

M E M O R A N D U M

TO: Lori Capone – Conservation Administrator, Town of Sudbury

FROM: Eric Bernardin, PE, LEED-AP, Vice President/Senior Engineer
Nick Lapointe, PE – Senior Project Manager
Aaron Keegan, PE – Project Engineer

DATE: 2/4/2022
Revised 2/10/2022
Revised 2/18/2022

RE: MassDEP File No. NE 301-1362 - Bruce Freeman Rail Trail NOI
Response to Conservation Agent Comments

Dear Ms. Capone

The following review comments were made by the by your office via email on January 26, 2022 in response to the NOI submission for the Bruce Freeman Rail Trail. The following are your comments followed by our response comments in bold.

1. Provide explanation on how and when invasives species removal within the LOW will be conducted to prevent unintentional spread.
Limit of Work (LOW): Per special provision and MassDOT standard contract, the contractor shall not introduce or move around any invasive plant species due to construction activities. Should this occur, it is the contractor's duty to address and rectify. If invasives exist in location prior to construction, then the locations of invasive colonies should be identified under the Items 102.33 Invasive Plant Management Strategy. Discussions of invasive plants and soil management begin prior to onset of construction activities. Any treatment occurs after clearing and grubbing and additional approval by the Con. Comm.
2. Provide a detailed Invasive Species Management Plan for mitigation, quantifying proposed mitigation in area, target species, and describing methodology of removal, any replacement plantings and/or follow-up management.
The details of invasive plant management, including timing and methodologies, are all prepared by the contractor subsequent to a required invasive plant walk/inspection and submitted for approval in the Invasive Plant Management Strategy report to both MassDOT and Sudbury Con. Comm. MassDOT contracts do not stipulate timing or methodology in the bid package.

In addition to the approximately 13 acres of the corridor that will be cleared, grubbed and any invasives removed, MassDOT has committed up to 120 man hours (for a crew

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of two people, or approx.. 240 hours) of invasives management for which the areas will be determined during construction once a IPMS has been developed with the con comm approval. The 120 man hrs. commitment may be applied using a variety of actions and methodologies, including cut & dab, targeted herbicide spraying, or removal by hand, all of which will depend on what is recommended by the IPMS plan drafted with Town participation. Any additional invasives management will occur within existing rail ROW (which may be outside the limit of work) however no management will occur that would result in new impacts (temporary or permanent) to wetland resources, including BVW, Bank, etc). It is estimated that cut & dab treatment could treat up to 4 acres with the proposed 120 hours, however results may vary given the invasive plants identified in the IPMS plan.

Furthermore, as an additional measure of good faith, MassDOT has agreed to clear & grub approximate 3,500 s.f. of invasives just south Hudson Road and plant a variety of native species (specifically pollinator shrubs/grasses) in order to cleanup up the existing invasives problem by the shopping plaza and create an aesthetically pleasing entrance to the trail. This work is not required to build the trail however MassDOT has offered this additional effort to the Conservation Commission and Town of Sudbury. See attached plan sketch showing proposed plantings and clearing.

The wetland replication work item also includes invasives management for the new area off of Morse Road paid for separately under the wetland replication work item.

3. Determine whether the wetland replication area can be repositioned closer to the ROW.
The Wetland replication area can be shifted slightly closer to the ROW to limit the encroachment into the existing field. This includes removing the small peninsula within the pond to create a larger, uninterrupted expanse of the wetland. The wetland replication area has been reconfigured in the proposed plan set submitted with the final NOI.
4. Consider modifying seed mix to include woody species.
The seed mix specifications have been added to include woody species as requested by the Conservation Coordinator. Appendix K of the final NOI submitted contains the seed mix specifications.
5. Provide Landscaping Plan for area south of Hudson Road and any other areas of substantial revegetation.
Although not required to construct the trail, MassDOT has agreed to offer this additional clearing of invasives and re-planting to provide a clear view of the trail at the intersection gateway with Hudson Road, to attract users to the trail, and to address a known location of invasives. The plan set submitted with the final NOI contains a new landscaped section south of Hudson Rd that shows clearing of invasives and planting of

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native vegetation, specifically those promoting pollination.

6. Page 71 of NOI, first paragraph, is missing text.
This has been revised in the NOI, former page 71 is now page 74 in the final NOI.
7. Laydown areas are not shown on the plan. The project will be conditioned that these elements occur outside of wetlands jurisdiction and within the approved limit of work. If additional areas are needed, they will be required to be outside jurisdictional areas, without additional review and approval from the Conservation Commission.
Conditions are anticipated and understood. The laydown areas are not called out on the plans in order to allow the contractor to formulate a construction strategy including the location of laydown areas. The contractor will be responsible for observing the conditions and jurisdictional areas of the Commission. MassDOT provides construction oversight throughout the construction contract period including observation of contractor adherence to the Order of Conditions.
8. Once constructed, the Town will be responsible for the long-term maintenance of the trail. The NOI notes that the trail shoulders will require bi-weekly mowing and will not be plowed in the winter. The applicant should confirm that DPW has the ability of mowing bi-weekly and maintain the porosity of pervious rest areas, and if not, how that may affect the drainage. A Long-Term Operation and Maintenance Plan should be developed for the trail and included in the NOI for review and approval.
A revised long-term operation and maintenance plan has been included in the final NOI as Appendix M, the Town DPW was consulted on the contents of the plan. The porous pavers will not be maintained (through vacuuming and other necessary measures) as we have remained conservative in our quantification of pervious area and have considered them equivalent to non-porous gravel material. We do however expect them to perform better than concrete or asphalt even if not maintained.
9. A Long-Term Operation and Maintenance Plan is included for the Broadacre parking area. This should be vetted with DPW to ensure it meets their normal operations.
The Broadacres parking area Op. & Maintenance Plan has been revised with input from the Town DPW and included in the final NOI as part of the revised Stormwater Report in Appendix G. All maintenance activities for the parking area are consistent with existing maintenance that are associated with typical roadway/municipal surface infrastructure in town (mowing, removal of trash, sweeping, maintenance of stormwater treatment areas, snow event clearing).
10. Additional wildlife study may be needed to confirm impacts to Bank will not result in destruction of important wildlife habitat as impacts exceed the permittable thresholds. The

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study identified possible bat roosting trees South of Hudson Road. The wildlife study that was conducted to date included the following recommendations for the Commission's consideration

- o The project should be located within the ROW, including staging, access, and parking.

The project is located within the ROW. MassDOT does not dictate staging areas on linear transportation projects however any staging areas outside of the proposed limits of work and subject of this NOI permit shall be required to comply further with separate filings completed by the contractor if within conservation jurisdictional areas.

- o Tree removal should be avoided, especially within 100 feet of vernal pools.

This project has been very sensitive to maintaining as much existing vegetation as possible. Tree removals have been limited to only what is required in order to construct the trail and install safety measures (include shoulders and guardrails)

- o Machinery should be cleaned to minimize new invasive species introduction.

This is required of the contractor as part of the general conditions of the MassDOT contract. This requirement will also be included as part of the IPMS plan that will be developed and approved by the commission prior to commencement of construction.

- o Plantings should consist of fruiting shrubs, pollinator habitat, and evergreens for cover.

Native plantings based on the Town of Sudbury plan list have been provided, including pollinators.

- o Stream Standards should be adhered to at perennial streams.

Stream crossing standards have been met at all perennial streams where work is proposed.

- o Trees could be evaluated for girdling, to create snags.

Girdling is not recommended near the rail trail due to safety concerns related to the risk of dead trees falling on the trail. Use of girdling/tree snags will be evaluated on a conditional basis by the contractor during construction. At the site walk before clearing and grubbing, MassDOT and the Town will be able to provide input to the contractor prior during which this method can be discussed and requested.

- o Brush piles should be created to provide wildlife habitat.

Brush piles may be placed outside the limit of work at the discretion of the Contractor per direction of the Con. Comm. which may be coordinated prior to onset of clearing and grubbing. A paragraph about determining locations for brush piles has been added to the Clearing and Grubbing special provision. The Town will be included on a site walk before clearing and grubbing during which locations for brush piles shall be determined.

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- Lighting should be minimized.
No lighting is proposed except one new light (dark sky compliant) at the new parking lot for public safety purposes/request of Police Department.

The applicant should provide information on how the project incorporated these recommendations and update the Commission at on any additional wildlife habitat studies that may be conducted.

An additional

A supplemental Wildlife Habitat Evaluation for the proposed Culvert at Station 167+17 *is complete and included with Appendix J of the final NOI.*

A Bat study has been completed and filed by MassDOT including an acoustic survey which did not find the Northern Long-Eared Bat in the project area.

11. Plan Sheets 9-11 show a cross sectional of the trail with a 2:1 slope noted as the maximum slope. When we went through the MEPA process, grades were revised to further minimize wetland fill and are proposed at a maximum of 1.5:1 and stabilized with erosion control blankets. The construction detail should reflect this change.
The plan sheets have been corrected to reflect the noted change.
12. The rest area shown on Sheet 1 is directly adjacent to Potential Vernal Pool 19. This VP was not identified as being certifiable, however, I would recommend the applicant consider working with DCR to locate communal amenities for both trails at their confluence, or the footprint of this rest area be reduced or moved to prevent this potential vernal pool from being degraded.
We have confirmed that the rest area can be shifted approximately 25' further south away y from the potential VP area as requested. This change is reflected in the final plans submitted with the NOI.
13. The rest area shown on Sheet 11/12 should be moved outside jurisdiction or information provided on why the site constraints would not allow this.
Rest area can be moved outside of 100' buffer as requested. This change is reflected in the final plans submitted with the NOI.
14. The sign area shown on Plan Sheet 13, west of Morse Road, should be reevaluated to reduce footprint.
This rest area has been eliminated from this area as requested. This change is reflected in the final plans submitted with the NOI.
15. The emergency vehicle turn-around shown on Plan Sheet 15 should be moved outside jurisdiction or information provided on why the site constraints would not allow this.
The emergency vehicle turnaround can be moved outside of the 100' buffer as

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requested. This change is reflected in the final plans submitted with the NOI.

16. Appendix K allows for tree removal outside the Limit of Work at the contractor's expense. This was going to be revised to prevent any vegetation removal beyond the LOW. A special condition will be included that any native vegetation removal conducted outside the LOW, without permission from the ConCom, will be a violation of the Order and requires full restoration to pre-existing conditions.

The clearing and grubbing specification does not allow work outside of the slope limits shown on the plans. An updated clearing and grubbing specification is included in Appendix K of the final NOI.

17. There are a number of approvals required by MassDOT within the specs provided, such as review of the suitability of imported soils and plant material. These should be revised to include approval by the ConCom, staff, and/or the Town's Environmental Monitor also.

The specifications included with the final NOI in Appendix K now include language directing the contractor to inform and include the Town Conservation Coordinator on the material submittals distribution list.

18. The language in Section 755.75 and 755.76 for the Wetland Specialist and the Wetland Monitoring Reports should be finalized.

The items have been finalized with the final NOI submittal. See Appendix K of the final NOI.

19. Section 767.121 states that erosion controls stakes can be removed from the erosion controls at the end of the project but can be left stockpiled on site. This should be revised to remove all erosion control materials from the site, following stabilization, except for the biodegradable erosion control blankets.

The item has been revised to require removal of stakes from the site. See Appendix K of the final NOI.

20. Provide information on the suitability of the modified rock fill for Pantry Brook bridge.

The modified rock fill is required for scour protection of new bridge footings based on hydraulic report reviewed by MassDOT. An additional effort has been provided to include wildlife passage by placing compost and topdressing and native seed between and on the surface of the modified rock fill to allow turtle and other invertebrates easier crossing under the bridge.

21. *More sedge plantings have been added at surrounding Hop Brook Bridge per the request of the Town. Final plans have been submitted with the final NOI reflecting this update.*

Notice of Intent

Sudbury-Concord Bike Path Construction (Bruce Freeman Rail Trail)

MassDOT Project #608164

Massachusetts Department of Transportation

December 22, 2021
Rev. February 22, 2022



190 High Street
Boston, MA 02110

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(Bruce Freeman Rail Trail)
MassDOT

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- J General Wildlife Habitat Evaluation, Supplemental WHE
- K Specifications
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- M Operation and Maintenance Plan for BRFT



1 WPA Form 3





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

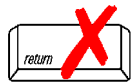
Document Transaction Number

Sudbury

City/Town

Important:

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



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

A. General Information

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

Bruce Freeman Rail Trail

a. Street Address

Sudbury

b. City/Town

01776

c. Zip Code

Latitude and Longitude:

42.36328

d. Latitude

-71.42269

e. Longitude

C10,C11,D10,E09,G09,H08,J08,K08

f. Assessors Map/Plat Number

5100

g. Parcel /Lot Number

2. Applicant:

Tim

a. First Name

Dexter

b. Last Name

MassDOT

c. Organization

10 Park Plaza RM 4260

d. Street Address

Boston

e. City/Town

MA

f. State

02116

g. Zip Code

857.368.4636

h. Phone Number

i. Fax Number

timothy.dexter@state.ma.us

j. Email Address

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

Chalita

a. First Name

Belfield

b. Last Name

MassDOT Rail Divison

c. Organization

10 Park Plaza, Suite 4160

d. Street Address

Boston

e. City/Town

MA

f. State

02116

g. Zip Code

857-368-8957

h. Phone Number

i. Fax Number

chalita.belfield@state.ma.us

j. Email address

4. Representative (if any):

Eric

a. First Name

Bernardin

b. Last Name

Fuss & O'Neill, Inc.

c. Company

1550 Main St

d. Street Address

Springfield

e. City/Town

MA

f. State

01103

g. Zip Code

413.452.0445

h. Phone Number

i. Fax Number

ebernardin@fando.com

j. Email address

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

a. Total Fee Paid

b. State Fee Paid

c. City/Town Fee Paid



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A. General Information (continued)

6. General Project Description:

Construction of a recreational trail on an inactive railroad right-of-way, parking area, connecting paths, intersection safety improvements & reconstruction

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

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

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

1. ☒ Yes ☐ No If yes, describe which limited project applies to this project. (See 310 CMR 10.24 and 10.53 for a complete list and description of limited project types)
- 310CMR 10.53(6) Redevelopment for recreational bicycle trail in riverfront area

2. Limited Project Type

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

8. Property recorded at the Registry of Deeds for:

Middlesex South

a. County

13117

c. Book

b. Certificate # (if registered land)

113

d. Page Number

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

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

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



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

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

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
a. <input checked="" type="checkbox"/> Bank	451 1. linear feet	317 2. linear feet
b. <input checked="" type="checkbox"/> Bordering Vegetated Wetland	2710 1. square feet	3760 2. square feet
c. <input checked="" type="checkbox"/> Land Under Waterbodies and Waterways	1746 1. square feet 0 3. cubic yards dredged	1,309 2. square feet

Resource Area	Size of Proposed Alteration	Proposed Replacement (if any)
d. <input checked="" type="checkbox"/> Bordering Land Subject to Flooding	1,736 1. square feet 67.5 3. cubic feet of flood storage lost	538 2. square feet 337 4. cubic feet replaced
e. <input type="checkbox"/> Isolated Land Subject to Flooding	1. square feet 2. cubic feet of flood storage lost	3. cubic feet replaced
f. <input checked="" type="checkbox"/> Riverfront Area	Hop Brook, Pantry Brook, Unnamed Tributary to Pantry Brook, Unnamed Tributary to Cold Brook	

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: 284951
square feet

4. Proposed alteration of the Riverfront Area:

<u>109626</u>	<u>67704</u>	<u>41922</u>
a. total square feet	b. square feet within 100 ft.	c. square feet between 100 ft. and 200 ft.

5. Has an alternatives analysis been done and is it attached to this NOI? ☒ Yes ☐ No

6. Was the lot where the activity is proposed created prior to August 1, 1996? ☒ Yes ☐ No

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

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



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

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

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

<u>Resource Area</u>	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
a. <input type="checkbox"/> Designated Port Areas	Indicate size under Land Under the Ocean, below	
b. <input type="checkbox"/> Land Under the Ocean	1. square feet _____ 2. cubic yards dredged _____	
c. <input type="checkbox"/> Barrier Beach	Indicate size under Coastal Beaches and/or Coastal Dunes below	
d. <input type="checkbox"/> Coastal Beaches	1. square feet _____	2. cubic yards beach nourishment _____
e. <input type="checkbox"/> Coastal Dunes	1. square feet _____	2. cubic yards dune nourishment _____
	<u>Size of Proposed Alteration</u>	<u>Proposed Replacement (if any)</u>
f. <input type="checkbox"/> Coastal Banks	1. linear feet _____	
g. <input type="checkbox"/> Rocky Intertidal Shores	1. square feet _____	
h. <input type="checkbox"/> Salt Marshes	1. square feet _____	2. sq ft restoration, rehab., creation _____
i. <input type="checkbox"/> Land Under Salt Ponds	1. square feet _____	
	2. cubic yards dredged _____	
j. <input type="checkbox"/> Land Containing Shellfish	1. square feet _____	
k. <input type="checkbox"/> Fish Runs	Indicate size under Coastal Banks, inland Bank, Land Under the Ocean, and/or inland Land Under Waterbodies and Waterways, above	
	1. cubic yards dredged _____	
l. <input type="checkbox"/> Land Subject to Coastal Storm Flowage	1. square feet _____	

4. ☐ Restoration/Enhancement

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

a. square feet of BVW _____

b. square feet of Salt Marsh _____

5. ☒ Project Involves Stream Crossings

0

a. number of new stream crossings

5

b. number of replacement stream crossings



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C. Other Applicable Standards and Requirements

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

Streamlined Massachusetts Endangered Species Act/Wetlands Protection Act Review

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

- a. ☐ Yes ☒ No **If yes, include proof of mailing or hand delivery of NOI to:**

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

2021

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

North Shore - Hull to New Hampshire border:

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

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

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

- c. ☐ Is this an aquaculture project?

- d. ☐ Yes ☐ No

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



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

Sudbury

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.



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

Sudbury

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.

Plan and Profile of Bruce Freeman Rail Trail in the Town of Sudbury

a. Plan Title

Fuss & O'Neill

Eric Bernardin

b. Prepared By

c. Signed and Stamped by

12/22/2021

1"=20'

d. Final Revision Date

e. Scale

f. Additional Plan or Document Title

g. Date

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

E. Fees

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

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

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
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

Sudbury

City/Town

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.

Tim Dexter

1. Signature of Applicant

12/17/2021

2. Date

Chalita Belfield

3. Signature of Property Owner (if different)

12/20/21

4. Date

EM Beard

5. Signature of Representative (if any)

12/22/2021

6. Date

For Conservation Commission:

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

For MassDEP:

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

Other:

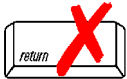
If the applicant has checked the "yes" box in any part of Section C, Item 3, above, refer to that section and the Instructions for additional submittal requirements.

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



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

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



A. Applicant Information

1. Location of Project:

a. Street Address

b. City/Town

c. Check number

d. Fee amount

2. Applicant Mailing Address:

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

3. Property Owner (if different):

a. First Name

b. Last Name

c. Organization

d. Mailing Address

e. City/Town

f. State

g. Zip Code

h. Phone Number

i. Fax Number

j. Email Address

B. Fees

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

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

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

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

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

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

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

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



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

B. Fees (continued)

Step 1/Type of Activity	Step 2/Number of Activities	Step 3/Individual Activity Fee	Step 4/Subtotal Activity Fee

Step 5/Total Project Fee: _____

Step 6/Fee Payments:

Total Project Fee: _____
a. Total Fee from Step 5

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

City/Town share of filing Fee: _____
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.)

Additional Owner:

**Henry Hayes Jr.
Town Manager of Sudbury, MA
Flynn Building
278 Old Sudbury Road
Sudbury, MA 01776
townmanager@sudbury.ma.us
(978)-443-0756**

2 Introduction

This Notice of Intent (NOI) describes the proposed extension of the Bruce Freeman Rail Trail (BFRT) in Sudbury, MA, also known as Phase 2D of the BFRT, and as Massachusetts Department of Transportation (MassDOT) Project #608164. Fuss & O'Neill respectfully submits this Notice of Intent (NOI) for the applicant, MassDOT pursuant to:

- The Massachusetts Wetland Protection Act, M.G.L. c. 131 § 40 (WPA)
- The WPA regulations (310 CMR 10.00)

As an agency of the Commonwealth providing essential government functions, MassDOT is exempt from municipal wetland bylaws and policies. This includes the following municipal bylaws:

- The Sudbury Wetlands Administration Bylaw (Town Bylaw)
- The Sudbury Wetlands Administration Bylaw Regulations (Town Bylaw Regulations) as amended September 25, 2017

Notwithstanding the exemption to the Town Bylaw, certain criteria of the Town Bylaw were feasible and practicable to meet for this Project. Therefore, for informational purposes, this document quantifies impacts under the Town Bylaw in Section 7 when describing proposed wetland mitigation. The proposed plans show resource area impacts according to WPA jurisdiction, but also show resource area boundaries under the Town Bylaw. Mitigation for impacts to Bordering Vegetative Wetland (BVW) is proposed that accounts for both the permanent impacts to BVW under WPA jurisdiction and permanent impacts to Town Bylaw jurisdictional Isolated Vegetated Wetland (IVW). An invasive plant management strategy is proposed covering an area commensurate with the proposed permanent impacts to 100-foot Buffer Zone.

Additionally, MassDOT is exempt from notifying abutters per the WPA Regulations at 310 CMR 10.05(4). The Town of Sudbury has elected to independently notify abutters of this NOI.

The proposed work (the Project) is inclusive of a new 4.4-mile segment of the Bruce Freeman Rail Trail (BFRT). The BFRT is a planned 25-mile shared-use recreational trail between Lowell and Framingham, Massachusetts utilizing an existing inactive rail corridor right of way (ROW). At present, approximately 14 miles of the BFRT has been constructed in the municipalities of Lowell, Chelmsford, Westford, Carlisle, Acton, and Concord. The BFRT has been planned to be constructed in the following six phases: 1, 2A, 2B, 2C, 2D, and 3. This Project was planned as Phase 2D. Each phase has been designed and permitted separately.

Project development has been a collaborative effort between MassDOT and the Town of Sudbury. The Project is eligible as a "limited project" under 310 CMR 10.58.

Proposed Project activities include:

- A 4.4 mile long and 10-foot-wide paved multi-use recreational path with crushed stone shoulders varying between one to three-foot wide on either side.
- Trailside rest areas that provide bench seating and bicycle racks.



- Regulatory and wayfinding signage along the trail for user safety and navigation. Additional signage to demarcate sensitive environmental areas.
- Cedar rail fencing to protect users from steep slopes and in some instances to screen adjacent properties such as industrial abutters or sensitive environmental areas.
- A new traffic signal at the trail crossing of Hudson Rd, a high intensity activated crosswalk (HAWK) signal at North Rd, and flashing pedestrian beacons at all other road crossings.
- Native tree and vegetative plantings throughout the project. The proposed plantings are mainly parallel to the shared-use path within the rail ROW for screening and to improve the ecological health of the forested corridor.
- A 268-foot long and 10-foot-wide paved shared-use path connection from the main trail to the existing parking area at the Parkinson Parcel. The path connection will travel through the lawn area of Parkinson Parcel to reach the existing parking area.
- A new 9,770 SF paved parking area containing 32 spaces adjacent to the trail at Morse Rd, on a parcel of the former Broadacres Farm. The parking area will include a waterless restroom and a recreational pavilion structure consisting of a gabled roof supported by wood beam columns.
- Conversion of the existing sidewalk from the BFRT crossing at North Rd to Davis Field recreational area into an 8-foot wide shared-use path. This 750ft long shared-use path will connect the BFRT with the existing parking and recreation area at Davis Field in Sudbury.
- The rehabilitation of an existing rail bridge at Hop Brook with a new bridge deck. The existing granite block wall abutments will be repaired and retained.
- The replacement of an existing rail bridge at Pantry Brook. The existing abutment walls will be cut to a lower height and retained. The superstructure of the bridge will be replaced by a concrete arch bridge spanning over the former abutment walls. The design minimizes impacts to Pantry Brook and provides wildlife crossing.
- Repair, replacement, and maintenance of existing culverts underneath the existing rail embankment.
- The construction of one new culvert not located at a stream, as an equalizer pipe for the conveyance of drainage.
- The construction of a wetland replication area at the former Broadacres Farm site.
- Implementation of an Invasive Plant Species Management Strategy as part of the proposed mitigation for the project.
- New grass lined infiltration swales parallel to the trail totaling a cumulative 3,395 linear feet.
- Earthwork, clearing, and grubbing incidental to construction in accordance with the special provisions and plans.



2.1 Project Purpose

The purpose of this project is to provide a non-motorized, fully accessible, 10-foot wide shared-use path through the Town of Sudbury which will serve as a historical, recreational, and alternative transportation resource for residents and visitors of all ages and abilities. The design of the trail seeks to maximize the benefits of the trail for the community and public at large while minimizing and mitigating any impacts to the natural environment.

The Project is proposed to be constructed in a single phase as a new segment of the planned 25-mile BFRT between Lowell and Framingham, Massachusetts along the former Lowell Secondary Track right-of-way (ROW) of Old Colony Rail Road. The ROW is now owned by The Massachusetts Department of Transportation Rail Division. The Town will enter into a long-term lease agreement with the MassDOT Rail Division which will allow the Town to operate and maintain the proposed new trail infrastructure.

The Project also serves the objectives of MassDOT's Healthy Transportation Policy Directive, P-13-0001, which formalized MassDOT's commitment to the implementation of transportation networks that serve all mode choices including walking and bicycling. Under the directive, MassDOT established a statewide goal to triple the distance traveled by walking, bicycling, and transit between 2013 and 2030.



3 Existing Conditions

The Project is located primarily in an inactive rail ROW corridor with a northern terminus at the Sudbury/Concord municipal boundary and a southern terminus at the Massachusetts Central Rail Trail (MCRT) located 100 feet west of the intersection of Union Ave and Station Road in Sudbury. The ROW is owned by MassDOT Rail Division and is 4.4 miles in length and 65 feet wide within the limits described. The rail ROW contains a raised earthen embankment topped with a 16ft wide dense graded and crushed ballast stone rail embankment embedded with wood rail ties. The wood rail ties anchor two steel rails (a single track), except where they have been removed at road crossings.

The rail ROW is predominantly a wooded corridor of mixed oak, white pine, and red maple intermixed with various wetland resource areas including intermittent and perennial streams, bordering vegetated wetlands, isolated vegetated wetlands, vernal pools (certified, eligible, and potential), and floodplain areas.

The surrounding land use of the rail ROW is suburban with adjacent parcels of single-family residential, agricultural use, protected open space, and commercial/industrial use. Generally, the adjacent land use becomes more industrial toward the southern end of the Project corridor.

The rail ROW crosses Hop Brook, a perennial stream, via a rail bridge. The existing bridge deck is structurally unsound and deteriorated. The existing granite block abutment walls are intact enough to allow repair and reuse.

The rail ROW also crosses Pantry Brook, a perennial stream, via a rail bridge. The existing granite block bridge abutment walls are partially collapsed into Pantry Brook.

There are 18 existing hydraulic culverts traversing the rail embankment, not including the two bridges. Site inspections found 6 in need of cleaning, 2 in need of headwall repair, and 3 in need of full replacement. One culvert in need of replacement has collapsed at an unnamed tributary to Hop Brook causing the tributary to cut through the rail embankment.

There are four cement concrete cattle crossings which pass underneath the rail embankment. No longer used for livestock, the passages allow for wildlife crossing.

The rail ROW has 9 at-grade road crossings. From north to south, the road crossings are: the driveway to Fairview Farm, North Rd (Route 117), Pantry Rd, Haynes Rd, Morse Rd, Hudson Rd (Route 27), Old Lancaster Road, Codjer Lane, and the industrial driveway of 71 Union Ave.

There are three parcels adjacent to and outside of the rail ROW where project work is proposed:

- 1) Davis Field at 195 North Rd is a 29-acre multi-use recreational area on North Rd with an entrance 500 feet east of the rail ROW. Davis Field is owned by the Town of Sudbury. There is an existing sidewalk connection from the rail ROW to the parking area of Davis Field. Davis



Field hosts various Town sporting activities and recreational leagues. There is also a trail through conservation land that connects to Davis Field.

- 2) Broadacres Farm at 82 Morse Rd, a former horse farm on the north side of Morse Rd abutting the rail ROW. The property is owned by the Town of Sudbury. The parcel is currently maintained as a field and was acquired for the purposes of recreation consistent with the proposed design.
- 3) The Parkinson Parcel is located just north of 36 Hudson Rd (Route 27) abutting the rail ROW. The property is open to the public, is used as a general recreational field, and has an existing parking area.

3.1 Project Locus Area

The Project Locus Area is therefore defined as the combination of:

- The 4.4 mile long and 65ft wide rail ROW owned by the MassDOT Rail Division.
- The limit of work for proposed work outside of the rail ROW on parcels owned by the Town of Sudbury.

The Project Locus Area totals 37.53 acres. Attached Figure 1 shows a locus map of the Project.

3.2 Resource Area Delineation and Determination

Wetland delineations were performed by VHB in December 2015 and June 2016. Vernal pool surveys were conducted in 2015 and 2017 by VHB and in 2018 by Stantec. The delineations were performed in accordance with methods developed by Massachusetts DEP and the U.S. Army Corps of Engineers and with respect to the Wetlands Protection Act.

An amended Order of Resource Area Determination (ORAD), was approved by the Conservation Commission on September 16, 2020. The Amended ORAD and is included in *Appendix B*.

Supplemental wetland delineations were performed by Fuss & O'Neill in March 2020 covering proposed work areas adjacent to:

- The Parkinson Parcel adjacent to 36 Hudson Rd
- Davis Field at 195 North Rd
- Broadacres Farm at 82 Morse Rd

The new delineations were performed in accordance with methods developed by Massachusetts DEP and the U.S. Army Corps of Engineers and with respect to the Wetlands Protection Act . Three reports delineating additional resource areas are included in *Appendix B*.



3.3 Protected Habitats

3.3.1 Priority/Estimated Habitat for State Listed Species

According to the 15th Edition of the Natural Heritage Atlas (August 2021), the Project Locus Area does not intersect or contain any Priority Habitats for State Protected Rare Species or State Estimated Habitats of Rare Wildlife. Figure 2, attached to this report, shows the Project Locus Area with respect to known Priority/Estimated Habitat. The Project Locus Area boundary is directly adjacent to PH 1349 located near the site of Broadacres Farm, 82 Morse Rd.

Appendix D contains a letter written by the Massachusetts Division of Fisheries and Wildlife commenting on the Division's review of the Environmental Notification Form for the Project. The letter states that the Project, as currently proposed, occurs near but not within Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the Massachusetts Natural Heritage Atlas (15th Edition).

3.3.2 Coldwater Fisheries Resources

There are two designated Coldwater Fisheries Resources (CFRs) within The Project Locus Areas as identified by MassWildlife:

- Hop Brook, identified by Bank Flags #32 and #33 as shown in the proposed plans of *Appendix F*.
- An Unnamed Tributary to Hop Brook, identified by Bank Flag #30 as shown in the proposed plans of *Appendix F*.

3.3.3 Areas of Critical Environmental Concern

According to the latest on-line maps available from MassGIS (Bureau of Geographic Information) in October 2021, the Project Locus Area is not within or near an Areas of Critical Environmental Concern (ACEC).

3.3.4 Vernal Pools and Outstanding Resource Waters

As described in the amended ORAD of *Appendix B*, a total of twenty-two certified, eligible to be certified, or potential vernal pools were identified in the vicinity of the proposed project. A total of 18 of the surveyed potential vernal pools were not found to be eligible for NHESP certification. One vernal pool is currently certified and three are eligible to be certified. The certified and eligible vernal pools are:

- Certified Vernal Pool 13 is located outside of the Project Locus Area, approximately 140ft west of the rail ROW boundary at plan Station 191+00. Vernal Pool 13 is the only Outstanding Resource Water (ORW) near the Project Locus Area. Certified vernal pools are Class B ORWs as defined by MassWildlife.



- Eligible Vernal Pool 4 is located within the rail ROW between plan Station 286+00 to 290+10 on the west side of the trail. Vernal Pool 4 is located within a bordering vegetative wetland area designated by the WF#6-100 flag series.
- Eligible Vernal Pool 11 is located within the rail ROW between plan Station 209+50 to 212+50 on the east side of the trail. Vernal Pool 11 is located within a bordering vegetative wetland area designated by the WF#24 flag series.
- Eligible Vernal Pool 12a is located outside of the Project Locus Area, approximately 150ft west of the rail ROW boundary at plan Station 209+50.



4 Proposed Conditions

4.1 Project Description

This section describes the proposed Project activities. The proposed work is described in the following categories:

- The BFRT shared-use path
- Bridge renovation at Hop Brook
- Bridge renovation at Pantry Brook
- Culvert renovation
- The new parking area
- Shared-use path connections

4.1.1 The Bruce Freeman Rail Trail Shared-Use Path

The Project proposes a 10 foot-wide bituminous asphalt paved shared-use path with shoulders varying in width between 1ft and 3ft made of crushed stone. This 4.4-mile length of shared-use path located within MassDOT Rail Division ROW is proposed to be designated as part of the Bruce Freeman Rail Trail (BFRT). The typical cross sections of the proposed shared-use path vary:

- The most common cross section is 14 feet wide with 2-foot-wide crushed stone shoulders.
- The narrowest path cross section totals 12 feet wide with 1-foot-wide shoulders designed to minimize wetland impacts.
- The widest path cross sections are 16 feet wide including 2-foot-wide crushed stone shoulders ending at a timber fence with an additional 1ft loam & seed shoulder extending outward from underneath the timber fence.

The design of typical cross sections of the shared-use path are included in the proposed plan set attached as *Appendix F*.

The shared-use path includes 18 proposed trailside rest areas, paved pads directly adjacent to the shared-use path. The rest areas vary in dimensions from smaller pads of 8ft wide by 10ft long to larger pads of 15ft wide by 65ft long. The rest areas typically contain one or more benches and bike racks depending on size. The shared-use path also includes two turnaround locations for emergency vehicles, segments where the path surface widens to 24ft for a length of 25ft.

The proposed shared-use path alignment is located on a previously developed and degraded area within the rail ROW. The existing width of dense graded railroad ballast stone beneath the rail tracks is typically 16-feet wide in the corridor.



The side slopes of the trail adjacent to the shoulders are proposed to be graded back to existing contours with loam & native seed. Slopes have been designed to avoid wetland impacts as much as possible by steepening up to a slope of 1.5:1 (horizontal: vertical) when necessary. The proposed trail surface will be an improvement for small invertebrates, turtles, and other wildlife compared to the existing condition as the vertical impediment of the steel rail tracks will be removed and replaced with a surface at ground level.

The construction of the BFRT shared-use path also includes proposed intersection safety improvements at the nine at-grade crossings with surface roads. At seven of the crossings, safety improvements consist of safety signage, pavement markings, pedestrian activated flashing beacons, and accessibility compliant wheel-chair ramps. Two crossings are proposed to receive additional safety improvements:

- The intersection of Hudson Rd and Peakham Rd is proposed to be reconstructed with a new traffic signal for vehicular traffic which will include an exclusive phase for the proposed BFRT crossing.
- The intersection of North Rd is proposed to have an overhead High-Intensity Activated Crosswalk (HAWK) signal for improved visibility and safety for trail users.

The proposed shared-use path work results in impacts to WPA jurisdictional resource areas including Bank, Bordering Vegetative Wetland (BVW), Land Under Water (LUW), Bordering Land Subject to Flooding (BLSF), Riverfront Area, and Buffer Zone. The proposed shared-use path also incurs impact to Isolated Vegetated Wetlands jurisdictional to 401 Water Quality Certification. Impacts associated with the shared-use path work are described in Section 6.

A long-term operating and maintenance plan, developed with consultation from the Town DPW, is included in *Appendix M*.

4.1.2 Bridge Renovation at Hop Brook

The Project proposes to renovate the bridge at Hop Brook for the purpose of providing a recreational non-motorized shared-use path crossing. No access to Hop Brook is proposed, meaning the proposed bridge does not allow fishing, boating, or other recreation access to the waters of Hop Brook. Bridge design plans for the Hop Brook Bridge are included in the proposed plans of *Appendix F*.

- The existing granite block bridge abutments will be repaired, cleaned, and retained. Re-use of the existing abutments at Hop Brook reduced the scope of proposed work within wetland resource areas including excavation, earth work, and dewatering.
- The superstructure supporting the bridge deck and the shared-use path will be replaced on top of the existing abutments.
- The new bridge span will change from an existing 28ft to 27.5ft in length. The width of the bridge deck will change from an existing 14ft to 16ft. The proposed safety rails on the bridge deck are 4ft in height.



- Proposed water control during construction consists of the use of a floating silt fence/turbidity curtain and the redirection of water surrounding the existing bridge abutments.

Impacts associated with the proposed work at Hop Brook Bridge include temporary impacts to Bank, BVW, and LUW, and Riverfront Area. Resource area impacts are described in Section 6.



4.1.3 Bridge Renovation at Pantry Brook

The Project proposes to renovate the bridge at Pantry Brook for the purpose of providing a recreational non-motorized trail crossing. No access to Pantry Brook is proposed, meaning the proposed bridge does not allow fishing, boating, or other recreation access to the waters of Pantry Brook. Bridge design plans for the Pantry Brook Bridge are included in the proposed plans of *Appendix F*.

- The collapsed portions of the existing granite abutments are proposed to be cut and lowered by approximately 11 feet. Retaining the existing abutments in place at a reduced height minimizes excavation and impacts to the stream channel bed, minimizes required dewatering, and allows for wildlife passage along the tops of the lowered abutments.
- A new bridge structure is proposed with footings behind (landward of) the lowered existing abutments to remain. The new bridge superstructure is a cement concrete arch design with cement concrete footings.
- Dumped riprap is proposed landward of the existing abutments to provide scour protection and stabilization. The riprap will transition to modified rockfill at elevation 120', the elevation of the top of the lowered abutments. The modified rockfill will be top-dressed with composted mulch and native seed mix to enhance wildlife crossing for small invertebrates underneath the bridge.
- Proposed water control during construction consists of the use of a floating silt fence/turbidity curtain and the redirection of water surrounding the existing bridge abutments.

Impacts associated with the proposed work at Pantry Brook include permanent and temporary impacts to Bank and BVW, temporary impacts to LUW, and permanent impacts to BLSF in the form of a sizeable cut (gain) in flood storage. Resource area impacts are described in Section 6.

4.1.4 Culvert Renovation

There are 18 existing culvert crossings underneath the rail embankment. Work is proposed at 13 culvert crossings including one new culvert not located at a stream crossing for the conveyance of drainage only. Table 1 shows the proposed culvert work at each location. The plan Station locations refer to the proposed plans of *Appendix F*.



Table 1: Summary of Proposed Culvert Work

Location Number	Plan Station Location	Existing Culvert Description	Proposed Work	Span (ft)	Stream Crossing
1	104+95	15" Reinforced concrete pipe	Remove Debris & Sediment from headwall areas	25 (ex.)	N/A
2	152+33	12" Clay Pipe	Abandon in Place, not hydraulically connected	35 (ex.)	N/A
3	160+06	1.8' H x 2.2' W Box culvert, stacked stone and granite slab	Retain	61 (ex.)	BF#32, Intermittent
4	167+20	0.75' H x 3' W inlet opening, Mortared stone box culvert, record plans describe three 12" clay pipes within culvert, west outlet buried, culvert collapsed	Remove ex. culvert. Replace with 48" diameter reinforced concrete pipe buried 2ft with a natural stream channel bottom. Restore former stream alignment to former culvert location.	22.5 (prop.)	BF#30, Intermittent, Unnamed tributary to Hop Brook
5	197+95	2.5' H x 2.5' W Box culvert, stacked stone and granite slab	Removed vegetation & debris around headwall, Reset stone headwall on west side	27 (ex.)	BF#26, BF#27, Intermittent
6	216+51 to 216+68 (Right)	12" Corrugated Metal Pipe	Remove Ex. culvert. Replace with 15" Reinforced concrete pipe, install concrete headwalls (MassDOT standard headwall 206.40)	17 (prop.)	BF#23, Intermittent
7	226+10	42" Cast Iron Pipe w/ mortared stone headwall	Retain	50.4 (ex.)	BF#21, Intermittent
8	240+88	1.7' H x 2.4' W, Box culvert, stacked stone and granite slab	Remove Debris & Sediment from headwall areas	40.1 (ex.)	BF#18, BF#19, Intermittent
9	247+28	2.5'H x 1.7'W', Box culvert, stacked stone and granite slab	Remove Debris & Sediment from headwall areas	24 (ex.)	BF#16, Intermittent

Location Number	Plan Station Location	Existing Culvert Description	Proposed Work	Span (ft)	Stream Crossing
10	273+34	2' Hx2' W, Box culvert, stacked stone and granite slab	Remove Debris & Sediment from headwall areas	42 (ex.)	BF#12, BF#15-14, Intermittent
11	284+44	2.0'H x 2.3'W, Concrete and masonry box culvert	Retain	57 (ex.)	BF#7, BF#8, Intermittent
12	285+36 (Left)	12" Corrugated Metal Pipe	Retain	40.6 (ex.)	BF#6, Intermittent
13	289+92	2.7' H x 2.3' W, Box culvert, stacked stone and granite slab at outlet, concrete headwall at inlet	Remove vegetation & debris within 5' of headwalls	43.2 (ex.)	BF#7, BF#15-6, Intermittent
14	301+34	12" Clay Pipe	Rem. Ex. culvert. Replace with 15" Reinforced concrete pipe	24 (prop.)	BF#15-6, BF#15-7, Intermittent
15	306+72	12" Clay Pipe	Retain ex. culvert pipe. Replace concrete headwalls	25.4 (ex.)	BF#5-200 Series, BF#6-100 Series, Intermittent
16	313+35	2' H x 2.5' W, Box culvert, stacked stone and granite slab	Retain	57 (ex.)	BF#3 perennial
17	327+42	3' H x 3' W, Box culvert, stacked stone and granite slab, partially buried	Remove Debris & Sediment from headwall areas	32 (ex.)	N/A
18	332+66	8" Clay Pipe	Retain	50 (ex.)	BF#2, Intermittent
19	257+48	N/A	New 12" Reinforced Concrete Pipe Culvert, Concrete headwall at east end (MassDOT standard headwall 206.40), 7'x5' area for stones at west pipe end	25 (prop.)	N/A, equalizer pipe, for conveyance of drainage

Proposed work at culverts results in permanent and temporary impacts to BVW, Bank, and LUW. Resource area impacts are described in Section 6.



4.1.5 New Parking Area

A new 32-space parking area is proposed on a Town-owned parcel directly adjacent to the rail ROW. The parcel is part of the former Broadacres farm pastureland and is currently maintained as a grass field. The location is at the northeast quadrant of the intersection of the rail ROW with Morse Rd.

The asphalt paved parking area surface is 9,770 SF in area. A waterless restroom structure, 165 SF in area, and a recreational pavilion structure, 640 SF in area, consisting of a gabled roof supported by wood beam columns are proposed adjacent to the parking area. A shared-use path connection is proposed between the parking area and the BFRT shared-use path, the path is 60 foot long and 10 wide.

Two earthen infiltration basins have been designed adjacent to the proposed parking area to manage stormwater from the parking area. More information regarding the design of the parking area infiltration basins is contained in *Appendix G*. The parking area is located between plan Stations 216+00 and 219+50 in the proposed plans of *Appendix F*.

The proposed work at the parking area is located within the 100-foot Buffer Zone to an intermittent stream. Resource area impacts are described in Section 6.

4.1.6 Shared-Use Path Connections

The Project includes two shared-use path connections designed to connect the BFRT with two existing parking areas for user accessibility:

- A paved shared-use path connection from the BFRT intersection with North Rd to the existing Davis Field parking lot located at 195 North Rd. The path will overlay an existing 5ft wide paved sidewalk. Davis Field is owned by the Town of Sudbury. The path is proposed to be 750ft long and 8ft wide. The path connection intersects the BFRT at plan Station 307+50 in the proposed plans of *Appendix F*.
- A paved shared-use path connection from the BFRT to the existing Parkinson Parcel parking area located adjacent to 36 Hudson Rd. The shared-use path connection is proposed to be located on an existing grass field maintained and owned by the Town. The new path connection is proposed to be 250ft long and 10ft wide. The path connection intersects the BFRT at plan Station 184+50 in the proposed plans of *Appendix F*.

The Davis Field path connection results in impact to 100-foot Buffer Zone to BVW. There are no resource area impacts associated with the Parkinson Parcel path connection.



4.1.7 Wetland Replication Area

An 2,240 SF wetland replication area is proposed outside of the rail ROW corridor at 82 Morse Rd on a parcel owned by the Town of Sudbury. The selected site is part of the former pasture at the Broadacres Farm site. The site contains an existing pond and BVW which the replication area is proposed adjacent to. The location is between 30ft and 145ft west of the rail ROW boundary at plan Station 212+75 in the proposed plans of *Appendix F*. The proposed plans include a Wetland Replication plan sheets detailing the proposed plantings, pgs. 139-140 of the proposed plans.

The proposed wetland is a seasonally saturated, Palustrine Broad-Leaved Deciduous Scrub-Shrub wetland (PSS1E). The wetland is proposed to have hummock-hollow topography and will provide habitat for local amphibian and reptile populations as well as augment existing habitat for a wide range of birds and mammals.

The construction activities include placement of erosion controls, excavation, planting, and seeding. The wetland replication area will result in an impact to the 100-foot Buffer Zone to an existing pond and BVW.

4.1.8 Sequence of Activities

The Project is proposed to be constructed in a single phase under the control and oversight of MassDOT who will provide on-site construction administrative and inspection services during the entire construction duration. The Town will also employ an environmental monitor to oversee construction activities. Long-term operation and maintenance will be the responsibility of the Town.

Although the contractor will have the ability to propose adjusting the sequence of work to optimize scheduling and efficiency, or may perform work simultaneously, a general sequence of construction is as follows:

- Creation of a Storm Water Pollution and Prevention Plan (SWPPP)
- Creation of an Invasive Plant Management Strategy (IPMS)
- Completion of any conditioned pre-construction activities as required by an Order of Conditions
- Establishment of wetland monitoring report protocols with wetland specialist
- Establishment of contractor access and laydown areas
- Work zone safety signage establishment for rail ROW access areas and proposed at-grade intersection improvements
- Removal of vegetation within the limit of work as needed for access and proposed work
- Erosion and sedimentation control installation
- Wetland replication area construction at 82 Morse Rd
- Construction of new parking area at Morse Rd
- Preparation of the existing rail bed for proposed work including rail and tie removal and grading to proposed limits for proposed trail bed



- Work on culverts and drainage improvements
- Bridge reconstruction work
- Construction of connecting shared-use paths to The Parkinson Parcel and Davis Field
- Final grading and paving of the BFRT shared-use path
- Planting of proposed native species trees along the trail as shown on the construction plans
- Intersection safety improvements at at-grade road crossings
- Intersection reconstruction work at Hudson Rd and Peakham Rd
- Restoration of temporary disturbances to wetland resource areas
- Removal of erosion and sedimentation controls

4.1.9 Vegetation Removal

The Project requires removal of existing vegetation, including trees, saplings, shrubs, and herbaceous vegetation within the limits of work as indicated on the construction plans included in *Appendix F*. The design has minimized tree removal to the maximum extent practicable by aligning the shared-use path overlaying the alignment of the existing rail tracks.

Prior to the start of construction, the proposed limits of work and erosion control barriers will be delineated with survey grade equipment and staked, and trees that require removal will be marked. In addition, prior to vegetation removal, the boundaries of wetlands will be clearly marked to help prevent encroachment.

Typical equipment used to clear vegetation includes tree shears, brush mowing units, a skidder bucket and/or manual climbers, a forwarder or tree dump truck, and a chipper with a winch. Hand cutting using chainsaws and brush saws will be used as necessary in sensitive areas.

Work items related to vegetation removal include the following. The contract specifications for each item are included in *Appendix K*.

101 Clearing and Grubbing Standard Specification

101.2 Clearing and Grubbing-Rail Trail

102.511 Tree Protection-Armoring and Pruning

105.40 Tree Removed (Excluding Stump) Diameter Under 24 Inches



5 Alternatives Analysis

The following Alternatives Analysis describes the selection of the Project alignment, the shared-use trail cross section design, and the bridge crossing designs with respect to minimizing environmental impacts and while meeting the Project purpose and need.

Cross Section Design

Trail surface and width were selected to be nearly consistent with other sections of the BFRT. While the shared-use path is proposed to be surfaced with hot mix asphalt, the shoulders have been designed as dense grade crushed stone with native grass buffers. The pavement width is proposed to be 10ft wide, the minimum standard width per MassDOT design guidelines for a bi-directional shared-use trail. Sections of the BFRT in other towns are 12-feet wide, but the abundance of wetland resources adjacent to the Sudbury railroad embankment resulted in the proposal of a 10ft wide path for the Project.

The dense graded crushed stone shoulder varies from 1ft wide to 3ft wide depending on the condition of the slopes and resources adjacent to the path. Adjacent to wetlands, shoulders were narrowed to 1ft which reduced the impacts to BVW by approximately 2,500 square feet. The shoulders not only provide for user safety but facilitate drainage sheet flow to the adjacent grass buffers and slopes, slowing the water flow and enhancing infiltration. Sections of the path with a 3ft wide shoulder design contain a timber guardrail for safety and to discourage off-trail use in nearby sensitive environmental areas. Where proposed, the guardrail necessitates the wider 3ft shoulder for bicycle clear-zone safety.

Alternatives for Shared-use Path Alignment

The preferred alternative to align the path along the already disturbed railroad corridor on the existing railroad ballast avoids impacts to many resources, while new construction would generally have more significant environmental and ROW acquisition consequences for previously unaltered areas.

Alternative roadway-associated alignments outside of the railroad corridor were evaluated at the major stream crossing locations to potentially avoid impacts to the Riverfront Areas.

Selected Alternative: Rail Trail along the Lowell Secondary Railroad Line

The need for a shared-use path has been identified by the Town of Sudbury community and region to offer safe off-road recreational and non-vehicular travel. Such paths improve healthy transportation options and reduce roadway congestion and greenhouse gas emissions. The BFRT proposes to convert previously disturbed land into a recreational and healthy transportation facility that can also be used as a shared-use path corridor for continuous non-motorized commuter travel between municipalities.

The preferred alternative was selected because it avoids, minimizes, and mitigates impacts to the environment and other resources while achieving the purpose of the Project. The existing rail ballast provides an ideal foundation for minimizing disturbance of unaltered wetland areas and utilizes an existing continuous ROW owned by MassDOT.

Alternative B: On-Road Project Location



On-road non-motorized multi-use passive recreational trails were examined but were found not feasible while simultaneously ensuring public safety with motorized traffic. This alternative did not realize the benefit of using existing railroad ROW to create a continuous regional shared-use path. Additionally, this alternative would require significant roadside land easements or purchases and the widening of existing roadway impervious area along with the associated environmental impacts. Standard on-road bike lanes are 5ft wide for each direction of travel. For these reasons, this alternative was dismissed.

Alternative C: Adjacent to Roadway

Alternative partially on-road alignments utilizing a combination of the existing railroad ROW and nearby roadway layouts were considered, but ultimately proved not feasible. Potential avoidance of the two main riverfront areas along the railroad ROW was considered. To avoid the railroad bed crossings of Pantry Brook and Hop Brook, a design of shared-use paths adjacent to roadway alternative was considered, an illustration is included in *Appendix I*.

In order to avoid the railroad ROW crossing of Hop Brook, an alternative of a shared-use path adjacent to the roadways from Old Lancaster Road to Union Avenue to the Project terminus (Option 1) near Station Road, and a variation on this utilizing adjacent conservation land (Option 3) was considered. To avoid the use of the railroad bed crossing of Pantry Brook, an alternative of a shared-use path adjacent to the roadways from Haynes Road to Concord Road to Morse Road (Option 2) was considered.

These adjacent to road non-motorized shared-use paths were examined but were ultimately not feasible, as they would require significant land easements or purchases and along with environmental impacts from the newly developed areas. Options 1-3 do have the benefit of using existing and previously developed railroad ROW to create a continuous regional shared-use path.

Additionally, at the roadway crossings of Pantry Brook and Hop Brook, new bridges or extensions of existing bridges would be required which would result in additional wetland and waterway impacts. There are numerous wetlands adjacent to the roadways that would be impacted if they were widened for adjacent shared-use paths, which commonly have a pavement width of 10-12ft.

Finally, avoiding the restoration of Pantry Brook Bridge on the railroad ROW would avoid minor wetland impacts there, but retaining the failed bridge and abutments collapsing into the stream would not be a desired outcome for the environmental integrity of the stream or human safety. For these reasons, the alternatives considering shared-use paths adjacent to roadways were dismissed.

Alternative D: No Build Scenario

The no-build scenario does not fulfill the overall project purpose of constructing a shared-use recreational trail in order to provide safe pedestrian and bicycle facilities. It also doesn't allow for the rehabilitation of the dilapidated structures and redevelopment and restoration of previously developed impacts. There are no existing facilities that may be designated to meet the Project purpose.

Alternatives for the Rail Trail Section between Stations 293+00 to 305+00



This section of the rail embankment is approximately 1,200 linear feet constrained by close BVW resource areas and more limited railroad embankment than other sections of the corridor. It was identified by the Town prior to the 25 percent design and alternative treatments to avoid and minimize impacts along this section were considered.

Alternatives included reduced path width, reduced shoulder width, and retaining walls. The Americans with Disabilities Act (ADA) and emergency vehicle-accessible path requires the 10-ft-wide trail cross section. It is proposed that the shoulder width will be reduced to 1-foot in this section to avoid additional wetland resource area impacts. The slimmed shoulder reduced the BVW impacts by approximately 2,500 square feet in this area.

While retaining walls were considered in this section and proposed at the 25 percent design stage to avoid and minimize wetland impacts, they are no longer proposed as it was determined that: 1) permanent impacts are largely reduced with the 1-foot shoulder at grade option, 2) temporary impacts are largely equivalent whether the 1-foot shoulder or retaining walls are proposed, and 3) avoiding any change in grade associated with short retaining walls was desirable from a movement of wildlife and habitat perspective.

To avoid and minimize impacts and still achieve the goals of the Project in this challenging section, the proposed path width has been reduced to 10ft wide, the shoulder width has been reduced to 1ft and there will be no retaining walls used. Other alternative treatments were dismissed as they didn't meet project goals or sufficiently reduce wetland impacts.

Bridge Alternatives

Alternatives were evaluated for the proposed renovation of two perennial stream crossings within the Project. At both crossing locations, the existing bridge abutments will be retained at Bank to reduce impacts to Bank and LUW. At Hop Brook, the existing abutments were in good enough condition to repair and retain. At Pantry Brook, the condition of the abutments did not allow for re-use however, retaining the existing abutments in place at a reduced height minimizes excavation and impacts to the stream channel bed, minimizes required dewatering, and allows for wildlife passage along the tops of the lowered abutments.

Pantry Brook Crossing (Bridge S-31-013)

A Pantry Brook Bridge design study was completed per MassDOT standards and resulted in two final alternatives being considered: Alternative 1, a precast concrete buried arch and Alternative 2, steel deck girders with a timber deck. Considerations for structure selection included environmental impacts, constructability, aesthetics, structure depths, bike ride quality, and estimated cost and maintenance. The two alternatives are anticipated to have similar impacts to LUW and bank. Alternative 2 would require larger equipment to deliver and erect the longer steel beams and require more tree clearing to create access for this equipment. Both alternatives satisfy hydraulic requirements and provide wildlife crossing accommodations below the bridge. Based on these factors, Alternative 1 – precast concrete buried arch is the selected alternative for final design.

Hop Brook Crossing (Bridge S-31-007)



With the abutments and wing walls at the Hop Brook crossing of the trail remaining in place and being restored, permanent impacts to the stream and associated wetland resources are avoided. Alternatives for the superstructure at Hop Brook were evaluated per MassDOT standards and included two final options: retaining the existing steel girders with new beams and decking or replacing the existing steel girders with lower profile steel girders and new beams and decking. It was determined that reuse of the existing steel girders would result in a vertical path profile change once the new decking is installed on top. Reuse of the existing steel girders would require modifications to the wing walls of the bridge, which was not desirable as they would result in environmental impacts, which are otherwise avoided. Therefore, new steel girders with a lower profile and avoidance of environmental impacts are proposed for Hop Brook Bridge.

Alternatives Analysis Summary

The Bruce Freeman Rail Trail project offers an opportunity to convert an inactive degraded railroad corridor into a 4.4-mile-long multimodal transportation and recreational trail in Sudbury, adding an extension to what is planned to be a continuous 25-mile alternative transportation corridor. The selected alternative for the Project avoids, minimizes, and mitigates impacts while achieving the Project purpose and need.



6 Proposed Impacts and Regulatory Compliance

The proposed Project will result in permanent and temporary impacts to WPA jurisdictional wetland resource areas as described in this section. Impacts to resource areas jurisdictional only to Town Bylaw are totaled in Section 7 and presented with the discussion of mitigation.

Table 2 summarizes the overall Project impacts. The impacts to each resource area are described in more detail in the subsections that follow.

Table 2: Summary of Total Resource Area Impacts

Overall WPA Resource Area Impacts	Perm	Temp	Total Impact	Total within Project Locus Area
Bank	135 LF	316 LF	451 LF	5,802 LF
Bordering Vegetative Wetlands (BVW)	1,190 SF	1,520 SF	2,710 SF	185,887 SF
Land Under Water (LUW)	449 SF	1,297 SF	1,746 SF	19,919 SF
Bordering Land Subject to Flooding (BLSF) Area	1,736 SF	-	1,736 SF	78,54 SF
Riverfront Area	65,857 SF	43,769 SF	109,626 SF	284,951 SF
Vernal Pools (WPA Certified or Eligible)	-	-	-	2 VPs in Project Locus 2 VPs outside Project Locus
100ft Buffer Zone	253,432 SF	175,793 SF	429,225 SF	1,122,312 SF
100' Buffer Zone to Certified or Eligible Vernal Pool	14,545 SF	7,531 SF	22,076 SF	66,163 SF
Section 401 & 404 Jurisdictional				
Isolated Vegetated Wetlands (IVW)	303 SF	166 SF	469 SF	14,593 SF

6.1 Bank (310 CMR 10.54)

The Project proposes permanent and temporary impacts to Bank resulting from the proposed work activities described in Section 4. Bank is proposed to be restored in situ at all temporary impact locations. Table 3 sums the proposed impacts to Bank by work activity. Table 4 details the proposed impacts to Bank at each project location.

Table 3: Summary of Impacts to Bank by Work Activity

Work Activity	Permanent Impact (LF)	Temporary Impact (LF)	Total Disturbed (LF)	Replaced (LF)
BFRT Shared-Use Path	0	0	0	0
Bridge Renovation	17	241	258	241
Culvert Renovation	118	75	193	76
Total	135	316	451	317

Table 4: Summary of Impacts to Bank

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Permanent Length (Ft.)	Temporary Length (Ft.)	Total Disturbed Length (Ft.)	Replaced Length (Ft.)	Impact Desc.	Resource Desc.	Flag Series
Bridge Renovation	126+26	Under Trail	Hop Brook		49	49	49	Abutment Work Area/Water Control	Perennial Stream (River)	BF#32-100 series
Bridge Renovation	126+50	Under Trail	Hop Brook		84	84	84	Abutment Work Area/Water Control	Perennial Stream (River)	BF#32-200
Culvert Renovation	166+89	West			4		4	Work Area for Replacement of Collapsed Culvert (South Bank)	Intermittent Stream	BF#30-205 to 206
Culvert Renovation	167+14	East			3		3	Work Area for Replacement of Collapsed Culvert (North Bank)	Intermittent Stream	BF#30-209 to 210
Culvert Renovation	167+24	West			8		8	Work Area for Replacement of Collapsed Culvert (North Bank)	Intermittent Stream	BF#30-308
Culvert Renovation	167+19	Under Trail		54		54		Replacement of Collapsed Culvert (South bank)	Intermittent Stream	BF#30-205 to 210
Culvert Renovation	167+31	Under Trail		46		46		Replacement of Collapsed Culvert (North bank)	Intermittent Stream	BF#30-105,321,319, 308
Culvert Renovation	216+48 to 216+54	East		6		6		Headwall Installation	Intermittent Stream	BF#23-300, 305
Culvert Renovation	216+46 to 216+51	East			6		6	Work Area for Headwall Installation	Intermittent Stream	BF#23-300-301

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Permanent Length (Ft.)	Temporary Length (Ft.)	Total Disturbed Length (Ft.)	Replaced Length (Ft.)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	216+46 to 216+51	East			7		7	Work Area for Headwall Installation	Intermittent Stream	BF#23-304-305
Culvert Renovation	216+68 to 216+76	East			8	8	8	Work Area for Headwall Installation	Intermittent Stream	BF#23-216 to 217
Culvert Renovation	216+69 to 216+99	East			6	6	6	Erosion control & Work Area	Intermittent Stream	BF#23-214 to 215
Culvert Renovation	216+68	East		6				Headwall Installation	Intermittent Stream	BF#23-215 to 216
Bridge Renovation	264+30	Under Trail	Pantry Brook	12		12		Dumped Rip Rap (South east bank)	Perennial Stream (River)	PS1-1 series
Bridge Renovation	264+37	Under Trail	Pantry Brook		52	52	52	Abutment Work Area/Water Control (South Bank)	Perennial Stream (River)	PS1-1 series
Bridge Renovation	264+52	Under Trail	Pantry Brook	5		5		Dumped Rip Rap (North East bank)	Perennial Stream (River)	PS1-1A series
Bridge Renovation	264+56	Under Trail	Pantry Brook		56	56	56	Abutment Work Area/Water Control (North Bank)	Perennial Stream (River)	PS1-1A series
Culvert Renovation	301+33	West			6	6	6	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series
Culvert Renovation	306+64	West			15	15	15	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series
Culvert Renovation	306+65	East			9	9	9	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series
Culvert Renovation	306+71	East			3	3	3	Erosion control & work area to replace headwall	Intermittent Stream	BF#15-6 series

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Permanent Length (Ft.)	Temporary Length (Ft.)	Total Disturbed Length (Ft.)	Replaced Length (Ft.)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	306+72	East		6				Embankment Grading, Loam & Seed	Intermittent Stream	BF#15-6 series
	Total:			135	316	451	316			

Description of Permanent Impacts to Bank

The cumulative permanent impacts to Bank total 134 LF, which is above the 50 LF cumulative project performance standard described in 310 CMR 10.54 (4)(a)(5). Culvert work at a single location makes up for 99 LF of the cumulative total or 73 percent. That location is Culvert 4 in Table 1 of Section 4 at Plan Station 167+20, where an existing culvert has collapsed causing an intermittent stream to wash through the rail embankment. The remaining permanent impacts to Bank cumulatively total 35 LF. Without the existing condition of the collapsed culvert, the cumulative permanent impacts to Bank would be below the performance standard limit of 50 LF.

The proposed permanent Bank impacts are described in more detail below at each location.

Impacts to Bank Caused by Culvert Renovation Work

- The proposed work at Culvert Location 4 will result in permanent impacts to Bank. The existing conditions and proposed work are described in Table 1 of Section 4. A total of 100 LF of permanent impacts to Bank, (54 LF and 46 LF on opposite sides of the stream) The existing culvert at this location is blocked and has collapsed. An intermittent stream designated by jurisdictional sections of the BF#30 flag series, also known as an unnamed tributary to Hop Brook, has cut around the collapsed culvert and washed through the existing rail embankment. The proposed work will replace the collapsed culvert. The work will result in permanent impacts to the Bank as the stream is returned to the replacement culvert in the location of the former culvert. The existing open channel crossing through the washed-out rail embankment will be repaired to a previously filled condition. More information on the proposed culvert design is provided in *Appendix H*. The stream crossing standards of the proposed replacement culvert are described in Section 6.

Regulatory Compliance: The proposed work is permissible under 310 CMR 10.54(4)(b) which states that:

"Notwithstanding the provisions of 310 CMR 10.54(4)(a), structures may be permitted in or on a Bank when required to prevent flood damage to facilities, buildings and roads constructed prior to the effective date of 310 CMR 10.51 through 10.60 or constructed pursuant to a Notice of Intent filed prior to the effective date of 310 CMR 10.51 through 10.60 (April 1, 1983), including the renovation or reconstruction (but not substantial enlargement) of such facilities, buildings and roads, provided that the following requirements are met:

- 1. The proposed protective structure, renovation or reconstruction is designed and constructed using best practical measures so as to minimize adverse effects on the characteristics and functions of the resource area;*
- 2. The applicant demonstrates that there is no reasonable method of protecting, renovating or rebuilding the facility in question other than the one proposed."*



The existing rail embankment facility was constructed prior to April 1, 1983. The rail embankment facility is proposed to be renovated by the Project as the structural base of a shared-use path. The work will not substantially enlarge the rail embankment.

The proposed 48-inch diameter culvert has been designed using the best practical measures to minimize adverse effects on the characteristics and functions of the resource area by proposing a minimally invasive structural footprint and limit of grading, proposing a natural stream bottom of 2ft inside the buried pipe, and by proposing that grading of the stream Bank in areas of disturbance will not exceed a ratio of 1 to 1.5 (vertical: horizontal).

Renovating the rail embankment facility by the proposed culvert replacement is the most reasonable method of renovating this pre-existing facility. A larger span crossing would require a more vertical profile of the shared-use path. If the trail profile were increased vertically, it would result in either a larger impact area from expanded limits of grading or vertical structural reinforcement such as a retaining wall, which would introduce a new barrier to wildlife crossing of small invertebrate.

The proposed work is compliant under 310 CMR 10.54(4)(c), as there is no habitat of rare species within the proposed within the proposed work limit.

- Proposed culvert work at Culvert 15 will result in 6 LF of permanent impact to Bank. The existing conditions and proposed work are described in Table 1 of Section 4. Culvert 15 is proposed to have headwalls replaced. The permanent Bank impact occurs at an intermittent stream designated by the BF#6-100 series. The cross section of the rail embankment is narrow with steep side slopes at this location, for this reason, the proposed work could not avoid the impact. The proposed impact is necessary for the maintenance of the culvert and to connect the embankment below the shared-use path back to the proposed replacement culvert headwall.

Regulatory Compliance: The proposed impact to Bank will fully comply with the general performance standards of 310 CMR 10.54(4)(a) through (c):

(a)

1. The physical stability of the Bank will be maintained. The proposed grading will result in a stabilized earthen Bank.
2. The water carrying capacity of the existing channel within the Bank will not be reduced.
3. Ground water and surface water quality will not be impaired. A work area surrounding the proposed culvert renovation work has been defined with erosion and sedimentation controls to protect the stream.
4. The capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries will not be impaired because the proposed loam & native seed treatment at the limit of grading will provide these features.
5. The capacity of the Bank to provide important wildlife habitat functions will not be impaired. A general wildlife habitat evaluation (WHE) was performed within the



Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated.

6. The proposed work at Culvert 15 consists of headwall replacement to an existing stream crossing. As such, the work has been designed to comply with the Stream Crossing Standards to the maximum extent practicable. Therefore, 10.54(4)(a)(6) does not apply, however the performance standards under 10.54(4)(a) are met based on 10.54(4)(a)(1) through (5).

(b) The proposed work will also have the benefit of preventing future flood damage to the rail embankment facility by repairing the existing damaged headwalls.

(c) The proposed work will not have an adverse effect on specified habitat sites of Rare Species, no such habitat sites exist within the Project Locus Area or near Culvert 15.

- Proposed work at Culvert Location 6 will cause permanent impacts to Bank. The existing conditions and proposed work is described in Table 1 of Section 4 as Culvert Location 6. A total of 12 LF of permanent impact to Bank is proposed. The existing culvert is a partially blocked and damaged 12" corrugated metal pipe with no headwalls. The proposed 15" reinforced concrete pipe culvert will include new headwalls. The culvert span could not be shortened to avoid this impact due to the presence of a shared-use path above the culvert span. The impacted Bank is part of the intermittent stream designated by the BF#23-200 and BF#23-300 flag series. The intermittent stream is in a human made former railroad drainage ditch that parallels the rail embankment and is of degraded quality.

Regulatory Compliance: The intermittent stream designated by the BF#23-200 and BF#23-300 flag series is unlikely to be significant to the interests specified in 310 CMR 10.54(1). The intermittent stream was originally constructed as a drainage ditch parallel to the tracks of the former railroad. Pursuant to 310 CMR 10.60, a general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated. The WHE report is provided in *Appendix J*.

The proposed impact to Bank will fully comply with the general performance standards of 310 CMR 10.54(4)(a) through (c):

(a)

1. The physical stability of the Bank will be maintained. The proposed headwalls will maintain the stability of the Bank.
2. The water carrying capacity of the existing channel within the Bank will not be reduced. The proposed new headwall will not reduce the carrying capacity of the existing channel. The culvert pipe is proposed to be enlarged from 12" to 15".
3. Ground water and surface water quality will not be impaired. A work area surrounding the proposed culvert renovation work has been defined with erosion and sedimentation controls to protect the stream.



4. The capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries will not be impaired because the proposed loam & native seed treatment at the limit of grading will provide these features once revegetated.
5. The capacity of the Bank to provide important wildlife habitat functions will not be impaired. A general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated.
6. The proposed work at Culvert 6 is the replacement of an existing stream crossing. As such, the work has been designed to comply with the Stream Crossing Standards to the maximum extent practicable. Therefore, 10.54(4)(a)(6) does not apply, however the performance standards under 10.54(4)(a) are met based on 10.54(4)(a)(1) through (5).

(b) While the proposed work at Culvert 6 is necessary due to the damaged condition of the existing culvert, the proposed work will also have the benefit of preventing flood damage by adding headwalls and new culvert pipe while also enlarging the culvert from 12" to 15" in diameter.

(c) The proposed work will not have an adverse effect on specified habitat sites of Rare Species, no such habitat sites exist within the Project Locus Area.

Impacts to Bank Caused by Bridge Renovation Work

- A total of 17 LF of permanent impact to Bank is proposed at Pantry Brook resulting from bridge renovation work. The impacts consist of 12 LF of Bank at plan Station 264+30 at the southeast footing of the proposed bridge and 5 LF of Bank at plan Station 264+52 at the northeast footing of the proposed bridge. Pantry Brook is a perennial stream.

The impacts are caused by the placement of dumped riprap (large angular stones) at the limit of Bank to protect the new bridge footings from scour. While the riprap is proposed to be located mostly behind the lowered existing abutment walls to remain, in two locations the proposed riprap meets the Pantry Brook Bank just outside of the existing bridge abutments. The proposed riprap alters the Bank in two relatively short sections underneath the bridge. The riprap will not cross the Bank, rather it will be placed on the Bank.

The proposed design retaining the existing abutment walls has reduced the need for excavation and disturbance to existing Bank. Wildlife crossing underneath the bridge will be enhanced by the presence of the lowered existing abutment wall, which may be traversed. Additionally, the riprap will be transitioned to a smaller size modified rockfill with a compost topdressing and seeding at elevation 120' which will be seeded with a native mix. Wildlife may travel on the top of the lowered abutment wall and access the modified rockfill with vegetated covering from the top of the wall.



Regulatory Compliance: The proposed impact to Bank will fully comply with the general performance standards of 310 CMR 10.54(4)(a) through (c):

(a)

1. The physical stability of the Bank will be enhanced by the proposed riprap which will provide scour protection during flooding events.
2. The water carrying capacity of the existing channel within the bank will not be reduced. The riprap will be at the landward side of the limit of Bank, not on the water side of Bank.
3. Ground water and surface water quality will not be impaired. A work area surrounding the proposed bridge renovation work has been defined. The bridge plans call for the control of water surrounding the limits of work with the use of a turbidity curtain. Erosion and sedimentation controls will be deployed on the landward side of the work area.
4. The capacity of the Bank to provide breeding habitat, escape cover, and food for fisheries will not be impaired because the proposed work takes place in a previously developed area. The existing conditions at the abutments of Pantry Brook Bridge consists of collapsed granite blocks at the limit of Bank.
5. The capacity of the Bank to provide important wildlife habitat functions will not be impaired. A general wildlife habitat evaluation (WHE) was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas is anticipated.
6. The proposed bridge renovation is the replacement of an existing stream crossing. As such, the work has been designed to comply with the Stream Crossing Standards to the maximum extent practicable. Therefore, 10.54(4)(a)(6) does not apply, however the performance standards under 10.54(4)(a) are met based on 10.54(4)(a)(1) through (5).

(b) While the Pantry Brook bridge renovation is proposed due to the structural deficiency of the existing bridge, the proposed work will also have the benefit of preventing flood damage. The proposed work at Pantry Brook Bridge will result in a net gain in flood storage capacity by removing at total volume of 78.4 CY (2,116.8 CF) below Base Flood Elevation 123.7' at Pantry Brook. The proposed riprap at Bank will stabilize the landward side of Bank and provide scour protection during flood events.

(c) The proposed work will not have an adverse effect on specified habitat sites of Rare Species, no such habitat sites exist within the Project Locus Area.

Description of Temporary Impacts to Bank



The proposed project will result in 316 LF of temporary impact to bank. Temporary impacts to Bank are proposed to occur due to designated work areas and erosion control throughout the project as indicated in Table 4. The temporary impacts to Bank are proposed to be restored in situ following construction.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls are proposed to be installed to protect stream water quality as shown on the proposed plans
- Work areas surrounding the existing bridge abutments call for the use of turbidity curtains to protect water quality
- Following construction, temporary impacts to Bank will be stabilized and restored in situ using a native seed mix.



6.2 Bordering Vegetated Wetlands (310 CMR 10.55)

The Project proposes permanent and temporary impacts to bordering vegetative wetlands (BVW) resulting from the proposed work activities described in Section 4. BVW is proposed to be restored in situ at all temporary impact locations. Permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7. Table 5 sums the proposed impacts to BVW by work activity. Table 6 details the proposed impacts to BVW at each project location.

Table 5: Summary of Impacts to BVW by Work Activity

Work Activity	Permanent Impact (SF)	Temporary Impact (SF)	Total Disturbed (SF)	Restored in Situ (SF)
BFRT Shared-Use Path	1,105	1,223	2,328	1,223
Bridge Renovation	85	259	344	259
Culvert Renovation	0	38	38	38
Total	1,190	1,520	2,710	1,520

Table 6: Summary of Impacts to BVW

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
BFRT Shared-Use Path	105+10				14	14	14	Erosion Control	WF#36-200 series
BFRT Shared-Use Path	105+10			5		5	0	Embankment Grading, Loam & Seed	WF#36-200 series
Bridge Renovation	126+08				47	47	47	Abutment Work Area/Water Control	WF#40-100 series
Bridge Renovation	263+94 to 264+28		Pantry Brook Area		42	42	42	Erosion Control	WF#14-100 series
Bridge Renovation	264+23		Pantry Brook Area	10		10	0	Dumped Rip Rap	WF#14-100 series
Bridge Renovation	264+34		Pantry Brook Area		35	35	35	Abutment Work Area/Water Control	WF#13-100 series
Bridge Renovation	264+61		Pantry Brook Area		31	31	31	Abutment Work Area/Water Control	WF#13-100 series
Bridge Renovation	264+21 to 264+32		Pantry Brook Area	47		47	0	Dumped Rip Rap	WF#13-100 series
Bridge Renovation	264+19 to 264+37		Pantry Brook Area		29	29	29	Erosion Control	WF#13-100 series

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
Bridge Renovation	264+67		Pantry Brook Area	15		15	0	Dumped Rip Rap	WF#13-100 series
Bridge Renovation	264+60 to 264+95		Pantry Brook Area		39	39	39	Erosion Control	WF#13-100 series
Bridge Renovation	264+57		Pantry Brook Area	13		13	0	Dumped Rip Rap	WF#14-100 series
Bridge Renovation	264+30 to 264+84		Pantry Brook Area		36	36	36	Erosion Control	WF#14-100 series
BFRT Shared-Use Path	292+44 to 297+14		Challenging BVW Section		503	503	503	Erosion Control	WF#7-100 series
BFRT Shared-Use Path	292+55 to 296+26		Challenging BVW Section	725		725	0	HMA Pavement, Gravel Shoulder, Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	293+18 to 294+15		Challenging BVW Section		88	88	88	Erosion Control	WF#6-100 series
BFRT Shared-Use Path	294+84 to 297+24		Challenging BVW Section		272	272	272	Erosion Control	WF#6-100 series
BFRT Shared-Use Path	295+08 to 297+08		Challenging BVW Section	190		190	0	Embankment Grading, Loam & Seed	WF#6-100 series
BFRT Shared-Use Path	296+55 to 296+76		Challenging BVW Section	2		2	0	Embankment Grading, Loam & Seed	WF#7-100 series

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
BFRT Shared-Use Path	297+24 to 297+78		Challenging BVW Section		8	8	8	Embankment Grading, Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	301+30		Challenging BVW Section		9	9	9	Erosion Control & Work Area for Headwall Replacement	WF#6-100 series
BFRT Shared-Use Path	301+38		Challenging BVW Section		12	12	12	Erosion Control & Work Area for Headwall Replacement	WF#6-100 series
BFRT Shared-Use Path	301+34		Challenging BVW Section		12	12	12	Erosion Control & Work Area for Headwall Replacement	WF#7-100 series
BFRT Shared-Use Path	302+96 to 303+14		Challenging BVW Section	2		2	0	Embankment Grading, Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	302+69 to 304+91		Challenging BVW Section		214	214	214	Erosion Control	WF#7-100 series
BFRT Shared-Use Path	303+66 to 304+20		Challenging BVW Section	26		26	0	Embankment Grading, Loam & Seed	WF#6-100 series

Work Activity	Plan Station	East/West of Trail	Name	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Restored in situ (SF)	Impact Disc.	Flag Series
BFRT Shared-Use Path	303+70 to 304+84		Challenging BVW Section	155		155	0	Gravel Shoulder, Embankment Grading Loam & Seed	WF#7-100 series
BFRT Shared-Use Path	303+39 to 304+29		Challenging BVW Section		91	91	91	Erosion Control	WF#6-100 series
Culvert Renovation	306+55				13	13	13	Erosion Control & Work Area	WF#5-400 series
Culvert Renovation	306+56				25	25	25	Erosion Control & Work Area	WF#5-300 series
	Total:			1,190	1,520	2,710	1,520		

Description of Permanent Impacts to BVW

Overall the proposed Project impacts to BVW total 2,710 square feet with 1,190 SF of permanent impacts and 1,520 SF of temporary impacts. This is below the 5,000 SF threshold of 310 CMR 10.55(4)(b).

The following describes the permanent impacts to BVW caused by the shared-use path construction and bridge renovation work.

Impacts to BVW Caused by Shared-Use Path Construction

- A cumulative total of 1,100 SF of permanent impact to BVW is proposed resulting from construction of the shared-use path between plan Stations 292+55 and 304+84. This 1,400-foot-long section of the rail ROW was described in the Alternatives Analysis as the challenge section due to the proximity of BVW to the existing rail embankment. Within this section, the shared-use path cross section design was narrowed from 14 feet to 12 feet to reduce BVW impacts by approximately 2,500 square feet of permanent impacts. The remaining permanent impacts occur due to the encroachment of the proposed path and shoulders on BVW parallel to the rail embankment. The permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7.
- A total of 5 SF of permanent impact to BVW is proposed resulting from construction of the shared-use path at plan Station 105+10 on the west side of the trail. The impact arises from a small encroachment of the trail on adjacent BVW from grading of earth between the shared-use path shoulder and existing ground contour. The permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7.

Impacts to BVW Caused by Bridge Renovation

- A cumulative total of 85 SF of permanent impacts to BVW are proposed resulting from bridge renovation work. The impacts occur at Pantry Brook Bridge between plan Stations 263+94 and 264+67. The impacts occur around the four footings of the proposed concrete arch bridge structure where scour protection is proposed that encroaches on surrounding BVW. The scour protection consists of dumped riprap up to until elevation 120' where a transition to modified rock fill with compost top dressing and native seeding is proposed to improve wildlife crossing. The permanent impacts to BVW are proposed to be replicated as part of the wetland replication area described in Section 7.

Description of Temporary Impacts to BVW

The proposed project will result in 1,520 SF of temporary impacts to BVW. The temporary impacts to BVW are proposed to be restored in situ.



Regulatory Compliance: The total proposed permanent and temporary impacts to BVW total 2,710 SF, which is below the 5,000 SF threshold of 310 CMR 10.55(4)(b). Proposed compliance with the performance standards of 310 CMR 10.55(4)(b)(1) through (7) is explained herein:

(b)

1. The surface of the replacement area proposed exceeds the lost area. The permanent impacts to BVW are proposed to be replicated in a wetland replication area exceeding the area of permanent impact as explained in Section 7.

2. Permanent impacts are not proposed to be replicated near the locations of impact within the rail ROW due to the presence of invasive species and the lack of suitable contiguous land area inside the rail ROW that would be conducive for BVW replication without impacting an existing wetland or necessitating the clearing of trees. The proposed wetland replication area is in a grass field that does not require the clearing of trees.

The proposed single replication area sized for the cumulative impacts along the long linear rail ROW will have a greater chance of surviving compared to smaller replication areas distributed throughout the rail ROW.

3. The proposed wetland replication area will not have the same slender horizontal configuration as the impacted areas inside of the Rail ROW. The proposed wetland replication area can accommodate a more compact and rounded area that avoids slenderness to improve the survival of plantings.

4. The replicated BVW will not have a hydraulic connection to the same waterbody as the impacted areas given that suitable land for replication could not be found within the rail ROW, this performance standard could not be met. The wetland replication area will however have a hydraulic connection to an existing BVW that borders an existing pond as described in Section 7.

5. The permanent impacts to BVW to be replicated will not be located within the reach of the same waterbody as the impacted areas given that suitable land for replication could not be found within the rail ROW, this performance standard could not be met. Rather than replicating each small BVW impact area individually at the same water body of impact, the cumulative Project impacts to BVW will be replicated in one location for greater survivability.

6. The Project performance specifications for wetland replication will require that at least 75% of the surface of the replacement or replication areas shall be reestablished with indigenous wetland plant species within two growing seasons and that prior to said vegetative reestablishment any exposed soil in the replacement area shall be temporarily stabilized to prevent erosion in accordance with standard U.S. Soil Conservation Service methods.

7. The replicated BVW will be provided in a manner which is consistent with all other General Performance Standards for each resource area in Part III of 310 CMR 10.00. The proposed



wetland replication area is located within the 100-foot Buffer Zone of BVW. The wetland replication area will improve the existing Buffer Zone which is currently a maintained grass field.

310 CMR 10.55(4)(c) is not relevant, the Project impacts exceed 500 SF.

The project complies with 310 CMR 10.55(4)(d). None of the proposed impacts to BVW occur in an area of specified habitat site of rare or invertebrate species.

The project complies with 310 CMR 10.55(4)(e). The Project Locus Area does not contain or overlap with any Areas of Critical Environmental Concern.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect BVW
- Following construction, temporary impacts to BVW will be restored
- The alternatives analysis for the Project looked at various cross section design alternatives to minimize BVW impacts while balancing trail user safety (narrowness) and wildlife crossing impacts (vertical profile). The proposed design narrows the path cross section from 14 to 12 feet between Station 292+00 and Station 305+00 to minimize BVW impacts. The narrowed shoulders in this section eliminated approximately 2,500 square feet of BVW impacts.
- A wetland replication area is proposed to replicate the permanent impacts to BVW. The proposed replication area will exceed the amount of permanent BVW impacts as explained in Section 7.



6.3 Land Under Water (310 CMR 10.56)

The Project proposes permanent and temporary impacts to land under water (LUW) resulting from the proposed work activities described in Section 4. LUW is proposed to be restored in situ at all temporary impact locations. Table 7 sums the proposed impacts to LUW by work activity. Table 8 details the proposed impacts to LUW at each project location.

Table 7: Summary of Impacts to LUW by Work Activity

Work Activity	Permanent Impact (SF)	Temporary Impact (SF)	Total Disturbed (SF)	Restored in situ (SF)
Bridge Renovation	0	1,011	1,011	1,011
Culvert Renovation	449	285	734	285
Total	449	1296	1,746	1,296

Table 8: Summary of Impacts to LUW

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Perm. Impact Area (SF)	Temp. Impact Area (SF)	Total Disturbed Area (SF)	Replaced Area (SF)	Impact Desc.	Resource Desc.	Flag Series
Bridge Renovation	126+30	Under Trail	Hop Brook		179	179	179	Abutment Work Area, Water Control	Perennial Stream (River)	BF #32-100 Series
Bridge Renovation	126+52	Under Trail	Hop Brook		347	347	347	Abutment Work Area, Water Control	Perennial Stream (River)	BF #32-200 Series
Culvert Renovation	167+18 to 167+33	Under Trail		345		345	59	Repair Culvert	Intermittent Stream	BF #30-105, 308, 320, 321, BF #30-206-210
Culvert Renovation	166+91 to 167+14	West		55		55	0	Repair Culvert	Intermittent Stream	BF #30-205-206
Culvert Renovation	167+14	East		10		10	0	Repair Culvert	Intermittent Stream	BF #30-208-209
Culvert Renovation	167+17	East			52	52	52	Work Area for culvert repair, returned to natural stream bed	Intermittent Stream	BF #30-208-209
Culvert Renovation	167+17	West			89	89	89	Work Area for culvert repair, returned to natural stream bed	Intermittent Stream	BF #30-205-206

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Perm. Impact Area (SF)	Temp. Impact Area (SF)	Total Disturbed Area (SF)	Replaced Area (SF)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	216+46 to 216+51	East			35	35	35	Work Area for Headwall Installation, erosion control	Intermittent Stream	BF#30-300,305
Culvert Renovation	216+69 to 216+75	East			42	42	42	Work Area for Headwall Installation, erosion control	Intermittent Stream	BF#30-215-216
Culvert Renovation	216+50	East		16		16	0	Headwall Replacement	Intermittent Stream	BF#23-300 to 305
Culvert Renovation	216+65	East		3		3	0	Headwall Replacement	Intermittent Stream	BF#23-215 to 216
Bridge Renovation	264+39	Under Trail	Pantry Brook		254	254	254	Bridge Abutment Work Area/Water Control	Perennial Stream (River)	PS1-1 Series
Bridge Renovation	264+55	Under Trail	Pantry Brook		231	231	231	Bridge Abutment Work Area/Water Control	Perennial Stream (River)	PS1-1A Series
Culvert Renovation	301+33	West			4	4	4	Erosion Control & Work Area	Intermittent Stream	BF#15-6-304, BF#15-6-130
Culvert Renovation	301+33	East			12	12	12	Erosion Control & Work Area	Intermittent Stream	BF#15-7-100 Series

Work Activity	Plan Station	East/West of Trail	Name of River/Stream	Perm. Impact Area (SF)	Temp. Impact Area (SF)	Total Disturbed Area (SF)	Replaced Area (SF)	Impact Desc.	Resource Desc.	Flag Series
Culvert Renovation	306+61	West			29	29	29	Erosion Control & Work Area	Intermittent Stream	BF#5-206 to 209
Culvert Renovation	306+60	West		8		8	0	Replace Headwall	Intermittent Stream	BF#5-207 to 208
Culvert Renovation	306+60	East		8		8	0	Replace Headwall	Intermittent Stream	BF#6-100 to 101
Culvert Renovation	306+61	East			22	22	22	Erosion Control & Work Area	Intermittent Stream	BF#6-102 to 105
Culvert Renovation	306+70	East		4		4	0	Embankment Grading, Headwall replacement	Intermittent Stream	BF#6-101 to 102
	Total:			449	1,296	1,746	1,355			

Description of Permanent Impacts

Overall, the cumulative project impacts to LUW total 1,746 SF with 449 SF of permanent and 1,296 SF of temporary. This total is below the cumulative threshold of 5,000 SF described in 310 CMR 10.56(4)(a)(4).

This following describes the proposed permanent impacts to LUW caused by culvert renovation and bridge renovation work.

Impacts to LUW Caused by Culvert Renovation

- Proposed work at Culvert Location 4 will result in permanent impacts to LUW. The existing conditions and proposed work are described in Table 1 of Section 4. A cumulative total of 410 SF of permanent impact to LUW is proposed from culvert renovation between plan Stations 166+91 and 167+17. The work will result in permanent impact to the existing LUW as the stream is returned to the replacement culvert from the washed out rail embankment. The existing open channel crossing through the washed-out rail embankment will be returned to a previously filled condition. The proposed culvert will have a natural stream bottom which will replace 59 SF of LUW. More information on the proposed culvert design is provided in *Appendix H*.

Regulatory Compliance: The performance standards of 310 CMR 10.56 (4)(a) through (c) are met as follows:

(a)

1. The water carrying capacity of the proposed culvert will be greater than the existing collapsed culvert to be replaced at this location. See the culvert design report in *Appendix H*.
2. Ground water surface quality will not be impaired by the proposed work. Erosion controls during construction will prevent sediment from entering the stream.
3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries will not be impaired by the proposed work. The proposed culvert will be located in the same location as the existing collapsed culvert. Proposed clearing surrounding the proposed culvert has been minimized and the grading of slopes has been made more steep to minimize disturbance to surrounding vegetated slopes. The proposed culvert will have a natural stream bottom to replace some habitat.
4. The proposed culvert will not impair the capacity of the land to provide important wildlife habitat functions. The proposed work will replace an existing collapsed culvert, and therefore will return the stream crossing to a prior condition for wildlife habitat function. The proposed work will not alter above 5,000 SF of LUW.
5. The culvert crossing has been designed to meet the Stream Crossing Standards to the maximum extent practicable pursuant to 310 CMR 10.53(8)(a). As such, 310 CMR 10.56(4)(a)(5) is not met, however 310 CMR 10.56 (4)(a) is still met based upon 10.56(4)(a)(1) through (4).



- (b) The location is an intermittent stream and there is no boat channel.
- (c) There are no specified habitat sites of rare vertebrate or invertebrate species in the Project Locus Area.

- Proposed work at Culvert Location 15 will result in permanent impact to LUW. The existing condition and proposed work is described in Table 1 of Section 4. A cumulative total of 20 SF of permanent impacts to LUW are proposed resulting from culvert renovation work at plan Stations 306+60 and 306+70. The impacts are caused by the replacement of a damaged culvert headwalls.

Regulatory Compliance: The performance standards of 310 CMR 10.56 (4)(a) through (c) are met as follows:

- (a)
 - 1. The water carrying capacity of the defined channel will be negligibly affected by the proposed impact.
 - 2. Ground water surface quality will not be impaired by the proposed work. Erosion controls during construction will prevent sediment from entering the stream.
 - 3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries will not be impaired by the proposed work. The proposed culvert will be located in the same location as the existing culvert. The finished grades back to the replacement headwalls will be constructed of loam & native seed for vegetative cover and the restoration of habitat.
 - 4. The proposed culvert will not impair the capacity of the land to provide important wildlife habitat functions. The proposed work will replace existing headwalls, and therefore will return the stream crossing to a prior condition for wildlife habitat function. The proposed work will not alter above 5,000 SF of LUW.
 - 5. Culvert 15 is an existing crossing and has been designed to meet the Stream Crossing Standards to the maximum extent practicable pursuant to 310 CMR 10.53(8)(a). As such, 310 CMR 10.56(4)(a)(5) is not met, however 310 CMR 10.56 (4)(a) is still met based upon 10.56(4)(a)(1) through (4).

- (b) The location is an intermittent stream, there is no boat channel.
- (c) There are no habitat sites of rare or vertebrate or invertebrate species in the Project Locus Area.

- Proposed work at Culvert Location 6 will result in permanent impact to LUW. The existing and proposed conditions are described in Table 1 of Section 4. A cumulative total of 19 SF of permanent impact to LUW is proposed from culvert renovation between plan Stations 216+50 and 216+65. The proposed impact occurs at the intermittent streams designated by the BF#23-200 and BF#23-300 series. The intermittent streams are former drainage ditches parallel to the rail embankment. The existing does not have headwalls. The footprint of the proposed cement concrete headwalls results in the 19 SF of permanent impact to LUW. The culvert span could



not be shortened at this location due to the shared-use path above the culvert that must be 10ft minimum in paved width.

Regulatory Compliance: The performance standards of 310 CMR 10.56 (4)(a) through (c) are met as follows:

(a)

1. The water carrying capacity of the defined channel will be negligibly affected by the proposed impact.
2. Ground and surface water quality will not be impaired by the proposed work. Erosion controls during construction will prevent sediment from entering the stream.
3. The capacity of said land to provide breeding habitat, escape cover and food for fisheries will not be impaired by the proposed work. The proposed culvert will be located in the same location as the existing culvert. The finished grades back to the new headwalls will be constructed of loam & native seed for vegetative cover and the restoration of habitat.
4. The proposed culvert will not impair the capacity of the land to provide important wildlife habitat functions. The location is a degraded drainage ditch parallel to the rail embankment. The proposed work will improve habitat functions by improving a deficient undersized existing culvert. The proposed work will not alter above 5, 000 SF of LUW.
5. The proposed culvert at an existing crossing has been designed to meet the Stream Crossing Standards to the maximum extent practicable pursuant to 310 CMR 10.53(8)(a). As such, 310 CMR 10.56(4)(a)(5) is not met, however 310 CMR 10.56 (4)(a) is still met based upon 10.56(4)(a)(1) through (4). Compliance with the stream crossing standards is described in Section 6.7.

(b) The location is an intermittent stream and there is no boat channel.

(c) There are no specified habitat sites of rare or vertebrate or invertebrate species in the Project Locus Area.

Description of Temporary Impacts

The Project will result in a total of 1,296 square feet of temporary impact to LUW. The temporary impacts to LUW are proposed to be restored in situ. The temporary impacts result from work area allowances at Hop Brook and Pantry Brook, work at Culvert Locations 4, 6, 14, and 15 as described in Table 1 of Section 4. The temporary impacts also occur due to the placement of erosion and sedimentation control during construction encroaching on LUW. This occurs where erosion and sediment controls are placed in the dry streambed of an intermittent stream to prevent sediment from grading above the Bank from entering the stream channel.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect stream water quality



- Work areas surrounding the existing bridge abutments call for the use of turbidity curtains to protect water quality
- Temporary impacts will be restored in situ following construction.



6.4 Bordering Land Subject to Flooding (310 CMR 10.57)

The Project proposes permanent impacts to Bordering Land Subject to Flooding resulting from the work activities described in Section 4. There are three areas of proposed permanent impact to BLSF: Hop Brook and Mineway Brook each have minor amounts of proposed earthen fill. The proposed fill at Hop Brook and Mineway Brook will be offset by compensatory flood storage of equal volume in the same respective BLSF zones and elevations. At Pantry Brook, the proposed impact is a significant cut to earth below BLSF, resulting in a gain of flood storage volume and requiring no compensatory storage.

Table 9 summarizes the locations of BLSF impact by work activity and impact area. Table 10 summarizes the locations of BLSF impact by elevation and impact volume.



Table 9: Summary of Impact BLSF in Area

Work Activity	BLSF Location & Station	Impact Area Station	Permanent Impact (square feet)	Temporary Impact (square feet)	Total Impact (square feet)	Impact Desc.
BFRT Shared-Use Path	Hop Brook STA 116+00 to 133+30 (East & West of trail) Base Flood Elevation 138.0'	STA 117+18 to 117+97 (West side of trail)	175		175	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Subtotal	175		175	
-	Mineway Brook STA 195+00 to 202+00 (West of trail) Base Flood Elevation 171.9'	-	-		-	No impacts
BFRT Shared-Use Path	Mineway Brook STA 195+00 to 202+00 (East of trail) Base Flood Elevation 174.3'	STA 197+81 to 198+72 (East side of trail)	148		148	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared-Use Path		STA 198+86 to 199+07 (East side of trail)	21		21	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared-Use Path		STA 200+48 to 201+68 (East side of trail)	240		240	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Subtotal	409		409	

Work Activity	BLSF Location & Station	Impact Area Station	Permanent Impact (square feet)	Temporary Impact (square feet)	Total Impact (square feet)	Impact Desc.
Bridge Renovation	Pantry Brook STA 261+00 to STA 267+00 (East & West of trail) Base Flood Elevation 123.7'	264+00 to 264+37 (South abutment west side of trail)	195		195	Cut and regrade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+00 to 264+37 (South abutment east side of trail)	215		215	Cut and regrade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+50 to 265+00 (North abutment west side of trail)	264		264	Cut and grade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+50 to 265+00 (North abutment east side of trail)	212		212	Cut and regrade embankment behind existing abutment with loam & native seed, placement of modified rock fill and riprap
Bridge Renovation		264+28 to 264+37 (underneath proposed bridge span, south abutment)	130		130	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap

Work Activity	BLSF Location & Station	Impact Area Station	Permanent Impact (square feet)	Temporary Impact (square feet)	Total Impact (square feet)	Impact Desc.
Bridge Renovation		264+49 to 264+58 (underneath proposed bridge span, North abutment)	136		136	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap
		Subtotal	1,152		1,152	
	Zone A BLSF STA 272+60 to 273+65 (west side of trail) STA 272+10 to 273+50 (east side of trail) STA 283+50 to 284+50 (west side of trail) STA 284+55 to 285+95 (east side of trail)	-	-	-	-	No impacts
	Tributary A to Cold Brook STA 310+50 to 314+50 (east side of trail) Base Flood Elevation 139.1'	-	-	-	-	No impacts
	Tributary A to Cold Brook STA 312+78 to 314+40 (west side of trail) Base Flood Elevation 140.7"	-	-	-	-	No impacts
		Total	1,736		1,736	

Table 10: Summary of Impact to BLSF by Elevation and Volume

Work Activity	BLSF Location & Station	Elevation (ft)	Fill (CY)	Cut (CY)	Net (+Fill/-Cut) (CY)	Impact Desc.
BFRT Shared- Use Path	Hop Brook STA 117+118 to 117+97 (West side of trail)	138'-137'	0.33	0	0.33	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Hop Brook Subtotal	0.33	0	0.33	
BFRT Shared- Use Path	Mineway Brook STA 197+81 to 198+72 (East side of trail)	174.3'-173.3'	1.21	0	1.21	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared- Use Path	Mineway Brook STA 198+86 to STA 199+07	174.3'-173.3'	0.17	0	0.17	Grading from trail shoulder to existing ground w/ loam & native seed fill
BFRT Shared- Use Path	Mineway Brook STA 200+48 to 201+68 (East side of trail)	174.3'-173.3'	0.83	0	0.83	Grading from trail shoulder to existing ground w/ loam & native seed fill
		Mineway Brook Subtotal	2.21	0	2.21	
Bridge Renovation	Pantry Brook 264+00 to 264+37 (South bridge abutment, east and west sides)	123.7'-122.7'	0	-8.08	-8.08	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap
		122.7'-121.7'	0	-9.30	-9.30	
		121.7'-120.7'	0	-6.53	-6.53	
		120.7'-119.7'	0	-2.31	-2.31	

Work Activity	BLSF Location & Station	Elevation (ft)	Fill (CY)	Cut (CY)	Net (+Fill/-Cut) (CY)	Impact Desc.
Bridge Renovation	Pantry Brook 264+50 to 265+00 (North bridge abutment, east and west sides)	123.7'-122.7'	0	10.56	-10.56	Reduction in height of existing abutment walls, Cut and grade embankments behind existing abutments, placement of modified rock fill and riprap
		122.7'-121.7'	0	-9.84	-9.84	
		121.7'-120.7'	0	-7.26	-7.26	
		120.7'-119.7'	0	-2.37	-2.37	
Bridge Renovation	Pantry Brook 264+49 to 265+00 (underneath proposed bridge span)	123.7'-122.7'	0	-6.41	-6.41	Reduction in height of existing abutment walls, Cut and regrade embankments behind existing abutments, placement of modified rock fill and riprap
		122.7'-121.7'	0	-6.84	-6.84	
		121.7'-120.7'	0	-5.65	-5.65	
		120.7'-119.7'	0	-3.20	-3.20	
		Pantry Brook Subtotal	0	-78.4	-78.4	

Compensatory Storage

At Hop Brook compensatory storage is located between plan Station 119+74 and 120+75 on the west side of the trail. The storage is provided between Elevation 138.0' and 137.0'. The compensatory storage volume area is 259 SF and the volume is 7.1 cubic yards (192 CF).

At Mineway Brook compensatory storage is located between plan Station 199+74 and 200+05 on the east side of the trail. The storage is provided between Elevation 174.3' and 173.3'. The compensatory storage volume area is 279 SF and the volume is 5.4 cubic yards (146 CF).

Regulatory Compliance: The proposed work is fully compliant with 310 CMR 10.57(4)(a) through (c) as explained here:

(a)

1. Compensatory storage is proposed to be provided at Hop Brook between plan Station

and at Mineway Brook at the same incremental foot in elevation where fill is proposed to occur as detailed in the above Table 9. The compensatory storage is proposed to be provided with an unrestricted hydraulic connection to the same waterway at which the corresponding fill is proposed.

2. Work within BLSF will not restrict flows so as to cause an increase in flood stage or velocity. The compensatory storage will be provided before the proposed fill occurs. No equipment or stockpiling of materials shall occur within the respective BLSF zones.

3. Less than 5,000 SF of BLSF is proposed to be altered. None of the proposed fill occurs within the 10-year flood plain. No disturbance to vernal pool habitat area is proposed.

(b). There are no proposed impacts to WPA jurisdictional Isolated Land Subject to Flooding in the Project Locus Area

(c). There are no specified habitat sites of rare or vertebrate or invertebrate species in the Project Locus Area.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect resource areas
- Compensatory storage at Hop Brook and Mineway Brook shall be provided at the same elevations where fill is proposed in each respective BLSF zone. The compensatory storage shall be created before the fill condition is created.



6.5 Riverfront Area (310 CMR 10.58)

There are five WPA jurisdictional Riverfront Areas (RFAs) totaling 284,949 square feet in area within the Project Locus Area. Each of the RFAs are previously disturbed and partially degraded. The RFAs are previously disturbed due to the past construction and operation of the former railroad. The RFAs are partially degraded due to the remaining surface of the 16-foot-wide rail embankment of dense graded crushed ballast stone, wood ties, and steel rails.

Table 11 summarizes the location and total area of RFAs within the Project Locus Area. The amount of existing degraded area is shown for each RFA.

Table 11: Summary of WPA Jurisdictional RFAs

Perennial Stream	Plan Station Range of RFA	0-100ft RFA (SF)	100-200ft RFA (SF)	Total RFA (SF)	Total Existing Degraded Area (SF)	Total Percent Existing Degraded
Hop Brook, BF#32&33	STA 121+35 to STA 134+13	61,132	22,942	84,074	20,448	24%
Hop Brook, BF#32	STA 157+91 to STA 164+89	26,337	19,477	45,814	11,168	24%
Pantry Brook PS1#	STA 254+79 to STA266+53	48,088	29,476	77,564	18,784	24%
Unnamed Tributary to Pantry Brook, BF#12	STA 268+64 to 275+39	18,920	25,320	44,240	10,800	24%
Unnamed Tributary to Cold Brook, BF#3	STA 311+33 to STA 316+40	18,896	14,361	33,257	8,112	24%
Total		173,373	111,576	284,949	69,312	24%

The Project proposes permanent and temporary impacts to Riverfront Area (RFA) resulting from the work activities described in Section 4. Table 12 details the proposed impacts to RFA at each project location with a description of the associated work activity. The construction of the shared-use path accounts for a vast majority of the impacts to RFA with minor impacts associated with bridge renovation.



Table 12: Summary of Impacts to RFAs

Station	Name of River	0ft-100ft Perm. (SF)	0ft-100ft Temp. (SF)	0ft-100ft Total Disturbed Area (SF)	100ft- 200ft Perm. (SF)	100ft- 200ft Temp. (SF)	100ft-200ft Total Disturbed Area (SF)	Total Perm. (SF)	Total Temp. (SF)	Total Disturbed Area (SF)	Work Activity	Desc.
121+35 to 134+13	BF-32-100 & BF-32-200, BF-33 series, Hop Brook	14,420	5,850	20,270	4,964	2,832	7,796	19,384	8,682	28,066	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed, Erosion Control
125+94 to 126+99	BF-32-100 & BF-32-200, BF-33 series, Hop Brook	0	441	441	0	0	0	0	441	441	Bridge Renovation	Clean & repair existing bridge abutments
157+91 to 164+89	BF-32-100 & BF-32-200 series, Hop Brook	6,265	2,943	9,208	4,312	2,275	6,587	10,577	5,218	15,795	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
254+79 to 266+53	PS-1 series, Pantry Brook	11,492	11,210	22,702	5,299	6,361	11,660	16,791	17,571	34,362	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
264+19 to 264+70	PS-1 series, Pantry Brook	1,412	179	1,591	0	0	0	1,412	179	1,591	Bridge Renovation	New bridge superstructure, duped riprap, modified rock fill
268+64 to 275+39	BF-12 series, Unnamed Tributary to Pantry Brook	4,139	2,718	6,857	5,728	4,233	9,961	9,867	6,951	16,818	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
311+33 to 316+40	BF-3 series, unnamed tributary to Cold Brook	4,589	2,046	6,635	3,237	2,681	5,918	7,826	4,727	12,553	BFRT Shared-Use Path	Perm: Paved Path & Crushed Gravel; Temp: Loam & Native Seed
Total		42,317	25,387	67,704	23,540	18,382	41,922	65,857	43,769	109,626		

The Project will also result in temporary impacts to RFA due to earth excavation or fill within the limits of grading or temporary erosion control. The temporary impact areas are proposed to be revegetated with loam and native seed mix. Native tree plantings are also proposed within RFAs, refer to the Construction Plans section of the proposed plans in *Appendix F* for the proposed plant species and proposed locations.

Regulatory Compliance Summary: The proposed work is fully compliant with 310 CMR 10.58(4)(a) through (b) as explained here:

(a) Protection of other Resource Areas.

As described in Section 6.2 (BVW) it is impractical for the project to meet all of the performance standards of 310 CMR 10.55 related to BVW replication near the location of impact and providing a hydraulic connection to the same waterway as the impacted in the rail ROW. The project proposes a single replication area sized for cumulative BVW impacts to improve the survival rate and to ensure the replication area is located in an area distanced from invasive species.

As described in Section 6.4 (BLSF), The Project was designed to fully comply with the performance standards of 310 CMR 10.57.

(b) Protection of Rare Species. The Project will not have any adverse effect on specified habitat of rare species. The Project Area Locus does not contain any Priority Habitats for State Protected Rare Species or State Estimated Habitats of Rare Wildlife.

In addition, the proposed work is fully compliant with 310 CMR 10.58(5)(a) through (h)

(5) Notwithstanding the provisions of 310 CMR 10.58(4)(c) and (d), the issuing authority may allow work to redevelop a previously developed riverfront area, provided the proposed work improves existing conditions. Redevelopment means replacement, rehabilitation or expansion of existing structures, improvement of existing roads, or reuse of degraded or previously developed areas.....

The Project is a redevelopment project. The RFAs in the Project Locus Area are within a previously developed rail corridor which includes a 16ft wide degraded area of dense graded crushed stone ballast, wood ties, and steel tracks. The proposed permanent impact area of the Project within the RFAs consists of a 10ft wide shared-use path surface and 1ft to 3ft wide crushed stone shoulders located within the previously degraded embankment area. The areas of temporary disturbance outside of the path shoulder will be revegetated with native species to restore the RFAs in situ.

(a) *Improvement over existing conditions.* The Project will result in an improvement to the RFAs over existing conditions by reducing the degraded ground cover area in each RFA. Overall The



Project will reduce the degraded area by approximately 4.9 percent among all RFAs. Additionally, the removal of the raised vertical rail tracks will improve crossing conditions for wildlife that may have been impeded such as some species of turtles or the spotted salamander. The trail design will not introduce any new vertical impedances to wildlife crossing.

- (b) *Stormwater management.* Stormwater management and erosion controls during construction will comply with all applicable standards. The Stormwater Management Standards (SMS) for The Project apply to the maximum extent practicable for bike paths per 310 CMR 10.05(6)(m)(6).
- (c) *Within 200-foot riverfront areas, proposed work shall not be located closer to the river than existing conditions or 100 feet, whichever is less...*

The trail will be located within the previously degraded area of 16ft wide rail ballast, and therefore will not be located closer to the riverfront than existing conditions. The proposed bridge renovation work will leave the existing bridge abutments in place at lowered heights. The proposed new superstructure at Pantry Brook is located behind (landward of) the existing bridge abutment, therefore it is not closer to the river.

- (d) *Proposed work, including expansion of existing structures, shall be located outside the riverfront area or toward the riverfront area boundary and away from the river...*

The Project is a redevelopment project that proposes reuse of existing degraded and previously developed areas in the RFA. The Project Locus Area is a former linear transportation corridor that currently crosses existing water bodies and their associated RFAs. The Project does not propose expansion of the existing degraded or previously developed areas in the RFA. To the extent feasible, the project has located work outside of the RFAs such as larger rest areas and emergency vehicle turnarounds.

- (e) *The area of proposed work shall not exceed the amount of degraded area, provided that the proposed work may alter up to 10% if the degraded area is less than 10% of the riverfront area, except in accordance with 310 CMR 10.58(5)(f) or (g).*

The proposed work shall not exceed the amount of existing degraded area in the RFAs. The existing degraded area within the RFAs is over 10 percent, each totaling approximately 24 percent as shown in Table 11. Therefore the Project is not limited to a degraded area of less than 10 percent. The proposed condition will reduce the existing degraded area within each RFA. The overall degraded area of all RFAs will be reduced by approximately 4.9 percent in the Project Locus Area.

- (f) *When an applicant proposes restoration on-site of degraded riverfront area, alteration may be allowed notwithstanding the criteria of 310 CMR 10.58(5)(c), (d), and (e) at a ratio in square feet of at least 1:1 of*



restored area to area of alteration not conforming to the criteria. Areas immediately along the river shall be selected for restoration. Alteration not conforming to the criteria shall begin at the riverfront area boundary.

There is a total of 43,769 square feet of proposed temporary RFA disturbance and 65,857 square feet of proposed permanent RFA disturbance associated with the Project. The only permanent disturbance is the 14 to 16-foot-wide paved shared-use path, which will be within the 16-foot-wide degraded area. All areas of disturbance outside of the paved shared-use path will be restored with native plantings and seed, which meets the criteria of 1:1. In addition, the Project will reduce the amount of existing degraded area by 4.9 percent.

(g) Riverfront Area Mitigation.

No RFA mitigation areas are proposed since the proposed degraded area in the RFAs will be less than existing conditions by approximately 4.9 percent and temporarily disturbed areas outside of the proposed permanent impact areas will be revegetated with native species of plantings and seed.

(h) The issuing authority shall include a continuing condition in the Certificate of Compliance for projects under 310 CMR 10.58(5)(f) or (g) prohibiting further alteration within the restoration or mitigation area, except as may be required to maintain the area in its restored or mitigated condition. Prior to requesting the issuance of the Certificate of Compliance, the applicant shall demonstrate the restoration or mitigation has been successfully completed for at least two growing seasons.

Proposed plantings within the restored RFA area shall have an establishment period of two growing seasons as defined in the special provisions for the project planting items.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect the RFAs and waterbodies.
- Temporary impacts to RFA will be restored with loam and native seed mix and native species plantings to improve the RFAs beyond existing condition
- The permanent impacts proposed will reduce the degraded area within the RFAs by an overall 4.9 percent compared to the existing condition.



6.6 100-foot Buffer Zone (310 CMR 10.53 (1))

The Project proposes permanent and temporary impacts to 100ft Buffer Zone resulting from the proposed work activities described in Section 4. The Buffer Zone is proposed to be replanted and seeded at all temporary impact locations. Table 13 sums the proposed impacts to the Buffer Zone by work activity. Table 14 details the proposed impacts to the Buffer Zone at each project location.

Table 13: Summary of Buffer Zone Impacts by Work Activity

Work Activity	Permanent Impact (SF)	Temporary Impact (SF)	Total Disturbed (SF)	Restored in Situ (SF)
BFRT Shared-Use Path/Culvert Renovation	217,230	136,631	353,861	136,631
Bridge Renovation	1,412	620	2,032	620
Shared-Use Path Connection	25,613	20,497	46,110	20,497
New Parking Area	9,177	12,916	22,093	12,916
Wetland Replication Area	0	5,129	5,129	5,129
Total	253,432	175,793	429,225	175,793

Table 14: Summary of Buffer Zone Impacts

Work Activity	Plan Station	Left/Right of Stationing (LT/RT)	East/West of Trail	Name (WF Number)	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Impact Desc.
BFRT Shared-Use Path	102+37 to 108+61	LT/RT	Both	WF-36	9,155	6,078	15,233	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	108+86 to 110+87	LT/RT	Both	WF-37	2,929	1,510	4,439	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	111+90 to 114+23	LT/RT	Both	WF-39	3,168	3,794	6,962	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed
BFRT Shared-Use Path	117+00 to 126+20	LT/RT	Both	WF-35, WF-40, WF-41, BF-32	14,136	6,783	20,919	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Bridge Renovation	126+20 to 126+53	LT/RT	Both	BF-32 (Hop Brook)	0	441	441	Cleaning & Repairing Existing Bridge abutment
BFRT Shared-Use Path	126+53 to 133+14	LT/RT	Both	WF-35, BF-32	10,176	3,716	13,892	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	151+00 to 164+20	LT/RT	Both	WF-32	18,699	14,352	33,051	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	164+48 to 168+32	LT/RT	Both	BF-30	5,407	4,472	9,879	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	195+56 to 201+00	LT/RT	Both	WF-26, WF-27	7,868	4,834	12,702	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed
BFRT Shared-Use Path	206+91 to 215+75	LT/RT	Both	WF-24, WF-25, BF 15-24	11,911	7,586	19,497	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Wetland Replication Area	212+46 to 213+15	LT	West	WF#20336 D405	0	5,129	5,129	Wetland Replication Area, Erosion Control, Loam & Seed Grading to Replication Area
BFRT Shared-Use Path	215+99 to 232+63	LT/RT	Both	WF-24, WF-25, BF 15-24, BF-23, WF-21, WF-23	25,622	18,444	44,066	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control

Work Activity	Plan Station	Left/Right of Stationing (LT/RT)	East/West of Trail	Name (WF Number)	Permanent Area (SF)	Temporary Area (SF)	Total Disturbed Area (SF)	Impact Desc.
New Parking Area	215+85 to 219+32	RT	East	BF-23 Series	0	12,916	12,916	Temp: Earthen Detention Basins
New Parking Area	215+64 to 217+70	RT	East	BF-23 Series	9,177	0	9,177	Perm: Paved Parking Area and connecting path to Trail, Rip Rap
BFRT Shared-Use Path	234+45 to 249+12	LT/RT	Both	WF-19, WF-18, WF-17, WF-16	22,296	14,589	36,885	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	253+50 to 264+24	LT/RT	Both	WF-14, WF-13, WF-12	14,434	13,137	27,571	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Bridge Renovation	264+24 to 264+62	LT/RT	Both	WF14, WF13	1,412	179	1,591	Work at Pantry Brook Bridge. New bridge superstructure, duped riprap, modified rock fill behind existing bridge abutment
BFRT Shared-Use Path	264+62 to 274+93	LT/RT	Both	WF-12, WF-13, WF14	14,897	8,469	23,366	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	275+15 to 284+41	LT/RT	Both	WF-42, WF-9, WF-8	14,094	7,857	21,951	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	284+54 to 307+50	LT/RT	Both	WF-6, WF-7, WF-5	30,440	14,284	44,724	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
BFRT Shared-Use Path	307+71 to 315+79	LT/RT	Both	WF-5, WF-4, WF-3	12,248	6,576	18,824	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Shared-use path connection	320+97 to 335+17	LT/RT	Both	WF-2, WF-1	21,227	17,818	39,045	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Shared-use path connection	1100+29 to 1101+32	LT/RT	Both	WF-5-103, WF-5-115	1,299	472	1,771	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Shared-use path connection	1101+34 to 1103+79	LT/RT	Both	WF#20336	3,087	2,207	5,294	Perm. Paved Path & Crushed Gravel. Temp. Loam & Native Seed, Erosion Control
Total:					253,432	175,793	429,225	

Description of Impacts

The Project Locus Area contains 1,122,312 SF of 100-foot Buffer Zone Area. The Project proposes 254,639 square feet (22.7% of Total Buffer Zone Area) of permanent impact. Permanent impacts are associated with the impervious surface of the paved shared-use path, the New Parking Area at Morse Rd, and the shared-use path connection to Davis Field.

The Project proposes 172,631 square feet (15.4% of Buffer Zone Area) of temporary impacts. Temporary impacts are associated with earth work and grading from the edge of the shared use path shoulder back to existing contours. Temporary impact areas are proposed to be replanted with a native seed mix and native plantings. For plantings see the Construction Plans section of the proposed plans in *Appendix F*.

BFRT Shared-Use Path

A majority of the cumulative impacts to the Buffer Zone occur as a result of the shared-use path construction throughout the rail ROW. The rail ROW is previously developed with a continuous 16-foot-wide degraded area spanning the entire corridor. The proposed permanent impacts to Buffer Zone occur within the previously degraded area of the rail ROW.

New Parking Area

Construction of the New Parking Area at Broadacres Farm results in both permanent and temporary impacts to Buffer Zone. The New Parking Area is within the Buffer Zone of intermittent streams designated by the BF#200 series and BF#300 series. The intermittent streams are remaining drainage ditches from the former railroad. The permanent impacts for the New Parking Area include the new paved parking surface, the shared-use path connection between the parking lot and the BFRT, a small waterless restroom, and a pavilion structure. The temporary impacts at the New Parking Area include grass lined infiltration basins for stormwater management.

Shared-Use Path Connection

The proposed shared-use path connection from the BFRT to the existing parking area at Davis Field results in impact to Buffer Zone. The proposed shared-use path connection is within the Buffer Zone of BVW designated by the WF#20336 series and the WF#5-100 series. The permanent impacts to Buffer Zone consist of the additional width of paved path area and proposed crushed stone shoulders. The temporary impacts occur from earthen grading of the proposed path connection back to existing contours with loam & native seed.

Bridge Renovation

The proposed work at Hop Brook Bridge and Pantry Brook Bridge each respectively result in impacts to Buffer Zone. The work at Hop Brook will result in temporary impacts to Buffer Zone related to cleaning and repairing the existing bridge abutment wall. The proposed work at Pantry Brook Bridge will result in permanent impacts to the Buffer Zone of the BVW designated as WF# 13 & WF# 14. The permanent impacts occur as a result of scour protection, rip rap and modified rockfill, around the footings of the proposed new bridge. Compost top-dressing on top of the modified rockfill will be



seeded with a native mix. Temporary impacts at Pantry Brook Bridge are caused by erosion control installation in the Buffer Zone.

Proposed Wetland Replication Area

The proposed wetland replication area is located on a Town-owned parcel of the former Broadacres Farm site. The location is within the Buffer Zone of BVW designated as the WF#20336 D400 series. The site was previously maintained as pastureland and is now maintained as a grass field. The proposed impact to Buffer Zone is temporary. The proposed wetland replication area will plant and seed the area with a native mix of trees and wetland seed mix, resulting in a loss of Buffer Zone to new BVW, but the creation of new BVW will itself create a new Buffer Zone area of equivalent size at the surrounding field.

Eligible Vernal Pools

There are two locations where permanent impacts to Buffer Zone occur within 100ft of an eligible-to-be-certified vernal pool, however, because the impact areas are previously developed and degraded they are not part of the 100ft habitat area despite being within 100 feet of the eligible vernal pool boundary. The two locations are:

- Work is proposed within 100ft of the boundary of Eligible Vernal Pool 11 as defined in the ORAD of *Appendix B* located at plan station beginning at 208+18. The permanent impact proposed is due to the paved shared use path and crushed stone shoulders. The temporary impact is due to grading back to existing ground. The proposed permanent impact is entirely within the existing degraded area of the 16-foot-wide existing rail embankment. The temporary impact area is within a previously cleared area and will be revegetated with loam & native seed.
- Work is proposed within 100ft of the boundary of Eligible Vernal Pool 4 as defined in the ORAD of *Appendix B* located at plan Station 285+10. The permanent impact is due to the paved shared use path and crushed stone shoulders. The temporary impact is due to grading back to existing ground. The proposed permanent impact is entirely within the existing degraded area of the 16-foot-wide existing rail embankment. The temporary impact area is within a previously cleared area will be revegetated with loam & native seed.

Regulatory Compliance:

The following paragraphs present a summary of how the Project will fully comply with the General Performance Standards for activities proposed within Buffer Zone per 310 CMR 10.53(1): *The potential for adverse impacts to Resource Areas from work in the Buffer Zone may increase with the extent of the work and the proximity to the Resource Area. The Issuing Authority may consider the characteristics of the Buffer Zone, such as the presence of steep slopes, that may increase the potential for adverse impacts on Resource Areas. Conditions may include limitations on the scope and location of work in the Buffer Zone as necessary to avoid*



alteration of Resource Areas. The Issuing Authority may require erosion and sedimentation controls during construction, a clear limit of work, and the preservation of natural vegetation adjacent to the Resource Area and/or other measures commensurate with the scope and location of the work within the Buffer Zone to protect the interests of M.G.L. c. 131, § 40. Where a Buffer Zone has already been developed, the Issuing Authority may consider the extent of existing development in its review of subsequent proposed work and, where prior development is extensive, may consider measures such as the restoration of natural vegetation adjacent to a Resource Area to protect the interest of M.G.L. c. 131, § 40. The purpose of preconstruction review of work in the Buffer Zone is to ensure that adjacent Resource Areas are not adversely affected during or after completion of the work.

The Buffer Zone areas are previously developed as a former rail ROW corridor, maintained grass fields at Broadacres Farm, or the existing sidewalk and earthen road embankment on North Rd.

The Project has been designed to contain permanent impacts to Buffer Zone within the existing developed areas to the maximum extent practical. The Project has been designed to minimize clearing and grubbing and vegetation removal in the Buffer Zone to the extent feasible. Erosion and sediment controls will be installed along the limits of work and at wetland boundaries for protection during construction. The planting of native tree species and ground cover along with the proposed use of native seed mix will restore the temporary disturbance areas to Buffer Zone.

Proposed Restoration and Mitigation Measures

- Erosion and sedimentation controls will be installed to protect areas outside the limit of work
- An Invasive Plant Management Strategy (IPMS) will be in place to protect the resource area (see Section 7 for more information)
- Proposed tree plantings of native species will provide restoration to the temporary impact areas of the 100-foot Buffer Zone
- Limits of grading with slopes steeper than 2:1 will be stabilized with erosion matting control or modified rock fill to allow the loam and seed cover to take root
- Post construction, the area outside of the trail maintenance area will be permitted to revegetate and accumulate woody debris for habitat



6.7 Isolated Vegetative Wetland

There are no WPA jurisdictional Isolated Vegetative Wetlands (IVW) in the Project Locus Area. The Amended ORAD of *Appendix B* describes a series of Isolated Vegetated Wetlands in the Project area that do not meet the criteria for Isolated Land Subject to flooding under 310 CMR 10.57. The IVW is however jurisdictional under Section 401/Section 404.

The construction of the BFRT Shared use path results in one impact area location to IVW.

Table 15: Impacts to IVW

Station	East/West of Trail	Name (WF Number)	Permanent Impact Area (SF)	Temporary Impact Area (SF)	Total Impact Area (SF)	Desc.	Flag #
STA 169+18 to 170+43	West	WF#31-100	303		303	Shared-use path, path shoulder, limit of grading	WF#31-100 to 105, WF#31-121 to WF#31-124
STA 169+20 to 170+62	West	WF#31-100		166	166	Erosion Control	WF#31-100 to 105, WF#31-121 to WF#31-125
Total:			303	166	469		

The IVW impact occur just south of Hudson Rd where a former drainage ditch parallels the rail embankment. The proposed trail was designed with a narrowed 1-foot-wide shoulder to minimize impacts to IVW at this location.



6.8 Massachusetts Stream Crossing Standards (310 CMR 10.53(8))

This section describes the stream crossing standards compliance for all proposed stream crossing work including bridges and culverts.

The Project proposes to renovate two inactive rail bridge crossings at two perennial streams, Hop Brook and Pantry Brook. Section 4 describes the proposed bridge renovation work at each location in more detail. Proposed bridge plans are included in the proposed project plans of *Appendix F*.

Culvert renovation work proposes to replace deficient existing culverts at Culvert Locations 4, 6, and 14 as described in Table 1 of Section 4. One new culvert is proposed to as a drainage equalizer pipe, Culvert Location 19, there is no stream crossing at this location.

Regulatory Compliance: Under 310 CMR 10.53(8), the replacement of an existing stream crossing shall demonstrate to the Issuing Authority that the impacts of the crossing have been avoided where possible, and when not possible have been minimized and that mitigation measures have been provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40. This standard is presumed to be met for the replacement of an existing non-tidal crossing if the work is designed to comply with the Massachusetts Stream Crossing Standards (“the MSC Standards”) to the maximum extent practicable.

Compliance with Stream Crossing Standards

Hop Brook Bridge

1. *Type of Crossing* – The Hop Brook Bridge Crossing will remain a bridge crossing consisting of granite block abutments with a new superstructure atop the existing abutment to be retained.
2. *Embedment* – The Hop Brook Bridge Crossing will remain a bridge crossing with an open channel stream bottom.
3. *Crossing Span* – The crossing span will remain as existing, approximately 27ft. The existing abutment walls will be repaired and reused. The design intent is to minimize excavation, wetland, and wildlife impacts.
4. *Height & Openness* – The proposed renovation at Hop Brook Bridge will raise the low chord elevation of the bridge superstructure by less than 0.5 feet. The openness ratio will therefore remain approximately the same as existing, which is 12.9 ft, well above the minimum standard of 0.82 ft.



5. *Substrate* – The proposed renovation at Hop Brook Bridge will maintain the existing natural bottom stream bed at the existing extents.
6. *Water Depth and Velocity* – The water depth and velocity will be maintained as in the existing condition due to the preservation of the existing bridge abutments in their existing locations.
7. *Banks* – Grading of the banks at Hop Brook is not necessary given the reuse of the existing bridge abutments.

Pantry Brook Bridge

1. *Type of Crossing* – The Pantry Brook Bridge Crossing will remain a bridge crossing. The proposed crossing will consist of the existing granite block abutments lowered considerably but retained above the Bank of Pantry Brook. A new cement concrete arch bridge spanning over the existing abutments is proposed to support the BRFT shared-use path.
2. *Embedment* – The Pantry Brook Bridge Crossing will remain a bridge crossing with an open channel stream bottom of the same dimensions as existing.
3. *Crossing Span* – The crossing span is proposed to change from an existing 12-foot span to a proposed 34-foot span. The proposed dumped riprap and modified rockfill at the footings of the cement concrete arch bridge structure will leave a hydraulic opening of approximately 25'-6" in width. The existing abutment walls will be lowered in elevation and retained underneath the proposed new bridge just above the ordinary high-water line. The design intent is to minimize excavation, wetland, and wildlife impacts.
4. *Height & Openness* – The proposed renovation at Pantry Brook Bridge will lower the low chord elevation of the bridge superstructure by approximately 2.5 feet, but widen the crossing as explained in #3. The openness ratio of the proposed Bridge will be 8.5ft, well above the minimum standard of 0.82 ft.
5. *Substrate* – The proposed renovation at Pantry Brook Bridge will maintain the existing natural bottom stream bed at the existing extents.
6. *Water Depth and Velocity* – The water depth and velocity will be maintained as in the existing condition due to the preservation of the existing bridge abutments.
7. *Banks* – Grading above the banks at Pantry Brook has been designed such that slope above bank does not exceed a ratio 1 to 1.5 (vertical: horizontal). The retention of the existing granite blocks is proposed to facilitate wildlife passage.



Culvert Location 4, Where Embankment Washout Exists, Station 167+17

1. *Type of Crossing* – The proposed replacement culvert will be embedded 2 feet thus creating an open bottom culvert.
2. *Embedment* – The proposed replacement culvert will be embedded 2 feet to provide for the long term-stability of the replacement culvert and enhance wildlife crossing.
3. *Crossing Span* – Given the recent erosion which has occurred downstream of the existing crossing, bankfull width was determined to be 7 feet. The proposed replacement culvert does not provide a new span of 1.2 times bankfull width, in order to maintain the approximate vertical profile of the shared-use path and minimize disturbance to the waterway.
4. *Height & Openness* – The openness ratio of the proposed replacement culvert is 0.33 however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 4 feet which will allow for the passage of wildlife across the multi-use path.
5. *Substrate* – Substrate to simulate a natural stream bottom will be placed within the 2 ft embedded portion of the replacement culvert. The importing of off-site material will be specified in the special provision for the project.
6. *Water Depth and Velocity* – A new stream channel with similar slope to that of existing will be provided by the new culvert. The proposed velocities through the new culvert will improve conditions and prevent further erosion of the downstream side of the culvert.
7. *Banks* – Grading of the stream bank within areas of disturbance has been designed such that slope of the replaced bank does not exceed a ratio 1 to 1.5 (vertical: horizontal).

Additional information on Culvert Location 4 is included in *Appendix H*.

Culvert Locations 6 and 14

The proposed culvert renovation work at Culvert Locations 6 and 14, as described in Table 1 of Section 4, each call for the replacement of a damaged 12" diameter pipe with a 15" diameter reinforced concrete pipe including new cement concrete headwalls.

For each location, the proposed replacement culvert has been proposed with the intent to reduce flooding, erosion, and to maintain the connectivity of existing habitats upstream and downstream of the crossing. The following summarizes how the proposed replacement culverts meet the Stream Crossing Standards to the maximum extent practicable.



