS "EXISTING VEGETATION TO REMAIN" WITHIN THE LIMIT OF WORK FOR REVIEW BY THE LANDSCAPE ARCHITECT PRIOR TO THE START OF CLEARING OPERATIONS.
17. RESEED DISTURBED AREAS.

ABBREVIATIONS

| | |
|---|---|
| BC | BOTTOM OF CURB |
| BOT | BOTTOM |
| BW | BOTTOM OF WALL |
| CB | CATCH BASIN |
| C.L.D.I.P. | CEMENT LINED DUCTILE IRON PIPE |
| DMH | DRAINAGE MANHOLE |
| ELEV | ELEVATION |
| FF | FINISHED FLOOR |
| FG | FINISHED GRADE |
| HDPE | HIGH DENISTY POLYETHYLENE |
| HYD | HYDRANT |
| INV | INVERT |
| MAX. | MAXIMUM |
| MIN. | MINIMUM |
| OHW | OVERHEAD WIRE |
| PVC | POLYVINYL CHLORIDE |
| SMH | SANITARY SEWER MANHOLE |
| TC | TOP OF CURB |
| TF | TOP OF FRAME |
| TW | TOP OF WALL |
| TYP. | TYPICAL |

| ZONING ZONE: BUSINESS C | | |
|---|---|---|
| | REQUIRED | PROVIDED |
| FRONT YARD SETBACK | 10 FEET | 287± FEET |
| SIDE YARD SETBACK | 25 FEET | 65± FEET |
| REAR YARD SETBACK | 50 FEET | 50 FEET |
| MAXIMUM HEIGHT | 4 STORIES 60 FEET | 1 STORY |
| MINIMUM LOT AREA | 20000 SF | 408406 SF |
| MINIMUM LOT FRONTAGE | 100 FEET | 142± FEET |
| MAXIMUM BUILDING COVERAGE | 50% | 11% |
| MAXIMUM IMPERVIOUS COVERAGE | 80% | 27% |
| MAXIMUM SQ. FT. FOR ANY SINGLE USE | 65,000 SF | 44120± SF |

MAIN BUILDING W/ GARAGE & WAREHOUSE = 36600± SF
COVERED STORAGE = 7520± SF
TOTAL SITE IMPERVIOUS = 113600± SF

PARKING:
ZONING SECTION 255-86C(1)(f): USE NOT LISTED
ZONING SECTION 255-86C(2)(a): 85% OF PEAK EMPLOYEES

REQUIRED PARKING:
NUMBER OF EX. EMPLOYEES = 27 SPACES
NUMBER OF FUTURE EMPLOYEES= 9 SPACES
TOTAL PEAK EMPLOYEES = 36 SPACES
85% PEAK EMPLOYEES = 31 SPACES

PROVIDED PARKING:
EMPLOYEE PARKING = 32 SPACES
VISITORS PARKING = 13 SPACES
GARAGE PARKING = 14 SPACES
TOTAL PROVIDED = 59 SPACES

File: J:\DWG\P2025\08\06\A10\Civil\Plan\20250806A10_DET01.dwg Layout: CN-101 Plotted: 2026-03-11 11:00 AM Saved: 2026-03-02 10:52 AM User: aimee.bell

Tecton ARCHITECTS

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Client/ Contractor

SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT

85 MAIN STREET
SOUTH HADLEY, MA

Project

NEW ADMINISTRATION & OPERATIONS CENTER

65 OLD LYMAN ROAD
SOUTH HADLEY, MA

Seals

ISSUED FOR LAND AGENCY PERMITTING ONLY

COMMONWEALTH OF MASSACHUSETTS
DANIEL F. DELANY
CIVIL
NO. 43477
REGISTERED PROFESSIONAL ENGINEER
3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

GENERAL NOTES

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

CN-002

LEGEND
(SYMBOLS NOT TO SCALE)

= CATCH BASIN
= SANITARY MANHOLE
= DRAINAGE MANHOLE
= WATER MANHOLE
= TELEPHONE MANHOLE
= ELECTRIC MANHOLE
= UNKNOWN MANHOLE
= YARD DRAIN
= CABLE MANHOLE
= FLARED END SECTION
= FIRE HYDRANT
= WATER GATE VALVE
= GAS GATE VALVE
= MISC. GATE VALVE
= VENT PIPE
= FILLCAP
= WELL
= MAIL BOX
= HAND HOLE
= CONTROLLER CABINET
= ELECTRIC TRANSFORMER
= UTILITY POLE
= GUY WIRE
= CROSSWALK POLE
= LIGHT POLE
= POST
= TRAFFIC LIGHT SUPPORT POLE
= STREET SIGN
= TREE (TYP.)
= MONITOR WELL
= BORING
= ELECTRIC METER
= GAS METER
= WATER METER
= TELEPHONE
= AC UNIT
= TREE LINE
= STONE WALL
= GUIDE RAIL
= DIRECTION OF FLOW
= I.P. PROPERTY CORNER
= MONUMENT
= DRILL HOLE
= SURVEY CONTROL POINT
= FENCE LINE
= WATER LINE
= GAS LINE
= ELECTRIC LINE
= CABLE TELEVISION LINE
= OVERHEAD WIRES
= POINT OF BEGINNING
= NORTHING
= EASTING
= NOW OR FORMERLY
= HAMPDEN COUNTY REGISTRY OF DEEDS
= DELTA ANGLE
= RADIUS
= TANGENT
= LENGTH
= CHORD
= CHORD BEARING
= FRONT YARD
= SIDE YARD
= REAR YARD
= CONTROL POINT

C.B. TYPE 'C-L'
T.F.=238.04
F.L.=234.24-24"CPE
F.L.=234.39-24"CPE

N53°32'23"E
18.00'

N53°32'23"E
203.09'

S53°32'23"W
203.09'

25'

SEWER EASEMENT
AREA = 5077± S.F.

89.35'

LOADING DOCK

SHED

RETAINING WALL

N23°12'42"E
148.41'

BITUMINOUS PAVEMENT

S.M.H.
T.F.=242.11
INV.=236.04

S66°47'18"E
15.00'

N23°12'42"E
149.57'

242.93

GRASS

WOODS

S35°59'05"E
280.87'

N/F
SOUTH HADLEY REALTY TRUST
H.C.R.D. BK.4773 PG.178

DRAINAGE EASEMENT
AREA = 7431± S.F.

10'

S66°28'04"E
18.69'

RIPRAP

N53°32'23"E
193.61'

15'

BITUMINOUS DRIVE

FENCE LINE

C.P. #1898
bm-rc-240.66
N=10531.71
E=10319.46
ELEV.=240.66

N66°52'19"W
28.99'

N02°14'52"E
113.15'

S87°22'41"E
64.00'

N02°14'52"E
93.00'

EDGE OF WOODS

ACCESS UTILITY EASEMENT NO.1
AREA = 103,177± S.F.
TO THE TOWN OF SOUTH HADLEY
H.C.R.D. BK.5245 PG.289

PARCEL 4
N/F
BIG Y FOODS INC
H.C.R.D. BK.12464 PG.112
AREA=466,347± SQ.FT.
10.71± AC.
RECONFIGURED PARCEL 4
AREA=408,406 SQ.FT.
9.38 AC.

SNET-TCO

OLD LYMAN ROAD A.K.A. LYMAN STREET
AN 1897 COUNTY LAYOUT 49.50' WIDE
SEE COUNTY COMMISSIONERS BOOK 14, PAGE 172

S.M.H.
T.F.=242.52
INV.=234.27

S35°59'05"E
142.04'

EDGE OF WOODS

C.P. #1919
brh-rc-239.58
N=10467.96
E=10684.72
ELEV.=239.58

F.L.=239.30-12"RCP

F.L.=239.09-12"RCP

ACCESS AND UTILITY EASEMENT NO.2
AREA = 9176± S.F.
TO THE TOWN OF SOUTH HADLEY
H.C.R.D. BK.5245 PG.289

S36°29'44"E
36.71'

SHIELD-15

WIRE FENCE

S.M.H.
T.F.=240.95
INV.=235.72

N/F
DANIEL W & CAROL A GOBLE
H.C.R.D. BK.12497 PG.232

S07°10'26"W
256.42'

CHAINLINK FENCE

S87°28'08"E
8.16'
= 00°38'59"
= 1380.06'
= 7.82'
= 15.65'
= 15.65'
= S 88°01'17" E

O CROSSROADS
ED WITH PARCEL
QUIRED)
Q.FT.

BITUMINOUS PAVEMENT
331.10'

92.94'

EDGE OF WOODS

S02°13'55"W
228.89'

8.3'

3.75'

556.18'

S87°26'35"W

749.56'

WATER BODY
8,600± S.F.
WATER SURFACE
ELEV.=235.31'
DATE: JAN. 13, 2020

S08°41'26"W
199.92'

N/F
GENE NYZIO
H.C.R.D. BK.4049 PG.94

&
.87

GRAPHIC SCALE
30 10 0 30
1" = 30'

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Project
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65 OLD LYMAN ROAD
SOUTH HADLEY, MA

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DANIEL F. DELANY
CIVIL
NO. 45477
REGISTERED PROFESSIONAL ENGINEER
COMMONWEALTH OF MASSACHUSETTS
3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title
EXISTING CONDITIONS PLAN

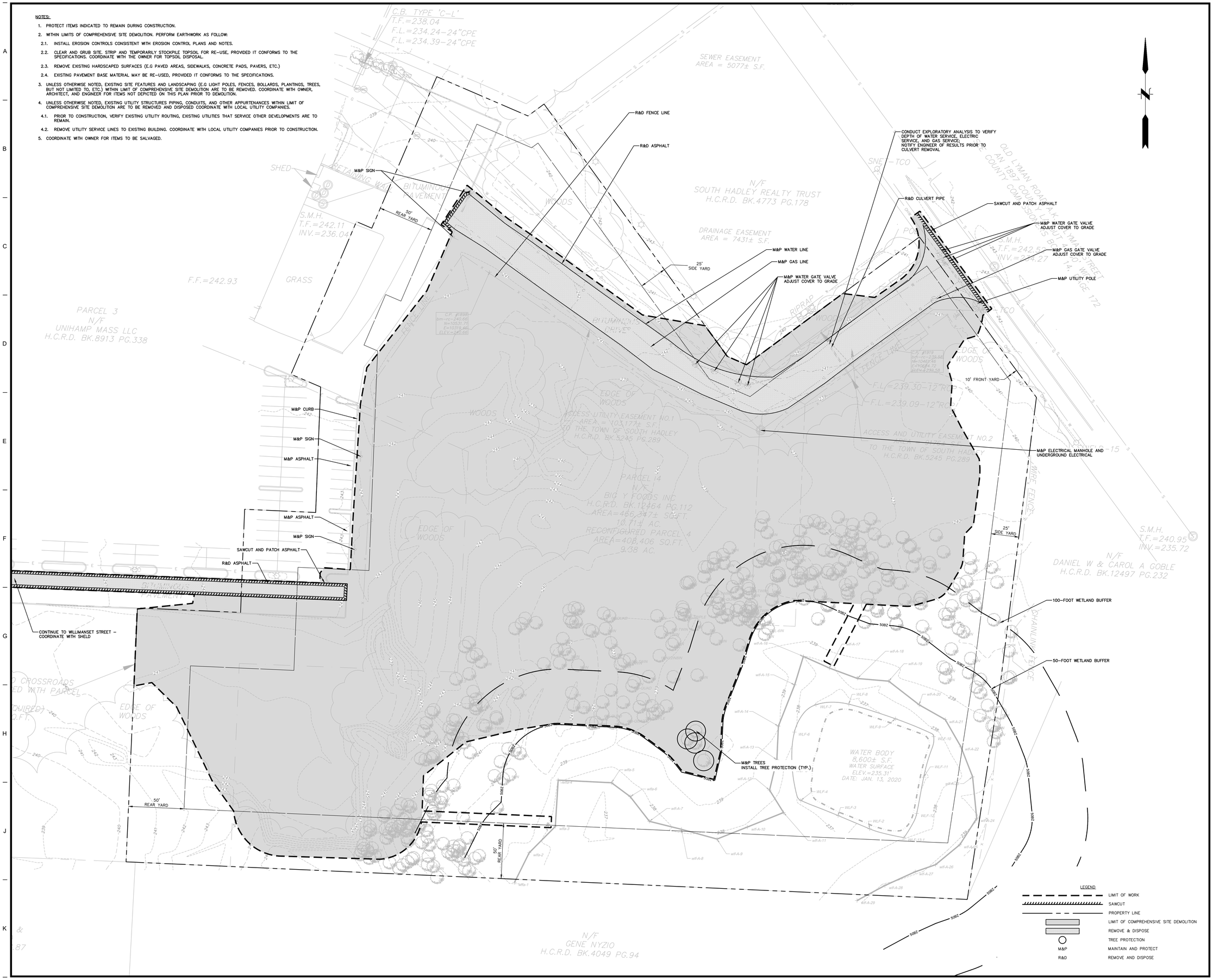
| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number
RC-101

File: J:\DWG\P\2025\0806\A10\Civil\Plan\20250806a10_EXC01.dwg Layout: RC-101 Plotted: 2026-03-11 1:14 PM Saved: 2026-03-11 1:13 PM User: Amma.Nefic
PC3: NONE STB/CTB: FO 2008 MONO.CTB

NOTES:

1. PROTECT ITEMS INDICATED TO REMAIN DURING CONSTRUCTION.
2. WITHIN LIMITS OF COMPREHENSIVE SITE DEMOLITION. PERFORM EARTHWORK AS FOLLOW:
   - 2.1. INSTALL EROSION CONTROLS CONSISTENT WITH EROSION CONTROL PLANS AND NOTES.
   - 2.2. CLEAR AND GRUB SITE. STRIP AND TEMPORARILY STOCKPILE TOPSOIL FOR RE-USE, PROVIDED IT CONFORMS TO THE SPECIFICATIONS. COORDINATE WITH THE OWNER FOR TOPSOIL DISPOSAL.
   - 2.3. REMOVE EXISTING HARDSCAPED SURFACES (E.G PAVED AREAS, SIDEWALKS, CONCRETE PADS, PAVERS, ETC.)
   - 2.4. EXISTING PAVEMENT BASE MATERIAL MAY BE RE-USED, PROVIDED IT CONFORMS TO THE SPECIFICATIONS.
3. UNLESS OTHERWSE NOTED, EXISTING SITE FEATURES AND LANDSCAPING (E.G LIGHT POLES, FENCES, BOLLARDS, PLANTINGS, TREES, BUT NOT LIMITED TO, ETC.) WITHIN LIMIT OF COMPREHENSIVE SITE DEMOLITION ARE TO BE REMOVED. COORDINATE WITH OWNER, ARCHITECT, AND ENGINEER FOR ITEMS NOT DEPICTED ON THIS PLAN PRIOR TO DEMOLITION.
4. UNLESS OTHERWSE NOTED, EXISTING UTILITY STRUCTURES PIPING, CONDUITS, AND OTHER APPURTENANCES WITHIN LIMIT OF COMPREHENSIVE SITE DEMOLITION ARE TO BE REMOVED AND DISPOSED COORDINATE WITH LOCAL UTILITY COMPANIES.
   - 4.1. PRIOR TO CONSTRUCTION, VERIFY EXISTING UTILITY ROUTING, EXISTING UTILITIES THAT SERVICE OTHER DEVELOPMENTS ARE TO REMAIN.
   - 4.2. REMOVE UTILITY SERVICE LINES TO EXISTING BUILDING. COORDINATE WITH LOCAL UTILITY COMPANIES PRIOR TO CONSTRUCTION.
5. COORDINATE WITH OWNER FOR ITEMS TO BE SALVAGED.




LEGEND

- LIMIT OF WORK
- SAWCUT
- PROPERTY LINE
- LIMIT OF COMPREHENSIVE SITE DEMOLITION
- REMOVE & DISPOSE
- TREE PROTECTION
- M&P — MAINTAIN AND PROTECT
- R&D — REMOVE AND DISPOSE

GRAPHIC SCALE

30 10 0 30

1" = 30'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Client/ Contractor

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COMMONWEALTH OF MASSACHUSETTS
DANIEL F. DELANY
CIVIL
NO. 45477
REGISTERED PROFESSIONAL ENGINEER
3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

SITE PREPARATION PLAN

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

CP-101


File: J:\DWG\P2025\0806\A10\Civil\Plan\20250806A10_DMO01.dwg Layout: CP-101 Plotted: 2026-03-11 1:17 PM Saved: 2026-03-11 11:54 AM User: Amina.Nefic
PCS: NONE STB/CTB: FO 2308 MONO.CTB

GENERAL CONSTRUCTION SEQUENCE:

CONSTRUCTION IS A DYNAMIC OPERATION THAT IS AFFECTED BY WEATHER AND OTHER UNANTICIPATED CONDITIONS. THEREFORE, THE LAYOUT OF EROSION AND SEDIMENT CONTROLS SHOWN ON THESE PLANS WILL LIKELY BE MODIFIED TO BEST MANAGE CHANGING FIELD CONDITIONS. THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS RECOGNIZE THIS. THE OWNER SHALL WORK IN CONCERT WITH THE ENGINEER, GENERAL CONTRACTOR, AND REGULATORY AGENCIES SO THAT THE INTENT OF THE GUIDELINES ARE MET UNTIL ALL DISTURBED AREAS ARE PERMANENTLY STABILIZED. THE FOLLOWING IS A GENERAL SEQUENCE OF MAJOR CONSTRUCTION OPERATIONS.

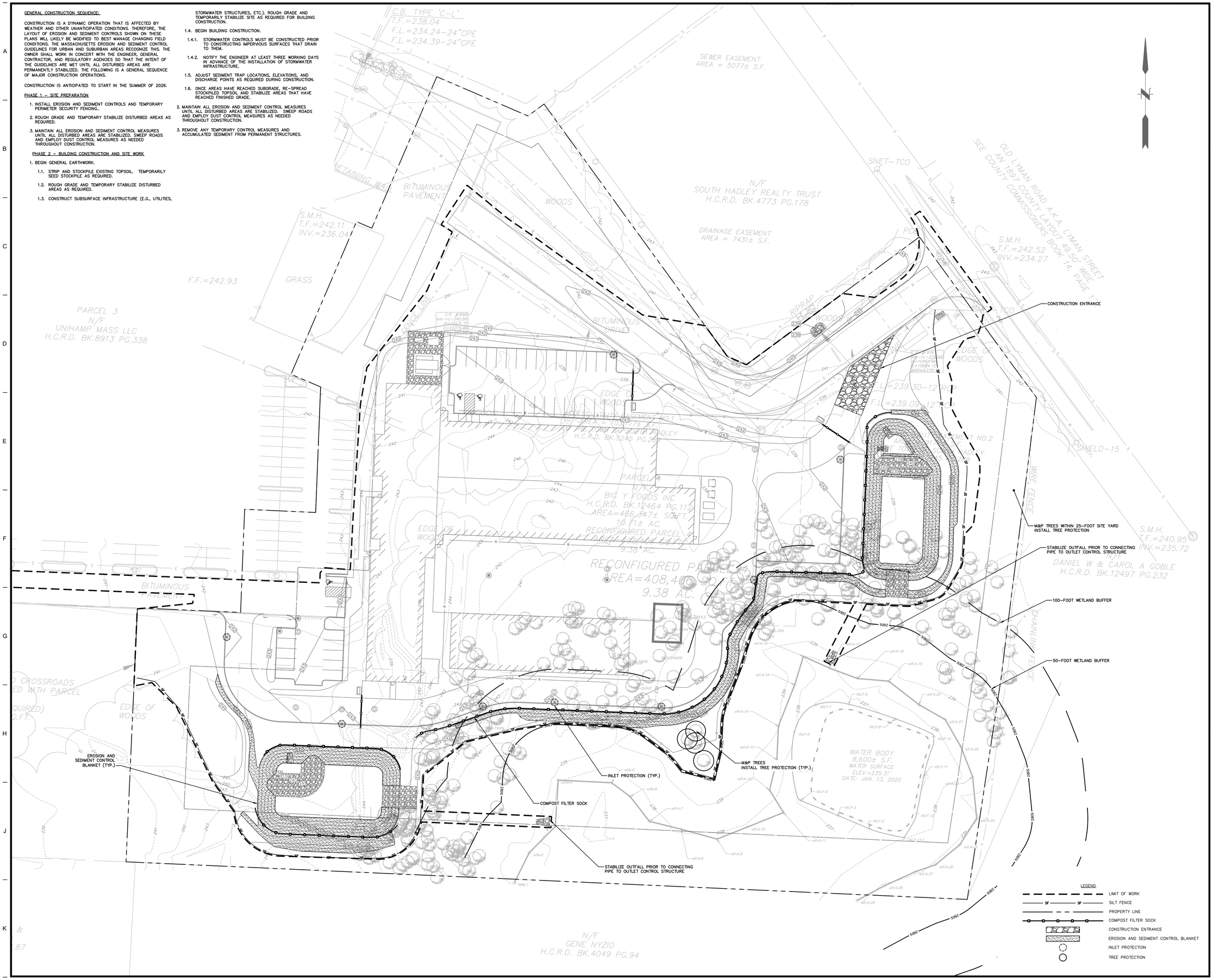
CONSTRUCTION IS ANTICIPATED TO START IN THE SUMMER OF 2026.

PHASE 1 – SITE PREPARATION

1. INSTALL EROSION AND SEDIMENT CONTROLS AND TEMPORARY PERIMETER SECURITY FENCING..
2. ROUGH GRADE AND TEMPORARY STABILIZE DISTURBED AREAS AS REQUIRED.
3. MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED. SWEEP ROADS AND EMPLOY DUST CONTROL MEASURES AS NEEDED THROUGHOUT CONSTRUCTION.

PHASE 2 – BUILDING CONSTRUCTION AND SITE WORK

1. BEGIN GENERAL EARTHWORK.
   - 1.1. STRIP AND STOCKPILE EXISTING TOPSOIL. TEMPORARILY SEED STOCKPILE AS REQUIRED.
   - 1.2. ROUGH GRADE AND TEMPORARY STABILIZE DISTURBED AREAS AS REQUIRED.
   - 1.3. CONSTRUCT SUBSURFACE INFRASTRUCTURE (E.G., UTILITIES, STORMWATER STRUCTURES, ETC.). ROUGH GRADE AND TEMPORARILY STABILIZE SITE AS REQUIRED FOR BUILDING CONSTRUCTION.
   - 1.4. BEGIN BUILDING CONSTRUCTION.
     - 1.4.1. STORMWATER CONTROLS MUST BE CONSTRUCTED PRIOR TO CONSTRUCTING IMPERVIOUS SURFACES THAT DRAIN TO THEM.
     - 1.4.2. NOTIFY THE ENGINEER AT LEAST THREE WORKING DAYS IN ADVANCE OF THE INSTALLATION OF STORMWATER INFRASTRUCTURE.
   - 1.5. ADJUST SEDIMENT TRAP LOCATIONS, ELEVATIONS, AND DISCHARGE POINTS AS REQUIRED DURING CONSTRUCTION.
   - 1.6. ONCE AREAS HAVE REACHED SUBGRADE, RE-SPREAD STOCKPILED TOPSOIL AND STABILIZE AREAS THAT HAVE REACHED FINISHED GRADE.
2. MAINTAIN ALL EROSION AND SEDIMENT CONTROL MEASURES UNTIL ALL DISTURBED AREAS ARE STABILIZED. SWEEP ROADS AND EMPLOY DUST CONTROL MEASURES AS NEEDED THROUGHOUT CONSTRUCTION.
3. REMOVE ANY TEMPORARY CONTROL MEASURES AND ACCUMULATED SEDIMENT FROM PERMANENT STRUCTURES.




GRAPHIC SCALE
30 10 0 30
1" = 30'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3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

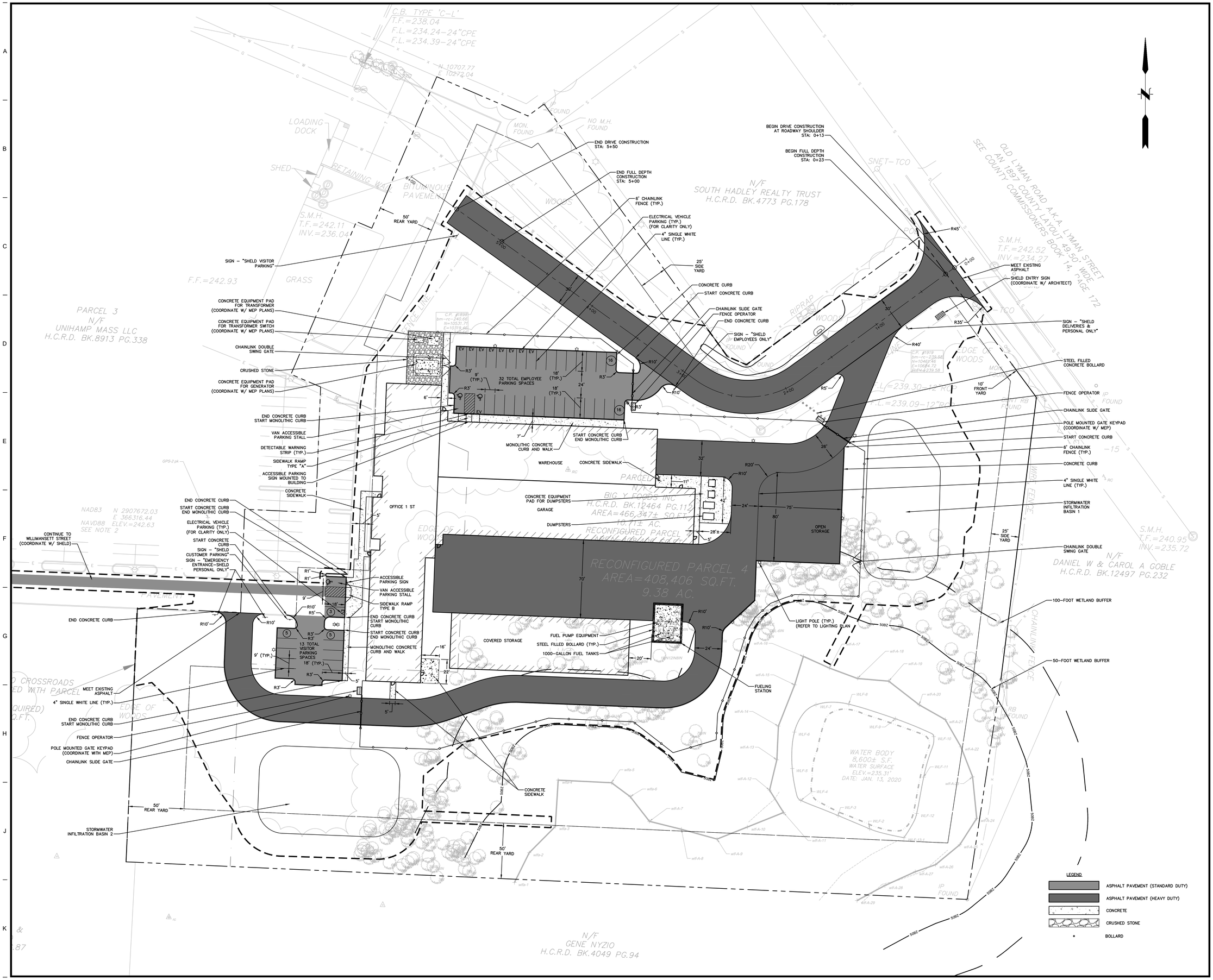
# EROSION AND SEDIMENT CONTROL PLAN

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

# CE-101


File: J:\DWG\P2025\0806\A10\Civil\Plan\20250806A10_DMO01.dwg Layout: CE-101 Plotted: 2026-03-11 1:17 PM Saved: 2026-03-11 11:54 AM User: Amina.Nefic
PC3: NONE STB:CTB: FO 2008 MONO.CTB





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GRAPHIC SCALE
30 10 0 30
1" = 30'

Seals

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REGISTERED PROFESSIONAL ENGINEER
3/11/26

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| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
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Drawing Title

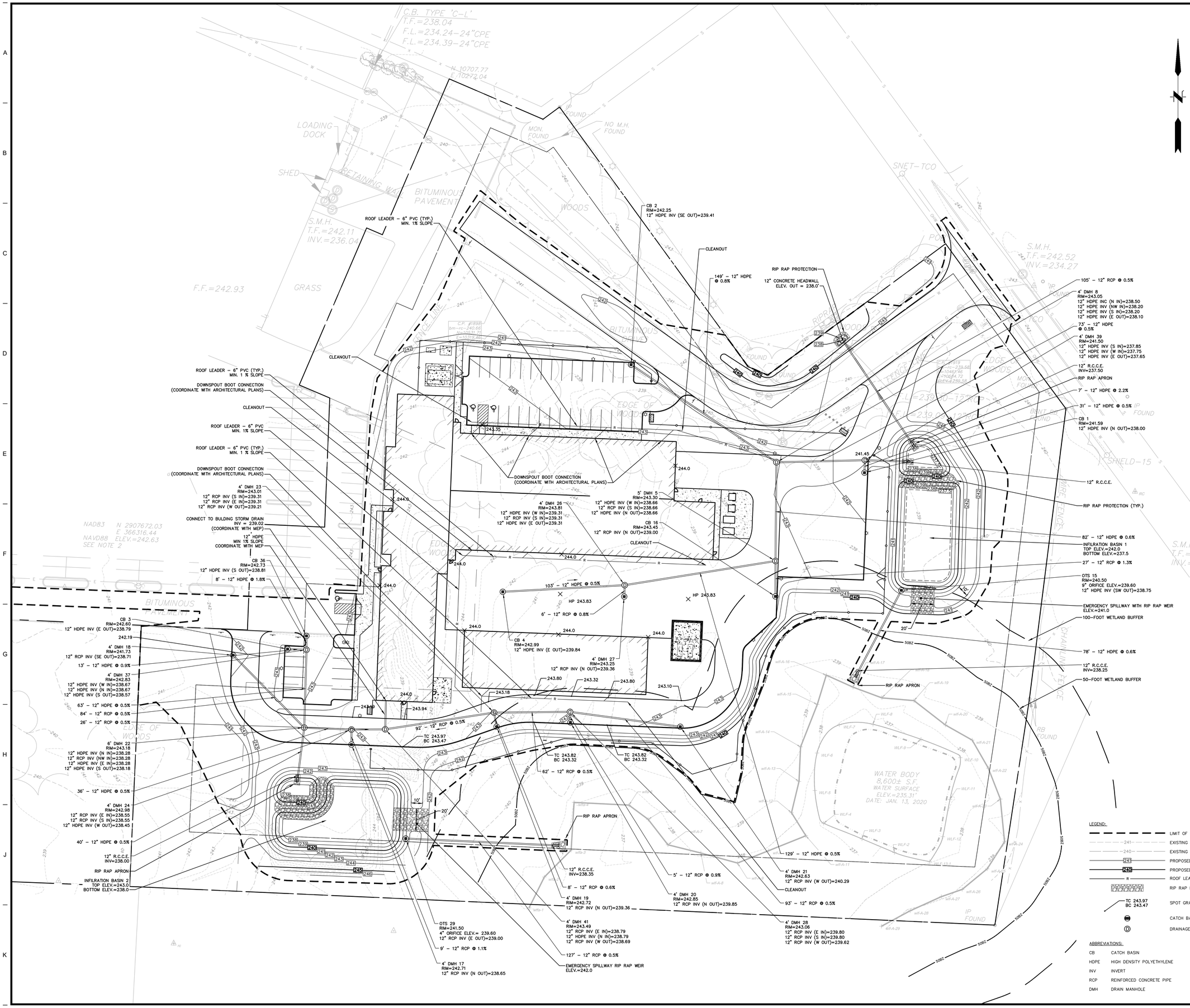
# SITE PLAN

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

# CS-101


File: J:\DWG\P2025\0806\A10\Civil\Plan\20250806A10_STP01.dwg Layout: CS-101 Plotted: 2026-03-11 11:02 AM Saved: 2026-03-11 9:58 AM User: Amina.Nefic

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Seals

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| No. | Date | Description |
|---|---|---|
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| 2 | 3/11/2026 | NOI SUBMISSION |

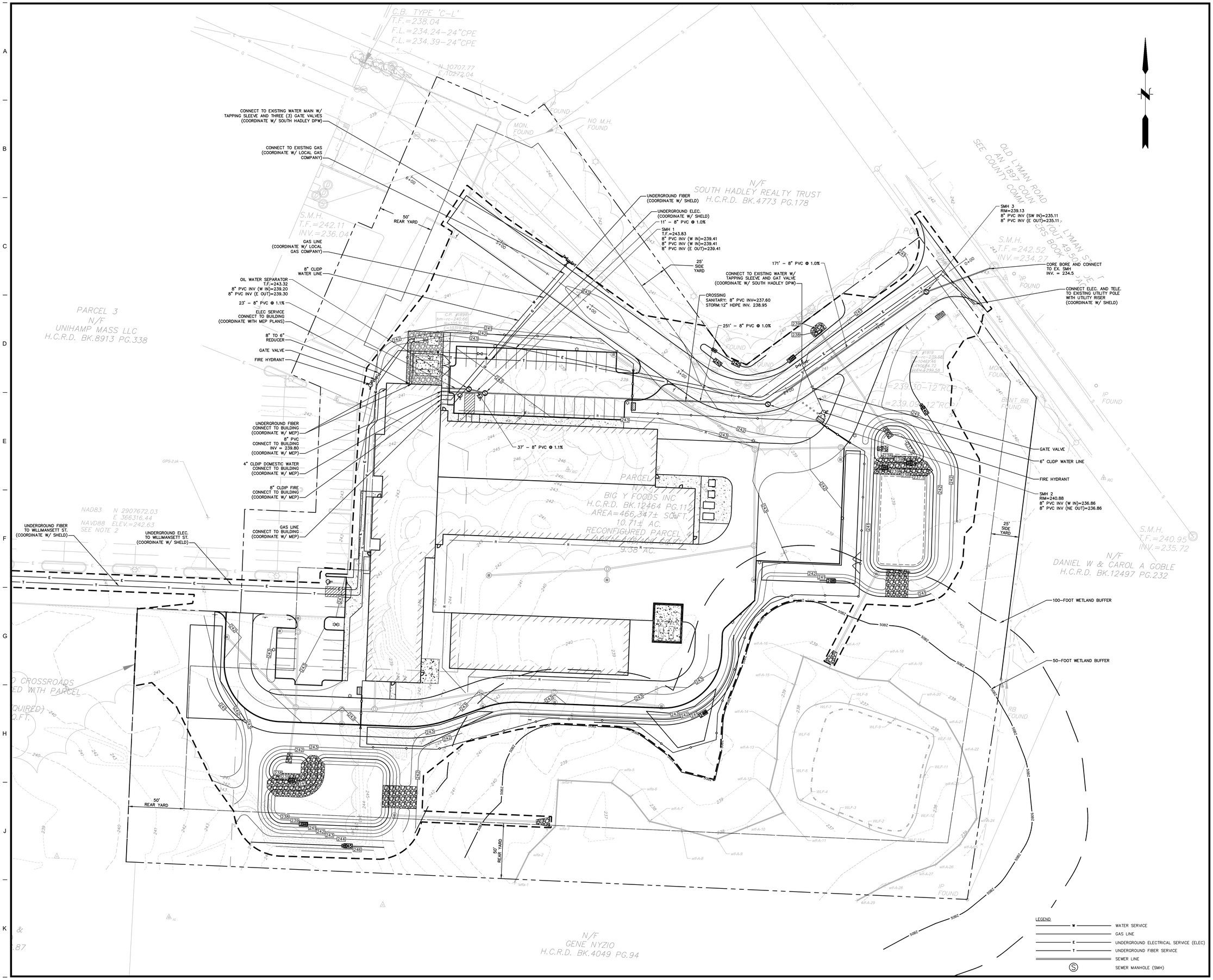
Drawing Title

**GRADING PLAN**

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

**CG-101**

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Seals

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|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

# UTILITY PLAN

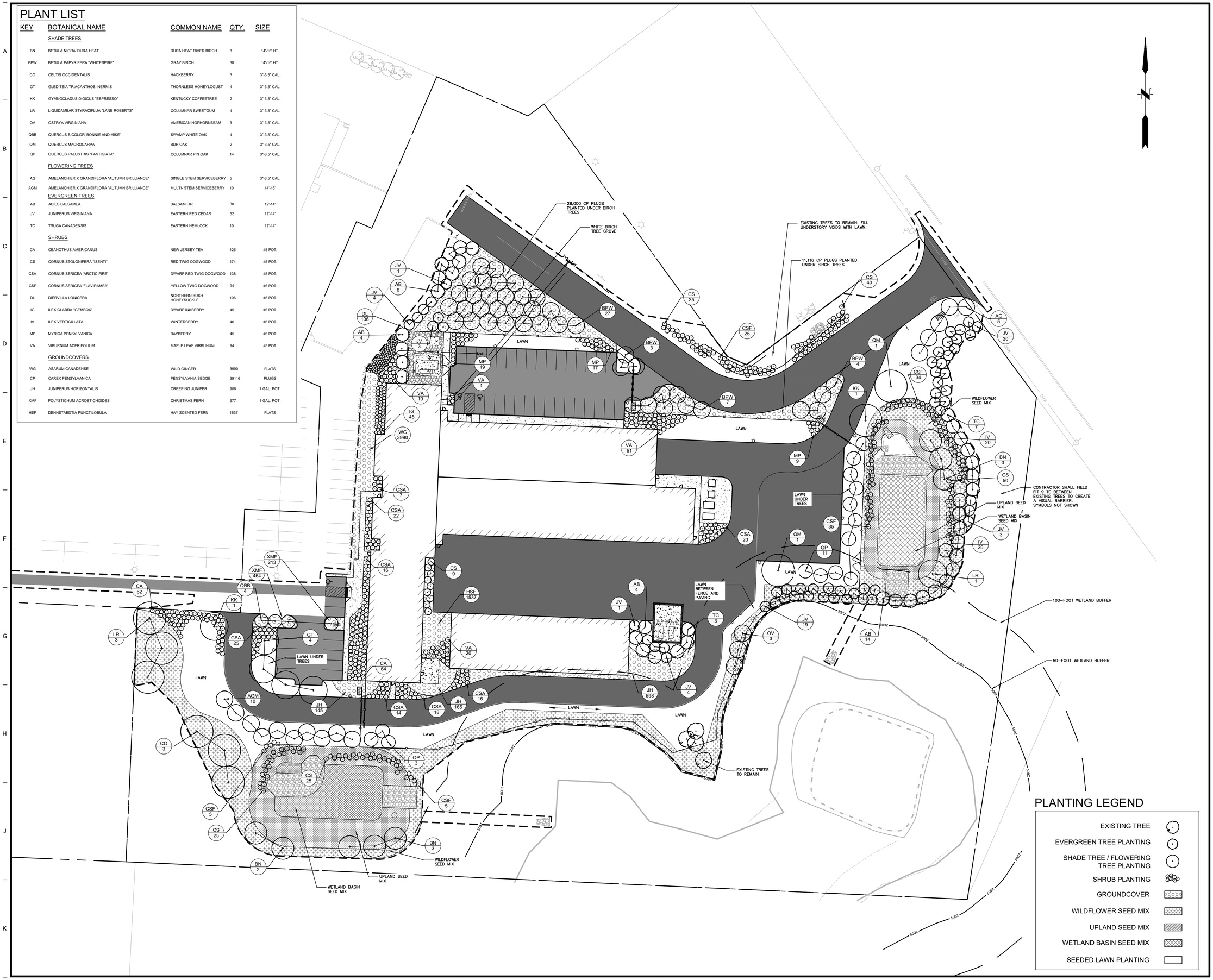
| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

# CU-101

# PLANT LIST

| KEY | BOTANICAL NAME | COMMON NAME | QTY. | SIZE |
|---|---|---|---|---|
| | SHADE TREES | | | |
| BN | BETULA NIGRA 'DURA HEAT' | DURA HEAT RIVER BIRCH | 8 | 14'-16' HT. |
| BPW | BETULA PAPYRIFERA "WHITESPIRE" | GRAY BIRCH | 38 | 14'-16' HT. |
| CO | CELTIS OCCIDENTALIS | HACKBERRY | 3 | 3"-3.5" CAL. |
| GT | GLEDITSIA TRIACANTHOS INERMIS | THORNLESS HONEYLOCUST | 4 | 3"-3.5" CAL. |
| KK | GYMNOCLADUS DIOICUS "ESPRESSO" | KENTUCKY COFFEETREE | 2 | 3"-3.5" CAL. |
| LR | LIQUIDAMBAR STYRACIFLUA "LANE ROBERTS" | COLUMNAR SWEETGUM | 4 | 3"-3.5" CAL. |
| OV | OSTRYA VIRGINIANA | AMERICAN HOPHORNBEAM | 3 | 3"-3.5" CAL. |
| QBB | QUERCUS BICOLOR 'BONNIE AND MIKE' | SWAMP WHITE OAK | 4 | 3"-3.5" CAL. |
| QM | QUERCUS MACROCARPA | BUR OAK | 2 | 3"-3.5" CAL. |
| QP | QUERCUS PALUSTRIS "FASTIGIATA" | COLUMNAR PIN OAK | 14 | 3"-3.5" CAL. |
| | FLOWERING TREES | | | |
| AG | AMELANCHIER X GRANDIFLORA "AUTUMN BRILLIANCE" | SINGLE STEM SERVICEBERRY | 5 | 3"-3.5" CAL. |
| AGM | AMELANCHIER X GRANDIFLORA "AUTUMN BRILLIANCE" | MULTI- STEM SERVICEBERRY | 10 | 14'-16' |
| | EVERGREEN TREES | | | |
| AB | ABIES BALSAMEA | BALSAM FIR | 30 | 12'-14' |
| JV | JUNIPERUS VIRGINIANA | EASTERN RED CEDAR | 52 | 12'-14' |
| TC | TSUGA CANADENSIS | EASTERN HEMLOCK | 10 | 12'-14' |
| | SHRUBS | | | |
| CA | CEANOTHUS AMERICANUS | NEW JERSEY TEA | 126 | #5 POT. |
| CS | CORNUS STOLONIFERA "ISENTI" | RED TWIG DOGWOOD | 174 | #5 POT. |
| CSA | CORNUS SERICEA 'ARCTIC FIRE' | DWARF RED TWIG DOGWOOD | 138 | #5 POT. |
| CSF | CORNUS SERICEA 'FLAVIRAMEA' | YELLOW TWIG DOGWOOD | 94 | #5 POT. |
| DL | DIERVILLA LONICERA | NORTHERN BUSH HONEYSUCKLE | 106 | #5 POT. |
| IG | ILEX GLABRA "GEMBOX" | DWARF INKBERRY | 45 | #5 POT. |
| IV | ILEX VERTICILLATA | WINTERBERRY | 40 | #5 POT. |
| MP | MYRICA PENSYLVANICA | BAYBERRY | 45 | #5 POT. |
| VA | VIBURNUM ACERIFOLIUM | MAPLE LEAF VIRBUNUM | 94 | #5 POT. |
| | GROUNDCOVERS | | | |
| WG | ASARUM CANADENSE | WILD GINGER | 3990 | FLATS |
| CP | CAREX PENSYLVANICA | PENSYLVANIA SEDGE | 39116 | PLUGS |
| JH | JUNIPERUS HORIZONTALIS | CREEPING JUNIPER | 908 | 1 GAL. POT. |
| XMF | POLYSTICHUM ACROSTICHOIDES | CHRISTMAS FERN | 677 | 1 GAL. POT. |
| HSF | DENNSTAEDTIA PUNCTILOBULA | HAY SCENTED FERN | 1537 | FLATS |




## PLANTING LEGEND

- EXISTING TREE
- EVERGREEN TREE PLANTING
- SHADE TREE / FLOWERING TREE PLANTING
- SHRUB PLANTING
- GROUNDCOVER
- WILDFLOWER SEED MIX
- UPLAND SEED MIX
- WETLAND BASIN SEED MIX
- SEEDED LAWN PLANTING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**SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT**

85 MAIN STREET
SOUTH HADLEY, MA

Project

**NEW ADMINISTRATION & OPERATIONS CENTER**

65 OLD LYMAN ROAD
SOUTH HADLEY, MA

GRAPHIC SCALE
30 10 0 30
1" = 30'

Seals

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3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |

Drawing Title

**PLANTING PLAN**

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

**LA1.01**


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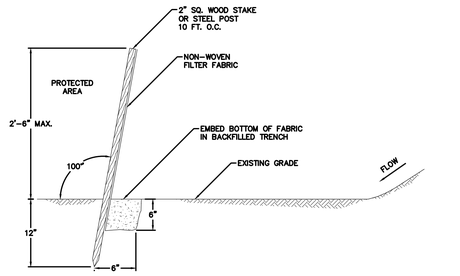
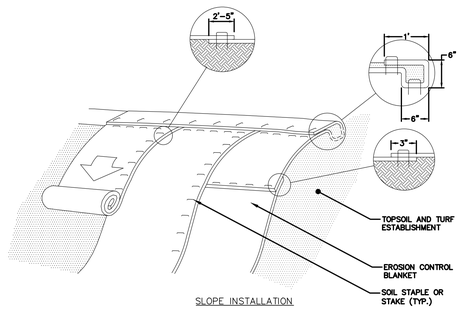
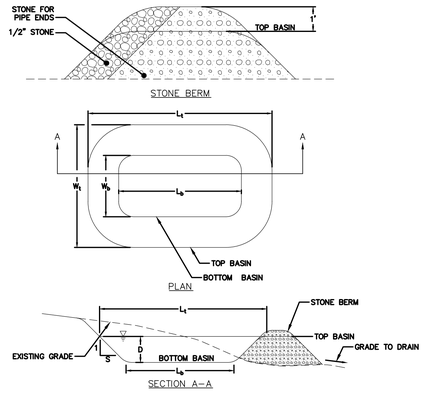



## 1 SILT FENCE
NOT TO SCALE

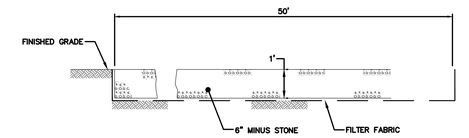



SLOPE INSTALLATION

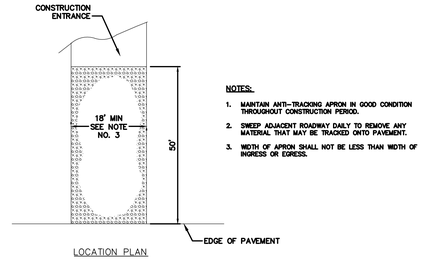



NOTES:
1. CONSTRUCT TEMPORARY SEDIMENT TRAP IN ACCORDANCE WITH THE MASSACHUSETTS EROSION AND SEDIMENT CONTROL GUIDELINES FOR URBAN AND SUBURBAN AREAS AND BASED ON ACTUAL FIELD CONDITIONS.
2. BASINS SHALL BE SIZED TO ACCOMODATE 2 INCHES OF RUNOFF PER ACRE THAT DRAIN TO THEM.
3. WHERE REQUIRED, TEMPORARY MODIFY STORMWATER STRUCTURES TO LOWER INLET ELEVATIONS TO ALLOW BASIN TO DRAIN. INSTALL INLET PROTECTION AT ALL INLETS.

## 4 TEMPORARY SEDIMENT TRAP
NOT TO SCALE



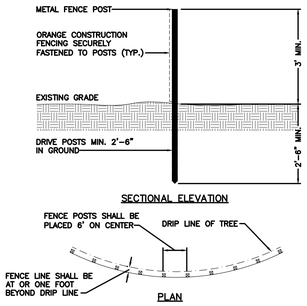

SECTION



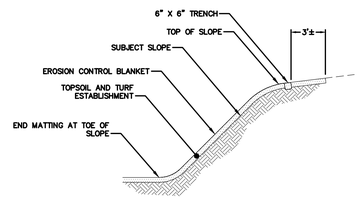

LOCATION PLAN

NOTES:
1. MAINTAIN ANTI-TRACKING APRON IN GOOD CONDITION THROUGHOUT CONSTRUCTION PERIOD.
2. SWEEP ADJACENT ROADWAY DAILY TO REMOVE ANY MATERIAL THAT MAY BE TRACKED ONTO PAVEMENT.
3. WIDTH OF APRON SHALL NOT BE LESS THAN WIDTH OF INGRESS OR EGRESS.

## 5 CONSTRUCTION ENTRANCE
NOT TO SCALE



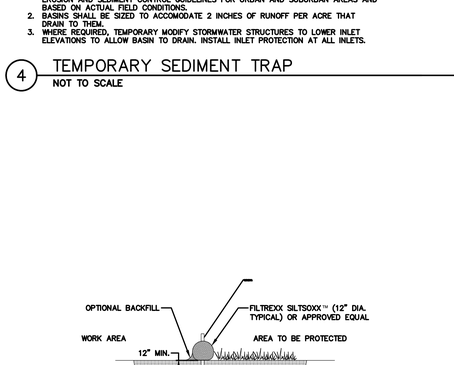

## 2 TREE PROTECTION FENCING
NOT TO SCALE




SECTION VIEW

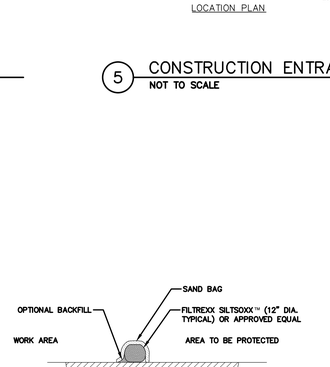
NOTES:
1. PREPARE TOPSOIL BEFORE INSTALLING BLANKET, INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
2. INSTALL IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
3. IN LOOSE SOIL CONDITIONS THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" MAY BE NECESSARY TO PROPERLY SECURE THE MATTING.

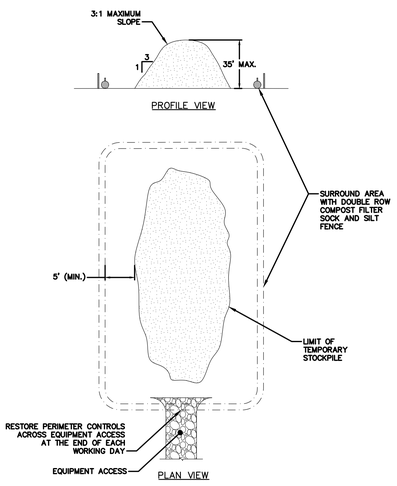
## 3 EROSION CONTROL BLANKET
NOT TO SCALE




NOTES:
1. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
2. UPON SATISFACTORY STABILIZATION OF UPGRADIENT AREAS, COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

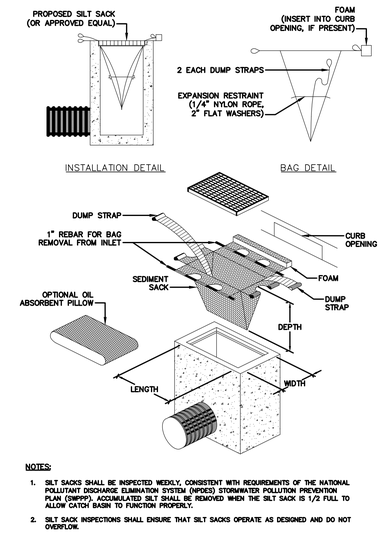
## 8 COMPOST FILTER SOCK
NOT TO SCALE




NOTES:
1. STABILIZE STOCKPILES WITH NON-INVASIVE FAST-GERMINATING SEED.

## 6 SOIL STOCKPILE AREA
NOT TO SCALE




NOTES:
1. SILT SACKS SHALL BE INSPECTED WEEKLY, CONSISTENT WITH REQUIREMENTS OF THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) STORMWATER POLLUTION PREVENTION PLAN (SWPPP). ACCUMULATED SILT SHALL BE REMOVED WHEN THE SILT SACK IS 1/2 FULL TO ALLOW CATCH BASIN TO FUNCTION PROPERLY.
2. SILT SACK INSPECTIONS SHALL ENSURE THAT SILT SACKS OPERATE AS DESIGNED AND DO NOT OVERFLOW.

## 7 INLET PROTECTION
NOT TO SCALE

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3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

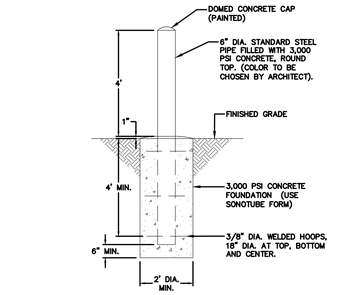
Drawing Title

**CONSTRUCTION DETAILS**

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

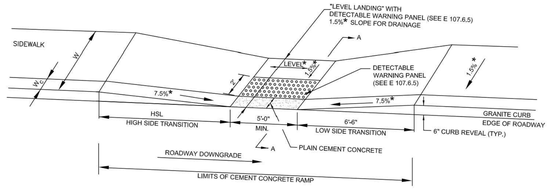
**CD-501**




NOTES:

1. BOLLARD LOCATIONS MAY REQUIRE FIELD ADJUSTMENT. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS WITH THE ENGINEER PRIOR TO CONSTRUCTION.

## 1 STEEL FILLED CONCRETE BOLLARD
NOT TO SCALE

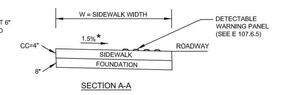



LEGEND

HSL = HIGH SIDE TRANSITION LENGTH (SEE E 107.9.0)
W = SIDEWALK WIDTH
$W_C$ = CURB WIDTH
CC = CEMENT CONCRETE
* = TOLERANCE FOR CONSTRUCTION ±0.5%

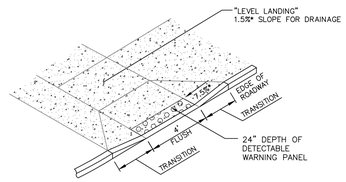
USABLE SIDEWALK WIDTH PER AAB = W-$W_C$
USABLE SIDEWALK WIDTH PER AAB IS NOT TO BE LESS THAN 4'0"
SEE E 107.6.5 FOR DETAILS OF DETECTABLE WARNING PANEL

NOTE:
ROADWAY, GUTTER, AND FIRST 6" OF SIDEWALK TO BE ADJUSTED FOR FIELD CONDITIONS



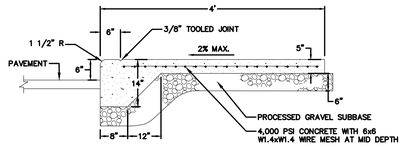

SECTION A-A

## 2 SIDEWALK RAMP TYPE "A"
NOT TO SCALE

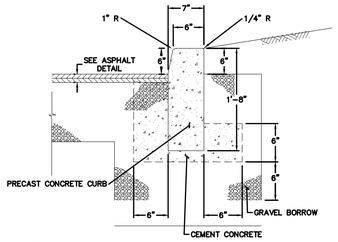



NOTE:
1. * CONSTRUCTION TOLERANCE ± 0.5%
2. REFER TO CONCRETE SIDEWALK DETAIL FOR REINFORCEMENT & JOINT DETAILS

## 3 SIDEWALK RAMP TYPE B
NOT TO SCALE

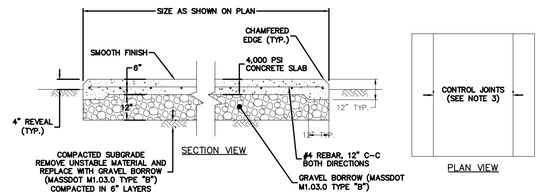



## 4 MONOLITHIC CONCRETE CURB AND WALK
NOT TO SCALE



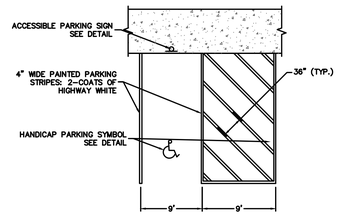

NOTES:
1. INCH DEEP BEVELED JOINT AT TOP AND FACE OF CURB.
2. FULL DEPTH EVERY 10 FEET. 1/2 INCH EXPANSION JOINT AND FILLER EVERY 30 FEET.

## 5 PRE-CAST CONCRETE CURB
NOT TO SCALE

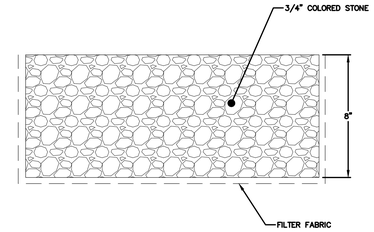



NOTES:
1. SEE MEP PLANS FOR SPECIFIC CONCRETE PAD DETAILS ASSOCIATED WITH ALL ELECTRICAL APPURTENANCES.
2. PAD REQUIREMENTS FROM EQUIPMENT MANUFACTURER SHOULD BE CONFIRMED PRIOR TO INSTALLATION.
3. CONTROL JOINTS: 8' O.C. CUT 24 HRS AFTER FINISH.
4. 4,000 PSI CONCRETE @ 28 DAYS.
5. CONCRETE PAD ON 12" COMPACTED GRAVEL BORROW, MONOLITHIC POUR.
6. SEE EQUIPMENT SUBMITTALS FOR CONDUIT STUB UP DETAILS.
7. PAD SHALL BE INSTALLED WITH 4" REVEAL TO GROUND SURFACE.
8. GRAVEL BORROW TO BE PLACED AND COMPACTED IN 6" LIFTS, COMPACTED TO 95% COMPACTION.

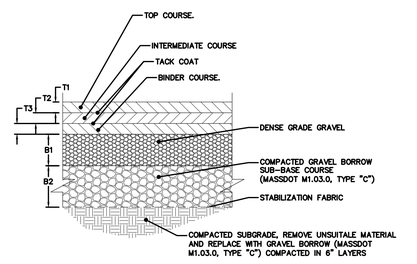
## 6 CONCRETE EQUIPMENT PAD
NOT TO SCALE




## 7 VAN ACCESSIBLE PARKING STALL
NOT TO SCALE

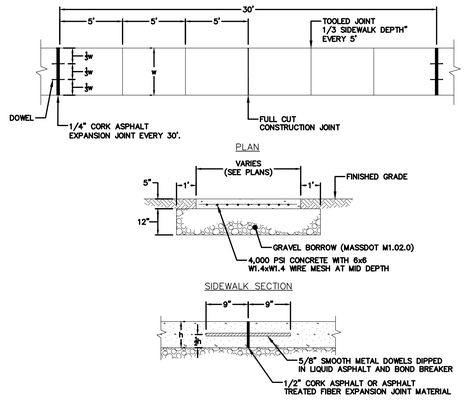



## 8 CRUSHED STONE
NOT TO SCALE



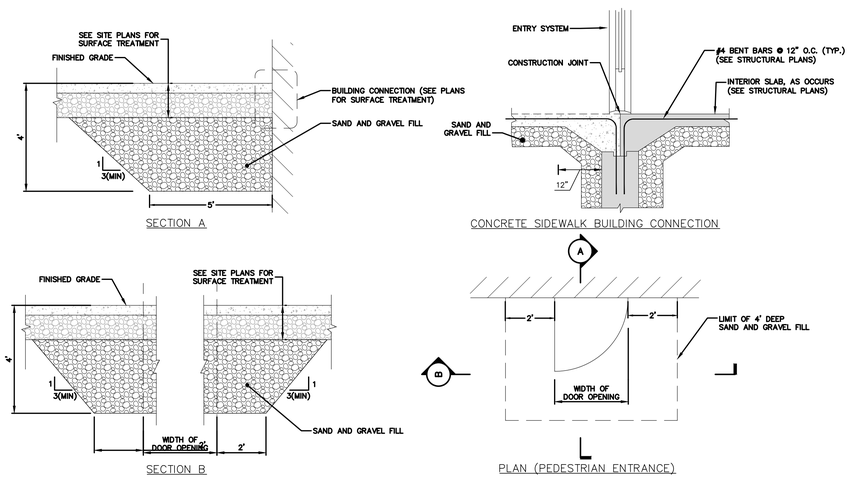

| ASPHALT TYPE | SURFACE COURSE | | INTERMEDIATE COURSE | | BASE COURSE | | B1 | B2 |
|---|---|---|---|---|---|---|---|---|
| | MASSDOT MIX DESIGNATION | T1 | MASSDOT MIX DESIGNATION | T2 | MASSDOT MIX DESIGNATION | T3 | | |
| STANDARD DUTY | SSC-12.5-P | 1-1/2" | SIC-19.0 | 1-1/2" | – | – | – | 12" |
| HEAVY DUTY | SSC-12.5-P | 2" | SIC-19.0 | 2" | – | – | 4" | 12" |
| ROADWAY PAVEMENT REPAIR | SSC-12.5-P | 2" | SIC-19.0 | 3" | SBC-37.5 | 3" | 4" | 12" |

## 9 ASPHALT PAVEMENT
NOT TO SCALE




NOTES:
1. PROVIDE TOOLED JOINT EVERY 5' (1/3 DEPTH OF SLAB).
2. REPLACE 1/4" EXPANSION JOINT IF EXISTING JOINT FALLS WITHIN RECONSTRUCTION.
3. PROVIDE JOINT SEALANT FOR EXPANSION JOINTS.

## 10 CONCRETE SIDEWALK
NOT TO SCALE




## 11 BUILDING ENTRYWAY CONNECTION
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COMMONWEALTH OF MASSACHUSETTS
DANIEL F. DELANY
CIVIL
NO. 45477
REGISTERED PROFESSIONAL ENGINEER
3/11/26

Issues / Revisions

| No. | Date | Description |
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| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

**CONSTRUCTION DETAILS**

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

**CD-502**

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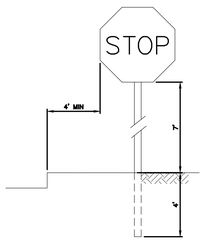
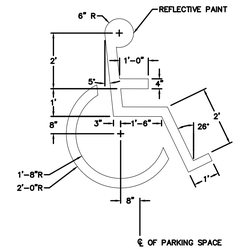



| SIGN GRAPHIC | SIGN NAME | SIZE | MUTCD REFERENCE |
|---|---|---|---|
| STOP | STOP SIGN | 24"X24" | R1-1 |
| RESERVED PARKING | ACCESSIBLE PARKING SIGN | 12"X18" | R7-8 |
| VAN ACCESSIBLE | VAN ACCESSIBLE PARKING SIGN | 12"X6" | R7-8B |

NOTE:
HIGH INTENSITY ENCAPSULATED LENS REFLECTIVE SHEETING SHALL BE USED FOR ALL SIGNS, THE 2009 "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES", THE 1990 MDPW "STANDARD DRAWINGS FOR SIGNS AND SUPPORTS", AND ALL AMENDMENTS WILL GOVERN.

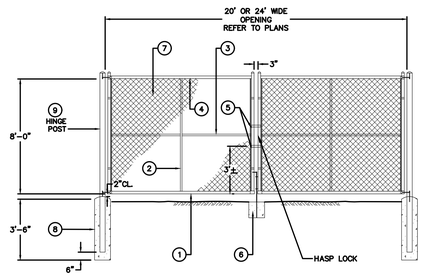
## 1 SIGNS
NOT TO SCALE




NOTES:

1. WHEELCHAIR SYMBOL PAINT SHALL CONFORM TO THE STRIPING PAINT SPECIFIED AND SYMBOL SHALL BE CENTERED IN THE STALL.
2. ALL PAVEMENT STRIPING SHALL CONFORM TO THE MOST RECENT MASSDOT SPECIFICATIONS.
3. ALL PAVEMENT STRIPING AND MARKINGS SHALL CONSIST OF CHLORINATED RUBBER PAINT APPLIED TO A DRY SURFACE WHEN THE TEMPERATURE IS GREATER THAN 40°F. PAINT SHALL BE APPLIED AT A MINIMUM OF 0.015" (15 MIL) FILM THICKNESS.

## 2 ACCESSIBLE PARKING SYMBOL
NOT TO SCALE

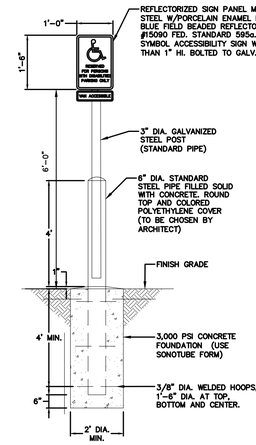



CHAIN LINK DOUBLE LEAF SWING GATE LEGEND

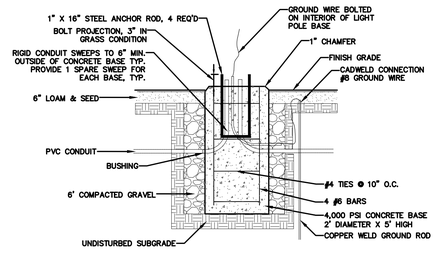
1. 2" SQUARE FRAME WELDED TO FORM FOUR SIDES OF LEAF
2. 1 1/4" SQUARE UPRIGHT BRACING WELDED TO FRAME
3. 1 1/4" SQUARE HORIZONTAL BRACING WELDED TO FRAME
4. TENSION BAR ATTACHED TO FRAME ON ALL FOUR SIDES WITH HOOK BOLTS
5. PADLOCK AND LATCH DEVICE
6. 12" DIA. x 12" DEEP CONC. COLLAR WITH STEEL PIPE FOR SET PIN. COLLAR AND PIPE SET FLUSH WITH PAVEMENT. PIPE TO DRAIN INTO GRAVEL BASE.
7. 9 GAUGE 2" WIRE MESH FABRIC (COMMERCIAL) BLACK VINYL COATED.
8. HINGE POST FOOTING SHALL BE 4,000 PSI CONCRETE. DIAMETER SHALL BE 4 TIMES POST WIDTH (MIN.)
9. SEE GATE TABLE

| GATE TABLE | |
|---|---|
| OPENING | HINGE POST |
| 20'-0" | 3" SQUARE |

## 3 CHAIN LINK DOUBLE LEAF SWING GATE
NOT TO SCALE




## 4 ACCESSIBLE PARKING SIGN
NOT TO SCALE




LIGHT POLE BASE DETAIL NOTES:
1. REUSE EXISTING LIGHT POLE BASE. IF NOT CONTRACTOR SHALL CONFIRM AND MATCH THE EXISTING FOUNDATION.

2. FOOTING SHALL BE SEATED ON DENSE, VIRGIN SUBGRADE, OR ON COMPACTED BANK RUN GRAVEL.

3. REMOVE ALL EXCESS EXCAVATED MATERIAL FROM THE SITE.

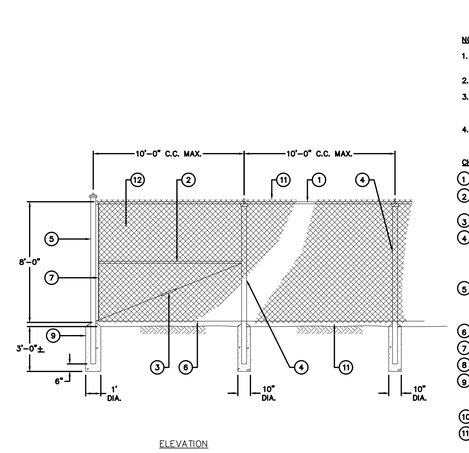
4 REINFORCING: NEW BILLET STEEL, A-615 DEFORMED, GRADE 40; ALL REINFORCING SHALL BE SECURELY TIED: 2" MINIMUM COVER OVER ALL REINFORCING BARS.

5. CONCRETE: EACH POLE BASE SHALL BE ONE MONOLITHIC POUR, MINIMUM 28-DAY STRENGTH = 4,000 PSI: MINIMUM CEMENT RATION = 7.2 BAGS/CY; MAXIMUM SLUMP 4"; CURE FOR MINIMUM OF SEVEN (7) DAYS.

6. ALL VERTICAL REINFORCING BARS SHALL BE ONE SINGLE BAR. NO SPLICING OF VERTICAL REINFORCING WILL BE ALLOWED.

7. ALL POLE BASES SHALL HAVE GROUND ROD DRIVEN ALONGSIDE AS SHOWN.

## 5 LIGHT POLE BASE
NOT TO SCALE




ELEVATION

NOTES

1. FOOTING DESIGN TO BE CHECKED BY AN ENGINEER FOR WIND LOADS IF SLATS ARE USED OR IF POOR SOIL CONDITIONS EXIST.
2. STRAIGHT RUNS BETWEEN BRACED POSTS SHALL NOT EXCEED 500 FT.
3. FENCE DETAILS ARE INTENDED AS A GUIDE ONLY. ALL FENCE MATERIALS AND CONSTRUCTION METHODS SHALL BE APPROVED BY THE ENGINEER AND FENCE MANUFACTURER.
4. ADD PRIVACY SLATS TO PROVIDE 20-50% TRANSPARENCY

CHAIN LINK FENCE LEGEND

1. 1 5/8" O.D. TOP RAIL ATTACH FABRIC WITH 6 GAUGE WIRE CLIP EVERY 24"
2. 1 5/8" O.D. BRACE FOR RAIL FENCES OVER 6 FEET HIGH AND ALL FENCES WITHOUT TOP RAIL
3. 5/16" TRUSS ROD AND TURNBUCKLE
4. INTERMEDIATE POST

| FENCE HEIGHT | SQUARE POST | ROUND POST |
|---|---|---|
| 8 FEET | 2 1/4" | 2 1/2" |

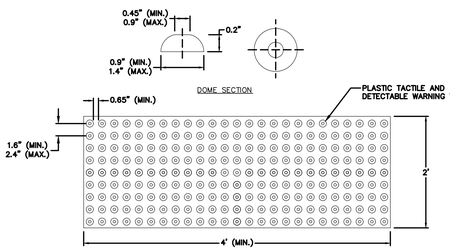
ATTACH TO C.L. FABRIC WITH CLIPS EVERY 15"

5. END OR CORNER POST

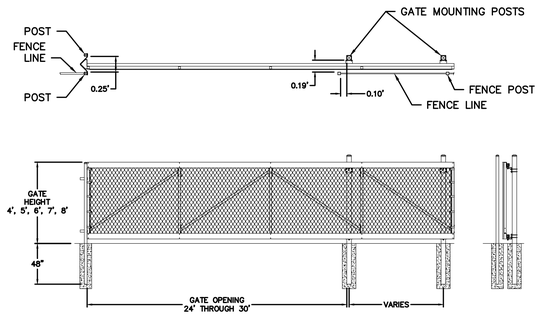
| FENCE HEIGHT | SQUARE POST | ROUND POST |
|---|---|---|
| 8 FEET | 2 1/2" | 3" |

6. 1 5/8" O.D. BOTTOM RAIL ATTACH FABRIC WITH 6 GAUGE WIRE CLIP EVERY 24"
7. TENSION ROD ATTACHED TO END OR CORNER POST
8. RESERVED.
9. 4,000 PSI CEMENT CONCRETE FOOTING 36" DEEP WITH 12" DIA. AT END POST AND 10" DIA. AT INTERMEDIATE POST. HOLE CORE IN UNDISTURBED OR COMPACTED SOIL. (SEE NOTE NO. 1)
10. RESERVED.
11. FABRIC SELVAGE:
UNDER 6 FEET SHALL BE KNUCKLED TOP AND BOTTOM
6 FEET AND OVER SHALL BE KNUCKLED BOTTOM AND TWISTED ON THE TOP
RECREATIONAL FENCING, REGARDLESS OF HEIGHT, SHALL BE KNUCKLED TOP AND BOTTOM
12. 9 GAUGE 2" WIRE MESH FABRIC (COMMERCIAL) BLACK VINYL COATED.

## 6 CHAIN LINK FENCE
NOT TO SCALE




## 7 DETECTABLE WARNING STRIP
NOT TO SCALE




NOTES:

1. VALUES SHOWN ARE NOMINAL AND NOT TO BE USED FOR INSTALLATION PURPOSES. SEE PRODUCT SPECIFICATION FOR INSTALLATION REQUIREMENTS.

## 8 CHAIN LINK SLIDE GATE
NOT TO SCALE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| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

CONSTRUCTION DETAILS

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| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

CD-503


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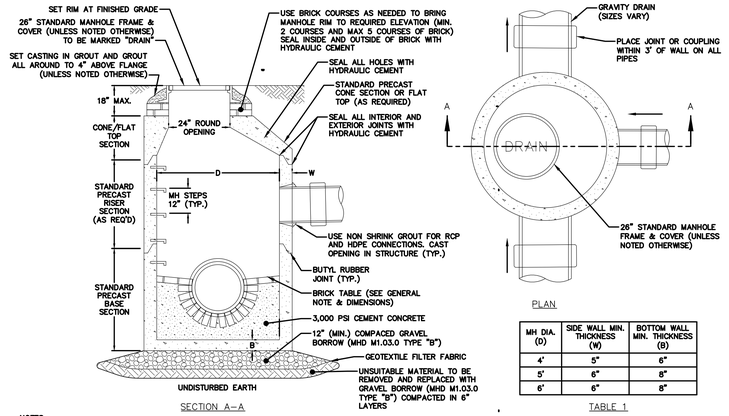



| MH DIA. (D) | SIDE WALL MIN. THICKNESS (W) | BOTTOM WALL MIN. THICKNESS (B) |
|---|---|---|
| 4' | 5" | 6" |
| 5' | 6" | 8" |
| 6' | 6" | 8" |

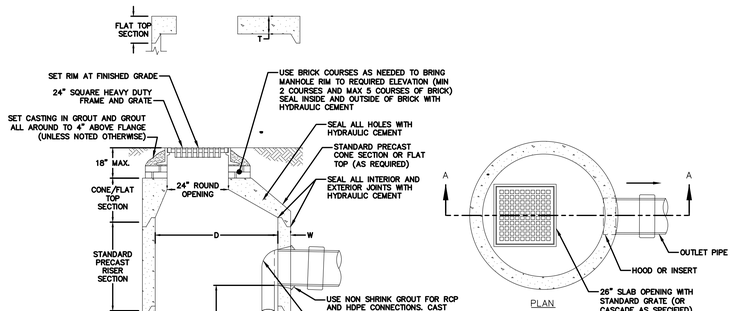
TABLE 1

NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, " STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS," LATEST EDITION.
2. GEOTEXTILE FABRIC SHALL BE INSTALLED AROUND TRENCH LIMITS TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" FOR 12"–24"; 6" FOR 30"–60".
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN F PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
6. MINIMUM COVER: MINIMUM COVER IN NON–TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. CONCRETE CAP MAY BE REQUIRED TO PREVENT FLOTATION FOR PIPE IN GROUNDWATER. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS36" MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OF TO TOP OF RIGID PAVEMENT.

## 1 DRAIN MANHOLE (DMH)

NOT TO SCALE




| MH DIA. (D) | SIDE WALL MIN. THICKNESS (W) | BOTTOM WALL MIN. THICKNESS (B) |
|---|---|---|
| 4' | 5" | 6" |
| 5' | 6" | 8" |
| 6' | 6" | 8" |

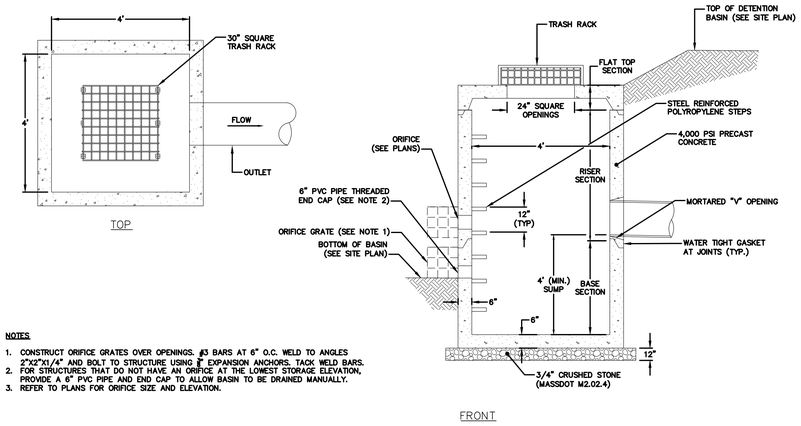
TABLE 1

NOTES:

1. ALL STRUCTURES SHALL BE SUITABLE FOR H–20 LOADING AND SHALL MEET THE REQUIREMENTS OF ASTM C478.

## 2 CATCH BASIN (CB)

NOT TO SCALE

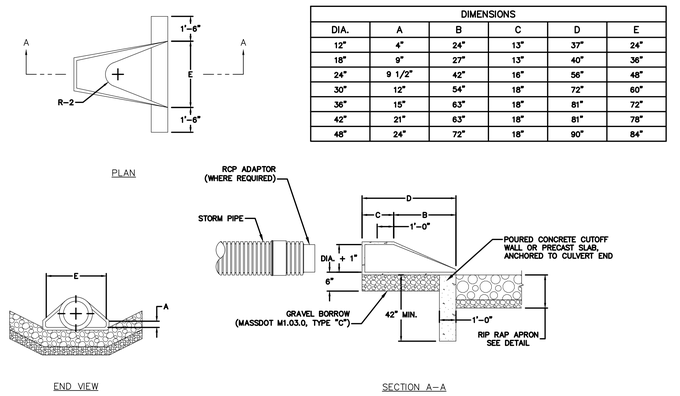



NOTES

1. CONSTRUCT ORIFICE GRATES OVER OPENINGS. #3 BARS AT 6" O.C. WELD TO ANGLES 2"X2"X1/4" AND BOLT TO STRUCTURE USING ½" EXPANSION ANCHORS. TACK WELD BARS.
2. FOR STRUCTURES THAT DO NOT HAVE AN ORIFICE AT THE LOWEST STORAGE ELEVATION, PROVIDE A 6" PVC PIPE AND END CAP TO ALLOW BASIN TO BE DRAINED MANUALLY.
3. REFER TO PLANS FOR ORIFICE SIZE AND ELEVATION.

## 3 OUTLET CONTROL STRUCTURE (OCS)

NOT TO SCALE




| DIMENSIONS | | | | | |
|---|---|---|---|---|---|
| DIA. | A | B | C | D | E |
| 12" | 4" | 24" | 13" | 37" | 24" |
| 18" | 9" | 27" | 13" | 40" | 36" |
| 24" | 9 1/2" | 42" | 16" | 56" | 48" |
| 30" | 12" | 54" | 18" | 72" | 60" |
| 36" | 15" | 63" | 18" | 81" | 72" |
| 42" | 21" | 63" | 18" | 81" | 78" |
| 48" | 24" | 72" | 18" | 90" | 84" |

## 4 REINFORCED CONCRETE CULVERT END (R.C.C.E)

NOT TO SCALE

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| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

**CD-504**

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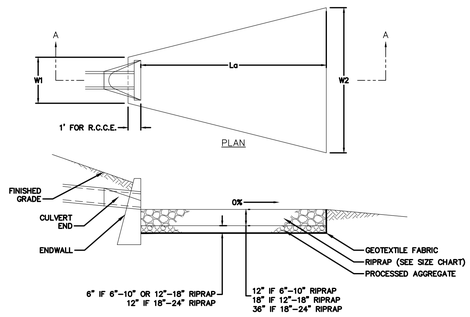



SECTION A-A

| PIPE SIZE | Lo | W1 | W2 | RIPRAP TYPE |
|---|---|---|---|---|
| 12" OR LESS | 12' | 3' | 11'-6" | 6"-10" |
| 15" | 14' | 4' | 14' | 6"-10" |
| 18" | 16' | 4'-8" | 16' | 12"-18" |
| 24" | 18' | 6' | 18' | 12"-18" |
| 30" | 18' | 7'-6" | 20'-6" | 12"-18 |
| 36" | 20' | 9' | 23' | 18"-24" |
| 42" | 22' | 10'-6" | 26' | 18"-24" |
| 48" | 26' | 12' | 30'-6" | 18"-24" |
| 54" | 28' | 13'-6" | 33'-6" | 18"-24" |
| 60" | 30' | 15' | 36' | 18"-24" |

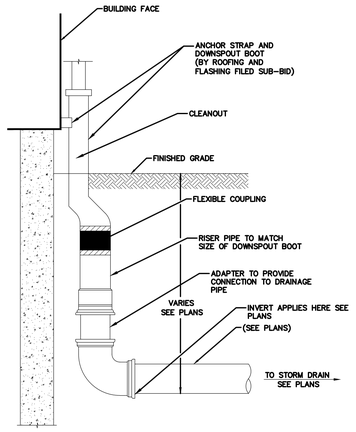
NOTE:
CALCULATION FOR APRON ARE BASED ON THE 2000 CONNDOT DRAINAGE MANUAL (REVISED DECEMBER 2003).

NOTES:

1. UNLESS OTHERWISE NOTED, INTERIOR DIAMETER (D) SHALL BE 4 FEET. AT A MINIMUM, INTERIOR DIAMETER SHALL BE 6" LARGER THAN THE LARGEST DIAMETER PIPE.
2. FRAME AND GRATE SHALL CONFORM TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONSTRUCTION STANDARD DETAILS:
   2.1. CATCH BASINS
   2.1.1. E204.2.0 WHERE ADJACENT TO CURBS.
   2.1.2. E201.6.0 AND E201.10.0 IN OTHER AREAS.
   2.2. MANHOLES
   2.2.1. E202.6.0 AND E202.8.0.
   2.2.2. MANHOLE COVERS SHALL HAVE "DRAIN" CAST INTO THE COVER.
3. CATCH BASIN HOODS SHALL CONFORM CONFORM TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONSTRUCTION STANDARD DETAILS E201.12.0.
4. STEPS SHALL CONFORM TO ASTM C478.
5. STRUCTURES SHALL BE DESIGNED FOR HS-20 LOADING.
6. REINFORCING STEEL SHALL CONFORM TO M306 AASHTO.
7. WATERTIGHT GASKET JOINTS SHALL BE BUTYL RESIN CONFORMING TO ASTM C990.
8. FLAT TOP SECTIONS ARE TO BE USED FOR STRUCTURE WITH AN INTERIOR DIAMETER (D) OF 6 FEET OR GREATER AND WHEN REQUIRED DUE TO PIPE COVER.

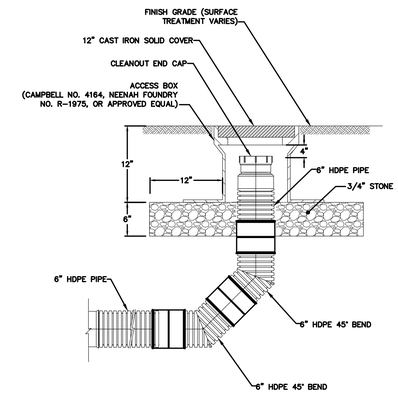
## 1 STORM STRUCTURE NOTES
NOT TO SCALE

## 2 RIP RAP APRON
NOT TO SCALE

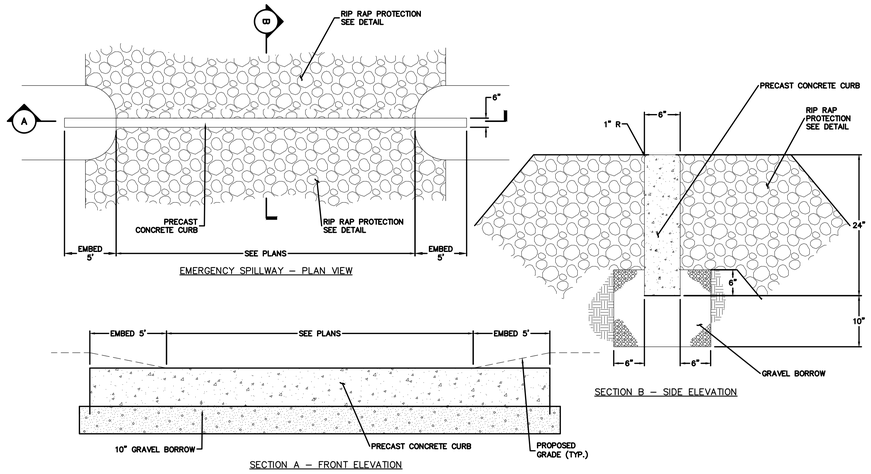



SIDE ELEVATION

## 3 DOWNSPOUT BOOT CONNECTION
NOT TO SCALE




## 4 CLEANOUT
NOT TO SCALE

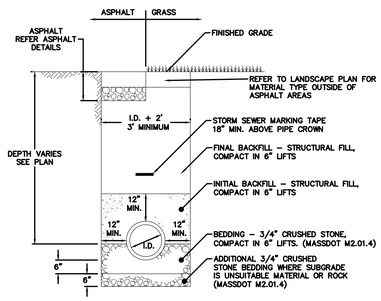



EMERGENCY SPILLWAY - PLAN VIEW

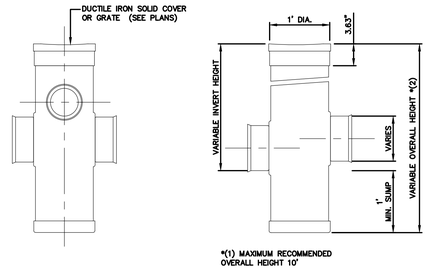
SECTION A - FRONT ELEVATION

SECTION B - SIDE ELEVATION

## 5 EMERGENCY SPILLWAY WITH RIP RAP WEIR
N.T.S.



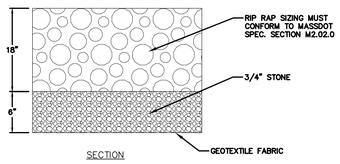

## 6 STORMWATER DRAINAGE TRENCH
NOT TO SCALE




NOTES:

1. SOLID COVERS SHALL BE 1'X1' H-20 RATED.
2. SEE PLANS FOR PIPE SIZE AND INVERTS.

## 7 YARD DRAIN (YD)
NOT TO SCALE

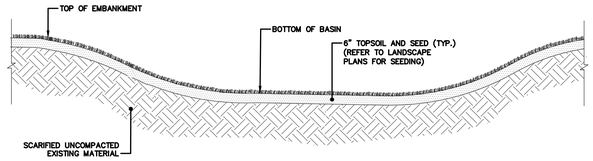



SECTION

## 8 RIP RAP PROTECTION
NOT TO SCALE

EMBANKMENT NOTES:

1. PERVIOUS BACKFILL MATERIAL FOR USE IN FILL AREAS ASSOCIATED WITH BASIN EMBANKMENTS SHALL BE COMPOSED OF SATISFACTORY ON-SITE MATERIAL OR BORROW SOIL MATERIALS WHEN SUFFICIENT SATISFACTORY SOIL MATERIALS ARE NOT AVAILABLE FROM EXCAVATIONS. SATISFACTORY ON-SITE MATERIAL SHALL HAVE SOIL CLASSIFICATION GROUPS OF GW, GP, GM, SW, SP, AND SM ACCORDING TO ASTM D 2487, OR A COMBINATION OF THESE GROUPS AND SHALL BE FREE OF ROCK OR GRAVEL LARGER THAN 3 INCHES (75 MM) IN ANY DIMENSION, DEBRIS, WASTE, FROZEN MATERIALS, VEGETATION, AND OTHER DELETERIOUS MATTER.
2. PIPE INSTALLED THROUGH EMBANKMENT SHALL INCLUDE WATER-TIGHT JOINTS.




BASIN

BASIN NOTES:
1. REFER TO LANDSCAPE PLANS FOR SEED MIX.

## 9 STORMWATER INFILTRATION BASIN AND SEDIMENT FOREBAY
N.T.S.

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| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

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**CD-505**

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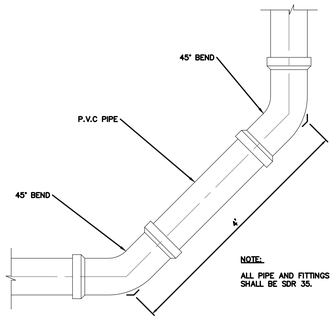
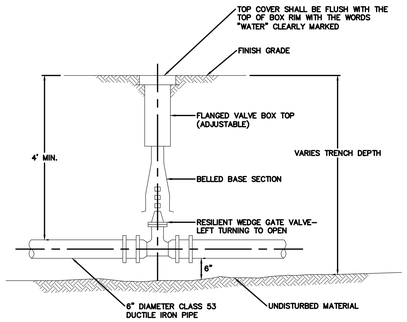
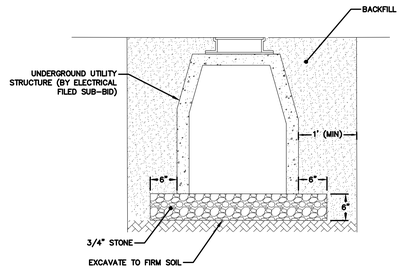



## 1 PIPE LAYOUT FOR 90° TURNS
NOT TO SCALE

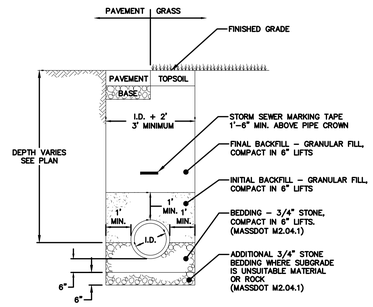



## 2 GATE VALVE
NOT TO SCALE

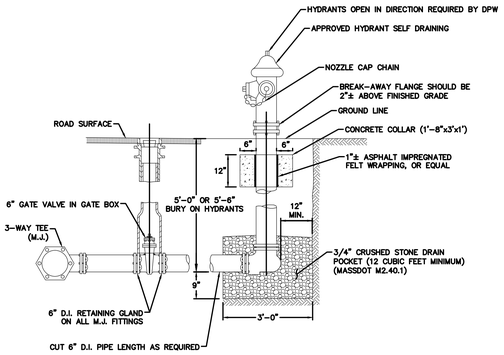



NOTES:
1. SEE ELECTRICAL PLANS FOR STRUCTURE SIZES.
2. STRUCTURES ARE FURNISHED BY THE ELECTRICAL FILED SUB–BID.
3. INSTALL THE STRUCTURE. COORDINATE WITH THE ELECTRICAL CONTRACTOR FOR EXACT PLACEMENT AND OTHER UTILITY CONNECTIONS.

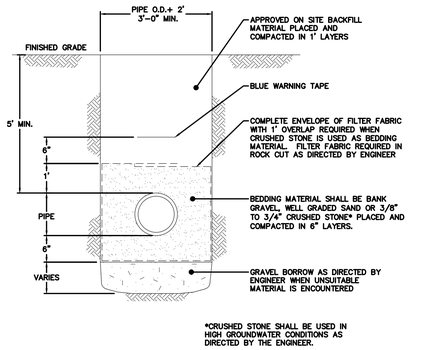
## 3 UNDERGROUND UTILITY STRUCTURE
NOT TO SCALE




## 4 SANITARY SEWER TRENCH
NOT TO SCALE

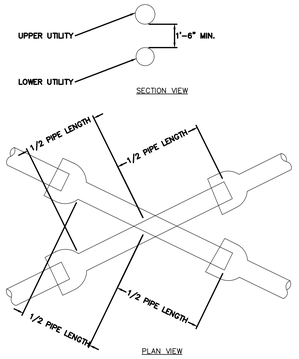



## 5 FIRE HYDRANT ASSEMBLY
NOT TO SCALE




*CRUSHED STONE SHALL BE USED IN HIGH GROUNDWATER CONDITIONS AS DIRECTED BY THE ENGINEER.

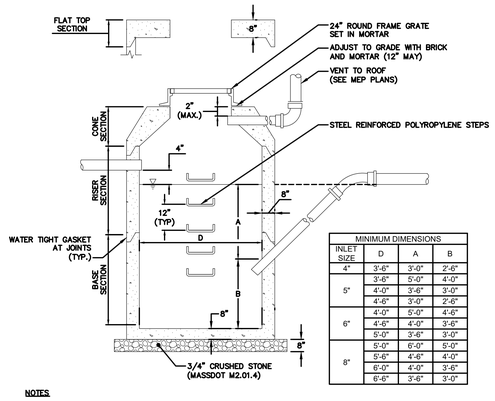
## 6 WATER MAIN TRENCH
NOT TO SCALE




NOTES

1. MAINTAIN 1'–6" MINIMUM CLEARANCE AT ALL UTILITY CROSSING WHERE POSSIBLE. LOCATE JOINTS AS FAR AWAY FROM CROSSING AS POSSIBLE.
   1.1. FOR SEWER PIPES, CUT FULL LENGTHS PIPES TO A LENGTH NO SMALLER THAN HALF THE PIPE LENGTH. MAINTAIN FACTORY BELL ENDS. DO NOT USE FLEXIBLE COUPLINGS.
   1.2. FOR WATER PIPES, CUT FULL LENGTH TO A LENGTH NO SMALLER THAN HALF THE PIPE LENGTH. PROVIDE MECHANICAL JOINTS AS NEEDED.
   1.3. FOR ELECTRIC AND TELECOM PIPES, CUT FULL LENGTH PIPES TO A LENGTH NO SMALLER THAN HALF THE PIPE LENGTH. MAINTAIN FACTORY BELL ENDS. DO NOT USE FLEXIBLE COUPLINGS.
2. IF 1'–6" OF CLEARANCE CAN NOT BE MAINTAINED, SURROUND BOTH PIPES WITH 1' OF 3,000 PSI CONCRETE FOR A LENGTH OF 10 FEET ON EITHER SIDE OF THE CROSSING OR 1' PAST THE NEAREST JOINT, WHICHEVER IS GREATER.

## 7 UTILITY CROSSING
NOT TO SCALE

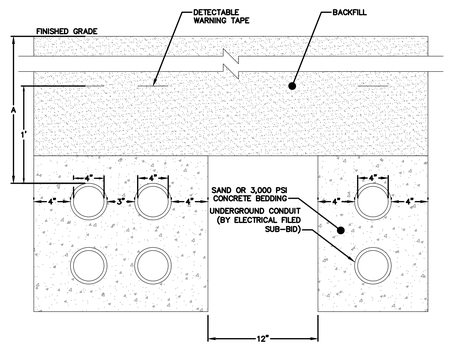



| MINIMUM DIMENSIONS | | | |
|---|---|---|---|
| INLET SIZE | D | A | B |
| 4" | 3'-6" | 3'-0" | 2'-6" |
| 5" | 3'-6" | 5'-0" | 4'-0" |
| | 4'-0" | 3'-6" | 3'-0" |
| | 4'-6" | 3'-0" | 2'-6" |
| 6" | 4'-0" | 5'-0" | 4'-6" |
| | 4'-6" | 4'-0" | 3'-6" |
| | 5'-0" | 3'-6" | 3'-0" |
| 8" | 5'-0" | 6'-0" | 5'-0" |
| | 5'-6" | 4'-6" | 4'-0" |
| | 6'-0" | 4'-0" | 3'-6" |
| | 6'-6" | 3'-6" | 3'-0" |

NOTES

1. STRUCTURE SHALL CONFORM TO 248 CMR 10: UNIFORM STATE PLUMBING CODE.
2. FRAME AND COVER SHALL CONFORM TO MASSACHUSETTS DEPARTMENT OF TRANSPORTATION CONSTRUCTION STANDARD DETAILS E202.6.0 AND E202.8.0
3. STEPS SHALL CONFORM TO ASTM C478.
4. STRUCTURE SHALL BE DESIGNED FOR HS–20 LOADING.
5. REINFORCING STEEL SHALL CONFORM TO ASTM A185.
6. WATERTIGHT GASKET JOINTS SHALL BE BUTYL RESIN CONFORMING TO ASTM C990.
7. FLAT TOP SECTIONS ARE TO BE USED FOR STRUCTURE WITH AN INTERIOR DIAMETER (D) OF 6 FEET OR GREATER AND WHEN REQUIRED DUE TO PIPE COVER.