1. *Type of Crossing* – Culverts 6 and 14 are proposed to be 15" diameter reinforced concrete pipes. The pipes are not proposed to be buried because the size of the pipe cannot be buried the minimum 2 feet.
2. *Embedment* – The pipes are not proposed to be buried as the size of the pipe, 15" in diameter, cannot be buried the minimum 2 feet.
3. *Crossing Span* – The proposed replacement culverts at Locations 6 and 14 do not provide a new span of 1.2 times bankfull width. Constraints of the vertical profile of the trail limit the ability to substantially raise the vertical alignment of the shared-use path at Culvert Locations 6 and 14 crossing without incurring additional wetland impacts or introducing new vertical barriers such as retaining walls. Proposed grades are also limited for practicality in order to maintain appropriate accessible grades along the shared-use path for all path users. The proposed replacement culverts will however still improve conditions for passage of semi-aquatic and terrestrial wildlife at the crossing by increasing the culvert diameter from 12" to 15".
4. *Height & Openness* – The openness ratio of the proposed replacement culverts is:
 - a. At culvert location 6, the openness ratio is 0.07 feet however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 4.5 feet with banks sloping no more than 1:1.5 (vertical: horizontal) which will allow for the passage of wildlife over the culvert using the trail surface.
 - b. At culvert location 14, the openness ratio is 0.05 feet however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 5.5 feet with banks sloping no more than 1:1.5 (vertical: horizontal) which will allow for the passage of wildlife around the culvert. For a culvert of this span, 24ft, a significantly larger open cross-sectional area would be required to achieve the recommended (0.82 ft) openness ratio. The open cross section of the culvert would need to be approximately equivalent to a 5ft diameter pipe. A new culvert of this size would result in a significant vertical alignment change to the BFRT trail surface that is impractical at this location.
5. *Substrate* – At Culvert Locations 6 and 14, the pipes are not proposed to be buried as the size of the proposed pipe, 15" in diameter, cannot be buried the minimum 2 feet.
6. *Water Depth and Velocity* – The replacement culverts will increase openness by enlarging the existing 12" culverts to 15" culverts, water depth and velocity will decrease.
7. *Banks* – Grading at the Banks the replacement culverts has been kept to a minimum to avoid wetland impacts. Grades will not exceed 1 to 1.5 (vertical to horizontal).



6.9 Wildlife Habitat Evaluations (310 CMR 10.60)

According to 310 CMR 10.60(1), to the extent that a proposed project will alter wildlife habitat beyond established thresholds for each respective wetland resource area, such alterations may be permitted only if they will have no adverse effects on wildlife habitat. Table 16 summarizes the proposed habitat disturbances with respect to WPA regulation thresholds.

Table 16: Wildlife Habitat Evaluation Thresholds per Wetland Resource Area

Wetland Resource Area	Appendix A Threshold	Appendix B Threshold	Total Project Disturbance (Perm. +Temp)
Bank	10 percent or 50 linear feet (whichever is less)	When triggered by Appendix A	451 LF
Bordering Vegetated Wetland	Below 5,000 square feet	Above 5,000 square feet	2,710 SF
Land Under Water	10 percent or 5,000 square feet (whichever is less)	When triggered by Appendix A	1,746 SF
Bordering Land Subject to Flooding	10 percent or 5,000 Square Feet (whichever is less), except for work that would adversely affect vernal pool habitat	When triggered by Appendix A or for any impacts to certified or documented vernal pool habitat	1,736 SF
RFA (Previously Developed)	Appendix A and Appendix B are not required for previously developed RFA		

The Project will result in impacts to Bank, BVW, LUW, BLSF, and RFA that are jurisdictional under the WPA. Impacts to BVW, LUW, and BLSF do not exceed the thresholds.

Impacts to Bank do exceed the threshold with 451 LF of total disturbed Bank, including 135 LF permanent Bank impacts and 316 LF of temporary Bank impacts. Temporary impacts to Bank are proposed to be restored in Situ post construction.

A General Wildlife Habitat Assessment Report was completed by Stantec in April 2020 and is included in *Appendix J*. The report concluded that no adverse effects to wildlife habitat were anticipated from the Project.

An additional Wildlife Habitat Evaluation was completed in February 2022. Stantec conducted an Appendix B Wildlife Habitat Evaluation for Culvert Location 4, at Station 167+17. The report is included in *Appendix J* of this NOI. This location is where a large majority of the proposed impacts to Bank in the Project occur. The report concluded the following on an evaluation of adverse effect:



"Pursuant to 310 CMR 10.60, the results of the data review and the results of the field survey were used to assess whether the proposed impacts at Culvert 4 will result in an adverse effect to wildlife habitat subject to the WPA. A number of Important Habitat Characteristics were observed in or adjacent to the work footprint for the culvert replacement project. None of the important habitat features identified will be permanently lost on a greater landscape scale as a result of the work associated with Culvert 4, as it is a short-duration project with a limited footprint and will improve stream quality and conditions post-construction (i.e. stabilize existing eroding banks through the railroad bed/fill while improving hydraulic capacity of existing culvert and sediment transport).

Additionally, no other high value habitats or species particularly sensitive to the construction of a rail trail were observed. The new repaired culvert is not expected to be a barrier to wildlife usage patterns in the Project or at the landscape level, as most species would shift habitat usage patterns, as needed, to carry out their life cycles during construction and post-construction. Therefore, potential habitat impact within jurisdiction of the WPA is localized, temporary, occurring in an area impacted by a collapsed culvert in a previously disturbed area, and would occur to habitat that is not considered critical. As a result, we do not anticipate an adverse effect to wildlife habitat within wetland resource areas based on the 100% Design Submittal."

Proposed Restoration Measures

- The existing rail tracks will be removed, eliminating an existing vertical barrier to wildlife movement across the rail embankment for small invertebrates and turtles.
- The proposed planting and seeding of temporary impact areas with native trees, seed, and ground cover shrubs will support wildlife habitat by providing nesting, food, and roosting areas.
- During the pre-construction site walk-through, areas for brush piles will be identified outside of the limits of work but inside of the rail ROW. The brush piles will serve as habitat for small mammals, amphibians, reptiles, and nesting habitat for songbirds.
- The repair of the washed-through culvert crossing at Culvert Location 4 will improve connectivity of the Unnamed Tributary to Hop Brook with Hop Brook, both designated as cold water fisheries.
- The creation of a new wetland replication area totaling 2,240 square feet. The proposed wetland replication area will provide habitat for local amphibian and reptile populations as well as augment existing habitat for a wide range of birds and mammals.

7 Mitigation Measures

7.1 Erosion and Sedimentation Control

The following erosion and sedimentation controls are proposed.



- SWPPP

Sedimentation control for the proposed project will be implemented through the National Pollutant Discharge Elimination System (NDPES) required Storm Water Pollution and Protection Plan (SWPPP) which must be prepared by the contractor prior to the commencement of construction. The Plan will include the General Permit conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. The SWPPP plan requires weekly inspection and monthly reporting of the condition of erosion controls. The Town will be included on the distribution list of the inspection forms and reports.

- Sediment Control Barriers

Staked compost filter tubes are proposed for sediment control barriers. The placement of sedimentation control barriers for the Project are shown on the proposed project plans in *Appendix F*. Sediment control barriers are proposed to be syncopated at sensitive wildlife crossings such as certified, eligible or potential vernal pools. The Construction Details section of the proposed plans includes compost filter tube details.

- Matting for Erosion Control & Modified Rock Fill for Slope Stabilization and Vegetation

Matting for erosion control is proposed where grading of swale side slopes adjacent to the proposed trail are at a slope of 2:1 (horizontal: vertical) or steeper. Modified rock fill shall be used as needed on any cut or fill slopes steeper than 2:1 in grade where poor soil conditions exist and matting for erosion control is deemed inadequate as directed by the engineer. Matting for erosion control shall be made from a biodegradable material and use biodegradable stakes or staples. The Construction Details of the proposed plans in *Appendix F* show typical examples of erosion control matting and modified rock fill. The modified rock fill is mixed with soil at the surface and may support seeding and vegetation.

- Rip Rap and Modified Rockfill with Compost Top Dressing

At the Pantry Brook Bridge, dumped rip rap is proposed between the Bank and the top of the existing abutment walls to be lowered and retained. The dumped riprap is proposed to transition to modified rockfill with compost top dressing planted with a native seed mix above the existing abutment walls. The riprap and modified rockfill will prevent scour and erosion between the Bank of Pantry Brook and the proposed new bridge abutments. The modified rock fill with compost will make a significant improvement for wildlife crossing under the bridge compared to rip rap alone by eliminating large voids and providing a vegetated surface. Yet, the modified rockfill beneath the surface is still massive enough to provide the erosion control and scour protection needed. See the proposed Pantry Brook Bridge plans section provided in *Appendix F*.

- Control of Water at Bridge Structures

The work area for control of water at Hop Brook and Pantry Brook is shown on the environmental impact plan sheets provided in the proposed plans of *Appendix F*. The bridge plans show a suggested water control plan detail consisting of sandbags to redirect water and a floating silt fence/turbidity curtain to prevent sediment from entering the respective streams. The project specification for Item 991 Control of Water is included in *Appendix K*.



7.2 Avoidance and Minimization

Impacts to wetland areas were carefully considered during the alternatives analysis and design and were minimized in the following ways:

- The selected alignment of the path utilizes a previously developed and degraded railroad corridor. As a result, impacts to previously undeveloped areas have been avoided and no new crossings at Hop Brook and Pantry Brook are required. Many of the proposed impacted wetlands adjacent to the trail are remnants from drainage ditches of the former railroad. A general Wildlife Habitat Evaluation was performed within the Project Locus Area which found that no adverse effect to wildlife habitat within the project wetland resource areas are anticipated, the WHE is included in *Appendix J*.
- The existing abutment walls to Hop Brook are proposed to be repaired and cleaned for continued use which will minimize the excavation impact to the Banks of Hop Brook and land under water.
- The proposed new bridge structure at Pantry Brook is proposed to be built around the existing abutment walls, which will be reduced in height but will remain above the existing Bank. By retaining the existing abutment walls at the banks of Pantry Brook, the design minimizes excavation and construction impacts to Pantry Brook and land under water.
- The width of the trail has been kept to a minimum standard 10 feet for a two-way shared-use path that can accommodate emergency vehicles. Previously built sections of the Bruce Freeman Rail Trail have been designed with a paved path surface as wide as 12ft in other locations, which is preferable for path users. Keeping the paved path surface to the minimum width avoided wetland impacts.
- The crushed stone shoulders of the trail have been reduced to 1ft wide from a standard minimum of 2ft in a challenging area of the rail ROW to minimize adjacent wetland area impacts. The section of the trail between plan Stations 293+00 and Station 305+00 has narrowed trail shoulders specifically to minimize impacts to adjacent BVW. This design choice reduced total impacts to BVW by approximately 2,500 square feet in this segment of the proposed path alone. A one-foot wide should was also used between stations 169+18 and 170+43 to minimize impacts to IVW.



7.3 Wetland Replication Area

Determination of Area

Notwithstanding MassDOT's exemption to Town Bylaw, the Town Bylaw jurisdictional resource area impacts have been tabulated for the project for the purpose of informing mitigation.

Table 17 summarizes the Town Bylaw jurisdictional wetland impacts that are would be incurred in addition to WPA jurisdictional impacts already enumerated in this report.

Table 17: Summary of Town Bylaw Jurisdictional Resource Area Impacts

		Additional Impacts Under Town Bylaw		
Town Bylaw Jurisdictional Resource Area	Unit	Perm.	Temp.	Total Impact
Bank	LF	1,313	-	-
0-100ft Sudbury Riverfront Area	SF	58,922	39,569	98,491
100-200ft Sudbury Riverfront Area	SF	33,493	24,038	57,531
Sudbury Riverfront Area	SF	92,415	63,607	156,022
Land Under Water	SF	4,272	-	4,272
Isolated Vegetative Wetlands	SF	303	166	469
Direct impact to Vernal Pools (Potential)	SF	-	-	-
100' AURA to Potential Vernal Pools	SF	67,120	44,906	112,026
Adjacent Upland Resource Areas (AURAs)	SF	9,461	7,210	16,671

For this Project it is feasible for MassDOT to propose a wetland replication area sized to mitigate for permanent impacts to WPA jurisdictional BVW and Town Bylaw jurisdictional IVW at a replication ratio of 1.5:1 (replication area: impact area), which is higher than MassDOT's more typical 1:1 replication ratio.

The wetland replication area has therefore been sized at 2,240 square feet, representing 1.5 times the sum of:

- 1,190 SF of WPA jurisdictional permanent impacts to BVW
- 303 SF of Town Bylaw jurisdictional permanent impacts to IVW

The Replication Site

A wetland replication area is proposed at one location outside of the rail ROW at 82 Morse Rd on a parcel owned by the Town of Sudbury. The selected site is part of the former pasture at the Broadacres Farm site. Adjacent to the proposed replication site, there is an existing BVW area designated by the

WF# 20336 D400 flag series. The site contains a pond designated by the WF# 20336 C300 series. Delineation reports on the wetland replication area site are included in *Appendix B*. The site is a maintained grass field; therefore no clearing of trees is necessary for the replication area.

Access to the wetland replication area will be from the rail ROW through a temporary access route at approx. Station 212+50 on the west side of the trail. This access route will require selective clearing to accommodate a 12ft wide passage for construction vehicles. Tree clearing necessary to create passage will be restored with new plantings after completion of the wetland replication area as shown on the construction plans.

The mitigation area will be constructed with oversight from a wetland specialist who must be hired by the contractor per the special provisions of the project, included in *Appendix K*. The proposed wetland is a seasonally saturated, Palustrine Broad-Leaved Deciduous Scrub-Shrub wetland (PSS1E).

The proposed wetland replication plans are included as pages 139-140 of the proposed plans in *Appendix F*. The wetland replication area will feature a hummock and hollow topography. Table 18 lists the proposed plantings.

Table 18: Proposed Wetland Replication Plantings

PLANT LIST					
SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	COMMENTS
TREES					
AR	11	ACER RUBRUM	RED MAPLE	4'-6' HT.	10' O.C.
BA	7	BETULA ALLEGHANIENSIS	YELLOW BIRCH	4'-6' HT.	10' O.C.
FP	4	FRAXINUS PENNSYLVANICA	GREEN ASH	4'-6' HT.	10' O.C.
UA	4	ULMUS RUBRA	SLIPPERY ELM	4'-6' HT.	10' O.C.
SHRUBS					
CR	6	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
IV	6	ILEX VERTICILLATA	WINTERBERRY HOLLY	2'-3' HT.	10' O.C. GROUPS OF 3
LB	6	LINDERA BENZOIN	SPICEBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
VC	6	VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	2'-3' HT.	10' O.C. GROUPS OF 3
VD	6	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-3' HT.	10' O.C. GROUPS OF 3
VL	6	VIBURNUM LENTAGO	NANNYBERRY	2'-3' HT.	10' O.C. GROUPS OF 3

The proposed wetland replication area will not have the same horizontal configuration or hydraulic connection as the location of permanent impacts to BVW and IVW due to the slender and widely distributed linear nature of the impacted areas within the rail ROW. The proposed wetland replication area has a more compact shape to improve the survival of plantings. The proposed off-site location of the replication area begins a distance of approx. 50ft from the rail ROW boundary.

The choice to create one cumulative wetland replication area on the selected site will also lower the chances of invasive species taking root in the replication area compared to a series of smaller replication sites located within the rail ROW.



The special provision for wetland replication will require that at least 95 percent of the replication area shall be established with indigenous wetland plant species within one growing season, the full specification for Inland Wetland Replication is included in *Appendix K*. The project also funds two additional years of Wetland Monitoring after final acceptance of the wetland replication area. The special provision for Wetland Monitoring Reports is included in *Appendix K*.

7.4 Invasive Plant Management Strategy

The Project includes a package of invasive plant management work activities including the following:

1. Clearing, Grubbing, and Planting

Work areas within the rail ROW, most typically located between the outer edge of the trail shoulder and the limit of earth work and grading, will be cleared and grubbed then replanted with loam and native seed. In some locations native plants, bushes, and shrubs will be planted. The result of this work activity will be the management of invasive species where the work happens to coincide with a location where invasive species exist.

2. Invasive Plant Management Strategy Plan and Treatment

The project includes work items for the creation of an Invasive Plant Management Strategy (IPMS) and a separate pay item for the execution of that strategy, the MassDOT standard work item is Herbicide Treatment for Invasive Plants, but ultimately the IPMS will determine the methodology of invasive species control. The Town will be included on the required site walk through the corridor during the IPMS development and will be consulted and copied on the drafting of the report. The MassDOT standard specifications for both the IPMS and treatment items are included in *Appendix K*.

The project currently proposes 80 hours for formulation of the management strategy and 120 hours of crew time for treatment, where a crew is defined as two workers. The coverage area per hour of crew time will vary by site invasive plant conditions and treatment type. MassDOT informally estimates a coverage rate of 4 acres within the rail ROW using a cut-and-dab treatment method.

3. Invasive Plant Management as Part of the Wetland Replication

The specification for the Inland Wetland Replication work item includes invasive management as part of the lump sum cost of the wetland replication work. This means that the project provides additional invasive management for the wetland replication area separate from the Invasive Plant Management Strategy described in #2 above. The Wetland Replication area is currently proposed as having an area of 2,240 SF or 0.05 Acres, this is also an estimate of the area of invasive management eligible to be performed under the work item.



Invasive Species Management as Mitigation

Notwithstanding MassDOT's exemption from Town Bylaw, the package of invasive plant management proposed by the project is likely already comparable in scale to the Project's permanent impacts to 100-foot Buffer Zone and Town Bylaw Jurisdictional AURA.

Table 19 tabulates the sum of permanent impacts to 100ft Buffer Zone and Town Bylaw AURA.

Table 19: Cumulative Permanent Impacts to Buffer Zone & AURA

Resource Area	Jurisdiction	Perm. Impacts (SF)	Perm. Impacts (Acres)
100ft Buffer Zone	WPA	254,639	5.8
AURA (exclusive of Buffer Zone)	Town Bylaw	9,461	0.2
Total		264,100	6.0

The proposed clearing and grubbing within the rail ROW will clear approx. 6.7 acres not including the area of the proposed trail surface and shoulders. Depending on the location of invasive plants, some of the area to be cleared and grubbed will provide treatment for invasive species by removal. Additionally, depending on site conditions and treatment type, the proposed 120 crew hours of invasives management treatment prescribed from the IPMS plan could conceivably treat an area equivalent to the 4 acres using a cut-and-dab treatment method. This additional treatment is proposed to occur within the rail ROW and potentially outside of the limits clearing and grubbing, depending on the locations identified in the IPMS plan.

8 Stormwater Management

Stormwater within the project area ultimately discharges to Hop Brook and Pantry Brook. Hop Brook is a Category 5 water body impaired by excess algal growth, phosphorus, and dissolved oxygen saturation. Pantry brook is a Category 5 water body impaired by fecal coliform. The Project will not contribute nutrient or pollutant runoff to the impaired water bodies as a shared-use path for non-motorized use.

Stormwater management during construction will comply with all applicable standards.

Proposed conditions will comply with 310 CMR 10.05(6)(m)6 which states that:

10.05(6)(m) The Stormwater Management Standards (SMS) shall apply to the maximum extent practicable to the following:

6. Footpaths bike paths and other paths for pedestrian and/or nonmotorized vehicle access.

Impervious Areas and Stormwater Management

Overall, The Project proposes to add 5.99 acres of new impervious area and remove 0.024 acres of impervious area, resulting in a net difference of 5.97 acres of impervious area created in the Project Locus Area which includes the 4.4 mile rail ROW. The proposed impervious areas and stormwater management are summarized as follows:

BFRT Shared-Use Path

The 10 ft wide paved surface of the BFRT will result in new impervious area within the rail ROW. The total impervious area within the rail ROW totals 5.48 acres. The entire rail ROW totals approximately 35 acres.

Stormwater will be managed from the BFRT trail by sheet-flow to the trail shoulders. The typically 2ft wide crushed stone shoulders will trap sediment and aid in infiltration, directing the water flow through the grass buffers for infiltration.

The paved surface is overlaid on the site of an existing 16ft wide compacted crushed stone rail embankment with wood ties embedded near the ground surface. Post development stormwater discharge from the trail will follow existing drainage conveyance patterns.

The end use of the Project will be an existing segment of the BFRT at the northern terminus and the Massachusetts Central Rail Trail (MCRT) at the southern terminus. The trail is designed to shed runoff to the trail shoulders and as such, is neither designed nor anticipated to shed significant runoff into any roads that intersect the trail at 9 locations.



The Project is not anticipated to increase pollutant loads within the Project Locus Area significantly above the existing conditions. The BFRT will be used by pedestrians and bicyclists, which will not contribute contaminants to the path surface. Other than emergency situations, motor vehicle access along the path will be limited to bi-weekly mowing over the trail shoulders. In addition, the BFRT will not be plowed and/or treated in the winter. Therefore, there will be little to no contaminants on the path surface to be washed off by storm water runoff.

New Parking Area at Morse Rd

The proposed 32 space parking area will create an impervious area of 9,770 SF. The parking area site also includes a paved path connection to the BFRT, a waterless restroom, and a pavilion structure. Bioretention basins are proposed to treat storm water discharge from the parking area.

The initial stormwater report submitted in December 2021 was peer-reviewed on behalf of the Town. *Appendix G* includes the revised stormwater from February 2022 and responses to the peer review comments.

Shared-Use Path Connections

The proposed shared-use path connection to the Parkinson Parcel parking area will result in a new impervious area of 2,614 square feet (0.06 acres). The path connects the BFRT and the crushed stone parking area at the Parkinson Parcel. The path surface will drain by sheet flow to crushed stone shoulders that will trap sediment and aid in infiltration, directing the water flow through the surrounding grass field for infiltration. A negligible flow is expected between the endpoints of the path connection as runoff will be shed from the path shoulders.

The proposed shared-use path connection to the Davis Field parking area will result in a new paved area of 2,178 square feet (0.05 acres) resulting from the widening of an existing 5ft sidewalk to an 8ft shared-use path connection from the BFRT to the parking area at Davis Field. The path surface will drain by sheet flow to crushed stone shoulders that will trap sediment and aid in infiltration, directing the water flow to grass buffer strips next to North Road for infiltration.

Widening at Hudson Rd

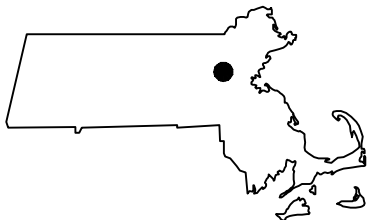
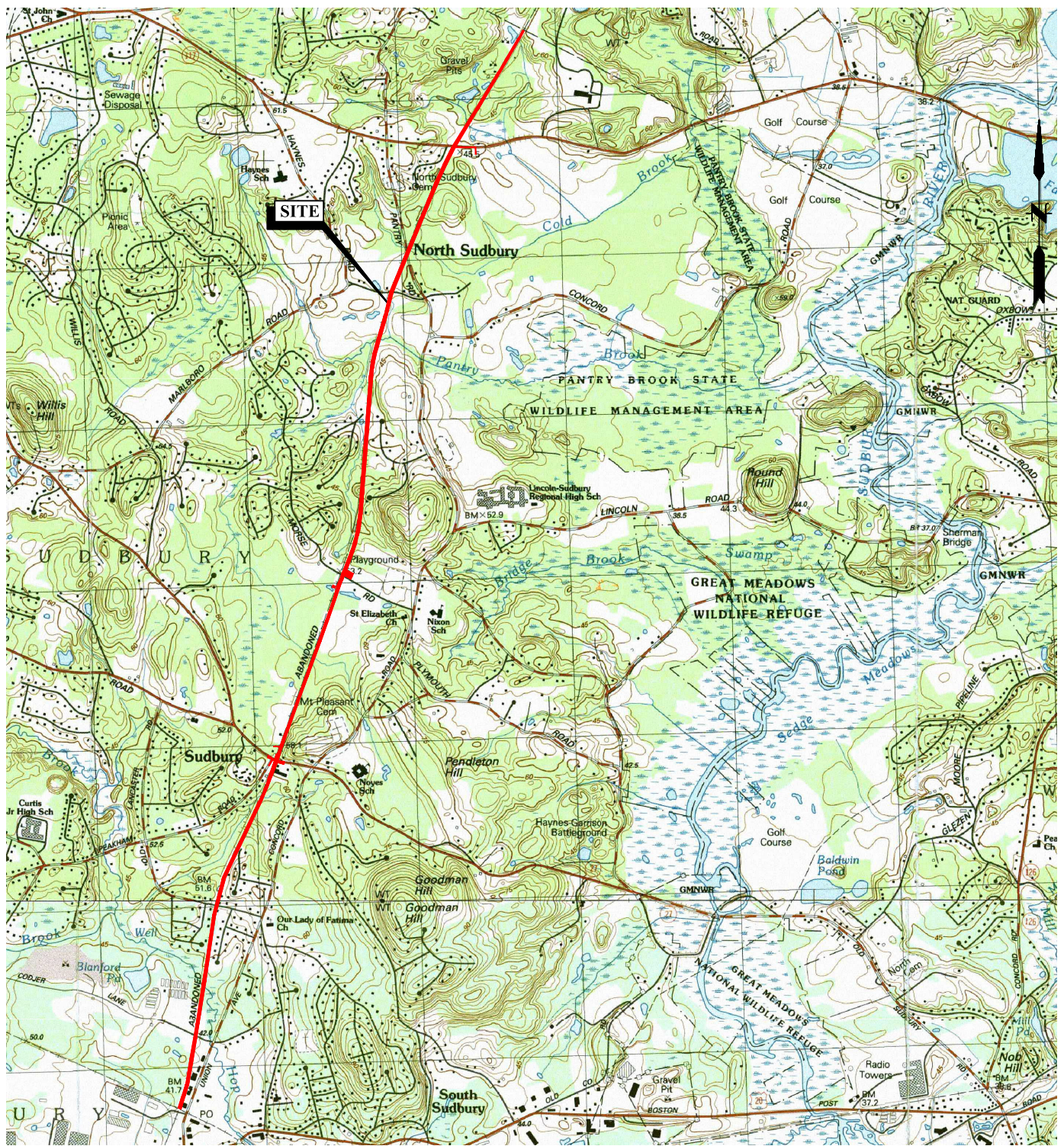
Hudson Rd is proposed to be widened by 4ft on the east side of the Peckham Rd intersection. A new paved area of 871 square feet (0.02 acres) results from the proposed widening. A new left-turn lane is proposed utilizing the existing width of pavement reallocated and the new pavement. The intersection currently has one catch basin. The proposed condition replaces that catch basin and adds two additional catch basins. The new deep sump catch basins will improve stormwater treatment at the intersection over the existing condition.



Figures

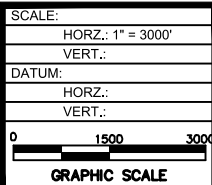
1. USGS Site Location Map
2. NHESP Habitats Map
3. Open Space Map
4. Historical Resources Map

LAYER STATE:



MAP REFERENCE

THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAPHIC QUADRANGLE IMAGES: q209898, q209902, q209906, q209910, q213898, q213902, q213906 AND q213910. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 04/16/2021. ORIGINAL MAP UNITS IN METERS.



FUSS & O'NEILL

1550 MAIN STREET, SUITE 400
 SPRINGFIELD, MA 01103
 413.452.0445
 www.fando.com

TOWN OF SUDBURY
 SITE LOCATION MAP

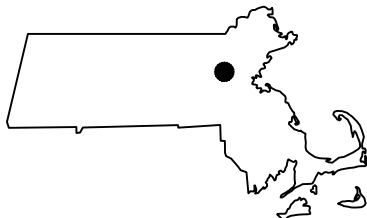
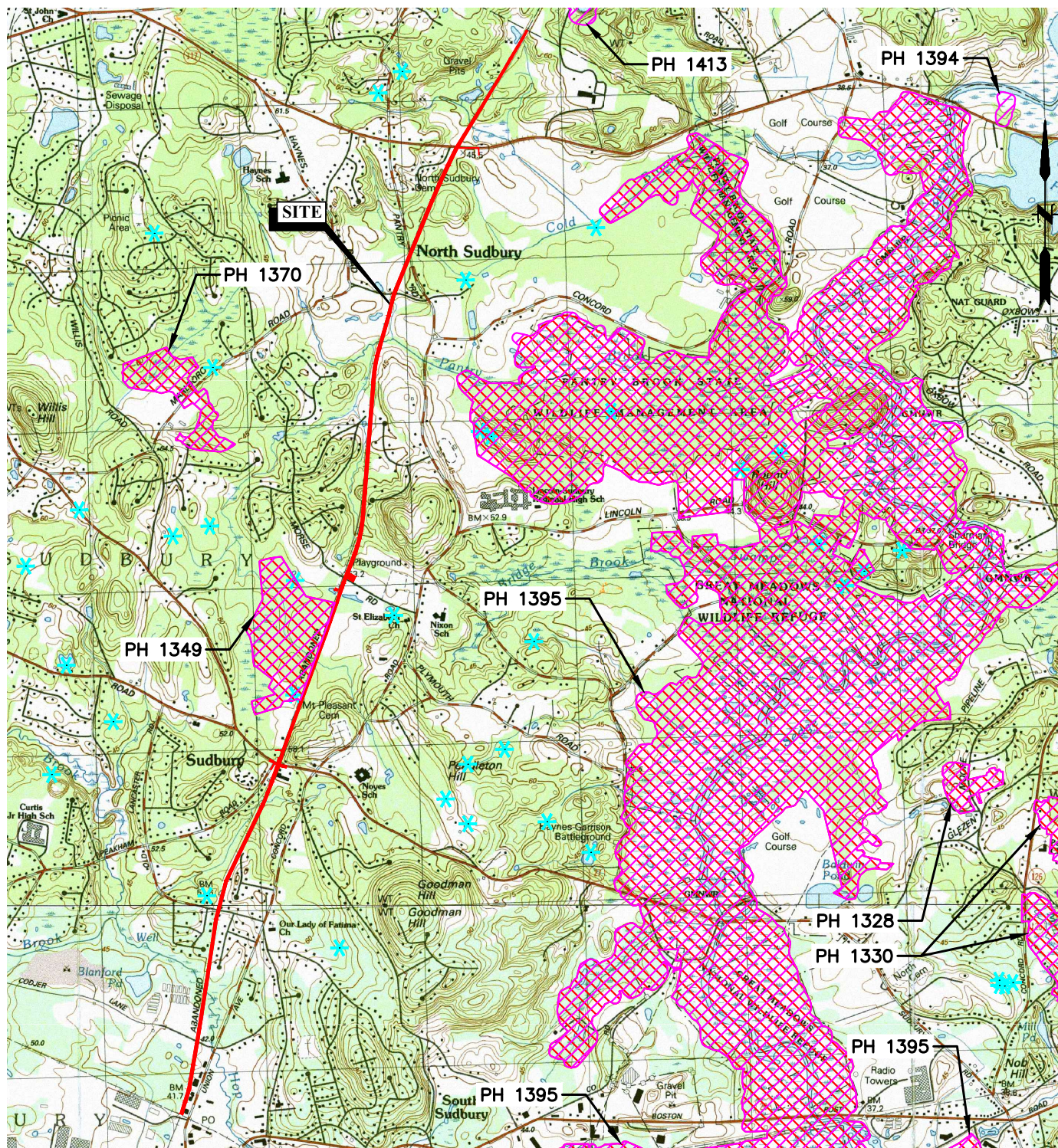
BRUCE FREEMAN RAIL TRAIL

SUDBURY

MASSACHUSETTS




PROJ. No.: 20200785.A10
 DATE: 10/27/2021

FIG.1



MAP REFERENCE
 THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAPHIC QUADRANGLE IMAGES: q209898, q209902, q209906, q209910, q213898, q213902, q213906 AND q213910. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 04/16/2021. NHESP DATA WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 10/27/2021
 ORIGINAL MAP UNITS IN METERS.

LEGEND

-  NHESP MA PRIORITY HABITATS FOR STATE-PROTECTED RARE SPECIES
-  NHESP MA ESTIMATED HABITATS OF RARE WILDLIFE
-  NHESP MA CERTIFIED VERNAL POOL

SCALE:	
HORZ.:	1" = 3000'
VERT.:	
DATUM:	
HORZ.:	
VERT.:	
0 1500 3000	
GRAPHIC SCALE	



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TOWN OF SUDBURY

NHESP MAP

BRUCE FREEMAN RAIL TRAIL

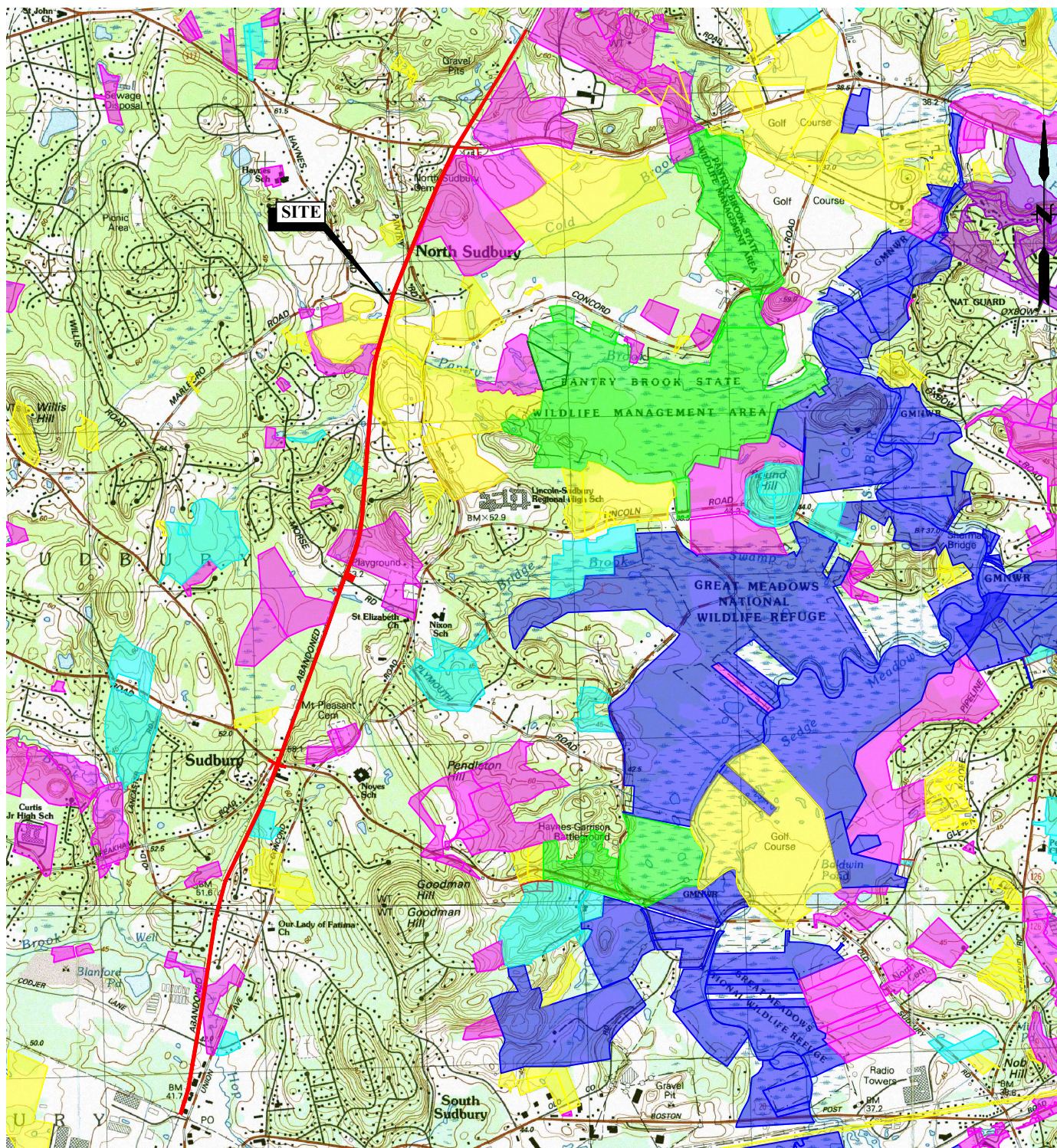
SUDBURY

MASSACHUSETTS

PROJ. No.: 20200785.A10
 DATE: 10/27/2021

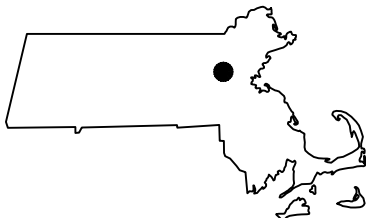
FIG.2

LAYER STATE:



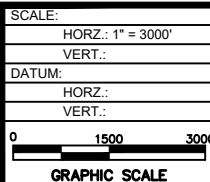
LEGEND

	PUBLIC NON-PROFIT
	PRIVATE
	FEDERAL
	MUNICIPAL
	LAND TRUST
	DCR-URBAN PARKS RECREATION



MAP REFERENCE

THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAPHIC QUADRANGLE IMAGES: q209898, q209902, q209906, q209910, q213898, q213902, q213906 AND q213910. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 04/16/2021. ORIGINAL MAP UNITS IN METERS.



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TOWN OF SUDBURY

OPEN SPACE MAP

BRUCE FREEMAN RAIL TRAIL

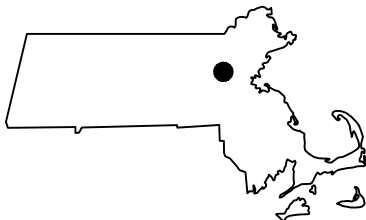
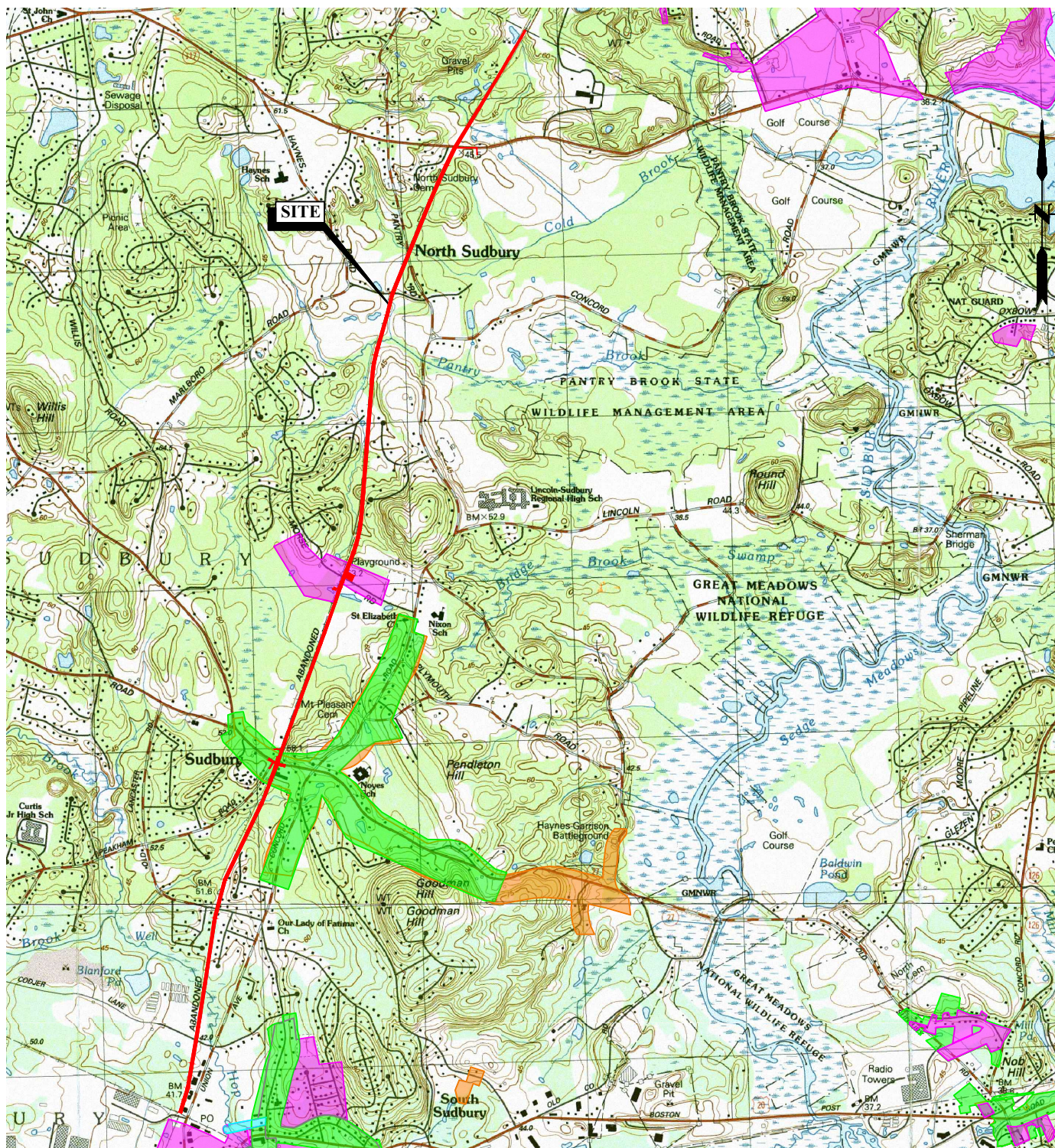
SUDBURY

MASSACHUSETTS

PROJ. No.: 20200785.A10
 DATE: 10/27/2021

FIG.3

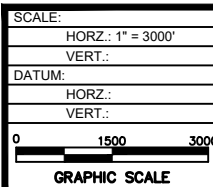
LAYER STATE:



MAP REFERENCE
 THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAPHIC QUADRANGLE IMAGES: q209898, q209902, q209906, q209910, q213898, q213902, q213906 AND q213910. QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 04/16/2021. ORIGINAL MAP UNITS IN METERS.

LEGEND

- NATIONAL REGISTER OF HISTORIC PLACES
- LOCAL HISTORIC DISTRICT
- INVENTORIED PROPERTIES
- NRHP AND LHD



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TOWN OF SUDBURY

HISTORICAL RESOURCES MAP

BRUCE FREEMAN RAIL TRAIL

SUDBURY

MASSACHUSETTS

PROJ. No.: 20200785.A10
 DATE: 10/27/2021

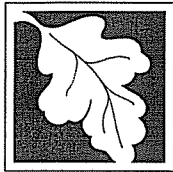
FIG.4

Appendix A

FEMA Flood Mapping

Appendix B

ORAD and Supplemental Delineation Report



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:

301-1193

MassDEP File Number

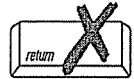
eDEP Transaction Number

Sudbury

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: Sudbury
1. Conservation Commission

2. This Issuance is for (check one):
a. ☒ Order of Resource Area Delineation
b. ☐ Amended Order of Resource Area Delineation

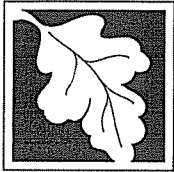
3. Applicant:
Sudbury Town Planning & Community Dev.
Dept. Town of Sudbury b. Last Name
c. Organization 278 Old Sudbury Rd.
d. Mailing Address Sudbury MA 01776
e. City/Town f. State g. Zip Code

4. Property Owner (if different from applicant):
Executive Office of Transportation and Construction b. Last Name
Commonwealth of MA
c. Organization 10 Park Plaza, Ssuite 3170
d. Mailing Address Boston MA 02116
e. City/Town f. State g. Zip Code

5. Project Location:
Railroad ROW Sudbury 01776
a. Street Address b. City/Town c. Zip Code
d. Assessors Map/Plat Number e. Parcel/Lot Number
Latitude and Longitude 42d39m065s -71d41m162s
(in degrees, minutes, seconds): f. Latitude g. Longitude

6. Dates: July 26, 2016
a. Date ANRAD filed b. Date Public Hearing Closed c. Date of Issuance

7. Title and Date (or Revised Date if applicable) of Final Plans and Other Documents:
Proposed Bike Path May 19, 2016
a. Title b. Date
c. Title d. Date



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:

301-1193
MassDEP File Number

eDEP Transaction Number

Sudbury
City/Town

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. bank

subject to receipt of a dated revised plan of the version received by email on Oct. 24, 2016

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.

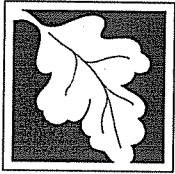
c. ☒ **Inaccurate:** The boundaries described on the referenced plan(s) and in the Abbreviated Notice of Resource Area Delineation were found to be inaccurate and cannot be confirmed for the following resource area(s):

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

Perennial stream including mean annual high water; vernal pools (including, but not limited to vernal pools protected under the Sudbury Wetlands Bylaw only)

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

Drought conditions and low groundwater during 2016 did not permit the identification of these resource areas.



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:

301-1193
MassDEP File Number

eDEP Transaction Number

Sudbury
City/Town

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.

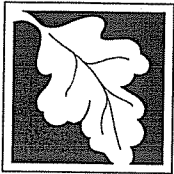
This Order must be signed by a majority of the Conservation Commission. The Order must be sent by certified mail (return receipt requested) or hand delivered to the applicant. A copy also must be mailed or hand delivered at the same time to the appropriate DEP Regional Office (see <http://www.mass.gov/eea/agencies/massdep/about/contacts/find-the-massdep-regional-office-for-your-city-or-town.html>).

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:

301-1193
MassDEP File Number

eDEP Transaction Number

Sudbury

City/Town

E. Signatures

Nov. 14, 2016
Date of Issuance

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

1. Number of Signers

[Signature]
Signature of Conservation Commission Member

[Signature]
Signature of Conservation Commission Member

[Signature]
Signature of Conservation Commission Member

[Signature]
Signature of Conservation Commission Member

[Signature]
Signature of Conservation Commission Member

Signature of Conservation Commission Member

[Signature]
Signature of Conservation Commission Member

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 _____ 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

3. ☐ By certified mail, return receipt requested on

a. Date

a. Date

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 S40

Provided by MassDEP:
MassDEP File #:301-1193
eDEP Transaction #:1204088
City/Town:SUDBURY

A. General Information

1. Conservation Commission SUDBURY

2. This Issuance is for (Check one):

- a. ☐ Order of Resource Area Delineation
b. ☒ Amended Order of Resource Area Delineation

3. Applicant Details

a. First Name TIM b. Last Name DEXTER
c. Organization MASSDOT
d. Mailing Address 10 Park Plaza, Suite 4260
e. City/Town Boston f. State MA g. ZIP 02116

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

5. Project Location

a. Street Address RAILROAD ROW
b. City/Town SUDBURY c. Zip 01776
d. Assessors Map/Plat# RAILROAD ROW e. Parcel/Lot#
f. Latitude 42.39499N g. Longitude 71.40958W

6. Dates

a. Date ANRAD Filed 7/26/2016 b. Date Public Hearing Closed 9/15/2020 c. Date Of Issuance 9/16/2020

7. Final Approved Plans and Other Documents

Plan Title	Plan Prepared By	Plan Signed By	Plan Final Date	Plan Scale
EXISTING CONDITIONS/SURVEY PLAN AT PROPOSED RAIL TRAIL	ATLANTIC ENGINEERING & SURVEY CONSULTANTS, INC.	JOHN PAULSON	7/28/2009	1 INCH = 40 FEET

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. ISOLATED VEGETATED WETLANDS (NON-JURISDICTIONAL UNDER WPA) VERNAL POOLS

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands
WPA Form 4B - Order of Resource Area
Delineation

Provided by MassDEP:
MassDEP File #:301-1193
eDEP Transaction #:1204088
City/Town:SUDBURY

Massachusetts Wetlands Protection Act M.G.L. c. 131 S40

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
a.

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, S 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 <http://www.mass.gov/dep/about/region/findyour.htm>).

D. Appeals


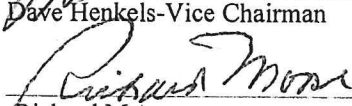
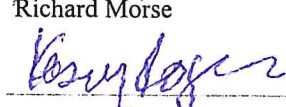

The applicant, the owner, any person aggrieved by this Order, any owner of land abutting the land subject to this Order, or any ten residents of the city or town in which such land is located, are hereby notified of their right to request the appropriate DEP Regional Office to issue a Superseding Order 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, S 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 S40

Provided by MassDEP:
MassDEP File #:301-1193
eDEP Transaction #:1204088
City or town:SUDBURY

E. Signatures

1. Date of Original Order 11/16/2016
No. of Signatures required 4


Dave Henkels-Vice Chairman

Richard Morse

Kasey Rogers

Mark Sevier

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, and the Amended Order will expire on the date of the Original Final Order unless extended in writing by the Department.

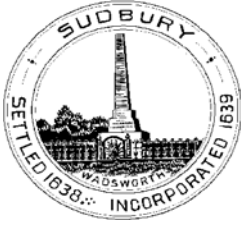
This Order is issued to the applicant and the property owner (if different) as follows:

3. ☒ By hand delivery on

4. ☐ By certified mail, return receipt requested on

a. Date _____

a. Date _____



**NOTICE OF PUBLIC HEARING
SUDBURY CONSERVATION COMMISSION
Virtual Meeting 6:30 PM**

The Sudbury Conservation Commission will hold a public hearing to review an Amendment to the Order of Resource Area Delineation filing (DEP #301-1193) to clarify jurisdictional wetland resource areas subject to the Wetlands Protection Act versus the Sudbury Wetland Administration Bylaw, to classify streams as intermittent or perennial, and to enter into the record the status of vernal pools along the MassDOT Right of Way in Sudbury, MA. MassDOT Highway Division, applicant. The hearing will be held on Monday, June 29, 2020 at 6:30 pm, via remote participation through Zoom. The link to join this Zoom meeting (<https://us02web.zoom.us/j/98803339162>) as well as copies of the application, may be reviewed on the Conservation Commission web page at: <https://sudbury.ma.us/conservationcommission/meeting/conservation-commission-meeting-monday-june-29-2020/>. Please contact the Conservation Office with any questions at 978-440-5470.

SUDBURY CONSERVATION COMMISSION
June 15, 2020



Charles D. Baker, Governor
Karyn E. Polito, Lieutenant Governor
Stephanie Pollack, Secretary & CEO
Jonathan L. Gulliver, Highway Administrator



June 15, 2020

Sudbury Conservation Commission
Department of Public Works
275 Old Lancaster Road
Sudbury, MA 01776

**Subject: ORAD Amendment Request, Bruce Freeman Rail Trail, Sudbury, MA
DEP File No. 301-1193**

Dear Commissioners:

Massachusetts Department of Transportation, Highway Division (MassDOT) submits this Amendment Request for the Order of Resource area Delineation (ORAD) issued by the Sudbury Conservation Commission (DEP File No. 301-1193) to the Town of Sudbury for the Bruce Freeman Rail Trail (BFRT) right-of-way property. The ORAD was recently extended by the Commission for an additional three years and is scheduled to expire in October 2022.

State and local wetland resource areas were approved by the Sudbury Conservation Commission through an ORAD dated November 2016. The ORAD was granted to the applicant, the Town of Sudbury, with permission from the property owner, Massachusetts Department of Transportation (MassDOT), to advance the design of the BFRT. However, the ORAD (and the submitted Abbreviated Notice of Resource Area Delineation (ANRAD) plans themselves) did not distinguish between Sudbury Wetland Administration Bylaw (Bylaw) jurisdictional wetlands and Massachusetts Wetlands Protection Act (WPA) jurisdictional wetlands. Furthermore, due to drought conditions at the time of ANRAD review, the Commission did not accept the classification of intermittent versus perennial streams as presented in the ANRAD application. The referenced ORAD was issued under both the Bylaw and WPA because at the time of filing the Applicant was the Town of Sudbury and not MassDOT. State agencies such as MassDOT are not ordinarily subject to local bylaws. MassDOT is seeking to make these distinctions as defined under the WPA in order to proceed with the permitting phase of the BFRT in an accurate manner and ensure compliance with WPA regulatory performance standards.

MassDOT reviewed the existing conditions plans of the proposed BFRT in Sudbury, MA to confirm the presence (or lack thereof) of Bordering Vegetated Wetlands (BVW), and classify the intermittent and perennial streams, as such terms are defined under the WPA. The results are discussed below.

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Subsequent to the ORAD being issued in 2016, additional detailed field investigations of potential vernal pools were conducted by VHB in 2017 and Stantec in 2018 in accordance with MA Natural Heritage and Endangered Species program (NHESP) guidance. MassDOT would like to enter these results into the record and identify those two pools (or portions thereof) that are within the right of way as certifiable vernal pools in accordance with NHESP Guidance.

Isolated Vegetated Wetlands

ANRAD plans were compared with publicly available wetlands information on MassGIS such as MassDEP wetlands, hydrological connection data layers, along with USGS maps, and identified nine distinct wetland flag series to review in the field based on whether they appeared isolated in the landscape or if there was a lack of mapped hydrological connection to another resource area. One additional wetland, WF-36 series, was identified as isolated on the plans and presumed to be correct. On April 1 and May 8, 2020, wetland scientists conducted a field inspection of these identified areas to confirm if the delineated vegetated wetlands are bordering wetlands under the WPA or isolated wetlands only under the Bylaw. Based on the results of the field inspection, MassDOT identified seven (7) vegetated wetland areas that are clearly isolated. See Figure 1 in Attachment A.

The identified freshwater wetland flag series listed in Table 1 should not be considered BVWs under the WPA because they are isolated in the landscape and do not border on a surface water body as required under 310 CMR 10.55. Nor should these flag series be considered Isolated Land Subject to Flooding under the WPA as they do not meet the volume and depth requirements under 310 CMR 10.57.

Waterways

Based on the plan assessment, review of USGS map information, and USGS StreamStats™ analysis, four perennial streams within the BFRT right of way were identified. The remaining bank flag series are to be considered intermittent. Finally, portions of one bank series do not meet the state WPA definition of a stream. See Table 1 and the summary below for further information.

Pursuant to 310 CMR 10.58(2)(a)1c, “a stream shown as intermittent or not shown on the current USGS map or more recent map provided by the Department, that has a watershed size less than one square mile, is intermittent unless the stream has a watershed size of at least ½ (0.50) square mile and has a predicted flow rate greater than or equal to 0.01 cubic feet per second at the 99% flow duration using the USGS Stream Stats method.”

Hop Brook (BF32 & BF33), Pantry Brook (PS1), a tributary to Pantry Brook (BF12), and a tributary to Cold Brook (BF3) are all USGS-mapped perennial and thus have associated 200-foot Riverfront Area under the WPA. Using the USGS Stream Stats program, the remaining streams mapped as intermittent or flagged in the field as identified in the plans were evaluated (see Attachment B). Because none of these streams are mapped as perennial by USGS, and all have watershed sizes of less than ½ square

mile as indicated by the Stream Stats program, none are considered perennial under the WPA regulations. Thus, none of these intermittent streams have associated Riverfront Area.

Portions of bank flag series BF-30 are up gradient of any other resource area according to the 2016 ANRAD existing condition plans (Sheets 17 and 18). This condition was field verified and determined that there was not a freshwater wetland (bordering or otherwise) or surface water body up gradient of these sections. These portions include flags BF 30-106 through BF 30-126, BF 30-132 through BF 30-139, and BF 30-333 through BF 30-321 (one continuous section on the east side of the trail), and flags BF 30-302 through BF 30-320 (one continuous section on west side of trail). While this stream may be considered jurisdictional under the Bylaw, in our opinion it would not be a regulated resource area under the WPA, as these portions do not meet the definition of a stream¹.

Perennial and intermittent streams have been categorized in Table 1 on the next page according to the WPA definitions.

Vernal Pools

The attached reports (Attachment C) have identified three additional certifiable vernal pools: PVP 4, PVP 11 and PVP 12a. Of these, only PVP 4 (associated with WF 6) and PVP 11 (associated with WF 24) appear to be within the BFRT ROW. It is important to note that while several of the IVWs identified in Table 1 were surveyed, no vernal pool species were found within these wetlands according to the survey results.

¹ According to 310 CMR 10.04, a "Stream means a body of running water, including brooks and creeks, which moves in a definite channel in the ground due to a hydraulic gradient, and which flows within, into or out of an Area Subject to Protection under M.G.L. c. 131, § 40. A portion of a stream may flow through a culvert or beneath a bridge. Such a body of running water which does not flow throughout the year (i.e., which is intermittent) is a stream except for that portion **upgradient of all bogs, swamps, wet meadows and marshes.**" [emphasis added]

Table 1 – Summary of Recommended Resource Area Classification under the WPA

FLAG SERIES	PLAN SHEET	CLASSIFICATION/STREAM TYPE UNDER WPA	APPROXIMATE AREA (IVW)	COMMENTS
BF36	2	Intermittent		
BF33	8	Perennial		Hop Brook
BF32	7, 8, 16	Perennial		Hop Brook
BF27	24	Intermittent		
BF26	24	Intermittent		
BF15-24	26, 28, 29	Intermittent		
BF23	27	Intermittent		
BF30*	17, 18	Intermittent <i>Flags BF 30-100 to 105, 30-200-212, 30-300 to 308, 300-13, 30-320 and 30-321 only</i>		Unnamed tributary to Hop Brook
BF21	29, 30, 31	Intermittent		
BF19	33	Intermittent		
BF 18	33	Intermittent		
BF17	33, 34	Intermittent		Not shown on USGS stream stats
BF16	34	Intermittent		
PS1	35, 36, 37	Perennial		Pantry Brook
BF15-6	47	Intermittent		
BF12	38, 39, 40	Perennial		Unnamed tributary to Pantry Brook
BF8	42, 43, 44, 48	Intermittent		Cold Brook
BF6	42, 43, 44, 48	Intermittent		Cold Brook
BF7	45	Intermittent		Not shown on USGS streamstats
BF5	48	Intermittent		
BF3	51, 52	Perennial		Unnamed tributary to Cold Brook
BF2	54, 55	Intermittent		
WF38	3	Isolated/Non-jurisdictional	1,550 sf	Included in VP survey (PVP ID 16)
WF36	22	Isolated/Non-jurisdictional	3,315 sf	Included in VP survey (PVP ID 15)
WF34	10	Isolated/Non-jurisdictional	~ 3,200 sf	Included in VP survey (PVP ID 14)
WF33	10	Isolated/Non-jurisdictional	1,200 sf	Not included in VP survey
WF31	18	Isolated/Non-jurisdictional	3,250 sf	Not included in VP survey
WF20	31	Isolated/Non-jurisdictional	~1,000 sf	Included in VP survey (PVP ID 10)
WF15	38	Isolated/Non-jurisdictional	850 sf	Not included in VP survey

ORAD Amendment Request Details

MassDOT requests that the Sudbury Conservation Commission revise the jurisdictional status of the previously approved wetland resource area delineation boundary to clarify status under the WPA and issue an amended ORAD to reflect any agreed upon jurisdictional changes under the WPA. Specifically, MassDOT is seeking to specify the Isolated Vegetated Wetlands as listed in Table 1 as non-jurisdictional under the WPA. Furthermore, the classification of intermittent and perennial should be documented in accordance with WPA regulations at 10.58 2(a)1 in the ORAD, as well as classification of the portions of flag series BF30 that do not meet the WPA definition of a stream. MassDOT is also seeking to enter the vernal pool survey results into the record as described.

MassDOT also requests that the ORAD be transferred to MassDOT from the Town of Sudbury to MassDOT as they are the property owner. The proposed activities to construct the BFRT would be analyzed in a separate Notice of Intent prepared by MassDOT as the Applicant under the WPA.

This Request was prepared in accordance with the Massachusetts Wetland Protection Act (MGL c.131 s.40) and implementing Regulations (310 CMR 10.00). This Amendment Request is being submitted for the Commission's review at the next available public hearing on June 29, 2020. If the Commission would like to conduct a site walk prior to that date or has any questions regarding this request, please do not hesitate to contact me at Timothy.Dexter@state.ma.us.

Sincerely,



Tim Dexter
Fish & Wildlife Supervisor
MassDOT Highway Division

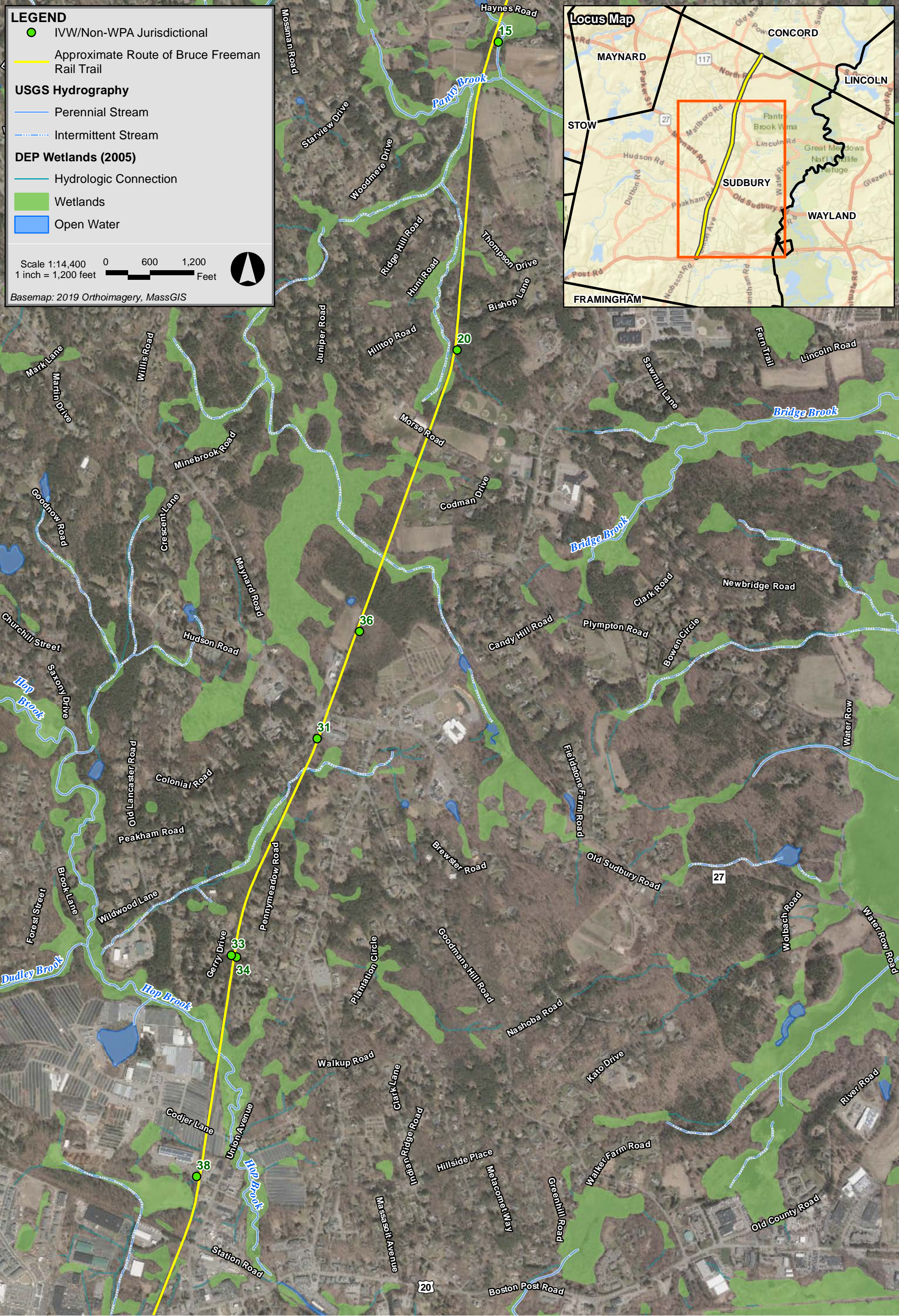
cc: DEP NERO

Attachments

- Attachment A – Figures
- Attachment B – Stream Stats results
- Attachment C – Vernal Pool Surveys

Attachment A - Figure 1

Isolated Vegetated Wetland Locations



Bruce Freeman Rail Trail Sudbury, Massachusetts

Attachment B

USGS Stream Stats Results

StreamStats Report

Region ID: MA

Workspace ID: MA20200514184801479000

Clicked Point (Latitude, Longitude): 42.41684, -71.40201

Time: 2020-05-14 14:48:17 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.000463	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	1.56	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters^[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.000463	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	1.56	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	-100000	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report^[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
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Low-Flow Statistics Citations

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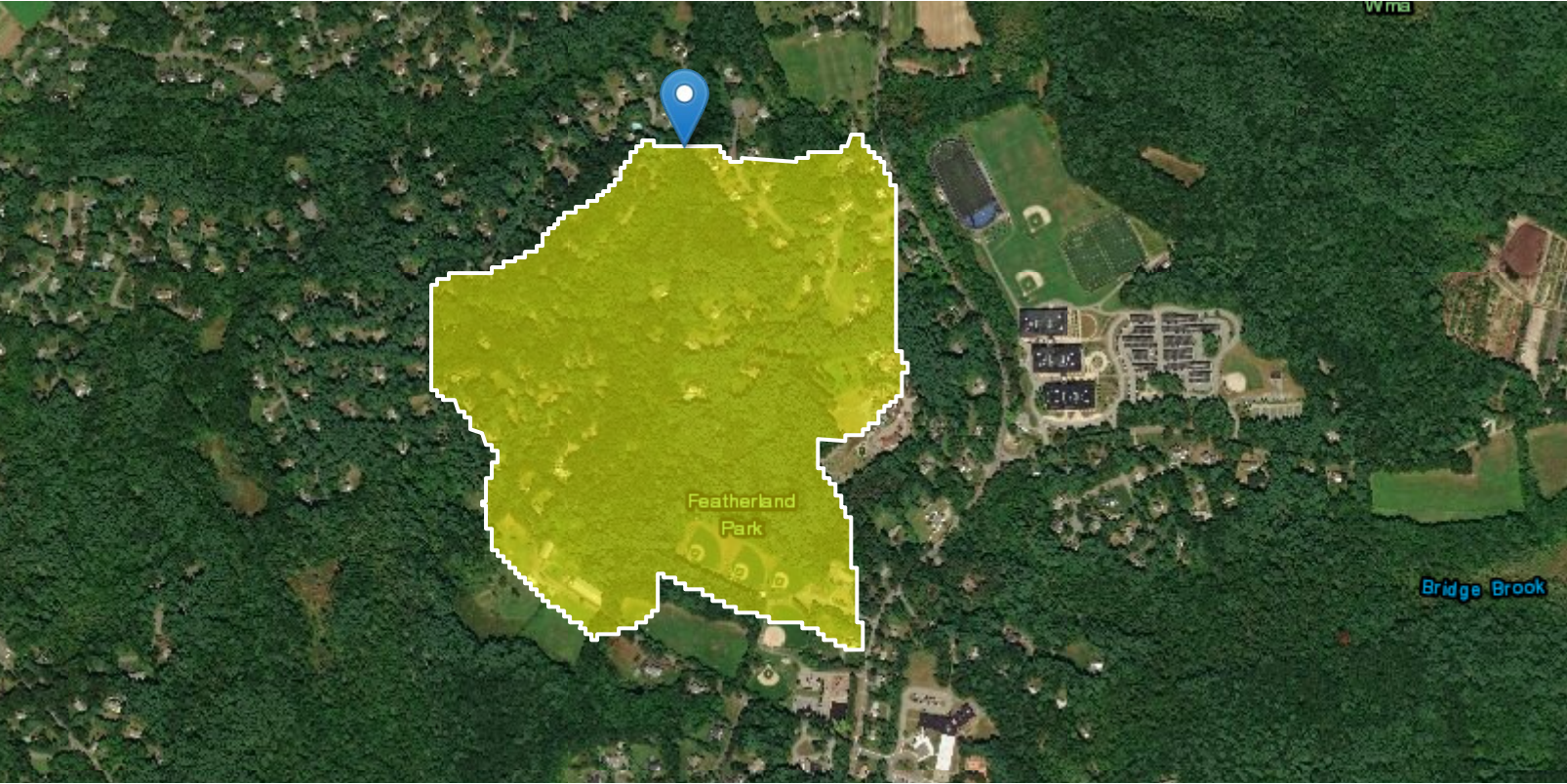
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Application Version: 4.3.11

StreamStats Report

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Workspace ID: MA20200514191833515000
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Time: 2020-05-14 15:18:49 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.22	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.488	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.23	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.22	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.488	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.23	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0182	ft^3/s
7 Day 10 Year Low Flow	0.00796	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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Application Version: 4.3.11

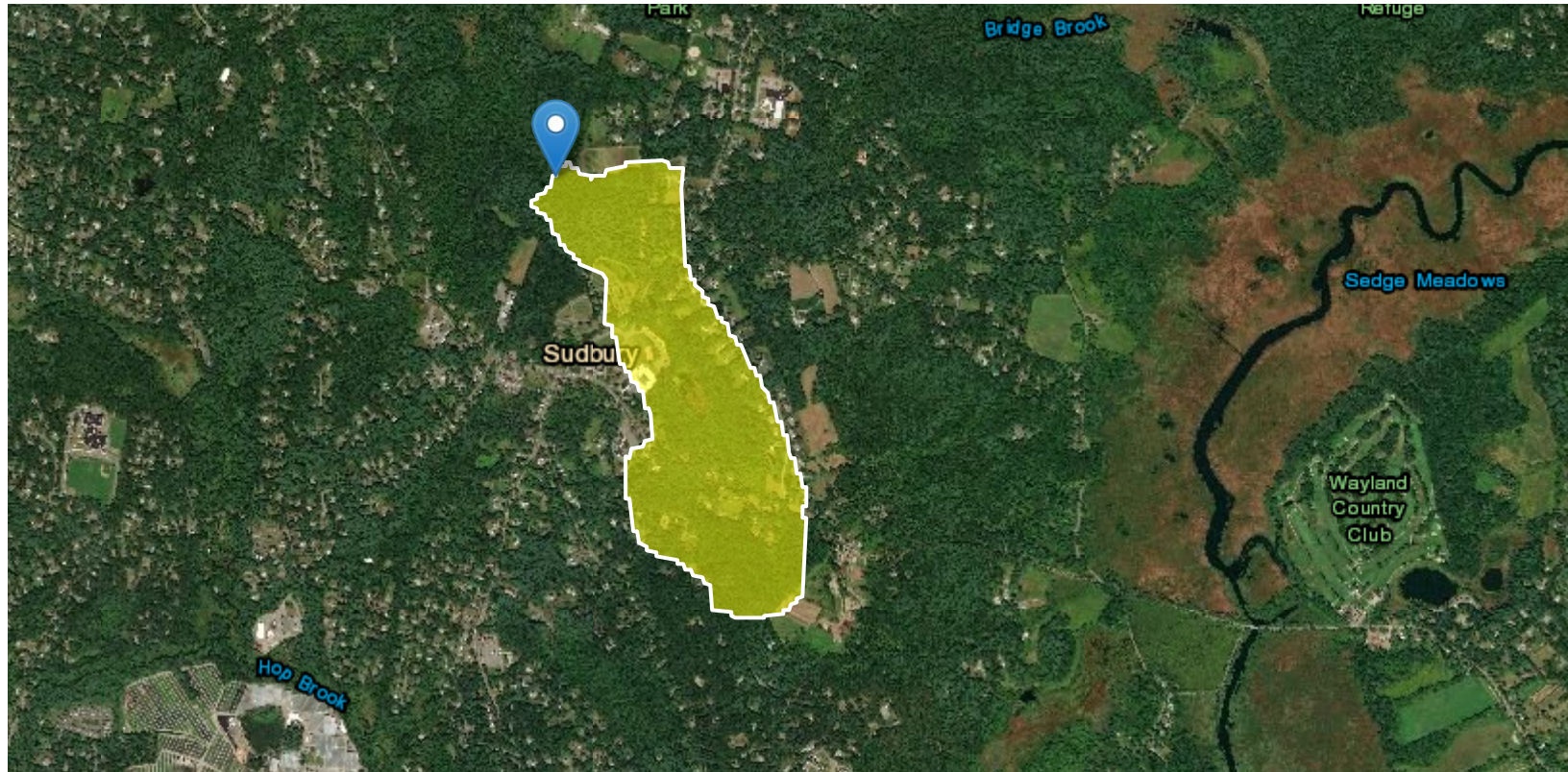
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Time: 2020-05-14 15:58:28 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.31	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	3.67	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.0607	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.31	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	3.67	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.0607	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errorsOne or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0137	ft^3/s
7 Day 10 Year Low Flow	0.00458	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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Application Version: 4.3.11

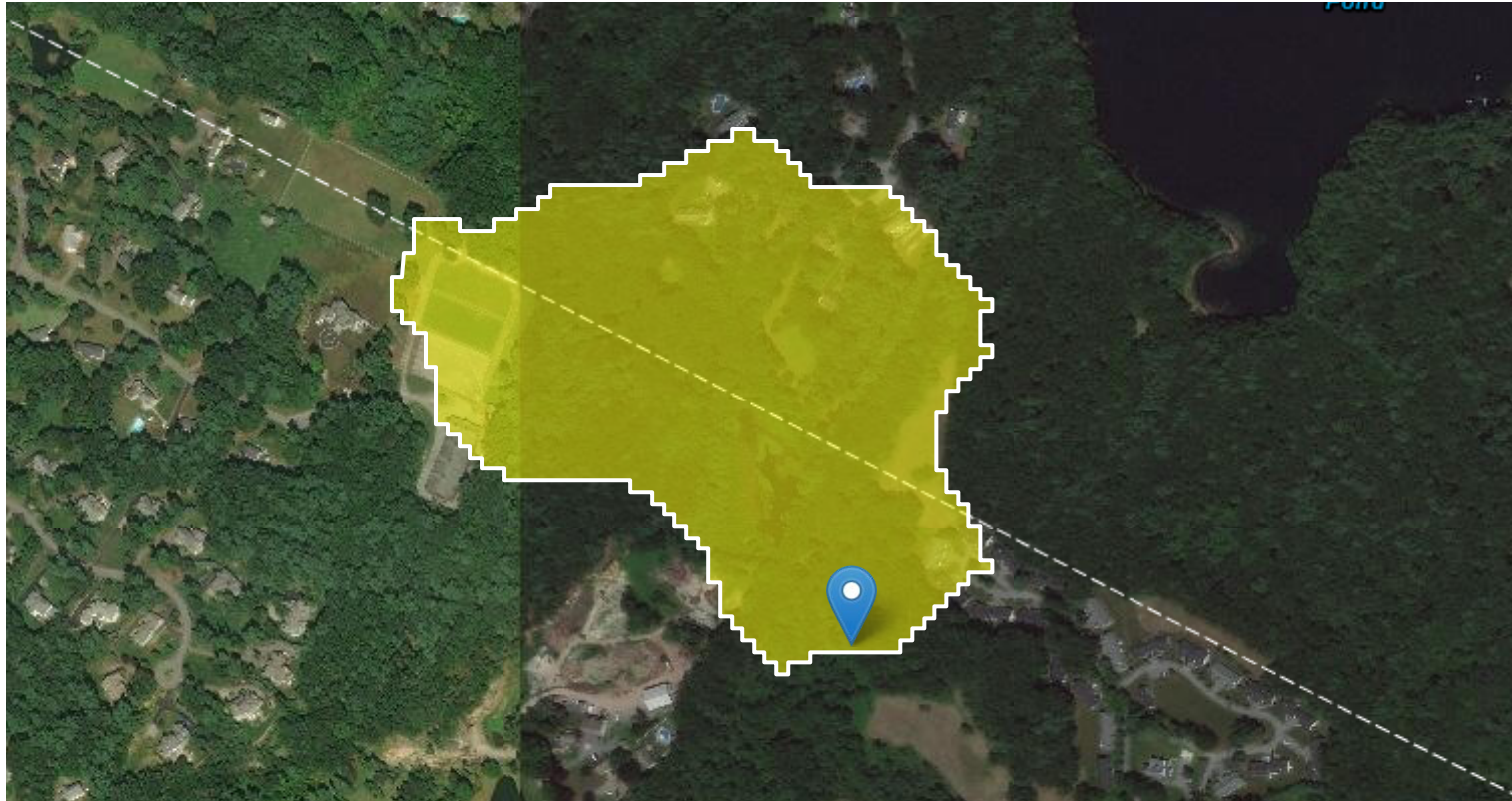
StreamStats Report

Region ID: MA

Workspace ID: MA20200514183759447000

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Time: 2020-05-14 14:38:15 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0599	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.973	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.0938	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0599	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.973	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.0938	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00236	ft^3/s
7 Day 10 Year Low Flow	0.00075	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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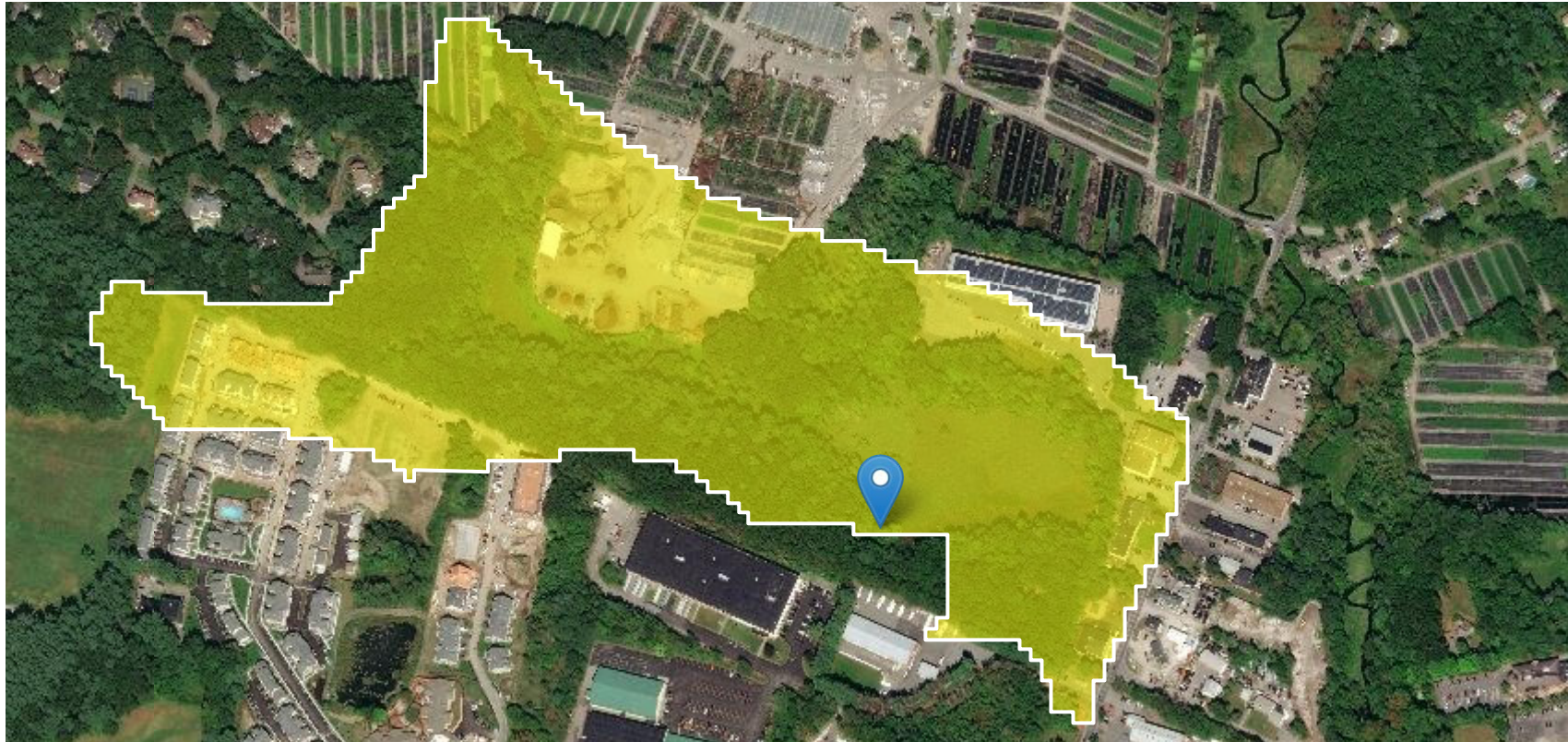
StreamStats Report

Region ID: MA

Workspace ID: MA20200514200930136000

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Time: 2020-05-14 16:09:46 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.1	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	0.27	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.41	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.1	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	0.27	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.41	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00504	ft^3/s
7 Day 10 Year Low Flow	0.00125	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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Application Version: 4.3.11

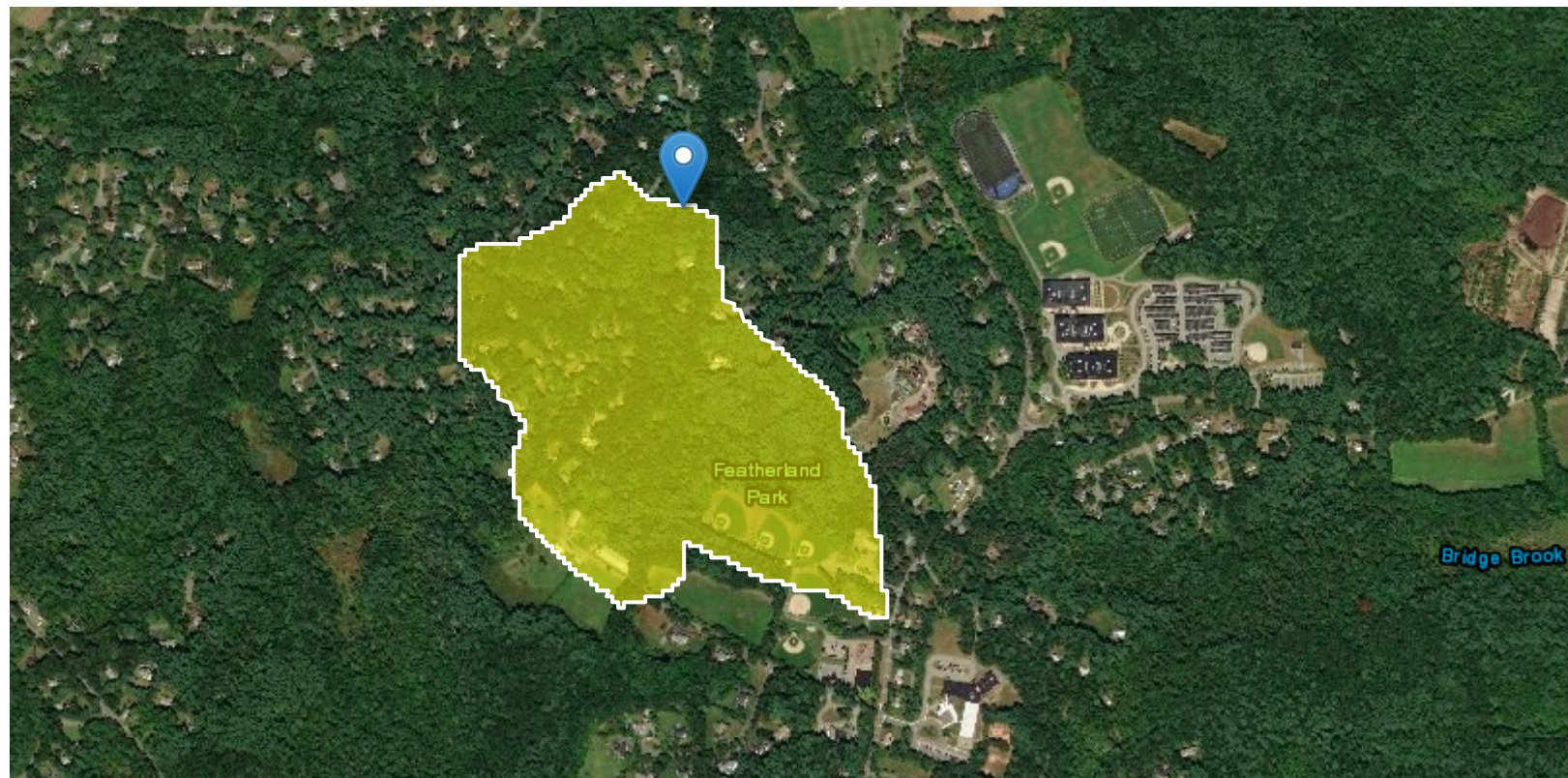
StreamStats Report

Region ID: MA

Workspace ID: MA20200514192159770000

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Time: 2020-05-14 15:22:16 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.15	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	4.861	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.18	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.15	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	4.861	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.18	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0105	ft^3/s
7 Day 10 Year Low Flow	0.00436	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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Application Version: 4.3.11

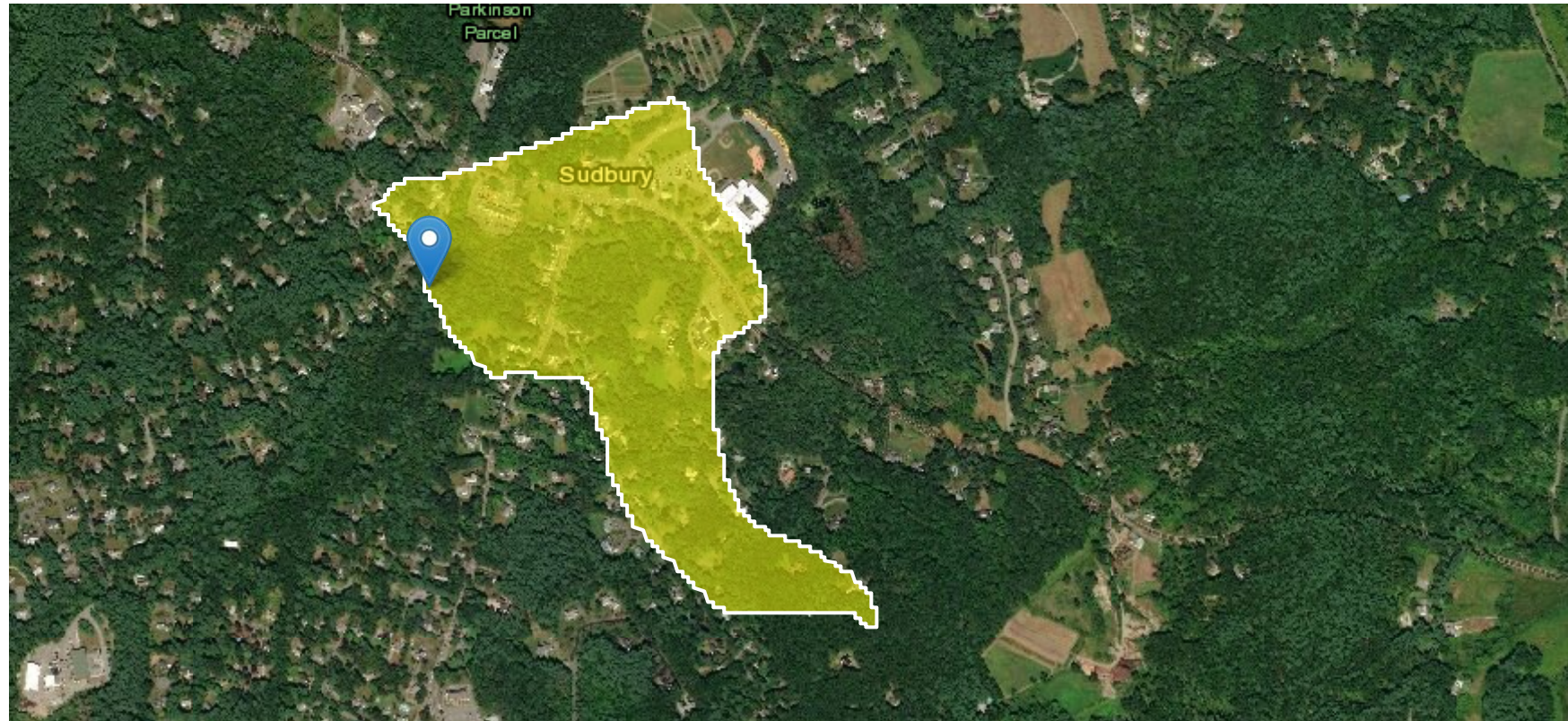
StreamStats Report

Region ID: MA

Workspace ID: MA20200514200455222000

Clicked Point (Latitude, Longitude): 42.38092, -71.41651

Time: 2020-05-14 16:05:11 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.16	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.589	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.000877	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00395	ft^3/s
7 Day 10 Year Low Flow	0.00102	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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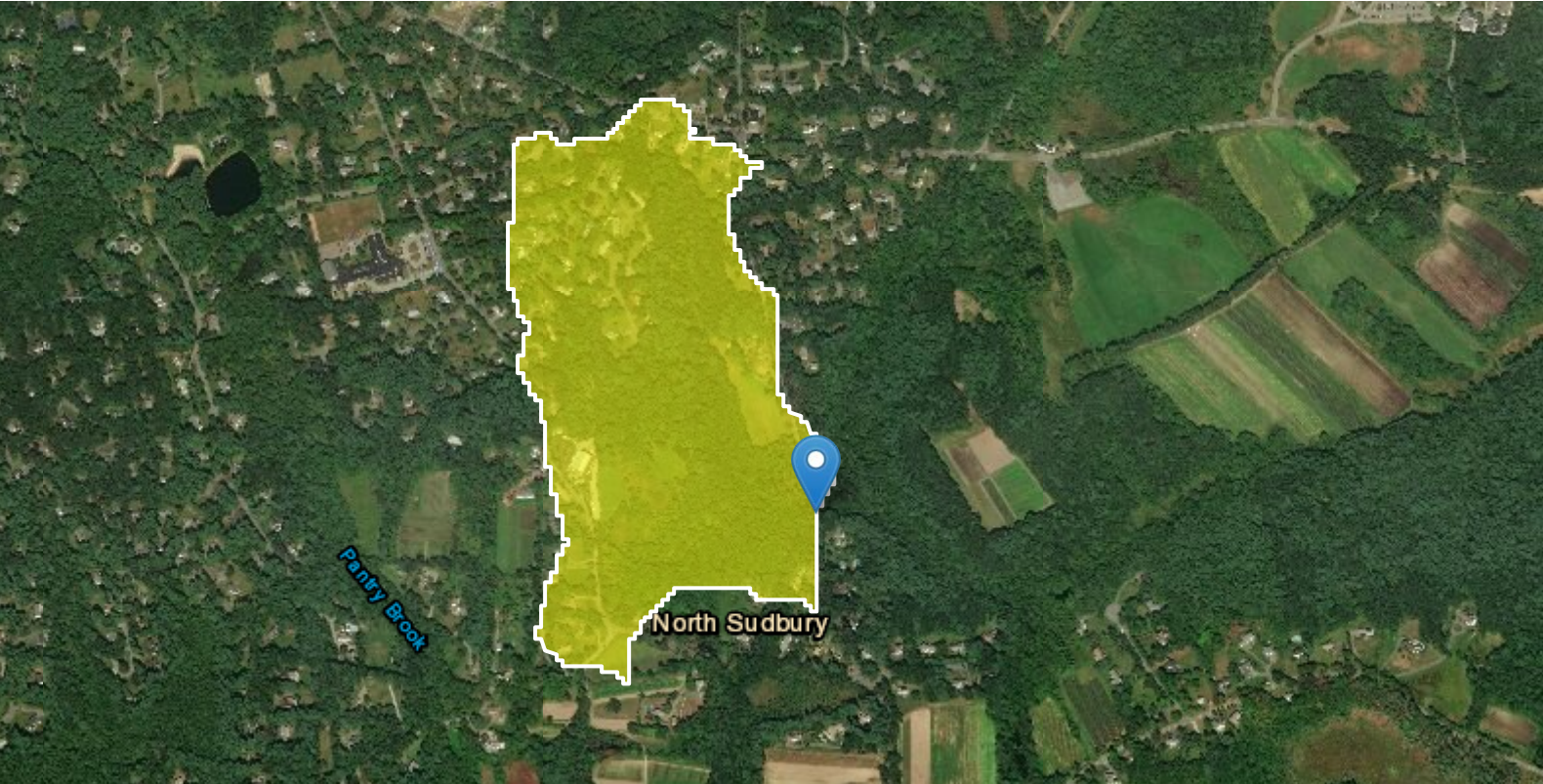
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Application Version: 4.3.11

StreamStats Report

Region ID: MA
Workspace ID: MA20200514190649965000
Clicked Point (Latitude, Longitude): 42.41173, -71.40523
Time: 2020-05-14 15:07:05 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.16	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	1.946	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.35	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	1.946	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.35	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers[Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.0132	ft^3/s
7 Day 10 Year Low Flow	0.00514	ft^3/s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

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Application Version: 4.3.11

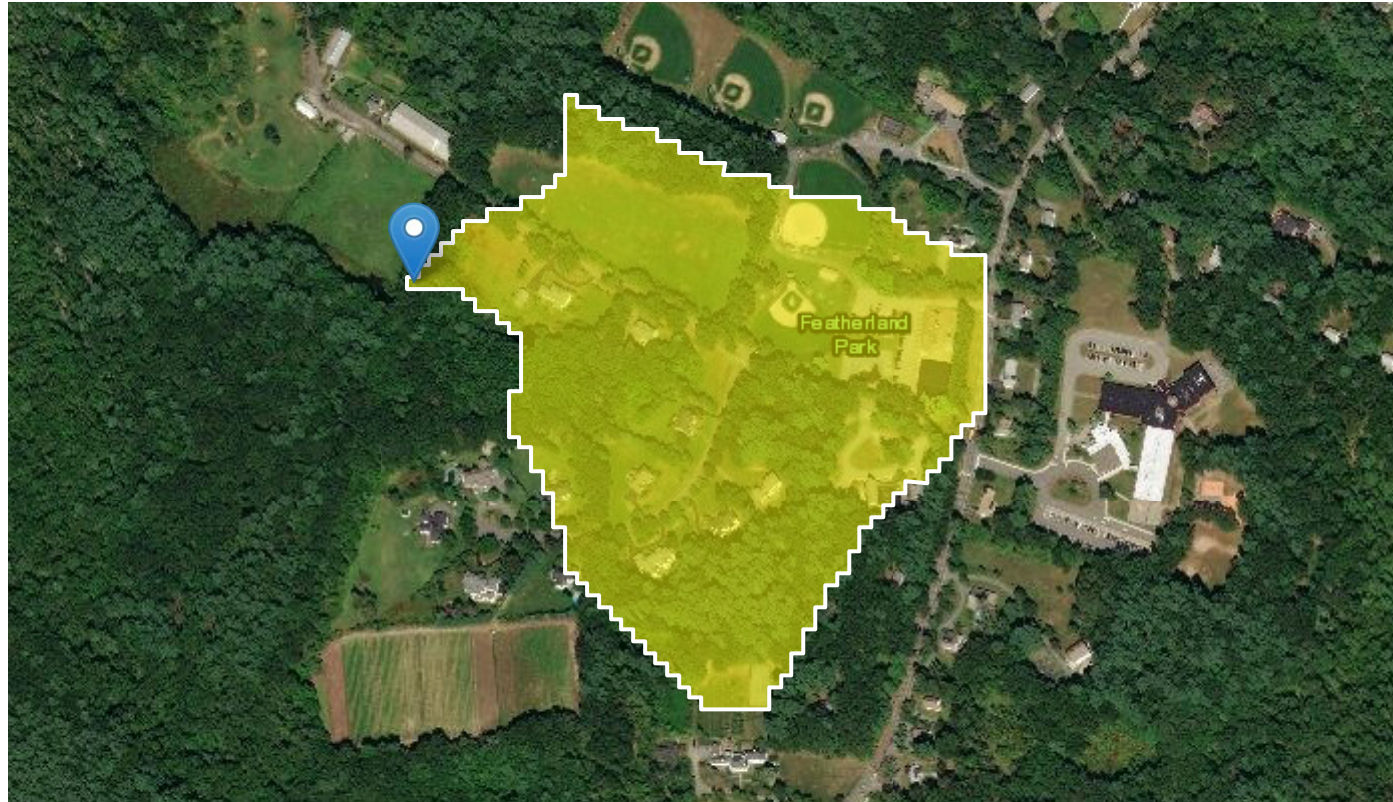
StreamStats Report

Region ID: MA

Workspace ID: MA20200514194929069000

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Time: 2020-05-14 15:49:46 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.0587	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM	1.79	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.0587	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	1.79	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	-100000	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
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Low-Flow Statistics Citations

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Application Version: 4.3.11

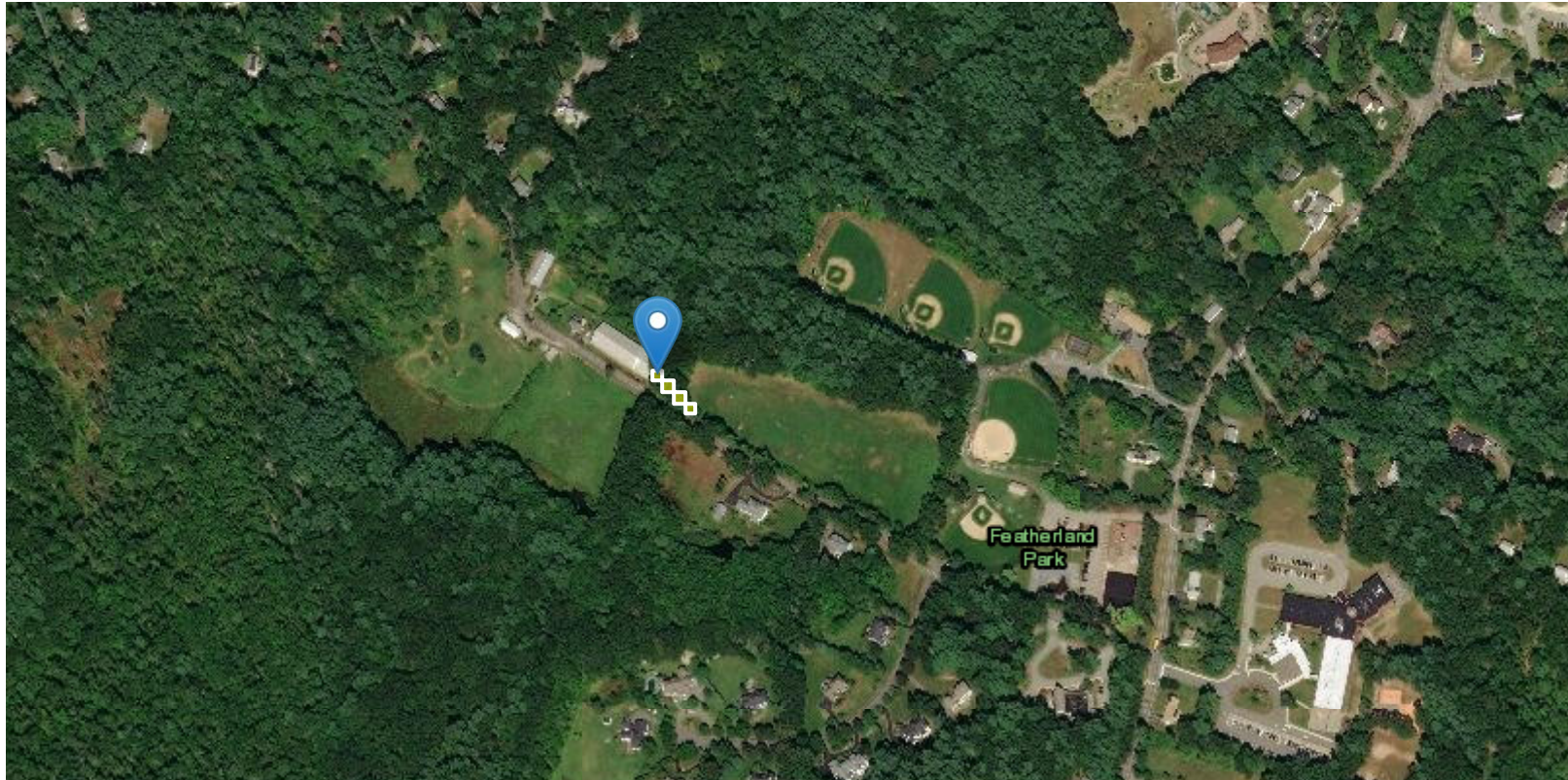
StreamStats Report

Region ID: MA

Workspace ID: MA20200514192955671000

Clicked Point (Latitude, Longitude): 42.39373, -71.41025

Time: 2020-05-14 15:30:12 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
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Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.000154	square miles
BSLDEM250	Mean basin slope computed from 1:250K DEM		percent
DRFTPERSTR	Area of stratified drift per unit of stream length	-100000	square mile per mile
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless

Low-Flow Statistics Parameters^[Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.000154	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM		percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	-100000	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Flow Report^[Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
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Low-Flow Statistics Citations

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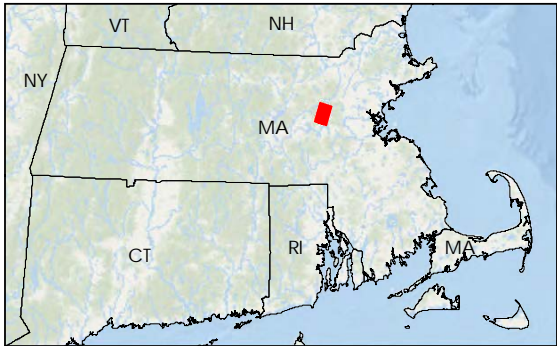
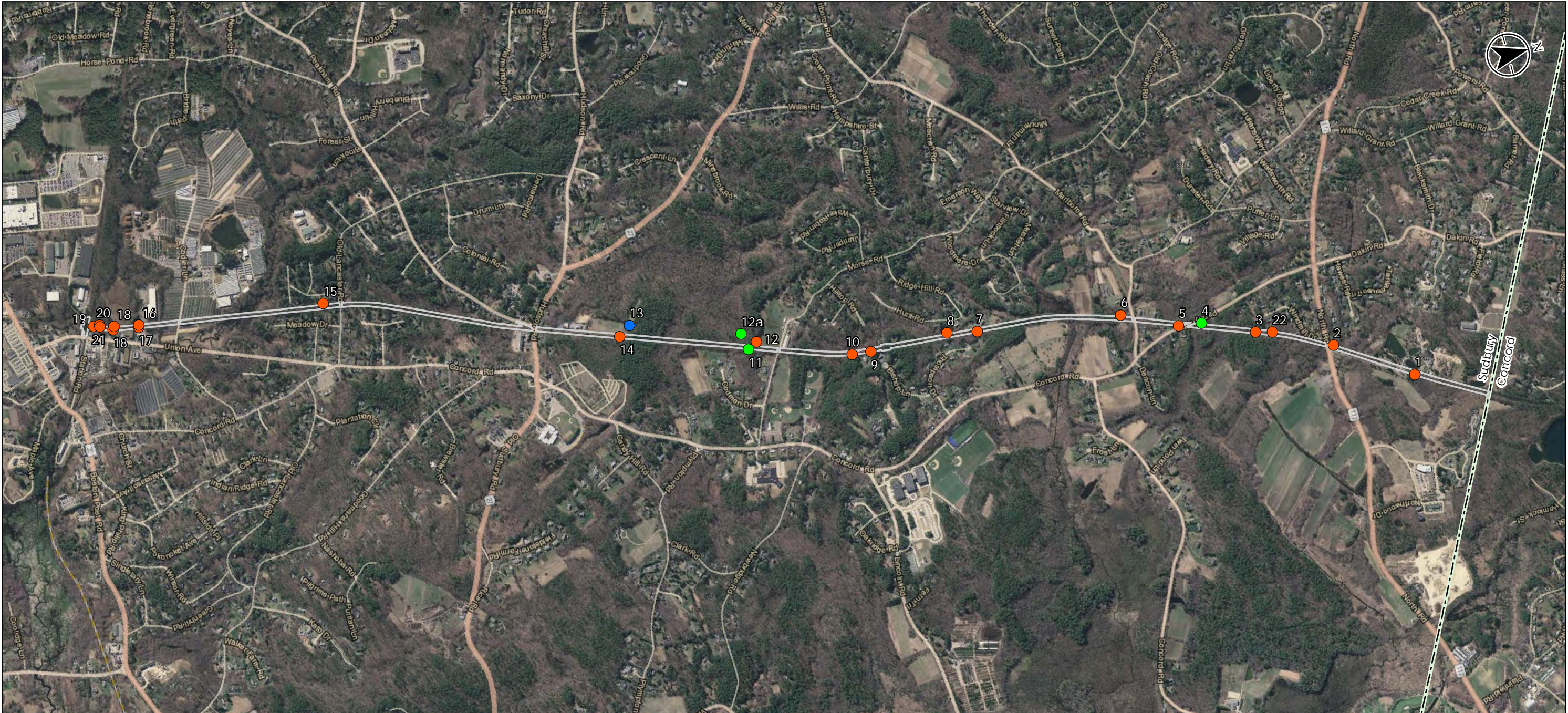
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Application Version: 4.3.11

Attachment C

Vernal Pool Investigations

Prepared by VHB and Stantec



- Legend**
- Vernal Pool Location
 - NHESP Certified Vernal Pool
 - Eligible to be Certified by NHESP
 - Not Eligible to be Certified by NHESP
 - Town Boundary
 - Subury Rail Trail

Data Sources

- Vernal pools 1 - 19 were digitized from the Existing Conditions Survey Plan At Proposed Rail Trail in Sudbury Mass., prepared by Atlantic Engineering and Survey Consultants Inc., dated June 30, 2008.
- Potential Vernal Pools 12a, 20 - 22 were located by Stantec on 4/17/2018 and 4/18/2018.
- Sudbury Rail Trail provided by MassGIS Sudbury parcel data layer.

0 1,000 2,000
Feet
1:20,000 (At original document size of 11x17)



Project Location 179410498
Sudbury, Massachusetts
Prepared by GC on 2018-05-01
Reviewed by DN on 2018-05-01

Client/Project
Sudbury Rail Trail

Figure No.
1
Title
2018 Potential Vernal Pool Survey

Notes

- Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
- Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

Table 1. Vernal Pool Survey Results: 2015, 2017 & 2018: Bruce Freeman Rail Trail, Sudbury, Massachusetts

2015	VHB		2017	VHB		2018	Stantec	
	Water Depth (in)	Findings		Volume (>200 cubic ft.)	Findings		Water Depth (in)	Findings
PVP 1	<1	No VP species found.	PVP 1	Yes	No VP species found.	PVP 1	2	No VP species found.
PVP 2	24-48	No VP species found.	PVP 2	Yes	No VP species found.	PVP 2	25	No VP species found.
PVP 3	2-3	No VP species found.	PVP 3	Yes	No VP species found.	PVP 3	8	No VP species found.
PVP 4	6-15	1 wood frog egg mass and 2 spotted salamander egg masses	PVP 4	Yes	12 wood frog egg masses, 100+ wood frog tadpoles, and 1 dead adult wood frog	PVP 4	12	Appx. 20 wood frog egg masses.
PVP 5	2-12	No VP species found. 1 predacious diving bettle observed.	PVP 5	No	No VP species found.	PVP 5	20	No VP species found.
PVP 6	2-6	No VP species found. Direct outlet to adjacent stream	PVP 6	Yes	No VP species found.	PVP 6	12	No VP species found. Pooled area in stream floodplain and fish observed.
PVP 7	6-8	No VP species found. Limited opportunity for egg mass attachment.	PVP 7	No	No VP species found.	PVP 7	11	No VP species found.
PVP 8	2-3	No VP species found. Water was flowing through area instead of ponding due to topography.	PVP 8	Yes	No VP species found. 1 adult green frog found.	PVP 8	0	No VP species found. Stream floodplain with no discernable pool boundary or pooled area.
SVP 9 ¹	2-5	No VP species found.	SVP 9 ¹	Yes	No VP species found.	SVP 9 ¹	24	2 dead salamanders; lead phase of eastern red-backed salamander (NHESP confirmed species identification).
PVP 10	0	No VP species found. Area was dry at time of inspection.	PVP 10	No	No VP species found.	PVP 10	0	No VP species found; area dry at time of inspection.
PVP 11	10-12	8 spotted salamander egg masses. Appx. 5 small (4in) fish swimming near some of the egg masses.	PVP 11	Yes	1 dead adult wood frog.	PVP 11	11	20 mole salamander spermatophores.
PVP 12	12-24	No VP species found. Limited opportunity for egg mass attachment.	PVP 12	Yes	No VP species found. Limited opportunity for egg mass attachment (2015 results).	PVP 12	>12	Farm pond beyond fence noted in 2015 and 2017. Expected to be permanent wetland.
						PVP 12a ^{2, 4}	10	9 wood frog egg masses.
CVP 13 ³	5-24	15+ spotted salamander egg masses, 15+ blue spotted salamander egg masses, 10+ wood frog egg masses found.	CVP 13 ³	Yes	15+ spotted salamander egg masses, 15+ blue spotted salamander egg masses, 15+ fairy shrimp.	CVP 13 ³	>36	52 spotted salamander egg masses, 73 blue-spotted salamander egg masses, 72 wood frog egg masses, and fairy shrimp.
PVP 14	4-6	No VP species found.	PVP 14	Yes	1 dead adult blue spotted salamander found. No other VP species found.	PVP 14		No VP species found.
PVP 15	4-18	1 wood frog egg mass found. No other signs of VP species.	PVP 15	No	No VP species found. No water present at time of inspection.	PVP 15	18	No VP species found.
PVP 16	2-10	No VP species found (10 wood frog egg masses found on 4/22/15).	PVP 16	Yes	No VP species found.	PVP 16		No VP species found.
PVP 17	0-6	No VP species found. Oil sheen present throughout isolated wetland.	PVP 17	No	No VP species found.	PVP 17	24	1 wood frog egg mass.
PVP 18	0-12	No VP species found.	PVP 18	Yes	No VP species found.	PVP 18	32	Intermitttent spring peeper calls.
PVP 19	0	No VP species found. Area was dry at time of inspection.	PVP 19	Yes	No VP species found.	PVP 19	16	No VP species found.
						PVP 20 ⁴	6	1 adult gray treefrog.
						PVP 21 ⁴	16	No VP species found.
						PVP 22 ⁴	8	No VP species found.

Bold text were identified as eligible for NHESP certification.

Notes: ¹ Previously identified as Subdbury Vernal Pool.

² Potential Vernal Pool surveyed in 2018 and located south of the PVP 12 surveyed in 2015 and 2017.

³ Previously Certified by NHESP.

⁴ New Potential Vernal Pool identified in 2018.

To: Jodie Kablack – Town of Sudbury

Date: May 22, 2015



Project #: 12984.00

From: Meghan Selby,
Environmental Scientist

Re: Vernal Pool Investigation

Memorandum

This memorandum describes the results of a field investigation that was conducted along the proposed Bruce Freeman Rail Trail (BFRT) corridor on April 24, 2015. The investigation included verifying the presence or absence of egg masses or individuals of obligate vernal pool species within certified and potential vernal pools along the BFRT corridor (Figure 1).

The *Existing Conditions Survey Plan at Proposed Rail Trail in Sudbury, Mass.*, prepared by Atlantic Engineering & Survey Consultants Inc., dated June 30, 2008, was used as the base for the vernal pool investigation (Attachment A). The plan set identified a single certified vernal pool (CVP), numerous potential vernal pools (PVPs), a single Sudbury vernal pool (SVP), and isolated wetlands. In addition to the previously identified areas the field team walked the corridor looking for any additional areas that had vernal pool characteristics. The following lists of vernal pool criteria were used as the basis for documenting areas along the corridor.

The results of the investigation are summarized in Table 1 and described in further detail the following sections.

Vernal Pool Criteria

The March 2009 *Guidelines for the Certification of Vernal Pool Habitat* (Guidelines) defines the Vernal Pool Certification Criteria based on biological and physical evidence.

Biological criteria include:

- Obligate species (wood frog (*Lithobates sylvaticus*), spotted salamander (*Ambystoma maculatum*), blue-spotted salamander (*A. laterale*), Jefferson salamander (*A. jeffersonianum*), and marbled salamander (*A. opacum*)
 - Wood frog chorusing
 - At least 5 pairs of mated wood frogs
 - At least 5 egg masses of either wood frogs or spotted salamanders
 - One egg mass of state-listed blue-spotted or Jefferson salamander
 - Mating adult salamanders
 - Salamander spermatophores
 - Salamander or wood frog larvae
 - Fairy shrimp (*Anostraca: Eubranchipus*)
- Facultative species (spring peeper, gray treefrog, American toad, Folwer's toad) – at least two species must be present.
 - Adult chorusing
 - At least 5 mated pairs
 - Any number of egg masses

101 Walnut Street
PO Box 9151
Watertown, MA 02472
P 617.924.1770

- Tadpoles

Physical criteria include evidence that there is a pool with no permanently flowing outlet (no culvert or stream). The Guidelines defines Vernal Pool Boundary as:

- A distinct and clear topographic break at the edge of a pool or
- The maximum observed or recorded extent of flooding, as evidenced by:
 - Leaf staining or other indicators of hydrology, or
 - The mean annual high water mark as observed in March through early April.

The *Sudbury Wetlands Administration Bylaw Regulations* (Revised August 11, 2014) further defines a vernal pool as:

any confined basin or depression not occurring in existing lawns, gardens, landscaped areas, or driveways which, at least in most years, holds water for a minimum of two continuous months during the spring and/or summer, contains at least 200 cubic feet of water at some time during most years, is free of adult predatory fish populations, and provides essential breeding and rearing habitat functions for amphibian, reptile, or other vernal pool community species.

Results

Results from the investigation are summarized in the following table and described in greater detail in the following section.

Table 1. Vernal Pool Investigation Results Summary

ID	Between Stations	Water Depth (in)	Findings
PVP 1	468.00-468.50	<1	No VP species found.
PVP 2	453.00-457.00	24-48	No VP species found.
PVP 3	440.50-441.50	2-3	No VP species found.
PVP 4*	431.50-435.00	6-15	1 wood frog egg mass and 2 spotted salamander egg masses.
PVP 5*	427.50-429.25	2-12	No VP species found. 1 predacious diving beetle observed.
PVP 6*	418.00-419.00	2-6	No VP species found. Direct outlet to adjacent stream.
PVP 7	393.50-395.50	6-8	No VP species found. Limited opportunity for egg mass attachment.
PVP 8	389.00-390.50	2-3	No VP species found. Water was flowing through area instead of ponding due to topography.
SVP 9	376.50-377.50	2-5	No VP species found.
PVP 10	373.00-374.50	0	No VP species found. Area was dry at time of inspection.

ID	Between Stations	Water Depth (in)	Findings
PVP 11*	384.50-385.50	10-12	8 spotted salamander egg masses. Approx. 5 small (~4in) fish swimming near some of the egg masses.
PVP 12*	354.50-356.00	12-24	No VP species found. Limited opportunity for egg mass attachment.
CVP 13*	336.00-337.00	5-24	15+ blue spotted salamander, 15+ spotted salamander, and 10+ wood frog egg masses found.
PVP 14*	334.00-335.00	4-6	No VP species found.
PVP 15	284.50-286.50	4-18	1 wood frog egg mass found. No other signs of VP species.
PVP 16	254.50-255.50	2-10	No VP species found. (~10 wood frog egg masses found on 4/22/15)
PVP 17	254.50-256.00	0-6	No VP species found. Oil sheen present throughout isolated wetland.
PVP 18	249.00-254.00	0-12	No VP species found.
PVP 19	247.00-248.00	0	No VP species found. Area was dry at time of inspection.

*Areas within mapped priority and estimated habitat as provided by NHESP.

Based on the findings of the April 2015 survey of potential vernal pools along the proposed Bruce Freeman Rail Trail in Sudbury, only Potential Vernal Pools 4, 11, 15, and 16 are eligible for certification as Vernal Pools with the Natural Heritage and Endangered Species Program. Vernal Pool 13 is already certified and was confirmed with by our findings. Although a single wood frog egg mass was observed within Potential Vernal Pool 15, it would not meet NHESP certification requirements.

The following are photographs from the field investigation of each of the pools, and additional site specific notes.

Potential Vernal Pool Area 1 – Between Stations 468.00 and 468.50.



PVP 1 was within a larger wetland complex. The area does not appear to hold enough water long enough for VP species utilization. Water levels were less than 1 inch. No VP species were observed.

Potential Vernal Pool Area 2 – Between Stations 453.00 and 457.00.



PVP 2 is part of a larger wetland complex. Water levels were to a depth of approximately 2 feet along the outer edge and up to 4 feet within the center of the pool. Despite the abundance of suitable egg laying locations (over hanging branches) no VP species or evidence of species was observed during the investigation.

Potential Vernal Pool Area 3 – Between Stations 440.50 and 441.50.

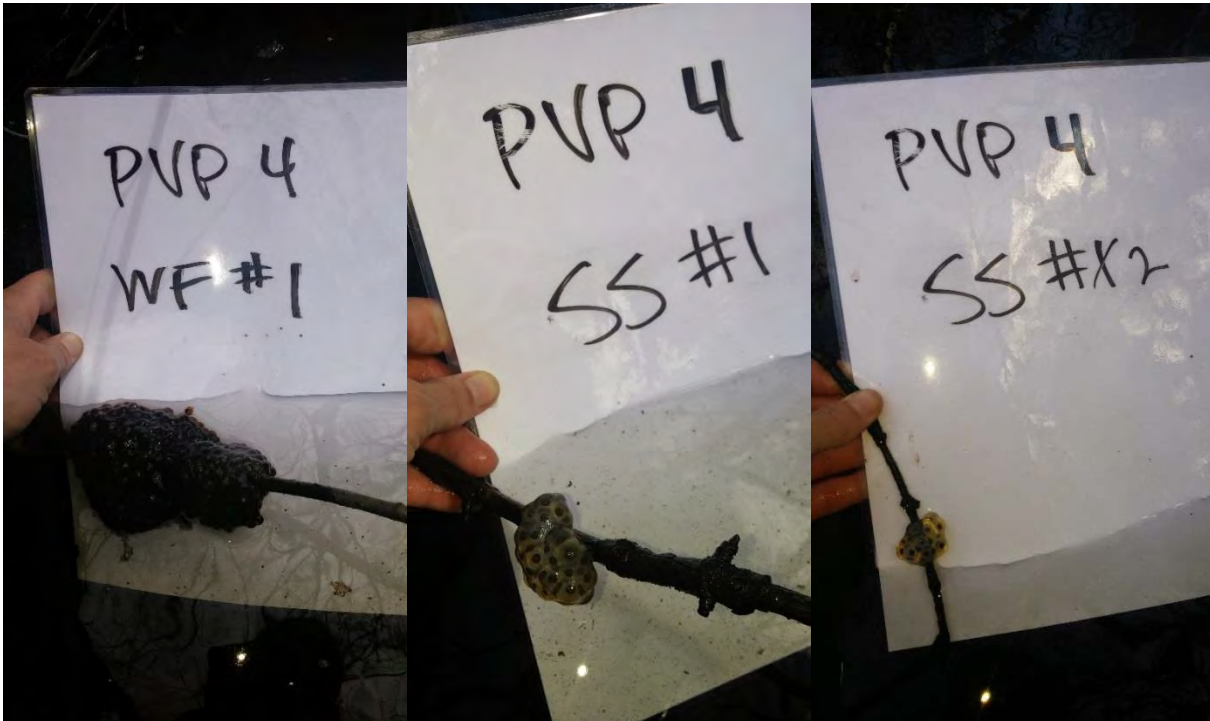


PVP 3 is a shallow and narrow depression that runs parallel to the rail bed. Water depths were 2-3 inches and no VP species were observed.

Potential Vernal Pool Area 4 – Between Stations 431.50 and 435.00.



PVP 4 is to the east of Pantry Road and on the western limit of the BFRT corridor. The pool had standing water ranging from 6 to 15 inches. High levels of iron were observed within the pool. Numerous branches were positioned along the edge of the pool, creating good egg mass attachment opportunities.



One wood frog and two spotted salamander egg masses were found within PVP 4. This area is within Priority Habitat of Rare Species (PH 617) and Estimated Habitat of Rare Wildlife (EH 543).

Potential Vernal Pool Area 5 – Between Stations 427.50 and 429.25.



PVP 5 is a narrow depression with shallow pockets of water along the fringes and up to 12 inches in the center. No VP species were observed within the pool. Clumps of algae were observed on some branches and within the deeper sections of the water. This area is within Priority Habitat of Rare Species (PH 617) and Estimated Habitat of Rare Wildlife (EH 543).

Potential Vernal Pool Area 6 – Between Stations 418.00 and 419.00.



PVP 6 is a shallow depression adjacent to a stream. Standing water within the depression ranged from 2 to 6 inches. No VP species were observed. This area is within Priority Habitat of Rare Species (PH 617) and Estimated Habitat of Rare Wildlife (EH 543).



Water within the PVP 6 area was actively draining into the adjacent stream at the time of the inspection.

Potential Vernal Pool Area 7 – Between Stations 393.50 and 395.50.



PVP 7 is a shallow depression with standing water ranging from 6 to 8 inches. The depression was approximately 10 feet at its widest point. No VP species were observed.

Potential Vernal Pool Area 8 – Between Stations 389.00 and 390.50.



PVP 8 is a shallow secondary channel adjacent to a well-defined stream. No VP species were observed.



PVP 8 had flowing water ranging from 2 to 3 inches deep before the confluence with the main stream channel.

Sudbury Vernal Pool 9 – Between Stations 376.50 and 377.50.



SVP 9 had approximately 2 to 5 inches of standing water. No permanent outlet was present. No VP species were observed.

Potential Vernal Pool Area 10 – Between Stations 373.00 and 374.50.



PVP 10 is a channel like depression that runs along rail bed's the toe of slope. The area was dry at the time of inspection. Based on topography within this area it is unlikely that water ponds up for the requisite period of time for VP species to utilization. No VP species were found.

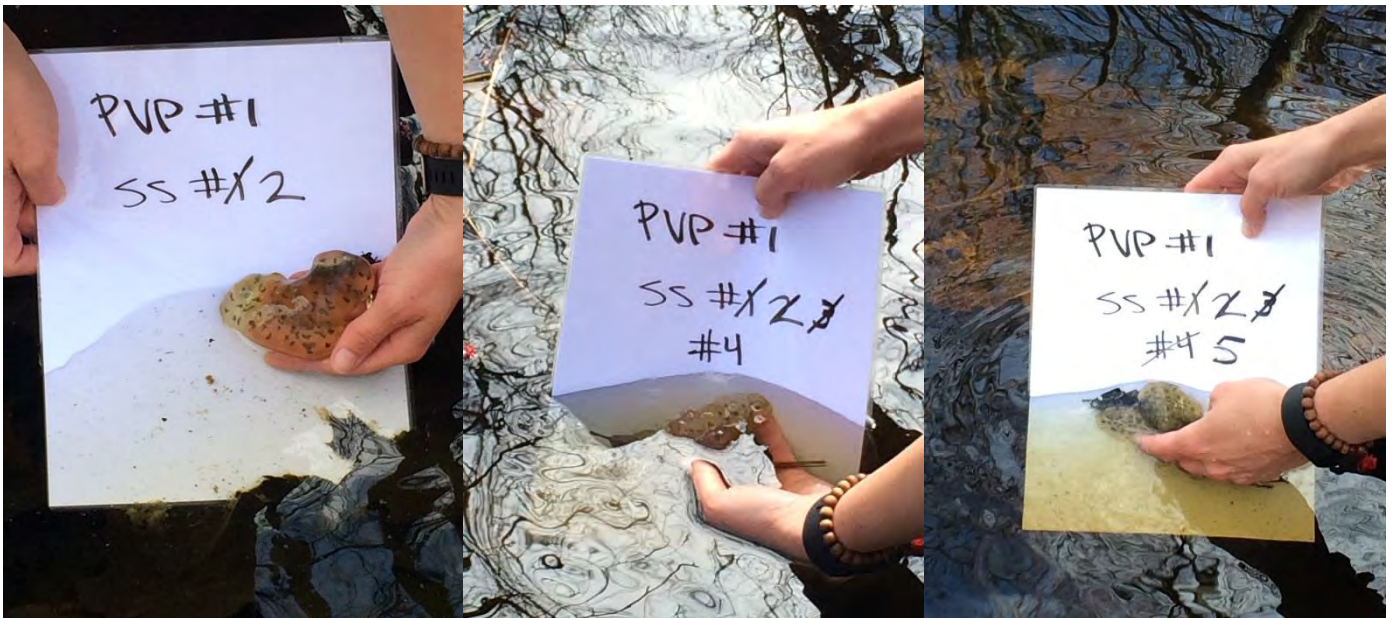
Potential Vernal Pool Area 11 – Between Stations 384.50 and 385.50.



PVP 11 is part of a larger wetland complex. The southern extent of the complex (as pictured above) had standing water between 10 and 12 inches.



The northern extent of the wetland complex (PVP 11) transitions into a wide channel and to the northeast a pond. Small fish approximately 4 inches in length were primarily observed within the larger channel area and a few were found swimming within a few feet of the spotted salamander egg masses.



Eight spotted salamander egg masses were observed within PVP 11. These were localized within the southern extent of the wetland complex. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437).

Potential Vernal Pool Area 12 – Between Stations 354.50 and 356.00



PVP 12 is on the western side of the BFRT corridor, across from PVP 11. PVP 12 is a farm pond that has the potential to hold water through most of the year. Water depths were approximately 1 to 2 feet. There were little to no branches within the outer fringe of the pond along the eastern limit (within the ROW easement). No VP species were found. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437).

Certified Vernal Pool 13 – Between Stations 336.00 and 337.00.



CVP 13 is approximately 80 by 100 feet and had up to approximately 2 feet of standing water at the time of the inspection. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437).



Wood frog (10+), spotted salamander (15+), and blue-spotted salamander (15+) egg masses were found throughout the pool. A number of individual and clusters of 2-5 eggs were also found throughout and on the bottom of the pool.

Potential Vernal Pool Area 14 – Between Stations 334.00 and 335.00.



PVP 14 was holding approximately 4 to 6 inches of standing water at the time of inspection. This area is within Priority Habitat of Rare Species (PH 528) and Estimated Habitat of Rare Wildlife (EH 437). No VP species were found.

Potential Vernal Pool Area 15 – Between Stations 284.50 and 286.50.



PVP 15 is a narrow depression that is coincident with the rail bed's toe of slope. The center of the depression was holding approximately 18 inches of water at the time of inspection. One wood frog egg mass was found. No other VP species were observed.

Potential Vernal Pool Area 16 – Between Stations 254.50 and 255.50.



PVP 16 is within a constructed detention basin. At the time of inspection standing water reached depths of 10 inches in the southern extent and the basin was dry in the northern extent. No VP species were observed. An oil sheen was present on the surface of the water and small piles of snow and associated debris were present. During a flagging event on April 15, 2015 staff heard wood frog chorusing and noted multiple wood frog egg masses within the center of the pool.

Potential Vernal Pool Area 17 – Between Stations 254.50 and 256.00.



PVP 17 is an isolated wetland. The depression was holding up to 6 inches of water in the center. An oil sheen was present within the pool and no VP species were observed.

Potential Vernal Pool Area 18 – Between Stations 249.00 and 254.00.

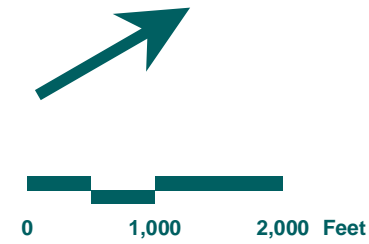
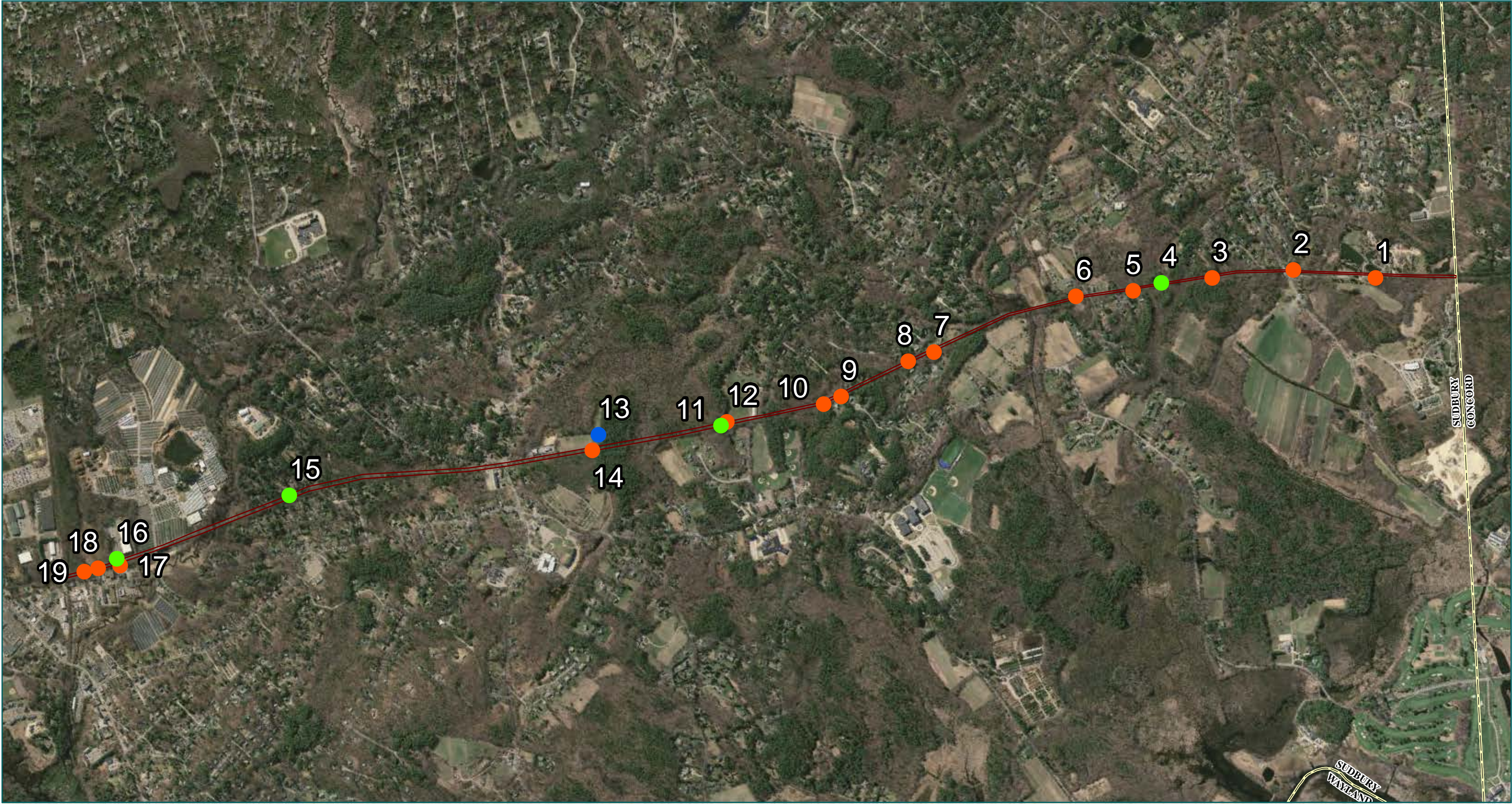


PVP area 18 is part of a large cattail marsh wetland complex with a stream channel flowing through the center. The stream is carried under the rail road bed through a culvert and connects to a wetland on the eastern side of the alignment. The investigation was limited to the railroad easement and no VP species were found.

Potential Vernal Pool Area 19 – Between Stations 247.00 and 248.00



PVP 19 is an isolated wetland located to the west of the rail alignment. The area was dry at the time of the inspection and no VP species were found.



- Legend**
- Certified Vernal Pool
 - Eligible to be Certified
 - Non-Eligible to be Certified
 - ▭ Bruce Freeman Rail Trail Corridor

Figure 1 – Site Location Map

**Bruce Freeman Rail Trail
Sudbury, Massachusetts**

SUDBURY BRUCE FREEMAN RAIL TRAIL

EXISTING CONDITIONS BASE SURVEY

SITE NOTES

- TOPOGRAPHY, PROPERTY LINE INFORMATION AND SITE FEATURES WERE OBTAINED FROM AN ON THE GROUND SURVEY BY ATLANTIC ENGINEERING PERFORMED BETWEEN MARCH AND JUNE OF 2008.
- THE LOCATIONS OF ALL EXISTING UTILITIES ARE TAKEN FROM EXISTING AVAILABLE INFORMATION AND SHOULD BE CONSIDERED APPROXIMATE. THERE MAY BE EXISTING LINES OTHER THAN THOSE SHOWN HEREON. THE CONTRACTOR SHALL BE REQUIRED TO CONTACT THE PROPER UTILITY COMPANIES AND DIG-SAFE PRIOR TO BEGINNING ANY CONSTRUCTION ON THE SITE. OUR FIRM DOES NOT WARRANT WARRANT OR GUARANTEE THE LOCATION OF ANY UTILITIES SHOWN HEREON.
- ALL ELEVATIONS REFER TO NORTH AMERICAN VERTICAL DATUM (NAD83) OF 1983. FROM NGVD OF 1929 USING "VERTCON" FROM THE NGS/NOAA.GOV WEB SITE.
- WETLANDS FLAGS DEMARCATING WETLAND RESOURCE AREAS WERE DELINEATED MARCH THROUGH MAY OF 2008 BY:
WETLANDS & LAND MANAGEMENT, INC.
DANVERS, MASSACHUSETTS
- PER THE COMMONWEALTH OF MASSACHUSETTS REPORTABLE HAZARDOUS RELEASE LOOKUP WEB SITE THERE ARE NO OPEN SITES WITHIN 100 FEET OF THE LOCUS.

PROPERTY LINE NOTES

- THE BOUNDARY LINES OF THE RAILROAD RIGHT OF WAY ARE DETERMINED FROM THE 1915 VALUATION PLANS FOR THE OLD COLONY RAILROAD COMPANY AND FROM CENTERLINE MONUMENTS FOUND ON THE GROUND. WHERE THE RIGHT OF WAY IS INDICATED TO BE WIDER THAN 66 FEET THE LOCATION OF THE BOUNDARIES ARE DETERMINED FROM ADJACENT DEEDS AND PLANS OF RECORD.
- THE LOCATIONS OF PROPERTY LINES OF OWNERS ABUTTING THE RAILROAD WERE DETERMINED FROM AVAILABLE DEEDS AND PLANS OF RECORD AND SHOULD BE CONSIDERED APPROXIMATE. NO BOUNDARY LINE DETERMINATIONS OF LANDS ABUTTING THE RAILROAD RIGHT OF WAY WERE PERFORMED AS PART OF THIS SURVEY.
- THE LOCATIONS OF STREET LINES CROSSING THE RAILROAD WERE DETERMINED FROM AVAILABLE DEEDS AND PLANS OF RECORD AND SHOULD BE CONSIDERED APPROXIMATE. NO BOUNDARY LINE DETERMINATIONS OF THESE STREET RIGHTS OF WAY WERE PERFORMED AS PART OF THIS SURVEY.

BENCHMARK NO:	DESCRIPTION	NAD88 ELEV.	NGVD ELEV.
1	RM 2-3	133.07	133.85
2	10060	139.94	140.77
3	10061	173.58	174.36
4	38G (7448)	168.65	169.43
5	RM 6-1	141.73	142.51

MONUMENT DESCRIPTIONS

RM 2-3 CHISELED SQUARE ON NORTHERLY CORNER OF WEST HEADWALL OF BOX CULVERT UNDER PANTRY ROAD/RAILROAD

10060 (STA 364) CHISELED SQUARE ON MILE POST 18

10061 (STA 365) CHISELED SQUARE ON BOULDER

RM 6-1 CHISELED SQUARE IN SOUTHEAST CORNER OF SOUTH ABUTMENT OF RAILROAD BRIDGE OVER HOP BROOK

38G MAGNETIC DISK IN CONCRETE MONUMENT

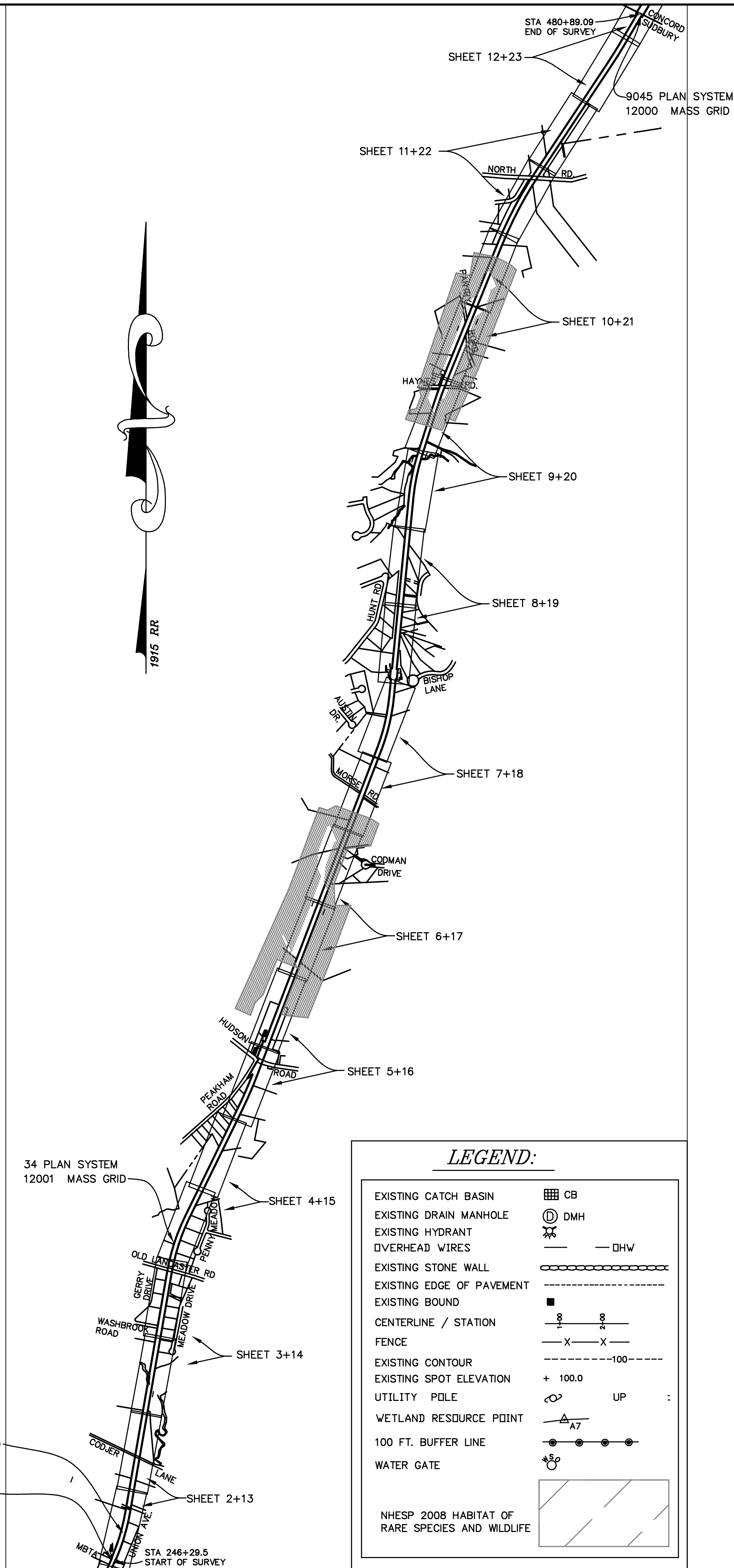
38F MAGNETIC DISK IN CONCRETE MONUMENT

Point numbers and Coordinates on Plan System			
Point	Northing	Easting	Description
9045	29364.49	13493.99	STA 480+89.09
34	11909.36	6888.17	MON 38G
14	7793.77	6172.94	MON 38F
9001	7397.92	6008.08	STA 246+29.5

Point numbers and Coordinates on Mass Grid System			
Point	Northing	Easting	Description
12000	518901.93	627845.26	STA 480+89.09
12001	501324.34	621572.57	CONTROL 38G
12002	497195.89	620935.73	CONTROL 38F
12003	496796.98	620778.42	STA 246+29.5

RIGHT OF WAY ABUTTERS

ParcelID	Owner	ParcelID	Owner
C10- 0005	KING THOMAS M & REBECCA L	F09- 0002	HAYNES HONORA
C10- 0009	FAIRVIEW DEVELOPMENT CORP	F09- 0003	SHEDD MATTHEW D & CAROL A
C10- 0010	NORMAN JOHN C & DORIS	F09- 0004	HAYNES HONORA
C10- 0011	FAIRVIEW DEVELOPMENT CORP	F09- 0006	TOWN OF SUDBURY
C10- 0012	NORMAN JOHN C & DORIS	F09- 0218	CRARY MINER A & HELEN H
C10- 0013	NORMAN JOHN C & DORIS	F09- 0219	SIMONSEN JORN & MIA
C10- 0400	FAIRVIEW DEVELOPMENT CORP	F09- 0415	WONG JEAN E & ARTHUR P
C10- 0401	FAIRVIEW DEVELOPMENT CORP	F09- 0515	WINNEG ROBERT D & CAROLINE V
C10- 0402	MAURER BRUCE D & F JEFFREY	F09- 0516	HERZOG LOUIS J & ROBIN
C11- 0301	TOWN OF SUDBURY	F09- 0517	SALVIA PETER M & SUSAN W
C11- 0301-A- 02	CLEARY MARGARET	F09- 0518	MUELLER KATHRYN E &
C11- 0301-A- 04	DUARTE PATRICIA	F10- 0511	FREEDMAN JON R &
C11- 0301-A- 06	WILSON LUCIE	F10- 0512	MCDERMOTT ROBERT F
C11- 0301-A- 08	LEVINE MILDRED & GRUNEBaum LIN	F10- 0514	LINNEG ROBERT D & CAROLINE V
C11- 0301-A- 10	CERULO MARGARET	G09- 000 2	TIGHE LAWRENCE W TRS THE HUDSO
C11- 0301-A- 12	SANTIAGO GLORIA R	G09- 0003	HOWE JANET R REVOCABLE TRUST
C11- 0301-A- 14	GASTAN LUDMILLA	G09- 0004	MCCARTHY LAURA B TRUSTEE
C11- 0301-A- 16	MCGRAW WILLIAM T & MARGERY E	G09- 0012	PENN CENTRAL TRANSPORTATION CO
C11- 0301-A- 18	GODFREY BRENDA	G09- 0100	BARTLETT DOROTHY M&MCCARTHY
C11- 0301-A- 20	JAMES ELETTRAUD U	G09- 0200	TOWN OF SUDBURY
C11- 0301-A- 22	BAHLKOW ADOLF & BARBARA	G09- 0300	ABRAMS LAURA B TRS
C11- 0301-A- 24	LEWIS NANCY	G09- 0807	RICHARDS JAMES C & SUSAN M
C11- 0301-A- 26	SPIRO CARMIN J & JACQUELINE	G09- 0808	WOL IN STEVEN M & MAUREEN G
C11- 0301-A- 28	ARONSON THERESA	H08- 0008	WEAVER JAMES C & MELANIE B
C11- 0301-A- 30	FARRELL MARGUERITE	H08- 0011	CHO CHONG M & WAI-WAI
C11- 0301-A- 32	AUFDERHAAR JUDITH	H08- 0012	WOLLENSAK RICHARD J & CLAIRE A
C11- 0301-A- 33	PERKINS VIRGINIA	H08- 0015	ENSLEY MICHAEL T & LAURIE A
C11- 0301-A- 34	KREYNES SAMUIL & PENKINA INNA	H08- 0016	ALTERIO DINO R & ROACH MAUREEN
C11- 0301-A- 35	FRAZER VIRGINIA R &	H08- 0017	THOMPSON MARY L
C11- 0301-A- 36	JANJANIAN MARY & ELEANOR	H08- 0018	WALLET RAYMOND J & THELMA SOSA
C11- 0301-A- 37	FRAIZE JOHN & ELLEN	H08- 0019	GOLS - CAVALLARO JENNI
C11- 0301-A- 39	INGERSOLL ROBERT & ELIZABETH	H08- 0020	DIMAURO MIRIAM
C11- 0301-A- 41	FREYDIN YEVGENIA	H08- 0021	BOND JOHN T & MARY A
C11- 0301-A- 42	GALLIGAN FRANCES TRUSTEE	H08- 0045	BORG CARL G & MARIAN A
C11- 0301-A- 43	SAWIN RUTH	H08- 0301	NEWTON ALAN L & THERESA W
C11- 0301-A- 44	BARNEY ANNA MAE	H08- 0310	NIGRELLI JAMES J JR &
C11- 0301-A- 45	POCH GAIL B & NANCY F	H08- 0311	KNEELAND WILLIAM E JR & ELAINE
C11- 0301-A- 46	GARDINER MARIE S TRS.	H08- 0312	MCCURE CHRISTOPHER &
C11- 0301-A- 47	REZNIK MARK & HELEN	H08- 0313	OSTAR BRUCE & SHPRESA
C11- 0301-A- 48	SULLIVAN LOUISE M	H09- 0001	LEWIS ANDREW J & STEPHANIE O
C11- 0301-A- 49	JACKSON SUSAN	H09- 0002	SOMERSET SUDBURY LLC
C11- 0301-A- 50	HERZOG ANITA	H09- 0007	SHILTS REED L & DAWN R
C11- 0301-A- 51	NELSON MURIEL	H09- 0012	SUDBURY VALLEY TRUSTEES INC
C11- 0301-A- 52	MANN ESTHER & WALDMAN STUART	H09- 0068	GILMARTIN MATTHEW S & MOLLY F
C11- 0301-A- 53	DIPALMA JAMES J & JANE M	J08- 0004	CODJER LANE LLC
C11- 0301-A- 54	GRUMAN LEONID N & ZINAIDA	J08- 0006	CAVICCHIO PAUL F JR
C11- 0301-A- 55	CHIODO FRANK & LAURA	J08- 0009	SUDBURY TOWN OF
C11- 0301-A- 56	DELUCA IRIS F TRS	J08- 0011	PENDLETON DAVID B & CAROLE E
C11- 0301-A- 57	ANDERSON EUNICE GAY &	J08- 0101	KREBS W MICHAEL & BARBARA P
C11- 0301-A- 58	SHAER PETER &	J08- 0111	LANZA MARK J &
C11- 0301-A- 59	MAGEE JOVANNA F TRS	J08- 0112	MURPHY GREG C & JENNIFER B
C11- 0301-A- 60	KURAS CATHERINE M	J08- 0113	HARTY DANIEL P
C11- 0301-A- 61	MONEIL MARCIA	J08- 0114	LEU JAMES C JR & TRACY GEHAN
C11- 0301-A- 63	GOLFMAN MARGARITA M & YOSEF	J08- 0115	ROBINS D JOAN
D10- 0001	RICHARD ARTHUR J & MARGARET A	J08- 0116	SHAW JOHN J & ANN C
D10- 0013	EAST GEORGE H JR &	J08- 0301	JONES CHERYL
D10- 0018	TOWN OF SUDBURY	J08- 0307	DAVIES ADRIAN G & MELINDA J
D10- 0024	VROMAN RICHARD J & MICHELLE R	J08- 0308	RODDY JANE HIGHTOWER
D10- 0207	EN GERMAN JEFFREY M	J08- 0309	MARCELYNAS GARY E & LESLIE A
D10- 0300	TOWN OF SUDBURY	J08- 0311	CUNNINGHAM MICHAEL & JEAN
D10- 0400	LYMAN LYNDEN & KRISTIN E	J08- 0501	CAVICCHIO PAUL F JR
D10- 0502	CERASUOLO DOMENIC & JOAN M	J08- 0502	CAVICCHIO PAUL F JR
D10- 0503	EAST GEORGE H JR & MARIE A	J08- 0503	CAVICCHIO PAUL F JR
E09- 0507	WALLACK ALLAN L & NADINE	K08- 0050	TUCKER EDWARD L & SANDRA A TR
E09- 0508	WALLACK ALLAN L & NADINE	K08- 0051	COTTON JORDAN L&MCIVER CLEMENT
E09- 0509	GLOVSKY CHARLES S & EILEEN G	K08- 0052	TUCKER SANDRA A
E09- 0510	WRY CHARLES A JR & RUTHANN	K08- 0053	BOSEKY LIMITED
E09- 0511	NEISON C KIRK DIANE P	K08- 0055	MCCARTHY LAURA B ET AL TRUSTEE
E09- 0600	ROCKLAGE SCOTT M & PATTY B	K08- 0057	PASQUARELLO THEODOR
E10- 0700	VERRILL STEPHEN & JOAN	K08- 0087	MCIVER CLEMENT L TR
F09- 0001	TOWN OF SUDBURY		



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SURVEY NOTES

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TREES NOTATED AS "TREE GREATER THAN 8" (TYP)" REPRESENT THE FIELD LOCATED TREE NEAREST TO THE EXISTING RAIL LINES.

DRAWING FILE: RAILTRAILfinal2-gps2
ATLANTIC JOB NO. A0801-02

I CERTIFY THAT THIS PLAN WAS PREPARED UNDER MY DIRECT SUPERVISION AND THAT TO THE BEST OF MY KNOWLEDGE, INFORMATION AND BELIEF IT CONFORMS WITH TECHNICAL, ETHICAL AND PROCEDURAL STANDARDS FOR THE PRACTICE OF LAND SURVEYING IN THE COMMONWEALTH OF MASSACHUSETTS.

JOHN B. PAULSON
No. 31725
PROFESSIONAL LAND SURVEYOR

JUNE 30, 2008
Date

ENGINEER:
ATLANTIC ENGINEERING & SURVEY CONSULTANTS INC.
97 TENNEY STREET - SUITE 5 - GEORGETOWN, MA 01833
PHONE: 978-352-7870 FAX: 978-352-9940

**EXISTING CONDITIONS
SURVEY PLAN
AT
PROPOSED RAIL TRAIL
IN
SUDBURY, MASS.**

PREPARED FOR: TOWN OF SUDBURY
275 OLD LANCASTER ROAD
SUDBURY, MA 01776

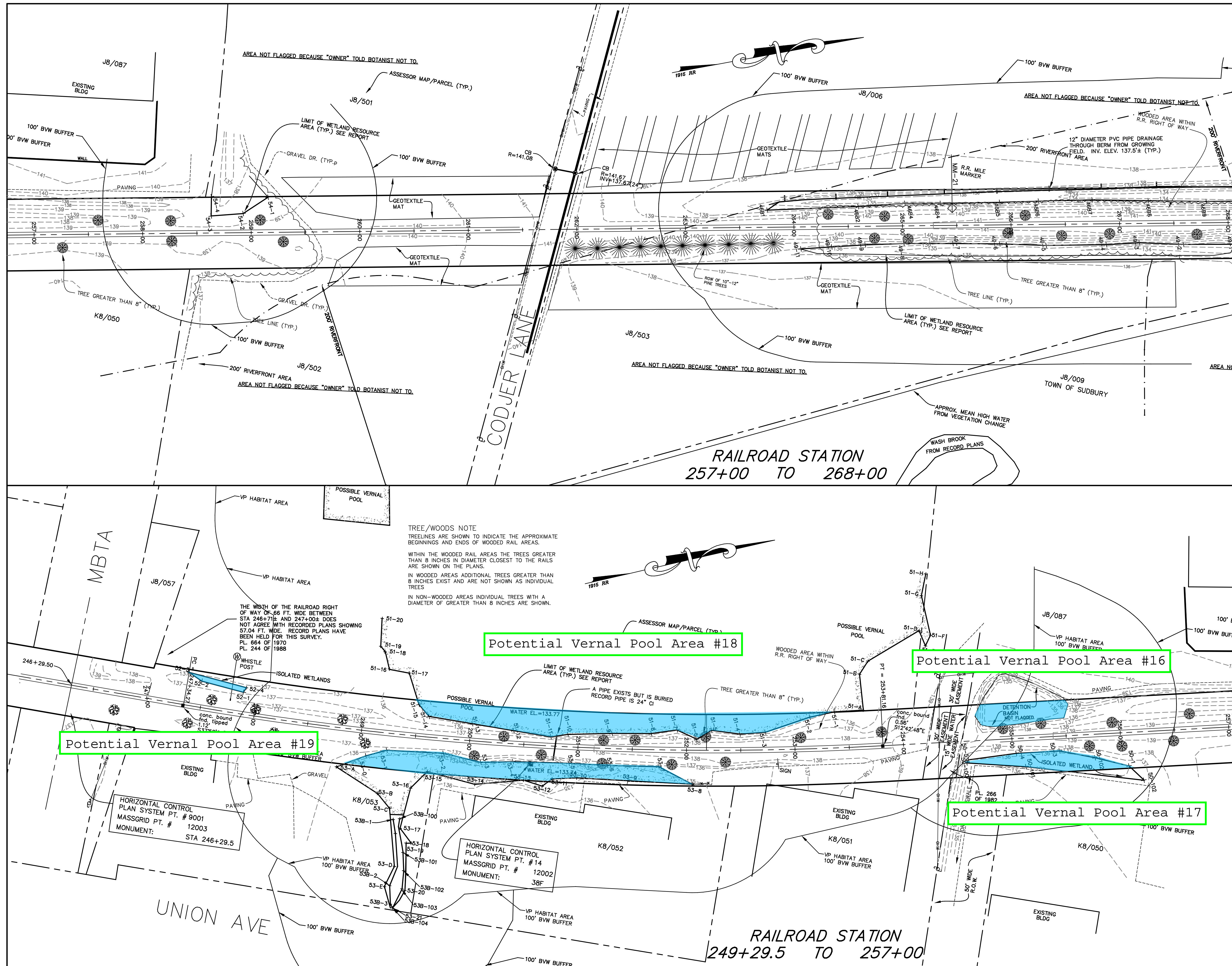
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Submission #	date	description
2	7/23/2008	Site Plan with TDPD
3	3/18/2009	REVISIONS
4	7/28/2009	PROFILE

Scale: 1" = 1000'

1000 0 1000 2000

SHEET 1 OF 23



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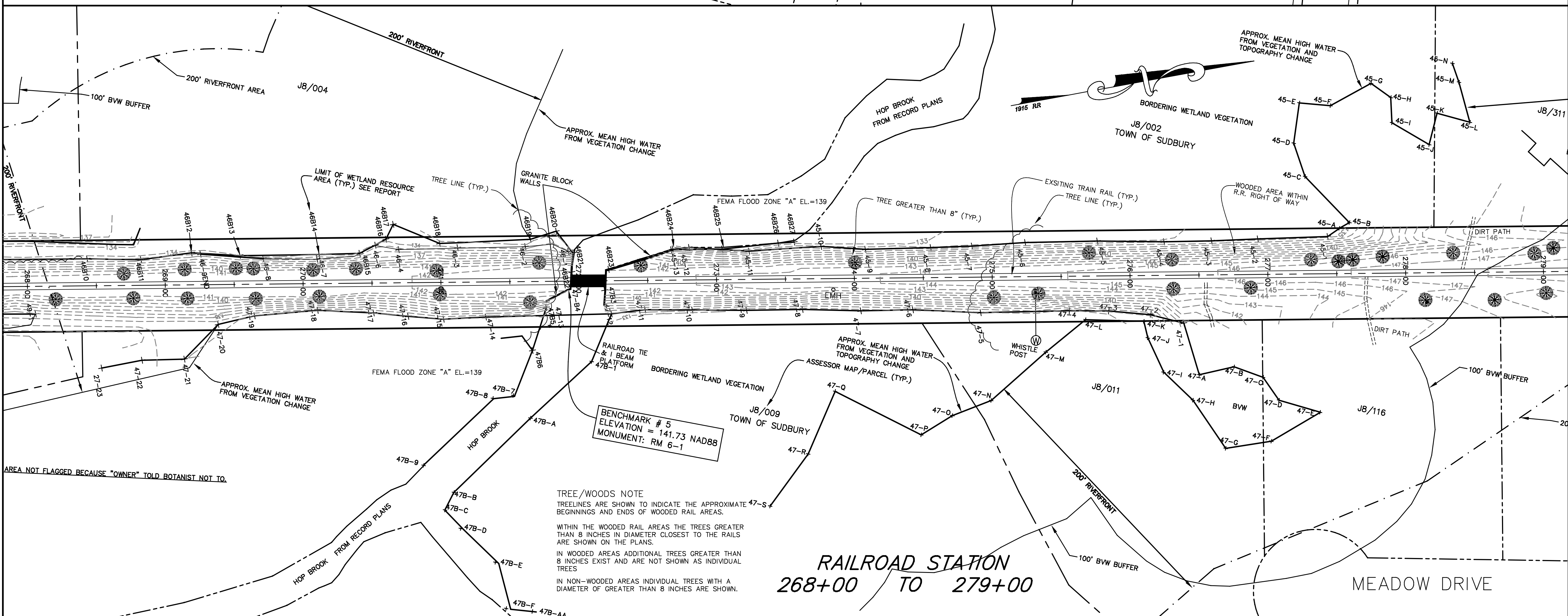
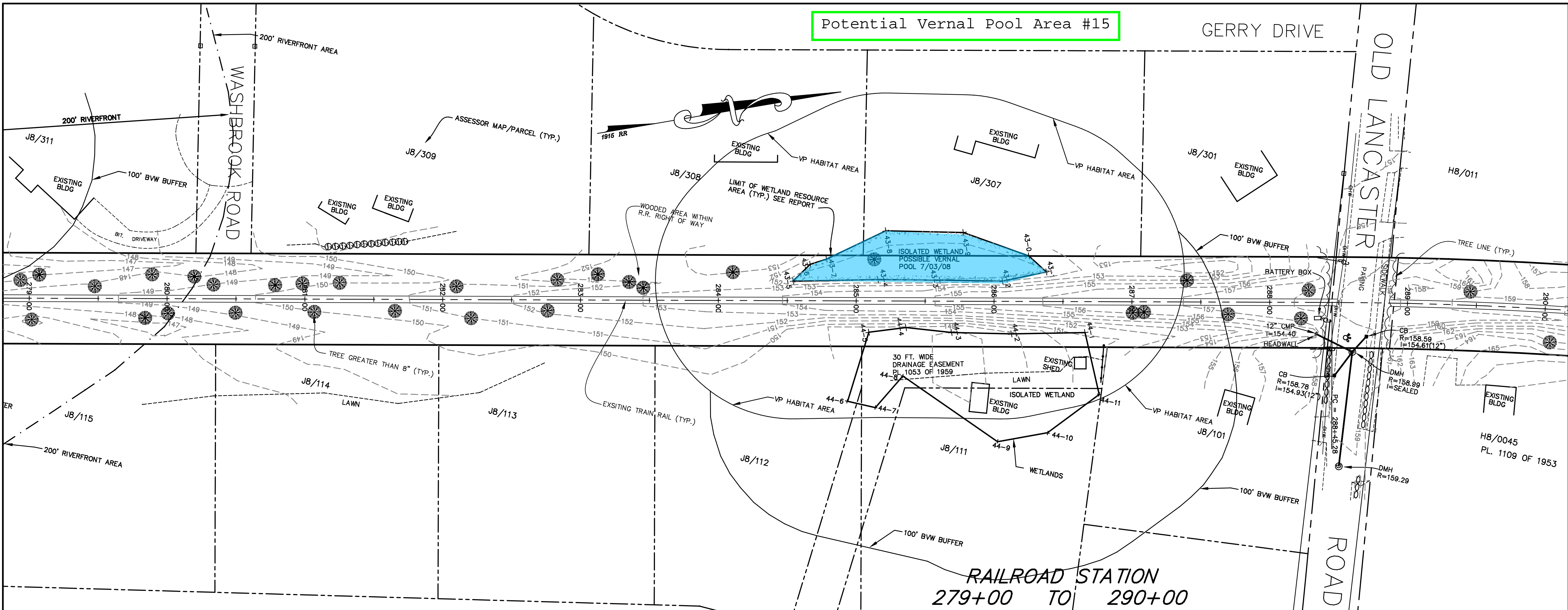
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40 0 40 80

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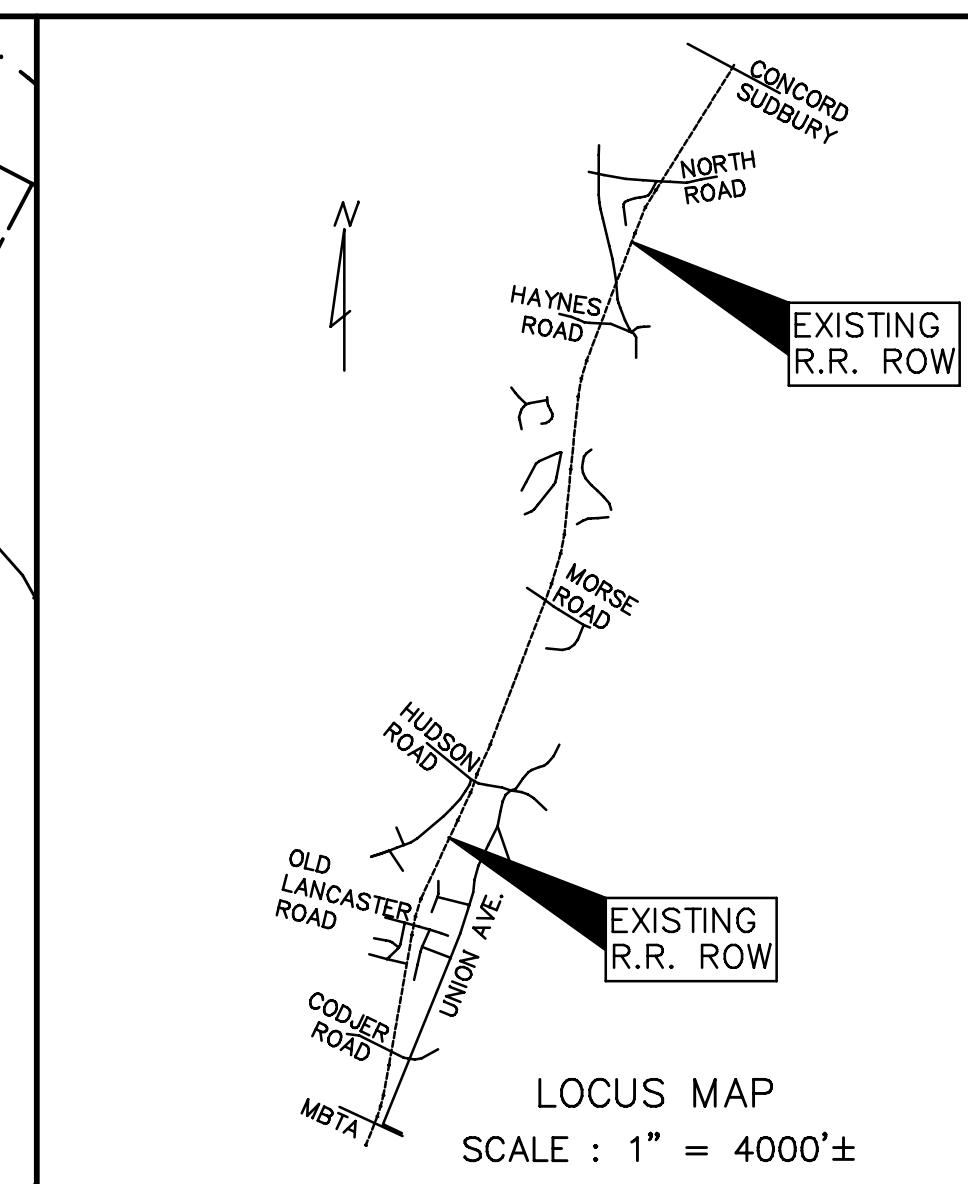
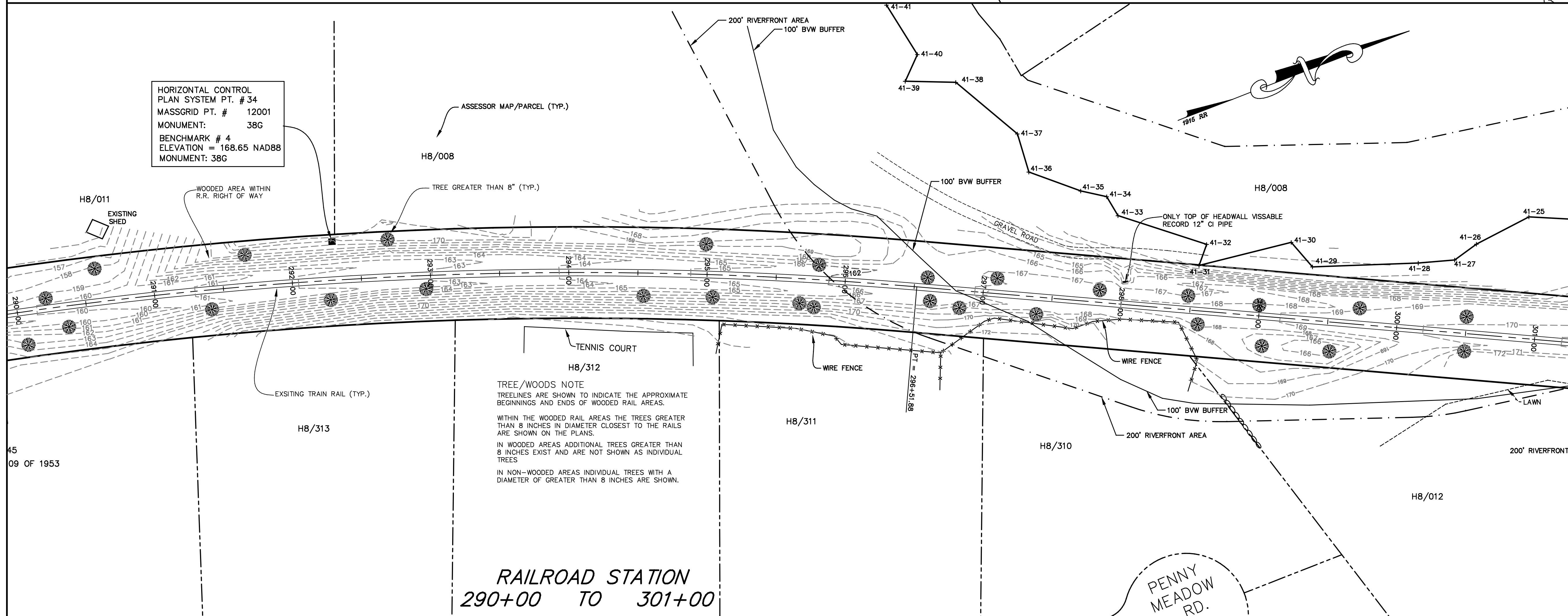
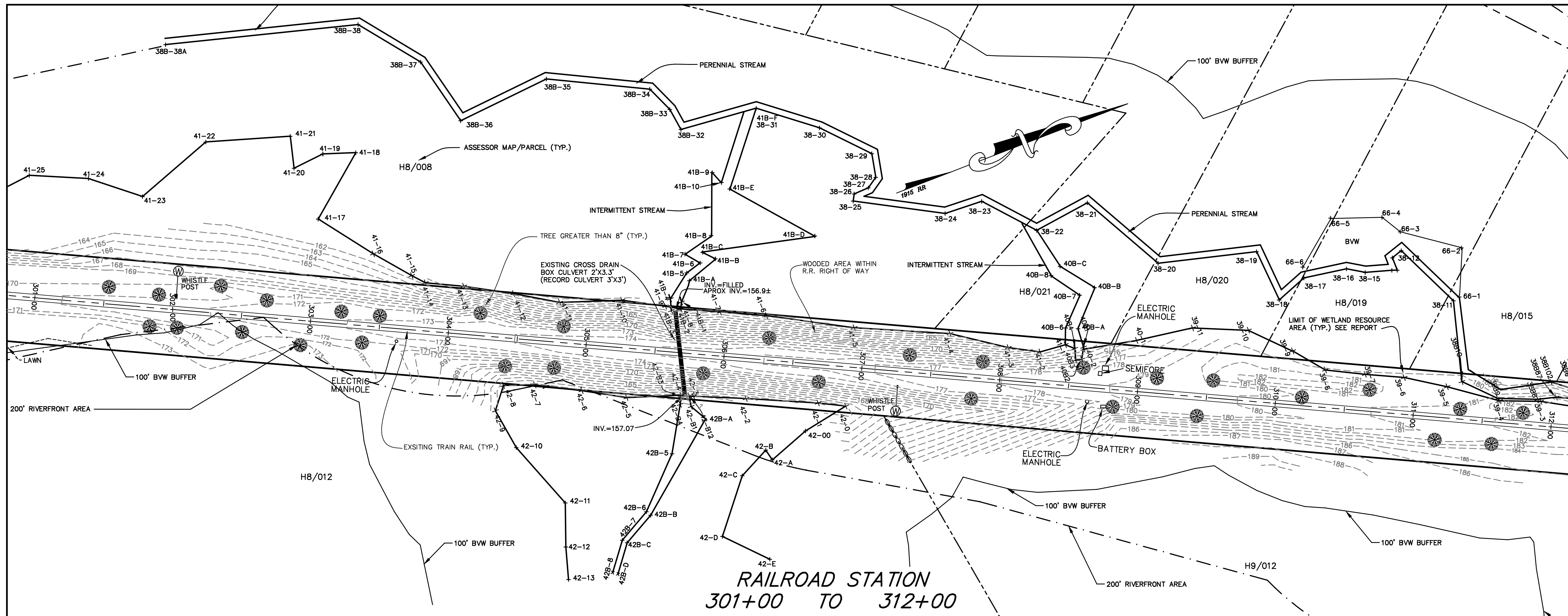
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40 0 40 80

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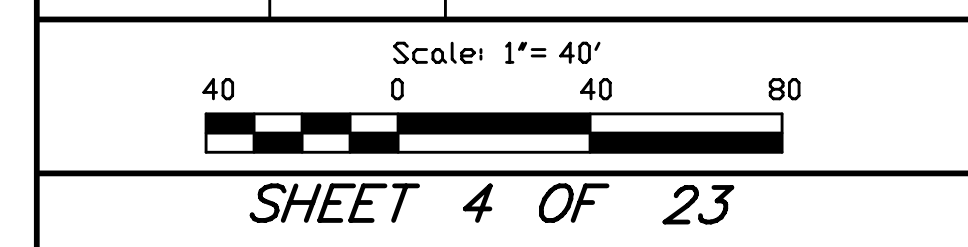
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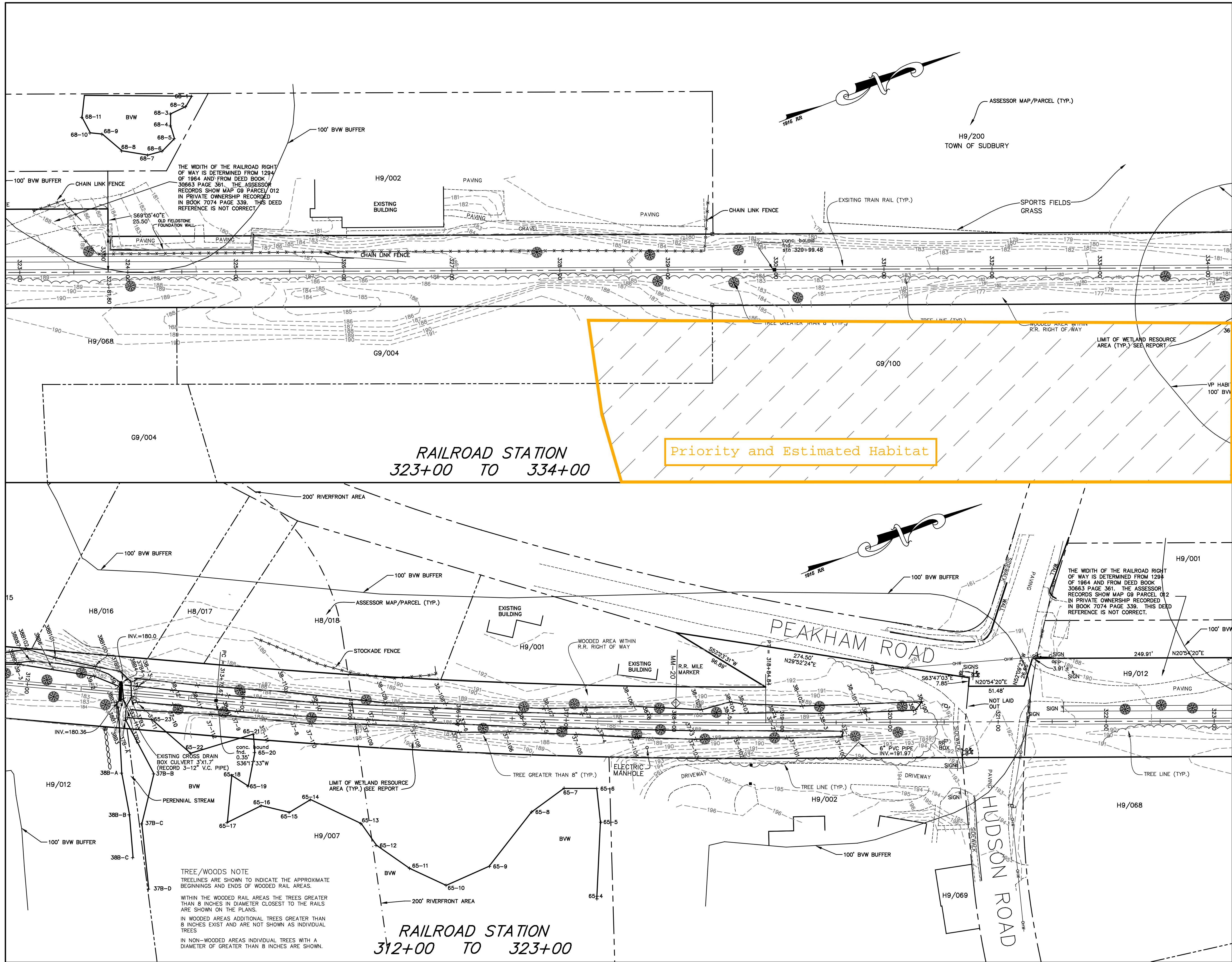
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CONCORD SUBURBY

NORTH ROAD

HAYNES ROAD

MORSE ROAD

HUDSON ROAD

OLD LANCASTER ROAD

COOPER ROAD

MBTA

EXISTING R.R. ROW

EXISTING R.R. ROW

LOCUS MAP

SCALE : 1" = 4000'±

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PROFESSOR OF MASSACHUSETTS
JOHN B. PAULSON
No. 31725
LAND SURVEYOR

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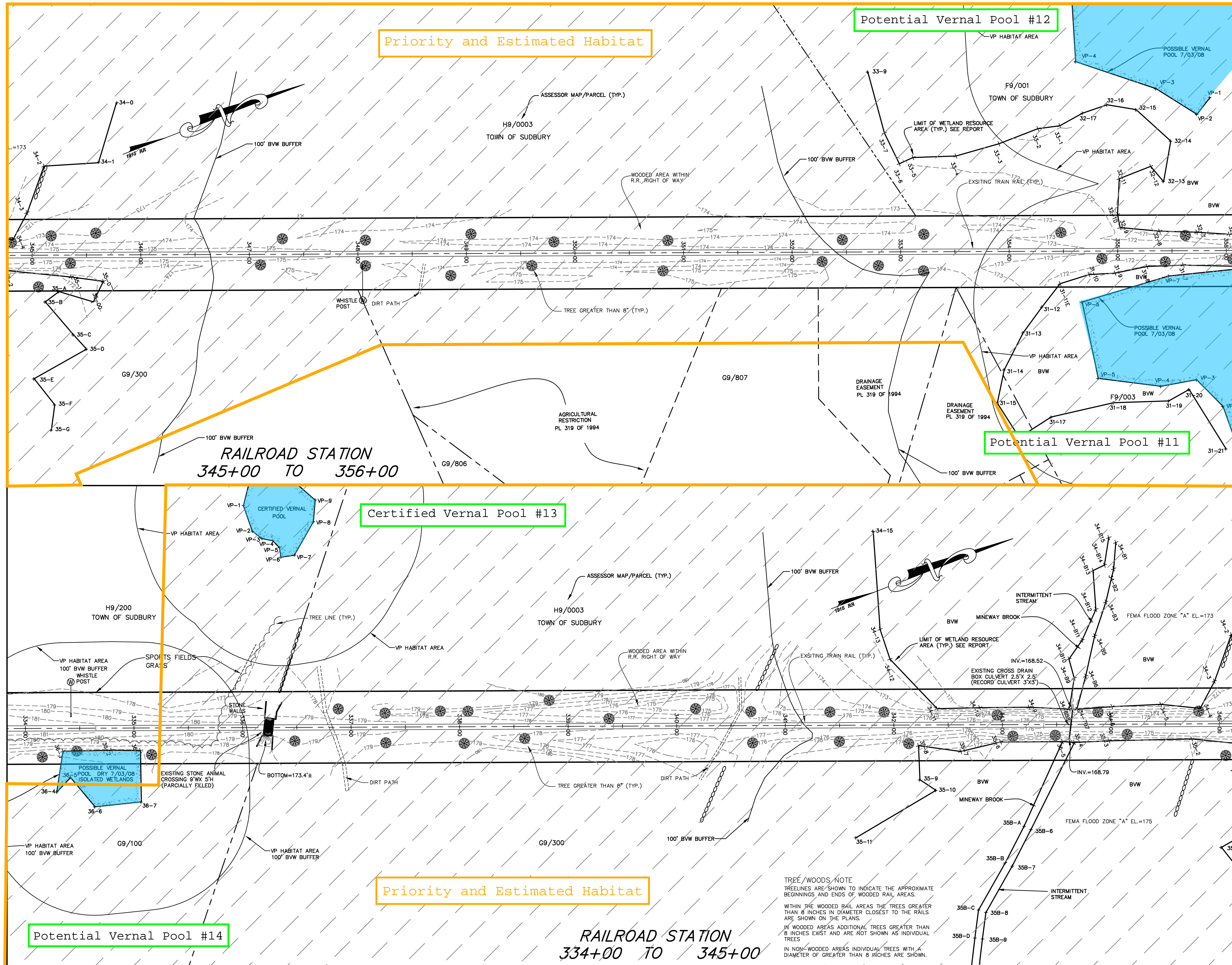
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SHEET 5 OF 23



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CONCORD
SUDBURY
NORTH
ROAD
HAYNES
ROAD
MORSE
ROAD
HUDSON
ROAD
OLD
LANCASTER
ROAD
COOPER
ROAD
MBTA
UNION
AVE

EXISTING
R.R. ROW

EXISTING
R.R. ROW

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SURVEY NOTES

PORTIONS OF THE BANK OF HOP BROOK AND PANTRY BROOK COULD
NOT BE ESTABLISHED AS TOWN LAND AS THE AREA WAS UNDER
WATER AT THE TIME OF THE RESOURCE DELINEATION.

THE CONTOUR INTERVAL ON THE PLAN IS 1 FOOT. SOME CONTOURS
ARE NOT LABELLED DUE TO THE SCALE OF THE PLAN AND THE
STEEPNESS OF THE GROUND SLOPE.

TREES NOTATED AS "TREE GREATER THAN 8" (TYP)" REPRESENT THE
FIELD LOCATED TREE NEAREST TO THE EXISTING RAIL LINES.

DRAWING FILE: RAILTRAILfinal2-gps2
ATLANTIC JOB NO. A0801-02

I CERTIFY THAT THIS PLAN WAS PREPARED
UNDER MY DIRECT SUPERVISION AND THAT TO THE BEST
OF MY KNOWLEDGE, INFORMATION AND BELIEF IT
CONFORMS WITH TECHNICAL, ETHICAL AND PROCEDURAL
STANDARDS FOR THE PRACTICE OF LAND SURVEYING
IN THE COMMONWEALTH OF MASSACHUSETTS.

PROFESSIONAL SURVEYOR
JOHN B. PAULSON
No. 31725

JUNE 30, 2008
Date

ENGINEER:
ATLANTIC ENGINEERING & SURVEY CONSULTANTS INC.
97 TENNEY STREET - SUITE 5 - GEORGETOWN, MA 01833
PHONE: 978-352-7870 FAX: 978-352-9940

**EXISTING CONDITIONS
SURVEY PLAN
AT
PROPOSED RAIL TRAIL
IN
SUDBURY, MASS.**

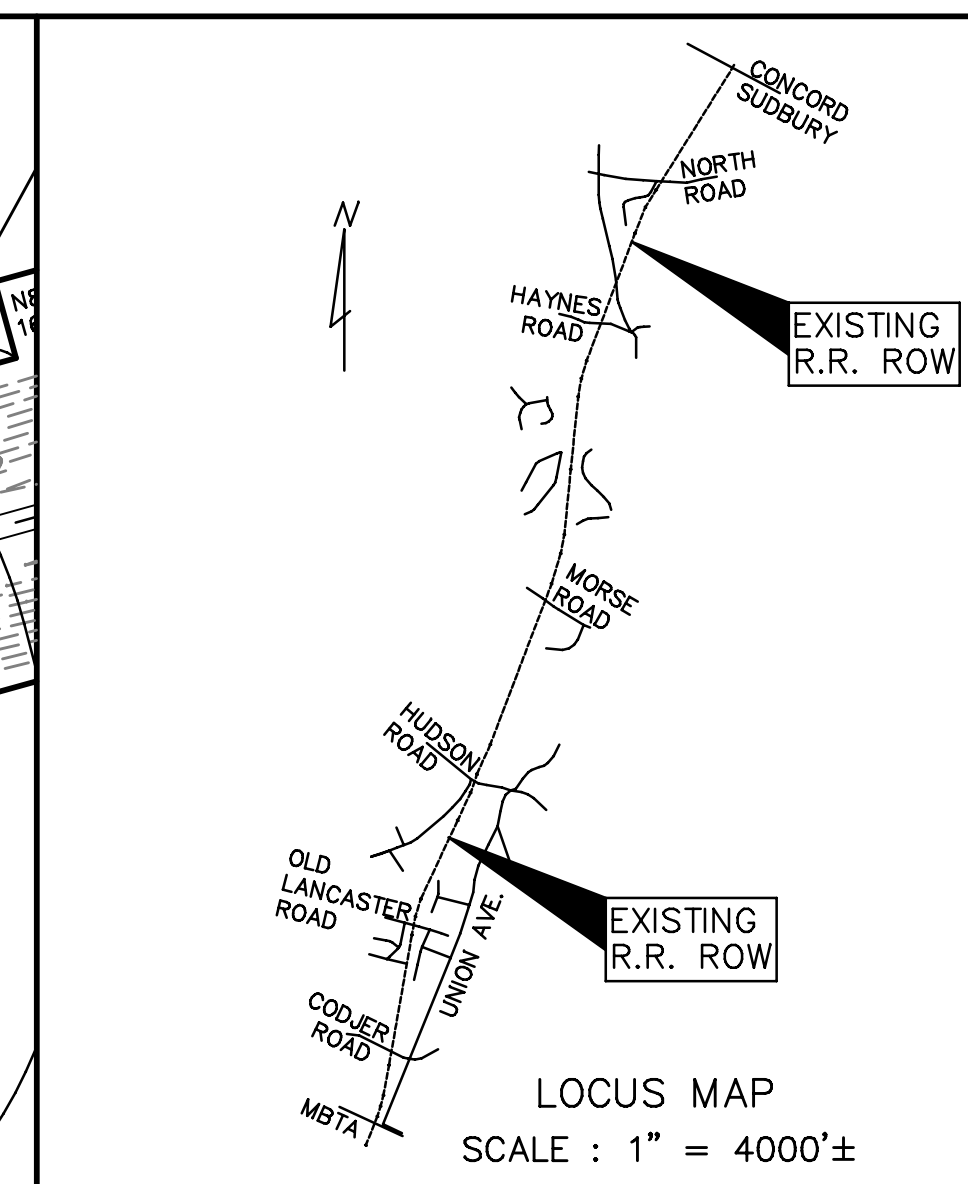
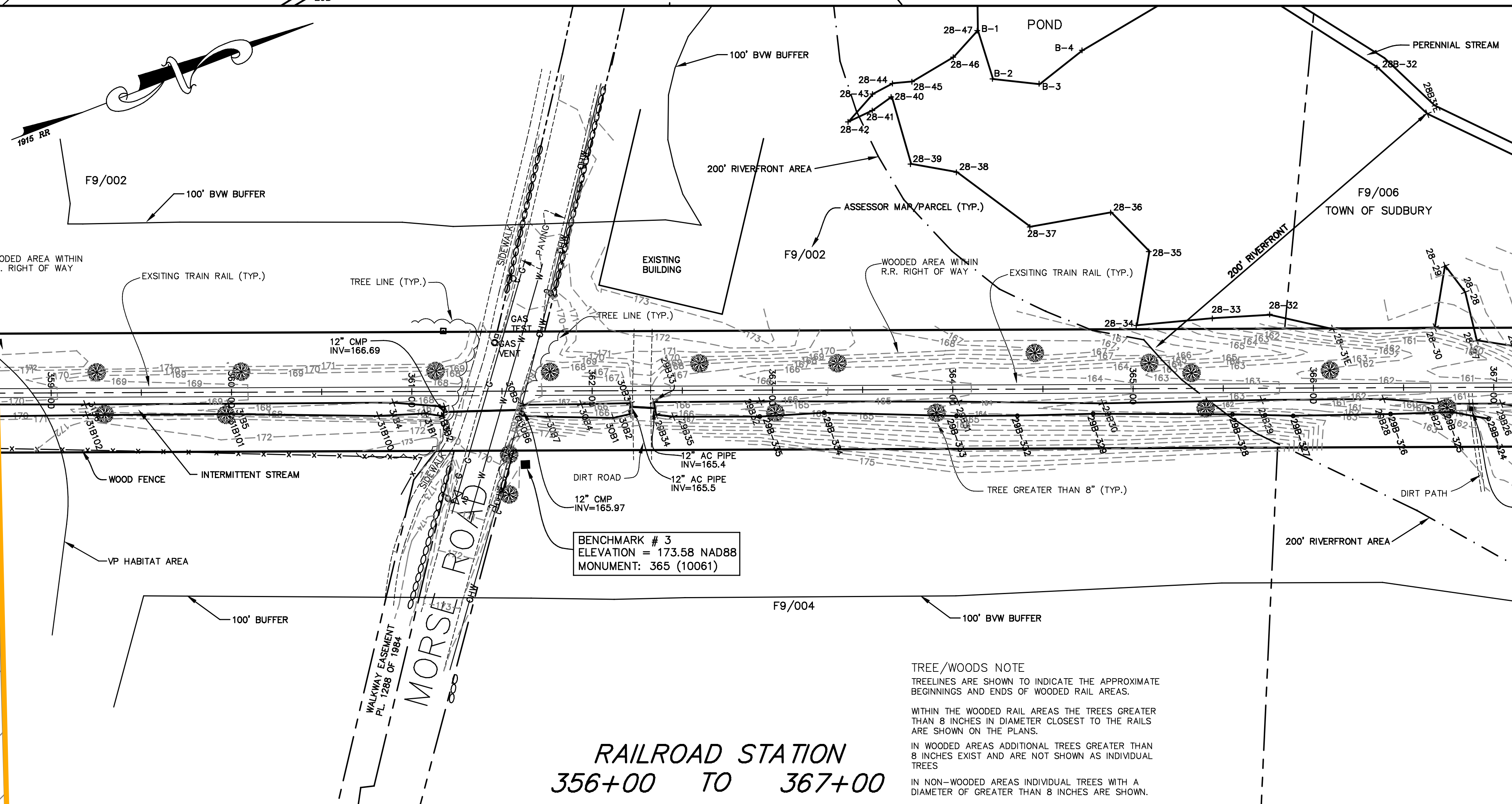
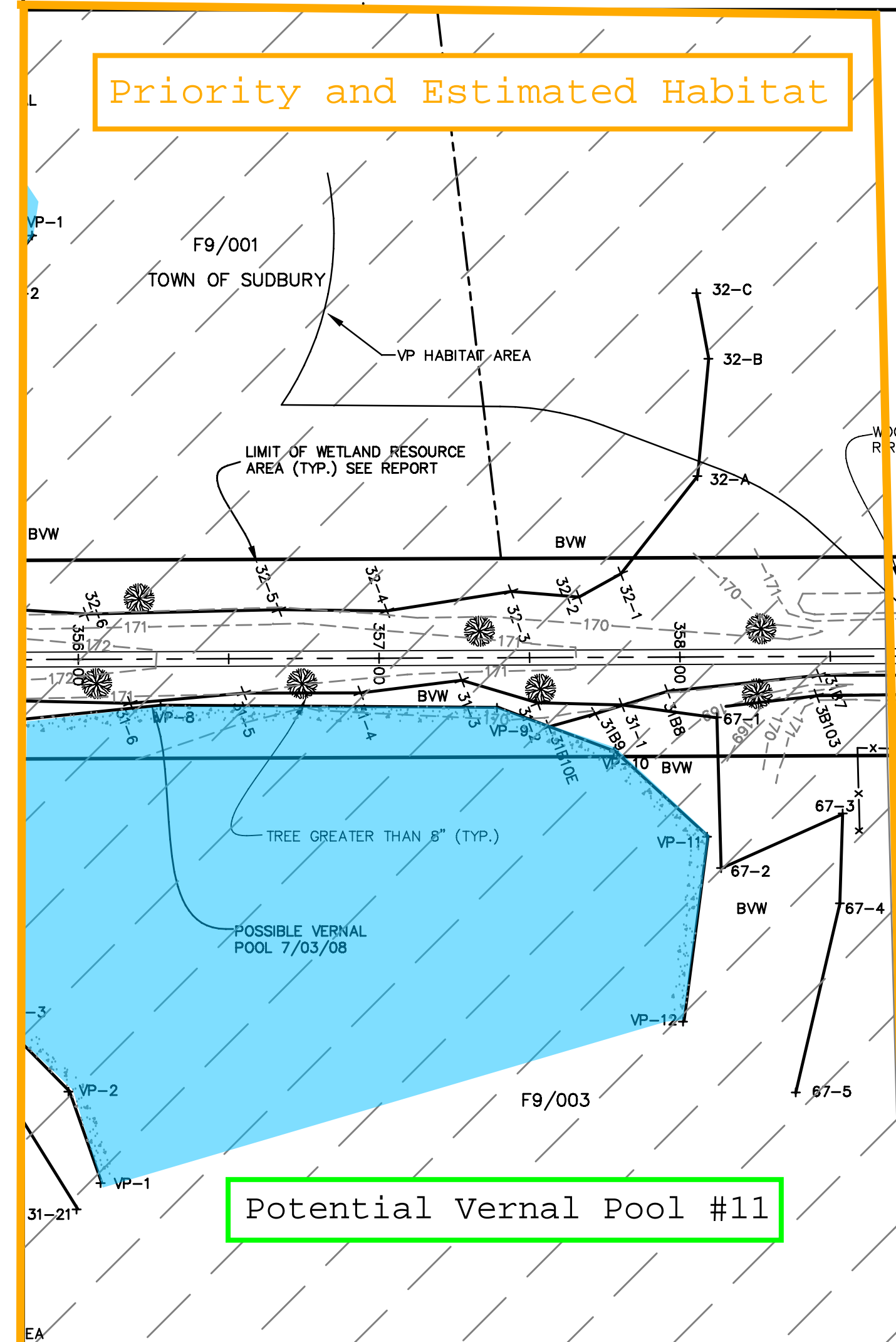
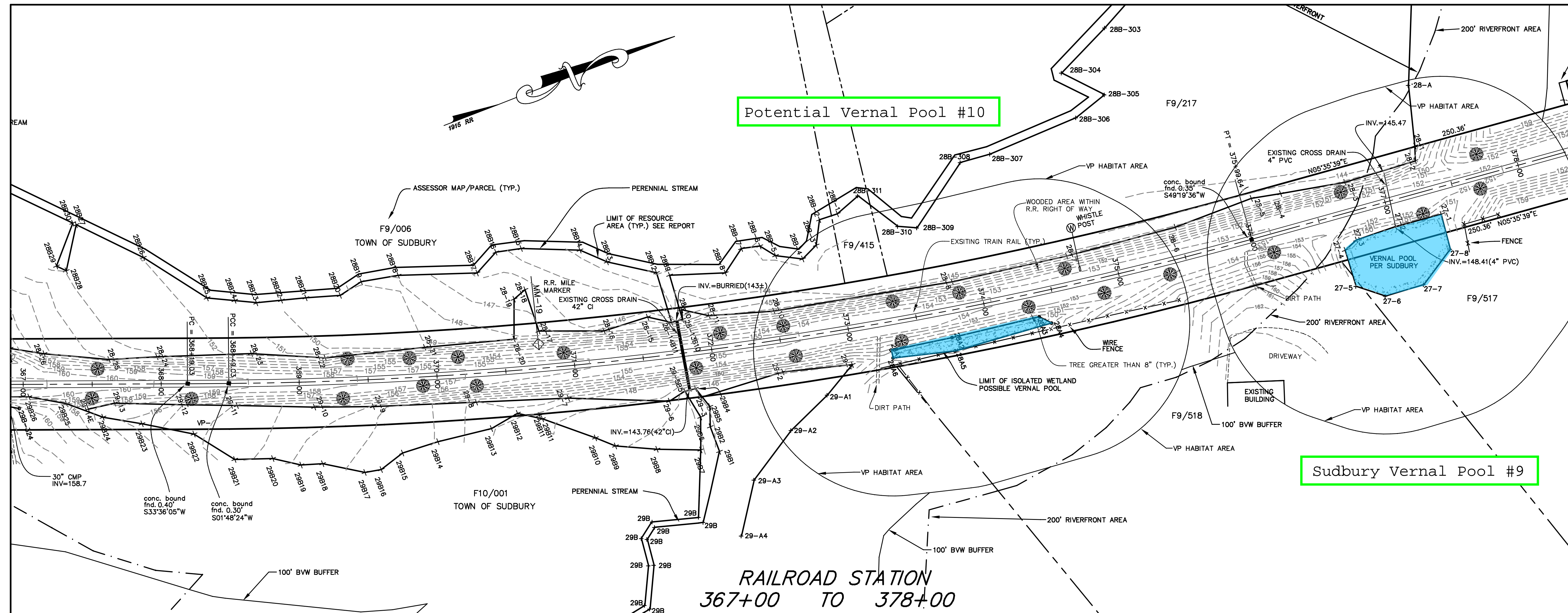
PREPARED FOR: TOWN OF SUDBURY
275 OLD LANCASTER ROAD
SUDBURY, MA 01776

DATE: JUNE 30, 2008 (1ST SUBMISSION)

Submission #	date	Site description
2	7/23/2008	Site Plan with TDPD
3	3/18/2009	REVISIONS
4	7/28/2009	PROFILE

Scale: 1" = 40'
40 0 40 80

SHEET 6 OF 23



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SURVEY NOTES

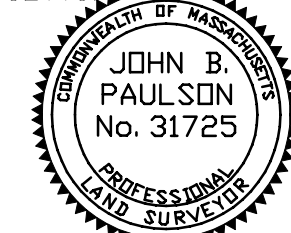
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ATLANTIC JOB NO. A0801-02

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JUNE 30, 2008
Date

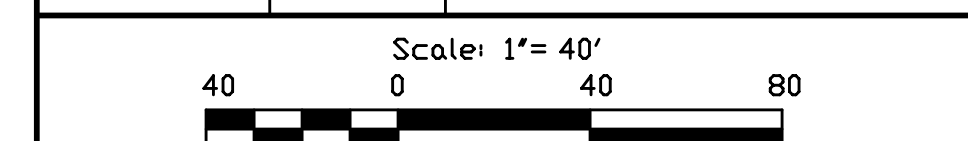
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97 TENNEY STREET - SUITE 5 - GEORGETOWN, MA 01833
PHONE: 978-352-7870 FAX: 978-352-9940

EXISTING CONDITIONS SURVEY PLAN AT PROPOSED RAIL TRAIL IN SUDBURY, MASS.

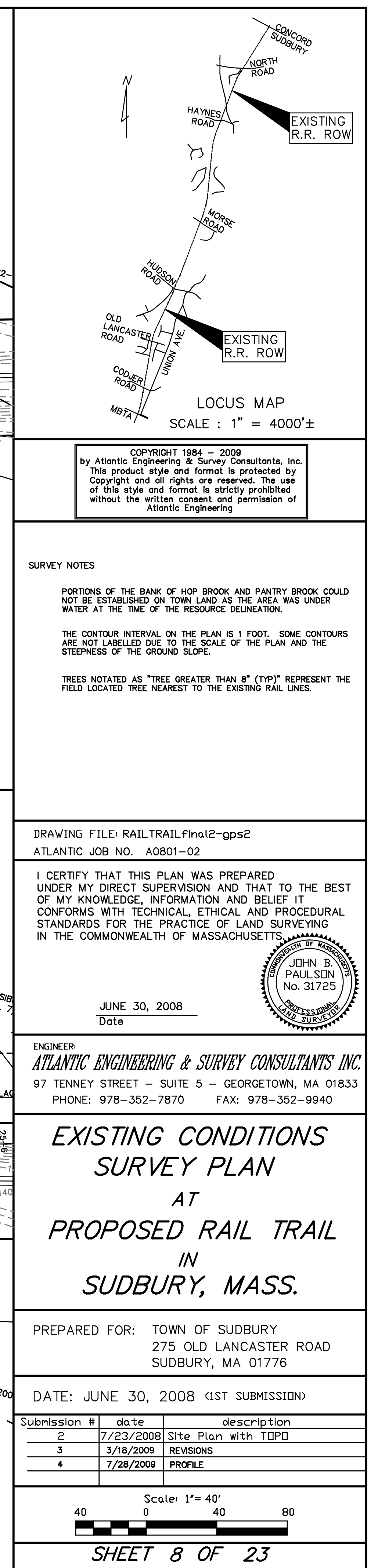
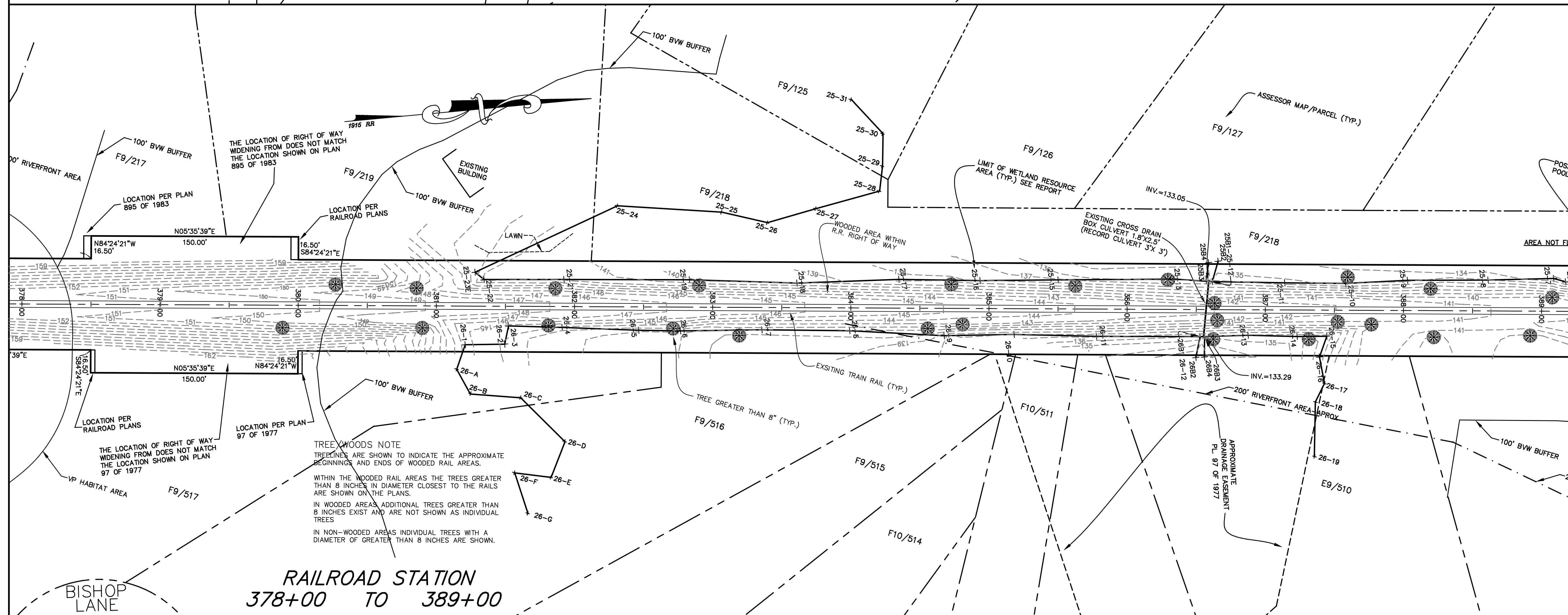
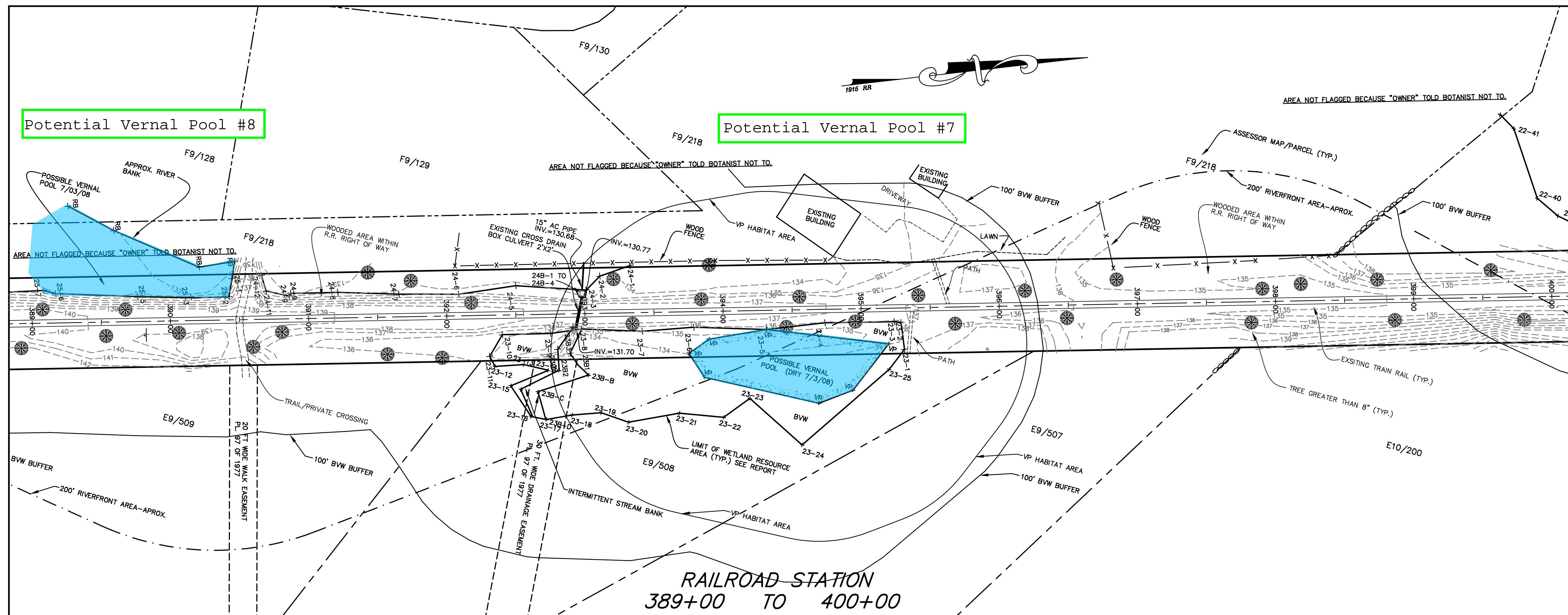
PREPARED FOR: TOWN OF SUDBURY
275 OLD LANCASTER ROAD
SUDBURY, MA 01776

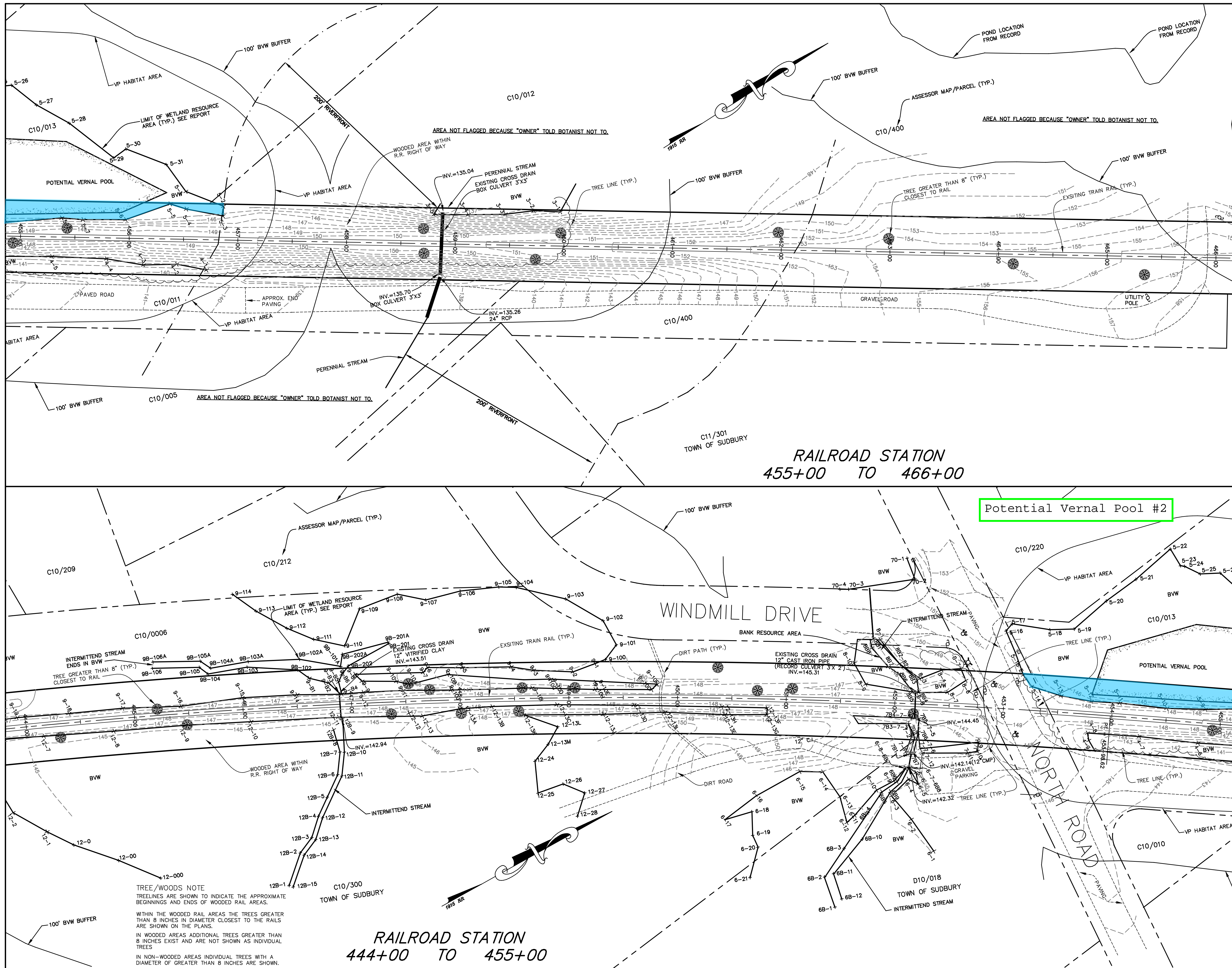
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Submission #	date	description
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TREE/WOODS NOTE
TREELINES ARE SHOWN TO INDICATE THE APPROXIMATE BEGINNINGS AND ENDS OF WOODED RAIL AREAS.
WITHIN THE WOODED RAIL AREAS THE TREES GREATER THAN 8 INCHES IN DIAMETER CLOSEST TO THE RAILS ARE SHOWN ON THE PLANS.
IN WOODED AREAS ADDITIONAL TREES GREATER THAN 8 INCHES EXIST AND ARE NOT SHOWN AS INDIVIDUAL TREES.
IN NON-WOODED AREAS INDIVIDUAL TREES WITH A DIAMETER OF GREATER THAN 8 INCHES ARE SHOWN.





CONCORD SUBURBY

NORTH ROAD

HAYNES ROAD

MORSE ROAD

HUDSON ROAD

OLD LANCASTER ROAD

COOPER ROAD

MBTA

EXISTING R.R. ROW

EXISTING R.R. ROW

LOCUS MAP

SCALE : 1" = 4000'±

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JOHN B. PAULSON
No. 31725
PROFESSIONAL LAND SURVEYOR

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PHONE: 978-352-7870 FAX: 978-352-9940

**EXISTING CONDITIONS
SURVEY PLAN
AT
PROPOSED RAIL TRAIL
IN
SUDBURY, MASS.**

PREPARED FOR: TOWN OF SUDBURY
275 OLD LANCASTER ROAD
SUDBURY, MA 01776

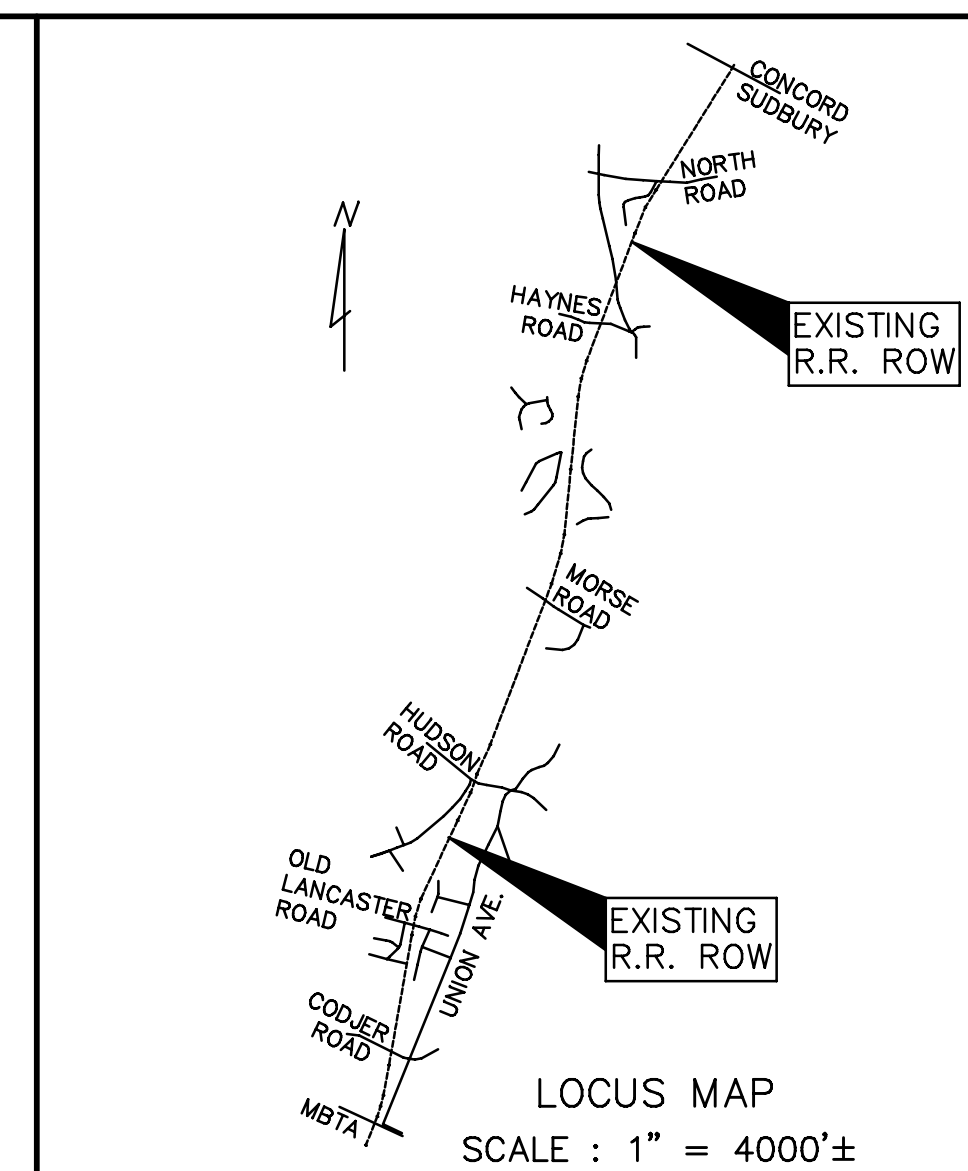
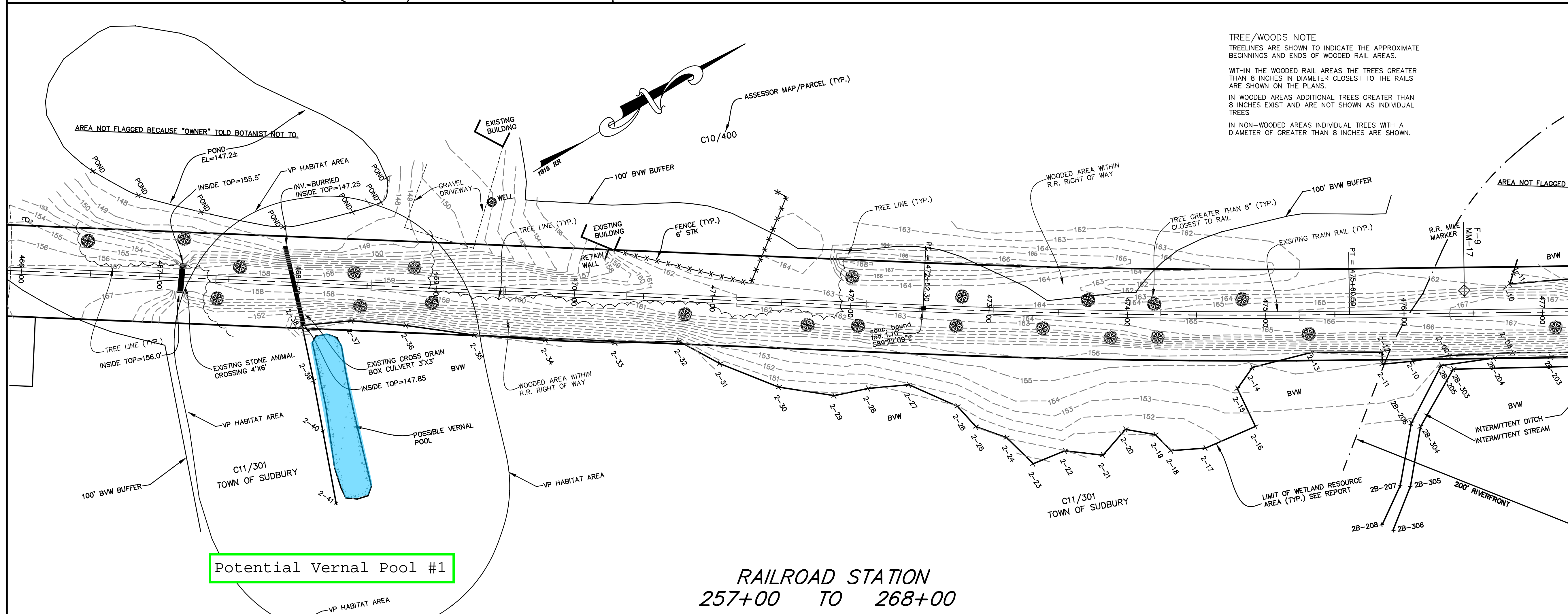
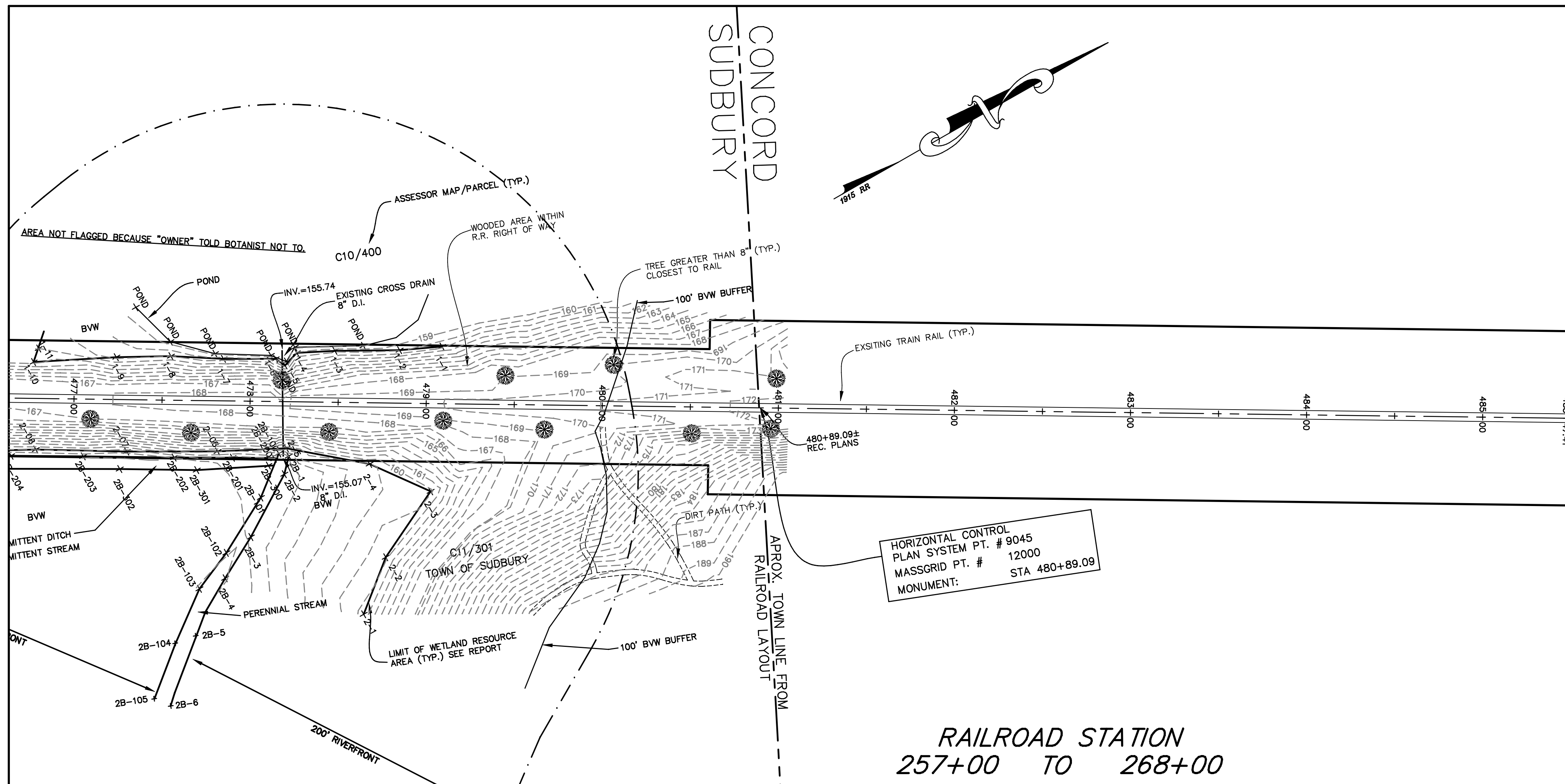
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Scale: 1" = 40'

40 0 40 80

SHEET 11 OF 23



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Scale: 1" = 40'
40 0 40 80
SHEET 12 OF 23



Massachusetts Inland Resource Area Delineation Report

Prepared For: Town of Sudbury

Project Location: Bruce Freeman Rail Trail
Broadacre Farm
82 Morse Road, Sudbury, Massachusetts
MassDOT Project No. 608164
Parcels No. F09-0002

Inspection Date(s): December 2, 2020

Regulated Inland Wetland Resource Areas:

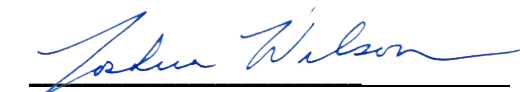
- | | |
|---|---|
| <input checked="" type="checkbox"/> Bank | <input checked="" type="checkbox"/> Bordering Vegetated Wetland (BVW) |
| <input checked="" type="checkbox"/> Land Under Water Bodies and Waterways | <input type="checkbox"/> Land Subject to Flooding (BLSF/ILSF) |
| <input type="checkbox"/> Riverfront Area | <input type="checkbox"/> Isolated Vegetated Wetland |
| <input checked="" type="checkbox"/> Buffer Zone | <input type="checkbox"/> Estimated Habitats of Rare Wildlife |
| <input type="checkbox"/> Vernal Pool (Certified and/or Potential) | <input type="checkbox"/> Priority Habitats of Rare Species |

Delineated Resource Area Field Numbering Sequence
[as depicted on the attached Resource Areas Map]:

Bank: 20336-C300-C324
Bordering Vegetated Wetland (BVW): D400-441

Inland resource areas were delineated in accordance with applicable local, state and federal statutes, as detailed within the Resource Area Description attachment. This delineation does not constitute an official wetland boundary until such time as it is accepted and approved by local, state or federal regulatory agencies.

The wetlands delineation was conducted by:


Joshua H. Wilson, PWS
Sr. Wetland Scientist/Soil Scientist

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Vermont
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California



Massachusetts Inland Resource Area Delineation Report Resource Area Description

ATTACHMENTS

- Resource Area Description
- DEP Bordering Vegetated Wetland (310 CMR 10.55)
Delineation Field Forms
- NRCS Soil Map and Soil Report
- Resource Areas Map

Massachusetts Inland Resource Area Delineation Report Resource Area Description

Introduction

Fuss & O'Neill Inc. performed a wetland resource area field inspection and delineation at 82 Morse Road in the Town of Sudbury (Parcel #F09/0002). The field inspection and delineation occurred on December 2, 2020. The purpose of the delineation was to locate the jurisdictional limits of areas regulated under the Wetlands Protection Act (M.G.L. c. 131 sec. 40) and associated Wetlands Protection Act Regulations (310 CMR 10).

Bank, Lund Under Water and Waterways (LUWW), and Bordering Vegetated Wetland (BVW) inland wetland resource were identified and delineated during the field investigation. Consecutively numbered flags were placed in the field to demarcate these resource area boundaries. These resource area boundary flags will be located by field survey. The flags and corresponding resource area labels are depicted on the attached *Resource Areas Sketch Map*. Regulated Buffer Zone on the Site is measured horizontally from the boundaries of Bank and/or BVW.

Maps retrieved from MassGIS were used to determine if specific regulated inland wetland resources have been mapped and/or documented on the Site. MassGIS maps depicts Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species Along the southern boundary of the site (PH1349). No Certified Vernal Pools, or Bordering Land Subject to Flooding are mapped on or adjacent to the Site. A detailed description of each regulated resource area present on the Site is provided below.

Resource Areas

Bank: Regulatory Framework and Delineation Methodology

Bank is defined under 310 CMR 10.54(2)(c) as "*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.*" Fuss & O'Neill Inc. performed a delineation of Bank within the area of interest using consecutively numbered flags placed in the field to demarcate the Bank a former pond located on the site.

Bank: Resource Description

Bank was identified in the field by the first observable break in topography between the water body and the adjacent BVW or upland. The waterbody on the property is limited to a former farm pond. The delineated Bank around the pond coincided with the Mean Annual High-Water Line (MAHWL)/bankfull, as defined under 310 CMR 10.58 (2)(a)(2). No evidence of riverine characteristics was noted along the pond bank during the inspection (i.e., no discernible direction of flow, no evidence of scour, etc.).

Land under Water Bodies and Waterways (LUWW)

LUWW is defined under 310 CMR 10.56 (2)(a) as "*the land beneath any creek, river, stream, pond or lake. Said land may be composed of organic muck or peat, fine sediments, rocks or bedrock.*" The boundary of LUWW is defined as the mean annual low water level (310 CMR 10.56 (2)(c)). LUWW was not specifically field delineated. For the intents and purposes of this resource area delineation, the delineated Banks of the former farm pond are analogous to the limits of LUWW.

Bordering Vegetated Wetlands (BVW): Regulatory Framework and Delineation Methodology

As stated in 310 CMR (2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetation community which occur in each type of freshwater wetland are specified in M.G.L. c 131 sec. 40.*"

Fuss & O'Neill Inc. inspected the Site for Bordering Vegetated Wetlands in accordance with methodology provided in the Massachusetts DEP handbook, *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*, (March 1995), the 1987 *Corps of Engineers Wetlands Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region* (Version 2.0. January 2012). Data regarding vegetation, soils, and hydrology was gathered to complete the required MassDEP BVW delineation field forms. Wetlands are categorized in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et.al. 1979).

Hydric soil determinations were made in accordance with *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC, 2004). The Wetland Indicator Status for plant species was ascertained using the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List*, Updated May 20, 2020.

BVW: Resource Area Description

Vegetation

The two BVW delineated on the Site are classified primarily as palustrine emergent/scrub-shrub wetlands. Common vegetation identified within the scrub-shrub BVW includes [common name (*scientific name*, indicator status)]: red maple (*Acer rubrum*, FAC), green ash (*Fraxinus*

pensylvanica, FACW), common winterberry (*Ilex verticillata*, FACW), Tatarian honeysuckle (*Lonicera tatarica*, FACU), tussock sedge (*Carex stricta*, OBL), and skunk cabbage (*Symplocarpus foetidus*, OBL). Portions of the wetland were in a mowed field and did not contain sufficient vegetative growth for classification.

Hydrology

The BVW delineated are adjacent to the former farm pond. Surface water observed at the Site appears to originate primarily from groundwater; it is assumed that a small amount is contributed by runoff and overland sheet flow from precipitation. No streams, channels or other types of connection conveying surface water were found.

Soils

The Natural Resource Conservation Service (NRCS) mapped hydric soil types on the Site include: Wareham loamy fine sand and Raypole silt loam. Upland soils mapped at the site include Windsor loamy sand. Detailed information regarding each of these soil series is included within the [NRCS Soil Map and Soil Report](#) attachment. Results of the detailed field analyses of soils on the Site were generally consistent with the published NRCS soil mapping with minor exceptions.

Buffer Zone

Buffer Zone is defined in 310 CRM 10.04 as "that area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a)." Buffer Zone within the area of interest is associated with BVW. The buffer zone on the Site contains upland forest and abandoned agricultural fields. Common vegetation within the Buffer Zone includes: red oak (*Quercus rubra*, FACU), red maple, eastern white pine (*Pinus strobus*, FACU), shagbark hickory (*Carya ovata*, UPL), multiflora rose (*Rosa multiflora*, FACU), Tatarian honeysuckle (*Lonicera tatarica*, FACU), silky dogwood, poison ivy (*Toxicodendron radicans*, FAC), fox grape, brambles (*Rubus spp.*), and Asiatic bittersweet (*Celastrus orbiculatus*, UPL).

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 82 Morse Rd DEP File #: _____

Check all that apply: _____
Sudbury (wetland)

- ☒ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Acer rubrum	50%	50%	Yes	FAC*
Fraxinus pensylvanica	50%	50%	Yes	FACW
Ilex verticillata	30%	75%	Yes	FACW*
Lonceria tatarica	10%	25%	Yes	FACU
Carex stricta	10%	66%	Yes	OBL
Symplocarpus foetidus	5%	33%	Yes	OBL*

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:

Number of dominant wetland indicator plants: 5

Number of dominant non-wetland indicator plants: 6

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? **yes** no

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
title/date:
map number:
soil type mapped:
hydric soil inclusions:

Are field observations consistent with soil survey? yes no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
---------	-------	--------------	---------------

Remarks:

3. Other:

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☐ Depth to free water in observation hole: _____
- ☐ Depth to soil saturation in observation hole: _____
- ☐ Water marks: _____
- ☐ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☐ Drainage patterns in BVW: _____
- ☐ Oxidized rhizospheres: _____
- ☐ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other):

- ☐ Other: _____

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	<u>X</u>	_____
Wetland hydrology present:		
Hydric soil present	_____	_____
Other indicators of hydrology present	_____	_____
Sample location is in a BVW	<u>X</u>	_____

Submit this form with the Request for Determination of Applicability or Notice of Intent.

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 82 Morse Rd DEP File #: _____

Check all that apply: _____
Sudbury (upland)

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Dactylis glomerata	30%	35%	Yes	FACU
Elymus repens	30%	35%	Yes	FACU
Phleum pratense	25%	30%	Yes	FACU

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:

Number of dominant wetland indicator plants: 0

Number of dominant non-wetland indicator plants: 3

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? yes **no**

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? ☒ yes ☐ no
title/date: USDA Web Soil Survey
map number:
soil type mapped: Windsor loamy Sand
hydric soil inclusions:

Are field observations consistent with soil survey? ☒ yes ☐ no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Ap	0-12 "	10YR2/1	fsl
Bw1	12-18 "	2Y3/3	fsl
Bw2	18-24 "	5YR6/3	2.5Y6/6 sl

Remarks:

3. Other:

Conclusion: Is soil hydric? yes ☐ no ☒

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☒ Depth to free water in observation hole: > 24 "
- ☐ Depth to soil saturation in observation hole: _____
- ☐ Water marks: _____
- ☐ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☐ Drainage patterns in BVW: _____
- ☐ Oxidized rhizospheres: _____
- ☐ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other):

- ☐ Other: _____

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	_____	<u>X</u>
Wetland hydrology present:		
Hydric soil present	_____	<u>X</u>
Other indicators of hydrology present	_____	_____
Sample location is in a BVW	_____	<u>X</u>

Submit this form with the Request for Determination of Applicability or Notice of Intent.

NRCS Soil Map and Soil Report

Hydric Rating by Map Unit—Middlesex County, Massachusetts
(20200785.A10 - BFRT, Sudbury, MA)









MAP LEGEND

Area of Interest (AOI)







 Area of Interest (AOI)

Soils







Soil Rating Polygons

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available


Soil Rating Lines

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available






Soil Rating Points

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available


Water Features

 Streams and Canals

Transportation

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

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 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.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
32B	Wareham loamy fine sand, 0 to 5 percent slopes	85	3.3	38.4%
33B	Raypol silt loam, 0 to 5 percent slopes	98	3.3	39.2%
255A	Windsor loamy sand, 0 to 3 percent slopes	0	1.9	22.4%
Totals for Area of Interest			8.5	100.0%

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

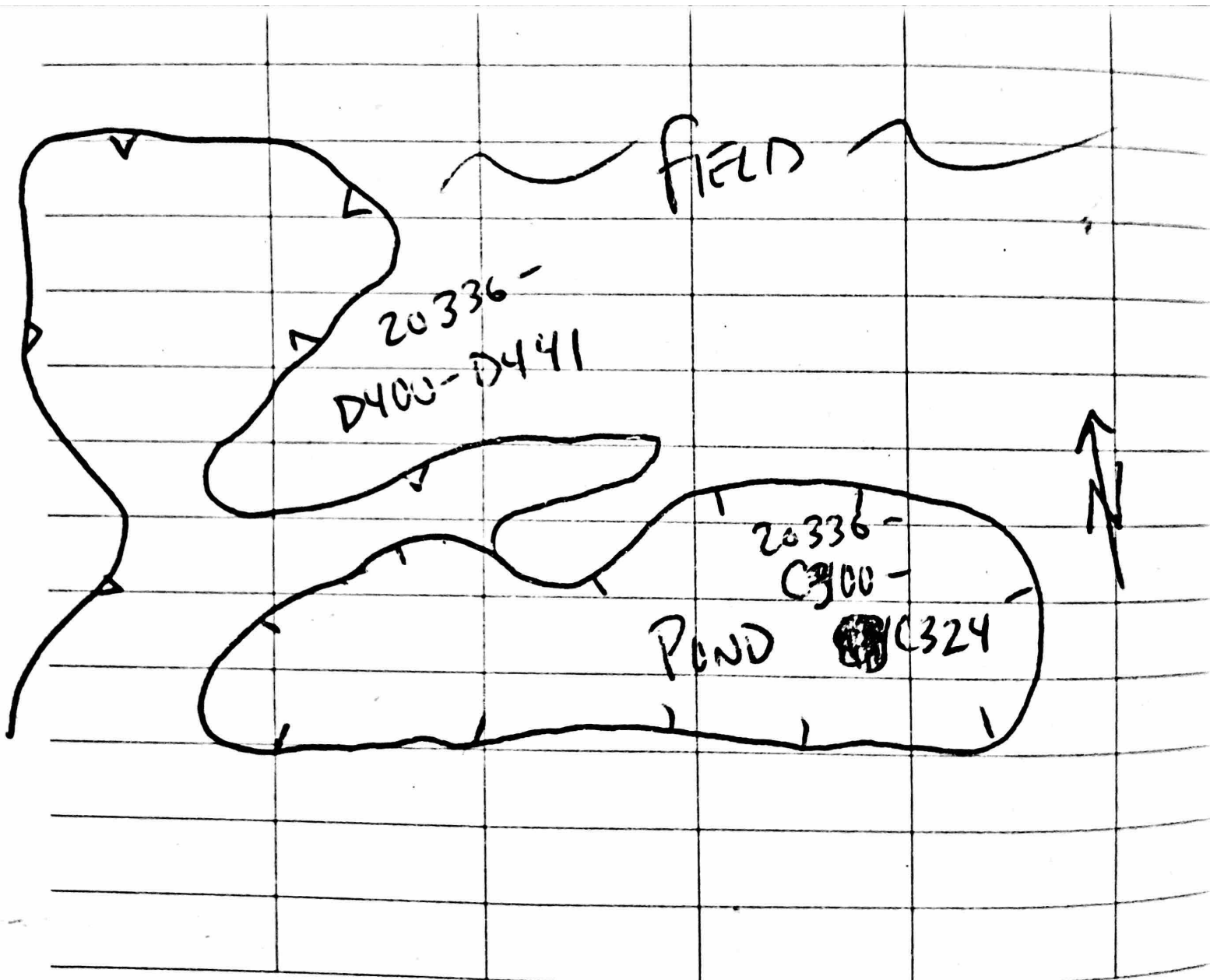
Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Resource Areas Map



Resource Area Delineation Sketch

82 Morse Rd, Sudbury, MA

Delineated by: Josh Wilson, Fuss & O'Neill

Delineated: 12/2/2020



Massachusetts Inland Resource Area Delineation Report

Prepared For: Town of Sudbury

Project Location: Bruce Freeman Rail Trail
Davis Field
195 North Rd, Sudbury, Massachusetts
MassDOT Project No. 608164
Parcels No. C10-0500

Inspection Date(s): December 2, 2020

Regulated Inland Wetland Resource Areas:

- | | |
|---|---|
| <input type="checkbox"/> Bank | <input checked="" type="checkbox"/> Bordering Vegetated Wetland (BVW) |
| <input type="checkbox"/> Land Under Water Bodies and Waterways | <input type="checkbox"/> Land Subject to Flooding (BLSF/ILSF) |
| <input type="checkbox"/> Riverfront Area | <input type="checkbox"/> Isolated Vegetated Wetland |
| <input checked="" type="checkbox"/> Buffer Zone | <input type="checkbox"/> Estimated Habitats of Rare Wildlife |
| <input type="checkbox"/> Vernal Pool (Certified and/or Potential) | <input type="checkbox"/> Priority Habitats of Rare Species |

Delineated Resource Area Field Numbering Sequence
[as depicted on the attached Resource Areas Map]:

Bordering Vegetated Wetland (BVW): E500-E506

Inland resource areas were delineated in accordance with applicable local, state and federal statutes, as detailed within the Resource Area Description attachment. This delineation does not constitute an official wetland boundary until such time as it is accepted and approved by local, state or federal regulatory agencies.

The wetlands delineation was conducted by:

Joshua H. Wilson, PWS
Sr. Wetland Scientist/Soil Scientist

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California



Massachusetts Inland Resource Area Delineation Report
Resource Area Description

ATTACHMENTS

- Resource Area Description
- DEP Bordering Vegetated Wetland (310 CMR 10.55)
Delineation Field Forms
- NRCS Soil Map and Soil Report
- Resource Areas Map

Massachusetts Inland Resource Area Delineation Report Resource Area Description

Introduction

Fuss & O'Neill Inc. performed a wetland resource area field inspection and delineation at 195 North Road in the Town of Sudbury (Parcel #C10-0500). The field inspection and delineation occurred on December 2, 2020. The purpose of the delineation was to locate the jurisdictional limits of areas regulated under the Wetlands Protection Act (M.G.L. c. 131 sec. 40) and associated Wetlands Protection Act Regulations (310 CMR 10). For the purposes of this project, the resource delineation effort was focused within 100 feet of the proposed bike trail corridor. All resources on the parcel were not delineated.

Bordering Vegetated Wetland (BVW) inland wetland resource was identified and delineated during the field investigation. Consecutively numbered flags were placed in the field to demarcate these resource area boundaries. These resource area boundary flags will be located by field survey. The flags and corresponding resource area labels are depicted on the attached *Resource Areas Sketch Map*. Regulated Buffer Zone on the Site is measured horizontally from the boundaries of BVW.

Maps retrieved from MassGIS were used to determine if specific regulated inland wetland resources have been mapped and/or documented on the Site. MassGIS maps do not depict Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species, Certified Vernal Pools, or Bordering Land Subject to Flooding on the Site. A detailed description of each regulated resource area present on the Site is provided below.

Resource Areas

Bordering Vegetated Wetlands (BVW): Regulatory Framework and Delineation Methodology

As stated in 310 CMR (2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetation community which occur in each type of freshwater wetland are specified in M.G.L. c 131 sec. 40.*"

Fuss & O'Neill Inc. inspected the Site for Bordering Vegetated Wetlands in accordance with methodology provided in the Massachusetts DEP handbook, *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*, (March 1995), the 1987 *Corps of Engineers Wetlands Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region* (Version 2.0. January 2012). Data regarding vegetation, soils, and hydrology was gathered to complete the

required MassDEP BVW delineation field forms. Wetlands are categorized in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et.al. 1979).

Hydric soil determinations were made in accordance with *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC, 2004). The Wetland Indicator Status for plant species was ascertained using the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List, Updated May 20, 2020*.

BVW: Resource Area Description

Vegetation

The BVW delineated on the Site are classified primarily as palustrine emergent wetlands. Common vegetation identified within the emergent BVW includes [common name (*scientific name*, indicator status)]: cattail (*Typha latifolia*, OBL), purple loosestrife (*Lythrum salicaria*, OBL) and silky dogwood (*Cornus amomum*, FACW). Portions of the wetland were in a mowed field and did not contain sufficient vegetative growth for classification.

Hydrology

The BVW delineated appear to part of an excavated drainage feature. Surface water observed at the Site appears to originate primarily from groundwater; it is assumed that a moderate amount of hydrologic flow is contributed by runoff and overland sheet flow from precipitation. No streams, channels or other types of connection conveying surface water were identified in the area of interest.

Soils

The Natural Resource Conservation Service (NRCS) does not map hydric soil types in the area of interest. Hydric soils in the vicinity of the area of interest include Scarboro muck and Swansea muck. Soils mapped in area of interest are upland soils, specifically, Sudbury fine sandy loam. Detailed information regarding each of these soil series is included within the NRCS Soil Map and Soil Report attachment. Results of the detailed field analyses of soils on the Site were generally consistent with the published NRCS soil mapping except for the BVW delineated in the area of interest. The soil in this delineated area is consistent with the Walpole sandy loam series.

Buffer Zone

Buffer Zone is defined in 310 CRM 10.04 as "that area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a)." Buffer Zone within the area of interest is associated with BVW. The buffer zone on the Site contains upland forest

and abandoned agricultural fields. Common vegetation within the Buffer Zone includes red oak (*Quercus rubra*, FACU), red maple (*Acer rubrum*, FACW), sugar maple (*Acer saccharum*, FACU), eastern white pine (*Pinus strobus*, FACU), shagbark hickory (*Carya ovata*, UPL), multiflora rose (*Rosa multiflora*, FACU), Tatarian honeysuckle (*Lonicera tatarica*, FACU), silky dogwood, poison ivy (*Toxicodendron radicans*, FAC), fox grape, brambles (*Rubus spp.*), and Asiatic bittersweet (*Celastrus orbiculatus*, UPL).

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 195 North Rd DEP File #: _____

Check all that apply: _____
Sudbury (wetland)

- ☒ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Typha latifolia	25%	25%	Yes	OBL
Lythrum salicaria	75%	75%	Yes	OBL
Cornus amomum	50%	100%	Yes	FACW

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:

Number of dominant wetland indicator plants: 3

Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? **yes** no

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
title/date:
map number:
soil type mapped:
hydric soil inclusions:

Are field observations consistent with soil survey? yes no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
---------	-------	--------------	---------------

Remarks:

3. Other:

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☐ Depth to free water in observation hole: _____
- ☐ Depth to soil saturation in observation hole: _____
- ☐ Water marks: _____
- ☐ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☐ Drainage patterns in BVW: _____
- ☐ Oxidized rhizospheres: _____
- ☐ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other):

- ☐ Other: _____

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	<u> X </u>	_____
Wetland hydrology present:		
Hydric soil present	_____	_____
Other indicators of hydrology present	_____	_____
Sample location is in a BVW	<u> X </u>	_____

Submit this form with the Request for Determination of Applicability or Notice of Intent.

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 195 North Rd DEP File #: _____

Check all that apply: _____
Sudbury (upland)

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*

Mowed field (species
not identified)

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus *Sphagnum*; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:

Number of dominant wetland indicator plants: _____

Number of dominant non-wetland indicator plants: _____

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? yes **no**

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? ☒ yes no
title/date: USDA Web Soil Survey
map number:
soil type mapped: Sudbury fine sandy loam
hydric soil inclusions:

Are field observations consistent with soil survey? ☒ yes no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Ap	0-12 "	10YR3/4	fsl
Bw1	12-15 "	10YR5/6	fsl
Bw2	15-24 "	2.5Y6/4	sl

Remarks:

3. Other:

Conclusion: Is soil hydric? yes ☒ no

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☒ Depth to free water in observation hole: >24 "
- ☐ Depth to soil saturation in observation hole: _____
- ☐ Water marks: _____
- ☐ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☐ Drainage patterns in BVW: _____
- ☐ Oxidized rhizospheres: _____
- ☐ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other):

- ☐ Other: _____

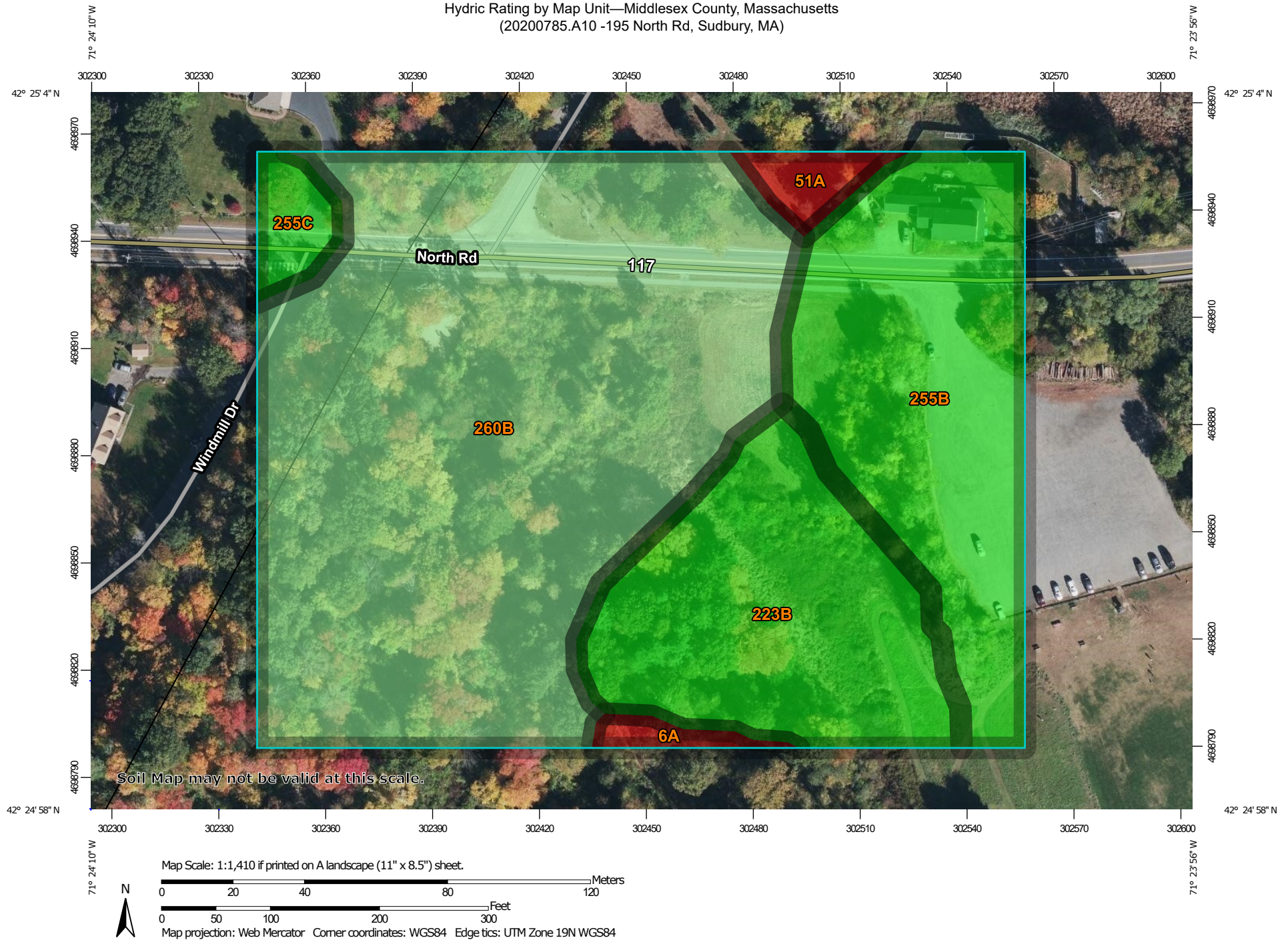
Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	_____	<u>X</u>
Wetland hydrology present:		
Hydric soil present	_____	<u>X</u>
Other indicators of hydrology present	_____	_____
Sample location is in a BVW	_____	<u>X</u>

Submit this form with the Request for Determination of Applicability or Notice of Intent.


NRCS Soil Map and Soil Report

Hydric Rating by Map Unit—Middlesex County, Massachusetts
(20200785.A10 -195 North Rd, Sudbury, MA)









MAP LEGEND

Area of Interest (AOI)







 Area of Interest (AOI)

Soils







Soil Rating Polygons

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available


Soil Rating Lines

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available






Soil Rating Points

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

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

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 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.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	100	0.1	0.9%
51A	Swansea muck, 0 to 1 percent slopes	100	0.1	1.7%
223B	Scio very fine sandy loam, 3 to 8 percent slopes	0	1.6	18.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	0	1.9	21.5%
255C	Windsor loamy sand, 8 to 15 percent slopes	0	0.2	2.2%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	4	4.9	55.5%
Totals for Area of Interest			8.9	100.0%

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

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Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Resource Areas Map

- NORTH Rd

outfall

PAV

↓
Park

20336-E500-E506

Resource Area Delineation Sketch

195 North Rd, Sudbury, MA

Delineated by: Josh Wilson, Fuss & O'Neill

Delineated: December 2, 2020



Massachusetts Inland Resource Area Delineation Report

Prepared For: Town of Sudbury

Project Location: Bruce Freeman Rail Trail
0 Hudson Rd, Sudbury, Massachusetts
MassDOT Project No. 608164
Parcels No. G08-0013, G09-0200, G09-0001

Inspection Date(s): December 2, 2020

Regulated Inland Wetland Resource Areas:

- | | |
|---|---|
| <input type="checkbox"/> Bank | <input checked="" type="checkbox"/> Bordering Vegetated Wetland (BVW) |
| <input type="checkbox"/> Land Under Water Bodies and Waterways | <input type="checkbox"/> Land Subject to Flooding (BLSF/ILSF) |
| <input type="checkbox"/> Riverfront Area | <input type="checkbox"/> Isolated Vegetated Wetland |
| <input checked="" type="checkbox"/> Buffer Zone | <input type="checkbox"/> Estimated Habitats of Rare Wildlife |
| <input type="checkbox"/> Vernal Pool (Certified and/or Potential) | <input type="checkbox"/> Priority Habitats of Rare Species |

Delineated Resource Area Field Numbering Sequence
[as depicted on the attached Resource Areas Map]:

Bordering Vegetated Wetland (BVW): A100-A114; B200-B207

Inland resource areas were delineated in accordance with applicable local, state and federal statutes, as detailed within the Resource Area Description attachment. This delineation does not constitute an official wetland boundary until such time as it is accepted and approved by local, state or federal regulatory agencies.

The wetlands delineation was conducted by:

Joshua H. Wilson, PWS

Sr. Wetland Scientist/Soil Scientist

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Connecticut
Massachusetts
Rhode Island
Vermont
Maine
California



Massachusetts Inland Resource Area Delineation Report Resource Area Description

ATTACHMENTS

- Resource Area Description
- DEP Bordering Vegetated Wetland (310 CMR 10.55)
Delineation Field Forms
- NRCS Soil Map and Soil Report
- Resource Areas Map

Massachusetts Inland Resource Area Delineation Report Resource Area Description

Introduction

Fuss & O'Neill Inc. performed a wetland resource area field inspection and delineation off Hudson Road in the Town of Sudbury (Parcels # G08-0013, G09-0200, G09-0001). The field inspection and delineation occurred on December 2, 2020. The purpose of the delineation was to locate the jurisdictional limits of areas regulated under the Wetlands Protection Act (M.G.L. c. 131 sec. 40) and associated Wetlands Protection Act Regulations (310 CMR 10). For the purposes of this project, the resource delineation effort was focused within 100 feet of the proposed bike trail corridor. All resources on the parcel were not delineated.

Bordering Vegetated Wetland (BVW) inland wetland resource was identified and delineated during the field investigation. Consecutively numbered flags were placed in the field to demarcate these resource area boundaries. These resource area boundary flags will be located by field survey. The flags and corresponding resource area labels are depicted on the attached *Resource Areas Sketch Map*. Regulated Buffer Zone on the Site is measured horizontally from the boundaries of BVW.

Maps retrieved from MassGIS were used to determine if specific regulated inland wetland resources have been mapped and/or documented on the Site. MassGIS maps do not depict Massachusetts Natural Heritage and Endangered Species Program (NHESP) Priority Habitats of Rare Species, Certified Vernal Pools, or Bordering Land Subject to Flooding on the Site. A detailed description of each regulated resource area present on the Site is provided below.

Resource Areas

Bordering Vegetated Wetlands (BVW): Regulatory Framework and Delineation Methodology

As stated in 310 CMR (2)(a), "*Bordering Vegetated Wetlands are freshwater wetlands which border on creeks, rivers, streams, ponds and lakes. The types of freshwater wetlands are wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. The ground and surface water regime and the vegetation community which occur in each type of freshwater wetland are specified in M.G.L. c 131 sec. 40.*"

Fuss & O'Neill Inc. inspected the Site for Bordering Vegetated Wetlands in accordance with methodology provided in the Massachusetts DEP handbook, *Delineating Bordering Vegetated Wetlands under the Massachusetts Wetlands Protection Act*, (March 1995), the 1987 *Corps of Engineers Wetlands Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetlands Delineation Manual: Northcentral and Northeast Region* (Version 2.0, January 2012). Data regarding vegetation, soils, and hydrology was gathered to complete the

required MassDEP BVW delineation field forms. Wetlands are categorized in accordance with *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et.al. 1979).

Hydric soil determinations were made in accordance with *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC, 2004). The Wetland Indicator Status for plant species was ascertained using the USACE *Northcentral and Northeast 2016 Regional Wetland Plant List, Updated May 20, 2020*.

BVW: Resource Area Description

Vegetation

The BVW delineated on the Site is classified primarily as palustrine forested/scrub-shrub wetlands. Common vegetation identified within the scrub-shrub BVW includes [common name (*scientific name*, indicator status)]: red maple (*Acer rubrum*, FAC), green ash (*Fraxinus pennsylvanica*, FACW), common winterberry (*Ilex verticillata*, FACW), Tatarian honeysuckle (*Lonicera tatarica*, FACU), tussock sedge (*Carex stricta*, OBL), and skunk cabbage (*Symplocarpus foetidus*, OBL). Portions of the wetland were in a mowed field and did not contain sufficient vegetative growth for classification.

Hydrology

The BVW delineated appear to be within a landscape depression and drainageway. Surface water observed at the Site appears to originate primarily from groundwater; it is assumed that a moderate amount of hydrologic flow is contributed by runoff and overland sheet flow from precipitation. No streams, channels or other types of connection conveying surface water were identified in the area of interest.

Soils

The Natural Resource Conservation Service (NRCS) does not map hydric soil types in the area of interest. Soils mapped in area of interest are upland soils, specifically, Deerfield loamy fine sand as well Paxton fine sandy loam. Detailed information regarding each of these soil series is included within the [NRCS Soil Map and Soil Report](#) attachment. Results of the detailed field analyses of soils on the Site were generally consistent with the published NRCS soil mapping except for the BVW delineated in the area of interest. The soil in this delineated area is consistent with the Ridgebury fine sandy loam series.

Buffer Zone

Buffer Zone is defined in 310 CRM 10.04 as "that area of land extending 100 feet horizontally outward from the boundary of any area specified in 310 CMR 10.02(1)(a)." Buffer Zone within the area of interest is associated with BVW. The buffer zone on the Site contains upland forest

DEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Forms

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 0 Hudson Rd DEP File #: _____

Check all that apply: _____
Sudbury (wetland)

- ☒ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☐ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Acer rubrum	60%	86%	Yes	FAC*
Fraxinus pensylvanica	10%	14%	No	
Ilex verticillata	40%	89%	Yes	FACW*
Lonceria tatarica	5%	11%	No	
Carex stricta	10%	66%	Yes	OBL
Symplocarpus foetidus	5%	33%	Yes	OBL*

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:

Number of dominant wetland indicator plants: 5

Number of dominant non-wetland indicator plants: 0

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? **yes** no

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? yes no
title/date:
map number:
soil type mapped:
hydric soil inclusions:

Are field observations consistent with soil survey? yes no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
---------	-------	--------------	---------------

Remarks:

3. Other:

Conclusion: Is soil hydric? yes no

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☐ Depth to free water in observation hole: _____
- ☐ Depth to soil saturation in observation hole: _____
- ☐ Water marks: _____
- ☐ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☐ Drainage patterns in BVW: _____
- ☐ Oxidized rhizospheres: _____
- ☐ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other):

- ☐ Other: _____

Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	<u> X </u>	_____
Wetland hydrology present:		
Hydric soil present	_____	_____
Other indicators of hydrology present	_____	_____
Sample location is in a BVW	<u> X </u>	_____

Submit this form with the Request for Determination of Applicability or Notice of Intent.

MassDEP Bordering Vegetated Wetland (310 CMR 10.55) Delineation Field Data Form

Applicant: Town of Sudbury Prepared by: Josh Wilson Project location: 0 Hudson Rd DEP File #: _____

Check all that apply: _____
Sudbury (upland)

- ☐ Vegetation alone presumed adequate to delineate BVW boundary: fill out Section I only
- ☒ Vegetation and other indicators of hydrology used to delineate BVW boundary: fill out Sections I and II
- ☐ Method other than dominance test used (attach additional information)

Section I.

Vegetation	Observation Plot Number:		Transect Number:	Date of Delineation:
A. Sample Layer & Plant Species (by common/scientific name)	B. Percent Cover (or basal Area)	C. Percent Dominance	D. Dominant Plant (yes or no)	E. Wetland Indicator Category*
Acer rubrum	7539 sq in	73%	Yes	FACW*
Picea abies	2289 sq in	22%	Yes	NI
Abies balsamea	530 sq in	5%	No	
Fraxinus pensylvanica(s)	20%	66%	Yes	FACW
A. rubrum(s)	5%	17%	No	
A. balsamea(s)	5%	17%	No	

* Use an asterisk to mark wetland indicator plants: plant species listed in the Wetlands Protection Act (MGL c.131, s.40); plants in the genus Sphagnum; plants listed as FAC, FAC+, FACW-, FACW, FACW+, or OBL; or plants with physiological or morphological adaptations. If any plants are identified as wetland indicator plants due to physiological or morphological adaptations, describe the adaptation next to the asterisk.

Vegetation conclusion:

Number of dominant wetland indicator plants: 2

Number of dominant non-wetland indicator plants: 1

Is the number of dominant wetland plants equal to or greater than the number of dominant non-wetland plants? **yes** no

If vegetation alone is presumed adequate to delineate the BVW boundary, submit this form with the Request for Determination of Applicability or Notice of Intent

Section II. Indicators of Hydrology

Hydric Soil Interpretation

1. Soil Survey

Is there a published soil survey for this site? ☒ yes ☐ no
title/date: USDA Web Soil Survey
map number:
soil type mapped: Paxton fine sandy loamy
hydric soil inclusions:

Are field observations consistent with soil survey? ☒ yes ☐ no
Remarks:

2. Soil Description

Horizon	Depth	Matrix Color	Mottles Color
Ap	0-8 "	10YR2/1	s1
Bw1	8-22 "	10YR3/3	10YR2/1 s1
Bw2	22-28 "	10YR5/4	10YR6/8 ls

Remarks:

3. Other:

Conclusion: Is soil hydric? yes ☐ no ☒

Other Indicators of Hydrology: (check all that apply & describe)

- ☐ Site Inundated: _____
- ☒ Depth to free water in observation hole: >28 "
- ☐ Depth to soil saturation in observation hole: _____
- ☐ Water marks: _____
- ☐ Drift lines: _____
- ☐ Sediment Deposits: _____
- ☐ Drainage patterns in BVW: _____
- ☐ Oxidized rhizospheres: _____
- ☐ Water-stained leaves: _____
- ☐ Recorded Data (streams, lake, or tidal gauge; aerial photo; other):

- ☐ Other: _____

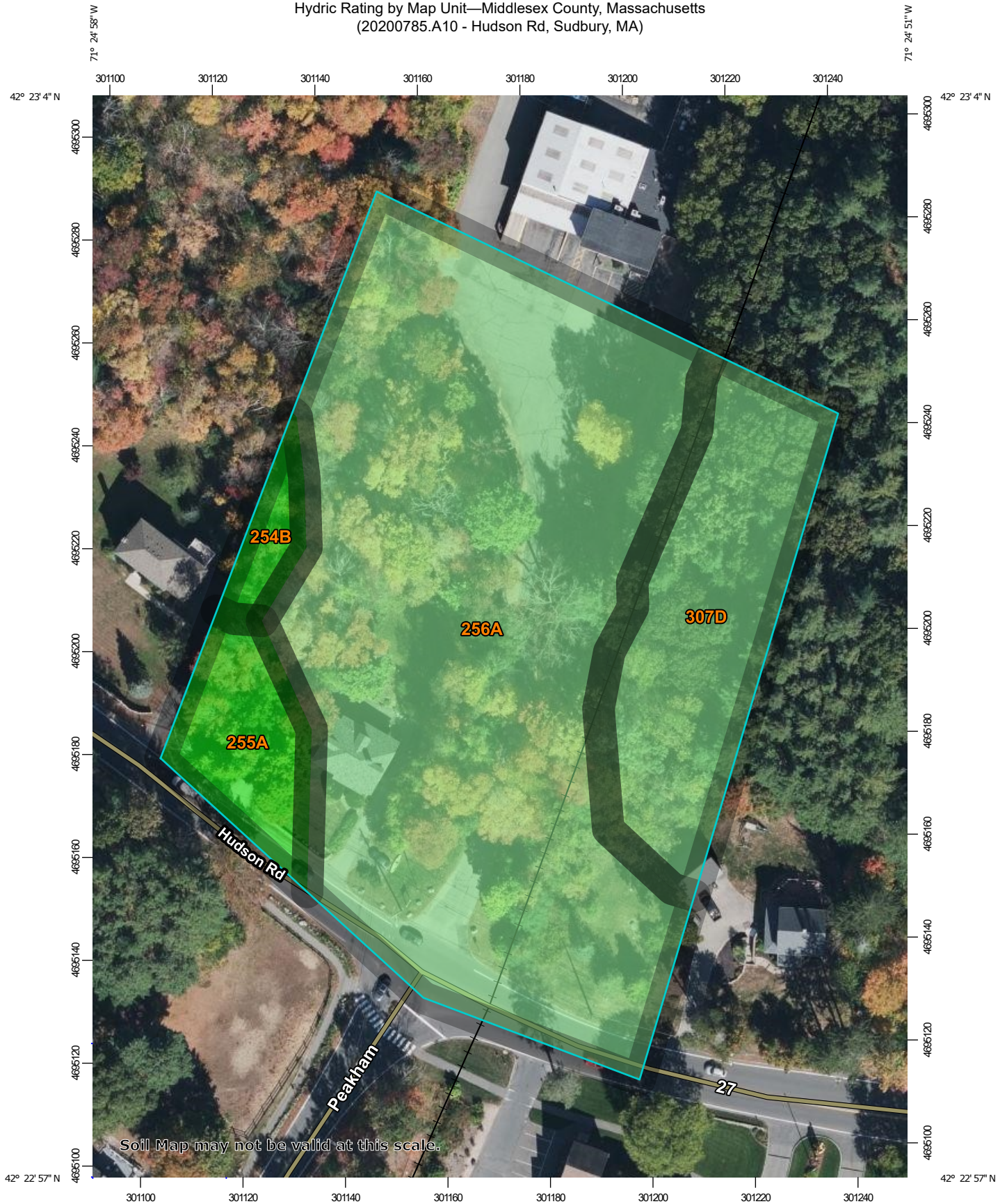
Vegetation and Hydrology Conclusion

	Yes	No
Number of wetland indicator plants ≥ # of non-wetland indicator plants	<u>X</u>	_____
Wetland hydrology present:		
Hydric soil present	_____	<u>X</u>
Other indicators of hydrology present	_____	<u>X</u>
Sample location is in a BVW	_____	<u>X</u>

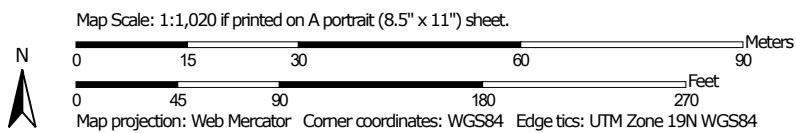
Submit this form with the Request for Determination of Applicability or Notice of Intent.