## 8 OIL/WATER SEPARATOR
NOT TO SCALE

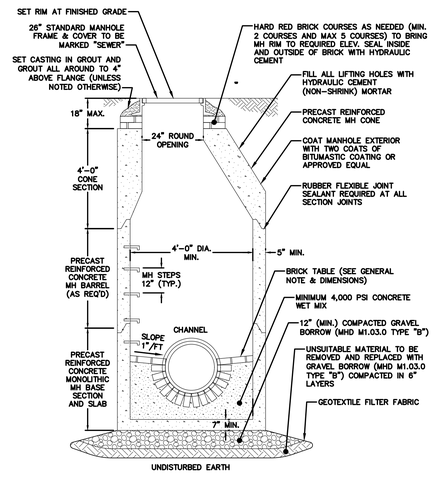



NOTES

1. INSTALL CONDUITS IN ACCORDANCE WITH LOCAL UTILITY COMPANY REGULATIONS.
2. CONCRETE BEDDING IS REQUIRED UNDER AREAS THAT WILL HAVE VEHICULAR TRAFFIC (E.G., ROADS, DRIVEWAYS, PARKING LOTS, EQUIPMENT ACCESS ROUTES, ETC.). EXTEND CONCRETE BEDDING 2' PAST EDGE OF TRAVELED WAY.
3. COORDINATE WITH ELECTRICAL CONTRACTOR PRIOR TO INSTALLATION.

| CONDUIT DEPTHS | |
|---|---|
| SERVICE | DIM "A" |
| PRIMARY | 3'–0" |
| SECONDARY | 2'–0" |
| TELEPHONE | 2'–0" |
| CABLE TV | 2'–0" |
| SITE LIGHTING | 2'–0" |

## 9 UNDERGROUND CONDUIT TRENCH
NOT TO SCALE




NOTES:

1. TYPICAL SANITARY MANHOLE TO BE 4 FEET IN DIAMETER.
2. 5'–0" DIAMETER FOR ALL MANHOLE DEPTHS GREATER THAN 12 FEET OR WHEN ORDERED BY THE ENGINEER.
3. 6" MIN. WALL THICKNESS AND 7" MIN. BASE THICKNESS WITH 5'–0" DIAMETER MANHOLES.
4. INNER EDGE OF BRICK TABLE TO BE AT ELEVATION OF CROWN OF TOP OF PIPE.
5. DESIGN LOAD – HS20
6. ALL INVERTS SHALL BE 4,000 PSI CEMENT CONCRETE IN VOID AREAS AND RED SEWER BRICK CONSTRUCTION.
7. INVERTS SHALL NOT BE BUILT ABOVE GRADE. ALL INVERTS SHALL BE BUILT IN PLACE AFTER ALL PIPES HAVE BEEN INSTALLED.
8. ALL STRUCTURES SHALL BE SUITABLE FOR H–20 LOADING AND SHALL MEET THE REQUIREMENTS OF ASTM C478.
9. MANHOLE SHALL BE VACUUM TESTED AND PRESSURE TESTED PRIOR TO BEING PLACED INTO SERVICE. ALL TESTING SHALL BE WITNESSED/COORDINATED BY SEWER DEPARTMENT.

## 10 SEWER MANHOLE (SMH)
NOT TO SCALE

Tecton ARCHITECTS

FUSS & O'NEILL
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Client/ Contractor

**SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT**

85 MAIN STREET
SOUTH HADLEY, MA

Project

**NEW ADMINISTRATION & OPERATIONS CENTER**

65 OLD LYMAN ROAD
SOUTH HADLEY, MA

Seals

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DANIEL F. DELANY CIVIL NO. 43477 REGISTERED PROFESSIONAL ENGINEER COMMONWEALTH OF MASSACHUSETTS
3/11/26

Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title

**CONSTRUCTION DETAILS**

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number

**CD-506**

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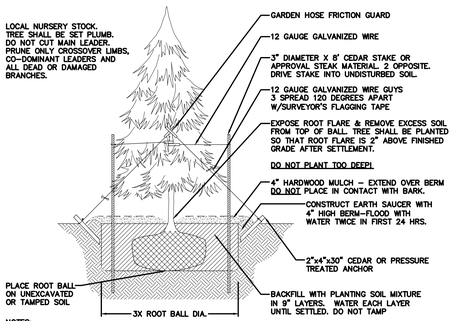
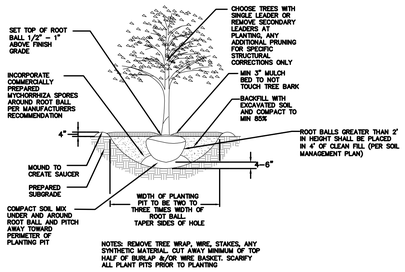


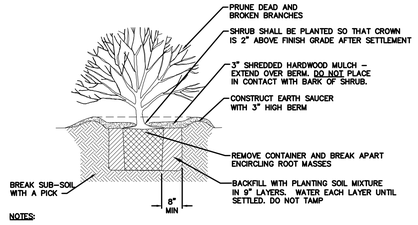

NOTES:
1. STAKES & GUYS SHALL BE REMOVED AT THE END OF THE FIRST GROWING SEASON AFTER PLANTING.
2. TIGHTEN WIRE OR CABLE ONLY ENOUGH TO KEEP FROM SLIPPING. ALLOW FOR SOME TRUNK MOVEMENT. PLASTIC HOSE SHALL BE LONG ENOUGH TO ACCOMMODATE 1–1/2" OF GROWTH AND BUFFER ALL BRANCHES FROM THE WIRE.
3. TUCK ANY LOOSE ENDS OF THE WIRE OR CABLE INTO THE WIRE WRAP SO THAT NO SHARP WIRE ENDS ARE EXPOSED.
4. TREES LESS THAN 8' HEIGHT SHALL BE STAKED.
5. TREES GREATER THAN 8' HEIGHT SHALL BE GUYED AND ANCHORED.
6. SPRAY WITH ANTIDESICCANT IN ACCORDANCE WITH MFG'S INSTRUCTIONS IF FOLIAGE IS PRESENT.
7. ALL TREES PLANTED WITHIN PARKING LOT ISLANDS SHALL BE INSTALLED WITH "ROOT BARRIER" EQUAL TO UNIVERSAL BARRIER MODEL UB–24–2 AS MAN BY DEEP ROOT. PLACE BARRIER AT PERIMETER OF ISLAND, BEHIND CURB.

1 EVERGREEN TREE PLANTING
NOT TO SCALE



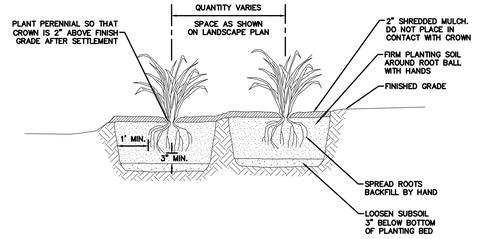

NOTES: REMOVE TREE WRAP, WIRE, STAKES, ANY SYNTHETIC MATERIAL. CUT AWAY MINIMUM OF TOP HALF OF BURLAP &/OR WIRE BASKET. SCARIFY ALL PLANT PITS PRIOR TO PLANTING

2 TREE PLANTING
NOT TO SCALE



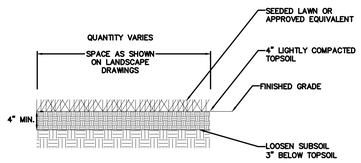

NOTES:
1. SPRAY WITH ANTI DESICCANT IN ACCORDANCE WITH MFG.'S RECOMMENDATIONS IF FOLIAGE IS PRESENT.
2. FOR CONTAINER GROWN SHRUBS, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.
3. INCORPORATE COMMERCIALLY PREPARED MYCORRHIZA SPORES IN THE SOIL IMMEDIATELY AROUND THE ROOT BALL AT RATES SPECIFIED BY THE MANUFACTURER.

3 SHRUB PLANTING FOR CONTAINERIZED SHRUBS
NOT TO SCALE




NOTES:
1. SPADED PLANTING SOIL MIX (3" BELOW ROOT BALL) ADD FERTILIZER WHEN MIXING. DO NOT COMPACT AFTER PLANTING.
2. WATER THOROUGHLY AFTER PLANTING.
3. PROVIDE WELL DRAINING SUBSOIL WHEN SOIL IS HEAVY OR COMPACTED.
4. FOR CONTAINER GROWN PLANTS, USE FINGERS OR SMALL HAND TOOLS TO PULL THE ROOTS OUT OF THE OUTER LAYER OF POTTING SOIL; THEN CUT OR PULL APART ANY ROOTS CIRCLING THE PERIMETER OF THE CONTAINER.

4 PERENNIAL PLANT BED
NOT TO SCALE




5 TYPICAL LAWN SEEDING
NOT TO SCALE

**NEW ENGLAND WETLAND PLANTS, INC**
14 Pearl Lane South Hadley, MA 01075
PHONE: 413-548-8000 FAX 413-549-4000
EMAIL: INFO@NEWP.COM WEB ADDRESS: WWW.NEWP.COM

**New England Roadside Matrix Upland Seed Mix**

| Botanical Name | Common Name | Indicator |
|---|---|---|
| *Elymus virginicus* | Virginia Wild Rye | FACW- |
| *Desmodium paniculatum* | Panicledleaf Tick Trefoil | |
| *Schizachyrium scoparium* | Little Bluestem | FACU |
| *Andropogon gerardii* | Big Bluestem | FAC |
| *Festuca rubra* | Red Fescue | FACU |
| *Sorghastrum nutans* | Indian Grass | UPL |
| *Panicum virgatum* | Switch Grass | FAC |
| *Rhus typhina* | Staghorn Sumac | |
| *Cornus racemosa* | Grey Dogwood | FAC |
| *Cornus amomum* | Silky Dogwood | FACW |
| *Oenothera biennis* | Evening Primrose | FACU- |
| *Asclepias tuberosa* | Butterfly Milkweed | NI |
| *Rudbeckia hirta* | Black Eyed Susan | FACU- |
| *Chamaecrista fasciculata* | Partridge Pea | FACU |
| *Eupatorium fistulosum (Eutrochium fistulosum)* | Hollow-Stem Joe Pye Weed | FACW |

APPLY: 35 LBS/ACRE :1250 sq ft/lb

The New England Roadside Matrix Mixes are designed for use along roads and highways. These mixes are unusual in that tey contain native grasses, wildflowers, and shrubs that are blended together as a native matrix seed mix. In areas that receive frequent mowing, the cold season grasses will dominate, such as those areas closet to the roadway shoulder. In areas farther from the road, which may be mown only once each year, or in hard to mow areas, such as around sign posts, the wildflower component will become dominant.. Along cuts and side slopes which may never be mown, the shrub component will add diversity and beauty to the roadside plantings.it is a particularly appropriate seed mix for roadsides, industrial sites, or cut and fill slopes. These mixes may be applied by hydroseeding, or by mechanical spreader. Always apply on a clean, wed-free seed bed. After sowing, lightly rake or roll the site to improve seed-to-soil contact. Best results are obtained with a mid-late spring seeding.summer seeding will benefit from a light mulching of clean, weed-free straw to conserve soil moisture

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

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**New England Erosion Control/Restoration Mix For Detention Basins and Moist Sites**

| Botanical Name | Common Name | Indicator |
|---|---|---|
| *Elymus riparius* | Riverbank Wild Rye | FACW |
| *Schizachyrium scoparium* | Little Bluestem | FACU |
| *Festuca rubra* | Red Fescue | FACU |
| *Andropogon gerardii* | Big Bluestem | FAC |
| *Panicum virgatum* | Switch Grass | FAC |
| *Vernonia noveboracensis* | New York Ironweed | FACW+ |
| *Agrostis perennans* | Upland Bentgrass | FACU |
| *Bidens frondosa* | Beggar Ticks | FACW |
| *Eupatorium maculatum (Eutrochium maculatum)* | Spotted Joe Pye Weed | OBL |
| *Eupatorium perfoliatum* | Boneset | FACW |
| *Aster novae-angliae (Symphyotrichum novae-anglia* | New England Aster | FACW- |
| *Scirpus cyperinus* | Wool Grass | FACW |
| *Juncus effusus* | Soft Rush | FACW+ |

APPLY: 35 LBS/ACRE :1250 sq ft/lb

The New England Erosion Control/Restoration Mix for Detention Basins and Moist Sites contains a selection of native grasses and wildflowers designed to colonize generally moist, recently disturbed sites where quick growth of vegetation is desired to stabilize the soil surface. It is an appropriate seed mix for ecologically sensitive restorations that require stabilization as well as long-term establishment of native vegetation. This mix is particularly appropriate for detention basins that do not hold standing water. Many of the plants in this mix can tolerate infrequent inundation, but not constant flooding. The mix may be applied by hand, by mechanical spreader, or by hydro-seeder. After sowing, lightly rake, roll or cultpack to insure good seed-to-soil contact. Best results are obtained with a Spring or late Summer seeding. Late Fall and Winter dormant seeding requires an increase in the application rate. A light mulching of clean, weed-free straw is recommended

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

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14 Pearl Lane South Hadley, MA 01075
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**New England Wildflower Mix**

| Botanical Name | Common Name | Indicator |
|---|---|---|
| *Schizachyrium scoparium* | Little Bluestem | FACU |
| *Sorghastrum nutans* | Indian Grass | UPL |
| *Chamaecrista fasciculata* | Partridge Pea | FACU |
| *Elymus virginicus* | Virginia Wild Rye | FACW- |
| *Elymus canadensis* | Canada Wild Rye | FACU+ |
| *Festuca rubra* | Red Fescue | FACU |
| *Asclepias tuberosa* | Butterfly Milkweed | NI |
| *Vernonia noveboracensis* | New York Ironweed | FACW+ |
| *Oenothera biennis* | Evening Primrose | FACU- |
| *Aster novae-angliae (Symphyotrichum novae-anglia* | New England Aster | FACW- |
| *Rudbeckia hirta* | Black Eyed Susan | FACU- |
| *Solidago juncea* | Early Goldenrod | |
| *Eupatorium fistulosum (Eutrochium fistulosum)* | Hollow-Stem Joe Pye Weed | FACW |
| *Aster lateriflorus (Symphyotrichum lateriflorum)* | Starved/Calico Aster | FACW |

APPLY: 23 LBS/ACRE :1900 sq ft/lb

New England Wetland Plants, Inc. may modify seed mixes at any time depending upon seed availability. The design criteria and ecological function of the mix will remain unchanged. Price is $/bulk pound, FOB warehouse, Plus SH and applicable taxes.

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85 MAIN STREET
SOUTH HADLEY, MA

Project
**NEW ADMINISTRATION & OPERATIONS CENTER**
65 OLD LYMAN ROAD
SOUTH HADLEY, MA

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COMMONWEALTH OF MASSACHUSETTS
DANIEL F. DELANY
CIVIL
NO. 45477
REGISTERED PROFESSIONAL ENGINEER
3/11/26

Issues / Revisions

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|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |
| 2 | 3/11/2026 | NOI SUBMISSION |

Drawing Title
CONSTRUCTION DETAILS

| | | | |
|---|---|---|---|
| Project Manager: | PF | Project No: | 20250806.A10 |
| Project Architect: | TECTON | Production Leader: | |
| Project Designer: | ATB, AN, RK | Peer Reviewer: | AG, DD |

Drawing Number
CD-507

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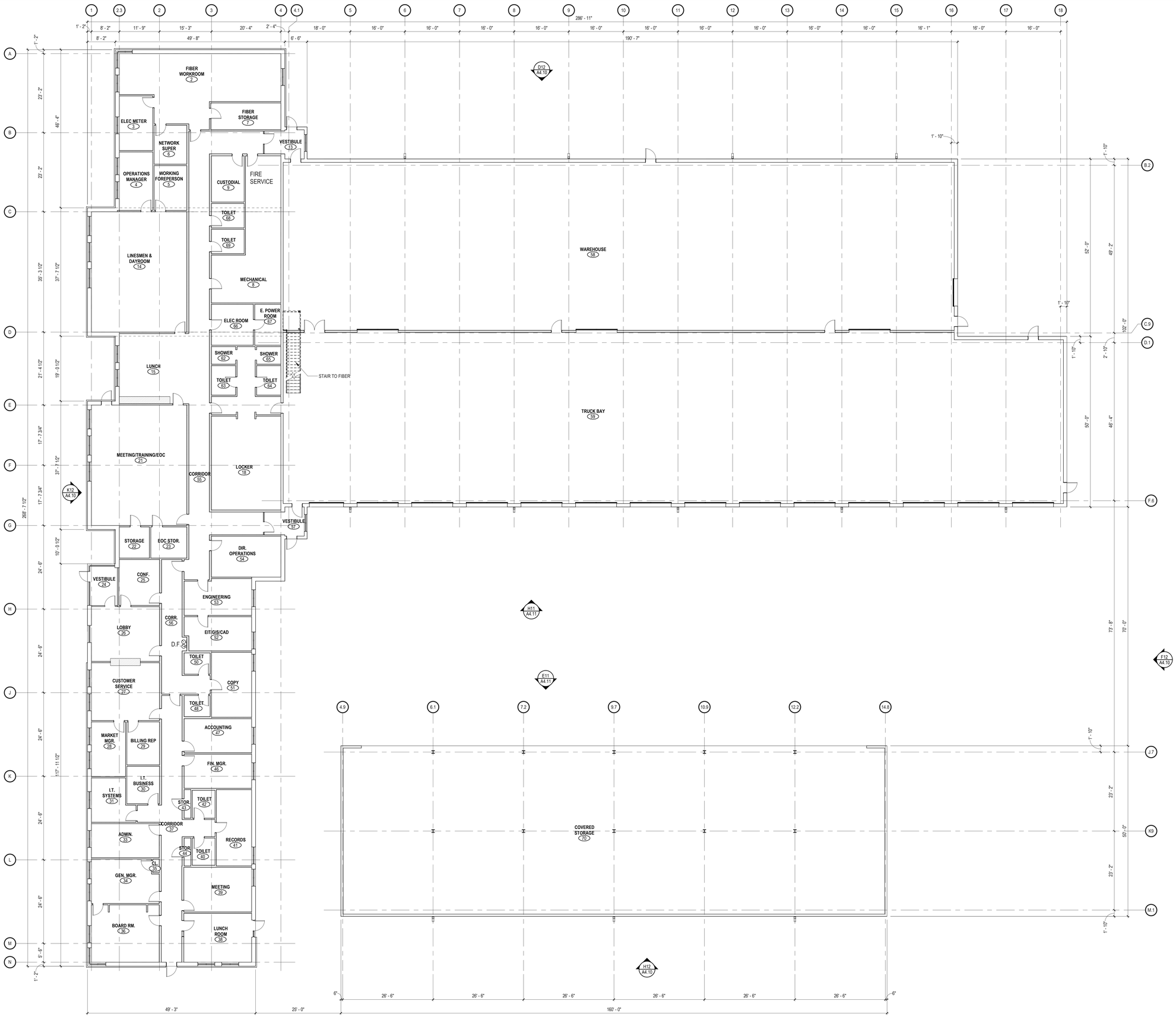


K12 **OVERALL FIRST FLOOR PLAN**
3/32" = 1'-0"

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85 MAIN STREET
SOUTH HADLEY, MA

Project

**NEW ADMINISTRATION & OPERATIONS CENTER**

65 OLD LYMAN ROAD
SOUTH HADLEY, MA

PROJECT NORTH

Seals

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|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |

Drawing Title

FIRST FLOOR OVERALL PLAN

| | |
|---|---|
| Project Manager: | Project No:Project Number |
| Project Architect: | Production Leader: |
| Project Designer: | Peer Reviewer: |

Drawing Number

A2.01

## K12 ROOF OVERALL PLAN

3/32" = 1'-0"

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Seals

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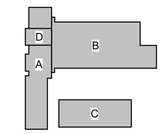



Issues / Revisions

| No. | Date | Description |
|---|---|---|
| 1 | 3/2/2026 | LAND AGENCY SUBMISSION |

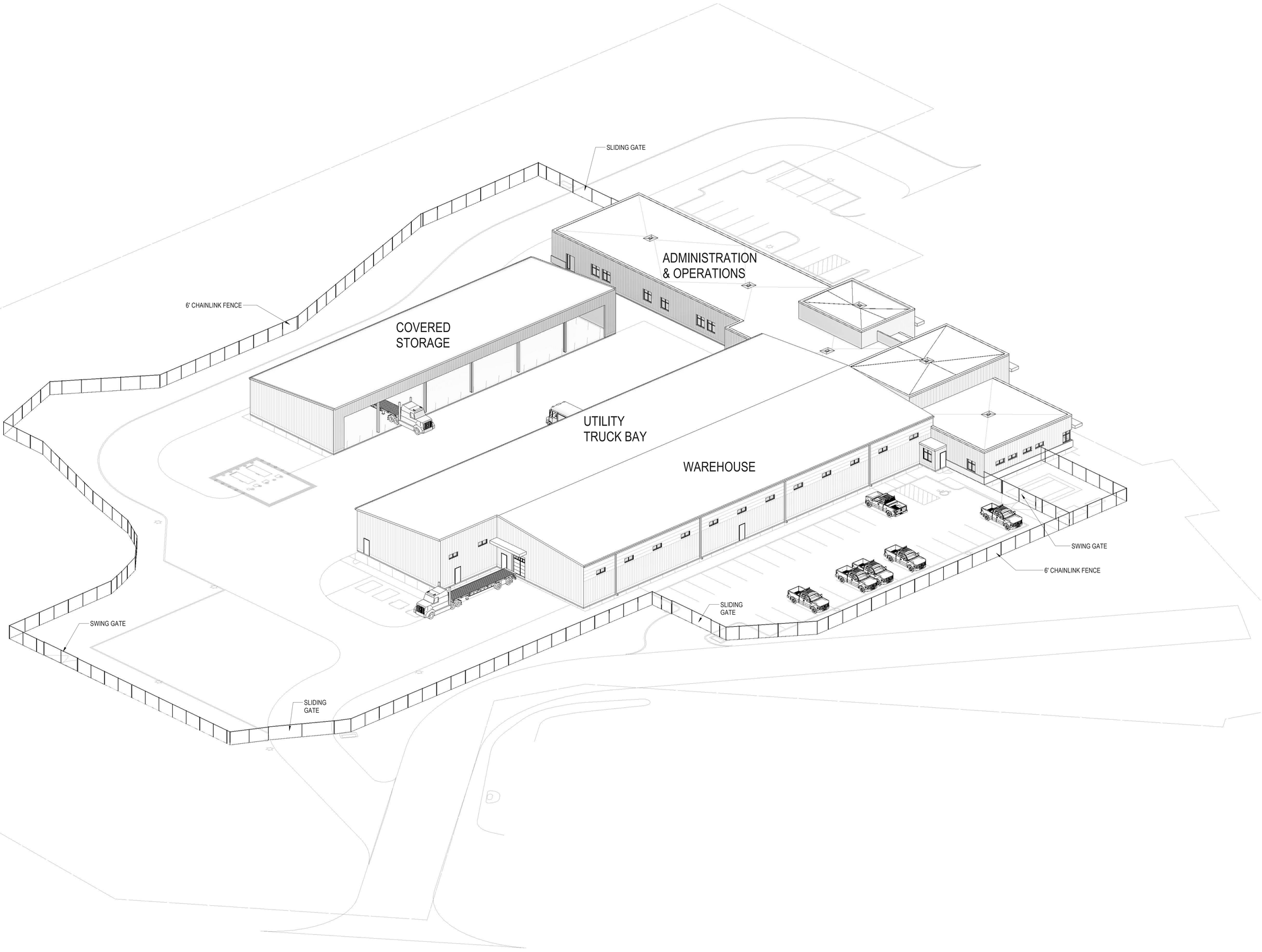
Drawing Title

ROOF OVERALL PLAN

| | |
|---|---|
| Project Manager: | Project No:Project Number |
| Project Architect: | Production Leader: |
| Project Designer: | Peer Reviewer: |

Drawing Number

A2.03




## k12 ROOF 3D VIEW 1

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Tecton ARCHITECTS

Client/ Contractor

**SOUTH HADLEY ELECTRIC LIGHT DEPARTMENT**

85 MAIN STREET
SOUTH HADLEY, MA

Project

**NEW ADMINISTRATION & OPERATIONS CENTER**

65 OLD LYMAN ROAD
SOUTH HADLEY, MA

Seals

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3D AERIAL VIEW

| | |
|---|---|
| Project Manager: | Project No:Project Number |
| Project Architect: | Production Leader: |
| Project Designer: | Peer Reviewer: |

Drawing Number

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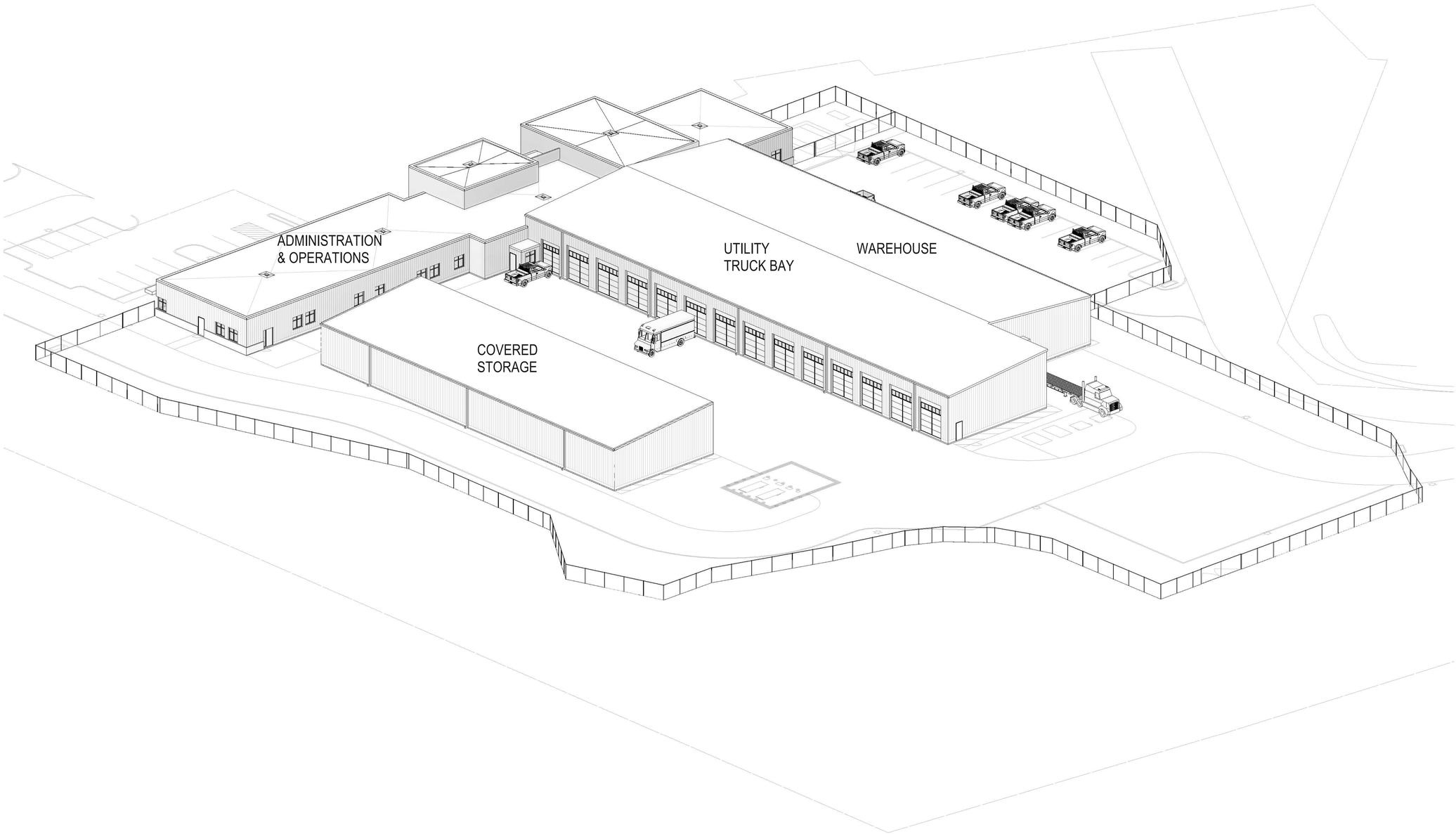


## K12 ROOF 3D VIEW 2

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| | |
|---|---|
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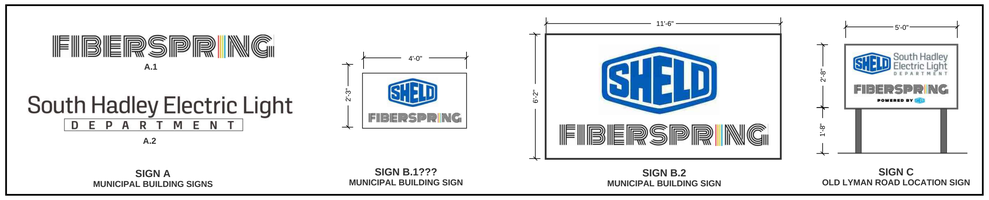
| Project Architect: | Production Leader: |
| Project Designer: | Peer Reviewer: |

Drawing Number

A2.05




**SIGN A**
MUNICIPAL BUILDING SIGNS

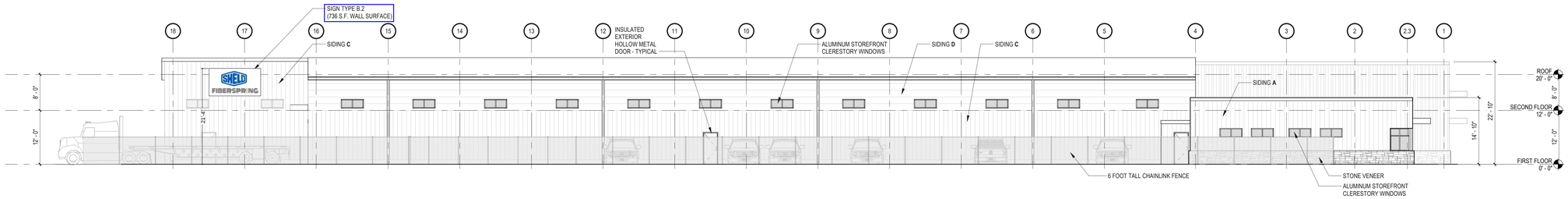
**SIGN B.1???**
MUNICIPAL BUILDING SIGN

**SIGN B.2**
MUNICIPAL BUILDING SIGN

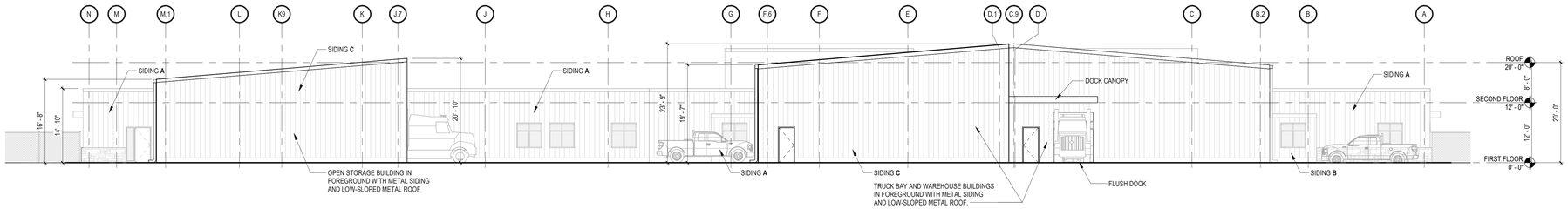
**SIGN C**
OLD LYMAN ROAD LOCATION SIGN

| TAG | LOCATION | MATERIAL | DESIGN / INSTALLATION | AREA (allowable) | SIZE (proposed) |
|---|---|---|---|---|---|
| **Type A.1** | (1) High building mounted | 1/2" plate bright aluminum | Indiv. pin mount cut lettering | 10% of wall area: 868sf x 0.1= 86sf | 14'-0"W x 1'-6"H = 21.00 sf |
| **Type A.2** | (1) High building mounted | 1/2" plate bright aluminum | Indiv. pin mount over single stencilled plate (Department) | 10% of wall area: 868sf x 0.1= 86sf | 16'-0"W x 1'-8"H = 21.00 sf |
| **Type B.1** | (1) Building mounted departmental entry sign | 1/2" plate bright aluminum | Stencilled Municipal Agency logos, stacked on single plate | 10% of wall area: 260sf x 0.1= 26sf | 4'-0"W x 2'-3"H = 9.00 sf |
| **Type B.2** | (1) Building mounted departmental entry sign | 2" aluminum box, shop painted white | Stencilled Municipal Agency logos, stacked on single plate | 10% of wall area: 736sf x 0.1= 73sf | 11'-6"W x 6'-2"H = 70.90 sf |
| **Type C** | (1) Rear access ground mounted site sign | 3.5" thk painted aluminum box, shop painted white | Stencilled Municipal logos on both surfaces, elevated and anchored by 2 posts | 1 sf per 4 lineal ft of lot frontage or 60 sf: 178ft / 4 = 44.5sf | 5'-0"W x 2'-8"H = 13.34 sf |

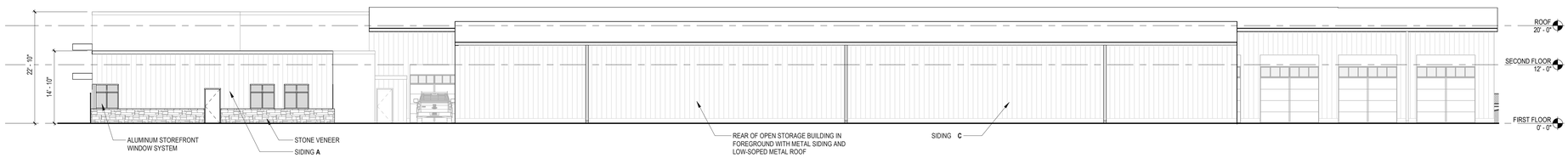
| NOTES | |
|---|---|
| 1 | Lit Municipal agency signs are permitted: No Lit signs proposed. |
| 2 | Signs shall not be painted on the building wall: No painted signs proposed |
| 3 | Aggregate area of sign(s) on any wall surface shall be less than 10% of such surface (including openings): Compliant, refer to elevations. |
| 4 | One freestanding sign is permitted per lot if located at least 30 feet from an adjoining lot line and 10 feet from the street line and does not exceed an area equal to frontage length divided by 4. Compliant, refer to site plan. |
| 5 | Municipal Agency directional signs permitted: Directional signs proposed, refer to civil site plan. |



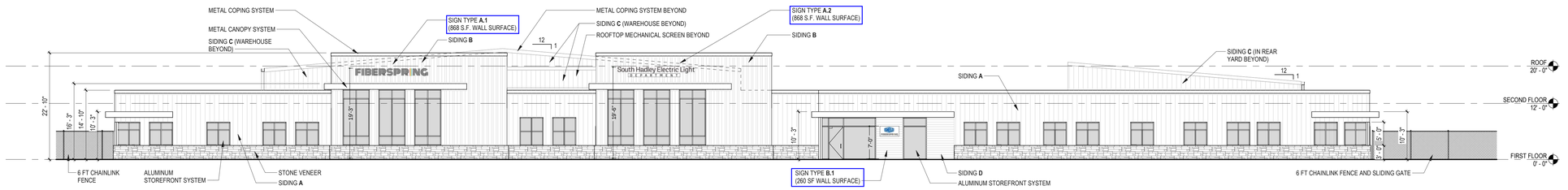

## D12 EXTERIOR NORTH ELEVATION
3/32" = 1'-0"




## F12 EXTERIOR EAST ELEVATION
3/32" = 1'-0"




## H12 EXTERIOR SOUTH ELEVATION
3/32" = 1'-0"




## K12 EXTERIOR WEST ELEVATION
3/32" = 1'-0"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EXTERIOR ELEVATIONS AND SIGNAGE DETAILS

| | |
|---|---|
| Project Manager: | Project No:Project Number |
| Project Architect: | Production Leader: |
| Project Designer: | Peer Reviewer: |

Drawing Number

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# Appendix B

Wetland Delineation Report & ANRAD

LANDTECH

Civil Engineering · Site Planning
Environmental Science & Engineering
Landscape Architecture · Land Surveying
Permit Coordination & Management
Construction Management & Financing

June 28, 2024

# Wetland Delineation Report

**Parcel No. 0014-0067-000**
**44 Willamansett Street**
**South Hadley, MA**

## Introduction

On-site investigations of the 9.38 acre, undeveloped property at **44 Willamansett Street in South Hadley, MA, identified as Map ID 0014-0067-000** were conducted on May 22 and June 4, 2024. The purpose of the site investigations was to identify and delineate Federal and Massachusetts Wetland resources ("resources") on the project site **(Figure 1).**

## Regulatory Applicability

The Massachusetts General Law Chapter 131, Section 40 and associated 310 Code of Massachusetts Regulations provides the definitions and procedures for protecting wetlands in Massachusetts. Bogs, swamps, marshes and wet meadows that border on water bodies are defined in the regulations as **Bordering Vegetated Wetlands (BVWs)** and are described as areas where soils are saturated or inundated such that they support plants adapted to tolerate at least periodically saturated conditions. Guidance for the delineation of BVWs is provided in the *Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands, Second Edition, September 2022*.

Section 404 of the Clean Water Act gives the Federal government regulatory jurisdiction of wetlands under the Army Corps of Engineers. Guidance for the delineation of federal jurisdictional wetlands is provided in the *Corps of Engineers Wetlands Delineation Manual* and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (January 2012).* The limits of federal wetlands are determined by the presence of three parameters: the presence of hydric soils, a preponderance of hydrophytic vegetation, and supportive hydrology.

## Existing Information Regarding Mapped Resources

According to the Natural Resource Conservation Service (NRCS) web-based soil survey, the soils on the site are mapped as Merrimac fine sandy loam, Windsor loamy sand and Walpole sandy loam **(Figure 2).** The NRCS defines these soils as follows:

> Merrimac fine sandy loam (254A): The Merrimac series consists of very deep, somewhat excessively drained soils formed in outwash. They are nearly level through very steep soils on outwash terraces and plains and other glaciofluvial landforms.
>
> Windsor loamy sand (255A): The Windsor series consists of very deep, excessively drained soils formed in sandy outwash or eolian deposits. They are nearly level through very steep soils on glaciofluvial landforms.
>
> Walpole sandy loam (31A): The Walpole Series consists of very deep, poorly drained sandy soils formed in outwash and stratified drift. They are nearly level to gently sloping soils in low-lying positions on terraces and plains.

The United States Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) On-line Wetlands Mapper depicts a forested wetland system in the southeast portion of the property **(Figure 3).** Using the Cowardin (1979) Classification System, this Freshwater Forested/Shrub Wetland (PFO1E) is defined by the NWI as follows:

*System Palustrine (P): The Palustrine System includes all nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean-derived salts is below 0.5 ppt. It also includes wetlands lacking such vegetation, but with all of the following four characteristics: (1) area less than 8 ha (20 acres); (2) active wave-formed or bedrock shoreline features lacking; (3) water depth in the deepest part of basin less than 2.5 m (8.2 ft) at low water; and (4) salinity due to ocean-derived salts less than 0.5 ppt.*

*Class Forested (FO): Characterized by woody vegetation that is 6 m tall or taller.*

*Subclass Broad-Leaved Deciduous (1 ): Woody angiosperms (trees or shrubs) with relatively wide, flat leaves that are shed during the cold or dry season; e.g., black ash (Fraxinus nigra).*

*Water Regime Seasonally Flooded/Saturated (E): Surface water is present for extended periods (generally for more than a month) during the growing season, but is absent by the end of the season in most years. When surface water is absent, the substrate typically remains saturated at or near the surface.*

## On-site Findings and Conclusions

The evaluation for the presence of wetland resources was conducted by walking the property and examining the soil, vegetation and hydrologic features on the site. Observations confirmed the presence of a forested wetland in a slightly depressed area in the southeast portion of the site (**Wetland A**). **(see Figure 1)**. This wetland meets the criteria of a vegetated bordering wetland and federal wetland, having hydric soils, a dominance of hydrophytic vegetation and evidence of seasonally saturated/inundated hydrology. The wetland was delineated with pink flagging labeled as "wetland delineation" with the alpha-numeric labels **WL# A-1 through WL# A-29.**

Available mapping from previous site evaluations show a second wetland area north of the flagged wetland (Wetland B). This area was evaluated and found to have a dominance of hydrophytic vegetation (primarily red maple , a facultative wetland plant), but does not contain hydric soils or evidence of wetland hydrology. Therefore this area does not meet the definition of a vegetated bordering wetland or a federal jurisdictional wetland and was not flagged. Wetland Determination Data Forms for areas A and B are appended and approximate locations of wetland sampling points are shown on Figure 1.

Questions regarding the information contained herein can be directed to the undersigned at cpallan@landtechconsult.com.

Very Truly Yours,
LANDTECH

Christopher Allan
Professional Wetland Scientist / Soil Scientist

# Figures

# Figure 1 Site Map

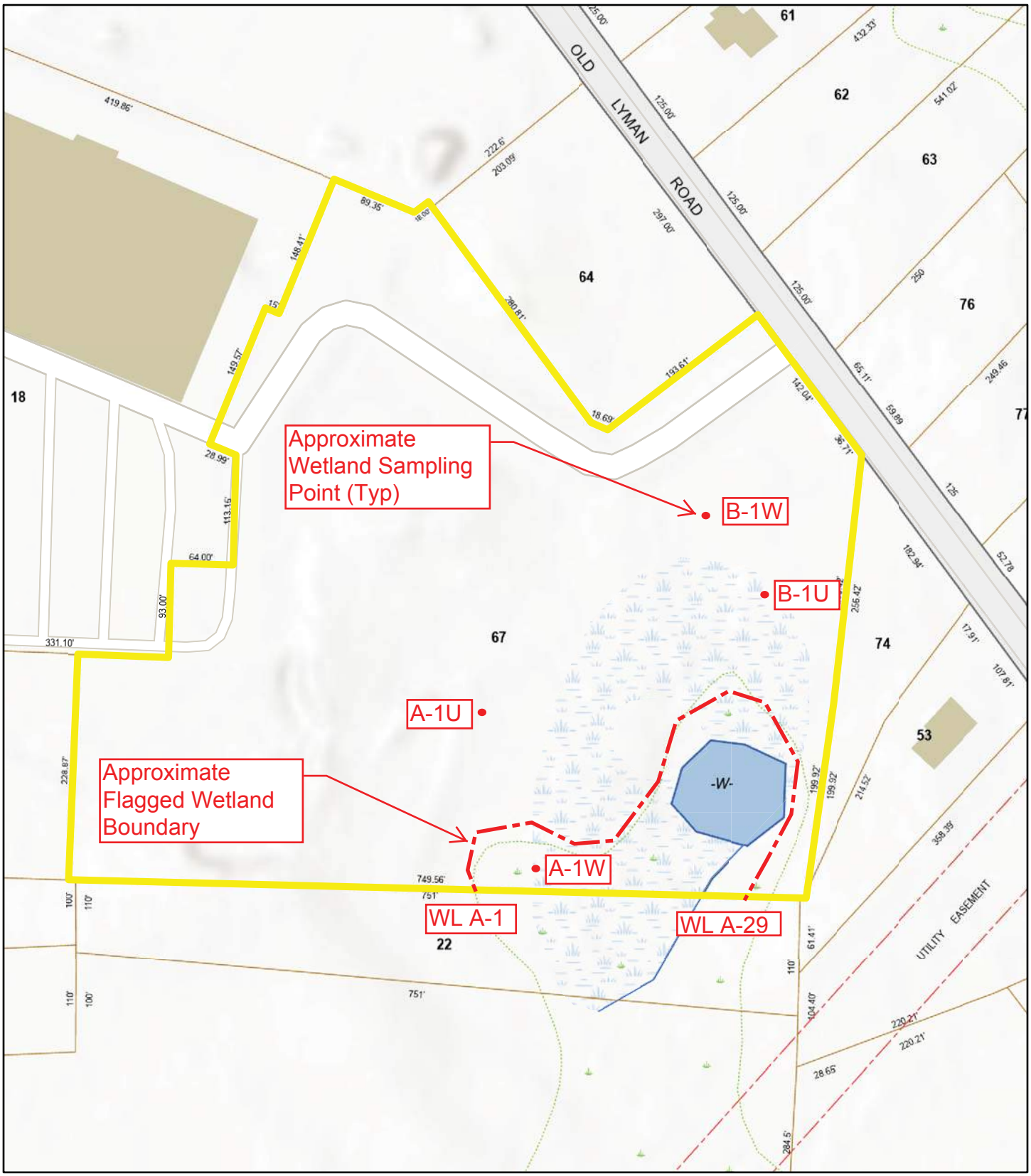
Town of South Hadley, MA

1 inch = 140 Feet

0 140 280 420

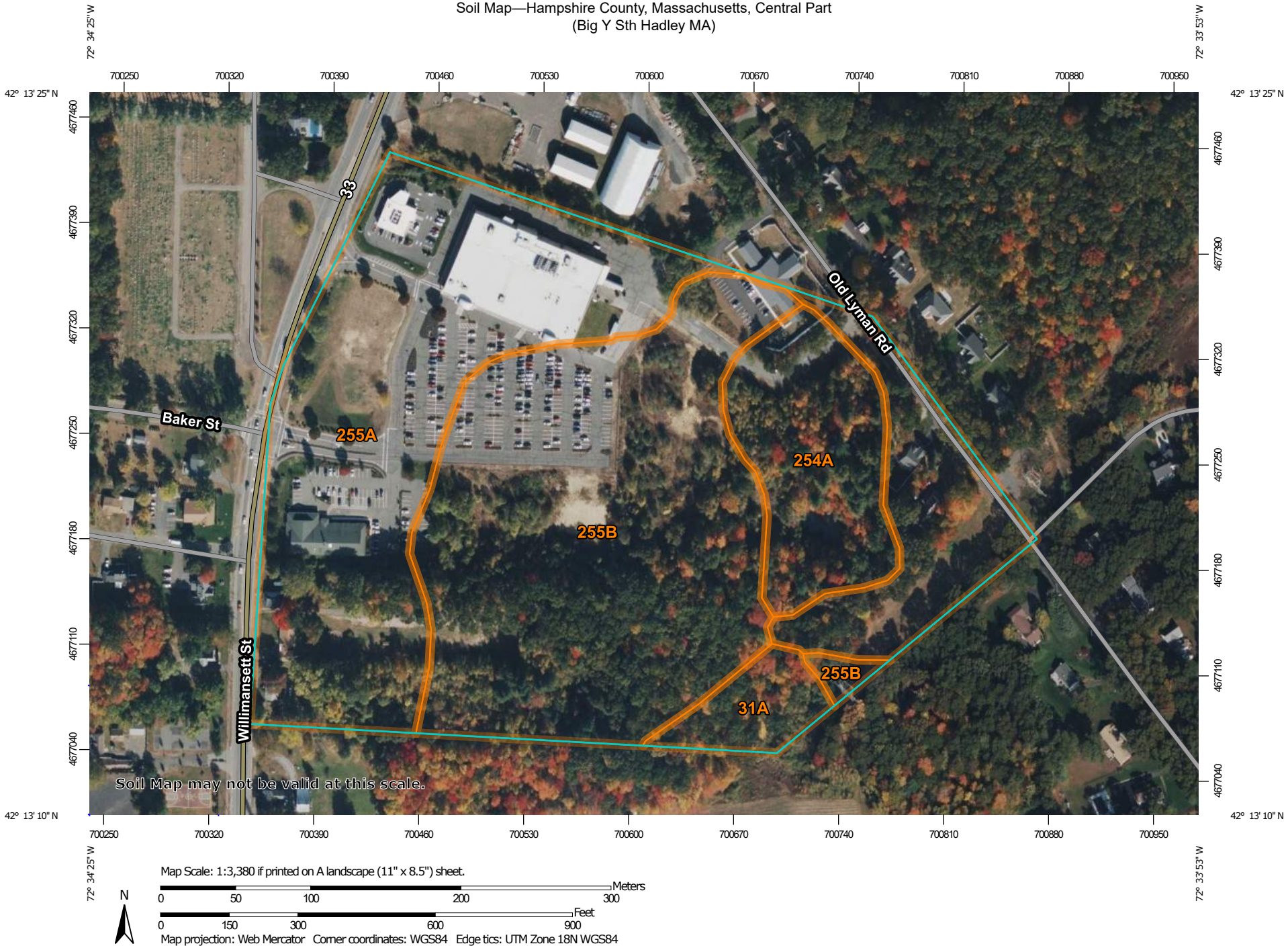
June 21, 2024

CAI Technologies
Precision Mapping. Geospatial Solutions.
www.cai-tech.com




Data shown on this map is provided for planning and informational purposes only. The municipality and CAI Technologies are not responsible for any use for other purposes or misuse or misrepresentation of this map.

Soil Map—Hampshire County, Massachusetts, Central Part
(Big Y Sth Hadley MA)




Map Scale: 1:3,380 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

## MAP LEGEND

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

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

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

**Water Features**
- Streams and Canals

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

**Background**
- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Hampshire County, Massachusetts, Central Part
Survey Area Data: Version 18, Sep 10, 2023

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

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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 |
|---|---|---|---|
| 31A | Walpole sandy loam, 0 to 3 percent slopes | 1.2 | 3.4% |
| 254A | Merrimac fine sandy loam, 0 to 3 percent slopes | 4.1 | 11.2% |
| 255A | Windsor loamy sand, 0 to 3 percent slopes | 16.5 | 45.6% |
| 255B | Windsor loamy sand, 3 to 8 percent slopes | 14.4 | 39.8% |
| **Totals for Area of Interest** | | **36.2** | **100.0%** |

U.S. Fish and Wildlife Service
National Wetlands Inventory

# Big Y, South Hadley, MA

June 21, 2024

**Wetlands**

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

# Wetland Determination Data Forms

## WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: South Hadley Big Y City/County: South Hadley, MA Sampling Date: 4June2024

Applicant/Owner: Big Y Foods State: MA Sampling Point: A1-U

Investigator(s): Anthony Zemba / Chris Allan Section, Township, Range:

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): slightly concave Slope (%): 0-5

Subregion (LRR or MLRA): LRR R Lat: 42.22133 Long: -72.56879 Datum: gps

Soil Map Unit Name: Windsor NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X | No | **Is the Sampled Area** |
| Hydric Soil Present? | Yes | No X | **within a Wetland?** **Yes** **No** X |
| Wetland Hydrology Present? | Yes | No X | If yes, optional Wetland Site ID: |

Remarks: (Explain alternative procedures here or in a separate report.)

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes | No x | Depth (inches): |
| Water Table Present? | Yes | No x | Depth (inches): |
| Saturation Present? (includes capillary fringe) | Yes | No x | Depth (inches): |

**Wetland Hydrology Present?** **Yes** **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

**VEGETATION** – Use scientific names of plants. Sampling Point: A1-U

| Tree Stratum (Plot size: 2872ft2) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Quercus vellutina* | 40 | Yes | UPL |
| 2. *Acer rubrum* | 20 | Yes | FAC |
| 3. *Betula populifolia* | 20 | Yes | FAC |
| 4. *Pinus strobus* | 10 | No | FACU |
| 5. *Prunus serotina* | 5 | No | FACU |
| 6. | | | |
| 7. | | | |
| | 95 | =Total Cover | |

| Sapling/Shrub Stratum (Plot size: 707ft2) | | | |
|---|---|---|---|
| 1. *Frangula alnus* | 50 | Yes | FAC |
| 2. *Betula populifolia* | 10 | No | FAC |
| 3. *Quercus rubra* | 10 | No | FACU |
| 4. *Pinus strobus* | 10 | No | FACU |
| 5. *Prunus serotina* | 5 | No | FACU |
| 6. | | | |
| 7. | | | |
| | 85 | =Total Cover | |

| Herb Stratum (Plot size: 78.5 ft2) | | | |
|---|---|---|---|
| 1. *Frangula alnus* | 5 | Yes | FAC |
| 2. *Onoclea sensibilis* | 5 | Yes | FACW |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 10 | =Total Cover | |

| Woody Vine Stratum (Plot size: ) | | | |
|---|---|---|---|
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83.3% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 5 | x 2 = | 10 |
| FAC species | 105 | x 3 = | 315 |
| FACU species | 40 | x 4 = | 160 |
| UPL species | 40 | x 5 = | 200 |
| Column Totals: | 190 (A) | | 685 (B) |

Prevalence Index = B/A = 3.61

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

**SOIL**

Sampling Point: A1-U

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-15 | 10YR 2/2 | | | | | | Sandy | loamy sand |
| 15-26 | 7.5YR 4/4 | | 5YR 3/4 | | | | Sandy | loamy sand |
| | | | | | | | | |
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| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** ___ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

## WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: South Hadley Big Y City/County: South Hadley Sampling Date: 4June2024

Applicant/Owner: Big Y Foods State: MA Sampling Point: A1-W

Investigator(s): Anthony Zemba, Chris Allan Section, Township, Range:

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): slightly concave Slope (%): 0-5

Subregion (LRR or MLRA): LRR R Lat: 42.22113 Long: -72.56881 Datum: gps

Soil Map Unit Name: Walpole NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | | |
|---|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X | No | **Is the Sampled Area** | |
| Hydric Soil Present? | Yes X | No | **within a Wetland?** | **Yes** X **No** |
| Wetland Hydrology Present? | Yes X | No | If yes, optional Wetland Site ID: | |

Remarks: (Explain alternative procedures here or in a separate report.)

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

| | | |
|---|---|---|
| Surface Water (A1) | x Water-Stained Leaves (B9) | Aquatic Fauna (B13) |
| High Water Table (A2) | Saturation (A3) | Marl Deposits (B15) |
| x Water Marks (B1) | Hydrogen Sulfide Odor (C1) | Sediment Deposits (B2) |
| Oxidized Rhizospheres on Living Roots (C3) | Drift Deposits (B3) | x Presence of Reduced Iron (C4) |
| Algal Mat or Crust (B4) | Recent Iron Reduction in Tilled Soils (C6) | Iron Deposits (B5) |
| Thin Muck Surface (C7) | Inundation Visible on Aerial Imagery (B7) | Other (Explain in Remarks) |
| x Sparsely Vegetated Concave Surface (B8) | | |

Secondary Indicators (minimum of two required)

| | | |
|---|---|---|
| Surface Soil Cracks (B6) | Drainage Patterns (B10) | x Moss Trim Lines (B16) |
| Dry-Season Water Table (C2) | Crayfish Burrows (C8) | Saturation Visible on Aerial Imagery (C9) |
| Stunted or Stressed Plants (D1) | Geomorphic Position (D2) | Shallow Aquitard (D3) |
| Microtopographic Relief (D4) | FAC-Neutral Test (D5) | |

**Field Observations:**

| | | | | |
|---|---|---|---|---|
| Surface Water Present? | Yes | No X | Depth (inches): | |
| Water Table Present? | Yes | No X | Depth (inches): | |
| Saturation Present? (includes capillary fringe) | Yes | No X | Depth (inches): 10" | **Wetland Hydrology Present?** **Yes** X **No** |

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

**VEGETATION** – Use scientific names of plants. Sampling Point: A1-W

| Tree Stratum (Plot size: 2827ft2) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Acer rubrum* | 30 | Yes | FAC |
| 2. *Quercus velutina* | 20 | Yes | UPL |
| 3. *Pinus strobus* | 15 | Yes | FACU |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 65 | =Total Cover | |
| **Sapling/Shrub Stratum** (Plot size: 707 ft2) | | | |
| 1. *Frangula alnus* | 30 | Yes | FAC |
| 2. *Vaccinium corymbosum* | 5 | No | FACW |
| 3. *Acer rubrum* | 5 | No | FAC |
| 4. *Quercus rubra* | 5 | No | FACU |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 45 | =Total Cover | |
| **Herb Stratum** (Plot size: 78.5ft 2) | | | |
| 1. *Frangula alnus* | 5 | Yes | FAC |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 5 | =Total Cover | |
| **Woody Vine Stratum** (Plot size: ) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 5 | x 2 = | 10 |
| FAC species | 70 | x 3 = | 210 |
| FACU species | 20 | x 4 = | 80 |
| UPL species | 20 | x 5 = | 100 |
| Column Totals: | 115 | (A) | 400 (B) |

Prevalence Index = B/A = 3.48

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

**SOIL**

Sampling Point: A1-W

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-7 | 10YR 2/1 | | | | | | Loamy/Clayey | sandy loam |
| 7-10 | 10YR 4/4 | | | | | | Loamy/Clayey | sandy loam |
| 10-23 | 10YR 4/2 | 90 | 5YR 3/4 | 10 | C | M | Loamy/Clayey | Prominent redox concentrations |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- X Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** X **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

## WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: South Hadley Big Y City/County: South Hadley, MA Sampling Date: 22May2024

Applicant/Owner: Big Y Foods State: MA Sampling Point: B-1U

Investigator(s): Anthony Zemba / Chris Allan Section, Township, Range:

Landform (hillside, terrace, etc.): terrace Local relief (concave, convex, none): slightly concave Slope (%): 0-5

Subregion (LRR or MLRA): LRR R Lat: 42.221878 Long: -72.567992 Datum: google earth

Soil Map Unit Name: Merrimac NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No ____ (If no, explain in Remarks.)

Are Vegetation N , Soil N , or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation N , Soil N , or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes ____ | No X | **Is the Sampled Area** |
| Hydric Soil Present? | Yes ____ | No X | **within a Wetland?** **Yes** ____ **No** X |
| Wetland Hydrology Present? | Yes ____ | No X | If yes, optional Wetland Site ID: |

Remarks: (Explain alternative procedures here or in a separate report.)

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes ____ | No X | Depth (inches): ____ |
| Water Table Present? | Yes ____ | No X | Depth (inches): ____ |
| Saturation Present? (includes capillary fringe) | Yes ____ | No X | Depth (inches): ____ |

**Wetland Hydrology Present?** **Yes** ____ **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

**VEGETATION** – Use scientific names of plants. Sampling Point: B-1U

| Tree Stratum (Plot size: 2872ft2) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Pinus strobus* | 80 | Yes | FACU |
| 2. *Acer rubrum* | 30 | Yes | FAC |
| 3. | | | |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| | 110 | =Total Cover | |
| **Sapling/Shrub Stratum** (Plot size: 707ft2) | | | |
| 1. *Acer rubrum* | 10 | Yes | FAC |
| 2. *Viburnum acerifolium* | 10 | Yes | UPL |
| 3. *Quercus rubra* | 10 | Yes | FACU |
| 4. *Juniperus virginiana* | 5 | No | FACU |
| 5. *Ilex verticillata* | 5 | No | FACW |
| 6. *Prunus serotina* | 5 | No | FACU |
| 7. | | | |
| | 45 | =Total Cover | |
| **Herb Stratum** (Plot size: 78.5ft 2) | | | |
| 1. *Maianthemum canadense* | 20 | Yes | FACU |
| 2. *Lycopodium clavatum* | 15 | Yes | FAC |
| 3. *Vaccinium pallidum* | 10 | Yes | UPL |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 45 | =Total Cover | |
| **Woody Vine Stratum** (Plot size: ) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 37.5% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 5 | x 2 = | 10 |
| FAC species | 55 | x 3 = | 165 |
| FACU species | 120 | x 4 = | 480 |
| UPL species | 20 | x 5 = | 100 |
| Column Totals: | 200 (A) | | 755 (B) |
| Prevalence Index = B/A = | | | 3.78 |

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** ___ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

## SOIL

Sampling Point: B-1U

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-8 | 10YR 2/1 | | | | | | Loamy/Clayey | fine sandy loam |
| 8-24 | 10YR 4/4 | | | | | | Loamy/Clayey | fine sandy loam |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
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| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** ___ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

## WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: South Hadley Big Y City/County: South Hadley Sampling Date: 22May2024

Applicant/Owner: Big Y Foods State: MA Sampling Point: B1-W

Investigator(s): Anthony Zemba, Chris Allan Section, Township, Range:

Landform (hillside, terrace, etc.): Terrace Local relief (concave, convex, none): slightly concave Slope (%): 0-5

Subregion (LRR or MLRA): LRR R Lat: 42.221947 Long: -72.567958 Datum: google earth

Soil Map Unit Name: Merrimac NWI classification: none

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

### SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

| | | | |
|---|---|---|---|
| Hydrophytic Vegetation Present? | Yes X | No | **Is the Sampled Area** |
| Hydric Soil Present? | Yes | No X | **within a Wetland?** **Yes** **No** X |
| Wetland Hydrology Present? | Yes | No X | If yes, optional Wetland Site ID: |

Remarks: (Explain alternative procedures here or in a separate report.)

### HYDROLOGY

**Wetland Hydrology Indicators:**

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

**Field Observations:**

| | | | |
|---|---|---|---|
| Surface Water Present? | Yes | No X | Depth (inches): |
| Water Table Present? | Yes | No X | Depth (inches): |
| Saturation Present? (includes capillary fringe) | Yes | No X | Depth (inches): 26" |

**Wetland Hydrology Present?** **Yes** **No** X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Hydrophytic vegetation present based upon dominance test (Red Maple)

**VEGETATION** – Use scientific names of plants. Sampling Point: B1-W

| Tree Stratum (Plot size: 2827ft2) | Absolute % Cover | Dominant Species? | Indicator Status |
|---|---|---|---|
| 1. *Acer rubrum* | 75 | Yes | FAC |
| 2. *Quercus velutina* | 10 | No | UPL |
| 3. *Nyssa sylvatica* | 5 | No | FAC |
| 4. *Betula alleghaniensis* | 5 | No | FAC |
| 5. *Quercus palustris* | 5 | No | FACW |
| 6. | | | |
| 7. | | | |
| | 100 | =Total Cover | |
| **Sapling/Shrub Stratum** (Plot size: 707 ft2) | | | |
| 1. *Vaccinium corymbosum* | 20 | Yes | FACW |
| 2. *Frangula alnus* | 10 | Yes | FAC |
| 3. *Quercus velutina* | 10 | Yes | UPL |
| 4. *Pinus strobus* | 5 | No | FACU |
| 5. *Acer rubrum* | 3 | No | FAC |
| 6. *Nyssa sylvatica* | 3 | No | FAC |
| 7. | | | |
| | 51 | =Total Cover | |
| **Herb Stratum** (Plot size: 78.5ft 2) | | | |
| 1. *Maianthemum canadense* | 85 | Yes | FACU |
| 2. *Osmundastrum cinnamomeum* | 3 | No | FACW |
| 3. *Gaultheria procumbens* | 3 | No | FACU |
| 4. | | | |
| 5. | | | |
| 6. | | | |
| 7. | | | |
| 8. | | | |
| 9. | | | |
| 10. | | | |
| 11. | | | |
| 12. | | | |
| | 91 | =Total Cover | |
| **Woody Vine Stratum** (Plot size: ) | | | |
| 1. | | | |
| 2. | | | |
| 3. | | | |
| 4. | | | |
| | | =Total Cover | |

**Dominance Test worksheet:**

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 60.0% (A/B)

**Prevalence Index worksheet:**

| Total % Cover of: | | Multiply by: | |
|---|---|---|---|
| OBL species | 0 | x 1 = | 0 |
| FACW species | 28 | x 2 = | 56 |
| FAC species | 101 | x 3 = | 303 |
| FACU species | 93 | x 4 = | 372 |
| UPL species | 20 | x 5 = | 100 |
| Column Totals: | 242 (A) | | 831 (B) |

Prevalence Index = B/A = 3.43

**Hydrophytic Vegetation Indicators:**

___ 1 - Rapid Test for Hydrophytic Vegetation

X 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0[1]

___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

**Definitions of Vegetation Strata:**

**Tree** – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

**Sapling/shrub** – Woody plants less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

**Herb** – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

**Woody vines** – All woody vines greater than 3.28 ft in height.

**Hydrophytic Vegetation Present?** **Yes** X **No** ___

Remarks: (Include photo numbers here or on a separate sheet.)

**SOIL**

Sampling Point: B1-W

**Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)**

| Depth | Matrix | | Redox Features | | | | | |
|---|---|---|---|---|---|---|---|---|
| (inches) | Color (moist) | % | Color (moist) | % | Type[1] | Loc[2] | Texture | Remarks |
| 0-9 | 10YR 2/1 | | | | | | Loamy/Clayey | fine sandy loam |
| 9-15 | 10YR 3/4 | | | | | | Loamy/Clayey | fine sandy loam |
| 15-21 | 10YR 4/3 | 90 | 5YR 3/4 | 10 | C | M | Loamy/Clayey | Distinct redox concentrations |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |
| | | | | | | | | |

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

**Hydric Soil Indicators:**

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ High Chroma Sands (S11) (**LRR K, L)**
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)
- ___ Marl (F10) (**LRR K, L**)

**Indicators for Problematic Hydric Soils[3]:**

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (F21)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

**Restrictive Layer (if observed):**

Type: _____

Depth (inches): _____

**Hydric Soil Present?** **Yes** ___ **No** X

Remarks:

This data form is revised from Northcentral and Northeast Regional Supplement Version 2.0 to reflect the NRCS Field Indicators of Hydric Soils version 7.0 March 2013 Errata. (http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_051293.docx)

LANDTECH

Civil Engineering · Site Planning
Environmental Science & Engineering
Landscape Architecture · Land Surveying
Permit Coordination & Management
Construction Management & Financing

July 31, 2024

# Addendum to Wetland Delineation Report dated June 28, 2024

**Parcel No. 0014-0067-000**
**44 Willamansett Street**
**South Hadley, MA**

In addition to the delineation of wetlands as described in Land-Tech's June 28, 2024 **Wetland Delineation Report**, the bank of an on-site water body was delineated on January 7, 2020. The water body is contained within the delineated Bordering Vegetated Wetlands as shown on the Resource Area Delineation Plan dated 6/28/2024 with latest revision date of 7/31/2024, prepared by F.A. Hesketh & Associates, Inc.

As defined in 310 Mass. Reg. 10.54, "*A Bank is the portion of the land surface which normally abuts and confines a water body. It occurs between a water body and a vegetated bordering wetland and adjacent flood plain, or, in the absence of these, it occurs between a water body and an upland. A Bank may be partially or totally vegetated, or it may be comprised of exposed soil, gravel or stone*."

The upper boundary of the bank (i.e. the first observable break in the slope abutting the water body) was delineated with flagging labeled WL-1 through WL-13 as shown on the Resource Area Delineation Plan.

Questions regarding the information contained herein can be directed to the undersigned at cpallan@landtechconsult.com.

Very Truly Yours,
LANDTECH

Christopher Allan
Professional Wetland Scientist / Soil Scientist

For Registry of Deeds Use Only

2024 00016161
Bk: 15260Pg: 12 Page: 1 of 8
Recorded: 10/17/2024 02:30 PM

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

# WPA Form 4B – Order of Resource Area Delineation

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

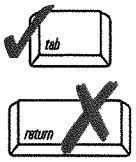
Provided by MassDEP:
288-0494
MassDEP File Number

eDEP Transaction Number

South Hadley
City/Town

## A. General Information

**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.

From: South Hadley
1. Conservation Commission

2. This Issuance is for (check one):

a. ☒ Order of Resource Area Delineation

b. ☐ Amended Order of Resource Area Delineation

3. Applicant:

Pam
a. First Name

McCarthy
b. Last Name

Big Y Foods, Inc.
c. Organization

2145 Rooseevelt Ave PO Box 7840
d. Mailing Address

Springfield
e. City/Town

MA
f. State

01102-7840
g. Zip Code

4. Property Owner (if different from applicant):

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

5. Project Location:

0 Willimansett St
a. Street Address

South Hadley
b. City/Town

01075
c. Zip Code

14
d. Assessors Map/Plat Number

67
e. Parcel/Lot Number

Latitude and Longitude (in degrees, minutes, seconds):

42d13m17.80s
f. Latitude

72d34m4.71s
g. Longitude

6. Dates:

July 12, 2024
a. Date ANRAD filed

August 21, 2024
b. Date Public Hearing Closed

August 30, 2024
c. Date of Issuance

## A. General Information (cont.)

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:

| | |
|---|---|
| Resource Area Delineation Plan prepared for Big Y Foods, Inc (Revised) | 7-31-2024 |
| a. Title | b. Date |
| Wetland Delination Report (6/28/24) & Addedum (7/31/24) | 6-28-2024 |
| c. Title | d. Date |

## B. Order of Delineation

1. The Conservation Commission has determined the following (check whichever is applicable):

a. ☒ **Accurate**: The boundaries described on the referenced plan(s) above and in the Abbreviated Notice of Resource Area Delineation are accurately drawn for the following resource area(s):

1. ☒ Bordering Vegetated Wetlands
2. ☒ Other resource area(s), specifically:

a. Water Body 8,600+/- SF and associated Bank

b. ☐ **Modified**: The boundaries described on the plan(s) referenced above, as modified by the Conservation Commission from the plans contained in the Abbreviated Notice of Resource Area Delineation, are accurately drawn from the following resource area(s):

1. ☐ Bordering Vegetated Wetlands
2. ☐ Other resource area(s), specifically:

a.

c. ☐ **Inaccurate**: The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

1. ☐ Bordering Vegetated Wetlands
2. ☐ Other resource area(s), specifically:

## B. Order of Delineation (cont.)

3. ☐ The boundaries were determined to be inaccurate because:

## C. Findings

This Order of Resource Area Delineation determines that the boundaries of those resource areas noted above, have been delineated and approved by the Commission and are binding as to all decisions rendered pursuant to the Massachusetts Wetlands Protection Act (M.G.L. c.131, § 40) and its regulations (310 CMR 10.00). This Order does not, however, determine the boundaries of any resource area or Buffer Zone to any resource area not specifically noted above, regardless of whether such boundaries are contained on the plans attached to this Order or to the Abbreviated Notice of Resource Area Delineation.

This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community).

## D. Appeals

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order of Resource Area Delineation. When requested to issue a Superseding Order of Resource Area Delineation, the Department's review is limited to the objections to the resource area delineation(s) stated in the appeal request. The request must be made by certified mail or hand delivery to the Department, with the appropriate filing fee and a completed Request for Departmental Action Fee Transmittal Form, as provided in 310 CMR 10.03(7) within ten business days from the date of issuance of this Order. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.

Any appellants seeking to appeal the Department's Superseding Order of Resource Area Delineation will be required to demonstrate prior participation in the review of this project. Previous participation in the permit proceeding means the submission of written information to the Conservation Commission prior to the close of the public hearing, requesting a Superseding Order or Determination, or providing written information to the Department prior to issuance of a Superseding Order or Determination.

The request shall state clearly and concisely the objections to the Order which is being appealed and how the Order does not contribute to the protection of the interests identified in the Massachusetts Wetlands Protection Act, (M.G.L. c. 131, § 40) and is inconsistent with the wetlands regulations (310 CMR 10.00). To the extent that the Order is based on a municipal bylaw or ordinance, and not on the Massachusetts Wetlands Protection Act or regulations, the Department of Environmental Protection has no appellate jurisdiction.

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

# WPA Form 4B – Order of Resource Area Delineation

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

Provided by MassDEP: 288-0494
MassDEP File Number

eDEP Transaction Number

South Hadley
City/Town

## E. Signatures

8/30/24
Date of Issuance

Please indicate the number of members who will sign this form.

6
1. Number of Signers

Signatures

| | |
|---|---|
| Neva Tolopko<br>Signature of Conservation Commission Member | Neva Tolopko<br>Printed Name |
| April Doroski<br>Signature of Conservation Commission Member | April Doroski<br>Printed Name |
| Kathleen Davis<br>Signature of Conservation Commission Member | Kathleen Davis<br>Printed Name |
| Tom Dennis<br>Signature of Conservation Commission Member | Tom Dennis<br>Printed Name |
| Jessica Schoendorf<br>Signature of Conservation Commission Member | Jessica Schoendorf<br>Printed Name |
| Terry Rosenfeld<br>Signature of Conservation Commission Member | Terry Rosenfeld<br>Printed Name |
| Signature of Conservation Commission Member | Printed Name |
| Signature of Conservation Commission Member | Printed Name |

**This Order is valid for three years from the date of issuance.**

If this Order constitutes an Amended Order of Resource Area Delineation, this Order does not extend the issuance date of the original Final Order, which expires on 8/30/2027 unless extended in writing by the issuing authority.

This Order is issued to the applicant and the property owner (if different) as follows:

2. ☐ By hand delivery on

a. Date

3. ☒ By certified mail, return receipt requested on

a. Date 8/30/24

RECEIVED
TOWN OF SOUTH HADLEY
TOWN CLERK'S OFFICE
SBC
2022 SEP 28 PM 12:28

# SOUTH HADLEY CONSERVATION COMMISSION
## VIRTUAL MEETING MINUTES
## SEPTEMBER 7, 2022

Agenda Item #7 --- Other New Business

Due to the COVID-19 state of emergency, the Commission had authorized the Conservation Administrator to sign Determinations and Orders on the Commission's behalf. A new vote was requested to be taken as all members were present. The previous votes were taken during meetings where not all current members were in attendance.

**Motion:** Commissioner Davis moved to authorize the Conservation Administrator to sign Determinations and Orders on behalf of Conservation Commissioners. Commissioner Doroski seconded the motion. Seven (7) out of seven (7) members present voted in favor of the motion by roll call vote (Neva Tolopko, William DeLuca, Garth Schwellenbach, Tom Dennis, Kathleen Davis, April Doroski, and Jessica Schoendorf).

Respectfully Submitted,

Colleen Canning, Planning/Conservation Coordinator

**SOUTH HADLEY CONSERVATION COMMISSION**
**Order of Resource Area Delineation**
**Findings of Fact**

**DEP File # 288-0494**

This Order of Resource Area Delineation is for 0 Willimansett St (Map 14 Parcel 67) associated with Abbreviated Notice of Resource Area Delineation #288-494 issued to Pam McCarthy of Big Y Foods, Inc.

Project Description
The site is an undeveloped vegetated parcel of 9.38 acres located between Willimansset St and Old Lyman Rd. The public hearing was scheduled for August 7, 2024. Due to lack of a quorum the public hearing opened on August 21, 2024. F.A. Hesketh & Associates, Inc of East Granby, Connecticut prepared the ANRAD application, associated plans and delineation reports for 848 linear feet of Bordering Vegetated Wetlands. A site visit was conducted on July 31, 2024. After the site visit, the applicant revised the delineation site plan and submitted an Addendum to Wetland Delineation Report adding the Bank of the waterbody 8,600+/- SF in the southeast corner of the parcel. The Conservation Commission has determined the Resource Area Delineation on the plan dated July 31, 2024 are Accurate and make the following findings:

1. This ANRAD is being reviewed under the Massachusetts Handbook for Delineation of Bordering Vegetated Wetlands (2022) and Corps of Engineers Wetlands Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (January 2012).
2. The following resource areas are determined by the Conservation Commission to accurately depict the Bordering Vegetated Wetlands on plan titled "Resource Area Delineation prepared for Big Y Foods, Inc" as prepared by F.A. Hesketh & Associates, Inc., final revision date July 31, 2024:
    a. The Bordering Vegetative Wetland (BVW) associated with the water body was delineated with flag series WL A-1 through WL A-29. This wetland meets the criteria of a vegetated bordering wetland and federal wetland, having hydric soils, a dominance of hydrophytic vegetation and evidence of seasonally saturated/inundated hydrology.
    b. The upper boundary of the bank (i.e. the first observable break in the slope abutting the water body) was delineated with flagging labeled WL-1 through WL-13 as shown on the Resource Area Delineation Plan. This bank is associated with the 8,600+/- SF water body in the southeast corner of the property.

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

# Request for Departmental Action Fee Transmittal Form

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

DEP File Number:

Provided by DEP

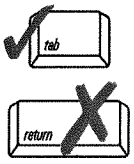
## A. Request Information

1. Location of Project

a. Street Address | b. City/Town, Zip

c. Check number | d. Fee amount

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




2. Person or party making request (if appropriate, name the citizen group's representative):

Name

Mailing Address

City/Town | State | Zip Code

Phone Number | Fax Number (if applicable)

3. Applicant (as shown on Determination of Applicability (Form 2), Order of Resource Area Delineation (Form 4B), Order of Conditions (Form 5), Restoration Order of Conditions (Form 5A), or Notice of Non-Significance (Form 6)):

Name

Mailing Address

City/Town | State | Zip Code

Phone Number | Fax Number (if applicable)

4. DEP File Number:

## B. Instructions

1. When the Departmental action request is for (check one):

☐ Superseding Order of Conditions – Fee: $120.00 (single family house projects) or $245 (all other projects)

☐ Superseding Determination of Applicability – Fee: $120

☐ Superseding Order of Resource Area Delineation – Fee: $120

Send this form and check or money order, payable to the *Commonwealth of Massachusetts,* to:

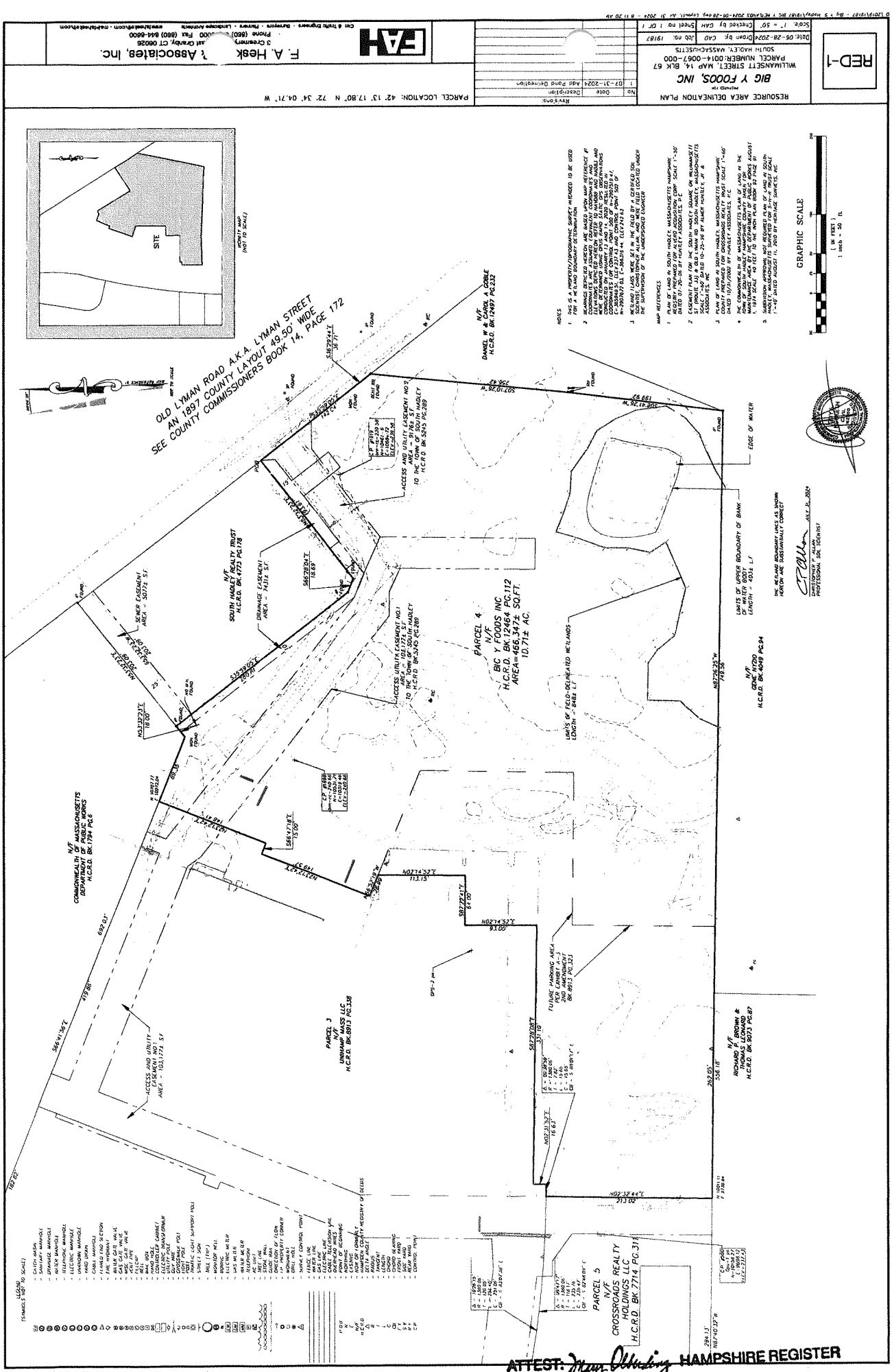
Department of Environmental Protection
Box 4062
Boston, MA 02211

## B. Instructions (cont.)

2. On a separate sheet attached to this form, state clearly and concisely the objections to the Determination or Order which is being appealed. To the extent that the Determination or Order is based on a municipal bylaw, and not on the Massachusetts Wetlands Protection Act or regulations, the Department has no appellate jurisdiction.

3. Send a **copy** of this form and a **copy** of the check or money order with the Request for a Superseding Determination or Order by certified mail or hand delivery to the appropriate DEP Regional Office (see https://www.mass.gov/service-details/massdep-regional-offices-by-community).

4. A copy of the request shall at the same time be sent by certified mail or hand delivery to the Conservation Commission and to the applicant, if he/she is not the appellant.


RESOURCE AREA DELINEATION PLAN
prepared for
BIG Y FOODS, INC
WILLIAMSETT STREET, MAP 14, BLK 67
PARCEL NUMBER:001-0067-000
SOUTH HADLEY, MASSACHUSETTS
RED-1
Date: 06-28-2024 Drawn by: CAD Job no.: 19187
Scale: 1" = 50' Checked by: CAH Sheet no.: OF 1
No. Date Description
1 07-31-2024 Add Pond Delineation
Revisions
PARCEL LOCATION: 42° 13' 17.80" N 72° 34' 04.71" W
F. A. Hebert Associates, Inc.
3 Creamery Hill, Granby, CT 06026
Phone (860) 844-6000 Fax (860) 844-6600
Civil & Traffic Engineers · Surveyors · Planners · Landscape Architects
www.fahebert.com · mail@fahebert.com
SITE
LOCUS MAP (NOT TO SCALE)
OLD LYMAN ROAD A.K.A. LYMAN STREET
AN 1897 COUNTY LAYOUT 49.50 WIDE
SEE COUNTY COMMISSIONERS BOOK 14, PAGE 172
N/F DANIEL W. CAROL A. COBLE H.C.R.D. BK.12497 PG.232
N/F SOUTH HADLEY REALTY TRUST H.C.R.D. BK.4773 PG.178
N/F COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS H.C.R.D. BK.1794 PG.6
N/F URBHAP MASS LLC H.C.R.D. BK.6913 PG.338
N/F CROSSROADS REALTY HOLDINGS LLC H.C.R.D. BK.7714 PG.311
N/F RICHARD P. BROWN & DONALD E. LOVELL H.C.R.D. BK.9021 PG.87
N/F DENE NYDO H.C.R.D. BK.4049 PG.94
PARCEL 4 N/F BIC Y FOODS INC H.C.R.D. BK.12464 PG.112 AREA=466,347± SQ.FT. 10.71± AC.
ACCESS AND UTILITY EASEMENT NO.1 AREA = 103,173 S.F.
ACCESS AND UTILITY EASEMENT NO.2 AREA = 91,762 S.F.
SEWER EASEMENT AREA = 30,772 S.F.
DRAINAGE EASEMENT AREA = 14,312 S.F.
LIMITS OF FIELD-DELINEATED WETLANDS LENGTH = 848± L.F.
LIMITS OF UPPER BOUNDARY OF BANK LENGTH = 1,058± L.F.
EDGE OF WATER
FUTURE PARKING AREA PER EXHIBIT A OF 2ND AMENDMENT BK.6913 PG.333
GRAPHIC SCALE
( IN FEET )
1 inch = 50 ft.
NOTES
1. THIS IS A PROPERTY/TOPOGRAPHIC SURVEY INTENDED TO BE USED FOR A WETLAND BOUNDARY DETERMINATION.
2. BEARINGS DEPICTED HEREON ARE BASED UPON MAP REFERENCE #1 (SEE BELOW) AND ARE REFERENCED TO THE MASSACHUSETTS COORDINATE SYSTEM, NORTH ZONE (NAD 83/2011). ELEVATIONS DEPICTED HEREON REFER TO NAVD88 AND ARE BASED ON A GPS OBSERVATION OF NGS CONTROL POINT "AB 0788" (PID: DF2908) WITH A PUBLISHED ELEVATION OF 267.38'.
3. WETLAND LIMITS WERE SET IN THE FIELD BY A CERTIFIED SOIL SCIENTIST AND LOCATED BY A FIELD CREW LOCATED UNDER THE SUPERVISION OF THE UNDERSIGNED ENGINEER.
MAP REFERENCES
1. PLAN OF LAND IN SOUTH HADLEY MASSACHUSETTS MAINSHARE DEVELOPMENT PREPARED FOR MAPLE ASSOCIATES, CORP. SCALE 1"=50' DATED 07-20-05 BY HANLEY ASSOCIATES, P.C.
2. EASEMENT PLAN FOR BIC SOUTH HADLEY SQUARE OR MILLMARKETT SQUARE, LLC IN SOUTH HADLEY MASSACHUSETTS SCALE 1"=40' DATED 10-24-07 BY HANLEY ASSOCIATES, P.C.
3. PLAN OF LAND IN SOUTH HADLEY MASSACHUSETTS MAINSHARE DEVELOPMENT PREPARED FOR MAPLE ASSOCIATES, P.C. SCALE 1"=40' DATED 10/31/2006 BY HANLEY ASSOCIATES, P.C.
4. THE COMMONWEALTH OF MASSACHUSETTS PLAN OF LAND IN SOUTH HADLEY SHOWING AREA BEING LAID OUT AS PUBLIC WORKS AUGUST 1, 1934 SCALE 40 FEET TO THE INCH PLAN BOOK 20 PAGE 87
5. SUBDIVISION APPROVAL NOT REQUIRED PLAN OF LAND IN SOUTH HADLEY MASSACHUSETTS PREPARED FOR BIG Y FOODS, INC. SCALE 1"=40' DATED AUGUST 11, 2010 BY HERITAGE SURVEYS, INC.
THE WETLAND BOUNDARY LINES AS SHOWN HEREON ARE SUBSTANTIALLY CORRECT
CHRISTOPHER P. ALLEN PROFESSIONAL SOIL SCIENTIST
JULY 31, 2024
LEGEND
CATCH BASIN
DRAINAGE MANHOLE
WATER MANHOLE
TELEPHONE MANHOLE
ELECTRIC MANHOLE
YARD DRAIN
CABLE MANHOLE
FLARED END SECTION
GAS VALVE MANHOLE
WATER GATE VALVE
GAS GATE VALVE
POST LINE
WELL
HAND HOLE
HAND HOLE W/ CABLE
ELECTRIC TRANSFORMER
ELECTRIC MANHOLE
UTILITY POLE
LIGHT POLE
TRAFFIC LIGHT SUPPORT POLE
STREET SIGN
MAIL (TYP.)
HANDICAP RAIL
BORING
ELECTRIC METER
WATER METER
TELEPHONE
GAS LINE
STONE WALL
DIRECTION OF FLOW
CONCRETE BOUND
MONUMENT
DRILL HOLE
WOOD CONTROL POINT
FENCE LINE
WATER LINE
ELECTRIC LINE
OVERHEAD ELECTRIC LINE
OVERHEAD WIRES
CONTOUR BEARING
EASEMENT
RADIUS
TANGENT
LENGTH
CHORD BEARING
CHORD LENGTH
FRONT YARD
REAR YARD
SIDE YARD
ATTEST: Mary Olberding HAMPSHIRE REGISTER
MARY OLBERDING

# Appendix C

## Stormwater Management Report

FUSS & O'NEILL
1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445
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# Stormwater Management Report
# South Hadley Electric Light Department Headquarters

65 Old Lyman Road, South Hadley, Massachusetts

Prepared For:

## South Hadley Electric Light Department

South Hadley, Massachusetts

March 2, 2026

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# 1 Executive Summary

The South Hadley Electric Light Department (SHELD) proposes to construct a new Headquarters located on Old Lyman Road in South Hadley, Massachusetts. The site is bound by the existing Big Y to the west, Old Lyman Road to the east and private properties to the south. The project location is depicted in Figure 1.

The site currently consists of driveways and paved parking lots associated with Big Y, grassed and wooded areas and a wetland located on the southeastern portion of the site. Proposed site improvements include development of the new main office, warehouse, and garage space, driveways, parking lots, stormwater infrastructure, utilities, landscaping and other site amenities.

The proposed stormwater management system has been designed in accordance with the guidelines outlined within the Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook and the Town of South Hadley Stormwater Management regulations. Stormwater management practices have been implemented to mitigate increases in peak runoff rates and provide stormwater treatment. The existing site conditions, proposed site conditions, and the proposed stormwater management system are described in detail in this report.

The design drawings include controls to protect wetland resource areas and properties adjacent to the development from erosion and sedimentation impacts caused by construction site runoff. The plan incorporates both non-structural and structural controls, such as inspections, waste management, good housekeeping and maintenance, perimeter sediment barriers, dust suppression, and a construction entrance. A Stormwater Pollution Prevention Plan (SWPPP) will be prepared as required under the Environmental Protection Agency's (EPA) National Pollutant Discharge Elimination System (NPDES) General Permit for Discharge from Construction Activities prior to the start of construction. Additional information related to erosion and sediment controls is included in this report. To ensure the long-term success of the stormwater management system, post-construction operation and maintenance practices will be required in accordance with the Long-Term Operation and Maintenance Plan that has been developed for the site and included in *Appendix I.*

# 2 Project Description

## 2.1 Existing Conditions

The project is located west of Old Lyman Road and east of the existing Big Y located on Willimansett Street in South Hadley, Massachusetts. The project is located within the Business C (BC) Zoning District according to the Town of South Hadley's Zoning Bylaws. The site is approximately 9.38 acres and is identified as parcel No. 14-67 by the Town of South Hadley Assessor.

Wetland resource areas were delineated by LandTech on May 22, 2024, and June 4, 2024. One bordering vegetated wetland was identified, and an inland bank associated with a pond is contained within the wetland, both are located in the southeast portion of the site.

According to the MassMapper Natural Heritage (NHESP) Atlas, 15$^{th}$ edition, the project site is not located within the limits of mapped NHESP Priority Habitats of Rare Species, Estimated Habitats of Rare Wildlife, or Area of Critical Environmental Concern (ACEC) as shown on the Resource Map included as *Figure 2.*

The site is characterized by Natural Resources Conservation Service (NRCS) as "Merrimac fine sandy loam, 0 to 3 percent slopes", "Windsor loamy sand, 0 to 3 percent slopes", and "Windsor loamy sand, 3 to 8 slopes".

According to NRCS, all site soils are classified as Hydrologic Soil Group (HSG) A. The NRCS soil report is included in *Appendix B.*

According to Federal Emergency Management (FEMA) mapping, the site does not lay within any flood zones based on the FEMA Flood Insurance rate Maps (FIRM) Panel Numbers 250170 0010 A, dated August 15, 1979.

In January of 2025, O'Reilly, Talbot & Okun (OTO) performed a series of borings and test pits on the site. The boring and test pit logs show the site contain fine to medium sand with traces of silt. This is consistent with the NRCS classification. Test pits also show groundwater ranging from 7.5 to 9 feet from existing grade. A copy of the OTO Preliminary Geotechnical Engineering Recommendations can be found in *Appendix C*. OTO's test pits were not witnessed as required per Volume 3, Chapter 1, Soil Evaluation, of the Stormwater Management regulations. Fuss & O'Neill is currently working with the Board of Health to schedule a time for them to review the completion of additional test pits. Once the test pits have been completed, test pit logs will be provided to the Planning Board.

The site is mostly wooded with small trees and brush, with some grass and sandy areas. The site does not contain any stormwater management systems. Stormwater currently sheet flows to the wetland areas, Big Y parking lot, or the adjacent properties.

## 2.2 Proposed Conditions

The proposed project consists of the construction of the new main office, warehouse, and garage space adjacent to the existing Big Y located on Willimansett Street in South Hadley, Massachusetts. In addition, the project proposes the construction of associated parking areas, driveways, sidewalks, stormwater infrastructure, utilities, landscaping, and other site amenities.

The proposed project does not propose to change the existing stormwater patterns. The Stormwater Management system is comprised of a stormwater collection system and stormwater infiltration basins. The stormwater system has been designed to provide reduction in peak stormwater discharge and stormwater treatment. The following BMPs are proposed for the project.

- A series of deep sump hooded catch basins.

- **Infiltration Basin B1** is located east of the proposed building and associated driveway and west of Old Lyman Street. The system provides treatment and recharge for the employee parking lot, area between the garage and the covered storage, the warehouse roof, and the northern and eastern driveways and surrounding grassed areas. Runoff from the basin discharges to design point Discharge Point (DP) 1.

- **Infiltration Basin B2** is located south of the proposed southern driveway area. The system provides treatment and recharge to the visitor parking, office building, garage building, covered storage, and driveways located east and south of the proposed buildings along with surrounding grassed areas. Runoff from the basin discharges to design point DP1.

The proposed BMPs have been sized to accommodate the 100-year design storm without overtopping. Outlet control structures in each infiltration system will manage the discharges from the site.

# 3 Hydrologic Analysis

The hydrologic analyses for existing and proposed conditions were completed using a computer software package, HydroCAD, to determine peak runoff flow rates and total runoff volumes for the watershed models. The model is based on the NRCS Technical Release 20 and Technical Release 55 (TR-55) and is subject to cumulative rainfall/volume dependent routing calculations. Hydrographs are prepared for each element of the watershed and routed through the dynamic-storage-indication method to produce various time-based results. Precipitation depths and intensities were taken from NOAA Point Precipitation Frequency Estimates (National Oceanic and Atmospheric Administration) for a 24-hour storm event.

Three design points were developed for the project and used as the limits of analysis as described below:

- Design Point 1 (denoted as Link DP1 in the hydrologic analyses) is a wetland area in the southeastern portion of the site
- Design Point 2 (denoted as Link DP2) is the adjacent properties located southwest of the site.
- Design Point 3 (denoted as Link DP3) is the existing Big Y parking lot and its associated stormwater management system.

The Pre-Development Hydrologic Analysis is included as *Appendix D* and the Post-Development Hydrologic Analysis is included as *Appendix E*.

Tabulations of the weighted curve numbers based on cover types and HSG for each sub-watershed are included in *Appendices C* and *D*. The following is a description of how each cover type was modeled:

- Vegetated areas were modeled as “50-75% Grass cover, Fair, HSG A” or “>75% Grass cover, Good, HSG A" depending on location.
- Impervious areas (e.g., sidewalks, asphalt pavement, concrete pads, etc.) were modeled as “Paved parking, HSG A”
- Gravel areas were modeled as “Gravel roads, HSG A”
- Dirt areas were modeled as “Dirt roads, HSG A”
- Wooded areas were modeled as “Woods, Good, HSG A”
- Building roofs were modeled as “Roofs, HSG A”

Based on the soil textural classification of the test pits conducted by OTO, an infiltration rate of 8.27 inch/hour was used for a Sand Texture Class, in accordance with Table 2.3.3 of the Stormwater Handbook.

## 3.1 Existing Watershed Summary

The majority of the stormwater runoff on site is conveyed from the existing property located north of the site via a culvert, the existing central wooded and grassed areas, and the via sheet flow and shallow concentrated flow to wetland area, design point DP1. Stormwater runoff from the southwestern existing parking lot and wooded areas flows to the adjacent properties, Design Point DP2. Stormwater runoff from the developed western portions of the site and grassed areas flow via sheet flow to the existing Big Y parking lot toward Design Point DP3.

Subcatchment areas are depicted on the Pre-Development Watershed Map included as Figure 4Proposed Watershed Summary

## 3.2 Proposed Watershed Summary

As a result of the proposed development, overall drainage patterns do not change. The boundary of the post-development analysis is the same as the pre-development conditions. However, the subcatchments have been further delineated to support the proposed site grading and size the BMPs. A majority of the proposed development will be conveyed via the proposed stormwater management system to DP 1. The remaining site areas will sheet flow to either DP2 or DP3. The post-development subcatchments are depicted on the Post-Development Watershed Map included as *Figure 5*.

## 3.3 Hydrologic Analysis Results

The proposed BMPs attenuate peak flows from the site, effectively reducing the site's runoff rates compared to pre-redevelopment condition. The pre- and post-development peak flow rates for the three design points are included in the tables below.

| 2 Year Design Storm | | | | |
|---|---|---|---|---|
| **Design Point** | **Existing Flow (CFS)** | **Proposed Flow (CFS)** | **Net Change (CFS)** | **Net Change (%)** |
| (1L) | 0.55 | 0.00 | -0.55 | -100% |
| (2L) | 0.01 | 0.01 | 0.00 | 0% |
| (3L) | 1.30 | 1.26 | -0.04 | -3% |
| **Total** | **1.86** | **1.27** | **-0.59** | **-32%** |

| 10 Year Design Storm | | | | |
|---|---|---|---|---|
| **Design Point** | **Existing Flow (CFS)** | **Proposed Flow (CFS)** | **Net Change (CFS)** | **Net Change (%)** |
| (1L) | 2.38 | 0.24 | -2.14 | -90% |
| (2L) | 0.24 | 0.21 | -0.03 | -13% |
| (3L) | 2.38 | 2.30 | -0.08 | -3% |
| **Total** | **5.00** | **2.75** | **-2.25** | **-45%** |

| 25 Year Design Storm | | | | |
|---|---|---|---|---|
| **Design Point** | **Existing Flow (CFS)** | **Proposed Flow (CFS)** | **Net Change (CFS)** | **Net Change (%)** |
| (1L) | 3.79 | 1.69 | -2.12 | -56% |
| (2L) | 0.63 | 0.56 | -0.07 | -11% |
| (3L) | 3.20 | 2.99 | -0.21 | -7% |
| **Total** | **7.62** | **5.22** | **-2.40** | **-31%** |

| 100 Year Design Storm | | | | |
|---|---|---|---|---|
| **Design Point** | **Existing Flow (CFS)** | **Proposed Flow (CFS)** | **Net Change (CFS)** | **Net Change (%)** |
| (1L) | 6.36 | 5.99 | -0.08 | -0.01 |
| (2L) | 1.48 | 1.36 | -0.12 | -0.08 |
| (3L) | 4.66 | 4.24 | -0.42 | -0.09 |
| **Total** | **12.50** | **11.88** | **-0.62** | **-0.05** |

## 4 Soil Erosion and Sedimentation Design

Soil erosion and sedimentation control details and narratives for construction periods are provided on the site plans. Soil erosion and sedimentation control details and procedures are consistent with the "Massachusetts Erosion and Sediment Control Guideline for Urban and Suburban Areas."

Construction period erosion and sedimentation controls will include a construction entrance, compost filter socks, silt fence, catch basin inlet protection, erosion control blankets, and water for dust control. Additional erosion and sediment controls will be utilized as required. Perimeter sediment controls will be placed down-gradient of disturbed areas. Water will be applied to exposed soils to provide dust control as needed.

Soil disturbance, stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures shall be recorded and maintained as part of the Stormwater Pollution Prevention Plan (SWPPP). This is prepared as required under the EPA NPDES General Permit for Discharge from Construction Activities.

Waste materials generated from construction activities will include excavated soil, trees, brush, stumps, and pavement. All excavation debris and other waste will be transported to an approved disposal facility. If required, materials may be temporarily stockpiled within designated staging areas. Details and procedures are provided on the site plans and are included in the SWPPP.

Construction materials, including site and building materials, will be present on-site during various stages of construction. All materials will be temporarily stored within designated staging or lay-down areas and will be transported to the site as needed. Construction vehicle fueling will take place on site. Staging areas will be located within the limit of work, and drip lines of existing trees to remain.

## 5 Construction Sequence

A detailed construction sequence is included in the site plans. This construction sequence is subject to change based on construction methods, weather, or due to other unforeseen circumstances. Any changes to the sequence of construction shall be addressed in the SWPPP, which shall be updated during construction to address site conditions.

# 6 Massachusetts Stormwater Handbook Standards

The following is a description of how the proposed project conforms with the stormwater management standards (Standards) outlined in the Massachusetts Stormwater Handbook. The Stormwater Management Checklist is included in Appendix F.

**Standard 1: No Untreated Discharge or Erosion to Wetlands**
No concentrated and untreated flows are proposed into wetlands and/or waterways of the Commonwealth. Stormwater outlet sizing calculations are included in *Appendix E*.

**Standard 2: Peak Rate Attenuation**
Post-development discharge rates from the 2-, 10-, 25-, and 100-year storm events will not increase as a result of the development compared to the pre-redevelopment condition. This will be achieved through the storage provided by the infiltration basins. Peak flow results are provided in Section 3.3. of this report.

**Standard 3: Stormwater Recharge**
The infiltration stormwater basins will allow infiltration and promote groundwater recharge. The proposed BMPs have been designed to provide storage in excess of the recharge volume required by this standard and drawdown within 72 hours. Stormwater recharge calculations are included in the BMP Sizing Calculations *Appendix G.*

Soils on site provide a rapid infiltration rate, 8.27 inches per hour. The project has been designed to provide 44-percent pretreatment through deep sump hooded catch basins and the sediment forebay. Pre-treatment Total Suspended Solid (TSS) removal calculations are included in *Appendix H.*

**Standard 4: Water Quality**
The infiltration basins will provide water quality treatment through infiltration. The proposed BMPs provide storage in excess of the water quality volume required by this standard. Water quality calculations are included in the BMP Sizing Calculations in *Appendix G.* In addition, deep sump hooded catch basin will provide additional TSS removal. TSS calculations are included in *Appendix H.*

**Standard 5: Land Uses with Higher Potential Pollutant Loads**
The project does not contain any area of higher pollutant loads as defined by the Massachusetts Stormwater Handbook.

**Standard 6: Critical Areas**
The site is not located within Zone II or Interim Wellhead Protection Areas, or other Critical Areas, which include Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, and Cold-Water Fisheries.

**Standard 7: Redevelopment**
The proposed project is not considered a Redevelopment project per the Massachusetts Stormwater Handbook.

**Standard 8: Construction Pollution Prevention and Erosion and Sediment Controls**
General erosion and sedimentation controls will be implemented and maintained in accordance with local, state, and federal requirements until construction is complete and disturbed areas have been stabilized. The extent and schedule for the commencement or cessation of construction activities, grading, and soil stabilization measures

will be recorded and maintained as part of the SWPPP prior to the start of construction. The SWPPP has been developed in accordance with the EPA NPDES General Permit for Discharge from Construction Activities.

**Standard 9: Long-Term Operation and Maintenance Plan**
A Long-Term Operation and Maintenance Plan has been prepared and is included in *Appendix I.*

**Standard 10: Illicit Discharges to Drainage System**
This project does not contain illicit discharges to Stormwater Management Systems as defined in the Massachusetts Stormwater Handbook. An Illicit Discharge Compliance Statement is included in *Appendix J*. A signed copy will be provided prior to construction.

## 7 Town of South Hadley Stormwater Management

The following is a description of how the proposed project conforms with the requirements of the South Hadley Stormwater Management regulations.

Per Section 200-19 A, stormwater Infiltration Basins are proposed for the project to provide infiltration, flow attenuation, and pollutant removal.

Per Section 200-19 B and C, the infiltration practices have been designed to retain the one-inch volume of rainfall runoff from impervious surfaces on-site. Thus, minimizing pollutants in the stormwater runoff prior to discharge to the wetlands or adjacent properties. Water quality calculations are provided in *Appendix G.*

Per Section 200-19 D, both infiltration basins have been designed with an emergency overflow system.

Per Section 200-19 E, the infiltration basins have been designed to attenuate peak flows and include rip rap protection at the outlets to ensure there is no increase in flooding or stream channel erosion downstream.

Per Section 200-19 F and Section 200-20 D, the project proposes the traditional collect and coney system. Unfortunately, existing and proposed topography does not allow enough pitch for the use of swales to collect and convey stormwater. In addition to the size of the development.

Per Section 200-20 A(6), infiltration basins have been designed with a minimum of 4 feet of vertical separation from seasonal high groundwater elevations.

Per Section 200-20 H, parking lots are treated with deep sump hooded catch basins to provide removal of oil and sediment prior to discharge to the infiltration basins.

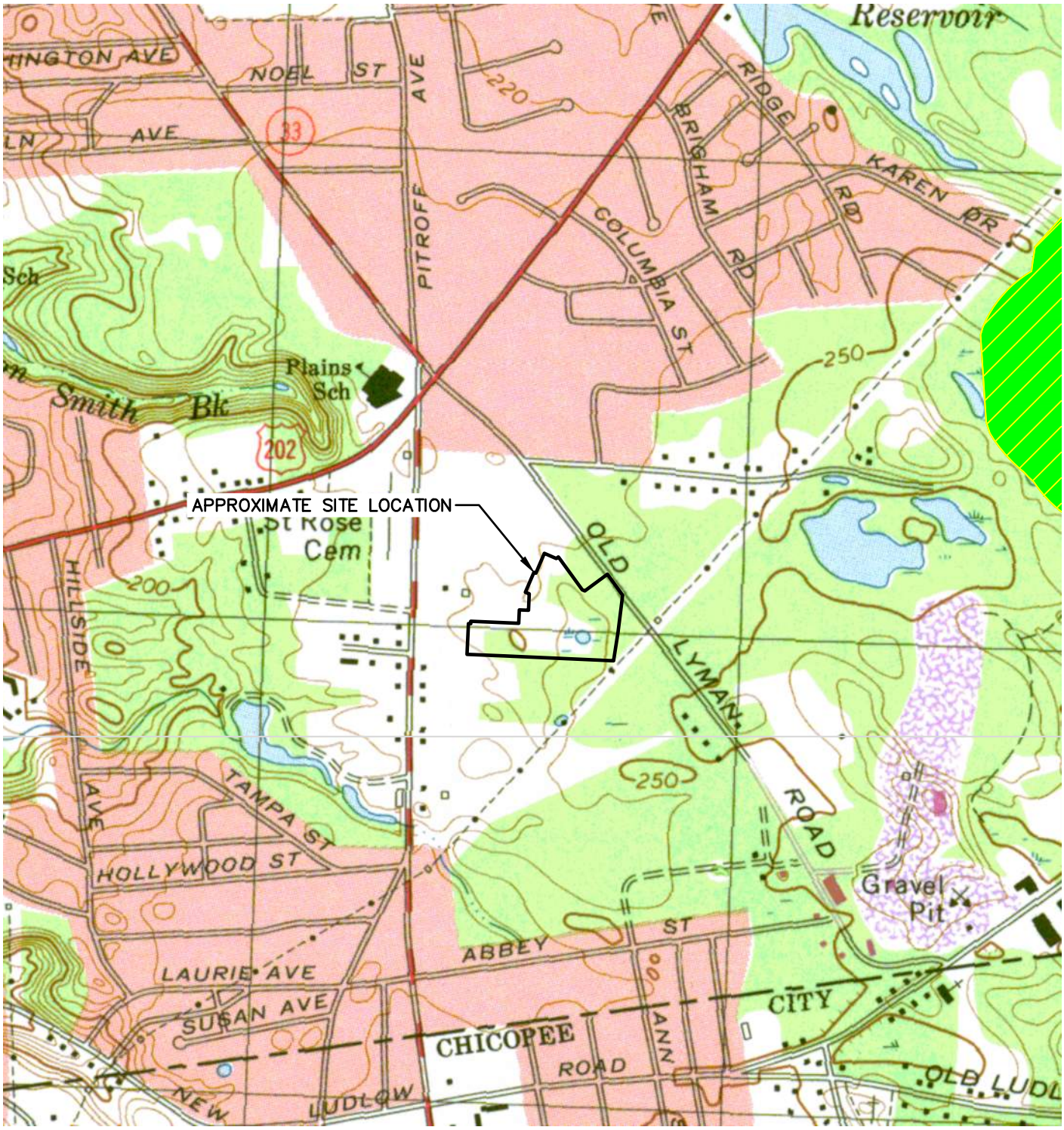
## 8 Summary

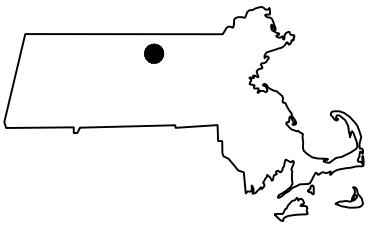
This Stormwater Management Report describes proposed work and stormwater management associated with the construction of the new South Hadley Electric Light District Headquarters located on Old Lyman Road, South Hadley, Massachusetts. The stormwater management system, which includes infiltration basins, will provide water quality treatment, groundwater recharge, and peak flow attenuation. Peak run-off rates and volumes from the site will decrease when compared to pre-development conditions during the 2-, 10-, 25-, and 100-year storm events.

The proposed design addresses the applicable standards set forth in the MassDEP Stormwater Management Guidelines and the Town of South Hadley Stormwater Management regulations as described above in this report. Soil erosion and sediment control measures have been incorporated into the design, and a site-specific SWPPP will be developed to mitigate the impacts of the proposed land disturbance and construction. Based on the conditions summarized above, the proposed site improvements will have no adverse effect on the abutters, on-site resource areas, or the receiving drainage systems.

# Figure 1

Site Location Map



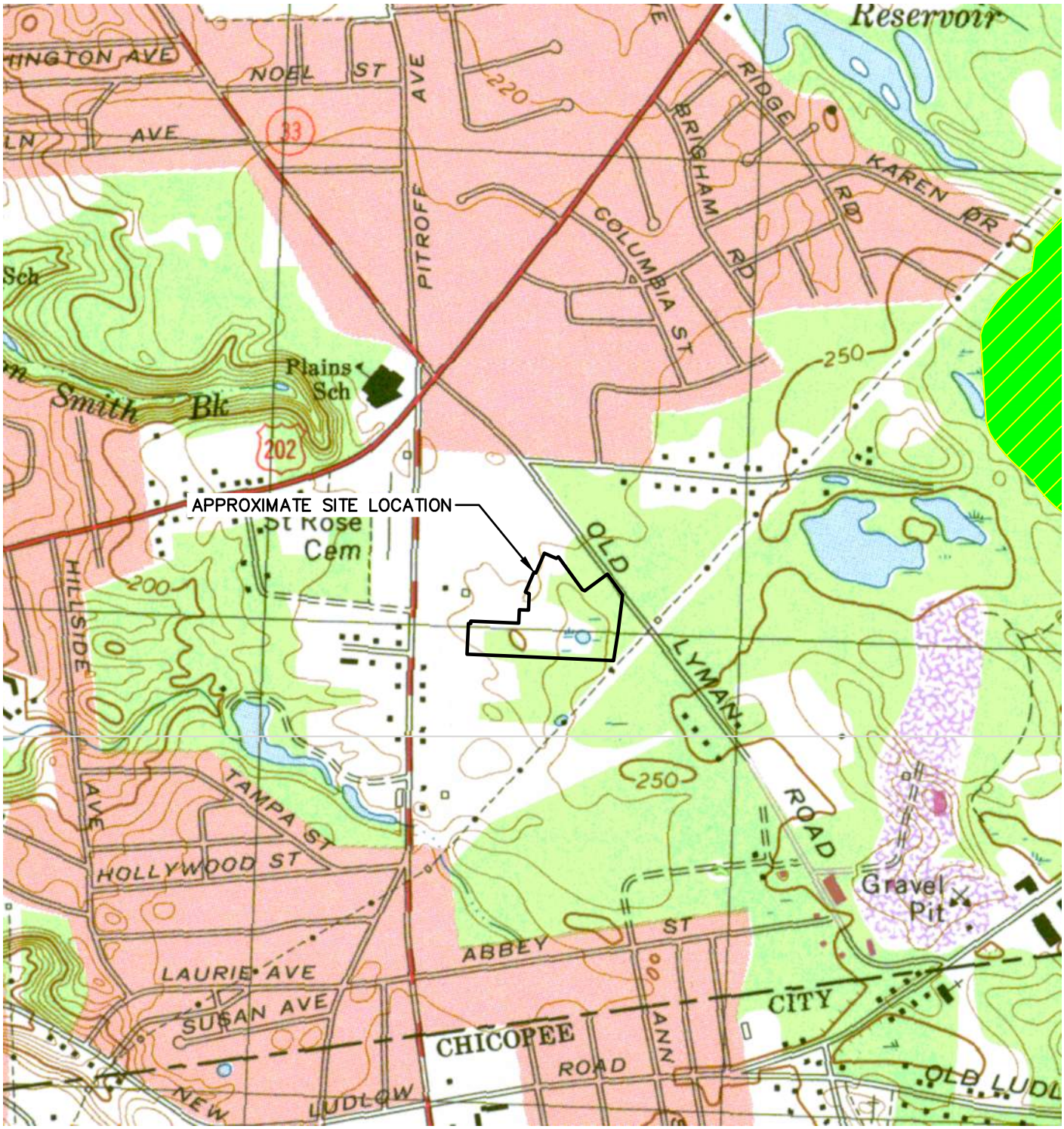
MAP REFERENCE
THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAHIC QUADRANGLE IMAGES: q113882, q113886. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 02/19/2026.
ORIGINAL MAP UNITS IN METERS.

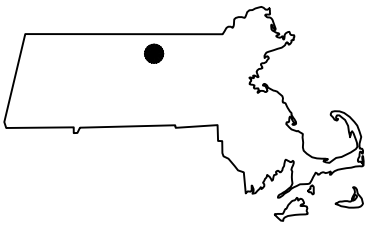
| | | | |
|---|---|---|---|
| SCALE: HORZ.: 1" = 1000' VERT.: - DATUM: HORZ.: - VERT.: - 0 500' 1000' GRAPHIC SCALE | FUSS & O'NEILL<br>1550 MAIN STREET, SUITE 400<br>SPRINGFIELD, MA 01103<br>413.452.0445<br>www.fando.com | SHELD<br>SITE LOCATION MAP<br>SHELD HEADQUARTERS<br>SOUTH HADLEY MASSACHUSETTS | PROJ. No.: 20250806A10<br>DATE: 03/02/2026<br>FIG.01 |

File: J:\DWG\P20250806A10\Civil\Figures\20250806A10_LOC01.dwg Layout: FIG.01 Plotted: 2026-02-25 3:29 PM Saved: 2026-02-25 3:28 PM User: Amina.Nefic
MS VIEW: LAYER STATE: PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB

# Figure 2

Resource Map



MAP REFERENCE
THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAHIC QUADRANGLE IMAGES: q113882, q113886. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 02/19/2026. ORIGINAL MAP UNITS IN METERS.

- NHESP ESTIMATED HABITATS OF RARE WILDLIFE
- NHESP PRIORITY HABITATS OF RARE SPECIES
- AREAS OF CRITICAL ENVIRONMENTAL CONCERN

SCALE:
HORZ.: 1" = 1000'
VERT.: -
DATUM:
HORZ.: -
VERT.: -
0 500' 1000'
GRAPHIC SCALE

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SHELD

RESOURCE MAP

SHELD HEADQUARTERS

SOUTH HADLEY MASSACHUSETTS

PROJ. No.: 20250806A10
DATE: 03/02/2026

FIG.01

File: J:\DWG\P20250806A10\Civil\Figures\20250806A10_LOC01.dwg Layout: FIG.02 Plotted: 2026-02-25 3:30 PM Saved: 2026-02-25 3:28 PM User: Amina.Nefic
MS VIEW: LAYER STATE: PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB

# Figure 3

Flood-Insurance Rate Map

ELEVATION REFERENCE MARKS
REFERENCE MARK
ELEVATION (FT. NGVD)
DESCRIPTION OF LOCATION
RM1 78.15 Metal rivet on the southeast end of the out shot of the southwest entrance to the South Hadley Town Hall, on the north side of Main Street, 300 feet southeast of the intersection of Bridge Street. (TBM No. 3139). Established by Harry R. Feldman, Inc.
RM2 168.99 Standard tablet stamped CS 1933 169, at top of 9 x 9 x 36 inches stone post set flush with ground, 1.6 miles north of South Hadley Falls, 20 feet north and 55 feet east of intersection of Lathrop and Brainerd Streets, 1 foot south of fence. Established by Harry R. Feldman, Inc.
RM3 257.49 Standard tablet stamped CAS 1933 257 in South Hadley Center, at Mount Holyoke College, at west entrance of Dwight Memorial Hall, on north end of second step. Established by Harry R. Feldman, Inc.
ZONE A13
ZONE B
ZONE C
ZONE A9
ZONE A3
ZONE A
LIMIT OF DETAILED STUDY
CORPORATE LIMITS
HAMPSHIRE COUNTY
HAMPDEN COUNTY
LEAPING WELL RESERVOIR
Bridge Dam
Linear Pond Dam Pedestrian Bridge
Steel Bridge
Stone Arch Bridge
Pedestrian Bridge
Stone Dam
Wood Bridge
US Highway 202 Bridge
State Highway 116 Bridge
Lyman Brook
Stony Brook
Nash Brook
Nonotuck Brook
Woodlot Brook
Factory Brook
Mill River
Connecticut River
MAIN STREET
PARK STREET
PLEASANT STREET
SOUTH STREET
BOLTON STREET
SPRING STREET
LUDLOW STREET
LAURIE AVENUE
GRANT ROAD
NORTH MAIN STREET
SOUTH MAIN STREET
WEST SUMMIT ST
TALLOW ST
FERRY STREET
BRIDGE STREET
LYMAN ROAD
OLD LYMAN ROAD
NOTCH ROAD
MOUNTAIN ROAD
SILVER STREET
PROSPECT LANE
PLEASANT ST
SMITH ST
KEY TO MAP
100-Year Flood Boundary
100-Year Flood Boundary
Zone Designations* With Date of Identification e.g., 12/2/71
100-Year Flood Boundary
100-Year Flood Boundary
ZONE B
ZONE A1-A30 DATE
ZONE AO DATE
ZONE B
Base Flood Elevation Line With Elevation In Feet**
513
Base Flood Elevation in Feet Where Uniform Within Zone**
(EL 967)
Elevation Reference Mark
RM7 ×
River Mile
• M1.5
**Referenced to the National Geodetic Vertical Datum of 1929
*EXPLANATION OF ZONE DESIGNATIONS
ZONE
EXPLANATION
A
Areas of 100-year flood; base flood elevations and flood hazard factors not determined.
AO
Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; average depths of inundation are shown, but no flood hazard factors are determined.
AH
Areas of 100-year shallow flooding where depths are between one (1) and three (3) feet; base flood elevations are shown, but no flood hazard factors are determined.
A1-A30
Areas of 100-year flood; base flood elevations and flood hazard factors determined.
A99
Areas of 100-year flood to be protected by flood protection system under construction; base flood elevations and flood hazard factors not determined.
B
Areas between limits of the 100-year flood and 500-year flood; or certain areas subject to 100-year flooding with average depths less than one (1) foot or where the contributing drainage area is less than one square mile; or areas protected by levees from the base flood. (Medium shading)
C
Areas of minimal flooding. (No shading)
D
Areas of undetermined, but possible, flood hazards.
V
Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors not determined.
V1-V30
Areas of 100-year coastal flood with velocity (wave action); base flood elevations and flood hazard factors determined.
NOTES TO USER
Certain areas not in the special flood hazard areas (zones A and V) may be protected by flood control structures.
This map is for flood insurance purposes only; it does not necessarily show all areas subject to flooding in the community or all planimetric features outside special flood hazard areas.
For adjoining map panels, see separately printed Index To Map Panels.
INITIAL IDENTIFICATION: MARCH 22, 1974
FLOOD HAZARD BOUNDARY MAP REVISIONS:
FLOOD INSURANCE RATE MAP EFFECTIVE: AUGUST 15, 1979
FLOOD INSURANCE RATE MAP REVISIONS:
Refer to the FLOOD INSURANCE RATE MAP EFFECTIVE date shown on this map to determine when actuarial rates apply to structures in the zones where elevations or depths have been established.
To determine if flood insurance is available in this community, contact your insurance agent, or call the National Flood Insurance Program, at (800) 638-6620, or (800) 424-8872.
APPROXIMATE SCALE
1000 0 1000 FEET
NATIONAL FLOOD INSURANCE PROGRAM
FIRM
FLOOD INSURANCE RATE MAP
TOWN OF
SOUTH HADLEY,
MASSACHUSETTS
HAMPSHIRE COUNTY
PANEL 10 OF 10
(SEE MAP INDEX FOR PANELS NOT PRINTED)
COMMUNITY-PANEL NUMBER
250170 0010 A
EFFECTIVE DATE:
AUGUST 15, 1979
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

# Figure 4

Pre-Development Watershed Map

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- EXISTING WATERSHED AREA
- TIME OF CONCENTRATION
- ASPHALT
- ROOF
- DIRT
- GRASS
- WOODS
- EXISTING CATCHMENT
- DISCHARGE POINT

SCALE: HORZ.: 1" = 80'
VERT.: -
DATUM: HORZ.: -
VERT.: -
0 40' 80'
GRAPHIC SCALE


FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com


# PRE-DEVELOPMENT WATERSHED MAP

SHELD HEADQUARTERS

SOUTH HADLEY MASSACHUSETTS

PROJ. No.: 20250806.A10
DATE: 03/02/2026

FIG.04


File: J:\DWG\P2025\0806\A10\Civil\Figures\20250806A10_DRNG01.dwg Layout: FIG.04 Plotted: 2026-02-27 2:03 PM Saved: 2026-02-27 1:50 PM User: Amina.Nefic
PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB
LAYER STATE:
MS VIEW:

# Figure 5

Post-Development Watershed Map

LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED WATERSHED AREA
- TIME OF CONCENTRATION
- ASPHALT
- ROOF
- POND
- GRASS
- WOODS
- PROPOSED CATCHMENT
- DISCHARGE POINT
- INFILTRATION BASIN

SCALE:
HORZ.: 1" = 80'
VERT.: -
DATUM:
HORZ.: -
VERT.: -
0 40' 80'
GRAPHIC SCALE


FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com


SHELD
POST-DEVELOPMENT WATERSHED MAP
SHELD HEADQUARTERS
SOUTH HADLEY
MASSACHUSETTS

PROJ. No.: 20250806.A10
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FIG.05


File: J:\DWG\P2025\0806\A10\Civil\Figures\20250806A10_DRNG01.dwg Layout: FIG.05 Plotted: 2026-02-27 2:05 PM Saved: 2026-02-27 1:50 PM User: Amina.Nefic
PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB
MS VIEW:
LAYER STATE:

# Appendix A

## Site Plans (Separately Bound)

# Appendix B

## NRCS Soil Report

Map Scale: 1:5,630 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

## MAP LEGEND

**Area of Interest (AOI)**

- Area of Interest (AOI)

**Soils**

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

**Special Point Features**

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

**Water Features**

- Streams and Canals

**Transportation**

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

**Background**

- Aerial Photography

## MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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: Hampshire County, Massachusetts, Central Part
Survey Area Data: Version 20, Sep 5, 2025

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

Date(s) aerial images were photographed: Oct 15, 2020—Oct 31, 2020

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 |
|---|---|---|---|
| 31A | Walpole sandy loam, 0 to 3 percent slopes | 3.7 | 3.0% |
| 254A | Merrimac fine sandy loam, 0 to 3 percent slopes | 4.1 | 3.4% |
| 255A | Windsor loamy sand, 0 to 3 percent slopes | 89.5 | 74.1% |
| 255B | Windsor loamy sand, 3 to 8 percent slopes | 21.5 | 17.8% |
| 256A | Deerfield loamy fine sand, 0 to 3 percent slopes | 1.9 | 1.6% |
| 750C | Windsor-Scitico-Amostown complex, 0 to 15 percent slopes | 0.2 | 0.1% |
| **Totals for Area of Interest** | | **120.8** | **100.0%** |

# Appendix C

Soil Investigations (Separately Bound)

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

J0381-63-01
February 14, 2025

SHELD
Attn: Sean Fitzgerald, General Manager
85 Main Street
South Hadley, Massachusetts 01075

Re: Preliminary Geotechnical Engineering Recommendations
Proposed SHELD Facility
64 Willimansett Street/Old Lyman Road
South Hadley, Massachusetts

Dear Mr. Fitzgerald:

O'Reilly, Talbot & Okun Associates, Inc. (OTO) is pleased to provide this preliminary report presenting our geotechnical engineering recommendations for the proposed South Hadley Electric Light Department (SHELD) facility to be constructed off Old Lyman Road in South Hadley, Massachusetts. A Site Locus is provided as Figure 1. A Site Plan is provided as Figure 2.

Our preliminary geotechnical recommendations are based upon subsurface conditions observed in six soil borings, two cone penetration test (CPT) soundings, and six test pits. Our services consisted of the full-time observation of the soil borings and test pits; coordination of the CPT soundings; field and laboratory testing; review of the logs, soil samples, and test data; engineering analyses; and preparation of this report. This report is subject to the Limitations attached as Appendix A.

Subsurface conditions are favorable for the proposed construction. Site soils generally consist of approximately 40 feet of loose to medium dense, fine or fine to medium sand over fine grained soils, followed by glacial till. At this time, it appears that the proposed buildings can be supported on traditional spread footings bearing upon densified native soils or engineered fill. Groundwater is present at an approximate depth of between 5 and 15 feet below the ground surface, based upon current topography. However, the groundwater table may be higher during wet periods or immediately after rain events. Therefore, dewatering may be necessary to construct footings and install utilities, depending on final Site layout and elevations.

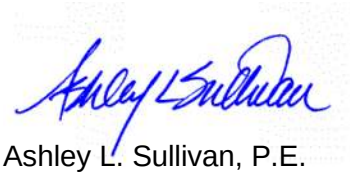
We understand that final grading concepts are in progress. The topography in portions of the Site varies by several feet. Therefore, we anticipate that significant earthwork will be required to level the Site and establish building and pavement subgrades, and that it is the developer's intent to re-use on-Site soils as engineered fill to the extent possible. The uniform sands are susceptible to disturbance, tend to dry out quickly, and may be difficult to compact. A preliminary discussion of the suitability of Site soils for re-use is discussed in the report.

This report should be reviewed and updated as necessary once final structure, layout, and grading designs are completed.

We appreciated the opportunity to be of service on this project. If you have any questions, please do not hesitate to contact the undersigned.

Sincerely yours,
O'Reilly, Talbot & Okun Associates, Inc.

Pierre J. Carriere, EIT
Project Engineer



Ashley L. Sullivan, P.E.
Principal

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Figures & Sheets

Figure 1: Site Locus

Figure 2: Site Plan

Sheet 1: General Compaction Guidelines

Appendix A: Limitations

Appendix B: ConeTec Report (January 20, 2025)

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Appendix D: Test Pit Logs and Photographs

Appendix E: Laboratory Data Sheets

## 1.0 PROJECT DESCRIPTION

The Site is located off Old Lyman Road in South Hadley, Massachusetts, on the parcel known as 64 Willimansett Street (Hampshire County Registry of Deeds, Book 12464, Page 112). The Site is currently undeveloped and is mostly covered by small trees and brush, with some open grass-covered or sandy areas. Wetlands are located in the southern portion of the property. The project area is bounded to the north by an existing access road, followed by commercial properties; to the east by Old Lyman Road and residential properties; to the south by wooded land; and to the west by the Big Y World Class Market building and parking lot. The location of the Site is shown on Figure 1.

The proposed project includes the construction of a new SHELD facility to consist of the following:

- An office building (footprint of approximately 12,000 square feet);
- A warehouse building (footprint of approximately 10,000 square feet);
- A garage building (footprint of approximately 12,000 square feet);
- A covered storage area (footprint of approximately 7,500 square feet);
- Paved areas including access roads and both staff and public parking;
- Stormwater basins in the north, east, and southwest portions of the Site; and
- Miscellaneous improvements including a fuel dispensing and storage area, generator mechanical yard, and open storage areas.

We understand that the facility is categorized as a Category IV structure(s).

We anticipate that the proposed buildings will be single-story, slab-on-grade structures. Framing materials and building loads are not known at this time. However, we expect that maximum column loads will be on the order of 100 kips or less, and strip footing loads will be on the order of 5 kips or less. The footprints of the proposed structures are shown on Figure 2.

We understand that final grading concepts are in progress. The Site was previously mined for sand, and topography in portions of the Site varies by several feet. Therefore, significant earthwork will be required to level the Site and establish building and pavement subgrades. We anticipate that fills needed to establish final grades will be generated from the excavations of soil piles and cuts to construct of the proposed infiltration basins. This report should be reviewed and updated as necessary once final structure, layout, and grading designs are completed. A preliminary discussion of the suitability of Site soils for reuse as engineered fill is discussed in Section 5.7.

## 2.0 SUBSURFACE EXPLORATIONS AND TESTING

Subsurface investigations consisted of six geotechnical soil borings, two cone penetration test (CPT) soundings, and six test pits. Soil boring, CPT, and test pit locations are shown on Figure 2.

An O'Reilly, Talbot & Okun Associates, Inc. (OTO) representative observed and logged each of the soil borings and test pits and coordinated CPT testing. Soil samples were described according to a modified version of the Burmister Soil Classification System. The CPT data were used to estimate soil behavior type, which is analogous to soil classification

based upon published correlations[1,2,3,4], and to measure the seismic shear wave velocity of the Site soils. Explorations were backfilled with Site soils upon completion.

### 2.1 Cone Penetration Tests

Two cone penetration test (CPT) soundings (SCPT25-01 and SCPT25-02) were performed by ConeTec, Inc. of West Berlin, New Jersey on January 8, 2024 using a C03-030 CPT Track Rig. A cone penetrometer is a cylindrical element with a conical tip that is pushed into the ground at a fixed rate while the resistance at the tip and friction along the sides of the penetrometer are measured on a continuous basis using electronic load cells. Soil properties such as density, friction angle, and strength can be approximated based upon the tip resistance, skin friction, and ratios calculated using these measurements.

The electronic CPT probe used for this project was a seismic piezocone (SCPTu) probe, equipped with a geophone to measure seismic shear wave velocity (S) and a pressure transducer to measure pore water pressure (u). The response of the Site soils under earthquake loadings can be estimated based upon seismic shear wave velocity measurements. A detailed discussion of the piezocone and shear wave velocity tests is presented in the attached ConeTec data report attached as Appendix B.

The CPT soundings were performed in the eastern and western portions of the Site. Since CPT measurements of tip resistance and skin friction are collected on a nearly continuous basis, detailed profiles of soil type and geotechnical properties (such as density, friction angle, and strength) were developed. The data from the CPT soundings indicated soil types and properties consistent with published correlations for the Standard Penetration Tests (SPT) performed in the soil borings.

Shear wave measurements were obtained at approximate three-foot intervals in soundings SCPT25-01 and SCPT25-02. These soundings were each terminated within a dense soil layer, likely glacial till, at a depth of approximately 100 feet.

### 2.2 Shear Wave Velocity Measurements

Sixty (60) seismic shear wave velocity (Vs) measurements (total) were obtained in CPT soundings SCPT25-01 and SCPT25-02 at approximate three-foot intervals, to provide a profile of shear wave velocity with depth at the Site. Shear wave velocity measurements are presented in the attached ConeTec data report. The approximate harmonic averages were 778 and 784 feet per second (fps), respectively, with velocities ranging from 569 to 979 fps for the two probes.

Shear wave velocity measurements were used to determine the Seismic Site Classification for the structural design of the building. The Site Classification was determined to be Class D based upon these measurements.

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[1] Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, "Seismic CPT to Measure In-Situ Shear Wave Velocity", Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.
[2] Robertson, P.K., 1990, "Soil Classification Using the Cone Penetration Test", Canadian Geotechnical Journal, Volume 27: 151-158.
[3] "Guide to Cone Penetration Testing for Geotechnical Engineering", by Robertson and Cabal, Gregg Drilling and Testing Inc. 6th Edition, December 2014.
[4] Robertson, P.K., 2009, "Interpretation of cone penetration tests – a unified approach", Canadian Geotechnical Journal, Volume 46: 1337-1355.

### 2.3 Soil Borings

Soil borings B-1 through B-6 were performed by Seaboard Drilling of Chicopee, Massachusetts. The borings were performed with a Diedrich D-50 track mounted drill rig, and advanced using hollow stem auger drilling techniques. Borings were performed in accessible areas within the footprint of the proposed office, warehouse, and garage buildings. Boring locations are shown on Figure 2. Borings B-1 through B-5 were terminated at a depth of 22 feet. Boring B-6 was extended to a depth of 42 feet.

Soil samples were collected from the borings on a semi-continuous basis from the ground surface to a depth of nine feet below ground surface, at a depth of ten feet, and every five feet thereafter. Samples were collected using a two-inch diameter split spoon sampler, driven 24 inches with a 140-pound hammer falling 30 inches (American Society for Testing and Materials Test Method D1586 “Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils”). The number of blows required to drive the sampler each six inches was recorded. The standard penetration resistance, or N-value, is the number of blows required to drive the sampler the middle 12 inches. Soil properties, such as strength and density, are related to the N-value. The field N-values are corrected to a standard 60% hammer efficiency, known as the $N_{60}$-value, to account for differing sampler type, borehole diameter, depth, and hammer type/efficiency. The N-values presented on the boring logs are field values and are not corrected values. However, the corrected $N_{60}$ values were determined and were used in our engineering calculations and analysis. Boring logs are attached as Appendix C.

The headspace of each soil sample collected from the borings was screened using a MiniRAE Lite Photo-Ionization Detector (PID). PID screening provides an assessment of volatile organic content of the samples. PID readings are provided on the boring logs.

### 2.4 Test Pits

Six test pits (designated T-1 through T-6) were performed by Seaboard Drilling of Riverside, Rhode Island using a Komatsu PC40MR mini excavator equipped with an approximately 0.3 cubic yard bucket. The test pits were performed to observe the nature of soils and any signs of seasonal high groundwater, as well as to determine the presence of over-sized material (cobbles and boulders). An OTO field engineer observed and logged each test pit. Test pit locations are shown on Figure 2. Test pit logs and photographs are attached as Appendix D.

### 2.5 In-Situ Hydraulic Conductivity Testing

Four in-situ hydraulic conductivity (or permeability) tests were performed immediately adjacent to test pits performed in the area of proposed stormwater basins. The hydraulic conductivity tests were performed with a Guelph permeameter, which uses a constant head testing methodology. The Guelph permeameter allows the rate of water recharge into an unsaturated soil to be measured while a constant water head is maintained.

The permeability test is performed by augering a shallow hole into the soil at the base of a test pit. The Guelph apparatus is then inserted, water is added to the apparatus, and the change in the rate of water flow from a reservoir over time is recorded. These data are

then used to calculate the coefficient of permeability or hydraulic conductivity. The results of in-situ permeability testing are discussed in Section 3.3.

### 2.1 Laboratory Analyses

Select soil samples collected from test pits were analyzed for grain size distribution by Allied Testing Laboratories of Springfield, Massachusetts. These tests were performed to evaluate the suitability of on-Site soils for use as engineered fill. The following samples were analyzed: T-4 (2'-6.5'), T-5 (0'-5'), T-5 (5'-9'), and T-6 (2.5'-4.5'). Results are discussed in Section 3.4 and 5.7.1. Laboratory data sheets are attached as Appendix E.

## 3.0 SUBSURFACE CONDITIONS

Subsurface conditions were interpreted based upon samples collected from the soil borings and test pits and supplemented with data from the CPT soundings. Conditions generally consisted of a surface layer of topsoil (where present), underlain by native sandy and fine-grained soils. Soil conditions are favorable for the proposed construction.

The Site is geologically situated near the eastern shore of former Lake Hitchcock, which was a large post-glacial lake that formerly covered much of the Connecticut River Valley. The lake was present from the final retreat of the continental glaciers (which once covered all of New England) until about 14,000 years ago, when the natural dam that formed the southern edge of the lake in Connecticut was eroded and the lake drained. Sediments consisting of thin interbedded layers of clay, silt, and sand (collectively known as varved clay) were deposited at the bottom of the lake. Published geologic maps[5] indicate that the lake bottom deposits at the Site are up to 50 feet thick.

### 3.1 Soil Conditions

*Topsoil*: Where present, up to 14 inches of topsoil was encountered at the ground surface. The topsoil consisted of brown to dark brown, fine or fine to medium sand with little silt and trace amounts of organics (roots). We note that testing for nutrient content, pH, or organic content was not part of this study. We recommend this testing be performed to evaluate the suitability of existing Site topsoil for reuse.

*Granular Soils:* Sandy soils were encountered at the ground surface or immediately beneath the topsoil in each boring. The upper (near-surface) portion of this soil layer consisted of loose to medium dense, fine sand with little to trace amounts of medium sand and silt. The proportion of medium sand generally increased at between 5 and 10 feet beneath the ground surface and varied thereafter. Each of the test pits was terminated in the upper sandy soils at a depth of between 9 and 11 feet. We note that portions of the near-surface soils may consist of reworked Site soils or imported material similar in composition to the native soils.

[5] Langer, W.H. (1979). "Map Showing Distribution and Thickness of the Principal Fine-Grained Deposits, Connecticut Valley Urban Area, Central New England", *Miscellaneous Investigations* Series, USGS Map No. 1-1074-C, Sheet 1 of 2.

Based upon the borings, the silt content of the granular soils increased at depths of approximately 16 to 22 feet. Borings B-1 through B-5 were terminated in silty sand at a depth of 22 feet below the ground surface.

*Native Fine-Grained Soils*: The fines (silt and clay) content continues to increase with depth, based upon boring B-6 and the CPT probes. Fine-grained soils that likely contain significantly less sand are present below a depth of 40 feet. This fine-grained soil layer extended to the maximum depth explored (approximately 100 feet) in CPT probes SCPT25-01 and SCPT25-02. Boring B-1 was terminated near the top of the fine-grained soil layer, at 42 feet below the ground surface.

Given the observed soil conditions, we do not anticipate that the fine grained soil layer will impact the proposed construction.

*Results of PID Screening*: The headspace of each sample collected from the soil borings was screened using a photoionization detector (PID). PID screening provides an assessment of the total organic vapor (TOV) content of the samples. The PID readings were generally below 2.0 parts per million (ppm) by volume, which are consistent with background values. PID readings of between 8 and 16 ppm were observed in the upper 2 to 4 feet in borings B-1 and B-2. However, no significant odors or staining were observed. PID readings are presented on the boring logs.

### 3.2 Groundwater Conditions

We note that groundwater appears to be relatively shallow at the Site (approximately 5 to 15 feet below the existing ground surface), based upon observations in the test pits and piezocone measurements from the CPT probes. A trace amount of redoximorphic features (i.e., rust mottling) was observed as shallow as 2 feet below the ground surface, and more significant mottling was encountered at depths of 3.5 to 8 feet. Recommendations for water control during construction are provided in Section 5.3.

### 3.3 In-Situ Hydraulic Conductivity Testing

In-situ hydraulic conductivity (or permeability) tests were performed immediately adjacent to three of the test pits (T-2, T-3, and T-5) to aid in design of the stormwater management systems. The hydraulic conductivity tests were performed with a Guelph permeameter, in a shallow hole augered at the base of a test pit. Results are presented in Table 1.

**Table 1**
**Hydraulic Conductivity Test Results**

| Test Pit | Test Depth (ft) | Soil Conditions | K Value (feet/day) |
|---|---|---|---|
| T-2 | 3.0 | Fine sand, little medium sand, trace silt | 23 |
| T-3 | 3.0 | Fine sand, trace medium sand, trace silt | 26 |
| | 7.5 | Fine sand, little medium sand, trace silt | 36 |
| T-5 | 5.5 | Fine to medium sand, trace silt, trace coarse sand | 76 |

The relative proportions of fine sand, medium sand, and silt appear to vary; therefore, we recommend that a relatively lower permeability value, on the order of 20 to 30 feet per day, be assumed for the design of stormwater management systems.

### 3.4 Grain Size Distribution Analyses

Four soil samples were submitted to Allied Testing Laboratories, Inc. of Springfield, Massachusetts for grain size distribution analysis. The samples were collected from test pits T-4, T-5, and T-6. The results were used to evaluate the suitability of the near-surface granular soils for reuse as engineered fill. Grain size distribution requirements are provided in Table 4. Laboratory testing results are discussed below and in Section 5.6. Laboratory data sheets are attached as Appendix E.

The near surface samples were generally classified as fine or fine to medium sand with trace amounts of silt. Two of the samples contained trace amounts of coarse sand and fine gravel. Additional information regarding the uniformity of on-Site soils and their use as engineered fill is presented in Section 5.7.

## 4.0 SIGNIFICANT GEOTECHNICAL ISSUES

The significant geotechnical issues for the proposed construction addressed in this report include the following: foundation type and bearing capacity; settlement; seismic design considerations; pavement subgrades; and the suitability of on-Site materials for use as engineered fill.

## 5.0 DESIGN RECOMMENDATIONS

The following recommendations are provided for the construction assumed in this report and refer to the 10th Edition of the Massachusetts State Building Code (MSBC), which includes amendments to the 2021 International Building Code (IBC) and became effective on October 11, 2024. The 9th Edition of the Building Code will apply concurrently with the

10th Edition until June 30, 2025.[6] For seismic parameters, both 9th and 10th Edition values are provided.

### 5.1 Preliminary Foundation Recommendations

The new building can be supported on normal spread footings bearing on densified native sandy soils and/or compacted Sand and Gravel or Crushed Stone fill.

The native near surface soils at the Site consist of a relatively clean (i.e., containing only minimal amounts of fine-grained soils) and uniform fine to medium sand, which will tend to dry out quickly and become loose and disturbed under normal construction traffic. In addition, their in-situ moisture content is often well below optimum. Additional information regarding on-Site soil properties and their re-use is provided in Section 5.7. Therefore, in areas where footings extend into native soils, we recommend that the contractor over-excavate footing subgrades by 6 inches and place 6 inches of compacted Sand and Gravel or Crushed Stone fill to protect foundation subgrades and provide a firm working surface. We note that it may be necessary to apply water and compact native subgrades immediately prior to placement of engineered fills. The Sand and Gravel or Crushed Stone fill beneath the footings should meet the grain size distribution characteristics outlined in Table 4.

Any non-engineered fill, debris, organics, topsoil, asphalt, or other deleterious materials should be removed from beneath the building footprint. Excavations resulting from the removal of unsuitable materials should be backfilled with compacted Sand and Gravel or Crushed Stone fill.

The proposed building can be founded on normal spread footing foundations bearing on densified native soils or compacted engineered fill. Provided the recommendations presented in this section are followed, we recommend that a maximum allowable bearing pressure of 3,000 pounds per square foot be used for the design of the proposed structures. We recommend that the entire building footprint be thoroughly proof compacted prior to construction.

Exterior footings should be embedded a minimum of 48 inches below the lowest adjacent grade for frost protection. Interior footings should bear at least two feet below the surrounding floor slab. Strip footings, beneath the load bearing walls, should be at least 18 inches wide. All other applicable requirements of the Massachusetts State Building Code (MSBC) should be followed.

Footings should not be placed on frozen soils. Footing excavations should be free of loose or disturbed materials. If boulders or cobbles larger than four inches in diameter are encountered in footing subgrades, they should be removed from within one foot of the

[6] Tenth edition of the MA State Building Code 780 | Mass.gov Building permit applications for projects utilizing the 9*th* Edition need to be filed on or before June 30, 2025. Applications received on or after July 1, 2025, that are based on the 9*th* Edition will not be accepted and will not be granted a building permit. Breaking ground on a jobsite does not need to begin immediately when obtaining a permit. However, if breaking ground does not commence within 180 days of a permit being issued, the permit may expire unless extended.

bottom of the footing and replaced with compacted Sand and Gravel or Crushed Stone fill. The footing subgrades should be densified immediately prior to placement of footing concrete with at least three passes with a vibrating plate compactor. If loose materials are present in the excavations, they shall be compacted to form a firm, dense bearing surface.

### 5.2 Settlement

We anticipate that the new buildings will be constructed near existing grade. We estimate that settlement of footings and slabs bearing on densified native soils or compacted engineered fill should be small and largely elastic in nature. Maximum settlements should be less than 1 inch and should occur relatively quickly after load application (during construction).

### 5.3 Concrete Slabs

We recommend that concrete slabs bear on at least 12 inches of compacted Sand and Gravel fill or Crushed Stone to provide uniform support and a capillary moisture break. The subgrade should also be free of large boulders or cobbles. The engineered fill beneath the concrete slabs should meet the grain size distribution characteristics outlined in Table 4.

The subgrade within the footprint of the proposed buildings should be stripped of topsoil and any non-engineered fill. Prior to the placement of any engineered fill, we recommend that the building footprint be thoroughly densified to treat any loose areas present. If non-engineered fill, soft, or disturbed areas are present, these materials should be removed and recompacted or replaced with compacted Sand and Gravel or Crushed Stone. Fill supporting slabs should be placed in accordance with the recommendations presented on Sheet 1.

For preliminary design, slabs may be designed using a standardized (based on a one square foot test plate) vertical subgrade modulus of 150 tons per cubic foot, provided the slab sits upon compacted structural fill. This subgrade modulus should be corrected for mat/slab size. This value should be re-evaluated during final design, when slab elevations are known.

### 5.4 Groundwater and Surface Water Control

Saturated soils were observed at a depth of between 5 and 15 feet below the existing ground surface. The difference in depth to groundwater appears to be due to elevation changes at the surface. The groundwater depth/elevation should be reviewed once final grading and slab elevations are known. Groundwater may be present at shallower depths during periods of wet weather. If groundwater is encountered during excavations for footings and utilities, it should be possible to dewater these excavations by trenching or using sump pumps.

We recommend that the building include perimeter drainage to control groundwater and surface water infiltration. The perimeter drainage system can consist of perforated PVC pipe, installed in a Crushed Stone trench and wrapped in a non-woven geotextile fabric. The perimeter drain should be designed to allow water to flow away from the foundation

via gravity. Clean-outs should also be provided in the perimeter drainage system to allow for future maintenance.

### 5.5 Seismic Considerations

Earthquake loadings must be considered under requirements in Section 1613 and 1806 of the 10th Edition (October 2024) of the Massachusetts State Building Code (MSBC). The 10th Edition of the MSBC is based upon the International Building Code 2021 (IBC) with Massachusetts amendments. Note that the IBC refers to ASCE-7, *Minimum Design Loads for Buildings and Other Structures*.

#### *5.5.1 Site Class and Earthquake Design Factors*

Section 1613 of the IBC covers lateral forces imposed on structures from earthquake shaking and requires that every structure be designed and constructed to resist the effects of earthquake motions in accordance with ASCE-7. Lateral forces are dependent on the type and properties of soils present beneath the Site, along with the geographic location.

The maximum considered earthquake spectral response acceleration at short periods ($S_s$) and at 1-sec ($S_1$) were determined per Table 1604.11 for South Hadley, Massachusetts, and are presented in Table 2.

Soil properties are represented through Site Classification. Procedures for the Site-specific determination of Site Classification are provided in Chapter 20 of ASCE-7. At this Site, we evaluated Site Classification using seismic shear wave velocity ($V_s$) measurements obtained in the CPT soundings. Based upon these measurements, the Site Class was determined to be Class D. Furthermore, the Site coefficients $F_a$ and $F_v$ were determined according to Tables of the IBC (2021), using both the $S_s$ and $S_1$ values and the Site Class. Seismic design values are provided in Table 2.

**Table 2**
**Seismic Design Parameters**

| Parameter | Value 9th Ed. MSBC | Value 10th Ed. MSBC |
|---|---|---|
| $S_s$ | 0.171 | 0.167 |
| $S_1$ | 0.066 | 0.056 |
| Site Class | D | D |
| $F_a$ | 1.6 | 1.6 |
| $F_v$ | 2.4 | 2.4 |

#### *5.5.2 Liquefaction*

Section 1806.4 relates to the liquefaction potential of the underlying soils. The liquefaction potential was evaluated for saturated Site soils using methods recommended by Youd

and Idriss[7]. It is unlikely that significant amounts of liquefaction-induced settlement would occur under the design earthquake.

### 5.6 Exterior Slabs and Pavements

This section provides recommendations for exterior entryways, slabs, and sidewalks, as well as flexible pavements.

#### *5.6.1 Concrete Slabs*

Exterior concrete slabs, such as those at entryways and sidewalks adjacent to the building should be designed to mitigate differential frost movement between adjacent slabs, doorways, and pavements. To address this concern, we recommend that concrete slabs at entryways be underlain by four feet of non-frost susceptible Sand and Gravel fill. Where exterior slabs butt against hard surfaces, we recommend that for the area beyond the edges of the slab, the bottom of Sand and Gravel fill should transition gradually upward at a slope of 3H:1V or flatter (zone of influence).

We recommend that concrete sidewalks that are outside the zone of influence of the building and entryways, as well as areas where differential frost movement would not cause a tripping hazard, bear on at least 12 inches of imported, compacted Sand and Gravel to provide uniform support and a capillary moisture break. Fill should be placed in accordance with the recommendations for compaction provided on Sheet 1. Subgrades should also be free of large boulders. We recommend that the entire subgrade of the sidewalk be proof compacted with a heavy vibrating roller to treat any loose areas. The Sand and Gravel fill beneath the concrete slabs and sidewalks should meet the grain size distribution characteristics described in Table 4.

#### *5.6.2 Flexible Pavement Design*

We expect that the proposed project will involve the construction of parking areas and roadways for use by light passenger vehicles and/or heavy vehicles. The recommended pavement design sections are presented in Table 3. We recommend that pavement subgrades be thoroughly proof compacted to treat any loose areas present.

The native near surface soils at the Site consist of a relatively uniform fine sand with generally trace amounts of silt. The poorly graded (uniform) Site soils will tend to dry out quickly and will become loose and disturbed under normal construction traffic when dry. These soils will tend to dry out and significant water may need to be applied to keep the moisture content near optimum. In addition, the team may consider supplementing these soils with coarser material. Additional information is provided in Section 5.7.1.

[7] Youd, T.L. and Idriss, I.M. (2001). "Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshops on Evaluation of Liquefaction Resistance of Soils", *Journal of Geotechnical and Geoenvironmental Engineering*, April 2001, pp. 297-313.

**Table 3**
**Recommended Pavement Design Sections**

| Layer | Thickness |
|---|---|
| Asphalt Finish Course | 1.5 inches |
| Asphalt Binder Course | 1.5 inches |
| Gravel Base Course | 12 inches |

The project civil engineer should review and revise the Asphalt Finish Course and Binder Course thicknesses as appropriate for the anticipated traffic loads. Table 4 presents recommendations for gradation requirements for the Gravel Base Course material. Please note that the Gravel Base Course specification is Mass Highway M1.03.1, Processed Gravel for Subbase.

### 5.7 Earthwork Considerations

We anticipate that earthwork for this project will include the following: cuts and fills to level the Site; excavations for footings; placement of compacted engineered fill beneath the building, floor slab, and pavements (as needed); and the treatment of the existing soils to address any localized loose areas that may be present.

#### *5.7.1 Engineered Fill Recommendations*

Four engineered fill types are recommended:

- Sand and Gravel for use immediately below footings, slabs, and sidewalks,
- Crushed Stone in drainage systems (as needed), and as an alternative to Sand and Gravel,
- Gravel Base Course for use beneath pavements, and
- Granular Fill for use as miscellaneous fill and to form the building pad at depths greater than 12 inches beneath floor slabs and footings.

Grain size distribution requirements are presented in Table 4.

**Table 4**
**Grain Size Distribution Requirements**

| Size | Sand and Gravel | Gravel Base Course | Granular Fill | Crushed Stone |
|---|---|---|---|---|
| | Percent Finer by Weight | | | |
| 3 inch | 100 | 100 | 100 | --- |
| 1 ½ inch | --- | 70-100 | --- | --- |
| 1 inch | --- | --- | --- | 100 |
| ¾ inch | --- | 50-85 | --- | 90-100 |
| ½ inch | 50-85 | --- | --- | 10-50 |
| ⅜ inch | --- | --- | --- | 0-20 |
| No. 4 | 40-75 | 30-60 | --- | 0-5 |
| No. 8 | --- | --- | --- | --- |
| No. 10 | --- | --- | 30-90 | --- |
| No. 40 | 10-35 | --- | 10-70 | --- |
| No. 200 | 0-10 | 0-10 | 0-15 | --- |

Please note that the Sand and Gravel specification is approximately that for Mass Highway M1.03.0, Type B Gravel Borrow.

Based upon the subsurface explorations and laboratory testing performed, the near-surface soils generally consist of a uniform fine sand. Therefore, it does not appear that significant amounts of near surface soils meet requirements for use as engineered fill beneath structures or immediately below pavements (within 2 feet). However, these soils may be placed as backfill in landscaped areas or in deep fill areas below pavements.

We note that the in-Situ moisture content of the near surface Site soils is likely to be several percent less (drier) than the optimal moisture content during dry periods. Therefore, it may be necessary to apply significant amounts of water for dust control and during compaction to facilitate proper compaction and keep them in a dense, compacted condition if they are exposed. In our experience, the in-situ moisture content of near surface granular soils could be five or more percent drier than the optimum moisture content during dry periods.

We recommend engineered fills that re-use Site soils be placed and compacted as a continuous operation so that they do not dry out between fill lifts. Compacted fills can be protected by placing a layer of well graded, compacted Sand and Gravel over surfaces that will be exposed for an extended period.

In addition to wetting the soils, the design team may consider methods such as supplementing existing Site soils with natural aggregates, the modification of construction sequencing or methods, or the use of geotextile stabilization fabrics. We note that it is common to supplement a uniform, poorly graded soil with gravel or crushed aggregate to create an improved material.

### *5.7.2 Compaction Recommendations*

Fill, debris, and topsoil (if encountered) should be removed from beneath the building footprint and should not be reused as fill beneath structures. To avoid point loads, any cobbles or boulders larger than four inches in diameter encountered at the subgrade should also be removed.

Prior to the placement of any engineered fill, we recommend that the entire building footprint be thoroughly proof compacted. Proof compaction should be accomplished by a minimum of six passes with a 6,000-pound vibratory roller. To facilitate compaction, the moisture content of the on-Site material should be maintained at or near the optimum moisture content as determined by ASTM D1557.

Compacted fill should be placed in lifts ranging in thickness between 6 and 12 inches depending on the size and type of equipment. Recommended degrees of compaction and compaction means and methods are presented on Sheet 1.

Compaction within five feet of foundation walls should be performed using a hand-operated roller or vibratory plate compactor. If the new walls are to be backfilled on both sides, placement and compaction of engineered fill should proceed on both sides of the wall so that the difference in top of fill on either side does not exceed two feet.

### *5.7.3 Construction Dewatering*

If necessary, it should be possible to dewater construction excavations by trenching or using sump pumps. The contractor should establish and maintain proper drainage of soils during construction (e.g., preventing excess stormwater from entering excavations).

### *5.7.4 Sloping and Earth Support*

Soil adjacent to excavations may become unstable when excavations extend deeper than four feet. Any groundwater or surface water runoff encountered during the excavations will need to be controlled via trenching and sumps to keep the excavation stable and dry. Shoring or sloping may be necessary to protect personnel and to provide stability. The soils encountered at the Site are estimated to be Type C soils for slope stability purposes. The maximum allowable slope for excavations of Class C soils is 1.5H:1V (34°). Protective systems for any excavation exceeding 20 feet in depth must be designed by a registered professional engineer. All excavations should conform to current OSHA requirements.

In areas where sloping is not feasible, excavations may require temporary earth support systems during construction. Based upon the current design, we do not anticipate that such systems will be needed to construct the building. If necessary, the design and engineering of the temporary earth support systems should be the responsibility of the contractor. Prior to construction, we recommend that the contractor evaluate the need for temporary earth support systems.

## 6.0 FINAL DESIGN AND CONSTRUCTION PHASE SERVICES

It is recommended that O'Reilly, Talbot & Okun Associates, Inc. (OTO) be retained during final design stages to review the recommendations provided in this report since only concept designs were available.

We recommend that OTO be retained during the construction design phase to prepare and/or review appropriate specification sections and drawings and meet with the Construction Manager and Owner's Project Manager to finalize construction plans.

During construction phases, we recommend that OTO be retained to provide engineering support, review submittals related to geotechnical aspects of the project, and to document subgrade conditions and preparation. Earthwork observation during construction should occur during excavations and subgrade preparation for the new structures.

# FIGURES

0 1000 FEET
0 0.5 1.0 MILES
0 0.5 1 KILOMETERS

1:24,000 SCALE NORTH AMERICAN VERTICAL DATUM OF 1988 10 FOOT CONTOUR INTERVAL

O:\J0300381 Caolo Bieniek Assoc Inc\63-01 Old Lyman Rd South Hadley - Geotech\Report and Figures\Figure 1 - Site Locus (24K scale).pdf


O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES
293 Bridge Street, Suite 500 Springfield, MA 01103 413.788.6222
www.OTO-ENV.com


# PROPOSED SHELD FACILITY

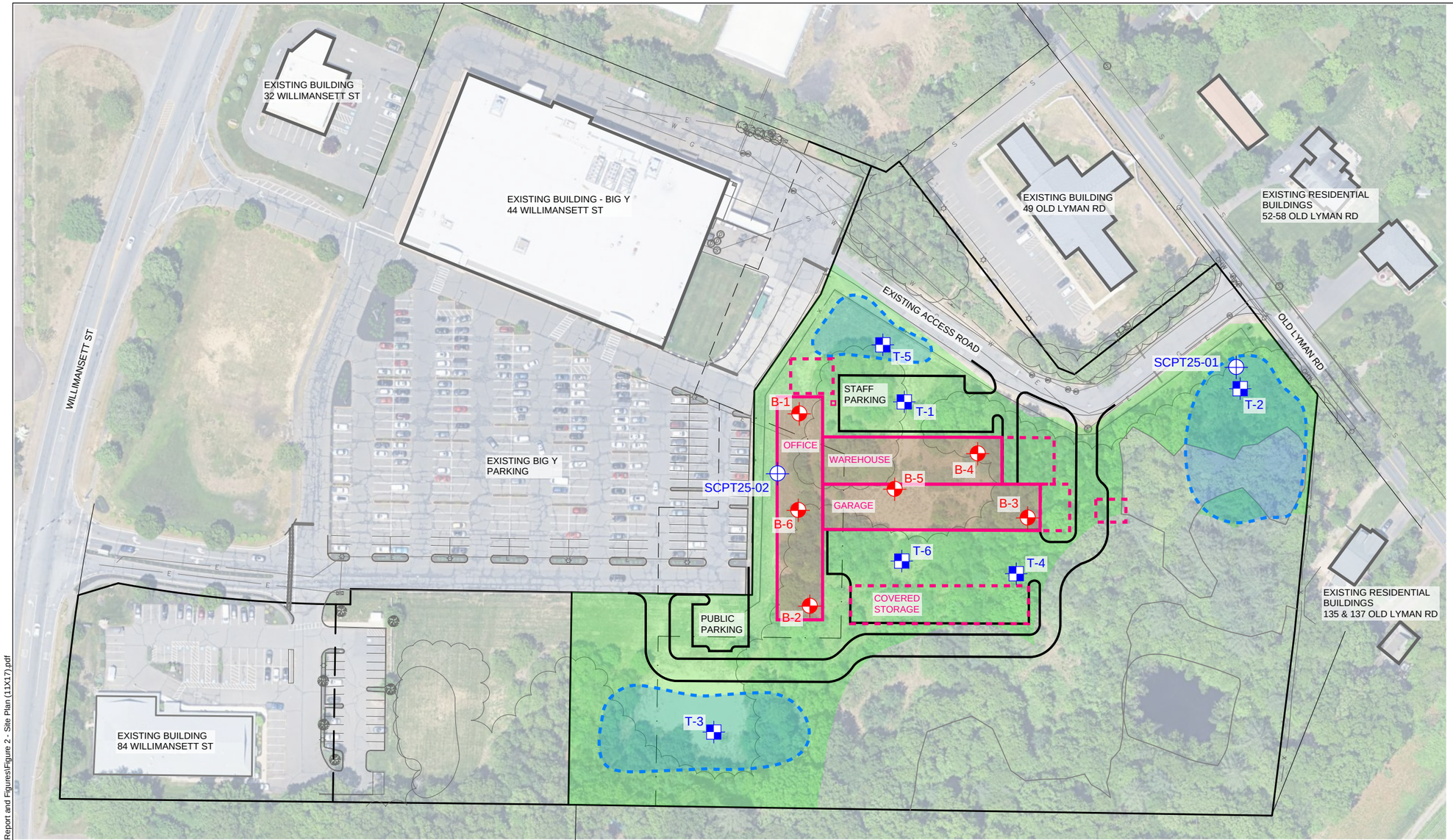
64 WILLIMANSETT STREET
SOUTH HADLEY, MASSACHUSETTS

## SITE LOCUS

Topographic Map Quadrants: SPRINGFIELD NORTH, MA
Map Version: 2021
Current As Of: 2021
Date: FEBRUARY 2025

PROJECT No. J0381-63-01

FIGURE No. 1




NOTES:

1. BASE PLAN PROVIDED TO OTO IN ELECTRONIC FORMAT; ORIGINAL DRAWING TITLED "LOT LINE RECONFIGURATION PLAN" (SHEET ANR-6), BY F.A. HESKETH & ASSOCIATES, DATED 05/04/2022.
2. PROPOSED SITE LAYOUT PROVIDED TO OTO IN ELECTRONIC FORMAT; ORIGINAL DRAWING TITLED "CONCEPTUAL SITE PLAN - 3D BORING LOCATION PLAN" (SHEET CONCEPT 3D-R1), BY CAOLO & BIENIEK ASSOCIATES, DATED 12/16/2024.
3. BASE IMAGERY FROM GOOGLE EARTH, RETRIEVED 12/03/2024.
4. APPROXIMATE SAMPLE LOCATIONS ARE SHOWN ACCORDING TO TAPED MEASUREMENS TAKEN FROM EXISTING SITE FEATURES OR BASED UPON MOBILE GPS APPLICATIONS.
5. ALL DATA IS TO BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHODS USED IN THE DEVELOPMENT OF THIS PLAN

LEGEND:

- PROPOSED SOIL BORING LOCATION, TO BE PERFORMED BY SEABOARD DRILLING AND OBSERVED BY OTO
- APPROXIMATE LOCATION OF CPT SOUNDING, PERFORMED BY CONETEC ON JANUARY 8, 2025
- APPROXIMATE LOCATION OF TEST PIT PERFORMED BY SEABOARD DRILLING ON JANUARY 8, 2025, OBSERVED BY OTO
- PROPOSED BUILDING
- PROPOSED OPEN STRUCTURE OR MISC./FUTURE SITE IMPROVEMENT
- PROPOSED STORMWATER BASIN

SCALE IN FEET
1" = 120'

0' 60' 120' 240'

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES
293 Bridge Street, Suite 500 Springfield, MA 01103 413.788.6222
www.OTO-ENV.com

DESIGNED BY: PJC
DRAWN BY: PJC
CHECKED BY: ALS
DATE: 02/04/2024
REV. DATE:

# PROPOSED SHELD FACILITY
64 WILLIMANSETT STREET
SOUTH HADLEY, MASSACHUSETTS

# SITE PLAN

PROJECT NO.
J0381-63-01

FIGURE NO.
2

O:\J0300381 Caolo Bieniek Assoc Inc\63-01 Old Lyman Rd South Hadley - Geotech\Report and Figures\Figure 2 - Site Plan (11X17).pdf

SHEETS

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**Table 1-1**
**Degree of Compaction Recommendations**

| Location | Minimum Compaction |
|---|---|
| Below Structures (Foundations and Slabs) | 95% |
| Below Pavements/Sidewalks/Exterior Slabs | 95% |
| Against Basement Walls/Retaining Walls | 92% |
| Utility Trenches | 95% |
| General Landscaped Areas | 90% |

Notes.
1. Percentage of the maximum dry density as determined by Modified Proctor ASTM D1557, Method C.
2. When location falls into two or more categories, the engineer should be notified to determine appropriate compaction efforts and/or methods.
3. Crushed stone should be compacted in lifts of 12 inches to form a dense matrix using either traditional compaction methods (vibratory plate and/or roller) or tamping with an excavator bucket in deep excavations. It is generally not necessary to perform laboratory or field density testing on crushed stone.

**Table 1-2**
**General Guidelines for Compaction Means and Methods**

| Compaction Method | Maximum Stone Size (Inches Diameter) | Maximum Lift Thickness (Inches) | | Minimum Number of Passes | |
|---|---|---|---|---|---|
| | | Below Structures & Pavement | Non-Critical Areas | Below Structures & Pavement | Non-Critical Areas |
| Hand-operated Vibratory Plate and confined spaces | 3 | 6 | 8 | 6 | 4 |
| Hand-operated vibratory drum roller (less than 1000 pounds) | 3 | 6 | 8 | 6 | 4 |
| Hand-operated vibratory drum roller (at least 1,000 pounds) | 6 | 8 | 10 | 6 | 4 |
| Light vibratory drum roller (minimum 3000 pounds) | 6 | 10 | 14 | 6 | 4 |
| Heavy vibratory drum roller (minimum 6000 pounds) | 6 | 12 | 18 | 6 | 4 |

Note: The contractor should reduce or stop drum vibration if pumping of the subgrade is observed.

\\otostoazfiles001.file.core.windows.net\jobfiles\Job Files\J0300\0381 Castle Bieniek Assoc Inc\63-01 Old Lyman Rd South Hadley - Geotech\Report and Figures\Sheet 1 - Compaction 0381-63-01.pdf

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PROPOSED SHELD FACILITY
64 WILLIMANSETT STREET
SOUTH HADLEY, MASSACHUSETTS

GENERAL COMPACTION GUIDELINES

DESIGNED BY: ALS
DRAWN BY: DAH
CHECKED BY: MJT
DATE: 02/04/2025
REV. DATE:

PROJECT No. J0381-63-01

SHEET No. 1

APPENDIX A

# LIMITATIONS

# LIMITATIONS

1. The observations presented in this report were made under the conditions described herein. The conclusions presented in this report were based solely upon the services described in the report and not on scientific tasks or procedures beyond the scope of the project or the time and budgetary constraints imposed by the client. The work described in this report was carried out in accordance with the Statement of Terms and Conditions attached to our proposal.

2. The analysis and recommendations submitted in this report are based in part upon the data obtained from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until construction. If variations then appear evident, it may be necessary to reevaluate the recommendations of this report.

3. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more erratic. For specific information, refer to the boring logs.

4. In the event that any changes in the nature, design or location of the proposed structures are planned, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing by O'Reilly, Talbot & Okun Associates Inc. It is recommended that we be retained to provide a general review of final plans and specifications.

5. Our report was prepared for the exclusive benefit of our client. Reliance upon the report and its conclusions is not made to third parties or future property owners.

APPENDIX B

# CONETEC REPORT
# JANUARY 20, 2025

# PRESENTATION OF SITE INVESTIGATION RESULTS

## Old Lyman Road - South Hadley, MA

**Prepared for:**
**O'Reilly, Talbot & Okun Engineering Associates**
**ConeTec Job No:** **25-53-28903**

Project Start Date: 2025-01-08
Project End Date: 2025-01-08
Release Date: 2025-01-20

**Report prepared by:**
**ConeTec, Inc.**

436 Commerce Lane, Unit C, West Berlin, NJ 08091
Tel: (856) 767-8600

ConeTecNJ@conetec.com
www.conetec.com
www.conetecdataservices.com

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# ABOUT THIS REPORT

The attached report presents the findings of the site investigation program.

At the request of: O'Reilly, Talbot & Okun Engineering Associates.

Conducted by: ConeTec, Inc.

Please be advised that this report, along with all associated data, is subject to the Third-Party Disclaimer and the Client Disclaimer contained in the 'Limitations' section of this report. For further reference, please consult the list of attached documents following the main body of the report.

| PROJECT | |
|---|---|
| Client Name | O'Reilly, Talbot & Okun Engineering Associates |
| Project Name | Old Lyman Road - South Hadley, MA |
| Test Types | SCPTu |
| ConeTec Project Number | 25-53-28903 |
| Additional Comments | None |

# CONTENTS

The following are included in the body of the report:


- Site Map
- Limitations and Closure
- Project Information
- Test Summaries and Plots
- Supporting Documents and Materials

# SITE MAP

All locations are approximate unless otherwise stated in the body of the report.

**ConeTec Job Number:** 25-53-28903

**Client:** O'Reilly, Talbot & Okun Engineering Associates

**Project:** Old Lyman Road - South Hadley, MA

**Date:** 2025-01-20

# LIMITATIONS

## Third-Party Disclaimer

'Report' refers to this document titled: Old Lyman Road - South Hadley, MA

The Report was prepared by ConeTec for: O'Reilly, Talbot & Okun Engineering Associates

The Report is confidential and may not be distributed to or relied upon by any third parties without the express written consent of ConeTec. Third parties who gain access to the Report do not acquire any rights by virtue of such access. Any use which a third party makes of the Report, or any reliance on or decisions made based on it, are the responsibility of such third parties. ConeTec accepts no responsibility for loss, damage and/or expense, if any, suffered by any third parties as a result of decisions made, or actions taken or not taken, which are in any way based on, or related to, the Report or any portion(s) thereof.

## Client Disclaimer

ConeTec was retained by: O'Reilly, Talbot & Okun Engineering Associates

'Report' refers to this document titled: Old Lyman Road - South Hadley, MA

ConeTec was retained to collect and provide the raw data ('Data') which is included in the Report.

ConeTec has collected and reported the Data in accordance with current industry standards. No other warranties, either expressed or implied, with respect to the Data is made by ConeTec. To fully understand the Data included in the Report, reference must be made to the supporting documents and other sources referenced in the Report in their entirety. Other than the Data, the contents of the Report, including any Interpretations, should not be relied upon in any fashion without independent verification. ConeTec is in no way responsible for any loss, damage or expense resulting from the use of, and/or reliance on, such material by any party.

## Closure

Thank you for the opportunity to contribute to this project. The equipment utilized, as well as the field procedures followed, fully complied with currently accepted best practice standards.

Report prepared by: Jenna Griggs
Anthony Rasmussen, Mike Coia

# PROJECT INFORMATION

| Rig Utilized | | |
|---|---|---|
| **Description** | **Deployment System** | **Test Type** |
| C03-030 CPT Track Rig | Twin mounted cylinders | SCPTu |

| Coordinates | | | |
|---|---|---|---|
| Test Type | Number of Locations | GPS Collection Method | EPSG Number |
| SCPTu | 2 | Consumer Grade GPS | 32618 (WGS84 / UTM Zone 18 North) |

| Piezocones Used for this Project | | | | | | |
|---|---|---|---|---|---|---|
| **Cone Description** | **Cone Number** | **Cross Sectional Area** ($cm^2$) | **Sleeve Area** ($cm^2$) | **Tip Capacity** (bar) | **Sleeve Capacity** (bar) | **Pore Pressure Capacity** (bar) |
| EC990:T1000F10U35 | 990 | 15 | 225 | 1000 | 10 | 35 |

| Cone Penetration Test (CPTu) | |
|---|---|
| **Depth reference** | Depths are referenced to the existing ground surface at the time of each test. |
| **Tip and sleeve data offset** | 0.1 Meters. This has been accounted for in the CPT data files. |
| **Additional Comments** | None |

| Calculated Geotechnical Parameters | |
|---|---|
| **Additional information** | The Normalized Soil Behavior Type Chart based on $Q_{tn}$ (SBT $Q_{tn}$) (Robertson, 2009) was used to classify the soil for this project. A detailed set of calculated CPTu parameters have been generated and are provided in Excel format files in the release folder. The CPTu parameter calculations are based on values of corrected tip resistance ($q_t$) sleeve friction ($f_s$) and pore pressure ($u_2$).<br><br>Effective stresses are calculated based on unit weights that have been assigned to the individual soil behavior type zones and the assumed equilibrium pore pressure profile.<br><br>Soils were classified as either drained or undrained based on the $Q_{tn}$ Normalized Soil Behavior Type Chart (Robertson, 2009). Calculations for both drained and undrained parameters were included for materials that classified as silt mixtures (zone 4).<br><br>For calculating undrained shear strength based on pore pressure ($S_u(N_{\Delta u})$) and undrained shear strength based on cone tip resistance ($S_u(N_{kt})$), an $N_{\Delta u}$ value of 6 and an $N_{kt}$ value of 15 were selected. |

# REPORT APPENDICES

The appendices listed below are included in the report:

- **Cone Penetration Test (CPTu) Summary and Standard CPTu Plots**
- **Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi, and N1(60)Ic**
- **Soil Behavior Type (SBT) Scatter Plots**
- **Pore Pressure Dissipation Test (PPD) Summary and PPD Plots**
- **Seismic Cone Penetration Test (SCPTu) Tabular Results**
- **SCPTu Test Plots**
- **SCPTu Velocity Wave Traces**
- **Supporting Documents and Materials**

# Cone Penetration Test (CPTu) Summary and Standard CPTu Plots

CONETEC

| | |
|---|---|
| **Job No:** | 25-53-28903 |
| **Client:** | OTO Engineering Associates |
| **Project:** | Old Lyman Road - South Hadley, MA |
| **Start Date:** | 8-Jan-2025 |
| **End Date:** | 8-Jan-2025 |

## CONE PENETRATION TEST SUMMARY

| Sounding ID | File Name | Date | Rig | Cone | Cone Area ($cm^2$) | Assumed Phreatic Surface[1] (ft) | Final Depth (ft) | Shear Wave Velocity Tests | Northing[2] (m) | Easting[2] (m) |
|---|---|---|---|---|---|---|---|---|---|---|
| SCPT25-01 | 25-53-28903_SP01 | 8-Jan-2025 | TC-30 | 990:T1000F10U35 | 15 | 7.9 | 101.54 | 31 | 4677314 | 700742 |
| SCPT25-02 | 25-53-28903_SP02 | 8-Jan-2025 | TC-30 | 990:T1000F10U35 | 15 | 11.7 | 93.26 | 29 | 4677279 | 700591 |
| Totals | 2 Soundings | | | | | | 194.80 ft | 60 Tests | | |

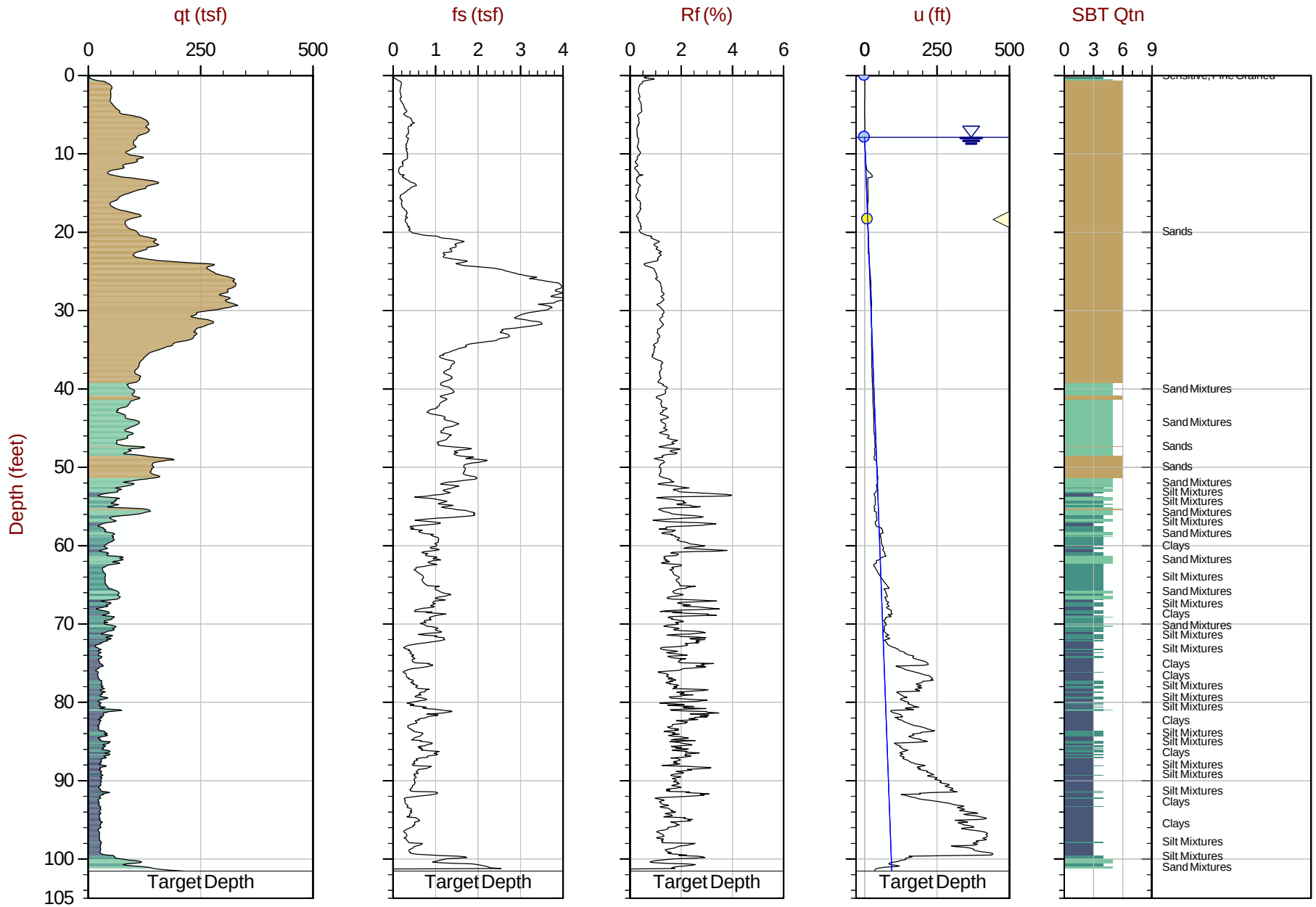
1. The assumed phreatic surface was based off the shallowest pore pressure dissipation test performed within the sounding. Hydrostatic conditions were assumed for the calculated parameters.
2. The coordinates were collected using a consumer grade GPS. EPSG number: 32618 (WGS84 / UTM Zone 18 North).