NRCS Soil Map and Soil Report

Hydric Rating by Map Unit—Middlesex County, Massachusetts
(20200785.A10 - Hudson Rd, Sudbury, MA)



Soil Map may not be valid at this scale.



Natural Resources
Conservation Service

Web Soil Survey
National Cooperative Soil Survey

11/4/2021
Page 1 of 5







MAP LEGEND

Area of Interest (AOI)







 Area of Interest (AOI)

Soils







Soil Rating Polygons

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available


Soil Rating Lines

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available






Soil Rating Points

-  Hydric (100%)
-  Hydric (66 to 99%)
-  Hydric (33 to 65%)
-  Hydric (1 to 32%)
-  Not Hydric (0%)
-  Not rated or not available

Water Features

 Streams and Canals

Transportation

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

Background

-  Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 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.

Hydric Rating by Map Unit

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0	0.1	2.5%
255A	Windsor loamy sand, 0 to 3 percent slopes	0	0.2	6.8%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	5	2.4	72.0%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	1	0.6	18.7%
Totals for Area of Interest			3.4	100.0%

Description

This rating indicates the percentage of map units that meets the criteria for hydric soils. Map units are composed of one or more map unit components or soil types, each of which is rated as hydric soil or not hydric. Map units that are made up dominantly of hydric soils may have small areas of minor nonhydric components in the higher positions on the landform, and map units that are made up dominantly of nonhydric soils may have small areas of minor hydric components in the lower positions on the landform. Each map unit is rated based on its respective components and the percentage of each component within the map unit.

The thematic map is color coded based on the composition of hydric components. The five color classes are separated as 100 percent hydric components, 66 to 99 percent hydric components, 33 to 65 percent hydric components, 1 to 32 percent hydric components, and less than one percent hydric components.

In Web Soil Survey, the Summary by Map Unit table that is displayed below the map pane contains a column named 'Rating'. In this column the percentage of each map unit that is classified as hydric is displayed.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (Federal Register, 1994). Under natural conditions, these soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil, however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (Federal Register, 2002). These criteria are used to identify map unit components that normally are associated with wetlands. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (Soil Survey Staff, 1999) and "Keys to Soil Taxonomy" (Soil Survey Staff, 2006) and in the "Soil Survey Manual" (Soil Survey Division Staff, 1993).

If soils are wet enough for a long enough period of time to be considered hydric, they should exhibit certain properties that can be easily observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils are specified in "Field Indicators of Hydric Soils in the United States" (Hurt and Vasilas, 2006).

References:

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18.

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service. U.S. Department of Agriculture Handbook 436.

Soil Survey Staff. 2006. Keys to soil taxonomy. 10th edition. U.S. Department of Agriculture, Natural Resources Conservation Service.

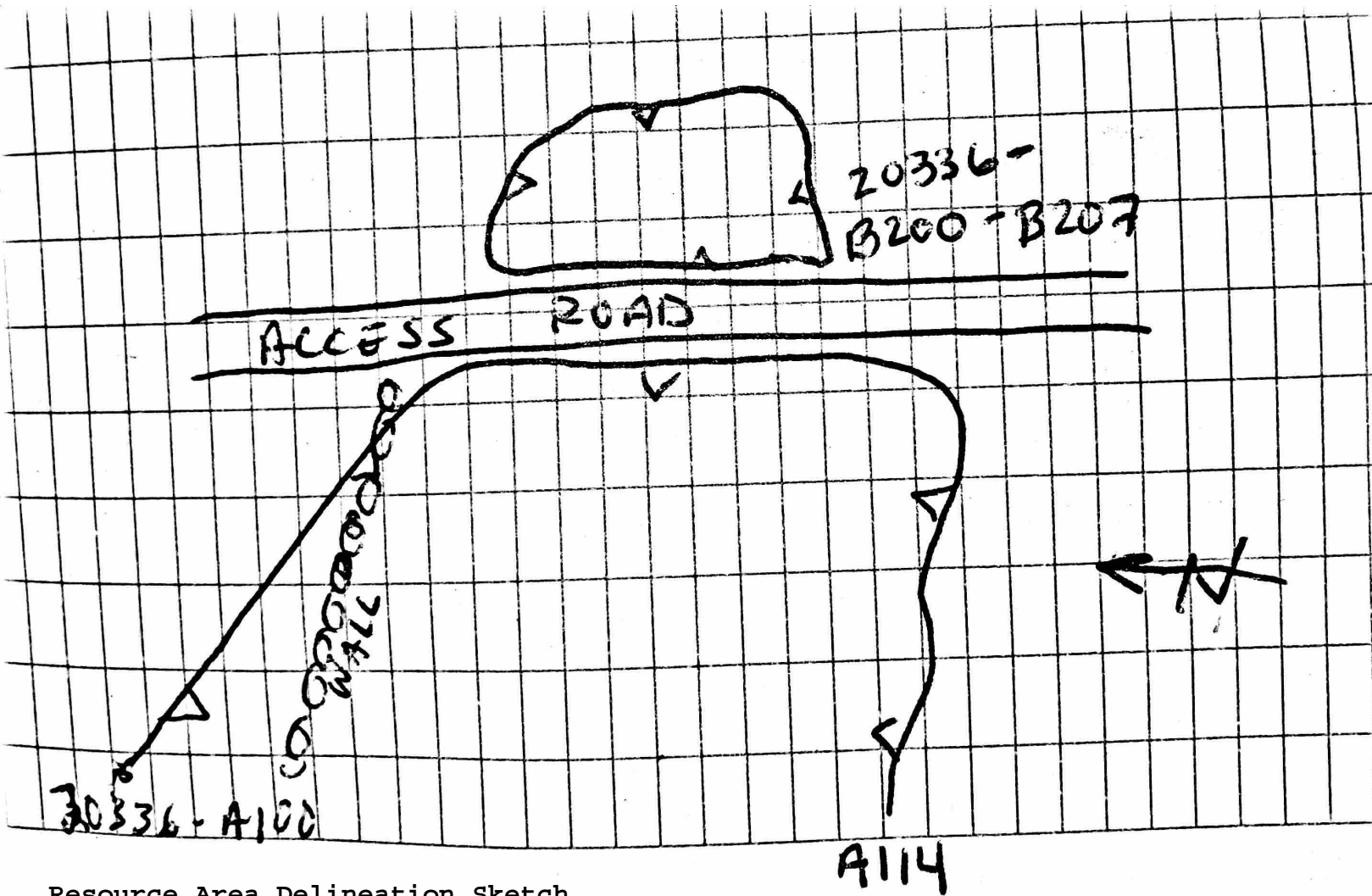
Rating Options

Aggregation Method: Percent Present

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Resource Areas Map



Resource Area Delineation Sketch

0 Hudson Rd, Sudbury, MA

Delineated by: Josh Wilson, Fuss & O'Neill

Delineated: December 2, 2020

Appendix C

NOI Circulation List



NOI Circulation List

<u>Copies</u>	<u>Recipient</u>
2	Town of Sudbury – Conservation Commission 275 Old Lancaster Road Sudbury, MA 01776
1	DEP-NERO Wetlands Division 205 Lowell Street, Wilmington, MA 01887
1	Natural Heritage and Endangered Species Program Division of Fisheries and Wildlife 1 Rabbit Hill Road Westborough, MA 01581

Not circulated to NHESP, See Letter from
NHESP in Appendix D

Appendix D

Agency Correspondence

Strysky, Alexander (EEA)

From: Paulson, David (FWE)
Sent: Tuesday, December 7, 2021 8:06 AM
To: Strysky, Alexander (EEA)
Cc: Cheeseman, Melany (FWE)
Subject: Bruce Freeman Rail Trail ENF (16482/07-23727)

December 7, 2021

Kathleen A. Theoharides, Secretary
Executive Office of Energy and Environmental Affairs
Attention: Alex Strysky, MEPA Office
100 Cambridge St.
Boston, Massachusetts 02114

Project Name: Bruce Freeman Rail Trail
Proponent: MassDOT and Town of Sudbury
Location: Sudbury
Document Reviewed: Environmental Notification Form
EEA No.: 16482
NHESP No.: 07-23727

Dear Secretary Theoharides:

The Natural Heritage & Endangered Species Program of the Massachusetts Division of Fisheries & Wildlife (the Division) has reviewed the Environmental Notification Form for the proposed Bruce Freeman Rail Trail Project and would like to offer the following comments regarding state-listed rare species and their habitats.

Based on a review of the plan that was provided and the information that is currently contained in our database, the Division has determined that this project, as currently proposed, occurs ***near but not within*** Estimated Habitat of Rare Wildlife or Priority Habitat as indicated in the Massachusetts Natural Heritage Atlas (15th Edition).

The project is not required to be reviewed for compliance with the rare wildlife species section of the Massachusetts Wetlands Protection Act Regulations (310 CMR 10.37, 10.59 & 10.58(4)(b)) or the MA Endangered Species Act Regulations (321 CMR 10.18). Any additional work beyond that shown on the submitted plan may require a filing with the Division.

We appreciate the opportunity to comment on this project. If you have any questions about this letter, please contact David Paulson, Senior Endangered Species Review Biologist, at (508) 389-6366 or david.paulson@state.ma.us.

David Paulson

Senior Endangered Species Review Biologist
Massachusetts Division of Fisheries & Wildlife
1 Rabbit Hill Road, Westborough, MA 01581
Temporary Phone: (845)-262-0481 | e: david.paulson@state.ma.us
mass.gov/masswildlife | facebook.com/masswildlife

Important: Our offices are currently closed and all non-essential state employees, including Environmental Review staff, are working remotely. We will respond to your inquiry as quickly as possible. Thank you for your patience. Please visit our website (www.mass.gov/nhesp) for updates.



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

September 16, 2021

Massachusetts Department of Transportation and Town of Sudbury
c/o Eric M. Bernardin, of Fuss and O'Neill,
150 Main Street, Suite 400
Springfield, MA 01103

RE: Jurisdictional Determination / Minor Project Modification: WW04-0000008

Bruce Freeman Rail Trail Crossings at Bridge No. S-31-007 and Bridge No. S-31-013 over
the Waters of Hop Brook and Pantry Brook, Sudbury, Middlesex County

Dear Mr. Bernardin:

Enclosed is the Determination of Applicability and approval of a Minor Project Modification for the referenced application issued pursuant to Waterways Regulations 310 CMR 9.06 and 310 CMR 9.22. This Determination may be recorded at the Middlesex County Registry of Deeds and a copy will be maintained in the Department files.

If you have any questions, please contact the Waterways Regulation Program at dep.waterways@mass.gov.

Sincerely,

Daniel J. Padien
Program Chief
Waterways Regulation Program

cc: Beth Suedmeyer, Town of Sudbury
Tim Dexter, Massachusetts Department of Transportation
Sudbury Conservation Commission



Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

One Winter Street Boston, MA 02108 • 617-292-5500

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Kathleen A. Theoharides
Secretary

Martin Suuberg
Commissioner

Jurisdictional Determination: WW04-0000008

Municipality: Sudbury, Middlesex County

DETERMINATION OF APPLICABILITY- 310 CMR 9.00

To: Massachusetts Department of Transportation &
Town of Sudbury
c/o Eric M. Bernardin
1550 Main Street, Suite 400
Springfield, MA 01103

Location of Site: Bruce Freeman Rail Trail
Hop Brook Bridge No. S-31-007
Pantry Brook Bridge No. S-31-013
Sudbury, MA 01776

Pursuant to 310 CMR 9.06, the Department of Environmental Protection Waterways Regulation Program (the “Department”) has reviewed and considered your request for a Determination of Applicability and its supporting documentation, and has made the following determination:

[X] The Determination is Positive: A portion of the above referenced site for which this determination is issued includes lands subject to jurisdiction under M.G.L Chapter 91 and its regulations at 310 CMR 9.00.

[] The Determination is Negative: A portion of the above referenced site for which this determination is issued includes lands not subject to jurisdiction under M.G.L Chapter 91 and its regulations at 310 CMR 9.00.

Massachusetts Department of Transportation and the Town of Sudbury (the “Applicants”) have requested a Determination of Applicability on behalf of to determine whether the replacement of the bridges along the proposed Bruce Freeman Rail Trail crossings over the non-tidal streams of Hop Brook and Pantry Brook in Sudbury in Middlesex County (the “project site”) are subject to licensing pursuant to Chapter 91 and the regulations at 310 CMR 9.00. Documentation in support of this request included a cover letter with project descriptions and Figures 1-9 dated May 4, 2021.

The Department determines that the proposed bridge replacements described in the in the application are located within areas subject to Chapter 91 jurisdiction pursuant to the provisions of 9.04(1)(e) and are activities subject to jurisdiction pursuant to 310 CMR 9.05(1)(a). However, the regulations at 310

This information is available in alternate format. Contact Michelle Waters-Ekanem, Director of Diversity/Civil Rights at 617-292-5751.

TTY# MassRelay Service 1-800-439-2370

MassDEP Website: www.mass.gov/dep

Printed on Recycled Paper

Bruce Freeman Rail Trail Bridge Nos. S-31-007 and S-31-013, Waters of Hop Brook and Pantry Brook,
Sudbury, Middlesex County
September 16, 2021

CMR 9.05(3) further prescribe that certain maintenance, repairs, and minor modifications as described at 310 CMR 9.22 of fill or structures for which a grant or license is presently valid, or which is exempt from licensing pursuant to 310 CMR 9.05(3)(b)-(h) do not require a license.

The Department notes the applicant's assertion on page 1 of the supplemental materials referenced herein:

It is also important to note that this Rail Trail will be a linear recreation corridor, and no access to the streams or brooks will be provided. There are no water-dependent uses, such as fishing or walking the shoreline, currently or proposed at these locations.

Upland areas landward of the Ordinary High-Water Line of Hop Brook and Pantry Brook are not geographic areas subject to jurisdiction of Chapter 91; the current and proposed uses of areas outside of Chapter 91 jurisdiction were not evaluated or considered as part of the Department's review of the Request for Determination of Applicability or the request for Minor Project Modification.

Based on a review of the initial application materials and the supplemental information provided on August 31, 2021, the Department determines that the bridge replacements as proposed therein meet the exemption at 310 CMR 9.05(3)(f) and standards at 310 CMR 9.22(3)(a) and (b) and are therefore authorized as an administrative approval through a Minor Project Modification, provided there is no impact to water-dependent use of the waterways. Please retain this letter as documentation of the Chapter 91 approval for the referenced activities.

This Determination does not relieve the Applicant from complying with all applicable Federal, State, or local statutes, ordinances, by-laws, or regulations.

Issued by the Department of Environmental Protection Waterways Regulation Program.

IN WITNESS WHEREAS, said Department of Environmental Protection have hereunto set their hands this 16 day of September in the year 2021



Daniel J. Padien
Program Chief
Waterways Regulation Program

Encl: Notice of Appeal Rights

Bruce Freeman Rail Trail Bridge Nos. S-31-007 and S-31-013, Waters of Hop Brook and Pantry Brook,
Sudbury, Middlesex County
September 16, 2021

NOTICE OF APPEAL RIGHTS

Who has the right to appeal?

The following persons shall have the right to an adjudicatory hearing concerning this decision by the Department to grant or deny a license or permit, in accordance with 310 CMR 9.17(1): (a) an Applicant who has demonstrated property rights in the lands in question, or which is a public agency; (b) any person aggrieved by the decision of the Department to grant a license or permit who has submitted written comments within the public comment period; (c) ten (10) residents of the Commonwealth who, pursuant to M.G.L. Chapter 30A, § 10A, have submitted comments within the public comment period with at least 5 of the 10 residents residing in the municipality(s) in which the license or permitted activity is located. The appeal shall clearly and specifically state the facts and grounds for the appeal and the relief sought, and each appealing resident shall file an affidavit stating the intent to be part of the group and to be represented by its authorized representative; (d) the municipal official in the affected municipality who has submitted written comments within the public comment period; and (e) MassCZM, for any project identified in 310 CMR 9.13(2)(a) for MassCZM participation or, in an Ocean Sanctuary, if it has filed a notice of participation within the public comment period.

How can I request an adjudicatory hearing?

A person requesting an adjudicatory hearing must submit a "Notice of Claim" to the Department, with a copy of the MassDEP Adjudicatory Hearing Fee Transmittal Form and include the details specified below, within twenty-one (21) days of the date of issuance of this decision. The MassDEP Transmittal Form and filing instructions are available at the following website: <https://www.mass.gov/how-to/file-an-appeal-with-massdeps-office-of-appeals-and-dispute-resolution>. The Notice of Claim must be made in writing and sent by certified mail or hand delivery to:

MassDEP
Case Administrator
One Winter Street, 2nd Floor
Boston, MA 02108

A copy of the complete Notice of Claim must be sent at the same time by certified mail or hand delivery to: (1) the Applicant, (2) the municipal official of the city or town where the project is located, and (3) the issuing office of the MassDEP, which in this case is located at:

MassDEP
Waterways Regulation Program
One Winter Street, 5th Floor
Boston, MA 02108

The MassDEP Adjudicatory Hearing Fee Transmittal Form and a valid check payable to "The Commonwealth of Massachusetts" in the amount of one hundred dollars (\$100) must be mailed to:

MassDEP
Commonwealth Master Lockbox
P.O. Box 4062
Boston, MA 02211

What information must be included in the hearing request?

Pursuant to 310 CMR 9.17(3), any Notice of Claim requesting an adjudicatory hearing must include the following:

- (a) the MassDEP Waterways Application File Number;
- (b) the complete name, address, fax number and telephone number of the Applicant;
- (c) the address of the project;
- (d) the complete name, address, fax number, and telephone number of the party filing the request and, if represented by counsel, the name, address, fax number, and phone number of the attorney;

Bruce Freeman Rail Trail Bridge Nos. S-31-007 and S-31-013, Waters of Hop Brook and Pantry Brook,
Sudbury, Middlesex County
September 16, 2021

- (e) if claiming to be a person aggrieved, the specific facts that demonstrate that the party satisfies the definition of “aggrieved person” found in 310 CMR 9.02;
- (f) a clear statement that a formal adjudicatory hearing is being requested;
- (g) a clear statement of the facts which are the grounds for the proceedings, the specific objections to the MassDEP’s written decision, and the relief sought through the adjudicatory hearing, including specifically the changes desired in the final written decision; and
- (h) a statement that a copy of the request has been sent to: the Applicant and the municipal official of the city or town where the project is located.

Dismissal of request

The request for appeal will be dismissed if the filing fee is not paid unless the appellant is exempt or is granted a waiver.

Exemptions

The filing fee is not required if the appellant is a city or town (or municipal agency), county, or district of the Commonwealth of Massachusetts, or a municipal housing authority.

Waiver

The Department may waive the adjudicatory hearing filing fee pursuant to 310 CMR 4.06(2) for a person who shows that paying the fee will create an undue financial hardship. A person seeking a waiver must file an affidavit setting forth the facts believed to support the claim of undue financial hardship together with the hearing request as provided above.

Appendix E

Illicit Impact Statement



Illicit Discharge Statement
Bruce Freeman Rail Trail Construction
Sudbury, MA

No illicit discharges are proposed to enter the redeveloped stormwater system located within the Bruce Freeman Rail Trail project area. Inspection procedures outlined in the Long-Term Operation and Maintenance Plan will be strictly followed to ensure contaminations 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. Town of Sudbury DPW personnel are informed of the illicit discharge detection and elimination procedures and that no illicit discharges are allowed to enter the stormwater system.

Appendix F

Proposed Project Plans

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION

PLAN AND PROFILE OF
BRUCE FREEMAN RAIL TRAIL
IN THE TOWN OF
SUDBURY & CONCORD
MIDDLESEX COUNTY

FEDERAL AID PROJECT NO. XXX-XXXX(XXX)X

PERMITTING PLAN SET NOT FOR CONSTRUCTION

100% SUBMITTAL

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	1	316
PROJECT FILE NO.		608164	

TITLE SHEET & INDEX

THE COMMONWEALTH OF MASSACHUSETTS DEPARTMENT OF TRANSPORTATION STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES 2021 EDITION, THE OCTOBER 2017 CONSTRUCTION STANDARD DETAILS, THE 2015 OVERHEAD SIGNAL STRUCTURE AND FOUNDATION STANDARD DRAWINGS, MASSDOT TRAFFIC MANAGEMENT PLANS AND DETAIL DRAWINGS, THE LATEST MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS WITH MASSACHUSETTS AMENDMENTS, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE 1968 STANDARD DRAWINGS FOR TRAFFIC SIGNALS AND HIGHWAY LIGHTING, AND THE LATEST EDITION OF THE AMERICAN STANDARD FOR NURSERY STOCK, WILL GOVERN.

PERMITTING PLAN
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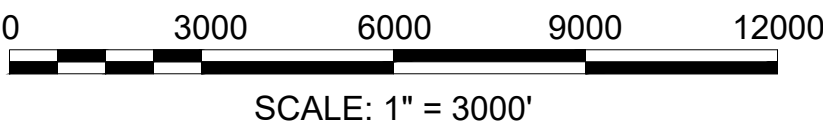
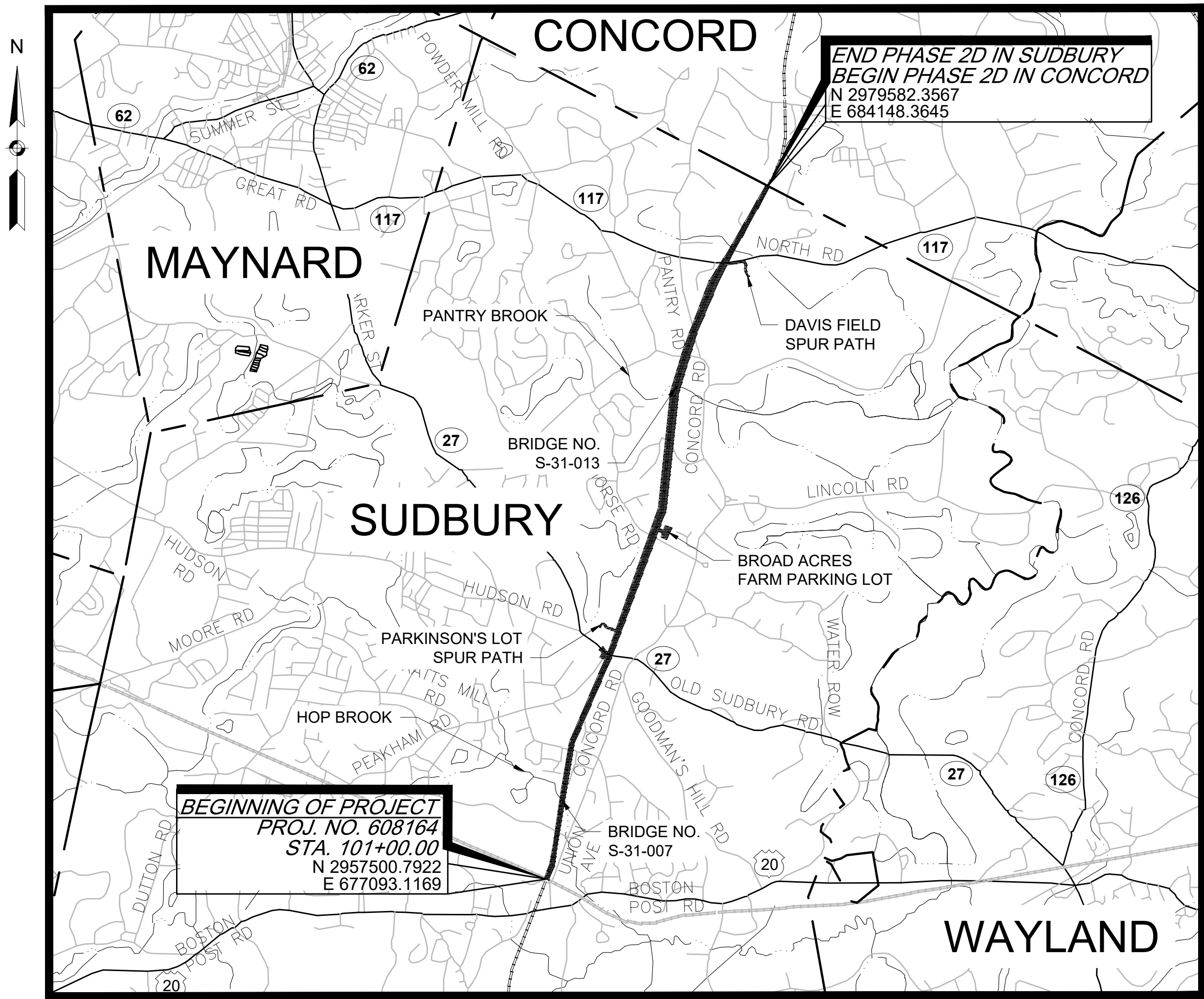
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DESCRIPTION

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LEGEND & ABBREVIATIONS*
KEY PLAN & BORING LOCATIONS*
BORING LOGS
TYPICAL SECTIONS*
ENVIRONMENTAL IMPACTS*
CONSTRUCTION PLANS*
PROFILES*
CURB & BASELINE TIE PLANS
GRADING PLANS*
PAVEMENT MARKING & SIGNING PLANS
TRAFFIC SIGN SUMMARY
TRAFFIC SIGNAL PLANS
TEMPORARY TRAFFIC CONTROL PLANS
DRAINAGE & UTILITY PLANS*
WETLAND REPLICATION PLANS*
CONSTRUCTION DETAILS*
WHEELCHAIR RAMP DETAILS*
BRIDGE PLANS*
CROSS SECTIONS*

* INDICATES TO BE INCLUDED IN PERMITTING PLANS



LENGTH OF PROJECT = 23,542.00 FEET = 4.459 MILES

DATE	DESCRIPTION	REV #
2-18-2022	FINAL NOI SUBMISSION	2
1-18-2022	100% DESIGN SUBMISSION	1
12-22-2021	NOI SUBMISSION	1
5-12-2021	75% DESIGN SUBMISSION	1



RECOMMENDED FOR APPROVAL

CHIEF ENGINEER DATE

DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED:

DIVISION ADMINISTRATOR DATE



FUSS & O'NEILL

190 HIGH STREET
BOSTON, MA 02110
617.282.4675
www.fando.com

GENERAL ABBREVIATIONS

ABAN	ABANDON
ADJ	ADJUST
APPROX	APPROXIMATE
A.C.	ASPHALT CONCRETE
ACCM PIPE	ASPHALT COATED CORRUGATED METAL PIPE
BIT.	BITUMINOUS
BC	BOTTOM OF CURB
BD.	BOUND
BL	BASELINE
BLDG	BUILDING
BM	BENCHMARK
BO	BY OTHERS
BOS	BOTTOM OF SLOPE
BR.	BRIDGE
CC	CEMENT CONCRETE
CCM	CEMENT CONCRETE MASONRY
CEM	CEMENT
CI	CURB INLET
CLF	CHAIN LINK FENCE
CL	CENTERLINE
CO.	COUNTY
CONC	CONCRETE
CONT	CONTINUOUS / CONTINUED
CONST	CONSTRUCTION
CR GR	CROWN GRADE
DIA	DIAMETER
DWY	DRIVEWAY
ELEV (or EL.)	ELEVATION
EMB	EMBANKMENT
EOP	EDGE OF PAVEMENT
EQ	EQUAL
EXIST (or EX)	EXISTING
EXC	EXCAVATION
FDN.	FOUNDATION
FDP	FULL DEPTH PAVEMENT
FLDSTN	FIELDSTONE
GAR	GARAGE
GD	GROUND
GRAN	GRANITE
GRAV	GRAVEL
GRD	GUARD
HMA	HOT MIX ASPHALT
HOR	HORIZONTAL
HWY	HIGHWAY
JCT	JUNCTION
LOAM	LOAM BORROW
LSA	LANDSCAPED AREA
LT	LEFT
MAHWL	MEAN AVERAGE HIGH WATER LINE
MAX	MAXIMUM
MB	MAILBOX
MHB	MASSACHUSETTS HIGHWAY BOUND
MIN	MINIMUM
MOD	MODIFIED
MSE	MECHANICALLY STABILIZED EARTH
NERR	NEW ENGLAND RAILROAD
NIC	NOT IN CONTRACT
NO.	NUMBER
NTS	NOT TO SCALE
O.C.	ON CENTER
O.D.	OUTSIDE DIAMETER
P.G.L.	PROFILE GRADE LINE
PREV	PREVIOUS/PREVIOUSLY
PROJ	PROJECT
PROP	PROPOSED
PSB	PLANTABLE SOIL BORROW
PVMT	PAVEMENT
R&D	REMOVE AND DISCARD
R&R	REMOVE AND RESET
R&S	REMOVE AND STACK
RD	ROAD
RDWY	ROADWAY
REB	REBUILD
REM	REMOVE
REMOD	REMODEL
RET	RETAIN
RET WALL	RETAINING WALL
ROW	RIGHT OF WAY
RR	RAILROAD
RT	RIGHT
SB	STONE BOUND
SHLD	SHOULDER
SHLO/S.H.L.O.	STATE HIGHWAY LAYOUT LINE

GENERAL ABBREVIATIONS (CONT)

ST	STREET
STA	STATION
STD	STANDARD
SW	SIDEWALK
TEMP	TEMPORARY
TC	TOP OF CURB
TOS	TOP OF SLOPE
TRANS	TRANSITION
TRM	TURF REINFORCING MAT
TYP	TYPICAL
VAR	VARIES
VERT	VERTICAL
WCR	WHEEL CHAIR RAMP
WP	WORKING POINT
X-SECT	CROSS SECTION

UTILITY ABBREVIATIONS

CB	CATCH BASIN
CBCI	CATCH BASIN WITH CURB INLET
CIP	CAST IRON PIPE
CIT	CHANGE IN TYPE
CMP	CORRUGATED METAL PIPE
CSP	CORRUGATED STEEL PIPE
DI	DROP INLET
DIP	DUCTILE IRON PIPE
FES	FLARED END SECTION
F&C	FRAME AND COVER
F&G	FRAME AND GRATE
GG	GAS GATE
GI	GUTTER INLET
GIP	GALVANIZED IRON PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HDW	HEADWALL
HYD	HYDRANT
INV	INVERT
LB	LEACH BASIN
LP	LIGHT POLE
MH	MANHOLE
MW	MONITORING WELL
OHW	OVERHEAD WIRE
PVC	POLYVINYLCHLORIDE PIPE
PWW	PAVED WATER WAY
RCP	REINFORCED CONCRETE PIPE
SMH	SEWER MANHOLE
TSV&B	TAPPING SLEEVE VALVE & BOX
UP	UTILITY POLE
WG	WATER GATE
WIP	WROUGHT IRON PIPE
WM	WATER METER/WATER MAIN

ALIGNMENT & GRADING ABBREVIATIONS

CC	CENTER OF CURVE
HP	HIGH POINT
I.T.	INTERSECTION OF TANGENT
LP	LOW POINT
PC	POINT OF CURVATURE
PCC	POINT OF COMPOUND CURVATURE
PI	POINT OF INTERSECTION
PNT	POINT
POC	POINT ON CURVE
POT	POINT ON TANGENT
PRC	POINT OF REVERSE CURVATURE
PT	POINT OF TANGENCY
∟PT	ANGLE POINT
R	RADIUS OF CURVATURE
T	TANGENT DISTANCE OF CURVE
TAN	TANGENT
25.45	SPOT ELEVATION

PROFILE ABBREVIATIONS

AD	ALGEBRAIC DIFFERENCE IN RATES OF GRADE
HSD	HORIZONTAL SIGHT DISTANCE
K	RATE OF VERTICAL CURVATURE
L	LENGTH OF CURVE
PVC	POINT OF VERTICAL CURVATURE
PVCC	POINT OF VERTICAL COMPOUND CURVATURE
PVI	POINT OF VERTICAL INTERSECTION
PVRC	POINT OF VERTICAL REVERSE CURVATURE
PVT	POINT OF VERTICAL TANGENCY
SSD	STOPPING SIGHT DISTANCE
VC	VERTICAL CURVE

TRAFFIC SIGNAL

CAB.	CABINET
CCVE	CLOSED CIRCUIT VIDEO EQUIPMENT
DW	STEADY DON'T WALK
FDW	FLASHING DON'T WALK
FR	FLASHING CIRCULAR RED
↵ FR↵	FLASHING RED LEFT ARROW
↵ FR↵	FLASHING RED RIGHT ARROW
FY	FLASHING CIRCULAR YELLOW
↵ FY↵	FLASHING YELLOW LEFT ARROW
↵ FY↵	FLASHING YELLOW RIGHT ARROW
G	STEADY CIRCULAR GREEN
↵ G↵	STEADY GREEN LEFT ARROW
↵ G↵	STEADY GREEN RIGHT ARROW
GSL	STEADY GREEN SLASH LEFT ARROW
GSR	STEADY GREEN SLASH RIGHT ARROW
↵ G↵	STEADY GREEN VERTICAL ARROW
OL	OVERLAP
PED	PEDESTRIAN
PTZ	PAN, TILT, ZOOM
R	STEADY CIRCULAR RED
↵ R↵	STEADY RED LEFT ARROW
↵ R↵	STEADY RED RIGHT ARROW
TR SIG	TRAFFIC SIGNAL
TSC	TRAFFIC SIGNAL CONDUIT
W	STEADY WALK
Y	STEADY CIRCULAR YELLOW
↵ Y↵	STEADY YELLOW LEFT ARROW
↵ Y↵	STEADY YELLOW RIGHT ARROW

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	2	319
PROJECT FILE NO.		608164	

GENERAL NOTES

GENERAL NOTES:

- EXISTING CONDITIONS AND TOPOGRAPHICAL INFORMATION FROM AN ACTUAL FIELD SURVEY CONDUCTED BY VHB, INC. IN DECEMBER 2015 THROUGH APRIL 2016. SUPPLEMENTARY FIELD SURVEY WAS CONDUCTED BY GCG ASSOCIATES FROM NOVEMBER 2020 THROUGH DECEMBER 2020.
- THE HORIZONTAL CONTROL IS BASED ON THE MASSACHUSETTS MAINLAND STATE PLANE COORDINATE SYSTEM AND THE NATIONAL GEODETIC SURVEY (NAD83). ALL ELEVATION IS US FEET, REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
- THE CONTRACTOR SHALL VERIFY ALL EXISTING DIMENSIONS AND GRADES IN THE FIELD BEFORE COMMENCING WORK AND PROMPTLY NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
- INFORMATION REGARDING THE LOCATION OF EXISTING UTILITIES HAS BEEN BASED UPON AVAILABLE INFORMATION AND MAY BE INCOMPLETE, AND WHERE SHOWN SHOULD BE CONSIDERED APPROXIMATE. NO GUARANTEE TO THE ACCURACY OF THE EXISTING UTILITIES FACILITIES SHOWN IN THIS PROJECT IS EXPRESSED OR IMPLIED UNLESS OTHERWISE NOTED. CONTRACTOR SHALL CONTACT "Mass DIG-SAFE", 1-888-344-7233. CONTRACTOR SHALL MAINTAIN MARKINGS WHERE NEEDED DURING PROJECT. ALL UTILITY LOCATIONS THAT DO NOT MATCH THE VERTICAL OR HORIZONTAL CONTROL SHOWN ON THE PLANS SHALL IMMEDIATELY BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION. THE CONTRACTOR SHALL VERIFY LOCATIONS OF UTILITIES AND SERVICE LATERALS PRIOR TO CONSTRUCTION. ANY CONFLICTS WITH LOCATIONS OF LIGHT POLES, TREES, ETC. SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION.
- DRAINAGE ELEVATIONS ARE PROVIDED FOR DESIGN PURPOSES ONLY. THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH THE PROPOSED DRAINAGE DESIGN. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER. ONLY AFTER THE CONTRACTOR VERIFIES ELEVATIONS FOR THE CONSTRUCTABILITY OF THE DRAINAGE SYSTEM SHALL ANY STRUCTURES BE ORDERED. ANY FIELD ADJUSTMENTS TO LINE & GRADE UP TO A DEPTH OF 5' SHALL BE INCLUDED IN THE COST OF THE PIPE. PIPE EXCAVATION GREATER THAN 5' WILL BE PAID UNDER CLASS B TRENCH EXCAVATION.
- THE CONTRACTOR SHALL VERIFY BY TEST PIT, THE LOCATIONS OF EXISTING UTILITIES WHICH MAY CONFLICT WITH PROPOSED CONDUIT AND SIGNAL EQUIPMENT. ANY FIELD ADJUSTMENTS REQUIRED WILL BE MADE AS APPROVED OR DIRECTED BY THE ENGINEER.
- WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE ENGINEER FOR RESOLUTION OF THE CONFLICT.
- THE CONTRACTOR SHALL ALTER THE MASONRY OF THE TOP SECTION OF ALL EXISTING DRAINAGE AND SEWER STRUCTURES AS NECESSARY FOR CHANGES IN GRADE, AND RESET ALL WATER AND DRAINAGE FRAMES, GRATES AND BOXES TO THE PROPOSED FINISH SURFACE GRADE. REQUIRED NEW MASONRY SHALL BE CLAY BRICK.
- THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF GAS, ELECTRIC, TELEPHONE AND ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES.
- EXISTING UTILITY POLES WILL BE RELOCATED BY OTHERS IF REQUIRED.
- PRIOR TO ONSET OF TREE REMOVAL ACTIVITIES, THE CONTRACTOR, RESIDENT ENGINEER AND MASSDOT LANDSCAPE ARCHITECT AND TOWN REPRESENTATIVE SHALL WALK SITE TO IDENTIFY TREES TO BE REMOVED.
- AREAS OUTSIDE THE LIMITS OF PROPOSED WORK DISTURBED BY THE CONTRACTOR'S OPERATIONS SHALL BE RESTORED BY THE CONTRACTOR TO THEIR ORIGINAL CONDITION AT NO EXPENSE TO THE OWNER.
- THE TERM "PROPOSED" (PROP) MEANS WORK TO BE CONSTRUCTED USING NEW MATERIALS OR, WHERE APPLICABLE, RE-USING EXISTING MATERIALS IDENTIFIED AS "REMOVE AND RESET" (R&R).
- JOINTS BETWEEN NEW ASPHALT CONCRETE ROADWAY PAVEMENT AND SAWCUT EXISTING PAVEMENT SHALL BE SEALED WITH BITUMEN AND BACKSANDDED.
- AFTER MILLING OPERATIONS AND PRIOR TO PAVING THE SUPERPAVE INTERMEDIATE OR SURFACES COURSES THE ENGINEER SHALL EVALUATE THE MILLED SURFACE AND SHALL APPLY THE APPROPRIATE REPAIR METHOD IF REQUIRED.
- EXISTING SIGNS WITHIN THE PROJECT LIMITS SHALL BE RETAINED UNLESS INDICATED OTHERWISE ON THE DRAWINGS.
- IF SUITABLE, ALL EXISTING GRANITE CURB & EDGING SHALL BE RE-USED IN THE PROPOSED WORK, EXCEPT CURVED STONES OF A DIFFERENT RADIUS THAN PROPOSED CURB.
- ALL PROPOSED HOT MIX ASPHALT CURB SHALL BE MASSDOT TYPE 3.
- ALL EXISTING STATE, COUNTY, CITY, AND TOWN LOCATION LINES AND PRIVATE PROPERTY LINES HAVE BEEN ESTABLISHED FROM AVAILABLE INFORMATION AND THEIR EXACT LOCATIONS ARE NOT GUARANTEED.
- ALL PROPOSED BOUNDS SHALL BE PLACED BY A LICENSED PROFESSIONAL SURVEYOR. THE CONTRACTOR SHALL EXERCISE DUE CARE WHEN WORKING AROUND ALL PROPERTY BOUNDS WHICH ARE TO REMAIN. SHOULD ANY DAMAGE TO A BOUND RESULT FROM THE ACTIONS OF THE CONTRACTOR, THE CONTRACTOR SHALL HAVE THE BOUND REPLACED AND/OR REALIGNED BY A LICENSED PROFESSIONAL SURVEYOR AS DIRECTED BY THE ENGINEER AT NO ADDITIONAL COST.
- DISPOSAL OF ALL SURPLUS MATERIAL SHALL BE AS APPROVED BY THE ENGINEER AND OWNER.
- LATERAL DRAIN PIPES SHALL BE INSTALLED WITH A PITCH OF 0.01 FOOT PER FOOT (MINIMUM) UNLESS NOTED OTHERWISE ON THE PLANS.

GENERAL SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		JERSEY BARRIER
		CATCH BASIN
		CATCH BASIN CURB INLET
		FLAG POLE
		GAS PUMP
		MAIL BOX
		POST SQUARE
		POST CIRCULAR
		WELL
		ELECTRIC HANDHOLE
		FENCE GATE POST
		GAS GATE
		BORING HOLE
		MONITORING WELL
		TEST PIT
		HYDRANT
		LIGHT POLE
		COUNTY BOUND
		GPS POINT
		CABLE MANHOLE
		DRAINAGE MANHOLE
		ELECTRIC MANHOLE
		GAS MANHOLE
		MISC MANHOLE
		SEWER MANHOLE
		TELEPHONE MANHOLE
		WATER MANHOLE
		MASSACHUSETTS HIGHWAY BOUND
		MONUMENT
		STONE BOUND
		TOWN OR CITY BOUND
		TRAVERSE OR TRIANGULATION STATION
		TROLLEY POLE OR GUY POLE
		TRANSMISSION POLE
		UTILITY POLE W/ FIREBOX
		UTILITY POLE WITH DOUBLE LIGHT
		UTILITY POLE W / 1 LIGHT
		UTILITY POLE
		BUSH
		TREE
		STUMP
		SWAMP / MARSH
		WATER GATE
		PARKING METER
		OVERHEAD CABLE/WIRE
		CURBING
		CONTOURS (ON-THE-GROUND SURVEY DATA)
		CONTOURS (PHOTOGRAMMETRIC DATA)
		UNDERGROUND DRAIN PIPE (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND ELECTRIC DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND GAS MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND SEWER MAIN (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND TELEPHONE DUCT (DOUBLE LINE 24 INCH AND OVER)
		UNDERGROUND WATER MAIN (DOUBLE LINE 24 INCH AND OVER)
		BALANCED STONE WALL
		GUARD RAIL - STEEL POSTS
		GUARD RAIL - WOOD POSTS
		CHAIN LINK OR METAL FENCE
		WOOD FENCE
		EROSION CONTROL
		DRAINAGE SWALE
		TREE LINE
		SAWCUT LINE
		TOP OR BOTTOM OF SLOPE
		LIMIT OF EDGE OF PAVEMENT OR COLD PLANE AND OVERLAY
		BANK OF RIVER OR STREAM
		BORDER OF WETLAND
		100 FT WETLAND BUFFER
		200 FT RIVERFRONT BUFFER
		STATE HIGHWAY LAYOUT
		TOWN OR CITY LAYOUT
		COUNTY LAYOUT
		RAILROAD SIDELINE
		TOWN OR CITY BOUNDARY LINE
		PROPERTY LINE OR APPROXIMATE PROPERTY LINE
		EASEMENT

TRAFFIC SYMBOLS

EXISTING	PROPOSED	DESCRIPTION
		CONTROLLER PHASE ACTUATED
		TRAFFIC SIGNAL HEAD (SIZE AS NOTED)
		WIRE LOOP DETECTOR (6' x 6' TYP UNLESS OTHERWISE SPECIFIED)
		VIDEO DETECTION CAMERA
		MICROWAVE DETECTOR
		PEDESTRIAN PUSH BUTTON, SIGN (DIRECTIONAL ARROW AS SHOWN) AND SADDLE
		EMERGENCY PREEMPTION CONFIRMATION STROBE LIGHT
		VEHICULAR SIGNAL HEAD
		VEHICULAR SIGNAL HEAD, OPTICALLY PROGRAMMED
		FLASHING BEACON
		PEDESTRIAN SIGNAL HEAD, (TYPE AS NOTED OR AS SPECIFIED)
		RAILROAD SIGNAL
		SIGNAL POST AND BASE (ALPHA-NUMERIC DESIGNATION NOTED)
		MAST ARM, SHAFT AND BASE (ARM LENGTH AS NOTED)
		HIGH MAST POLE OR TOWER
		SIGN AND POST
		SIGN AND POST (2 POSTS)
		MAST ARM WITH LUMINAIRE
		OPTICAL PRE-EMPTION DETECTOR
		CONTROL CABINET, GROUND MOUNTED
		CONTROL CABINET, POLE MOUNTED
		FLASHING BEACON CONTROL AND METER PEDESTAL
		LOAD CENTER ASSEMBLY
		PULL BOX 12"x12" (OR AS NOTED)
		ELECTRIC HANDHOLE 12"x24" (OR AS NOTED)
		TRAFFIC SIGNAL CONDUIT

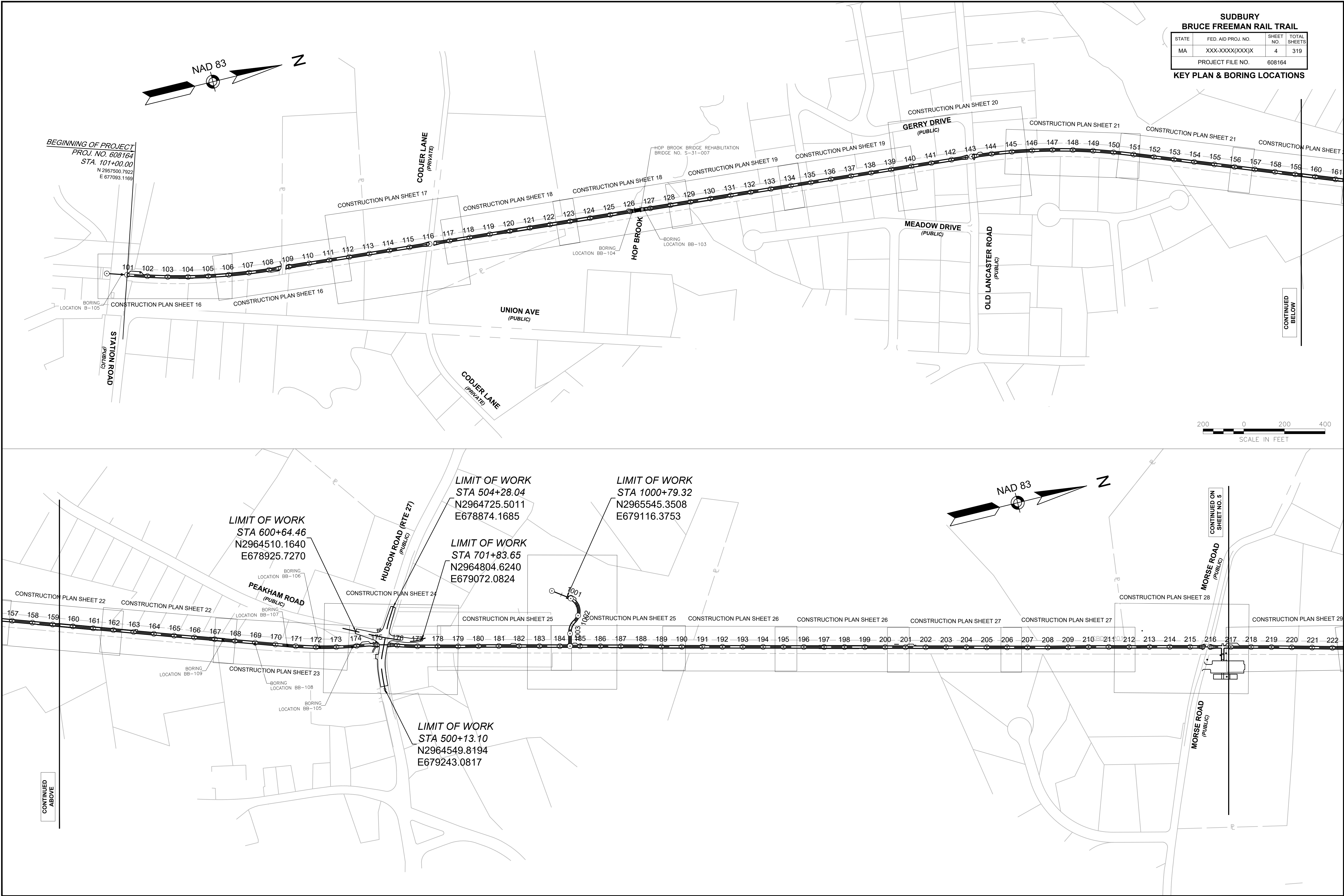
PAVEMENT MARKINGS SYMBOLS

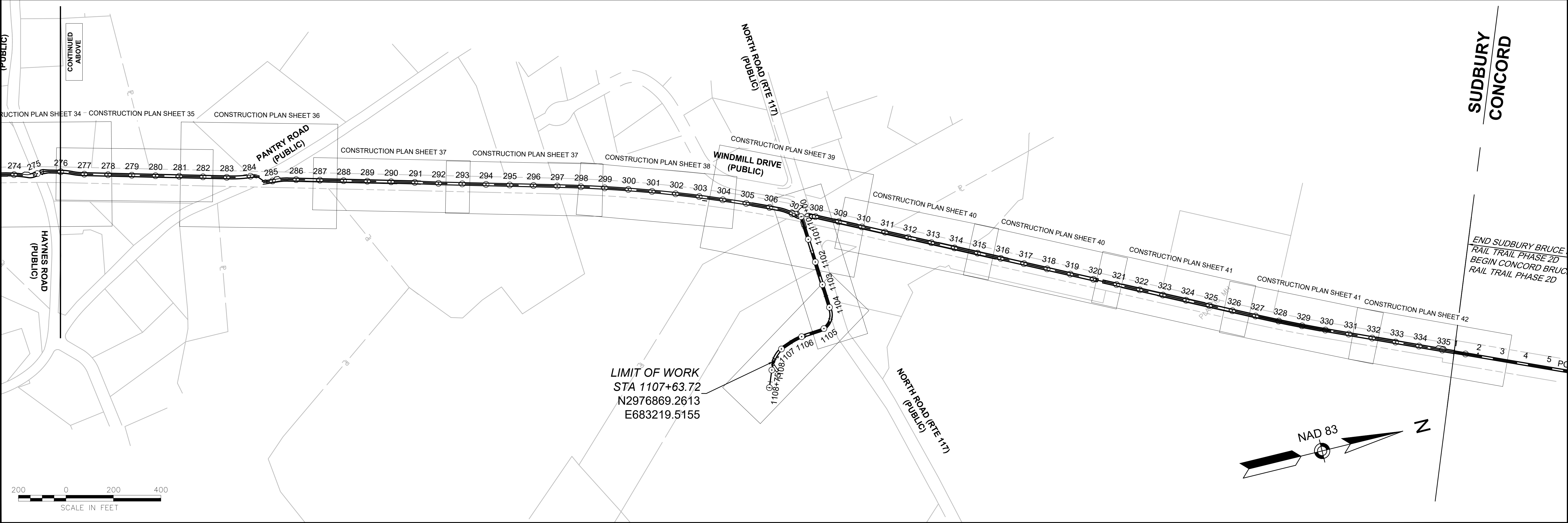
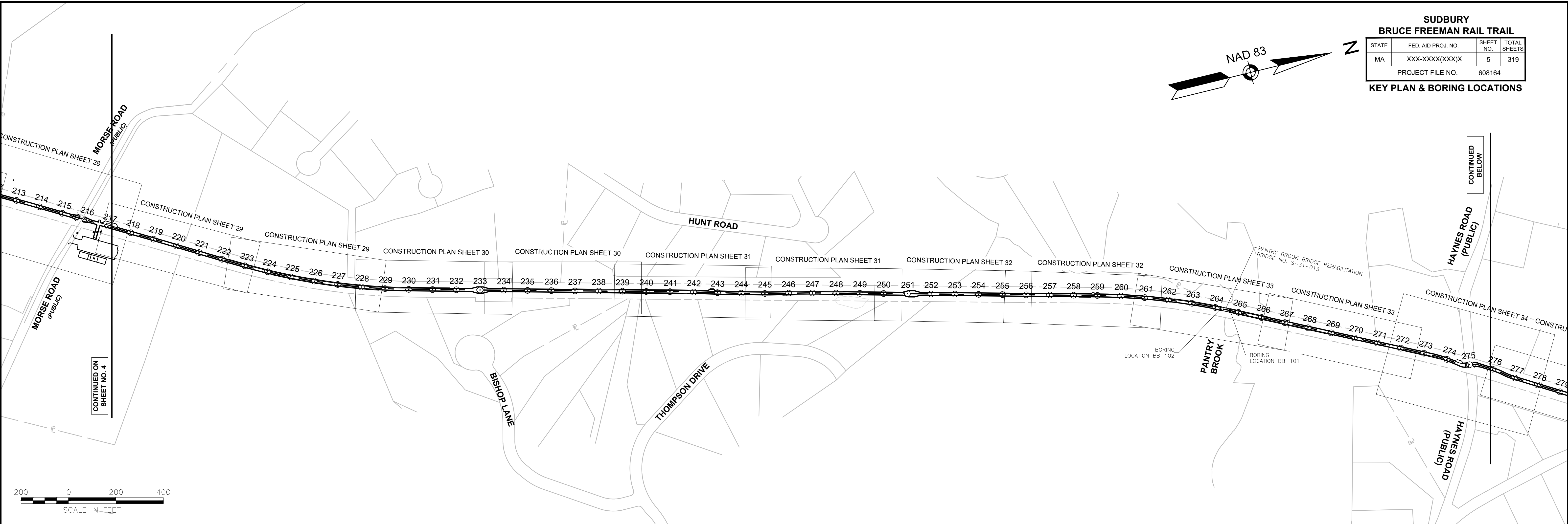
EXISTING	PROPOSED	DESCRIPTION
		PAVEMENT ARROW - WHITE
		LEGEND "ONLY" - WHITE
		STOP LINE
		CROSSWALK
		SOLID WHITE LINE
		SOLID YELLOW LINE
		BROKEN WHITE LINE
		BROKEN YELLOW LINE
		DOTTED WHITE LINE
		DOTTED YELLOW LINE
		DOTTED WHITE LINE EXTENSION
		DOTTED YELLOW LINE EXTENSION
		DOUBLE WHITE LINE
		DOUBLE YELLOW LINE
		LONG DASHED YELLOW LINE

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	4	319
PROJECT FILE NO.		608164	

KEY PLAN & BORING LOCATIONS





SUDBURY BRUCE FREEMAN RAIL TRAIL			
STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	10	319
PROJECT FILE NO.		608164	
TYPICAL SECTIONS			

PAVEMENT NOTES:

- PROPOSED SHARED-USE PATH**
SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE - 9.5 (SSC - 9.5)
INTERMEDIATE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE - 19.0 (SIC - 19.0)
SUBBASE: 4" to 8" GRAVEL BORROW, TYPE b (FOR LEVELING)
OVER RESHAPED EXISTING RAILROAD BALLAST
- PROPOSED PARKING LOT FULL DEPTH PAVEMENT**
SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE - POLYMER (SSC - 12.5 - P) - OVER
BASE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE (SIC - 19.0) - OVER
FOUNDATION: 8" GRAVEL BORROW, TYPE b
- PROPOSED FULL DEPTH CONSTRUCTION (LESS THAN 4.00' WIDE) - PEAKHAM ROAD & HUDSON ROAD**
SURFACE: 1-3/4" SUPERPAVE SURFACE COURSE - POLYMER (SSC - 12.5 - P) - OVER
INTERMEDIATE: 2-1/2" SUPERPAVE INTERMEDIATE COURSE (SIC - 19.0) - OVER
BASE: 6" HIGH EARLY STRENGTH CEMENT CONCRETE BASE COURSE 4000psi, 610, 3/4" OVER
SUBBASE: 8" GRAVEL BORROW, TYPE b.
- PROPOSED PAVEMENT MILLING & OVERLAY - PEAKHAM ROAD & HUDSON ROAD**
1-3/4" PAVEMENT MILLING
1-3/4" SUPERPAVE SURFACE COURSE - POLYMER (SSC - 12.5 - P)
- PROPOSED HOT MIX ASPHALT SIDEWALK & DRIVEWAY**
SURFACE: 1-1/2" SUPERPAVE SURFACE COURSE (SIC - 9.5) - OVER
2-1/2" SUPERPAVE INTERMEDIATE COURSE (SIC - 12.5)
FOUNDATION: 8" GRAVEL BORROW, TYPE b
- PROPOSED CEMENT CONCRETE WALK, REST AREA & WHEELCHAIR RAMP**
SURFACE: 4" CEMENT CONCRETE AIR ENTRAINED 4000 PSI, 3/4", 610
SUBBASE: 8" GRAVEL BORROW, TYPE b

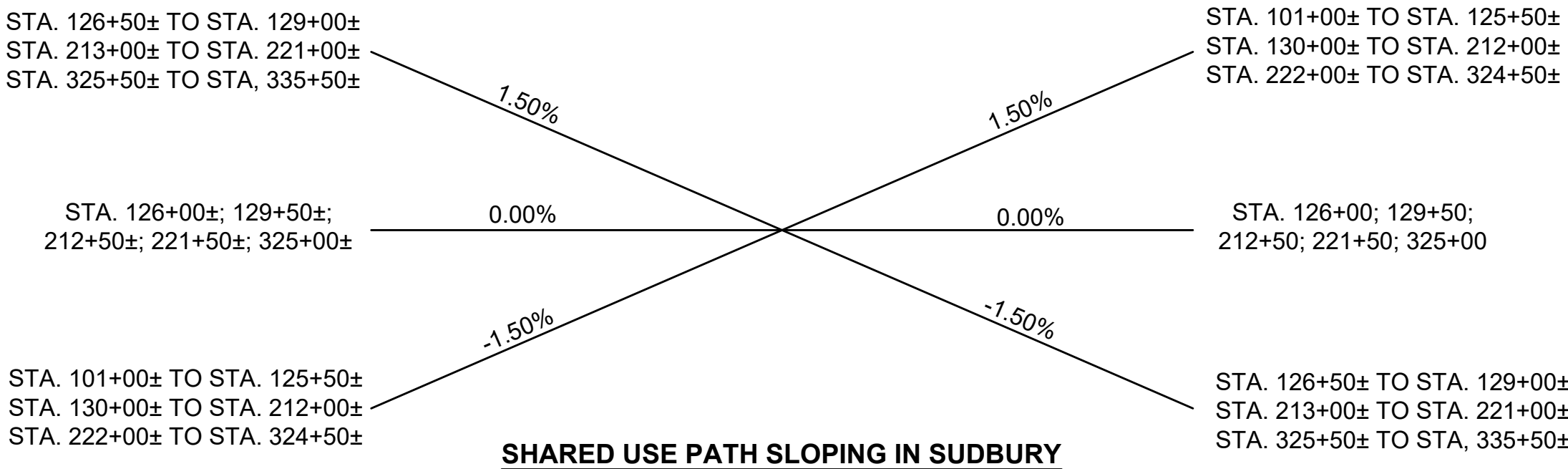
NOTES: EXIST. GRAVEL/BALLAST SUBGROUND MATERIAL DETERMINED BY THE ENGINEER TO BE SUITABLE SHALL REMAIN. THE DEPTH OF THE GRAVEL BORROW WILL BE AS REQUIRED BASED ON THE PROPOSED SUB-BASE ELEVATIONS.

AFTER REMOVAL OF STEEL RAILS AND WOOD TIMBER, ROUGH GRADE AND COMPACT SUBGROUND AREA. THEN PLACE AND COMPACT GRAVEL BORROW SUB-BASE MATERIAL IN MULTIPLE LIFTS.

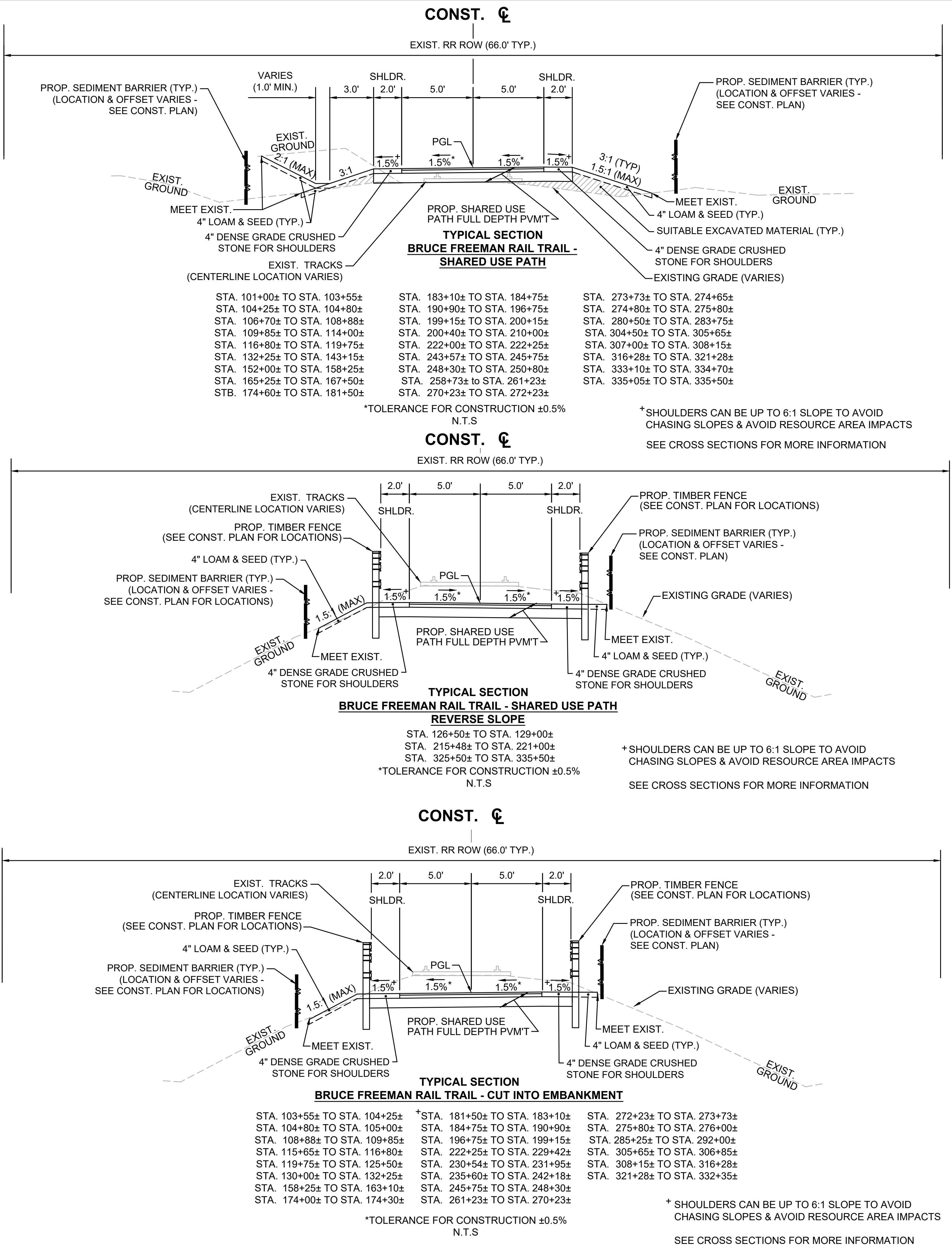
ASPHALT EMULSION FOR TACK COAT AND HMA JOINT SEALANT SHALL BE APPLIED PER SECTION 450 QA OF THE SPECIAL PROVISIONS.

HMA FOR PATCHING SHALL BE USED FOR ALL PERMANENT, PARTIAL, AND FULL DEPTH PAVEMENT REPAIRS OF UNSOUND PAVEMENT PER SECTION 450 IN AREAS OUTSIDE OF PROP. OSED FULL DEPTH RECLAMATION OR RECONSTRUCTION ROADWAY AREAS.

HMA FOR MISCELLANEOUS WORK SHALL BE USED FOR ALL TEMPORARY CONSTRUCTION, TAPER RAMPS, CURB CUT RAMPS, TEMPORARY TRENCH REPAIR, ETC.



NOTE: 1. THE SECTIONS OF PROPOSED ROADWAY NOT COVERED IN THE RANGE OF STATIONS ASSOCIATED WITH THE TYPICAL SECTIONS ARE EITHER IN TRANSITION OR ARE LOCATED AT INTERSECTIONS AND THEREFOR HAVE NOT BEEN SHOWN. REFER TO CROSS SECTION SHEETS FOR MORE DETAILS.

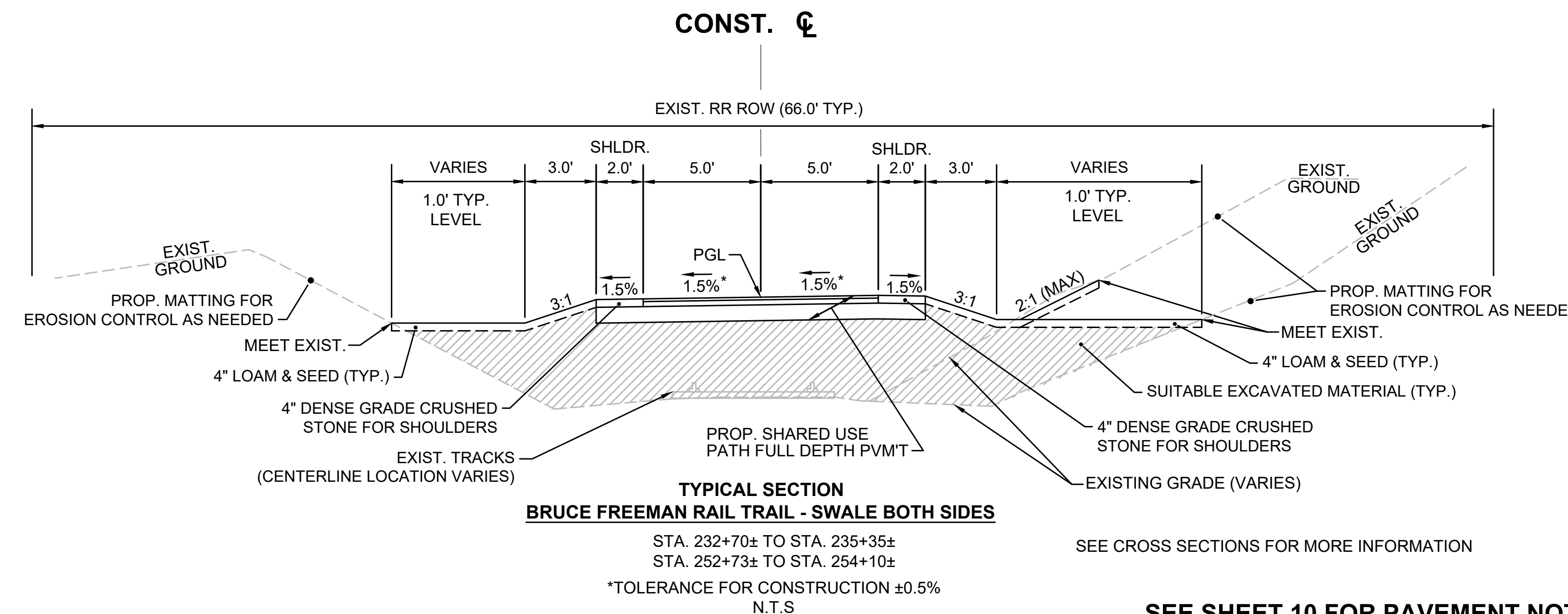
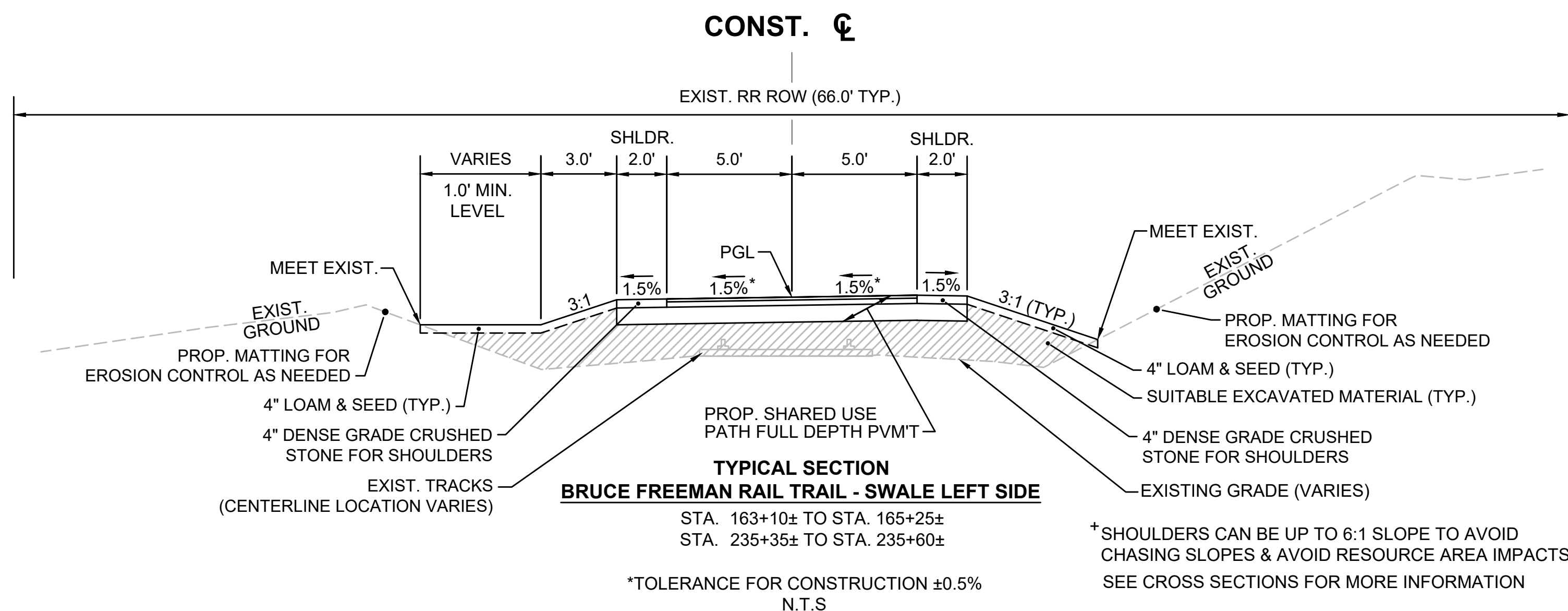
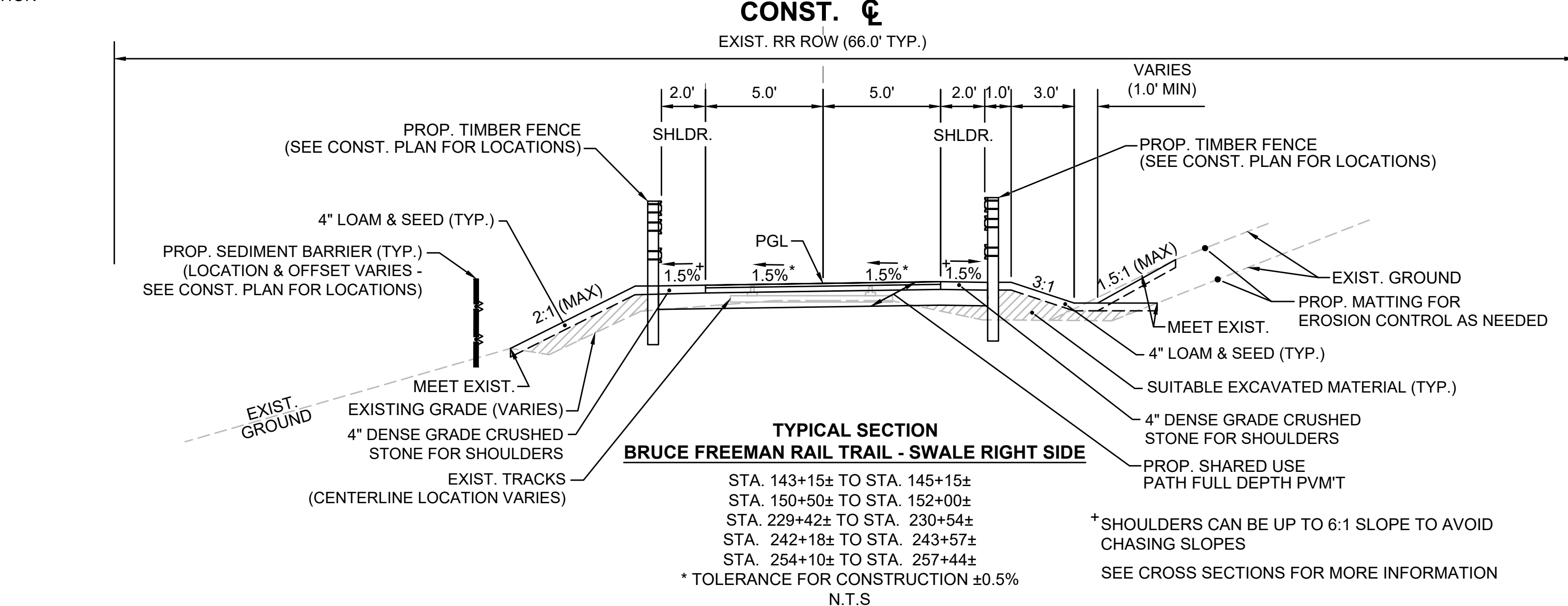
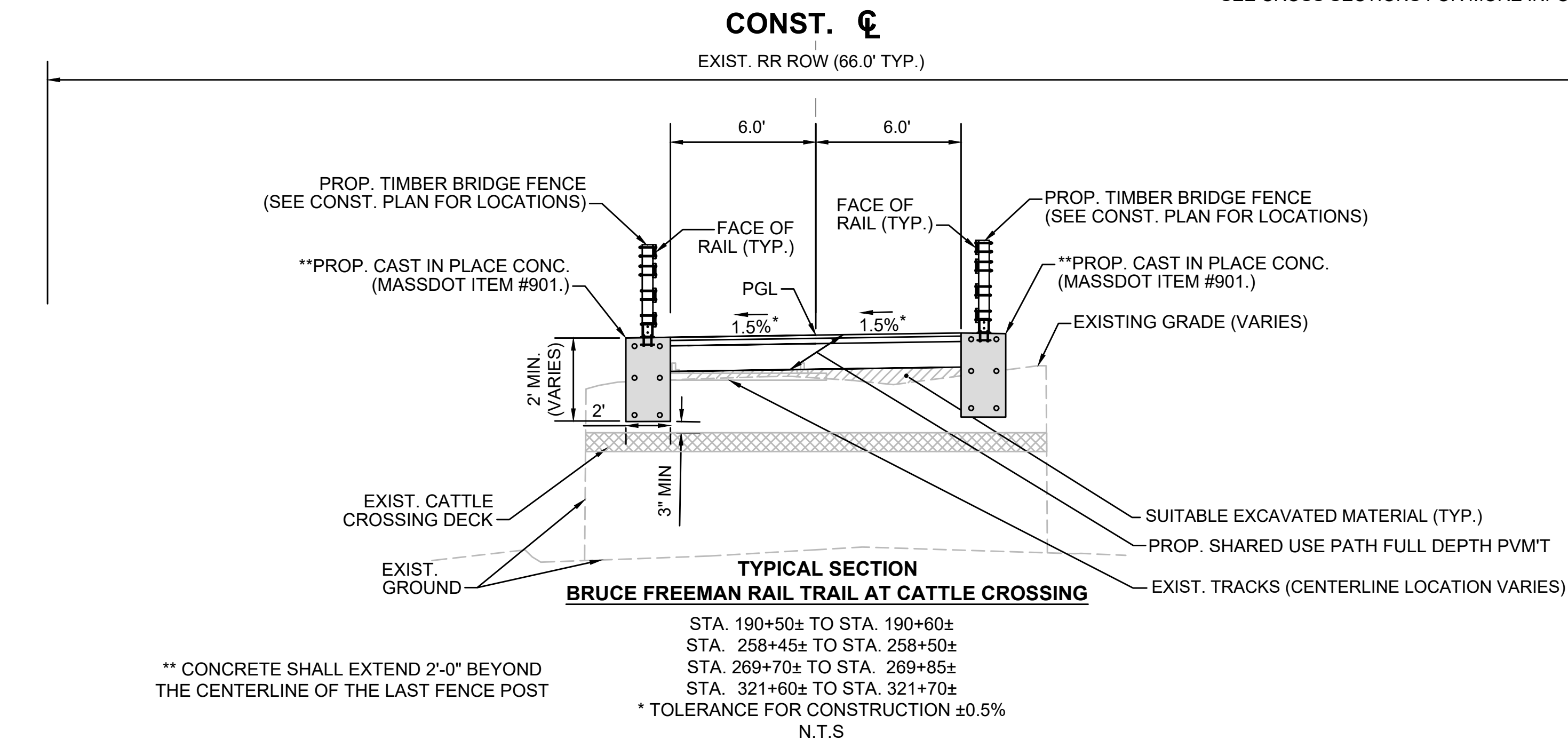
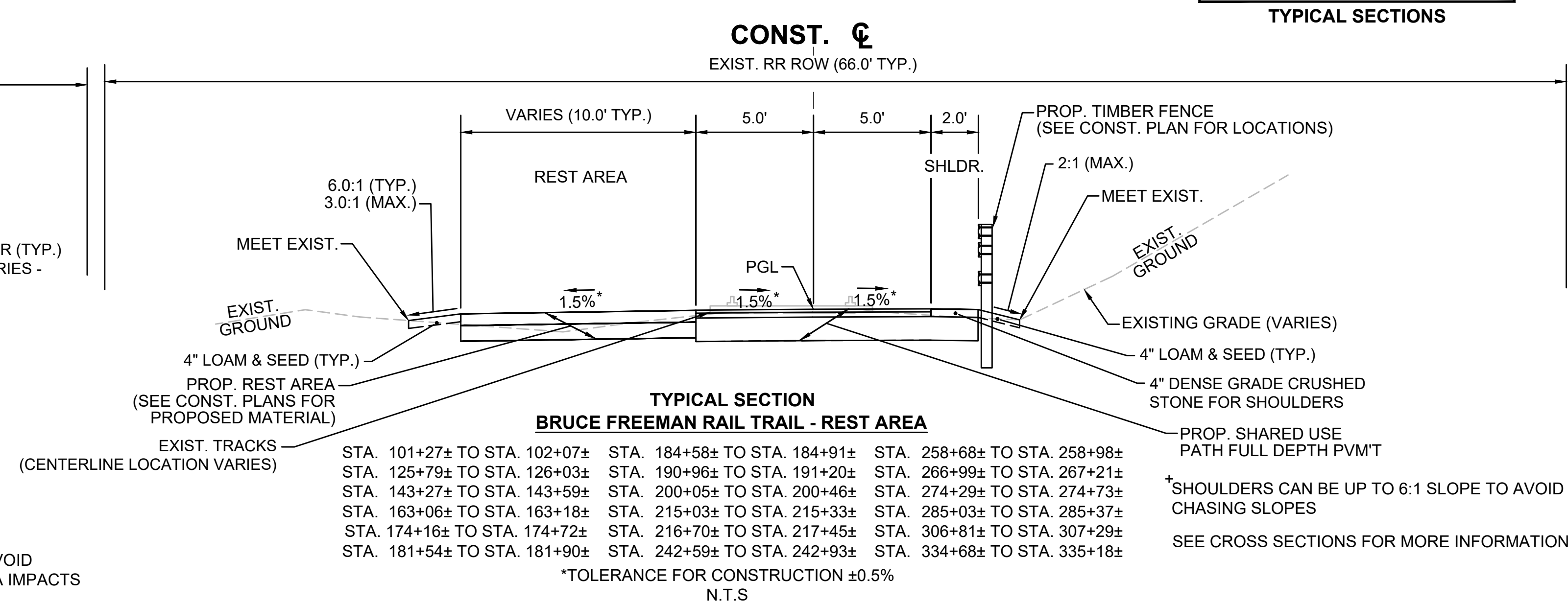
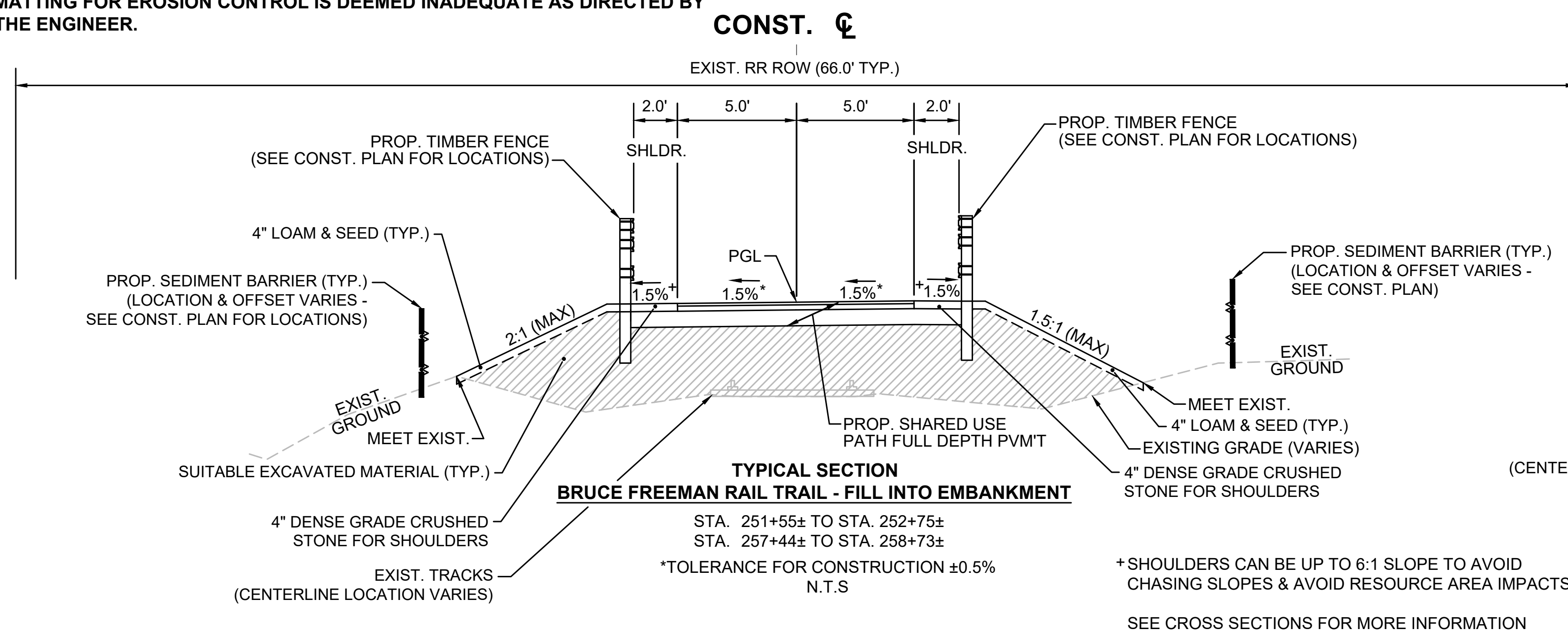


NOTES:

1. MATTING FOR EROSION CONTROL SHALL BE INSTALLED ON EXISTING SIDE SLOPES THAT ARE 2:1 OR STEEPER THAT ARE NOT WITHIN JUTE MESH WATERWAY AREAS.
2. MODIFIED ROCK FILL SHALL BE USED AS NEEDED ON ANY CUT OR FILL SLOPES STEEPER THAN 2:1 WHERE POOR SOIL CONDITIONS EXIST AND MATTING FOR EROSION CONTROL IS DEEMED INADEQUATE AS DIRECTED BY THE ENGINEER.

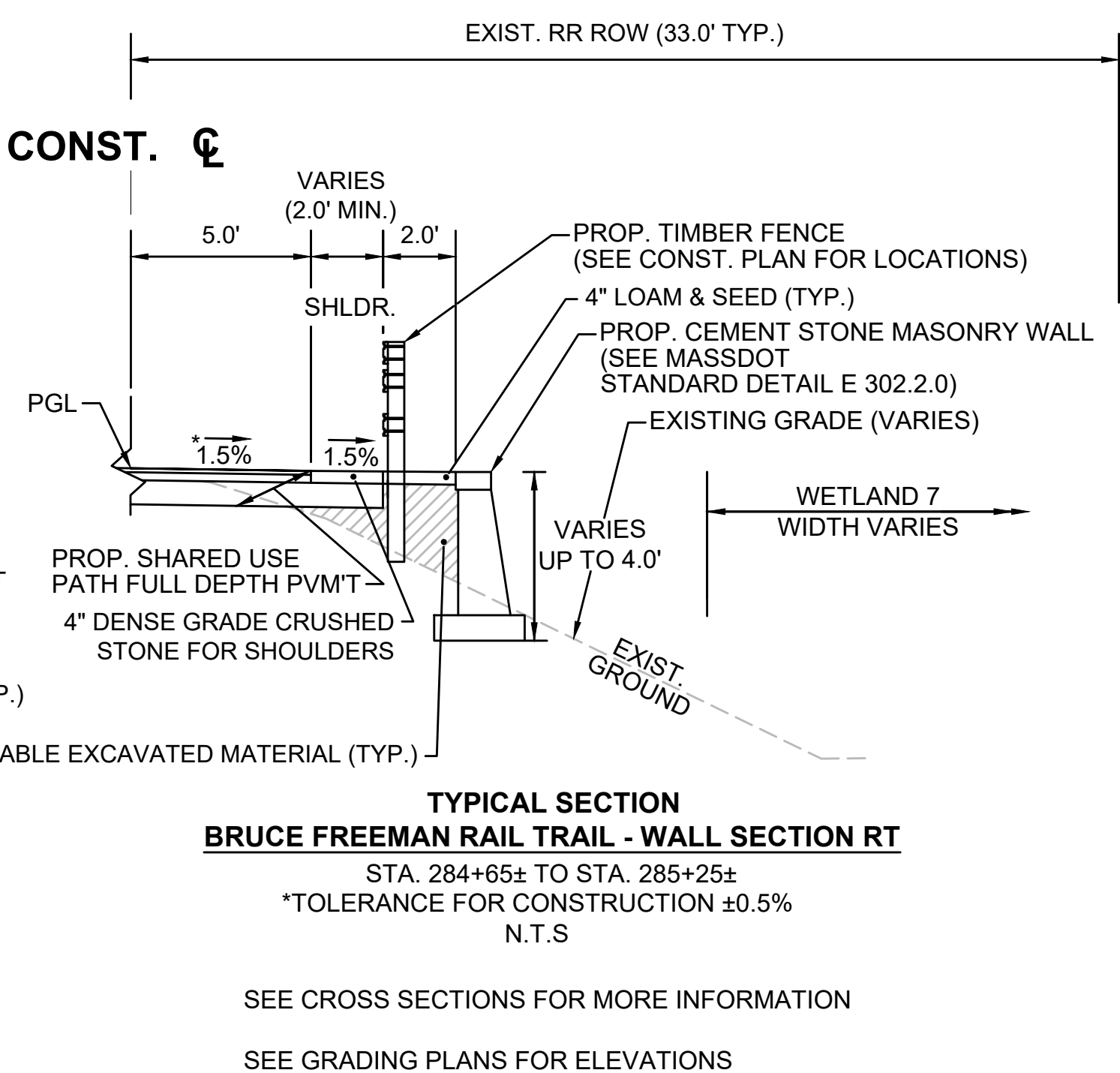
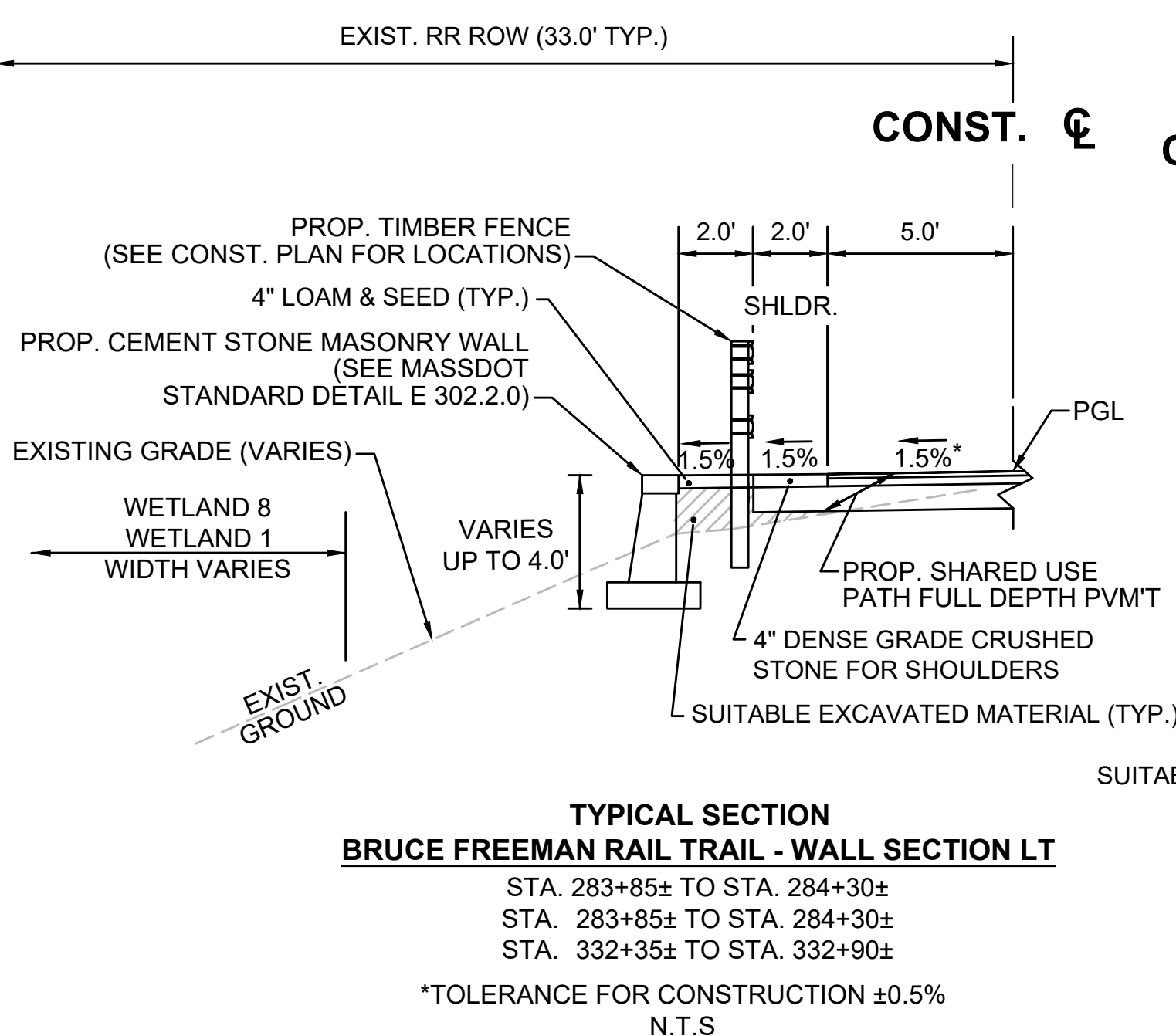
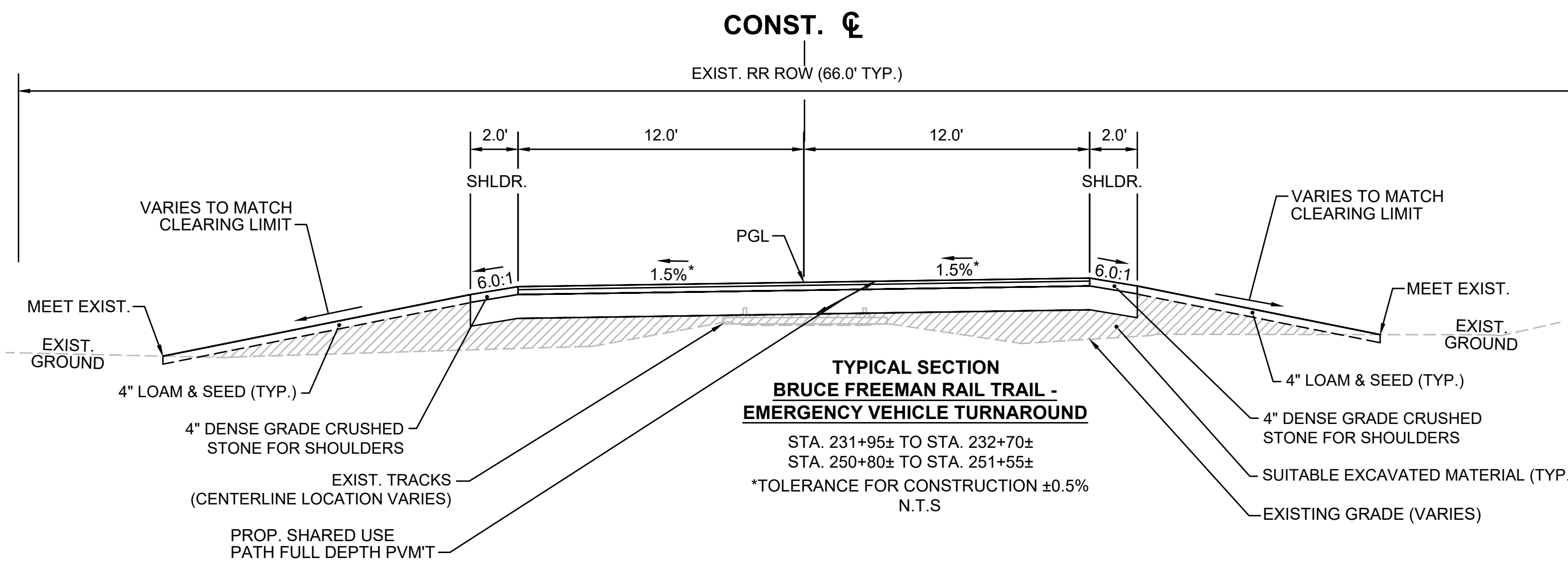
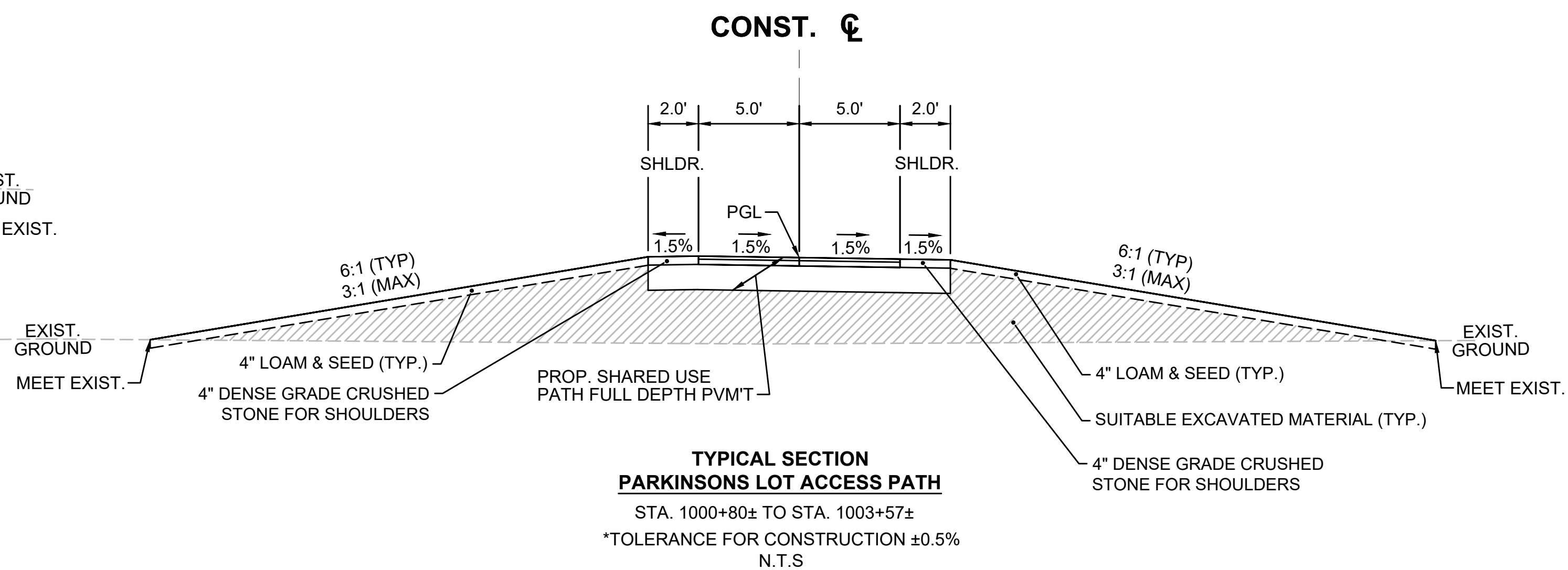
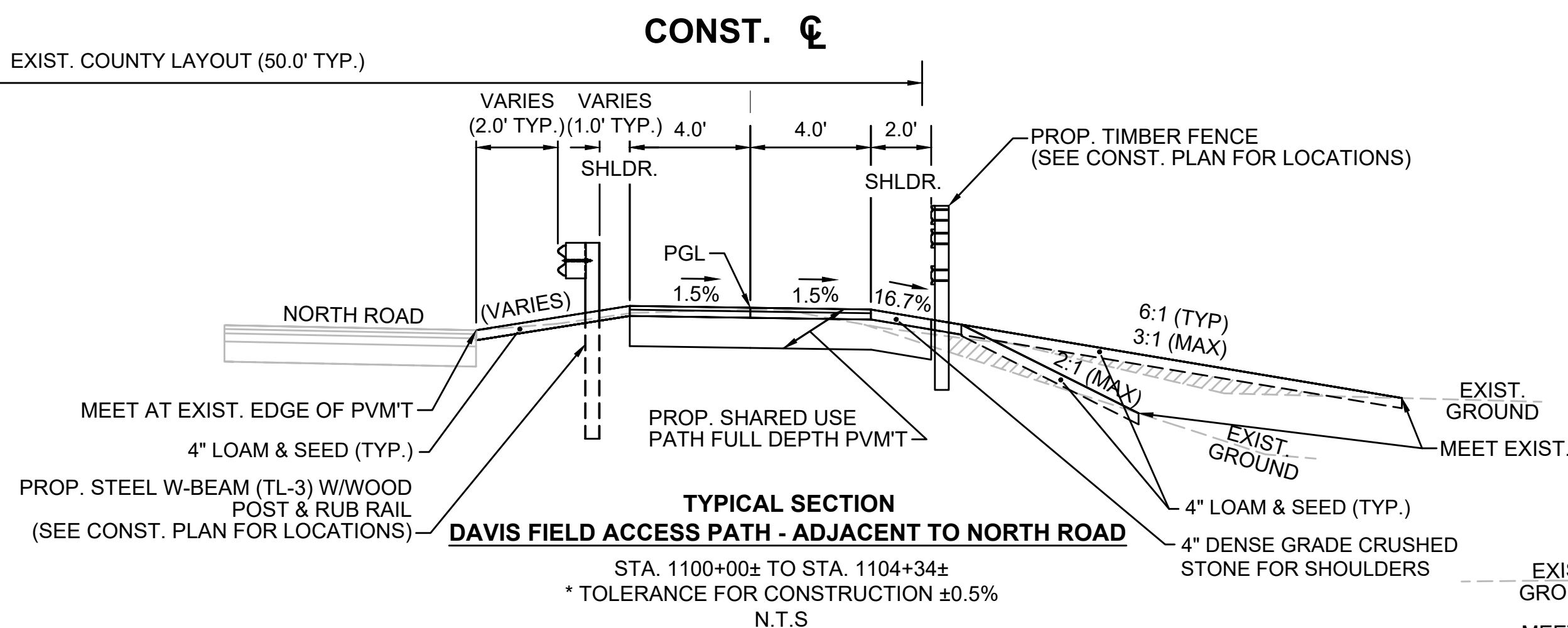
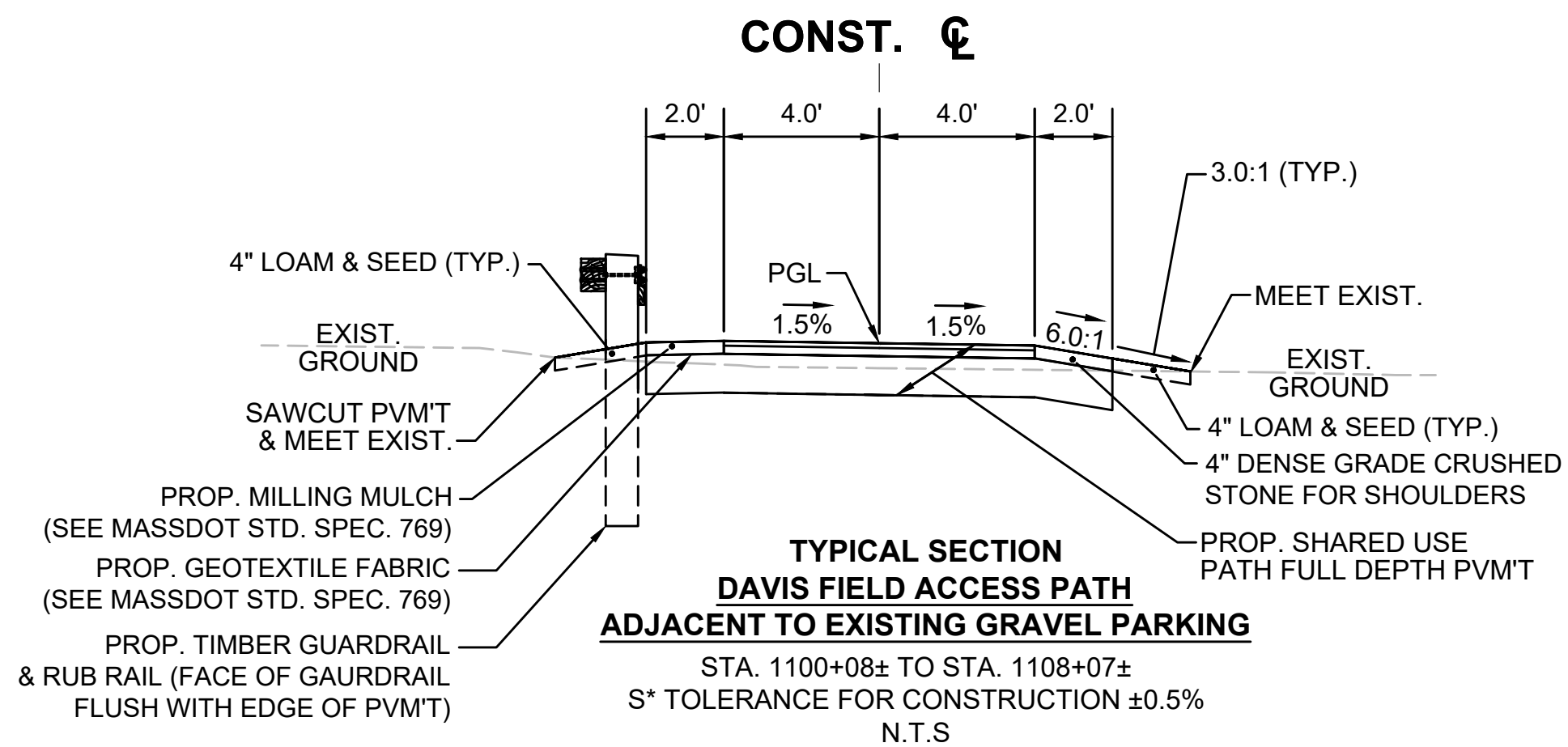
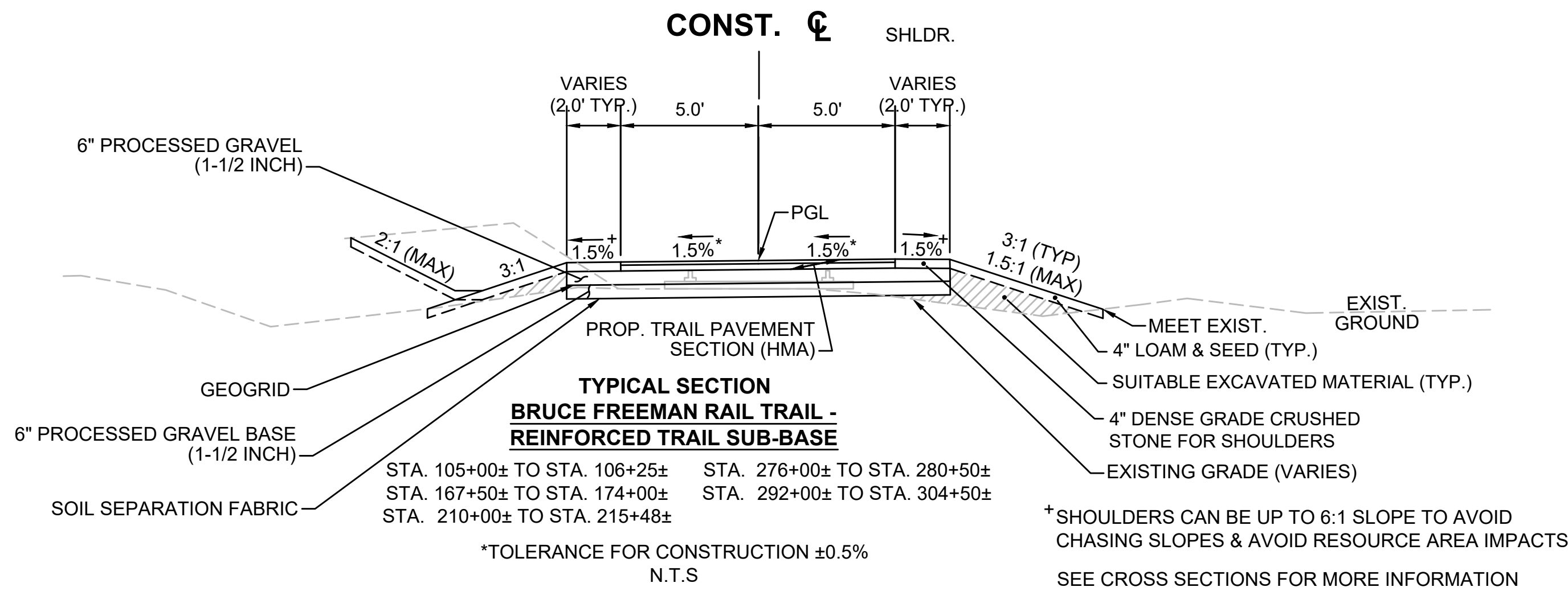
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	11	319
PROJECT FILE NO.		608164	

TYPICAL SECTIONS

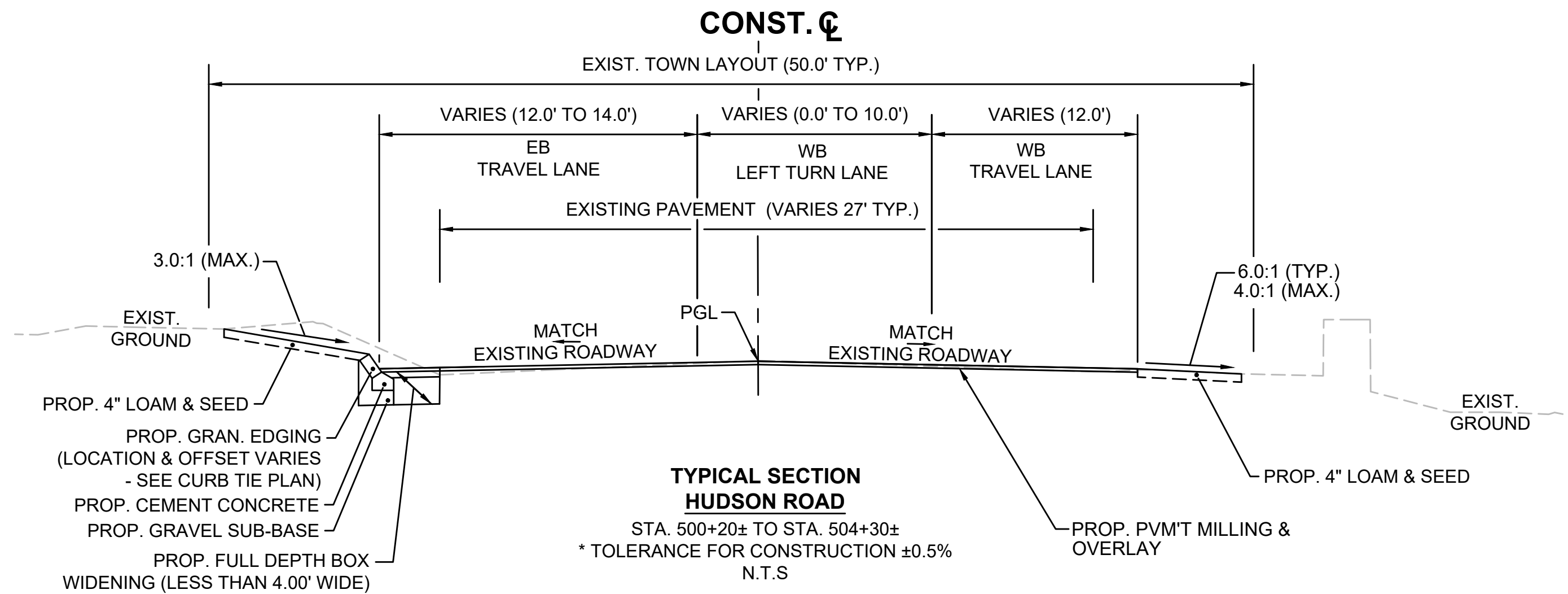
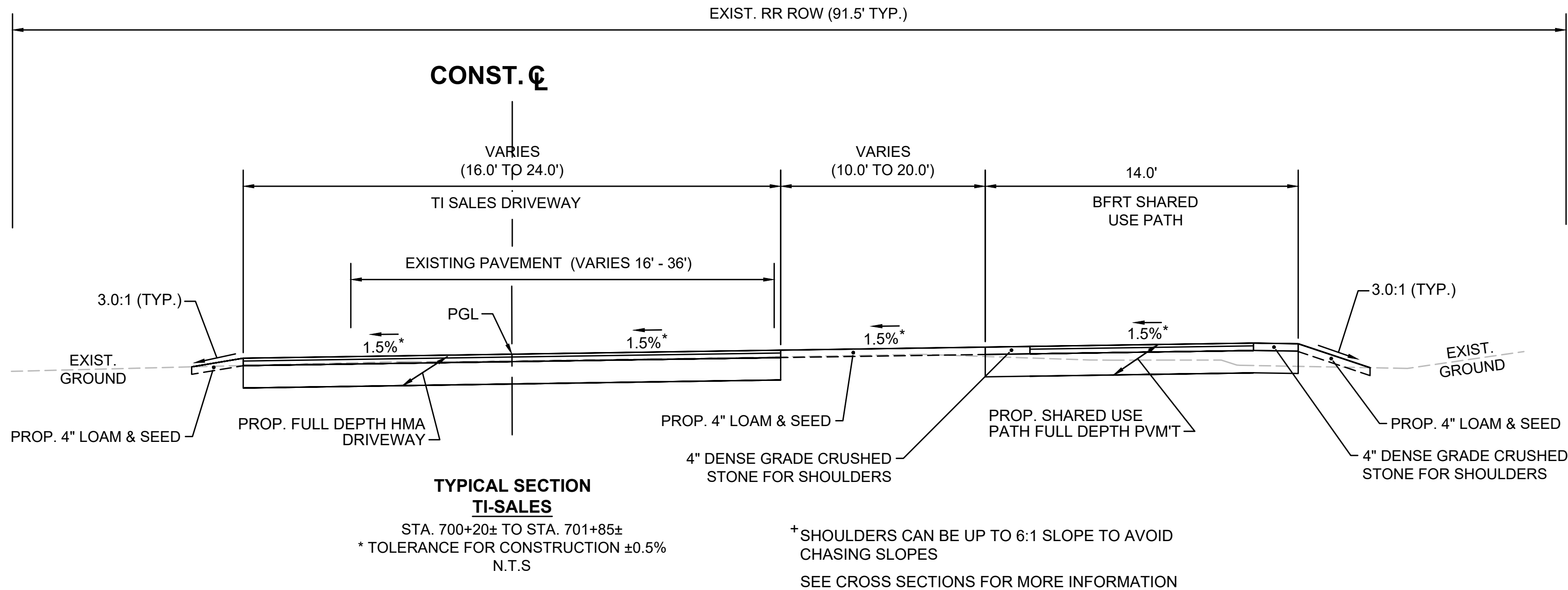
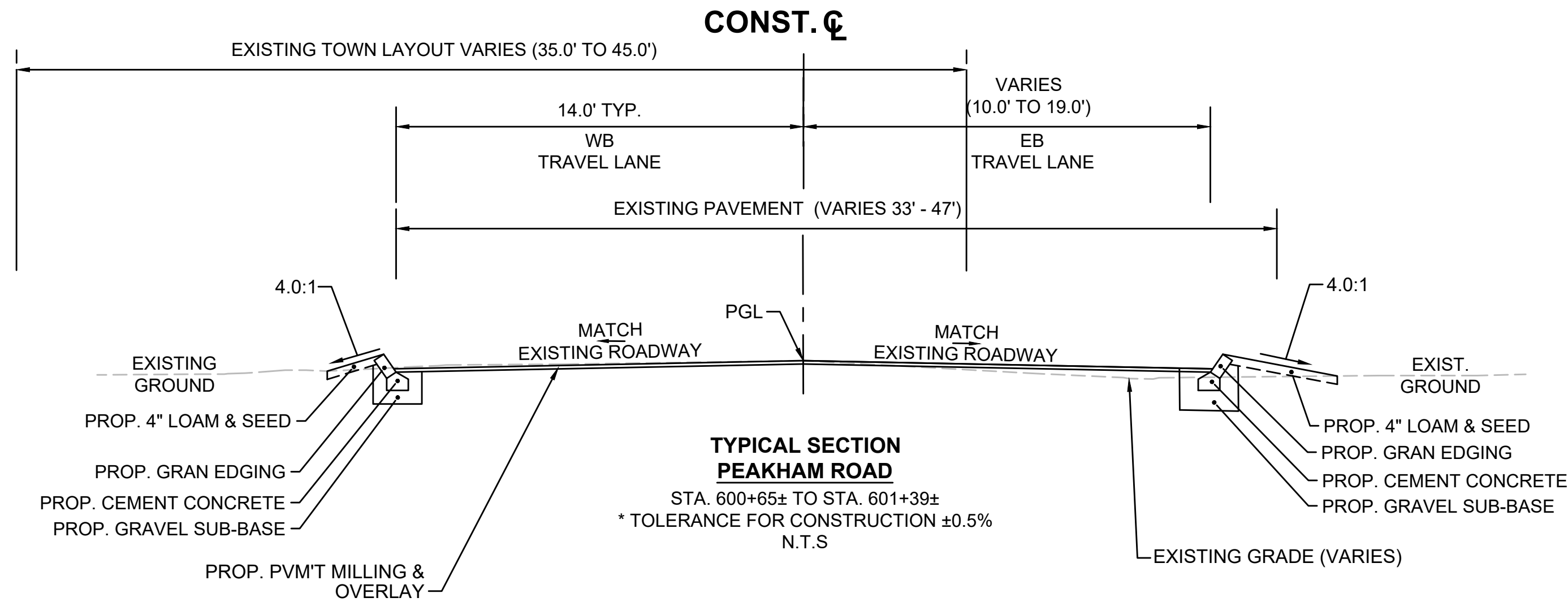
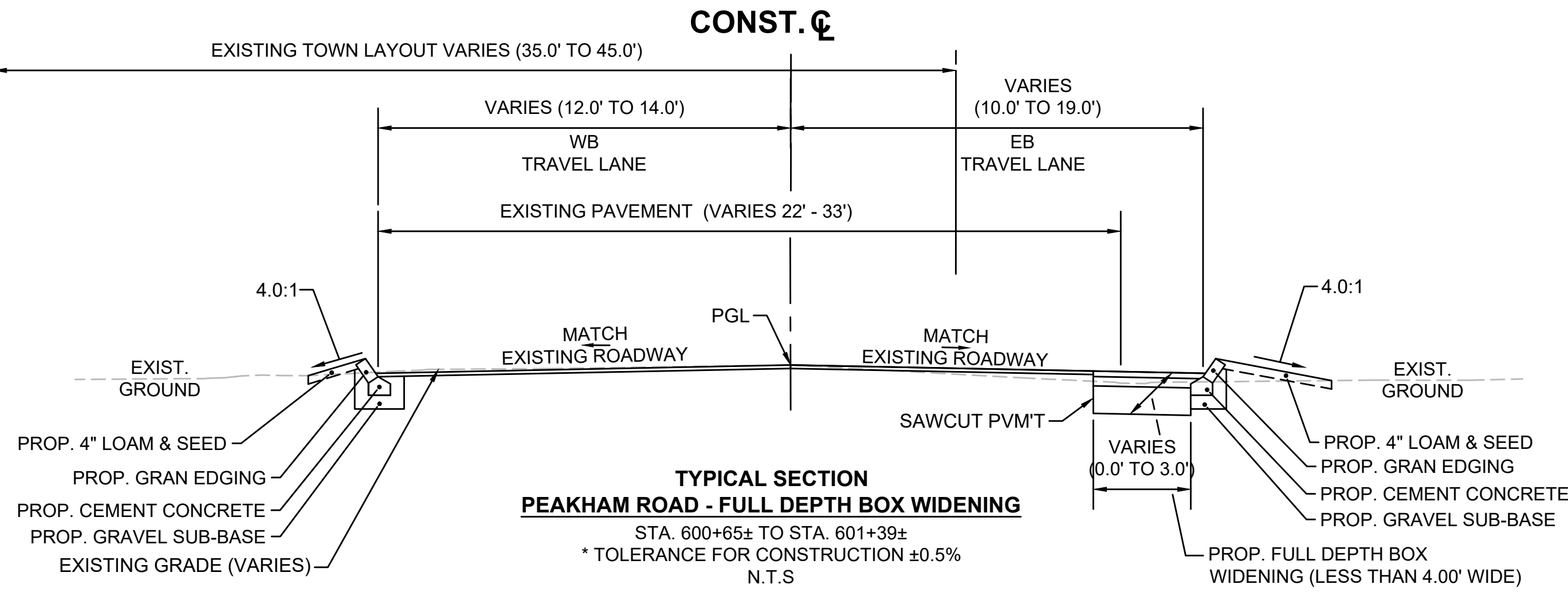


SEE SHEET 10 FOR PAVEMENT NOTE

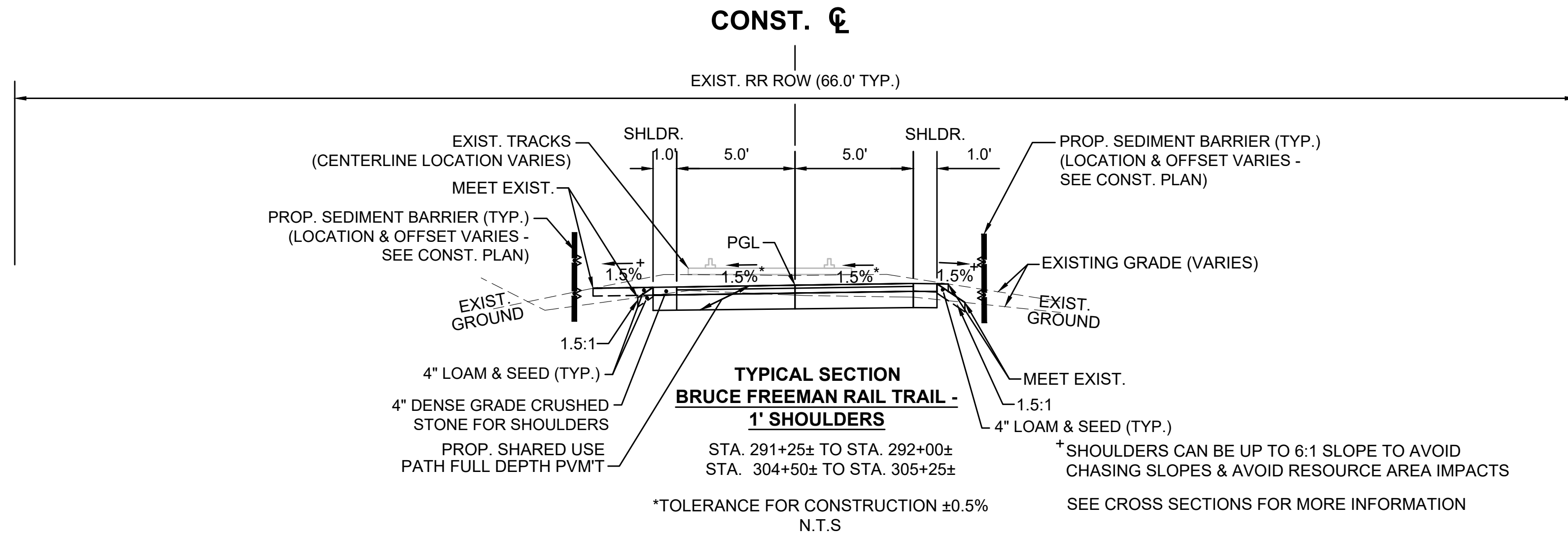
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STA.TE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	12	319
PROJECT FILE NO.		608164	
TYPICAL SECTIONS			



SEE SHEET 10 FOR PAVEMENT NOTES

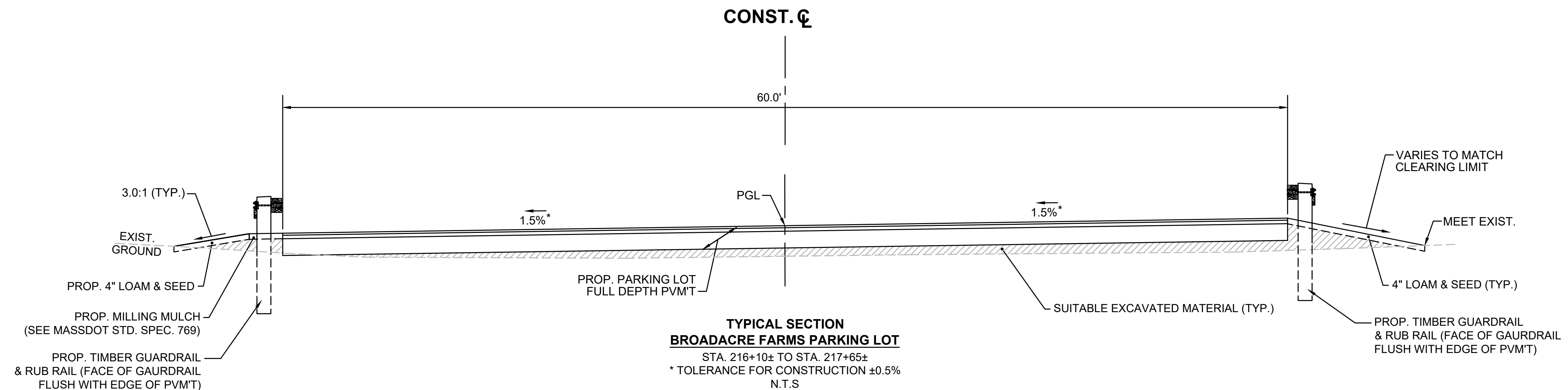
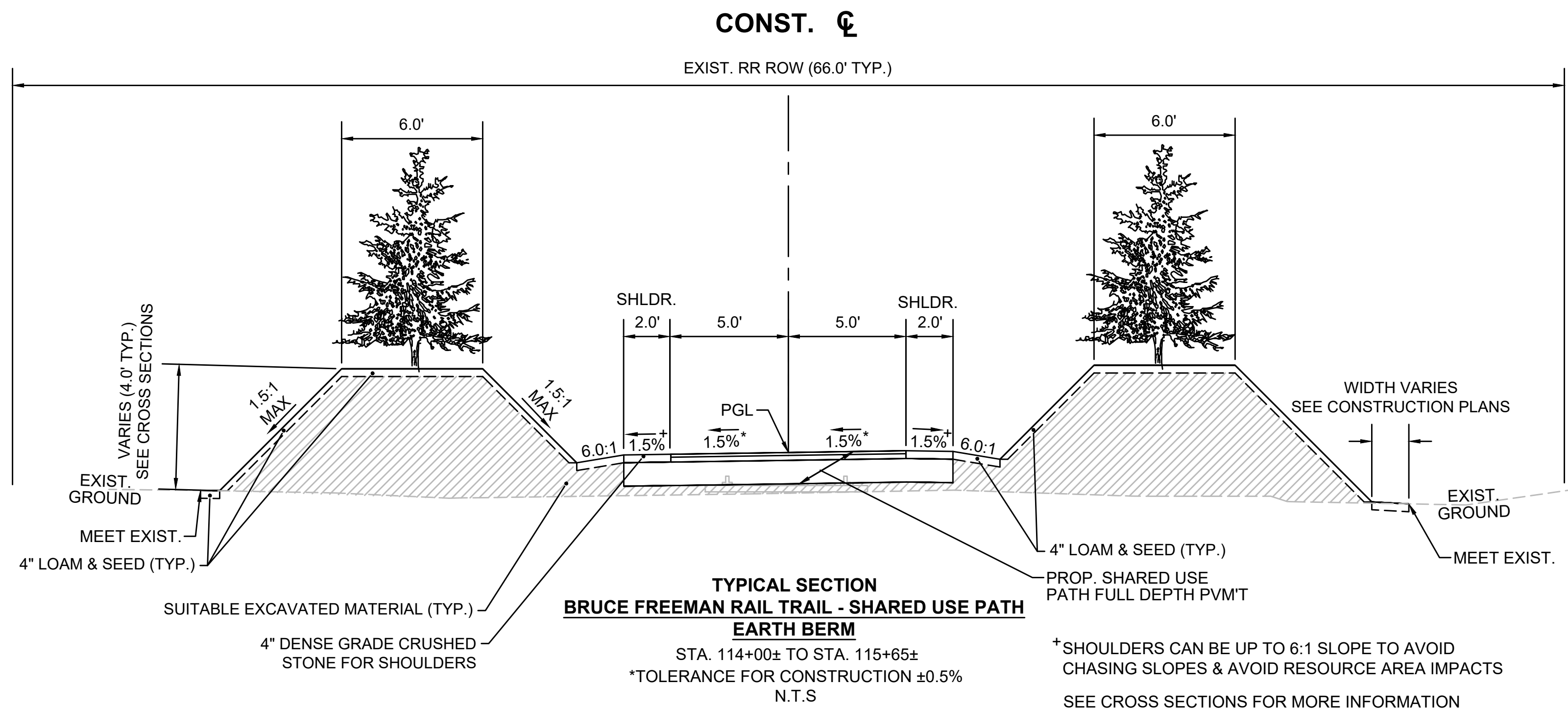
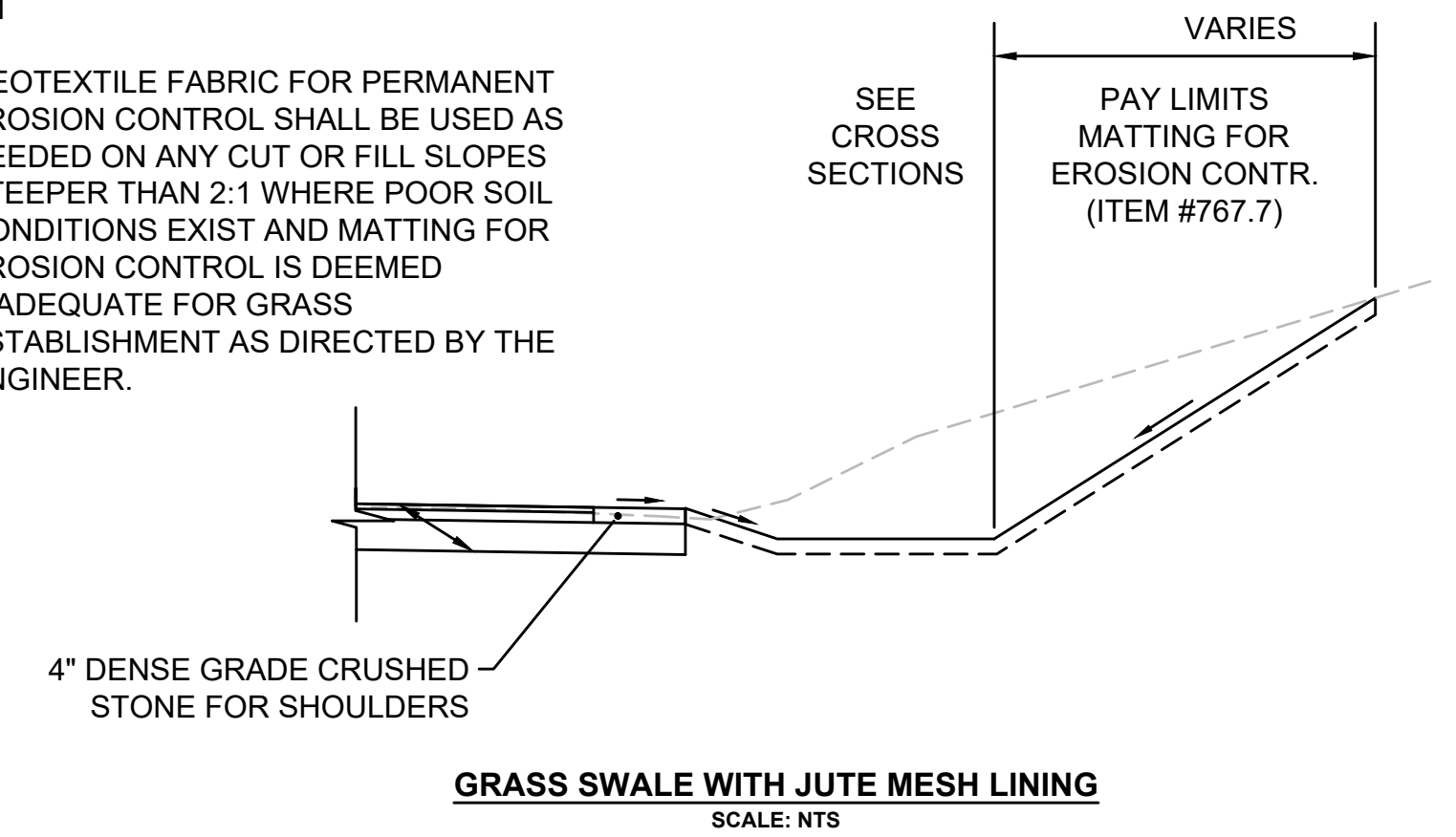


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MA	XXX-XXXX(XXX)X	14	319
PROJECT FILE NO.		608164	
TYPICAL SECTIONS			

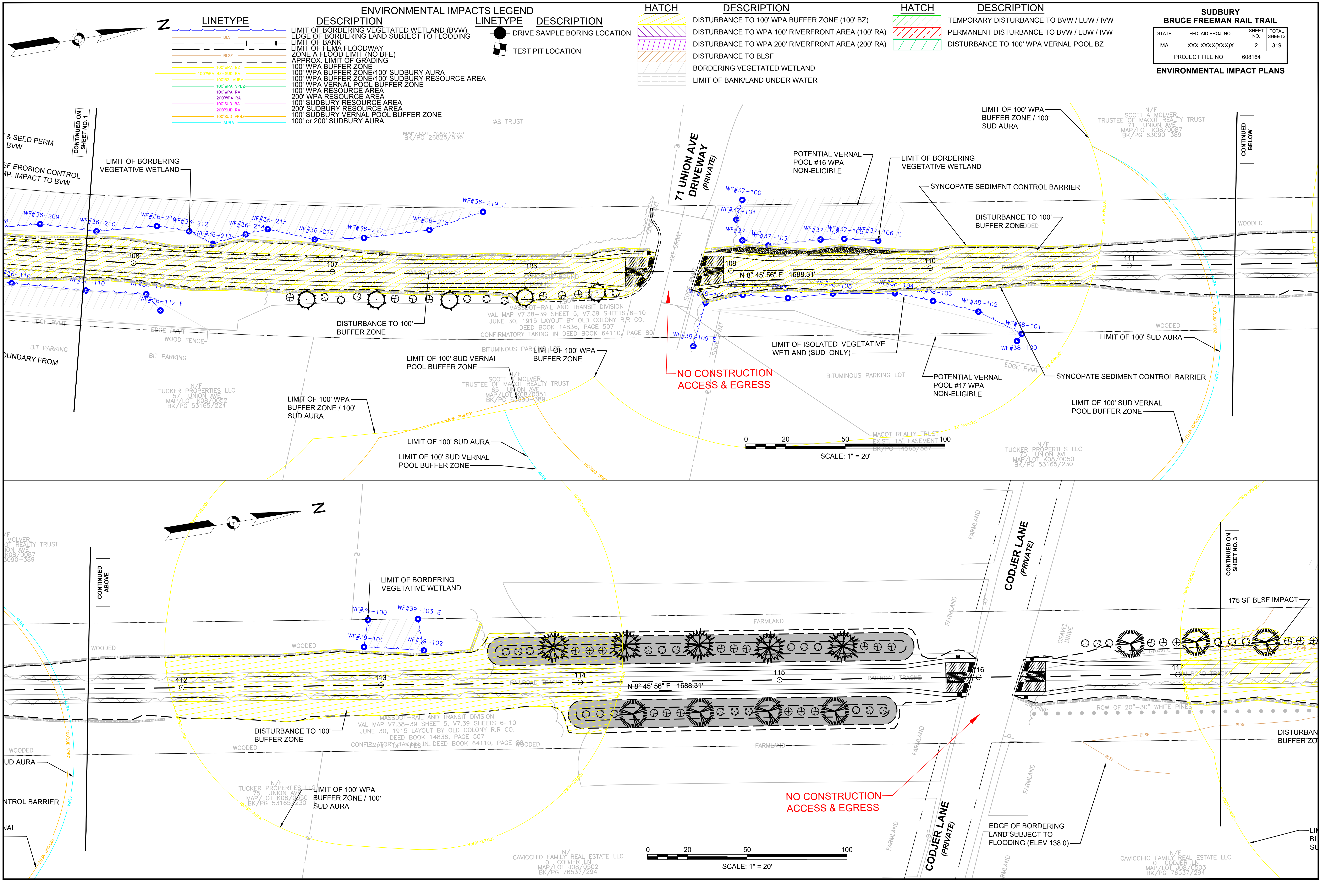


NOTES:

- MATting FOR EROSION CONTROL SHALL BE INSTALLED ON SIDE SLOPES THAT ARE 2:1
- GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL SHALL BE USED AS NEEDED ON ANY CUT OR FILL SLOPES STEEPER THAN 2:1 WHERE POOR SOIL CONDITIONS EXIST AND MATting FOR EROSION CONTROL IS DEEMED INADEQUATE FOR GRASS ESTABLISHMENT AS DIRECTED BY THE ENGINEER.