CONETEC

# OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 09:54
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-01
Cone: 990:T1000F10U35 Area=15 cm²




Max Depth: 30.950 m / 101.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 25-53-28903_SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4677314m E: 700742m

Overplot Item: Hydrostatic Line; Ueq; Assumed Ueq; PPD, Ueq achieved; PPD, Ueq not achieved; PPD, Ueq assumed

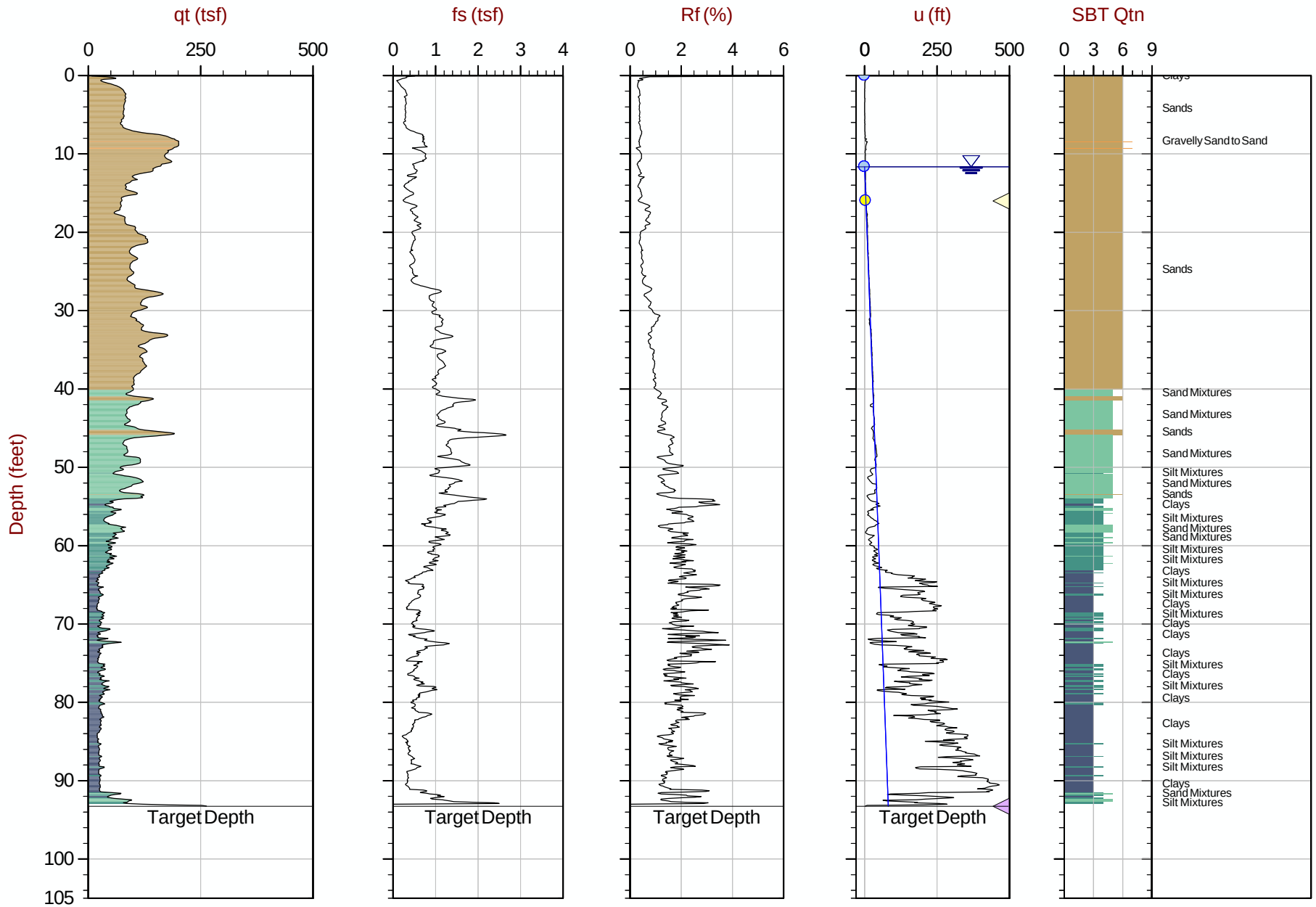
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 13:34
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02
Cone: 990:T1000F10U35 Area=15 cm²




Max Depth: 28.425 m / 93.26 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 25-53-28903_SP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4677279m E: 700591m

Overplot Item: Hydrostatic Line  Ueq  Assumed Ueq  PPD, Ueq achieved  PPD, Ueq not achieved  PPD, Ueq assumed

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

# Advanced Cone Penetration Test Plots with Ic, Su(Nkt), Phi, and N1(60)Ic

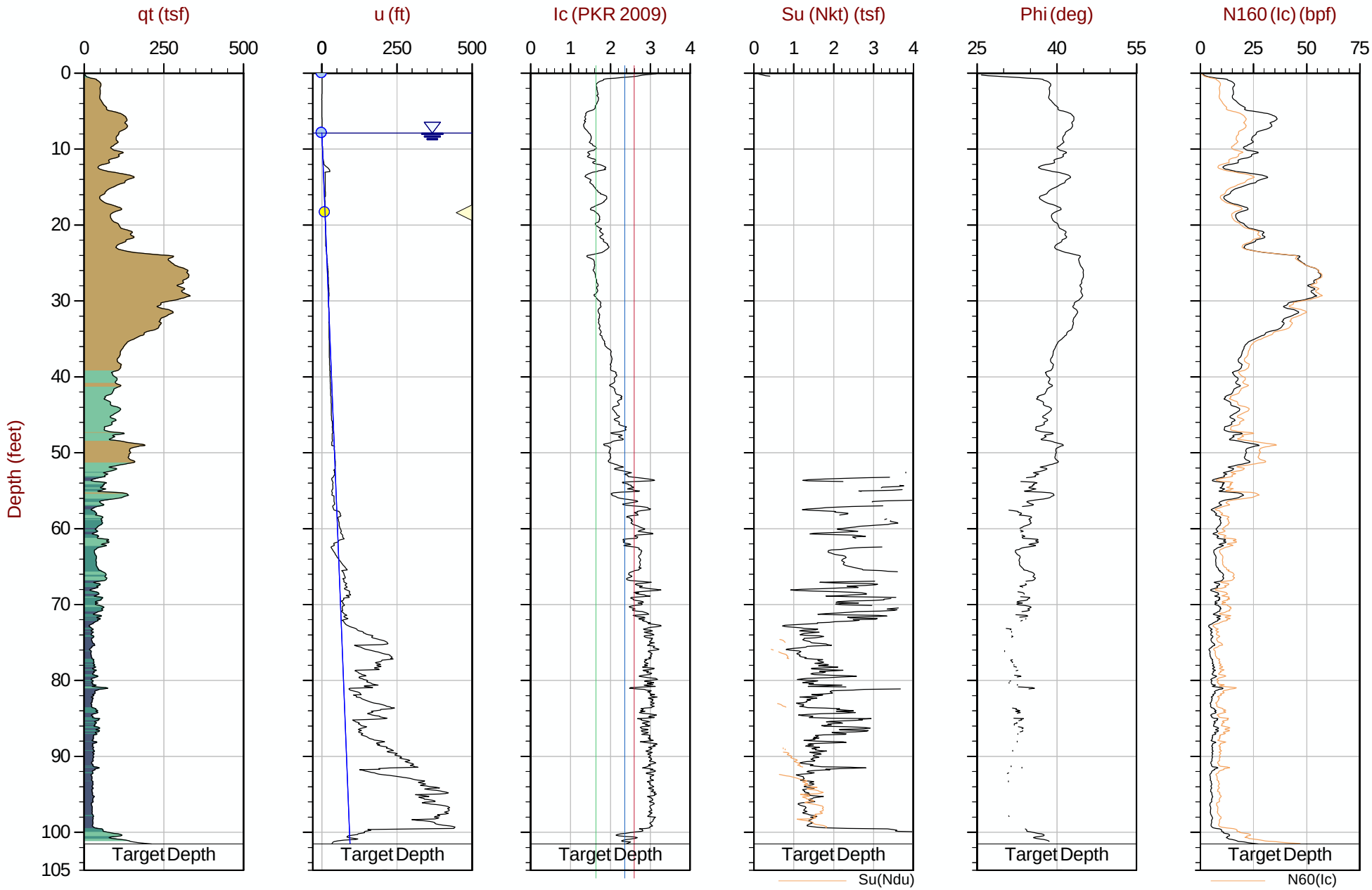
CONETEC

CONETEC

# OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 09:54
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-01
Cone: 990:T1000F10U35 Area=15 cm²




Max Depth: 30.950 m / 101.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 25-53-28903_SP01.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4677314m E: 700742m

Overplot Item: Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved | PPD, Ueq assumed

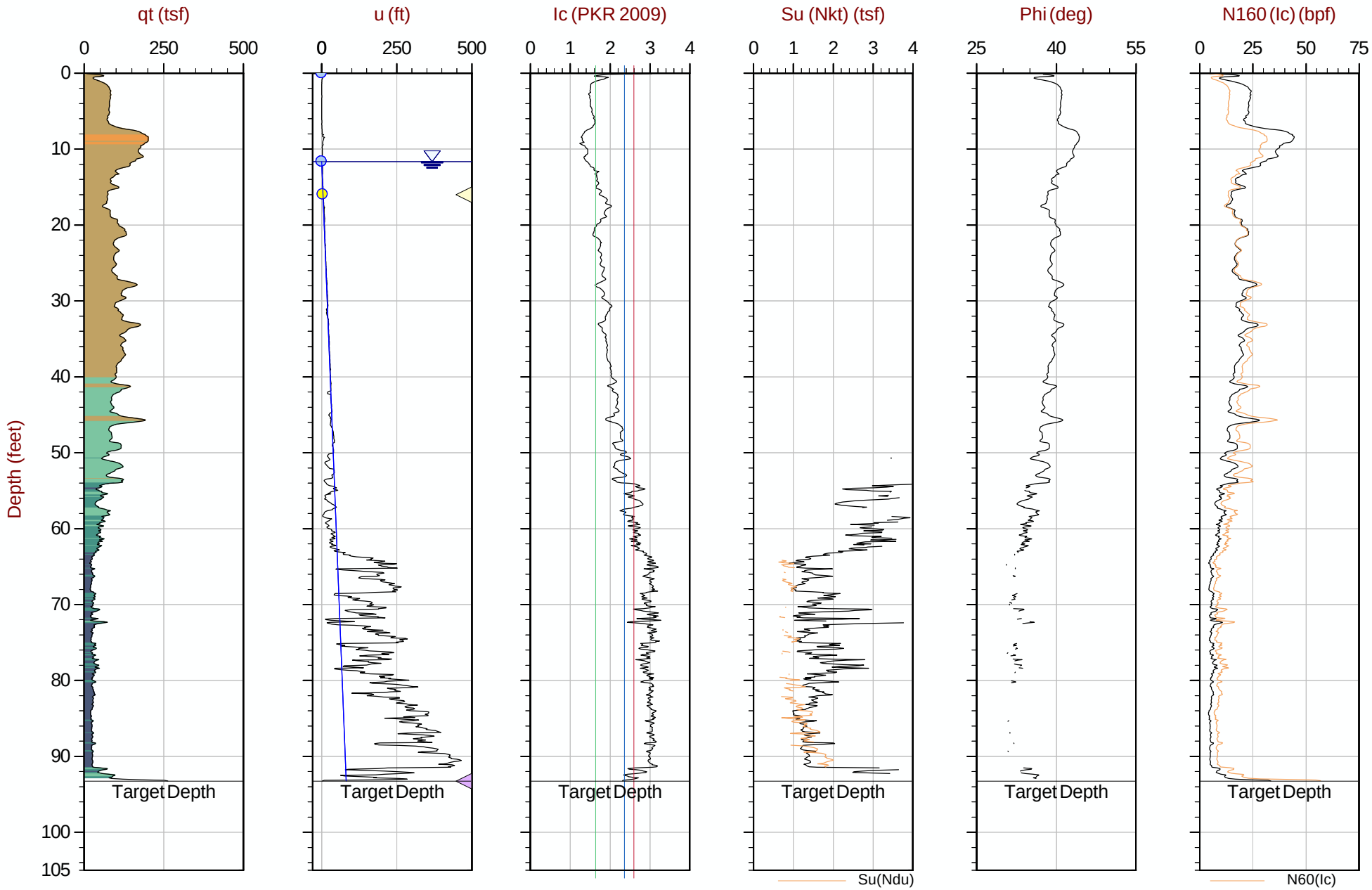
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 13:34
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02
Cone: 990:T1000F10U35 Area=15 cm²




Max Depth: 28.425 m / 93.26 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 25-53-28903_SP02.COR
Unit Wt: SBTQtn (PKR2009)
Su Nkt/Ndu: 15.0 / 6.0

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4677279m E: 700591m

Overplot Item: Hydrostatic Line, Ueq, Assumed Ueq, PPD, Ueq achieved, PPD, Ueq not achieved, PPD, Ueq assumed

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

# Soil Behavior Type (SBT) Scatter Plots

CONETEC

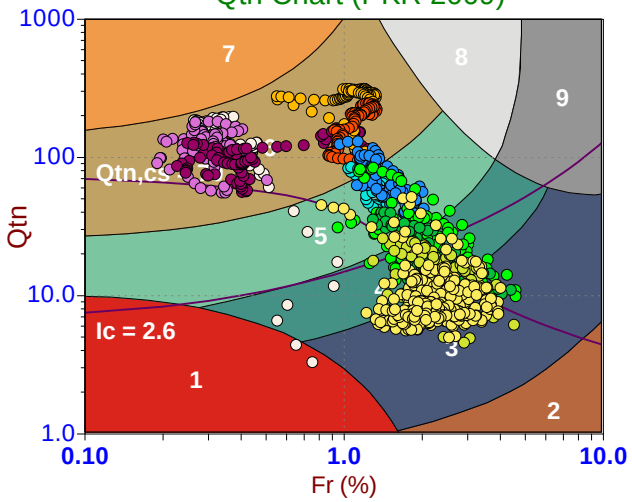
CONETEC

# OTO Engineering Associates

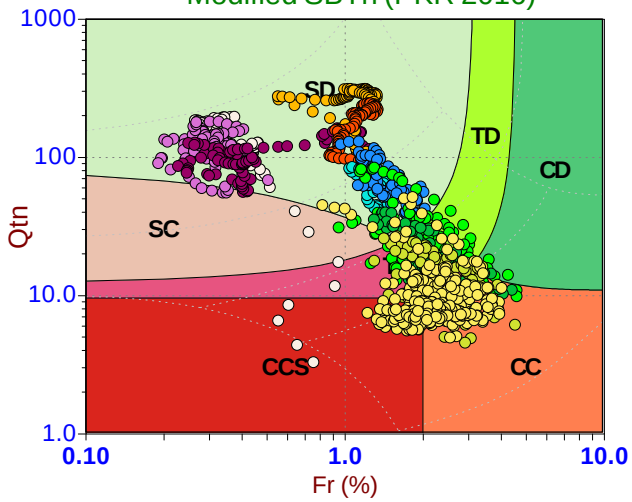
Job No: 25-53-28903
Date: 2025-01-08 09:54
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-01
Cone: 990:T1000F10U35 Area=15 cm²

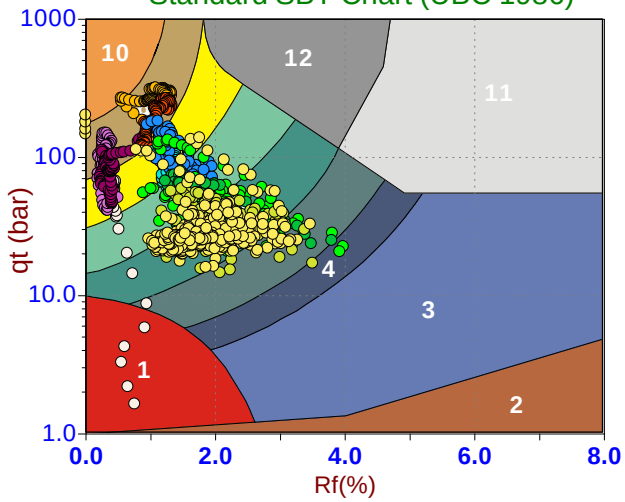
## Qtn Chart (PKR 2009)




## Modified SBTn (PKR 2016)




## Standard SBT Chart (UBC 1986)




### Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

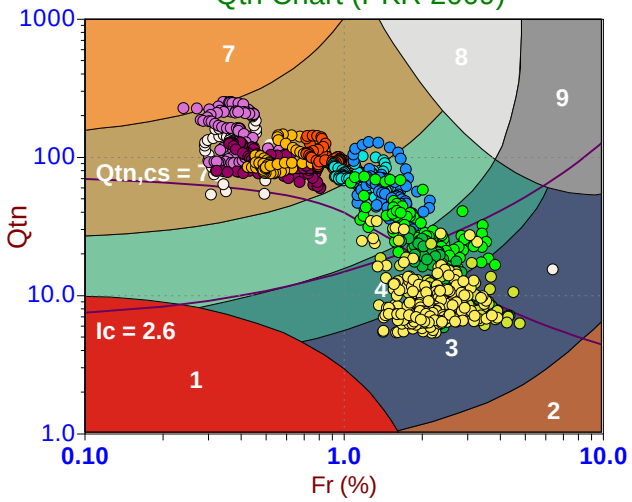
CONETEC

# OTO Engineering Associates

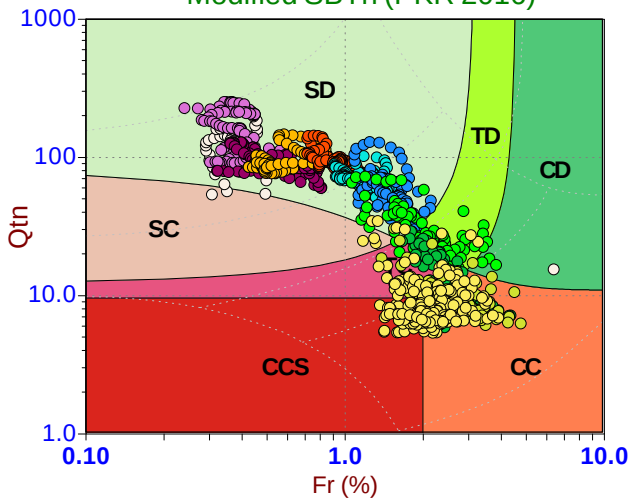
Job No: 25-53-28903
Date: 2025-01-08 13:34
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02
Cone: 990:T1000F10U35 Area=15 cm²

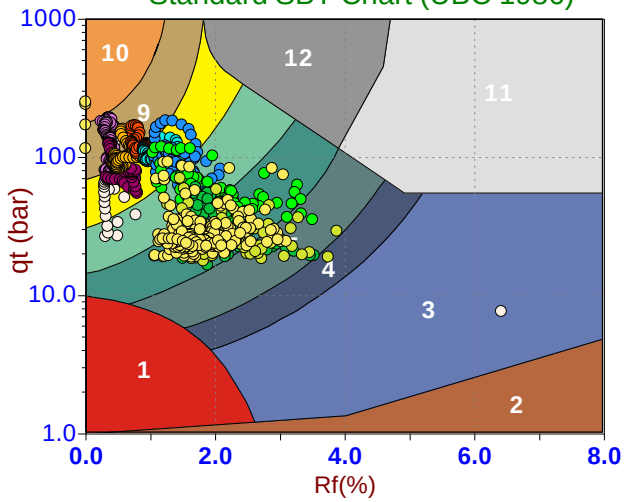
## Qtn Chart (PKR 2009)




## Modified SBTn (PKR 2016)




## Standard SBT Chart (UBC 1986)




### Depth Ranges

- >0.0 to 7.5 ft
- >7.5 to 15.0 ft
- >15.0 to 22.5 ft
- >22.5 to 30.0 ft
- >30.0 to 37.5 ft
- >37.5 to 45.0 ft
- >45.0 to 52.5 ft
- >52.5 to 60.0 ft
- >60.0 to 67.5 ft
- >67.5 to 75.0 ft
- >75.0 ft

### Legend

- Sensitive, Fine Grained
- Organic Soils
- Clays
- Silt Mixtures
- Sand Mixtures
- Sands
- Gravelly Sand to Sand
- Stiff Sand to Clayey Sand
- Very Stiff Fine Grained

### Legend

- CCS (Cont. sensitive clay like)
- CC (Cont. clay like)
- TC (Cont. transitional)
- SC (Cont. sand like)
- CD (Dil. clay like)
- TD (Dil. transitional)
- SD (Dil. sand like)

### Legend

- Sensitive Fines
- Organic Soil
- Clay
- Silty Clay
- Clayey Silt
- Silt
- Sandy Silt
- Silty Sand/Sand
- Sand
- Gravelly Sand
- Stiff Fine Grained
- Cemented Sand

# Pore Pressure Dissipation Test (PPD) Summary and PPD Plots

CONETEC

| | |
|---|---|
| **Job No:** | 25-53-28903 |
| **Client:** | OTO Engineering Associates |
| **Project:** | Old Lyman Road - South Hadley, MA |
| **Start Date:** | 8-Jan-2025 |
| **End Date:** | 8-Jan-2025 |

# CPTu PORE PRESSURE DISSIPATION SUMMARY

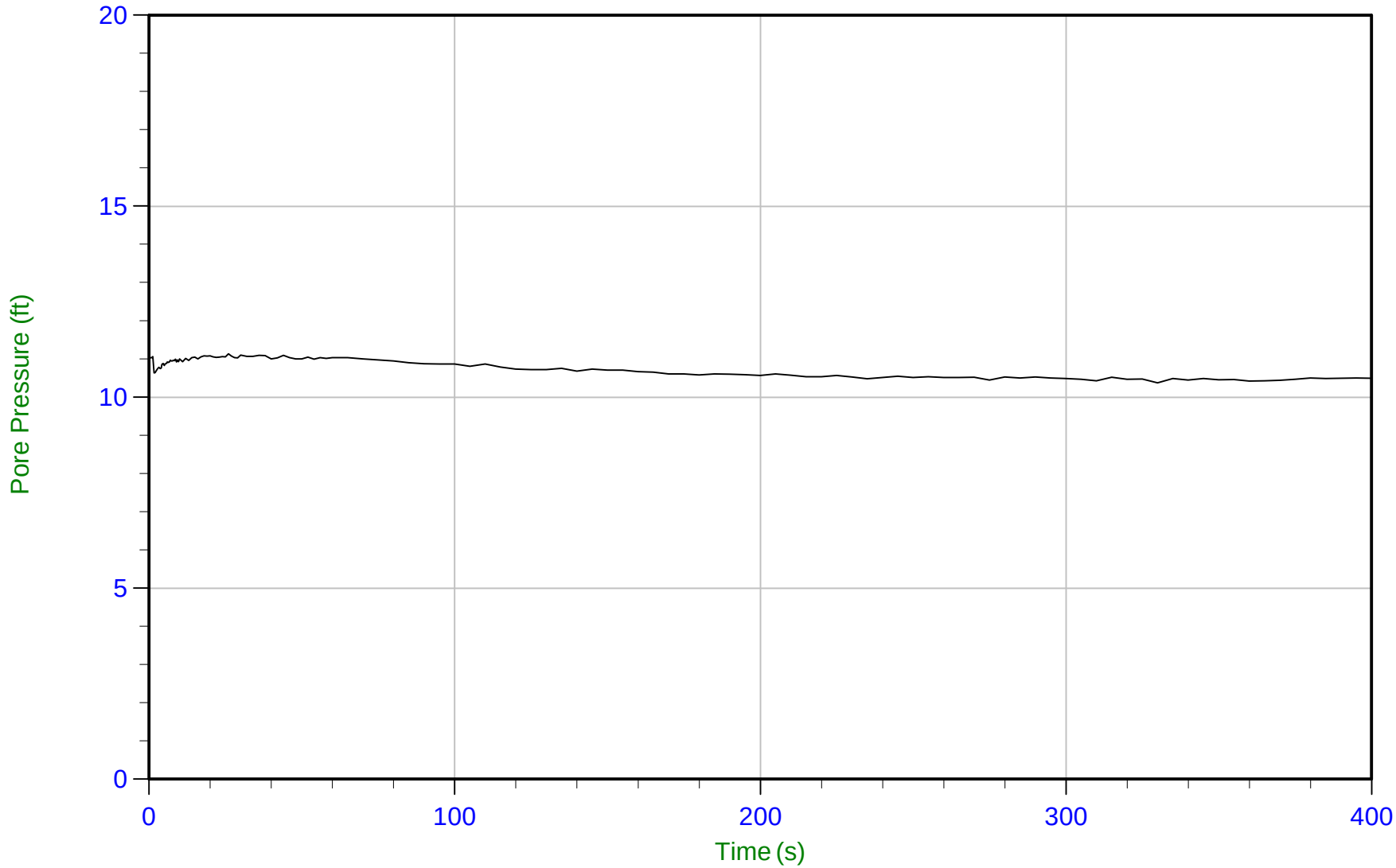
| Sounding ID | File Name | Cone Area ($cm^2$) | Duration (s) | Test Depth (ft) | Estimated Equilibrium Pore Pressure $U_{eq}$ (ft) | Calculated Phreatic Surface (ft) |
|---|---|---|---|---|---|---|
| SCPT25-01 | 25-53-28903_SP01 | 15 | 400 | 18.37 | 10.5 | 7.9 |
| SCPT25-02 | 25-53-28903_SP02 | 15 | 400 | 15.99 | 4.3 | 11.7 |
| SCPT25-02 | 25-53-28903_SP02 | 15 | 200 | 93.26 | Not Achieved | |
| Totals | 3 Dissipations | | 17 min | | | |

CONETEC

OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 09:54
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-01
Cone: 990:T1000F10U35 Area=15 cm²




Trace Summary:

Filename: 25-53-28903_SP01.PPF2
Depth: 5.600 m / 18.372 ft
Duration: 400.0 s

u Min: 10.4 ft
u Max: 11.1 ft
u Final: 10.5 ft

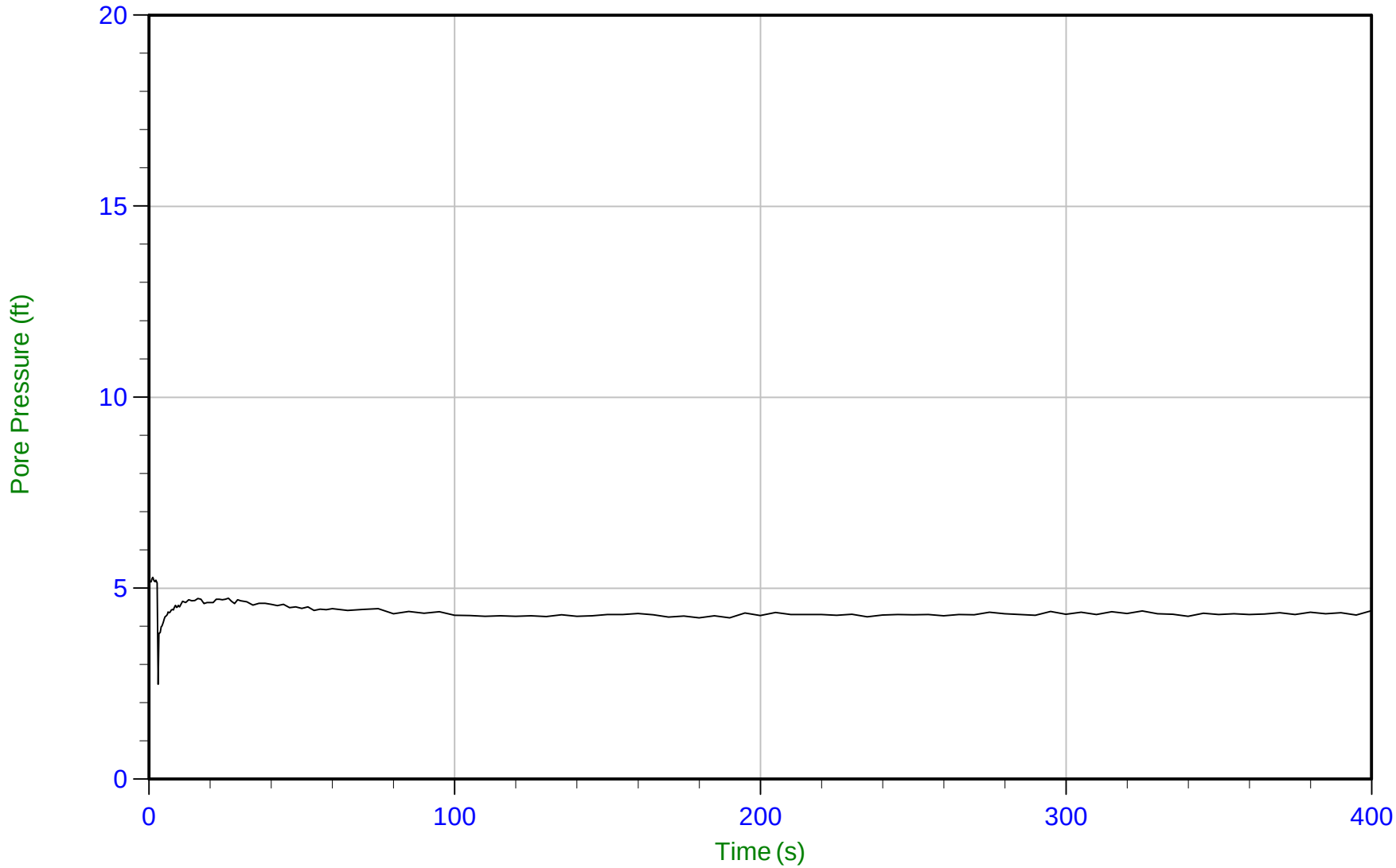
WT: 2.4 m / 7.9 ft
Ueq: 10.5 ft

CONETEC

OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 13:34
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02
Cone: 990:T1000F10U35 Area=15 cm²




Trace Summary:

Filename: 25-53-28903_SP02.PPF2
Depth: 4.875 m / 15.994 ft
Duration: 400.0 s

u Min: 2.5 ft
u Max: 5.3 ft
u Final: 4.4 ft

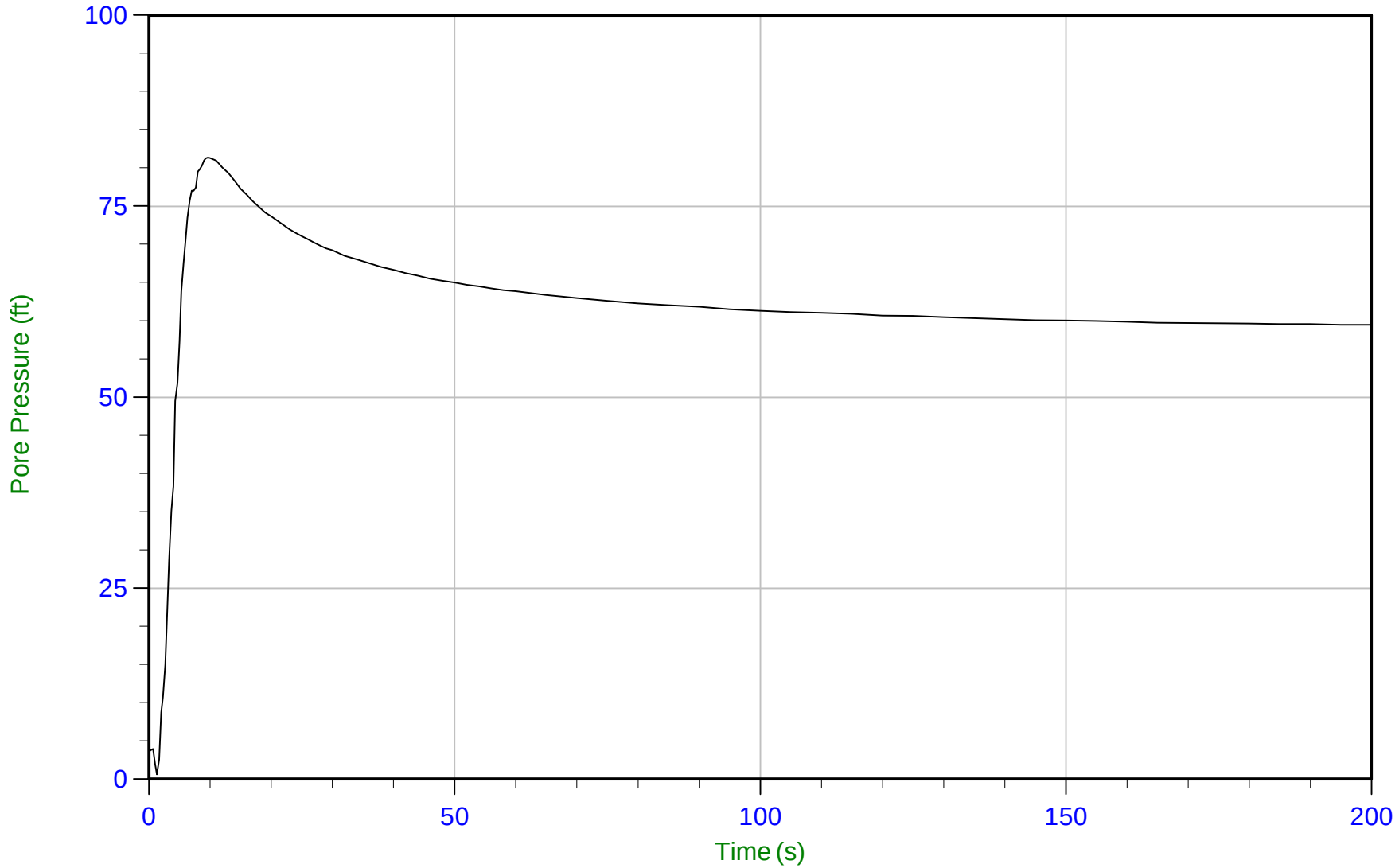
WT: 3.6 m / 11.7 ft
Ueq: 4.3 ft

CONETEC

OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 13:34
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02
Cone: 990:T1000F10U35 Area=15 cm²




Trace Summary:

Filename: 25-53-28903_SP02.PPF2
Depth: 28.425 m / 93.257 ft
Duration: 200.0 s

u Min: 0.6 ft
u Max: 81.4 ft
u Final: 59.5 ft

# Seismic Cone Penetration Test (SCPTu) Tabular Results

CONETEC

| | |
|---|---|
| **Job No:** | 25-53-28903 |
| **Client:** | OTO Engineering Associates |
| **Project:** | Old Lyman Road - South Hadley, MA |
| **Sounding ID:** | SCPT25-01 |
| **Date:** | 08-Jan-2025 |
| **Seismic Source:** | Beam |
| **Seismic Offset (ft):** | 0.49 |
| **Source Depth (ft):** | 0.00 |
| **Geophone Offset (ft):** | 0.66 |

## SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

| Tip Depth (ft) | Geophone Depth (ft) | Ray Path (ft) | Ray Path Difference (ft) | Travel Time Interval (ms) | Interval Velocity (ft/s) |
|---|---|---|---|---|---|
| 3.12 | 2.46 | 2.51 | | | |
| 6.40 | 5.74 | 5.76 | 3.25 | 5.16 | 631 |
| 9.58 | 8.92 | 8.94 | 3.18 | 5.58 | 569 |
| 12.96 | 12.30 | 12.31 | 3.38 | 5.21 | 647 |
| 16.24 | 15.58 | 15.59 | 3.28 | 5.05 | 649 |
| 19.52 | 18.86 | 18.87 | 3.28 | 5.05 | 650 |
| 22.80 | 22.15 | 22.15 | 3.28 | 4.47 | 734 |
| 26.08 | 25.43 | 25.43 | 3.28 | 3.40 | 967 |
| 29.36 | 28.71 | 28.71 | 3.28 | 3.39 | 969 |
| 32.58 | 31.92 | 31.93 | 3.22 | 3.52 | 914 |
| 35.93 | 35.27 | 35.27 | 3.35 | 4.10 | 815 |
| 39.21 | 38.55 | 38.55 | 3.28 | 4.46 | 736 |
| 42.49 | 41.83 | 41.83 | 3.28 | 4.46 | 736 |
| 45.77 | 45.11 | 45.11 | 3.28 | 4.46 | 736 |
| 49.05 | 48.39 | 48.40 | 3.28 | 4.36 | 753 |
| 52.33 | 51.67 | 51.68 | 3.28 | 4.00 | 821 |
| 55.61 | 54.95 | 54.96 | 3.28 | 4.28 | 767 |
| 58.79 | 58.14 | 58.14 | 3.18 | 4.24 | 750 |
| 62.17 | 61.52 | 61.52 | 3.38 | 4.08 | 829 |
| 65.45 | 64.80 | 64.80 | 3.28 | 4.10 | 800 |
| 68.73 | 68.08 | 68.08 | 3.28 | 4.05 | 811 |
| 72.01 | 71.36 | 71.36 | 3.28 | 4.13 | 794 |
| 75.30 | 74.64 | 74.64 | 3.28 | 4.19 | 784 |
| 78.58 | 77.92 | 77.92 | 3.28 | 4.08 | 805 |
| 81.86 | 81.20 | 81.20 | 3.28 | 3.94 | 833 |
| 85.14 | 84.48 | 84.48 | 3.28 | 3.98 | 825 |
| 88.42 | 87.76 | 87.76 | 3.28 | 3.89 | 843 |
| 91.70 | 91.04 | 91.04 | 3.28 | 3.79 | 866 |
| 94.98 | 94.32 | 94.33 | 3.28 | 3.74 | 878 |
| 98.26 | 97.61 | 97.61 | 3.28 | 3.79 | 866 |
| 101.54 | 100.89 | 100.89 | 3.28 | 3.52 | 933 |

| | |
|---|---|
| **Job No:** | 25-53-28903 |
| **Client:** | OTO Engineering Associates |
| **Project:** | Old Lyman Road - South Hadley, MA |
| **Sounding ID:** | SCPT25-02 |
| **Date:** | 08-Jan-2025 |
| **Seismic Source:** | Beam |
| **Seismic Offset (ft):** | 0.49 |
| **Source Depth (ft):** | 0.00 |
| **Geophone Offset (ft):** | 0.66 |

## SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

| Tip Depth (ft) | Geophone Depth (ft) | Ray Path (ft) | Ray Path Difference (ft) | Travel Time Interval (ms) | Interval Velocity (ft/s) |
|---|---|---|---|---|---|
| 2.89 | 2.23 | 2.28 | | | |
| 6.17 | 5.51 | 5.53 | 3.25 | 5.07 | 641 |
| 9.45 | 8.79 | 8.81 | 3.27 | 4.59 | 714 |
| 12.73 | 12.07 | 12.08 | 3.28 | 4.27 | 767 |
| 16.01 | 15.35 | 15.36 | 3.28 | 4.64 | 707 |
| 19.29 | 18.64 | 18.64 | 3.28 | 4.79 | 685 |
| 22.57 | 21.92 | 21.92 | 3.28 | 4.53 | 724 |
| 25.85 | 25.20 | 25.20 | 3.28 | 4.64 | 708 |
| 29.13 | 28.48 | 28.48 | 3.28 | 4.10 | 800 |
| 32.32 | 31.66 | 31.66 | 3.18 | 3.63 | 877 |
| 35.70 | 35.04 | 35.04 | 3.38 | 3.74 | 904 |
| 38.98 | 38.32 | 38.32 | 3.28 | 3.97 | 827 |
| 42.26 | 41.60 | 41.60 | 3.28 | 4.32 | 760 |
| 45.54 | 44.88 | 44.89 | 3.28 | 4.17 | 787 |
| 48.82 | 48.16 | 48.17 | 3.28 | 4.29 | 765 |
| 52.10 | 51.44 | 51.45 | 3.28 | 4.20 | 781 |
| 55.38 | 54.72 | 54.73 | 3.28 | 4.17 | 787 |
| 58.66 | 58.01 | 58.01 | 3.28 | 4.25 | 771 |
| 61.94 | 61.29 | 61.29 | 3.28 | 4.04 | 813 |
| 65.22 | 64.57 | 64.57 | 3.28 | 4.17 | 786 |
| 68.50 | 67.85 | 67.85 | 3.28 | 4.22 | 778 |
| 71.78 | 71.13 | 71.13 | 3.28 | 4.13 | 795 |
| 75.07 | 74.41 | 74.41 | 3.28 | 4.08 | 804 |
| 78.35 | 77.69 | 77.69 | 3.28 | 4.07 | 806 |
| 81.63 | 80.97 | 80.97 | 3.28 | 3.96 | 829 |
| 84.91 | 84.25 | 84.25 | 3.28 | 3.85 | 853 |
| 88.19 | 87.53 | 87.53 | 3.28 | 3.87 | 847 |
| 91.47 | 90.81 | 90.81 | 3.28 | 3.62 | 907 |
| 93.24 | 92.59 | 92.59 | 1.77 | 1.81 | 979 |

# SCPTu Test Plots

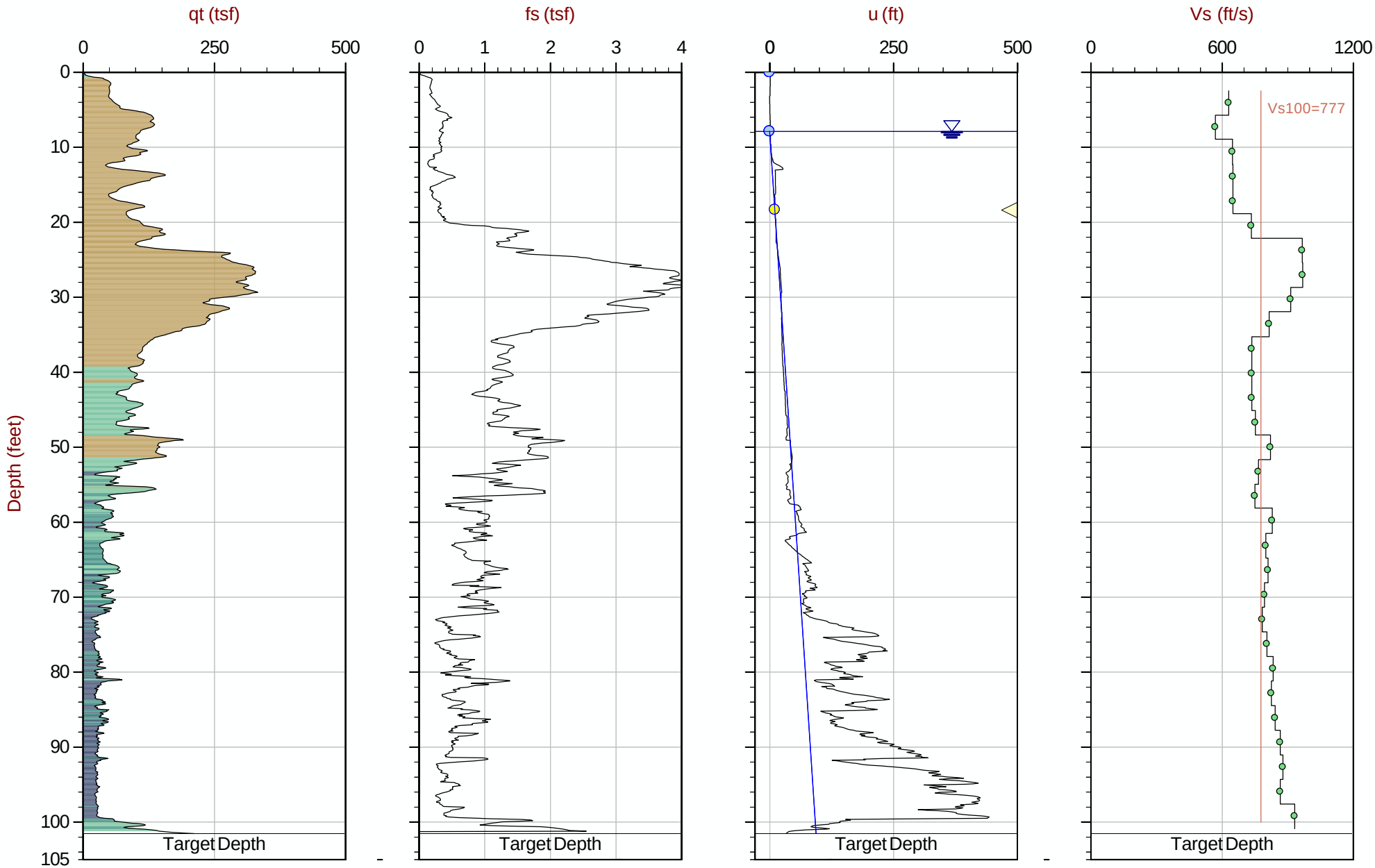
CONETEC

CONETEC

# OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 09:54
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-01
Cone: 990:T1000F10U35 Area=15 cm²




Max Depth: 30.950 m / 101.54 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 25-53-28903_SP01.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4677314m E: 700742m

Overplot Item: Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved | PPD, Ueq assumed

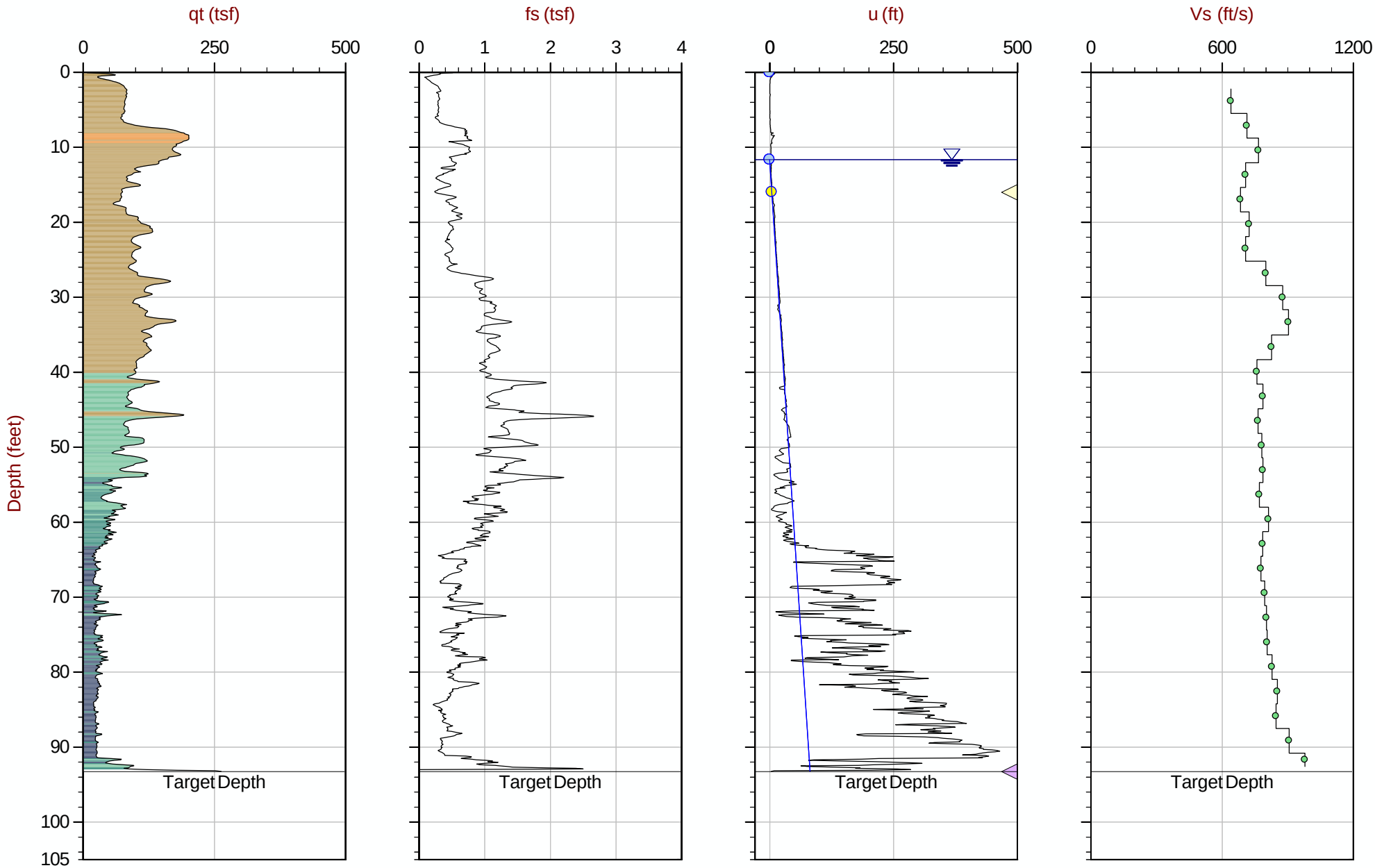
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

# OTO Engineering Associates

Job No: 25-53-28903
Date: 2025-01-08 13:34
Site: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02
Cone: 990:T1000F10U35 Area=15 cm²




Max Depth: 28.425 m / 93.26 ft
Depth Inc: 0.025 m / 0.082 ft
Avg Int: Every Point

File: 25-53-28903_SP02.COR
Unit Wt: SBTQtn (PKR2009)

SBT: Robertson, 2009 and 2010
Coords: UTM Zone 18 N: 4677279m E: 700591m

Overplot Item: Hydrostatic Line, Ueq, Assumed Ueq, PPD, Ueq achieved, PPD, Ueq not achieved, PPD, Ueq assumed

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

# SCPTu Velocity Wave Traces

CONETEC

CONETEC

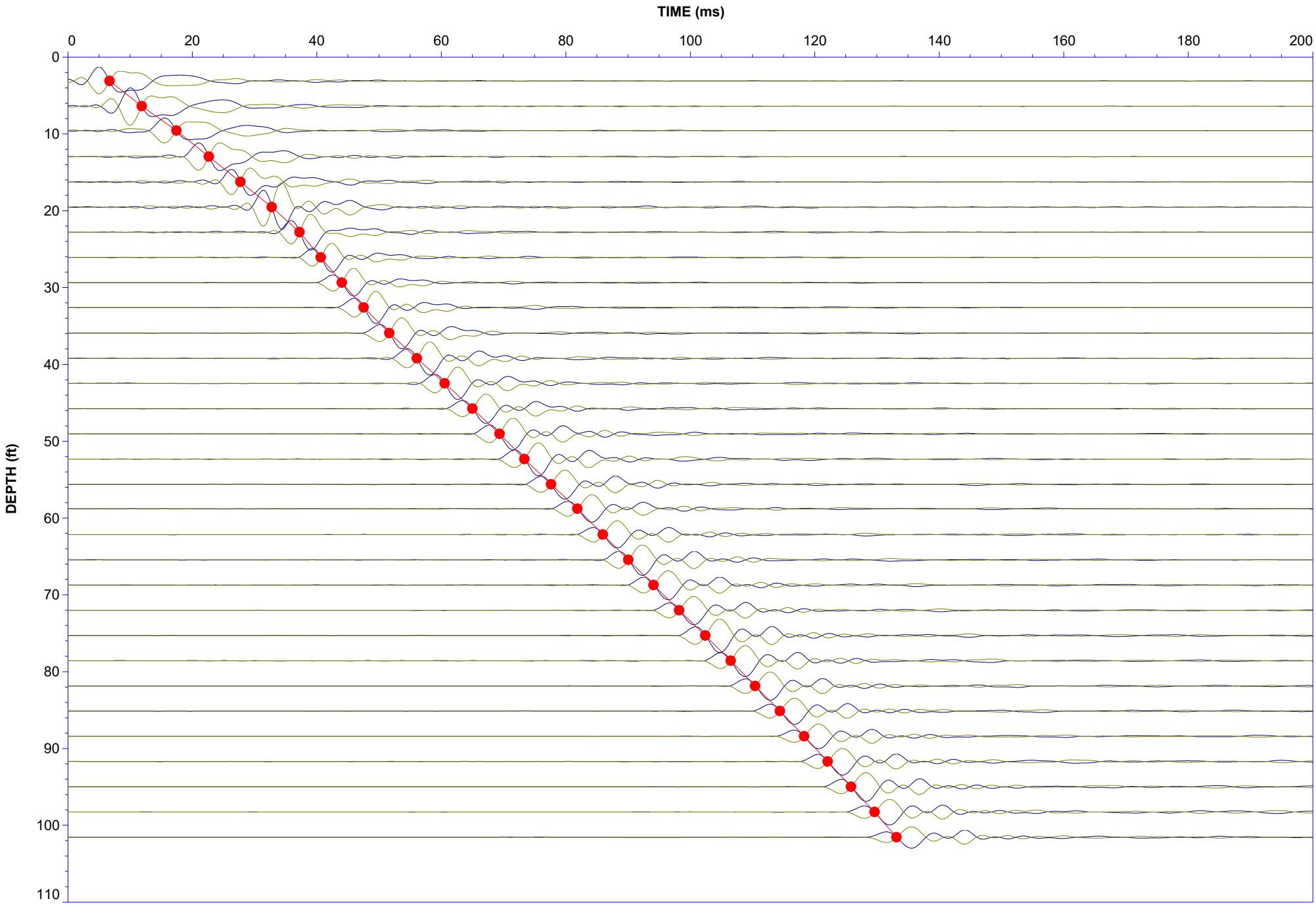
Job No: 25-53-28903
Date: 08-Jan-2025

Client: OTO Engineering Associates

Project: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-01

Filter: BP 0-250 Hz



CONETEC

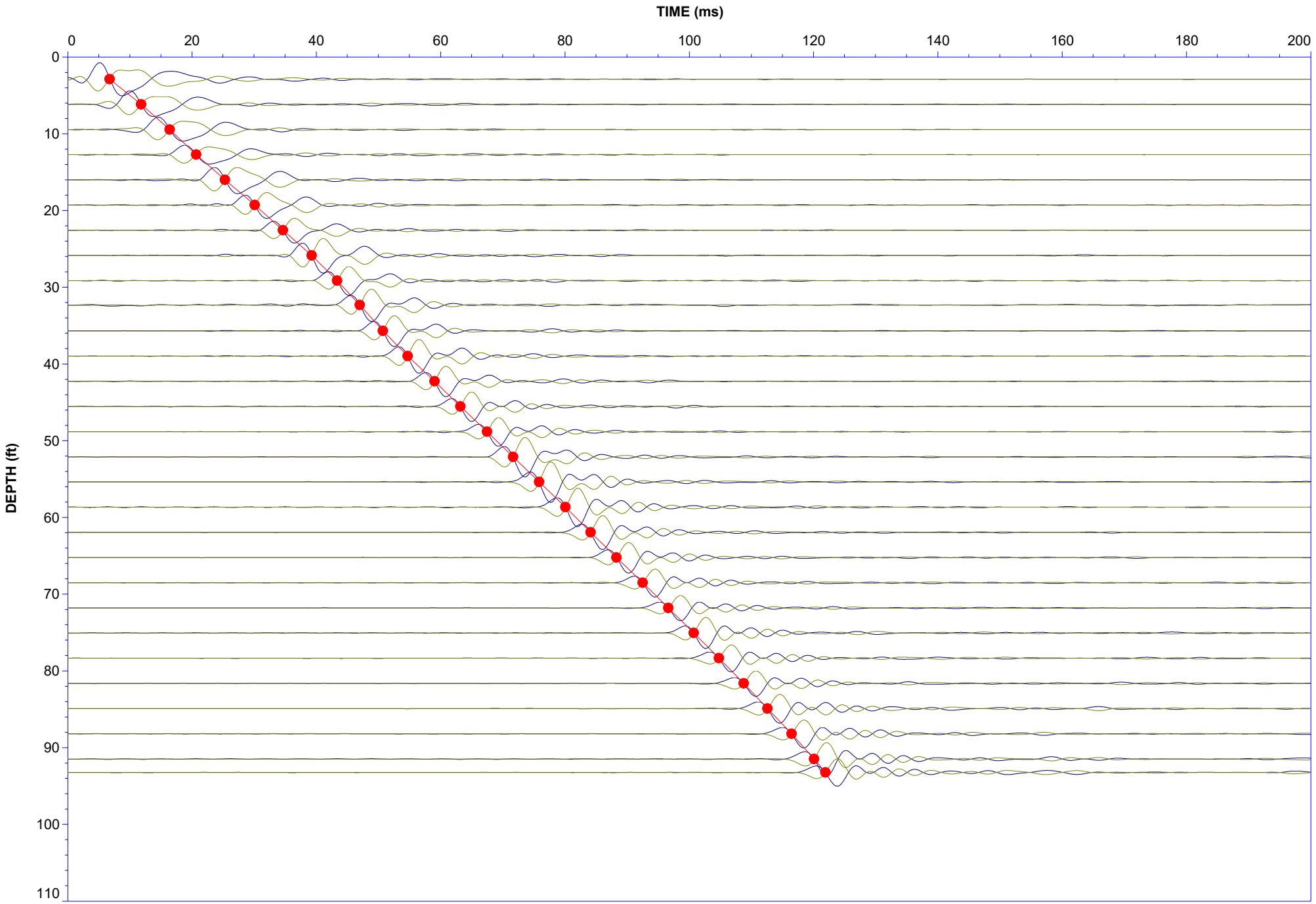
Job No: 25-53-28903
Date: 08-Jan-2025

Client: OTO Engineering Associates

Project: Old Lyman Road - South Hadley, MA

Sounding: SCPT25-02

Filter: BP 0-250 Hz



# Supporting Documents and Materials

CONETEC

# SUPPORTING DOCUMENTS AND MATERIALS

The documents and materials listed below are included in the report:

- **Methodology Statements**
- **Cone Penetration Digital File Formats**
- **Description of Methods for Calculated CPTu Geotechnical Parameters**
- **Calibration Records**

# Methodology Statements

CONETEC

# METHODOLOGY STATEMENTS

## CONE PENETRATION TEST (CPTu) - eSeries

Cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd., a subsidiary of ConeTec.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and two geophone sensors for recording seismic signals. All signals are amplified and measured with minimum sixteen-bit resolution down hole within the cone body, and the signals are sent to the surface using a high bandwidth, error corrected digital interface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 $cm^2$ and 15 $cm^2$ tip base area configurations in order to maximize signal resolution for various soil conditions. The specific piezocone used for each test is described in the CPT summary table. The 15 $cm^2$ penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 $cm^2$ piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 millimeters diameter over a length of 32 millimeters with tapered leading and trailing edges) located at a distance of 585 millimeters above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "$u_2$" position (ASTM Type 2). The filter is six millimeters thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meets or exceeds those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

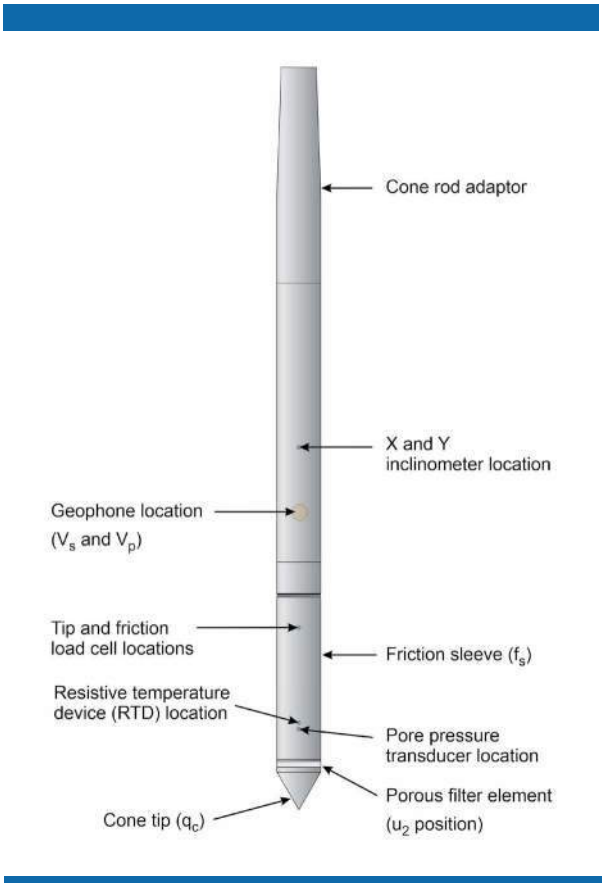



**Figure CPTu. Piezocone Penetrometer (15 cm²)**

The ConeTec data acquisition system consists of a Windows based computer, signal interface box, and power supply. The signal interface combines depth increment signals, seismic trigger signals and the downhole digital data. This combined data is then sent to the Windows based computer for collection and presentation. The data is recorded at fixed depth increments using a depth encoder that is either portable or integrated into the rig. The typical recording interval is 2.5 centimeters; custom recording intervals are possible.

The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance ($q_c$)
- Sleeve friction ($f_s$)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPTu operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of two centimeters per second, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil under vacuum pressure prior to use
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance ($q_t$), sleeve friction ($f_s$) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson, P.K., 2010. The Soil Behavior Type (SBT) classification chart developed by Robertson, P.K., 2010 is presented in Figure SBT. It should be noted that it is not always possible to accurately identify a soil behavior type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

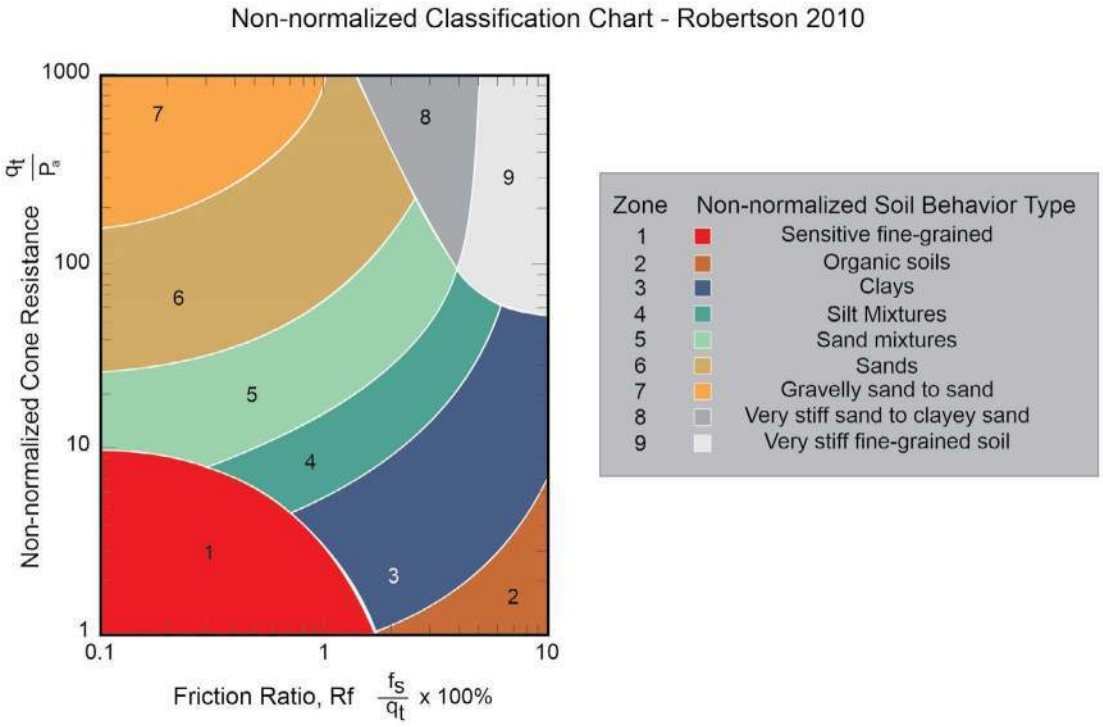



**Figure SBT. Non-Normalized Soil Behavior Type Classification Chart (SBT)**

The recorded tip resistance ($q_c$) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance ($q_t$) according to the following expression presented in Robertson et al. (1986):

$$q_t = q_c + (1-a) \bullet u_2$$

where: $q_t$ is the corrected tip resistance
$q_c$ is the recorded tip resistance
$u_2$ is the recorded dynamic pore pressure behind the tip ($u_2$ position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction ($f_s$) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

For additional information on CPTu interpretations and calculated geotechnical parameters, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

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# PORE PRESSURE DISSIPATION TEST

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

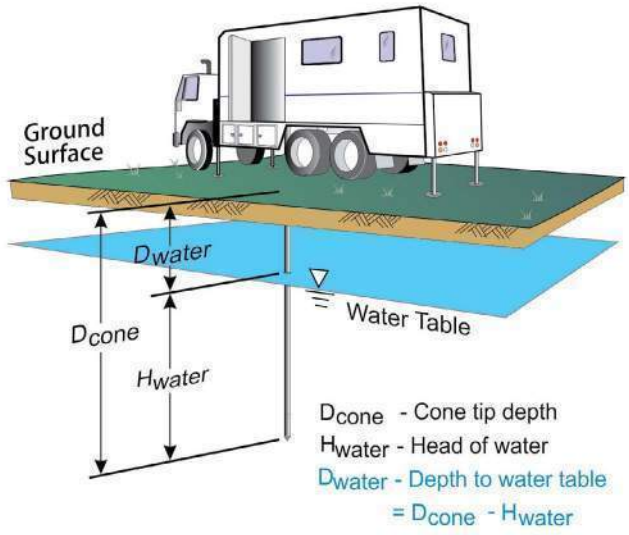



**Figure PPD-1. Pore pressure dissipation test setup**

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

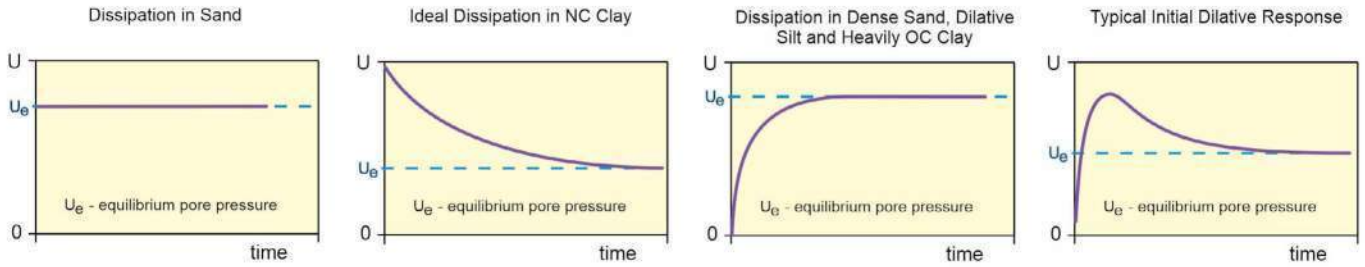
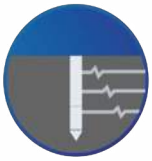



**Figure PPD-2. Pore pressure dissipation curve examples**

In order to interpret the equilibrium pore pressure ($u_{eq}$) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve in Figure PPD-2.



## SEISMIC CONE PENETRATION TEST (SCPTu) - eSeries

Shear wave velocity (Vs) testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave velocity (Vp) testing is also performed.

ConeTec's piezocone penetrometers are manufactured with one horizontally active geophone (28 hertz) and one vertically active geophone (28 hertz). Both geophones are rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip. The vertically mounted geophone is more sensitive to compression waves.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances, an auger source or an imbedded impulsive source may be used for both shear waves and compression waves. The hammer and beam act as a contact trigger that initiates the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded in the memory of the cone using a fast analog to digital converter. The seismic trace is then transmitted digitally uphole to a Windows based computer through a signal interface box for recording and analysis. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

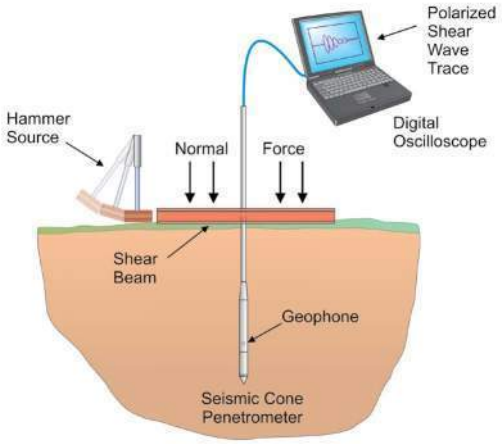



**Figure SCPTu-1. Illustration of the SCPTu system**

All testing is performed in accordance to ConeTec's SCPTu operating procedures which are in general accordance with the current ASTM D5778 and ASTM D7400 standards.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Typically, five wave traces for each orientation are recorded for quality control and uncertainty analysis purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et al. (1986).

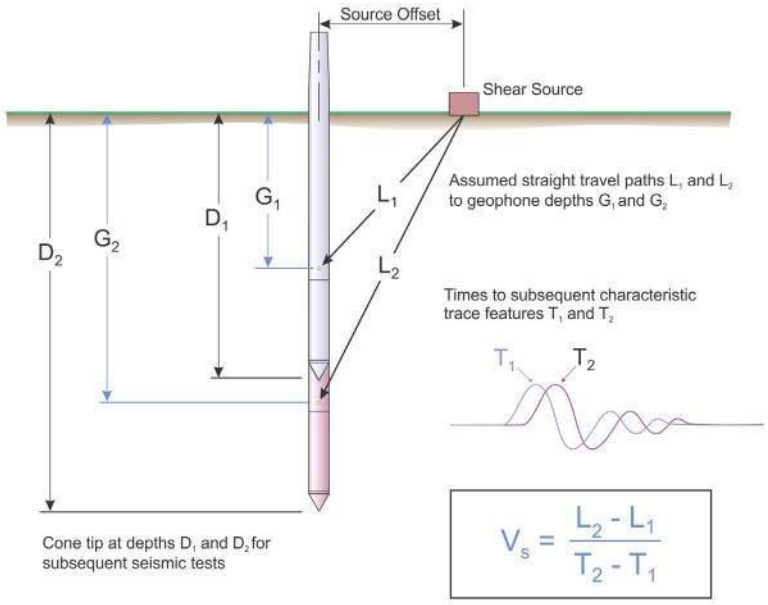



**Figure SCPTu-2. Illustration of a seismic cone penetration test**

For the determination of interval travel times the wave traces from all depths are displayed in analysis software. The results of the interval picks are supplied in the relevant appendix of this report. Standard practice for ConeTec is to record five wave traces for each source direction at each test depth. Outlier impacts are identified in the field and the impacts are repeated. For the final wave trace profile, the traces are stacked in the time domain to display a single average trace.

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

In some cases, usually for shear wave velocity testing, more than one characteristic marker may be used. If there is an overlap between different sets of characteristic markers, then the average time value for those sets of interval times is applied to the determination of velocity.

Ideally, all depths are used for the determination of the velocity profile. However, an interval may be skipped if there is some ambiguity or quality concern with a particular depth, resulting in a larger interval.

Tabular velocity results and SCPTu plots are presented in the relevant appendix.

For all SCPTu soundings that have achieved a depth of at least 100 feet (30 meters), the average shear wave velocity to a depth of 100 feet ($\overline{v}_S$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE (2010).

$$\bar{v}_s = \frac{\sum_{i=1} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
$d_i$ = the thickness of any layer between 0 and 100 ft (30 m)
$v_{si}$ = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = the total thickness of all layers between 0 and 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to $V_{s100}$ or $V_{s30}$.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

**REFERENCES**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# Cone Penetration Digital File Formats

CONETEC

# CONE PENETRATION DIGITAL FILE FORMATS - eSeries

## CPT Data Files (COR Extension)

ConeTec CPT data files are stored in ASCII text files that are readable by almost any text editor. ConeTec file names start with the job number (which includes the two digit year number) an underscore as a separating character, followed by two letters based on the type of test and the sounding ID. The last character position is reserved for an identifier letter (such as b, c, d etc) used to uniquely distinguish multiple soundings at the same location. The CPT sounding file has the extension COR. As an example, for job number 21-02-00001 the first CPT sounding will have file name 21-02-00001_CP01.COR

The sounding (COR) file consists of the following components:

1. Two lines of header information
2. Data records
3. End of data marker
4. Units information

**Header Lines**

Line 1: Columns 1-6 may be blank or may indicate the version number of the recording software
Columns 7-21 contain the sounding Date and Time (Date is MM:DD:YY)
Columns 23-38 contain the sounding Operator
Columns 51-100 contain extended Job Location information

Line 2: Columns 1-16 contain the Job Location
Columns 17-32 contain the Cone ID
Columns 33-47 contain the sounding number
Columns 51-100 may contain extended sounding ID information

**Data Records**

The data records contain 4 or more columns of data in floating point format. A comma and spaces separate each data item:

Column 1: Sounding Depth (meters)
Column 2: Tip ($q_c$), recorded in units selected by the operator
Column 3: Sleeve ($f_s$), recorded in units selected by the operator
Column 4: Dynamic pore pressure (u), recorded in units selected by the operator
Column 5: Empty or may contain other requested data such as Gamma, Resistivity or UVIF data

**End of Data Marker**

After the last line of data there is a line containing an ASCII 26 (CTL-Z) character (small rectangular shaped character) followed by a newline (carriage return / line feed). This is used to mark the end of data.

**Units Information**

The last section of the file contains information about the units that were selected for the sounding. A separator bar makes up the first line. The second line contains the type of units used for depth, $q_c$, $f_s$ and u. The third line contains the conversion values required for ConeTec's software to convert the recorded data to an internal set of base units (bar for $q_c$, bar for $f_s$ and meters for u). Additional lines intended for internal ConeTec use may appear following the conversion values.

## CPT Data Files (XLS Extension)

Excel format files of ConeTec CPT data are also generated from corresponding COR files. The XLS files have the same base file name as the COR file with a -BSC suffix. The information in the file is presented in table format and contains additional information about the sounding such as coordinate information, and tip net area ratio.

The BSCI suffix is given to XLS files which are enhanced versions of the BSC files and include the same data records in addition to inclination data collected for each sounding.

## CPT Dissipation Files (XLS Extension)

Pore pressure dissipation files are provided in Excel format and contain each dissipation trace that exceeds a minimum duration (selected during post-processing) formatted column wise within the spreadsheet. The first column (Column A) contains the time in seconds and the second column (Column B) contains the time in minutes. Subsequent columns contain the dissipation trace data. The columns extend to the longest trace of the data set.

Detailed header information is provided at the top of the worksheet. The test depth in meters and feet, the number of points in the trace and the particular units are all presented at the top of each trace column.

CPT Dissipation files have the same naming convention as the CPT sounding files with a "–PPD" suffix.

**Data Records**

Each file will contain dissipation traces that exceed a minimum duration (selected during post-processing) in a particular column. The dissipation pore pressure values are typically recorded at varying time intervals throughout the trace; rapidly to start and increasing as the duration of the test lengthens. The test depth in meters and feet, the number of points in the trace and the trace number are identified at the top of each trace column.

## Cone Type Designations

| Cone ID | Cone Description | Tip Cross Sect. Area ($cm^2$) | Tip Capacity (bar) | Sleeve Area ($cm^2$)** | Sleeve Capacity (bar) | Pore Pressure Capacity (bar) |
|---|---|---|---|---|---|---|
| **EC###** | A15T1500F15U35 | 15 | 1500 | 225 | 15 | 35 |
| **EC###** | A15T375F10U35 | 15 | 375 | 225 | 10 | 35 |
| **EC###** | A10T1000F10U35 | 10 | 1000 | 150 | 10 | 35 |

### refers to the Cone ID number
**Outer Cylindrical Area

# Description of Methods for Calculated CPT Geotechnical Parameters

CONETEC

# CALCULATED CPT GEOTECHNICAL PARAMETERS

## A Detailed Description of the Methods Used in ConeTec's CPT Geotechnical Parameter Calculation and Plotting Software

Revision SZW-Rev 18

Revised February 10, 2023
Prepared by Jim Greig, M.A.Sc, P.Eng (BC, AB, ON)

Limitations

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates. For this project, ConeTec has provided site investigation services, prepared factual data reporting and produced geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

To understand the calculations that have been performed and to be able to reproduce the calculated parameters the user is directed to the basic descriptions for the methods in this document and the detailed descriptions and their associated limitations and appropriateness in the technical references cited for each parameter.

**ConeTec's Calculated CPT Geotechnical Parameters as of February 10, 2023.**

ConeTec's CPT parameter calculation and plotting routine provides a tabular output of geotechnical parameters based on current published CPT correlations and is subject to change to reflect the current state of practice. Due to drainage conditions and the basic assumptions and limitations of the correlations, not all geotechnical parameters provided are considered applicable for all soil types. The results are presented only as a guide for geotechnical use and should be carefully examined for consideration in any geotechnical design. Reference to current literature is strongly recommended. ConeTec does not warranty the correctness or the applicability of any of the geotechnical parameters calculated by the program and does not assume liability for any use of the results in any design or review. For verification purposes we recommend that representative hand calculations be done for any parameter that is critical for design purposes. The end user of the parameter output should also be fully aware of the techniques and the limitations of any method used by the program. The purpose of this document is to inform the user as to which methods were used and to direct the end user to the appropriate technical papers and/or publications for further reference.

The geotechnical parameter output was prepared specifically for the site and project named in the accompanying report subject to objectives, site conditions and criteria provided to ConeTec by the client. The output may not be relied upon by any other party or for any other site without the express written permission of ConeTec Group (ConeTec) or any of its affiliates.

The CPT calculations are based on values of tip resistance, sleeve friction and pore pressures considered at each data point or averaged over a user specified layer thickness (e.g., 0.20 m). Note that $q_t$ is the tip resistance corrected for pore pressure effects and $q_c$ is the recorded tip resistance. The corrected tip resistance (corrected using $u_2$ pore pressure values) is used for all calculations. Since all ConeTec cones have equal end area friction sleeves pore pressure corrections to sleeve friction, $f_s$, are not performed.

Corrected tip resistance: $q_t = q_c + (1-a) \cdot u_2$ (consistent units are required)

where: $q_t$ is the corrected tip resistance
$q_c$ is the recorded tip resistance
$u_2$ is the recorded dynamic pore pressure from behind the tip ($u_2$ position)
$a$ is the Net Area Ratio for the cone (typically 0.80 for ConeTec cones)

The total stress calculations are based on soil unit weight values that have been assigned to the Soil Behavior Type (SBT) zones, from a user defined unit weight profile, by using a single uniform value throughout the profile, through unit weight estimation techniques described in various technical papers or from a combination of these methods. The parameter output files indicate the method(s) used.

Effective vertical overburden stresses are calculated using the total stress and equilibrium pore pressure ($u_{eq}$ or $u_o$) values derived from an assumed hydrostatic distribution of pore pressures below the water table or from a user defined equilibrium pore pressure profile (typically obtained from CPT dissipation tests) or a combination of the two. For over water projects the stress effects of the column of water above the mudline are taken into account as is the appropriate unit weight of water. How this is done depends on where the instruments are zeroed (i.e. on deck or at the mudline). The parameter output files indicate the method(s) used.

A majority of parameter calculations are derived from or driven by results based on material types as determined by the various soil behavior type charts depicted in Figures 1 through 6. The parameter output files indicate the method(s) used.

The Soil Behavior Type classification chart shown in Figure 1 is the classic non-normalized SBT Chart developed at the University of British Columbia and reported in Robertson, Campanella, Gillespie and Greig (1986). Figure 2 shows the original normalized (linear method) SBTn chart developed by Robertson (1990). The Bq classification charts

shown in Figures 3a and 3b incorporate pore pressures into the SBT classification and are based on the methods described in Robertson (1990). Many of these charts have been summarized in Lunne, Robertson and Powell (1997). The Jefferies and Davies SBT chart shown in Figure 3c is based on the techniques discussed in Jefferies and Davies (1993) which introduced the concept of the Soil Behavior Type Index parameter, $I_c$. Take note that the $I_c$ parameter developed by Robertson and Fear (1995) and Robertson and Wride (1998) is similar in concept but uses a slightly different calculation method than that defined by Jefferies and Davies (1993) as the latter incorporates pore pressure in their technique through the use of the Bq parameter. The normalized Qtn SBT chart shown in Figure 4 is based on the work by Robertson (2009) utilizing a variable stress ratio exponent, n, for normalization based on a slightly modified redefinition and iterative approach for $I_c$. The boundary curves drawn on the chart are based on the work described in Robertson (2010).

Figure 5 shows a revised 1986 SBT Chart presented to CPT'10 by Robertson (2010b). It is known as the Updated non-normalized Soil Behavior Chart (also referred to as the Rev SBT Chart (PKR2010) in our output files). This chart was produced to be more in line with all post-1986 Robertson charts having the same 9 soil type zones, a $\log_{10}$ axis for friction ratio, $R_f$ in this case, and a unitless tip resistance axis.

Figure 6 shows a revised behavior based chart by Robertson (2016) depicting contractive-dilative zones. As the zones represent material behavior rather than soil gradation ConeTec has chosen a set of zone colors that are less likely to be confused with material type colors from previous SBT charts. These colors differ from those used by Dr. Robertson. A green palette was selected for the dilative (desirable) side of the chart and a red palette for the contractive side of the chart.

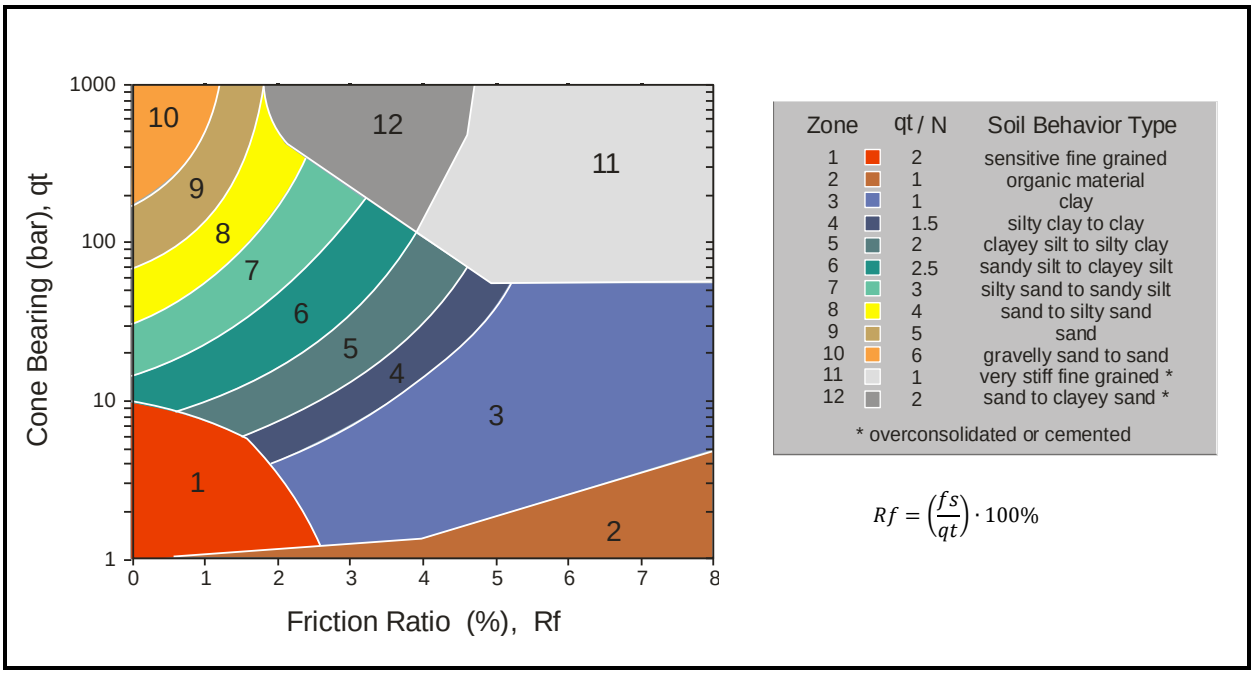



Figure 1. Non-normalized Soil Behavior Type Classification Chart (SBT)

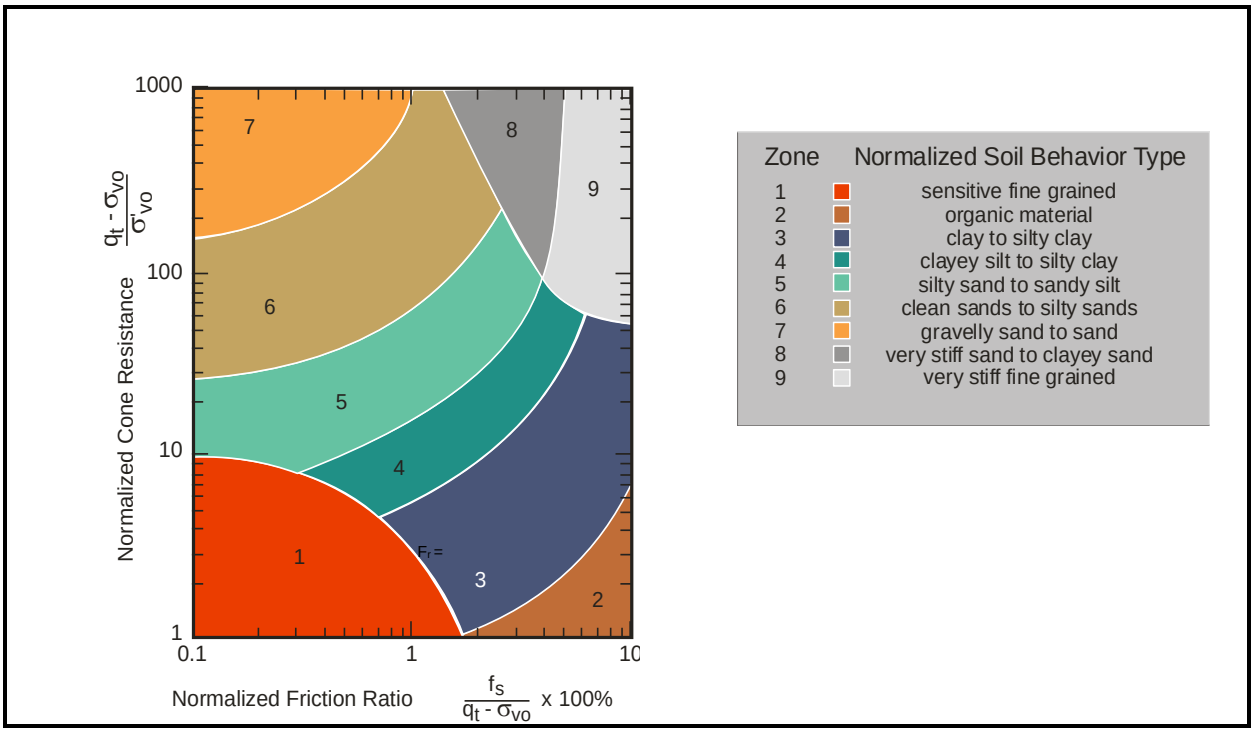



Figure 2. Normalized Soil Behavior Type Classification Chart (SBTn)

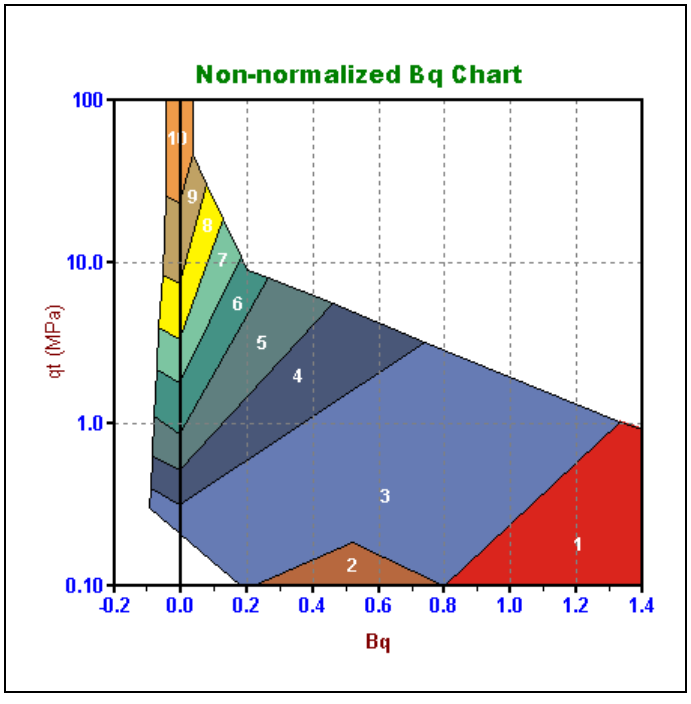



Figure 3a. Alternate Soil Behavior Type Chart (SBT Bq): $q_t$ - $B_q$

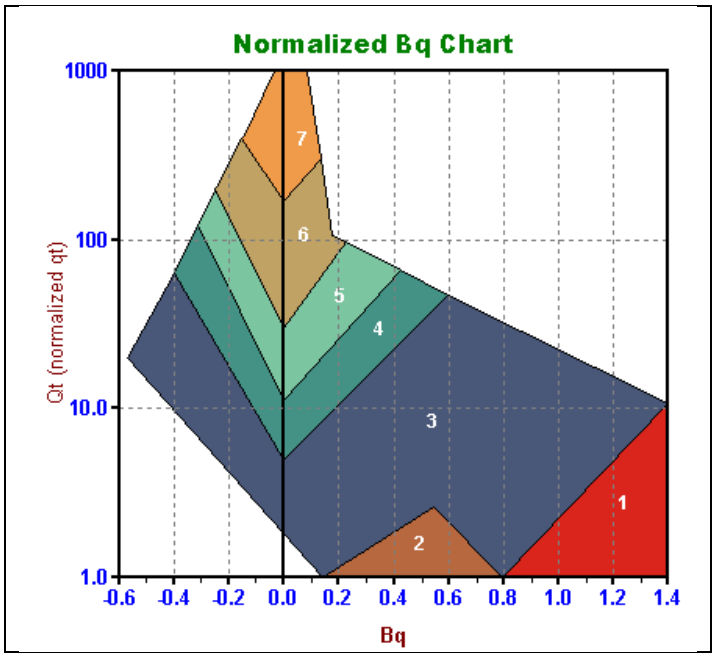



Figure 3b. Alternate Soil Behavior Type Charts (SBT Bqn): $Q_t$-$B_q$

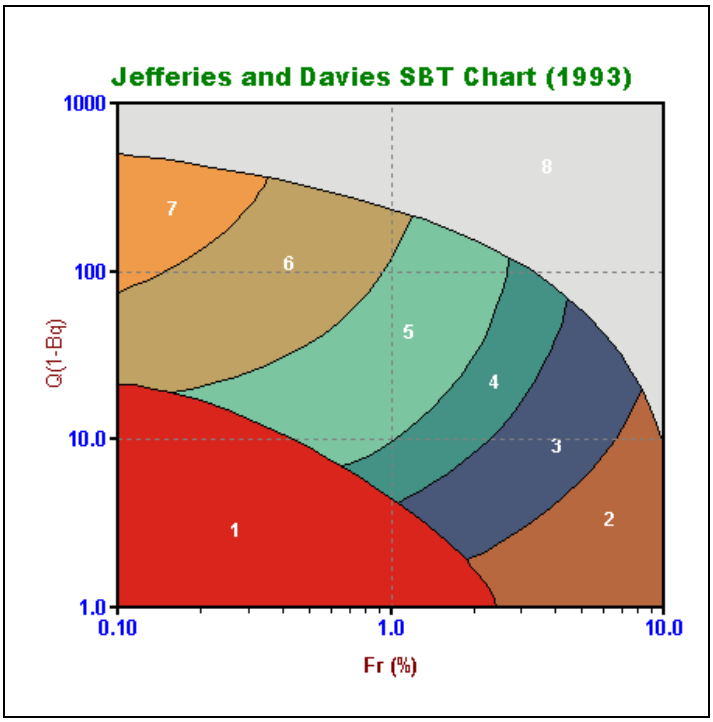



Figure 3c. Alternate Soil Behavior Type Charts: $Q(1-B_q)$ - $F_r$

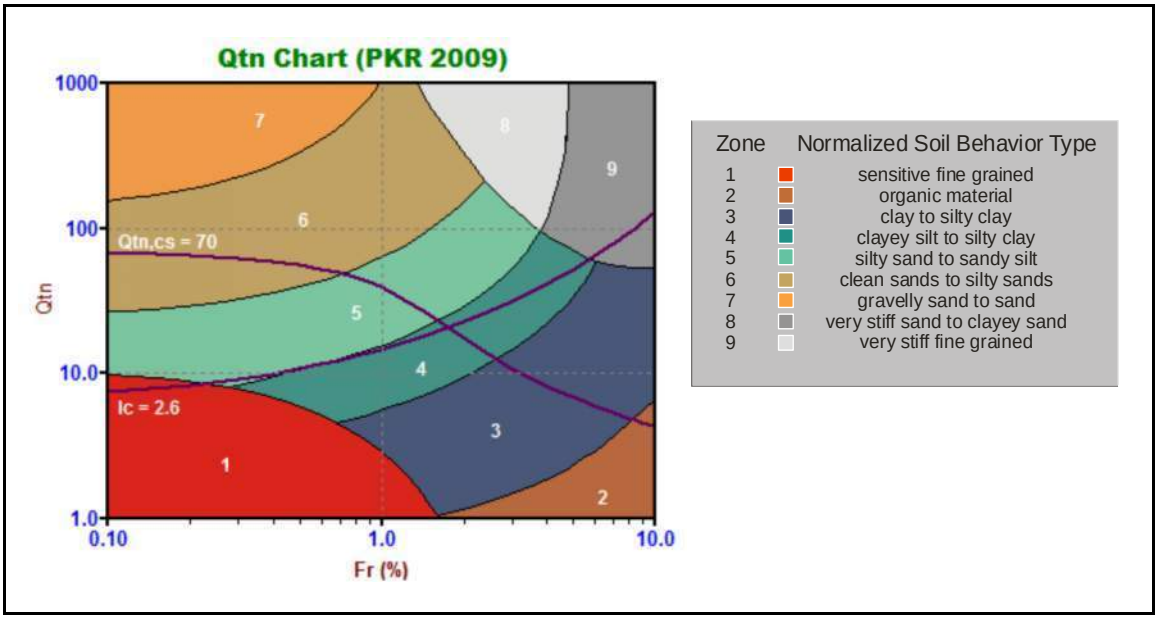



Figure 4. Normalized Soil Behavior Type Chart using $Q_{tn}$ (SBT Qtn)

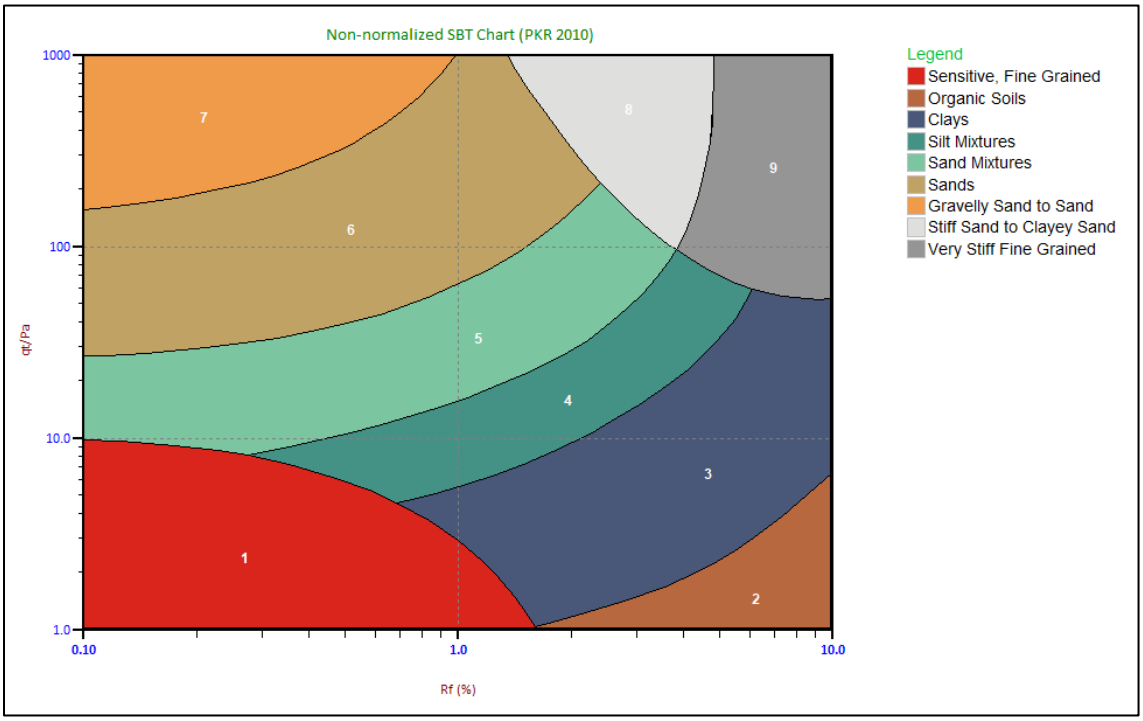



Figure 5. Non-normalized Soil Behavior Type Chart (2010)

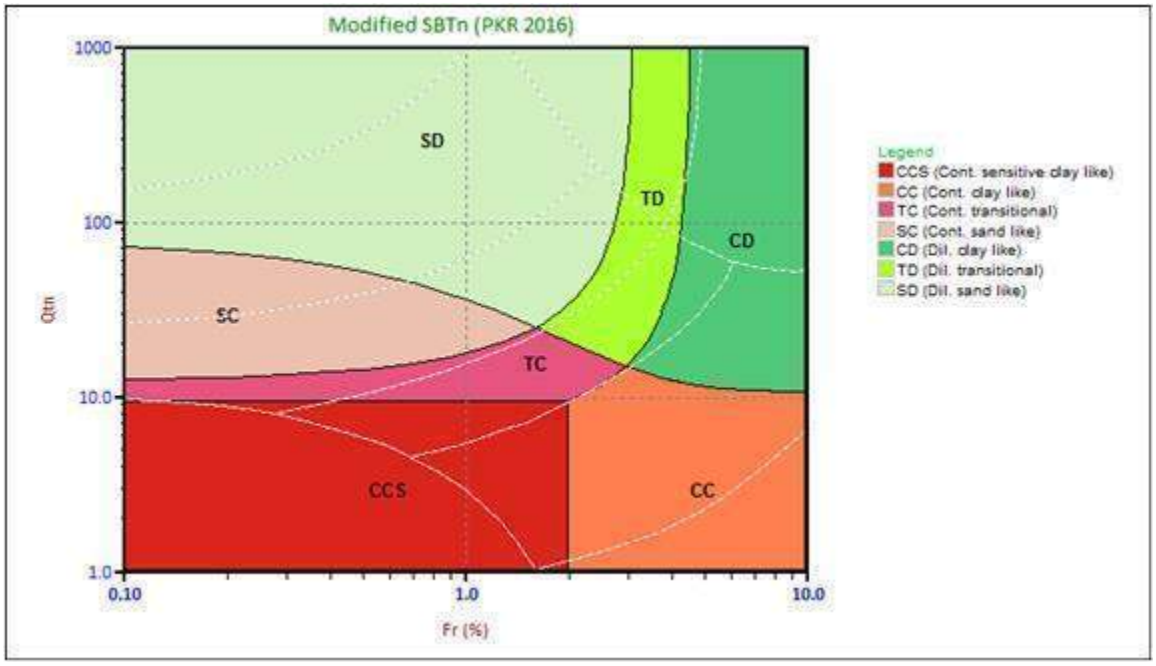



Figure 6. Modified SBTn Behavior Based Chart

Details regarding the geotechnical parameter calculations are provided in Tables 1a and 1b. The appropriate references cited are listed in Table 2. Non-liquefaction specific parameters are detailed in Table 1a and liquefaction specific parameters are detailed in Table 1b.

Where methods are based on charts or techniques that are too complex to describe in this summary, we recommend that the user refer to the cited material. Specific limitations for each method are described in the cited material.

Where the results of a calculation/correlation are deemed *'invalid'* the value will be represented by the text strings "-9999", "-9999.0", the value 0.0 (Zero) or an empty cell. Invalid results will occur because of (and not limited to) one or a combination of:

1. Invalid or undefined CPT data (e.g., drilled out section or data gap).

2. Where the calculation method is inappropriate, for example, drained parameters in a material behaving in an undrained manner (and vice versa).

3. Where input values are beyond the range of the referenced charts or specified limitations of the correlation method.

4. Where pre-requisite or intermediate parameter calculations are invalid.

The parameters selected for output from the program are often specific to a particular project. As such, not all of the calculated parameters listed in Tables 1and 1a may be included in the output files delivered with this report.

The output files are typically provided in Microsoft Excel XLS, XLSX or CSV format. The ConeTec software has several options for output depending on the number or types of calculated parameters desired or those specifically contracted for by the client. Each output file is named using the original file base name (from the .COR file) followed

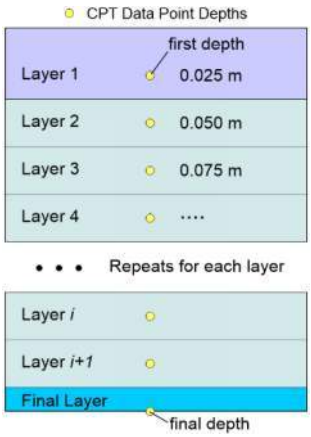
by a three or four character indicator of the output set selected (e.g. BSC, TBL, NLI, NL2, IFI, IFI2, IFI3) and possibly followed by an operator selected suffix identifying the characteristics of the particular calculation run.

**Table 1a. CPT Parameter Calculation Methods – Non liquefaction Parameters**

Reference Notes: CK* - Common Knowledge, U* - Unpublished

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| Depth | Mid Layer Depth<br><br>*(where calculations are done at each point then Mid Layer Depth = Recorded Depth)* | *[Depth (Layer Top) + Depth (Layer Bottom)]/ 2.0* | CK* |
| Elevation | Elevation of Mid Layer is based on the sounding collar elevation supplied by the client or through a site survey<br><br>In Sweden a variation of elevation is used where the elevation increases with depth. We refer to this as inverse elevation. | Elevation = Collar Elevation – Depth<br><br>InverseElevation = Collar Elevation + Depth | CK*<br><br>N/A |
| Avg qc | Averaged recorded tip value ($q_c$) | $Avgqc = \frac{1}{n}\sum_{i=1}^{n} q_c$<br>*n=1 when calculations are done at each point* | CK* |
| Avg qt | Averaged corrected tip ($q_t$) where:<br>$q_t = q_c + (1-a)\cdot u_2$<br><br>Averaged $q_t$ is not calculated using the average $q_c$ and averaged u values. Averaged $q_t$ is based on the average of the $q_t$ values calculated at each data point. | $Avgqt = \frac{1}{n}\sum_{i=1}^{n} q_t$<br>*n=1 when calculations are done at each point* | 1 |
| Avg fs | Averaged sleeve friction ($f_s$)<br><br>No pore pressure corrections are applied to $f_s$. | $Avgfs = \frac{1}{n}\sum_{i=1}^{n} fs$<br>*n=1 when calculations are done at each point* | CK* |
| Avg Rf | Averaged friction ratio ($R_f$) where friction ratio is defined as:<br>$R_f = 100\% \cdot \frac{fs}{q_t}$ | $AvgRf = 100\% \cdot \frac{Avgfs}{Avgqt}$<br>*not an average of individual $R_f$ values* | CK* |
| Avg u | Averaged dynamic pore pressure *(u)* | $Avgu = \frac{1}{n}\sum_{i=1}^{n} u_i$<br>*n=1 when calculations are done at each point* | CK* |
| Avg Res | Averaged Resistivity (this data is not always available since it is a specialized test requiring an additional module) | $AvgRes = \frac{1}{n}\sum_{i=1}^{n} Resistivity_i$<br>*n=1 when calculations are done at each point* | CK* |
| Avg UVIF | Averaged UVIF ultra-violet induced fluorescence (this data is not always available since it is a specialized test requiring an additional module) | $AvgUVIF = \frac{1}{n}\sum_{i=1}^{n} UVIF_i$<br>*n=1 when calculations are done at each point* | CK* |
| Avg Temp | Averaged Temperature (this data is not always available) | $AvgTemp = \frac{1}{n}\sum_{i=1}^{n} Temperature_i$<br>*n=1 when calculations are done at each point* | CK* |
| Avg Gamma | Averaged Gamma Counts (this data is not always available since it is a specialized test requiring an additional module) | $AvgGamma = \frac{1}{n}\sum_{i=1}^{n} Gamma_i$<br>*n=1 when calculations are done at each point* | CK* |
| SBT | Soil Behavior Type as defined by Robertson et al 1986 (often referred to as Robertson and Campanella, 1986) | See Figure 1 | 1, 5 |
| SBTn | Normalized Soil Behavior Type as defined by Robertson 1990 (linear normalization using $Q_t$, now referred to as $Q_{t1}$) | See Figure 2 | 2, 5 |

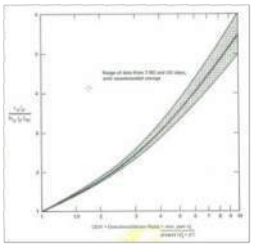
| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| SBT-Bq | Non-normalized Soil Behavior type based on non-normalized tip resistance and the $B_q$ parameter | See Figure 3a | 1, 2, 5 |
| SBT-Bqn | Normalized Soil Behavior type based on normalized tip resistance ($Q_t$, now called $Q_{t1}$) and the $B_q$ parameter | See Figure 3b | 2, 5 |
| SBT-JandD | Soil Behavior Type as defined by Jeffries and Davies | See Figure 3c | 7 |
| SBT Qtn | Soil Behavior Type as defined by Robertson (2009) using a variable stress ratio exponent for normalization based on $I_{c\ (PKR\ 2009)}$ | See Figure 4 | 15 |
| Modified Non-normalized SBT Chart<br><br>SBT (PKR2010) | This is a revised version of the simple 1986 non-normalized SBT chart (presented at CPT '10). The revised version has been reduced from 12 zones to 9 zones to be similar to the normalized Robertson charts. Other updates include a dimensionless tip resistance normalized to atmospheric pressure, $q_t/P_a$, on the vertical axis and a log scale for non-normalized friction ratio, $R_f$, along the horizontal axis. | See Figure 5 | 33 |
| Modified SBTn (contractive /dilative) | Modified SBTn chart as defined by Robertson (2016) indicating zones of contractive/dilative behavior. Note that ConeTec displays the chart with colors different from Robertson. ConeTec's colors were chosen to avoid confusion with soil type descriptions. | See Figure 6 | 30 |
| Unit Wt. | Unit Weight of soil determined from one of the following user selectable options:<br><br>1) uniform value<br>2) value assigned to each SBT zone<br>3) value assigned to each SBTn zone<br>4) value assigned to SBTn zone as determined from Robertson and Wride (1998) based on $q_{c1n}$<br>5) values assigned to SBT Qtn zones<br>6) values based on Robertson updated non-normalized Soil Behavior Type Chart (2010b)<br>6) Mayne $f_s$ (sleeve friction) method<br>7) Robertson and Cabal 2010 method<br>8) user supplied unit weight profile<br><br>The last option may co-exist with any of the other options. | See references | 3, 5, 15, 21, 24, 29, 33 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| TStress<br><br>$\sigma_v$ | Total vertical overburden stress at Mid Layer Depth<br><br>*A layer is defined as the averaging interval specified by the user where depths are reported at their respective mid-layer depth.*<br><br>For data calculated at each point layers are defined using the recorded depth as the mid-point of the layer. Thus, a layer starts half-way between the previous depth and the current depth unless this is the first point in which case the layer start is at zero depth. The layer bottom is half-way from the current depth to the next depth unless it is the last data point.<br><br>Defining layers affects how stresses are calculated since the unit weight attributed to a data point is used throughout the entire layer. This means that to calculate the stresses the total stress at the top and bottom of a layer are required. The stress at mid layer is determined by adding the incremental stress from the layer top to the mid-layer depth. The stress at the layer bottom becomes the stress at the top of the subsequent layer. Stresses are NOT calculated from mid-point to mid-point.<br><br>For over-water work the total stress due to the column of water above the mid line is taken into account where appropriate. | $TStress = \sum_{i=1}^{n} \gamma_i h_i$<br>*where* $\gamma_i$ is layer unit weight<br>$h_i$ is layer thickness<br>  | CK* |
| EStress<br>$\sigma_v'$ | Effective vertical overburden stress at mid-layer depth. | $\sigma_v' = \sigma_v - u_{eq}$ | CK* |
| Equil u<br>$u_{eq}$ or $u_0$ | Equilibrium pore pressures are determined from one of the following user selectable options:<br><br>1) hydrostatic below the water table<br>2) user supplied profile<br>3) combination of those above<br><br>When a user supplied profile is used/provided a linear interpolation is performed between equilibrium pore pressures defined at specific depths. If the profile values start below the water table then a linear transition from zero pressure at the water table to the first defined pointed is used.<br><br>Equilibrium pore pressures may come from dissipation tests, adjacent piezometers or other sources. Occasionally, an extra equilibrium point ("assumed value") will be provided in the profile that does not come from a recorded value to smooth out any abrupt changes or to deal with material interfaces. These "assumed" values will be indicated on our plots and in tabular summaries. | For the hydrostatic option:<br><br>$u_{eq} = \gamma_w \cdot (D - D_{wt})$<br>where $u_{eq}$ is equilibrium pore pressure<br>$\gamma_w$ is the unit weight of water<br>D is the current depth<br>$D_{wt}$ is the depth to the water table | CK* |
| $K_0$ | Coefficient of earth pressure at rest, $K_0$. | $K_O = (1 - \sin\Phi') OCR^{\sin\Phi'}$ | 17 |
| $C_n$ | Overburden stress correction factor<br>used for $(N_1)_{60}$ and older CPT parameters. | $C_n = (P_a/\sigma_v')^{0.5}$<br><br>where *$0.0 < C_n < 2.0$ (user adjustable, typically ranging from 1.7 to 2.0)*<br>*$P_a$ is atmospheric pressure (100 kPa)* | 4, 12 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $C_q$ | Overburden stress normalizing factor. | $C_q = 1.8 / [0.8 + (\sigma_v'/P_a)]$<br>where *$0.0 < C_q < 2.0$ (user adjustable)*<br>*$P_a$ is atmospheric pressure (100 kPa)*<br><br>*Robertson and Wride define $C_q$ to be the same as $C_n$. The Olson definition above is used in the program.* | 3, 12 |
| $N_{60}$ | SPT N value at 60% energy calculated from $q_t/N$ ratios assigned to each SBT zone. This method has abrupt N value changes at zone boundaries. | *See Figure 1* | 5 |
| $(N_1)_{60}$ | SPT $N_{60}$ value corrected for overburden pressure. | *$(N_1)_{60} = C_n \bullet N_{60}$* | 4 |
| $N_{60}I_c$ | SPT $N_{60}$ values based on the $I_c$ parameter, as defined by Robertson and Wride 1998 (3), or by Robertson 2009 (15). | $(q_t/P_a)/ N_{60} = 8.5 (1 – I_c/4.6)$<br>$(q_t/P_a)/ N_{60} = 10^{(1.1268 – 0.2817Ic)}$<br>$P_a$ being atmospheric pressure | 3, 5<br>15, 31 |
| $(N_1)_{60}I_c$ | SPT $N_{60}$ value corrected for overburden pressure (using $N_{60}$ $I_c$). User has 3 options. | *1) $(N_1)_{60}Ic = C_n \bullet (N_{60} I_c)$*<br>2) $q_{c1n}/ (N_1)_{60}I_c = 8.5 (1 – I_c/4.6)$<br>3) $(Q_{tn})/ (N_1)_{60}I_c = 10^{(1.1268 – 0.2817Ic)}$ | 4<br>5<br>15, 31 |
| $S_u$<br>or $S_u$ ($N_{kt}$) | Undrained shear strength based on $q_t$<br>$S_u$ factor $N_{kt}$ is user selectable. | $Su = \frac{qt - \sigma_v}{N_{kt}}$ | 1, 5 |
| $S_u$<br>or $S_u$ ($N_{du}$)<br>or $S_u$ ($N_{\Delta u}$) | Undrained shear strength based on pore pressure<br>$S_u$ factor $N_{\Delta u}$ is user selectable. | $Su = \frac{u_2 - u_{eq}}{N_{\Delta u}}$ | 1, 5 |
| $D_r$ | Relative Density determined from one of the following user selectable options:<br><br>1) Ticino Sand<br>2) Hokksund Sand<br>3) Schmertmann (1978)<br>4) Jamiolkowski (1985) - All Sands<br>5) Jamiolkowski et al (2003) (various compressibilities, $K_o$) | See reference (methods 1 through 4)<br>Jamiolkowski et al (2003) reference | 5<br>14 |
| PHI<br>$\phi$ | Friction Angle determined from one of the following user selectable options (methods 1 through 4 are for sands and method 5 is for silts and clays):<br><br>1) Campanella and Robertson<br>2) Durgunoglu and Mitchel<br>3) Janbu<br>4) Kulhawy and Mayne<br>5) NTH method (clays and silts) | See appropriate reference | 5<br>5<br>5<br>11<br>23 |
| Delta U/$q_t$<br>$\Delta u/q_t$<br>$du/q_t$ | Differential pore pressure ratio<br>(older parameter used before $B_q$ was established) | $= \frac{\Delta u}{qt}$<br><br>*where:* $\Delta u = u - u_{eq}$<br>*and $u$ = dynamic pore pressure*<br>*$u_{eq}$ = equilibrium pore pressure* | 39 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $B_q$ | Pore pressure parameter | $Bq = \frac{\Delta u}{qt - \sigma_v}$<br>where: $\Delta u = u - u_{eq}$<br>*and* $u$ *= dynamic pore pressure*<br>$u_{eq}$ *= equilibrium pore pressure* | 1, 2, 5 |
| Net $q_t$ or qtNet | Net tip resistance<br>(used in many subsequent correlations) | $qt - \sigma_v$ | 36 |
| $q_e$ or qE or $q_E$ | Effective tip resistance<br>(using the dynamic pore pressure $u_2$ and not equilibrium pore pressure) | $q_t - u_2$ | 36 |
| qeNorm | Normalized effective tip resistance | $\frac{qt - u_2}{\sigma_v'}$ | 36 |
| $Q_t$ or Norm: Qt or $Q_{t1}$ | Normalized $q_t$ for Soil Behavior Type classification as defined by Robertson (1990) using a linear stress normalization. Note this is different from $Q_{tn}$. This parameter was renamed to $Q_{t1}$ in Robertson, 2009. Without normalization limits this parameter calculates to very high unrealistic values at low stresses. | $Qt = \frac{qt - \sigma_v}{\sigma_v'}$ | 2, 5, 15 |
| $F_r$ or Norm: Fr | Normalized Friction Ratio for Soil Behavior Type classification as defined by Robertson (1990) | $Fr = 100\% \cdot \frac{fs}{qt - \sigma_v}$ | 2, 5 |
| Q(1-$B_q$)<br>Q(1-$B_q$) + 1 | Q(1-$B_q$) grouping as suggested by Jefferies and Davies for their classification chart and the establishment of their $I_c$ parameter. Later papers added the +1 term to the equation. | $Q \cdot (1 - Bq)$<br>$Q \cdot (1 - Bq) + 1$<br>*where Bq is defined as above and Q is the same as the normalized tip resistance,* $Q_{t1}$*, defined above* | 6, 7, 34 |
| $q_{c1}$ | Normalized tip resistance, $q_{c1}$, using a fixed stress ratio exponent, n (this method has stress units) | $q_{c1} = q_t \cdot (Pa/\sigma_v')^{0.5}$<br>where: $P_a$ = atmospheric pressure | 21 |
| $q_{c1}$ (0.5) | Normalized tip resistance, $q_{c1}$, using a fixed stress ratio exponent, n (this method is unit-less) | $q_{c1}\,(0.5) = (q_t/P_a) \cdot (Pa/\sigma_v')^{0.5}$<br>where: $P_a$ = atmospheric pressure | 5 |
| $q_{c1}$ ($C_n$) | Normalized tip resistance, $q_{c1}$, based on $C_n$<br>(this method has stress units) | $q_{c1}(Cn) = C_n * q_t$ | 5, 12 |
| $q_{c1}$ ($C_q$) | Normalized tip resistance, $q_{c1}$, based on $C_q$<br>(this method has stress units) | $q_{c1}\,(Cq) = C_q * q_t$ (some papers use $q_c$) | 5, 12 |
| $q_{c1n}$ | normalized tip resistance, $q_{c1n}$, using a variable stress ratio exponent, n (where n=0.0, 0.70, or 1.0)<br>(this method is unit-less) | $q_{c1n} = (q_t / P_a)(P_a/\sigma_v')^n$<br>where: $P_a$ = atm. Pressure and n varies as described below | 3 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $I_c$ or Ic (RW1998) | Soil Behavior Type Index as defined by Robertson and Wride (1997, 1998) for estimating grain size characteristics and providing smooth gradational changes across the SBTn chart.<br><br>Ic(RW1998) is different from that of Jefferies and Davies (7) and is different from Ic(PKR2009). | $I_c = [(3.47 - \log_{10}Q)^2 + (\log_{10} Fr + 1.22)^2]^{0.5}$<br><br>*Where:* $Q = \left(\frac{qt - \sigma_v}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$<br><br>*Or* $Q = q_{c1n} = \left(\frac{qt}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^n$<br><br>*depending on the iteration in determining $I_c$*<br><br>*And Fr is in percent*<br>*$P_a$ = atmospheric pressure*<br><br>*n has the following distinct values:*<br>*0.5, 0.75 and 1.0*<br>*and is determined in an iterative manner based on the resulting $I_c$ in each iteration*<br><br>*Note that NCEER replaced 0.75 with 0.70* | 3, 4, 5<br><br>10 |
| $I_c$ (PKR 2009) | Soil Behavior Type Index, $I_c$ (PKR 2009) is based on a variable stress ratio exponent n, which itself is based on $I_c$ (PKR 2009). An iterative calculation is required to determine $I_c$ (PKR 2009) and its corresponding n (PKR 2009). | *$I_c$ (PKR 2009) =*<br>*$[(3.47 - \log_{10}Q_{tn})^2 + (1.22 + \log_{10}F_r)^2]^{0.5}$* | 15 |
| n (PKR 2009) | Stress ratio exponent n, based on $I_c$ (PKR 2009).<br>An iterative calculation is required to determine n (PKR 2009) and its corresponding $I_c$ (PKR 2009). | *n (PKR 2009) = 0.381 ($I_c$) + 0.05 ($\sigma_v'/P_a$) – 0.15* | 15 |
| $Q_{tn}$ (PKR 2009) | Normalized tip resistance using a variable stress ratio exponent based on $I_c$ (PKR 2009) and n (PKR 2009). An iterative calculation is required to determine $Q_{tn}$ (PKR 2009). | *$Q_{tn} = [(qt - \sigma_v)/P_a](P_a/\sigma_v')^n$*<br>*where $P_a$ = atmospheric pressure (100 kPa)*<br>*n = stress ratio exponent described above* | 15 |
| FC | Apparent fines content (%) | *FC=1.75($Ic^{3.25}$) - 3.7*<br>*FC=100 for $I_c > 3.5$*<br>*FC=0 for $I_c < 1.26$*<br>*FC = 5% if 1.64 < $I_c$ < 2.6 AND $F_r$<0.5* | 3 |
| $I_c$ Zone | This parameter is the Soil Behavior Type zone based on the $I_c$ parameter (valid for zones 2 through 7 on SBTn or SBT Qtn charts) | $I_c$ < 1.31 Zone = 7<br>1.31 < $I_c$ < 2.05 Zone = 6<br>2.05 < $I_c$ < 2.60 Zone = 5<br>2.60 < $I_c$ < 2.95 Zone = 4<br>2.95 < $I_c$ < 3.60 Zone = 3<br>$I_c$ > 3.60 Zone = 2 | 3 |
| CD | The contractive / dilative boundary on Robertson's Modified SBTn (contractive/dilative) Chart shown in Figure 6 above. The boundary is marked as CD = 70 on the chart in the relevant paper. Similar to the $Q_{tn,cs}$ = 70 line in Figure 4. | CD = 70 = $(Q_{tn} - 11)(1 + 0.06F_r)^{17}$<br><br>lower bound of CD = 60:<br>CD = 60 = $(Q_{tn} - 9.5)(1 + 0.06F_r)^{17}$ | 30 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $I_B$ | Hyberbolic fit defining the boundary between SBT soil types proposed by Schneider as a better fit than the $I_c$ circles. $I_B$ = 32 represents the boundary for most sand like soils. $I_B$ = 22 represents the upper boundary for most clay like soils. The region between $I_B$=22 and $I_B$=32 is the "transitional soil" zone. | $I_B = 100\ (Q_{tn} + 10) / (70 + Q_{tn} F_r)$ | 30 |
| State Param or State Parameter or ψ | The state parameter index, ψ, is defined as the difference between the current void ratio, e, and the critical void ratio, $e_c$.<br>Positive ψ - contractive soil<br>Negative ψ - dilative soil<br><br>This is based on the work by Been and Jefferies (1985) and Plewes, Davies and Jefferies (1992)<br><br>This method uses mean normal stresses based on a uniform value of $K_0$ or a calculated $K_0$ using methods described elsewhere in this document | See reference | 6, 8 |
| Yield Stress $\sigma_p'$ | Yield stress is calculated using the following methods<br><br>1) General method<br><br>2) 1st order approximation using $q_t$Net (clays)<br>3) 1st order approximation using $\Delta u_2$ (clays)<br>4) 1st order approximation using $q_e$ (clays)<br>5) Based on Vs | All stresses in kPa<br><br>1) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)^{m'} (\sigma_{atm}/100)^{1-m'}$<br><br>where $m' = 1 - \frac{0.28}{1 + (I_c / 2.65)^{25}}$<br><br>2) $\sigma_p' = 0.33 \cdot (q_t - \sigma_v)$<br>3) $\sigma_p' = 0.54 \cdot (\Delta u_2)$ $\Delta u_2 = u_2 - u_0$<br>4) $\sigma_p' = 0.60 \cdot (q_t - u_2)$<br>5) $\sigma_p' = (Vs/4.59)^{1.47}$ | 19<br><br>20<br>20<br>20<br>18 |
| OCR<br><br>OCR(JS1978)<br><br>YSR(Mayne2014)<br>YSR (qtNet)<br>YSR (deltaU)<br>YSR (qe)<br>YSR (Vs)<br>OCR (PKR2015) | Over Consolidation Ratio based on<br><br>1) Schmertmann (1978) method involving a plot plot of $S_u/\sigma_v'$ /( $S_u/\sigma_v')_{NC}$ and OCR<br>  <br>2) based on Yield stresses described above<br>3) approximate version based on qtNet<br>4) approximate version based on Δu<br>5) approximate version based on effective tip, $q_e$<br>6) approximate version based on shear wave velocity, $V_s$ and $\sigma_v'$<br>7) based on Qt | 1) requires a user defined value for NC $Su/P_c'$ ratio<br><br>2 through 5) *based on yield stresses*<br><br>6) YSR (Vs) = $\sigma_p'(Vs) / \sigma_v'$<br>7) OCR = $0.25 \cdot (Qt)^{1.25}$ | 9<br><br>19<br>20<br>20<br>20<br>18<br>32 |
| Es/qt | Intermediate parameter for calculating Young's Modulus, E, in sands. It is the Y axis of the reference chart.<br><br>Note that Figured 5.59 from reference 5, Lunne, Robertson and Powell, (LRP) has an error. The X axis values are too high by a factor of 10. The plot is based on Baldi's (not Bellotti as cited in | Based on Figure 5.59 in the reference | 5, 37 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| | LRP) original Figure 3 where the X axis is: $\frac{q_c}{\sqrt{\sigma_v'}}$ (both in kPa) with a range of 200 to 3000.<br><br>Figure 5.59 from LRP shows a dimensionless form of the equation, $q_{c1}$, displaying the same range of values.<br>Figure 5.59's X axis uses $q_{c1} = \left(\frac{q_c}{P_a}\right)\left(\frac{P_a}{\sigma_v'}\right)^{0.5}$<br><br>The two expressions are not the same: they differ by a factor of $\frac{\sqrt{P_a}}{P_a}$. With $P_a$ taken to be 100 kPa the factor is 1/10.<br><br>Substituting typical values of 200 bar (20000 kPa) for $q_c$ and 225 kPa for $\sigma_v'$ one gets: 20000 / 15 = 1333.33 for Bellotti's axis and $(200/1)(100/225)^{0.5}$ = 200 * (10/15) = 133.3 for LRP's axis (noting that $P_a$ = 1 bar) showing a factor of 10 difference. | | |
| Es or $E_s$<br>Young's Modulus E | Young's Modulus based on the work done in Italy. There are three types of sands considered in this technique. The user selects the appropriate type for the site from:<br><br>a) OC Sands<br>b) Aged NC Sands<br>c) Recent NC Sands<br><br>Each sand type has a family of curves that depend on mean normal stress. The program calculates mean normal stress and linearly interpolates between the two extremes provided in the $E_s/q_t$ chart. $E_s$ is evaluated for an axial strain of 0.1%. | Mean normal stress is evaluated from:<br>$\sigma_m' = \frac{1}{3}(\sigma_v' + \sigma_h' + \sigma_h')$<br>where $\sigma_v'$= vertical effective stress<br>$\sigma_h'$= horizontal effective stress<br>*and* $\sigma_h = K_o \cdot \sigma_v'$ with $K_o$ assumed to be 0.5 | 5 |
| Delta U/TStress<br>$\Delta u / \sigma_v$ | Differential pore pressure ratio with respect to total stress | $= \frac{\Delta u}{\sigma_v}$ *where:* $\Delta u = u - u_{eq}$ | 39 |
| Delta U/EStress, P Value, Excess Pore Pressure Ratio<br>$\Delta u/\sigma_v'$ | Differential pore pressure ratio with respect to effective stress. Key parameter (P, Normalized Pore Pressure Parameter, Excess Pore Pressure Ratio) in the Winckler et. al. static liquefaction method. | $= \frac{\Delta u}{\sigma_v'}$ *where:* $\Delta u = u - u_{eq}$ | 25, 25a |
| Su/EStress<br>$S_u/\sigma_v'$ | Undrained shear strength ratio with respect to vertical effective overburden stress using the $S_u$ ($N_{kt}$) method | = $Su\ (N_{kt}) / \sigma_v'$ | 9, 23 |
| Vs or $V_s$ | Recorded shear wave velocities (not estimated).<br>The shear wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same $V_s$ value. | recorded data | 27 |
| Vp or $V_p$ | Recorded compression wave (or P wave) velocities (not estimated). The P wave velocities are typically collected over 1 m depth intervals. Each data point over the relevant depth range is assigned the same $V_p$ value. | recorded data | 27 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $V_{s30}$<br>$V_{s100}$ | The average shear wave velocity of the near surface materials to a depth of 30 m (100 ft). It is based on the sum of all travel times through all layers in the top 30m (100 ft).<br><br>$V_{s100}$ is the same calculation as $V_{s30}$ except down to a depth of 100 feet. | $V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\left(\frac{layer\ thickness}{layer\ shear\ wave\ velocity}\right)}$<br><br>$V_{s30} = \frac{total\ thickness\ of\ all\ layers\ to\ 30\ m}{\Sigma\ (layer\ travel\ times)}$ | 38 |
| $G_{max}$ | $G_{max}$ determined from SCPT shear wave velocities (not estimated values). Note that seismic data ($V_s$) is collected over set depth intervals (typically 1 meter). Each data point over the test segment is assigned the same $V_s$ value. Since soil density changes with depth, slightly different $G_{max}$ values may be calculated over the test depth interval. | $G_{max} = \rho V_s^2$<br>where ρ is the mass density of the soil determined from the estimated unit weights at each test depth | 27 |
| qtNet/$G_{max}$ | Net tip resistance ratio with respect to the small strain modulus $G_{max}$ determined from SCPT shear wave velocities (not estimated values) | $= (qt - \sigma_v) / G_{max}$<br>where $G_{max} = \rho V_s^2$<br>and ρ is the mass density of the soil determined from the estimated unit weights at each test depth | 15, 28, 30 |
| qUlt | A site specific and client specific parameter for estimating the limiting stress for "crane walk" accessibility | $q_{ult} = CraneWalkFactor \cdot S_u$<br>Where: *CraneWalkFactor* is client provided | U* |
| Estimated $G_o$ | Estimated value for small strain shear modulus | $G_o = 0.0188[10^{(0.55Ic + 1,68)}](q_t - \sigma_v)$ | 15 |
| Estimated $E_{25}$ | Estimated value for Young's Modulus, E, at a 25% working load | $E_{25} = \alpha_E$ (qtNet)<br>where $\alpha_E = 0.015[10^{(0.55Ic + 1,68)}]$ | 15 |
| $k_{SBT}$ | Estimated soil permeability derived from Soil Behavior Type (SBT) Chart $I_c$ values. | For $1.0 < I_c \leq 3.27$:<br>$k = 10^{(0.952 - 3.04Ic)}$ in m/s<br><br>For $3.27 < Ic < 4.0$:<br>$k = 10^{(-4.52 - 1.37Ic)}$ in m/s | 35 |
| M or D'<br><br>Constrained Modulus | Constrained Modulus based on<br>1) Robertson, M<br><br>2) Mayne, D' | 1) Robertson<br>$M = \alpha_M (q_t - \sigma_v)$<br><br>$I_c > 2.2$ (fine grained)<br>$\alpha_M = Qt$ when $Qt < 14$<br>$\alpha_M = 14$ when $Qt > 14$<br><br>$Ic < 2.2$ (coarse grained)<br>$\alpha_M = 0.0188\ [10^{(0.55Ic + 1.68)}]$<br><br>$D' = \alpha_D (qt - \sigma_v)$<br>where $\alpha_D = 5$ | 32<br><br>23 |

**Table 1b. CPT Parameter Calculation Methods – Liquefaction Parameters**

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $K_{SPT}$ or $K_s$ | Equivalent clean sand factor for $(N_1)60$ | $K_{SPT} = 1 + ((0.75/30) \bullet (FC - 5))$ | 10 |
| $K_{CPT}$ or $K_c$ (RW1998) | Equivalent clean sand correction for $q_{c1N}$ | $K_{cpt} = 1.0$ for $I_c \leq 1.64$<br>$K_{cpt} = f(I_c)$ for $I_c > 1.64$ (see reference)<br>$K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$ | 3, 10 |
| $K_c$ (PKR 2010) | Clean sand equivalent factor to be applied to $Q_{tn}$ | $K_c = 1.0$ for $I_c \leq 1.64$<br>$K_c = -0.403\ I_c^4 + 5.581\ I_c^3 - 21.63 I_c^2 + 33.75\ I_c - 17.88$ for $I_c > 1.64$ | 16 |
| $(N_1)_{60cs}I_C$ | Clean sand equivalent SPT $(N_1)_{60}I_c$. User has 3 options. | 1) $(N_1)_{60cs}Ic = \alpha + \beta((N_1)_{60}I_c)$<br>2) $(N_1)_{60cs}Ic = K_{SPT} * ((N_1)_{60}I_c)$<br>3) $(q_{c1ncs})/(N_1)_{60cs}I_c = 8.5\ (1 - I_c/4.6)$<br><br>FC ≤ 5%: $\alpha = 0,\ \beta = 1.0$<br>FC ≥ 35% $\alpha = 5.0,\ \beta = 1.2$<br>5% < FC < 35% $\alpha = exp[1.76 - (190/FC^2)]$<br>$\beta = [0.99 + (FC^{1.5}/1000)]$ | 10<br>10<br>5 |
| $q_{c1ncs}$ | Clean sand equivalent $q_{c1n}$ | $q_{c1ncs} = q_{c1n} \bullet K_{cpt}$ | 3 |
| $Q_{tn,cs}$ (PKR 2010) | Clean sand equivalent for $Q_{tn}$ described above<br>- $Q_{tn}$ being the normalized tip resistance based on a variable stress exponent as defined by Robertson (2009) | $Q_{tn,cs} = Q_{tn} \cdot K_c$ (PKR 2016) | 16 |
| Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$ | Liquefied shear strength ratio as defined by Olson and Stark | $\frac{S_u(Liq)}{\sigma_v'} = 0.03 + 0.0143(q_{c1})$<br><br>Note: $\sigma_v'$ and $s_v'$ are synonymous | 13 |
| Su(Liq)/ESv or $S_u(Liq)/\sigma_v'$ (PKR 2010) | Liquefied shear strength ratio as defined by Robertson (2010) | $\frac{S_u(Liq)}{\sigma_v'}$<br>Based on a function involving $Q_{tn,cs}$ | 16 |
| $S_u$ (Liq) (PKR 2010) | Liquefied shear strength derived from the liquefied shear strength ratio and effective overburden stress | $S_u(Liq) = \sigma_v' \cdot \left(\frac{S_u(Liq)}{\sigma_v'}\right)$ | 16 |
| Cont/Dilat Tip | Contractive / Dilative $q_{c1}$ Boundary based on $(N_1)_{60}$ | $(\sigma_v')_{boundary} = 9.58 \times 10^{-4}\ [(N_1)_{60}]^{4.79}$<br>$q_{c1}$ is calculated from specified $q_t$(MPa)/N ratio | 13 |
| CRR | Cyclic Resistance Ratio (for Magnitude 7.5) | $q_{c1ncs} < 50$:<br>$CRR_{7.5} = 0.833\ [q_{c1ncs}/1000] + 0.05$<br><br>$50 \leq q_{c1ncs} < 160$:<br>$CRR_{7.5} = 93\ [q_{c1ncs}/1000]^3 + 0.08$ | 10 |
| Kg or $K_g$ | Small strain Stiffness Ratio Factor, $K_g$ | $[G_{max}/q_t]/[q_{c1n}{}^{-m}]$<br>m = empirical exponent, typically 0.75 | 26 |

| Calculated Parameter | Description | Equation | Ref |
|---|---|---|---|
| $K_g$* | Revised $K_g$ factor extended to fine grained soils (Robertson). | $K_g^* = (G_o / q_n)(Q_{tn})^{0.75}$ where $q_n$ is the net tip resistance = $q_t - \sigma_v$ | 30 |
| SP Distance | State Parameter Distance, Winckler static liquefaction method | Perpendicular distance on $Q_{tn}$ chart from plotted point to state parameter $\Psi$ = -0.05 curve | 25 |
| URS NP Fr | Normalized friction ratio point on $\Psi$ = -0.05 curve used in SP distance calculation | | 25 |
| URS NP $Q_{tn}$ | Normalized tip resistance ($Q_{tn}$) point on $\Psi$ = -0.05 curve used in SP Distance calculation | | 25 |

**Table 2. References**


| No. | Reference |
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# Calibration Records

CONETEC

ADARA

Adara Systems Ltd.
201-8327 Eastlake Drive, Burnaby, BC, Canada V5A4W2
Tel: 1-604-273-6013

# CERTIFICATE OF CALIBRATION

| Calibration Information | | | |
|---|---|---|---|
| Cone Serial Number | EC990 | Model | A15 T1000 F10 U35 |
| Calibration Date (YYYY-MM-DD) | 2024-12-11 | | |
| Calibration Due (YYYY-MM-DD) | 2025-12-11 | | |
| Calibration Performed By | Diane Eden | Signature | Digitally signed by Diane Eden Date: 2024-12-12 |
| Calibration Approved By | Vishrut Khunt | Signature | Digitally signed by Vishrut Khunt Date: 2024-12-12 |

| Lab Condition | As Found | As Left | | |
|---|---|---|---|---|
| Lab Temperature | N/A | 23˚C | | |
| Lab Humidity | N/A | 26% | Reason for Calibration | Repair |

| Cone Information | | | | |
|---|---|---|---|---|
| Tip Stress Limit | 1000 | bar | Tip End Area | 15 cm² |
| Friction Stress Limit | 10 | bar | Friction Surface Area | 225 cm² |
| Pressure Limit | 35 | bar | RTD Location | Pressure Carrier |
| X-Inclinometer Limit | 30 | degrees | Geophone | X and Z |
| Y-Inclinometer Limit | 30 | degrees | Temperature Range | -20°C to 60°C |

## Baseline Summary: (For Reference Only)

| Channel | Units | As Found | As Left |
|---|---|---|---|
| Tip | bar | N/A | 0.197 |
| Sleeve | bar | N/A | -0.021 |
| Pressure | bar | N/A | 1.008 |
| X-Inclinometer | degrees | N/A | -0.018 |
| Y-Inclinometer | degrees | N/A | 0.011 |
| Temperature | ˚C | N/A | 23.188 |

*Classified in accordance with ISO 22476-1:2012 Class 1*
*Classified in accordance with ISO 22476-1:2012 Class 2*

*Calibrated in general accordance with the ASTM D5778-20 and D7400-19 standards*

*Calibrated with Adara calibration procedure EC_CPTCAL-2.3*

*Collective uncertainty of the measurement standards conforms to a test uncertainty ratio (TUR) of 3:1 for tip and sleeve measurement and 4:1 for pressure measurement with a confidence level k=2*

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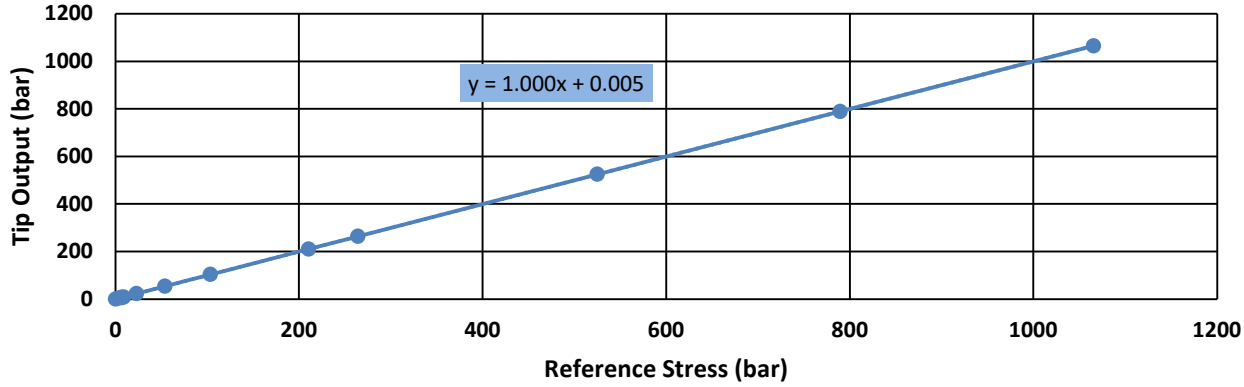
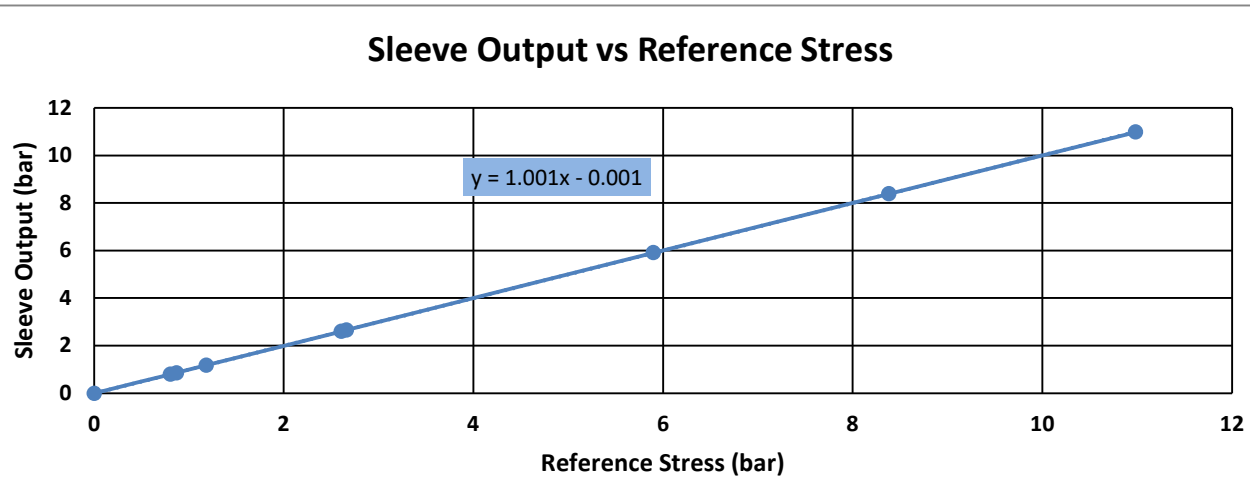
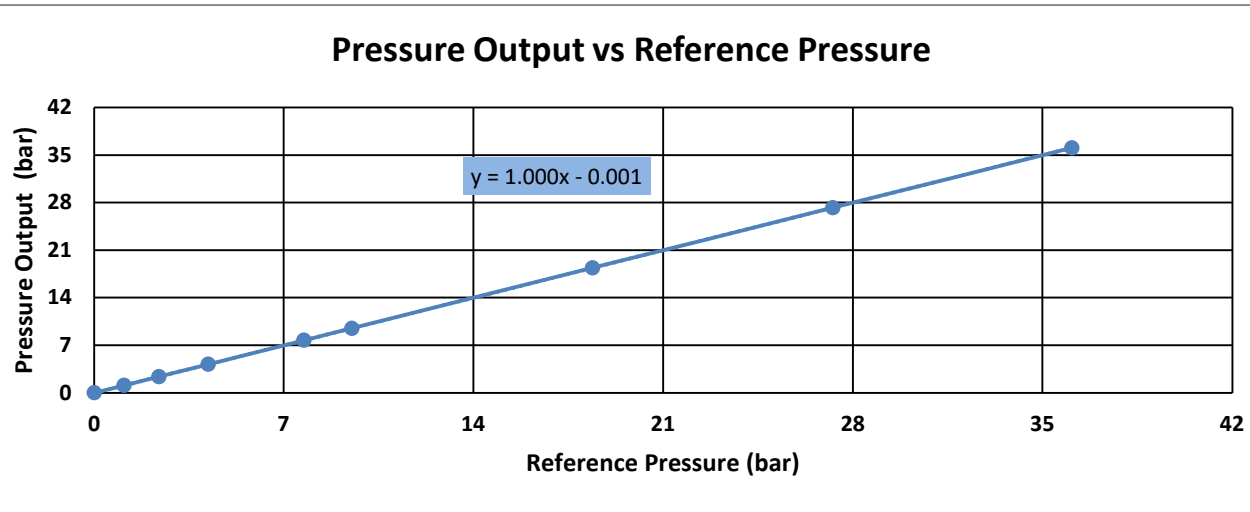
## Cone Output vs Reference Stress/Pressure Plots



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## Calibration Results

| Tip Calibration | | | | | |
|---|---|---|---|---|---|
| | As Found | | | As Left | |
| Max. Non Linearity | 0.00% | PASS | Max. Non Linearity | 0.01% | PASS |
| Calibration Error | 0.04% | PASS | Calibration Error | 0.03% | PASS |

| Sleeve Calibration | | | | | |
|---|---|---|---|---|---|
| | As Found | | | As Left | |
| Max. Non Linearity | 0.55% | FAIL | Max. Non Linearity | 0.13% | PASS |
| Calibration Error | 1.12% | FAIL | Calibration Error | 0.29% | PASS |

| Pressure Calibration | | | | | |
|---|---|---|---|---|---|
| | As Found | | | As Left | |
| Max. Non Linearity | N/A | N/A | Max. Non Linearity | 0.04% | PASS |
| Calibration Error | N/A | N/A | Calibration Error | 0.10% | PASS |

| X-Inclinometer Calibration | | | | | |
|---|---|---|---|---|---|
| | As Found | | | As Left | |
| Max. Non Linearity | N/A | N/A | Max. Non Linearity | 0.54% | PASS |
| Calibration Error | N/A | N/A | Calibration Error | -1.08% | PASS |

| Y-Inclinometer Calibration | | | | | |
|---|---|---|---|---|---|
| | As Found | | | As Left | |
| Max. Non Linearity | N/A | N/A | Max. Non Linearity | -0.25% | PASS |
| Calibration Error | N/A | N/A | Calibration Error | 0.50% | PASS |

| Seismic Calibration | | | | | |
|---|---|---|---|---|---|
| | As Found | | | As Left | |
| Trigger Delay Error | N/A | N/A | Trigger Delay Error | 0.01% | PASS |

| Temperature Calibration | | | |
|---|---|---|---|
| Full Scale Error | 0.10% | PASS | |

| Channel | Cold | Room | Hot | Units |
|---|---|---|---|---|
| Ref_Temp | 2.7 | 24.2 | 43.0 | ˚C |
| Tip | 1.227 | -0.129 | -0.583 | bar |
| Sleeve | -0.028 | -0.023 | -0.004 | bar |
| Pressure | 1.041 | 1.064 | 1.065 | bar |
| Temperature | 2.567 | 24.158 | 42.951 | ˚C |

| | | |
|---|---|---|
| Tip Temperature Coefficient | -0.045 bar/˚C | PASS |
| Sleeve Temperature Coefficient | 0.001 bar/˚C | PASS |
| Pressure Temperature Coefficient | 0.001 bar/˚C | PASS |

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## Testing Equipment Details

| Testing Machines | Model Number | Serial Number | Calibration Number | Due Date |
|---|---|---|---|---|
| Tip Load Cell | Precision | P-10289 | 101141 | 2025-07-03 |
| Sleeve Load Cell | Precision | P-11313 | 101214 | 2025-10-21 |
| Digital Loadcell Indicator | 4215 | 62140 | 101141 | 2025-07-02 |
| Fluke Reference Pressure Monitor | RPM4 A10Ms | 3910 | 100835 | 2024-12-12 |
| Tektronix Function Generator | AFG1022 | 1820013 | 101200 | 2025-09-30 |
| Thermometer | THS-222-555 | D23255834 | 101116 | 2025-06-27 |
| Thermometer | THS-222-555 | D23255829 | 101116 | 2025-06-27 |
| Thermometer | THS-222-555 | D20345575 | 101116 | 2025-06-27 |

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## Adara Error Definitions

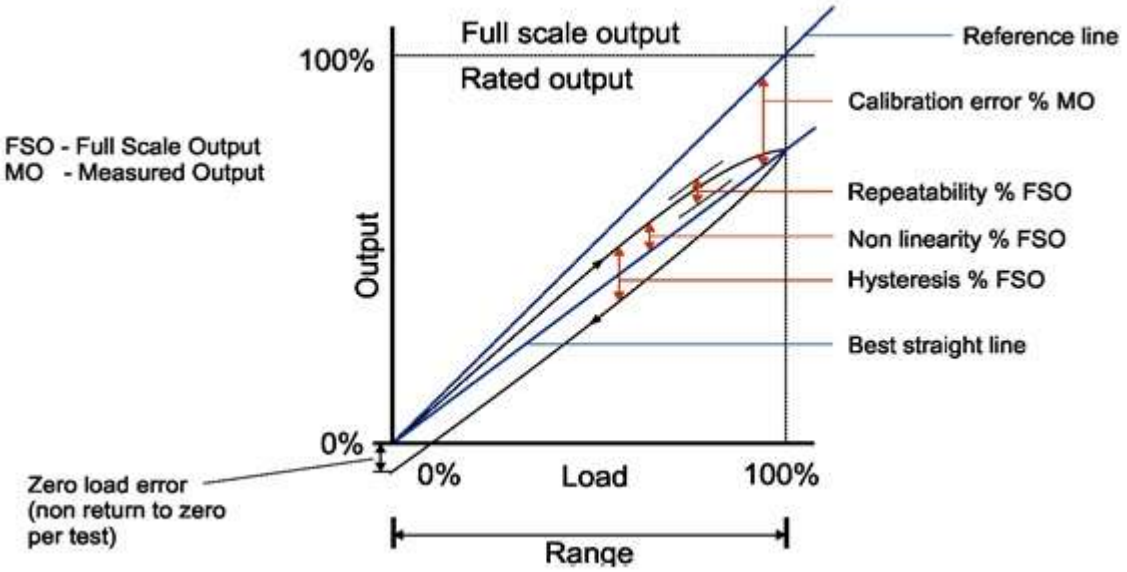


*Figure 1: Definition of Calibration Terms for Load Cell and Transducers (Adapted from [1])*

| | |
|---|---|
| Actual Sensitivity | The slope of the best fit line through all data points starting at zero load. |
| Slope Error | The error in the best fit line compared to the ideal linear calibration in % .<br>Slope Error = (Best Fit Slope - Ideal Slope) / Ideal Slope |
| Maximum Non Linearity | This value represents the maximum error (absolute value) relative to the best fit line considering each calibration point starting at loads greater than approximately 10% of FSO.<br>The reported errors are a percent error of FSO.<br>Adara's Pass/Fail criteria is 0.5% of FSO (ASTM is 0.5% of FSO at loads > 20% FSO). |
| Calibration Error | This value represents the maximum error (absolute value) in the recorded load value as compared to the actual load value for each calibration point for loads greater than approximately 10% of FSO.<br>Adara's Pass/Fail criteria for the tip and sleeve is 0.5% of MO and 1.0% of MO for the pore pressure (ASTM for the tip and sleeve is 1.5% and 1.0% of MO respectively at loads greater than 20% of FSO) |

## Temperature Check Passing Criteria

| | | |
|---|---|---|
| Tip Temperature Coefficient | <0.200 | bar/˚C |
| Sleeve Temperature Coefficient | <0.005 | bar/˚C |
| Pressure Temperature Coefficient | <0.0196 | bar/˚C |

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## ASTM D5778-20 Annex A Summary [1]

A1.4 Force Transducer Calibration Requirements

A1.4.1 states the following limits:

| | | |
|---|---|---|
| Non Linearity | Tip | ≤ +0.5% of FSO |
| | Sleeve | ≤ +1.0% of FSO |
| Calibration Error | Tip | ≤ +1.5% of MO at loads > 20% FSO |
| | Sleeve | ≤ +1.0% of MO at loads > 20% FSO |

A1.5 Pressure Transducer Calibrations

A1.5.1 limits:

| | | |
|---|---|---|
| Non Linearity | Pore Pressure | ≤ +1.0% of FSO |
| Calibration Error | Pore Pressure | not specified |

## ISO 22476 -1:2012 Summary [2]

Section 5.2 states the following allowable minimum accuracy

| | | |
|---|---|---|
| Class 1 | Cone Resistance | 35 kPa or 5% |
| | Sleeve Friction | 5 kPa or 10% |
| | Pore Pressure | 10 kPa or 2% |
| Class 2 | Cone Resistance | 100 kPa or 5% |
| | Sleeve Friction | 15 kPa or 15% |
| | Pore Pressure | 25 kPa or 3% |

Note: ISO Compliance is based on low end calibration only.

## References

[1] ASTM D5778-20. "Standard Test Method for Electronic Friction Cone and Piezocone Penetration Testing of Soils". ASTM, West Conshohocken, PA, USA.

[2] ISO 22476-1:2012. "Geotechnical investigation and testing - Field Testing - Part 1: Electrical cone and piezocone penetration test". ISO, Geneva, Switzerland.

ASTM D7400-19. "Standard Test Methods for Downhole Seismic Testing". ASTM, West Conshohocken, PA, USA.

APPENDIX C

# SOIL BORING LOGS

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

# BORING LOGS

## SUMMARY OF THE BURMISTER SOIL CLASSIFICATION SYSTEM (MODIFIED)

***RELATIVE DENSITY (of non-plastic soils) OR CONSISTENCY (of plastic soils)***

| STANDARD PENETRATION TEST (SPT) |
|---|
| Method: Samples were collected in accordance with ASTM D1586, using a 2" diameter split spoon sampler driven 24 inches. If samples were collected using direct push methodology (Geoprobe), SPTs were not performed and relative density/consistency were not reported.<br>N-Value: The number of blows with a 140 lb. hammer required to drive the sampler the middle 12 inches.<br>WOR: Weight Of Rod (depth dependent)<br>WOH: Weight Of Hammer (140 lbs.) |

| COHESIONLESS SOILS | | COHESIVE SOILS | |
|---|---|---|---|
| BLOWS/FOOT (SPT N-Value) | RELATIVE DENSITY | BLOWS/FOOT (SPT N-Value) | CONSISTENCY |
| 0-4 | Very loose | <2 | Very soft |
| 4-10 | Loose | 2-4 | Soft |
| 10-30 | Medium dense | 4-8 | Medium Stiff |
| 30-50 | Dense | 8-15 | Stiff |
| >50 | Very dense | 15-30 | Very stiff |
| *Based upon uncorrected field N-values | | >30 | Hard |

***MATERIAL: (major constituent identified in CAPITAL letters)***

| COHESIONLESS SOILS | | |
|---|---|---|
| MATERIAL | FRACTION | GRAIN SIZE RANGE |
| **GRAVEL** | Coarse | 3/4" to 3" |
| | Fine | 1/4" to 3/4" |
| **SAND** | Coarse | 1/16" to 1/4" |
| | Medium | 1/64" to 1/16" |
| | Fine | Finest visible & distinguishable particles |
| **SILT/CLAY** | see adjacent table | Cannot distinguish individual particles |
| **COBBLES** | 3" to 6" in diameter | |
| **BOULDERS** | > 6" in diameter | |
| Note: Boulders and cobbles are observed in test pits and/or auger cuttings. | | |

| COHESIVE SOILS | | |
|---|---|---|
| SMALLEST DIAMETER | PLASTICITY | IDENTITY |
| None | Non-plastic | **SILT** |
| 1/4" (pencil) | Slight | **Clayey SILT** |
| 1/8" | Low | **SILT & CLAY** |
| 1/16" | Medium | **CLAY & SILT** |
| 1/32" | High | **Silty CLAY** |
| 1/64" | Very High | **CLAY** |
| Wetted sample is rolled in hands to smallest possible diameter before breaking. | | |

**ORGANIC SILT:** Typically gray to dark gray, often has strong $H_2S$ odor. May contain shells or shell fragments. Light weight.

**Fibrous PEAT:** Light weight, spongy, mostly visible organic matter, water squeezed readily from sample. Typically near top of layer.

**Fine grained PEAT:** Light weight, spongy, little visible organic matter, water squeezed from sample. Typically below fibrous peat.

**DEBRIS:** Detailed contents described in parentheses (wood, glass, ash, crushed brick, metal, etc.)

**BEDROCK:** Underlying rock beneath loose soil, can be weathered (easily crushed) or competent (difficult to crush).

***ADDITIONAL CONSTITUENTS***

| TERM | % OF TOTAL |
|---|---|
| and | 35-50% |
| some | 20-35% |
| little | 10-20% |
| trace | 1-10% |

***COMMON TERMS***

**Glacial till:** Very dense/hard, heterogeneous mixture of sand, silt, clay, sub-angular gravel. Deposited at base of glaciers, which covered all of New England.

**Varved clay:** Fine-grained, post-glacial lake sediments characterized by alternating layers (or varves) of silt, sand and clay.

**Fill:** Material used to raise ground, can be engineered or non-engineered.

***COMMON FIELD MEASUREMENTS***

Torvane: Undrained shear strength is estimated using a pocket torvane. Values in tons/ft$^2$ (tsf).

Penetrometer: Unconfined compressive strength is estimated using a pocket penetrometer. Values in tons/ft$^2$ (tsf).

RQD: Rock Quality Designation is determined by measuring total length of pieces of core 4" or greater and dividing by the total length of the run, expressed as %. 100-90% excellent; 90-75% good; 75-50% fair; 50-25% poor; 25-0% very poor.

PID: Soil screened for volatile organic compounds (VOCs) using a photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF BORING B-1



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC | | |
| JOB NUMBER | 0381-63-01 | FINAL DEPTH (ft) | 22.0 | DRILLING EQUIPMENT | D-50 Track Mounted Rig | | |
| LOCATION | South Hadley, MA | SURFACE ELEV (ft) | -- | FOREMAN | Nick | CASING | |
| START DATE | 1/27/2025 | DISTURBED SAMPLES | 7 | HELPER | Keeler | CASE DIAMETER | N/A |
| FINISH DATE | 1/27/2025 | UNDISTURBED SAMPLES | 0 | BIT TYPE | Hollow Stem Auger | HAMMER WGT | N/A |
| ENGINEER/SCIENTIST | Pierre Carriere | WATER LEVEL | | ROD TYPE | A (1 5/8" O.D.) | HAMMER DROP | N/A |
| BORING LOCATION | North portion of proposed office building | FIRST (ft) | 9.0 | SAMPLER | 2" O.D. Split Spoon | ROCK CORING INFORMATION | |
| | | LAST (ft) | N/A | HAMMER TYPE | Automatic | TYPE | N/A |
| | | TIME (hr) | N/A | HAMMER WGT/DROP | 140 lb / 30" | SIZE | N/A |

| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | SAMPLES: REC. (in) | SAMPLES: TYPE/ NO. | SAMPLES: FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | 3/4/6/7 | 19/24 | S-1 (0'-2') | PID 1.6 ppm | Top 8": Medium dense, brown, fine SAND, little medium sand, trace coarse sand, trace silt, trace organics (roots), damp (TOPSOIL)<br>Bottom 11": Medium dense, brown to light brown, fine SAND, trace medium sand, trace silt, damp | TOPSOIL<br>FINE SAND | 1. |
| | 9/13/13/12 | 20/24 | S-2 (2'-4') | PID 8.4 ppm | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp<br>Bottom 17": Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 5' | | | | | | | |
| | 6/8/9/11 | 23/24 | S-3 (5'-7') | PID 0.3 ppm | Top 15": Medium dense, light brown, fine SAND, trace (+) silt, moist<br>Bottom 7": Medium dense, very light brown, fine SAND, little medium sand, trace silt, damp (5% redoximorphic features) | | |
| | 9/10/10/11 | 22/24 | S-4 (7'-9') | PID 0.2 ppm | Top 11": Medium dense, very light brown, fine SAND, trace medium sand, trace (+) silt, moist<br>Bottom 11": Medium dense, very light brown, fine SAND, little medium sand, trace coarse sand, trace silt, moist (wet at tip) | 8.0<br>F-M SAND | |
| 10' | | | | | | | |
| | 4/7/8/7 | 22/24 | S-5 (10'-12') | PID 0.0 ppm | | | |
| 15' | | | | | | | |
| | 1/3/5/9 | 24/24 | S-6 (15'-17') | PID 0.0 ppm | Top 19": Loose, light brown, fine to medium SAND, trace coarse sand, trace (+) silt, wet<br>Bottom 5": Loose, light brown, fine SAND, little medium sand, little silt, wet | | |
| 20' | | | | | | | |
| | 4/5/7/10 | 24/24 | S-7 (20'-22') | PID 0.0 ppm | Top 6": Medium dense, light brown, fine to medium SAND, trace coarse sand, trace silt, wet<br>Bottom 18": Medium dense, light brown, fine SAND, little silt, trace medium sand, wet (pocket of red, silty clay with fine sand in sample) | 20.5<br>SILTY FINE SAND<br>22.0 | |
| | End of exploration at 22' | | | | | | |
| 25' | | | | | | | |

Remarks:
1. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.

**PROJECT NO.**
**0381-63-01**

**LOG OF BORING**
**B-1**

O'Reilly, Talbot & Okun
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## LOG OF BORING B-2



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC | | |
| JOB NUMBER | 0381-63-01 | FINAL DEPTH (ft) | 22.0 | DRILLING EQUIPMENT | B-53 Truck Mounted Rig | | |
| LOCATION | South Hadley, MA | SURFACE ELEV (ft) | -- | FOREMAN | Nick | CASING | |
| START DATE | 1/28/2025 | DISTURBED SAMPLES | 7 | HELPER | Keeler | CASE DIAMETER | N/A |
| FINISH DATE | 1/28/2025 | UNDISTURBED SAMPLES | 0 | BIT TYPE | Hollow Stem Auger | HAMMER WGT | N/A |
| ENGINEER/SCIENTIST | Pierre Carriere | WATER LEVEL | | ROD TYPE | A (1 5/8" O.D.) | HAMMER DROP | N/A |
| BORING LOCATION | South portion of proposed office building | FIRST (ft) | 15.0 | SAMPLER | 2" O.D. Split Spoon | ROCK CORING INFORMATION | |
| | | LAST (ft) | N/A | HAMMER TYPE | Automatic | TYPE | N/A |
| | | TIME (hr) | N/A | HAMMER WGT/DROP | 140 lb / 30" | SIZE | N/A |

| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | REC. (in) | TYPE/ NO. | FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | 2/2/3/4 | 23/24 | S-1 (0'-2') | PID 16.0 ppm | Top 1": Loose, dark brown, fine SAND, trace medium sand, trace (+) silt, trace organics (roots), damp (TOPSOIL) Next 6": Loose, brown, fine SAND, trace medium sand, trace silt, damp Bottom 16": Loose, light brown, fine SAND, trace medium sand, trace silt, damp | TOPSOIL FINE SAND | 1. |
| | 4/3/4/3 | 24/24 | S-2 (2'-4') | PID 0.0 ppm | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 5' | | | | | | | |
| | 3/4/3/4 | 22/24 | S-3 (5'-7') | PID 0.0 ppm | Loose, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| | 3/4/4/4 | 22/24 | S-4 (7'-9') | PID 0.0 ppm | Loose, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 10' | | | | | | 10.0 | |
| | 4/8/11/14 | 24/24 | S-5 (10'-12') | PID 0.0 ppm | Medium dense, light brown to very light brown, fine SAND, little to trace medium sand, trace silt, moist (trace coarse sand in bottom 4") | FINE TO MEDIUM SAND | |
| 15' | | | | | | ▽ | |
| | 6/8/7/8 | 20/24 | S-6 (15'-17') | PID 0.1 ppm | Top 4": Medium dense, brown to light brown, fine SAND, trace medium sand, trace (+) silt, wet Next 5": Medium dense, brown, fine to medium SAND, trace coarse sand, trace fine gravel, trace silt, wet Next 5": Medium dense, grayish brown, fine SAND, little medium sand, trace (+) silt, wet Bottom 6": Medium dense, brown, fine to medium SAND, trace coarse sand, trace fine gravel, trace silt, wet | = | |
| 20' | | | | | | | |
| | 4/7/7/11 | 24/24 | S-7 (20'-22') | PID 0.1 ppm | Medium dense, brown to grayish brown, fine SAND, little to trace medium sand, trace (+) silt, wet (heavy rust staining near middle) | 22.0 | |
| | | | | | End of exploration at 22' | | |
| 25' | | | | | | | |

Remarks:
1. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.

**PROJECT NO.**
**0381-63-01**

**LOG OF BORING**
**B-2**

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## LOG OF BORING B-3



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC | | |
| JOB NUMBER | 0381-63-01 | FINAL DEPTH (ft) | 22.0 | DRILLING EQUIPMENT | B-53 Truck Mounted Rig | | |
| LOCATION | South Hadley, MA | SURFACE ELEV (ft) | -- | FOREMAN | Nick | CASING | |
| START DATE | 1/27/2025 | DISTURBED SAMPLES | 7 | HELPER | Keeler | CASE DIAMETER | N/A |
| FINISH DATE | 1/27/2025 | UNDISTURBED SAMPLES | 0 | BIT TYPE | Hollow Stem Auger | HAMMER WGT | N/A |
| ENGINEER/SCIENTIST | Pierre Carriere | WATER LEVEL | | ROD TYPE | A (1 5/8" O.D.) | HAMMER DROP | N/A |
| BORING LOCATION | East portion of proposed garage building | FIRST (ft) | 5.0 | SAMPLER | 2" O.D. Split Spoon | ROCK CORING INFORMATION | |
| | | LAST (ft) | N/A | HAMMER TYPE | Automatic | TYPE | N/A |
| | | TIME (hr) | N/A | HAMMER WGT/DROP | 140 lb / 30" | SIZE | N/A |

| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | SAMPLES: REC. (in) | SAMPLES: TYPE/ NO. | SAMPLES: FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | 2/3/3/3 | 18/24 | S-1 (0'-2') | PID 0.2 ppm | Top 5": Loose, dark brown to brown, fine SAND, little silt, trace medium sand, trace organics (roots), damp<br>Bottom 13": Loose, brown, fine SAND, trace medium sand, trace silt, damp | TOPSOIL<br>FINE SAND | 1. |
| | 3/3/4/4 | 22/24 | S-2 (2'-4') | PID 0.1 ppm | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp<br>Bottom 10": Loose, light brown, fine SAND, little medium sand, trace silt, trace coarse sand, damp | | |
| 5' | | | | | | 5.0 | |
| | 4/5/6/7 | 20/24 | S-3 (5'-7') | PID 0.1 ppm | Medium dense, light brown, fine SAND, little to trace medium sand, trace coarse sand, trace silt, wet | FINE TO MEDIUM SAND | |
| | 5/6/5/6 | 21/24 | S-4 (7'-9') | PID 0.1 ppm | Medium dense, light brown, fine to medium SAND, trace coarse sand, trace silt, wet | | |
| 10' | | | | | | | |
| | 2/2/2/7 | 24/24 | S-5 (10'-12') | PID 0.0 ppm | Loose, light brown to brown, fine SAND, little to trace medium sand, trace (+) silt, wet (heavy rust staining in bottom half of sample) | | |
| 15' | | | | | | | |
| | 8/14/18/21 | 24/24 | S-6 (15'-17') | PID 0.2 ppm | Top 8": Dense, brown, fine SAND, little medium sand, trace (+) silt, wet<br>Bottom 16": Dense, brown, fine SAND, little silt, wet | | |
| 20' | | | | | | | |
| | 9/11/11/10 | 24/24 | S-7 (20'-22') | PID 0.1 ppm | Medium dense, brown, fine SAND, little to trace medium sand, trace (+) silt, wet (heavy rust staining near bottom) | 22.0 | |
| | | | | | End of exploration at 22' | | |
| 25' | | | | | | | |

Remarks:
1. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.

**PROJECT NO.**
**0381-63-01**

**LOG OF BORING**
**B-3**

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## LOG OF BORING B-4



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC | | |
| JOB NUMBER | 0381-63-01 | FINAL DEPTH (ft) | 22.0 | DRILLING EQUIPMENT | B-53 Truck Mounted Rig | | |
| LOCATION | South Hadley, MA | SURFACE ELEV (ft) | -- | FOREMAN | Nick | CASING | |
| START DATE | 1/28/2025 | DISTURBED SAMPLES | 7 | HELPER | Keeler | CASE DIAMETER | N/A |
| FINISH DATE | 1/28/2025 | UNDISTURBED SAMPLES | 0 | BIT TYPE | Hollow Stem Auger | HAMMER WGT | N/A |
| ENGINEER/SCIENTIST | Pierre Carriere | WATER LEVEL | | ROD TYPE | A (1 5/8" O.D.) | HAMMER DROP | N/A |
| BORING LOCATION | Eastern portion of proposed warehouse building | FIRST (ft) | 8.0 | SAMPLER | 2" O.D. Split Spoon | ROCK CORING INFORMATION | |
| | | LAST (ft) | N/A | HAMMER TYPE | Automatic | TYPE | N/A |
| | | TIME (hr) | N/A | HAMMER WGT/DROP | 140 lb / 30" | SIZE | N/A |

| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | SAMPLES: REC. (in) | SAMPLES: TYPE/ NO. | SAMPLES: FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | 2/3/4/4 | 21/24 | S-1 (0'-2') | PID 1.2 ppm | Top 6": Loose, dark brown, fine SAND, trace medium sand, trace (+) silt, trace organics (roots), damp (TOPSOIL)<br>Bottom 15": Loose, brown, fine SAND, trace medium sand, trace silt, damp | TOPSOIL<br>FINE SAND | 1. |
| | 4/4/3/4 | 22/24 | S-2 (2'-4') | PID 0.0 ppm | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp<br>Bottom 20": Loose, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 5' | | | | | | | |
| | 3/5/5/6 | 22/24 | S-3 (5'-7') | PID 0.0 ppm | Top 20": Medium dense, light brown to very light brown, fine SAND, trace medium sand, trace (+) silt, damp<br>Bottom 2": Medium dense, light brown, fine to medium SAND, trace coarse sand, trace silt, trace fine gravel, damp | 7.0 | |
| | 5/6/8/7 | 20/24 | S-4 (7'-9') | PID 0.0 ppm | Medium dense, light brown to very light brown, fine SAND, little to trace medium sand, trace coarse sand, trace silt, moist<br>(wet in bottom half of sample; 5% redoximorphic features) | F-M SAND | |
| 10' | | | | | | | |
| | 5/5/6/8 | 22/24 | S-5 (10'-12') | PID 0.1 ppm | Medium dense, brown to light brown, fine SAND, little medium sand, trace coarse sand, trace silt, wet (15% redoximorphic features) | | |
| 15' | | | | | | | |
| | 5/5/6/6 | 24/24 | S-6 (15'-17') | PID 0.1 ppm | Top 12": Medium dense, brown to light brown, fine SAND, little medium sand, trace coarse sand, trace silt, wet<br>Bottom 12": Medium dense, grayish brown, fine SAND, trace medium sand, trace (+) silt, wet | 16.0<br>SILTY FINE SAND | |
| 20' | | | | | | | |
| | 6/6/13/19 | 14/24 | S-7 (20'-22') | PID 0.0 ppm | Medium dense, grayish brown, fine SAND, little to trace (+) silt, trace medium sand, wet (heavy rust staining near top) | 22.0 | |
| | | | | | End of exploration at 22' | | |
| 25' | | | | | | | |

Remarks:
1. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.

**PROJECT NO.**
**0381-63-01**

**LOG OF BORING**
**B-4**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF BORING B-5



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC | | |
| JOB NUMBER | 0381-63-01 | FINAL DEPTH (ft) | 22.0 | DRILLING EQUIPMENT | B-53 Truck Mounted Rig | | |
| LOCATION | South Hadley, MA | SURFACE ELEV (ft) | -- | FOREMAN | Nick | CASING | |
| START DATE | 1/28/2025 | DISTURBED SAMPLES | 7 | HELPER | Keeler | CASE DIAMETER | N/A |
| FINISH DATE | 1/28/2025 | UNDISTURBED SAMPLES | 0 | BIT TYPE | Hollow Stem Auger | HAMMER WGT | N/A |
| ENGINEER/SCIENTIST | Pierre Carriere | WATER LEVEL | | ROD TYPE | A (1 5/8" O.D.) | HAMMER DROP | N/A |
| BORING LOCATION | Western portion of proposed warehouse and garage buildings | FIRST (ft) | 12.0 | SAMPLER | 2" O.D. Split Spoon | ROCK CORING INFORMATION | |
| | | LAST (ft) | N/A | HAMMER TYPE | Automatic | TYPE | N/A |
| | | TIME (hr) | N/A | HAMMER WGT/DROP | 140 lb / 30" | SIZE | N/A |

| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | SAMPLES: REC. (in) | SAMPLES: TYPE/ NO. | SAMPLES: FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | 6/6/3/4 | 20/24 | S-1 (0'-2') | PID 0.1 ppm | Top 10": Loose, brown, fine SAND, trace medium sand, trace silt, trace organics (roots), damp<br>Bottom 10": Loose, light brown, fine SAND, trace medium sand, trace silt, damp | FINE SAND | 1. |
| | 3/3/3/4 | 22/24 | S-2 (2'-4') | PID 0.0 ppm | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 5' | | | | | | | |
| | 3/4/5/7 | 24/24 | S-3 (5'-7') | PID 0.1 ppm | Loose, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| | 5/7/9/11 | 24/24 | S-4 (7'-9') | PID 0.0 ppm | Top 12": Medium dense, brown to light brown, fine SAND, trace medium sand, trace silt, moist<br>Next 5": Medium dense, light brown, fine SAND, little medium sand, trace coarse sand, trace silt, moist<br>Bottom 7": Medium dense, very light brown, fine SAND, trace medium sand, trace silt, moist | 8.0<br>FINE TO MEDIUM SAND | |
| 10' | | | | | | | |
| | 5/7/7/7 | 24/24 | S-5 (10'-12') | PID 0.1 ppm | Medium dense, brown to light brown, fine SAND, little to trace medium sand, trace silt, moist (wet at tip) | ▽ | |
| 15' | | | | | | | |
| | 4/5/5/11 | 20/24 | S-6 (15'-17') | PID 0.1 ppm | Top 15": Medium dense, brown to light brown, fine SAND, little to trace medium sand, trace (+) silt, wet<br>Bottom 5": Medium dense, grayish brown, fine SAND, little silt, trace medium sand, wet | 16.5<br>SILTY FINE SAND | |
| 20' | | | | | | | |
| | 1/2/3/4 | 24/24 | S-7 (20'-22') | PID 0.1 ppm | Loose, grayish brown, fine SAND, trace (+) silt, trace medium sand, wet | 22.0 | |
| | | | | | End of exploration at 22' | | |
| 25' | | | | | | | |

Remarks:
1. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.

**PROJECT NO.**
**0381-63-01**

**LOG OF BORING**
**B-5**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF BORING B-6



| | | | | | | | |
|---|---|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC | | |
| JOB NUMBER | 0381-63-01 | FINAL DEPTH (ft) | 42.0 | DRILLING EQUIPMENT | B-53 Truck Mounted Rig | | |
| LOCATION | South Hadley, MA | SURFACE ELEV (ft) | -- | FOREMAN | Nick | CASING | |
| START DATE | 1/27/2025 | DISTURBED SAMPLES | 11 | HELPER | Keeler | CASE DIAMETER | N/A |
| FINISH DATE | 1/27/2025 | UNDISTURBED SAMPLES | 0 | BIT TYPE | Hollow Stem Auger | HAMMER WGT | N/A |
| ENGINEER/SCIENTIST | Pierre Carriere | WATER LEVEL | | ROD TYPE | A (1 5/8" O.D.) | HAMMER DROP | N/A |
| BORING LOCATION | Central portion of proposed office building | FIRST (ft) | 15.0 | SAMPLER | 2" O.D. Split Spoon | ROCK CORING INFORMATION | |
| | | LAST (ft) | N/A | HAMMER TYPE | Automatic | TYPE | N/A |
| | | TIME (hr) | N/A | HAMMER WGT/DROP | 140 lb / 30" | SIZE | N/A |

| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | SAMPLES: REC. (in) | SAMPLES: TYPE/ NO. | SAMPLES: FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | 6/18/13/11 | 19/24 | S-1 (0'-2') | PID 0.0 ppm | Top 4": Dense, brown, fine SAND, little medium sand, trace silt, damp<br>Next 7: Dense, dark brown, fine SAND, little medium sand, trace silt, trace organics (roots), damp (wood or tree root near top)<br>Bottom 8": Dense, light brown, fine SAND, trace silt, trace medium sand, damp | FINE SAND<br>TOPSOIL<br>FINE SAND | 1. |
| | 8/8/7/5 | 20/24 | S-2 (2'-4') | PID 0.0 ppm | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 5' | | | | | | | |
| | 6/5/4/6 | 10/24 | S-3 (5'-7') | PID 0.0 ppm | Loose, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| | 4/4/5/5 | 18/24 | S-4 (7'-9') | PID 0.0 ppm | Loose, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 10' | | | | | | | |
| | 6/9/13/14 | 16/24 | S-5 (10'-12') | PID 0.0 ppm | Top 8": Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp<br>Bottom 8": Medium dense, very light brown, fine SAND, little medium sand, trace coarse sand, damp | | |
| 15' | | | | | | ▽ | |
| | 5/5/4/5 | 22/24 | S-6 (15'-17') | PID 0.0 ppm | Loose, brown to light brown, fine to medium SAND, trace coarse sand, trace fine gravel, trace silt, wet | FINE TO MEDIUM SAND | |
| 20' | | | | | | | |
| | 4/5/5/6 | 24/24 | S-7 (20'-22') | PID 0.0 ppm | Medium dense, light brown, fine SAND, little to trace medium sand, trace silt, trace coarse sand, wet | | |
| 25' | | | | | | | |
| | 4/4/6/9 | 24/24 | S-8 (25'-27') | PID 0.0 ppm | Top 16": Medium dense, light brown, fine to medium SAND, trace coarse sand, trace fine gravel, trace silt, wet<br>Bottom 8": Medium dense, light grayish brown, fine SAND, trace (+) silt, trace medium sand, wet | 26.0<br>SILTY FINE SAND | |

Remarks:
1. Soil screened in field using MiniRAE Lite photoionization detector (PID) referenced to benzene in air. Readings in parts per million (ppm) by volume.
2. WOR = Weight of rods.

**PROJECT NO.** 0381-63-01

**LOG OF BORING** B-6

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

Job No. 0381-63-01

## LOG OF BORING B-6



| DEPTH (ft)/ SAMPLES | SAMPLES: PENETR. RESIST. (bl / 6 in) | SAMPLES: REC. (in) | SAMPLES: TYPE/ NO. | SAMPLES: FIELD TEST DATA | SAMPLE DESCRIPTION (MODIFIED BURMISTER) | PROFILE DEPTH (ft) ELEV. | REMARKS/ WELL CONSTRUCTION |
|---|---|---|---|---|---|---|---|
| | | | | | | SILTY FINE SAND (CONTINUED) | |
| 30' | | | | | | | |
| | 8/8/8/11 | 24/24 | S-9 (30'-32') | PID 0.0 ppm | Top 7": Medium dense, light brown, fine SAND, little medium sand, trace silt, wet<br>Bottom 17": Medium dense, brown, fine SAND, little silt, trace medium sand, wet | | |
| | | | | | Medium dense, light brown, fine SAND, trace medium sand, trace silt, damp | | |
| 35' | | | | | | | |
| | 2/3/4/5 | 24/24 | S-10 (35'-37') | PID 0.0 ppm | Top 7": Loose, brown, fine SAND, little medium sand, trace (+) silt, wet<br>Next 13": Loose, brown, fine SAND, little silt, trace medium sand, wet<br>Bottom 4": Loose, gray, fine sand, little silt, wet | | |
| 40' | | | | | | | |
| | WOR 12"/2/4 | 24/24 | S-11 (40'-42') | PID 0.0 ppm | Very loose, grayish brown, fine SAND, little silt, wet | 42.0 | 2. |
| | | | | | End of exploration at 42' | | |
| 45' | | | | | | | |
| 50' | | | | | | | |
| 55' | | | | | | | |
| 60' | | | | | | | |

APPENDIX D

# TEST PIT LOGS AND PHOTOGRAPHS

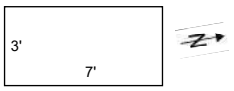
O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF TEST PIT T-1

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC |
| JOB NO. | 0381-63-01 | DATE | 1/8/2025 | OPERATOR | David |
| LOCATION | South Hadley, MA | WEATHER | Mostly sunny, windy, 23°F | BACKHOE | Komatsu PC40MR |
| TEST PIT LOCATION | Central portion of proposed staff parking lot | START TIME | 11:10 | CAPACITY (cy) | 0.3 |
| | | FINISH TIME | 11:35 | GS ELEV. (ft) | -- |
| | | OTO STAFF | Pierre Carriere | FINAL DEPTH (ft) | 9.0 |

| DEPTH (ft) | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDERS/ COBBLES COUNT | BOULDERS/ COBBLES CLASS | SAMPLE NO. | FIELD TEST DATA | REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0'-0.7': Brown, fine to medium SAND, little to trace (+) silt, trace organics (roots), damp | E | 0 | -- | -- | -- | |
| 1' | 0.7'-3.5': Brown to light brown, fine SAND, little medium sand, trace silt, damp | | 0 | -- | -- | -- | |
| 2' | 5% rust mottling at 2' | | | | | | |
| 3' | | | | | | | |
| 4' | 3.5'-9.0': Light brown to very light brown, fine to medium SAND, trace silt, damp | | 0 | -- | -- | -- | |
| 5' | 10% rust mottling at 5.0' | | | | | | |
| 6' | 20% rust mottling at 6.0' | | | | | | |
| | Heavy rust staining and moist soils at 6.5' | | | | | | |
| 7' | | | | | | | |
| 8' | Groundwater seepage and wet soils at 8.0' | | | | | | |
| 9' | Side walls caving at 9.0' | | | | | | |
| | End of Exploration at 9.0' | | | | | | |
| 10' | | | | | | | |
| 11' | | | | | | | |

**TEST PIT PLAN**




APPROXIMATE VOLUME = 7.0 cy

**EXCAVATION EFFORT**

| | |
|---|---|
| Easy | E |
| Moderate | M |
| Difficult | D |
| Very Difficult | V |

**BOULDER/COBBLE CLASS**

| Type | Size | Abbr. |
|---|---|---|
| Cobble | 3" - 6" | C |
| Small | 6" - 18" | S |
| Medium | 18" - 36" | M |
| Large | 36" and Larger | L |

**PROPORTIONS USED**

| Term | Relative Quantity |
|---|---|
| and | 35% - 50% |
| some | 20% - 35% |
| little | 10% - 20% |
| trace | 10% or less |

**GROUNDWATER CONDITIONS**

| | |
|---|---|
| GW Encountered?: | Yes |
| GW Depth (ft): | 8.0 |
| GW Elevation (ft): | -- |
| Elapsed Time (min): | N/A |

Remarks:

**PROJECT NO.**

**0381-63-01**

**LOG OF TEST PIT**

**T-1**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**TEST PIT PHOTOGRAPHS T-1**

Test pit T-1

T-1 side wall

T-1 side wall

T-1 spoils pile

| Remarks: | **PROJECT NO.** **0381-63-01** |
|---|---|
| | **LOG OF TEST PIT** **T-1** |

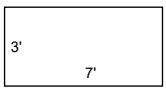
O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF TEST PIT T-2

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC |
| JOB NO. | 0381-63-01 | DATE | 1/8/2025 | OPERATOR | David |
| LOCATION | South Hadley, MA | WEATHER | Mostly sunny, windy, 25°F | BACKHOE | Komatsu PC40MR |
| TEST PIT LOCATION | North portion of proposed stormwater basin in northeast portion of site | START TIME | 14:25 | CAPACITY (cy) | 0.3 |
| | | FINISH TIME | 15:20 | GS ELEV. (ft) | -- |
| | | OTO STAFF | Pierre Carriere | FINAL DEPTH (ft) | 10.0 |

| DEPTH (ft) | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDERS/ COBBLES COUNT | BOULDERS/ COBBLES CLASS | SAMPLE NO. | FIELD TEST DATA | REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0'-0.5': Dark brown, fine to medium SAND, little silt, trace organics (roots), damp (TOPSOIL) | E | 0 | -- | -- | -- | |
| 1' | 0.5'-2.0': Brown, fine SAND, trace medium sand, trace silt, damp | | 0 | -- | -- | -- | |
| 2' | | | | | | | |
| | 2.0'-5.0': Light brown, fine SAND, little medium sand, trace silt, damp<br><5% rust mottling at 2.0' | | 0 | -- | -- | -- | |
| 3' | | | | | | | 1. |
| 4' | | | | | | | |
| 5' | | | | | | | |
| | 5.0'-10.0': Very light brown, fine to medium SAND, trace silt, damp<br>15% rust mottling at 5.0' | | 0 | -- | -- | -- | |
| 6' | | | | | | | |
| 7' | Moist soils at 7.0' | | | | | | |
| 8' | Groundwater seepage and wet soils at 8.0' | | | | | | |
| 9' | | | | | | | |
| 10' | Side walls caving at 10.0' | | | | | | |
| | End of exploration at 10.0' | | | | | | |
| 11' | | | | | | | |

**TEST PIT PLAN**




APPROXIMATE VOLUME = 7.8 cy

**EXCAVATION EFFORT**

| | |
|---|---|
| Easy | E |
| Moderate | M |
| Difficult | D |
| Very Difficult | V |

**BOULDER/COBBLE CLASS**

| Type | Size | Abbr. |
|---|---|---|
| Cobble | 3" - 6" | C |
| Small | 6" - 18" | S |
| Medium | 18" - 36" | M |
| Large | 36" and Larger | L |

**PROPORTIONS USED**

| Term | Relative Quantity |
|---|---|
| and | 35% - 50% |
| some | 20% - 35% |
| little | 10% - 20% |
| trace | 10% or less |

**GROUNDWATER CONDITIONS**

| | |
|---|---|
| GW Encountered?: | Yes |
| GW Depth (ft): | 8.0 |
| GW Elevation (ft): | -- |
| Elapsed Time (min): | N/A |

Remarks:
1. Permeability test performed adjacent to test pit T-2 at a depth of 3.0' below ground surface.

**PROJECT NO.**

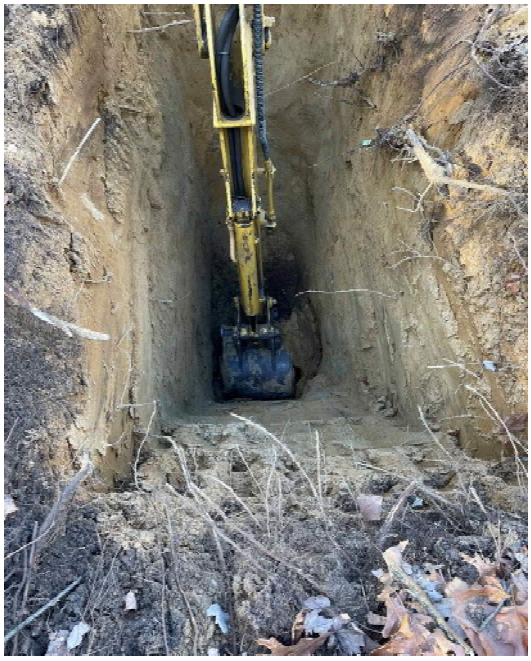
**0381-63-01**

**LOG OF TEST PIT**

**T-2**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**TEST PIT PHOTOGRAPHS T-2**



Test pit T-2

T-2 side wall

T-2 side wall

T-2 spoils pile

| Remarks: | **PROJECT NO.** **0381-63-01** |
|---|---|
| | **LOG OF TEST PIT** **T-2** |

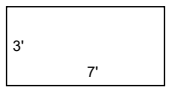
O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF TEST PIT T-3

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC |
| JOB NO. | 0381-63-01 | DATE | 1/8/2025 | OPERATOR | David |
| LOCATION | South Hadley, MA | WEATHER | Mostly sunny, windy, 24°F | BACKHOE | Komatsu PC40MR |
| TEST PIT LOCATION | Proposed stormwater basin in southwestern portion of site | START TIME | 13:00 | CAPACITY (cy) | 0.3 |
| | | FINISH TIME | 14:00 | GS ELEV. (ft) | -- |
| | | OTO STAFF | Pierre Carriere | FINAL DEPTH (ft) | 11.0 |

| DEPTH (ft) | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDERS/ COBBLES COUNT | BOULDERS/ COBBLES CLASS | SAMPLE NO. | FIELD TEST DATA | REMARKS |
|---|---|---|---|---|---|---|---|
| 0' | 0.0'-6.0': Very light brown, fine SAND, trace medium sand, trace silt, damp | E | 0 | -- | -- | -- | |
| 6' | 6.0'-8.0': Light brown, fine SAND, little medium sand, trace silt, moist | | 0 | -- | -- | -- | 1. |
| 8' | 8.0'-11.0': Very light brown, fine to medium SAND, trace (+) silt, moist<br>15% rust mottling at 8.0' | | 0 | -- | -- | -- | |
| 11' | Groundwater seepage at 11.0' | | | | | | 1. |
| | End of exploration at 11.0' | | | | | | |

**TEST PIT PLAN**




APPROXIMATE VOLUME = 8.6 cy

**EXCAVATION EFFORT**

| | |
|---|---|
| Easy | E |
| Moderate | M |
| Difficult | D |
| Very Difficult | V |

**BOULDER/COBBLE CLASS**

| Type | Size | Abbr. |
|---|---|---|
| Cobble | 3" - 6" | C |
| Small | 6" - 18" | S |
| Medium | 18" - 36" | M |
| Large | 36" and Larger | L |

**PROPORTIONS USED**

| Term | Relative Quantity |
|---|---|
| and | 35% - 50% |
| some | 20% - 35% |
| little | 10% - 20% |
| trace | 10% or less |

**GROUNDWATER CONDITIONS**

| | |
|---|---|
| GW Encountered?: | Yes |
| GW Depth (ft): | 11.0 |
| GW Elevation (ft): | -- |
| Elapsed Time (min): | N/A |

Remarks:
1. Permeability tests performed adjacent to test pit T-3 at depths of 3.0' and 7.5' below ground surface.

**PROJECT NO.**

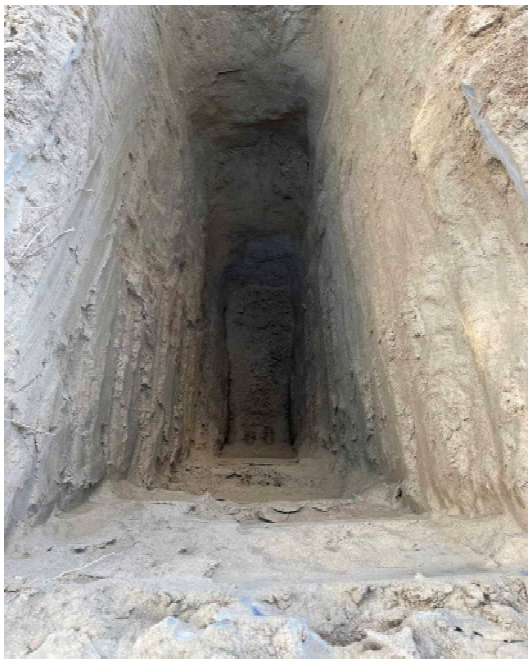
**0381-63-01**

**LOG OF TEST PIT**

**T-3**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**TEST PIT PHOTOGRAPHS T-3**



Test pit T-3

T-3 side wall

T-3 side wall

T-3 spoils pile

| Remarks: | **PROJECT NO.** **0381-63-01** |
|---|---|
| | **LOG OF TEST PIT** **T-3** |

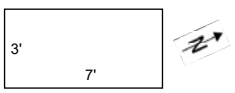
O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF TEST PIT T-4

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC |
| JOB NO. | 0381-63-01 | DATE | 1/8/2025 | OPERATOR | David |
| LOCATION | South Hadley, MA | WEATHER | Mostly sunny, windy, 24°F | BACKHOE | Komatsu PC40MR |
| TEST PIT LOCATION | Near east portion of proposed covered storage in southern part of site | START TIME | 12:20 | CAPACITY (cy) | 0.3 |
| | | FINISH TIME | 12:50 | GS ELEV. (ft) | -- |
| | | OTO STAFF | Pierre Carriere | FINAL DEPTH (ft) | 10.0 |

| DEPTH (ft) | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDERS/ COBBLES COUNT | BOULDERS/ COBBLES CLASS | SAMPLE NO. | FIELD TEST DATA | REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0'-0.7': Dark brown, fine to medium SAND, little silt, trace organics (roots), damp (TOPSOIL) | E | 0 | -- | -- | -- | |
| 1' | 0.7'-2.0': Brown, fine SAND, trace medium sand, trace (+) silt, damp | | 0 | -- | -- | -- | |
| 2' | 2.0'-6.5': Light brown, fine SAND, little medium sand, trace silt, damp | | 0 | -- | -- | -- | |
| | 5% rust mottling at 2.5' | | | | | | |
| 3' | | | | | | | |
| | 15% rust mottling at 3.5' | | | | | | |
| 4' | | | | | | | |
| 5' | | | | | | | |
| 6' | 6.5'-10.0': Light brown, fine to medium SAND, trace silt, trace coarse sand, damp | | 0 | -- | -- | -- | |
| 7' | | | | | | | |
| | Groundwater seepage and wet soils at 7.5' | | | | | | |
| 8' | | | | | | | |
| 9' | | | | | | | |
| 10' | Side walls caving at 10.0' | | | | | | |
| | End of exploration at 10.0' | | | | | | |
| 11' | | | | | | | |

**TEST PIT PLAN**




APPROXIMATE VOLUME = 7.8 cy

**EXCAVATION EFFORT**

| | |
|---|---|
| Easy | E |
| Moderate | M |
| Difficult | D |
| Very Difficult | V |

**BOULDER/COBBLE CLASS**

| Type | Size | Abbr. |
|---|---|---|
| Cobble | 3" - 6" | C |
| Small | 6" - 18" | S |
| Medium | 18" - 36" | M |
| Large | 36" and Larger | L |

**PROPORTIONS USED**

| Term | Relative Quantity |
|---|---|
| and | 35% - 50% |
| some | 20% - 35% |
| little | 10% - 20% |
| trace | 10% or less |

**GROUNDWATER CONDITIONS**

| | |
|---|---|
| GW Encountered?: | Yes |
| GW Depth (ft): | 7.5 |
| GW Elevation (ft): | -- |
| Elapsed Time (min): | N/A |

Remarks:

**PROJECT NO.**

**0381-63-01**

**LOG OF TEST PIT**

**T-4**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**TEST PIT PHOTOGRAPHS T-4**

Test pit T-4

T-4 side wall

T-4 side wall

T-4 spoils pile

| Remarks: | PROJECT NO.<br>0381-63-01 |
|---|---|
| | LOG OF TEST PIT<br>T-4 |

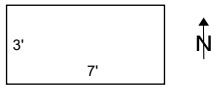
O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF TEST PIT T-5

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC |
| JOB NO. | 0381-63-01 | DATE | 1/8/2025 | OPERATOR | David |
| LOCATION | South Hadley, MA | WEATHER | Mostly sunny, windy, 23°F | BACKHOE | Komatsu PC40MR |
| TEST PIT LOCATION | East portion of proposed stormwater basin in northern portion of site | START TIME | 10:25 | CAPACITY (cy) | 0.3 |
| | | FINISH TIME | 11:00 | GS ELEV. (ft) | -- |
| | | OTO STAFF | Pierre Carriere | FINAL DEPTH (ft) | 9.0 |

| DEPTH (ft) | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDERS/ COBBLES COUNT | BOULDERS/ COBBLES CLASS | SAMPLE NO. | FIELD TEST DATA | REMARKS |
|---|---|---|---|---|---|---|---|
| 1' 2' 3' 4' 5' | 0.0'-5.0': Light brown to very light brown, fine SAND, trace medium sand, trace silt, damp | E | 0 | -- | -- | -- | |
| 6' 7' 8' 9' | 5.0'-9.0': Light brown, fine to medium sand, trace silt, trace coarse sand, damp<br>10% rust mottling at 5.0'<br>20% rust mottling and moist soils at 6.0'<br>Groundwater seepage and wet soils at 8.5'<br>Side walls caving at 9.0' | | 0 | -- | -- | -- | 1. |
| 10' 11' | End of exploration at 9.0' | | | | | | |

**TEST PIT PLAN**




APPROXIMATE VOLUME = 7.0 cy

**EXCAVATION EFFORT**

| | |
|---|---|
| Easy | E |
| Moderate | M |
| Difficult | D |
| Very Difficult | V |

**BOULDER/COBBLE CLASS**

| Type | Size | Abbr. |
|---|---|---|
| Cobble | 3" - 6" | C |
| Small | 6" - 18" | S |
| Medium | 18" - 36" | M |
| Large | 36" and Larger | L |

**PROPORTIONS USED**

| Term | Relative Quantity |
|---|---|
| and | 35% - 50% |
| some | 20% - 35% |
| little | 10% - 20% |
| trace | 10% or less |

**GROUNDWATER CONDITIONS**

| | |
|---|---|
| GW Encountered?: | Yes |
| GW Depth (ft): | 8.5 |
| GW Elevation (ft): | -- |
| Elapsed Time (min): | N/A |

Remarks:
1. Permeability test performed adjacent to test pit T-2 at a depth of 5.5' below ground surface.