SEE SHEET 10 FOR PAVEMENT NOTES

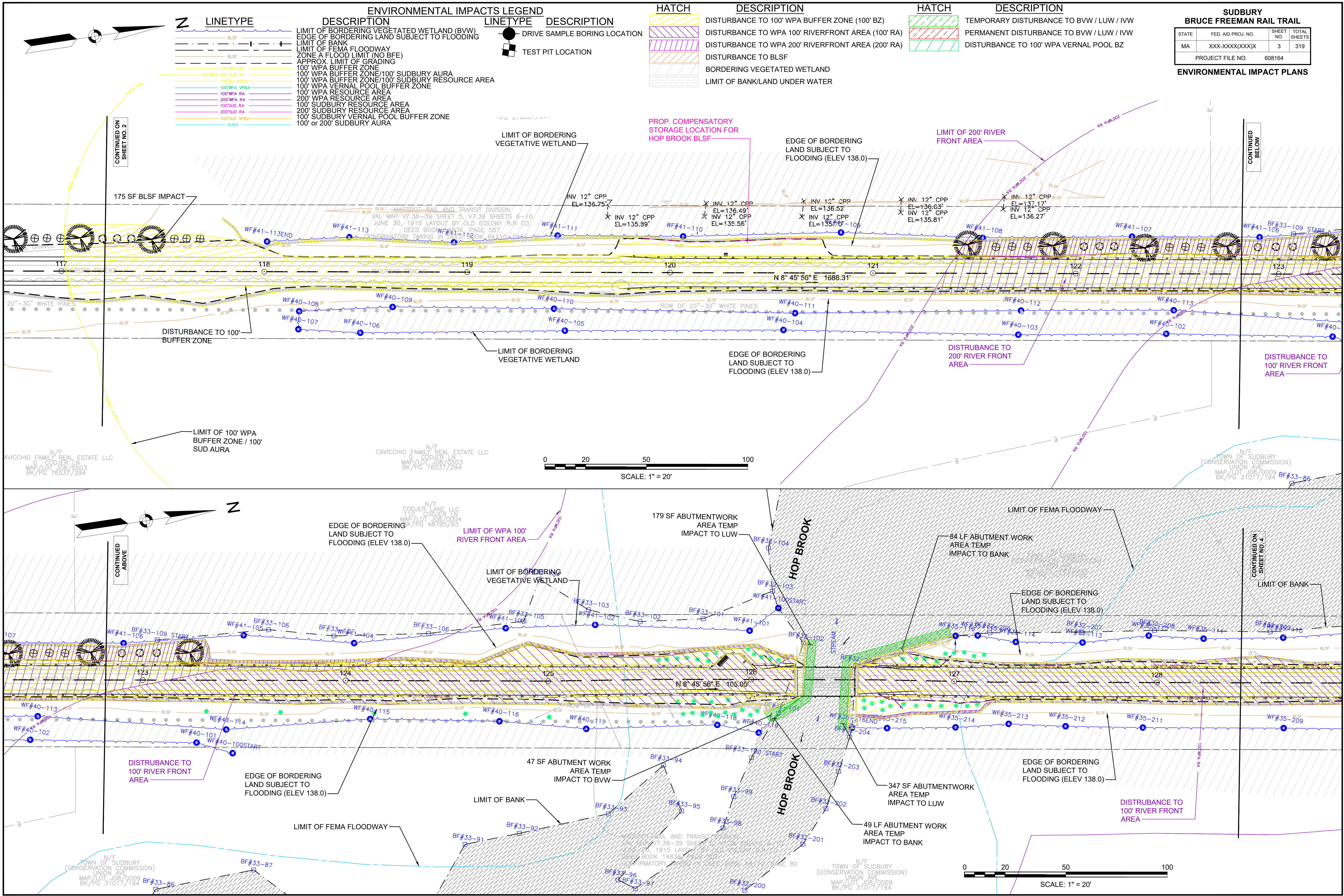


SUDBURY

BRUCE FREEMAN RAIL TRAIL

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MA	XXX-XXXX(XXX)X	2	319
PROJECT FILE NO.		608164	

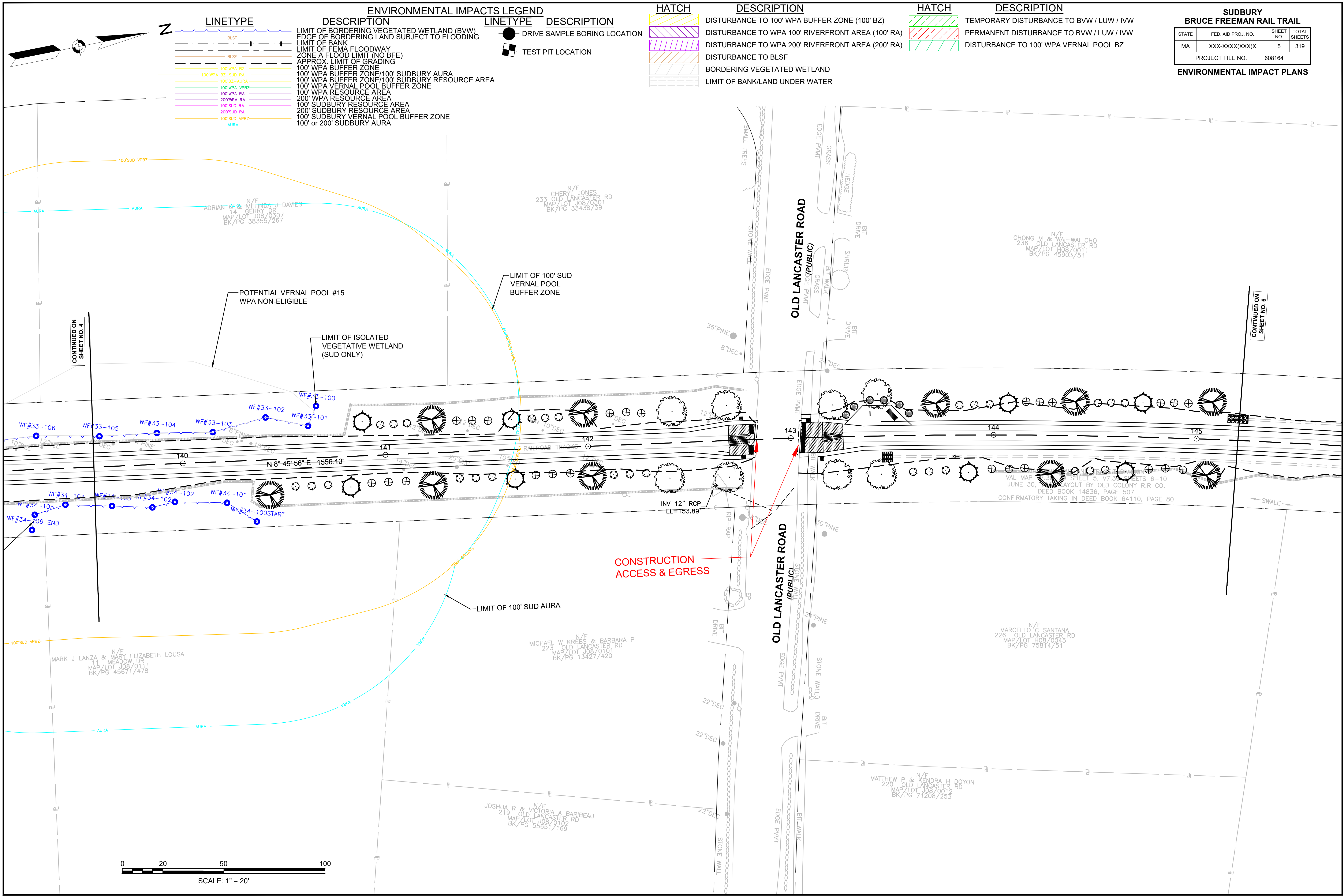
ENVIRONMENTAL IMPACT PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

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MA	XXX-XXX(XXX)X	3	319
PROJECT FILE NO.		608164	

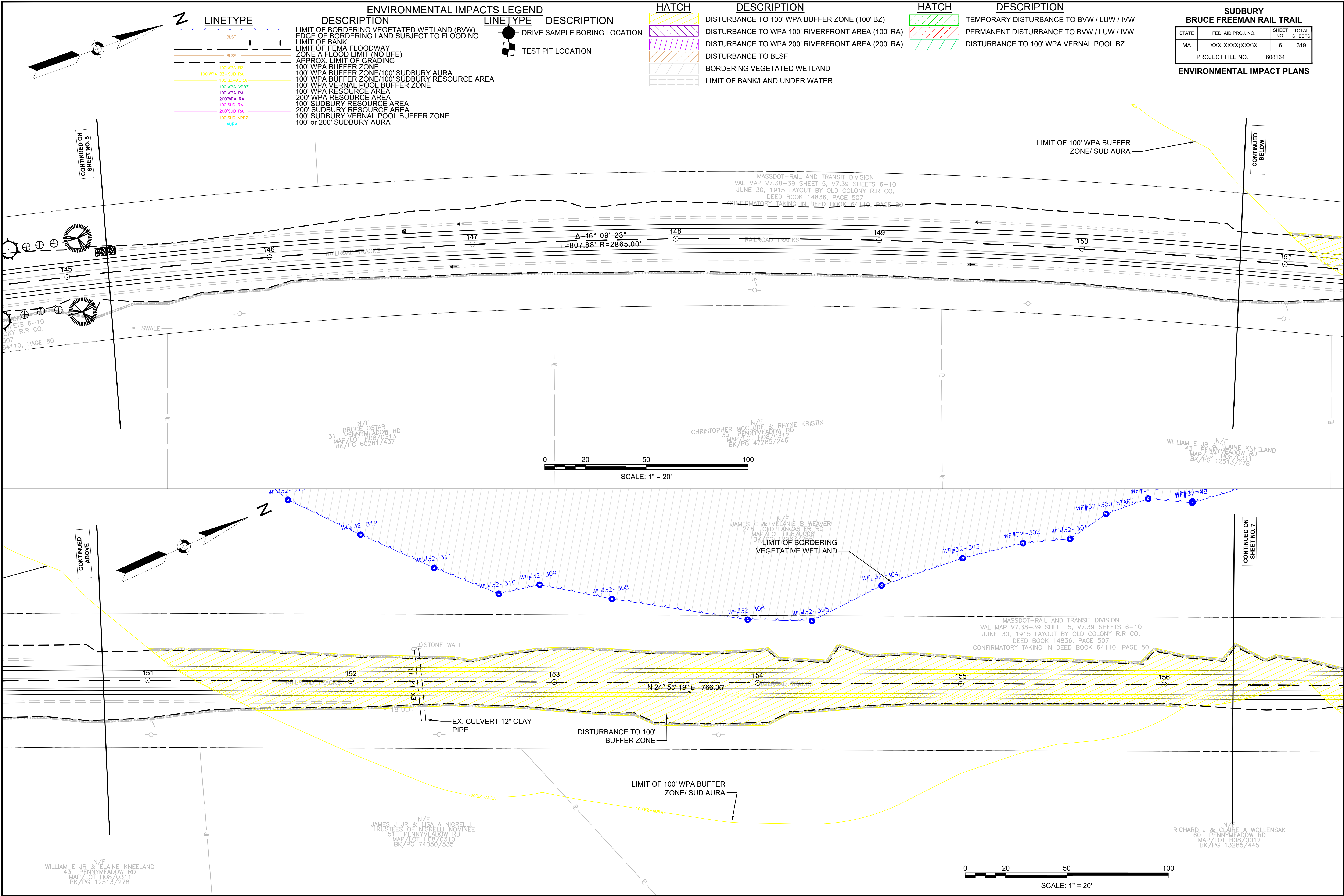
ENVIRONMENTAL IMPACT PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

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MA	XXX-XXXX(XXX)X	5	319
PROJECT FILE NO.		608164	

ENVIRONMENTAL IMPACT PLANS



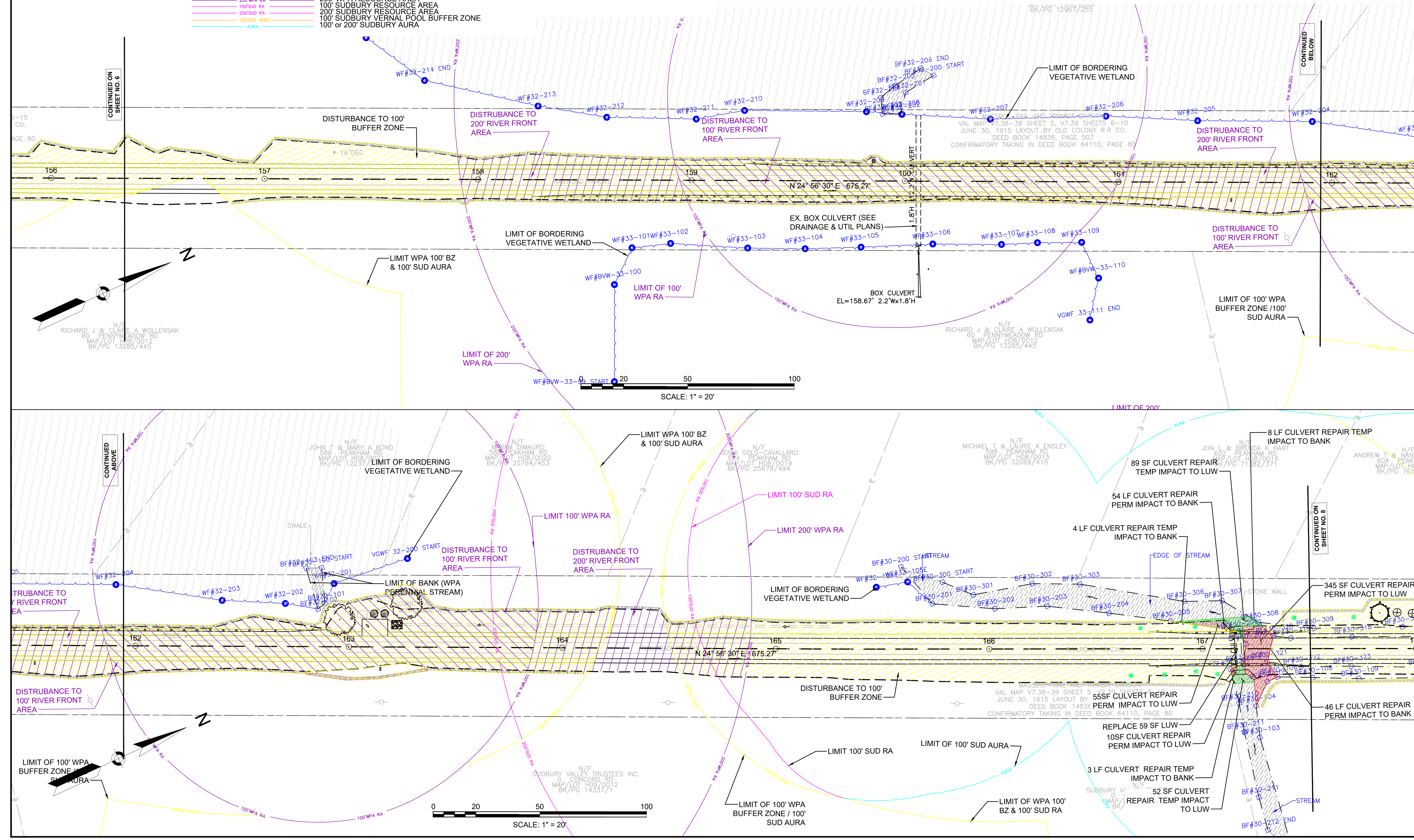
ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	100' WPA RESOURCE AREA
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	7	319
PROJECT FILE NO.		608164	
ENVIRONMENTAL IMPACT PLANS			



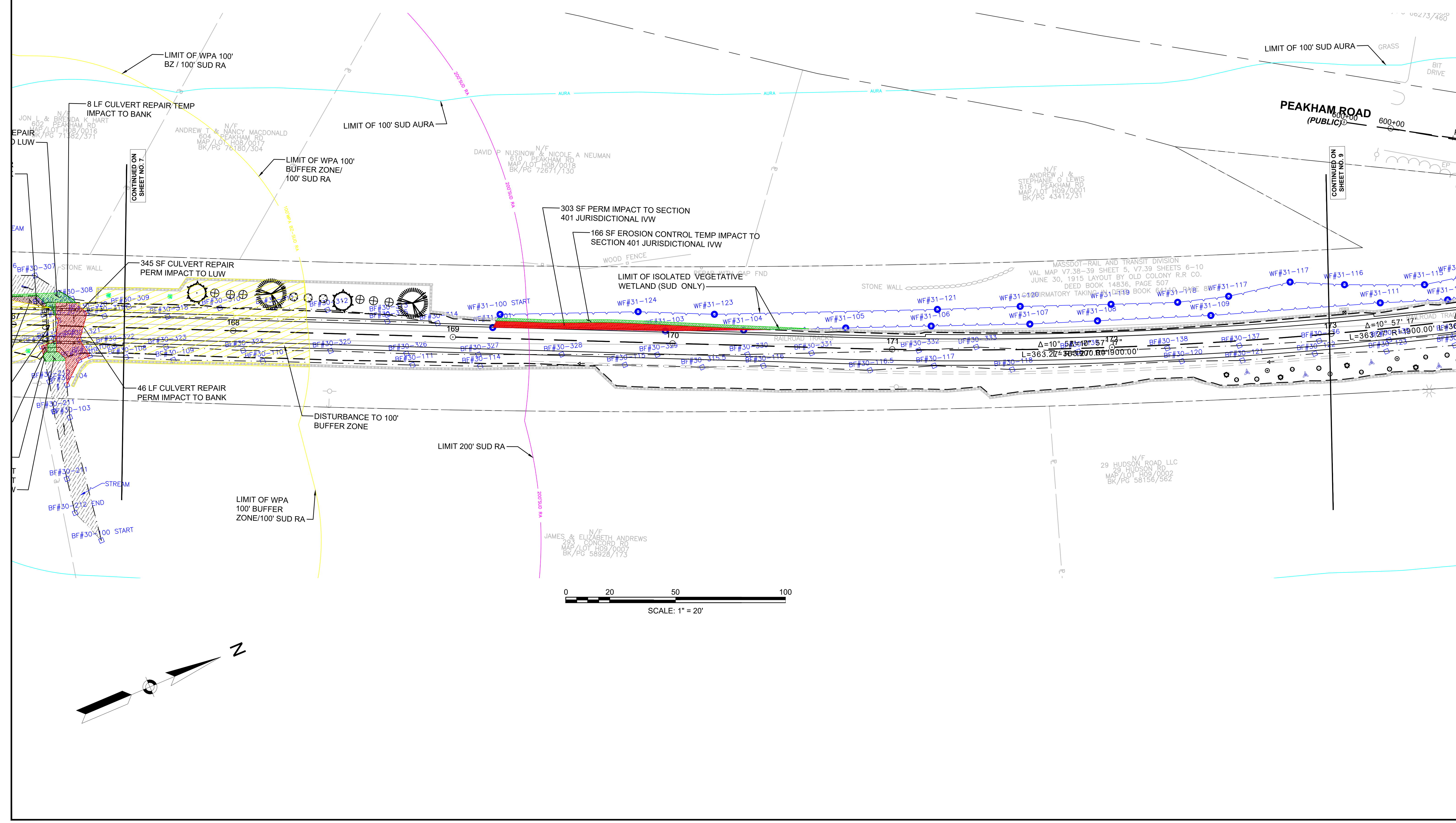
ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	100' WPA RESOURCE AREA
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' or 200' SUDBURY AURA

LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	8	319
PROJECT FILE NO.		608164	
ENVIRONMENTAL IMPACT PLANS			

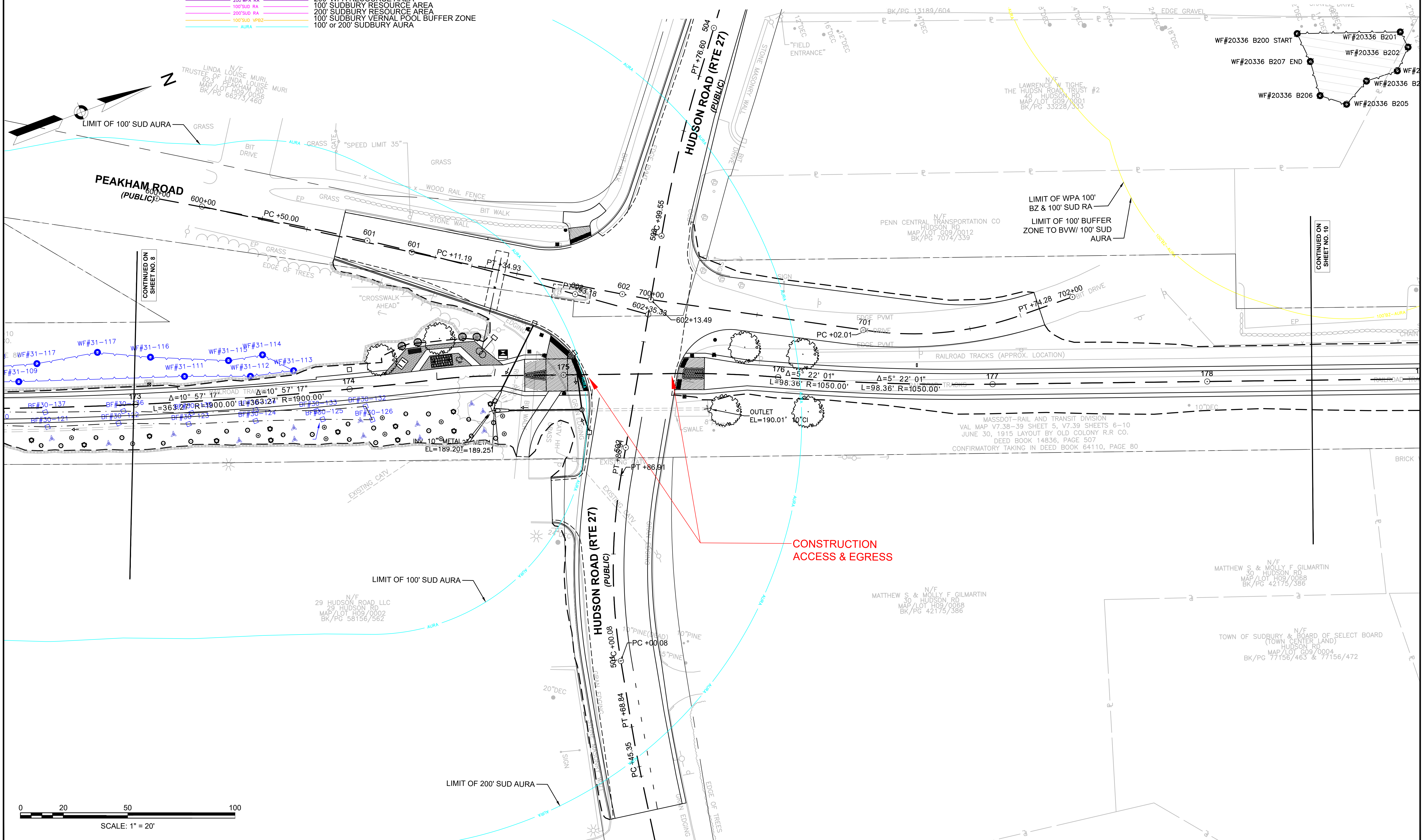


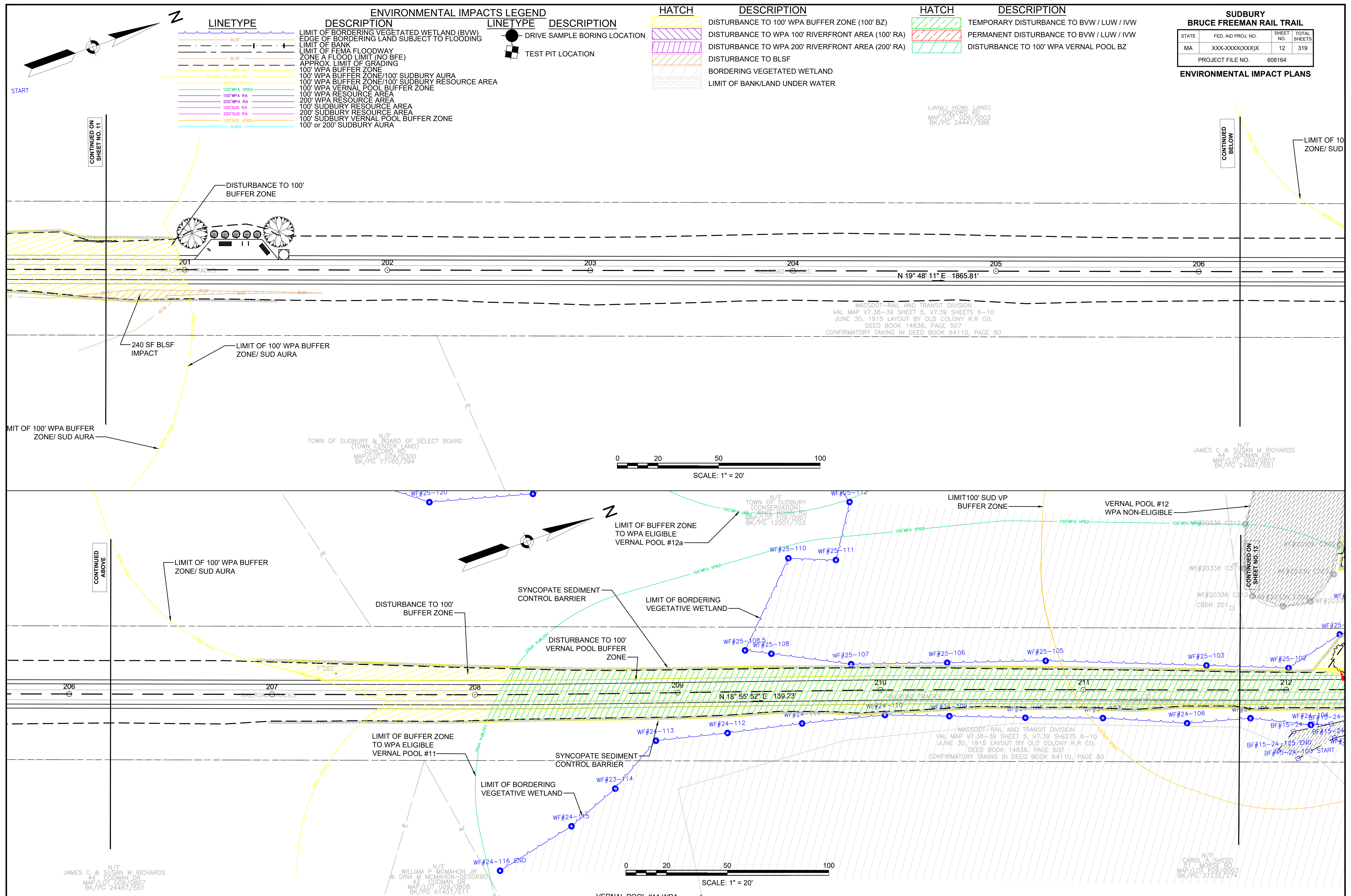
ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	100' WPA RESOURCE AREA
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' or 200' SUDBURY AURA
LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

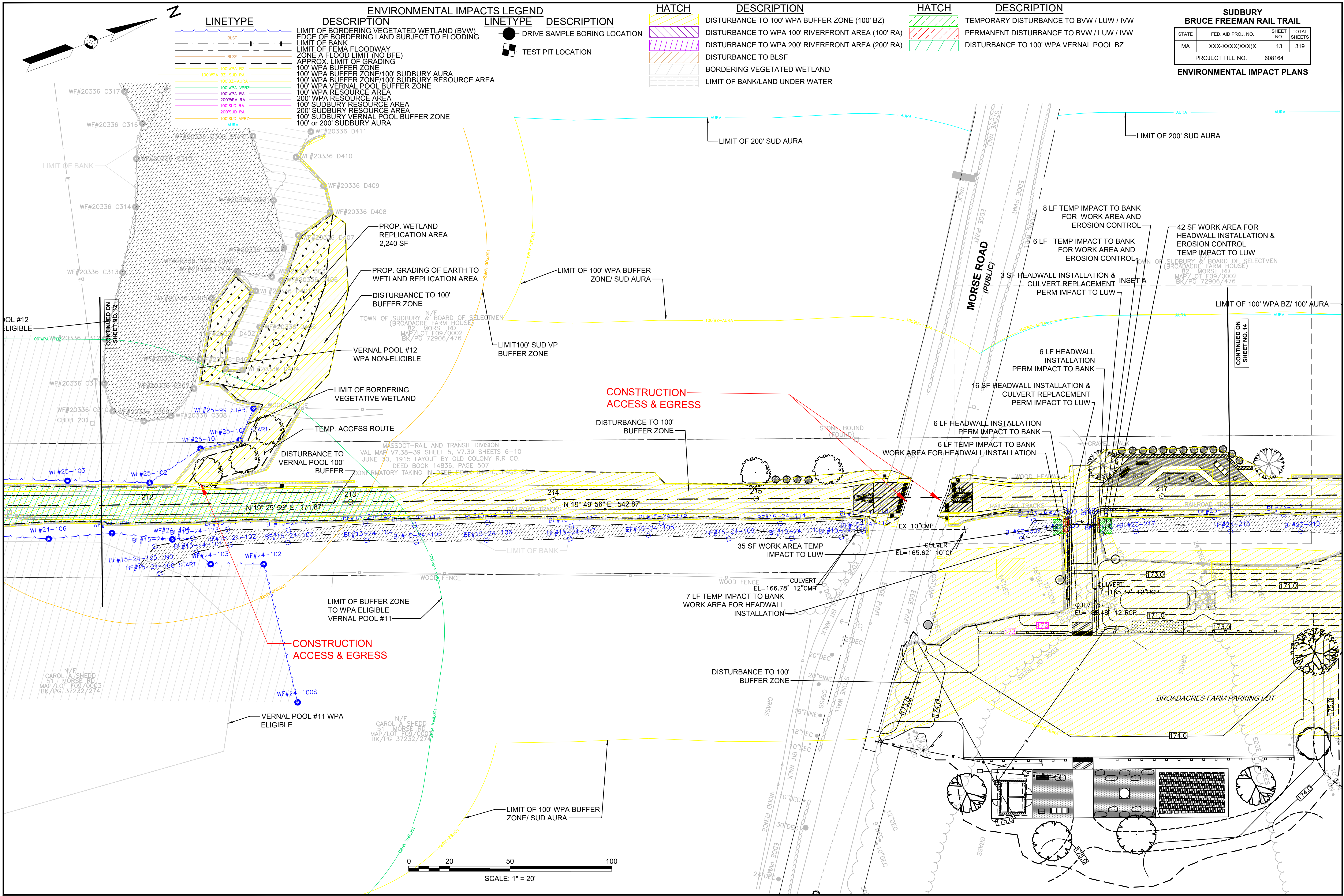
HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	9	319
PROJECT FILE NO.		608164	
ENVIRONMENTAL IMPACT PLANS			





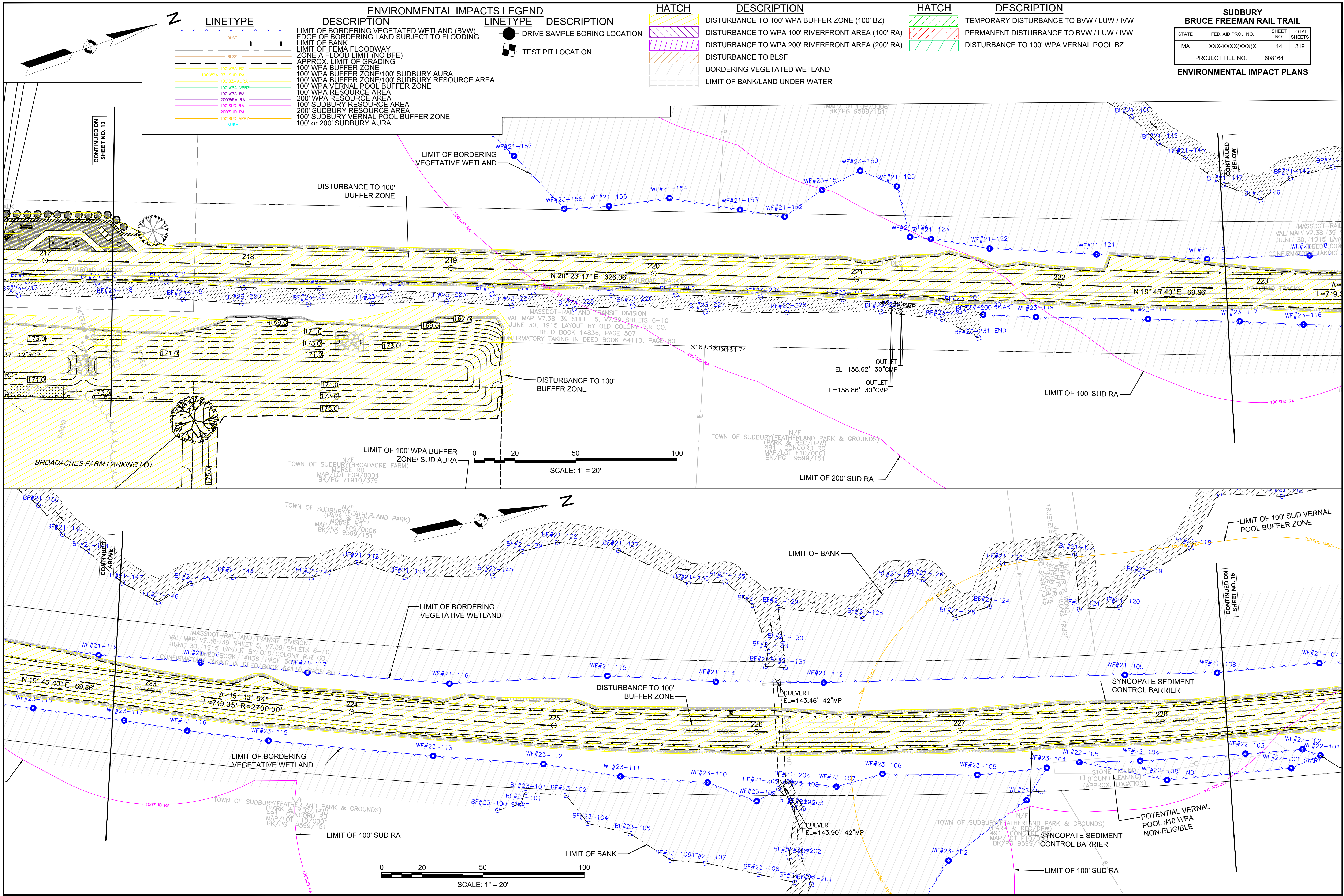


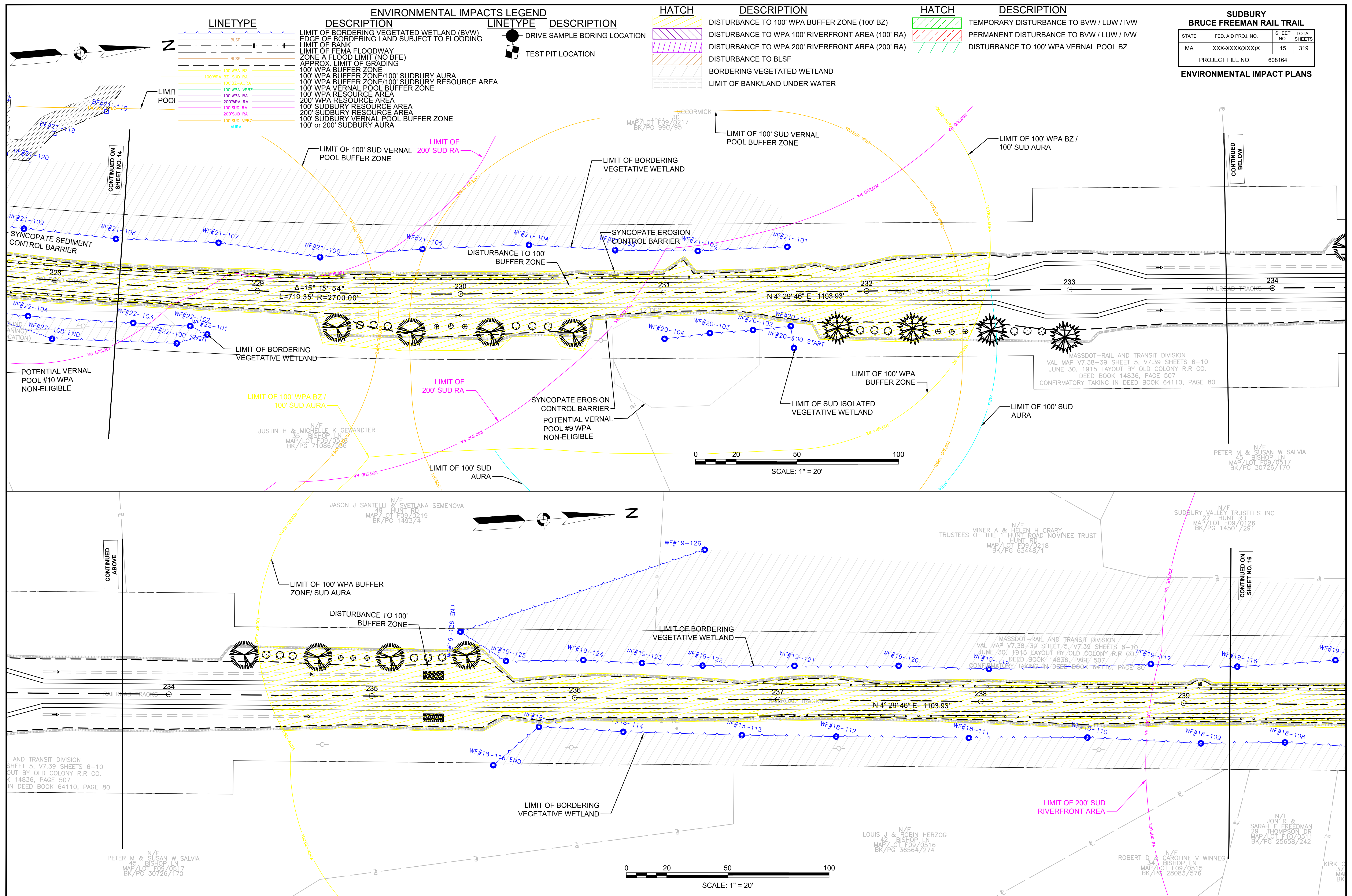
ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BZ
	100' WPA BZ-SUD RA
	100' BZ-AURA
	100' WPA VPBZ
	100' WPA RA
	200' WPA RA
	100' SUD RA
	200' SUD RA
	100' SUD VPBZ
	AURA
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

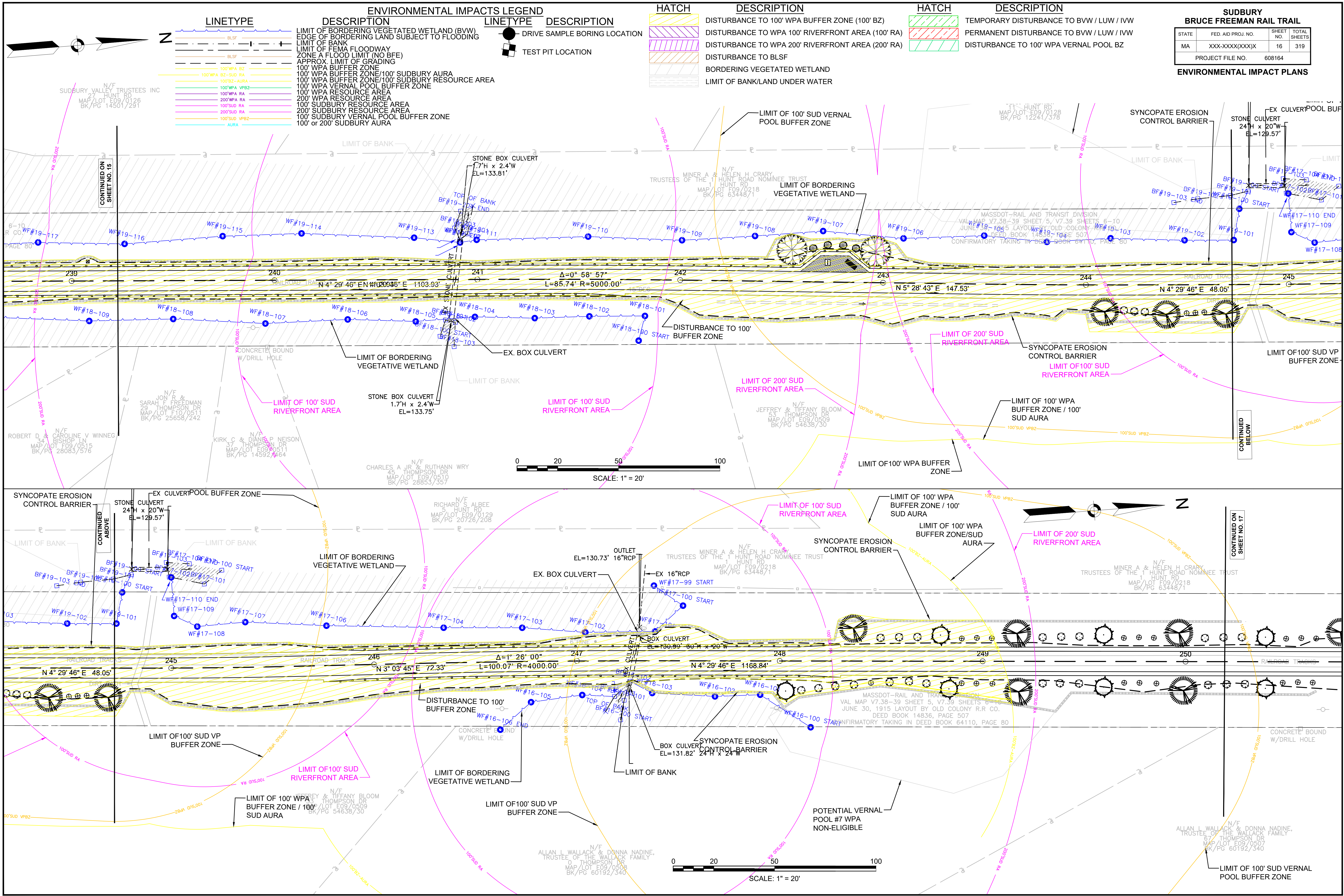
HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

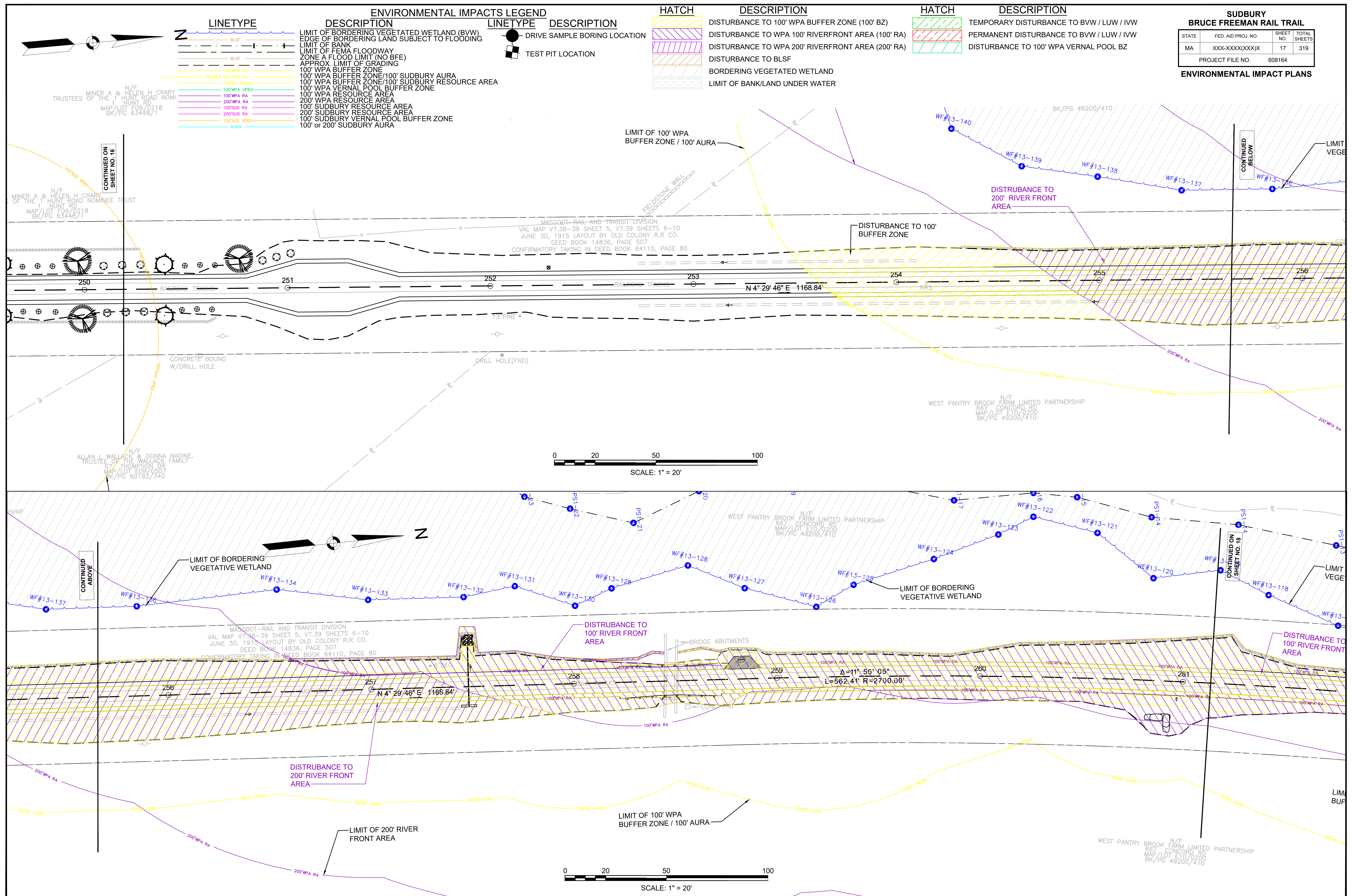
HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

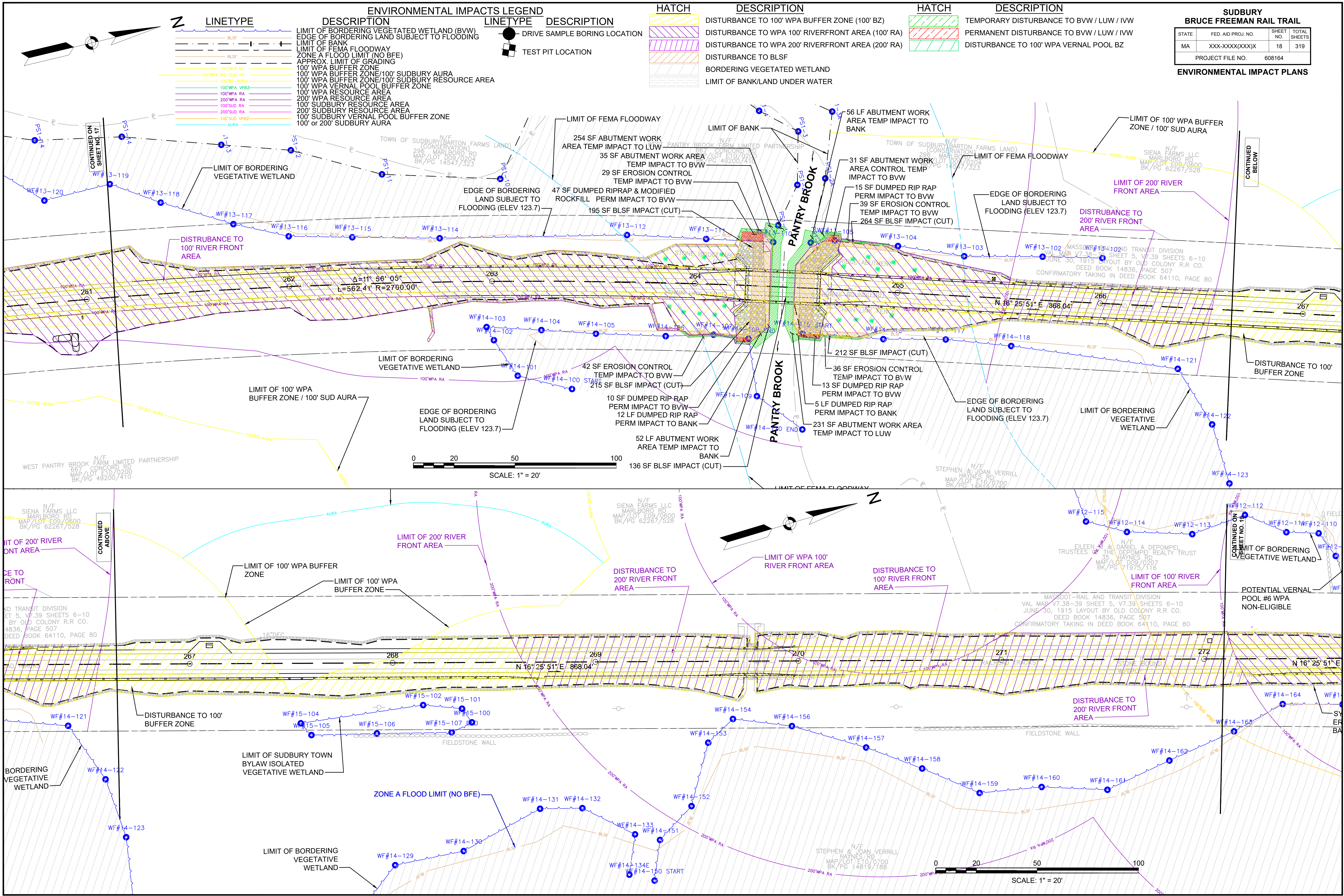
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	13	319
PROJECT FILE NO.		608164	
ENVIRONMENTAL IMPACT PLANS			





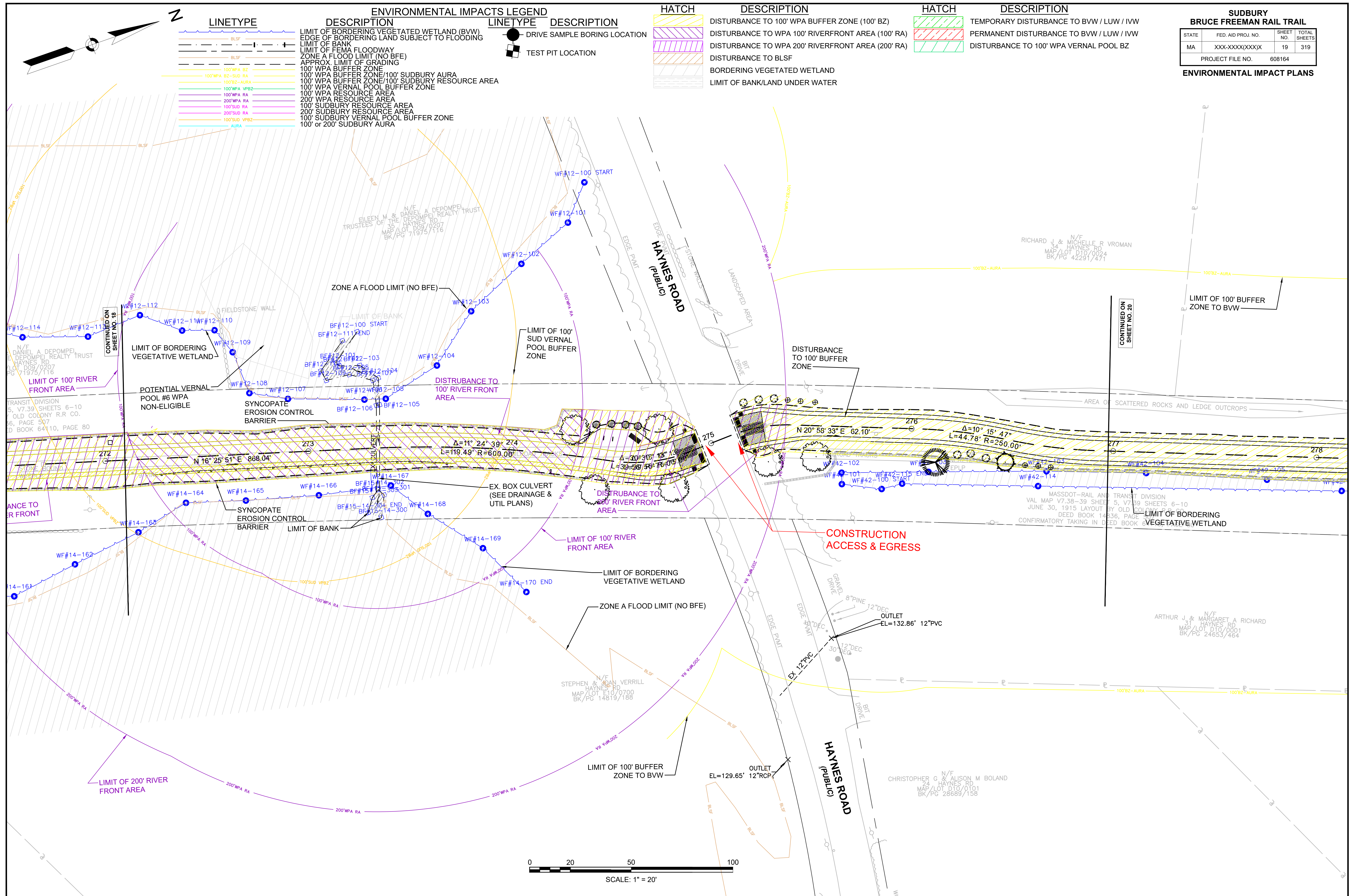






BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	18	319
PROJECT FILE NO.		608164	

ENVIRONMENTAL IMPACT PLANS



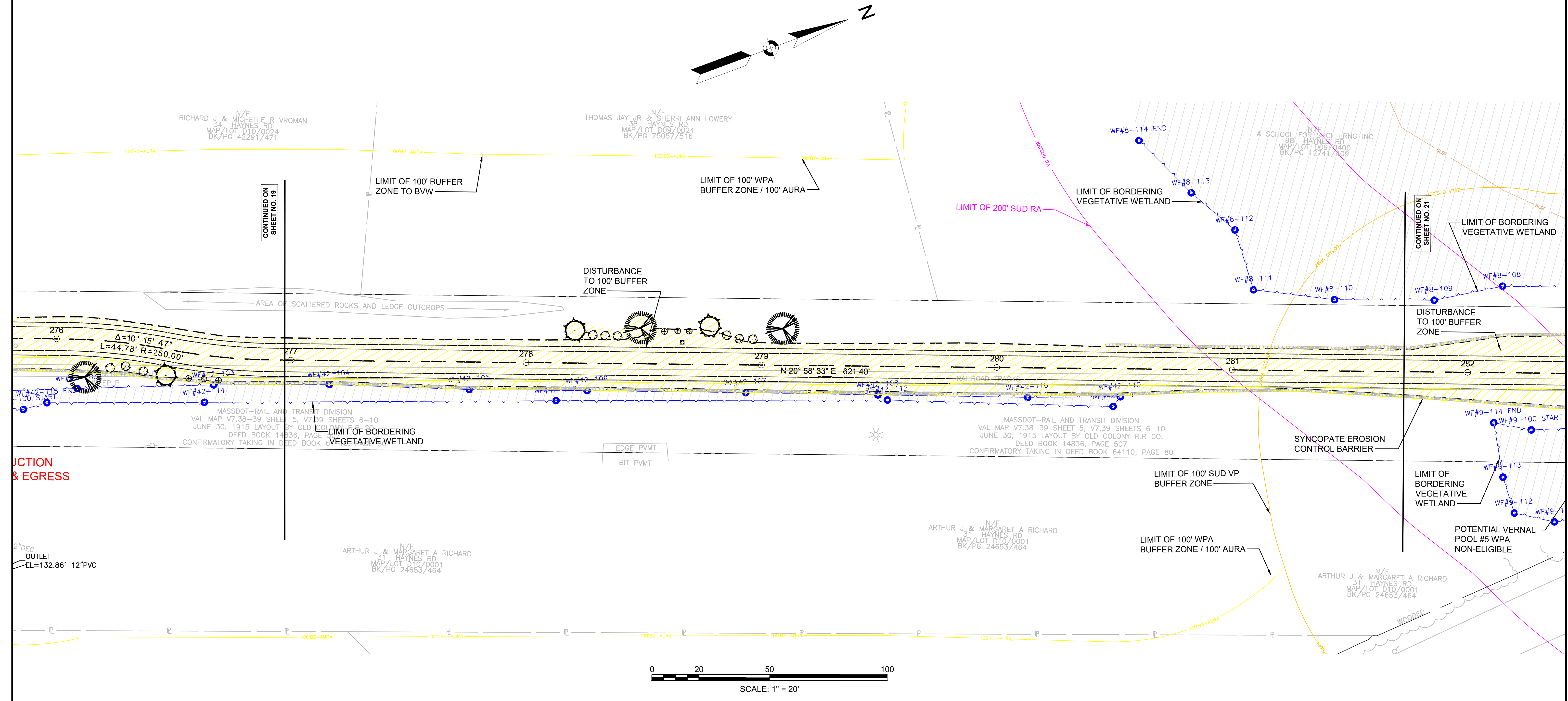
ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	100' WPA RESOURCE AREA
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	200' SUDBURY VERNAL POOL BUFFER ZONE
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' or 200' SUDBURY AURA

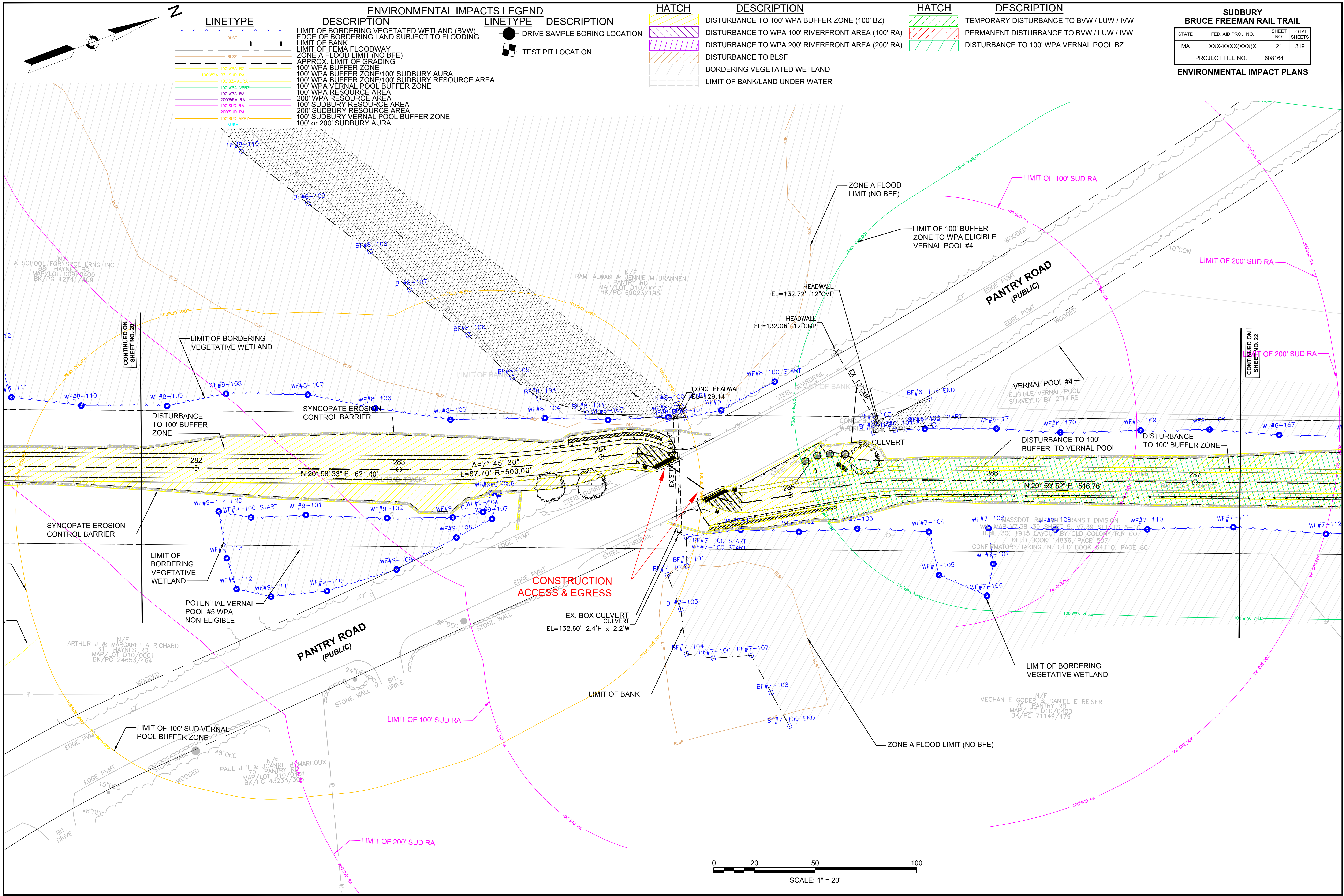
LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	20	319
PROJECT FILE NO.		608164	
ENVIRONMENTAL IMPACT PLANS			



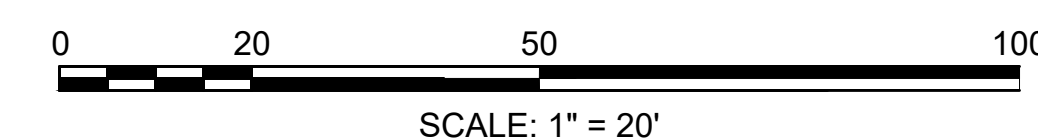


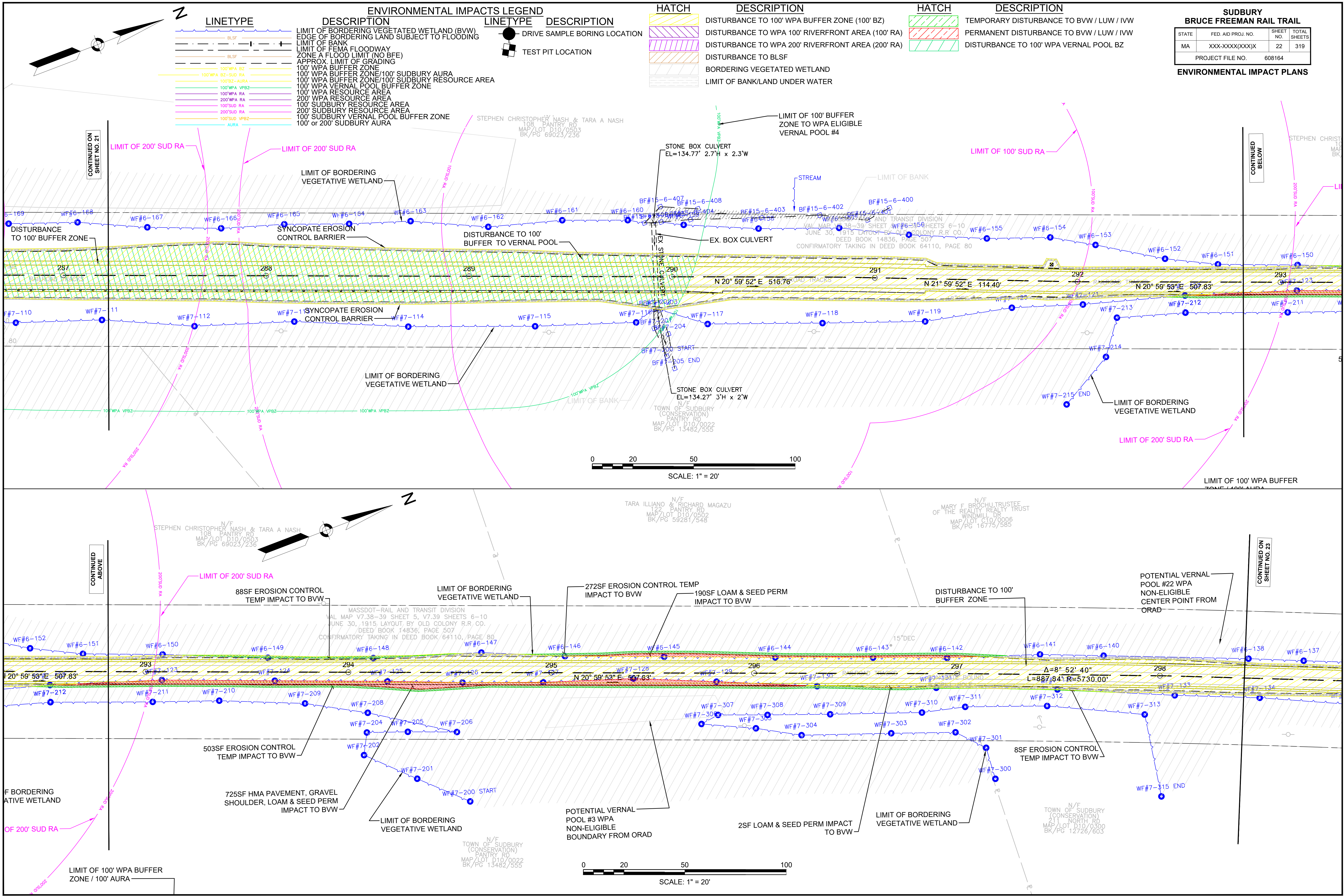
ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' or 200' SUDBURY AURA
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

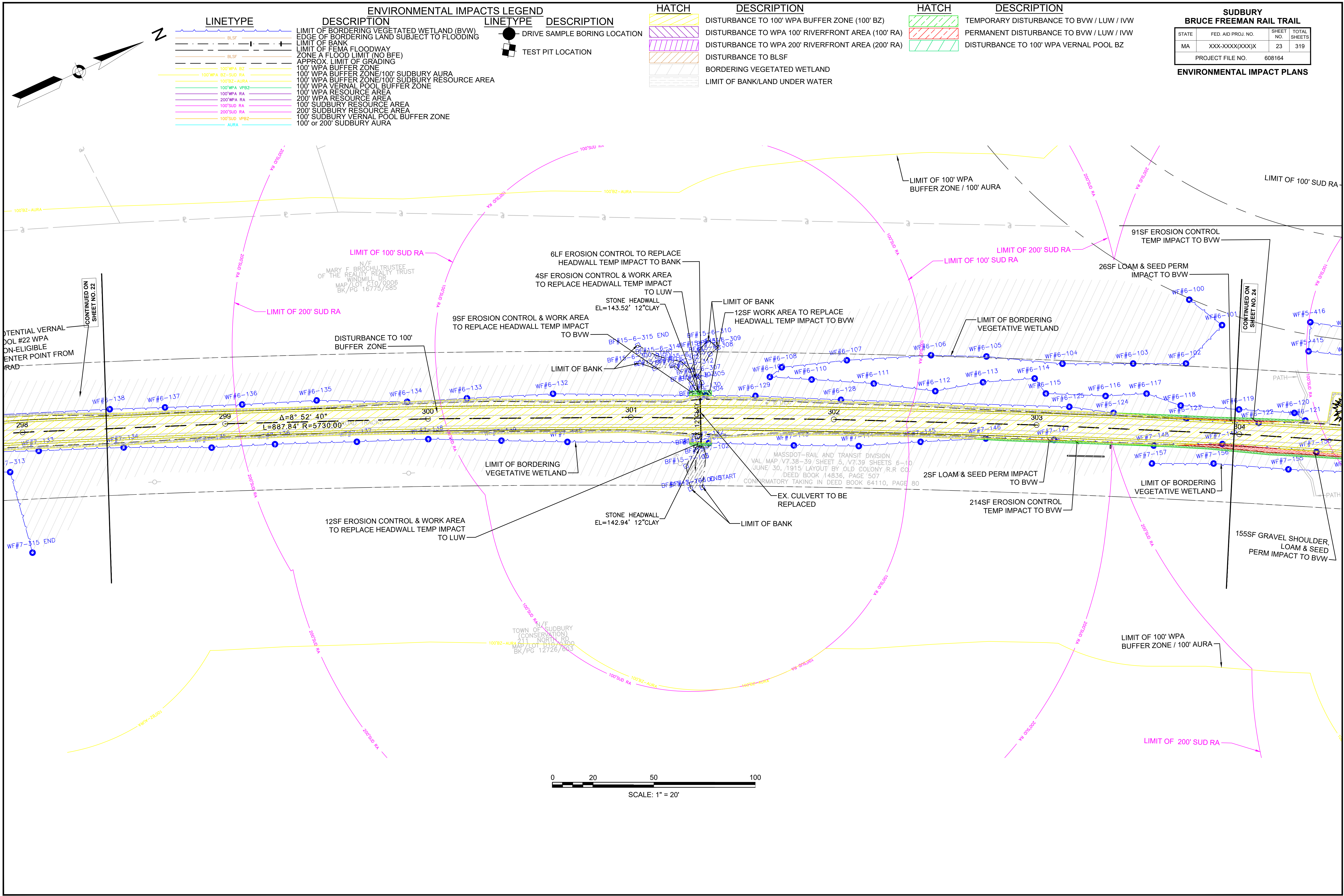
HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	21	319
PROJECT FILE NO.		608164	
ENVIRONMENTAL IMPACT PLANS			







ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	100' WPA RESOURCE AREA
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' SUDBURY AURA

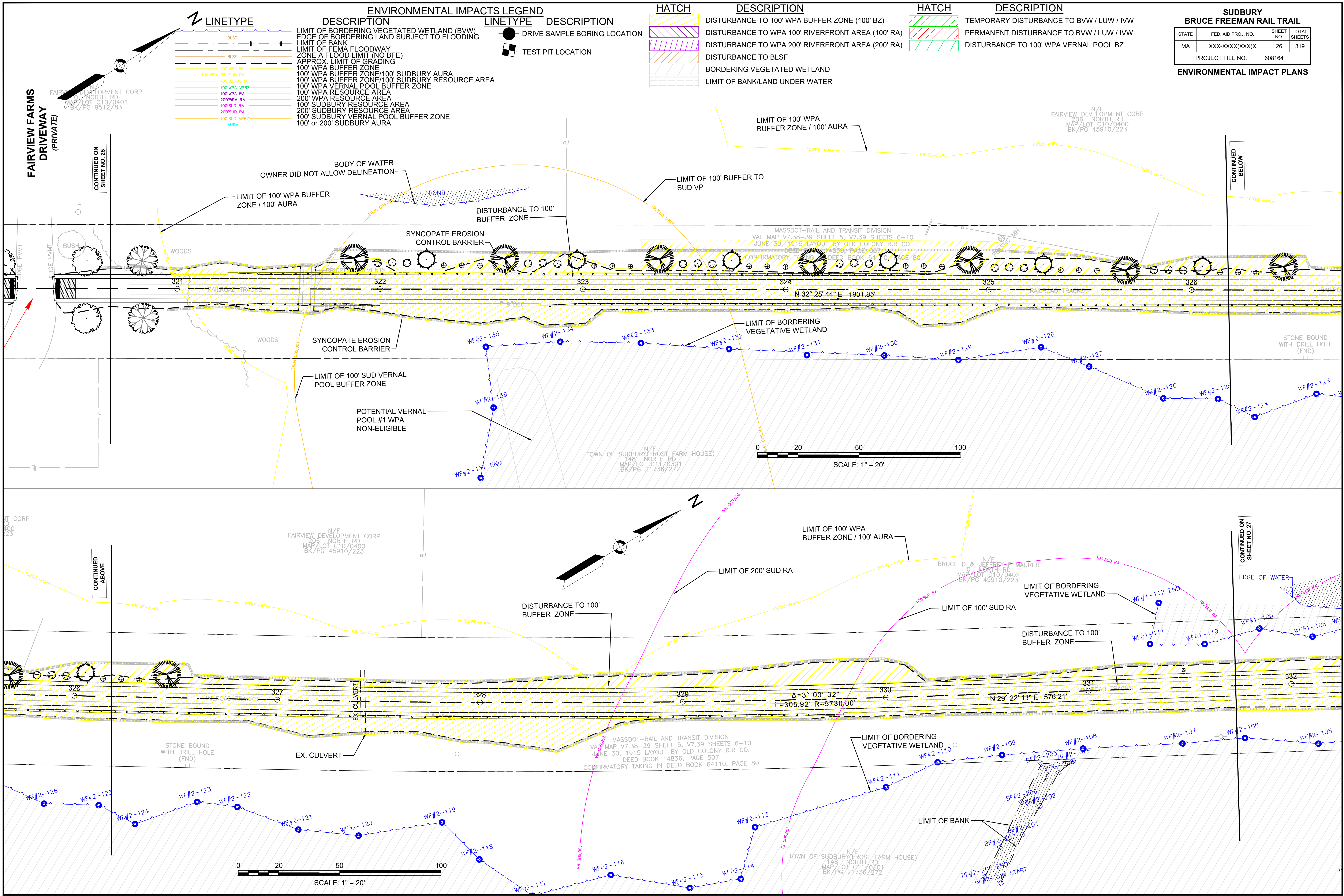
LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	23	319
PROJECT FILE NO.		608164	

ENVIRONMENTAL IMPACT PLANS



ENVIRONMENTAL IMPACTS LEGEND	
LINETYPE	DESCRIPTION
	LIMIT OF BORDERING VEGETATED WETLAND (BVW)
	EDGE OF BORDERING LAND SUBJECT TO FLOODING
	LIMIT OF BANK
	LIMIT OF FEMA FLOODWAY
	ZONE A FLOOD LIMIT (NO BFE)
	APPROX. LIMIT OF GRADING
	100' WPA BUFFER ZONE
	100' WPA BUFFER ZONE/100' SUDBURY AURA
	100' WPA BUFFER ZONE/100' SUDBURY RESOURCE AREA
	100' WPA VERNAL POOL BUFFER ZONE
	100' WPA RESOURCE AREA
	200' WPA RESOURCE AREA
	100' SUDBURY RESOURCE AREA
	200' SUDBURY RESOURCE AREA
	100' SUDBURY VERNAL POOL BUFFER ZONE
	100' or 200' SUDBURY AURA

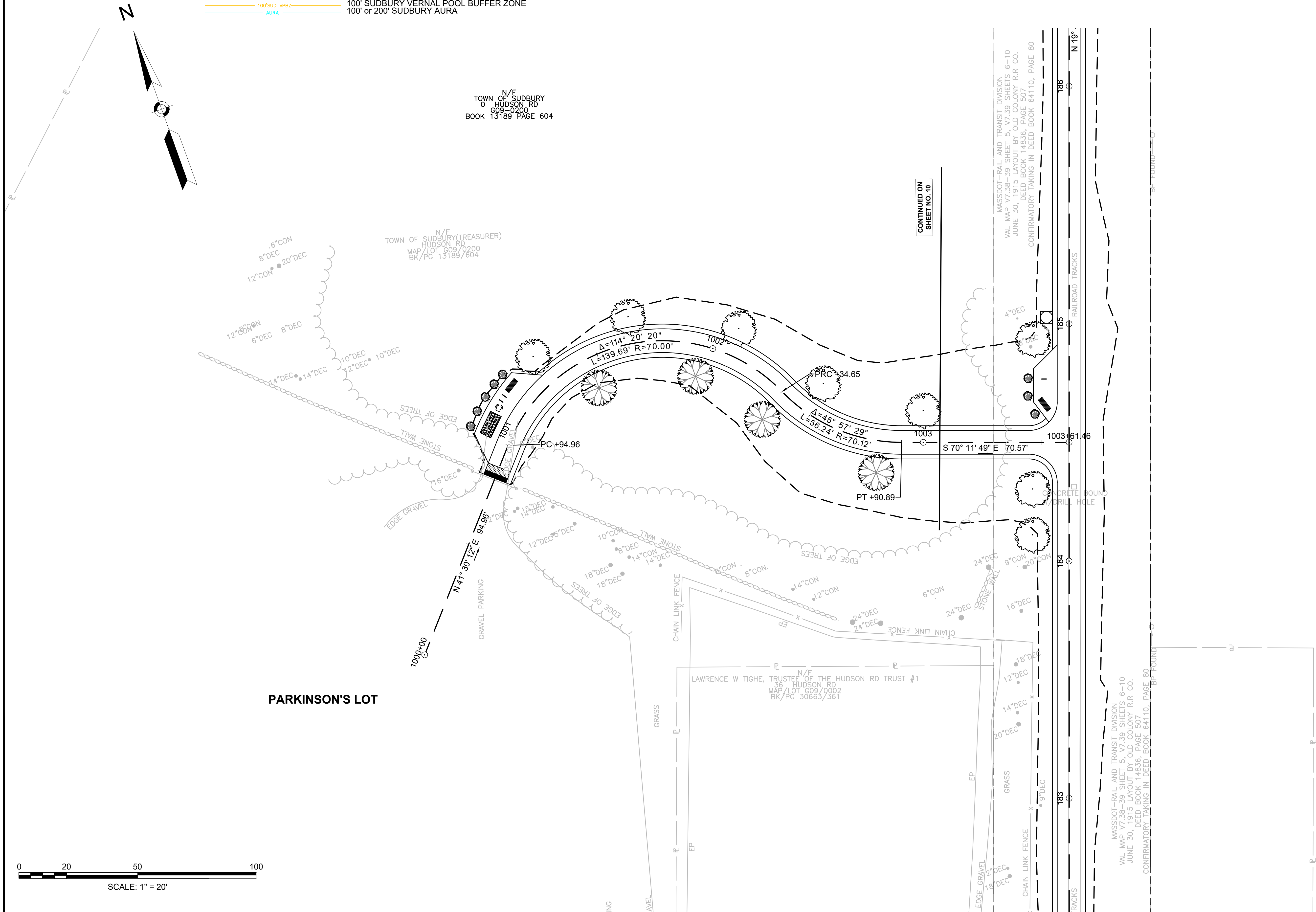
LINETYPE	DESCRIPTION
	DRIVE SAMPLE BORING LOCATION
	TEST PIT LOCATION

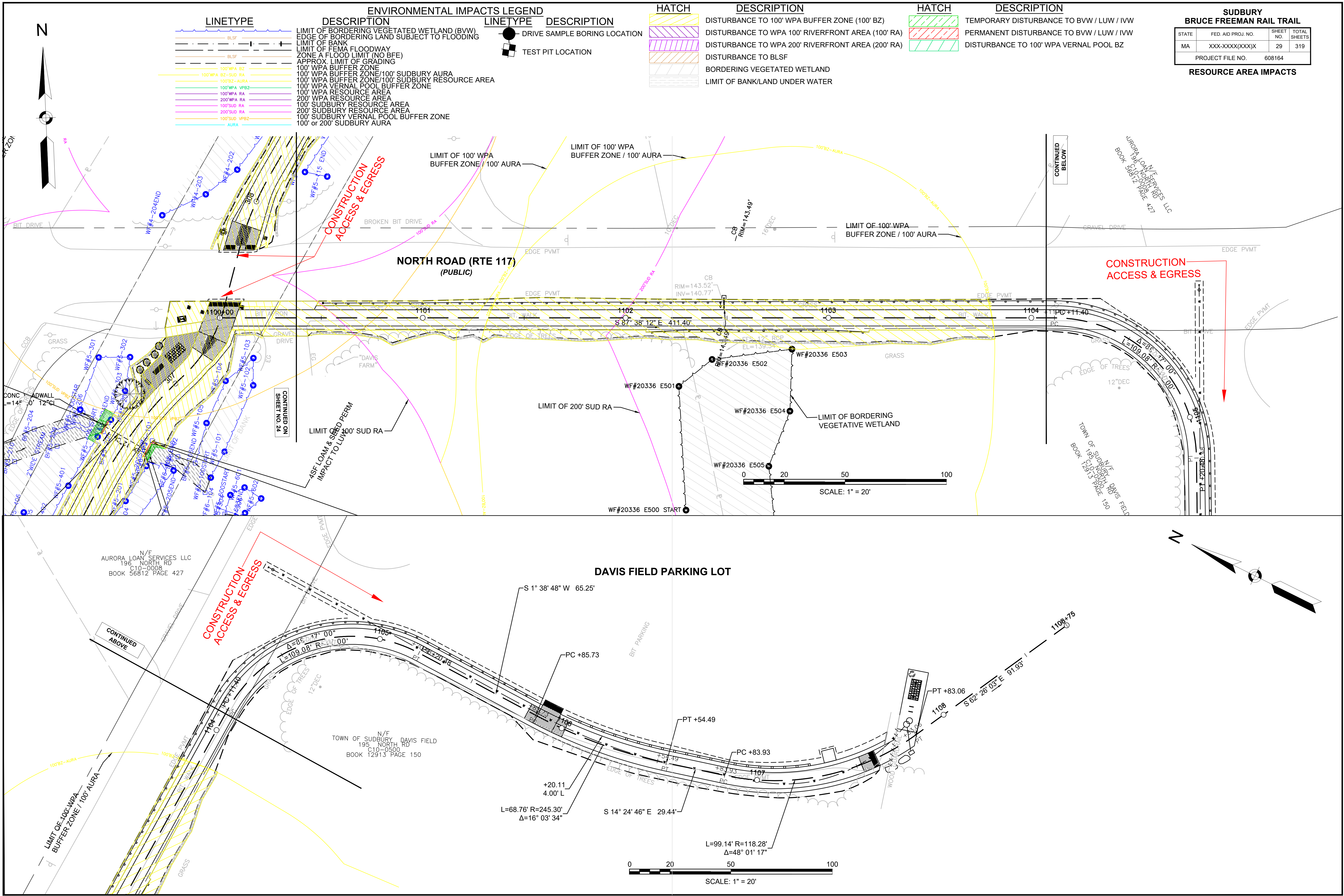
HATCH	DESCRIPTION
	DISTURBANCE TO 100' WPA BUFFER ZONE (100' BZ)
	DISTURBANCE TO WPA 100' RIVERFRONT AREA (100' RA)
	DISTURBANCE TO WPA 200' RIVERFRONT AREA (200' RA)
	DISTURBANCE TO BLSF
	BORDERING VEGETATED WETLAND
	LIMIT OF BANK/LAND UNDER WATER

HATCH	DESCRIPTION
	TEMPORARY DISTURBANCE TO BVW / LUW / IVW
	PERMANENT DISTURBANCE TO BVW / LUW / IVW
	DISTURBANCE TO 100' WPA VERNAL POOL BZ

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	28	319
PROJECT FILE NO.		608164	

ENVIRONMENTAL IMPACT PLANS





FENCING DETAILS
TIMBER FENCE (THREE-RAIL) 103+55 RT TO STA. 104+25 RT
TIMBER FENCE (THREE-RAIL) 104+80 LT TO STA. 107+15 LT

HIGHWAY GUARD DETAILS
NONE

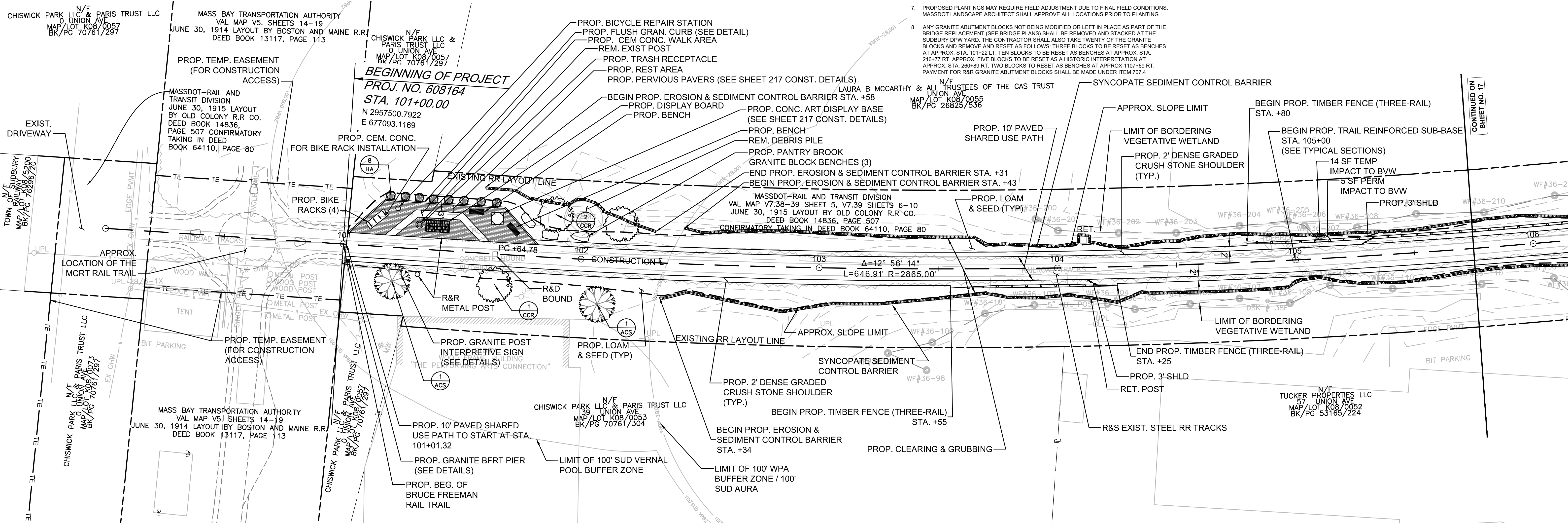
TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
ORNAMENTAL MIX				
CCR	CERCIS CANADENSIS	REDBUD	3	2-3" CAL.
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY	2	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	8	3 GAL.



PROJECT SUMMARY PLANT LIST				
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
VISUAL SCREEN MIX				
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	13	4-5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	161	3 GAL.
IG	ILEX GLABRA	INKBERRY	131	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	54	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	40	5-6' HT.
EROSION CONTROL MIX				
SS	CAREX STRICTA	TUSsock SEDGE	30	PLUG
CS	CORNUS SERICEA & SALIX SSP	DOGWOOD AND WILLOW	11	1 GAL.
ORNAMENTAL MIX				
CCR	CERCIS CANADENSIS	REDBUD	48	2-3" CAL.
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY	19	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	80	3 GAL.

PROJECT SUMMARY PLANT LIST (continued)				
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
SHADE TREES				
AS	ACER SACCHARUM	SUGAR MAPLE	1	2-3" CAL.
TA	TILIA AMERICANA	AMERICAN LINDEN	1	2-3" CAL.
QR	QUERCUS RUBRA	NORTHERN RED OAK	2	2-3" CAL.
BN	BETULA NIGRA	RIVER BIRCH	2	2-2.5" CAL.
NATIVE VEGETATION PLUGS				
PV	PANICUM VIRGATUM	SWITCHGRASS	13	PLUG
SL	SPIREA LATIFOLIA	MEADOWSWEET	11	PLUG
AT	ASCLEPIAS TUBEROSA	BUTTERFLY WEED	11	PLUG
AL	ASTER LAEVIS	SMOOTH ASTER	12	PLUG
CP	COMPTONIA PEREGRINA	SWEET FERN	12	PLUG
SEED MIX				
LOW UPLAND SEED MIX			210,655 SQ. FT.	0.86 LB/ 2,500 SQ. FT.
WOODLAND EDGE SHADE MIX			3,333 SQ. FT.	0.86 LB/ 2,500 SQ. FT.
MID-HEIGHT POLLINATOR MIX			2,500 SQ. FT.	1.15 LB/ 2,500 SQ. FT.
WETLAND/ BASIN MIX (SEASONALLY FLOODED)			47,314 SQ. FT.	1.15 LB/ 2,500 SQ. FT.

NOTES:

- REMOVAL AND HANDLING OF EXISTING RAILS, COMPONENTS AND OTHER MATERIALS WITHIN THE PROJECT LIMIT SHALL BE PAID UNDER THE CORRESPONDING ITEMS.
- SEE TYPICAL SECTIONS FOR FORMATION OF SHARED USE PATH SHOULDERS AND MATERIAL SPECIFICATIONS.
- ALL EXISTING STRUCTURES WITHIN CURB RAMP AREAS SHALL BE ADJUSTED TO BE FLUSH WITH CURB RAMP SURFACE.
- PRIOR TO ANY CLEARING, GRUBBING, OR TREE TRIMMING, THE CONTRACTOR SHALL STAKEOUT THE CLEARING LIMITS AS SHOWN ON THE CONSTRUCTION PLANS. THE CONTRACTOR SHALL THEN PERFORM A SITE WALK WITH MASSDOT DISTRICT 3 PROJECTS OFFICE, RESIDENT ENGINEER, MASSDOT LANDSCAPE ARCHITECT, AND TOWN OF SUDBURY TO CONFIRM THESE CLEARING LIMITS.
- ALL TREES WITHIN SLOPE LIMITS/CLEARING LIMITS SHALL BE REMOVED UNLESS OTHERWISE NOTED ON PLANS. PAYMENT FOR TREE REMOVALS THE SLOPE LIMITS SHALL BE PAID FOR UNDER CLEARING & GRUBBING ITEM PER STANDARD SPECIFICATIONS.
- NO CLEARING OUTSIDE OF THE SLOPE LIMITS SHALL OCCUR FOR CONTRACTOR CONVENIENCE WITHOUT PRIOR AUTHORIZATION FROM THE TOWN OF SUDBURY AND THE RESIDENT ENGINEER. THE CONTRACTOR SHALL ONLY BE PAID FOR CLEARING AND GRUBBING FROM SLOPE LIMIT TO SLOPE LIMIT AS SHOWN ON PLANS.
- PROPOSED PLANTINGS MAY REQUIRE FIELD ADJUSTMENT DUE TO FINAL FIELD CONDITIONS. MASSDOT LANDSCAPE ARCHITECT SHALL APPROVE ALL LOCATIONS PRIOR TO PLANTING.
- ANY GRANITE ABUTMENT BLOCKS NOT BEING MODIFIED OR LEFT IN PLACE AS PART OF THE BRIDGE REPLACEMENT (SEE BRIDGE PLANS) SHALL BE REMOVED AND STACKED AT THE SUDBURY DPW YARD. THE CONTRACTOR SHALL ALSO TAKE TWENTY OF THE GRANITE BLOCKS AND REMOVE AND RESET AS FOLLOWS: THREE BLOCKS TO BE RESET AS BENCHES AT APPROX. STA. 101+22 LT. TEN BLOCKS TO BE RESET AS BENCHES AT APPROX. STA. 216+77 RT. APPROX. FIVE BLOCKS TO BE RESET AS A HISTORIC INTERPRETATION AT APPROX. STA. 260+89 RT. TWO BLOCKS TO BE RESET AS BENCHES AT APPROX. 1107+69 RT. PAYMENT FOR R&R GRANITE ABUTMENT BLOCKS SHALL BE MADE UNDER ITEM 707.4.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL #

PLANT QUANTITY AND SPECIES

X#

X

XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	16	319

PROJECT FILE NO. 608164

CONSTRUCTION PLANS

0 20 50 100

SCALE: 1" = 20'

PLANT LIST NOTES:

1. ALL CALLOUTS FOR LOAM & SEED BY REFER TO THE LOW UPLAND SEED MIX BY DEFAULT UNLESS AN ALTERNATE SEED MIX IS SPECIFIED IN THE CALLOUT

FOR PROFILE SEE SHEET NO. 48

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	5	4-5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	29	3 GAL.
IG	ILEX GLABRA	INKBERRY	25	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	6	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	5	6-8' HT.

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	5	4-5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	29	3 GAL.
IG	ILEX GLABRA	INKBERRY	25	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	6	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	5	6-8' HT.

NONE

TRAFFIC SIGNAL CONDUIT

NONE

NONE

DRAINAGE DETAILS

NONE

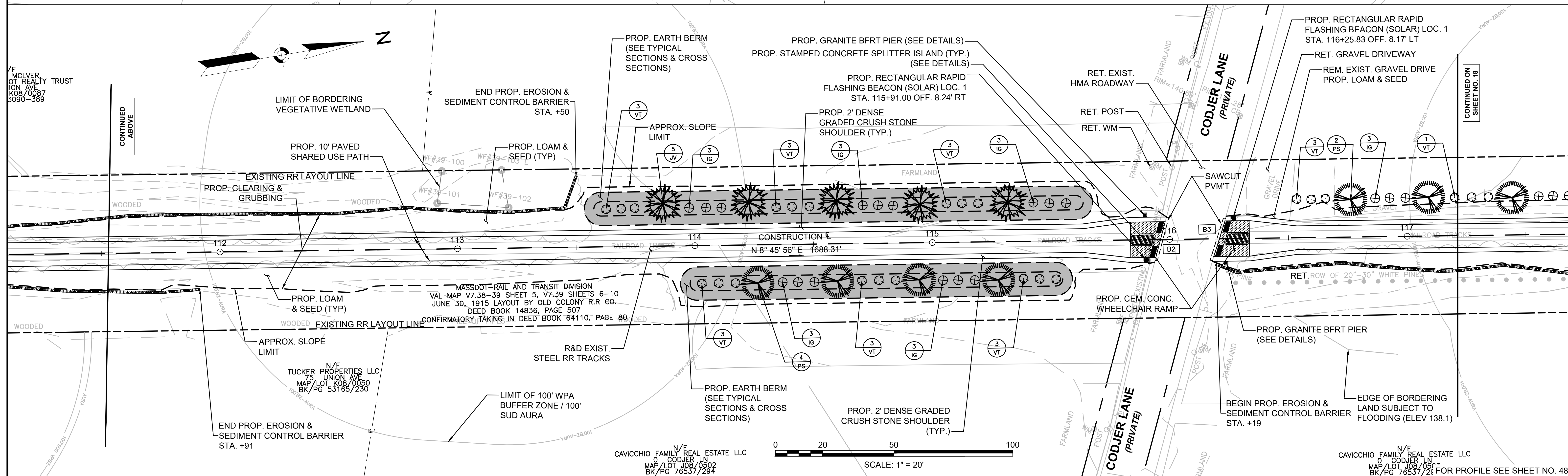
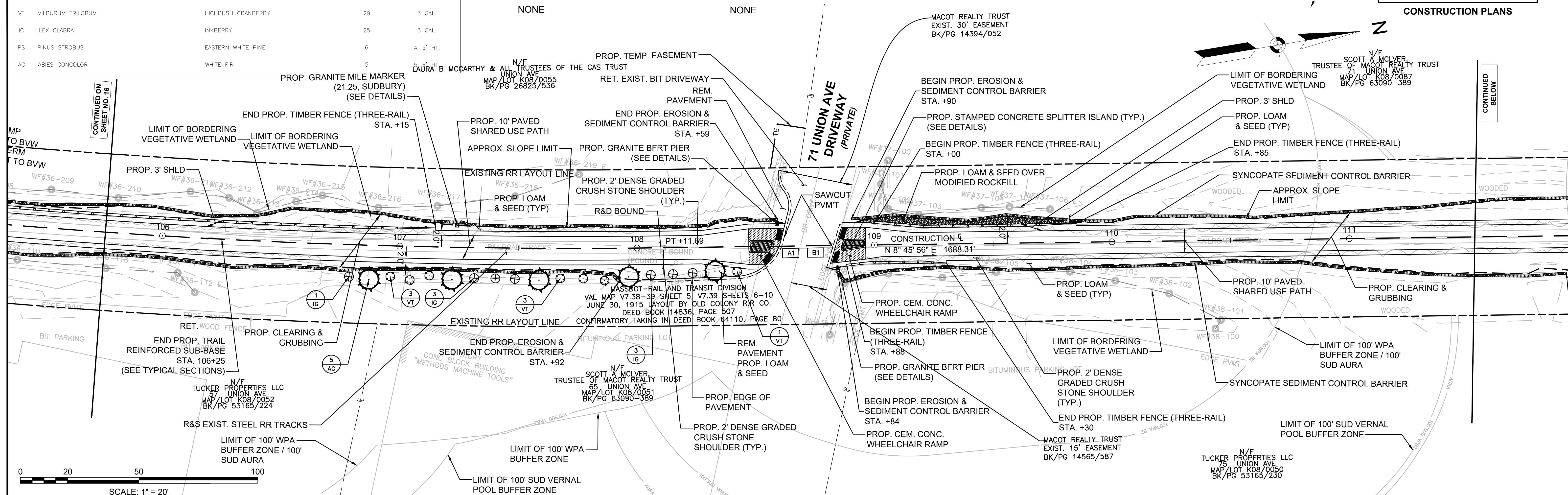
TIMBER FENCE (THREE-RAIL) STA. 104+80 LT TO STA. 107+15 LT
TIMBER FENCE (THREE-RAIL) STA. 108+88 RT TO STA. 109+30 RT
TIMBER FENCE (THREE-RAIL) STA. 109+00 LT TO STA. 109+85 LT

PROPOSED WHEELCHAIR
RAMP DETAIL #

PLANT QUANTITY AND SPECIES

STATE	FED. AID PROJ. NO.	SHEET NO.	TOT SHEET
MA	XXX-XXXX(XXX)X	17	31
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS



TIMBER FENCE (THREE-RAIL) STA. 119+75 LT TO STA. 132+25 LT
TIMBER FENCE (THREE-RAIL) STA. 119+75 RT TO STA. 130+75 RT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

KEY	BOTANICAL NAME
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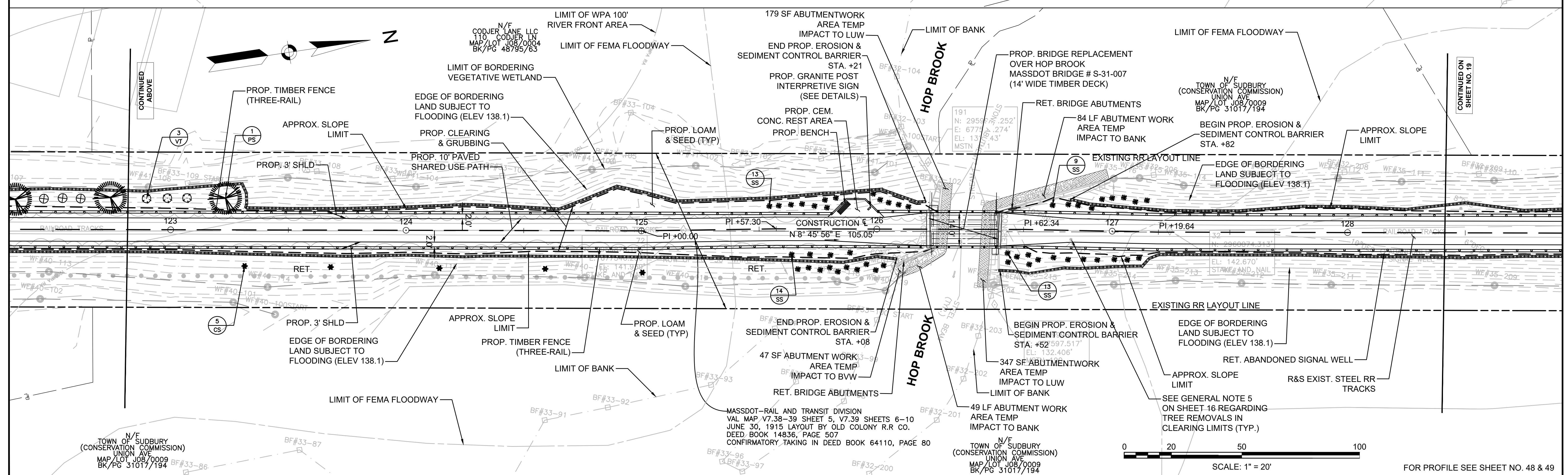
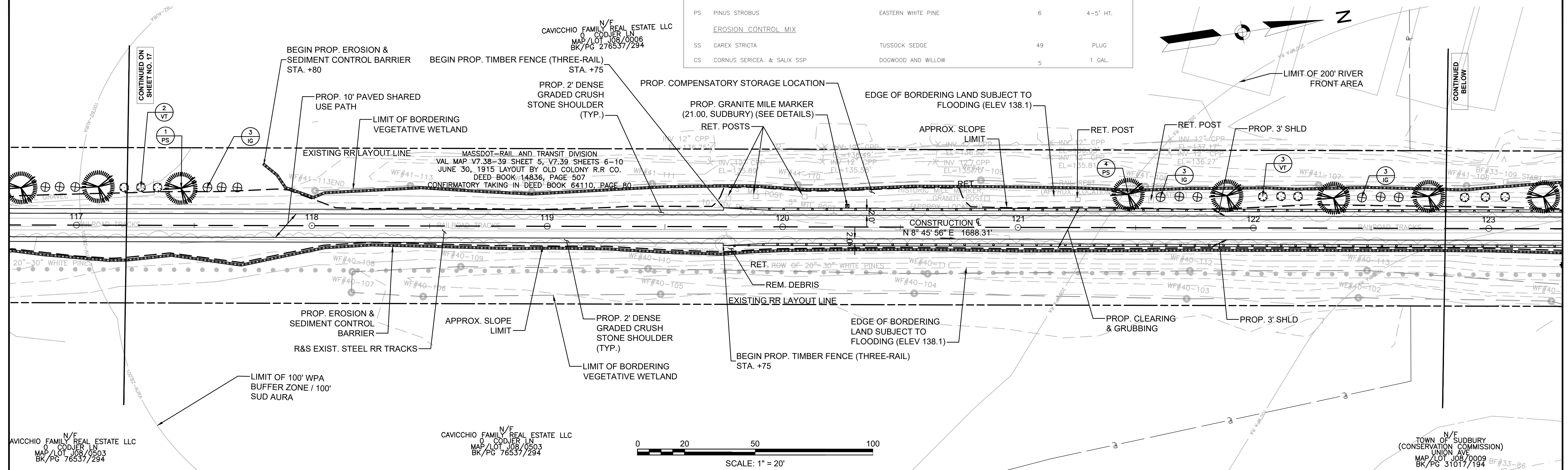
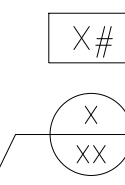
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	8	3 GAL.
IG	ILEX GLABRA	INKBERRY	9	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	6	4-5' HT.
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSsock SEDGE	49	PLUG
CS	CORNUS SERICEA. & SALIX SSP	DOGWOOD AND WILLOW	5	1 GAL.

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	18	319
PROJECT FILE NO.		608164	

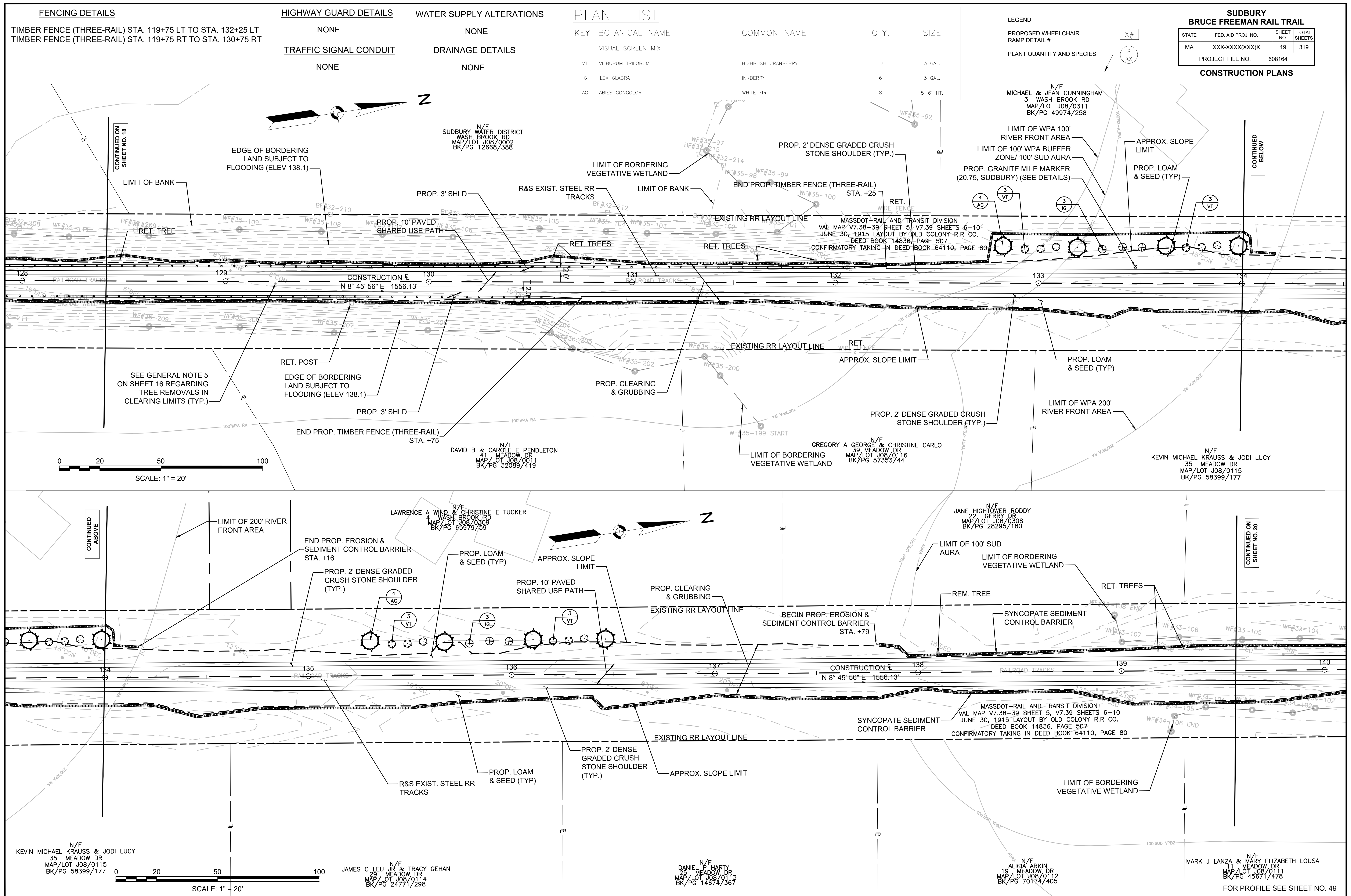
LEGEND:

PROPOSED WHEELCHAIR

PLANT QUANTITY AND SPECIES



FOR PROFILE SEE SHEET NO. 48 & 49



FENCING DETAILS
NONE

HIGHWAY GUARD DETAILS
NONE
TRAFFIC SIGNAL CONDUIT
NONE

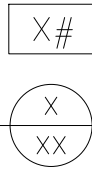
WATER SUPPLY ALTERATIONS
NONE
DRAINAGE DETAILS
NONE

PLANT LIST

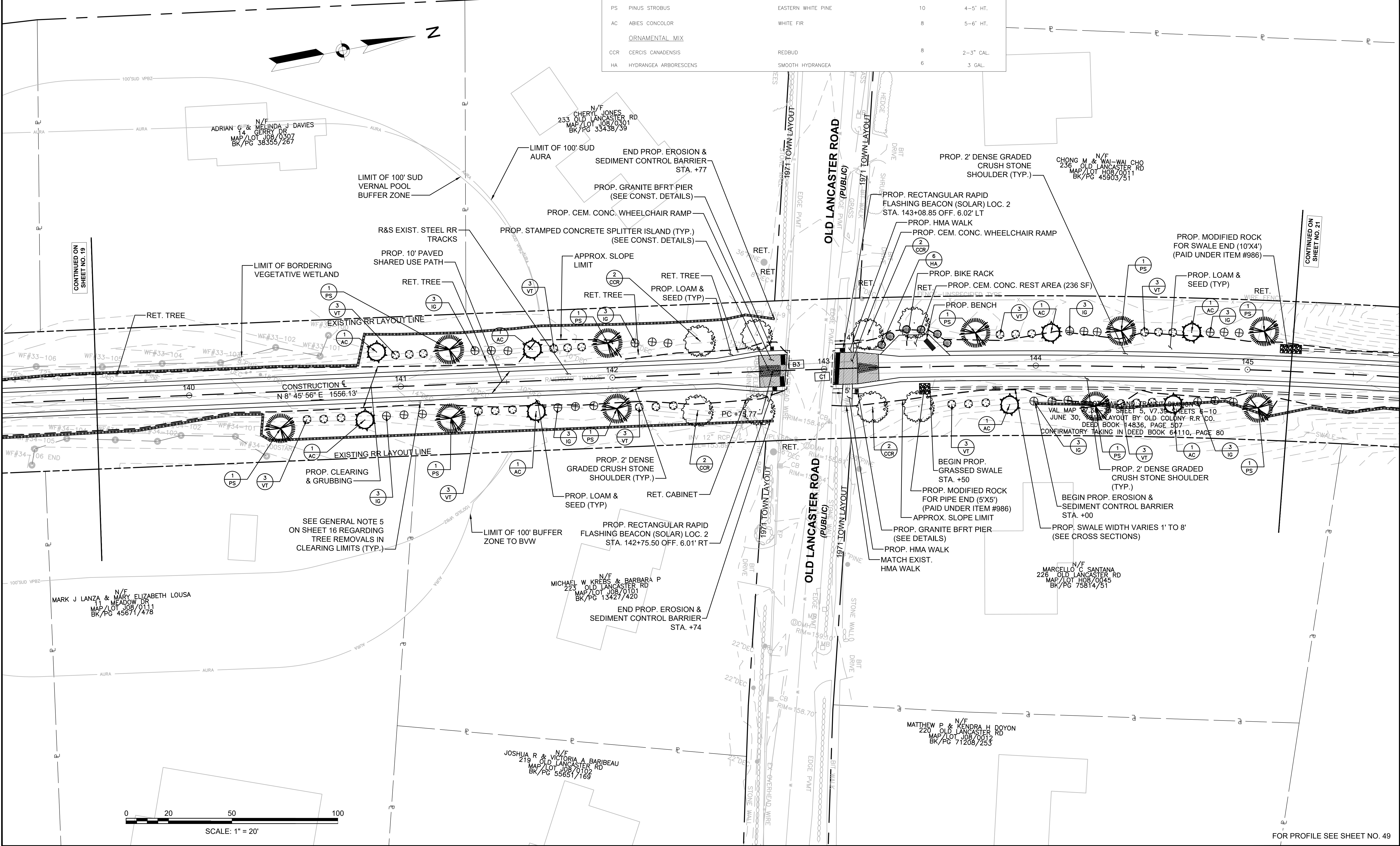
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
VISUAL SCREEN MIX				
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	27	3 GAL.
IG	ILEX GLABRA	INKBERRY	24	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	10	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	8	5-6' HT.
ORNAMENTAL MIX				
CCR	CERCIS CANADENSIS	REDBUD	8	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	6	3 GAL.