**PROJECT NO.**

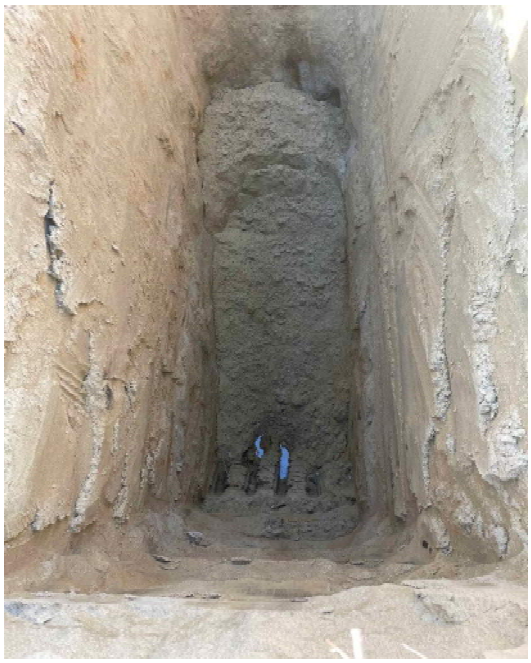
**0381-63-01**

**LOG OF TEST PIT**

**T-5**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**TEST PIT PHOTOGRAPHS T-5**



Test pit T-5

T-5 side wall

T-5 side wall

T-5 spoils pile

| Remarks: | **PROJECT NO.** **0381-63-01** |
|---|---|
| | **LOG OF TEST PIT** **T-5** |

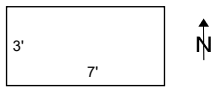
O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

## LOG OF TEST PIT T-6

| | | | | | |
|---|---|---|---|---|---|
| PROJECT | Proposed SHELD Facility | | | CONTRACTOR | Seaboard Drilling, LLC |
| JOB NO. | 0381-63-01 | DATE | 1/8/2025 | OPERATOR | David |
| LOCATION | South Hadley, MA | WEATHER | Mostly sunny, windy, 24°F | BACKHOE | Komatsu PC40MR |
| TEST PIT LOCATION | Proposed pavement area in southern central portion of site | START TIME | 11:40 | CAPACITY (cy) | 0.3 |
| | | FINISH TIME | 12:10 | GS ELEV. (ft) | -- |
| | | OTO STAFF | Pierre Carriere | FINAL DEPTH (ft) | 9.5 |

| DEPTH (ft) | SOIL DESCRIPTION | EXCAV. EFFORT | BOULDERS/ COBBLES COUNT | BOULDERS/ COBBLES CLASS | SAMPLE NO. | FIELD TEST DATA | REMARKS |
|---|---|---|---|---|---|---|---|
| 0' | 0.0'-1.2': Dark brown, fine to medium SAND, little silt, trace coarse sand, trace organics (roots), damp (TOPSOIL) | E | 0 | -- | -- | -- | |
| 1' | | | | | | | |
| | 1.2'-2.5': Brown, fine SAND, trace medium sand, trace silt, damp | | 0 | -- | -- | -- | |
| 2' | | | | | | | |
| | 2.5'-9.5': Light brown, fine to medium SAND, trace (+) silt, damp | | 0 | -- | -- | -- | |
| 3' | | | | | | | |
| 4' | | | | | | | |
| 5' | | | | | | | |
| 6' | | | | | | | |
| 7' | | | | | | | |
| 8' | | | | | | | |
| 9' | Groundwater seepage and wet soils at 9.0' | | | | | | |
| | End of exploration at 9.5' | | | | | | |
| 10' | | | | | | | |
| 11' | | | | | | | |

**TEST PIT PLAN**




APPROXIMATE VOLUME = 7.4 cy

**EXCAVATION EFFORT**

| | |
|---|---|
| Easy | E |
| Moderate | M |
| Difficult | D |
| Very Difficult | V |

**BOULDER/COBBLE CLASS**

| Type | Size | Abbr. |
|---|---|---|
| Cobble | 3" - 6" | C |
| Small | 6" - 18" | S |
| Medium | 18" - 36" | M |
| Large | 36" and Larger | L |

**PROPORTIONS USED**

| Term | Relative Quantity |
|---|---|
| and | 35% - 50% |
| some | 20% - 35% |
| little | 10% - 20% |
| trace | 10% or less |

**GROUNDWATER CONDITIONS**

| | |
|---|---|
| GW Encountered?: | Yes |
| GW Depth (ft): | 9.0 |
| GW Elevation (ft): | -- |
| Elapsed Time (min): | N/A |

Remarks:

**PROJECT NO.**

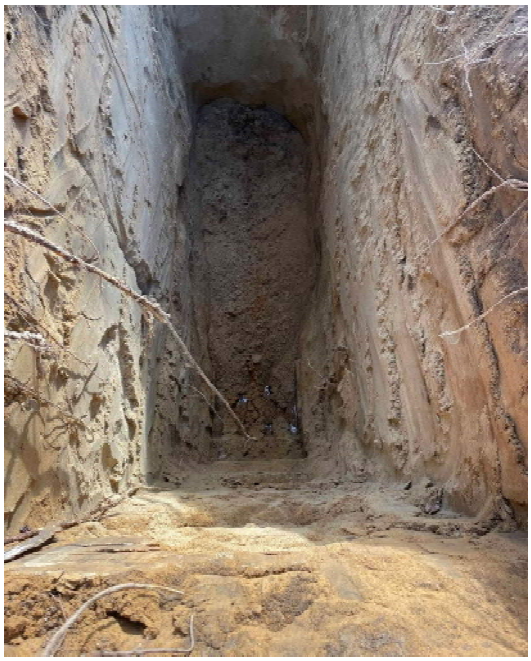
**0381-63-01**

**LOG OF TEST PIT**

**T-6**

O'Reilly, Talbot & Okun
ENGINEERING ASSOCIATES

**TEST PIT PHOTOGRAPHS T-6**



Test pit T-6

T-6 side wall

T-6 side wall

T-6 spoils pile

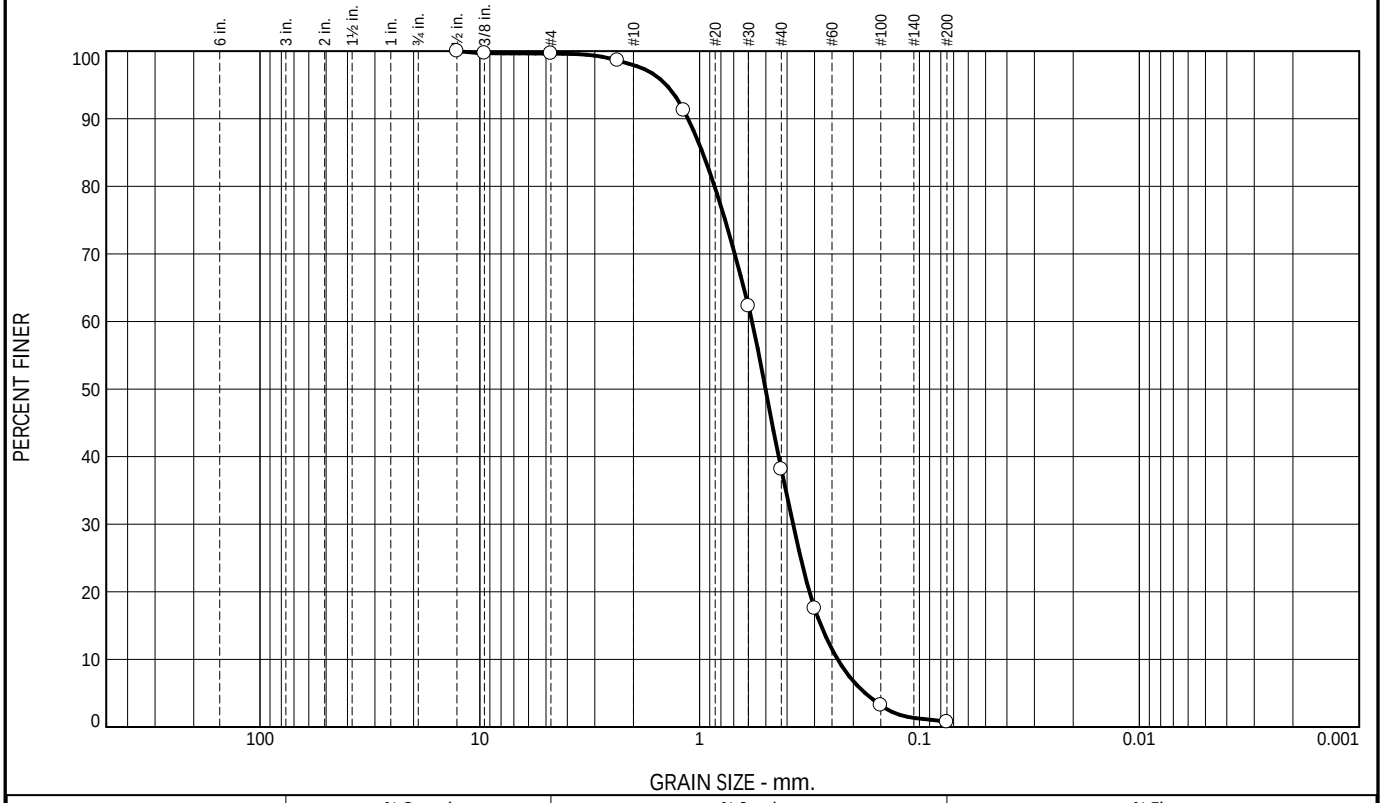
| Remarks: | **PROJECT NO.** **0381-63-01** |
|---|---|
| | **LOG OF TEST PIT** **T-6** |

APPENDIX E

# LABORATORY DATA SHEETS

# Particle Size Distribution Report

ASTM C117 & C136




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.4 | 1.7 | 59.8 | 37.4 | 0.7 | |

Test Results (ASTM C117 & C136)

| Sieve Size or Diam. (mm.) | Finer (%) | Spec.* (%) | Out of Spec. (%) | Pct. of Fines |
|---|---|---|---|---|
| 1/2 | 100.0 | | | |
| 3/8 | 99.7 | | | |
| #4 | 99.6 | | | |
| #8 | 98.6 | | | |
| #16 | 91.2 | | | |
| #30 | 62.3 | | | |
| #40 | 38.1 | | | |
| #50 | 17.5 | | | |
| #100 | 3.2 | | | |
| #200 | 0.7 | | | |

* (no specification provided)

Material Description

T-4 (2'-6.5')

Atterberg Limits

PL= LL= PI=

Coefficients

$D_{90}$= 1.1288 $D_{85}$= 0.9702 $D_{60}$= 0.5774
$D_{50}$= 0.5012 $D_{30}$= 0.3756 $D_{15}$= 0.2804
$D_{10}$= 0.2357 $C_u$= 2.45 $C_c$= 1.04

Classification

USCS= SP AASHTO=

Test Remarks

This sample was delivered to ATL. This sample was washed.

Sample Number: 1743

Sample Date: 1/9/25

ALLIED TESTING LABORATORIES, INC.
Springfield, Massachusetts

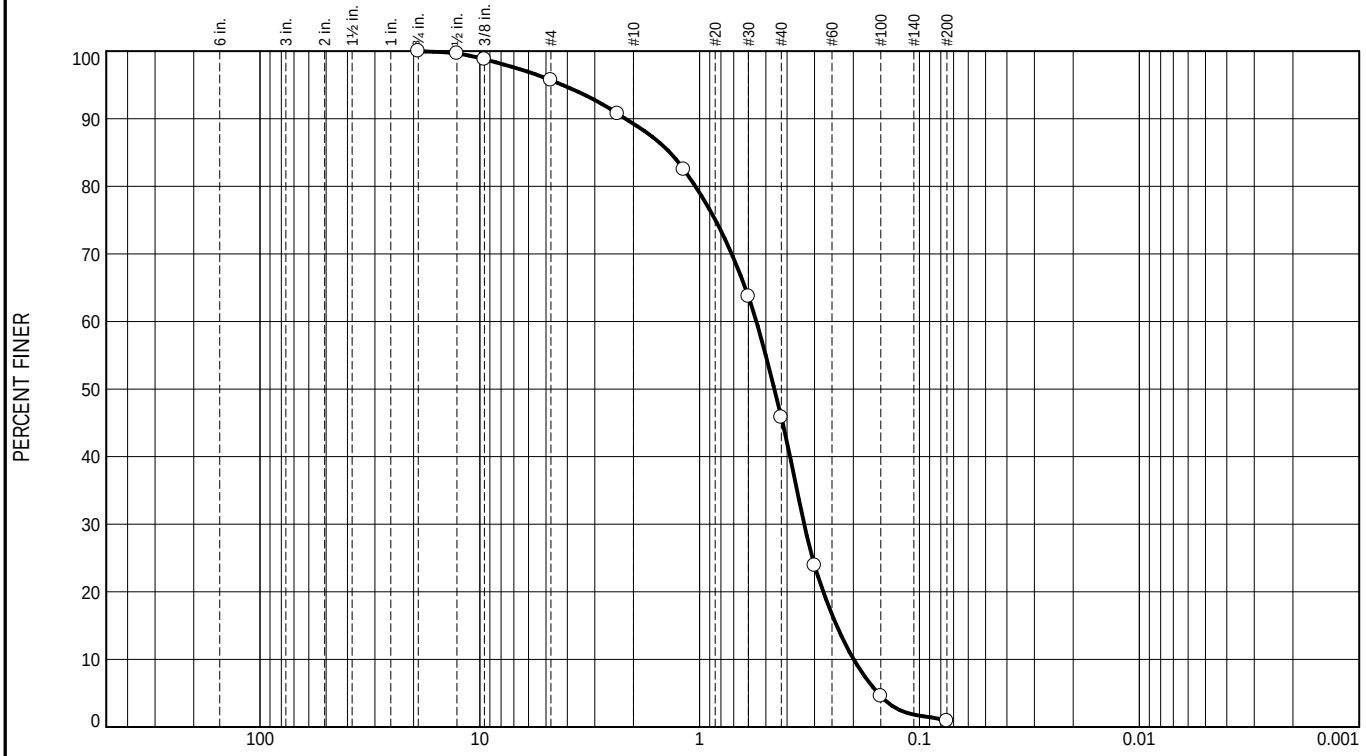
Client: OTO
Project: South Hadley Electric Light Dept.

Project No: 0381-63-01 Figure

Checked By: John McGreevy

# Particle Size Distribution Report

ASTM C117 & C136




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 4.3 | 6.5 | 43.4 | 44.9 | 0.9 | |

Test Results (ASTM C117 & C136)

| Sieve Size or Diam. (mm.) | Finer (%) | Spec.* (%) | Out of Spec. (%) | Pct. of Fines |
|---|---|---|---|---|
| 3/4 | 100.0 | | | |
| 1/2 | 99.7 | | | |
| 3/8 | 98.8 | | | |
| #4 | 95.7 | | | |
| #8 | 90.7 | | | |
| #16 | 82.5 | | | |
| #30 | 63.7 | | | |
| #40 | 45.8 | | | |
| #50 | 23.9 | | | |
| #100 | 4.6 | | | |
| #200 | 0.9 | | | |

* (no specification provided)

Material Description

T-5 (5'-9')

Atterberg Limits

PL= LL= PI=

Coefficients

$D_{90}$= 2.1767 $D_{85}$= 1.3643 $D_{60}$= 0.5514
$D_{50}$= 0.4572 $D_{30}$= 0.3347 $D_{15}$= 0.2382
$D_{10}$= 0.1991 $C_u$= 2.77 $C_c$= 1.02

Classification

USCS= SP AASHTO=

Test Remarks

This sample was delivered to ATL. This sample was washed.

Sample Number: 1744

Sample Date: 1/9/25

ALLIED TESTING LABORATORIES, INC.
Springfield, Massachusetts

Client: OTO
Project: South Hadley Electric Light Dept.

Project No: 0381-63-01 Figure

Checked By: John McGreevy

# Particle Size Distribution Report

ASTM C117 & C136

| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 11.2 | 83.3 | 5.5 | |

Test Results (ASTM C117 & C136)

| Sieve Size or Diam. (mm.) | Finer (%) | Spec.* (%) | Out of Spec. (%) | Pct. of Fines |
|---|---|---|---|---|
| #8 | 100.0 | | | |
| #16 | 99.6 | | | |
| #30 | 96.3 | | | |
| #40 | 88.8 | | | |
| #50 | 72.7 | | | |
| #100 | 31.9 | | | |
| #200 | 5.5 | | | |

* (no specification provided)

Material Description

T-5 (0'-5')

Atterberg Limits

PL= LL= PI=

Coefficients

$D_{90}$= 0.4414 $D_{85}$= 0.3854 $D_{60}$= 0.2412
$D_{50}$= 0.2057 $D_{30}$= 0.1442 $D_{15}$= 0.0980
$D_{10}$= 0.0848 $C_u$= 2.84 $C_c$= 1.02

Classification

USCS= AASHTO=

Test Remarks

This sample was delivered to ATL. This sample was washed.

Sample Number: 1745

Sample Date: 1/9/25

ALLIED TESTING LABORATORIES, INC.
Springfield, Massachusetts

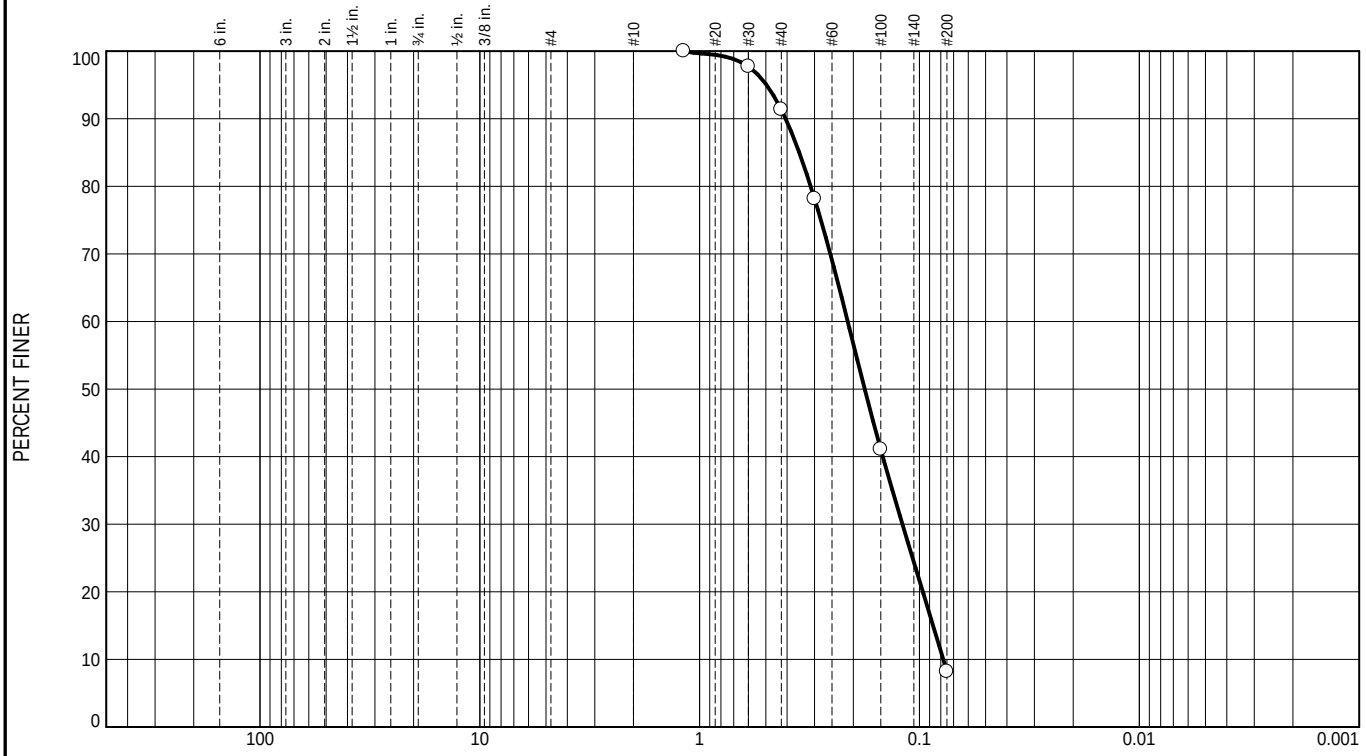
Client: OTO
Project: South Hadley Electric Light Dept.

Project No: 0381-63-01 Figure

Checked By: John McGreevy

# Particle Size Distribution Report

ASTM C117 & C136




| % +3" | % Gravel | | % Sand | | | % Fines | |
|---|---|---|---|---|---|---|---|
| | Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
| 0.0 | 0.0 | 0.0 | 0.0 | 8.7 | 83.1 | 8.2 | |

Test Results (ASTM C117 & C136)

| Sieve Size or Diam. (mm.) | Finer (%) | Spec.* (%) | Out of Spec. (%) | Pct. of Fines |
|---|---|---|---|---|
| #16 | 100.0 | | | |
| #30 | 97.7 | | | |
| #40 | 91.3 | | | |
| #50 | 78.1 | | | |
| #100 | 41.1 | | | |
| #200 | 8.2 | | | |

* (no specification provided)

Material Description

T-6 (2.5'-4.5')

Atterberg Limits

PL= LL= PI=

Coefficients

$D_{90}$= 0.4061 $D_{85}$= 0.3524 $D_{60}$= 0.2121
$D_{50}$= 0.1774 $D_{30}$= 0.1195 $D_{15}$= 0.0867
$D_{10}$= 0.0779 $C_u$= 2.72 $C_c$= 0.86

Classification

USCS= AASHTO=

Test Remarks

This sample was delivered to ATL. This sample was washed.

Sample Number: 1746

Sample Date: 1/9/25

ALLIED TESTING LABORATORIES, INC.
Springfield, Massachusetts

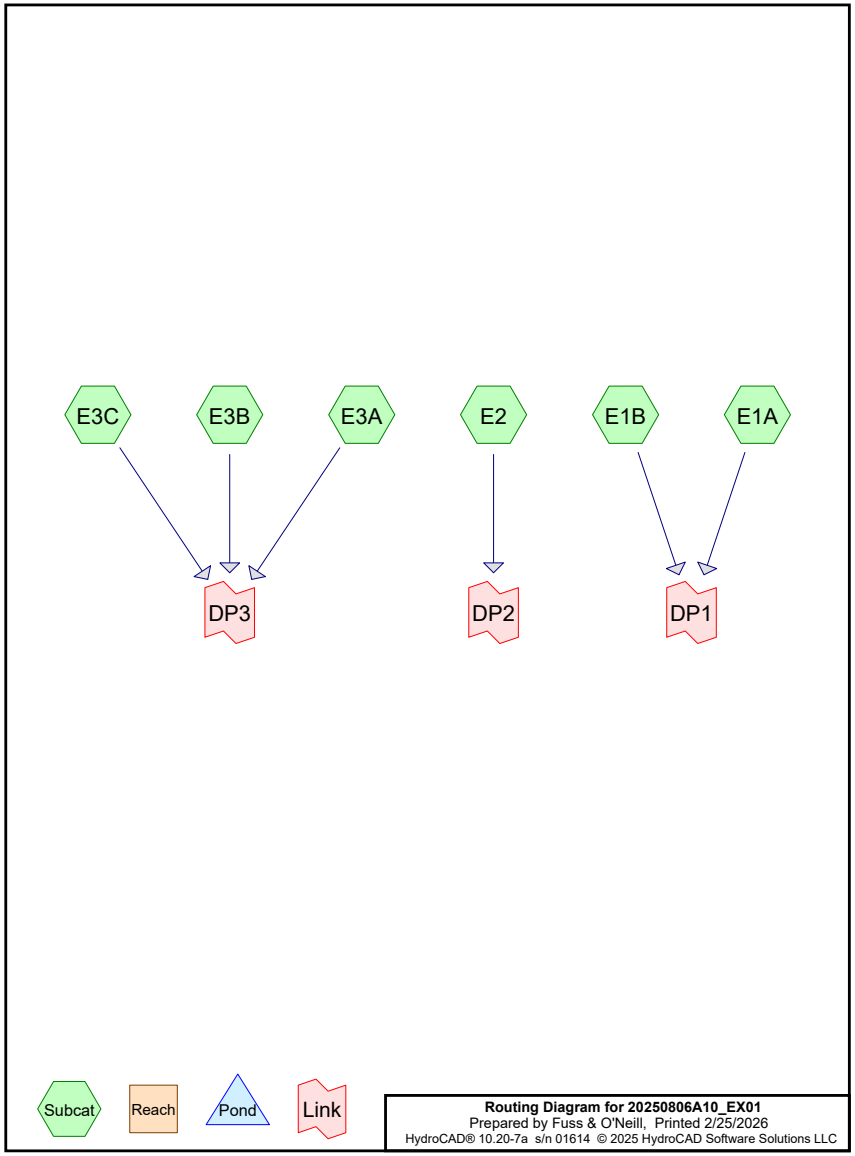
Client: OTO
Project: South Hadley Electric Light Dept.

Project No: 0381-63-01 Figure

Checked By: John McGreevy

# Appendix D

## Pre-Development Hydrologic Analysis






## Rainfall Events Listing

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | 2-YR | Type III 24-hr | | Default | 24.00 | 1 | 3.09 | 2 |
| 2 | 10-YR | Type III 24-hr | | Default | 24.00 | 1 | 4.98 | 2 |
| 3 | 25-YR | Type III 24-hr | | Default | 24.00 | 1 | 6.16 | 2 |
| 4 | 100-YR | Type III 24-hr | | Default | 24.00 | 1 | 7.98 | 2 |

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 2.930 | 49 | 50-75% Grass cover, Fair, HSG A (E1A, E1B, E2, E3A, E3B, E3C) |
| 0.322 | 72 | Dirt roads, HSG A (E3A) |
| 1.499 | 98 | Paved parking, HSG A (E1A, E1B, E2, E3A, E3B, E3C) |
| 0.129 | 98 | Roofs, HSG A (E1A) |
| 5.557 | 30 | Woods, Good, HSG A (E1A, E1B, E2, E3A, E3B) |
| **10.438** | **47** | **TOTAL AREA** |



## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 10.438 | HSG A | E1A, E1B, E2, E3A, E3B, E3C |
| 0.000 | HSG B | |
| 0.000 | HSG C | |
| 0.000 | HSG D | |
| 0.000 | Other | |
| **10.438** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 2.930 | 0.000 | 0.000 | 0.000 | 0.000 | 2.930 | 50-75% Grass cover, Fair | E1A, E1B, E2, E3A, E3B, E3C |
| 0.322 | 0.000 | 0.000 | 0.000 | 0.000 | 0.322 | Dirt roads | E3A |
| 1.499 | 0.000 | 0.000 | 0.000 | 0.000 | 1.499 | Paved parking | E1A, E1B, E2, E3A, E3B, E3C |
| 0.129 | 0.000 | 0.000 | 0.000 | 0.000 | 0.129 | Roofs | E1A |
| 5.557 | 0.000 | 0.000 | 0.000 | 0.000 | 5.557 | Woods, Good | E1A, E1B, E2, E3A, E3B |
| **10.438** | **0.000** | **0.000** | **0.000** | **0.000** | **10.438** | **TOTAL AREA** | |



Time span=0.00-60.00 hrs, dt=0.03 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentE1A:** Runoff Area=63,648 sf 36.72% Impervious Runoff Depth=0.47"
Tc=6.0 min CN=63 Runoff=0.55 cfs 0.057 af

**SubcatchmentE1B:** Runoff Area=266,973 sf 6.74% Impervious Runoff Depth=0.00"
Flow Length=354' Tc=29.7 min CN=39 Runoff=0.00 cfs 0.000 af

**SubcatchmentE2:** Runoff Area=42,839 sf 21.35% Impervious Runoff Depth=0.06"
Flow Length=292' Tc=14.3 min CN=47 Runoff=0.01 cfs 0.005 af

**SubcatchmentE3A:** Runoff Area=57,099 sf 0.57% Impervious Runoff Depth=0.11"
Flow Length=555' Tc=25.5 min CN=50 Runoff=0.02 cfs 0.012 af

**SubcatchmentE3B:** Runoff Area=15,086 sf 76.24% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=86 Runoff=0.70 cfs 0.050 af

**SubcatchmentE3C:** Runoff Area=9,018 sf 95.07% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=96 Runoff=0.59 cfs 0.046 af

**Link DP1:** Inflow=0.55 cfs 0.057 af
Primary=0.55 cfs 0.057 af

**Link DP2:** Inflow=0.01 cfs 0.005 af
Primary=0.01 cfs 0.005 af

**Link DP3:** Inflow=1.30 cfs 0.107 af
Primary=1.30 cfs 0.107 af

**Total Runoff Area = 10.438 ac Runoff Volume = 0.170 af Average Runoff Depth = 0.19"**
**84.40% Pervious = 8.810 ac 15.60% Impervious = 1.628 ac**

## Summary for Subcatchment E1A:

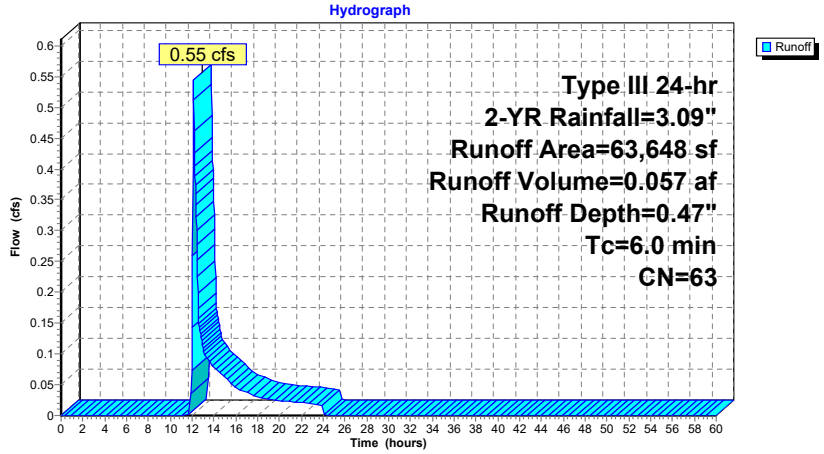
Runoff = 0.55 cfs @ 12.12 hrs, Volume= 0.057 af, Depth= 0.47"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 17,757 | 98 | Paved parking, HSG A |
| 26,041 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,235 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 63,648 | 63 | Weighted Average |
| 40,276 | | 63.28% Pervious Area |
| 23,372 | | 36.72% Impervious Area |

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

### Subcatchment E1A:






## Summary for Subcatchment E1B:

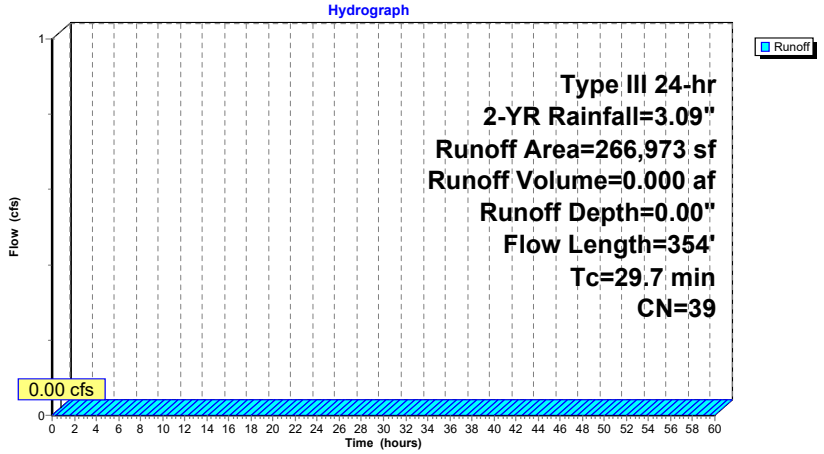
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 18,002 | 98 | Paved parking, HSG A |
| 62,428 | 49 | 50-75% Grass cover, Fair, HSG A |
| 186,543 | 30 | Woods, Good, HSG A |
| 266,973 | 39 | Weighted Average |
| 248,971 | | 93.26% Pervious Area |
| 18,002 | | 6.74% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0746 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 3.4 | 165 | 0.0258 | 0.80 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 18.9 | 139 | 0.0006 | 0.12 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 29.7 | 354 | Total | | | |

### Subcatchment E1B:



## Summary for Subcatchment E2:

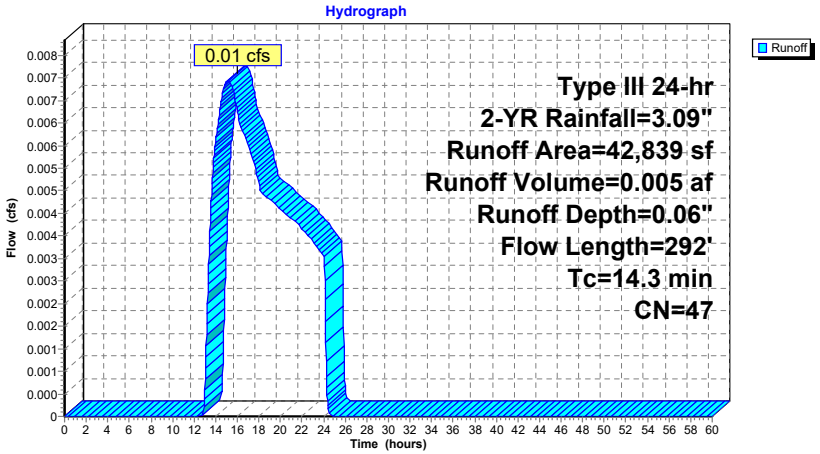
Runoff = 0.01 cfs @ 15.15 hrs, Volume= 0.005 af, Depth= 0.06"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 9,145 | 98 | Paved parking, HSG A |
| 6,651 | 49 | 50-75% Grass cover, Fair, HSG A |
| 27,043 | 30 | Woods, Good, HSG A |
| 42,839 | 47 | Weighted Average |
| 33,694 | | 78.65% Pervious Area |
| 9,145 | | 21.35% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.7 | 50 | 0.0384 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 4.6 | 242 | 0.0307 | 0.88 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 14.3 | 292 | Total | | | |

### Subcatchment E2:






## Summary for Subcatchment E3A:

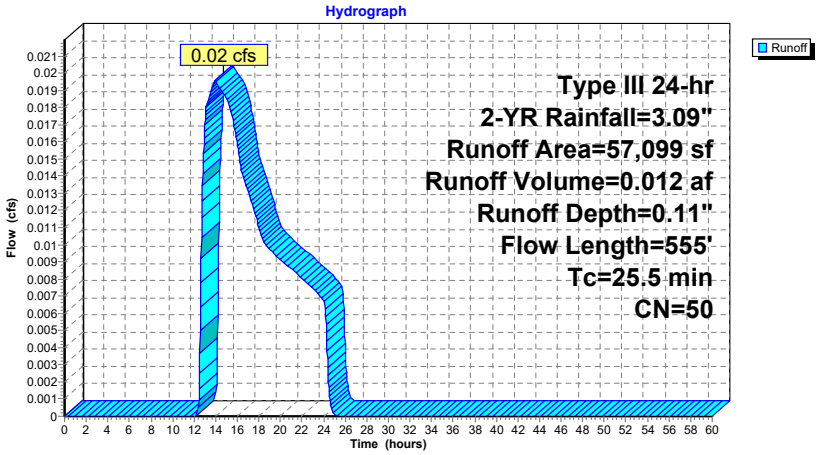
Runoff = 0.02 cfs @ 13.93 hrs, Volume= 0.012 af, Depth= 0.11"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 324 | 98 | Paved parking, HSG A |
| 28,583 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,153 | 30 | Woods, Good, HSG A |
| 14,039 | 72 | Dirt roads, HSG A |
| 57,099 | 50 | Weighted Average |
| 56,775 | | 99.43% Pervious Area |
| 324 | | 0.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 40 | 0.1617 | 0.15 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.3 | 10 | 0.0009 | 0.07 | | **Sheet Flow,** Fallow n= 0.050 P2= 3.09" |
| 1.9 | 175 | 0.0090 | 1.53 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.4 | 104 | 0.0022 | 0.23 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 25.5 | 555 | Total | | | |

### Subcatchment E3A:






### Summary for Subcatchment E3B:

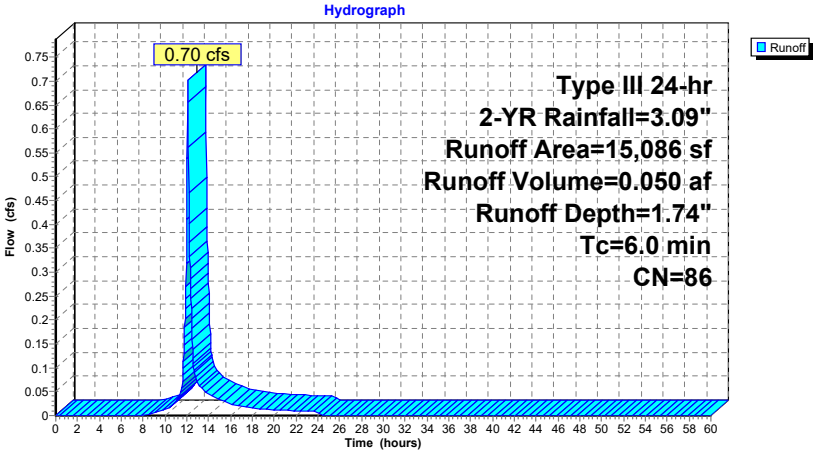
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 1.74"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 11,501 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 15,086 | 86 | Weighted Average |
| 3,585 | | 23.76% Pervious Area |
| 11,501 | | 76.24% Impervious Area |

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

### Subcatchment E3B:



## Summary for Subcatchment E3C:

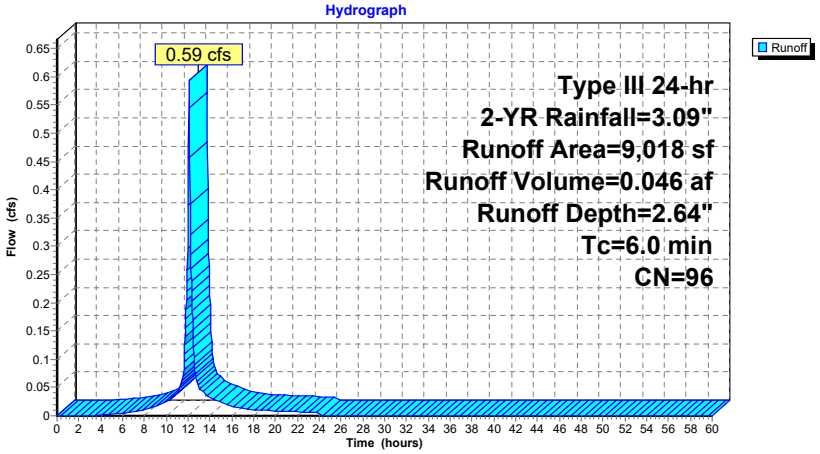
Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.046 af, Depth= 2.64"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 8,573 | 98 | Paved parking, HSG A |
| 445 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,018 | 96 | Weighted Average |
| 445 | | 4.93% Pervious Area |
| 8,573 | | 95.07% Impervious Area |

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

### Subcatchment E3C:



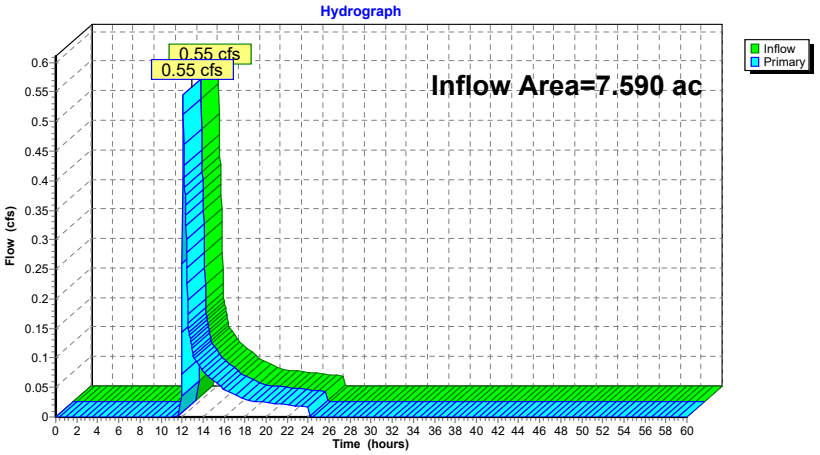



## Summary for Link DP1:

Inflow Area = 7.590 ac, 12.51% Impervious, Inflow Depth = 0.09" for 2-YR event
Inflow = 0.55 cfs @ 12.12 hrs, Volume= 0.057 af
Primary = 0.55 cfs @ 12.12 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

### Link DP1:

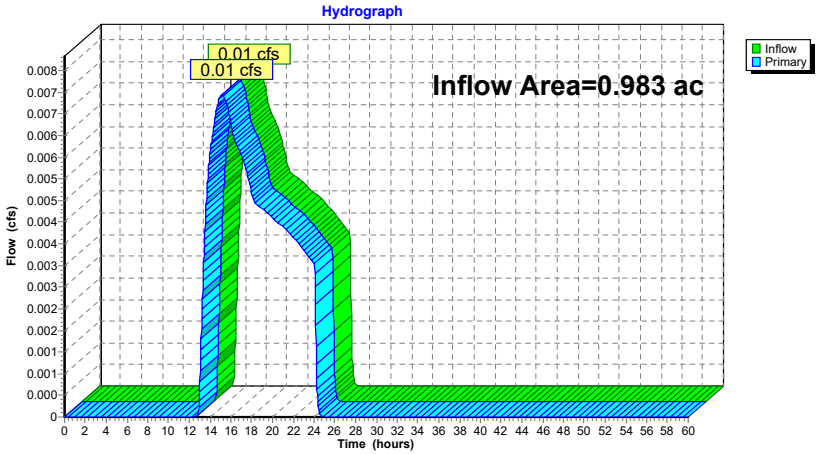


## Summary for Link DP2:

Inflow Area = 0.983 ac, 21.35% Impervious, Inflow Depth = 0.06" for 2-YR event
Inflow = 0.01 cfs @ 15.15 hrs, Volume= 0.005 af
Primary = 0.01 cfs @ 15.15 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP2:



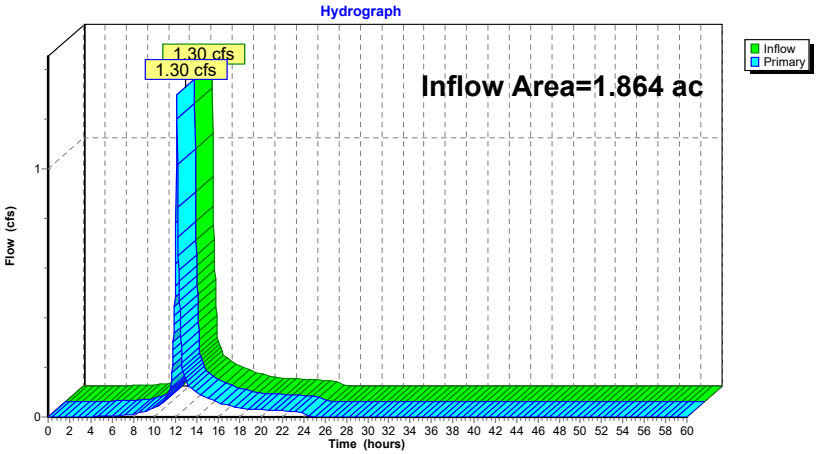



## Summary for Link DP3:

Inflow Area = 1.864 ac, 25.12% Impervious, Inflow Depth = 0.69" for 2-YR event
Inflow = 1.30 cfs @ 12.09 hrs, Volume= 0.107 af
Primary = 1.30 cfs @ 12.09 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP3:



Time span=0.00-60.00 hrs, dt=0.03 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentE1A:** Runoff Area=63,648 sf 36.72% Impervious Runoff Depth=1.50"
Tc=6.0 min CN=63 Runoff=2.38 cfs 0.182 af

**SubcatchmentE1B:** Runoff Area=266,973 sf 6.74% Impervious Runoff Depth=0.20"
Flow Length=354' Tc=29.7 min CN=39 Runoff=0.17 cfs 0.100 af

**SubcatchmentE2:** Runoff Area=42,839 sf 21.35% Impervious Runoff Depth=0.53"
Flow Length=292' Tc=14.3 min CN=47 Runoff=0.24 cfs 0.043 af

**SubcatchmentE3A:** Runoff Area=57,099 sf 0.57% Impervious Runoff Depth=0.68"
Flow Length=555' Tc=25.5 min CN=50 Runoff=0.43 cfs 0.075 af

**SubcatchmentE3B:** Runoff Area=15,086 sf 76.24% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=86 Runoff=1.37 cfs 0.100 af

**SubcatchmentE3C:** Runoff Area=9,018 sf 95.07% Impervious Runoff Depth=4.51"
Tc=6.0 min CN=96 Runoff=0.99 cfs 0.078 af

**Link DP1:** Inflow=2.38 cfs 0.282 af
Primary=2.38 cfs 0.282 af

**Link DP2:** Inflow=0.24 cfs 0.043 af
Primary=0.24 cfs 0.043 af

**Link DP3:** Inflow=2.38 cfs 0.252 af
Primary=2.38 cfs 0.252 af

**Total Runoff Area = 10.438 ac Runoff Volume = 0.578 af Average Runoff Depth = 0.66"**
**84.40% Pervious = 8.810 ac 15.60% Impervious = 1.628 ac**



## Summary for Subcatchment E1A:

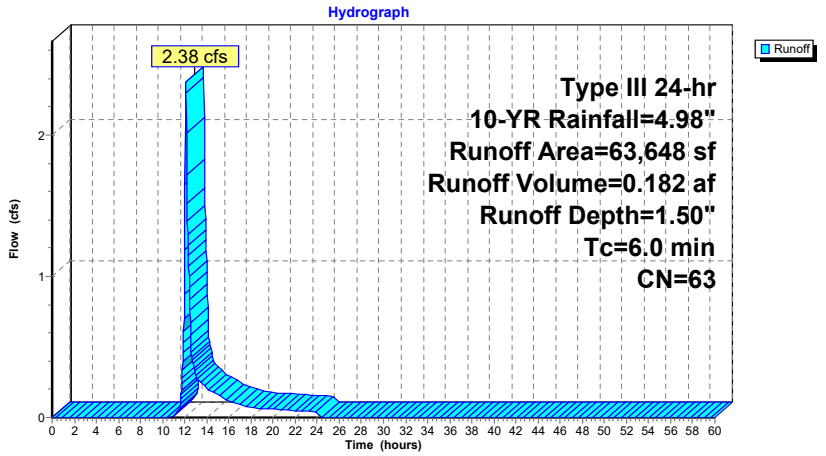
Runoff = 2.38 cfs @ 12.10 hrs, Volume= 0.182 af, Depth= 1.50"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 17,757 | 98 | Paved parking, HSG A |
| 26,041 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,235 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 63,648 | 63 | Weighted Average |
| 40,276 | | 63.28% Pervious Area |
| 23,372 | | 36.72% Impervious Area |

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

## Subcatchment E1A:



## Summary for Subcatchment E1B:

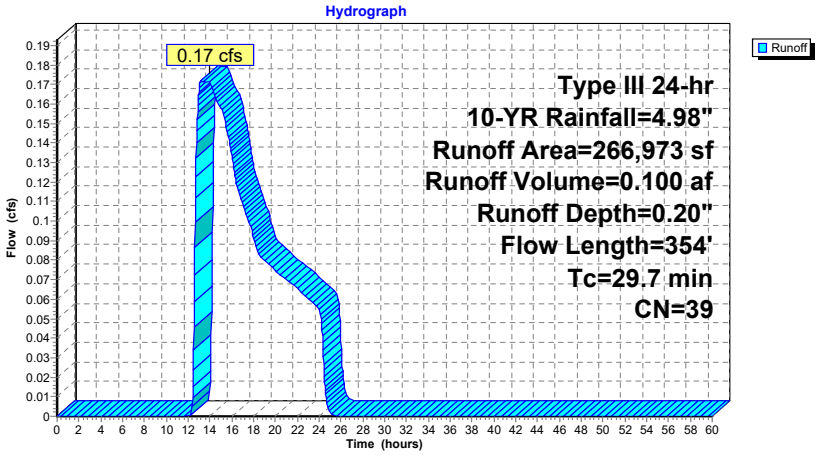
Runoff = 0.17 cfs @ 13.17 hrs, Volume= 0.100 af, Depth= 0.20"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 18,002 | 98 | Paved parking, HSG A |
| 62,428 | 49 | 50-75% Grass cover, Fair, HSG A |
| 186,543 | 30 | Woods, Good, HSG A |
| 266,973 | 39 | Weighted Average |
| 248,971 | | 93.26% Pervious Area |
| 18,002 | | 6.74% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0746 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 3.4 | 165 | 0.0258 | 0.80 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 18.9 | 139 | 0.0006 | 0.12 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 29.7 | 354 | Total | | | |

**Subcatchment E1B:**






## Summary for Subcatchment E2:

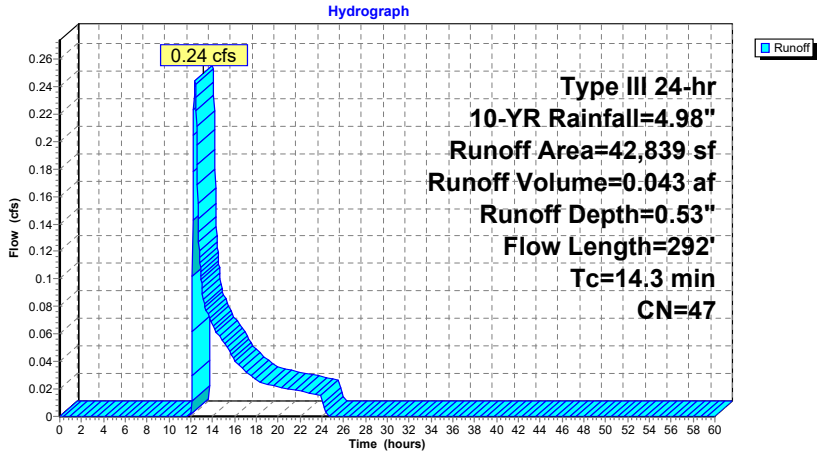
Runoff = 0.24 cfs @ 12.39 hrs, Volume= 0.043 af, Depth= 0.53"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 9,145 | 98 | Paved parking, HSG A |
| 6,651 | 49 | 50-75% Grass cover, Fair, HSG A |
| 27,043 | 30 | Woods, Good, HSG A |
| 42,839 | 47 | Weighted Average |
| 33,694 | | 78.65% Pervious Area |
| 9,145 | | 21.35% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.7 | 50 | 0.0384 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 4.6 | 242 | 0.0307 | 0.88 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 14.3 | 292 | Total | | | |

**Subcatchment E2:**



## Summary for Subcatchment E3A:

Runoff = 0.43 cfs @ 12.49 hrs, Volume= 0.075 af, Depth= 0.68"
Routed to Link DP3 :

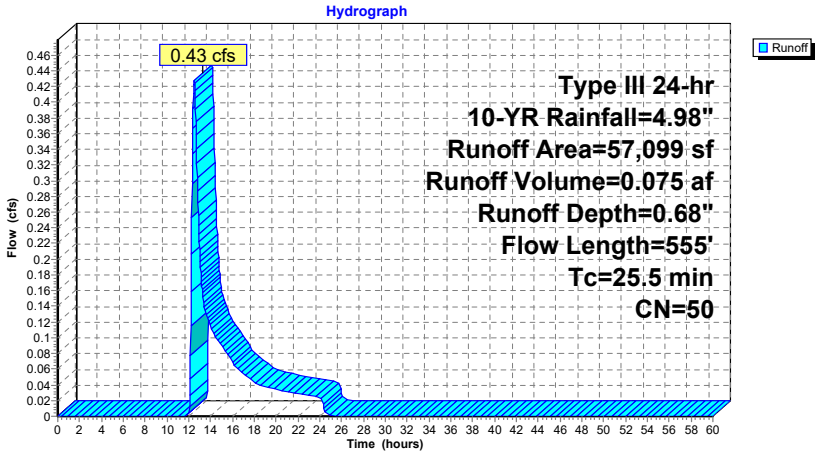
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 324 | 98 | Paved parking, HSG A |
| 28,583 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,153 | 30 | Woods, Good, HSG A |
| 14,039 | 72 | Dirt roads, HSG A |
| 57,099 | 50 | Weighted Average |
| 56,775 | | 99.43% Pervious Area |
| 324 | | 0.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 40 | 0.1617 | 0.15 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.3 | 10 | 0.0009 | 0.07 | | **Sheet Flow,** Fallow n= 0.050 P2= 3.09" |
| 1.9 | 175 | 0.0090 | 1.53 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.4 | 104 | 0.0022 | 0.23 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 25.5 | 555 | Total | | | |



## Subcatchment E3A:



## Summary for Subcatchment E3B:

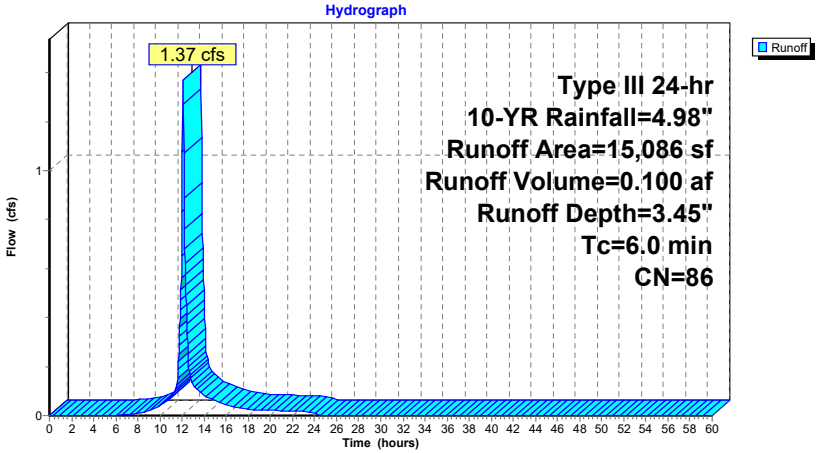
Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.100 af, Depth= 3.45"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 11,501 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 15,086 | 86 | Weighted Average |
| 3,585 | | 23.76% Pervious Area |
| 11,501 | | 76.24% Impervious Area |

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

### Subcatchment E3B:






## Summary for Subcatchment E3C:

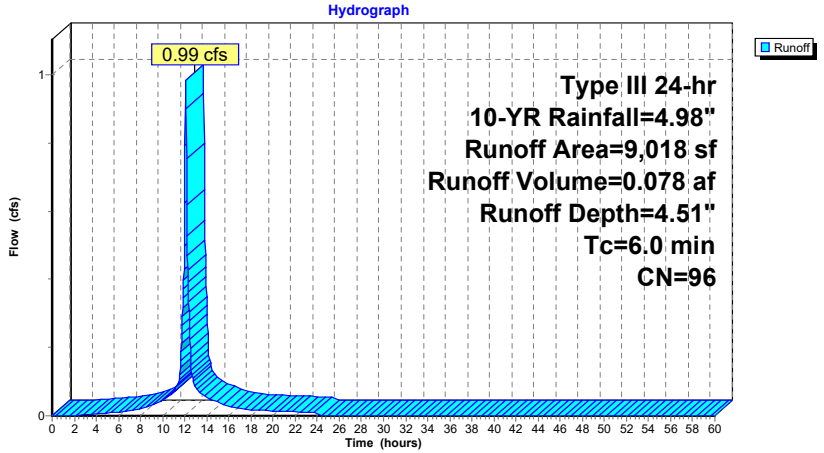
Runoff = 0.99 cfs @ 12.08 hrs, Volume= 0.078 af, Depth= 4.51"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 8,573 | 98 | Paved parking, HSG A |
| 445 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,018 | 96 | Weighted Average |
| 445 | | 4.93% Pervious Area |
| 8,573 | | 95.07% Impervious Area |

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

### Subcatchment E3C:

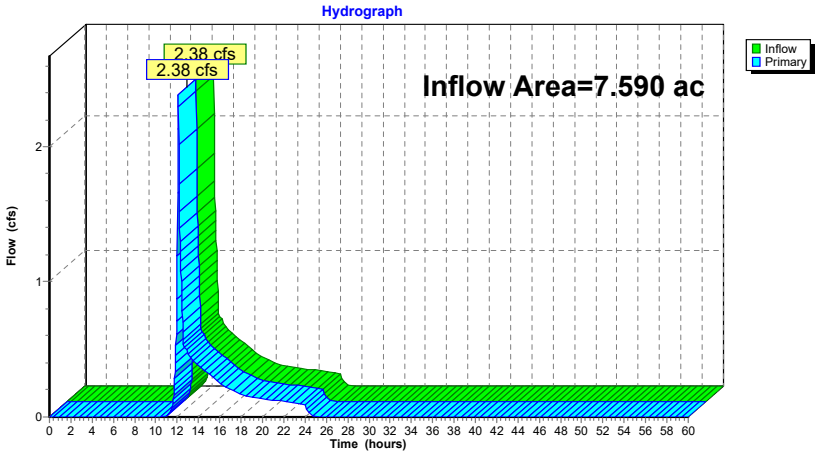


## Summary for Link DP1:

Inflow Area = 7.590 ac, 12.51% Impervious, Inflow Depth = 0.45" for 10-YR event
Inflow = 2.38 cfs @ 12.10 hrs, Volume= 0.282 af
Primary = 2.38 cfs @ 12.10 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP1:



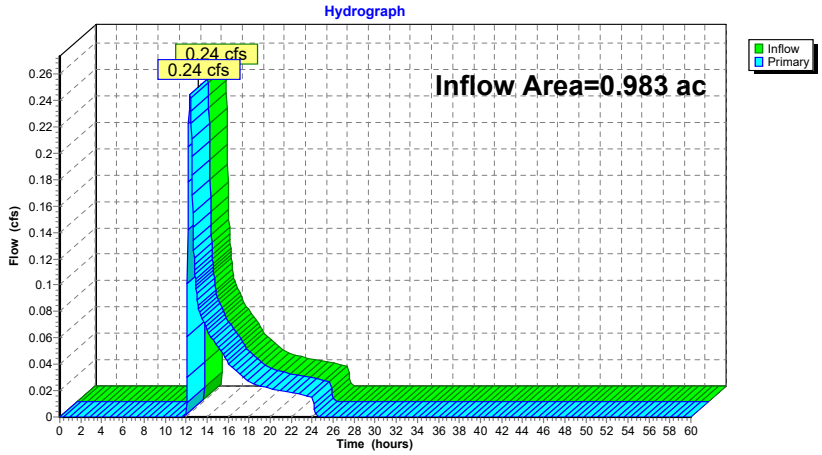



## Summary for Link DP2:

Inflow Area = 0.983 ac, 21.35% Impervious, Inflow Depth = 0.53" for 10-YR event
Inflow = 0.24 cfs @ 12.39 hrs, Volume= 0.043 af
Primary = 0.24 cfs @ 12.39 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP2:

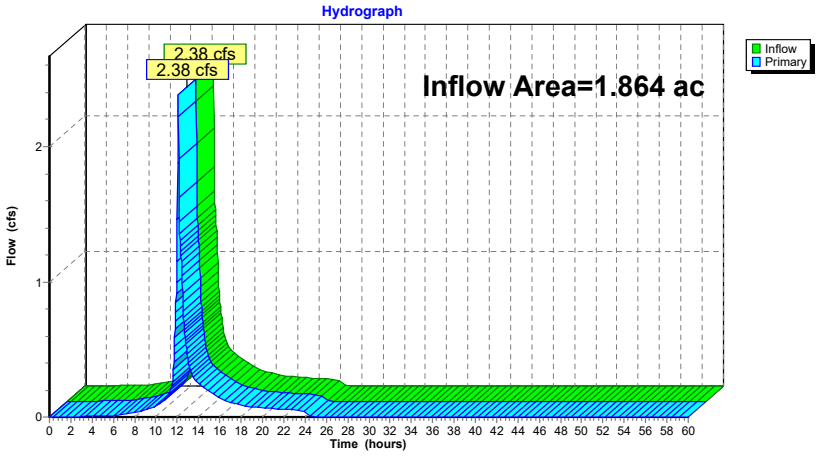


## Summary for Link DP3:

Inflow Area = 1.864 ac, 25.12% Impervious, Inflow Depth = 1.62" for 10-YR event
Inflow = 2.38 cfs @ 12.09 hrs, Volume= 0.252 af
Primary = 2.38 cfs @ 12.09 hrs, Volume= 0.252 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP3:






Time span=0.00-60.00 hrs, dt=0.03 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentE1A:** Runoff Area=63,648 sf 36.72% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=63 Runoff=3.79 cfs 0.279 af

**SubcatchmentE1B:** Runoff Area=266,973 sf 6.74% Impervious Runoff Depth=0.49"
Flow Length=354' Tc=29.7 min CN=39 Runoff=0.93 cfs 0.251 af

**SubcatchmentE2:** Runoff Area=42,839 sf 21.35% Impervious Runoff Depth=1.00"
Flow Length=292' Tc=14.3 min CN=47 Runoff=0.63 cfs 0.082 af

**SubcatchmentE3A:** Runoff Area=57,099 sf 0.57% Impervious Runoff Depth=1.22"
Flow Length=555' Tc=25.5 min CN=50 Runoff=0.92 cfs 0.134 af

**SubcatchmentE3B:** Runoff Area=15,086 sf 76.24% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=86 Runoff=1.80 cfs 0.132 af

**SubcatchmentE3C:** Runoff Area=9,018 sf 95.07% Impervious Runoff Depth=5.69"
Tc=6.0 min CN=96 Runoff=1.23 cfs 0.098 af

**Link DP1:** Inflow=3.79 cfs 0.530 af
Primary=3.79 cfs 0.530 af

**Link DP2:** Inflow=0.63 cfs 0.082 af
Primary=0.63 cfs 0.082 af

**Link DP3:** Inflow=3.20 cfs 0.363 af
Primary=3.20 cfs 0.363 af

**Total Runoff Area = 10.438 ac Runoff Volume = 0.976 af Average Runoff Depth = 1.12"**
**84.40% Pervious = 8.810 ac 15.60% Impervious = 1.628 ac**

## Summary for Subcatchment E1A:

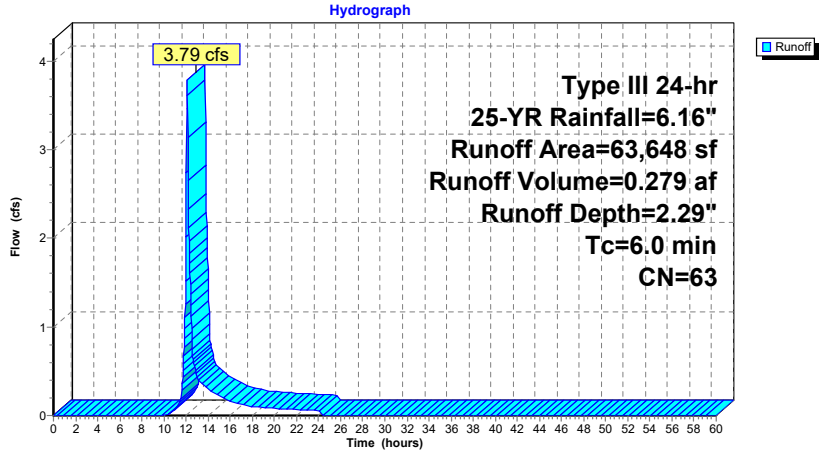
Runoff = 3.79 cfs @ 12.09 hrs, Volume= 0.279 af, Depth= 2.29"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 17,757 | 98 | Paved parking, HSG A |
| 26,041 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,235 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 63,648 | 63 | Weighted Average |
| 40,276 | | 63.28% Pervious Area |
| 23,372 | | 36.72% Impervious Area |

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

### Subcatchment E1A:






## Summary for Subcatchment E1B:

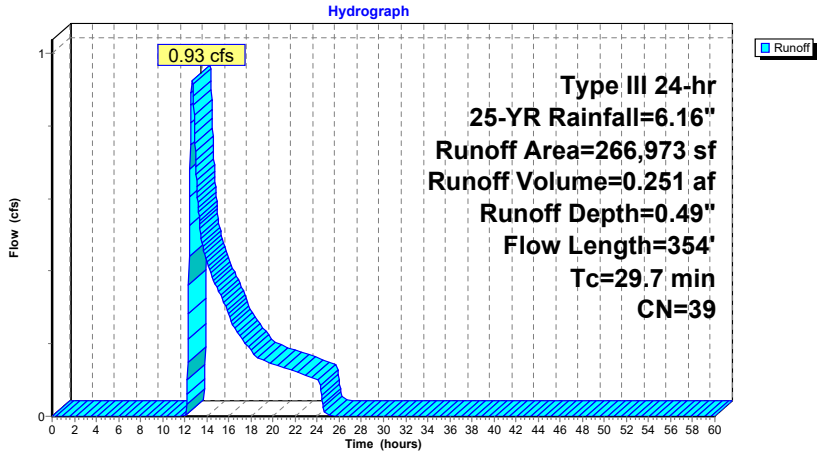
Runoff = 0.93 cfs @ 12.68 hrs, Volume= 0.251 af, Depth= 0.49"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 18,002 | 98 | Paved parking, HSG A |
| 62,428 | 49 | 50-75% Grass cover, Fair, HSG A |
| 186,543 | 30 | Woods, Good, HSG A |
| 266,973 | 39 | Weighted Average |
| 248,971 | | 93.26% Pervious Area |
| 18,002 | | 6.74% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0746 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 3.4 | 165 | 0.0258 | 0.80 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 18.9 | 139 | 0.0006 | 0.12 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 29.7 | 354 | Total | | | |

### Subcatchment E1B:



## Summary for Subcatchment E2:

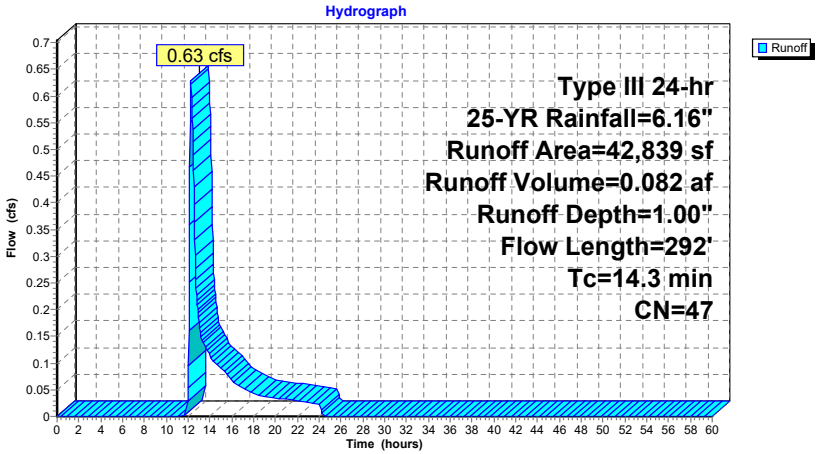
Runoff = 0.63 cfs @ 12.26 hrs, Volume= 0.082 af, Depth= 1.00"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 9,145 | 98 | Paved parking, HSG A |
| 6,651 | 49 | 50-75% Grass cover, Fair, HSG A |
| 27,043 | 30 | Woods, Good, HSG A |
| 42,839 | 47 | Weighted Average |
| 33,694 | | 78.65% Pervious Area |
| 9,145 | | 21.35% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.7 | 50 | 0.0384 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 4.6 | 242 | 0.0307 | 0.88 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 14.3 | 292 | Total | | | |

### Subcatchment E2:






## Summary for Subcatchment E3A:

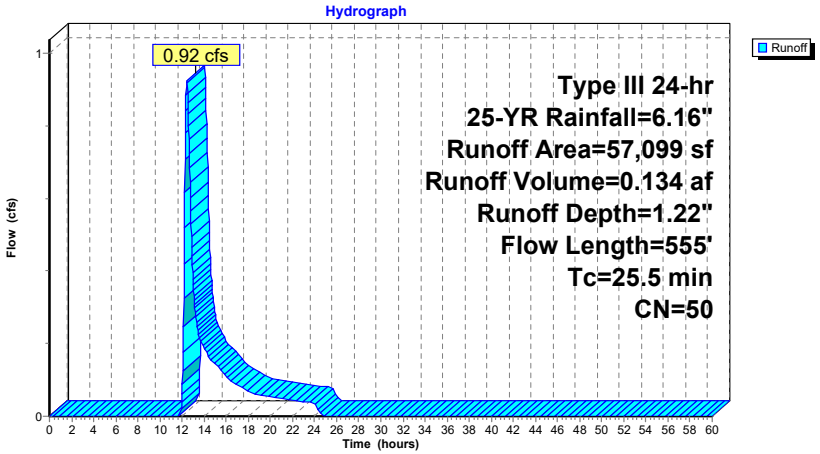
Runoff = 0.92 cfs @ 12.43 hrs, Volume= 0.134 af, Depth= 1.22"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 324 | 98 | Paved parking, HSG A |
| 28,583 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,153 | 30 | Woods, Good, HSG A |
| 14,039 | 72 | Dirt roads, HSG A |
| 57,099 | 50 | Weighted Average |
| 56,775 | | 99.43% Pervious Area |
| 324 | | 0.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 40 | 0.1617 | 0.15 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.3 | 10 | 0.0009 | 0.07 | | **Sheet Flow,** Fallow n= 0.050 P2= 3.09" |
| 1.9 | 175 | 0.0090 | 1.53 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.4 | 104 | 0.0022 | 0.23 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 25.5 | 555 | Total | | | |

### Subcatchment E3A:






### Summary for Subcatchment E3B:

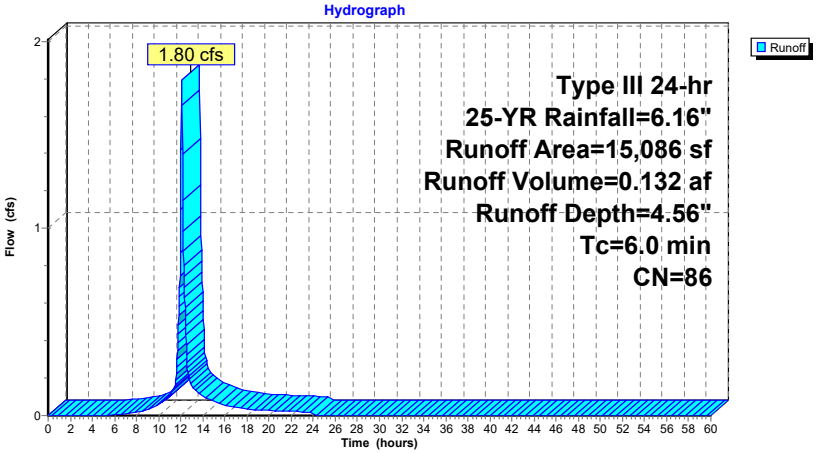
Runoff = 1.80 cfs @ 12.09 hrs, Volume= 0.132 af, Depth= 4.56"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 11,501 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 15,086 | 86 | Weighted Average |
| 3,585 | | 23.76% Pervious Area |
| 11,501 | | 76.24% Impervious Area |

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

### Subcatchment E3B:



## Summary for Subcatchment E3C:

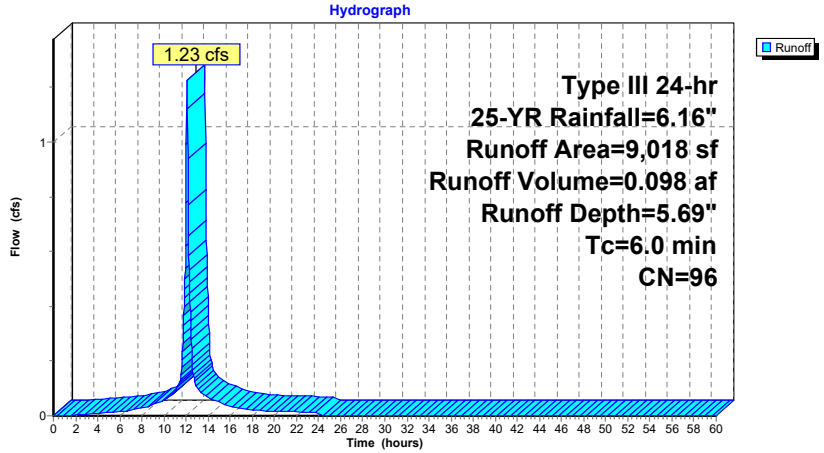
Runoff = 1.23 cfs @ 12.08 hrs, Volume= 0.098 af, Depth= 5.69"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 8,573 | 98 | Paved parking, HSG A |
| 445 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,018 | 96 | Weighted Average |
| 445 | | 4.93% Pervious Area |
| 8,573 | | 95.07% Impervious Area |

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

### Subcatchment E3C:



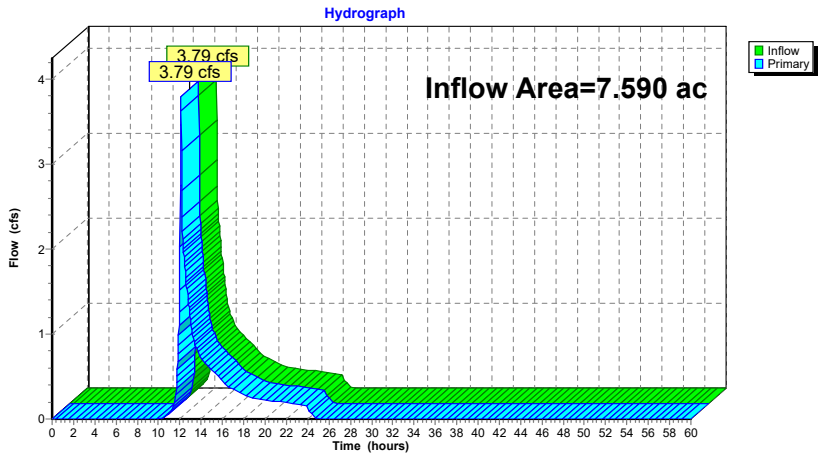



## Summary for Link DP1:

Inflow Area = 7.590 ac, 12.51% Impervious, Inflow Depth = 0.84" for 25-YR event
Inflow = 3.79 cfs @ 12.10 hrs, Volume= 0.530 af
Primary = 3.79 cfs @ 12.10 hrs, Volume= 0.530 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

### Link DP1:

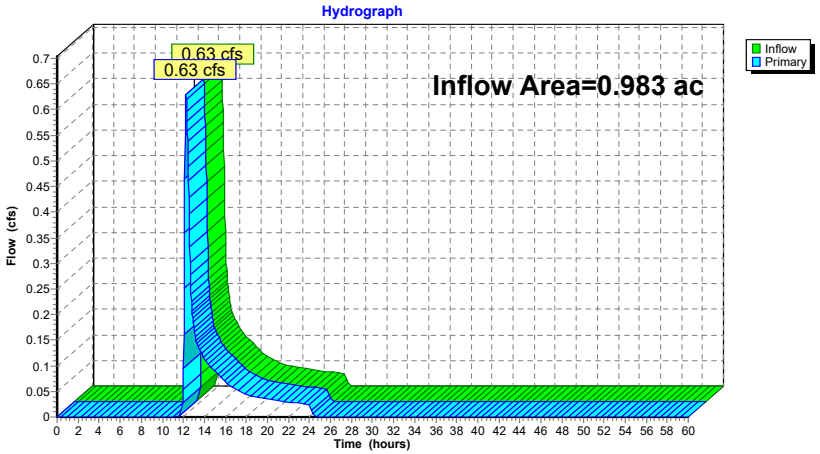


## Summary for Link DP2:

Inflow Area = 0.983 ac, 21.35% Impervious, Inflow Depth = 1.00" for 25-YR event
Inflow = 0.63 cfs @ 12.26 hrs, Volume= 0.082 af
Primary = 0.63 cfs @ 12.26 hrs, Volume= 0.082 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP2:



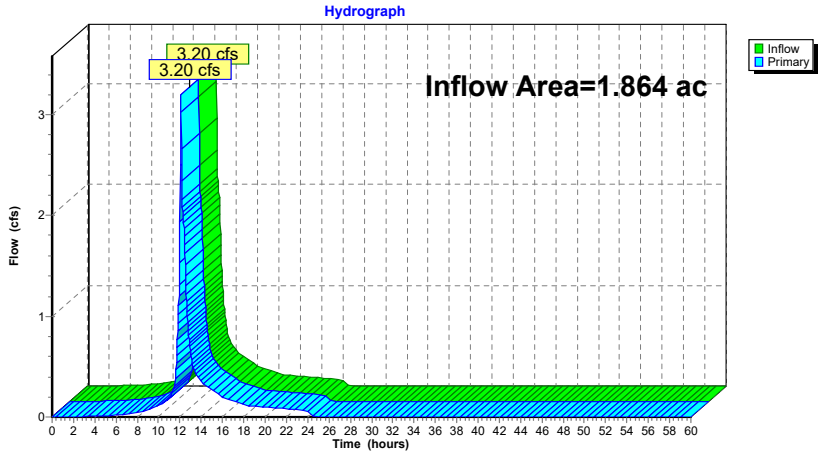



## Summary for Link DP3:

Inflow Area = 1.864 ac, 25.12% Impervious, Inflow Depth = 2.34" for 25-YR event
Inflow = 3.20 cfs @ 12.09 hrs, Volume= 0.363 af
Primary = 3.20 cfs @ 12.09 hrs, Volume= 0.363 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP3:



Time span=0.00-60.00 hrs, dt=0.03 hrs, 2001 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentE1A:** Runoff Area=63,648 sf 36.72% Impervious Runoff Depth=3.65"
Tc=6.0 min CN=63 Runoff=6.19 cfs 0.445 af

**SubcatchmentE1B:** Runoff Area=266,973 sf 6.74% Impervious Runoff Depth=1.15"
Flow Length=354' Tc=29.7 min CN=39 Runoff=3.26 cfs 0.587 af

**SubcatchmentE2:** Runoff Area=42,839 sf 21.35% Impervious Runoff Depth=1.93"
Flow Length=292' Tc=14.3 min CN=47 Runoff=1.48 cfs 0.158 af

**SubcatchmentE3A:** Runoff Area=57,099 sf 0.57% Impervious Runoff Depth=2.24"
Flow Length=555' Tc=25.5 min CN=50 Runoff=1.91 cfs 0.244 af

**SubcatchmentE3B:** Runoff Area=15,086 sf 76.24% Impervious Runoff Depth=6.31"
Tc=6.0 min CN=86 Runoff=2.44 cfs 0.182 af

**SubcatchmentE3C:** Runoff Area=9,018 sf 95.07% Impervious Runoff Depth=7.50"
Tc=6.0 min CN=96 Runoff=1.60 cfs 0.129 af

**Link DP1:** Inflow=6.36 cfs 1.031 af
Primary=6.36 cfs 1.031 af

**Link DP2:** Inflow=1.48 cfs 0.158 af
Primary=1.48 cfs 0.158 af

**Link DP3:** Inflow=4.66 cfs 0.556 af
Primary=4.66 cfs 0.556 af

**Total Runoff Area = 10.438 ac Runoff Volume = 1.745 af Average Runoff Depth = 2.01"**
**84.40% Pervious = 8.810 ac 15.60% Impervious = 1.628 ac**



## Summary for Subcatchment E1A:

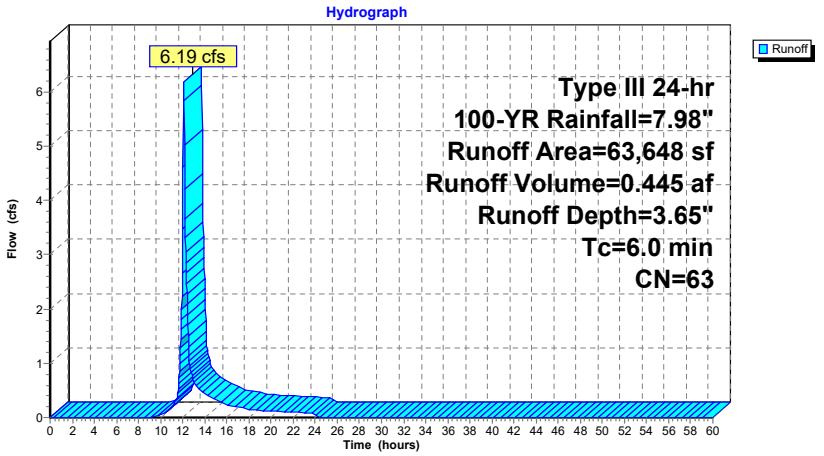
Runoff = 6.19 cfs @ 12.09 hrs, Volume= 0.445 af, Depth= 3.65"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 17,757 | 98 | Paved parking, HSG A |
| 26,041 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,235 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 63,648 | 63 | Weighted Average |
| 40,276 | | 63.28% Pervious Area |
| 23,372 | | 36.72% Impervious Area |

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

## Subcatchment E1A:



## Summary for Subcatchment E1B:

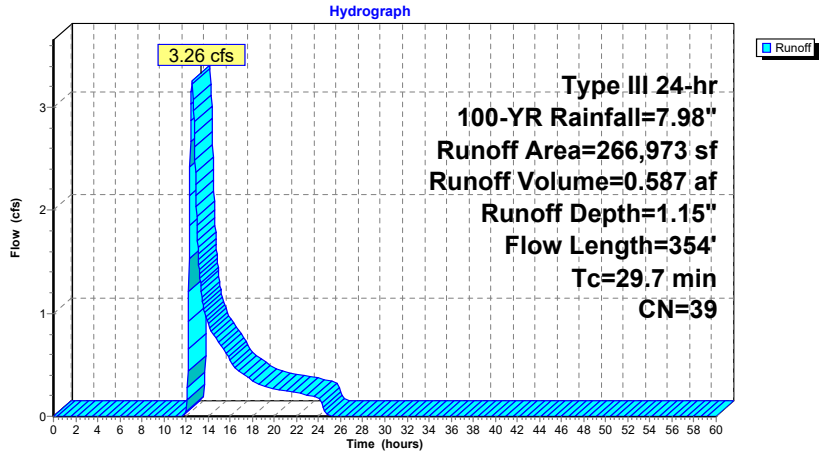
Runoff = 3.26 cfs @ 12.55 hrs, Volume= 0.587 af, Depth= 1.15"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 18,002 | 98 | Paved parking, HSG A |
| 62,428 | 49 | 50-75% Grass cover, Fair, HSG A |
| 186,543 | 30 | Woods, Good, HSG A |
| 266,973 | 39 | Weighted Average |
| 248,971 | | 93.26% Pervious Area |
| 18,002 | | 6.74% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 7.4 | 50 | 0.0746 | 0.11 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 3.4 | 165 | 0.0258 | 0.80 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 18.9 | 139 | 0.0006 | 0.12 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 29.7 | 354 | Total | | | |

### Subcatchment E1B:






## Summary for Subcatchment E2:

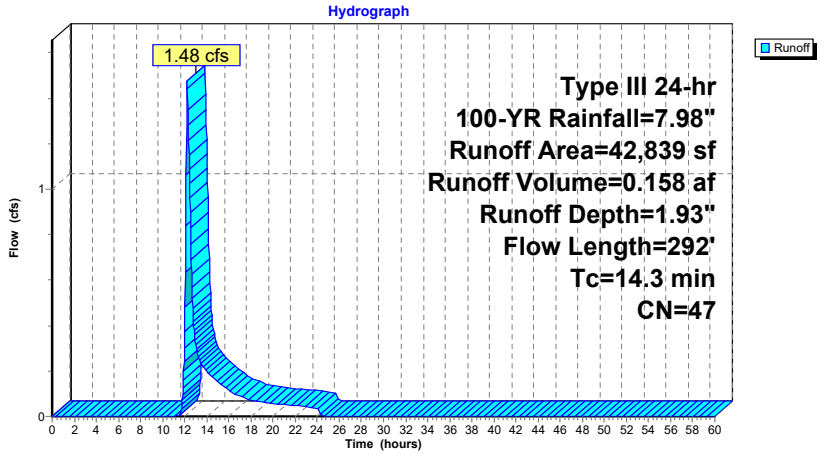
Runoff = 1.48 cfs @ 12.22 hrs, Volume= 0.158 af, Depth= 1.93"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 9,145 | 98 | Paved parking, HSG A |
| 6,651 | 49 | 50-75% Grass cover, Fair, HSG A |
| 27,043 | 30 | Woods, Good, HSG A |
| 42,839 | 47 | Weighted Average |
| 33,694 | | 78.65% Pervious Area |
| 9,145 | | 21.35% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.7 | 50 | 0.0384 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 4.6 | 242 | 0.0307 | 0.88 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 14.3 | 292 | Total | | | |

### Subcatchment E2:



## Summary for Subcatchment E3A:

Runoff = 1.91 cfs @ 12.40 hrs, Volume= 0.244 af, Depth= 2.24"
Routed to Link DP3 :

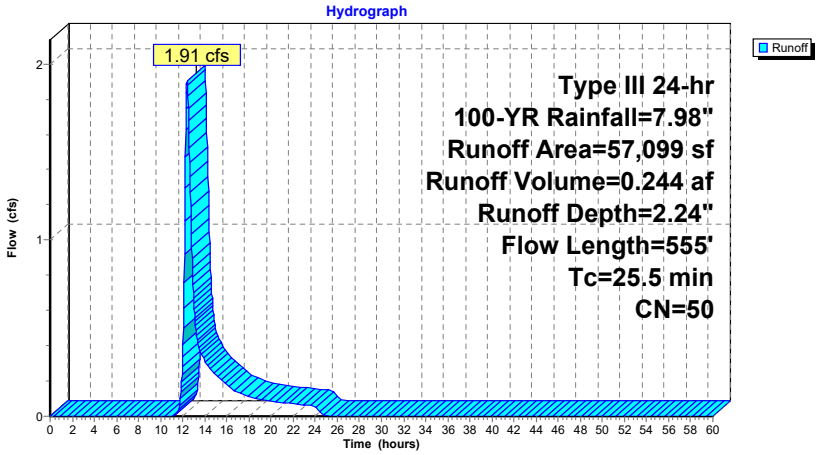
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 324 | 98 | Paved parking, HSG A |
| 28,583 | 49 | 50-75% Grass cover, Fair, HSG A |
| 14,153 | 30 | Woods, Good, HSG A |
| 14,039 | 72 | Dirt roads, HSG A |
| 57,099 | 50 | Weighted Average |
| 56,775 | | 99.43% Pervious Area |
| 324 | | 0.57% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 4.6 | 40 | 0.1617 | 0.15 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.3 | 10 | 0.0009 | 0.07 | | **Sheet Flow,** Fallow n= 0.050 P2= 3.09" |
| 1.9 | 175 | 0.0090 | 1.53 | | **Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps |
| 7.4 | 104 | 0.0022 | 0.23 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 25.5 | 555 | Total | | | |



## Subcatchment E3A:



## Summary for Subcatchment E3B:

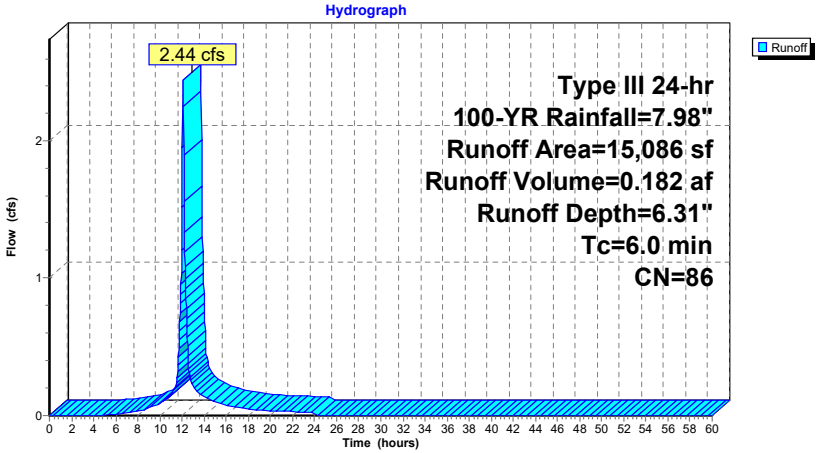
Runoff = 2.44 cfs @ 12.09 hrs, Volume= 0.182 af, Depth= 6.31"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 11,501 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 15,086 | 86 | Weighted Average |
| 3,585 | | 23.76% Pervious Area |
| 11,501 | | 76.24% Impervious Area |

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

### Subcatchment E3B:






## Summary for Subcatchment E3C:

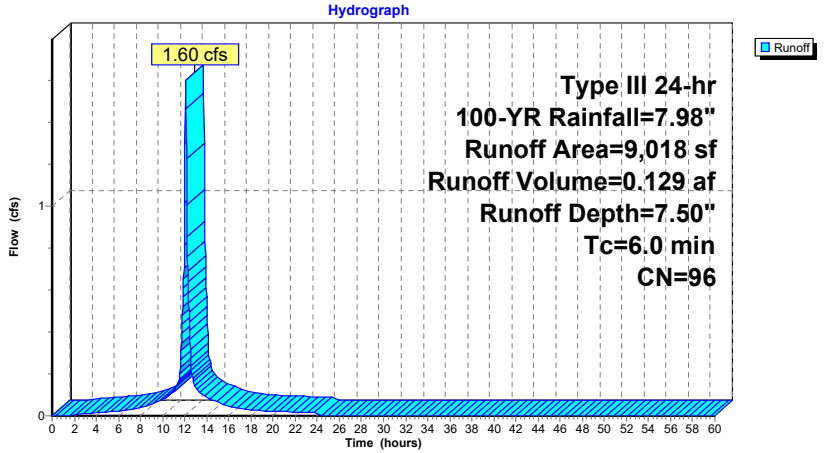
Runoff = 1.60 cfs @ 12.08 hrs, Volume= 0.129 af, Depth= 7.50"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 8,573 | 98 | Paved parking, HSG A |
| 445 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,018 | 96 | Weighted Average |
| 445 | | 4.93% Pervious Area |
| 8,573 | | 95.07% Impervious Area |

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

### Subcatchment E3C:

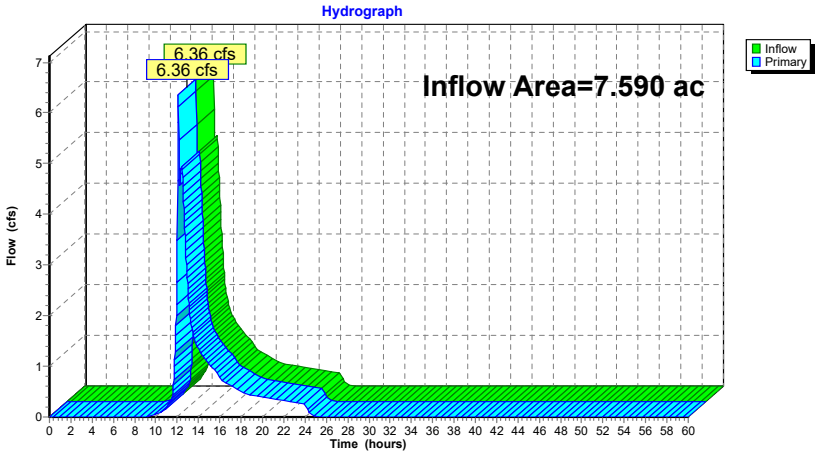


## Summary for Link DP1:

Inflow Area = 7.590 ac, 12.51% Impervious, Inflow Depth = 1.63" for 100-YR event
Inflow = 6.36 cfs @ 12.10 hrs, Volume= 1.031 af
Primary = 6.36 cfs @ 12.10 hrs, Volume= 1.031 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP1:



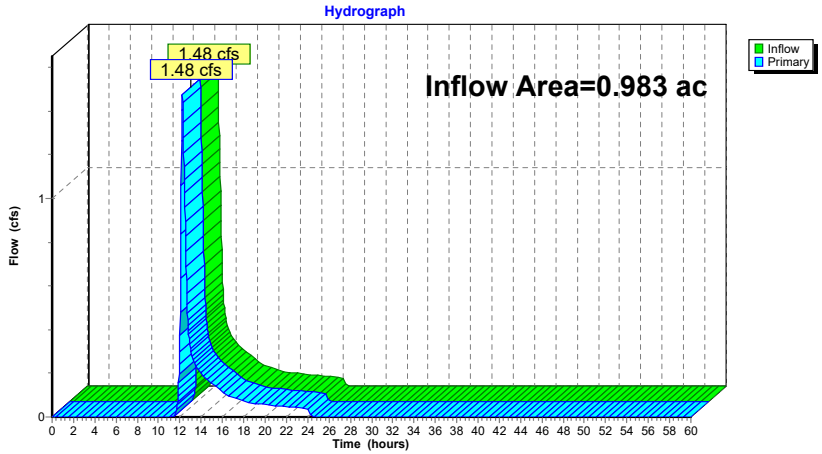



## Summary for Link DP2:

Inflow Area = 0.983 ac, 21.35% Impervious, Inflow Depth = 1.93" for 100-YR event
Inflow = 1.48 cfs @ 12.22 hrs, Volume= 0.158 af
Primary = 1.48 cfs @ 12.22 hrs, Volume= 0.158 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP2:

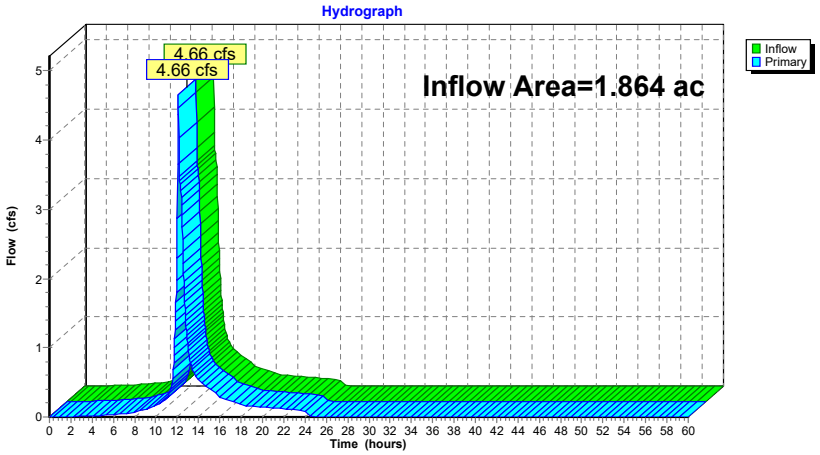


## Summary for Link DP3:

Inflow Area = 1.864 ac, 25.12% Impervious, Inflow Depth = 3.58" for 100-YR event
Inflow = 4.66 cfs @ 12.09 hrs, Volume= 0.556 af
Primary = 4.66 cfs @ 12.09 hrs, Volume= 0.556 af, Atten= 0%, Lag= 0.0 min

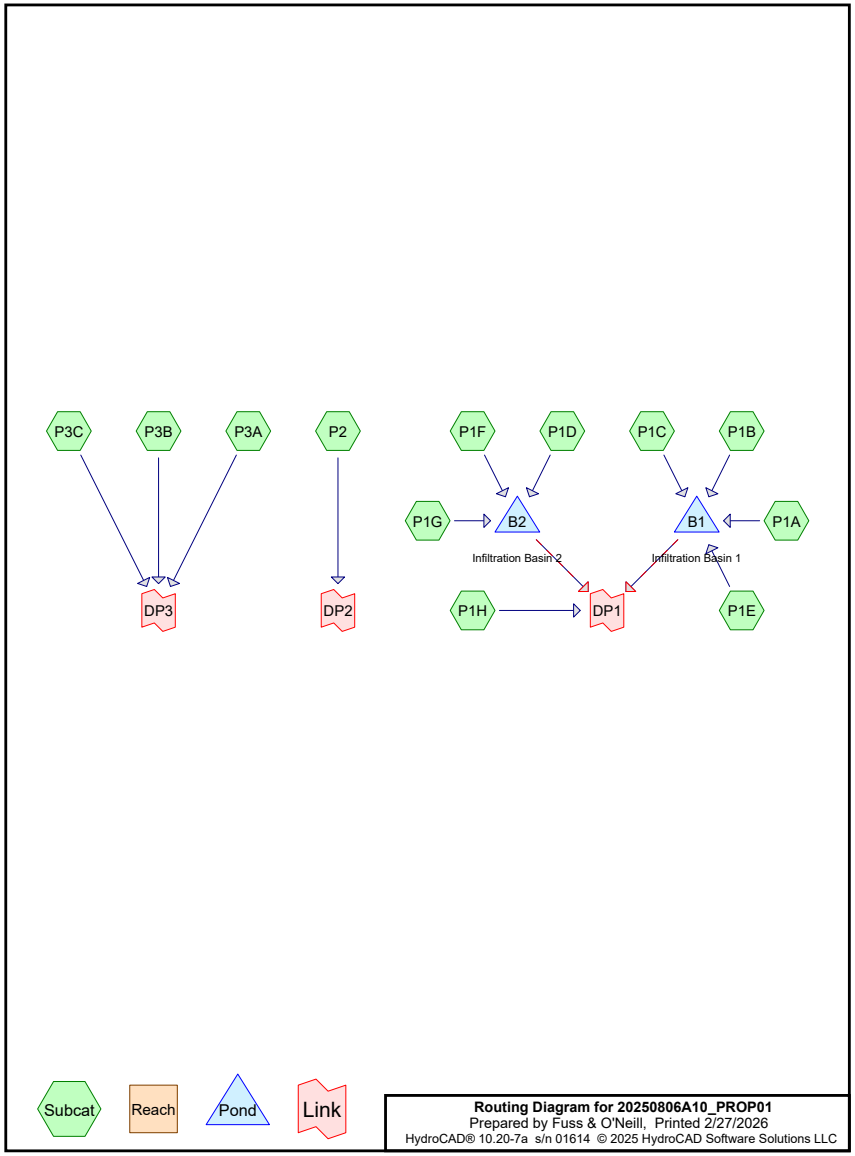
Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.03 hrs

## Link DP3:



# Appendix E

## Post-Development Hydrologic Analysis






## Rainfall Events Listing

| Event# | Event Name | Storm Type | Curve | Mode | Duration (hours) | B/B | Depth (inches) | AMC |
|---|---|---|---|---|---|---|---|---|
| 1 | 2-YR | Type III 24-hr | | Default | 24.00 | 1 | 3.09 | 2 |
| 2 | 10-YR | Type III 24-hr | | Default | 24.00 | 1 | 4.98 | 2 |
| 3 | 25-YR | Type III 24-hr | | Default | 24.00 | 1 | 6.16 | 2 |
| 4 | 100-YR | Type III 24-hr | | Default | 24.00 | 1 | 7.98 | 2 |

## Area Listing (all nodes)

| Area (acres) | CN | Description (subcatchment-numbers) |
|---|---|---|
| 0.781 | 49 | 50-75% Grass cover, Fair, HSG A (P3A, P3B, P3C) |
| 2.342 | 39 | >75% Grass cover, Good, HSG A (P1A, P1B, P1C, P1G, P1H, P2) |
| 0.022 | 76 | Gravel roads, HSG A (P1B) |
| 2.217 | 98 | Paved parking, HSG A (P1A, P1B, P1C, P2, P3A, P3B, P3C) |
| 0.861 | 98 | Paved roads w/curbs & sewers, HSG A (P1G) |
| 1.136 | 98 | Roofs, HSG A (P1A, P1D, P1E, P1F, P1G) |
| 0.417 | 98 | Water Surface, 0% imp, HSG A (P1C, P1G) |
| 2.662 | 30 | Woods, Good, HSG A (P1A, P1B, P1C, P1G, P1H, P2, P3A, P3C) |
| **10.438** | **64** | **TOTAL AREA** |



## Soil Listing (all nodes)

| Area (acres) | Soil Group | Subcatchment Numbers |
|---|---|---|
| 10.438 | HSG A | P1A, P1B, P1C, P1D, P1E, P1F, P1G, P1H, P2, P3A, P3B, P3C |
| 0.000 | HSG B | |
| 0.000 | HSG C | |
| 0.000 | HSG D | |
| 0.000 | Other | |
| **10.438** | | **TOTAL AREA** |

## Ground Covers (all nodes)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.781 | 0.000 | 0.000 | 0.000 | 0.000 | 0.781 | 50-75% Grass cover, Fair | P3 A, P3 B, P3 C |
| 2.342 | 0.000 | 0.000 | 0.000 | 0.000 | 2.342 | >75% Grass cover, Good | P1 A, P1 B, P1 C, P1 G, P1 H, P2 |
| 0.022 | 0.000 | 0.000 | 0.000 | 0.000 | 0.022 | Gravel roads | P1 B |
| 2.217 | 0.000 | 0.000 | 0.000 | 0.000 | 2.217 | Paved parking | P1 A, P1 B, P1 C, P2, P3 A, P3 B, P3 C |
| 0.861 | 0.000 | 0.000 | 0.000 | 0.000 | 0.861 | Paved roads w/curbs & sewers | P1 G |
| 1.136 | 0.000 | 0.000 | 0.000 | 0.000 | 1.136 | Roofs | P1 A, P1 D, P1 E, P1 F, P1 G |



## Ground Covers (all nodes) (continued)

| HSG-A (acres) | HSG-B (acres) | HSG-C (acres) | HSG-D (acres) | Other (acres) | Total (acres) | Ground Cover | Subcatchment Numbers |
|---|---|---|---|---|---|---|---|
| 0.417 | 0.000 | 0.000 | 0.000 | 0.000 | 0.417 | Water Surface, 0% imp | P1 C, P1 G |
| 2.662 | 0.000 | 0.000 | 0.000 | 0.000 | 2.662 | Woods, Good | P1 A, P1 B, P1 C, P1 G, P1 H, P2, P3 A, P3 C |
| **10.438** | **0.000** | **0.000** | **0.000** | **0.000** | **10.438** | **TOTAL AREA** | |

## Pipe Listing (all nodes)

| Line# | Node Number | In-Invert (feet) | Out-Invert (feet) | Length (feet) | Slope (ft/ft) | n | Width (inches) | Diam/Height (inches) | Inside-Fill (inches) | Node Name |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | B1 | 238.75 | 238.25 | 78.0 | 0.0064 | 0.013 | 0.0 | 12.0 | 0.0 | |
| 2 | B2 | 239.00 | 238.35 | 127.0 | 0.0051 | 0.013 | 0.0 | 12.0 | 0.0 | |



Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentP1A:** Runoff Area=58,806 sf 33.43% Impervious Runoff Depth=0.27"
Tc=6.0 min CN=57 Runoff=0.17 cfs 0.031 af

**SubcatchmentP1B:** Runoff Area=65,967 sf 58.25% Impervious Runoff Depth=0.97"
Tc=6.0 min CN=74 Runoff=1.59 cfs 0.122 af

**SubcatchmentP1C:** Runoff Area=48,750 sf 30.71% Impervious Runoff Depth=0.55"
Tc=6.0 min CN=65 Runoff=0.54 cfs 0.051 af

**SubcatchmentP1D:** Runoff Area=13,953 sf 100.00% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=98 Runoff=0.94 cfs 0.076 af

**SubcatchmentP1E:** Runoff Area=9,956 sf 100.00% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=98 Runoff=0.67 cfs 0.054 af

**SubcatchmentP1F:** Runoff Area=11,934 sf 100.00% Impervious Runoff Depth=2.86"
Tc=6.0 min CN=98 Runoff=0.80 cfs 0.065 af

**SubcatchmentP1G:** Runoff Area=70,407 sf 64.66% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=85 Runoff=3.09 cfs 0.224 af

**SubcatchmentP1H:** Runoff Area=67,999 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=152' Tc=17.0 min CN=32 Runoff=0.00 cfs 0.000 af

**SubcatchmentP2:** Runoff Area=42,847 sf 20.69% Impervious Runoff Depth=0.04"
Tc=14.3 min CN=46 Runoff=0.01 cfs 0.004 af

**SubcatchmentP3A:** Runoff Area=40,162 sf 0.75% Impervious Runoff Depth=0.03"
Flow Length=416' Tc=21.8 min CN=45 Runoff=0.00 cfs 0.002 af

**SubcatchmentP3B:** Runoff Area=8,932 sf 96.13% Impervious Runoff Depth=2.64"
Tc=6.0 min CN=96 Runoff=0.58 cfs 0.045 af

**SubcatchmentP3C:** Runoff Area=14,946 sf 76.01% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=86 Runoff=0.69 cfs 0.050 af

**Pond B1: Infiltration Basin 1** Peak Elev=238.05' Storage=2,076 cf Inflow=2.87 cfs 0.258 af
Discarded=0.77 cfs 0.258 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.77 cfs 0.258 af

**Pond B2: Infiltration Basin 2** Peak Elev=239.04' Storage=4,370 cf Inflow=4.83 cfs 0.366 af
Discarded=0.91 cfs 0.366 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.91 cfs 0.366 af

**Link DP1:** Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

**Link DP2:** Inflow=0.01 cfs 0.004 af
Primary=0.01 cfs 0.004 af

**Link DP3:** Inflow=1.26 cfs 0.097 af
Primary=1.26 cfs 0.097 af

**Total Runoff Area = 10.438 ac Runoff Volume = 0.725 af Average Runoff Depth = 0.83"**
**59.63% Pervious = 6.224 ac 40.37% Impervious = 4.213 ac**



## Summary for Subcatchment P1A:

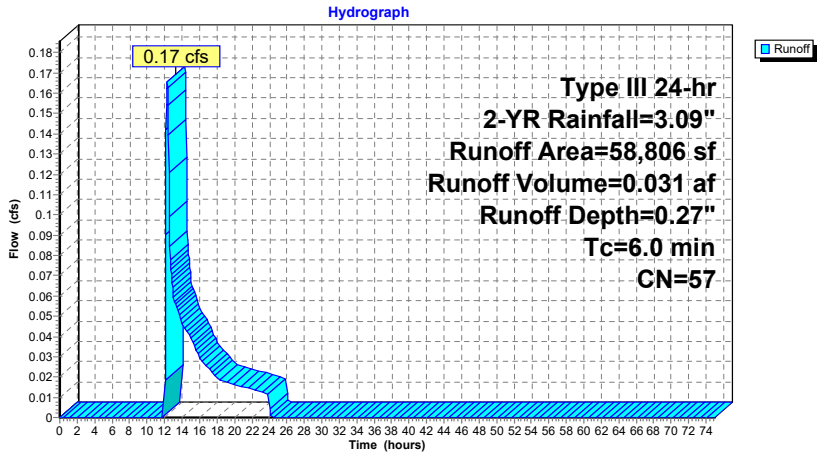
Runoff = 0.17 cfs @ 12.30 hrs, Volume= 0.031 af, Depth= 0.27"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 14,041 | 98 | Paved parking, HSG A |
| 25,305 | 39 | >75% Grass cover, Good, HSG A |
| 13,845 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 58,806 | 57 | Weighted Average |
| 39,150 | | 66.57% Pervious Area |
| 19,656 | | 33.43% Impervious Area |

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

## Subcatchment P1A:



## Summary for Subcatchment P1B:

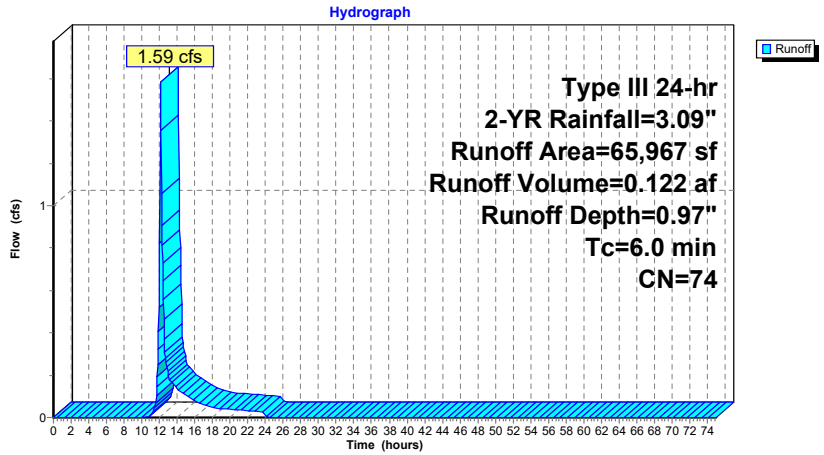
Runoff = 1.59 cfs @ 12.10 hrs, Volume= 0.122 af, Depth= 0.97"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 38,427 | 98 | Paved parking, HSG A |
| 941 | 76 | Gravel roads, HSG A |
| 26,404 | 39 | >75% Grass cover, Good, HSG A |
| 195 | 30 | Woods, Good, HSG A |
| 65,967 | 74 | Weighted Average |
| 27,540 | | 41.75% Pervious Area |
| 38,427 | | 58.25% Impervious Area |

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

## Subcatchment P1B:






## Summary for Subcatchment P1C:

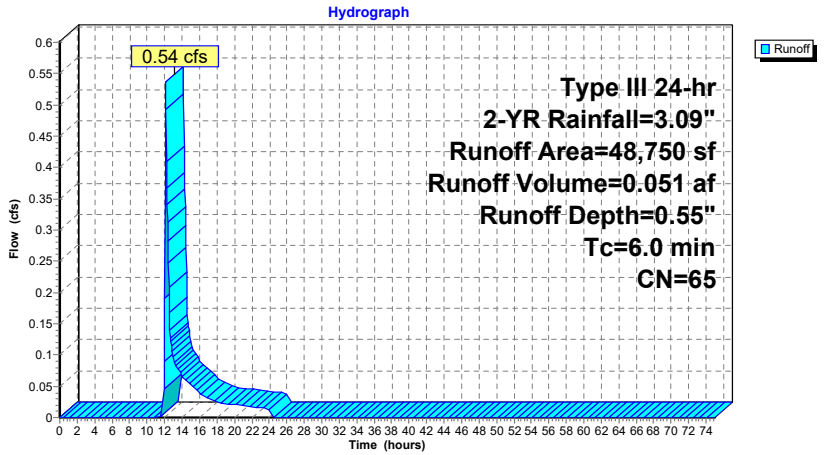
Runoff = 0.54 cfs @ 12.11 hrs, Volume= 0.051 af, Depth= 0.55"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 14,969 | 98 | Paved parking, HSG A |
| 12,574 | 39 | >75% Grass cover, Good, HSG A |
| 12,548 | 30 | Woods, Good, HSG A |
| 8,659 | 98 | Water Surface, 0% imp, HSG A |
| 48,750 | 65 | Weighted Average |
| 33,781 | | 69.29% Pervious Area |
| 14,969 | | 30.71% Impervious Area |

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

## Subcatchment P1C:



## Summary for Subcatchment P1D:

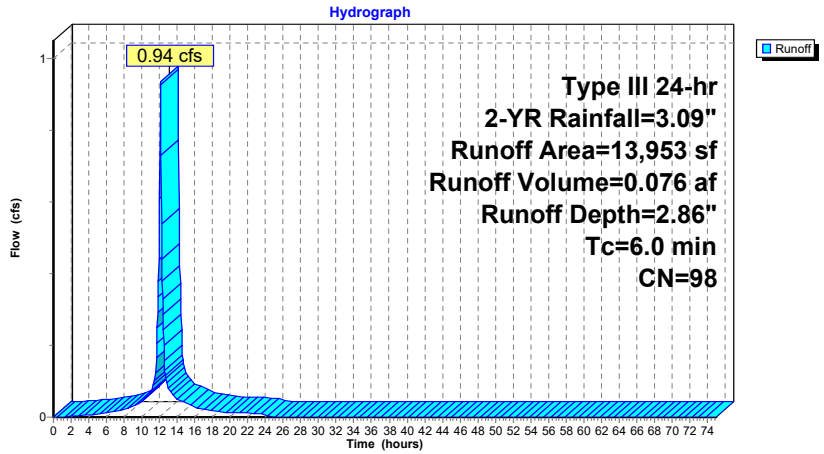
Runoff = 0.94 cfs @ 12.09 hrs, Volume= 0.076 af, Depth= 2.86"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 13,953 | 98 | Roofs, HSG A |
| 13,953 | | 100.00% Impervious Area |

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

### Subcatchment P1D:






## Summary for Subcatchment P1E:

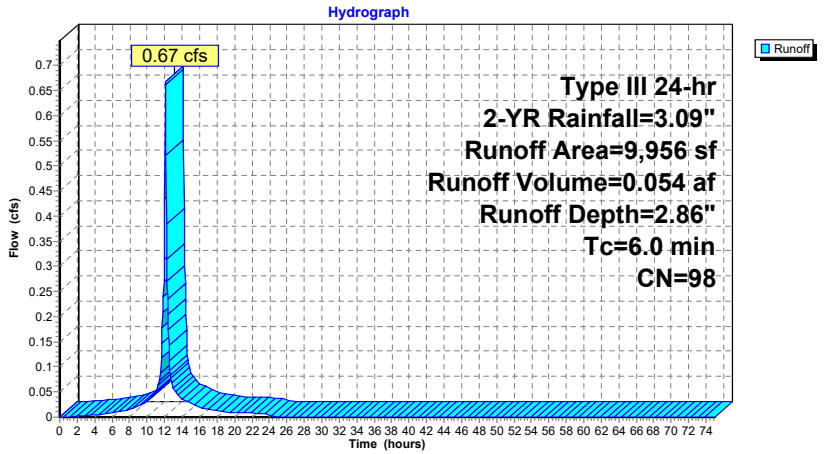
Runoff = 0.67 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 2.86"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 9,956 | 98 | Roofs, HSG A |
| 9,956 | | 100.00% Impervious Area |

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

### Subcatchment P1E:



## Summary for Subcatchment P1F:

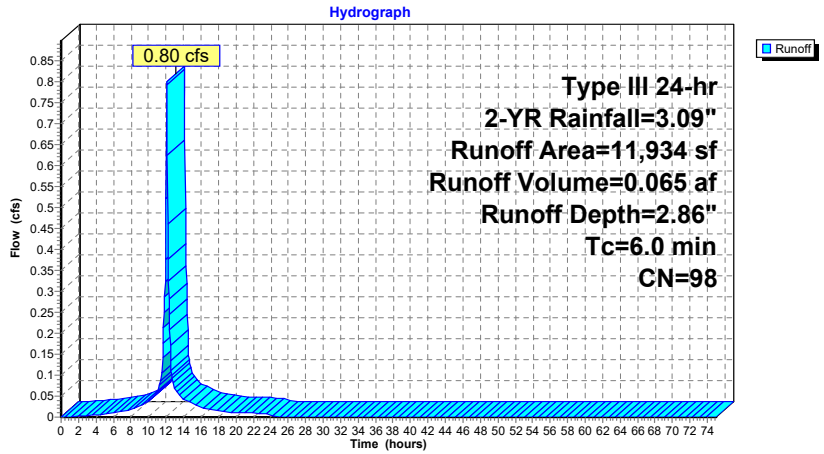
Runoff = 0.80 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.86"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 11,934 | 98 | Roofs, HSG A |
| 11,934 | | 100.00% Impervious Area |

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

### Subcatchment P1F:






## Summary for Subcatchment P1G:

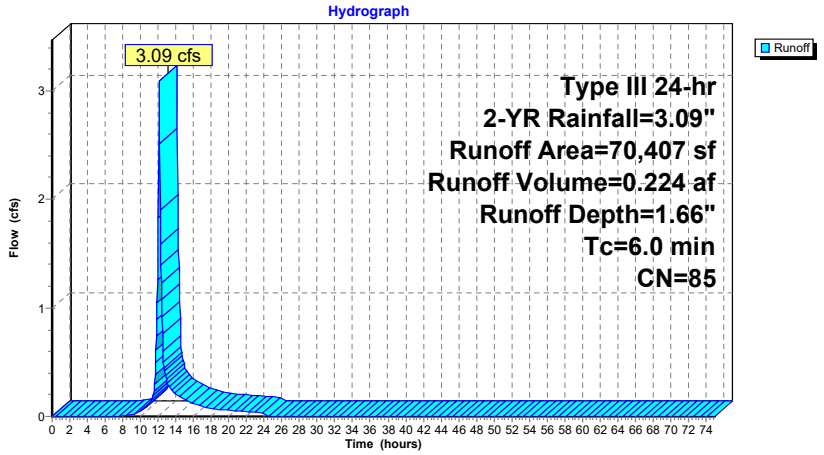
Runoff = 3.09 cfs @ 12.09 hrs, Volume= 0.224 af, Depth= 1.66"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 37,488 | 98 | Paved roads w/curbs & sewers, HSG A |
| 14,758 | 39 | >75% Grass cover, Good, HSG A |
| 611 | 30 | Woods, Good, HSG A |
| 8,038 | 98 | Roofs, HSG A |
| 9,512 | 98 | Water Surface, 0% imp, HSG A |
| 70,407 | 85 | Weighted Average |
| 24,881 | | 35.34% Pervious Area |
| 45,526 | | 64.66% Impervious Area |

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

### Subcatchment P1G:



## Summary for Subcatchment P1H:

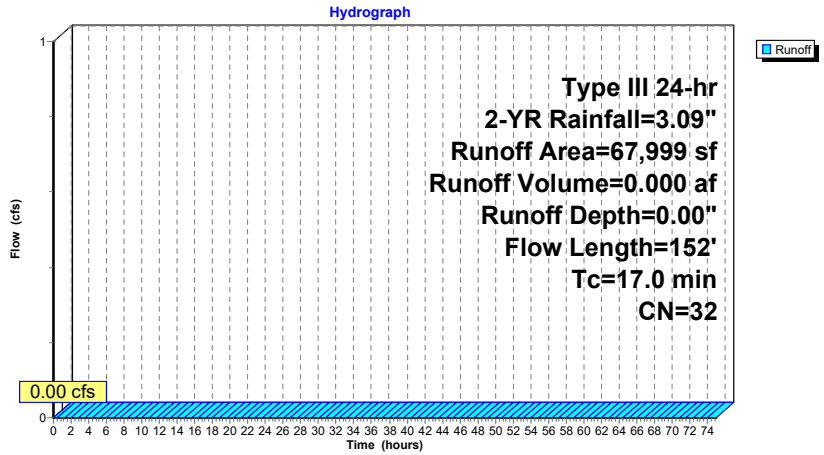
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 15,717 | 39 | >75% Grass cover, Good, HSG A |
| 52,282 | 30 | Woods, Good, HSG A |
| 67,999 | 32 | Weighted Average |
| 67,999 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.6 | 50 | 0.0136 | 0.06 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.4 | 102 | 0.0199 | 0.71 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 152 | Total | | | |

### Subcatchment P1H:






## Summary for Subcatchment P2:

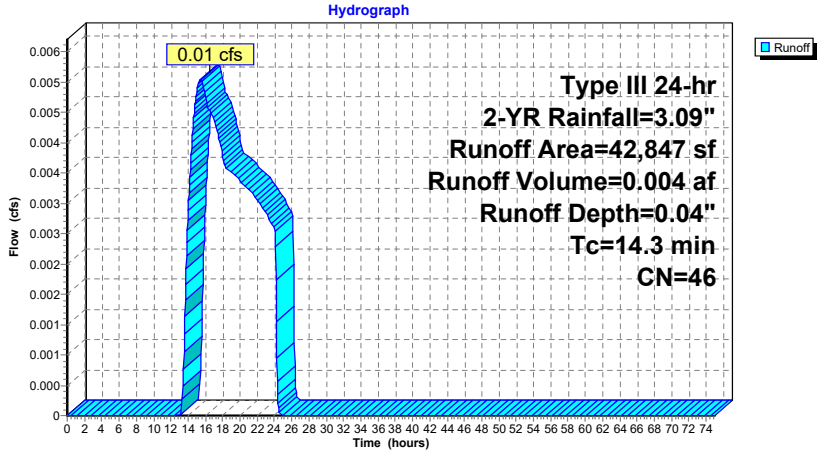
Runoff = 0.01 cfs @ 15.45 hrs, Volume= 0.004 af, Depth= 0.04"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 8,865 | 98 | Paved parking, HSG A |
| 7,279 | 39 | >75% Grass cover, Good, HSG A |
| 26,703 | 30 | Woods, Good, HSG A |
| 42,847 | 46 | Weighted Average |
| 33,982 | | 79.31% Pervious Area |
| 8,865 | | 20.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.3 | | | | | **Direct Entry, Same as Pre-dev** |

### Subcatchment P2:



## Summary for Subcatchment P3A:

Runoff = 0.00 cfs @ 15.89 hrs, Volume= 0.002 af, Depth= 0.03"
Routed to Link DP3 :

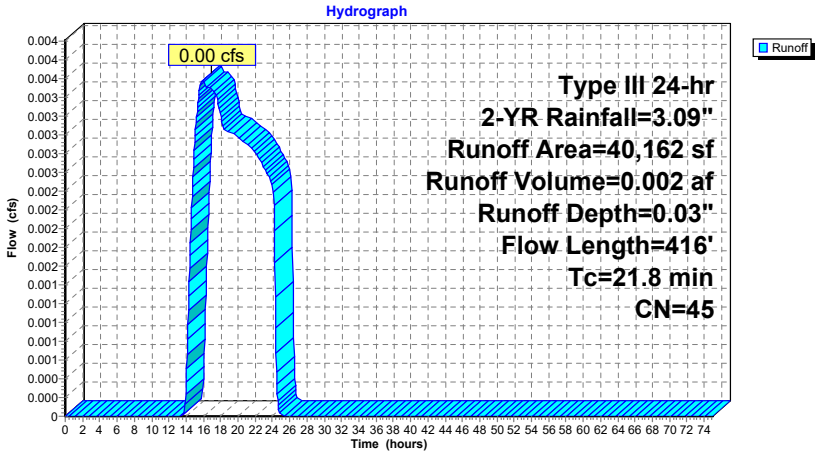
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 303 | 98 | Paved parking, HSG A |
| 30,163 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,696 | 30 | Woods, Good, HSG A |
| 40,162 | 45 | Weighted Average |
| 39,859 | | 99.25% Pervious Area |
| 303 | | 0.75% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.2 | 50 | 0.0430 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 0.6 | 26 | 0.0235 | 0.77 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 0.5 | 33 | 0.0588 | 1.21 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.2 | 81 | 0.0149 | 0.61 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 21.8 | 416 | Total | | | |



## Subcatchment P3A:



## Summary for Subcatchment P3B:

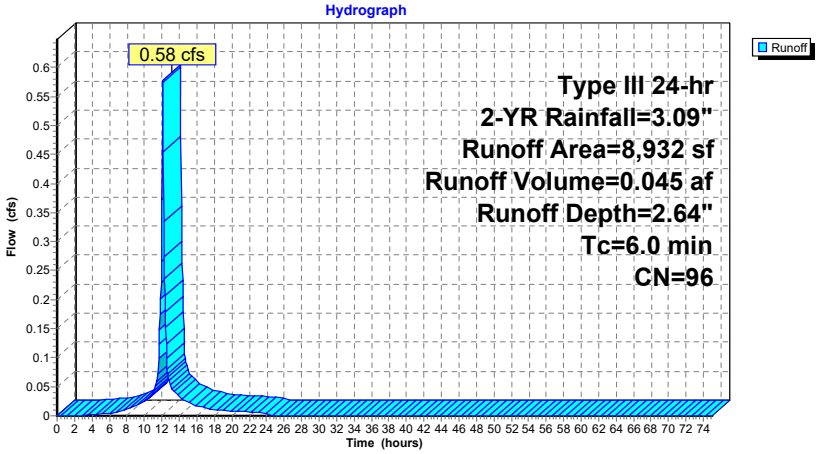
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 2.64"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 8,586 | 98 | Paved parking, HSG A |
| 346 | 49 | 50-75% Grass cover, Fair, HSG A |
| 8,932 | 96 | Weighted Average |
| 346 | | 3.87% Pervious Area |
| 8,586 | | 96.13% Impervious Area |

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

### Subcatchment P3B:






## Summary for Subcatchment P3C:

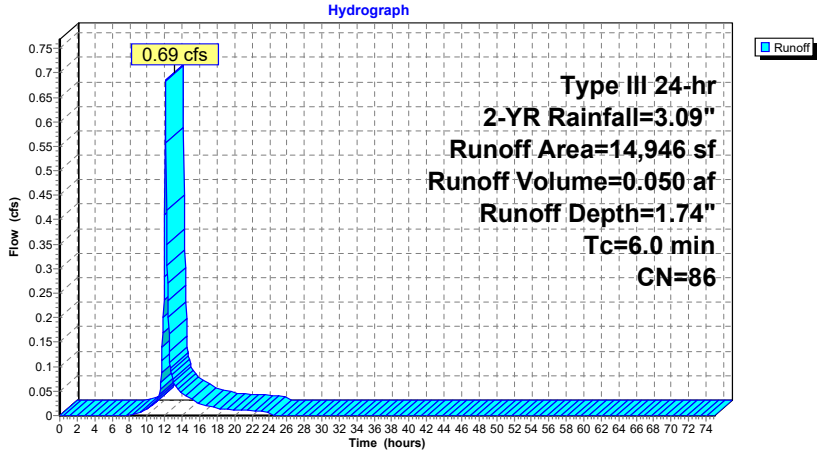
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 1.74"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YR Rainfall=3.09"

| Area (sf) | CN | Description |
|---|---|---|
| 11,361 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 14,946 | 86 | Weighted Average |
| 3,585 | | 23.99% Pervious Area |
| 11,361 | | 76.01% Impervious Area |

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

### Subcatchment P3C:



## Summary for Pond B1: Infiltration Basin 1

Inflow Area = 4.212 ac, 45.24% Impervious, Inflow Depth = 0.74" for 2-YR event
Inflow = 2.87 cfs @ 12.10 hrs, Volume= 0.258 af
Outflow = 0.77 cfs @ 12.55 hrs, Volume= 0.258 af, Atten= 73%, Lag= 26.6 min
Discarded = 0.77 cfs @ 12.55 hrs, Volume= 0.258 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 238.05' @ 12.55 hrs Surf.Area= 4,033 sf Storage= 2,076 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 14.8 min ( 873.1 - 858.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 237.50' | 26,990 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 237.50 | 3,493 | 0 | 0 |
| 238.00 | 3,978 | 1,868 | 1,868 |
| 239.00 | 5,033 | 4,506 | 6,373 |
| 240.00 | 6,202 | 5,618 | 11,991 |
| 241.00 | 7,569 | 6,886 | 18,876 |
| 242.00 | 8,659 | 8,114 | 26,990 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 238.75' | **12.0" Round Culvert**<br>L= 78.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 238.75' / 238.25' S= 0.0064 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 241.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 237.50' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 240.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

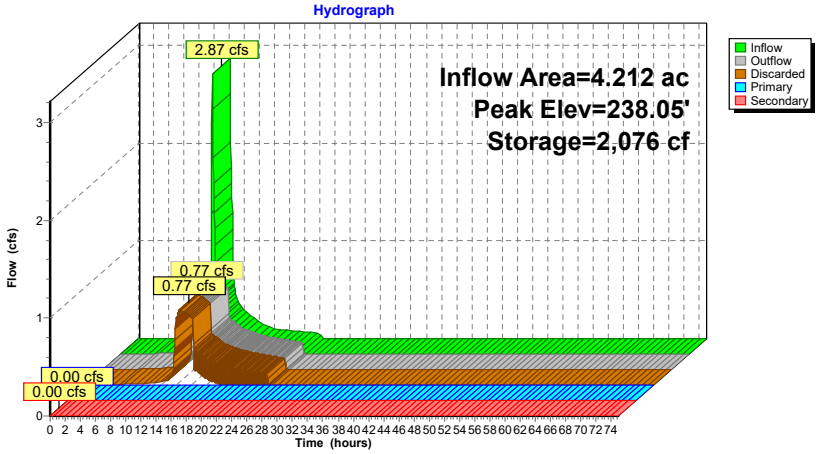


**Discarded OutFlow** Max=0.77 cfs @ 12.55 hrs HW=238.05' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.77 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=237.50' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** ( Controls 0.00 cfs)
└**4=Grate** ( Controls 0.00 cfs)
└**5=Orifice** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=237.50' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B1: Infiltration Basin 1



## Summary for Pond B2: Infiltration Basin 2

Inflow Area = 2.211 ac, 74.16% Impervious, Inflow Depth = 1.99" for 2-YR event
Inflow = 4.83 cfs @ 12.09 hrs, Volume= 0.366 af
Outflow = 0.91 cfs @ 12.55 hrs, Volume= 0.366 af, Atten= 81%, Lag= 27.6 min
Discarded = 0.91 cfs @ 12.55 hrs, Volume= 0.366 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 239.04' @ 12.55 hrs Surf.Area= 4,735 sf Storage= 4,370 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 31.2 min ( 831.6 - 800.4 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 238.00' | 32,644 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 238.00 | 3,639 | 0 | 0 |
| 239.00 | 4,684 | 4,162 | 4,162 |
| 240.00 | 5,843 | 5,264 | 9,425 |
| 241.00 | 7,114 | 6,479 | 15,904 |
| 242.00 | 8,427 | 7,771 | 23,674 |
| 243.00 | 9,513 | 8,970 | 32,644 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 239.00' | **12.0" Round Culvert**<br>L= 127.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 239.00' / 238.35' S= 0.0051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 242.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 238.00' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 241.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **4.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

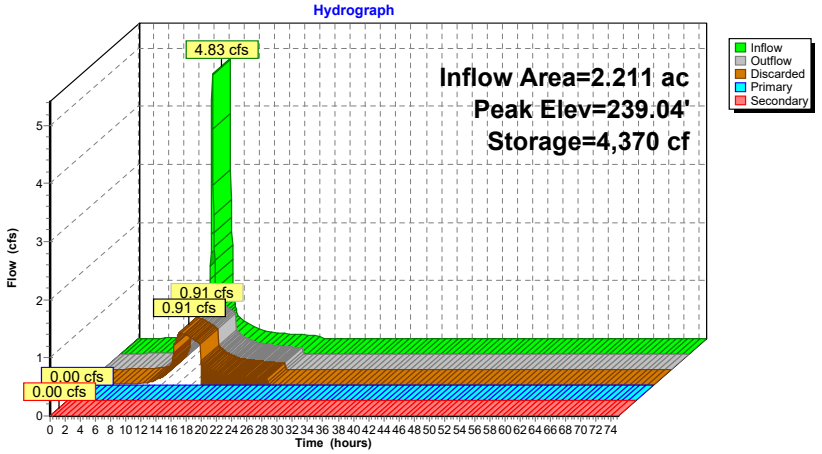


**Discarded OutFlow** Max=0.91 cfs @ 12.55 hrs HW=239.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.91 cfs)

**Primary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=238.00' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** ( Controls 0.00 cfs)
└**4=Grate** ( Controls 0.00 cfs)
└**5=Orifice** ( Controls 0.00 cfs)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=238.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B2: Infiltration Basin 2

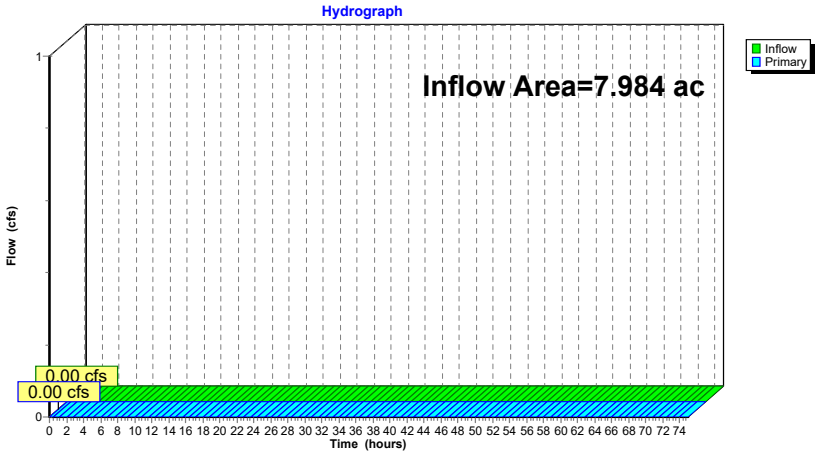


## Summary for Link DP1:

Inflow Area = 7.984 ac, 44.40% Impervious, Inflow Depth = 0.00" for 2-YR event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP1:



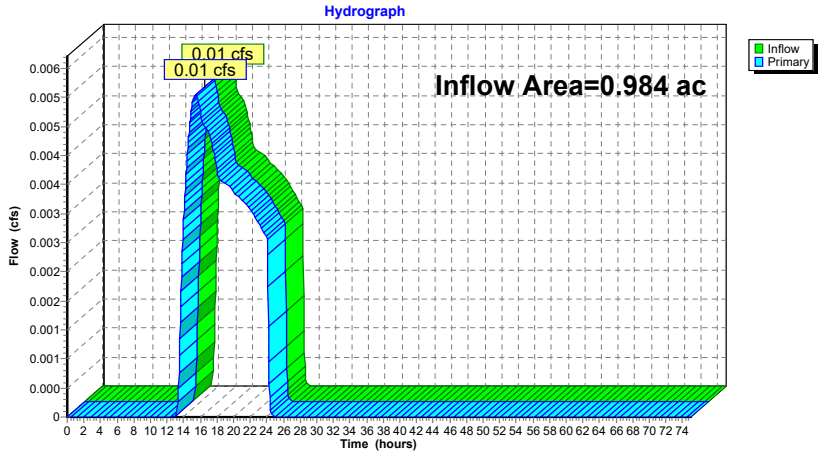



## Summary for Link DP2:

Inflow Area = 0.984 ac, 20.69% Impervious, Inflow Depth = 0.04" for 2-YR event
Inflow = 0.01 cfs @ 15.45 hrs, Volume= 0.004 af
Primary = 0.01 cfs @ 15.45 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP2:

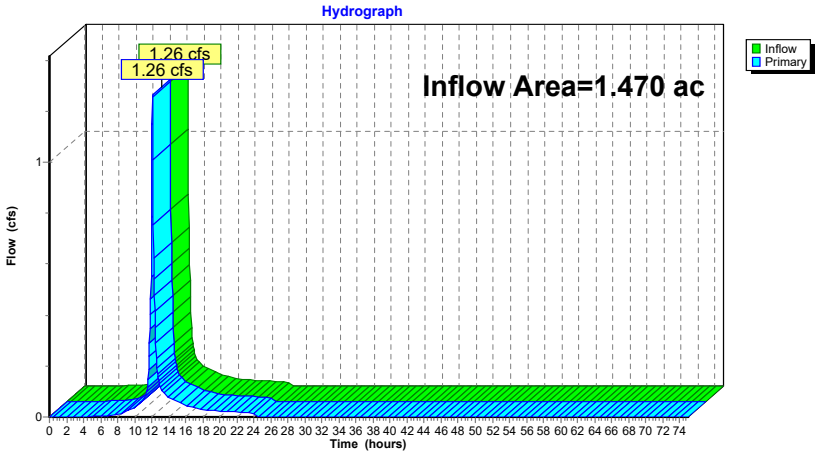


## Summary for Link DP3:

Inflow Area = 1.470 ac, 31.62% Impervious, Inflow Depth = 0.79" for 2-YR event
Inflow = 1.26 cfs @ 12.09 hrs, Volume= 0.097 af
Primary = 1.26 cfs @ 12.09 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP3:






Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentP1A:** Runoff Area=58,806 sf 33.43% Impervious Runoff Depth=1.09"
Tc=6.0 min CN=57 Runoff=1.44 cfs 0.123 af

**SubcatchmentP1B:** Runoff Area=65,967 sf 58.25% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=74 Runoff=4.07 cfs 0.296 af

**SubcatchmentP1C:** Runoff Area=48,750 sf 30.71% Impervious Runoff Depth=1.64"
Tc=6.0 min CN=65 Runoff=2.01 cfs 0.153 af

**SubcatchmentP1D:** Runoff Area=13,953 sf 100.00% Impervious Runoff Depth=4.74"
Tc=6.0 min CN=98 Runoff=1.52 cfs 0.127 af

**SubcatchmentP1E:** Runoff Area=9,956 sf 100.00% Impervious Runoff Depth=4.74"
Tc=6.0 min CN=98 Runoff=1.09 cfs 0.090 af

**SubcatchmentP1F:** Runoff Area=11,934 sf 100.00% Impervious Runoff Depth=4.74"
Tc=6.0 min CN=98 Runoff=1.30 cfs 0.108 af

**SubcatchmentP1G:** Runoff Area=70,407 sf 64.66% Impervious Runoff Depth=3.35"
Tc=6.0 min CN=85 Runoff=6.15 cfs 0.451 af

**SubcatchmentP1H:** Runoff Area=67,999 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=152' Tc=17.0 min CN=32 Runoff=0.00 cfs 0.003 af

**SubcatchmentP2:** Runoff Area=42,847 sf 20.69% Impervious Runoff Depth=0.48"
Tc=14.3 min CN=46 Runoff=0.21 cfs 0.040 af

**SubcatchmentP3A:** Runoff Area=40,162 sf 0.75% Impervious Runoff Depth=0.44"
Flow Length=416' Tc=21.8 min CN=45 Runoff=0.15 cfs 0.033 af

**SubcatchmentP3B:** Runoff Area=8,932 sf 96.13% Impervious Runoff Depth=4.51"
Tc=6.0 min CN=96 Runoff=0.96 cfs 0.077 af

**SubcatchmentP3C:** Runoff Area=14,946 sf 76.01% Impervious Runoff Depth=3.45"
Tc=6.0 min CN=86 Runoff=1.34 cfs 0.099 af

**Pond B1: Infiltration Basin 1** Peak Elev=239.62' Storage=9,696 cf Inflow=8.59 cfs 0.663 af
Discarded=1.10 cfs 0.664 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=1.10 cfs 0.664 af

**Pond B2: Infiltration Basin 2** Peak Elev=240.10' Storage=10,014 cf Inflow=8.97 cfs 0.686 af
Discarded=1.14 cfs 0.664 af Primary=0.24 cfs 0.023 af Secondary=0.00 cfs 0.000 af Outflow=1.39 cfs 0.687 af

**Link DP1:** Inflow=0.24 cfs 0.026 af
Primary=0.24 cfs 0.026 af

**Link DP2:** Inflow=0.21 cfs 0.040 af
Primary=0.21 cfs 0.040 af

**Link DP3:** Inflow=2.30 cfs 0.209 af
Primary=2.30 cfs 0.209 af

**Total Runoff Area = 10.438 ac Runoff Volume = 1.601 af Average Runoff Depth = 1.84"**
**59.63% Pervious = 6.224 ac 40.37% Impervious = 4.213 ac**



## Summary for Subcatchment P1A:

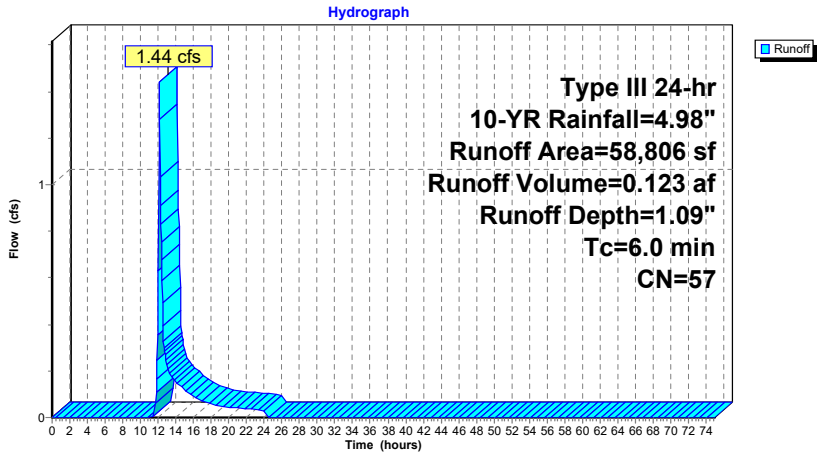
Runoff = 1.44 cfs @ 12.11 hrs, Volume= 0.123 af, Depth= 1.09"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 14,041 | 98 | Paved parking, HSG A |
| 25,305 | 39 | >75% Grass cover, Good, HSG A |
| 13,845 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 58,806 | 57 | Weighted Average |
| 39,150 | | 66.57% Pervious Area |
| 19,656 | | 33.43% Impervious Area |

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

## Subcatchment P1A:



## Summary for Subcatchment P1B:

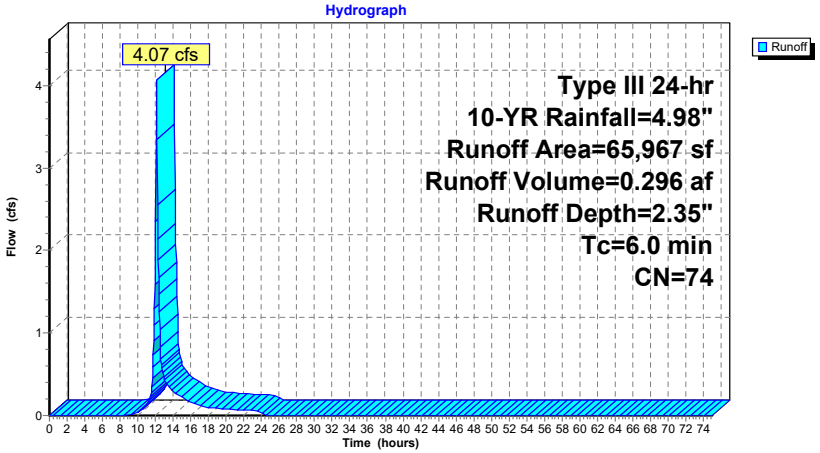
Runoff = 4.07 cfs @ 12.09 hrs, Volume= 0.296 af, Depth= 2.35"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 38,427 | 98 | Paved parking, HSG A |
| 941 | 76 | Gravel roads, HSG A |
| 26,404 | 39 | >75% Grass cover, Good, HSG A |
| 195 | 30 | Woods, Good, HSG A |
| 65,967 | 74 | Weighted Average |
| 27,540 | | 41.75% Pervious Area |
| 38,427 | | 58.25% Impervious Area |

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

## Subcatchment P1B:






## Summary for Subcatchment P1C:

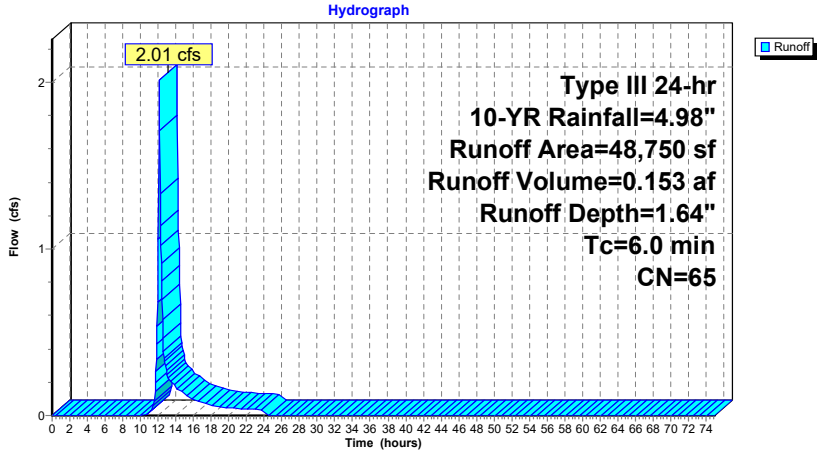
Runoff = 2.01 cfs @ 12.10 hrs, Volume= 0.153 af, Depth= 1.64"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 14,969 | 98 | Paved parking, HSG A |
| 12,574 | 39 | >75% Grass cover, Good, HSG A |
| 12,548 | 30 | Woods, Good, HSG A |
| 8,659 | 98 | Water Surface, 0% imp, HSG A |
| 48,750 | 65 | Weighted Average |
| 33,781 | | 69.29% Pervious Area |
| 14,969 | | 30.71% Impervious Area |

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

## Subcatchment P1C:



## Summary for Subcatchment P1D:

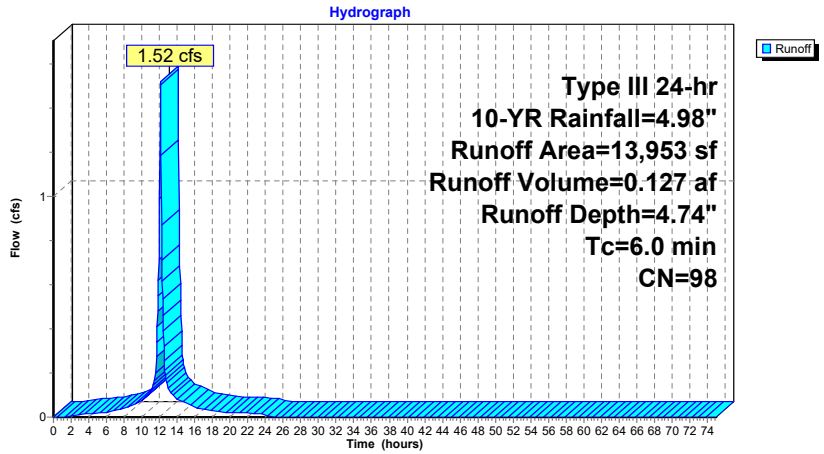
Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.127 af, Depth= 4.74"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 13,953 | 98 | Roofs, HSG A |
| 13,953 | | 100.00% Impervious Area |

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

### Subcatchment P1D:






## Summary for Subcatchment P1E:

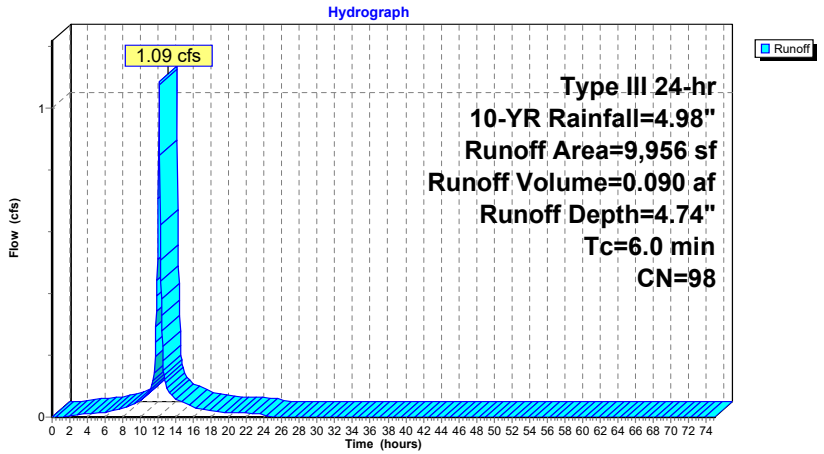
Runoff = 1.09 cfs @ 12.09 hrs, Volume= 0.090 af, Depth= 4.74"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 9,956 | 98 | Roofs, HSG A |
| 9,956 | | 100.00% Impervious Area |

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

### Subcatchment P1E:



## Summary for Subcatchment P1F:

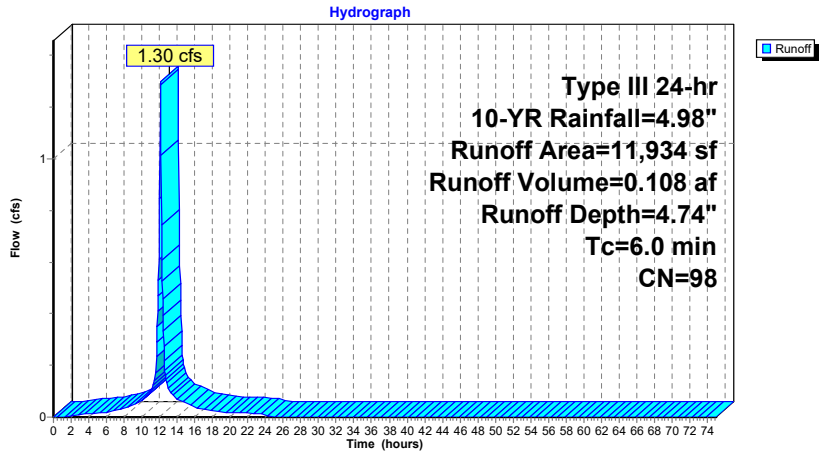
Runoff = 1.30 cfs @ 12.09 hrs, Volume= 0.108 af, Depth= 4.74"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 11,934 | 98 | Roofs, HSG A |
| 11,934 | | 100.00% Impervious Area |

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

### Subcatchment P1F:






## Summary for Subcatchment P1G:

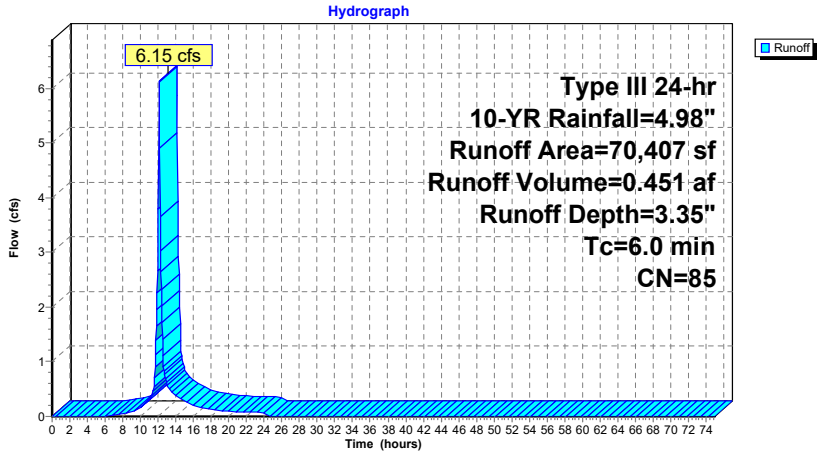
Runoff = 6.15 cfs @ 12.09 hrs, Volume= 0.451 af, Depth= 3.35"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 37,488 | 98 | Paved roads w/curbs & sewers, HSG A |
| 14,758 | 39 | >75% Grass cover, Good, HSG A |
| 611 | 30 | Woods, Good, HSG A |
| 8,038 | 98 | Roofs, HSG A |
| 9,512 | 98 | Water Surface, 0% imp, HSG A |
| 70,407 | 85 | Weighted Average |
| 24,881 | | 35.34% Pervious Area |
| 45,526 | | 64.66% Impervious Area |

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

### Subcatchment P1G:



## Summary for Subcatchment P1H:

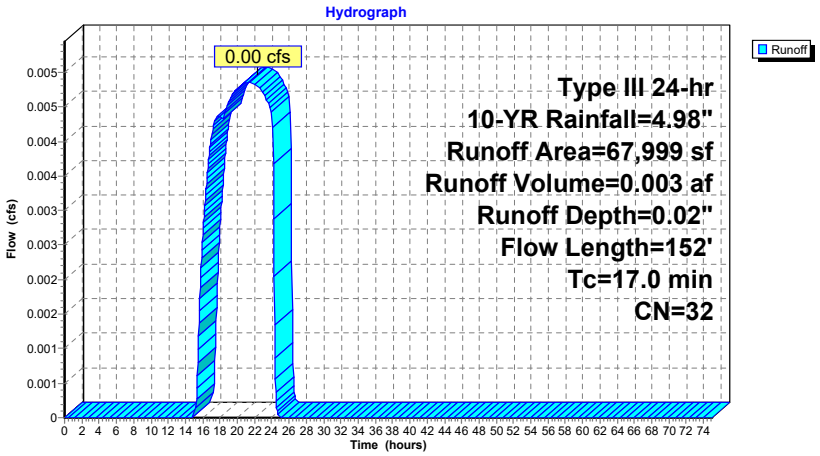
Runoff = 0.00 cfs @ 21.34 hrs, Volume= 0.003 af, Depth= 0.02"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 15,717 | 39 | >75% Grass cover, Good, HSG A |
| 52,282 | 30 | Woods, Good, HSG A |
| 67,999 | 32 | Weighted Average |
| 67,999 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.6 | 50 | 0.0136 | 0.06 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.4 | 102 | 0.0199 | 0.71 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 152 | Total | | | |

### Subcatchment P1H:






## Summary for Subcatchment P2:

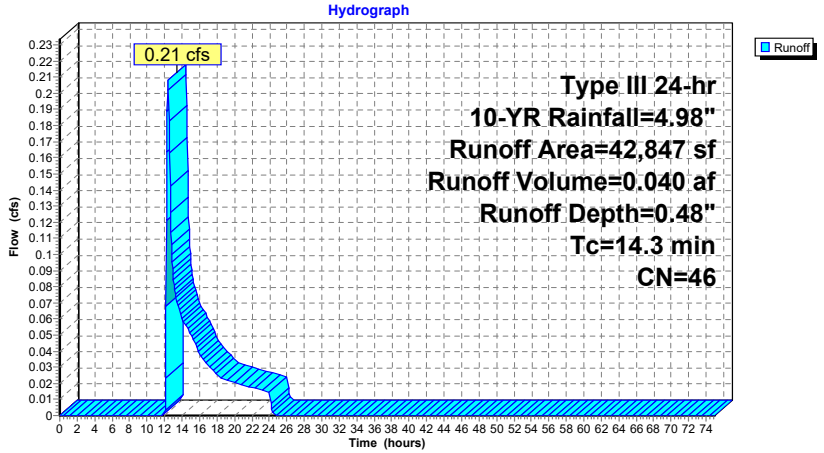
Runoff = 0.21 cfs @ 12.41 hrs, Volume= 0.040 af, Depth= 0.48"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 8,865 | 98 | Paved parking, HSG A |
| 7,279 | 39 | >75% Grass cover, Good, HSG A |
| 26,703 | 30 | Woods, Good, HSG A |
| 42,847 | 46 | Weighted Average |
| 33,982 | | 79.31% Pervious Area |
| 8,865 | | 20.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.3 | | | | | **Direct Entry, Same as Pre-dev** |

### Subcatchment P2:



## Summary for Subcatchment P3A:

Runoff = 0.15 cfs @ 12.55 hrs, Volume= 0.033 af, Depth= 0.44"
Routed to Link DP3 :

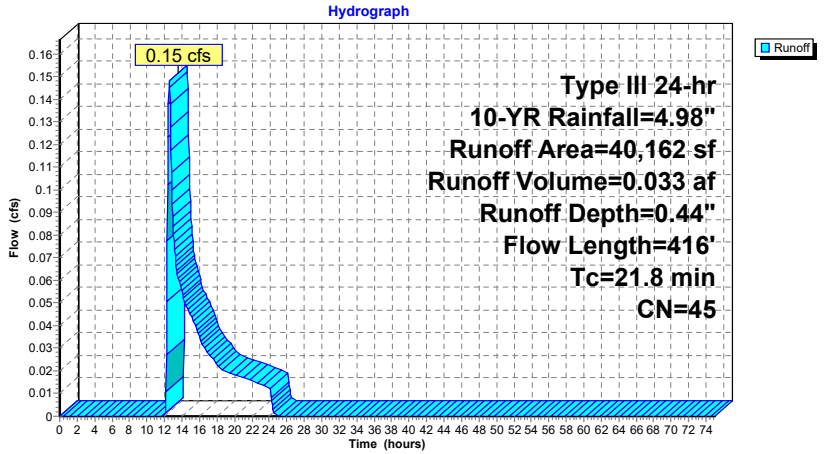
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 303 | 98 | Paved parking, HSG A |
| 30,163 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,696 | 30 | Woods, Good, HSG A |
| 40,162 | 45 | Weighted Average |
| 39,859 | | 99.25% Pervious Area |
| 303 | | 0.75% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.2 | 50 | 0.0430 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 0.6 | 26 | 0.0235 | 0.77 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 0.5 | 33 | 0.0588 | 1.21 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.2 | 81 | 0.0149 | 0.61 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 21.8 | 416 | Total | | | |



## Subcatchment P3A:



## Summary for Subcatchment P3B:

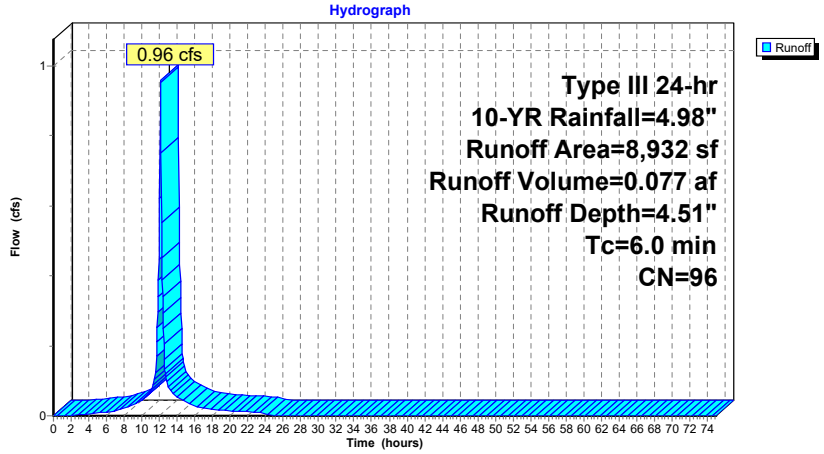
Runoff = 0.96 cfs @ 12.09 hrs, Volume= 0.077 af, Depth= 4.51"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 8,586 | 98 | Paved parking, HSG A |
| 346 | 49 | 50-75% Grass cover, Fair, HSG A |
| 8,932 | 96 | Weighted Average |
| 346 | | 3.87% Pervious Area |
| 8,586 | | 96.13% Impervious Area |

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

### Subcatchment P3B:






## Summary for Subcatchment P3C:

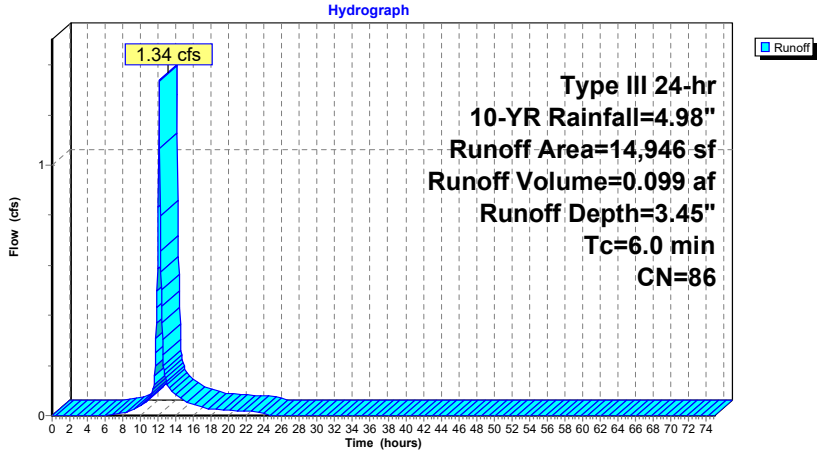
Runoff = 1.34 cfs @ 12.09 hrs, Volume= 0.099 af, Depth= 3.45"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YR Rainfall=4.98"

| Area (sf) | CN | Description |
|---|---|---|
| 11,361 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 14,946 | 86 | Weighted Average |
| 3,585 | | 23.99% Pervious Area |
| 11,361 | | 76.01% Impervious Area |

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

### Subcatchment P3C:



## Summary for Pond B1: Infiltration Basin 1

Inflow Area = 4.212 ac, 45.24% Impervious, Inflow Depth = 1.89" for 10-YR event
Inflow = 8.59 cfs @ 12.10 hrs, Volume= 0.663 af
Outflow = 1.10 cfs @ 12.91 hrs, Volume= 0.664 af, Atten= 87%, Lag= 48.5 min
Discarded = 1.10 cfs @ 12.91 hrs, Volume= 0.664 af
Primary = 0.00 cfs @ 12.91 hrs, Volume= 0.000 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 239.62' @ 12.91 hrs Surf.Area= 5,753 sf Storage= 9,696 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 80.7 min ( 920.5 - 839.8 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 237.50' | 26,990 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 237.50 | 3,493 | 0 | 0 |
| 238.00 | 3,978 | 1,868 | 1,868 |
| 239.00 | 5,033 | 4,506 | 6,373 |
| 240.00 | 6,202 | 5,618 | 11,991 |
| 241.00 | 7,569 | 6,886 | 18,876 |
| 242.00 | 8,659 | 8,114 | 26,990 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 238.75' | **12.0" Round Culvert**<br>L= 78.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 238.75' / 238.25' S= 0.0064 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 241.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 237.50' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 240.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

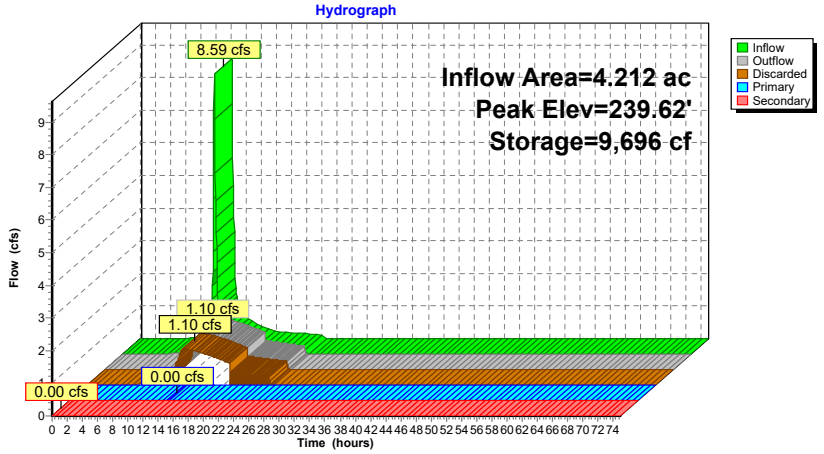


**Discarded OutFlow** Max=1.10 cfs @ 12.91 hrs HW=239.62' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.10 cfs)

**Primary OutFlow** Max=0.00 cfs @ 12.91 hrs HW=239.62' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.00 cfs of 1.95 cfs potential flow)
└**4=Grate** ( Controls 0.00 cfs)
└**5=Orifice** (Orifice Controls 0.00 cfs @ 0.43 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=237.50' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B1: Infiltration Basin 1



## Summary for Pond B2: Infiltration Basin 2

Inflow Area = 2.211 ac, 74.16% Impervious, Inflow Depth = 3.72" for 10-YR event
Inflow = 8.97 cfs @ 12.09 hrs, Volume= 0.686 af
Outflow = 1.39 cfs @ 12.59 hrs, Volume= 0.687 af, Atten= 85%, Lag= 30.1 min
Discarded = 1.14 cfs @ 12.59 hrs, Volume= 0.664 af
Primary = 0.24 cfs @ 12.59 hrs, Volume= 0.023 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 240.10' @ 12.59 hrs Surf.Area= 5,970 sf Storage= 10,014 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 64.3 min ( 851.6 - 787.3 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 238.00' | 32,644 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 238.00 | 3,639 | 0 | 0 |
| 239.00 | 4,684 | 4,162 | 4,162 |
| 240.00 | 5,843 | 5,264 | 9,425 |
| 241.00 | 7,114 | 6,479 | 15,904 |
| 242.00 | 8,427 | 7,771 | 23,674 |
| 243.00 | 9,513 | 8,970 | 32,644 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 239.00' | **12.0" Round Culvert**<br>L= 127.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 239.00' / 238.35' S= 0.0051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 242.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 238.00' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 241.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **4.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

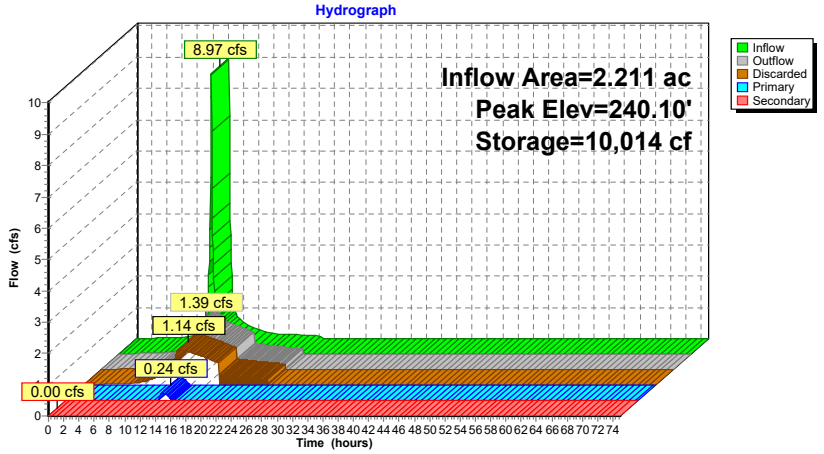


**Discarded OutFlow** Max=1.14 cfs @ 12.59 hrs HW=240.10' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.14 cfs)

**Primary OutFlow** Max=0.24 cfs @ 12.59 hrs HW=240.10' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.24 cfs of 2.50 cfs potential flow)
└**4=Grate** ( Controls 0.00 cfs)
└**5=Orifice** (Orifice Controls 0.24 cfs @ 2.78 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=238.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B2: Infiltration Basin 2

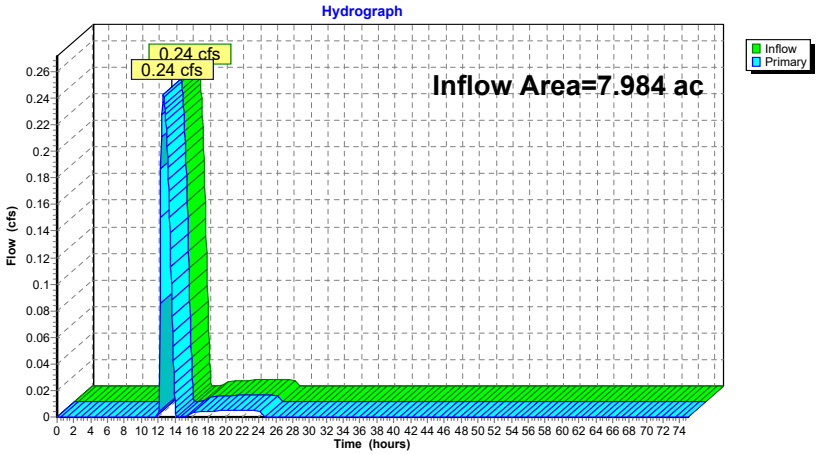


## Summary for Link DP1:

Inflow Area = 7.984 ac, 44.40% Impervious, Inflow Depth = 0.04" for 10-YR event
Inflow = 0.24 cfs @ 12.59 hrs, Volume= 0.026 af
Primary = 0.24 cfs @ 12.59 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP1:



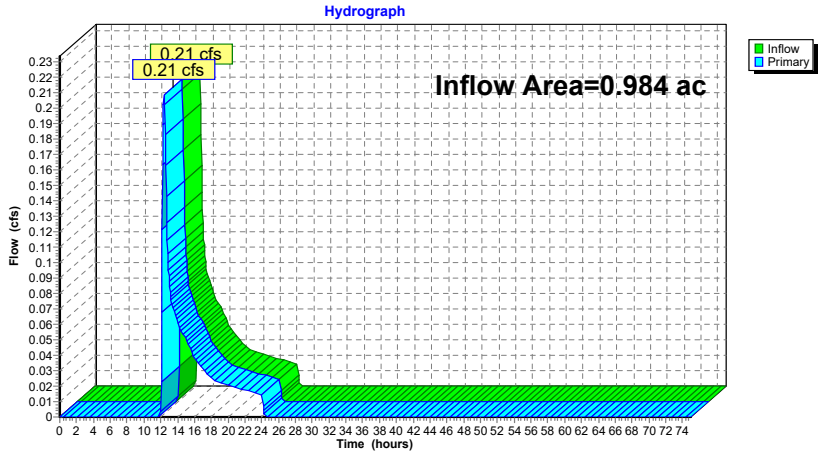



## Summary for Link DP2:

Inflow Area = 0.984 ac, 20.69% Impervious, Inflow Depth = 0.48" for 10-YR event
Inflow = 0.21 cfs @ 12.41 hrs, Volume= 0.040 af
Primary = 0.21 cfs @ 12.41 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP2:

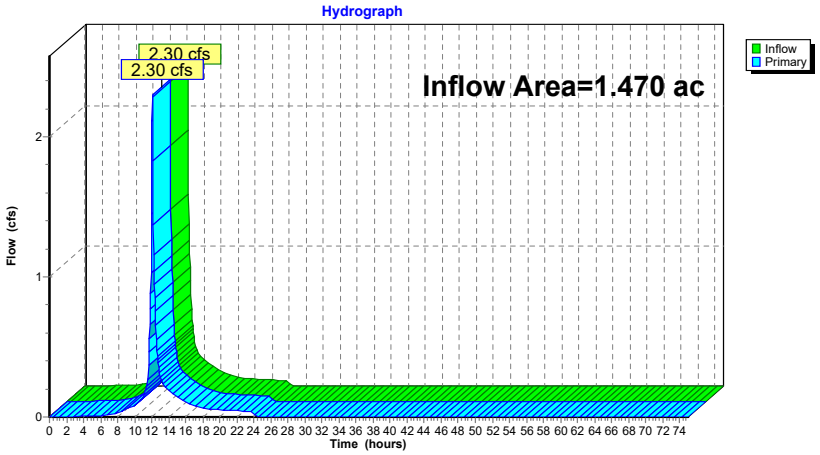


## Summary for Link DP3:

Inflow Area = 1.470 ac, 31.62% Impervious, Inflow Depth = 1.71" for 10-YR event
Inflow = 2.30 cfs @ 12.09 hrs, Volume= 0.209 af
Primary = 2.30 cfs @ 12.09 hrs, Volume= 0.209 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP3:






Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentP1A:** Runoff Area=58,806 sf 33.43% Impervious Runoff Depth=1.77"
Tc=6.0 min CN=57 Runoff=2.55 cfs 0.200 af

**SubcatchmentP1B:** Runoff Area=65,967 sf 58.25% Impervious Runoff Depth=3.32"
Tc=6.0 min CN=74 Runoff=5.78 cfs 0.419 af

**SubcatchmentP1C:** Runoff Area=48,750 sf 30.71% Impervious Runoff Depth=2.47"
Tc=6.0 min CN=65 Runoff=3.12 cfs 0.230 af

**SubcatchmentP1D:** Runoff Area=13,953 sf 100.00% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=98 Runoff=1.89 cfs 0.158 af

**SubcatchmentP1E:** Runoff Area=9,956 sf 100.00% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=98 Runoff=1.35 cfs 0.113 af

**SubcatchmentP1F:** Runoff Area=11,934 sf 100.00% Impervious Runoff Depth=5.92"
Tc=6.0 min CN=98 Runoff=1.62 cfs 0.135 af

**SubcatchmentP1G:** Runoff Area=70,407 sf 64.66% Impervious Runoff Depth=4.45"
Tc=6.0 min CN=85 Runoff=8.09 cfs 0.600 af

**SubcatchmentP1H:** Runoff Area=67,999 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=152' Tc=17.0 min CN=32 Runoff=0.03 cfs 0.020 af

**SubcatchmentP2:** Runoff Area=42,847 sf 20.69% Impervious Runoff Depth=0.93"
Tc=14.3 min CN=46 Runoff=0.56 cfs 0.077 af

**SubcatchmentP3A:** Runoff Area=40,162 sf 0.75% Impervious Runoff Depth=0.87"
Flow Length=416' Tc=21.8 min CN=45 Runoff=0.41 cfs 0.067 af

**SubcatchmentP3B:** Runoff Area=8,932 sf 96.13% Impervious Runoff Depth=5.69"
Tc=6.0 min CN=96 Runoff=1.20 cfs 0.097 af

**SubcatchmentP3C:** Runoff Area=14,946 sf 76.01% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=86 Runoff=1.75 cfs 0.130 af

**Pond B1: Infiltration Basin 1** Peak Elev=240.33' Storage=14,144 cf Inflow=12.78 cfs 0.962 af
Discarded=1.27 cfs 0.845 af Primary=1.28 cfs 0.117 af Secondary=0.00 cfs 0.000 af Outflow=2.56 cfs 0.962 af

**Pond B2: Infiltration Basin 2** Peak Elev=240.69' Storage=13,735 cf Inflow=11.59 cfs 0.893 af
Discarded=1.29 cfs 0.824 af Primary=0.40 cfs 0.070 af Secondary=0.00 cfs 0.000 af Outflow=1.69 cfs 0.893 af

**Link DP1:** Inflow=1.69 cfs 0.207 af
Primary=1.69 cfs 0.207 af

**Link DP2:** Inflow=0.56 cfs 0.077 af
Primary=0.56 cfs 0.077 af

**Link DP3:** Inflow=2.99 cfs 0.294 af
Primary=2.99 cfs 0.294 af

**Total Runoff Area = 10.438 ac Runoff Volume = 2.246 af Average Runoff Depth = 2.58"**
**59.63% Pervious = 6.224 ac 40.37% Impervious = 4.213 ac**



## Summary for Subcatchment P1A:

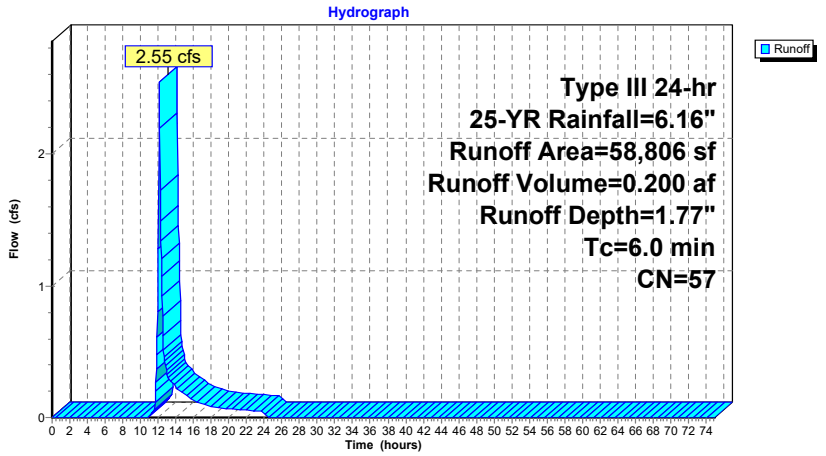
Runoff = 2.55 cfs @ 12.10 hrs, Volume= 0.200 af, Depth= 1.77"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 14,041 | 98 | Paved parking, HSG A |
| 25,305 | 39 | >75% Grass cover, Good, HSG A |
| 13,845 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 58,806 | 57 | Weighted Average |
| 39,150 | | 66.57% Pervious Area |
| 19,656 | | 33.43% Impervious Area |

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

## Subcatchment P1A:



## Summary for Subcatchment P1B:

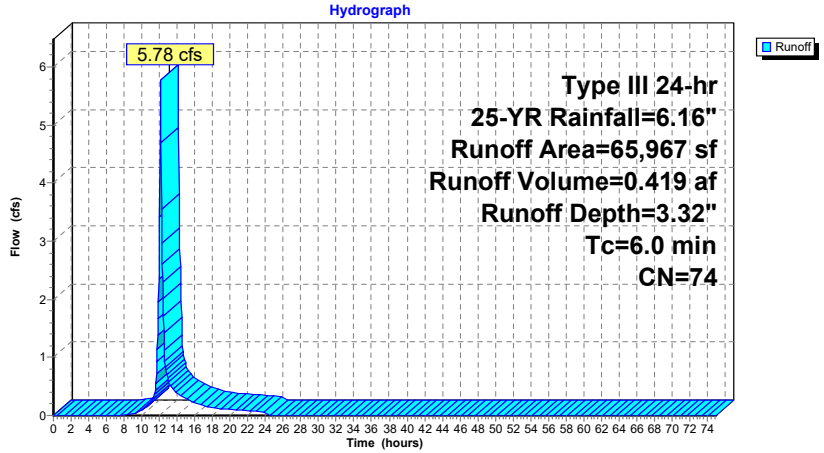
Runoff = 5.78 cfs @ 12.09 hrs, Volume= 0.419 af, Depth= 3.32"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 38,427 | 98 | Paved parking, HSG A |
| 941 | 76 | Gravel roads, HSG A |
| 26,404 | 39 | >75% Grass cover, Good, HSG A |
| 195 | 30 | Woods, Good, HSG A |
| 65,967 | 74 | Weighted Average |
| 27,540 | | 41.75% Pervious Area |
| 38,427 | | 58.25% Impervious Area |

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

## Subcatchment P1B:






## Summary for Subcatchment P1C:

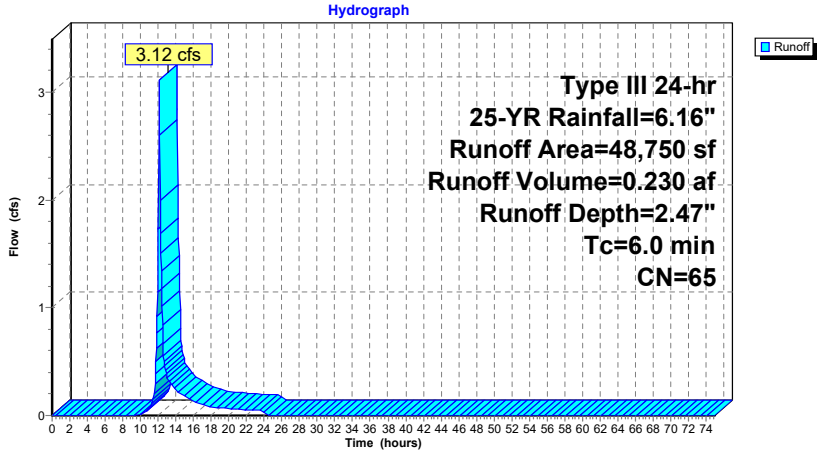
Runoff = 3.12 cfs @ 12.10 hrs, Volume= 0.230 af, Depth= 2.47"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 14,969 | 98 | Paved parking, HSG A |
| 12,574 | 39 | >75% Grass cover, Good, HSG A |
| 12,548 | 30 | Woods, Good, HSG A |
| 8,659 | 98 | Water Surface, 0% imp, HSG A |
| 48,750 | 65 | Weighted Average |
| 33,781 | | 69.29% Pervious Area |
| 14,969 | | 30.71% Impervious Area |

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

## Subcatchment P1C:



## Summary for Subcatchment P1D:

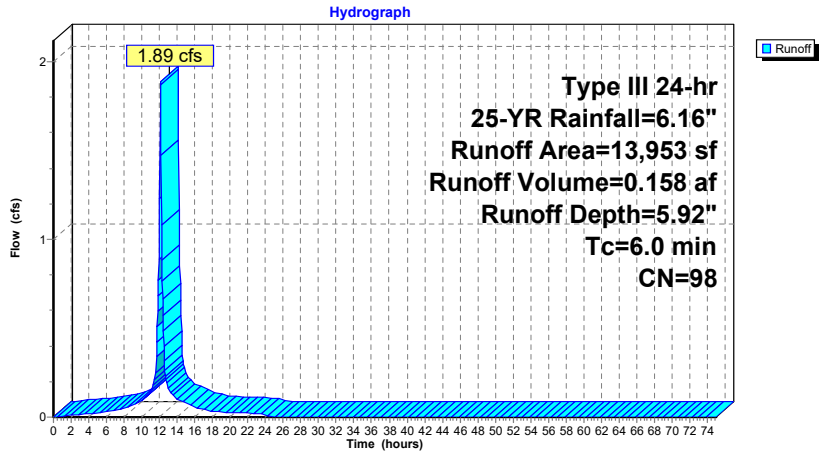
Runoff = 1.89 cfs @ 12.09 hrs, Volume= 0.158 af, Depth= 5.92"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 13,953 | 98 | Roofs, HSG A |
| 13,953 | | 100.00% Impervious Area |

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

### Subcatchment P1D:






## Summary for Subcatchment P1E:

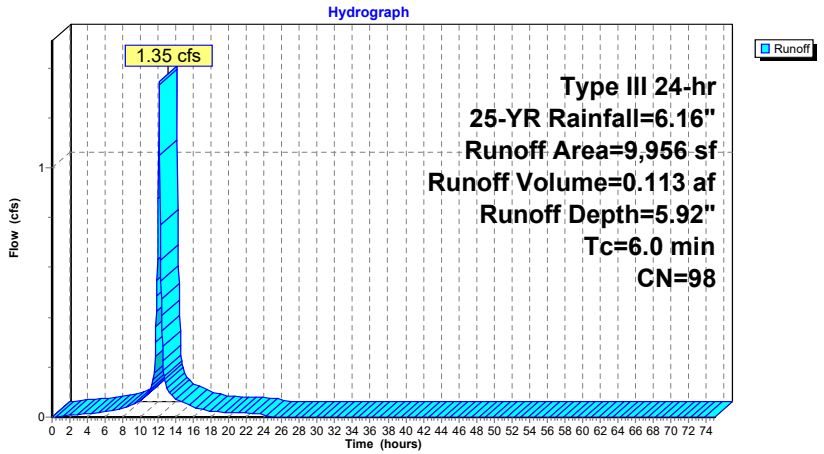
Runoff = 1.35 cfs @ 12.09 hrs, Volume= 0.113 af, Depth= 5.92"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 9,956 | 98 | Roofs, HSG A |
| 9,956 | | 100.00% Impervious Area |

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

### Subcatchment P1E:



## Summary for Subcatchment P1F:

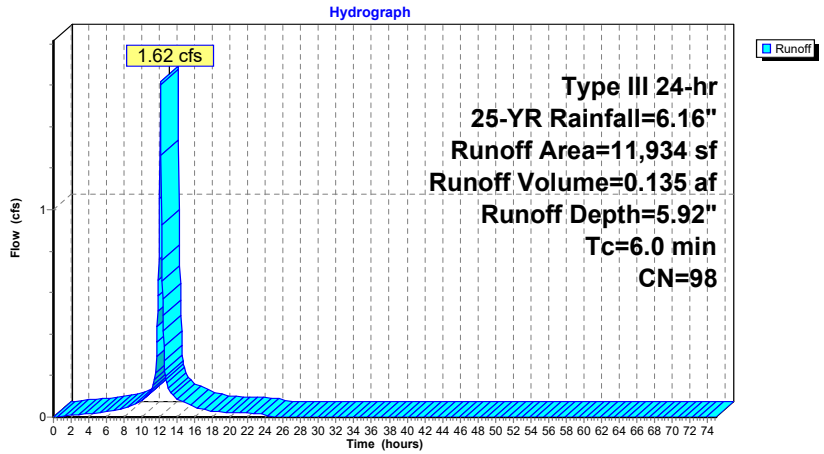
Runoff = 1.62 cfs @ 12.09 hrs, Volume= 0.135 af, Depth= 5.92"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 11,934 | 98 | Roofs, HSG A |
| 11,934 | | 100.00% Impervious Area |

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

### Subcatchment P1F:






## Summary for Subcatchment P1G:

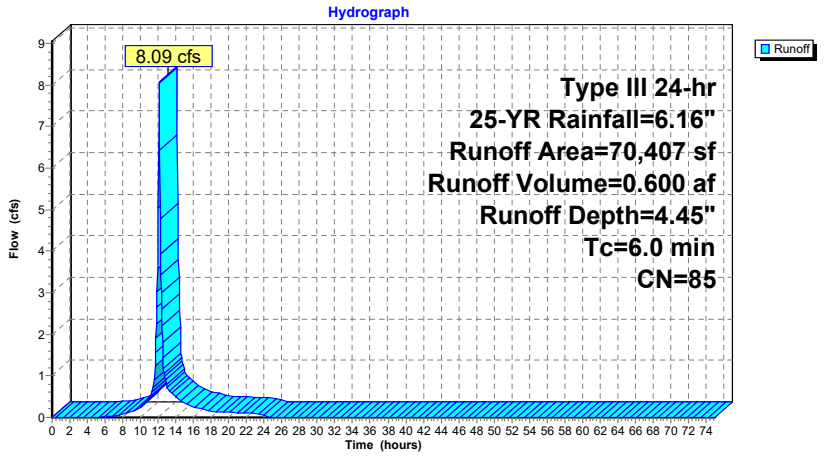
Runoff = 8.09 cfs @ 12.09 hrs, Volume= 0.600 af, Depth= 4.45"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 37,488 | 98 | Paved roads w/curbs & sewers, HSG A |
| 14,758 | 39 | >75% Grass cover, Good, HSG A |
| 611 | 30 | Woods, Good, HSG A |
| 8,038 | 98 | Roofs, HSG A |
| 9,512 | 98 | Water Surface, 0% imp, HSG A |
| 70,407 | 85 | Weighted Average |
| 24,881 | | 35.34% Pervious Area |
| 45,526 | | 64.66% Impervious Area |

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

### Subcatchment P1G:



## Summary for Subcatchment P1H:

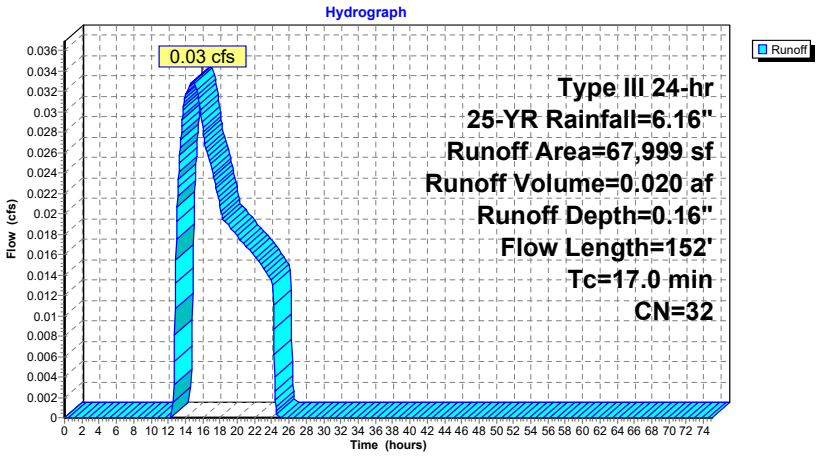
Runoff = 0.03 cfs @ 14.84 hrs, Volume= 0.020 af, Depth= 0.16"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 15,717 | 39 | >75% Grass cover, Good, HSG A |
| 52,282 | 30 | Woods, Good, HSG A |
| 67,999 | 32 | Weighted Average |
| 67,999 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.6 | 50 | 0.0136 | 0.06 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.4 | 102 | 0.0199 | 0.71 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 152 | Total | | | |

### Subcatchment P1H:






## Summary for Subcatchment P2:

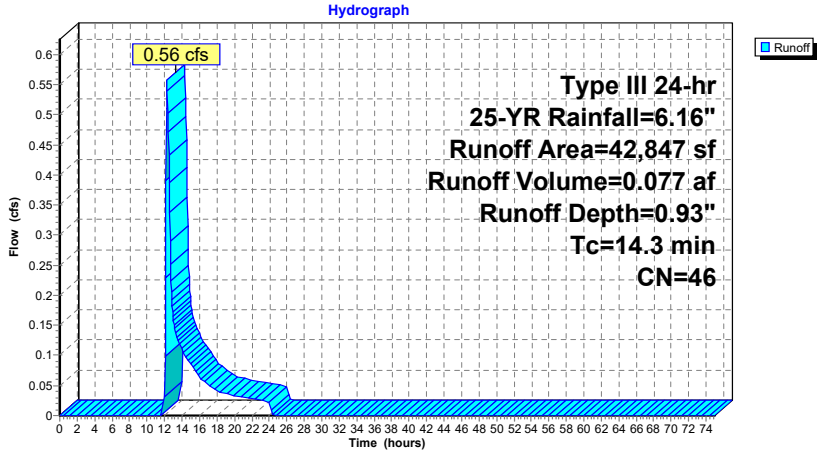
Runoff = 0.56 cfs @ 12.27 hrs, Volume= 0.077 af, Depth= 0.93"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 8,865 | 98 | Paved parking, HSG A |
| 7,279 | 39 | >75% Grass cover, Good, HSG A |
| 26,703 | 30 | Woods, Good, HSG A |
| 42,847 | 46 | Weighted Average |
| 33,982 | | 79.31% Pervious Area |
| 8,865 | | 20.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.3 | | | | | **Direct Entry, Same as Pre-dev** |

### Subcatchment P2:



## Summary for Subcatchment P3A:

Runoff = 0.41 cfs @ 12.43 hrs, Volume= 0.067 af, Depth= 0.87"
Routed to Link DP3 :

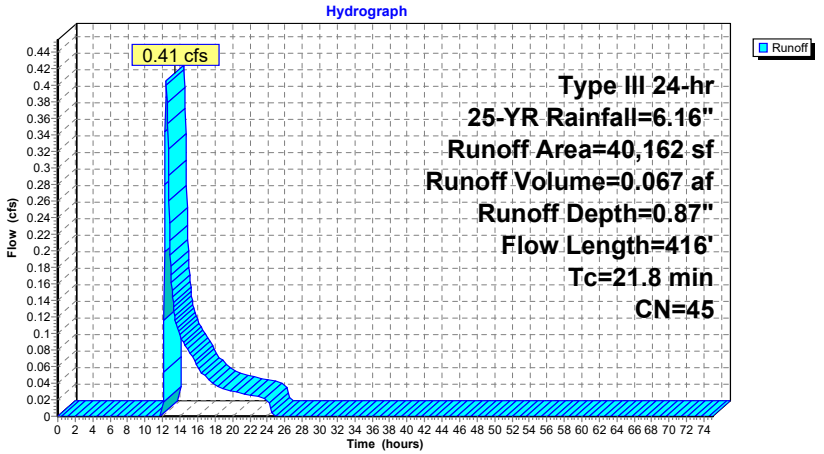
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 303 | 98 | Paved parking, HSG A |
| 30,163 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,696 | 30 | Woods, Good, HSG A |
| 40,162 | 45 | Weighted Average |
| 39,859 | | 99.25% Pervious Area |
| 303 | | 0.75% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.2 | 50 | 0.0430 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 0.6 | 26 | 0.0235 | 0.77 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 0.5 | 33 | 0.0588 | 1.21 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.2 | 81 | 0.0149 | 0.61 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 21.8 | 416 | Total | | | |



## Subcatchment P3A:



## Summary for Subcatchment P3B:

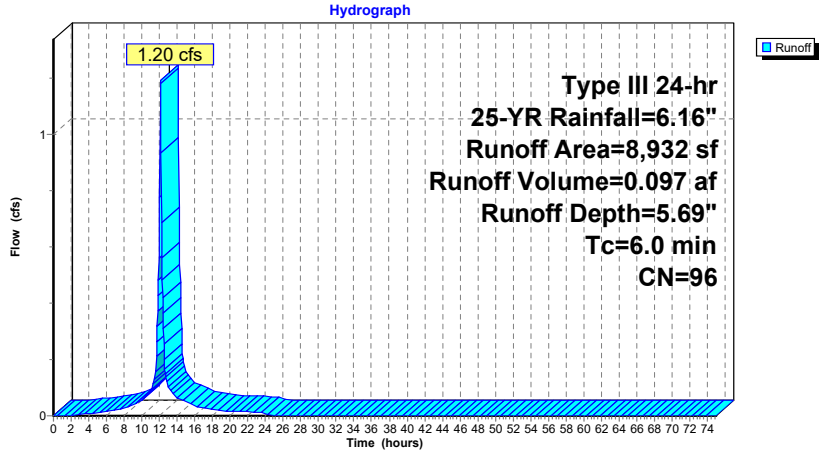
Runoff = 1.20 cfs @ 12.09 hrs, Volume= 0.097 af, Depth= 5.69"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 8,586 | 98 | Paved parking, HSG A |
| 346 | 49 | 50-75% Grass cover, Fair, HSG A |
| 8,932 | 96 | Weighted Average |
| 346 | | 3.87% Pervious Area |
| 8,586 | | 96.13% Impervious Area |

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

### Subcatchment P3B:






## Summary for Subcatchment P3C:

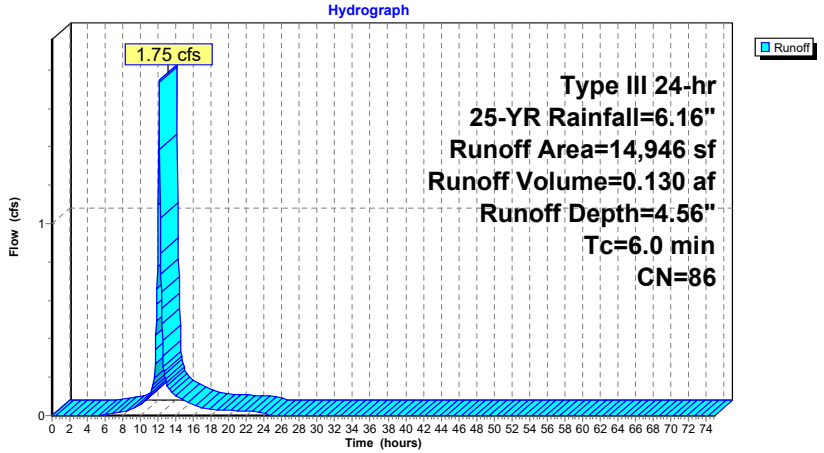
Runoff = 1.75 cfs @ 12.09 hrs, Volume= 0.130 af, Depth= 4.56"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YR Rainfall=6.16"

| Area (sf) | CN | Description |
|---|---|---|
| 11,361 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 14,946 | 86 | Weighted Average |
| 3,585 | | 23.99% Pervious Area |
| 11,361 | | 76.01% Impervious Area |

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

### Subcatchment P3C:



## Summary for Pond B1: Infiltration Basin 1

Inflow Area = 4.212 ac, 45.24% Impervious, Inflow Depth = 2.74" for 25-YR event
Inflow = 12.78 cfs @ 12.10 hrs, Volume= 0.962 af
Outflow = 2.56 cfs @ 12.56 hrs, Volume= 0.962 af, Atten= 80%, Lag= 28.0 min
Discarded = 1.27 cfs @ 12.56 hrs, Volume= 0.845 af
Primary = 1.28 cfs @ 12.56 hrs, Volume= 0.117 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 240.33' @ 12.56 hrs Surf.Area= 6,660 sf Storage= 14,144 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 86.6 min ( 918.2 - 831.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 237.50' | 26,990 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 237.50 | 3,493 | 0 | 0 |
| 238.00 | 3,978 | 1,868 | 1,868 |
| 239.00 | 5,033 | 4,506 | 6,373 |
| 240.00 | 6,202 | 5,618 | 11,991 |
| 241.00 | 7,569 | 6,886 | 18,876 |
| 242.00 | 8,659 | 8,114 | 26,990 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 238.75' | **12.0" Round Culvert**<br>L= 78.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 238.75' / 238.25' S= 0.0064 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 241.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 237.50' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 240.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