LEGEND:

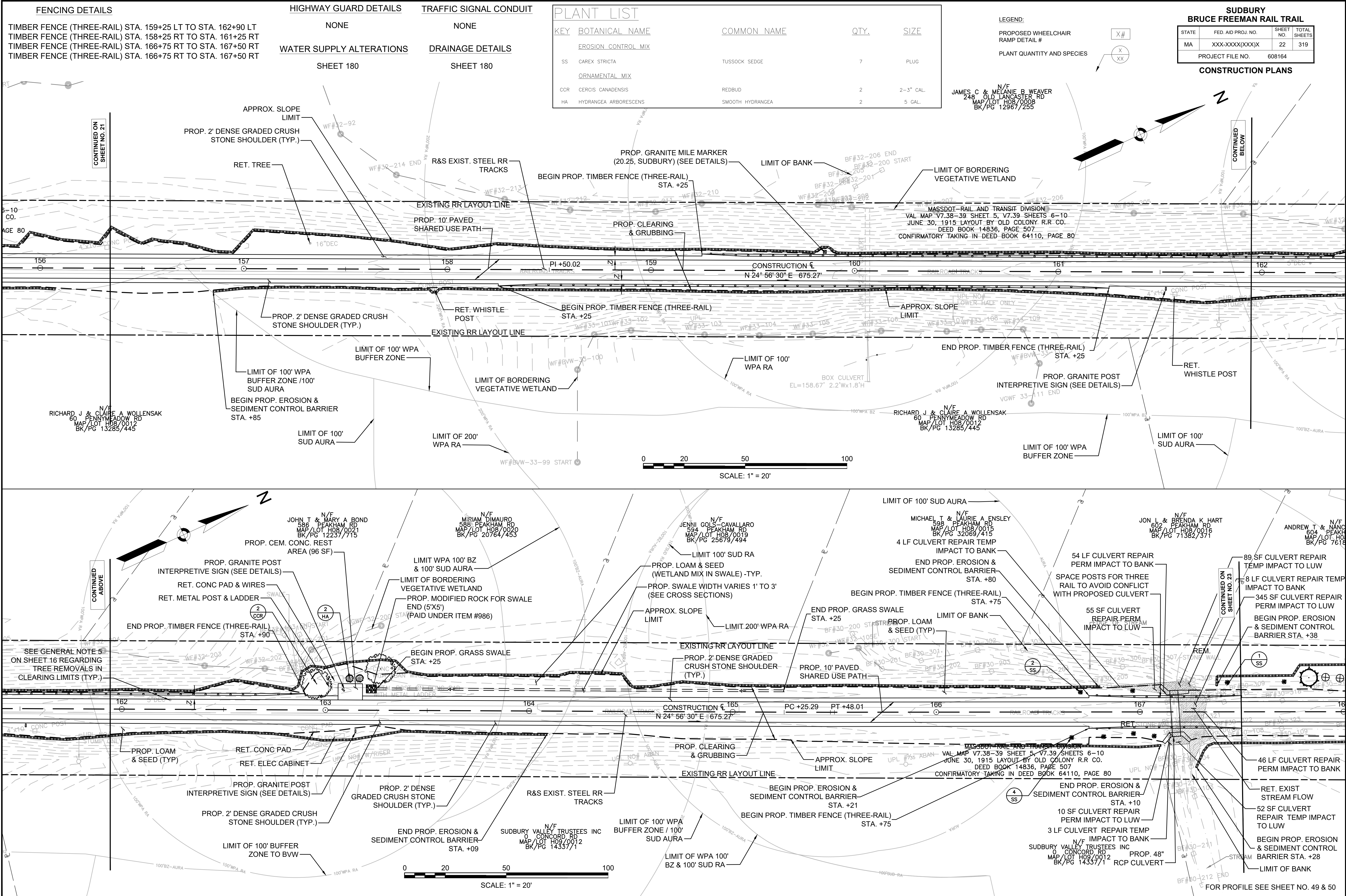
PROPOSED WHEELCHAIR
RAMP DETAIL #
PLANT QUANTITY AND SPECIES



SUDBURY BRUCE FREEMAN RAIL TRAIL			
TATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	20	3
PROJECT FILE NO.		608164	
CONSTRUCTION PLANS			



FOR PROFILE SEE SHEET NO. 49



FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 166+75 RT TO STA. 167+50 RT
TIMBER FENCE (THREE-RAIL) STA. 166+75 LT TO STA. 167+50 LT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

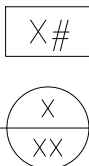
DRAINAGE DETAILS

NONE

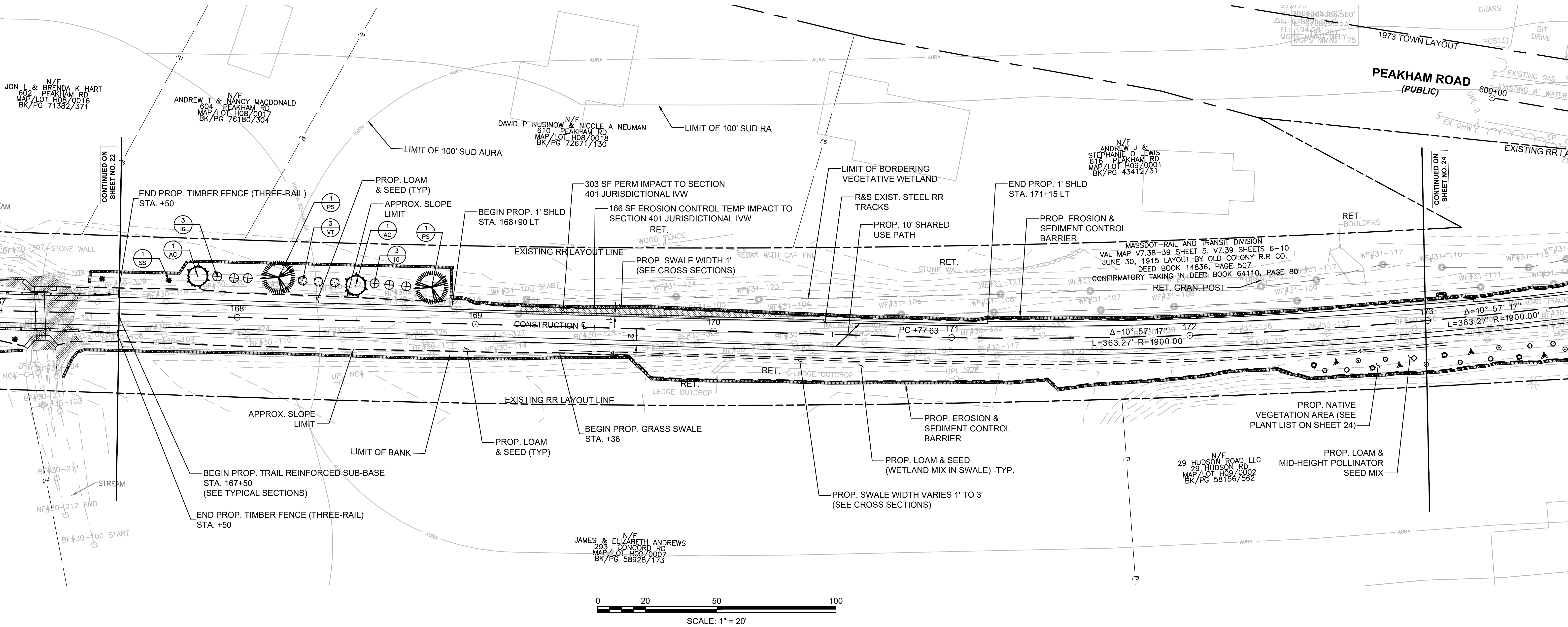
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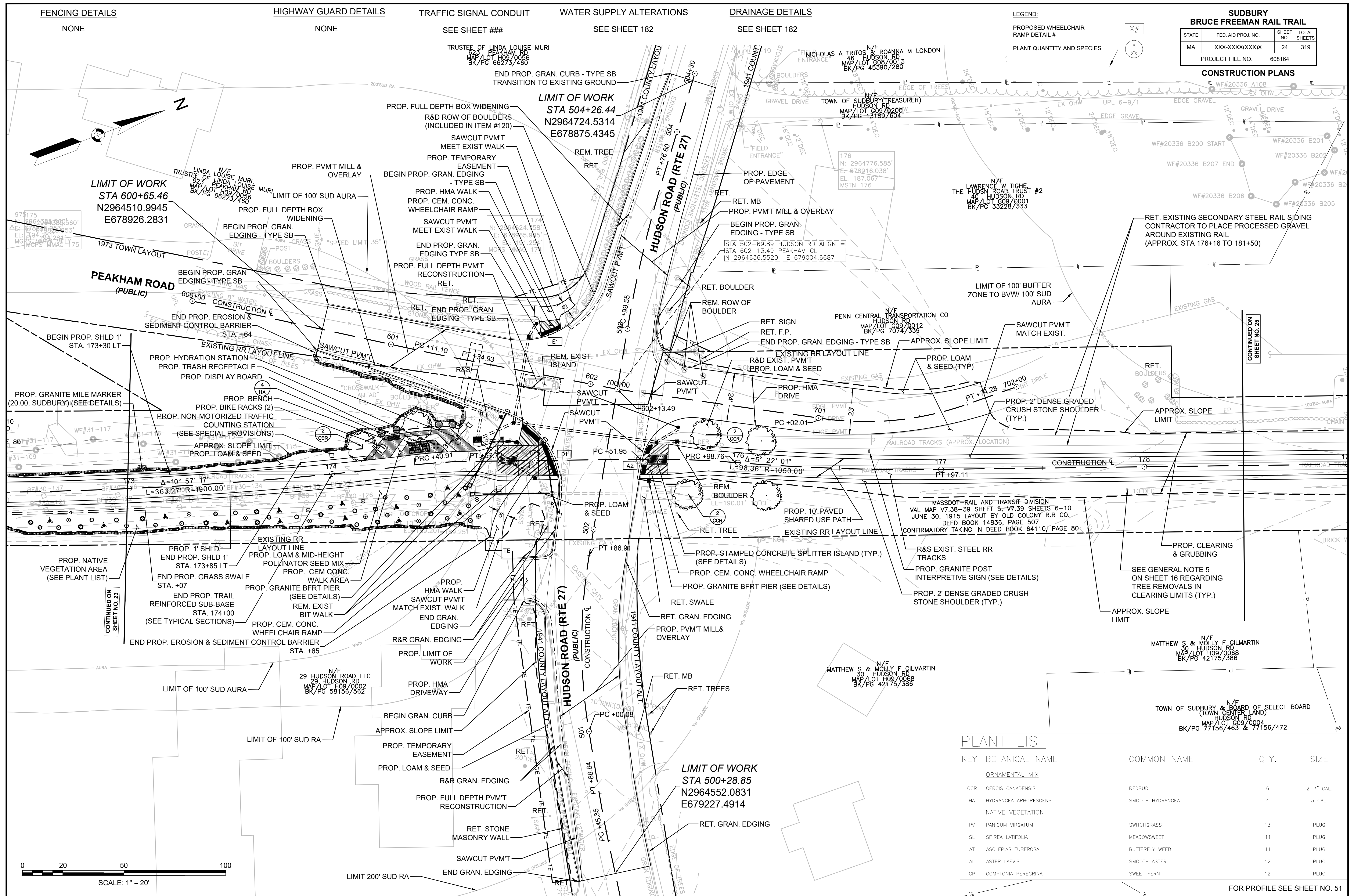
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
VISUAL SCREEN MIX				
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	3	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	2	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	2	5-6' HT.
EROSION CONTROL MIX				
SS	CAREX STRICTA	TUSsock SEDGE	1	PLUG

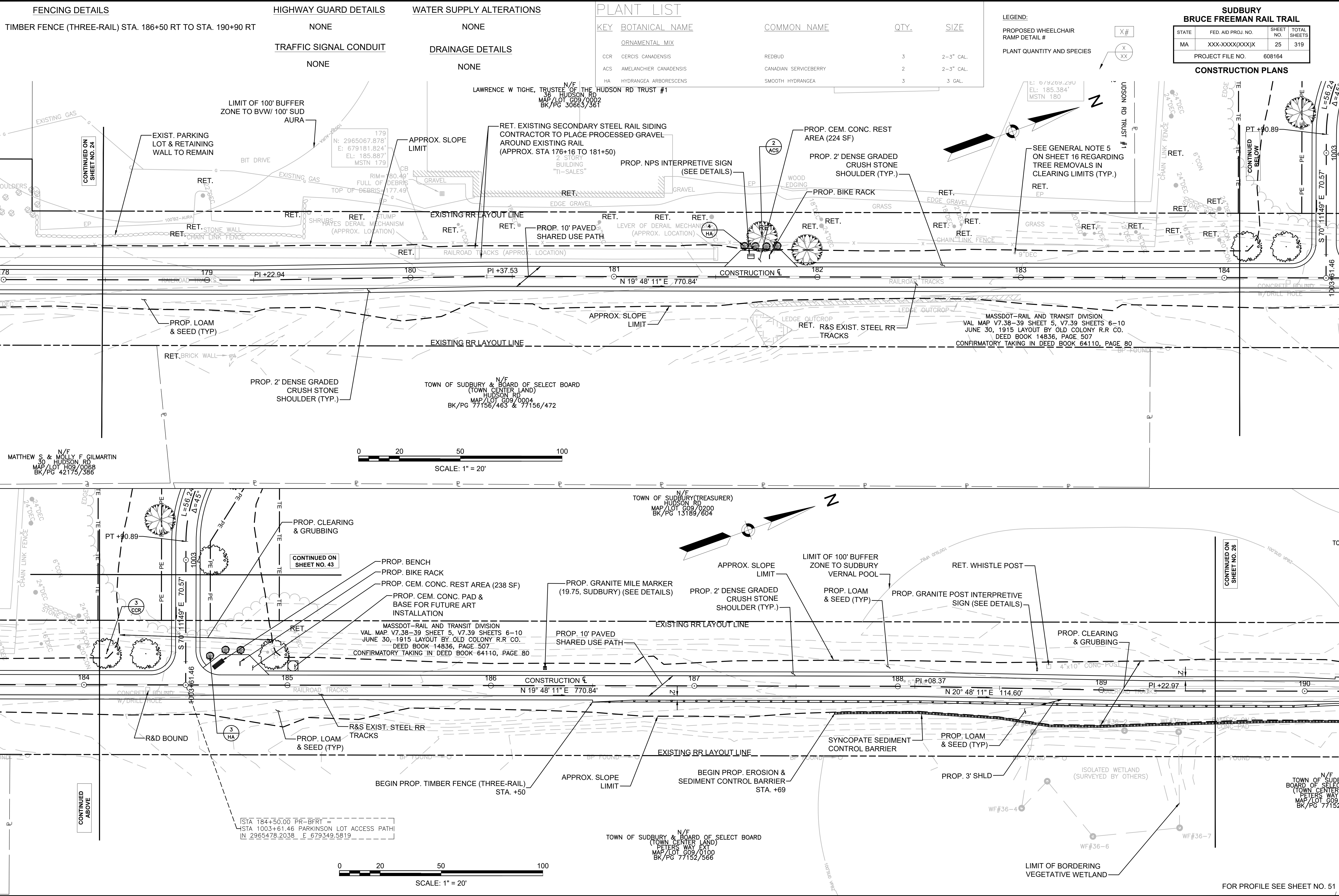
LEGEND:
PROPOSED WHEELCHAIR
RAMP DETAIL #
PLANT QUANTITY AND SPECIES

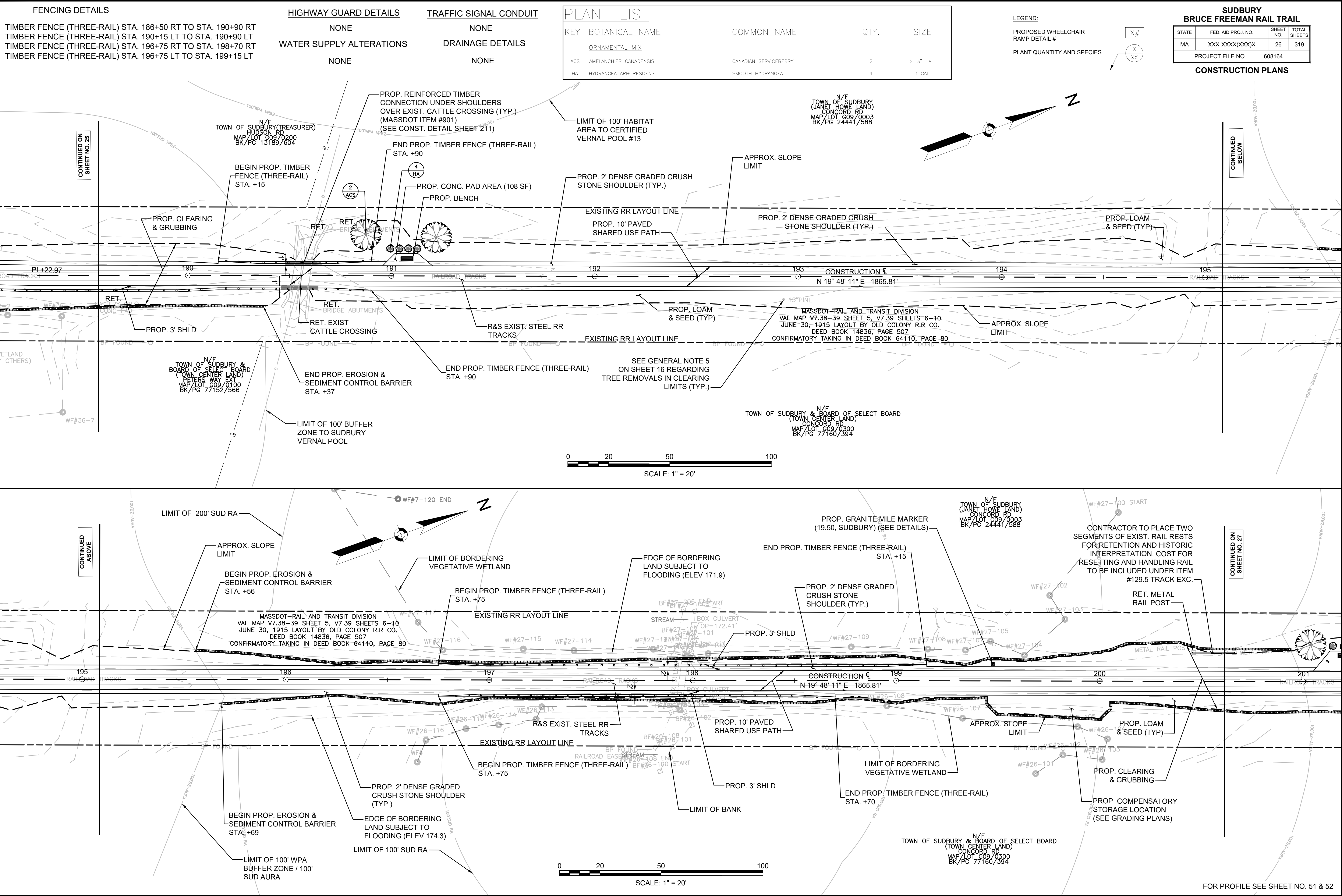


SUDBURY BRUCE FREEMAN RAIL TRAIL			
TATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	23	31
PROJECT FILE NO.		608164	
CONSTRUCTION PLANS			









STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	27	319
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	27	319
PROJECT FILE NO.		608164	

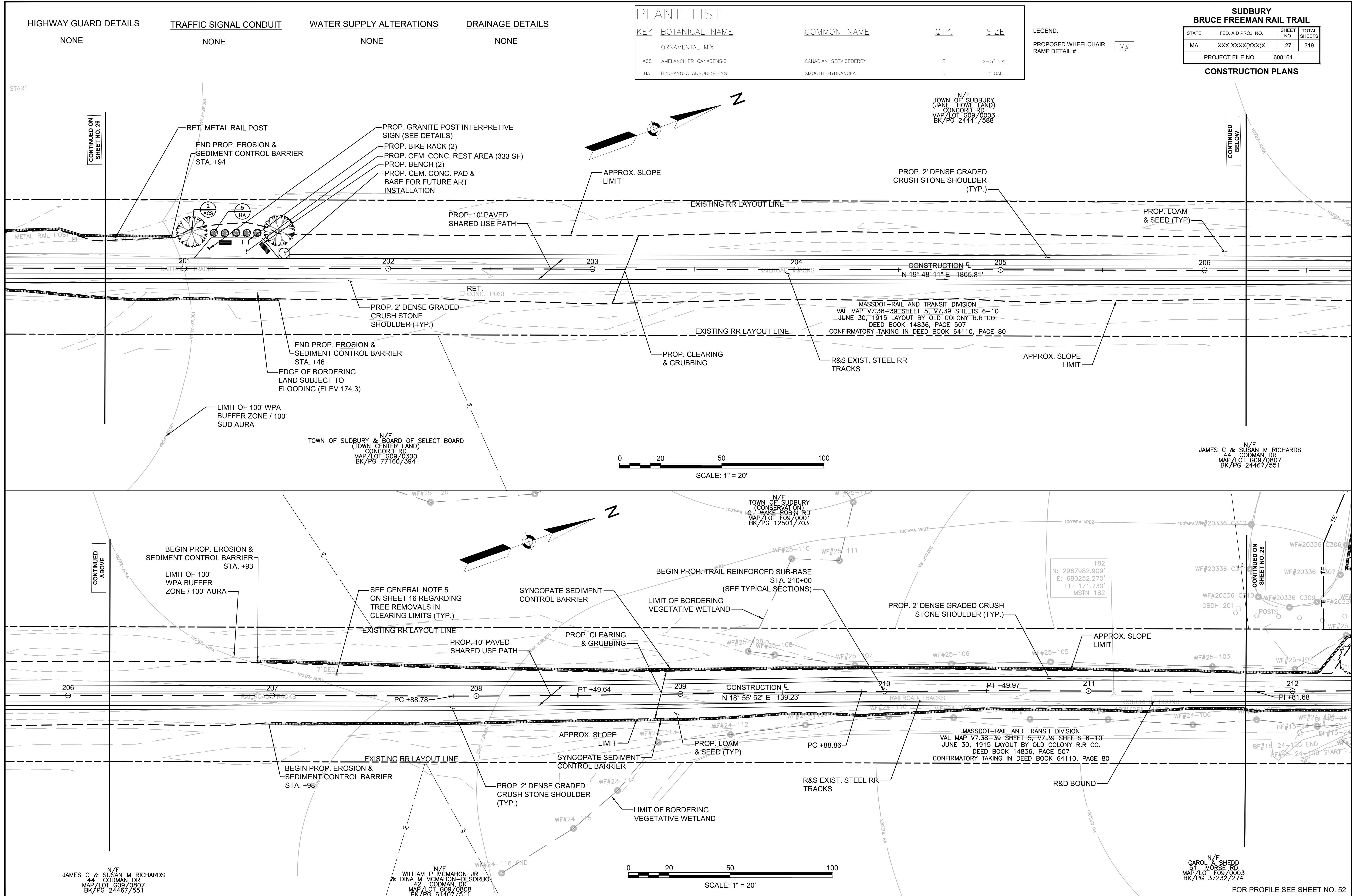
FOR PROFILE SEE SHEET NO. 52

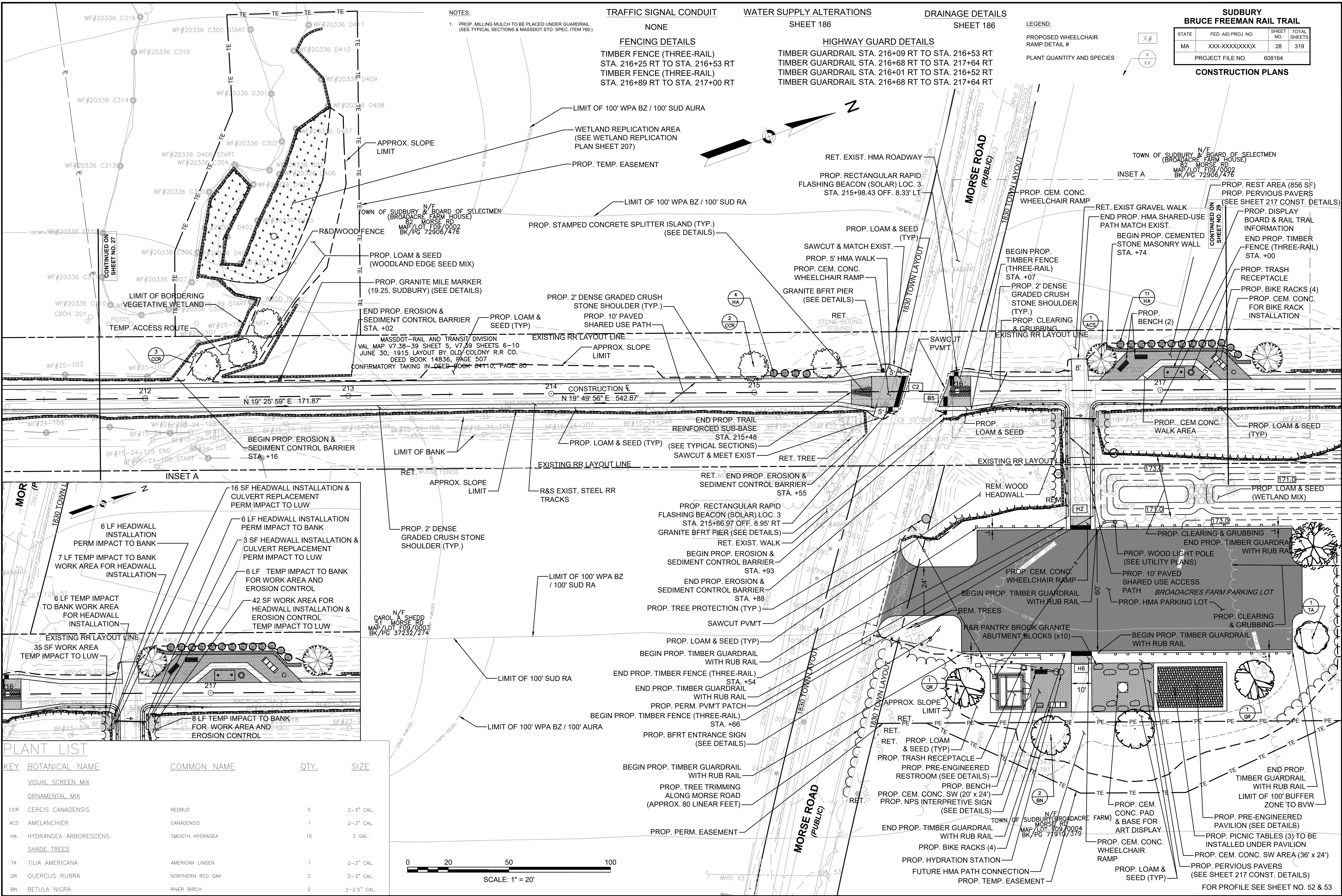
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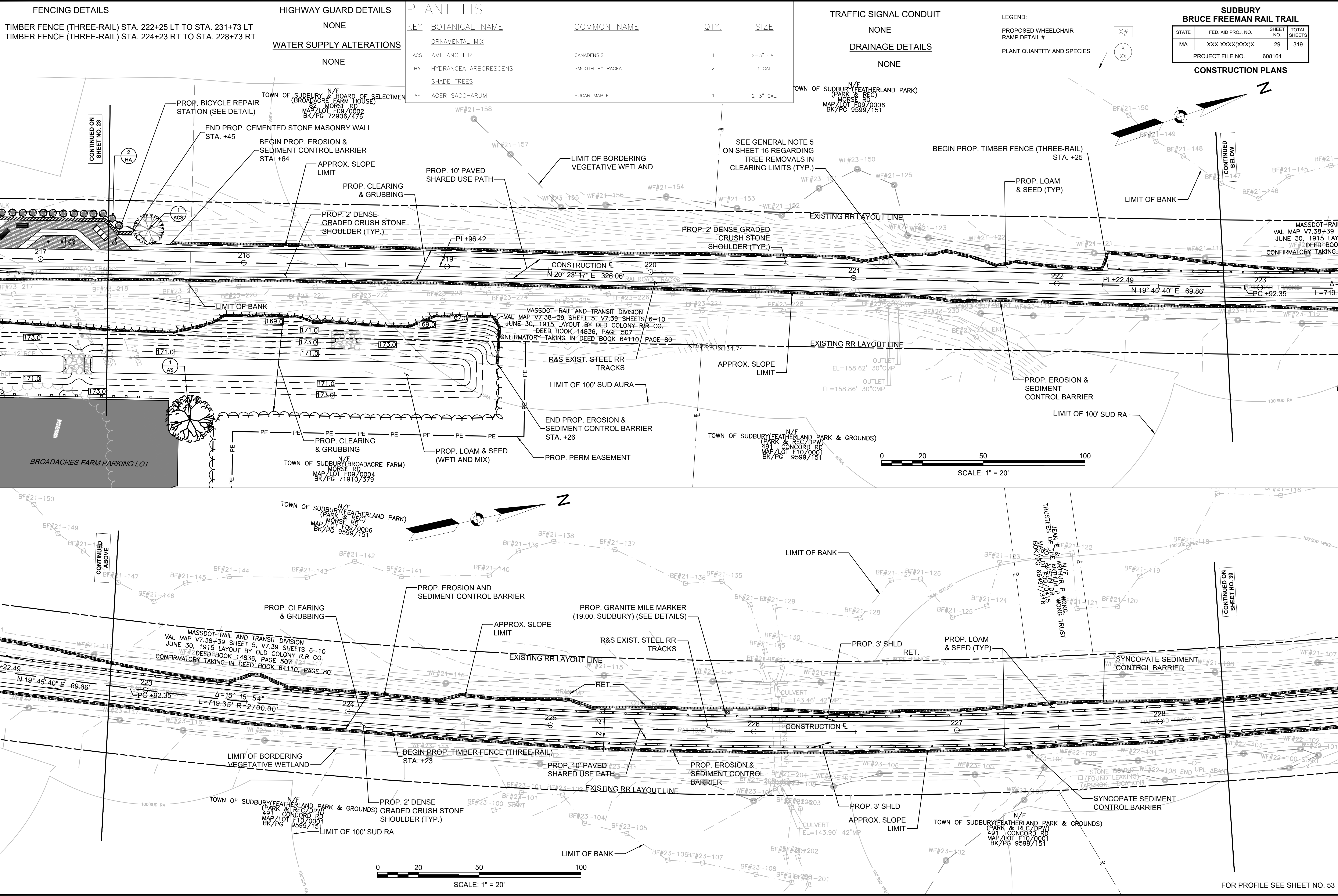
PROPOSED WHEELCHAIR
RAMP DETAIL #

X#

PLANT LIST				
KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
ORNAMENTAL MIX				
ACS	AMELANCHIER CANADENSIS	CANADIAN SERVICEBERRY	2	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRANGEA	5	3 GAL.







FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 222+25 LT TO STA. 231+73 LT
TIMBER FENCE (THREE-RAIL) STA. 224+23 RT TO STA. 228+73 RT
TIMBER FENCE (THREE-RAIL) STA. 236+90 LT TO STA. 243+45 LT
TIMBER FENCE (THREE-RAIL) STA. 236+90 RT TO STA. 241+73 RT

HIGHWAY GUARD DETAILS

NONE

WATER SUPPLY ALTERATIONS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

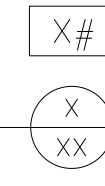
DRAINAGE DETAILS

NONE

LEGEND:

PROPOSED WHEELCHAIR
RAMP DETAIL #

PLANT QUANTITY AND SPECIES



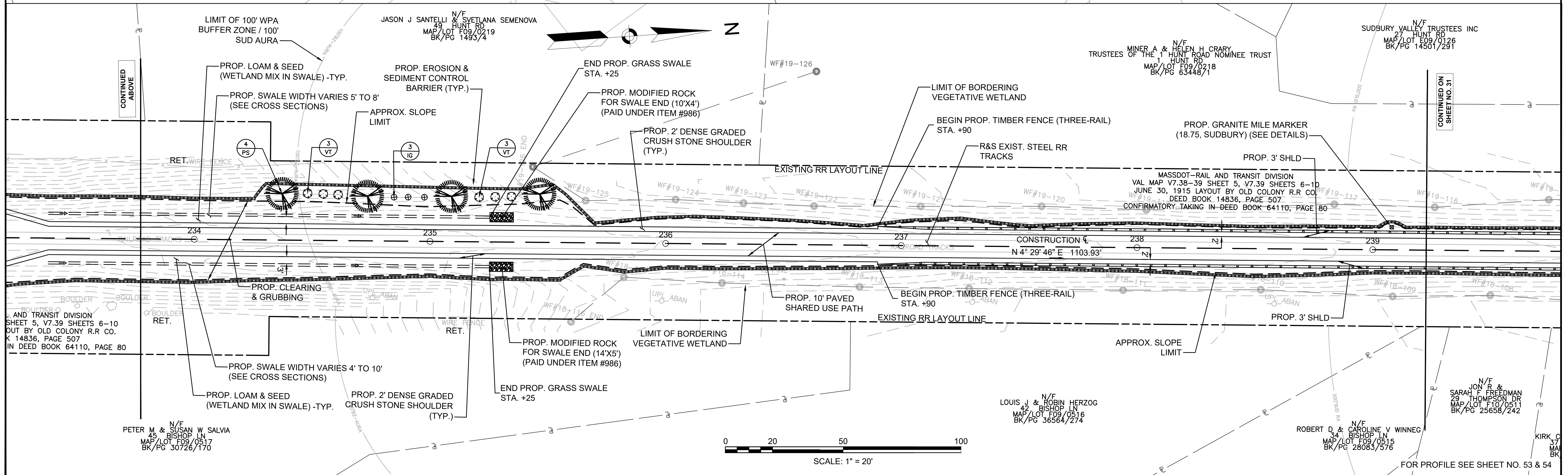
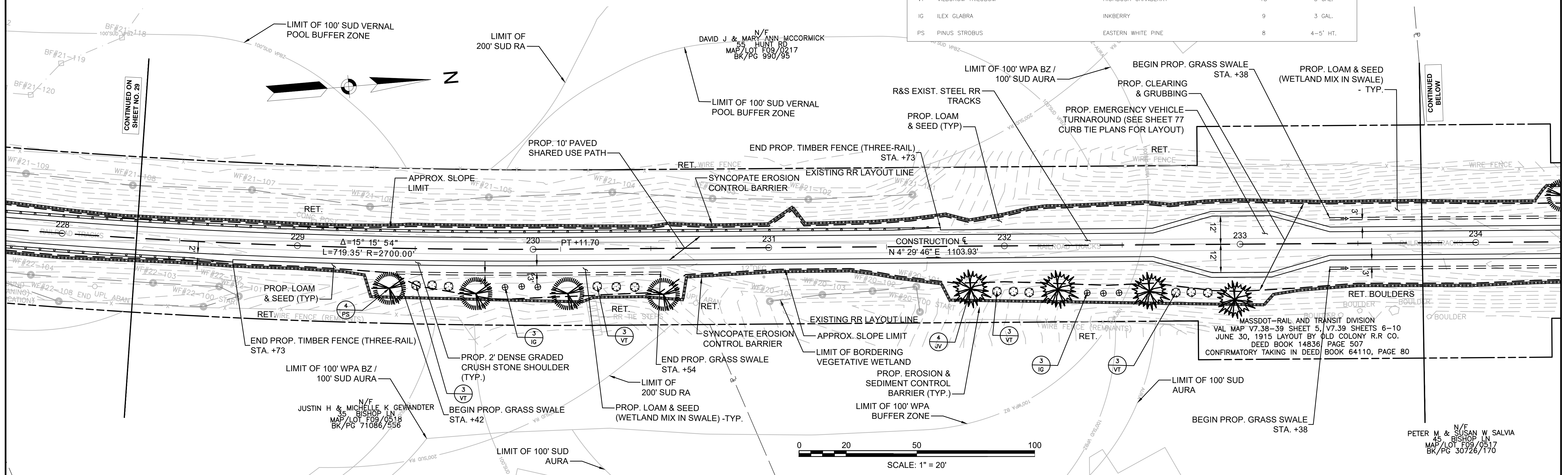
PLANT LIST

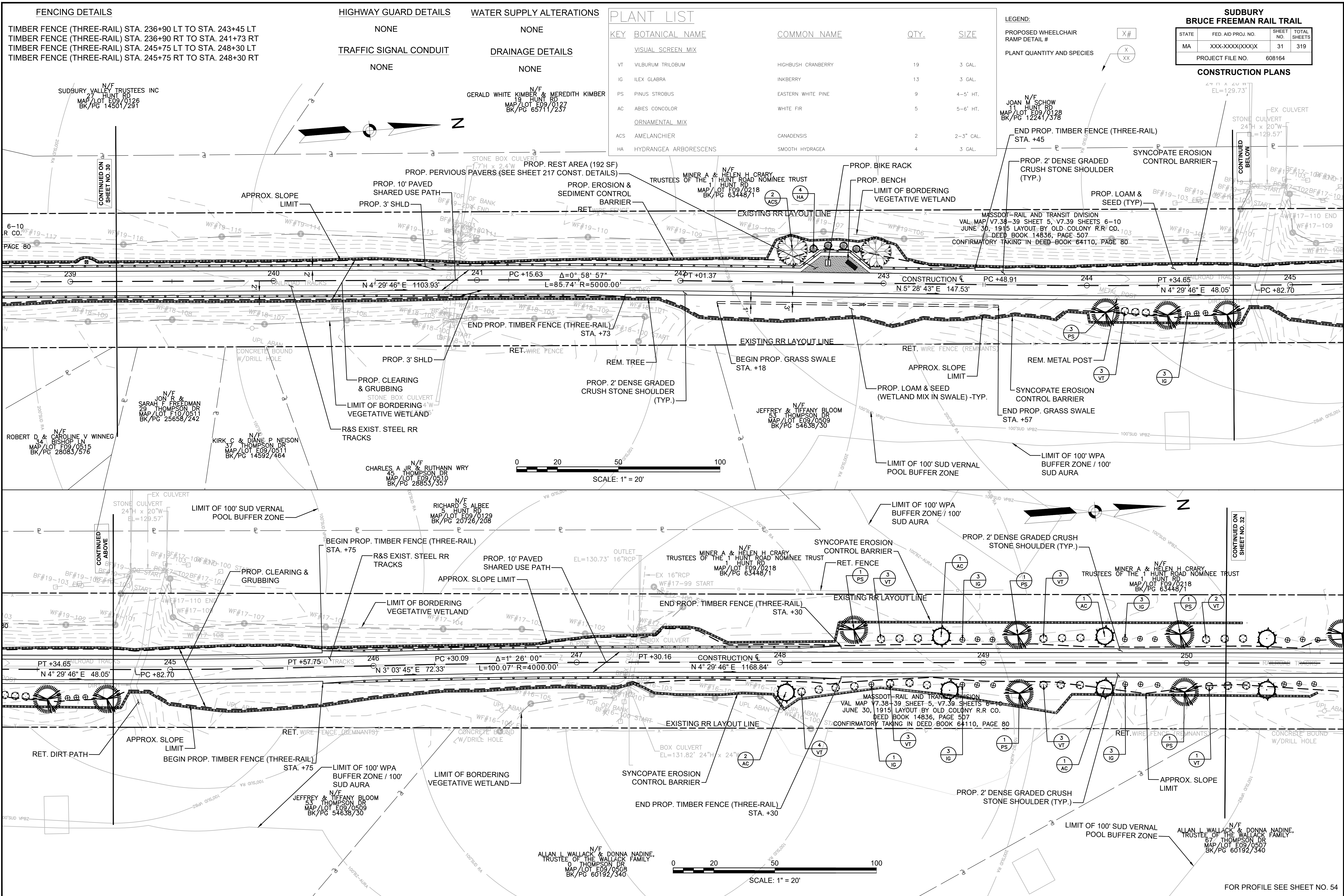
<u>KEY</u>	<u>BOTANICAL NAME</u>	<u>COMMON NAME</u>	<u>QTY.</u>	<u>SIZE</u>
	<u>VISUAL SCREEN MIX</u>			
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	4	4-5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	18	3 GAL.
IG	ILEX GLABRA	INKBERRY	9	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	8	4-5' HT.

**SUDBURY
BRUCE FREEMAN RAIL TRAIL**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	30	319
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS





FENCING DETAILS
TIMBER FENCE (THREE-RAIL) STA. 258+22 RT TO STA. 258+72 RT
TIMBER FENCE (THREE-RAIL) STA. 258+22 LT TO STA. 258+72 LT

HIGHWAY GUARD DETAILS
NONE

WATER SUPPLY ALTERATIONS
NONE

TRAFFIC SIGNAL CONDUIT
NONE

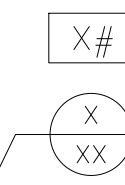
DRAINAGE DETAILS
SHEET 190

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	1	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	2	5-6' HT.

LEGEND:

PROPOSED WHEELCHAIR
RAMP DETAIL #



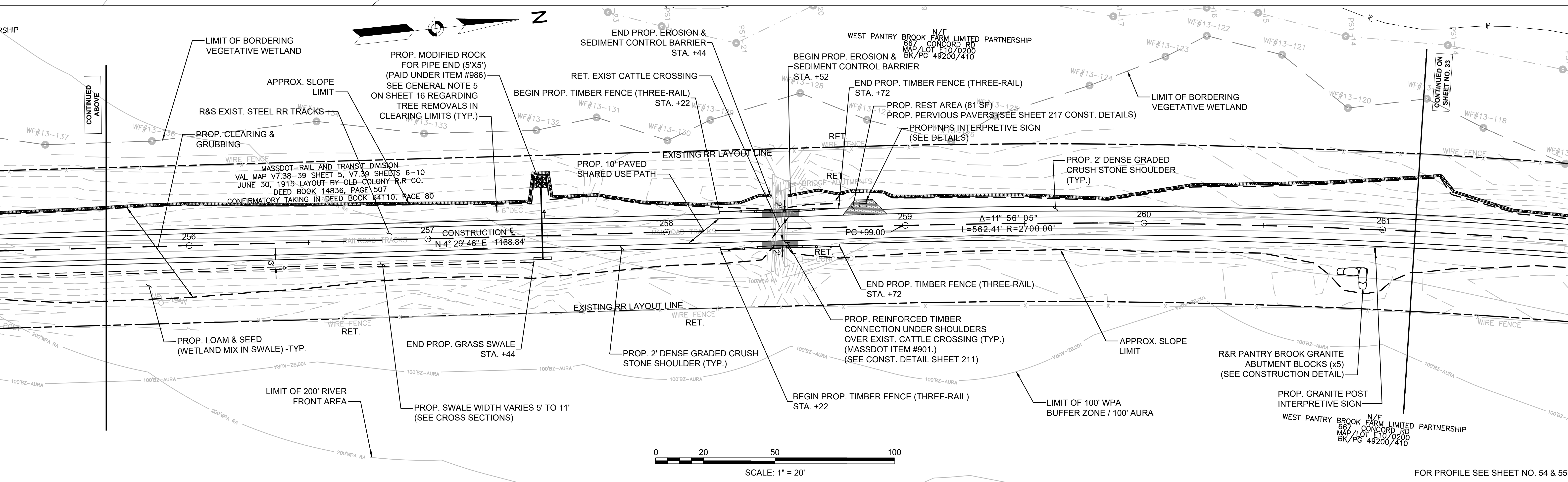
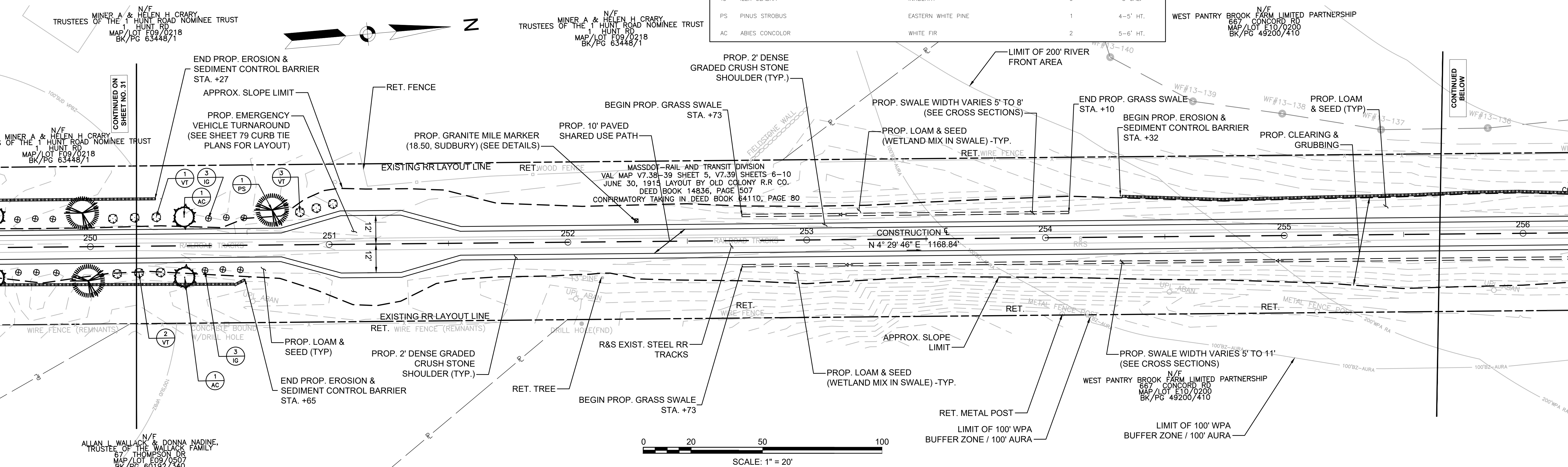
PLANT QUANTITY AND SPECIES

SUDBURY BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	32	319

PROJECT FILE NO. 608164

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 54 & 55

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 262+25 LT TO STA. 266+25 LT
TIMBER FENCE (THREE-RAIL) STA. 264+00 RT TO STA. 268+75 RT
TIMBER FENCE (THREE-RAIL) STA. 269+52 LT TO STA. 270+02 LT
TIMBER FENCE (THREE-RAIL) STA. 269+52 RT TO STA. 270+02 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

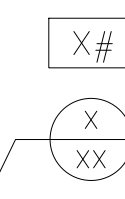
PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	EROSION CONTROL MIX			
SS	CAREX STRICTA	TUSsock SEDGE	19	PLUG

LEGEND:

PROPOSED WHEELCHAIR
RAMP DETAIL #

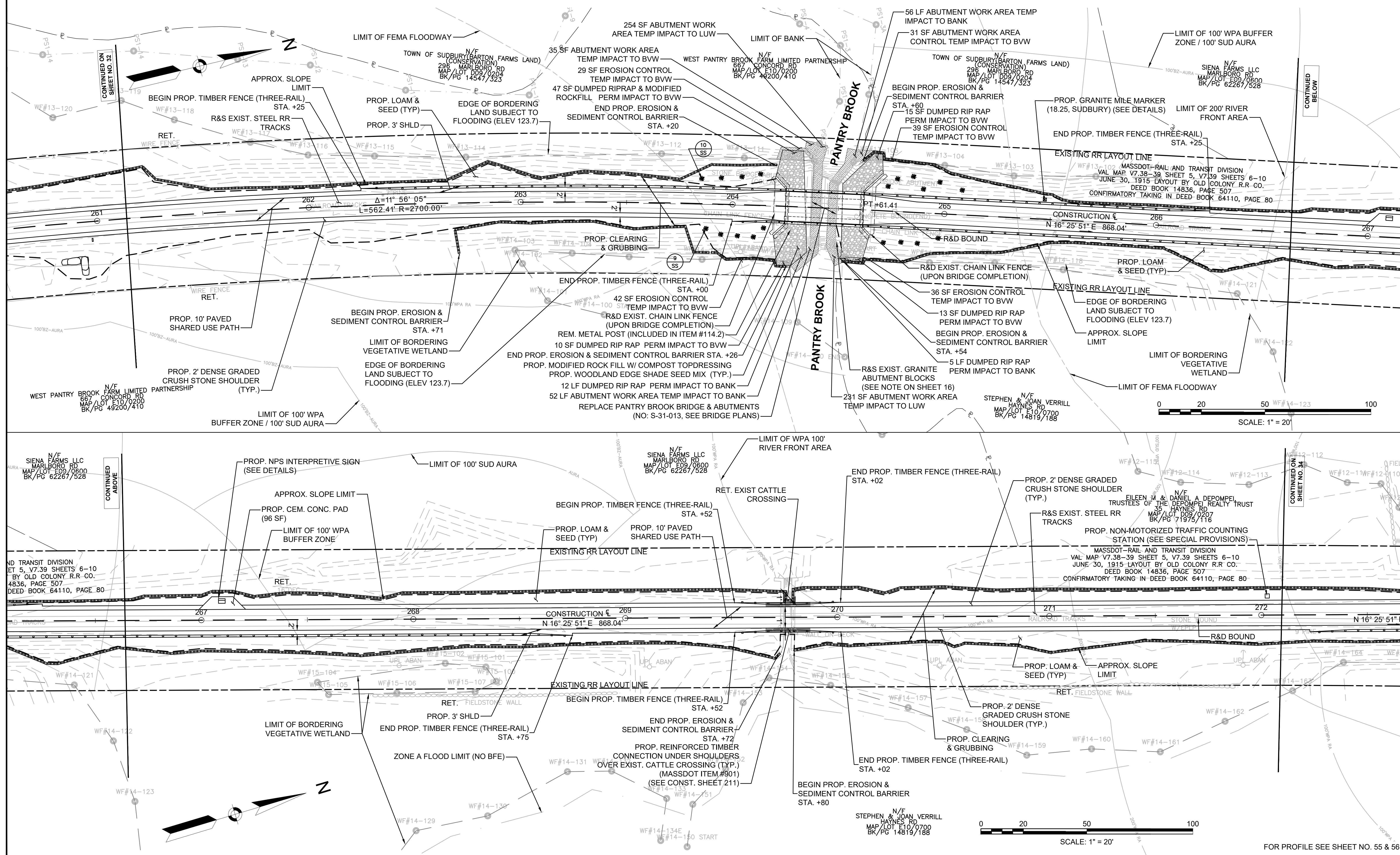
PLANT QUANTITY AND SP



**SUDBURY
BRUCE FREEMAN RAIL TRAIL**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	33	31
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 55 & 56

FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 272+23 RT TO STA. 273+73 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

NONE

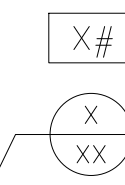
PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
<u>VISUAL SCREEN MIX</u>				
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	6	3 GAL.
PS	PINUS STROBUS	EASTERN WHITE PINE	1	4-5' HT.
AC	ABIES CONCOLOR	WHITE FIR	1	5-6' HT.
<u>ORNAMENTAL MIX</u>				
CCR	CERCIS CANADENSIS	REDBUD	6	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	4	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR

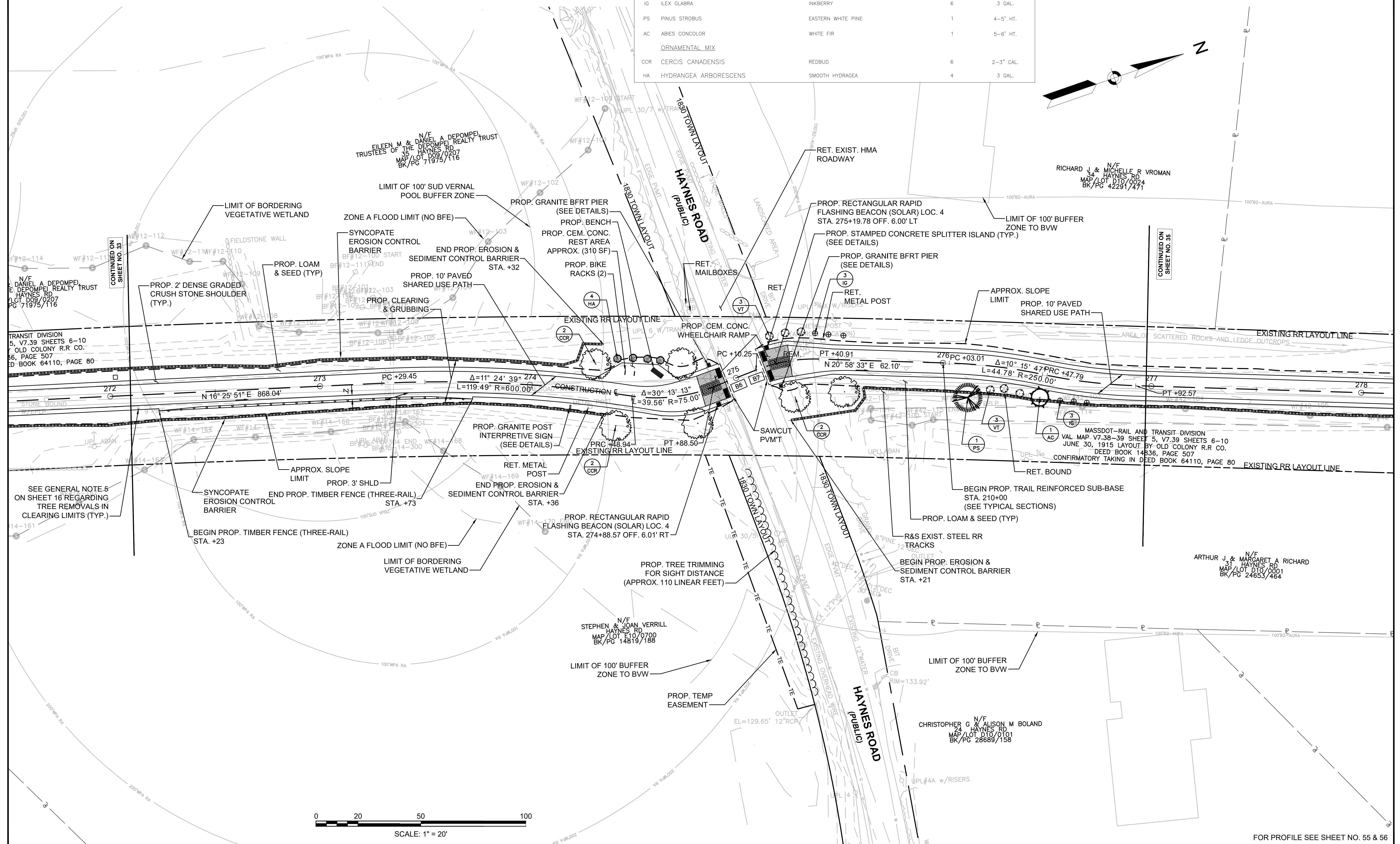
PLANT QUANTITY AND SPECIES



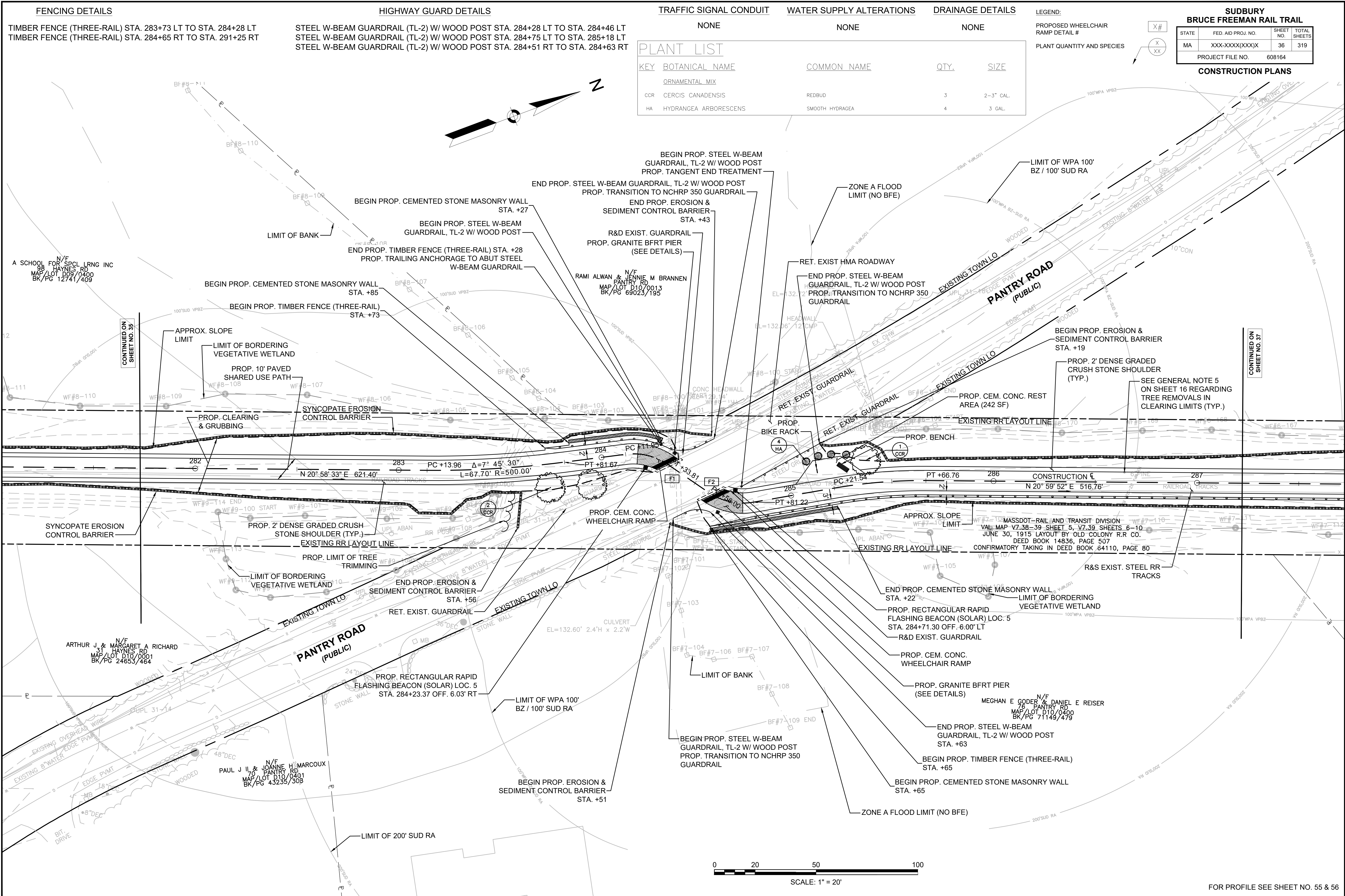
**SUDBURY
BRUCE FREEMAN RAIL TRAIL**

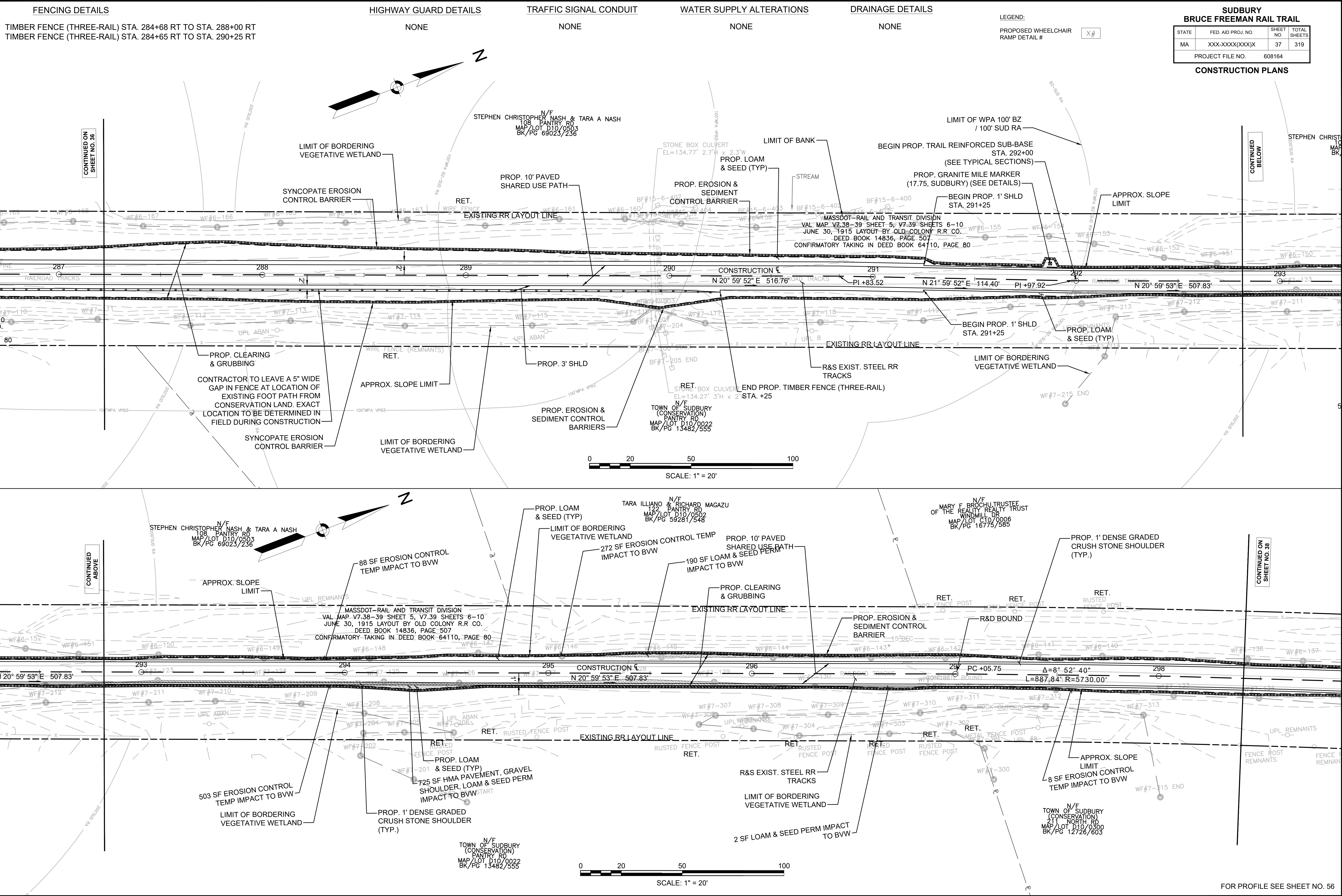
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	34	319
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 55 & 56





FENCING DETAILS

TIMBER FENCE (THREE-RAIL) STA. 308+79 LT TO STA. 309+79 LT
TIMBER FENCE (THREE-RAIL) STA. 308+16 RT TO STA. 315+79 RT

HIGHWAY GUARD DETAILS

NONE

TRAFFIC SIGNAL CONDUIT

SEE SHEET ###

WATER SUPPLY ALTERATIONS

NONE

DRAINAGE DETAILS

SEE SHEET 197

LEGEND:

PROPOSED WHEELCHAIR
RAMP DETAIL #

X#

PLANT QUANTITY AND SPECIES

X
XX

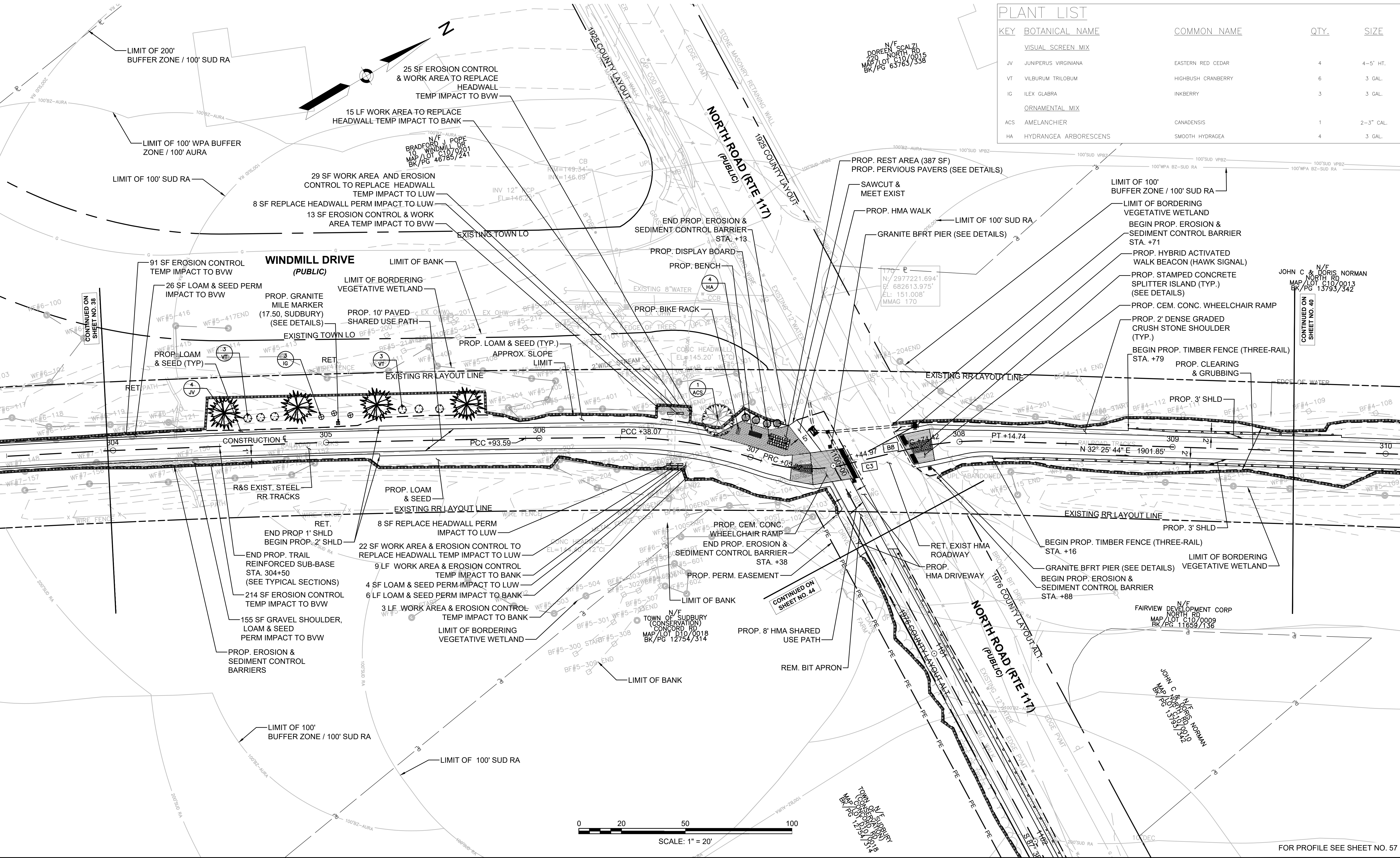
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	39	319
PROJECT FILE NO.		608164	

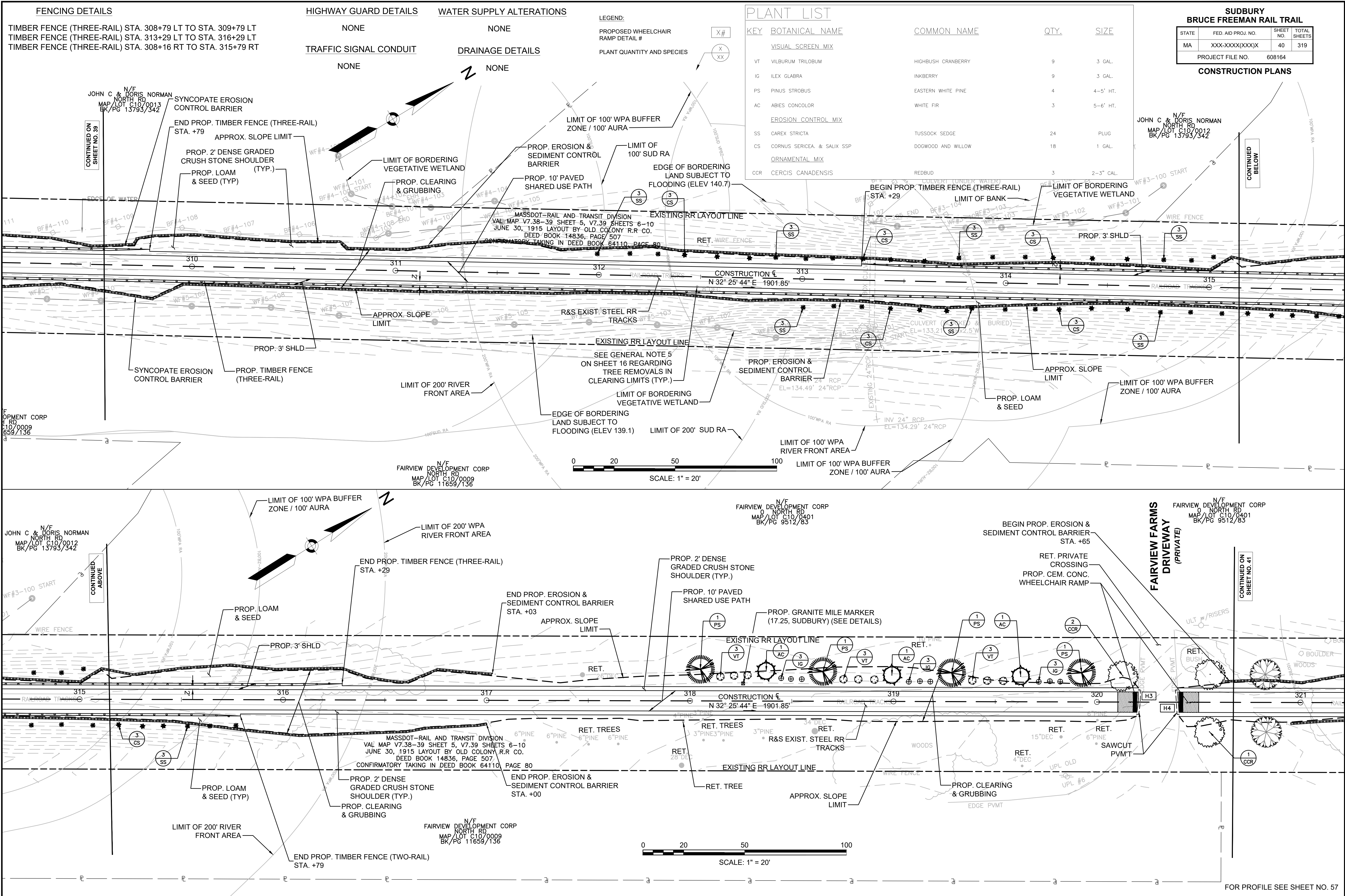
CONSTRUCTION PLANS

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
VISUAL SCREEN MIX				
JV	JUNIPERUS VIRGINIANA	EASTERN RED CEDAR	4	4-5' HT.
VT	VILBURUM TRILOBUM	HIGHBUSH CRANBERRY	6	3 GAL.
IG	ILEX GLABRA	INKBERRY	3	3 GAL.
ORNAMENTAL MIX				
ACS	AMELANCHIER	CANADENSIS	1	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	4	3 GAL.



FOR PROFILE SEE SHEET NO. 57



TIMBER FENCE (THREE-RAIL) STA. 321+25 LT TO STA. 324+79 LT
TIMBER FENCE (THREE-RAIL) STA. 321+25 RT TO STA. 322+00 RT
TIMBER FENCE (THREE-RAIL) STA. 322+79 RT TO STA. 329+79 RT

NONE

NONE

NONE

NONE

KEY	BOTANICAL NAME
-----	----------------

LEGEND:

PROPOSED WHEELCHAIR

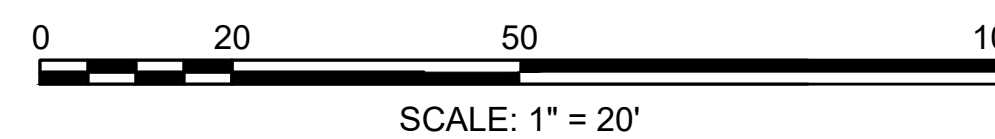
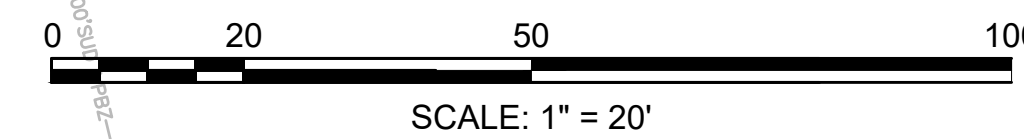
PLANT QUANTITY AND SPECIES

X#

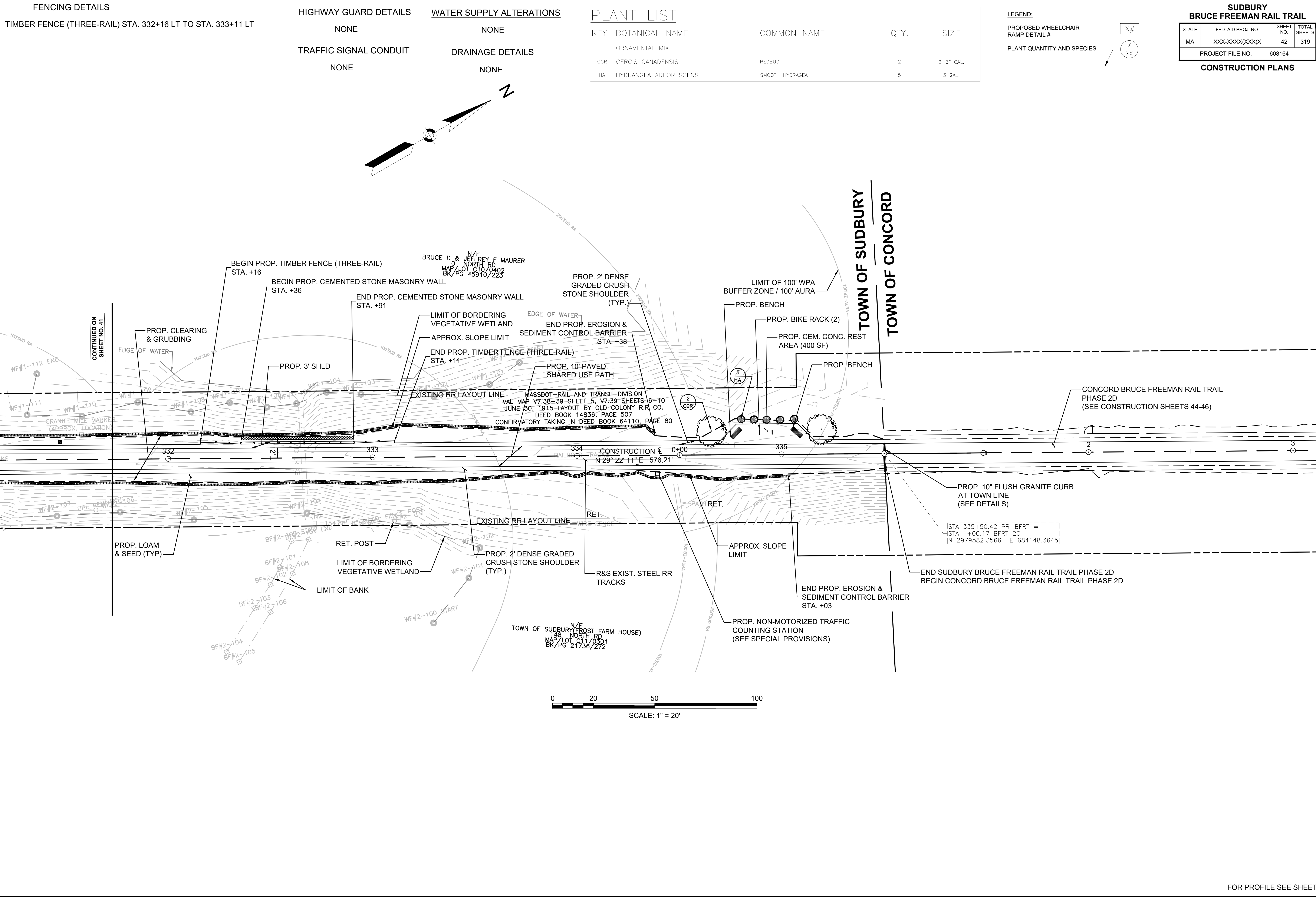
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	41	319
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS



FOR PROFILE SEE SHEET NO. 57 & 58



0 20 50 100

SCALE: 1" = 20'

FENCING DETAILS
NONE

HIGHWAY GUARD DETAILS
NONE

TRAFFIC SIGNAL CONDUIT
NONE

WATER SUPPLY ALTERATIONS
NONE

DRAINAGE DETAILS
NONE

PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
ORNAMENTAL MIX				
CCR	CERCIS CANADENSIS	REDBUD	5	2-3" CAL.
ACS	AMELANCHIER	CANADENSIS	4	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	5	3 GAL.

LEGEND:

PROPOSED WHEELCHAIR RAMP DETAIL #

PLANT QUANTITY AND SPECIES

X#

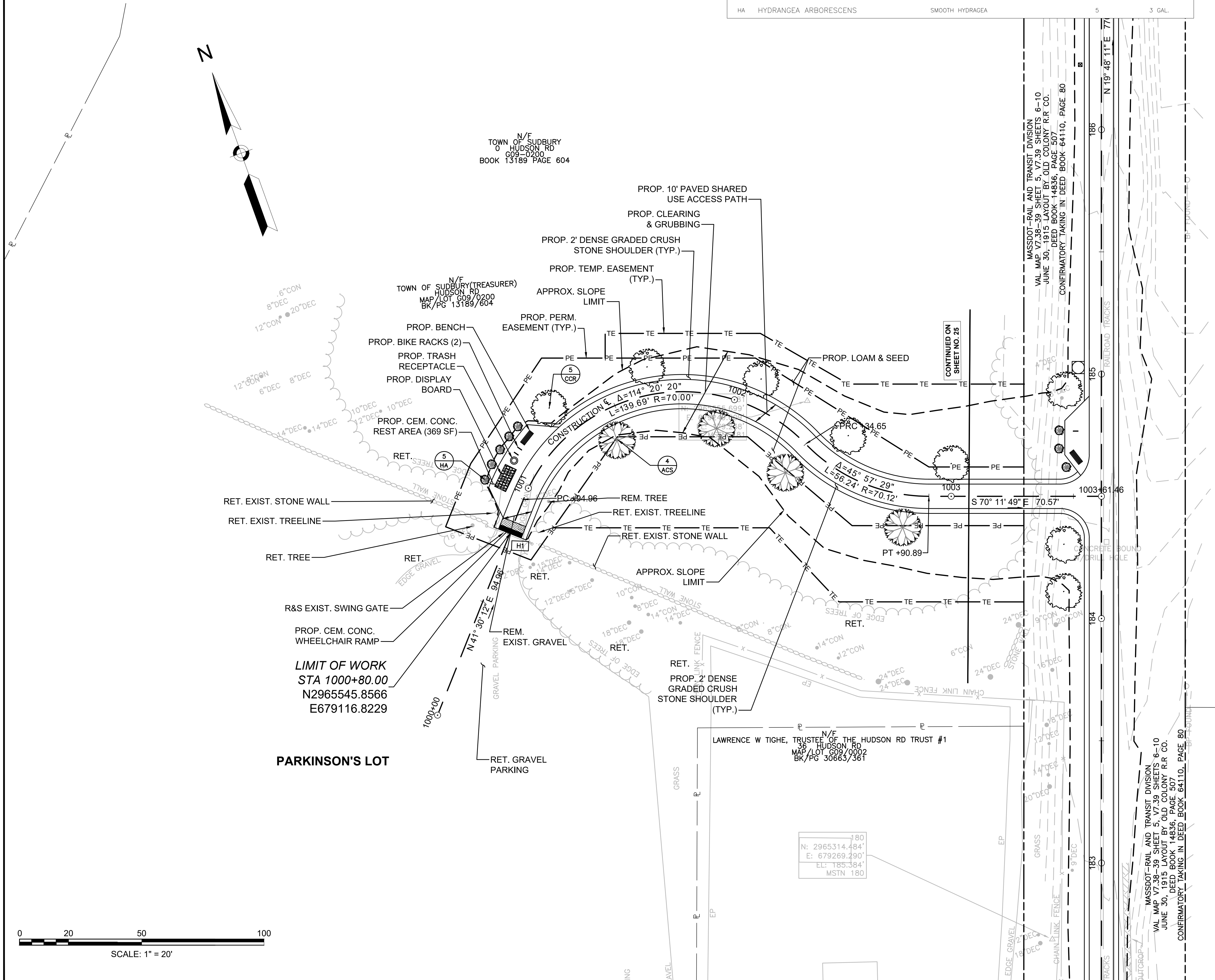
X
XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	43	319

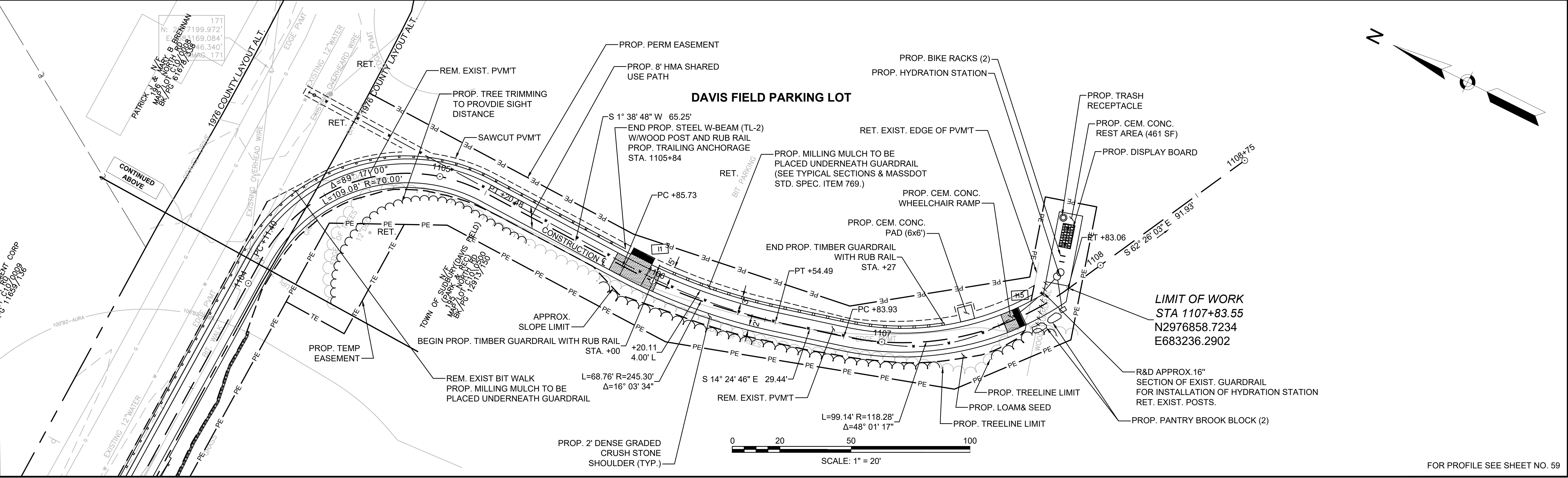
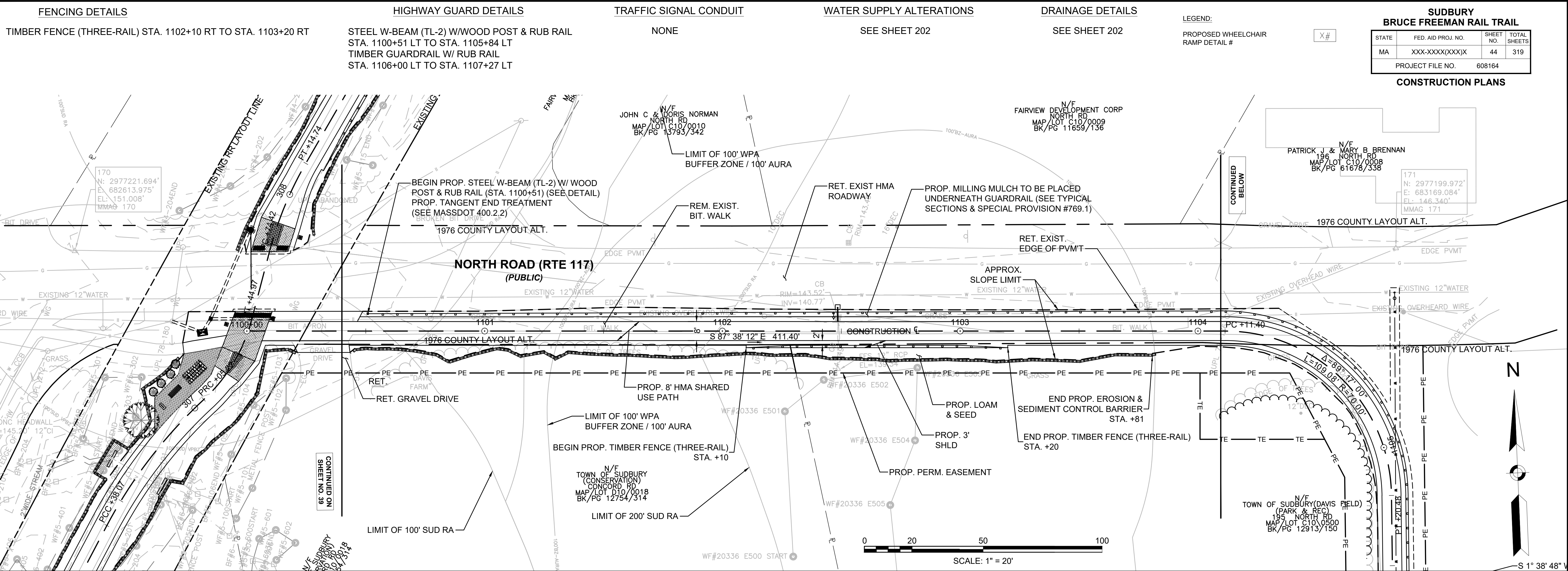
PROJECT FILE NO. 608164

CONSTRUCTION PLANS



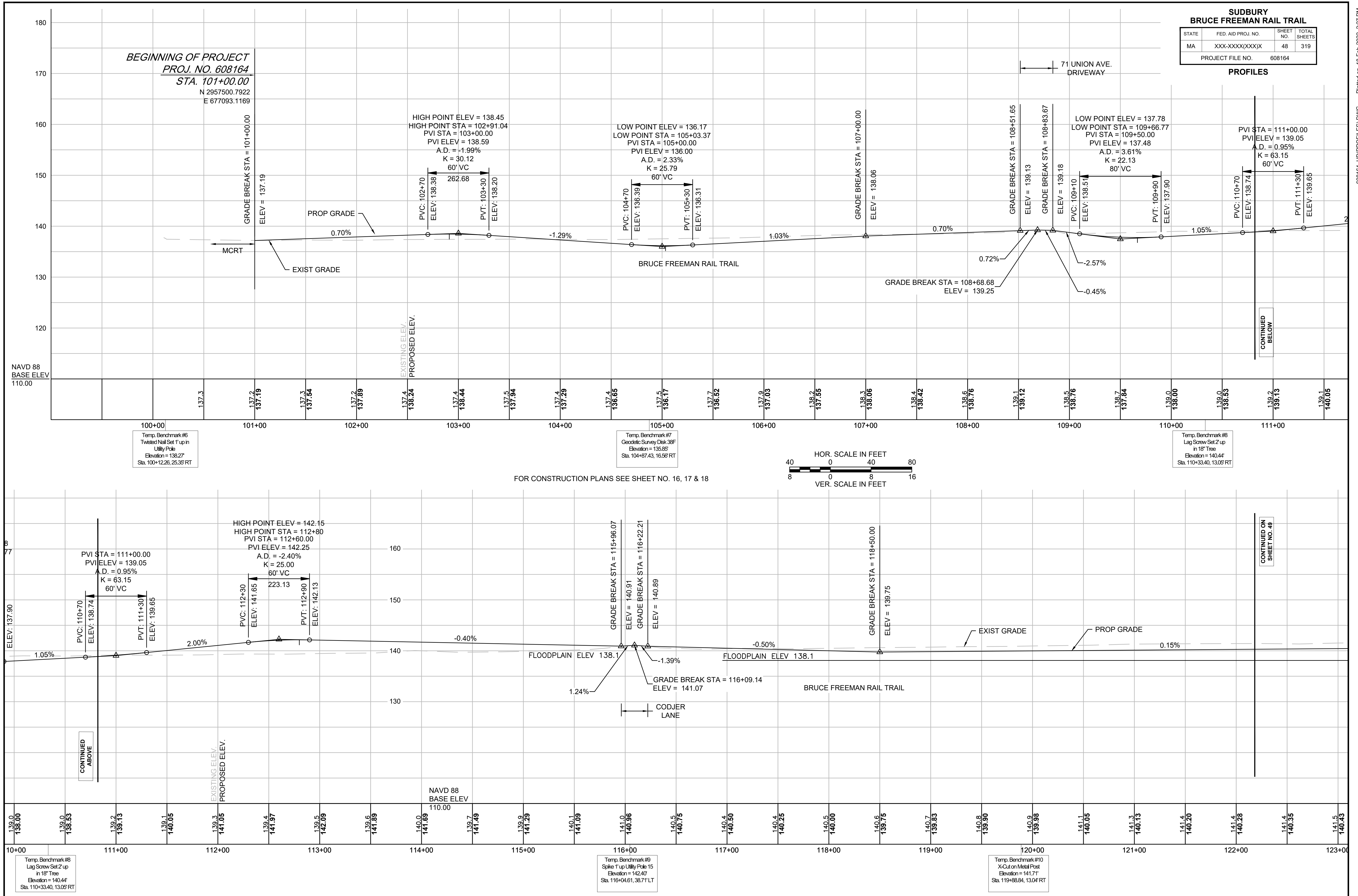
MASSDOT-RAIL AND TRANSIT DIVISION
VAL MAP V7.38-39 SHEET 5, V7.39 SHEETS 6-10
JUNE 30, 1915 LAYOUT BY OLD COLONY R.R. CO.
DEED BOOK 14836, PAGE 507
CONFIRMATORY TAKING IN DEED BOOK 64110, PAGE 80

FOR PROFILE SEE SHEET NO. 59



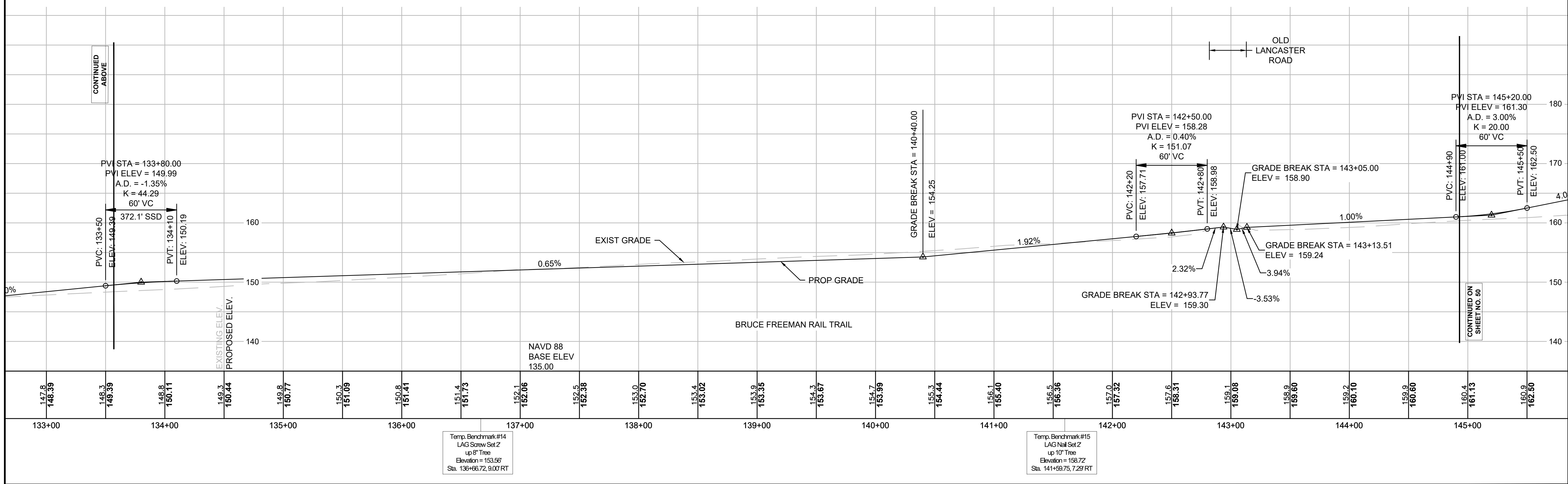
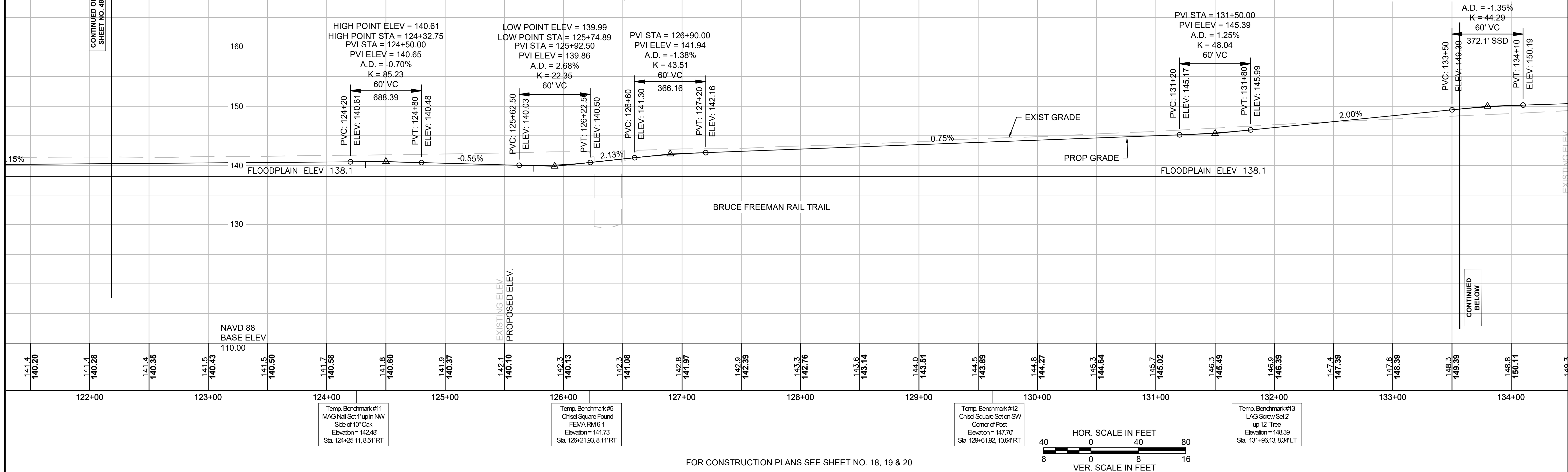
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	48	319
PROJECT FILE NO.		608164	

PROFILES



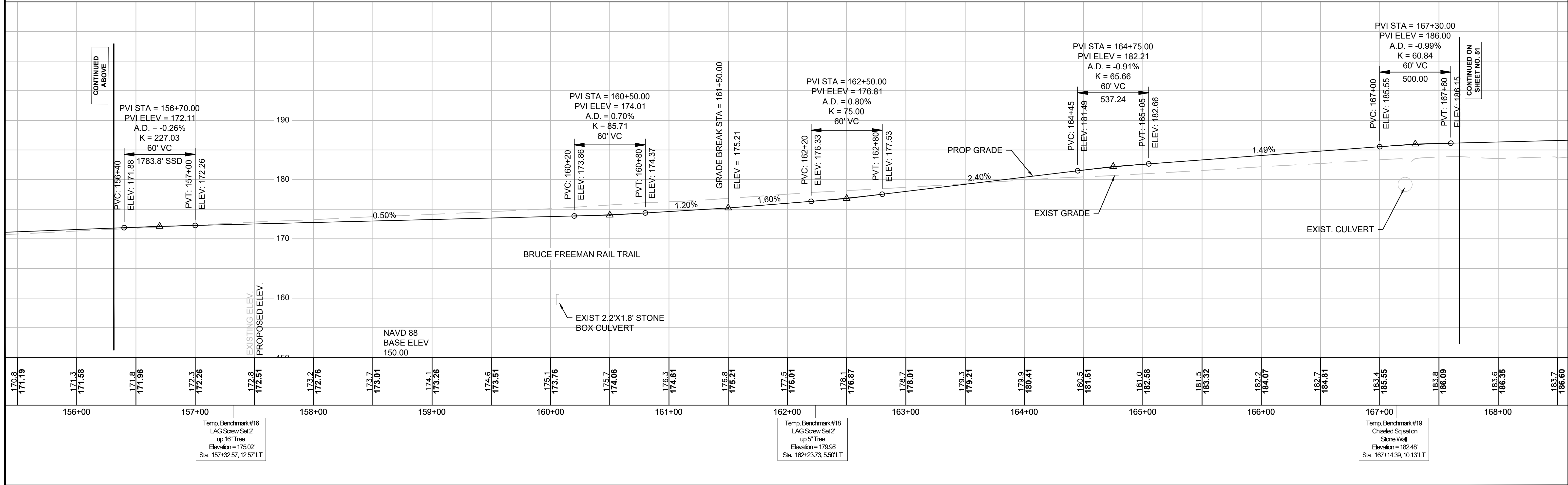
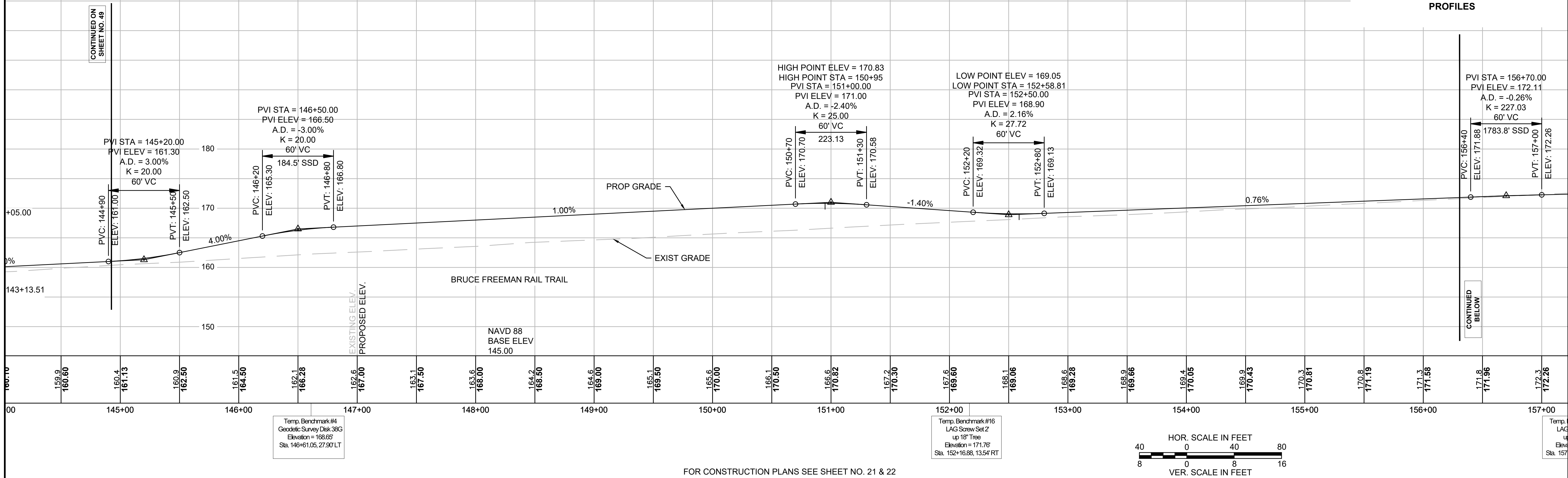
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	49	319
PROJECT FILE NO.		608164	

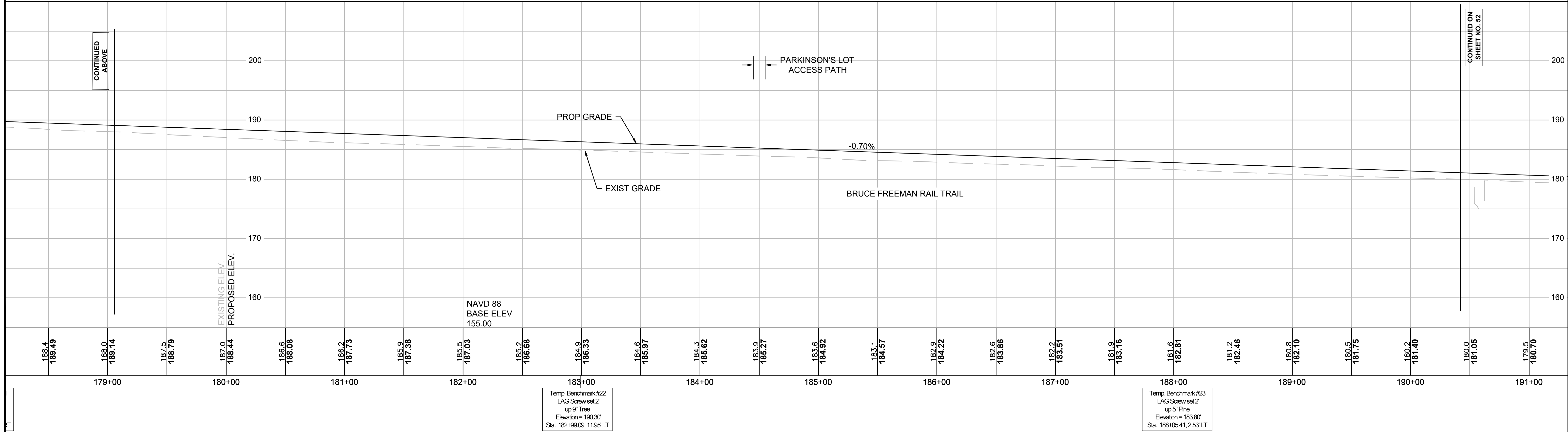
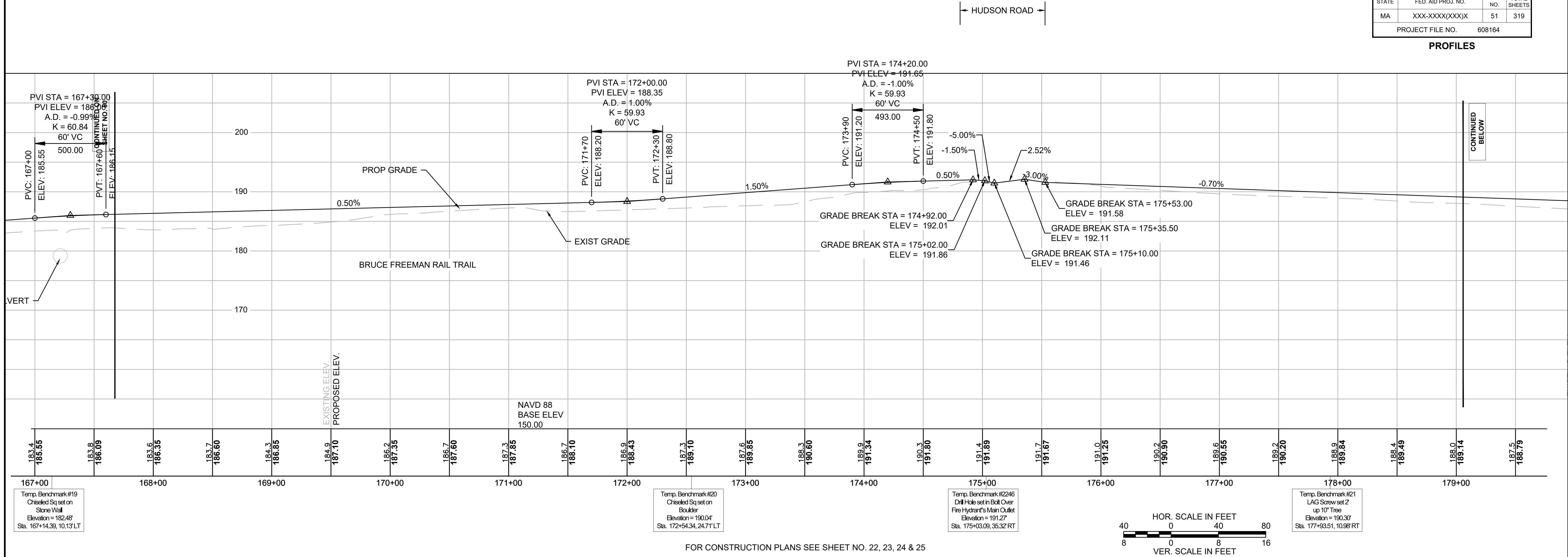
PROFILES



SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	50	319
PROJECT FILE NO.		608164	

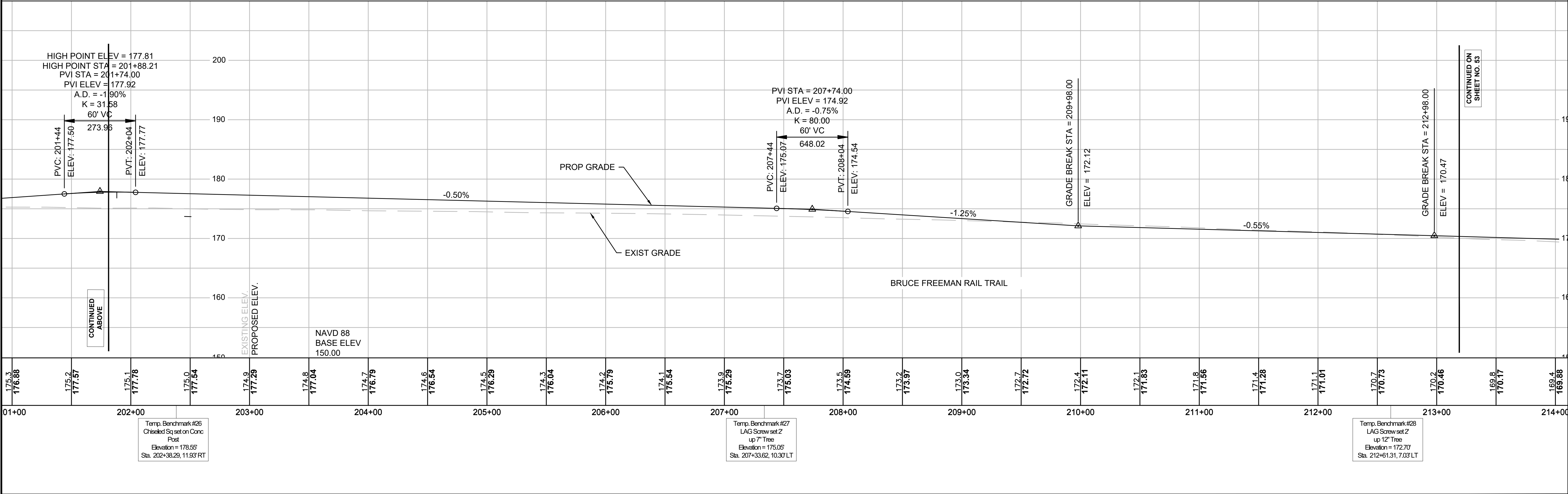
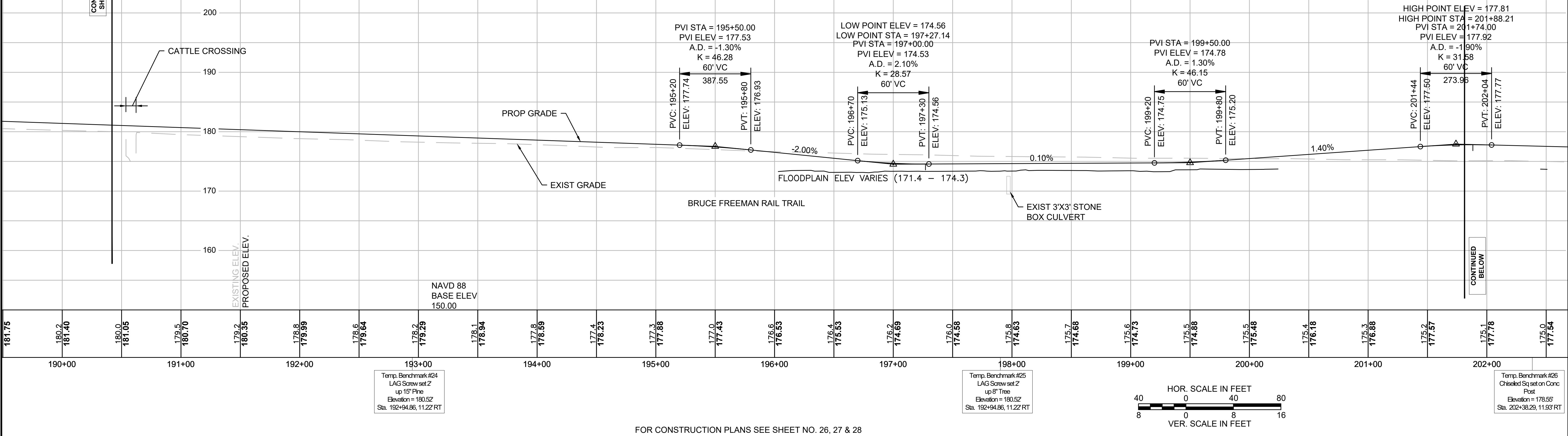
PROFILES





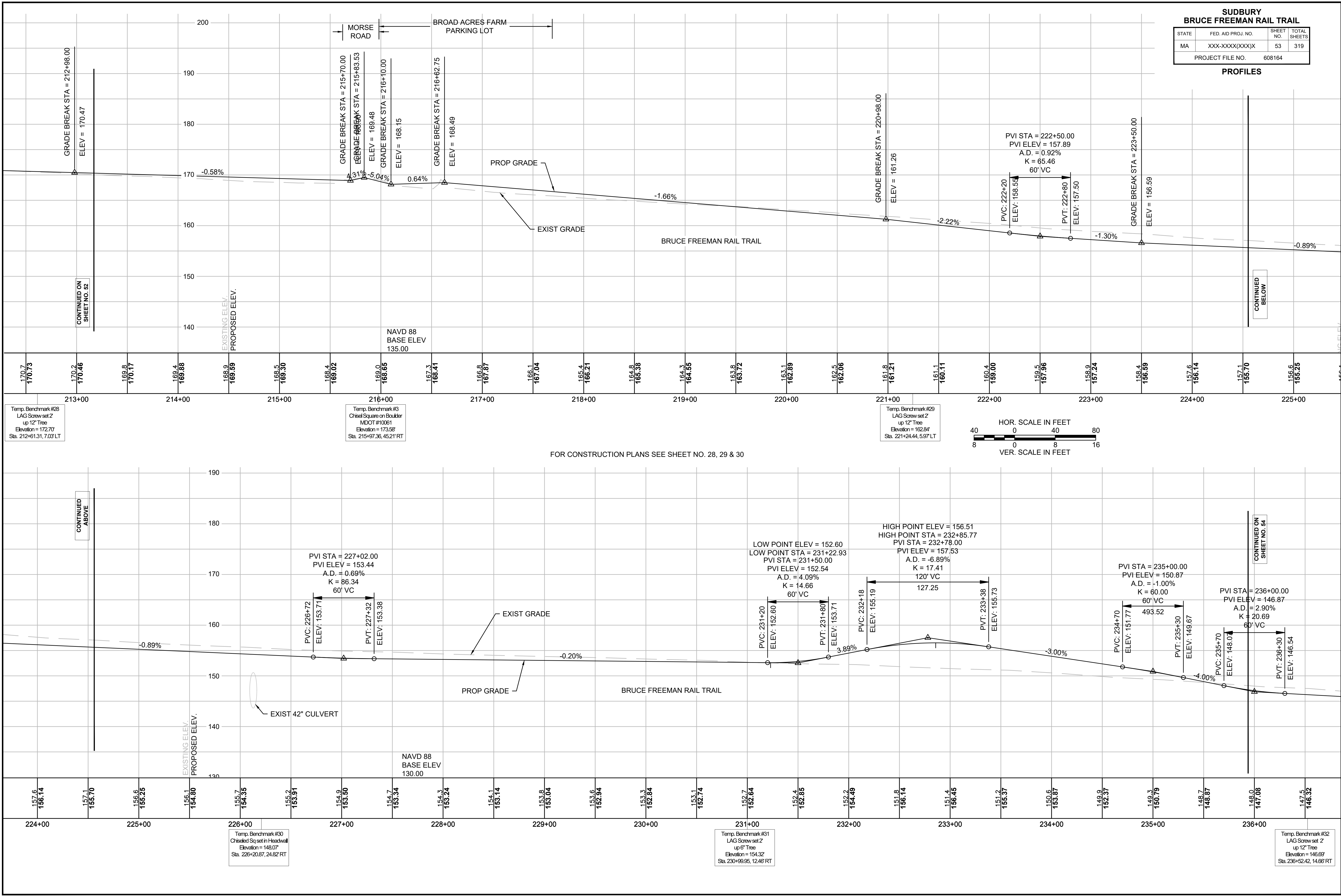
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	52	319
PROJECT FILE NO.		608164	

PROFILES



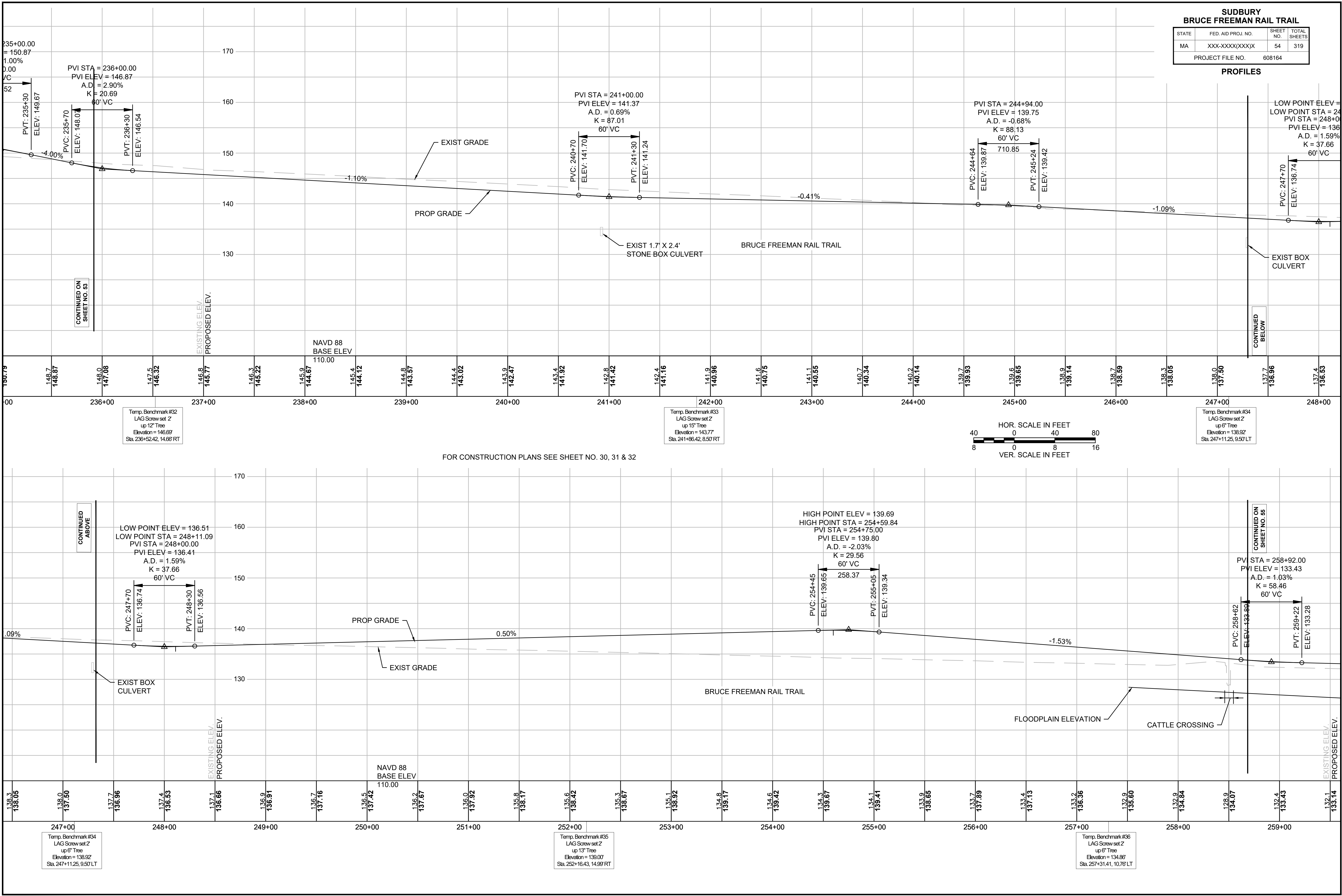
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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	53	319
PROJECT FILE NO.		608164	

PROFILES



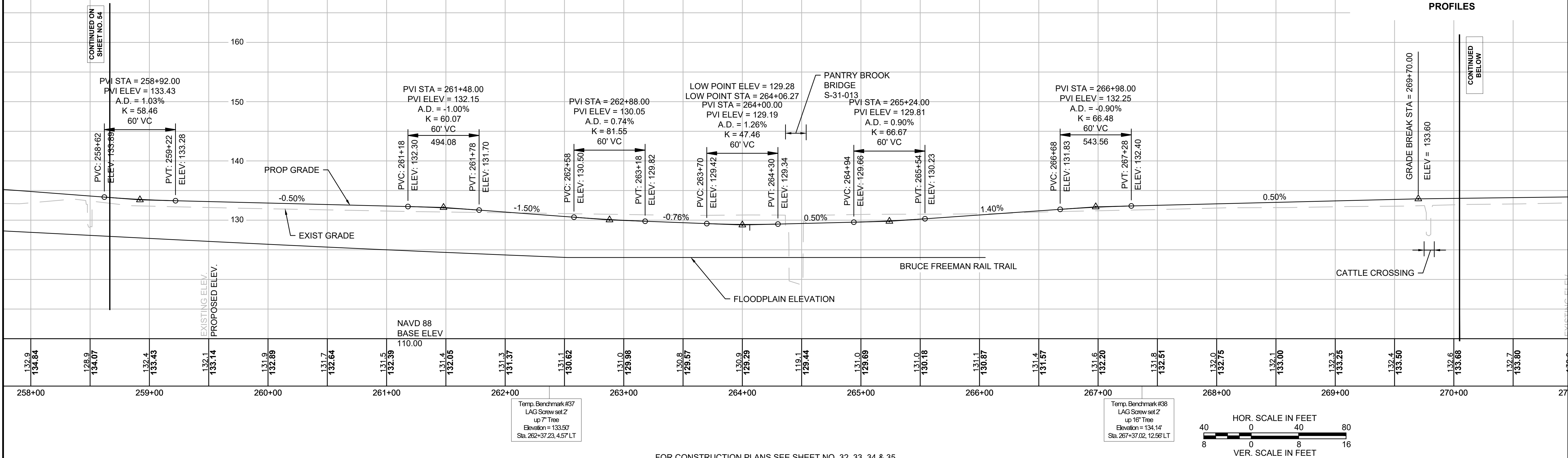
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	54	319
PROJECT FILE NO.		608164	

PROFILES

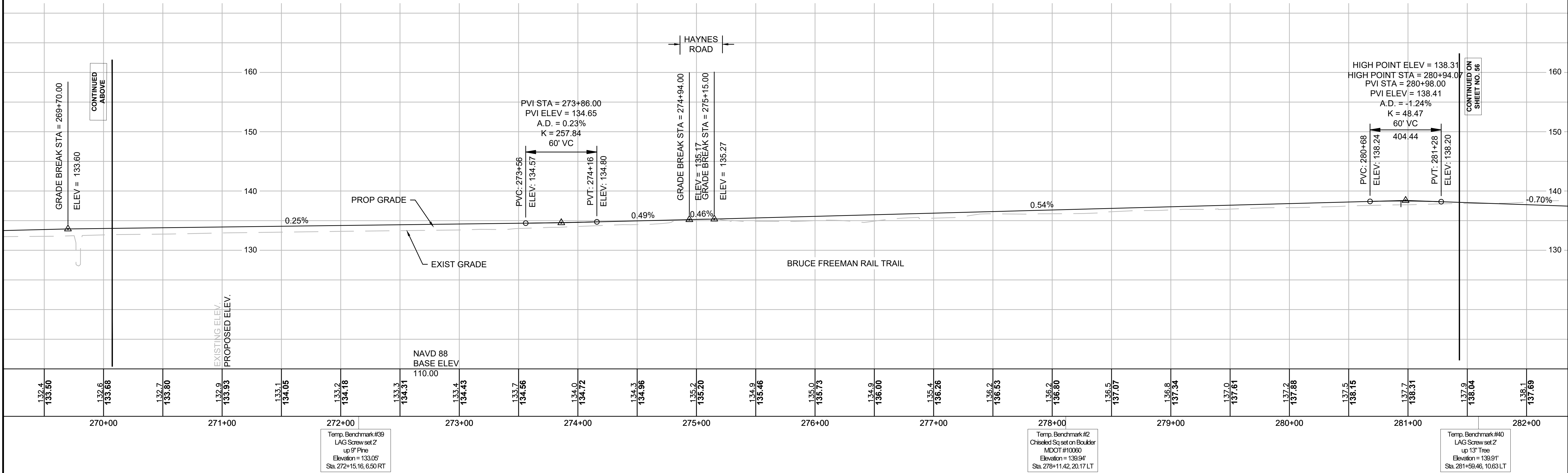


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	55	319
PROJECT FILE NO.		608164	

PROFILES

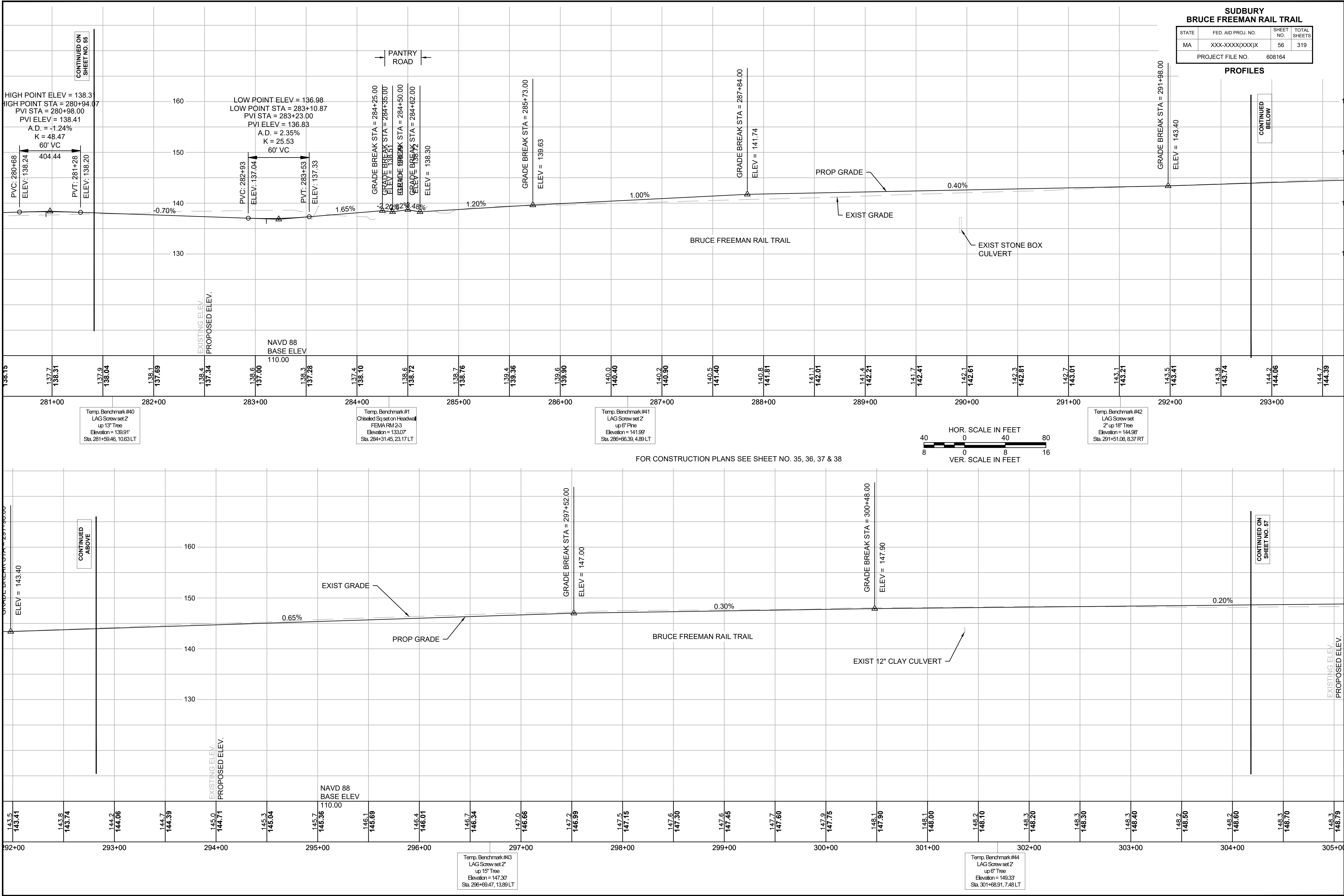


FOR CONSTRUCTION PLANS SEE SHEET NO. 32, 33, 34 & 35



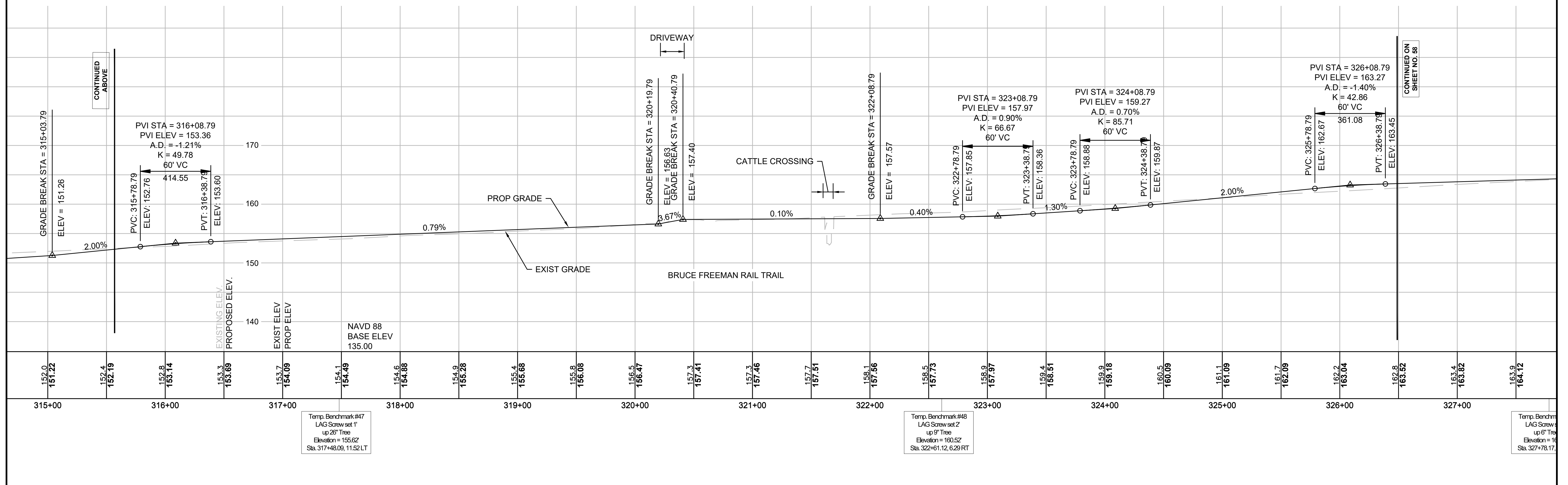
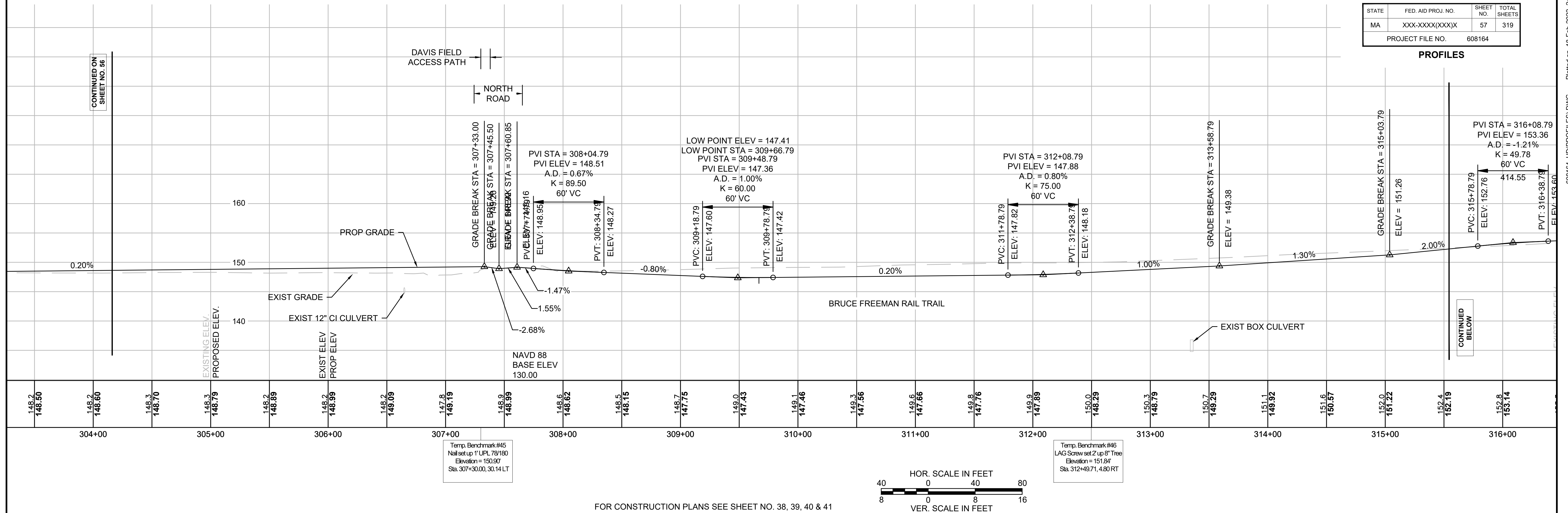
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	56	319
PROJECT FILE NO.		608164	

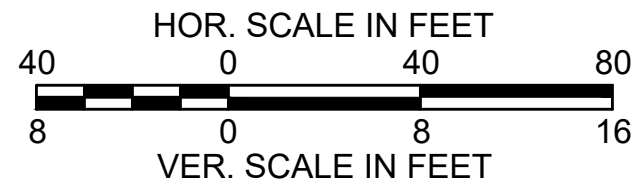
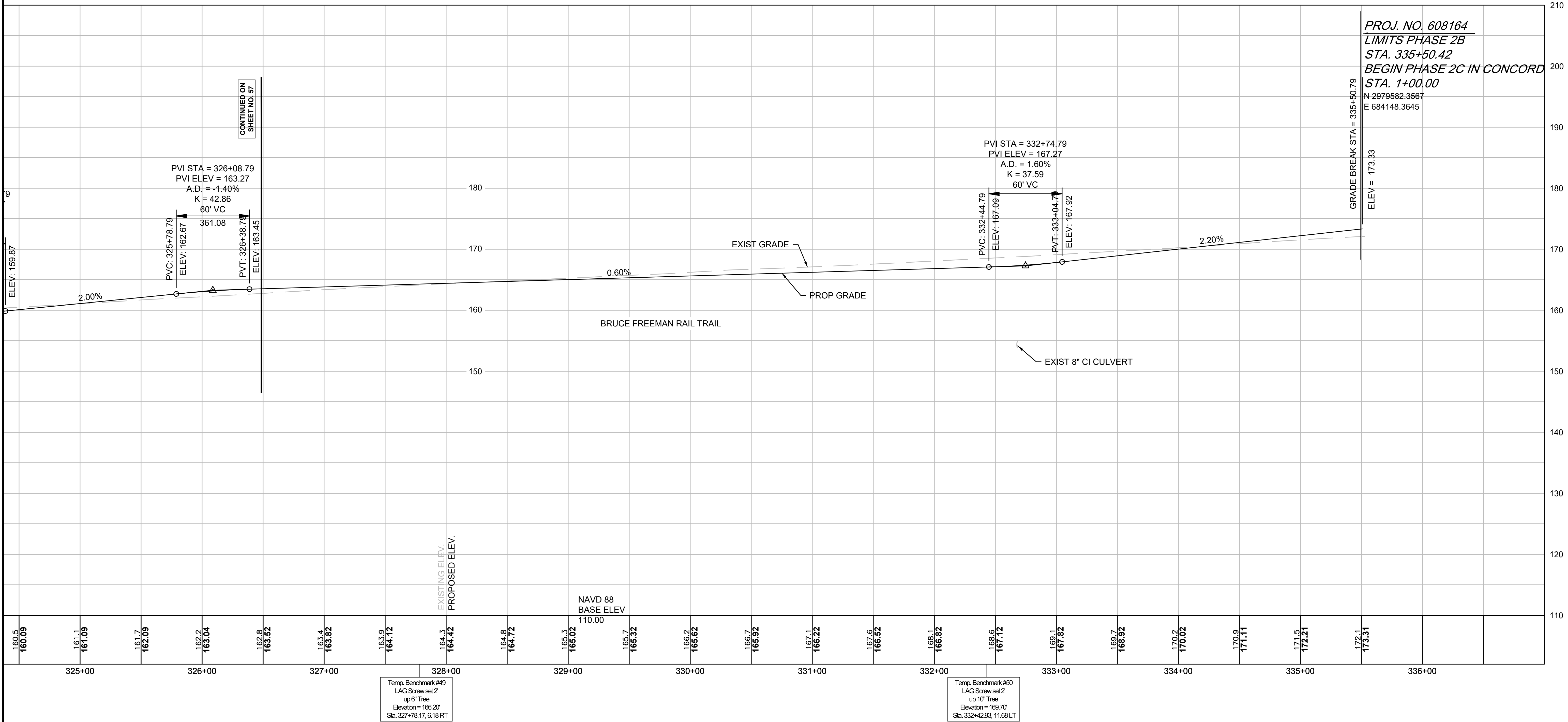
PROFILES



STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	57	319
PROJECT FILE NO.		608164	

PROFILES

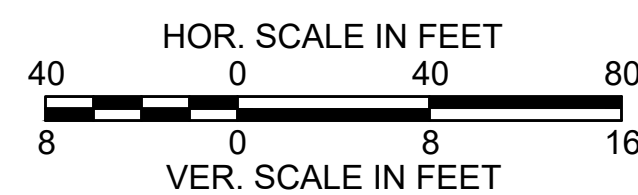
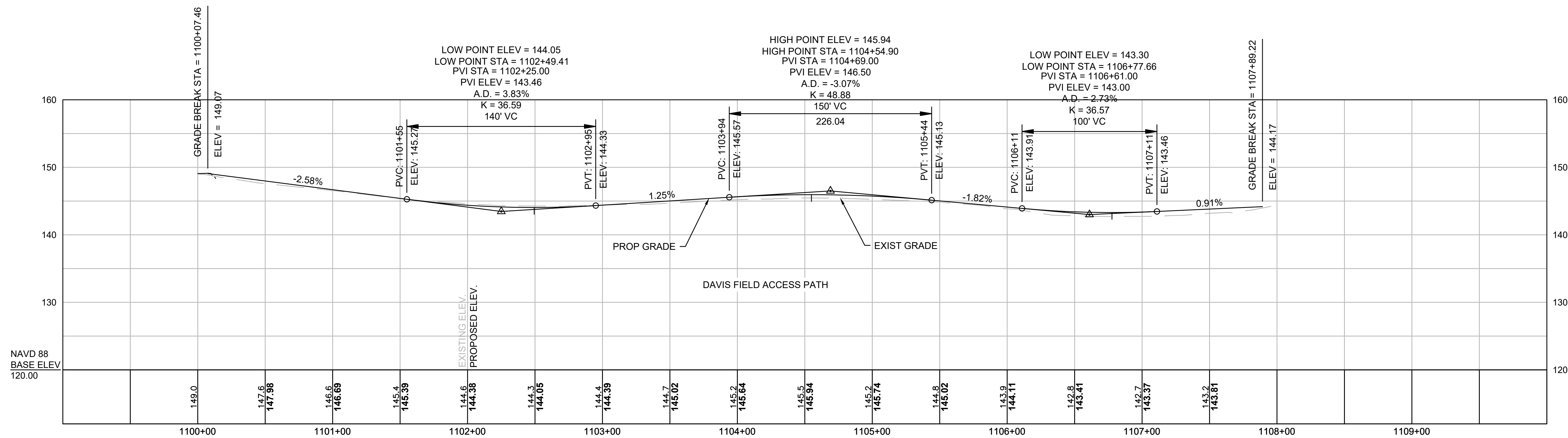
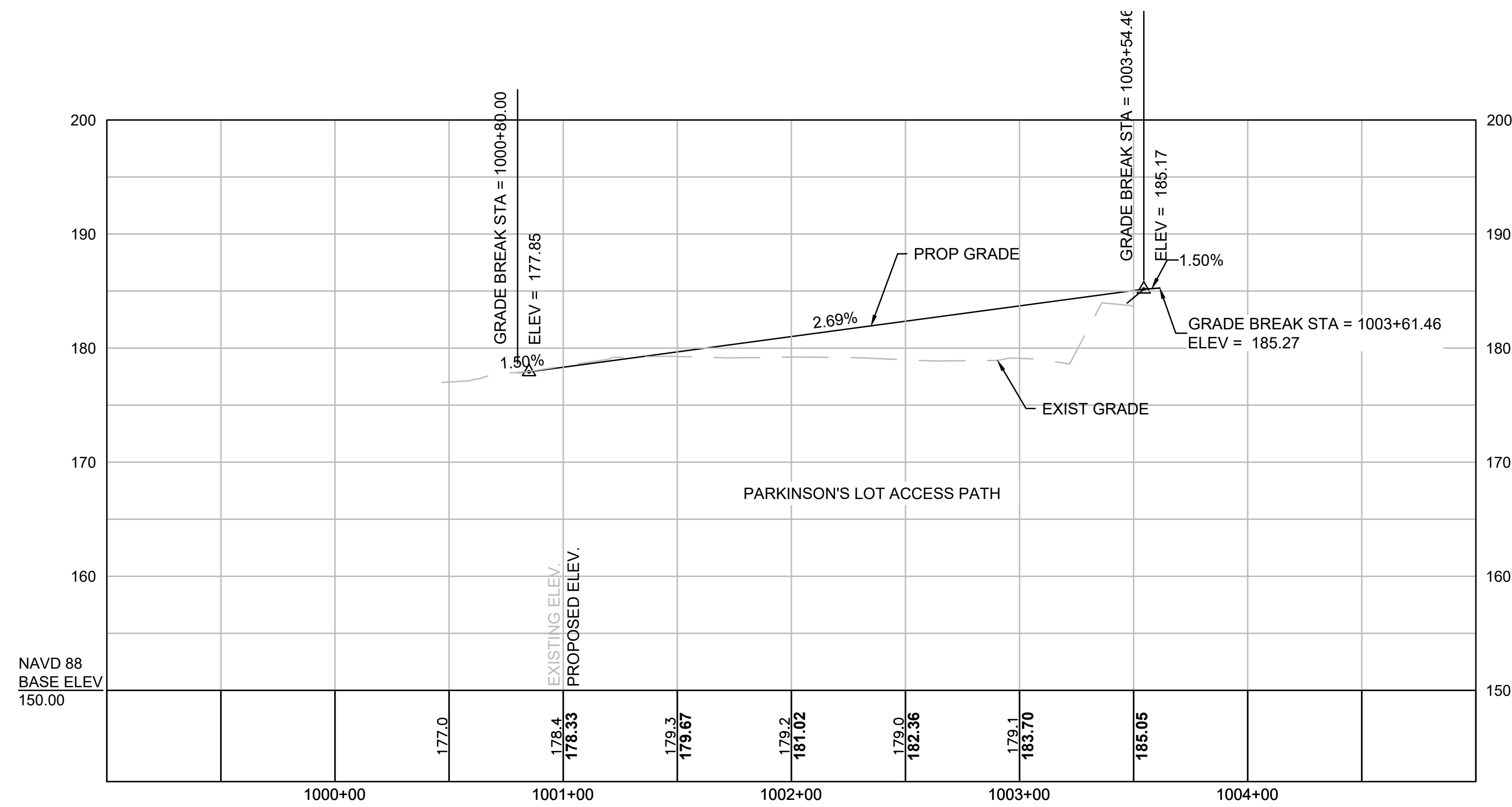
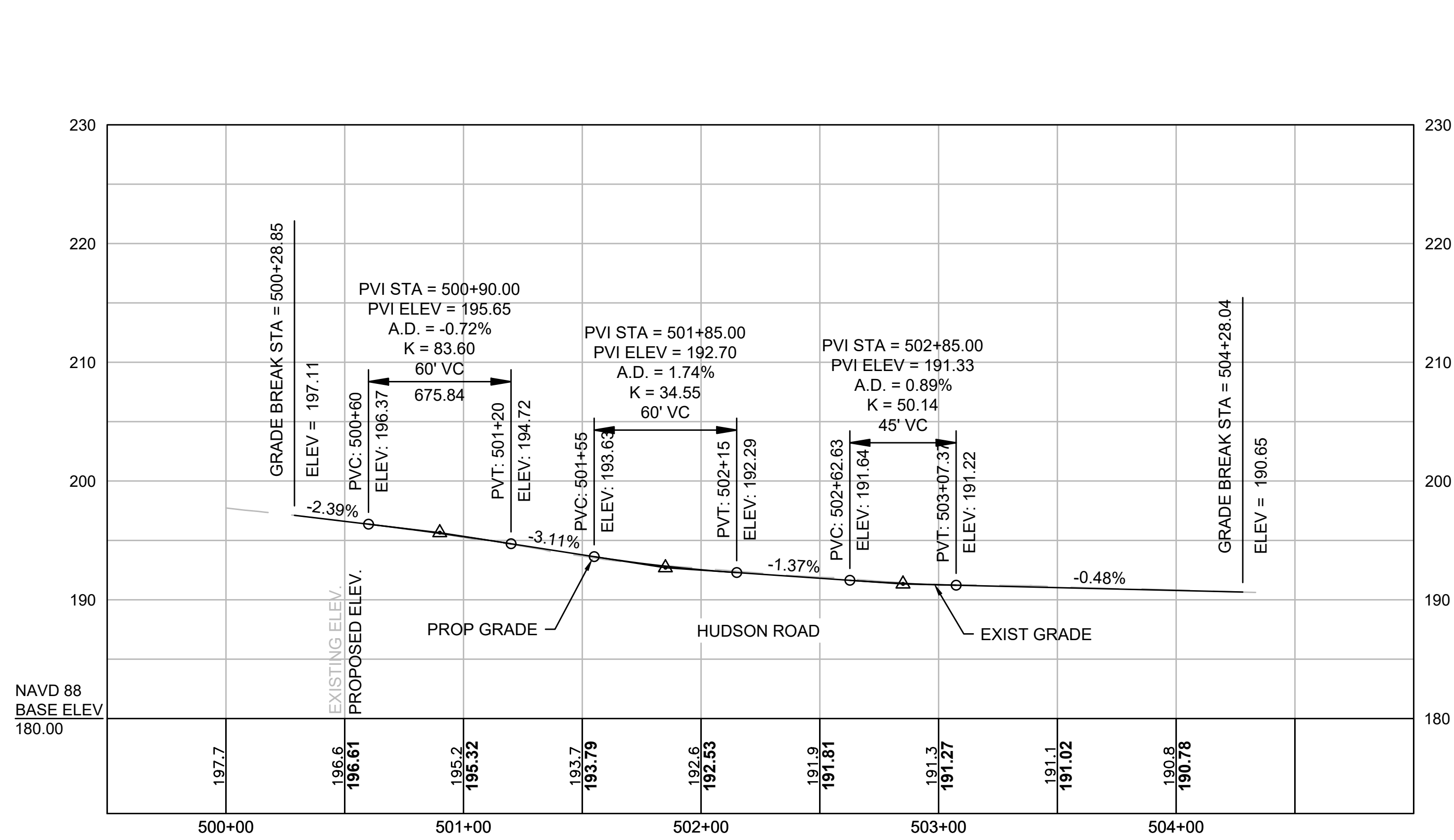


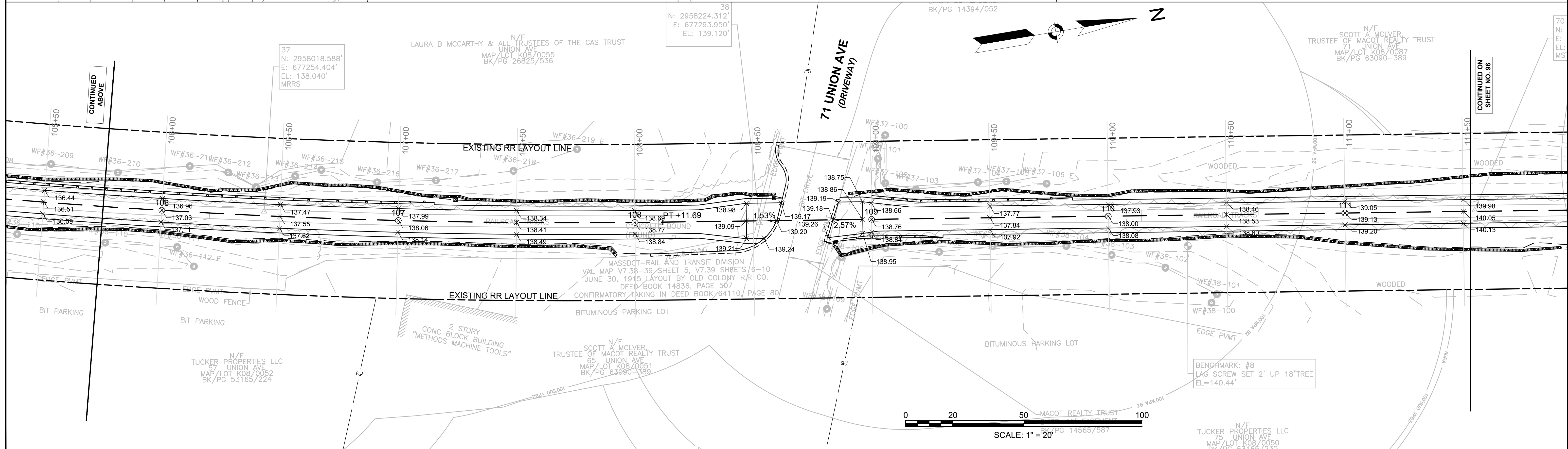
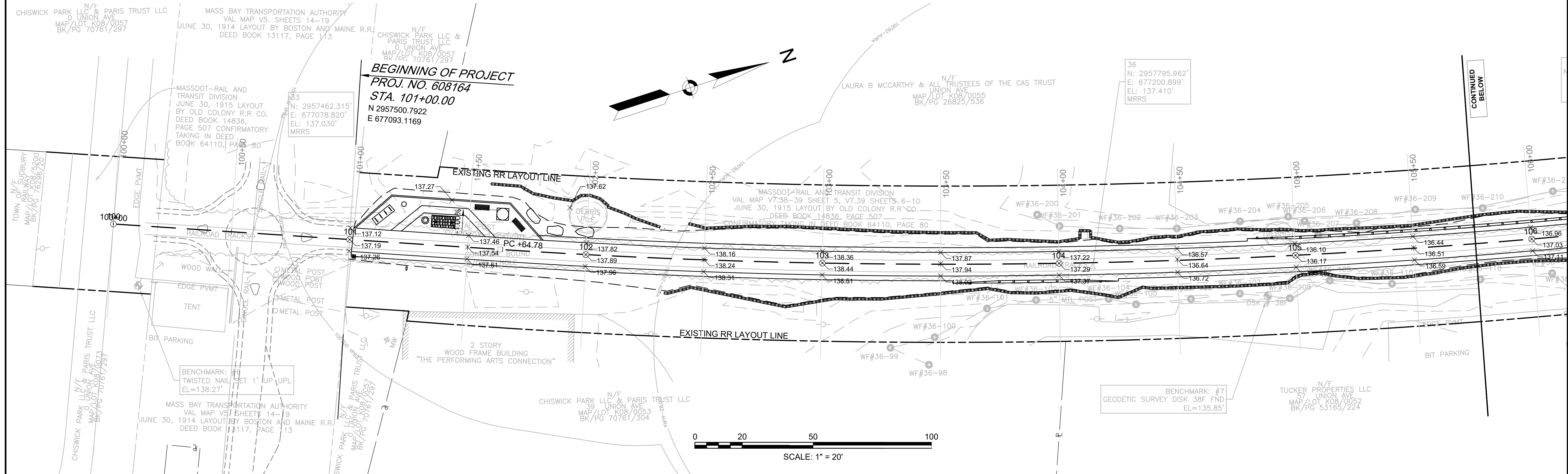


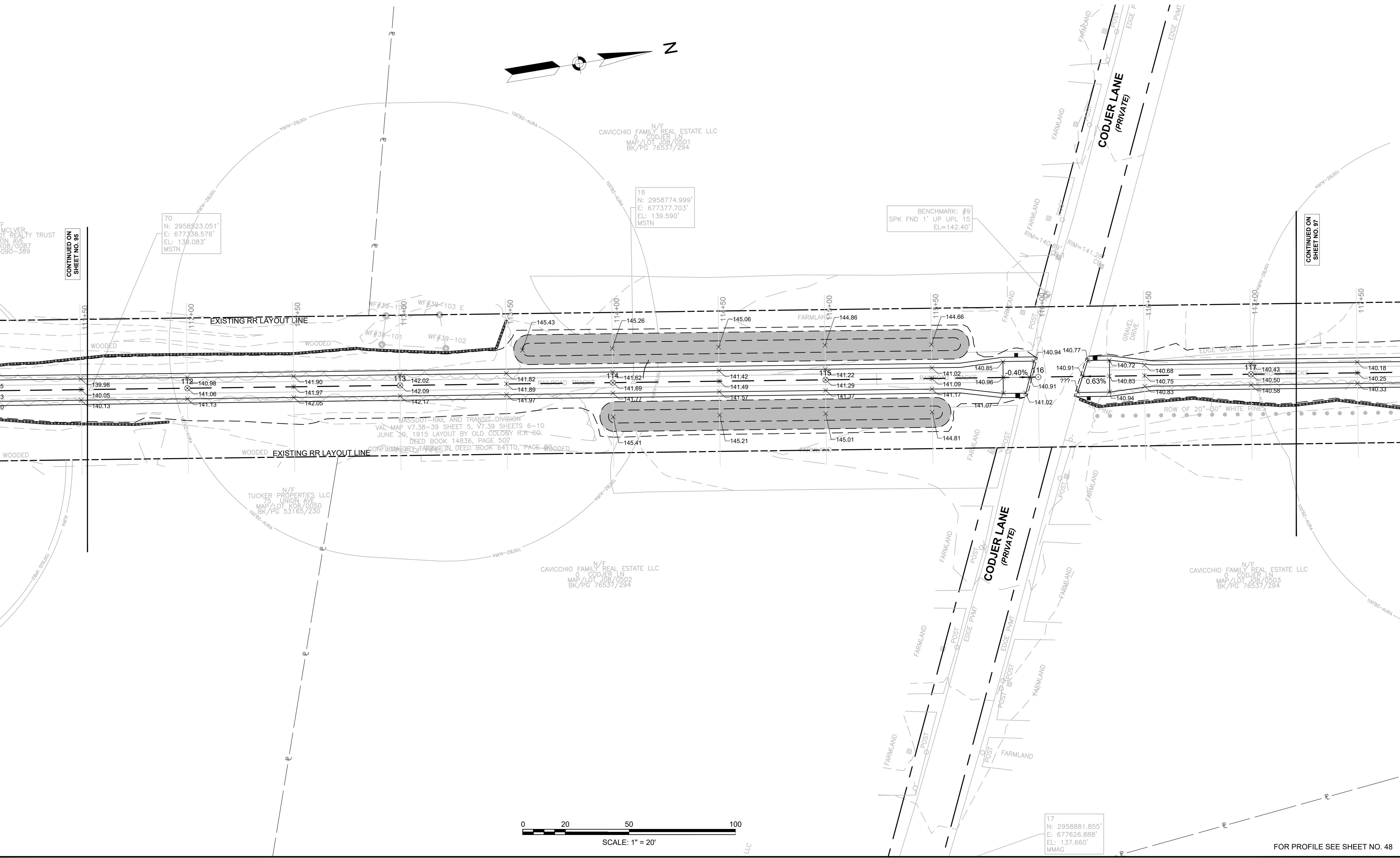
FOR CONSTRUCTION PLANS SEE SHEET NO. 41 & 42

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	59	319
PROJECT FILE NO.		608164	

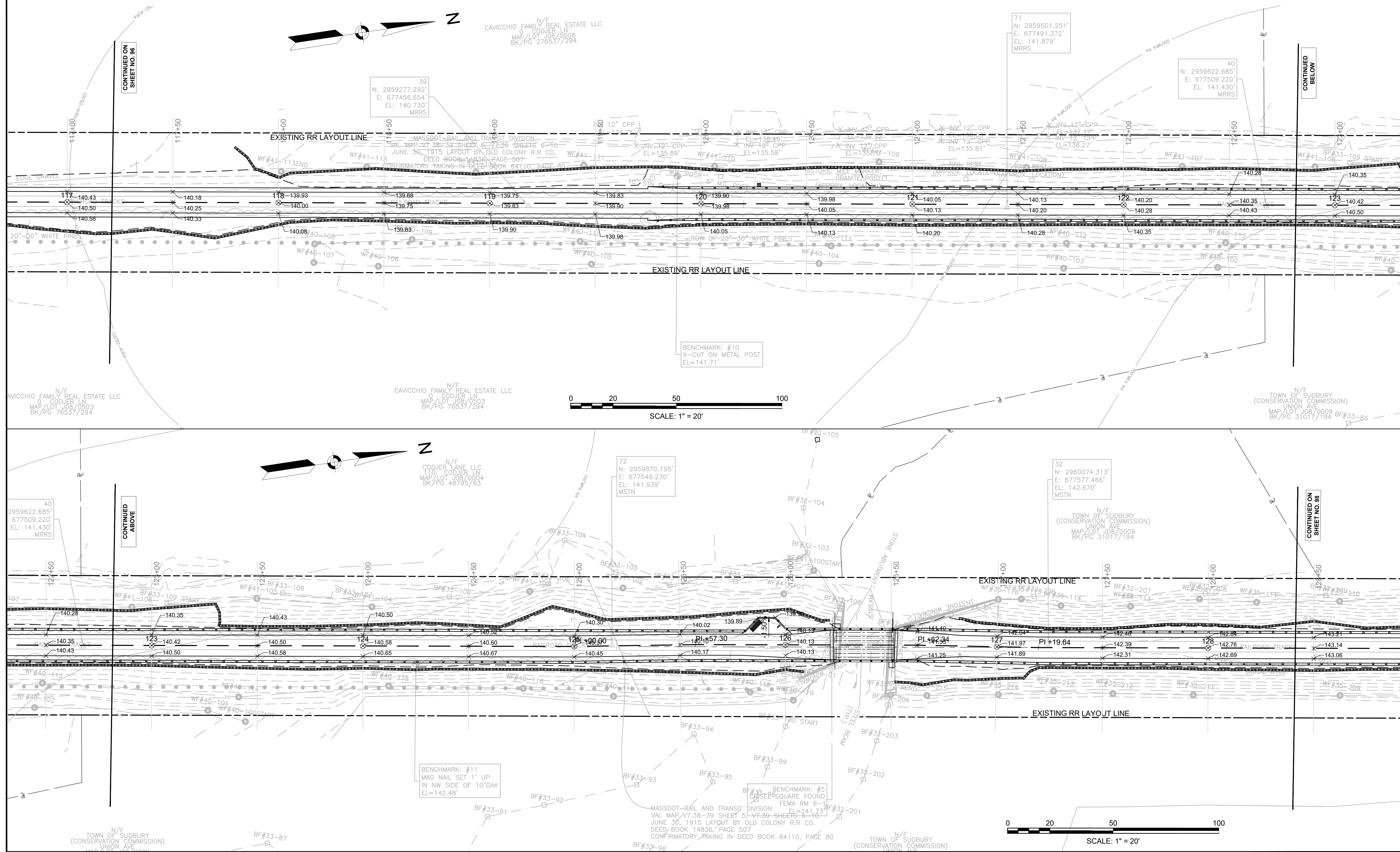
PROFILES



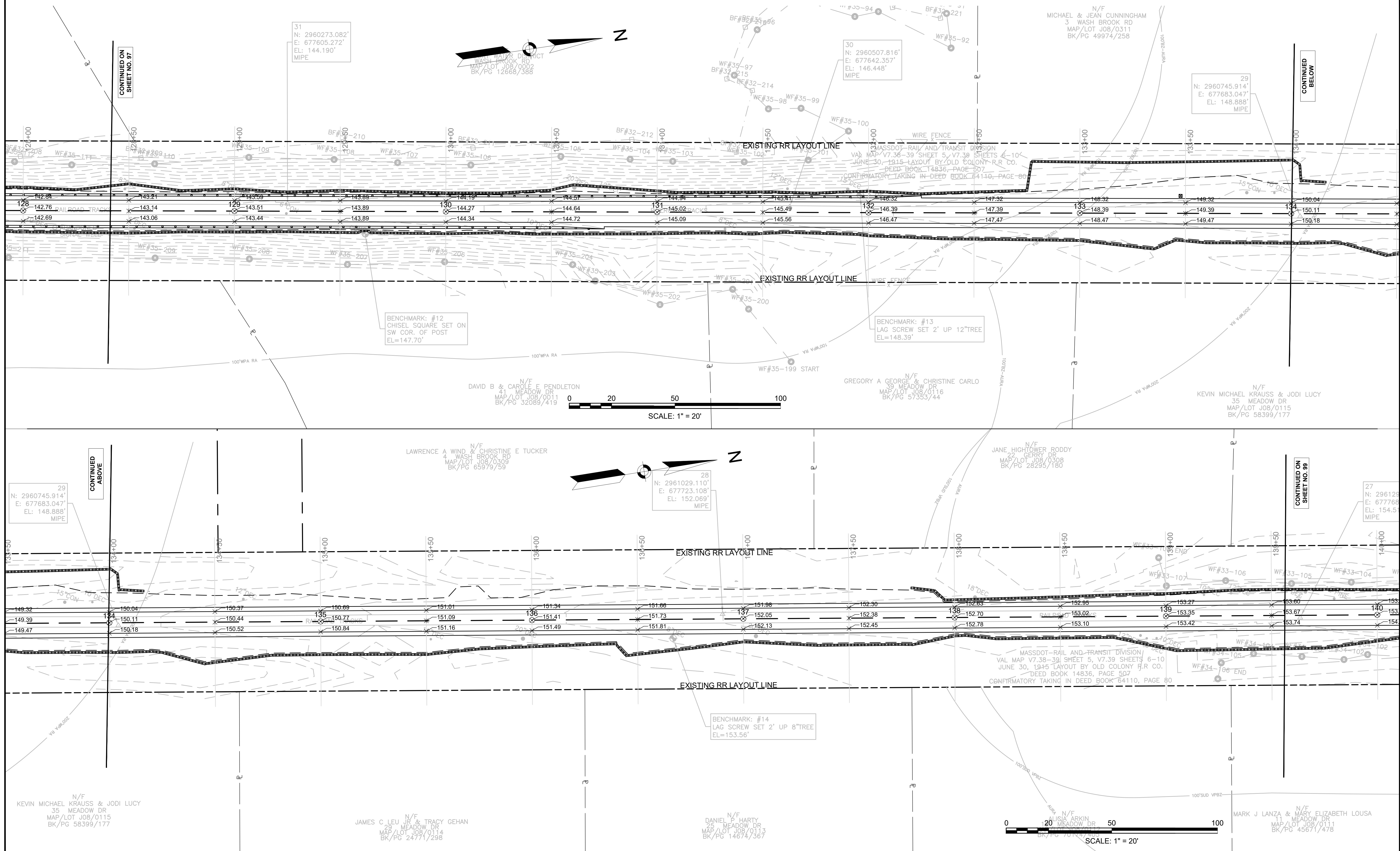




SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	97	319
PROJECT FILE NO.		608164	
GRADING PLANS			



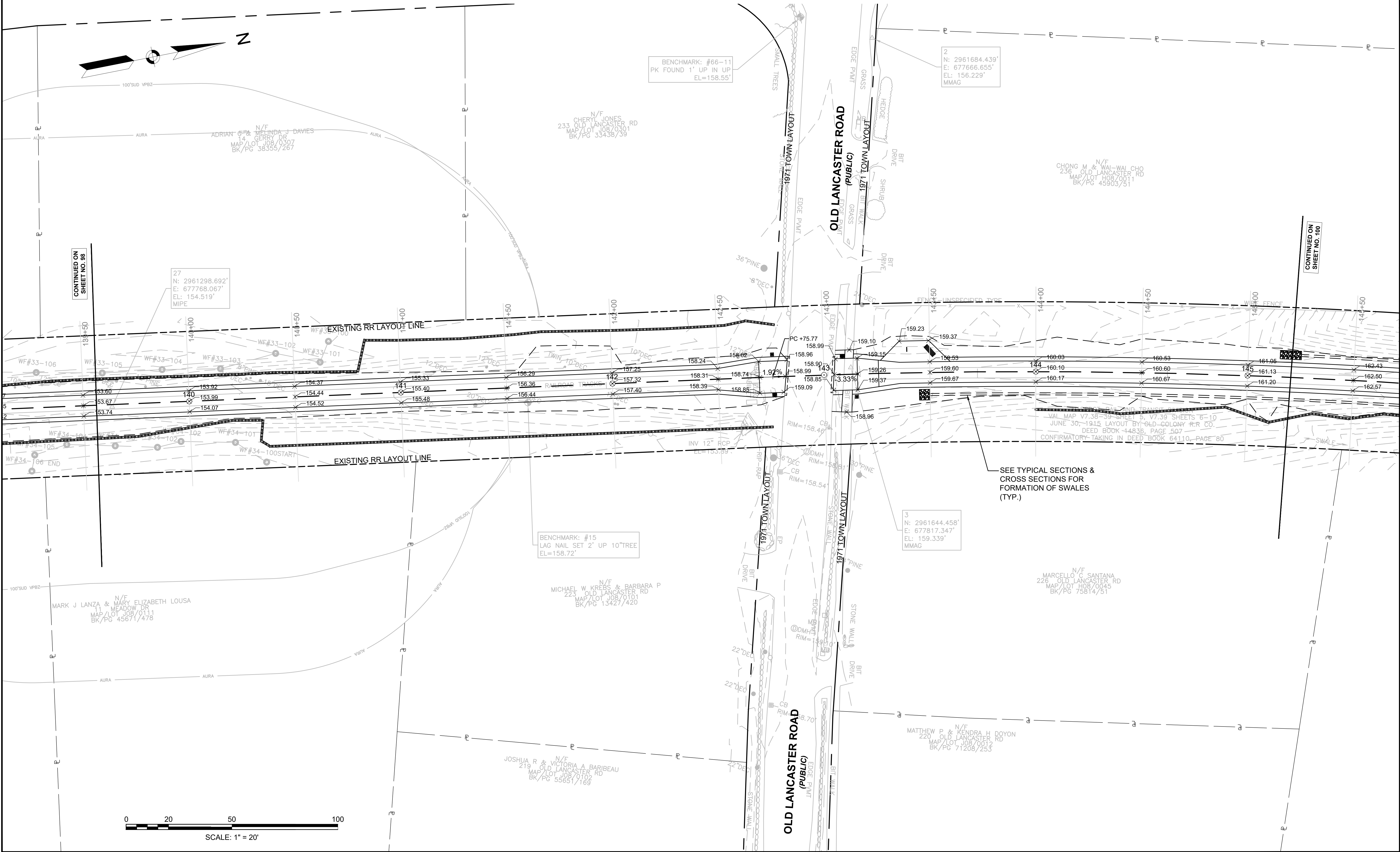
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	98	319
PROJECT FILE NO.		608164	
GRADING PLANS			



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	99	319
PROJECT FILE NO.		608164	

GRADING PLANS

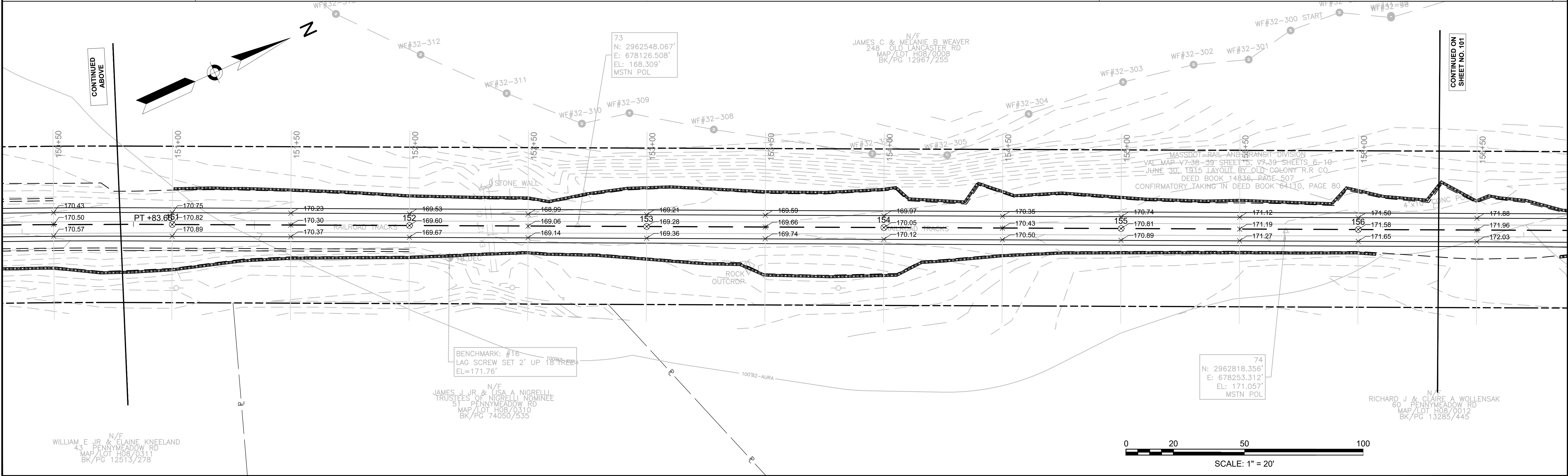
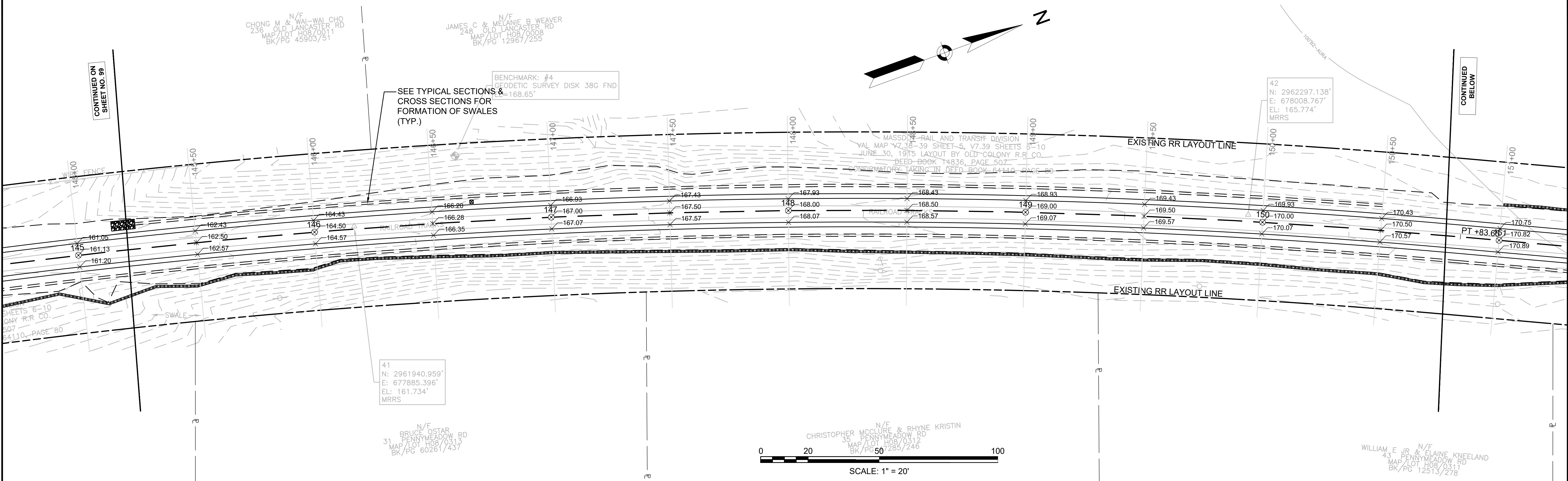


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	100	319

PROJECT FILE NO. 608164

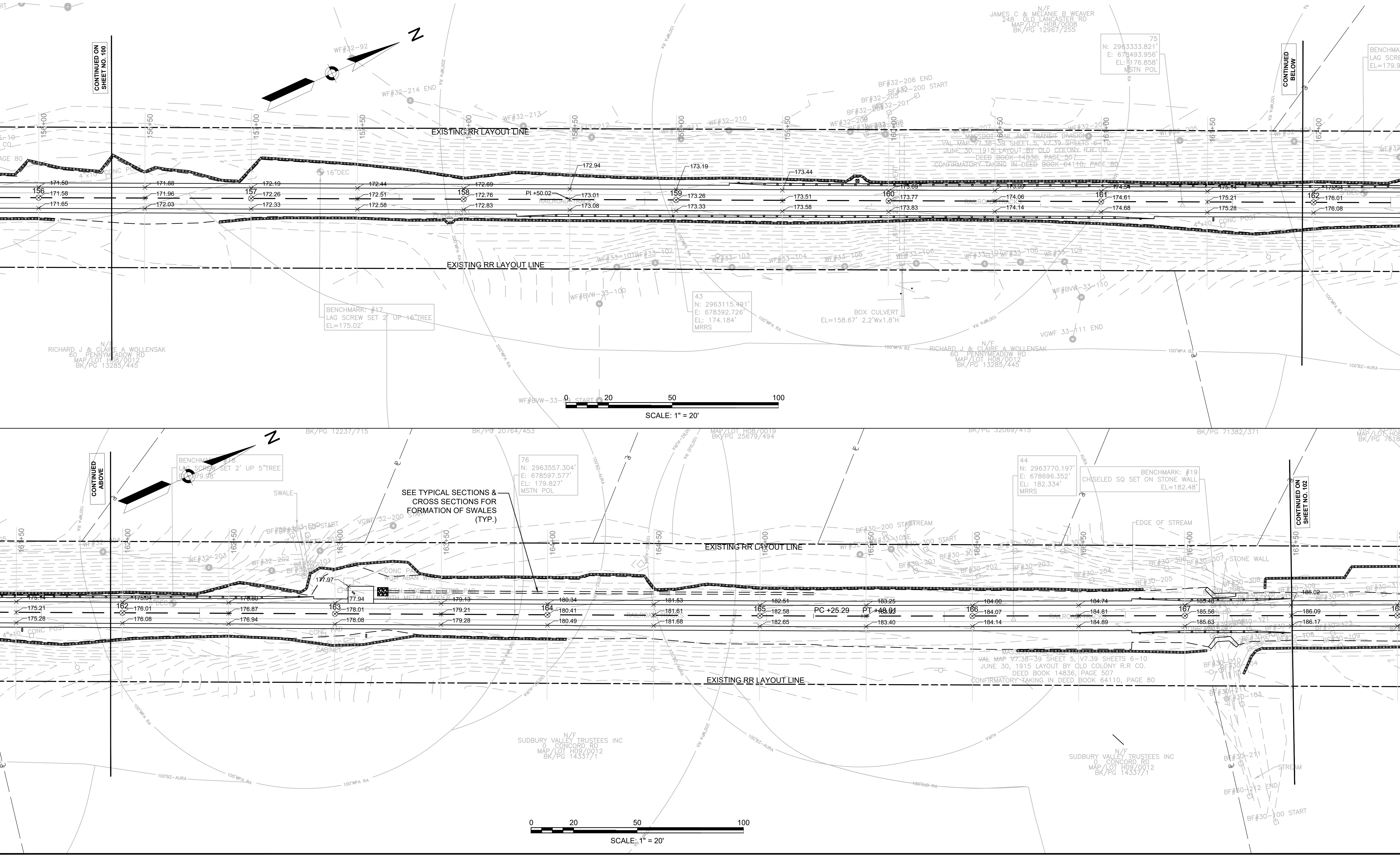
GRADING PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	101	319
PROJECT FILE NO.		608164	

GRADING PLANS

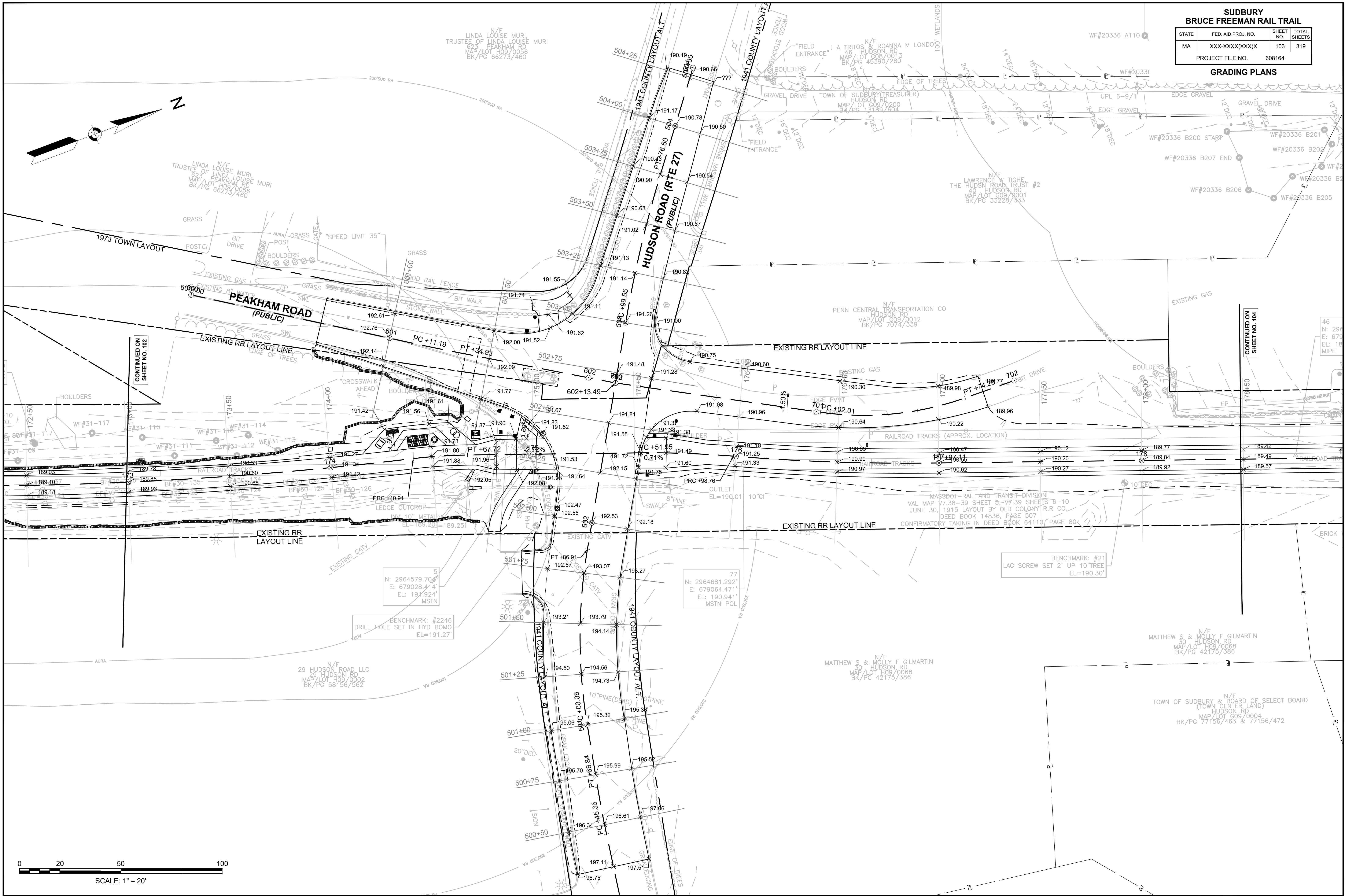


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	103	319

PROJECT FILE NO. 608164

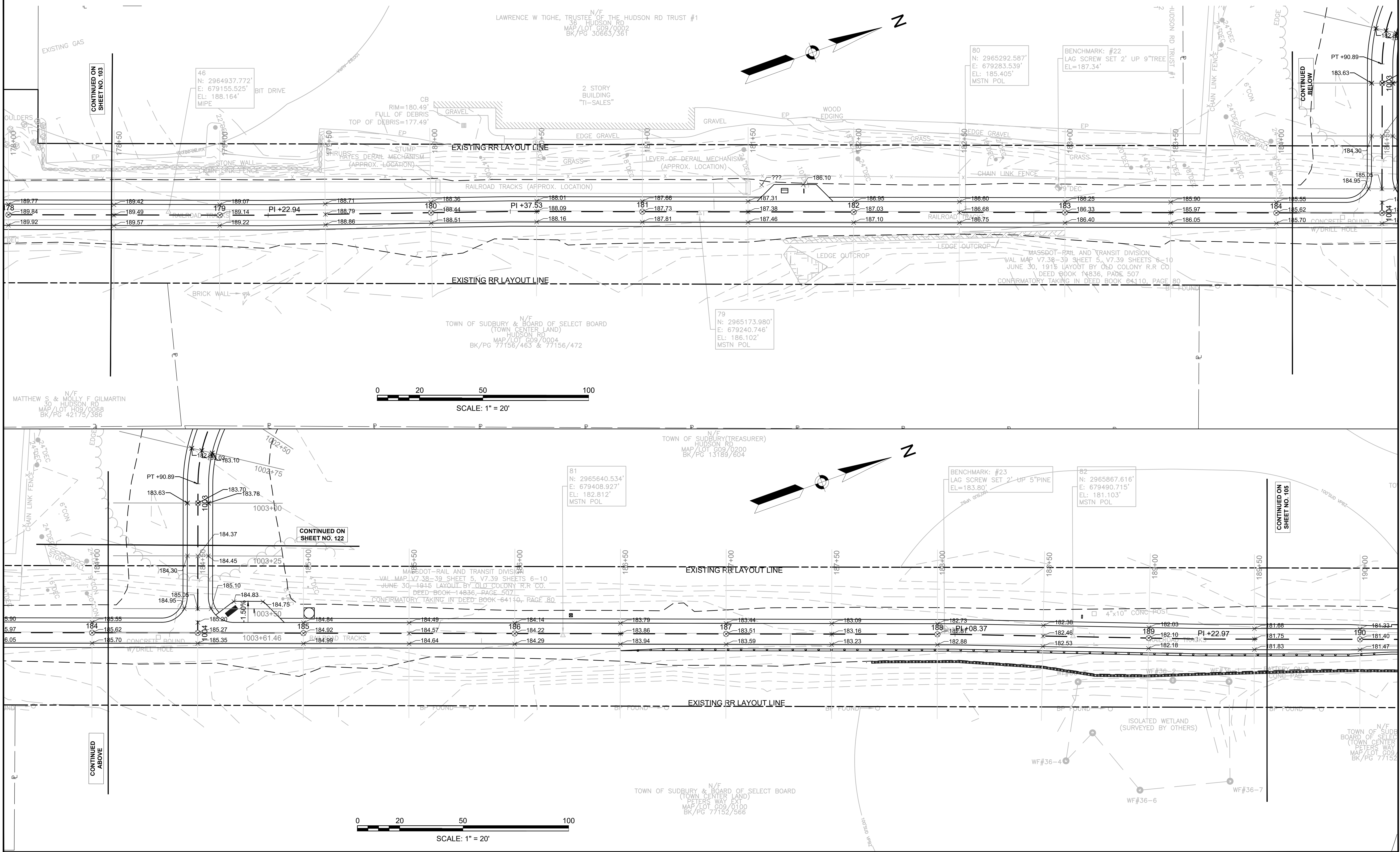
GRADING PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	104	319
PROJECT FILE NO.		608164	

GRADING PLANS



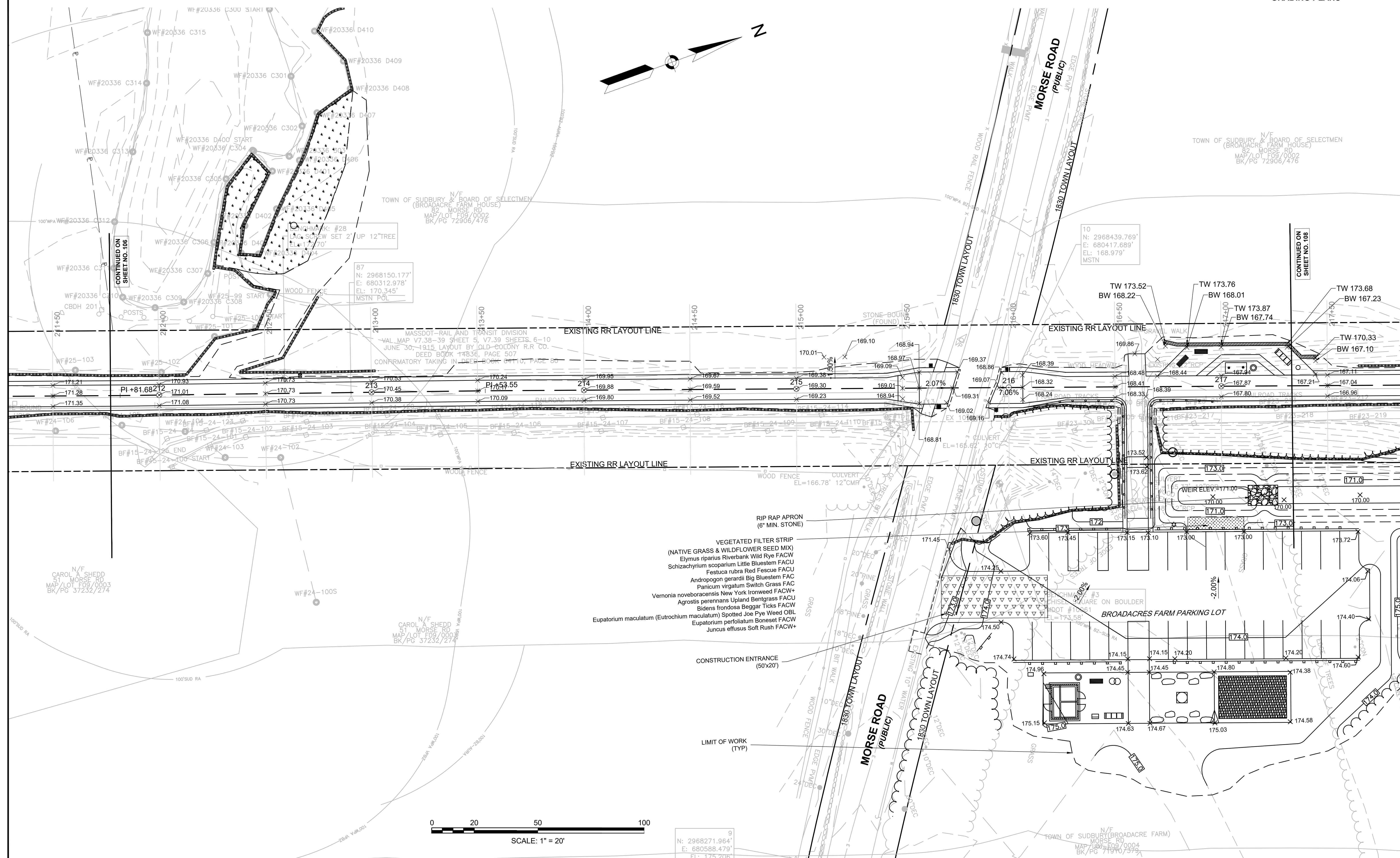


NOTE:
CONTRACTOR TO PROVIDE CONSTRUCTION FENCING
ALONG THE PERIMETER OF THE BASIN DURING
CONSTRUCTION.

**SUDBURY
BRUCE FREEMAN RAIL TRAIL**

STATE	FED. AID PROJ. NO.	SHEET NO.	SHEET TOTAL
MA	XXX-XXXX(XXX)X	107	31
PROJECT FILE NO.		608164	

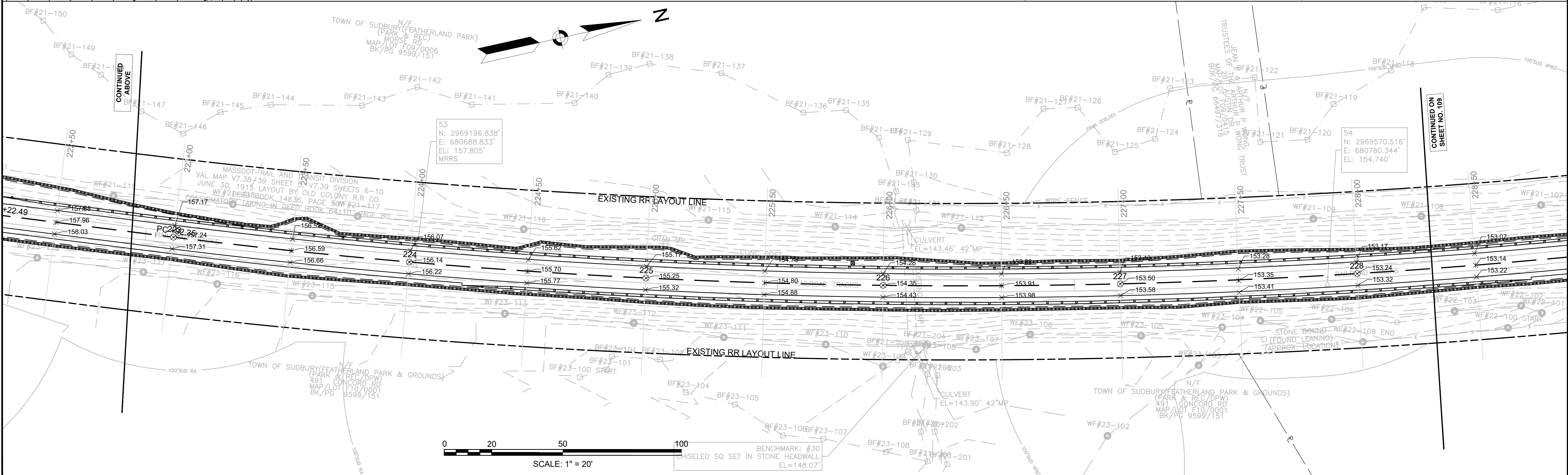
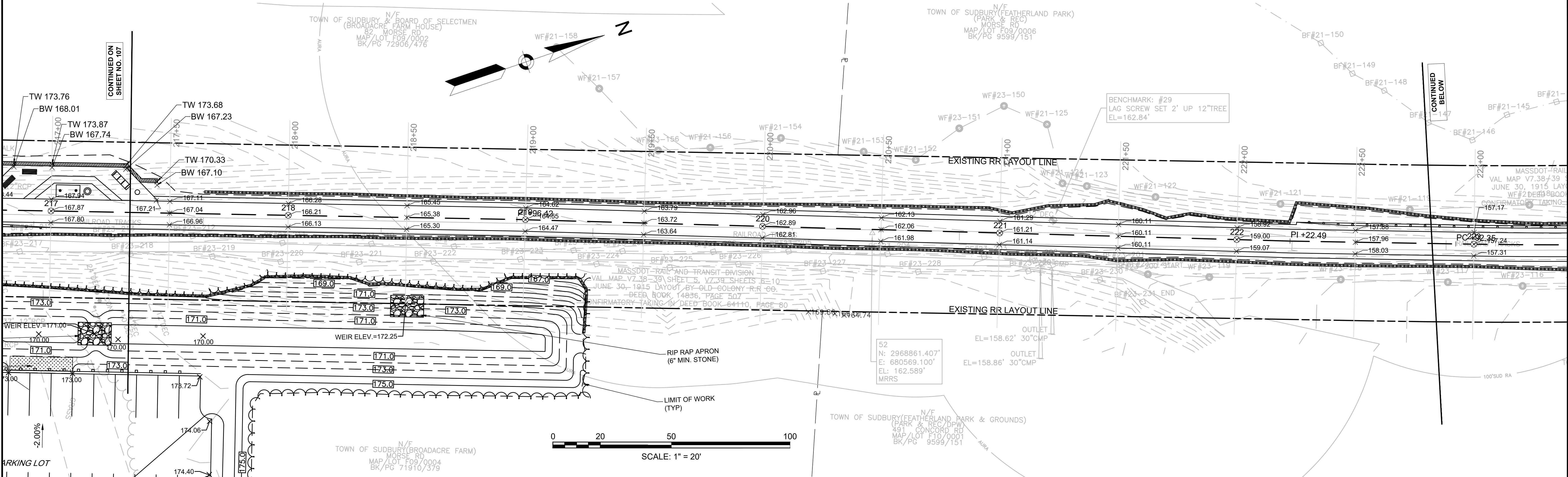
GRADING PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	108	319
PROJECT FILE NO.		608164	

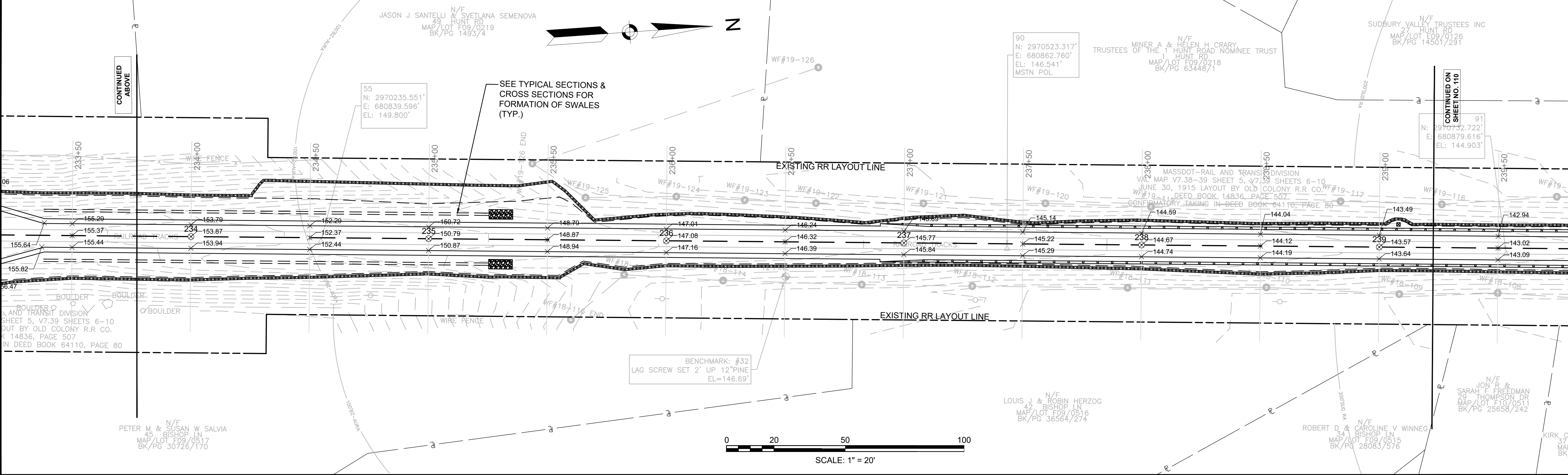
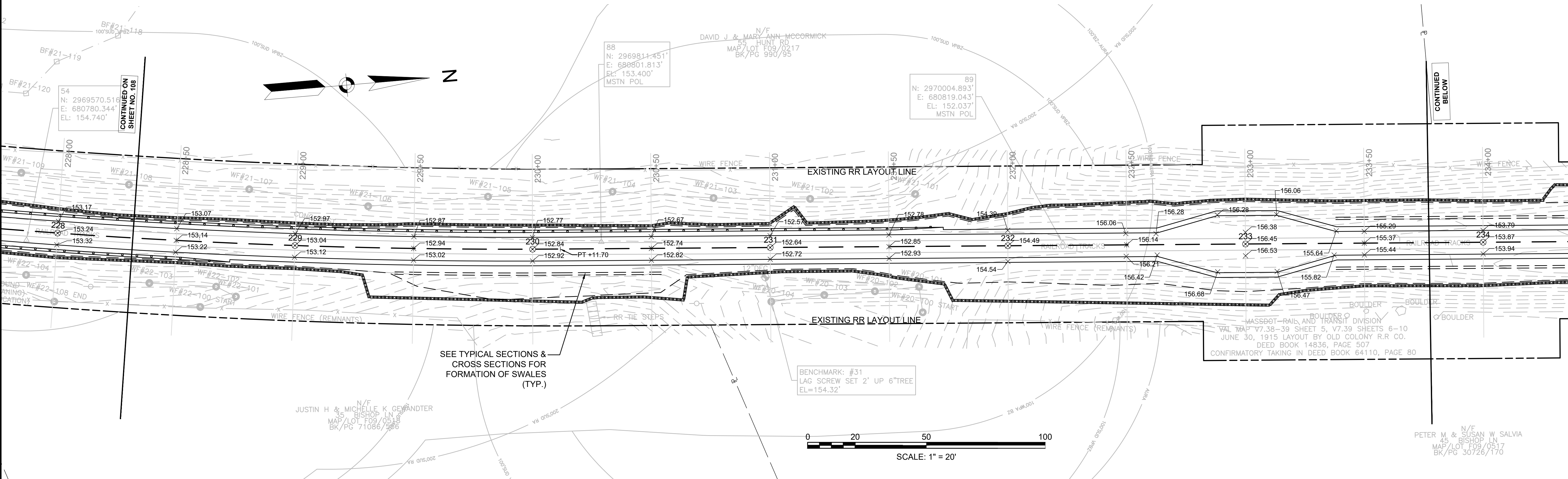
GRADING PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	109	319
PROJECT FILE NO.		608164	

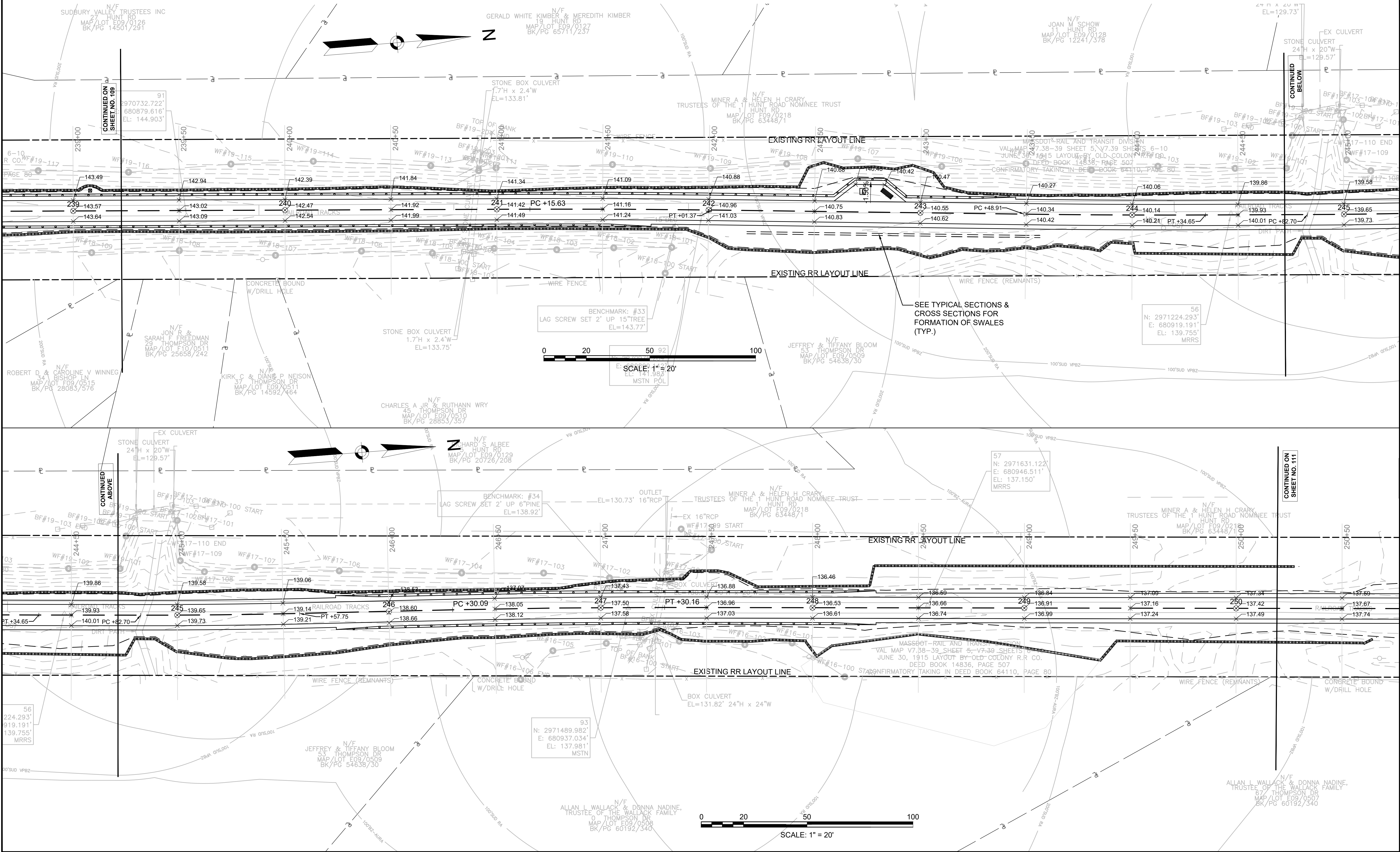
GRADING PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	110	319
PROJECT FILE NO.		608164	

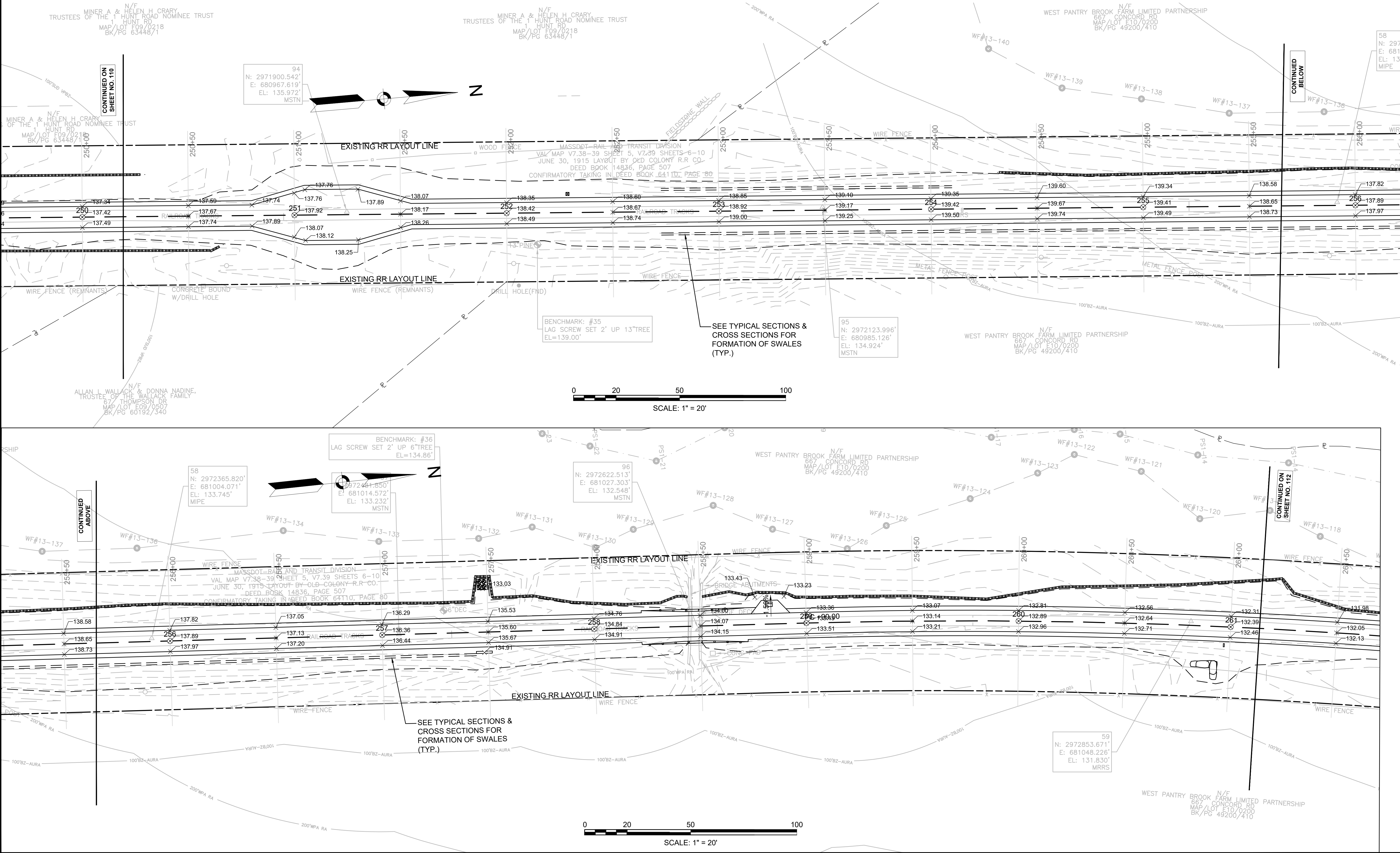
GRADING PLANS



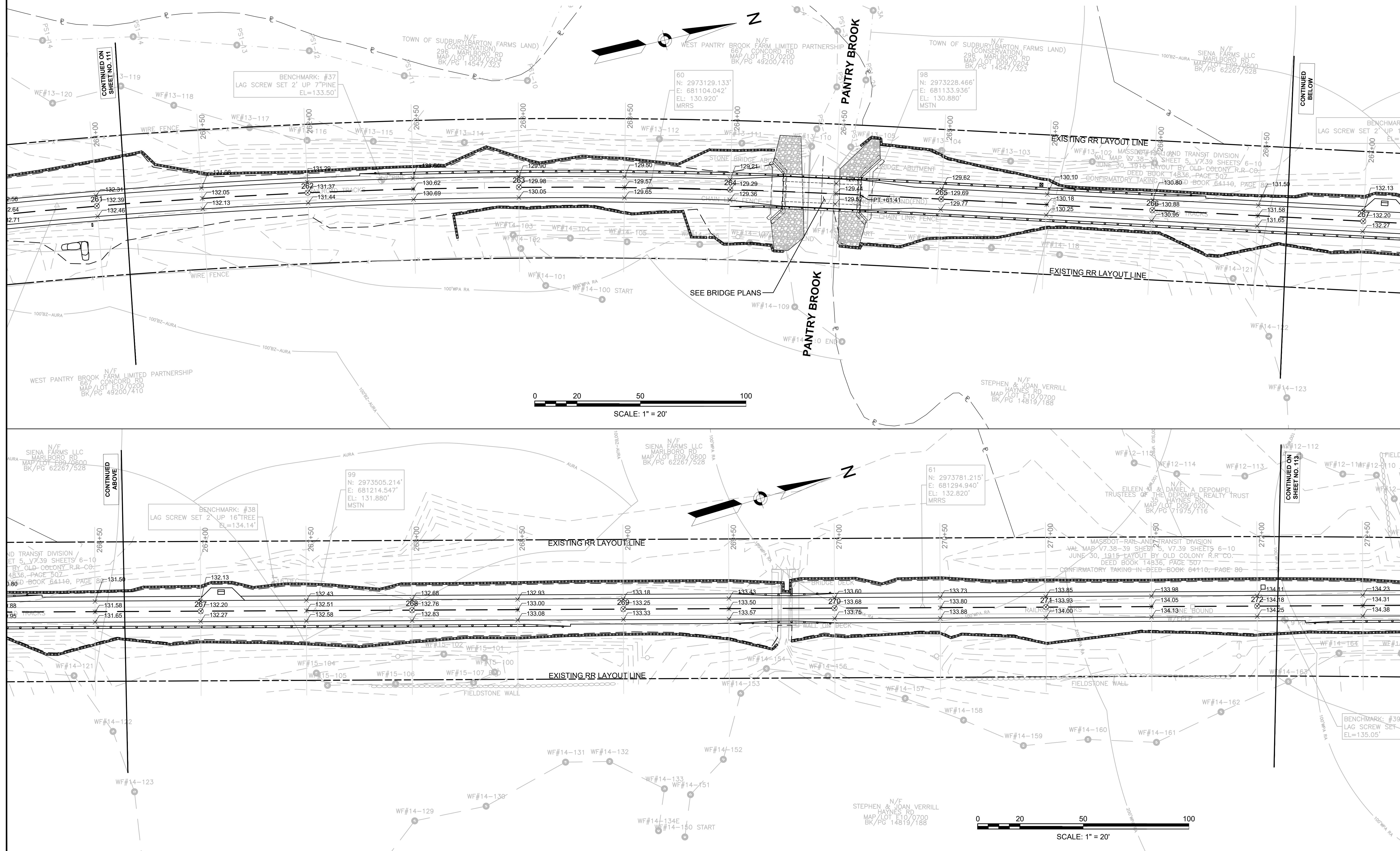
SUDBURY
BRUCE FREEMAN RAIL TRAIL

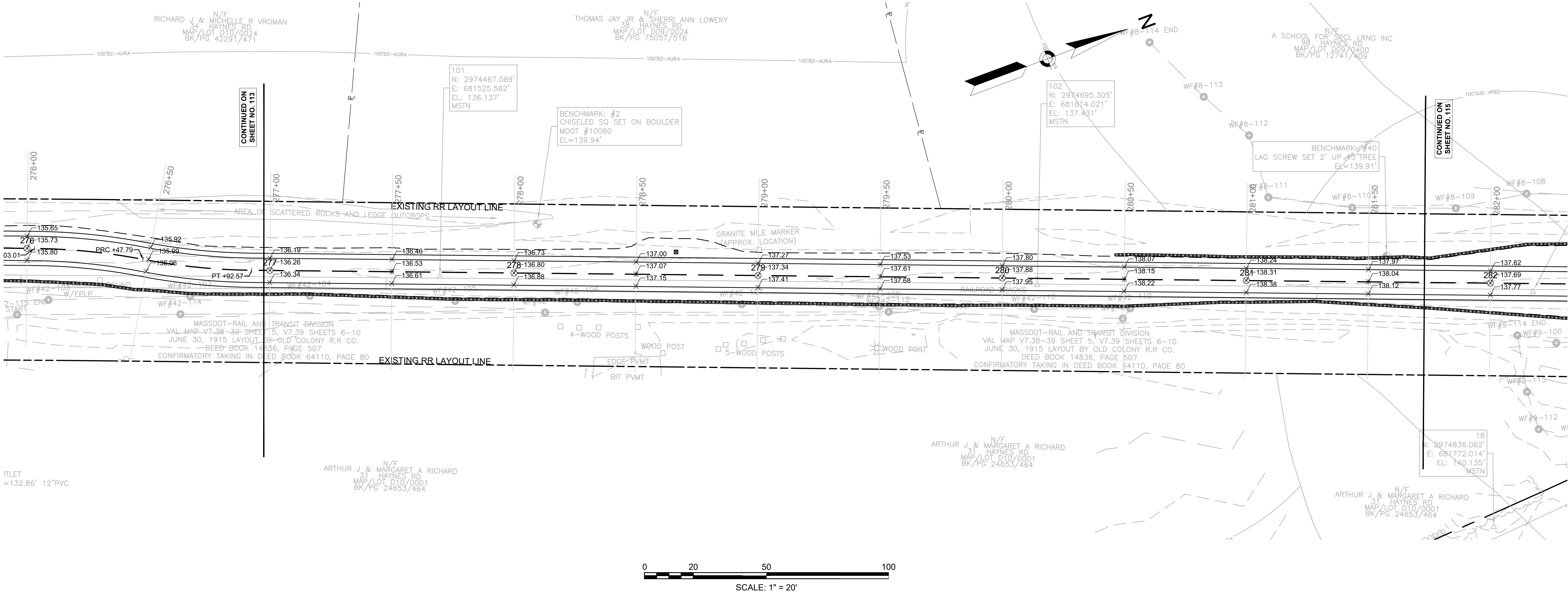
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	111	319
PROJECT FILE NO.		608164	

GRADING PLANS



SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	112	319
PROJECT FILE NO.		608164	
GRADING PLANS			

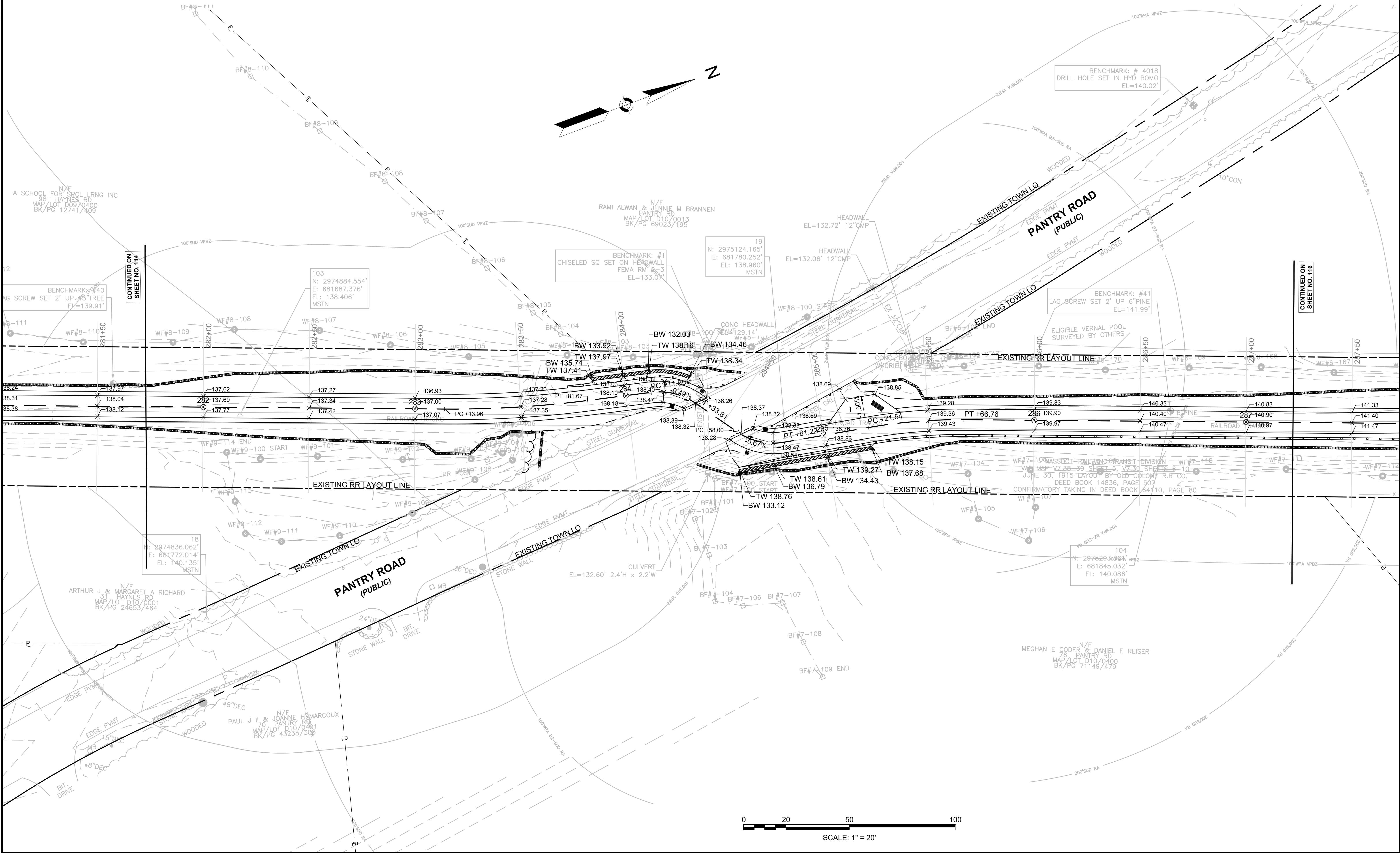


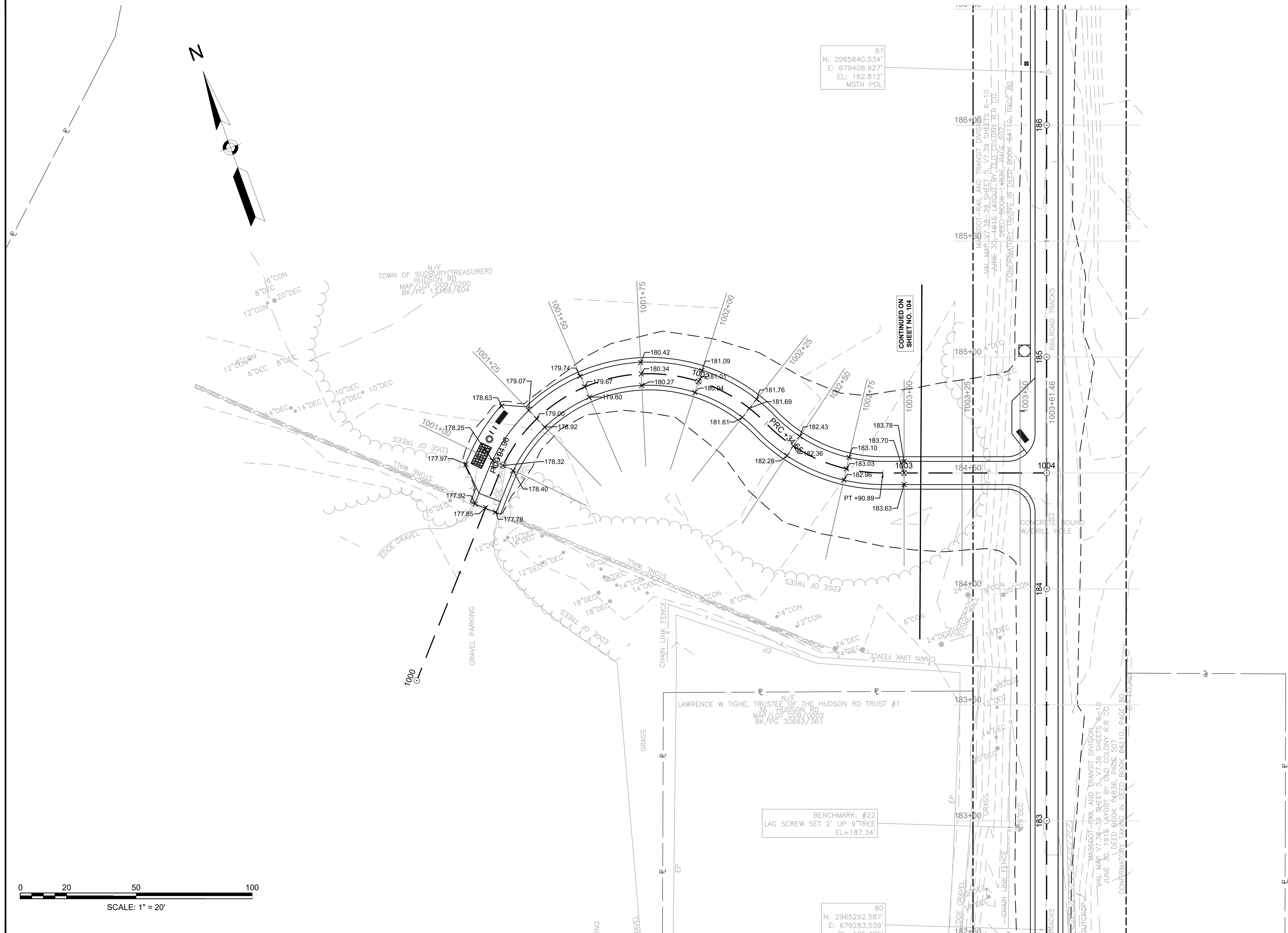


SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	115	319
PROJECT FILE NO.		608164	

GRADING PLANS

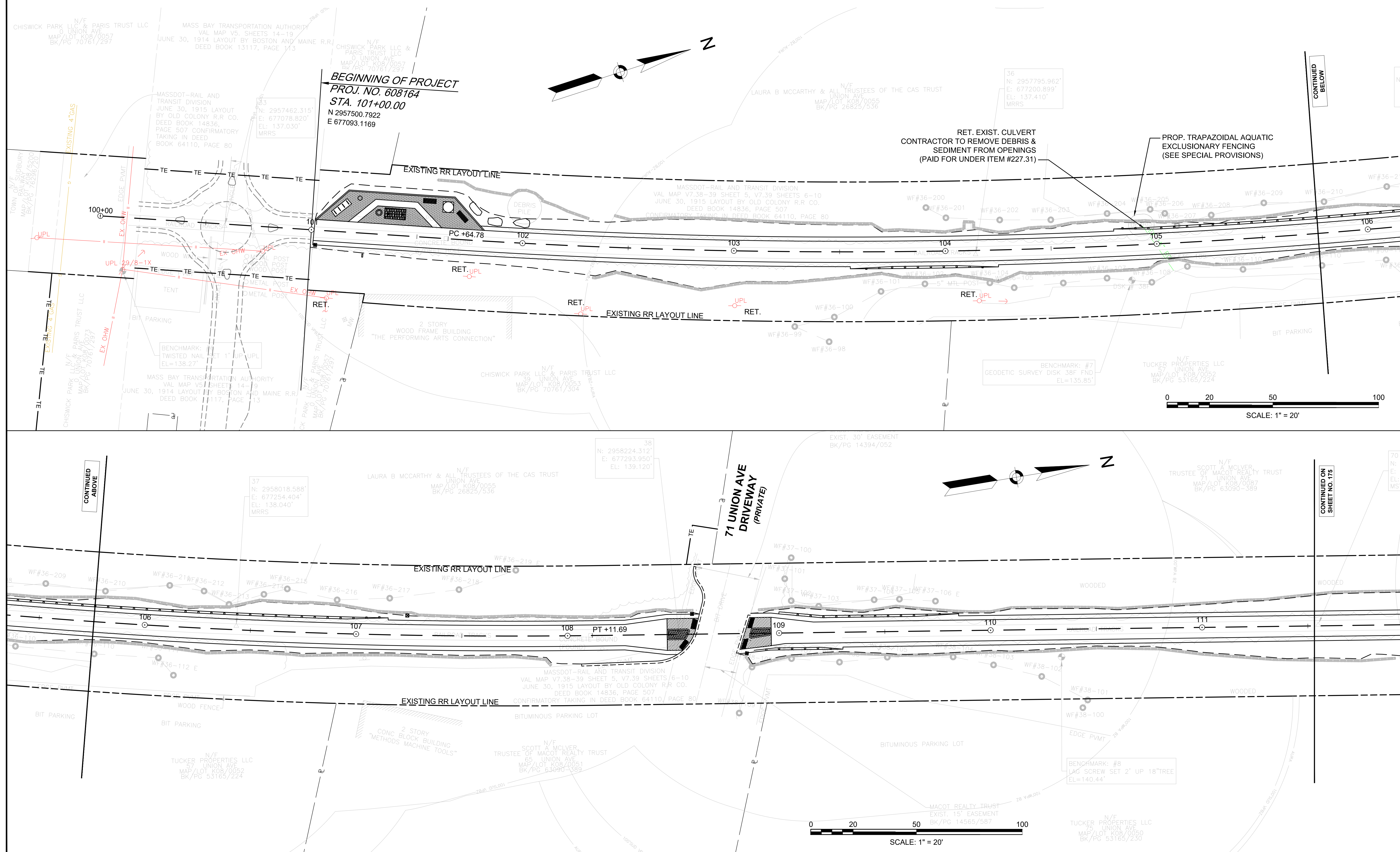




1. PROP. CONCRETE HEADWALLS SHALL CONFORM TO MASSDOT DETAIL E 206.4.0 & E 206.6.0.
2. ALL CATCH BASIN FRAME AND GRATES TO BE MASSDOT CASCADE TYPE.

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	174	319
PROJECT FILE NO.		608164	

DRAINAGE & UTILITY PLANS

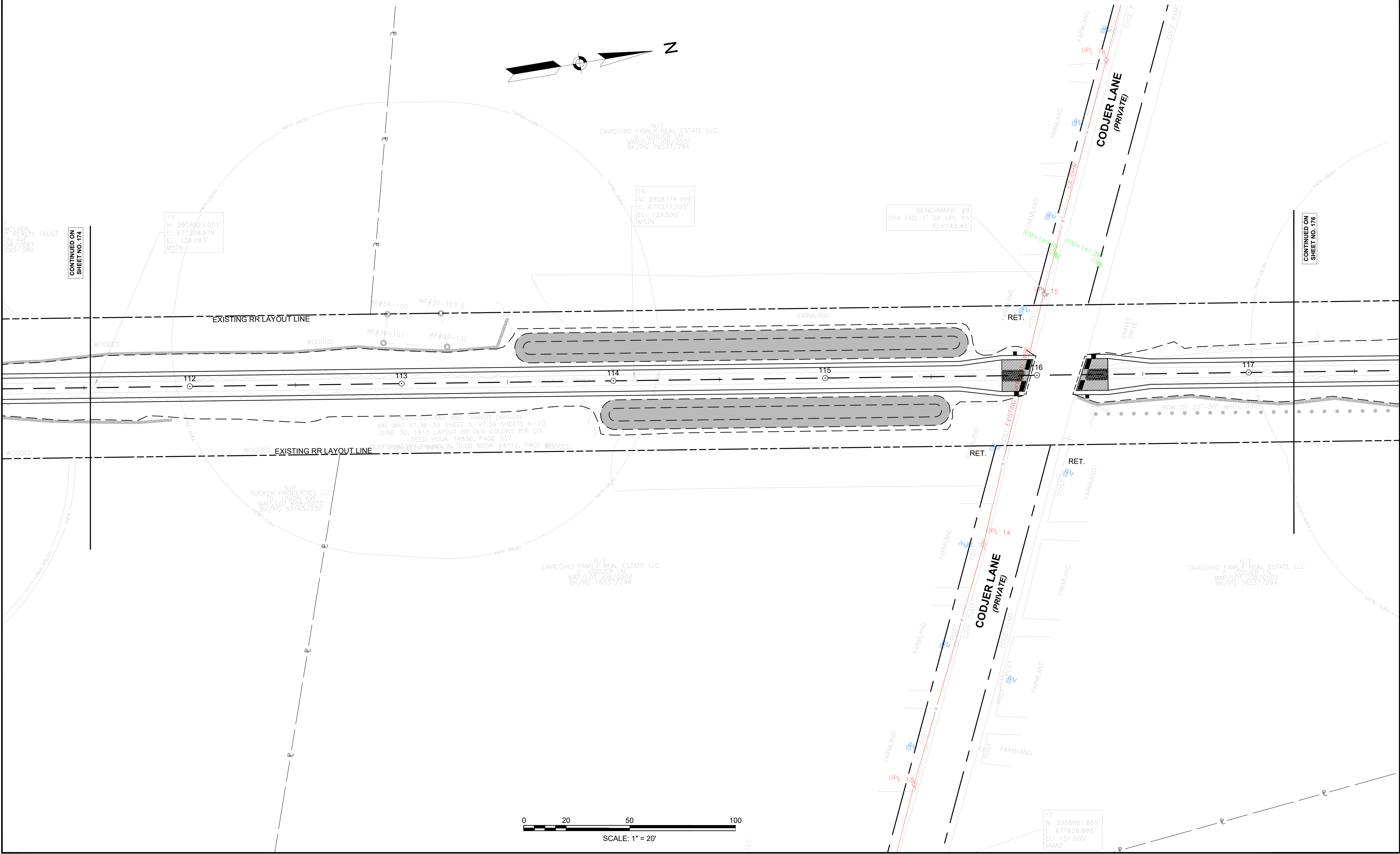


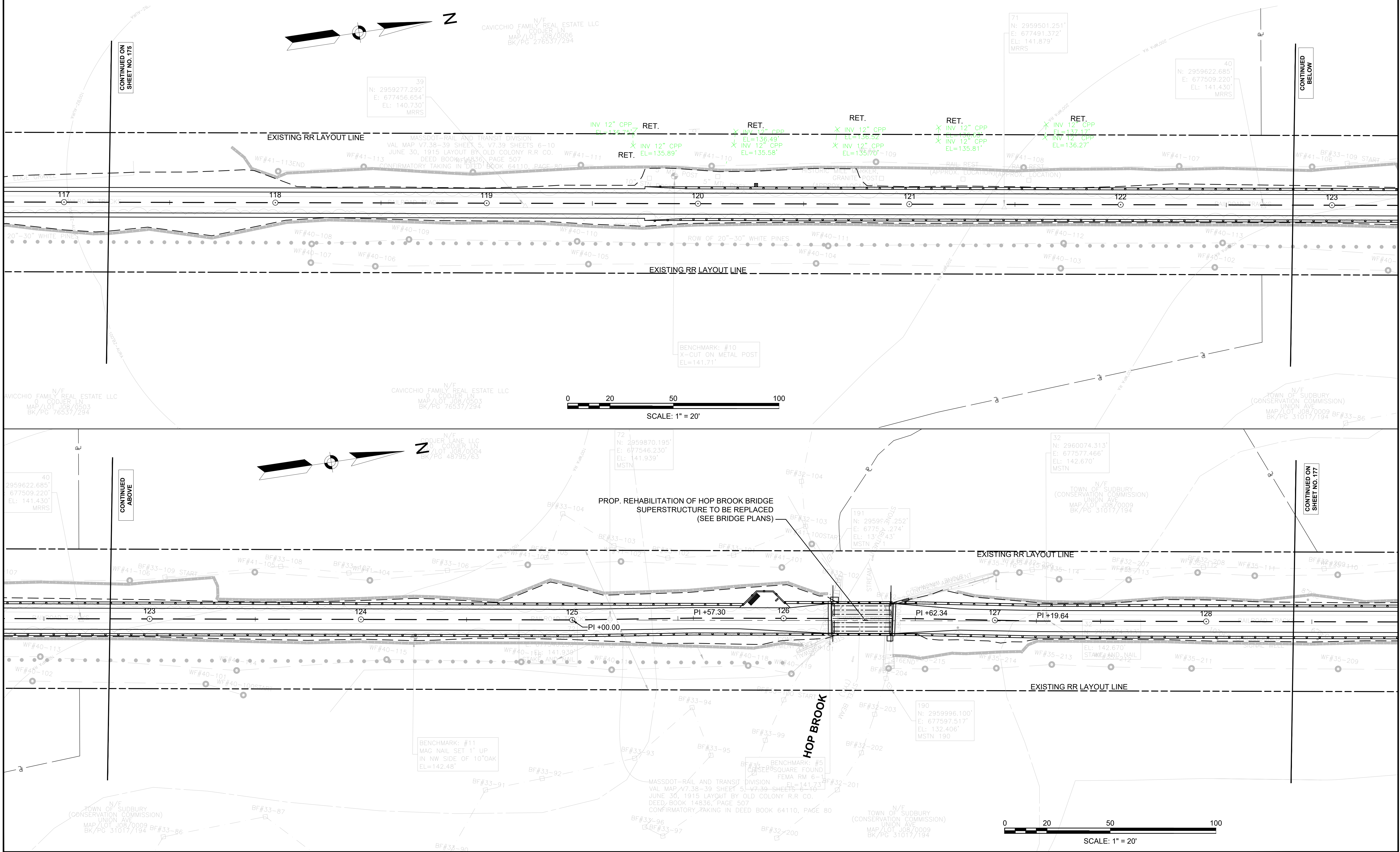
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	175	319

PROJECT FILE NO. 608164

DRAINAGE & UTILITY PLANS



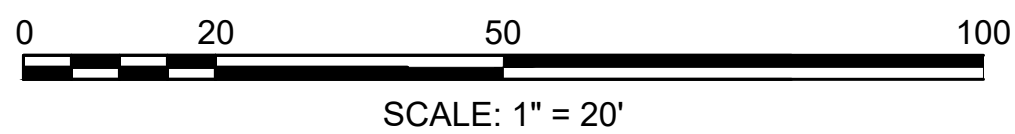
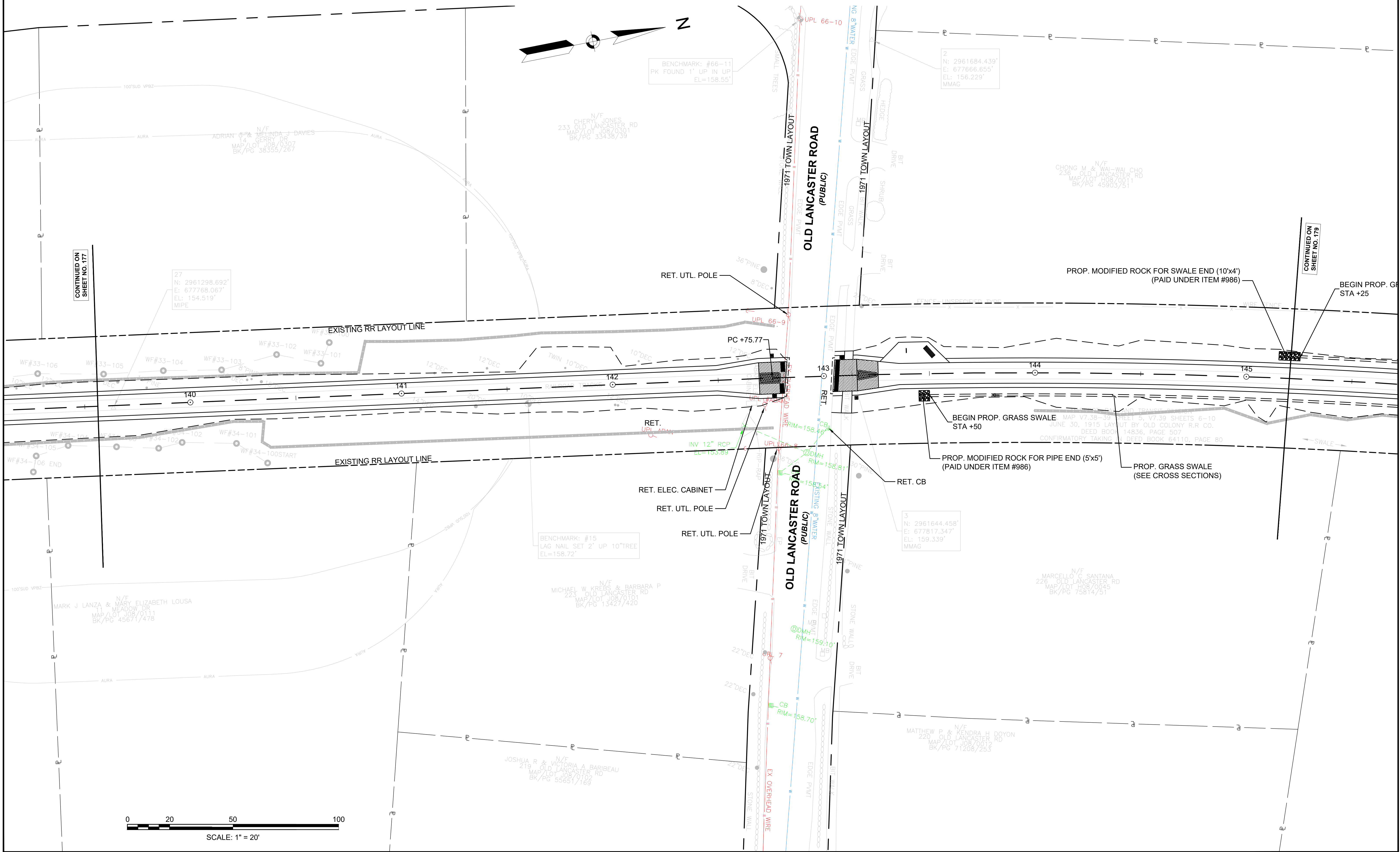


SUDBURY
BRUCE FREEMAN RAIL TRAIL

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DRAINAGE & UTILITY PLANS

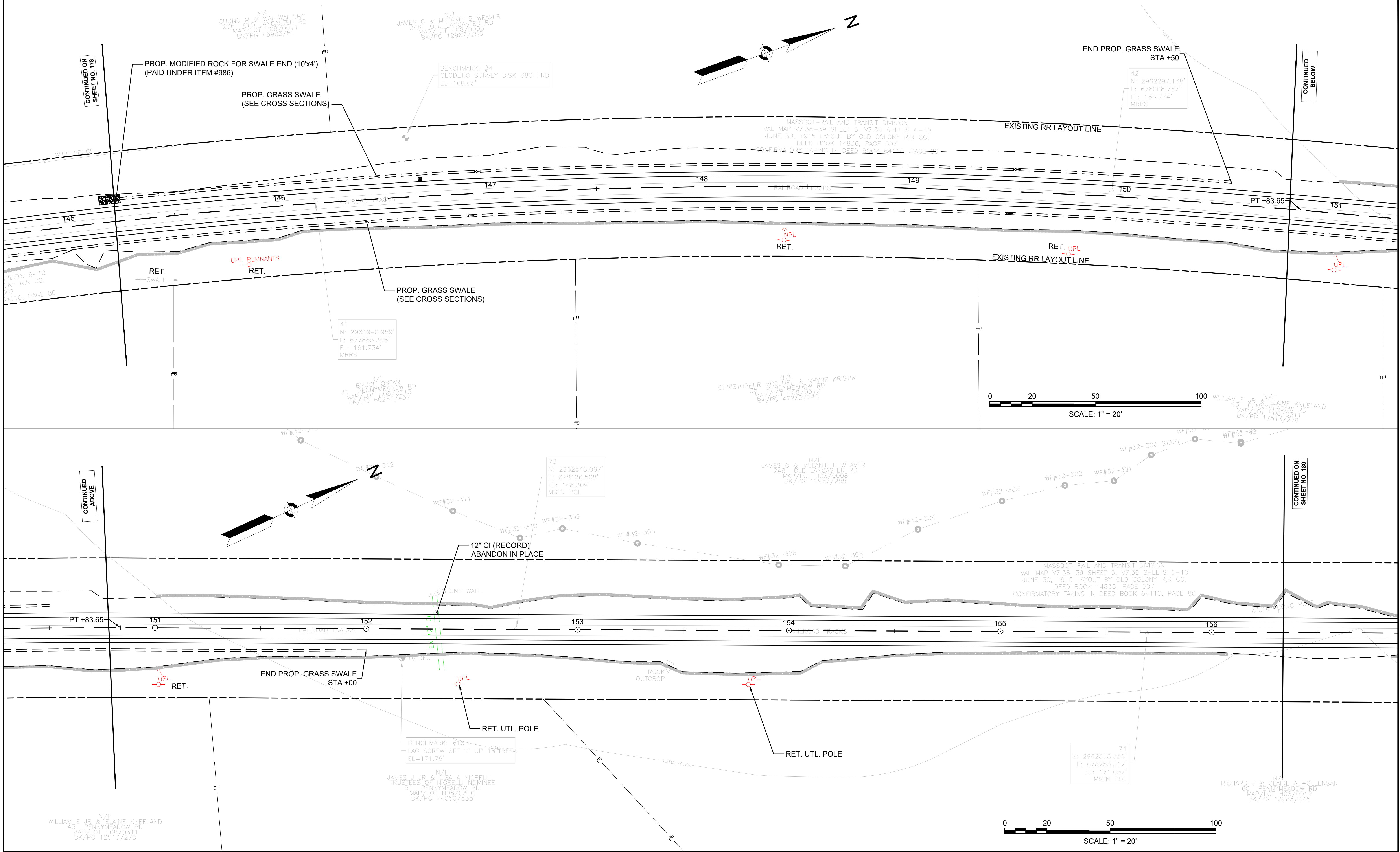


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BRUCE FREEMAN RAIL TRAIL

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PROJECT FILE NO. 608164

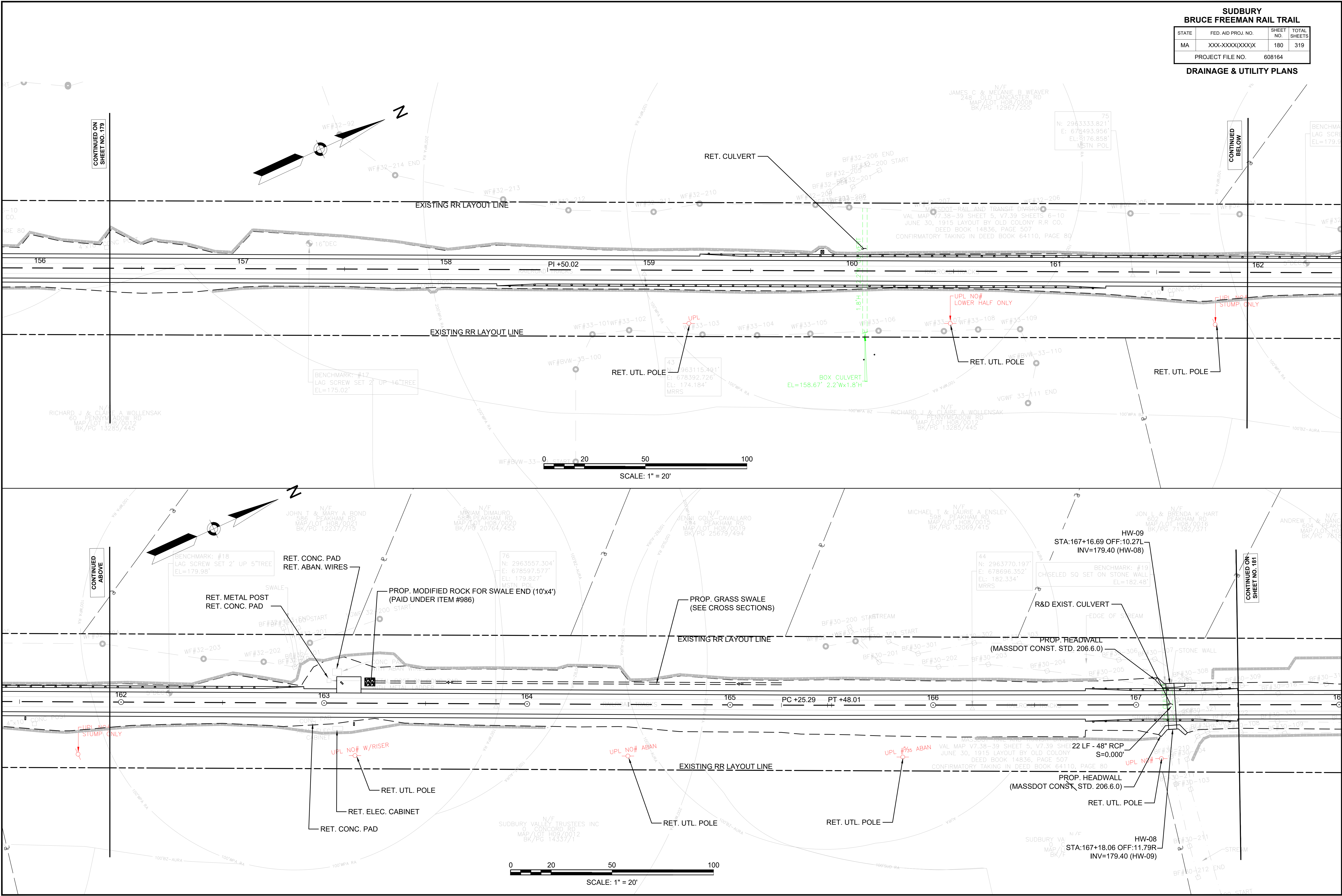
DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

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PROJECT FILE NO.		608164	

DRAINAGE & UTILITY PLANS

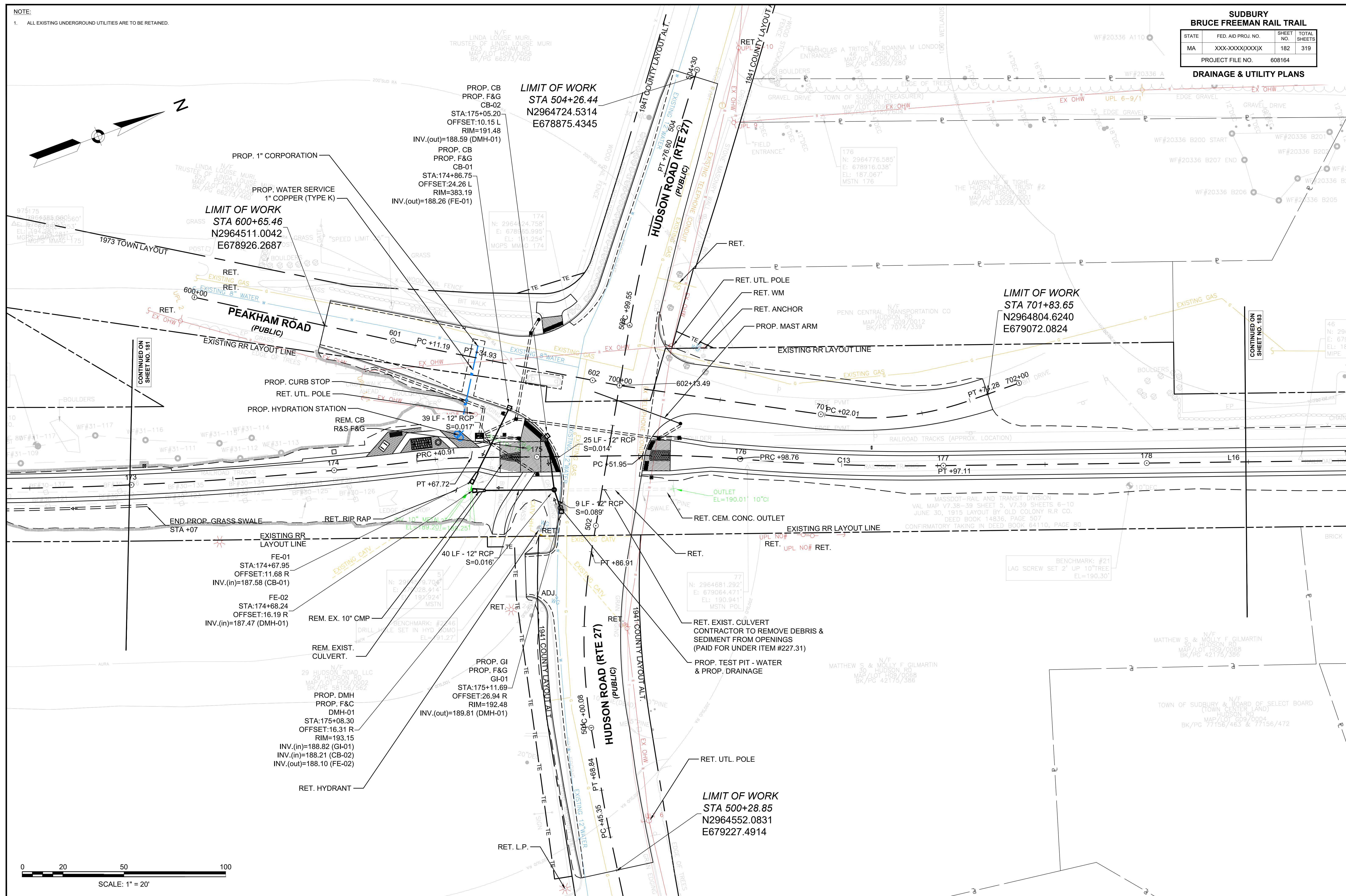


NOTE:

1. ALL EXISTING UNDERGROUND UTILITIES ARE TO BE RETAINED

SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	182	319
PROJECT FILE NO.		608164	

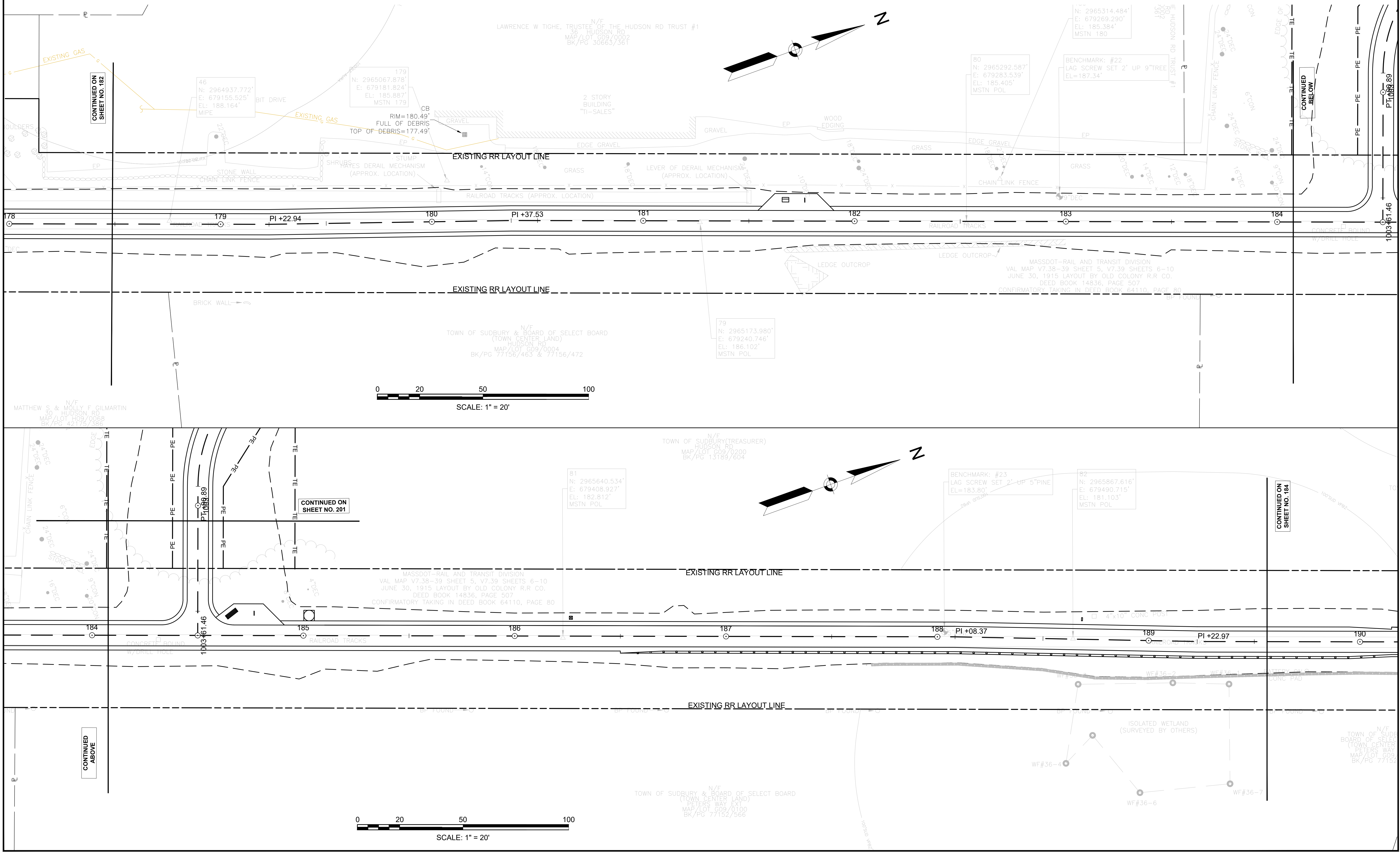
DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

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PROJECT FILE NO.		608164	

DRAINAGE & UTILITY PLANS

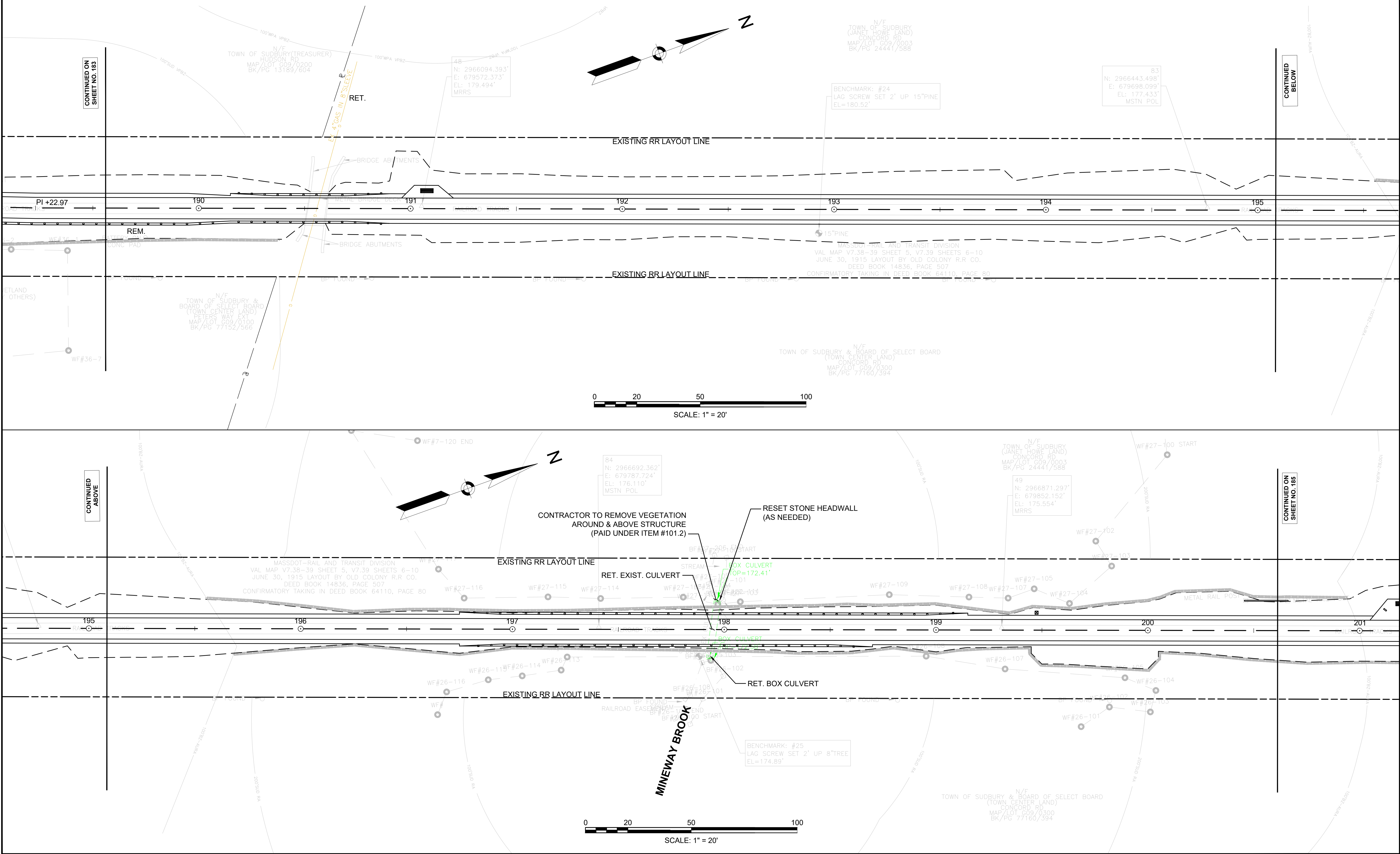


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BRUCE FREEMAN RAIL TRAIL

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PROJECT FILE NO. 608164

DRAINAGE & UTILITY PLANS

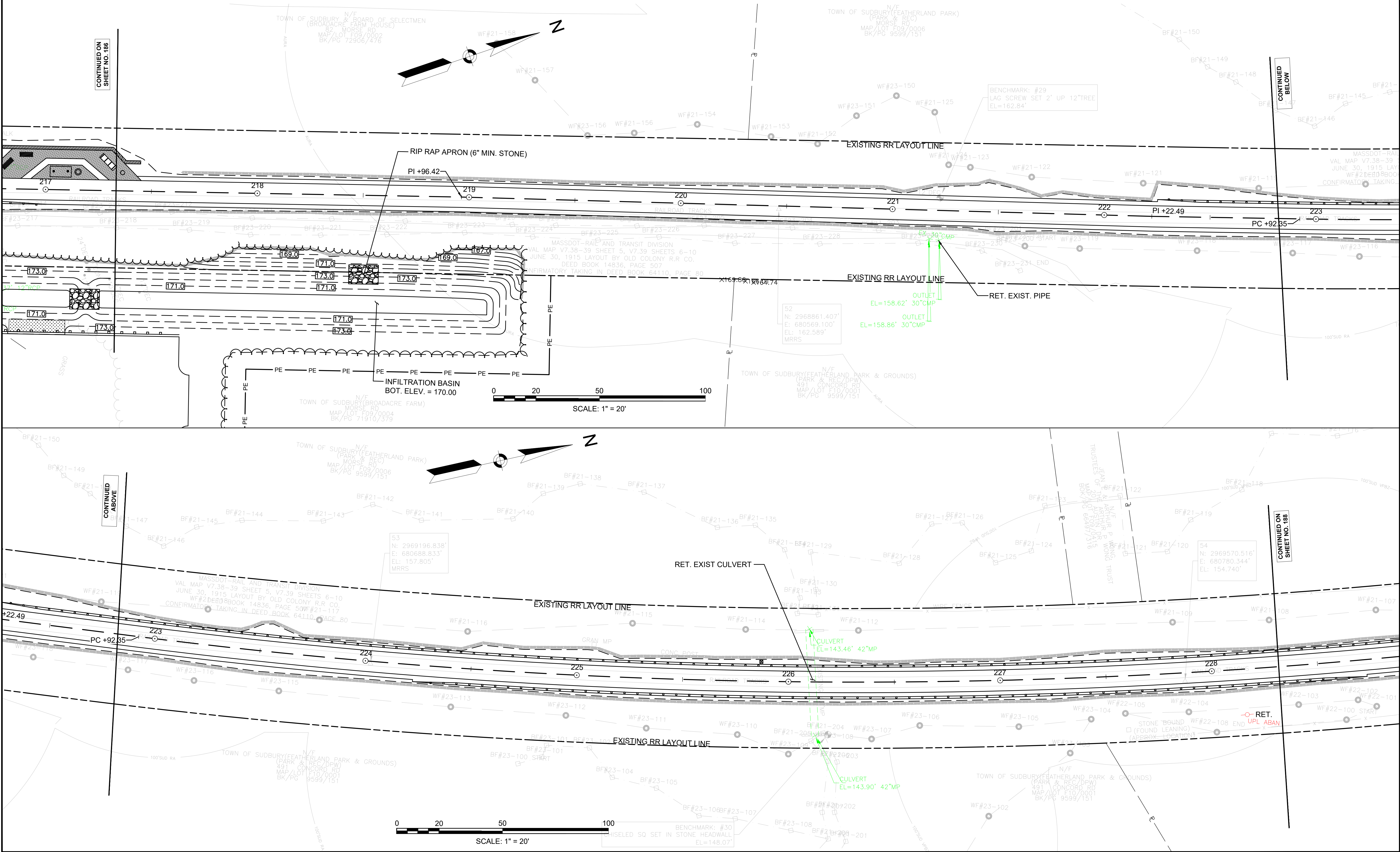




SUDBURY
BRUCE FREEMAN RAIL TRAIL

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DRAINAGE & UTILITY PLANS

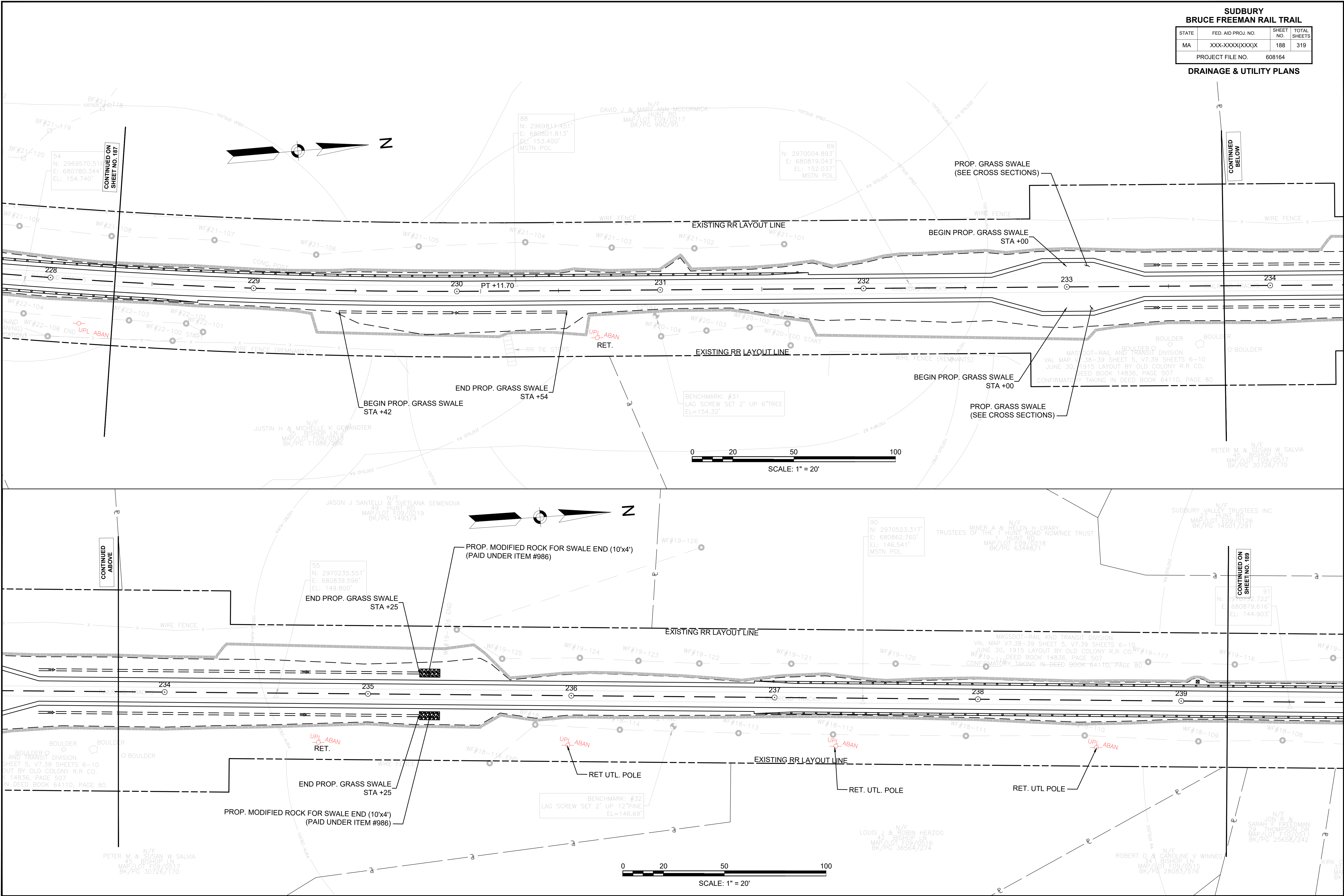


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BRUCE FREEMAN RAIL TRAIL

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PROJECT FILE NO. 608164

DRAINAGE & UTILITY PLANS

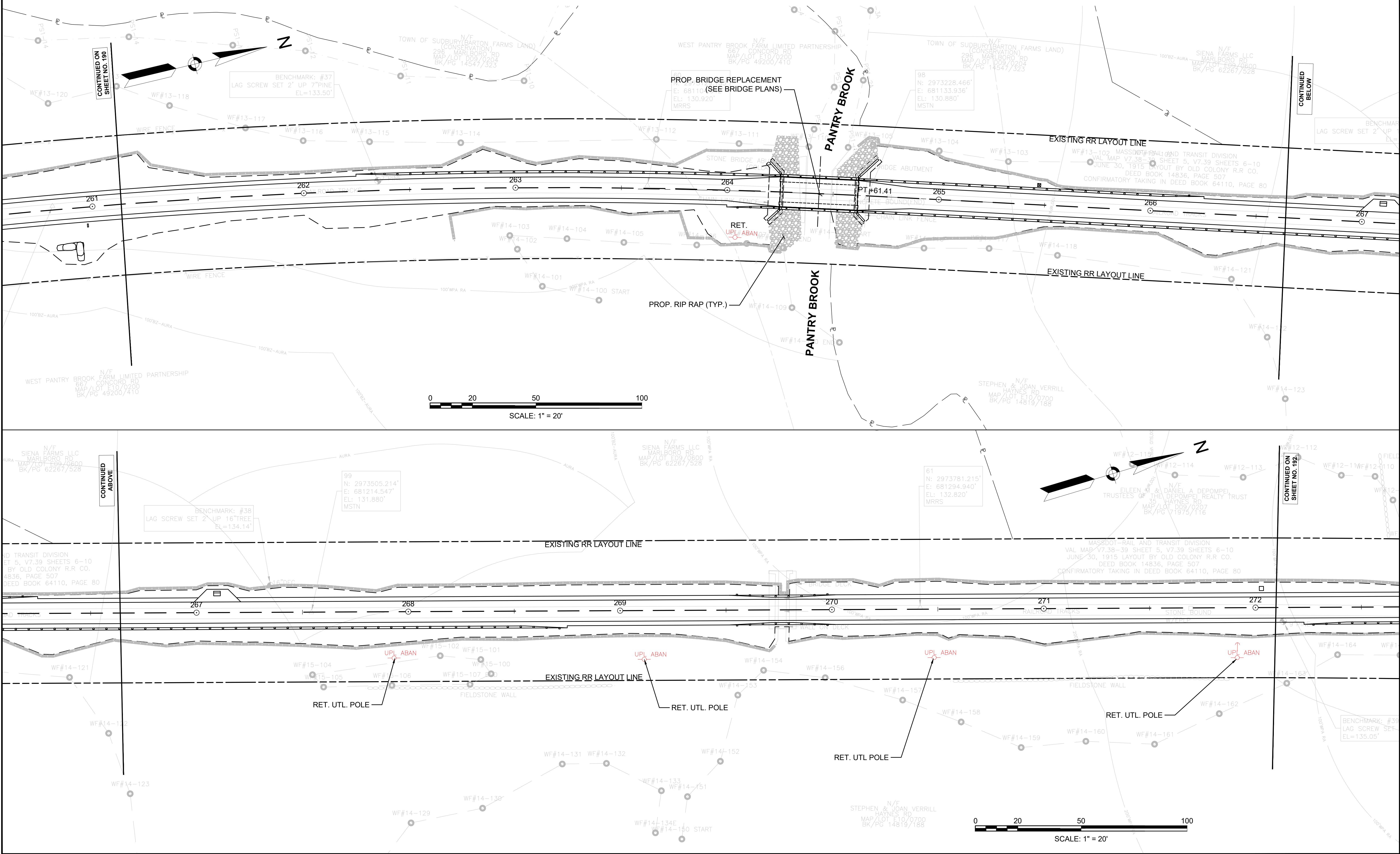


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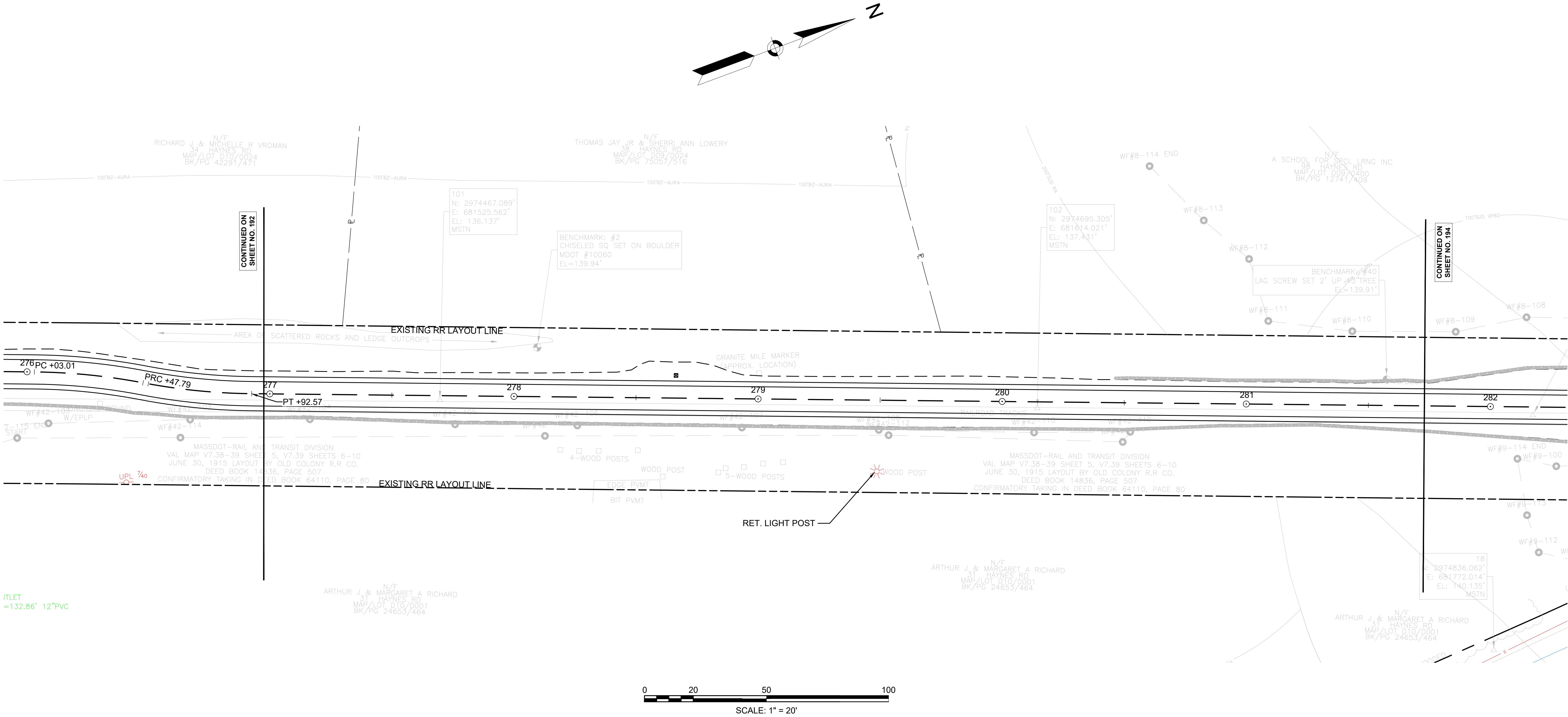
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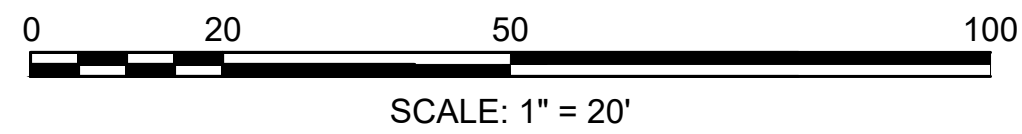
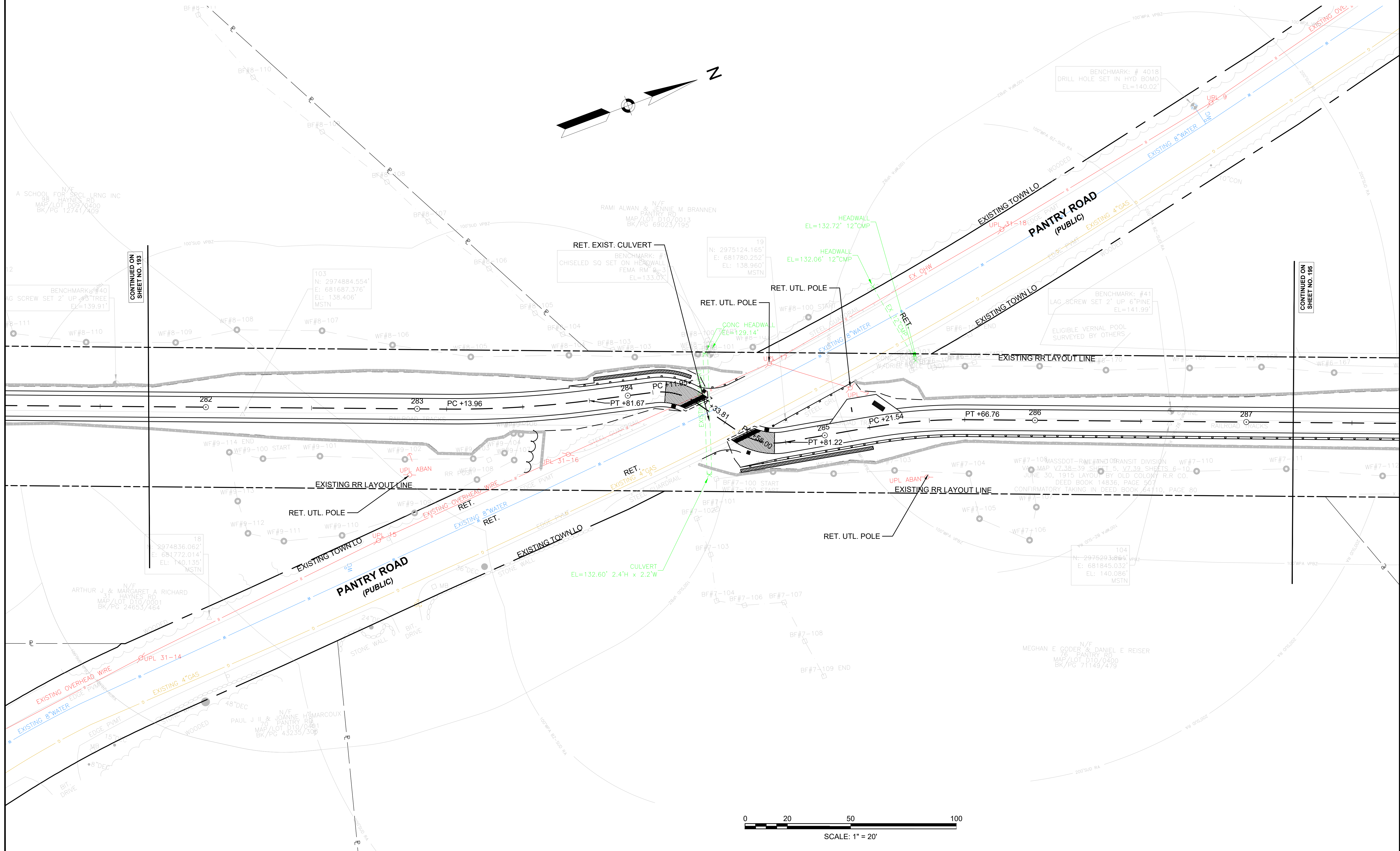


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BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
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PROJECT FILE NO.		608164	