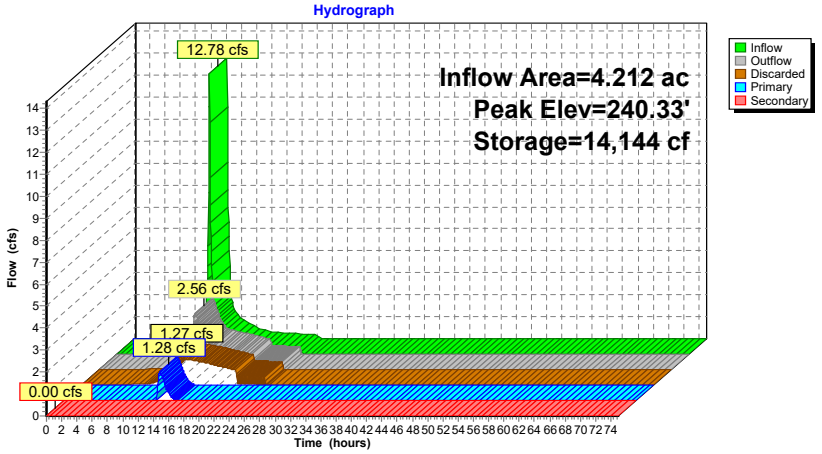


**Discarded OutFlow** Max=1.27 cfs @ 12.56 hrs HW=240.33' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.27 cfs)

**Primary OutFlow** Max=1.28 cfs @ 12.56 hrs HW=240.33' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.28 cfs of 3.30 cfs potential flow)
└**4=Grate** ( Controls 0.00 cfs)
└**5=Orifice** (Orifice Controls 1.28 cfs @ 2.92 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=237.50' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B1: Infiltration Basin 1



## Summary for Pond B2: Infiltration Basin 2

Inflow Area = 2.211 ac, 74.16% Impervious, Inflow Depth = 4.85" for 25-YR event
Inflow = 11.59 cfs @ 12.09 hrs, Volume= 0.893 af
Outflow = 1.69 cfs @ 12.60 hrs, Volume= 0.893 af, Atten= 85%, Lag= 30.9 min
Discarded = 1.29 cfs @ 12.60 hrs, Volume= 0.824 af
Primary = 0.40 cfs @ 12.60 hrs, Volume= 0.070 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 240.69' @ 12.60 hrs Surf.Area= 6,715 sf Storage= 13,735 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 75.8 min ( 857.4 - 781.6 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 238.00' | 32,644 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 238.00 | 3,639 | 0 | 0 |
| 239.00 | 4,684 | 4,162 | 4,162 |
| 240.00 | 5,843 | 5,264 | 9,425 |
| 241.00 | 7,114 | 6,479 | 15,904 |
| 242.00 | 8,427 | 7,771 | 23,674 |
| 243.00 | 9,513 | 8,970 | 32,644 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 239.00' | **12.0" Round Culvert**<br>L= 127.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 239.00' / 238.35' S= 0.0051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 242.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 238.00' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 241.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **4.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

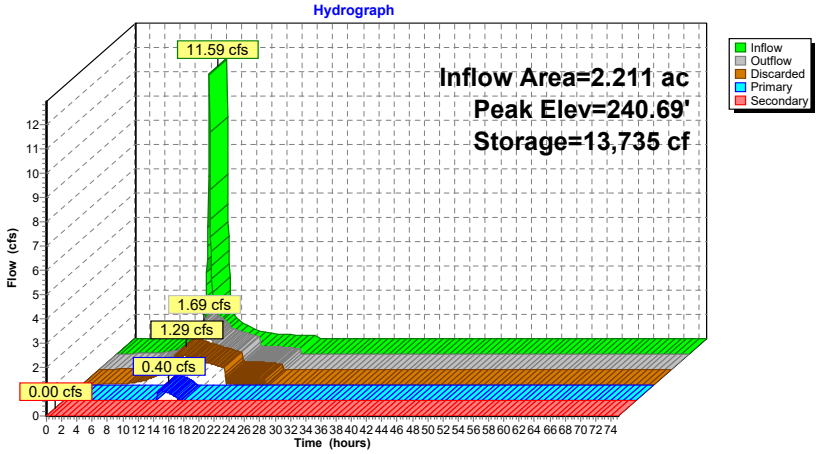


**Discarded OutFlow** Max=1.29 cfs @ 12.60 hrs HW=240.69' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.29 cfs)

**Primary OutFlow** Max=0.40 cfs @ 12.60 hrs HW=240.69' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.40 cfs of 3.11 cfs potential flow)
└**4=Grate** ( Controls 0.00 cfs)
└**5=Orifice** (Orifice Controls 0.40 cfs @ 4.62 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=238.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B2: Infiltration Basin 2

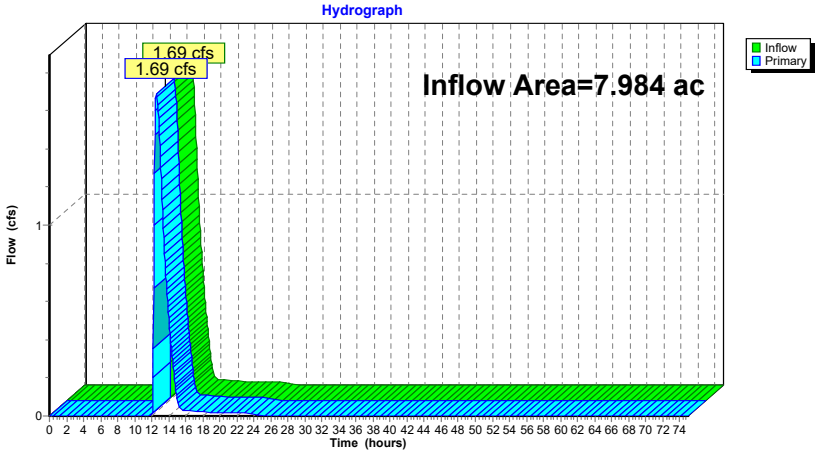


## Summary for Link DP1:

Inflow Area = 7.984 ac, 44.40% Impervious, Inflow Depth = 0.31" for 25-YR event
Inflow = 1.69 cfs @ 12.57 hrs, Volume= 0.207 af
Primary = 1.69 cfs @ 12.57 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP1:



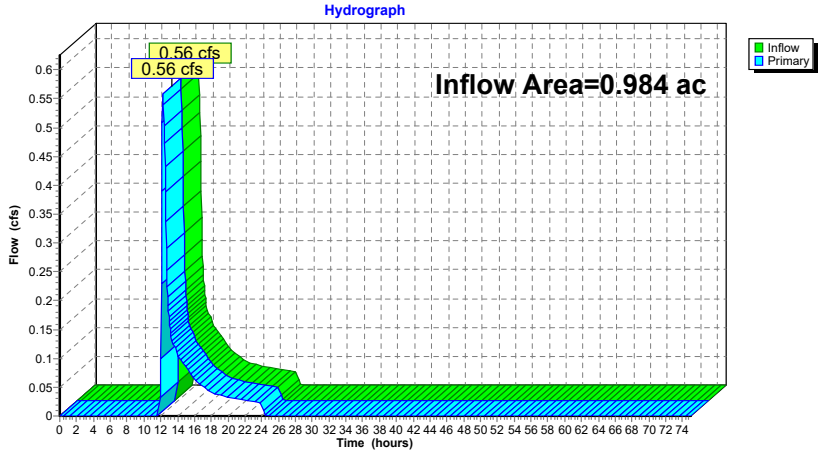



## Summary for Link DP2:

Inflow Area = 0.984 ac, 20.69% Impervious, Inflow Depth = 0.93" for 25-YR event
Inflow = 0.56 cfs @ 12.27 hrs, Volume= 0.077 af
Primary = 0.56 cfs @ 12.27 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP2:

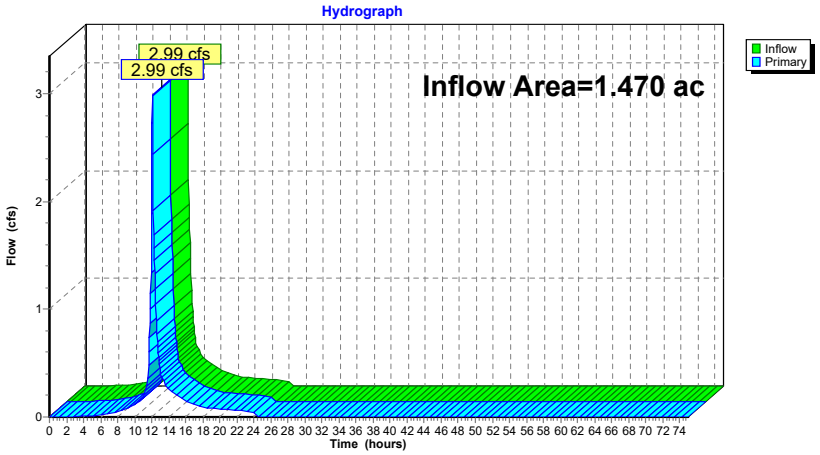


## Summary for Link DP3:

Inflow Area = 1.470 ac, 31.62% Impervious, Inflow Depth = 2.40" for 25-YR event
Inflow = 2.99 cfs @ 12.09 hrs, Volume= 0.294 af
Primary = 2.99 cfs @ 12.09 hrs, Volume= 0.294 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP3:






Time span=0.00-75.00 hrs, dt=0.05 hrs, 1501 points x 3
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

**SubcatchmentP1A:** Runoff Area=58,806 sf 33.43% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=57 Runoff=4.52 cfs 0.336 af

**SubcatchmentP1B:** Runoff Area=65,967 sf 58.25% Impervious Runoff Depth=4.91"
Tc=6.0 min CN=74 Runoff=8.51 cfs 0.619 af

**SubcatchmentP1C:** Runoff Area=48,750 sf 30.71% Impervious Runoff Depth=3.88"
Tc=6.0 min CN=65 Runoff=4.98 cfs 0.362 af

**SubcatchmentP1D:** Runoff Area=13,953 sf 100.00% Impervious Runoff Depth=7.74"
Tc=6.0 min CN=98 Runoff=2.45 cfs 0.207 af

**SubcatchmentP1E:** Runoff Area=9,956 sf 100.00% Impervious Runoff Depth=7.74"
Tc=6.0 min CN=98 Runoff=1.75 cfs 0.147 af

**SubcatchmentP1F:** Runoff Area=11,934 sf 100.00% Impervious Runoff Depth=7.74"
Tc=6.0 min CN=98 Runoff=2.10 cfs 0.177 af

**SubcatchmentP1G:** Runoff Area=70,407 sf 64.66% Impervious Runoff Depth=6.19"
Tc=6.0 min CN=85 Runoff=11.06 cfs 0.834 af

**SubcatchmentP1H:** Runoff Area=67,999 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=152' Tc=17.0 min CN=32 Runoff=0.29 cfs 0.072 af

**SubcatchmentP2:** Runoff Area=42,847 sf 20.69% Impervious Runoff Depth=1.83"
Tc=14.3 min CN=46 Runoff=1.36 cfs 0.150 af

**SubcatchmentP3A:** Runoff Area=40,162 sf 0.75% Impervious Runoff Depth=1.73"
Flow Length=416' Tc=21.8 min CN=45 Runoff=1.01 cfs 0.133 af

**SubcatchmentP3B:** Runoff Area=8,932 sf 96.13% Impervious Runoff Depth=7.50"
Tc=6.0 min CN=96 Runoff=1.56 cfs 0.128 af

**SubcatchmentP3C:** Runoff Area=14,946 sf 76.01% Impervious Runoff Depth=6.31"
Tc=6.0 min CN=86 Runoff=2.38 cfs 0.180 af

**Pond B1: Infiltration Basin 1** Peak Elev=241.10' Storage=19,655 cf Inflow=19.74 cfs 1.465 af
Discarded=1.47 cfs 1.043 af Primary=4.32 cfs 0.409 af Secondary=0.88 cfs 0.013 af Outflow=6.66 cfs 1.465 af

**Pond B2: Infiltration Basin 2** Peak Elev=241.55' Storage=19,989 cf Inflow=15.61 cfs 1.218 af
Discarded=1.50 cfs 1.063 af Primary=0.82 cfs 0.154 af Secondary=0.00 cfs 0.000 af Outflow=2.32 cfs 1.218 af

**Link DP1:** Inflow=5.99 cfs 0.648 af
Primary=5.99 cfs 0.648 af

**Link DP2:** Inflow=1.36 cfs 0.150 af
Primary=1.36 cfs 0.150 af

**Link DP3:** Inflow=4.24 cfs 0.441 af
Primary=4.24 cfs 0.441 af

**Total Runoff Area = 10.438 ac Runoff Volume = 3.346 af Average Runoff Depth = 3.85"**
**59.63% Pervious = 6.224 ac 40.37% Impervious = 4.213 ac**



## Summary for Subcatchment P1A:

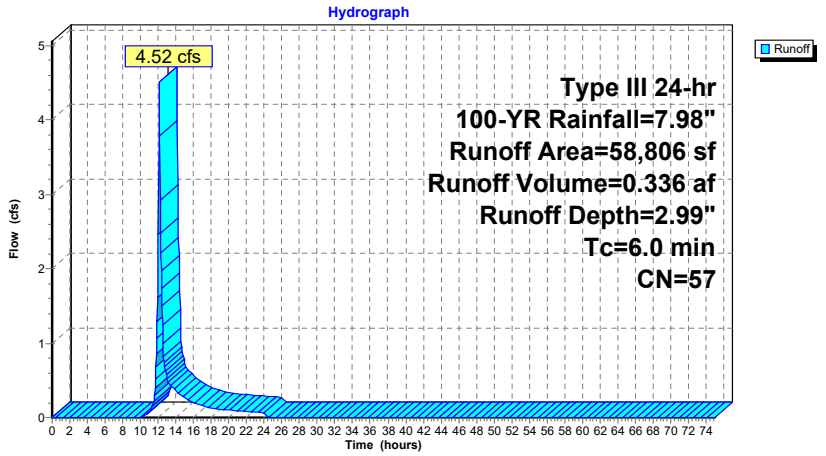
Runoff = 4.52 cfs @ 12.10 hrs, Volume= 0.336 af, Depth= 2.99"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 14,041 | 98 | Paved parking, HSG A |
| 25,305 | 39 | >75% Grass cover, Good, HSG A |
| 13,845 | 30 | Woods, Good, HSG A |
| 5,615 | 98 | Roofs, HSG A |
| 58,806 | 57 | Weighted Average |
| 39,150 | | 66.57% Pervious Area |
| 19,656 | | 33.43% Impervious Area |

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

## Subcatchment P1A:



## Summary for Subcatchment P1B:

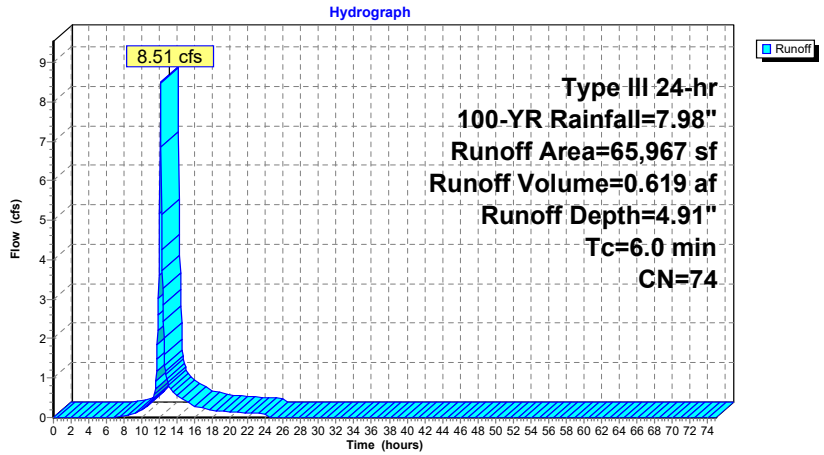
Runoff = 8.51 cfs @ 12.09 hrs, Volume= 0.619 af, Depth= 4.91"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 38,427 | 98 | Paved parking, HSG A |
| 941 | 76 | Gravel roads, HSG A |
| 26,404 | 39 | >75% Grass cover, Good, HSG A |
| 195 | 30 | Woods, Good, HSG A |
| 65,967 | 74 | Weighted Average |
| 27,540 | | 41.75% Pervious Area |
| 38,427 | | 58.25% Impervious Area |

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

### Subcatchment P1B:






## Summary for Subcatchment P1C:

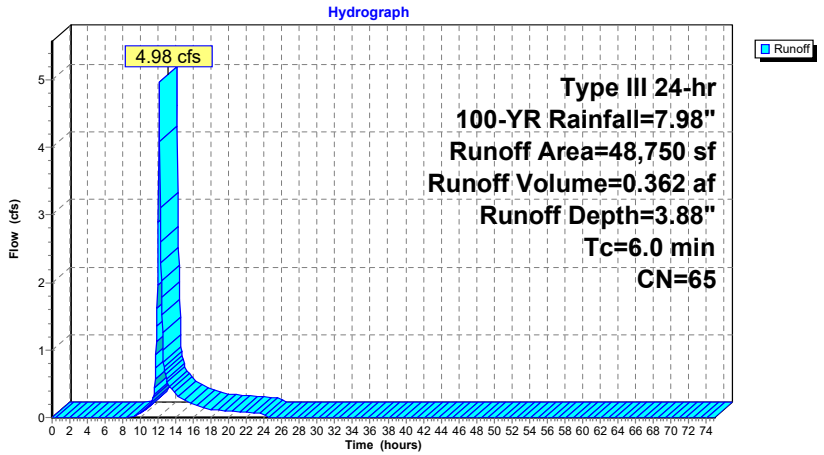
Runoff = 4.98 cfs @ 12.09 hrs, Volume= 0.362 af, Depth= 3.88"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 14,969 | 98 | Paved parking, HSG A |
| 12,574 | 39 | >75% Grass cover, Good, HSG A |
| 12,548 | 30 | Woods, Good, HSG A |
| 8,659 | 98 | Water Surface, 0% imp, HSG A |
| 48,750 | 65 | Weighted Average |
| 33,781 | | 69.29% Pervious Area |
| 14,969 | | 30.71% Impervious Area |

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

### Subcatchment P1C:



## Summary for Subcatchment P1D:

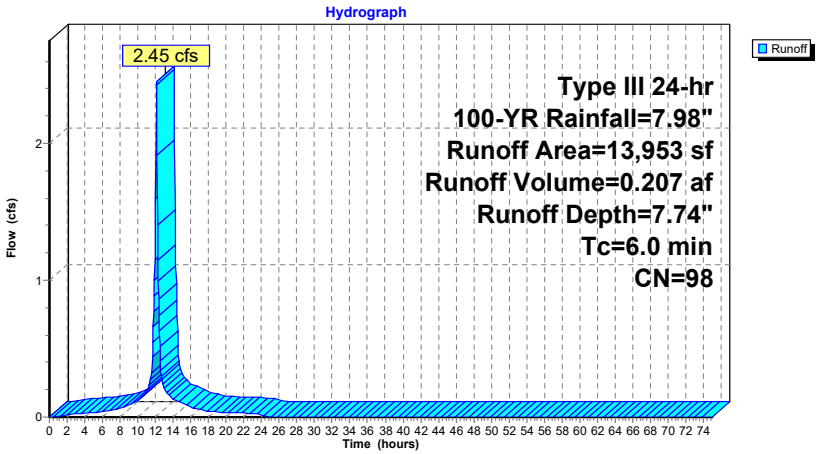
Runoff = 2.45 cfs @ 12.09 hrs, Volume= 0.207 af, Depth= 7.74"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 13,953 | 98 | Roofs, HSG A |
| 13,953 | | 100.00% Impervious Area |

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

### Subcatchment P1D:






## Summary for Subcatchment P1E:

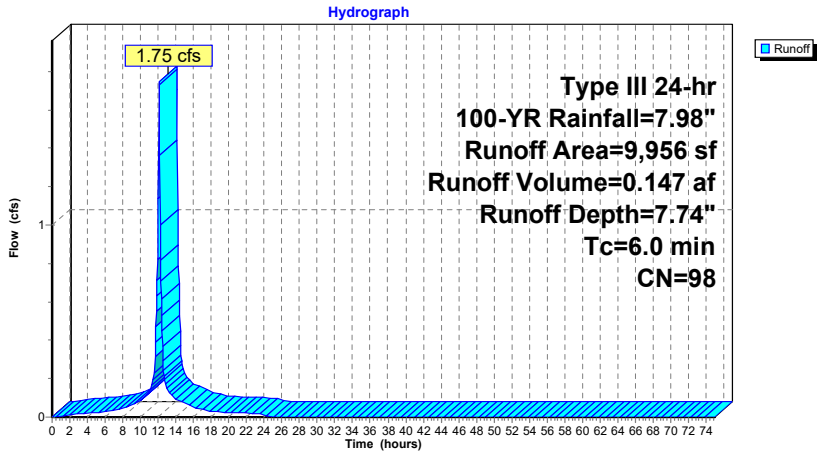
Runoff = 1.75 cfs @ 12.09 hrs, Volume= 0.147 af, Depth= 7.74"
Routed to Pond B1 : Infiltration Basin 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 9,956 | 98 | Roofs, HSG A |
| 9,956 | | 100.00% Impervious Area |

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

### Subcatchment P1E:



## Summary for Subcatchment P1F:

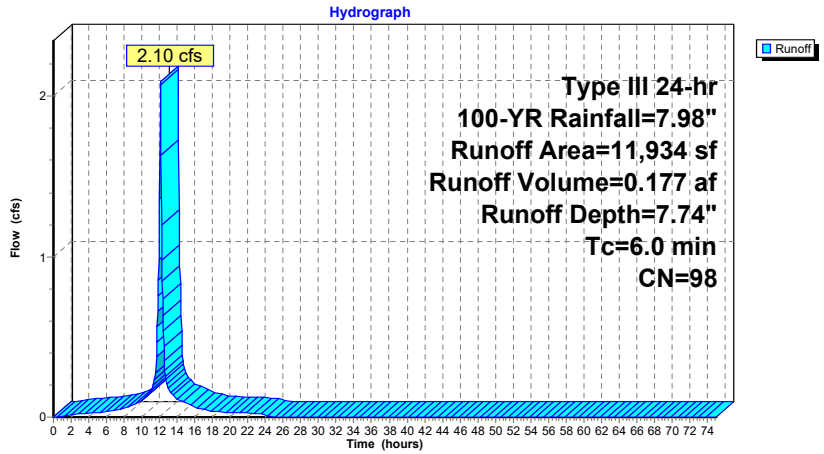
Runoff = 2.10 cfs @ 12.09 hrs, Volume= 0.177 af, Depth= 7.74"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 11,934 | 98 | Roofs, HSG A |
| 11,934 | | 100.00% Impervious Area |

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

### Subcatchment P1F:






## Summary for Subcatchment P1G:

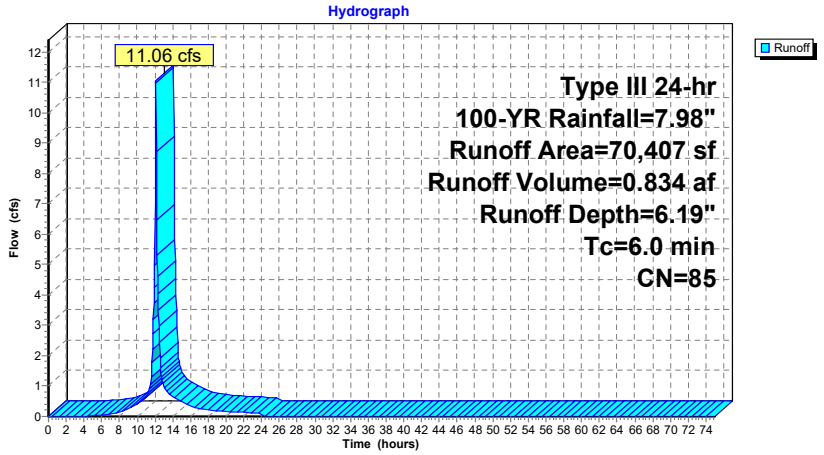
Runoff = 11.06 cfs @ 12.09 hrs, Volume= 0.834 af, Depth= 6.19"
Routed to Pond B2 : Infiltration Basin 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 37,488 | 98 | Paved roads w/curbs & sewers, HSG A |
| 14,758 | 39 | >75% Grass cover, Good, HSG A |
| 611 | 30 | Woods, Good, HSG A |
| 8,038 | 98 | Roofs, HSG A |
| 9,512 | 98 | Water Surface, 0% imp, HSG A |
| 70,407 | 85 | Weighted Average |
| 24,881 | | 35.34% Pervious Area |
| 45,526 | | 64.66% Impervious Area |

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

### Subcatchment P1G:



## Summary for Subcatchment P1H:

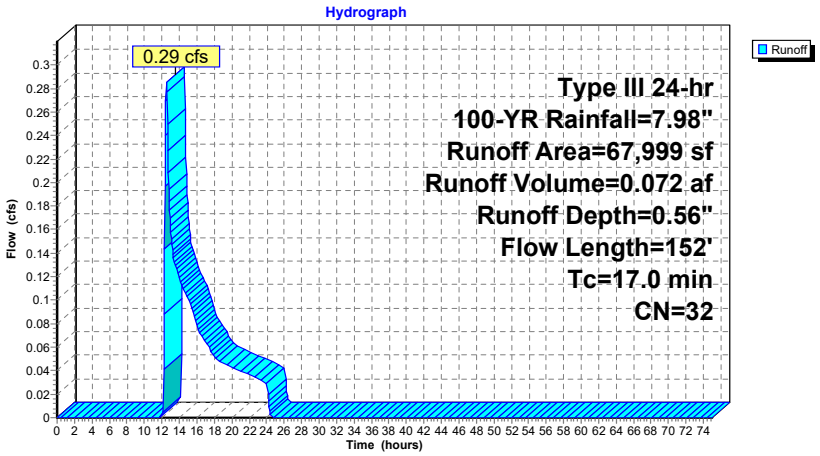
Runoff = 0.29 cfs @ 12.52 hrs, Volume= 0.072 af, Depth= 0.56"
Routed to Link DP1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 15,717 | 39 | >75% Grass cover, Good, HSG A |
| 52,282 | 30 | Woods, Good, HSG A |
| 67,999 | 32 | Weighted Average |
| 67,999 | | 100.00% Pervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.6 | 50 | 0.0136 | 0.06 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 2.4 | 102 | 0.0199 | 0.71 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 17.0 | 152 | Total | | | |

### Subcatchment P1H:






## Summary for Subcatchment P2:

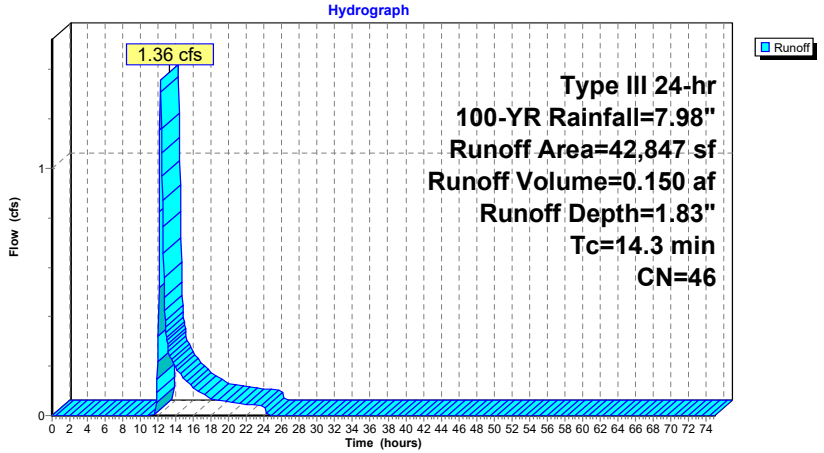
Runoff = 1.36 cfs @ 12.23 hrs, Volume= 0.150 af, Depth= 1.83"
Routed to Link DP2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 8,865 | 98 | Paved parking, HSG A |
| 7,279 | 39 | >75% Grass cover, Good, HSG A |
| 26,703 | 30 | Woods, Good, HSG A |
| 42,847 | 46 | Weighted Average |
| 33,982 | | 79.31% Pervious Area |
| 8,865 | | 20.69% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 14.3 | | | | | **Direct Entry, Same as Pre-dev** |

### Subcatchment P2:



## Summary for Subcatchment P3A:

Runoff = 1.01 cfs @ 12.36 hrs, Volume= 0.133 af, Depth= 1.73"
Routed to Link DP3 :

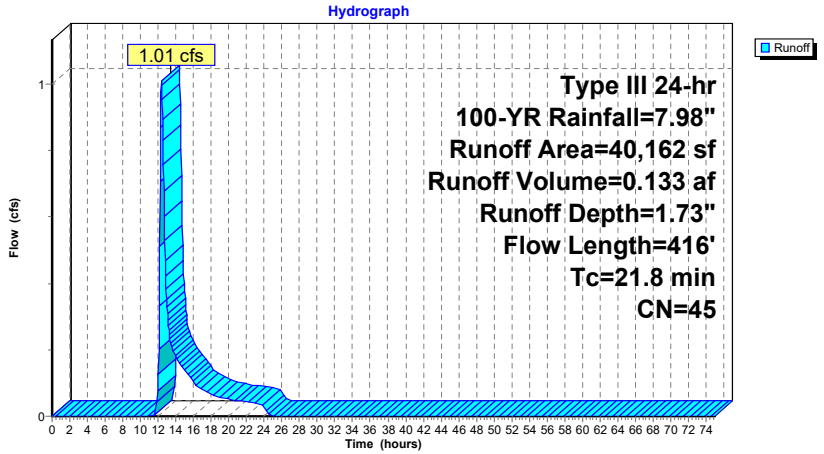
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 303 | 98 | Paved parking, HSG A |
| 30,163 | 49 | 50-75% Grass cover, Fair, HSG A |
| 9,696 | 30 | Woods, Good, HSG A |
| 40,162 | 45 | Weighted Average |
| 39,859 | | 99.25% Pervious Area |
| 303 | | 0.75% Impervious Area |

| Tc (min) | Length (feet) | Slope (ft/ft) | Velocity (ft/sec) | Capacity (cfs) | Description |
|---|---|---|---|---|---|
| 9.2 | 50 | 0.0430 | 0.09 | | **Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.09" |
| 0.6 | 26 | 0.0235 | 0.77 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 0.5 | 33 | 0.0588 | 1.21 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 2.2 | 81 | 0.0149 | 0.61 | | **Shallow Concentrated Flow,** Woodland Kv= 5.0 fps |
| 3.7 | 118 | 0.0057 | 0.53 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 5.6 | 108 | 0.0021 | 0.32 | | **Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps |
| 21.8 | 416 | Total | | | |



## Subcatchment P3A:



## Summary for Subcatchment P3B:

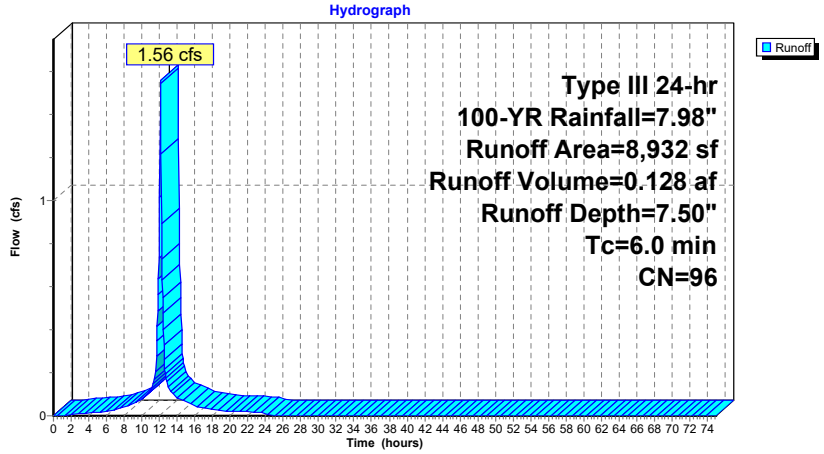
Runoff = 1.56 cfs @ 12.09 hrs, Volume= 0.128 af, Depth= 7.50"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 8,586 | 98 | Paved parking, HSG A |
| 346 | 49 | 50-75% Grass cover, Fair, HSG A |
| 8,932 | 96 | Weighted Average |
| 346 | | 3.87% Pervious Area |
| 8,586 | | 96.13% Impervious Area |

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

### Subcatchment P3B:






## Summary for Subcatchment P3C:

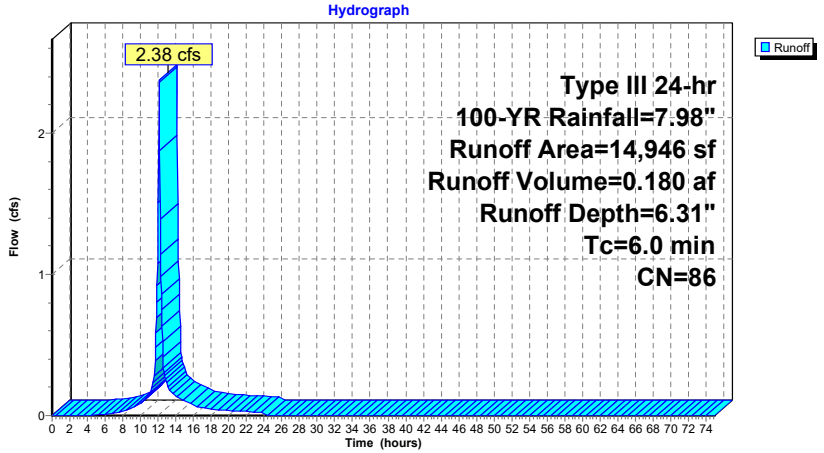
Runoff = 2.38 cfs @ 12.09 hrs, Volume= 0.180 af, Depth= 6.31"
Routed to Link DP3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YR Rainfall=7.98"

| Area (sf) | CN | Description |
|---|---|---|
| 11,361 | 98 | Paved parking, HSG A |
| 3,491 | 49 | 50-75% Grass cover, Fair, HSG A |
| 94 | 30 | Woods, Good, HSG A |
| 14,946 | 86 | Weighted Average |
| 3,585 | | 23.99% Pervious Area |
| 11,361 | | 76.01% Impervious Area |

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

### Subcatchment P3C:



## Summary for Pond B1: Infiltration Basin 1

Inflow Area = 4.212 ac, 45.24% Impervious, Inflow Depth = 4.17" for 100-YR event
Inflow = 19.74 cfs @ 12.09 hrs, Volume= 1.465 af
Outflow = 6.66 cfs @ 12.41 hrs, Volume= 1.465 af, Atten= 66%, Lag= 19.3 min
Discarded = 1.47 cfs @ 12.42 hrs, Volume= 1.043 af
Primary = 4.32 cfs @ 12.42 hrs, Volume= 0.409 af
Routed to Link DP1 :
Secondary = 0.88 cfs @ 12.41 hrs, Volume= 0.013 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 241.10' @ 12.42 hrs Surf.Area= 7,680 sf Storage= 19,655 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 77.9 min ( 899.9 - 822.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 237.50' | 26,990 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 237.50 | 3,493 | 0 | 0 |
| 238.00 | 3,978 | 1,868 | 1,868 |
| 239.00 | 5,033 | 4,506 | 6,373 |
| 240.00 | 6,202 | 5,618 | 11,991 |
| 241.00 | 7,569 | 6,886 | 18,876 |
| 242.00 | 8,659 | 8,114 | 26,990 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 238.75' | **12.0" Round Culvert**<br>L= 78.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 238.75' / 238.25' S= 0.0064 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 241.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 237.50' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 240.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **9.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

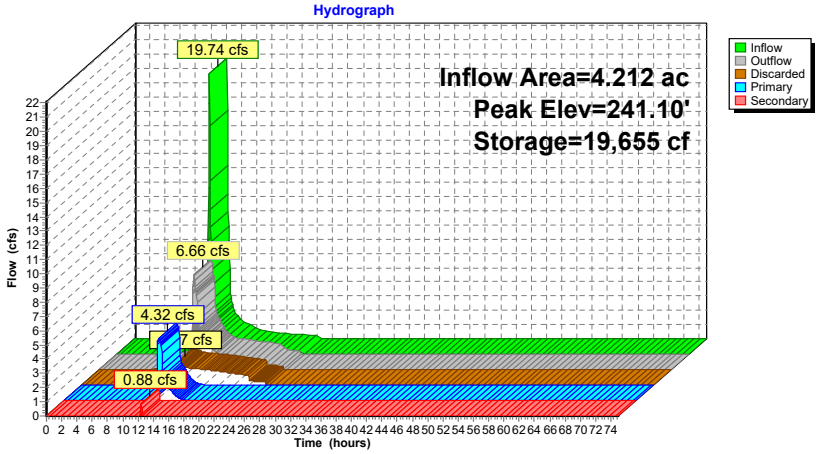


**Discarded OutFlow** Max=1.47 cfs @ 12.42 hrs HW=241.10' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.47 cfs)

**Primary OutFlow** Max=4.31 cfs @ 12.42 hrs HW=241.10' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Barrel Controls 4.31 cfs @ 5.49 fps)
└**4=Grate** (Passes < 12.14 cfs potential flow)
└**5=Orifice** (Passes < 2.26 cfs potential flow)

**Secondary OutFlow** Max=0.84 cfs @ 12.41 hrs HW=241.10' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.84 cfs @ 0.85 fps)

### Pond B1: Infiltration Basin 1



## Summary for Pond B2: Infiltration Basin 2

Inflow Area = 2.211 ac, 74.16% Impervious, Inflow Depth = 6.61" for 100-YR event
Inflow = 15.61 cfs @ 12.09 hrs, Volume= 1.218 af
Outflow = 2.32 cfs @ 12.59 hrs, Volume= 1.218 af, Atten= 85%, Lag= 30.4 min
Discarded = 1.50 cfs @ 12.59 hrs, Volume= 1.063 af
Primary = 0.82 cfs @ 12.59 hrs, Volume= 0.154 af
Routed to Link DP1 :
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 :

Routing by Dyn-Stor-Ind method, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 241.55' @ 12.59 hrs Surf.Area= 7,832 sf Storage= 19,989 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 93.0 min ( 868.0 - 775.0 )

| Volume | Invert | Avail.Storage | Storage Description |
|---|---|---|---|
| #1 | 238.00' | 32,644 cf | **Custom Stage Data (Prismatic)** Listed below (Recalc) |

| Elevation (feet) | Surf.Area (sq-ft) | Inc.Store (cubic-feet) | Cum.Store (cubic-feet) |
|---|---|---|---|
| 238.00 | 3,639 | 0 | 0 |
| 239.00 | 4,684 | 4,162 | 4,162 |
| 240.00 | 5,843 | 5,264 | 9,425 |
| 241.00 | 7,114 | 6,479 | 15,904 |
| 242.00 | 8,427 | 7,771 | 23,674 |
| 243.00 | 9,513 | 8,970 | 32,644 |

| Device | Routing | Invert | Outlet Devices |
|---|---|---|---|
| #1 | Primary | 239.00' | **12.0" Round Culvert**<br>L= 127.0' RCP, square edge headwall, Ke= 0.500<br>Inlet / Outlet Invert= 239.00' / 238.35' S= 0.0051 '/' Cc= 0.900<br>n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf |
| #2 | Secondary | 242.00' | **10.0' long x 1.0' breadth Broad-Crested Rectangular Weir**<br>Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00<br>Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32 |
| #3 | Discarded | 238.00' | **8.270 in/hr Exfiltration over Surface area** |
| #4 | Device 1 | 241.50' | **24.0" x 24.0" Horiz. Grate** C= 0.600<br>Limited to weir flow at low heads |
| #5 | Device 1 | 239.60' | **4.0" Vert. Orifice** C= 0.600 Limited to weir flow at low heads |

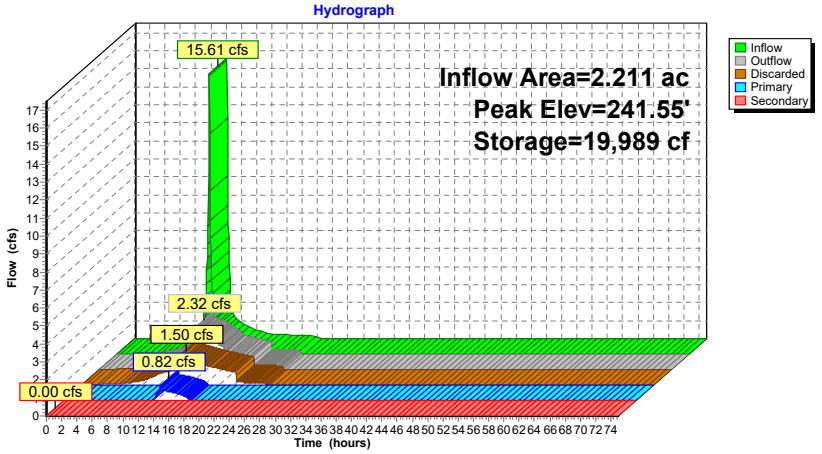


**Discarded OutFlow** Max=1.50 cfs @ 12.59 hrs HW=241.55' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 1.50 cfs)

**Primary OutFlow** Max=0.82 cfs @ 12.59 hrs HW=241.55' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 0.82 cfs of 3.99 cfs potential flow)
└**4=Grate** (Weir Controls 0.26 cfs @ 0.70 fps)
└**5=Orifice** (Orifice Controls 0.56 cfs @ 6.42 fps)

**Secondary OutFlow** Max=0.00 cfs @ 0.00 hrs HW=238.00' TW=0.00' (Dynamic Tailwater)
└**2=Broad-Crested Rectangular Weir** ( Controls 0.00 cfs)

### Pond B2: Infiltration Basin 2

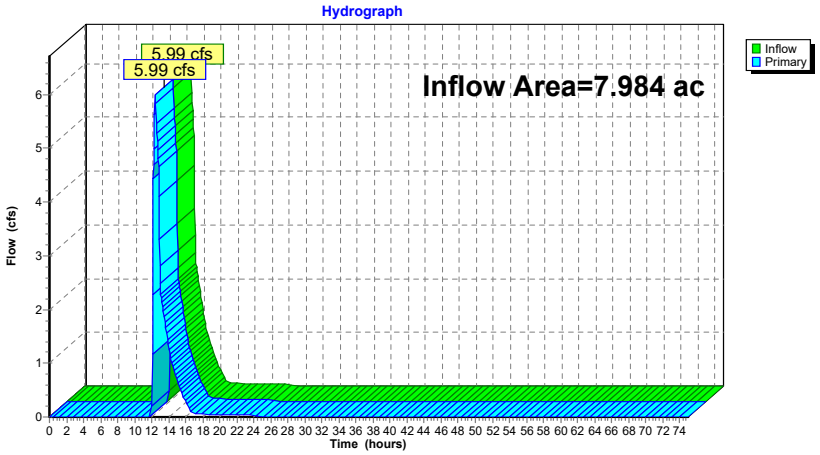


## Summary for Link DP1:

Inflow Area = 7.984 ac, 44.40% Impervious, Inflow Depth = 0.97" for 100-YR event
Inflow = 5.99 cfs @ 12.42 hrs, Volume= 0.648 af
Primary = 5.99 cfs @ 12.42 hrs, Volume= 0.648 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP1:



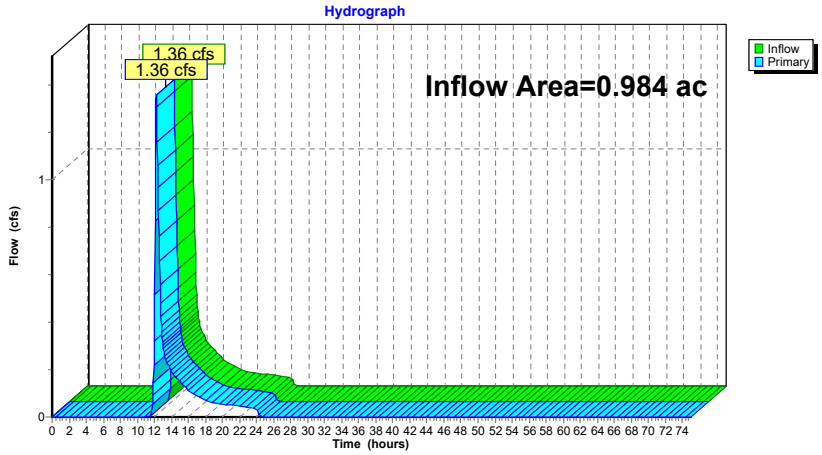



## Summary for Link DP2:

Inflow Area = 0.984 ac, 20.69% Impervious, Inflow Depth = 1.83" for 100-YR event
Inflow = 1.36 cfs @ 12.23 hrs, Volume= 0.150 af
Primary = 1.36 cfs @ 12.23 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP2:

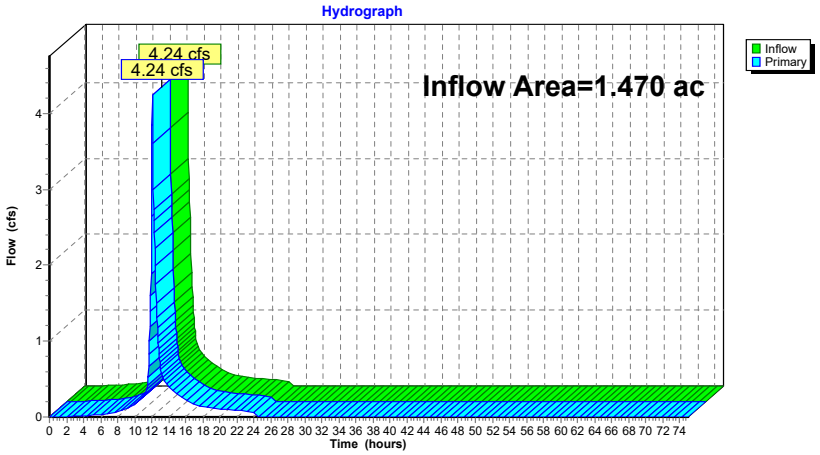


## Summary for Link DP3:

Inflow Area = 1.470 ac, 31.62% Impervious, Inflow Depth = 3.60" for 100-YR event
Inflow = 4.24 cfs @ 12.09 hrs, Volume= 0.441 af
Primary = 4.24 cfs @ 12.09 hrs, Volume= 0.441 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-75.00 hrs, dt= 0.05 hrs

## Link DP3:



# Appendix F

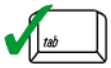
## Stormwater Management Checklist

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

# Checklist for Stormwater Report

## A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## B. Stormwater Checklist and Certification

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

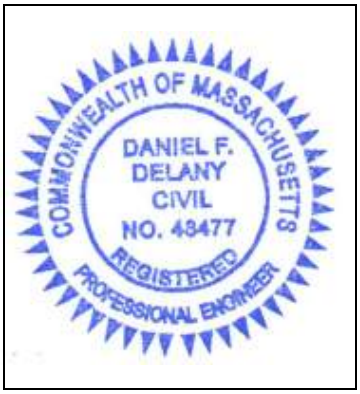
*Note:* Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that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

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

## Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature




3/2/26

Signature and Date

## Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

# Checklist for Stormwater Report

## Checklist (continued)

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

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

**Standard 1: No New Untreated Discharges**

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 2: Peak Rate Attenuation**

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

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

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

**Standard 3: Recharge**

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

**Standard 3: Recharge** (continued)

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

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

**Standard 4: Water Quality**

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

**Standard 6: Critical Areas**

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

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

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

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

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

# Checklist for Stormwater Report

## Checklist (continued)

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

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

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

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

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

**Standard 9: Operation and Maintenance Plan**

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

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

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

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

**Standard 10: Prohibition of Illicit Discharges**

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

☒ An Illicit Discharge Compliance Statement is attached;

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

# Appendix G

## BMP Sizing Calculations

| BMP Sizing Table | | | | | |
|---|---|---|---|---|---|
| **BMP** | **Required Rv (cf)** | **Required WQV (cf)** | **Provided Storage (cf)** | **Treatment %** | **Weighted Treatment %** |
| **1PB** | 5,513 | 9,188 | 9,603 | 105% | 100% |
| **2PB** | 4,046 | 6,744 | 7,181 | 106% | 100% |

# Infiltration Basin B1

**Objective: Size Best Management Practice (BMP) in accordance with Standards 3 and 4 of the MA Stormwater Handbook. BMP shall be sized to infiltrate the required recharge volume (Standard 3) and provide treatment for the required water quality volume (Standard 4).**

**1) Calculate Required Recharge Volume (Standard 3)**

$R_V = (F/12)*(A_{IMP})$ 5,513 cf

| | | |
|---|---|---|
| F (target depth factor) | 0.6 | in (soil group C, Table 2.3.2 of MA Stormwater Handbook) |
| $A_{IMP}$ (impervious area) | 110,260 | sf |

**2) Calculate Drawdown Time (Standard 3)**

$T_d$=Storage Volume / (K*(1'/12")*Bottom Area)= 4 hours

| | | |
|---|---|---|
| Storage Volume | 9,603 | cf at lowest el. 239.60 orifice elevation (from HydroCad) |
| K (sat. hydraulic conductivity) | 8.27 | in/hr (Rawls Rate for Sandy Loam, Table 2.3.3 of MA Stormwater Handbook) |
| Bottom Area | 3,493 | sf (from HydroCAD) |

**4 < 72 hrs**

**3) Calculate Water Quality Volume (WQv) (Standard 4)**

$V_{WQ} = (D_{WQ}/12)*(A_{IMP})$= 9,188 cf

| | | | |
|---|---|---|---|
| $D_{WQ}$ (water quality depth) | 1 | in | (1" for LUHPPL, Zone II, or critical area, 0.5" other) |
| $A_{IMP}$ (impervious area) | 110,260 | sf | |

**4) Size BMP to store greater of $V_{WQ}$ and $R_V$**

| | | | |
|---|---|---|---|
| $V_{WQ}$= | 9,188 | cf | |
| $R_V$= | 5,513 | cf | |
| Actual Storage= | 9,603 | cf | (from HydroCAD) |

**9,603 > 9,188**

# Infiltration Basin B2

**Objective: Size Best Management Practice (BMP) in accordance with Standards 3 and 4 of the MA Stormwater Handbook. BMP shall be sized to infiltrate the required recharge volume (Standard 3) and provide treatment for the required water quality volume (Standard 4).**

**1) Calculate Required Recharge Volume (Standard 3)**

$R_V = (F/12)*(A_{IMP})$ 4,046 cf

| | | |
|---|---|---|
| F (target depth factor) | 0.6 | in (soil group C, Table 2.3.2 of MA Stormwater Handbook) |
| $A_{IMP}$ (impervious area) | 80,925 | sf |

**2) Calculate Drawdown Time (Standard 3)**

$T_d$=Storage Volume / (K*(1'/12")*Bottom Area)= 3 hours

| | | |
|---|---|---|
| Storage Volume | 7,181 | cf at lowest el. 239.60 orifice elevation (from HydroCad) |
| K (sat. hydraulic conductivity) | 8.27 | in/hr (Rawls Rate for Sandy Loam, Table 2.3.3 of MA Stormwater Handbook) |
| Bottom Area | 3,639 | sf (from HydroCAD) |

**3 < 72 hrs**

**3) Calculate Water Quality Volume (WQv) (Standard 4)**

$V_{WQ} = (D_{WQ}/12)*(A_{IMP})$= 6,744 cf

| | | |
|---|---|---|
| $D_{WQ}$ (water quality depth) | 1 | in (1" for LUHPPL, Zone II, or critical area, 0.5" other) |
| $A_{IMP}$ (impervious area) | 80,925 | sf |

**4) Size BMP to store greater of $V_{WQ}$ and $R_V$**

| | | | |
|---|---|---|---|
| $V_{WQ}$= | 6,744 | cf | |
| $R_V$= | 4,046 | cf | |
| Actual Storage= | 7,181 | cf | (from HydroCAD) |

**7,181 > 6,744**

# Appendix H

## TSS Removal Calculations

| | | | |
|---|---|---|---|
| **Project:** | South Hadley Electric Light Department | **Prepared By:** | AHN |
| **Site Location:** | Old Lyman Road, South Hadley, MA | **Date:** | 3/2/2026 |
| **Project Number:** | 20250806.A10 | | |
| **Outfall Location:** | Pretreatment - DP1 | | |
| **Treatment Train:** | CB-B1 | | |

| BMP | TSS Removal Efficiency | Starting TSS Load | TSS Removed | TSS Remaining |
|---|---|---|---|---|
| Deep Sump Catch Basin | 25% | 1.00 | 0.25 | 0.75 |
| Sediment Forebay | 25% | 0.75 | 0.19 | 0.56 |
| | | 0.56 | 0.00 | 0.56 |
| | | 0.56 | 0.00 | 0.56 |

**Total TSS Removal Efficiency = 44%**

| | | | |
|---|---|---|---|
| **Project:** | South Hadley Electric Light Department | **Prepared By:** | AHN |
| **Site Location:** | Old Lyman Road, South Hadley, MA | **Date:** | 3/2/2026 |
| **Project Number:** | 20250806.A10 | | |
| **Outfall Location:** | DP1 | | |
| **Treatment Train:** | CB-B1 | | |

| BMP | TSS Removal Efficiency | Starting TSS Load | TSS Removed | TSS Remaining |
|---|---|---|---|---|
| Deep Sump Catch Basin | 25% | 1.00 | 0.25 | 0.75 |
| Infiltration Basin | 80% | 0.75 | 0.60 | 0.15 |
| | | 0.15 | 0.00 | 0.15 |
| | | 0.15 | 0.00 | 0.15 |

**Total TSS Removal Efficiency = 85%**

| | | | |
|---|---|---|---|
| **Project:** | South Hadley Electric Light Department | **Prepared By:** | AHN |
| **Site Location:** | Old Lyman Road, South Hadley, MA | **Date:** | 3/2/2026 |
| **Project Number:** | 20250806.A10 | | |
| **Outfall Location:** | Pretreatment - DP2 | | |
| **Treatment Train:** | CB-B2 | | |

| BMP | TSS Removal Efficiency | Starting TSS Load | TSS Removed | TSS Remaining |
|---|---|---|---|---|
| Deep Sump Catch Basin | 25% | 1.00 | 0.25 | 0.75 |
| Sediment Forebay | 25% | 0.75 | 0.19 | 0.56 |
| | | 0.56 | 0.00 | 0.56 |
| | | 0.56 | 0.00 | 0.56 |

**Total TSS Removal Efficiency = 44%**

| | | | |
|---|---|---|---|
| **Project:** | South Hadley Electric Light Department | **Prepared By:** | AHN |
| **Site Location:** | Old Lyman Road, South Hadley, MA | **Date:** | 3/2/2026 |
| **Project Number:** | 20250806.A10 | | |
| **Outfall Location:** | DP2 | | |
| **Treatment Train:** | CB-B2 | | |

| BMP | TSS Removal Efficiency | Starting TSS Load | TSS Removed | TSS Remaining |
|---|---|---|---|---|
| Deep Sump Catch Basin | 25% | 1.00 | 0.25 | 0.75 |
| Infiltration Basin | 80% | 0.75 | 0.60 | 0.15 |
| | | 0.15 | 0.00 | 0.15 |
| | | 0.15 | 0.00 | 0.15 |

**Total TSS Removal Efficiency = 85%**

# Appendix I

## Long-Term Operation and Maintenance Plan

FUSS & O'NEILL
1550 Main Street, Suite 400
Springfield, MA 01103
413.452.0445
www.fando.com

# Long-Term Operation and Maintenance Plan
# South Hadley Electric Light Department
## Willimansett Street, South Hadley, Massachusetts

**Prepared For:**
## South Hadley Electric Light Department
**South Hadley, Massachusetts**

March 2, 2026

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End of Report

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B Annual O&M Budgetary Opinion of Cost


End of Report

# 1 Introduction

The purpose of this Long-Term Operation and Maintenance Plan (O&M Plan) is to outline the requirements for source control and pollution prevention for the proposed South Hadley Light Department HQ Complex located on Willimansett Street in South Hadley, Massachusetts. The site is currently mostly undeveloped with grassed and wooded areas. An existing paved driveway is located on the northern portion of the site. The site is bound by the existing Big Y located to the west, Old Lyman Road to the east and private properties to the south. The project location is depicted on the Site Location Map attached as *Figure 1.*

The proposed includes the construction of a new South Hadley Electric Light District Headquarters, which includes a main office building, a warehouse, and a garage space, along with associated parking lots, sidewalks, stormwater infrastructure, utilities, and landscaping.

The Stormwater Management system is comprised of infiltration basins, and a stormwater collection system. *Figure 2* provides a map depicting the location of the BMPs.

The long-term requirements include following proper site operation procedures and implementing an inspection and maintenance program to ensure the success and minimize the deterioration of the stormwater system over time. The Contractor is responsible for implementing this O&M Plan during construction. The Owner (South Hadley Electric Light Department) is responsible thereafter. Maintenance operations shall be funded by the Owner. In the event the facility becomes owned by different entities, this Long-Term Operation and Maintenance Plan shall be transferred to the future owners/operators. Checklists to assist with the inspection and maintenance activities are provided in *Appendix A*.

This plan has been prepared in accordance with the requirements set forth in Standard 4 and Standard 9 of the Massachusetts Stormwater Handbook.

# 2 Pollution Prevention

The following pollution prevention activities shall be conducted to minimize potential impacts on stormwater runoff quality. The Contractor is responsible for all activities during construction. The Owner is responsible thereafter.

## 2.1 Good Housekeeping

Good housekeeping shall be implemented to minimize the impacts to protected areas by pollutants, soil, and fugitive sediment. The site shall be kept in good working order. Trash shall be kept in covered containers (i.e., dumpsters) to prevent waste from escaping. Fugitive litter that is deposited on the site shall be removed and placed in a proper enclosed container.

## 2.2 Vehicle Washing

The washing of vehicles is to occur on concrete aprons. Vehicle washing is not to occur during rain events.

During vehicle washing, the following procedure shall be followed:

1. Inspect vehicles for leaks.

2. Wash vehicles using domestic water and soaps recommended by the manufacturer for outdoor vehicle washing. Do not use harsh detergents or de-greasers. Do not wash materials from vehicles that could cause pollution in the environment. Do not wash the interior truck beds, engine compartments, undercarriages, or similar components.

3. Upon completion of vehicle washing, remove vehicle from area. Rinse concrete pad to divert residual wash water towards sediment forebay.

## 2.3 Chemical and Petroleum Products

All chemical and petroleum product containers stored on the site (excluding those contained within vehicles and equipment) shall be provided with impermeable containment which will hold at least 110% of the volume of the largest container, or 10% of the total volume of all containers in the area, whichever is larger, without overflow from the containment area. All chemicals and their containers shall be stored under a roofed area. Containers of 100 gallons capacity or more may be stored without a roof only if stored in a double-walled tank. On-site vehicles shall be monitored for leaks and receive maintenance as needed.

### 2.3.1 Spill Control Practices

Any discharge of waste oil or other pollutant to the stormwater system will be reported immediately to the Massachusetts Department of Environmental Protection (MA DEP). The Owner will be responsible for any incident of groundwater contamination resulting from the improper discharge of pollutants to the stormwater system and may be required by MA DEP to remediate incidents that may impact groundwater quality. Should property ownership be transferred, the subsequent owner/operator will be informed of the legal responsibilities associated with operation of the stormwater system, as indicated above.

The following practices shall be implemented to mitigate spills of material and prevent their release to the waters of the Commonwealth:

- The manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.

- Materials and equipment necessary for spill cleanup will be kept in material storage areas. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.

- Spills will be cleaned up immediately after discovery.

- Spills of toxic or hazardous material will be reported to the appropriate State and local government agency, regardless of size.

## 2.4 Landscaped Areas

Lawn areas will be mowed during the growing seasons as required to maintain a healthy stand of vegetation. This is typically once a week but can vary depending on weather conditions. If bagged, grass clippings are to be removed from the site and legally disposed of at an off-site location.

Fertilizers, if required for the maintenance of lawn areas, will be applied only in the amounts recommended by the manufacturer. If kept on site, fertilizers will be stored in a covered area. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.

## 2.5 Pet Waste Management

There are no provisions for accommodating pets as part of the public safety facility operation. If pets or service animals are required by facility staff, the O&M Plan shall be amended to include pet waste management practices.

## 2.6 Snow Management

Stormwater runoff caused by snow melt must be properly managed to prevent erosion and pollution. The removal of snow and ice during precipitation events is especially important for SHELD to ensure a safe means of egress from the site, allowing for faster emergency response times. Therefore, a snow management plan has been developed to identify storage areas throughout the site.

Determine the best areas on the site to stockpile snow, keeping pedestrians and car routes cleared. Also take into consideration the locations of BMPs to ensure proper functioning of the stormwater management system. *Figure 3*, Snow Storage Plan, provides a map showing the snow storage locations.

# 3 Inspection and Maintenance Requirements for Permanent Stormwater Controls

The following inspection and maintenance activities shall be conducted to ensure the success and minimize the deterioration of the stormwater system over time. *Figure 2* provides a map depicting the location of the components of the stormwater management system. Checklists to assist with the inspection and maintenance activities are provided in *Appendix A*.

## 3.1 Infiltration Basins

### 3.1.1 Post-Construction Inspections

Following construction, the infiltration basins shall be inspected after every storm event larger than one inch in the first six months. The appearance of standing water 48 to 72 hours post storm event may indicate that there is clogging. Clogging can be the result of upland sediment erosion, excessive compaction of soil, or low spots and should be addressed immediately.

Vegetation shall be watered once every two to three days for first two months, then sporadically after establishment during the first year after installation. If droughty, watering after the initial year may be required.

If at least 25 percent vegetation coverage is not established after the first growing season, reinforcement planting should be installed. If the surface of the basins becomes clogged to the point that standing water is observed on the surface 72 hours after precipitation events, remove accumulated sediment or till the surface to break up any hard-packed soil and then vegetate.

### 3.1.2 Monthly Periodic Inspections

The infiltration basins shall be inspected monthly for evidence for vegetation health and the presence of trash (e.g., litter, debris, etc.). Trash deposited on the surface of the basins shall be removed manually and shall be disposed of in accordance with applicable local, state, and federal guidelines and regulations. Mowing shall occur when vegetation reaches a height at which it cannot support its own weight (typically two (2) to twelve (12) times per year), remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Inspect and clean pretreatment devices associated with basins at least twice a year, and ideally every other month.

### 3.1.3 Semiannual Inspections

Inspections should occur twice per year. During these inspections the infiltration basins should be checked for signs of differential settlement, cracking, erosion, leakage, conditions of riprap, sediment accumulation, and the health of the turf.

Sediment shall be removed from the basins when the accumulation exceeds one inch or when there is evidence that the infiltration capacity has been significantly reduced. Sediment and debris must be removed manually with rakes rather than heavy equipment to avoid compacting. Removed sediments shall be dewatered (if necessary) and disposed of in an acceptable manner.

Use deep tilling to break up clogged surfaces and revegetate immediately. Remove sediment from the basins as necessary but wait until the floor of the basins are thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible.

Any areas within the extents of the basins that are subject to erosion or gullying shall be replenished with the original design material and re-vegetated according to design drawings. Prune vegetated areas and remove any dead materials. Separation of herbaceous vegetation rootstock should occur when over-crowding is observed, or approximately once every three years. If required, apply fertilizer to areas where vegetation is not fully established.

## 3.2 Sediment Forebays

### 3.2.1 Post-Construction Inspections

Sediment forebays shall be inspected after every storm event larger than one inch in the first six months following construction.

If the surface of the forebays becomes clogged to the point that standing water is observed on the surface 36 hours after precipitation events, remove accumulated sediment or till the surface to break up any hard-packed soil and then vegetate.

Vegetation shall be watered once every two to three days for the first two months, then sporadically after establishment during the first year after installation. If droughty, watering after the initial year may be required. If at least 25 percent vegetation coverage is not established after the first growing season, reinforcement planting should be installed.

### 3.2.2 Monthly Periodic Inspections

The sediment forebay shall be inspected monthly for evidence for vegetation health, the presence of trash (e.g., litter, debris, etc.), and sediment accumulation. Trash deposited on the surface of the forebays should be removed manually and shall be disposed of in accordance with applicable local, state, and federal guidelines and regulations.

If sediment has accumulated to half the depth of the forebay, remove the sediment. Otherwise, note the depth on the inspection checklist. Sediment and debris must be removed manually with rakes rather than heavy equipment to avoid compacting. Removed sediments shall be dewatered (if necessary) and disposed of in accordance with applicable local, state, and federal guidelines and regulations.

### 3.2.3 Quarterly Inspections

The quarterly inspection of the forebays should include checking for standing water or other evidence of clogging by accumulated sediments, checking inlets and outlets for signs of erosion and damage, checking the overflow structures for blockage and structural integrity, and checking the slopes of the forebays for erosion or gullying. Inspect stone to determine if high flows have caused scour beneath the channels or dislodged any of the stone. If repairs are needed, they should be performed immediately.

Remove accumulated sediment on a quarterly basis, regardless of the depth. Sediment and debris must be removed manually with rakes rather than heavy equipment to avoid compacting. Removed sediments shall be dewatered (if necessary) and disposed of in accordance with applicable local, state, and federal guidelines and regulations.

If the forebay is clogged, use deep tilling to break up clogged surfaces. If required, remove sediment from the forebays as necessary but wait until the floor of the forebays are thoroughly dry. Use light equipment to remove the top layer so as to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible.

Any areas that are subject to erosion or gullying shall be replenished with topsoil and re-vegetated according to design drawings. Erosion control blankets shall be used as needed to ensure stabilization of the floor and side slopes of the forebay during revegetation.

### 3.2.4 Mowing

The forebay shall be mowed as required to maintain a healthy stand of grass between three (3) and six (6) inches tall.

## 3.3 Drainage Structures

### 3.3.1 Post-Construction Inspections

Immediately prior to the end of construction and acceptance by the Owner, the Contractor shall clean all drainage structures.

### 3.3.2 Quarterly Inspections

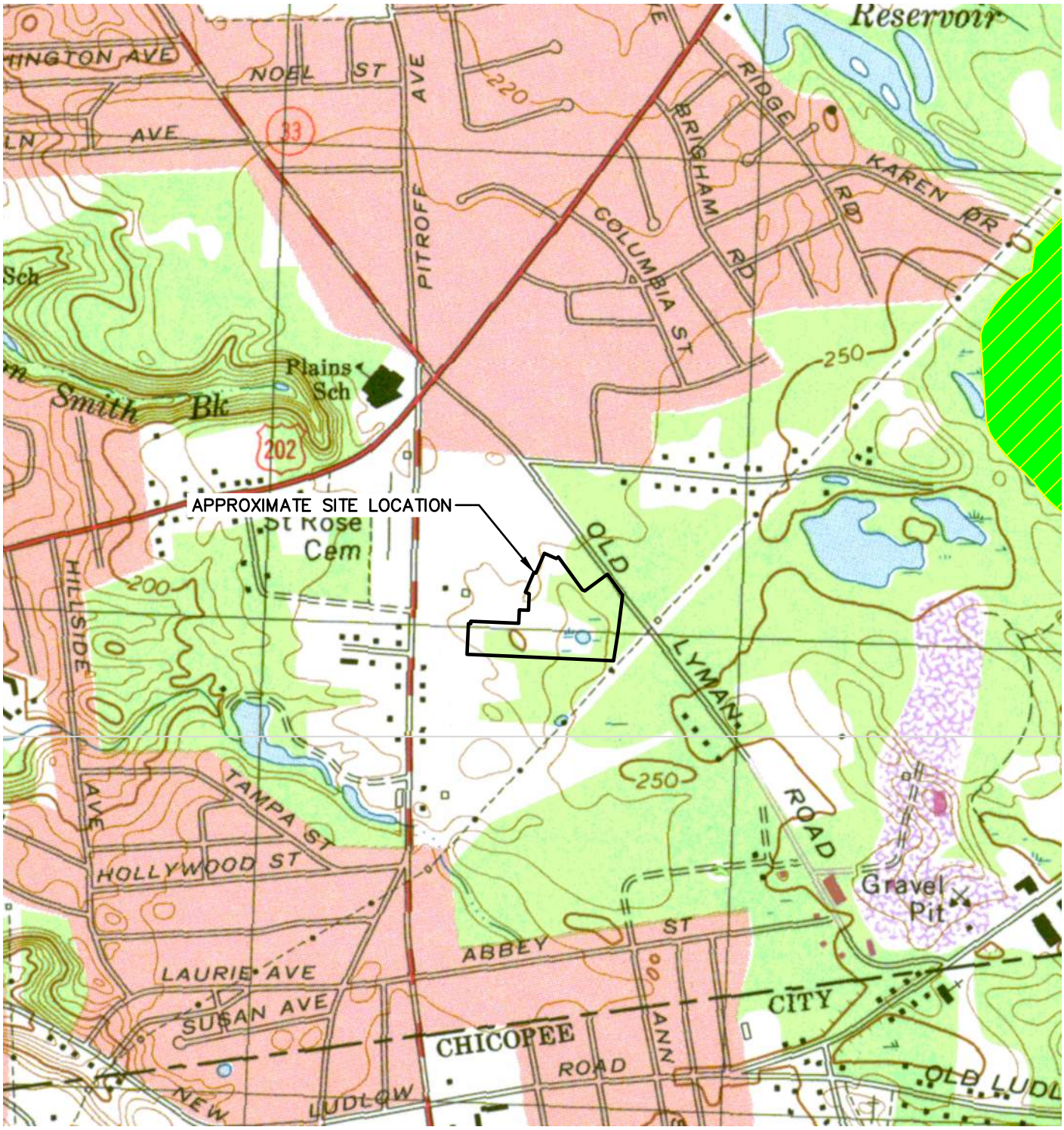
Drainage structures shall be inspected at minimum of four times per year, at minimum. Sediment shall be removed at least twice per year, or when the depth reaches half the height between the bottom of the structure and the lowest pipe invert elevation. Inspections shall include checking for debris, sediment, and hydrocarbons, and structural integrity or damage. Deficiencies must be corrected immediately. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations. Grates shall not be welded to the frame so the structures can be easily inspected and maintained.

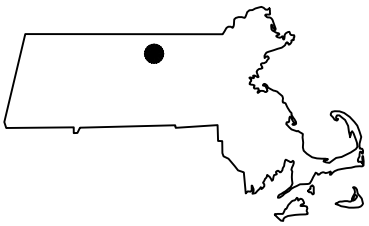
## 3.4 Anticipated Costs

The annual cost for the inspections and maintenance of the property is estimated to be from $15,000 to $23,000 per year, if performed by an independent third party. A budgetary opinion of cost of the maintenance is included in *Appendix B.*

# Figure 1

Site Location Map



MAP REFERENCE
THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAHIC QUADRANGLE IMAGES: q113882, q113886. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 02/19/2026.
ORIGINAL MAP UNITS IN METERS.

| | | | |
|---|---|---|---|
| SCALE: HORZ.: 1" = 1000' VERT.: - DATUM: HORZ.: - VERT.: - 0 500' 1000' GRAPHIC SCALE | FUSS & O'NEILL<br>1550 MAIN STREET, SUITE 400<br>SPRINGFIELD, MA 01103<br>413.452.0445<br>www.fando.com | SHELD<br>SITE LOCATION MAP<br>SHELD HEADQUARTERS<br>SOUTH HADLEY MASSACHUSETTS | PROJ. No.: 20250806A10<br>DATE: 03/02/2026<br>FIG.01 |

File: J:\DWG\P20250806A10\Civil\Figures\20250806A10_LOC01.dwg Layout: FIG.01 Plotted: 2026-02-25 3:29 PM Saved: 2026-02-25 3:28 PM User: Amina.Nefic
MS VIEW: LAYER STATE: PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO.STB

# Figure 2

BMP Location Plan

File: J:\DWG\P2025\0806\A10\Civil\Figures\20250806A10_BMP01.dwg Layout: BMP Plotted: 2026-02-27 2:59 PM Saved: 2026-02-27 2:58 PM User: Amina.Nefic
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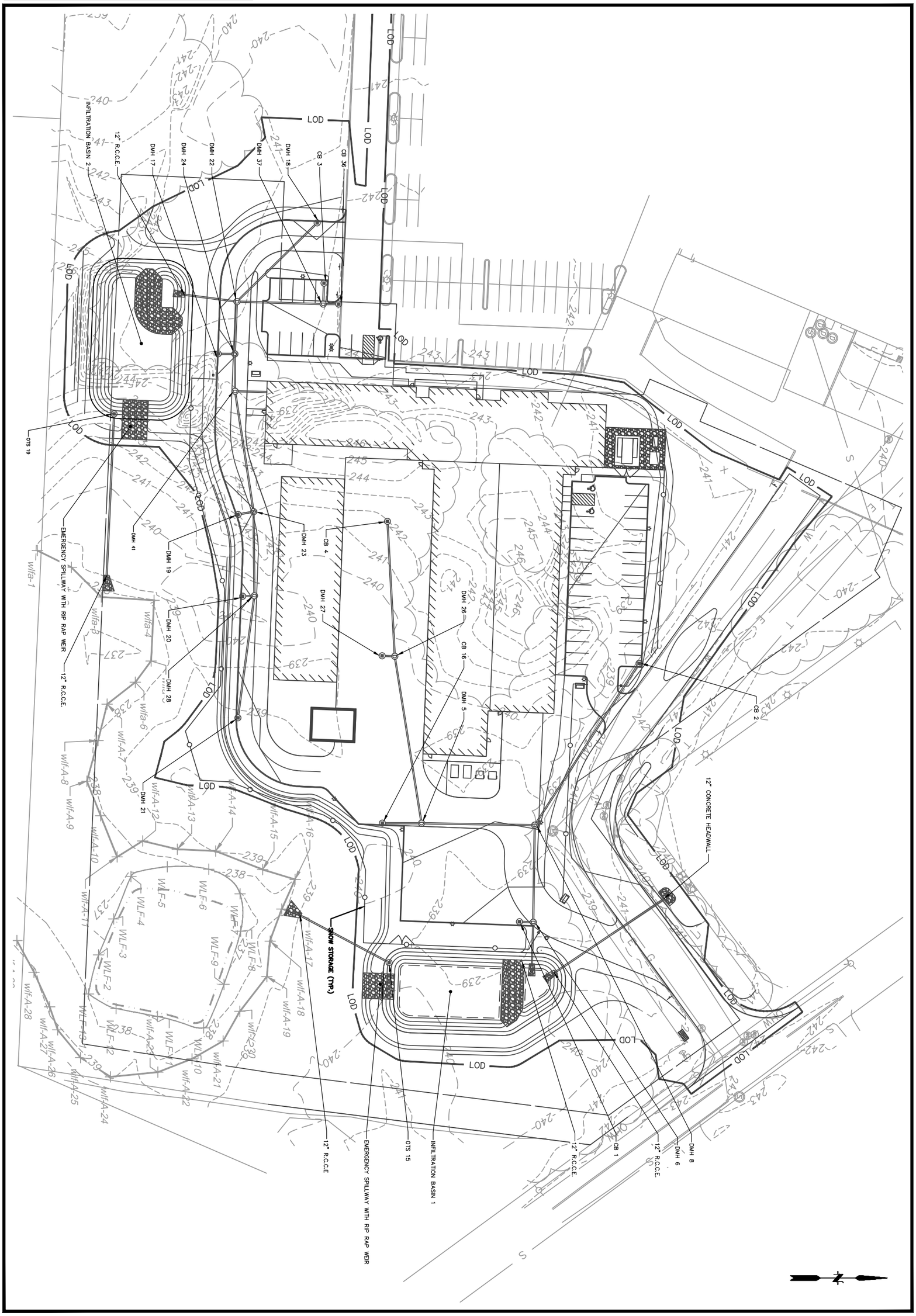


FIG.02

PROJ. No: 20250806A10
DATE: 03/02/2026

SHELD

BMP LOCATION MAP

SHELD HEADQUARTERS

SOUTH HADLEY MASSHUSETTS

FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com

SCALE:
HORZ.: 1" = 60'
VERT.: -
DATUM:
HORZ.: -
VERT.: -
0 30' 60'
GRAPHIC SCALE

# Figure 3

Snow Storage Plan

File: J:\DWG\P2025\0806\A10\Civil\Figures\20250806A10_BMP01.dwg Layout: SNOW STORAGE Plotted: 2026-02-25 3:02 PM Saved: 2026-02-25 2:54 PM User: Amina.Nefic
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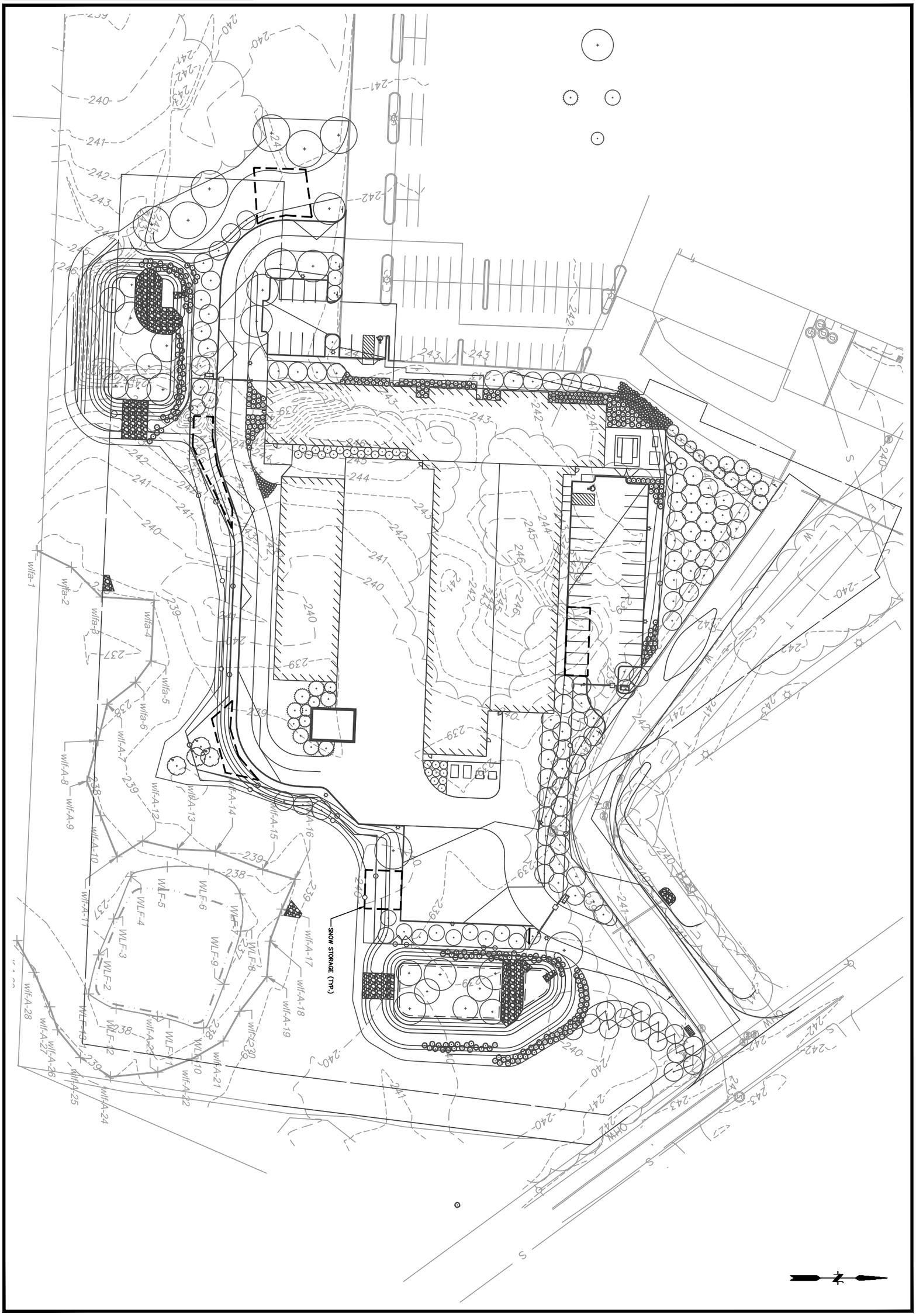


FIG.03

PROJ. No: 20250806A10
DATE: 03/02/2026

SHELD

SNOW STORAGE PLAN

SHELD HEADQUARTERS

SOUTH HADLEY MASSACHUSETTS

FUSS & O'NEILL
1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fando.com

SCALE:
HORZ.: 1" = 70'
VERT.: -
DATUM:
HORZ.: -
VERT.: -
0 35' 70'
GRAPHIC SCALE

# Appendix A

## Operation, Maintenance, and Management Inspection Checklist

**Operation, Maintenance, and Management Inspection Checklists**
**Master Checklist**
**South Hadley Electric Light Department**

**Inspection Year:** _____

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Infiltration Basins** | | | | | | | | | | | | |
| Inspect for and remove trash (monthly) | | | | | | | | | | | | |
| Mow (as needed) | | | | | | | | | | | | |
| Semi-Annual Inspection | | | | | | | | | | | | |
| **Sediment Forebay** | | | | | | | | | | | | |
| Inspect for and Remove Trash (monthly) | | | | | | | | | | | | |
| Mow (as required) | | | | | | | | | | | | |
| Annual Inspection | | | | | | | | | | | | |
| **Drainage Structures** | | | | | | | | | | | | |
| Quarterly Inspection | | | | | | | | | | | | |

**Operation, Maintenance, and Management Inspection Checklists**
**Infiltration Basins**
**South Hadley Electric Light Department**

Inspector Name: _____

Inspection Date: _____

Reviewed By: _____

Review Date: _____

**Type of Inspection (Circle One):**

Monthly Semi-Annual

**BMP Name:**

_____

| No. | Monthly | Semi-Annual | Item | Criteria | Satisfactory | Unsatisfactory | Notes |
|---|---|---|---|---|---|---|---|
| 1 | | | Trash/Debris | Basin is free of debris, litter, and waste. | | | |
| 2 | | | Turf | Grass has not reached a height at which it cannot support its own weight | | | |
| 3 | | | Sediment | Depth of Sediment is less than one inch. | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | | | Clogging | Basins appears to be draining freely and not clogged. | | | |
| 5 | | | Overflow Structures | Overflow structures are free of blockage and are structurally sound | | | |
| 6 | | | Erosion | There are no signs of erosion and scouring. | | | |
| 7 | | | Vegetation | Vegetation is satisfactorily pruned to remove any dead material. Rootstocks are not overcrowded. | | | |

**Operation, Maintenance, and Management Inspection Checklists**
**Sediment Forebay**
**South Hadley Electric Light Department**

Inspector Name: _____

Inspection Date: _____

Reviewed By: _____

Review Date: _____

**Type of Inspection (Circle One):**

Monthly Annual

**BMP Name:**

_____

| No. | Monthly | Annual | Item | Criteria | Satisfactory | Unsatisfactory | Notes |
|---|---|---|---|---|---|---|---|
| 1 | | | Trash/Debris | Basin is free of debris, litter, and waste. | | | |
| 2 | | | Turf | Grass is between three and six inches tall. | | | |
| 3 | | | Sediment | Depth of sediment is less than half the depth of the forebay. | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 4 | | | Clogging | Basins appears to be draining freely and not clogged. | | | |
| 5 | | | Overflow Structures | Overflow structures are free of blockage and are structurally sound | | | |
| 6 | | | Erosion | There are no signs of erosion and scouring. | | | |
| 7 | | | Vegetation | Vegetation is satisfactorily pruned to remove any dead material. Rootstocks are not overcrowded. | | | |

**Operation, Maintenance, and Management Inspection Checklists**
**Drainage Structures**
**South Hadley Electric Light Deparment**

Inspector Name: _____

Inspection Date: _____

Reviewed By: _____

Review Date: _____

**Type of Inspection (Circle One):**

Quarterly

**Structure Name:**

_____

| No. | Quarterly | Item | Criteria | Satisfactory | Unsatisfactory | Notes |
|---|---|---|---|---|---|---|
| 1 | | Trash/Debris | Structure is free of debris, litter, and waste. | | | |
| 2 | | Sediment | Depth of sediment is less than half the height between the bottom of the structure and the lowest pipe invert elevation and has been removed within the last six months. | | | |
| 3 | | Concrete Surfaces | Concrete surfaces are structurally sound and have negligible spalling and cracking. | | | |

# Appendix B

## Annual O&M Budgetary Opinion of Cost

FUSS & O'NEILL

**FUSS & O'NEILL, INC.**

| **BUDGETARY OPINION OF COST** | DATE PREPARED : 03/02/2026 | SHEET 1 OF 1 |
|---|---|---|
| PROJECT : Peabody Public Safety Headquarters | BASIS : | |
| LOCATION : 44 Willimantic Street, South Hadley, Massachusetts | | |
| DESCRIPTION: Long Term Stormwater O&M Costs | ESTIMATOR : | CHECKED BY : |

Since Fuss & O'Neill has no control over the cost of labor, materials, equipment or services furnished by others, or over the Contractor(s)' methods of determining prices, or over competitive bidding or market conditions, Fuss & O'Neill's opinion of probable Total Project Costs and Construction Cost are made on the basis of Fuss & O'Neill's experience and qualifications and represent Fuss & O'Neill's best judgment as an experienced and qualified professional engineer, familiar with the construction industry; but Fuss & O'Neill cannot and does not guarantee that proposals, bids or actual Total Project or Construction Costs will not vary from opinions of probable cost prepared by Fuss & O'Neill. If prior to the bidding or negotiating Phase the Owner wishes greater assurance as to Total Project or Construction Costs, the Owner shall employ an independent cost estimator.

| ITEM NO. | ITEM DESCRIPTION | UNIT MEAS. | NO. UNITS | PER UNIT | TOTAL COST |
|---|---|---|---|---|---|
| | | | | | |
| 1 | Site Inspections[2] | EA | 12 | $ 500.00 | $ 6,000.00 |
| 2 | Monthly Removal of Trash[3] | EA | 12 | $ 250.00 | $ 3,000.00 |
| 3 | Mowing of Infiltration Basins[4] | EA | 2 | $ 550.00 | $ 1,100.00 |
| 4 | Sediment Removal from Infiltration Basins[5] | EA | 2 | $ 1,000.00 | $ 2,000.00 |
| 5 | Vacuum Truck - Drainage Structures[6] | EA | 2 | $ 2,800.00 | $ 5,600.00 |
| | | | | | **$ 17,700.00** |
| | | | | **TOTAL COST (-15% TO +30% ROUNDED)** | **$15,000 TO $23,000** |

Notes

1. The following equipment and labor rates were used for this estimate: Site Inspector - $1,000/day; Laborer - $500/day; Skidsteer & Operator - $1,000/day; Dump Truck - $500/day; Vacum Truck - $1800/day
2. Assume a Site Inspector is required for 1/2 day per inspection.
3. Assumes 1 Laborer for a 1/2 day.
4. Assumes 1 Laborer for a 1 day and an additional $50 for a weedwacker.
5. Assumes 1 Laborer, 1 Skidsteer & Operator, and 1 Dump Truck for 1/2 day.
6. Assumes 2 Laborers and 1 Vaccum Truck for 1 Day.

# Appendix J

## Illicit Discharge Compliance Statement

FUSS & O'NEILL

**Illicit Discharge Compliance Statement**
**South Hadley Electric Light Department Headquarters**
**South Hadley, MA**

No illicit discharges are proposed to enter the developed stormwater system located within the South Hadley Electric Light Department Headquarters project area. Inspection procedures outlined in the Long-Term Operation and Maintenance Plan will be strictly followed so contaminants do not enter the stormwater system. Illicit discharge detection and elimination procedures will be implemented routinely by visual inspections to prevent illicit discharges into the stormwater system. Further, I certify that the stormwater management system as shown on the referenced plans will be maintained in accordance with the conditions of the Long-Term Operation and Maintenance Plan.

Responsible Party: _____ Date: _____

# Appendix D

## Abutter Information

**Notification to Abutters**

By Hand Delivery, Certified Mail (return receipt requested), or Certificates of Mailing

*This is a notification required by law. You are receiving this notification because you have been identified as the owner of land abutting another parcel of land for which certain activities are proposed. Those activities require a permit under the Massachusetts Wetlands Protection Act (M.G.L. c. 131, § 40) and the South Hadley Local Wetlands Bylaw (Chapter 240).*

In accordance with the second paragraph of the Massachusetts Wetlands Protection Act, and 310 CMR 10.05(4)(a) of the Wetlands Regulations, you are hereby notified that:

A. A Notice of Intent was filed with the South Hadley Conservation Commission on March 11, 2026 seeking permission to remove, fill, dredge, or alter an area subject to protection under M.G.L. c. 131 §40. The following is a description of the proposed activity/activities:

> The proposed project includes the development of a new South Hadley Electric Light Department headquarters complex including a main office, warehouse, garage space, and associated site features.

B. The name of the applicant is:
Attn: Sean Fitzgerald
South Hadley Electric Light Department
85 Main Street
South Hadley, MA 01075
413-536-1050
sfitzgerald@sheld.org

C. The address of the land where the activity is proposed is: 65 Old Lyman Road, South Hadley Parcel #14-67.

D. Copies of the Notice of Intent may be examined or obtained at the office of the South Hadley Conservation Commission, located at 116 Main Street, Room U6 South Hadley, MA 01075. The regular business hours of the Commission are 8:30AM-4:00PM, Monday-Friday and the Commission may be reached at 413-538-5030, ext. 6187.

E. Copies of the Notice of Intent may be obtained from the applicant or Fuss & O'Neill by calling Paul Fleming at 413-333-5883 An administrative fee may be applied for providing copies of the NOI and plans.

F. Information regarding the date, time, and location of the public hearing regarding the Notice of Intent may be obtained from the South Hadley Conservation Commission. Notice of the public hearing will be published at least five business days in advance, in the Town Reminder.

Notification provided pursuant to the above requirement does not automatically confer standing to the recipient to request Departmental Action for the underlying matter. See 310 CMR 10.05(7)(a)4.

# 100 feet Abutters List Report

South Hadley, MA
February 24, 2026

**Subject Property:**

| | | | |
|---|---|---|---|
| Parcel Number: | 0014-0067-000 | Mailing Address: | BIG Y FOODS INC |
| CAMA Number: | 0014-0067-000 | | 2145 ROOSEVELT AV |
| Property Address: | WILLIMANSETT ST | | SPRINGFIELD, MA 01104-7840 |

**Abutters:**

| | | | |
|---|---|---|---|
| Parcel Number: | 0014-0018-000 | Mailing Address: | UNIHAMP MASS LLC |
| CAMA Number: | 0014-0018-000 | | ONE EXECUTIVE BLVD |
| Property Address: | 44 WILLIMANSETT ST | | YONKERS, NY 10701 |
| Parcel Number: | 0014-0022-000 | Mailing Address: | NYZIO, ADAM P NYZIO, SETH R & |
| CAMA Number: | 0014-0022-000 | | BENJAMIN C |
| Property Address: | WILLIMANSETT ST | | 475 S WASHINGTON ST |
| | | | BELCHERTOWN, DE 01007 |
| Parcel Number: | 0014-0023-000 | Mailing Address: | NYZIO, BENJAMIN C NYZIO, SETH R |
| CAMA Number: | 0014-0023-000 | | 98 WILLIMANSETT ST |
| Property Address: | 98 WILLIMANSETT ST | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0024-000 | Mailing Address: | KURAS EDWARD J & CAROLYN J |
| CAMA Number: | 0014-0024-000 | | 94 WILLIMANSETT ST |
| Property Address: | 94 WILLIMANSETT ST | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0025-000 | Mailing Address: | DONNELLY, SEAN PATRICK BERKEY, |
| CAMA Number: | 0014-0025-000 | | MAIYA BAO KITTLESON |
| Property Address: | 88 WILLIMANSETT ST | | 88 WILLIMANSETT ST |
| | | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0043-000 | Mailing Address: | CROSSROADS REALTY HOLDINGS LLC |
| CAMA Number: | 0014-0043-000 | | 2101 VIA FUENTES |
| Property Address: | 84 WILLIMANSETT ST | | VERO BEACH, FL |
| Parcel Number: | 0014-0045-000 | Mailing Address: | COMMONWEALTH OF MASS DPW YARD |
| CAMA Number: | 0014-0045-000 | | 251 CAUSEWAY ST |
| Property Address: | 28 WILLIMANSETT ST | | BOSTON, MA 02114 |
| Parcel Number: | 0014-0052-000 | Mailing Address: | JUBINVILLE ANN L TRUSTEE |
| CAMA Number: | 0014-0052-000 | | 141 OLD LYMAN RD |
| Property Address: | OLD LYMAN RD | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0053-000 | Mailing Address: | MANN ROBERT A |
| CAMA Number: | 0014-0053-000 | | 137 OLD LYMAN RD |
| Property Address: | 137 OLD LYMAN RD | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0062-000 | Mailing Address: | GOLOB JANE E |
| CAMA Number: | 0014-0062-000 | | 52 OLD LYMAN RD |
| Property Address: | 52 OLD LYMAN RD | | SOUTH HADLEY, MA 01075-2629 |

# 100 feet Abutters List Report

South Hadley, MA
February 24, 2026

| | | | |
|---|---|---|---|
| Parcel Number: | 0014-0063-000 | Mailing Address: | KLEEBERG, CHRISTOPHER |
| CAMA Number: | 0014-0063-000 | | 56 OLD LYMAN RD |
| Property Address: | 56 OLD LYMAN RD | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0064-000 | Mailing Address: | CENTER FOR HUMAN DEVELOPMENT INC |
| CAMA Number: | 0014-0064-000 | | 332 BIRNIE AV |
| Property Address: | 51 OLD LYMAN RD | | SPRINGFIELD, MA 01107-1104 |
| Parcel Number: | 0014-0074-000 | Mailing Address: | SCHWARTZ, KEVIN |
| CAMA Number: | 0014-0074-000 | | 135 OLD LYMAN RD |
| Property Address: | 135 OLD LYMAN RD | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0076-000 | Mailing Address: | WALZ JOHN W & SHERRY R |
| CAMA Number: | 0014-0076-000 | | 58 OLD LYMAN RD |
| Property Address: | 58 OLD LYMAN RD | | SOUTH HADLEY, MA 01075 |
| Parcel Number: | 0014-0077-000 | Mailing Address: | WOLOWICZ EDWARD S JR & SARAH E |
| CAMA Number: | 0014-0077-000 | | 60 OLD LYMAN RD |
| Property Address: | 60 OLD LYMAN RD | | SOUTH HADLEY, MA 01075 |