DRAINAGE & UTILITY PLANS

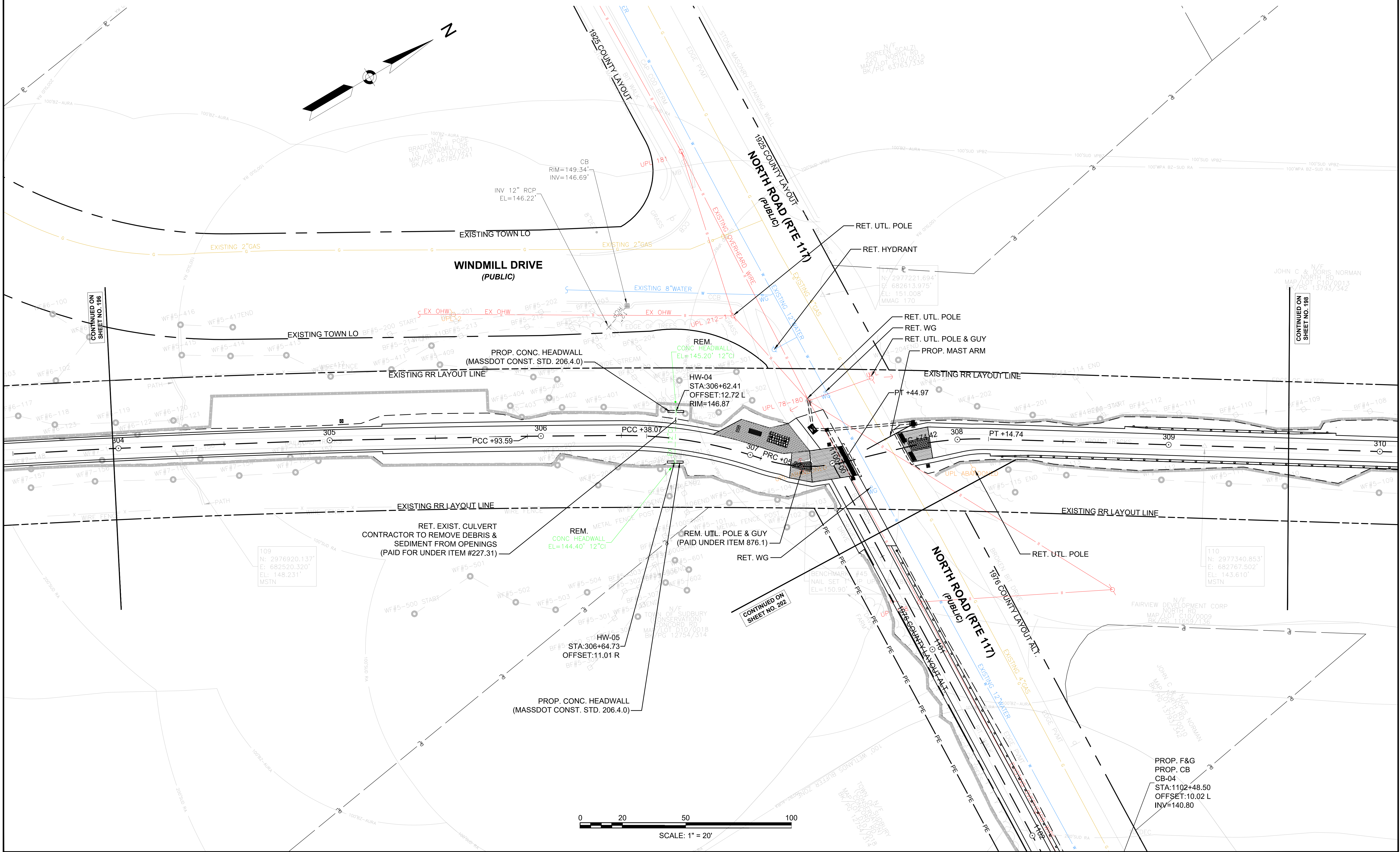




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BRUCE FREEMAN RAIL TRAIL

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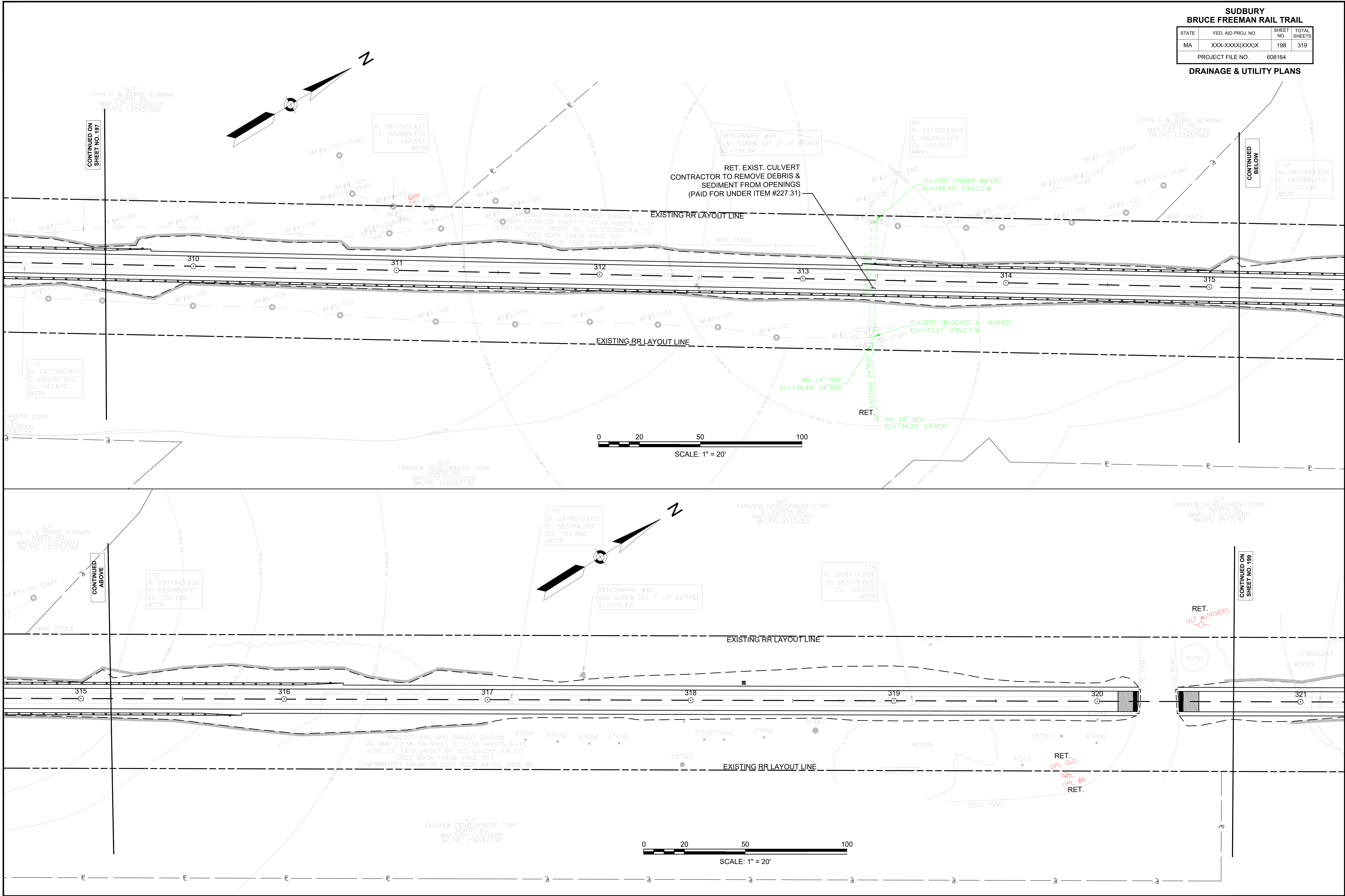
DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

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MA	XXX-XXX(XXX)X	198	319
PROJECT FILE NO.		608164	

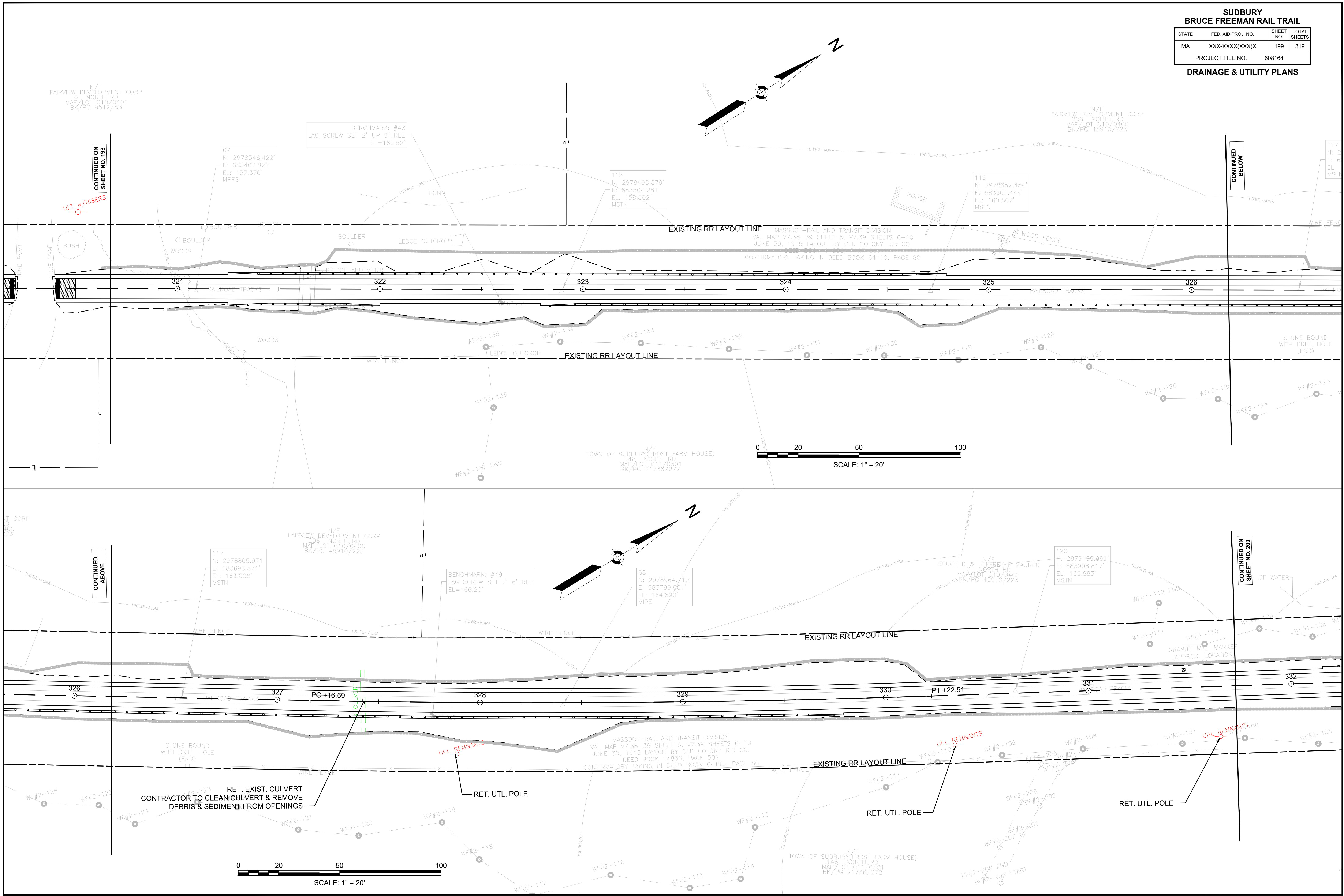
DRAINAGE & UTILITY PLANS



SUDBURY
BRUCE FREEMAN RAIL TRAIL

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MA	XXX-XXXX(XXX)X	199	319
PROJECT FILE NO.		608164	

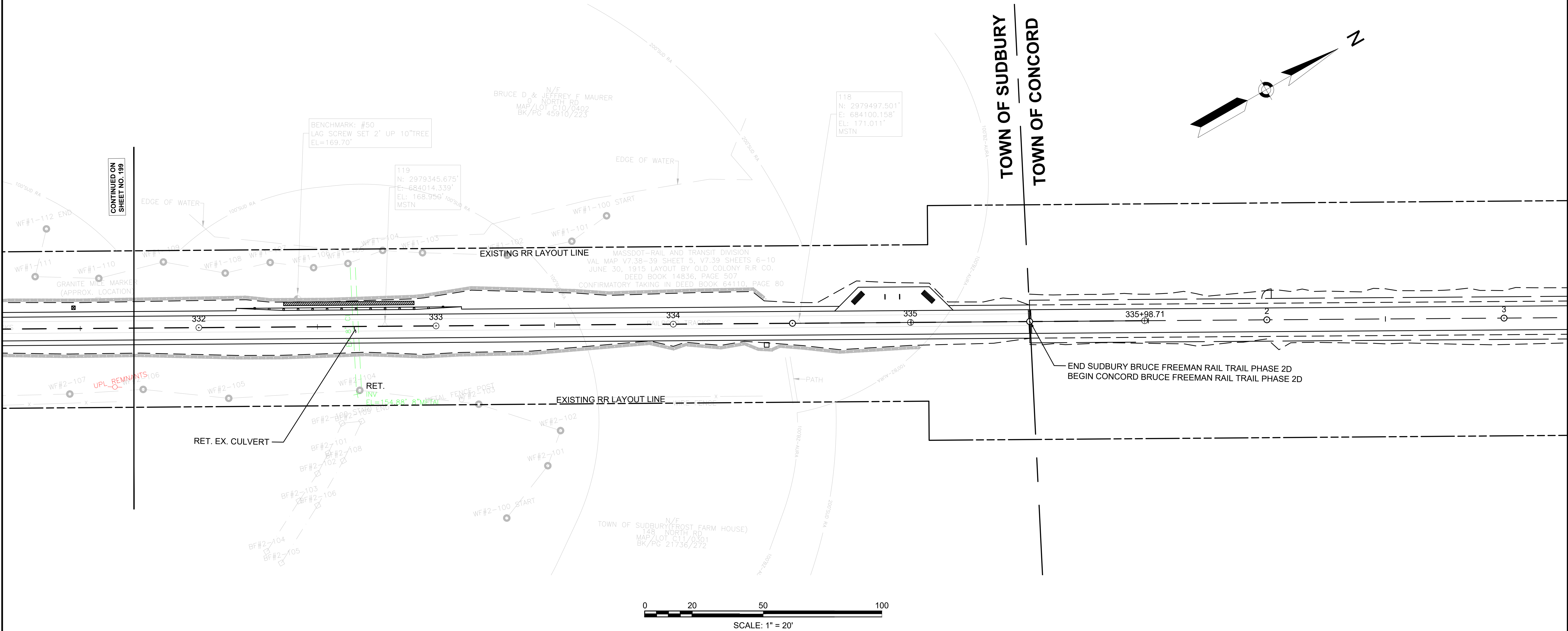
DRAINAGE & UTILITY PLANS

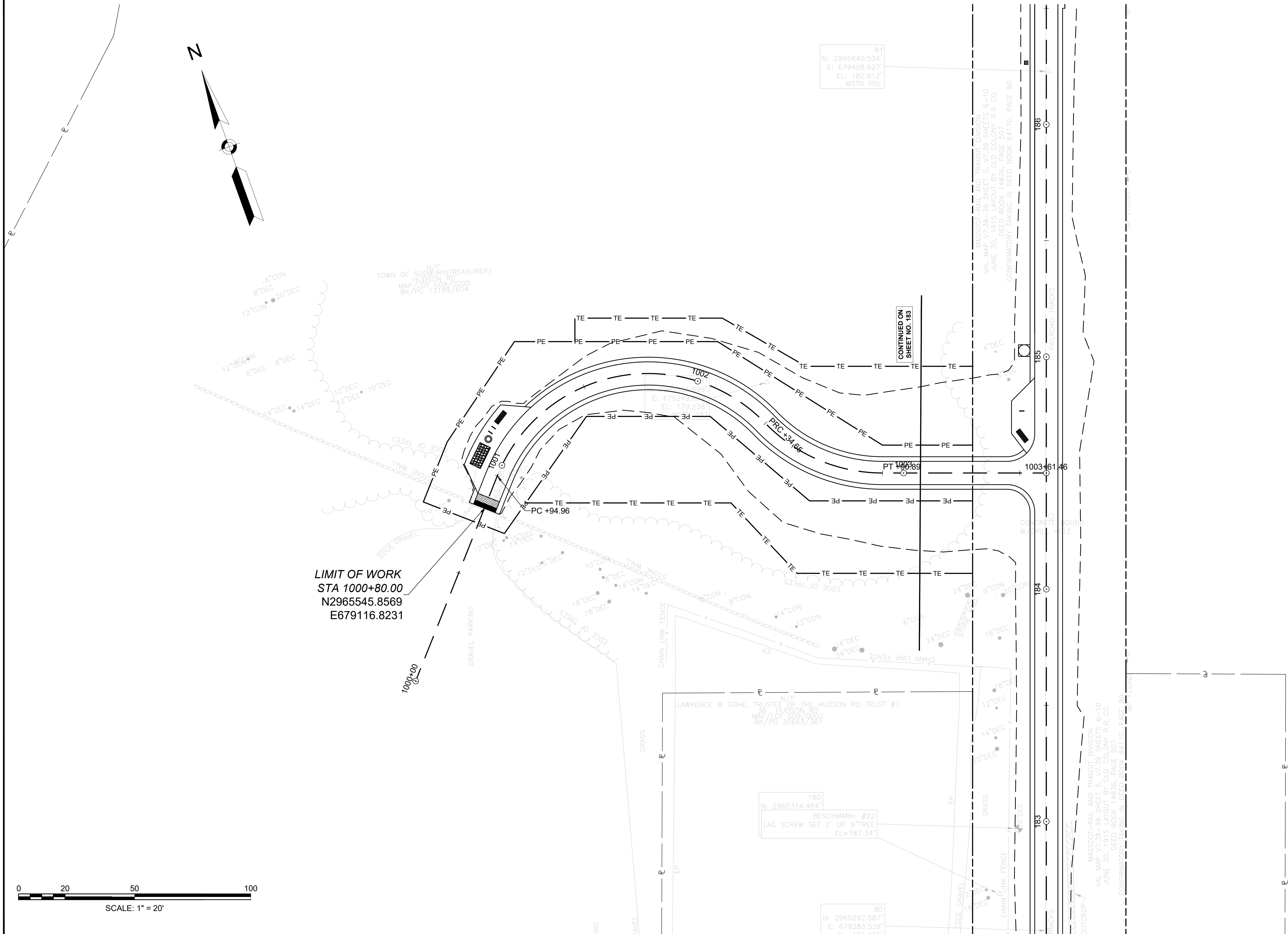


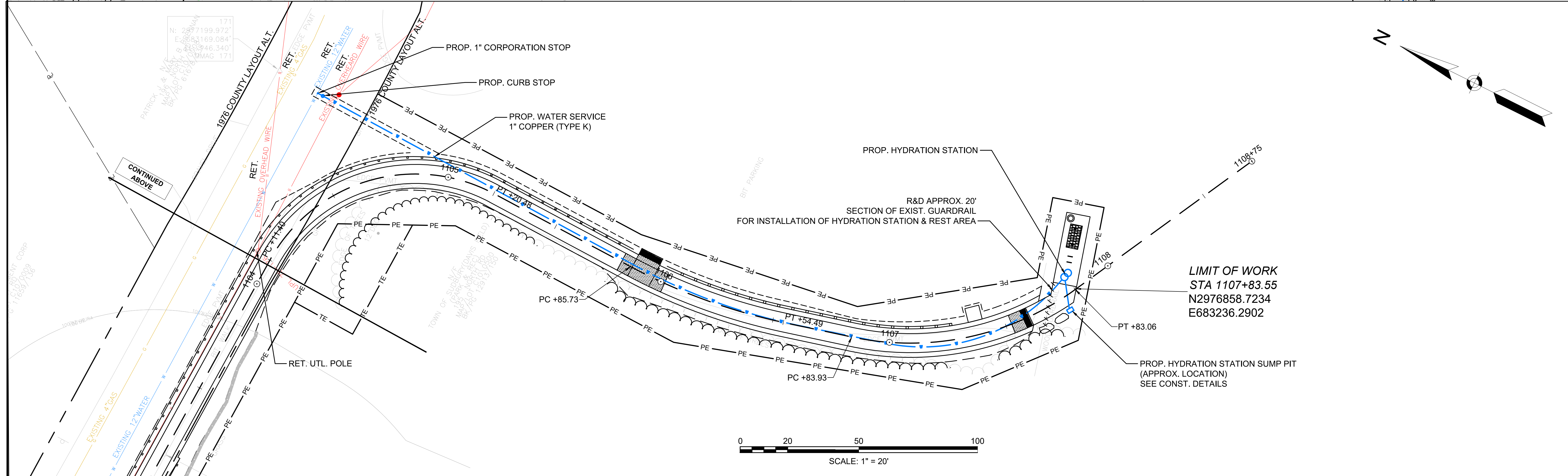
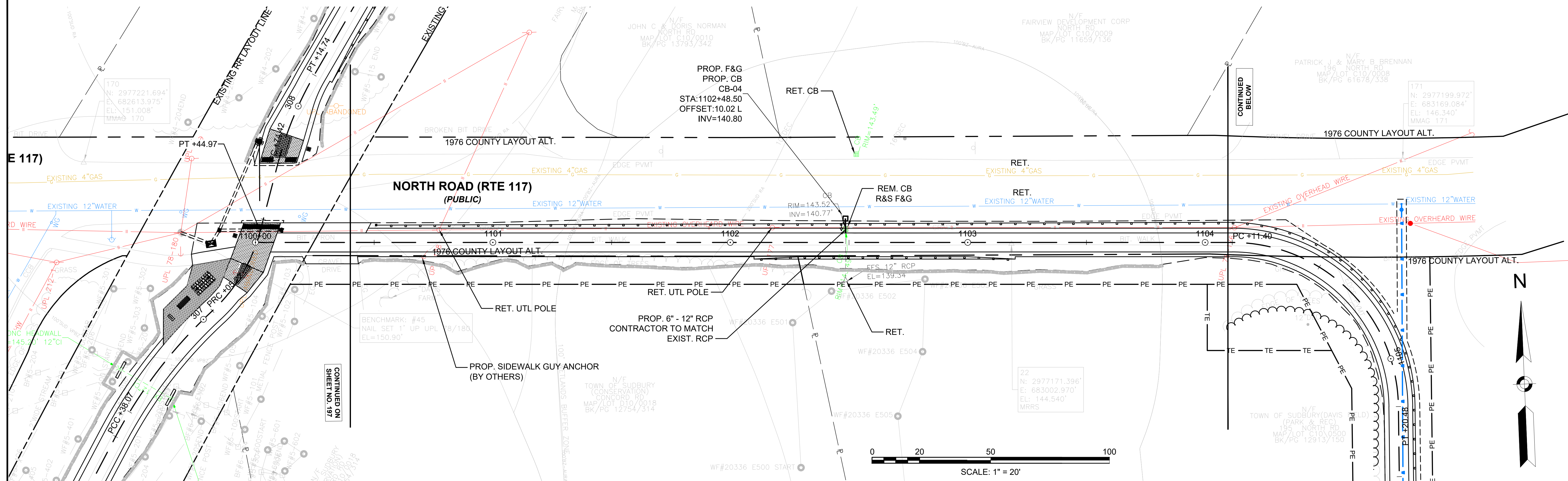
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BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	200	319
PROJECT FILE NO.		608164	

DRAINAGE & UTILITY PLANS







WETLAND REPLICATION PLAN NOTES

GENERAL NOTES

1. THE CONTRACTOR SHALL MAKE ALL NECESSARY CONSTRUCTION NOTIFICATIONS AND APPLY FOR AND OBTAIN ALL NECESSARY PERMITS PRIOR TO CONSTRUCTION. THE CONTRACTOR SHALL ALSO PAY ALL FEES AND POST ALL BONDS ASSOCIATED WITH THE SAME, AND COORDINATE WITH THE ENGINEER AND ARCHITECT AS REQUIRED.
2. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR JOB SITE SAFETY AND ALL CONSTRUCTION MEANS AND METHODS.
3. LIMIT OF WORK SHALL BE EROSION CONTROL BARRIERS, LIMIT OF GRADING AND SITE PROPERTY LINES AND/OR AS INDICATED ON DRAWINGS.
4. ANY ALTERATION TO THESE DRAWINGS MADE IN THE FIELD DURING CONSTRUCTION SHALL BE RECORDED BY THE CONTRACTOR ON RECORD DOCUMENTS.
5. ANY AREA OUTSIDE THE LIMIT OF WORK THAT IS DISTURBED SHALL BE RESTORED TO ITS ORIGINAL CONDITION AT NO COST TO OWNER.
6. EXISTING TREES AND SHRUBS OUTSIDE THE LIMITS OF GRADING SHALL BE REMOVED ONLY UPON PRIOR APPROVAL OF THE OWNER.
7. FOR DRAWING LEGIBILITY, ALL EXISTING TOPOGRAPHIC FEATURES, EXISTING UTILITIES, PROPERTY BOUNDARIES, EASEMENTS, ETC. MAY NOT BE SHOWN ON ALL DRAWINGS. REFER TO ALL REFERENCED DRAWINGS AND OTHER DRAWINGS IN THIS SET FOR ADDITIONAL INFORMATION.
8. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COMPLIANCE WITH ALL PERMIT CONDITIONS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SUBMITTING, SECURING AND COMPLIANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) CONSTRUCTION GENERAL PERMIT, AS ADMINISTERED BY THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

EROSION CONTROL AND SEDIMENTATION NOTES

1. CONTRACTOR SHALL MAINTAIN ANY EROSION CONTROL MEASURES DURING THE ENTIRE CONSTRUCTION PERIOD.
2. ANY SEDIMENT TRACKED ONTO THE PUBLIC RIGHT-OF-WAYS SHALL BE SWEEPED AT THE END OF EACH WORKING DAY.
3. ALL DEBRIS GENERATED DURING SITE PREPARATION ACTIVITIES SHALL BE LEGALLY DISPOSED OF OFF SITE.
4. SITE ELEMENTS TO REMAIN MUST BE PROTECTED FOR DURATION OF PROJECT.
5. ADDITIONAL EROSION CONTROL MEASURES SHALL BE IMPLEMENTED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR OWNER'S REPRESENTATIVE (E.G., PROFESSIONAL ENGINEER, WETLAND SCIENTIST, CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER).
6. THE WETLAND REPLICATION SITE WILL BE ACCESSED FROM THE BRUCE FREEMAN RAIL TRAIL. ALL POINTS OF CONSTRUCTION EGRESS OR INGRESS SHALL BE MAINTAINED TO PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC ROADS.
7. EXTREME CARE SHALL BE EXERCISED SO AS TO PREVENT ANY UNSUITABLE MATERIAL FROM ENTERING WETLAND LOCATED OUTSIDE THE LIMIT OF WORK AND OFF PROPERTY.
8. ADDITIONAL EROSION CONTROLS SHALL BE LOCATED AS CONDITIONS WARRANT OR AS DIRECTED BY THE OWNER OR THEIR REPRESENTATIVE.

LAYOUT AND MATERIALS NOTES

1. ALL LINES AND DIMENSIONS ARE PARALLEL OR PERPENDICULAR TO THE LINES FROM WHICH THEY ARE MEASURED UNLESS OTHERWISE INDICATED.
2. CONTRACTOR SHALL REPORT SIGNIFICANT CONFLICTS TO THE OWNER AND THE ENGINEER FOR RESOLUTION.
3. THE CONTRACTOR SHALL NOTIFY THE ENGINEER OF ANY DISCREPANCIES BETWEEN SITE PLAN DIMENSIONS AND BUILDING PLANS BEFORE PROCEEDING WITH ANY PORTION OF SITE WORK WHICH MAY BE AFFECTED SO THAT PROPER ADJUSTMENTS TO THE SITE LAYOUT CAN BE MADE IF NECESSARY.
4. PROTECT EXISTING PROPERTY MONUMENTS AND ABUTTING PROPERTIES DURING CONSTRUCTION ACTIVITIES.

GRADING, DRAINAGE AND UTILITY NOTES

1. UNDERGROUND UTILITIES WERE COMPILED FROM AVAILABLE RECORD PLANS OF UTILITY COMPANIES AND PUBLIC AGENCIES, ARE APPROXIMATE AND ASSUMED. BEFORE COMMENCING SITE WORK IN ANY AREA, CONTACT "DIG SAFE" AT 1-888-344-7233 AND THE OWNER TO ACCURATELY LOCATE UNDERGROUND UTILITIES. ANY DAMAGE TO EXISTING UTILITIES OR STRUCTURES SHALL BE THE CONTRACTOR'S RESPONSIBILITY. NO EXCAVATION SHALL BE DONE UNTIL UTILITY COMPANIES AND THE OWNER ARE PROPERLY NOTIFIED IN ADVANCE.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THAT THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS DO NOT CONFLICT WITH ANY KNOWN EXISTING OR OTHER PROPOSED IMPROVEMENTS. IF ANY CONFLICTS ARE DISCOVERED, THE CONTRACTOR SHALL NOTIFY THE OWNER AND THE ENGINEER PRIOR TO INSTALLATION OF ANY PORTION OF THE SITE WORK WHICH WOULD BE AFFECTED.
3. ALL WORK PERFORMED AND ALL MATERIALS FURNISHED SHALL CONFORM WITH THE LINES, GRADES AND OTHER SPECIFIC REQUIREMENTS OR SPECIFICATIONS FOR THE PROJECT AS SHOWN ON THE PLANS.
4. THE CONTRACTOR SHALL VERIFY EXISTING GRADES IN THE FIELD AND REPORT ANY DISCREPANCIES IMMEDIATELY TO THE ENGINEER OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER. THE CONTRACTOR SHALL MAKE ALL ARRANGEMENTS FOR THE ALTERATION AND ADJUSTMENT OF ANY OTHER PRIVATE UTILITIES BY THE UTILITY COMPANIES, AS REQUIRED. WHERE AN EXISTING UTILITY IS FOUND TO CONFLICT WITH THE PROPOSED WORK, THE LOCATION, ELEVATION AND SIZE OF THE UTILITY SHALL BE ACCURATELY DETERMINED WITHOUT DELAY BY THE CONTRACTOR, AND THE INFORMATION FURNISHED TO THE OWNER AND ENGINEER FOR RESOLUTION.
5. THE CONTRACTOR SHALL REMOVE ALL EROSION CONTROL BARRIERS AFTER REVEGETATION OF DISTURBED AREAS AND AFTER APPROVAL OF THE CONSERVATION COMMISSION AND WETLAND SPECIALIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER.
6. PITCH EVENLY BETWEEN SPOT GRADES.

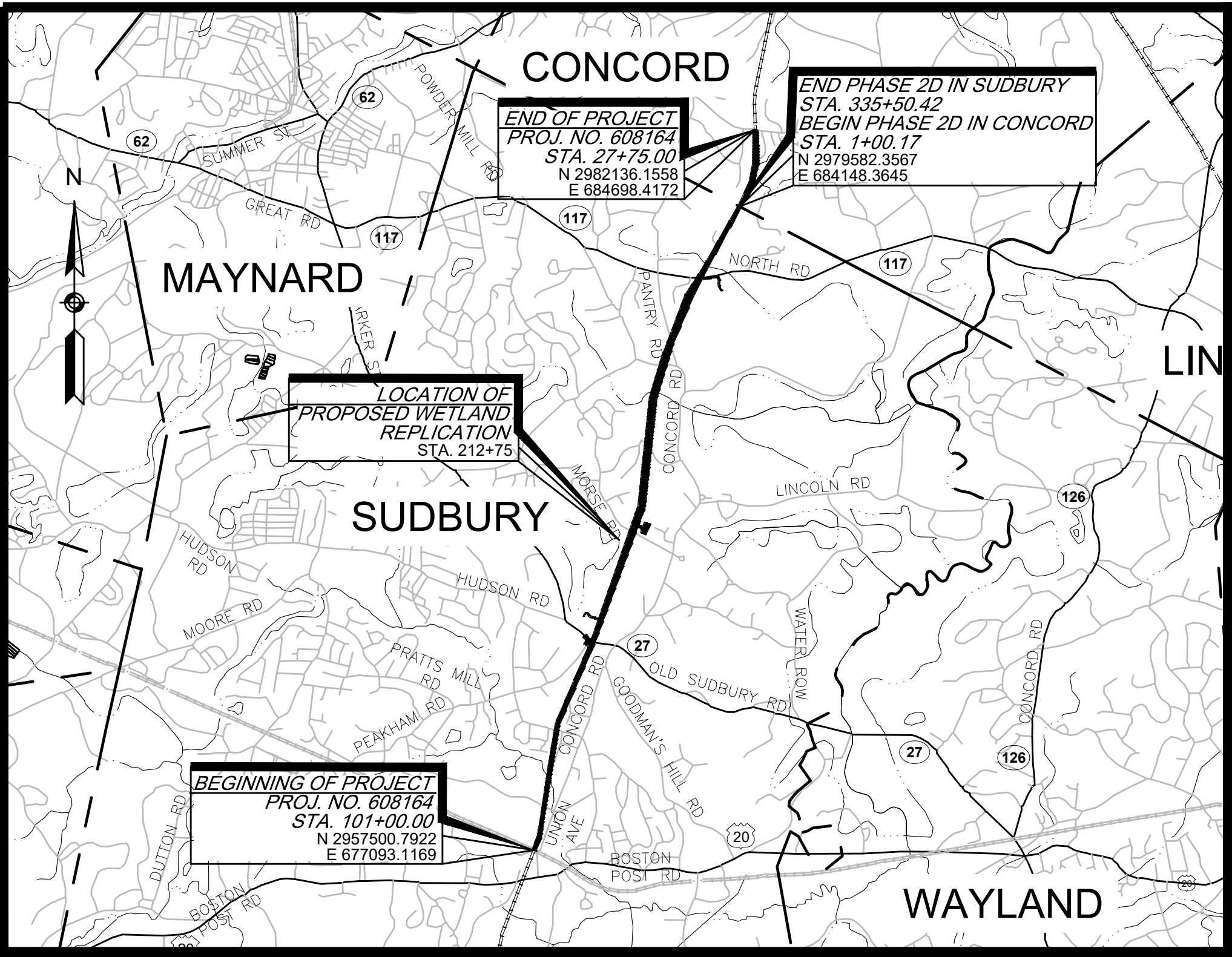
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	206	319
PROJECT FILE NO.		608164	

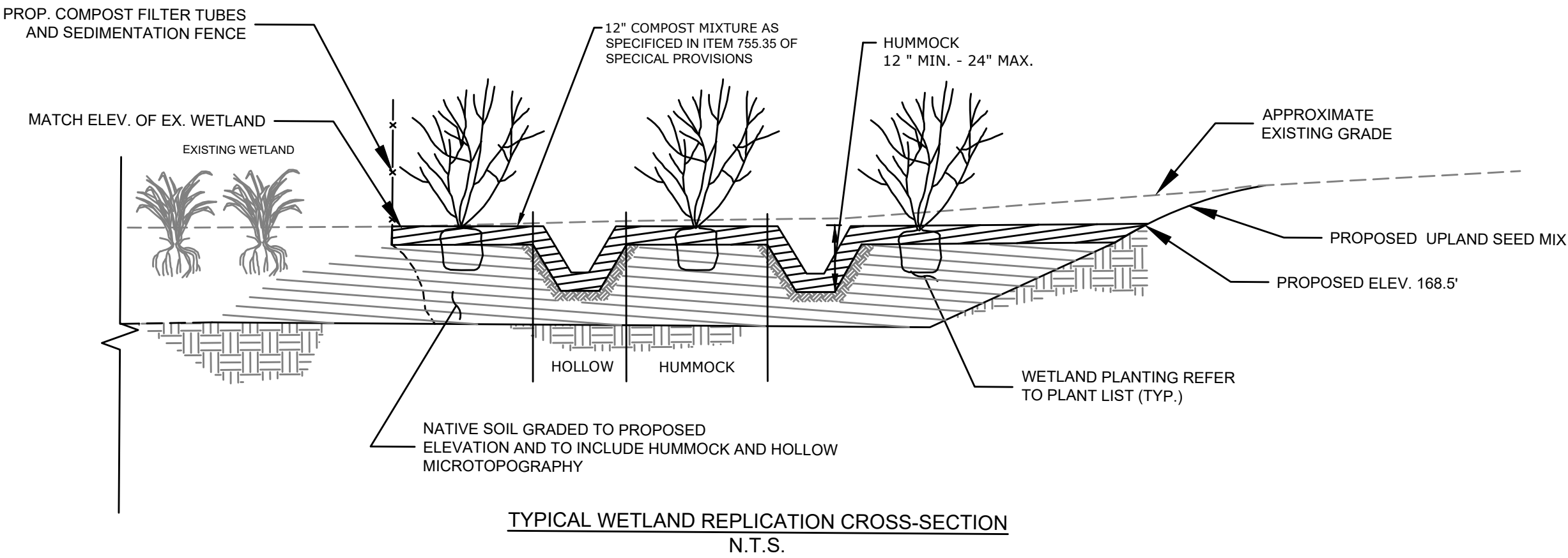
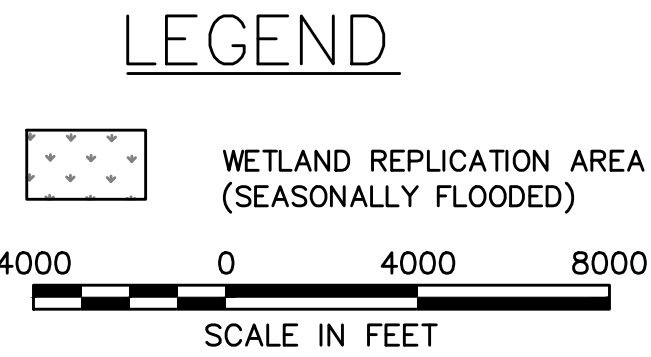
WETLAND REPLICATION PLANS

WETLAND CONSTRUCTION NOTES

1. A PRECONSTRUCTION MEETING SHALL BE HELD BEFORE INITIATING CONSTRUCTION. THE PRECONSTRUCTION MEETING SHALL BE ATTENDED BY THE DESIGNATED PROFESSIONAL WETLAND SCIENTIST, SITE ENGINEER, CONSTRUCTION GENERAL MANAGER, SITE CONTRACTOR, LANDSCAPE CONTRACTOR, AND ANY OTHER CONTRACTOR INVOLVED IN THE REPLICATION ACTIVITY.
2. WETLAND REPLICATION SHALL BE CONDUCTED IN ACCORDANCE WITH THESE DRAWINGS, SPECIAL PROVISIONS AND REQUIREMENTS OUTLINED IN THE ORDER OF CONDITIONS AS ISSUED BY THE TOWN OF SUDBURY CONSERVATION COMMISSION.
3. ALL EXISTING WETLAND DELINEATION WITHIN 100 FEET OF THE WORK AREA WILL BE RE-FLAGGED EVERY 25 FEET.
4. EROSION CONTROLS SHALL BE INSTALLED PER EROSION CONTROL PLAN, REPAIRED AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD OF WETLAND MITIGATION AND UNTIL THE SITE IS FULLY STABILIZED BY VEGETATION (SEED MIX). EROSION CONTROLS SHALL THEN BE REMOVED FROM THE SITE.
5. A WETLAND SCIENTIST SHALL BE ON SITE TO MONITOR PLANTING AND GRADING OF THE WETLAND REPLICATION AREA TO ENSURE COMPLIANCE WITH APPROVED PLANS.
6. INVASIVE NON-NATIVE PLANT SPECIES IN OR IMMEDIATELY ADJACENT TO REPLICATION AREA SHALL BE IDENTIFIED AND TAGGED FOR ERADICATION OR REMOVAL. REMOVED INVASIVE PLANT MATERIAL SHALL BE DISPOSED OF AT AN APPROVED OFF-SITE LOCATION.
7. IF USED, HERBICIDE SELECTION AND TIMING FOR INVASIVE SPECIES CONTROL SHALL BE APPROVED BY A PROFESSIONAL WETLAND SCIENTIST OR OTHER QUALIFIED PROFESSIONAL.
8. IF USED, HERBICIDE APPLICATION FOR INVASIVE SPECIES CONTROL SHALL BE PERFORMED BY A PROFESSIONAL CERTIFIED BY THE STATE OF MASSACHUSETTS. DOCUMENTATION OF CERTIFICATION SHALL BE SUBMITTED TO THE SITE CONSTRUCTION GENERAL MANAGER.
9. GRADING AND PLANTINGS WILL NOT BE CONDUCTED DURING PERIODS OF HIGH WATER. CONSTRUCTION OF THE REPLICATION AREA WILL CONTINUE UNINTERRUPTED TO AVOID EROSION AND THE SILTATION OF WETLANDS.
10. COMPACTION OF SOILS IN THE WETLAND REPLICATION AREA SHALL BE MINIMIZED TO THE MAXIMUM EXTENT PRACTICABLE BY THE USE OF LOW-GROUND PRESSURE MACHINERY.
11. SHOULD COMPACTION OCCUR, SOILS SHALL BE TILLED OR DISKED IN TWO DIRECTIONS TO RE-FRACTURE A MINIMUM OF TWELVE (12) INCHES BELOW FINISHED GRADE.
12. BURIED ORGANIC WETLAND SOILS ENCOUNTERED DURING EXCAVATION MAY BE LEFT IN PLACE. IF TEMPORARY STOCKPILING OF WETLAND SOIL IS NECESSARY, MATERIAL MUST BE COVERED TO PREVENT LEACHING, MOISTURE LOSS AND SEDIMENT TRANSPORT.
13. GRADING LINES DEPICTED ON THE PLAN ARE DRAWN SMOOTHLY. ACTUAL SURFACE GRADES ACROSS WETLAND 'FLOOR' SHALL REFLECT HUMMOCK AND HOLLOW TOPOGRAPHY OF NATURAL WETLANDS.
14. THE SUBGRADE OF WETLAND REPLACEMENT AREAS WILL BE GRADED A MINIMUM OF ONE FOOT BELOW THE ADJACENT WETLANDS. NO GRADING WILL BE PERMITTED WITHIN THE EXISTING WETLAND AREAS EXCEPT TO CUT OPENINGS IN BERMS TO ESTABLISH HYDRAULIC CONDUCTIVITY BETWEEN THE REPLACEMENT WETLAND AND THE WETLAND REPLICATION.
15. FINAL SUB-GRADES SHALL BE REVIEWED AND APPROVED BY A PROFESSIONAL WETLAND SCIENTIST AFTER REVIEW OF SEASONAL, LOCAL HIGH GROUNDWATER MONITORING DATA AND FIELD CONDITIONS. MODIFICATIONS OF FINAL GRADES MAY BE MADE IN THE FIELD AS DIRECTED BY A PROFESSIONAL WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER.
16. A TWELVE-INCH LAYER OF NATURAL ORGANIC SOIL OR MIXTURE OF GOOD QUALITY TOPSOIL AND CLEAN LEAF COMPOST PER THE SOIL SPECIFICATIONS OF ITEM 755.35 WILL BE PLACED IN THE BOTTOM OF THE REPLACEMENT AREA. SOIL AND COMPOST SHOULD BE CERTIFIED FREE OF INVASIVE PLANT SEEDS OR OTHER ARTIFICIAL MATERIAL.
17. SIDE SLOPES OF NON-WETLAND (UPLAND) AREAS SHALL BE GRADED WITH A MINIMUM OF FOUR INCHES OF THE SOIL MIXTURE AS DESCRIBED ABOVE.
18. NO SOIL AMENDMENT OR FERTILIZER SHALL BE APPLIED OR ADDED UNLESS DIRECTED BY A PROFESSIONAL WETLAND SCIENTIST.
19. WHERE CALLED FOR, REPLICATION AREAS SHALL BE SEEDED IMMEDIATELY FOLLOWING PLACEMENT AND FINAL GRADING INCLUDING MICROTOPOGRAPHY. SPRING SEEDING SHOULD OCCUR AFTER THE GROUND THAWS AND BEFORE JUNE 30. FALL SEEDING SHOULD OCCUR AFTER OCTOBER 15 AND BEFORE THE SOIL FREEZES.
20. ALL WETLAND AREAS SHALL BE SEEDED USING THE SEED MIX SPECIFIED IN ITEM 765.554 WETLAND MIX/BASIN MIX AND SHALL BE APPLIED AT A RATE ACCORDING TO THE ITEM SPECIFICATION.
21. UPLAND AREAS SHALL BE SEEDED USING THE SEED MIX SPECIFIED IN ITEM 765.416. UPLAND SHADE MIX AND SHALL BE APPLIED AT A RATE ACCORDING TO THE ITEM SPECIFICATION.
22. SEED SHALL BE FRESH, RECLEANED SEED OF THE LATEST CROP. SEED SHALL BE DELIVERED TO THE SITE IN THE ORIGINAL CONTAINERS WHICH SHALL BEAR THE VENDOR'S GUARANTEE OF ANALYSIS.
23. DEVIATIONS FROM THE PLANTING SCHEDULE AND/OR APPROVED PLANTING LIST MUST BE APPROVED IN ADVANCE BY A PROFESSIONAL WETLAND SCIENTIST OR CERTIFIED ECOLOGICAL RESTORATION PRACTITIONER.
24. THE LANDSCAPE CONTRACTOR SHALL CLEAN UP AND REMOVE ANY DEBRIS FROM THE SITE CAUSED BY THE LANDSCAPE CONTRACTOR.
25. PLANT LISTS MAY BE ALTERED BASED ON FIELD CONDITIONS AS DIRECTED BY A PROFESSIONAL WETLAND SCIENTIST.
26. ALL PLANT MATERIALS SHALL CARRY A FULL GUARANTEE FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE TO INCLUDE PROMPT TREATMENT OR REMOVAL AND REPLACEMENT OF ANY PLANTS FOUND TO BE IN AN UNHEALTHY CONDITION BY THE WETLAND SPECIALIST OR LANDSCAPE ARCHITECT. ALL REPLACEMENTS SHALL BE OF THE SAME KINDS AND SIZE OF PLANTS SPECIFIED IN THE PLANT LIST.
27. WETLAND REPLICATION AREAS WILL BE INSPECTED IN ACCORDANCE WITH THE SPECIFICATIONS OF ITEM 755.35 INLAND WETLAND REPLICATION AND ITEM 755.76 WETLAND MONITORING REPORTS TO IDENTIFY INVASIVE SPECIES AND A REPORT DETAILING TO RELATIVE SUCCESS OF THE MITIGATION PLAN IN TERMS OF BOTH THE HEALTH AND SURVIVAL OF WETLAND PLANTINGS SHALL BE PREPARED.
28. DURING AND AFTER THE FIRST AND SECOND GROWING SEASON, THE SUCCESS OF THE VEGETATIVE GROWTH WILL BE REVIEWED AND EVALUATED. ADDITIONAL VEGETATION WILL BE PLANTED AS NECESSARY TO REPLACE STRESSED OR MISSING VEGETATION AND TO ACHIEVE THE 75% SURVIVAL RATE SPECIFIED IN THE SPECIAL PROVISIONS.

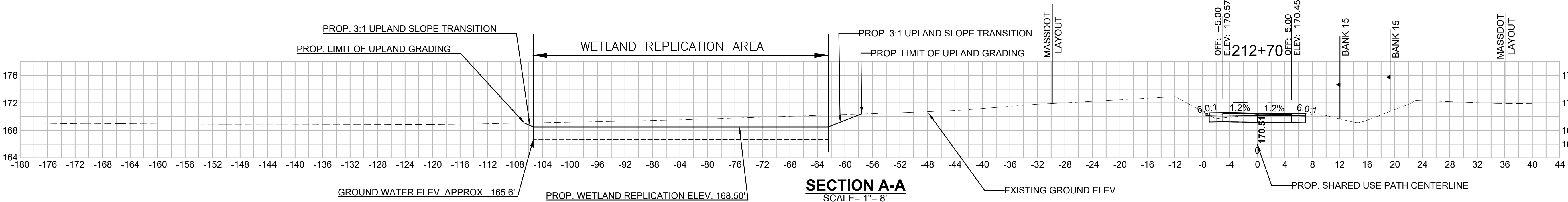
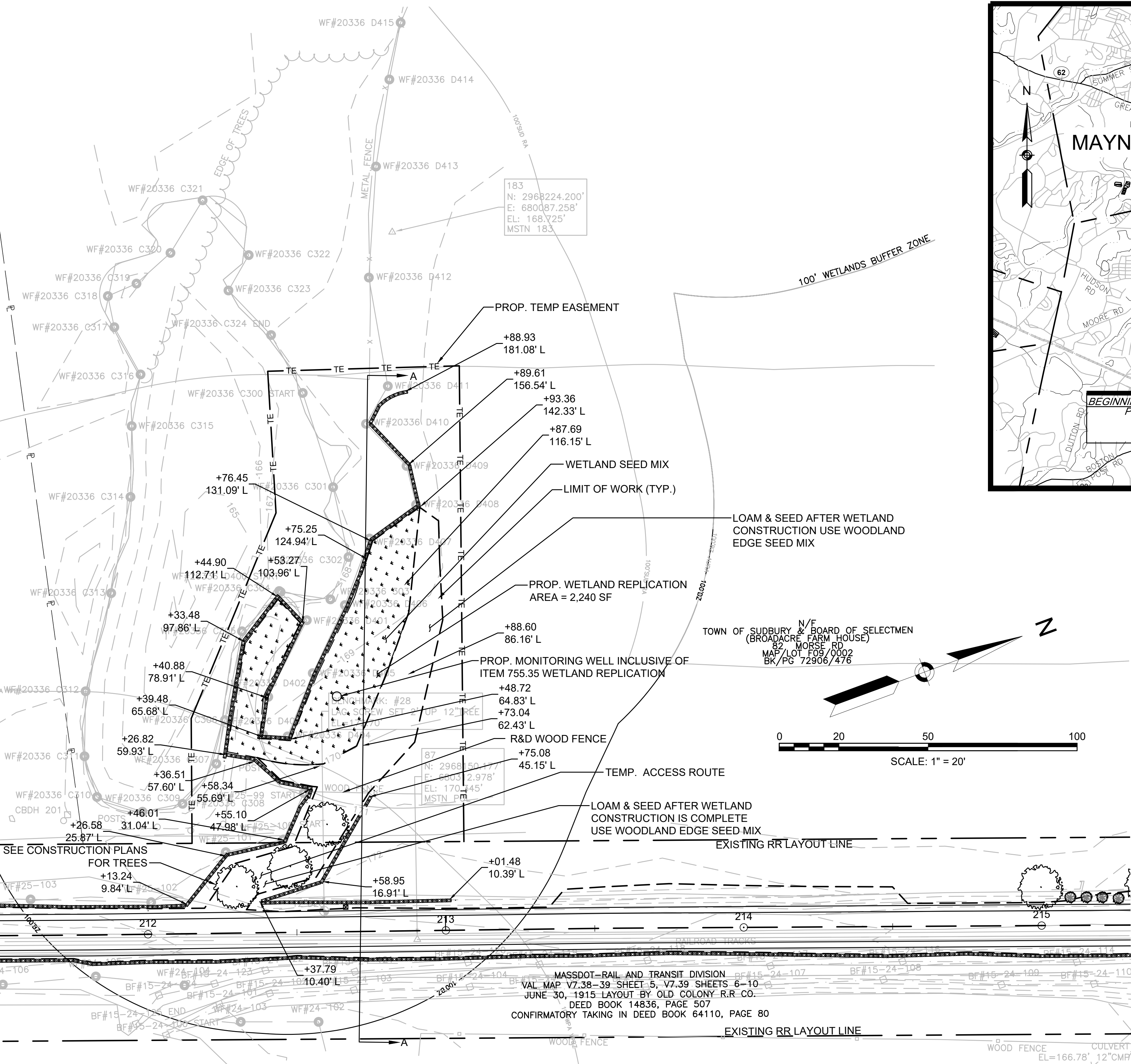


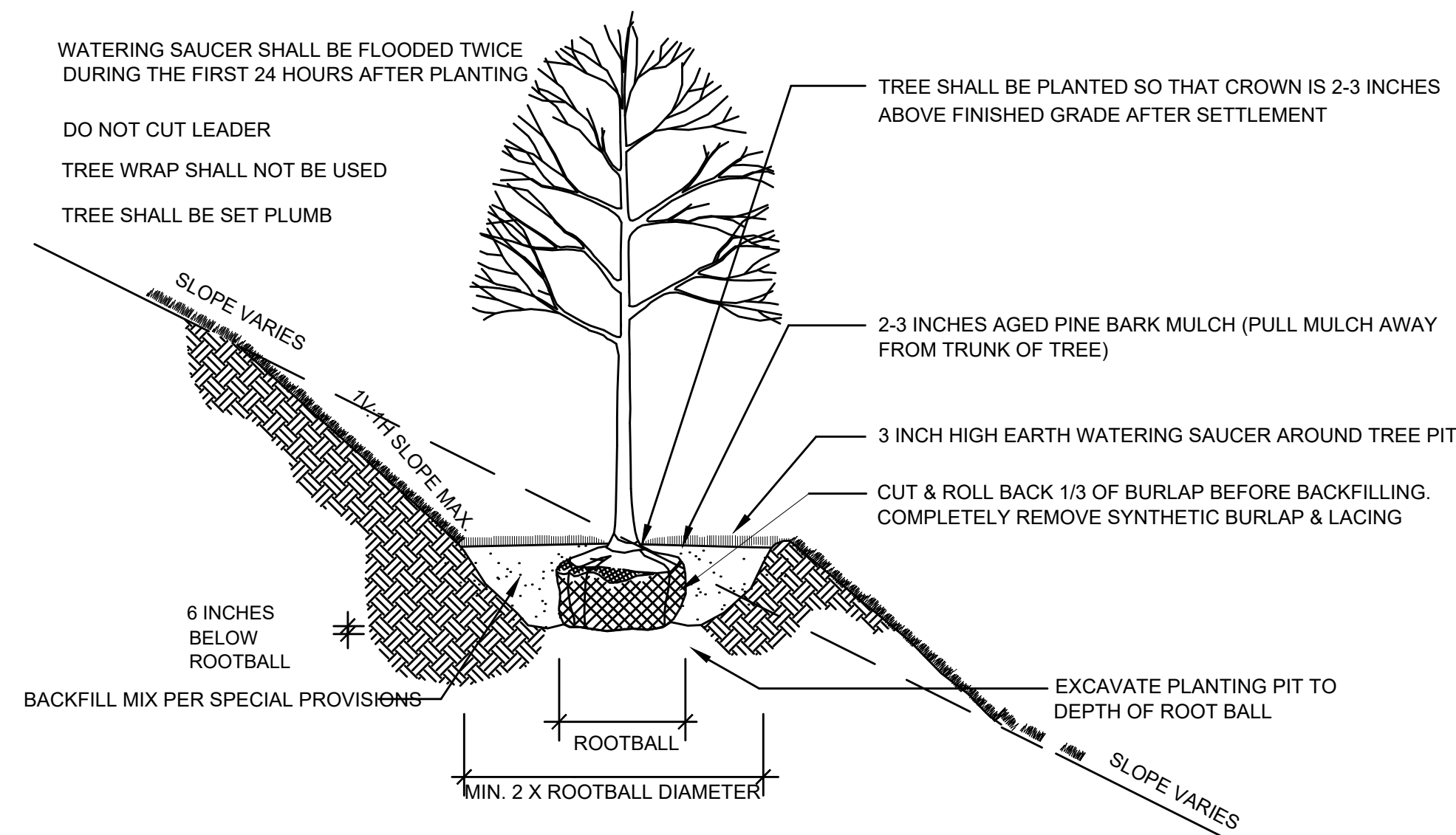
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STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	207	319
PROJECT FILE NO.		608164	
WETLAND REPLICATION PLANS			



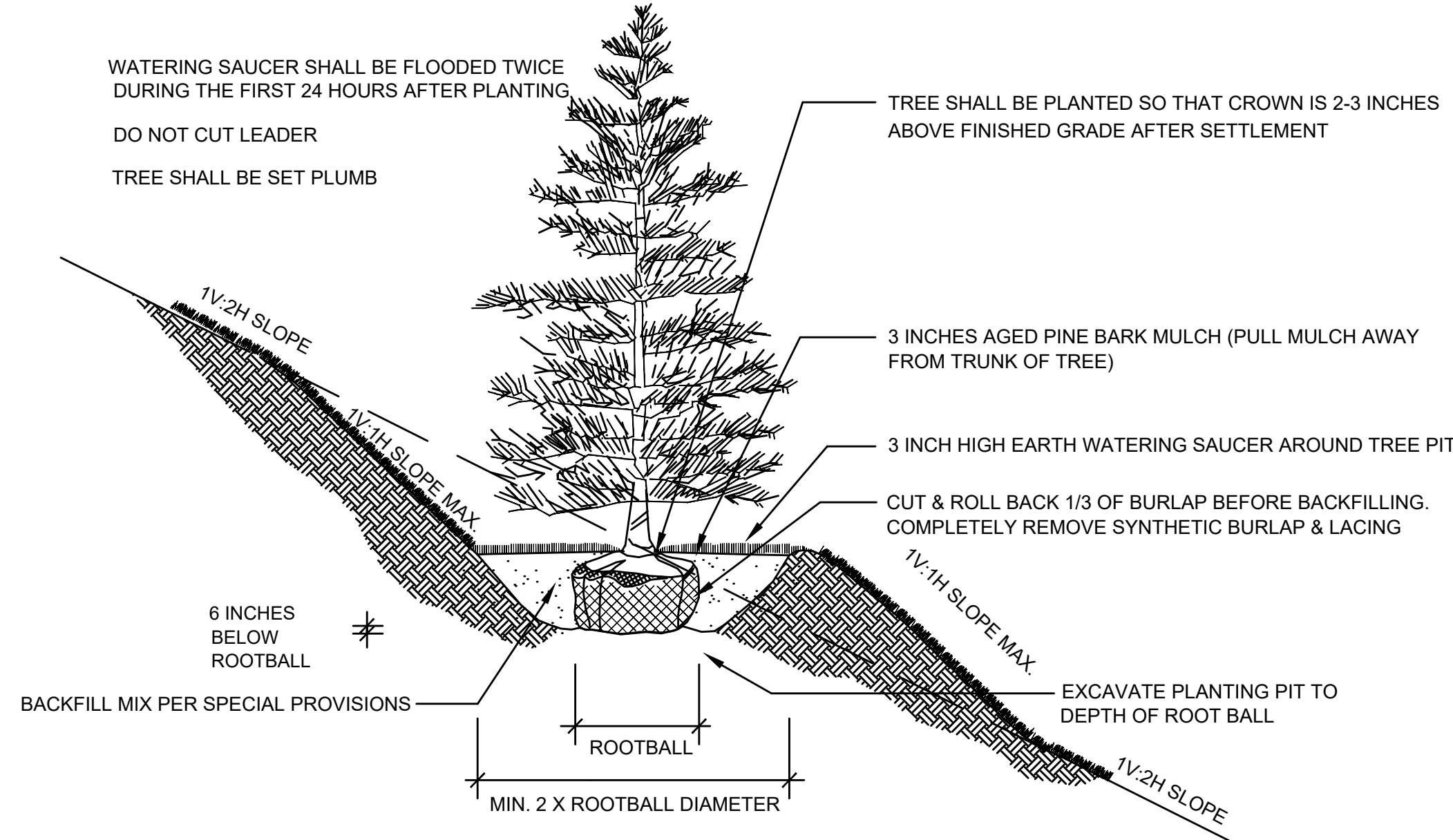
WETLAND REPLICATION AREA PLANT LIST

SYMBOL	QUANTITY	BOTANICAL NAME	COMMON NAME	SIZE	COMMENTS
TREES					
AR	8	ACER RUBRUM	RED MAPLE	4'-6' HT.	10' O.C.
BA	5	BETULA ALLEGHANIENSIS	YELLOW BIRCH	4'-6' HT.	10' O.C.
FP	3	FRAXINUS PENNSYLVANICA	GREEN ASH	4'-6' HT.	10' O.C.
UA	3	ULMUS RUBRA	SLIPPERY ELM	4'-6' HT.	10' O.C.
SHRUBS					
CR	6	CLETHRA ALNIFOLIA	SWEET PEPPERBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
IV	6	ILEX VERTICILLATA	WINTERBERRY HOLLY	2'-3' HT.	10' O.C. GROUPS OF 3
LB	6	LINDERA BENZOIN	SPICEBUSH	2'-3' HT.	10' O.C. GROUPS OF 3
VC	6	VACCINIUM CORYMBOSUM	HIGHBUSH BLUEBERRY	2'-3' HT.	10' O.C. GROUPS OF 3
VD	6	VIBURNUM DENTATUM	NORTHERN ARROWWOOD	2'-3' HT.	10' O.C. GROUPS OF 3
VL	6	VIBURNUM LENTAGO	NANNYBERRY	2'-3' HT.	10' O.C. GROUPS OF 3

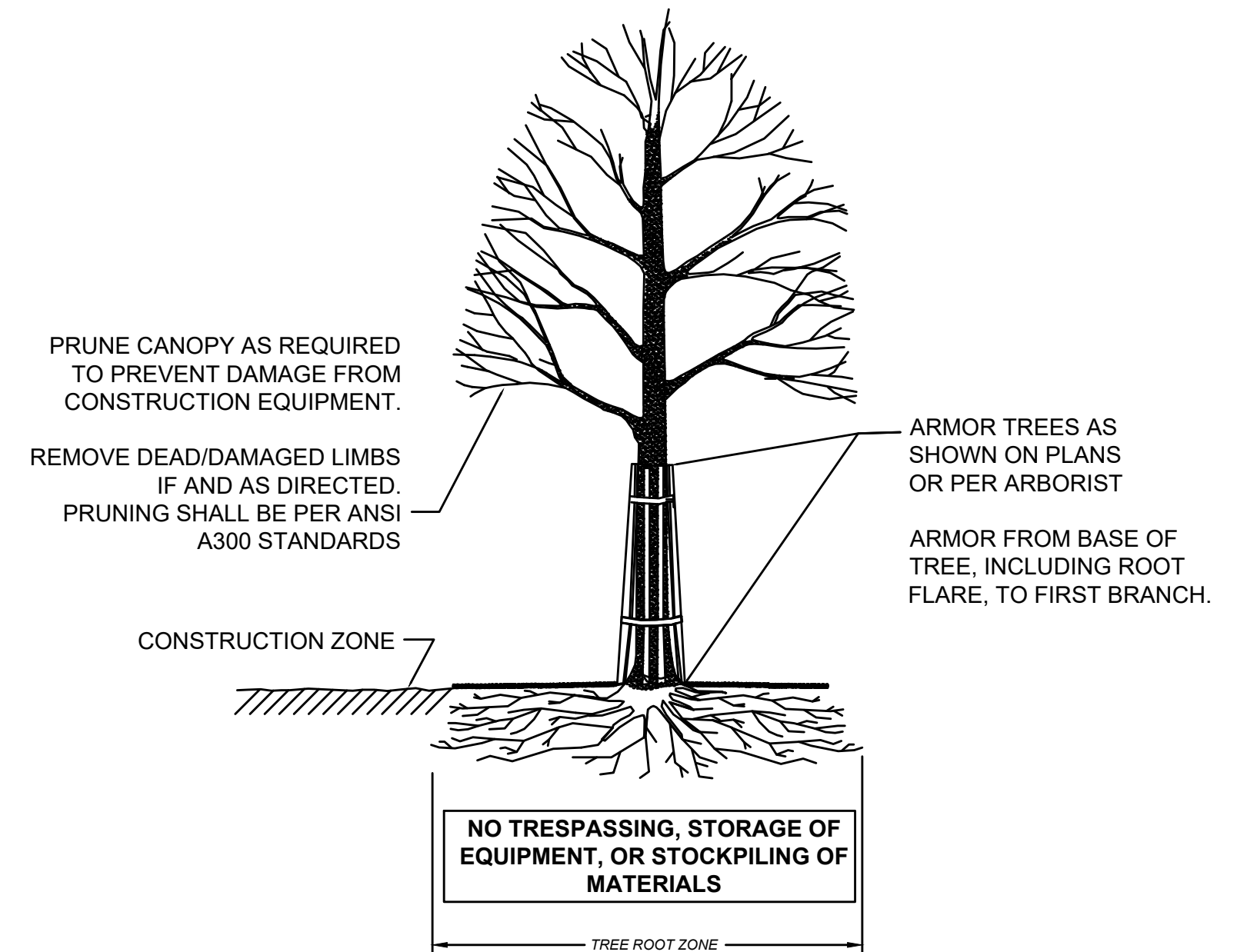




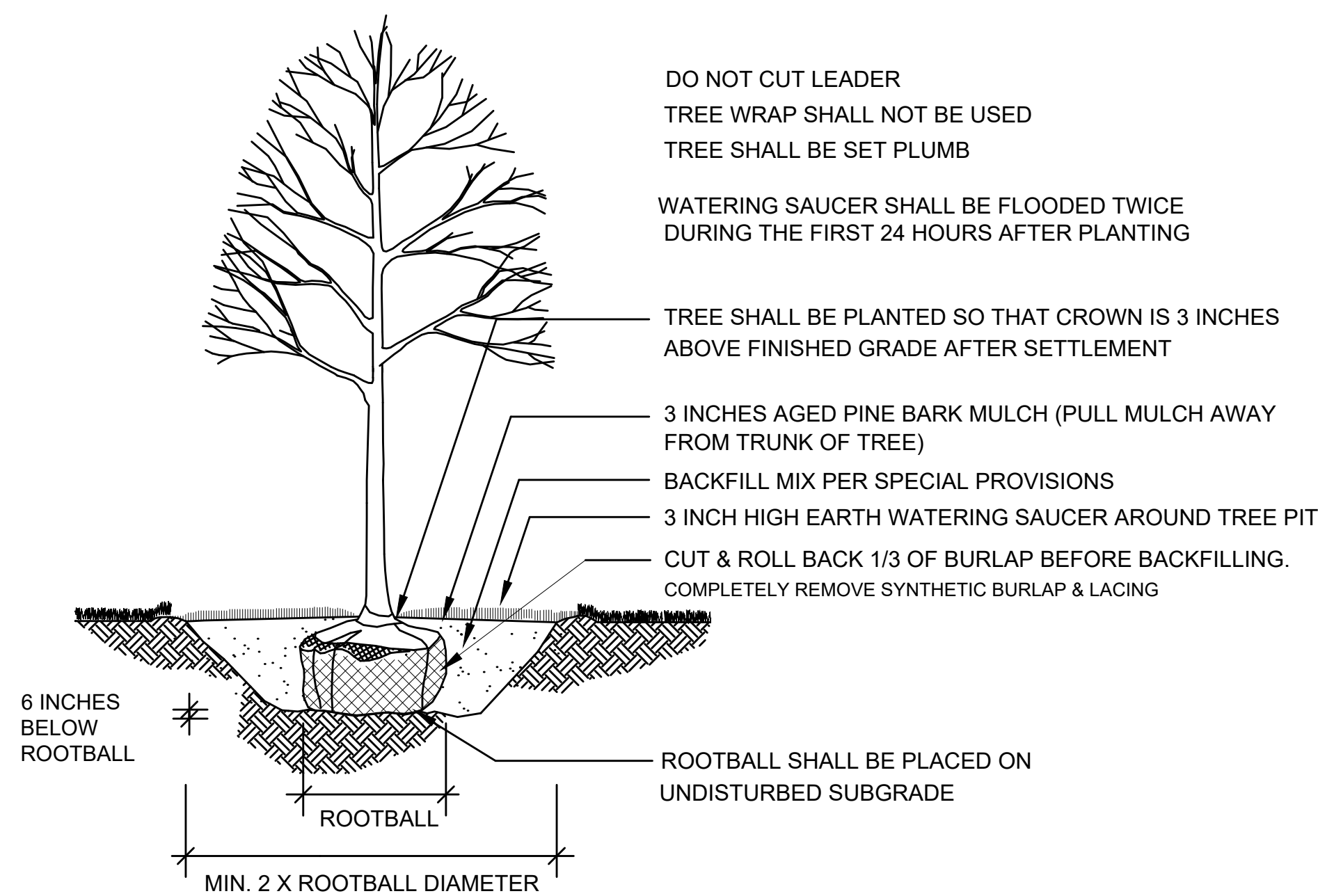
1 DECIDUOUS TREE PLANTING (SLOPE)
SCALE: N.T.S.



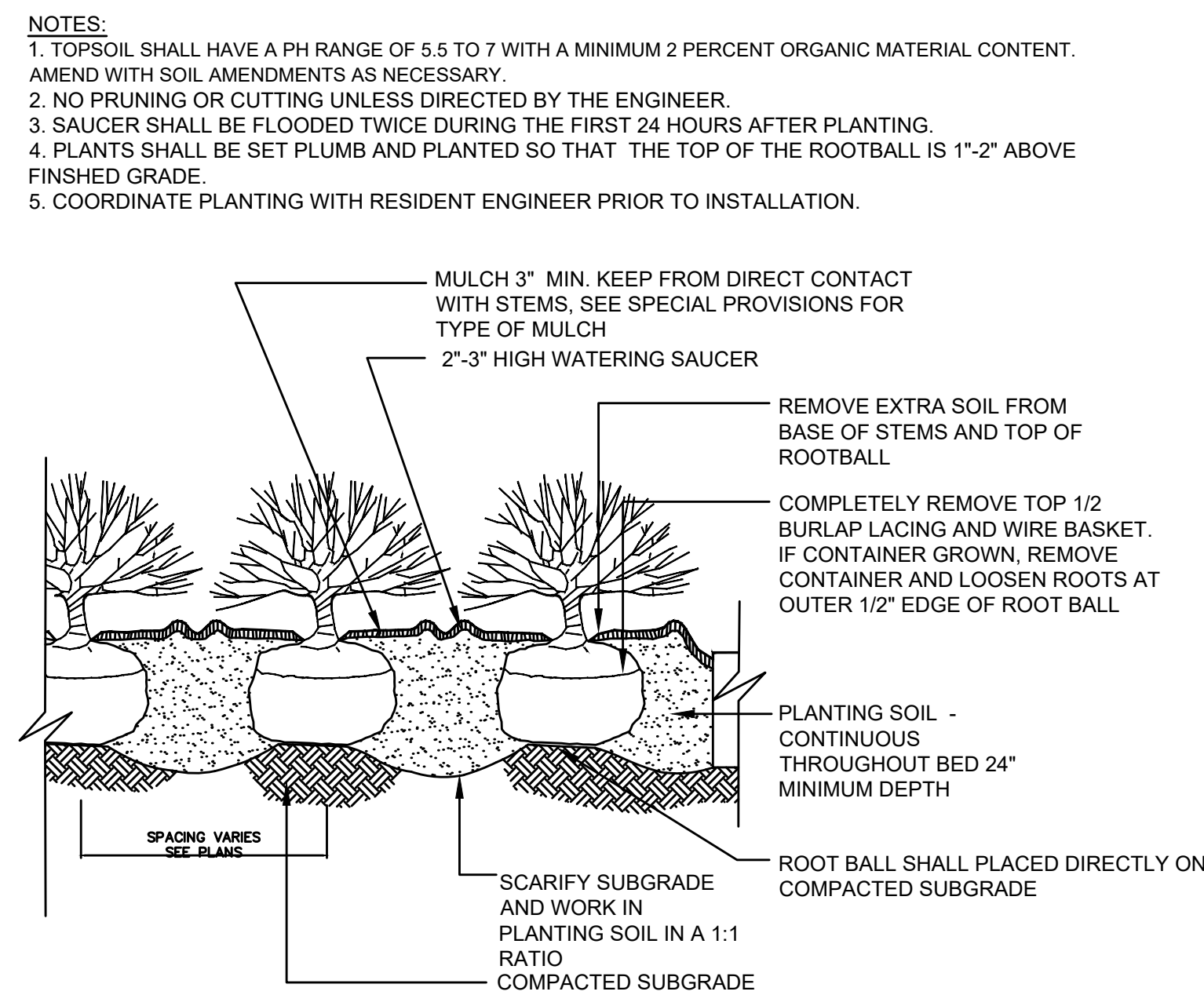
2 EVERGREEN TREE PLANTING (SLOPE)
SCALE: N.T.S.



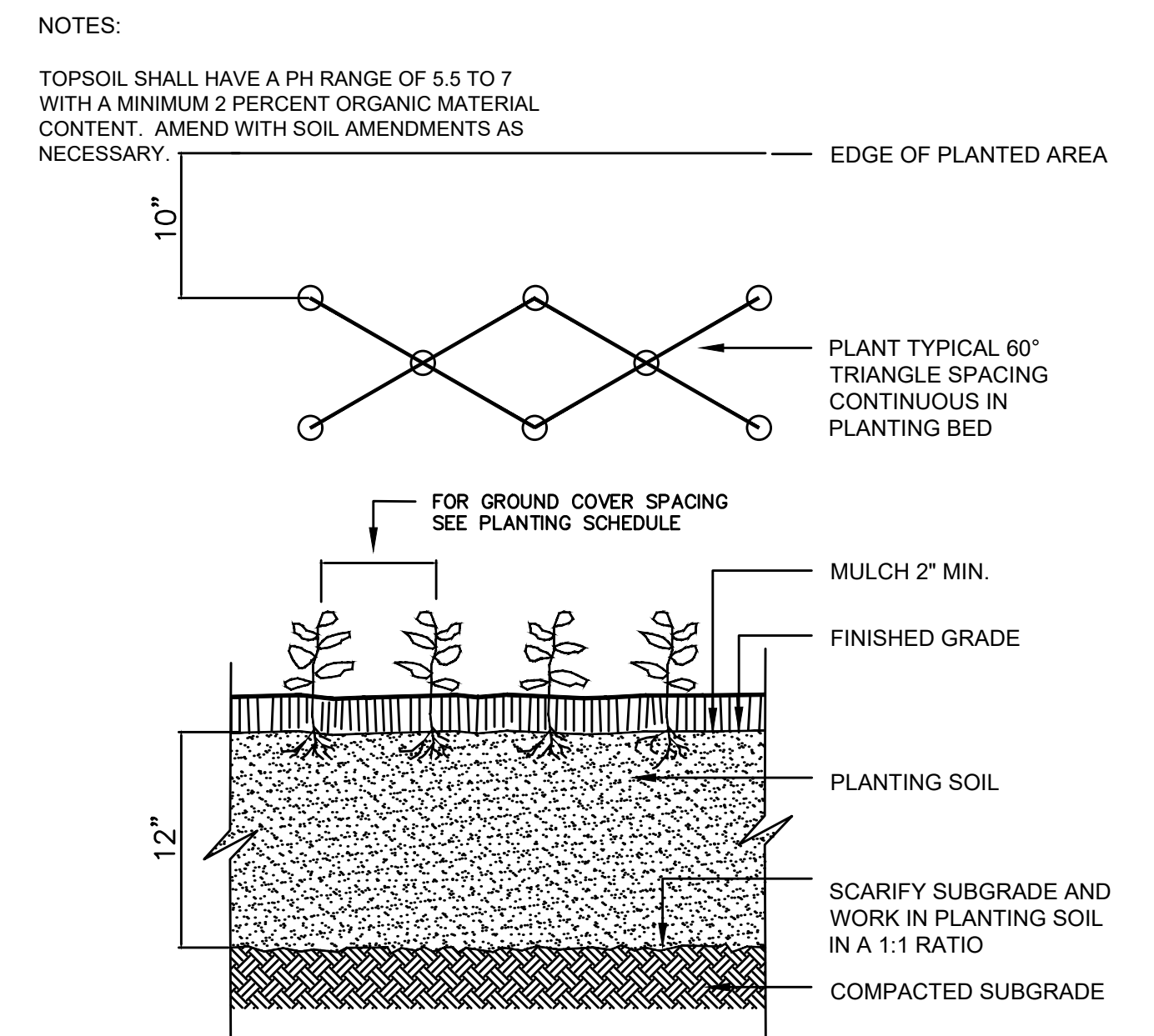
3 INDIVIDUAL TREE PROTECTION
SCALE: N.T.S.



4 DECIDUOUS TREE PLANTING
SCALE: N.T.S.



5 SHRUB AND PERENNIAL PLANTING
SCALE: N.T.S.



6 GROUNDCOVER PLANTING
SCALE: N.T.S.

Diagram illustrating the cross-section of a trench repair. The diagram shows the following layers and dimensions:

- ALL VERTICAL EDGES OF REMAINING PAVEMENT SHALL BE PAINTED WITH LIGHT COAT OF ASPHALT EMULSION(TYP)**
- WIDTH OF TRENCH**
- 4 1/2" OF SUPERPAVE INTERMEDIATE COURSE - 19.0 OR MATCH EXIST. THICKNESS WHICHEVER IS GREATER. LAY IN TWO OR MORE EQUAL THICKNESS COURSES OF NO MORE THAN 2 1/4" DEPTH. PAYMENT FOR THIS ASPHALT SHALL BE MADE UNDER ITEM #451**
- EXISTING ROAD SURFACE**
- 12" GRAVEL BORROW SUBBASE**
- 12" MIN.** (Dimension for the gravel borrow subbase layer)
- APPROVED BACKFILL IN ROADWAY RECONSTRUCTION AREAS (SEE NOTES)**
- 12" MIN.** (Dimension for the backfill layer)
- PROP. HMA TOP COURSES AS SHOWN ON TYPICAL SECTIONS. PAYMENT SHALL BE MADE UNDER APPROPRIATE SUPERPAVE ITEM NUMBERS.**

SAWCUT EXISTING BITUMINOUS PAVEMENT

WIDTH OF TRENCH

2" HMA TOP COURSE

EXISTING ROAD SURFACE

20" OF GRAVEL BORROW SUBBASE

12" MIN.

12" MIN.

EXISTING BIT. CONC. PAVEMENT AND SUBBASE SHALL BE REMOVED BETWEEN EDGES OF TRENCH IN THIS AREA

APPROVED BACKFILL

CATCH BASIN SILT SACK

NOTES:

- SIZED TO FIT ANY SIZE OR SHAPE CATCH BASIN.
- ALL SEAMS DOUBLE STITCHED.
- PERMEABILITY - REGULAR FLOW SILTSACK - 40 gal./min./sq. ft.
HI - FLOW SILTSACK - 200 gal./min./sq. ft.

Dimensions and Details:

- TAPERED/POINTED END
- HALF-LAP JOINT, W/ REINFORCING PLATES ON EACH SIDE (SIMPSON STRONG-TIE 1212 HTPC OR EQUIVALENT.)
- 6"x6" PRESSURE TREATED S.P. SUPPORT ARM
- SIGN PANEL TO BE ALUPANEL (FIXED)
- (SEE SIGN SUMMARY AND SPECIAL PROVISIONS FOR SIGN LAYOUT)
- 2'-10"
- 2'-3"
- 7'-8"
- 9'-2"
- 4'-9"
- 6"
- 1'-0"
- 6"x6" PRESSURE TREATED S.P. WOOD POST
WOOD POST SHALL BE A STAINED COLOR BY CHOSEN THE TOWN AND ENGINEER
- DIRECT SET POST
3' MIN. EMBEDMENT
- 3' MIN.
- 4000 PSI, 1.5 INCH,
565 CEMENT CONCRETE
FOR POST FOUNDATION
- 6"

NOTE: SIGNS SHOULD BE W11-15 AS SHOWN HERE:

15' (TYP)

6' (MIN)

10' (MAX) TO FACE OF CURB

10" (MAX) FOR SIDE REACH

1" (MAX) x 45" CHAMFER (TYP)

1'-8"

4"

TRAVEL WAY

CURB

ADA-COMPLIANT SURFACE

CEMENT CONCRETE FOUNDATION

SOLAR PANEL ORIENTED FOR OPTIMAL SUNLIGHT CAPTURE (NOT REQUIRED FOR AC POWER)

NEMA ENCLOSURE FOR CONTROLLER (SIZE MAY VARY)

W11-2 SIGN (TYP. SEE SPECIAL PROVISIONS) (FACING EACH DIRECTION OF TRAFFIC)

DUAL RECTANGULAR YELLOW LED BEACONS IN NEMA ENCLOSURE (FACING EACH DIRECTION OF TRAFFIC)

W16-7P SIGN (FACING EACH DIRECTION OF TRAFFIC)

R10-25 SIGN

APS PUSHBUTTON

TRAFFIC SIGNAL POST & PEDESTAL

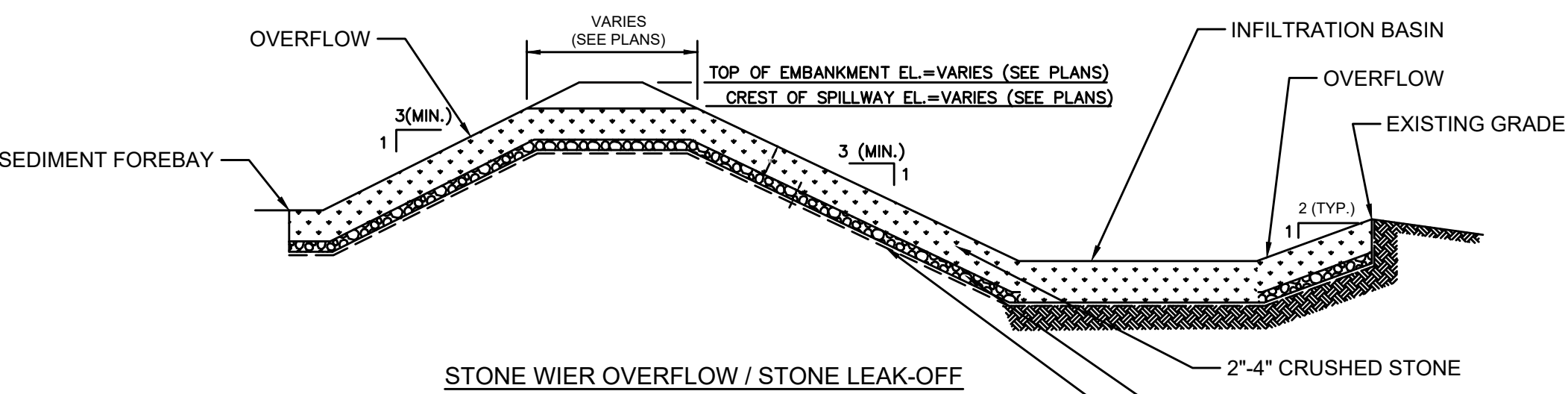
PEDESTRIAN RADAR OR MICROWAVE DETECTION

TOWN STANDARD CUSTOM WARNING "WAIT FOR VEHICLES TO STOP BEFORE CROSSING"

WAIT FOR VEHICLES TO STOP BEFORE CROSSING

RRFB NOTES:

- PAYMENT FOR PRECAST FOUNDATION INCLUSIVE UNDER ITEM 824.221 & 824.222
- ALL POSTS, BRACKETS, AND HARDWARE SHALL BE FACTORY GLOSS BLACK.
- RRFB SHALL BE EQUIPPED WITH BOTH RADAR/MICROWAVE DETECTION AND TRADITIONAL PUSH BUTTON AS SECONDARY ACTIVATION MEASURE.

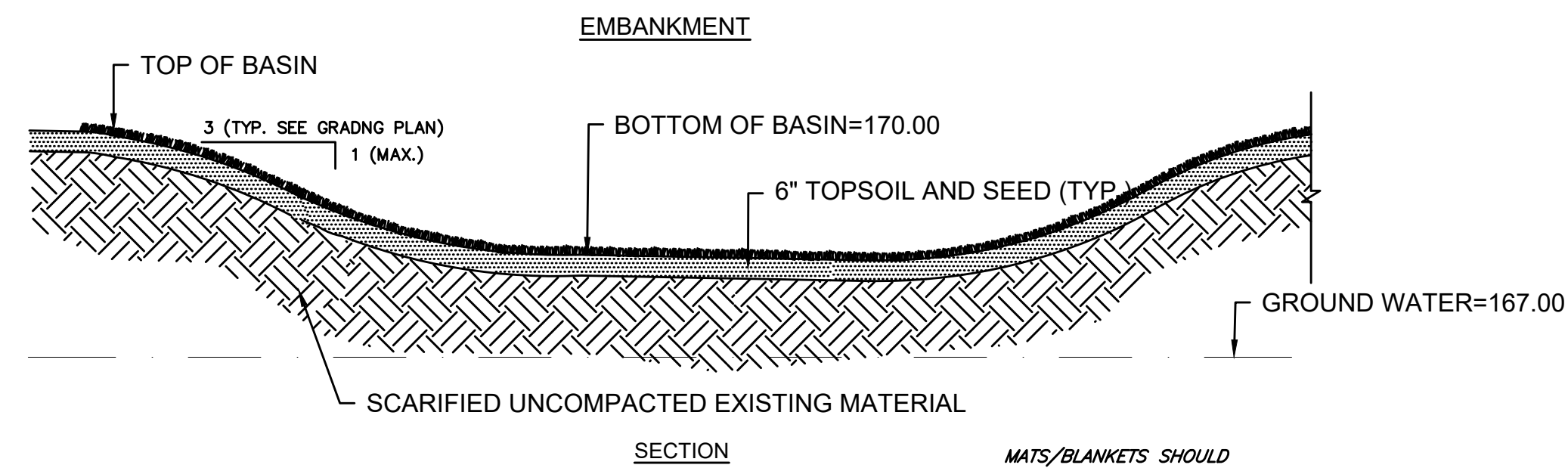


NOTES:

1. IMPERVIOUS MATERIAL FOR USE IN BASIN EMBANKMENT AREAS AND WHERE SHOWN ON THE PLANS SHALL BE COMPOSED OF CLAYS, SILTY CLAYS, OR CLAYEY SILTS. THE SOIL SHALL BE FREE OF RUBBISH, ICE, VEGETATIVE MATTER, LOAM, OR OTHER DEBRIS AND HAVE THE FOLLOWING GRADATION AS DEFINED BY A STANDARD SIEVE TEST (ASTM D422):

MIN. PERCENT PASSING (BY WT.)	SEIVE SIZE
100	3.5"
80-100	3/4"
40-90	No. 4
30-85	No. 40
25-75	No. 200

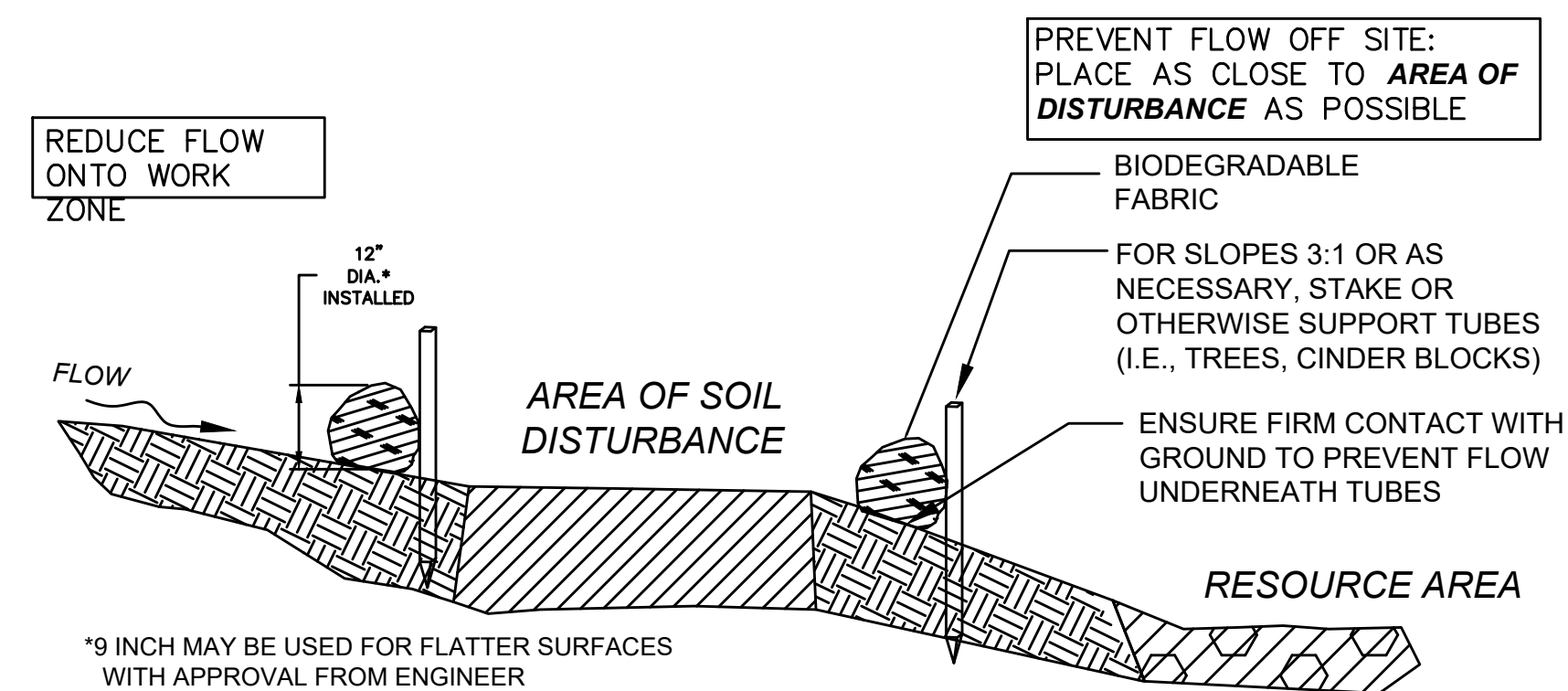
2. PERVIOUS BACKFILL MATERIAL FOR USE IN FILL AREAS ASSOCIATED WITH BASIN EMBANKMENTS SHALL BE COMPOSED OF ORDINARY BORROW MATERIAL (ITEM 150.) OR EXCAVATED MATERIAL FROM THE SITE DEEMED RE-USEABLE BY THE ENGINEER. SATISFACTORY ON-SITE MATERIAL SHALL HAVE SOIL CLASSIFICATION GROUPS OF GW, GP, GM, SW, 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.



13 INFILTRATION BASIN

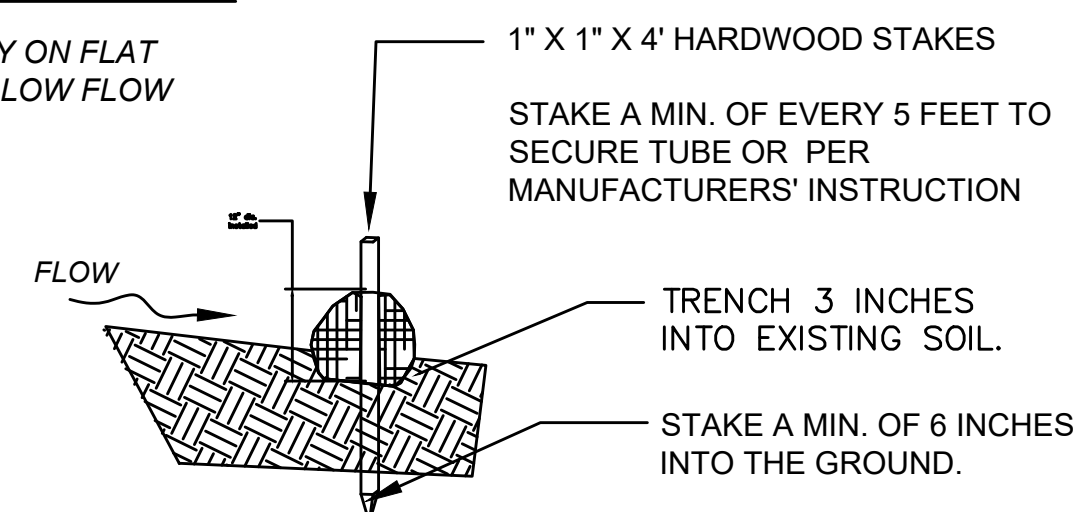
SCALE: N.T.S.

COMPOST FILTER TUBE

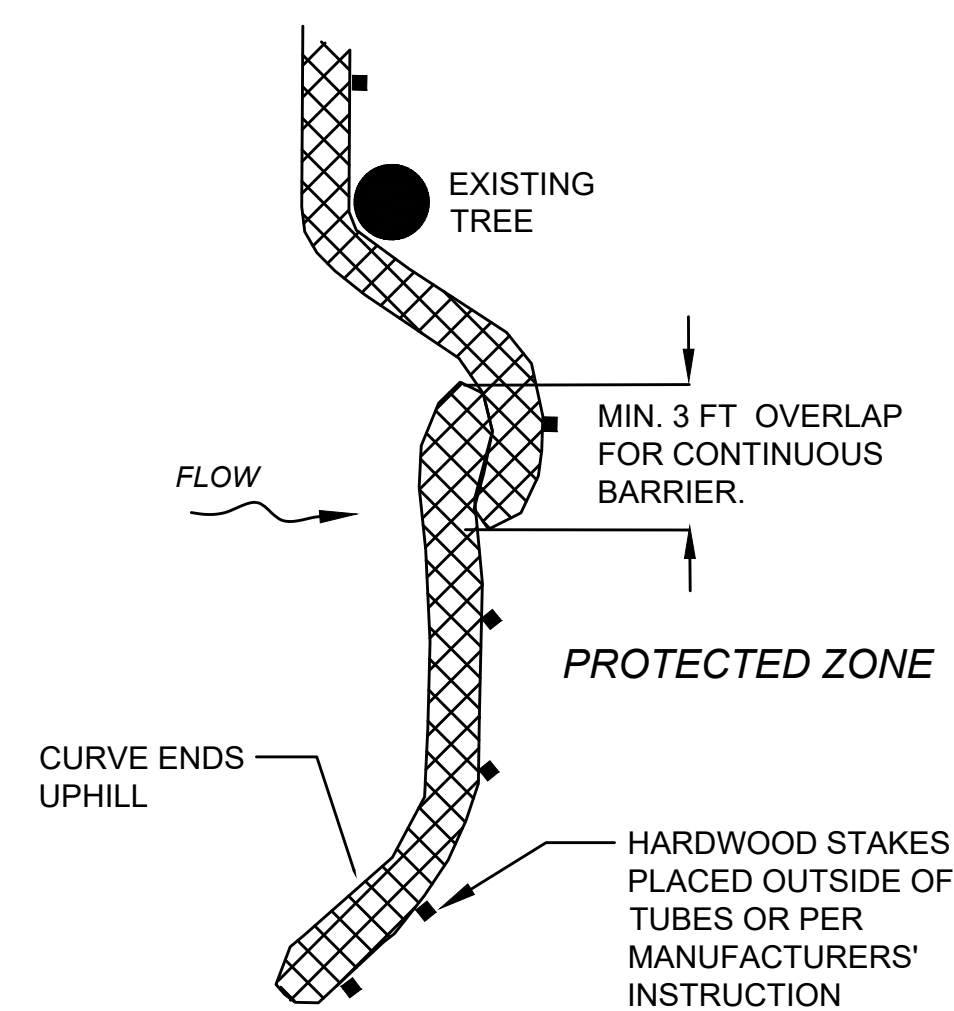


12 INCH STRAW WATTLE

TO BE USED ONLY ON FLAT SURFACES WITH LOW FLOW



SECTION

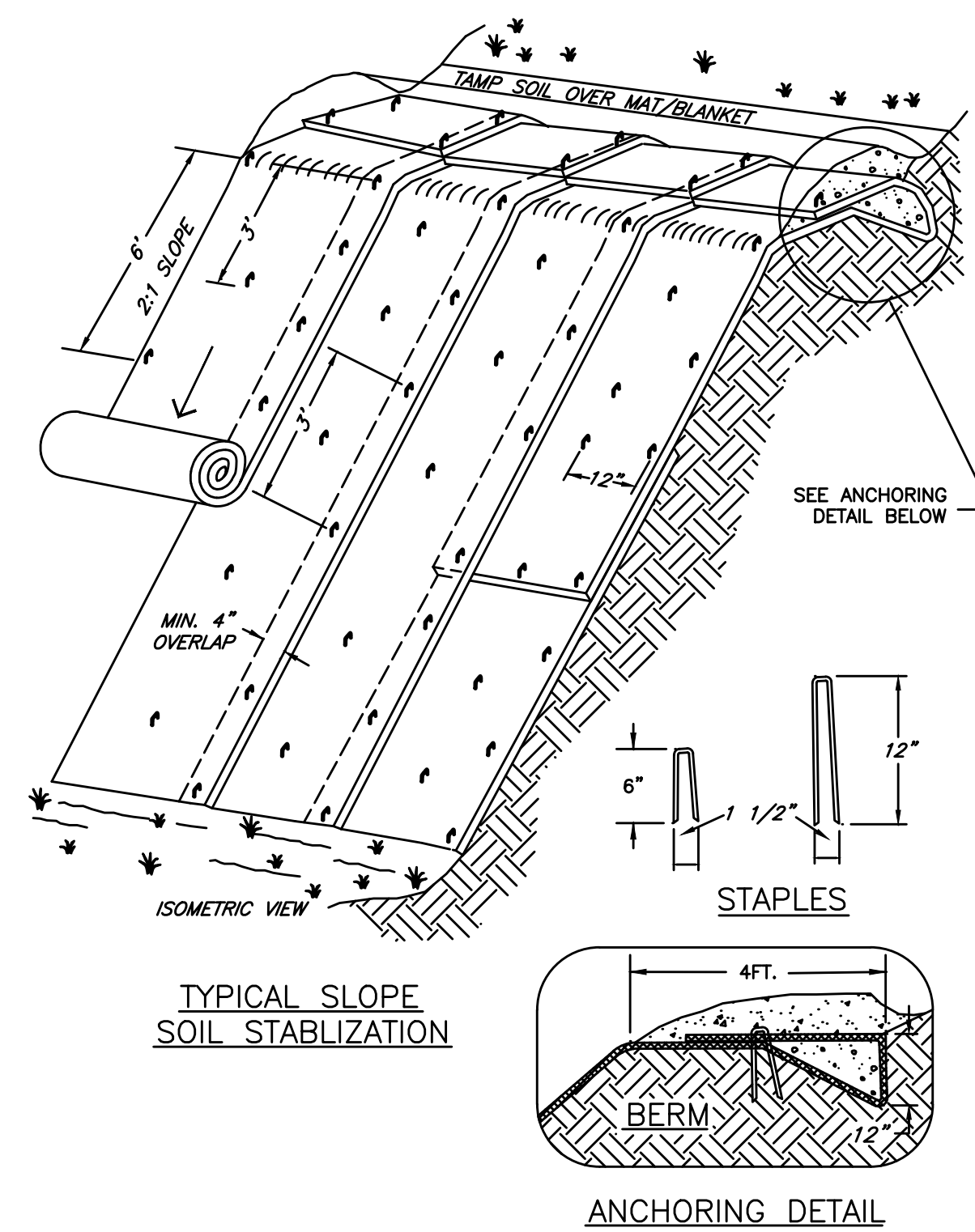


PLACE TUBE ALONG CONTOURS AND PERPENDICULAR TO FLOW.

ADJUST LOCATION AS REQUIRED FOR OPTIMUM EFFECTIVENESS. DO NOT INSTALL IN WATERWAYS.

PLACE STAKES AS NEEDED TO SECURE TUBES IN PLACE.

PLAN VIEW

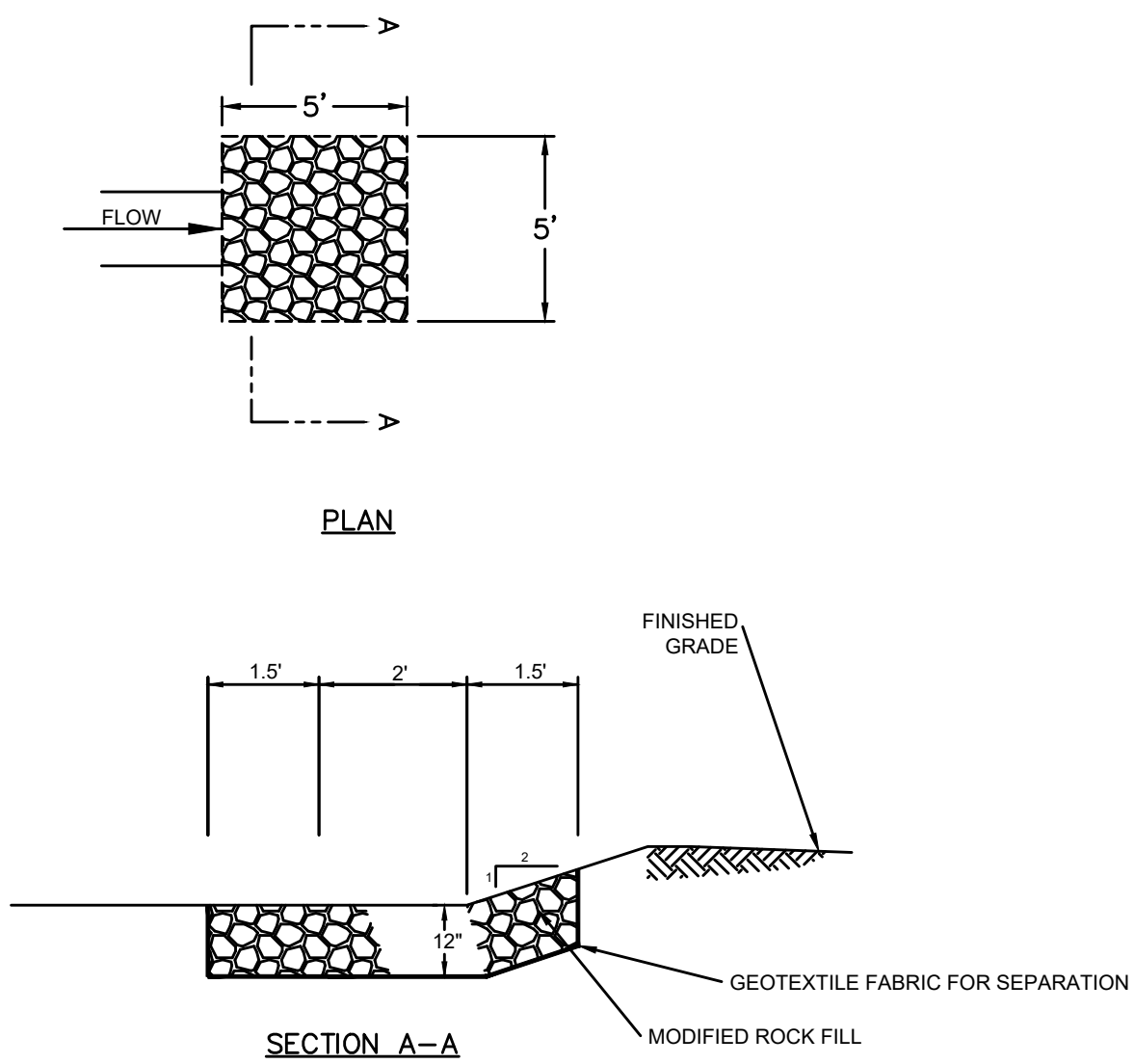


NOTES:

1. MATTING FOR EROSION CONTROL MUST BE MADE FROM 100% BIODEGRADABLE MATERIAL.
2. STAPLES OR STAKES MAY BE USED TO SECURE THE MATTING. THE STAPLES OR STAKES MUST BE MADE FROM A 100% BIODEGRADABLE MATERIAL.

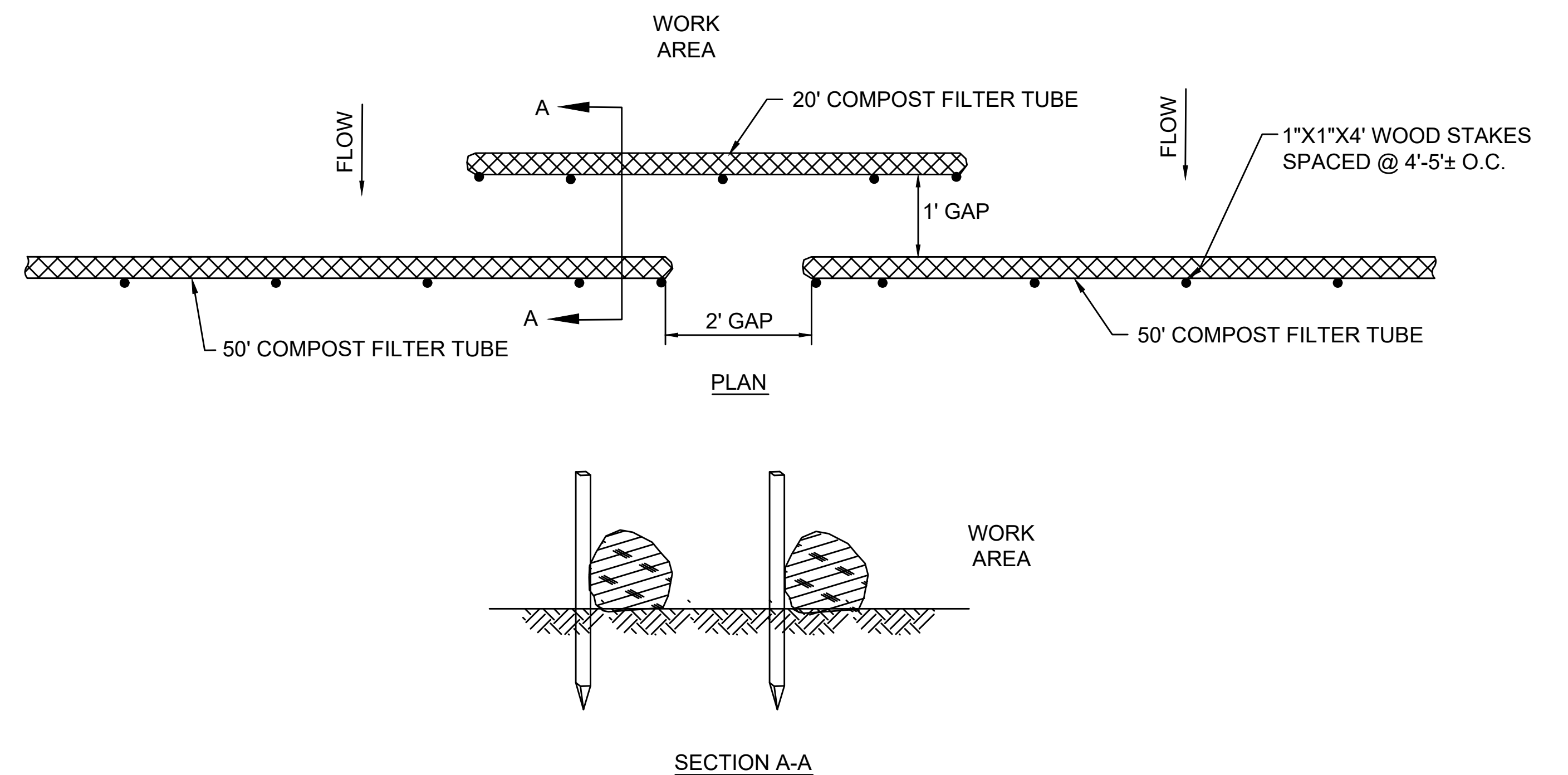
14 MATTING FOR EROSION CONTROL

SCALE: N.T.S.



15 MODIFIED ROCK FOR SWALE ENDS (5'X5')

SCALE: N.T.S.



NOTES:

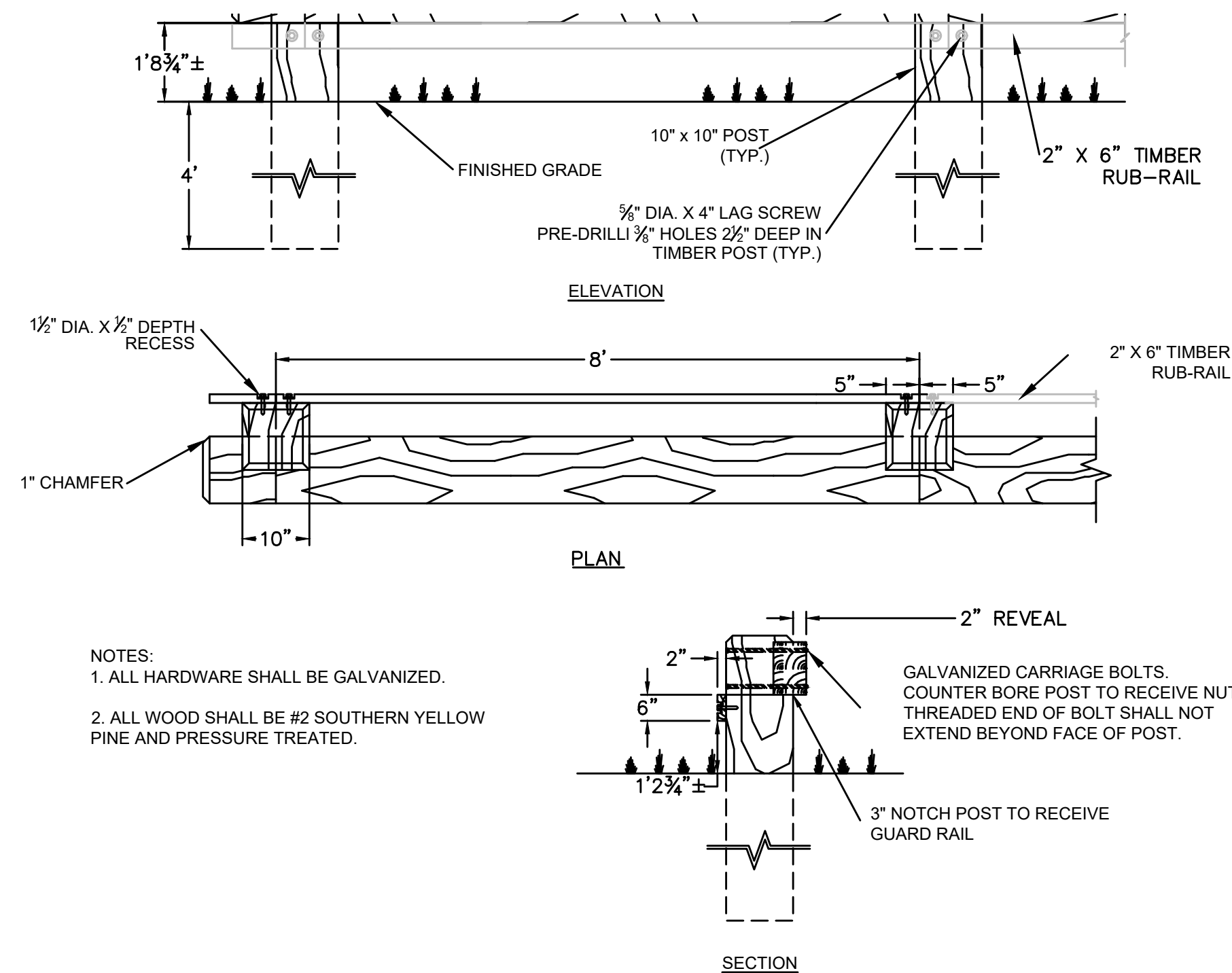
1. SYNCOPATED COMPOST FILTER TUBES SHALL BE USED WHEN BORDERING VERNAL POOLS AS SHOWN ON THE PLANS.

16 SEDIMENT BARRIERS – COMPOST FILTER TUBES

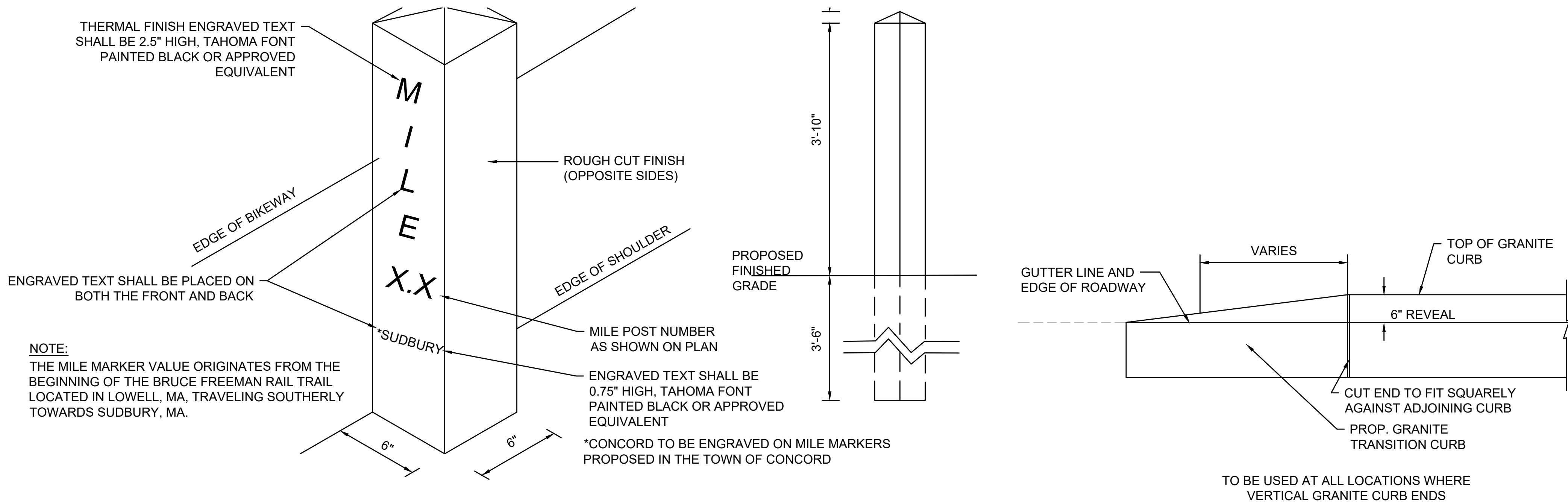
SCALE: N.T.S.

17 SYNCOPATED SEDIMENT CONTROL BARRIER

SCALE: N.T.S.

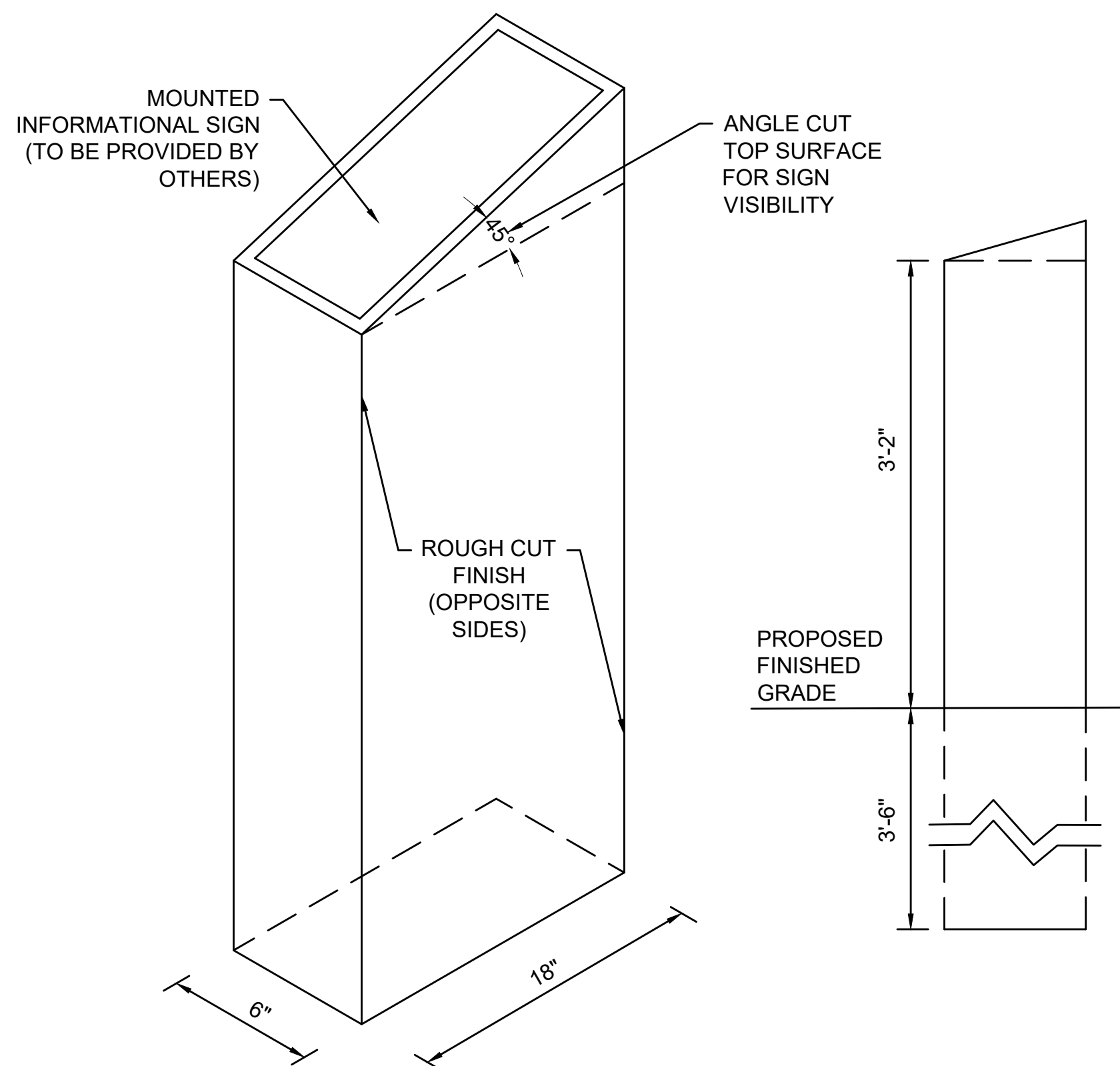


18 TIMBER POST GUARDRAIL
SCALE: N.T.S.

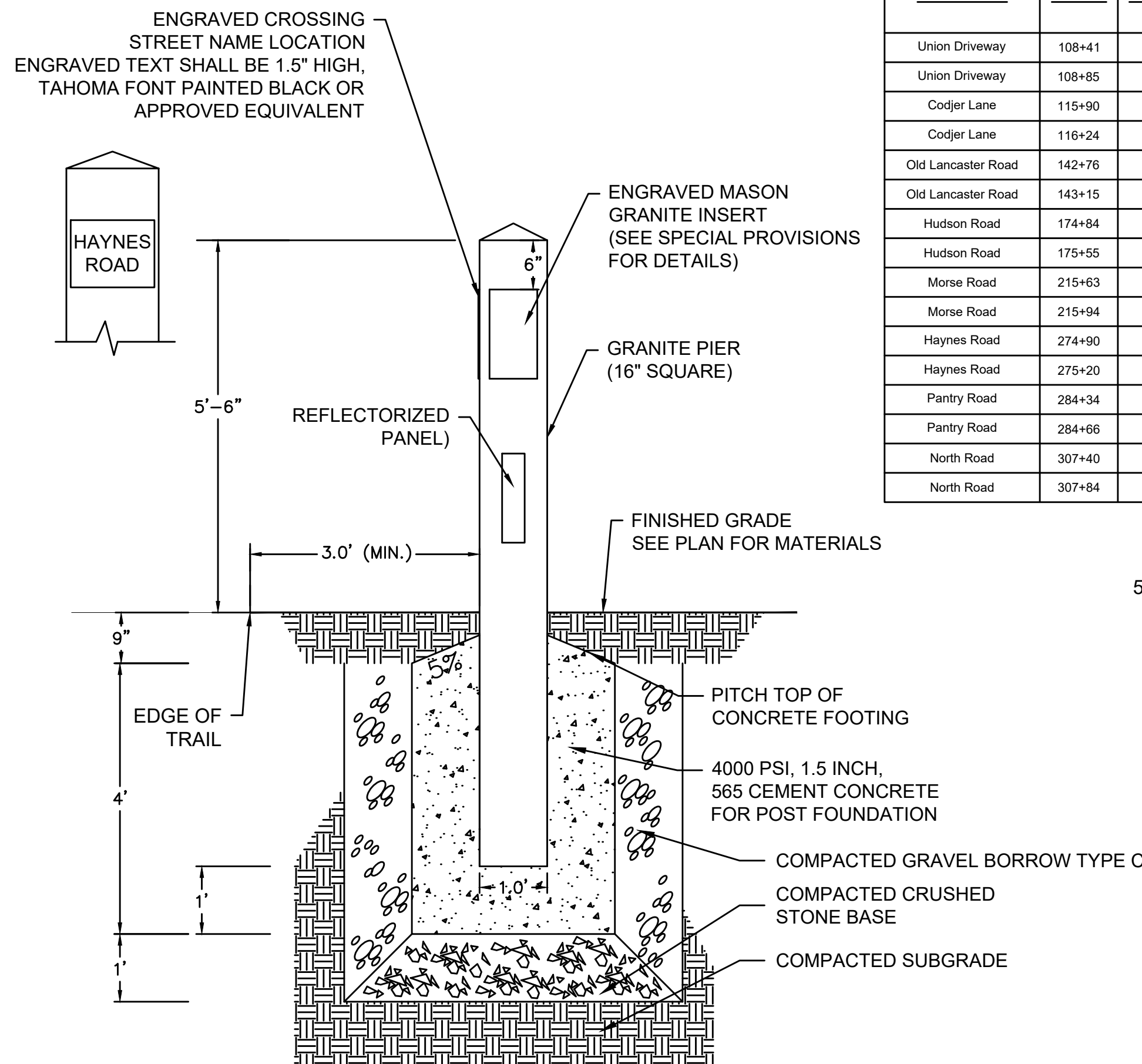


19 GRANITE MILE MARKER
SCALE: N.T.S.

20 TRANSITION CURB DETAIL
SCALE: N.T.S.

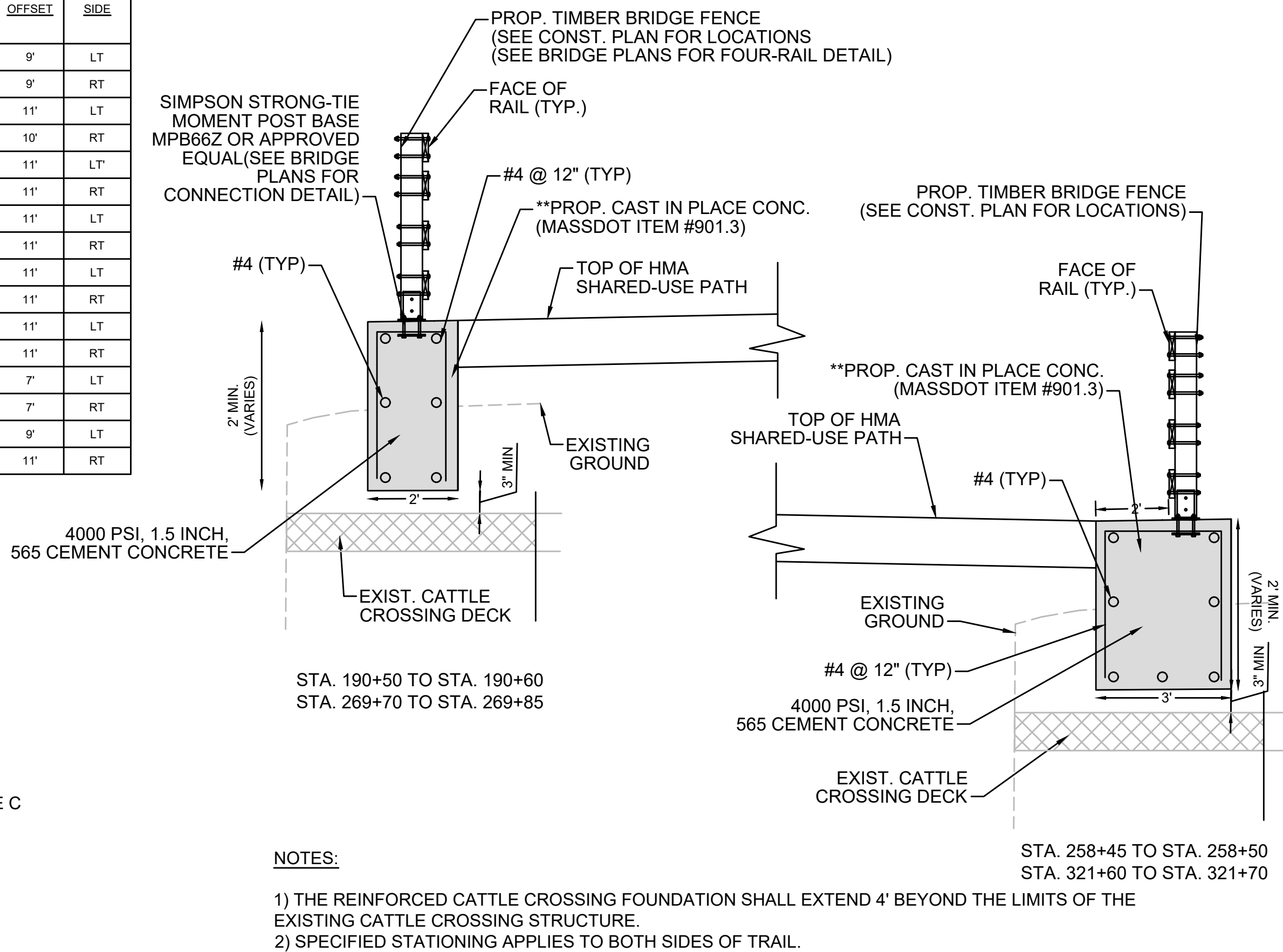


21 GRANITE POST INTERPRETIVE SIGN
SCALE: N.T.S.



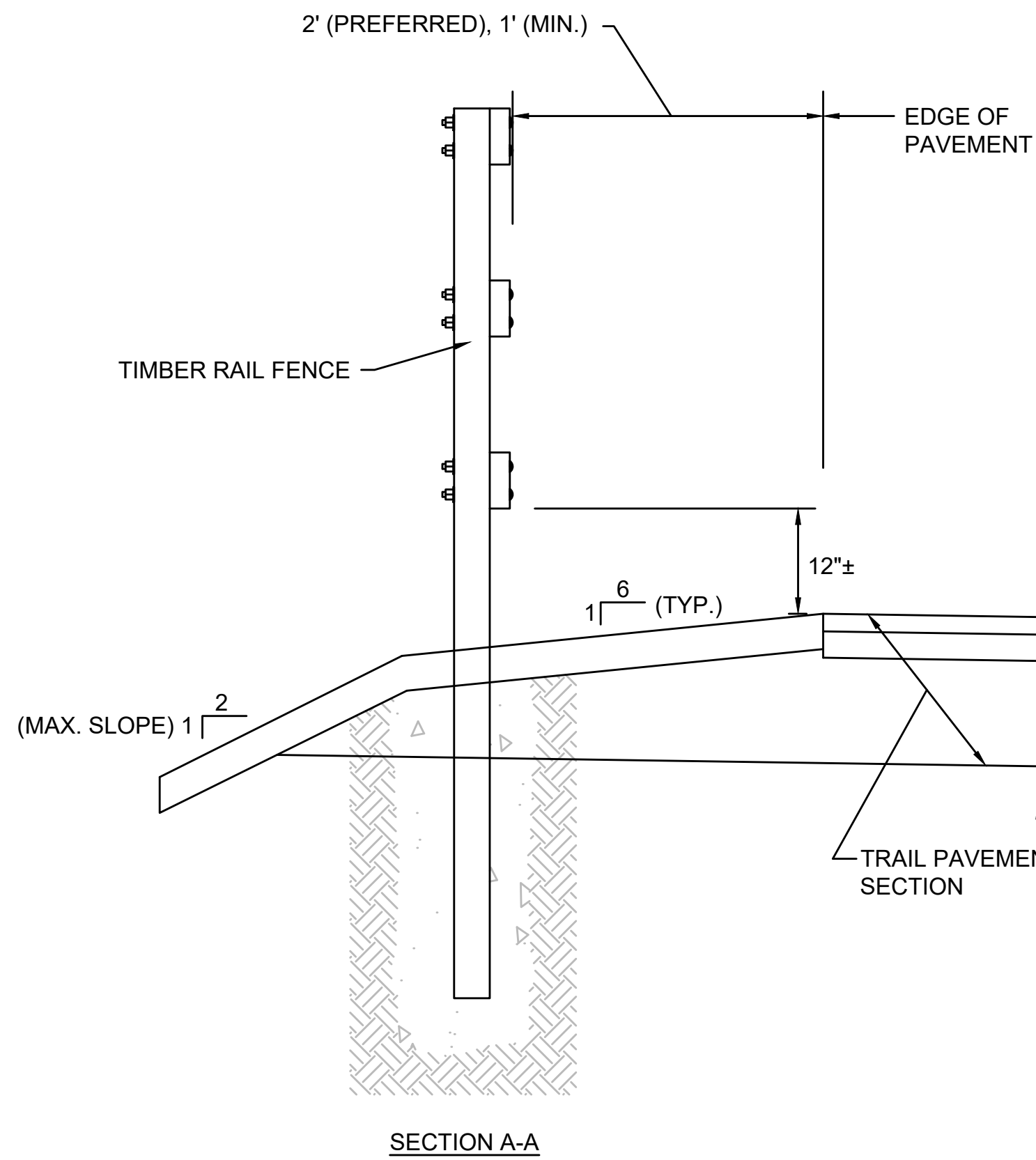
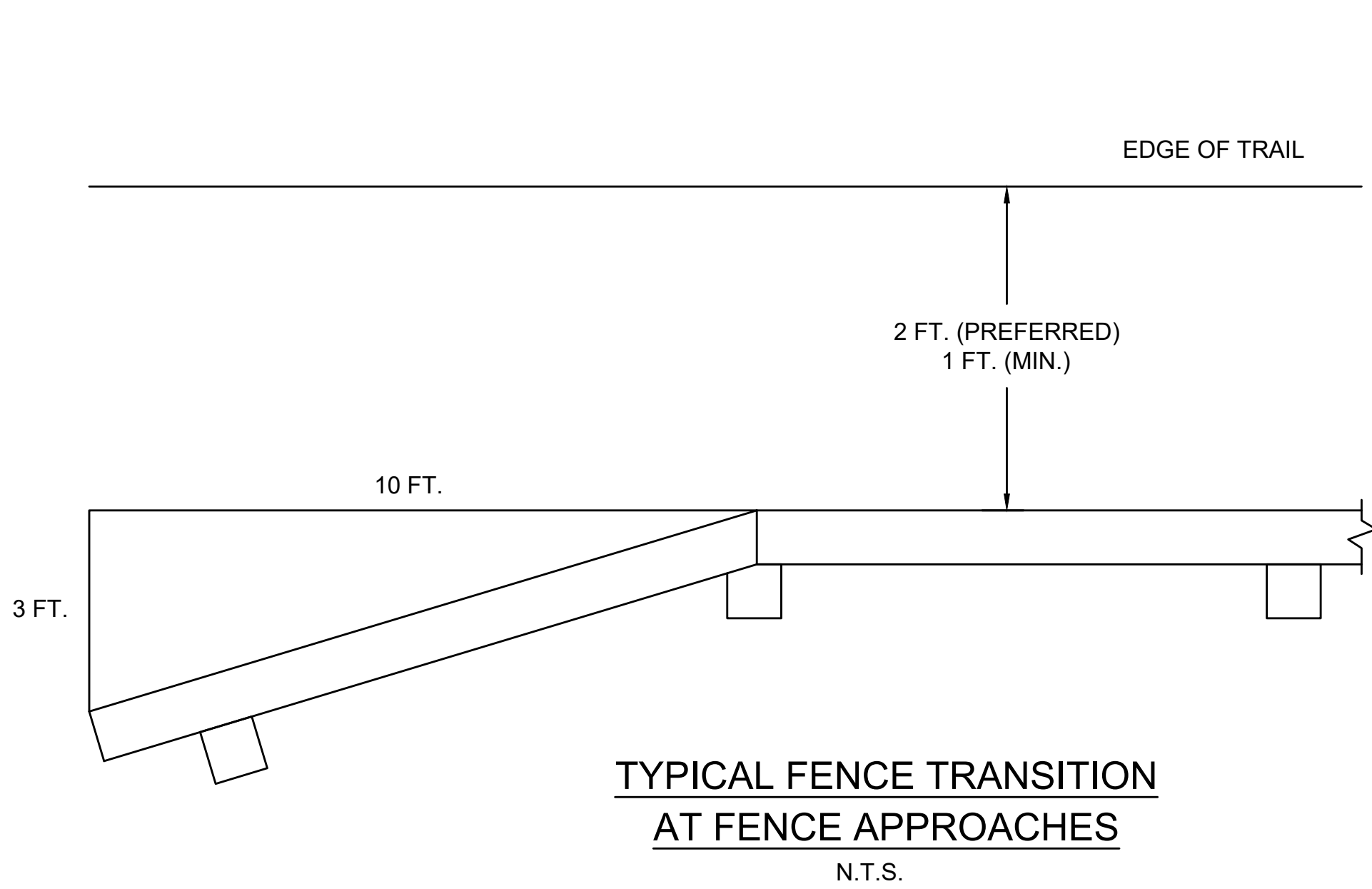
22 GRANITE BRUCE FREEMAN RAIL TRAIL PIER
SCALE: N.T.S.

GRANITE PIER LOCATIONS			
STREET NAME	STATION	OFFSET	SIDE
Union Driveway	108+41	9'	LT
Union Driveway	108+85	9'	RT
Codjer Lane	115+90	11'	LT
Codjer Lane	116+24	10'	RT
Old Lancaster Road	142+76	11'	LT*
Old Lancaster Road	143+15	11'	RT
Hudson Road	174+84	11'	LT
Hudson Road	175+55	11'	RT
Morse Road	215+63	11'	LT
Morse Road	215+94	11'	RT
Haynes Road	274+90	11'	LT
Haynes Road	275+20	11'	RT
Pantry Road	284+34	7'	LT
Pantry Road	284+66	7'	RT
North Road	307+40	9'	LT
North Road	307+84	11'	RT



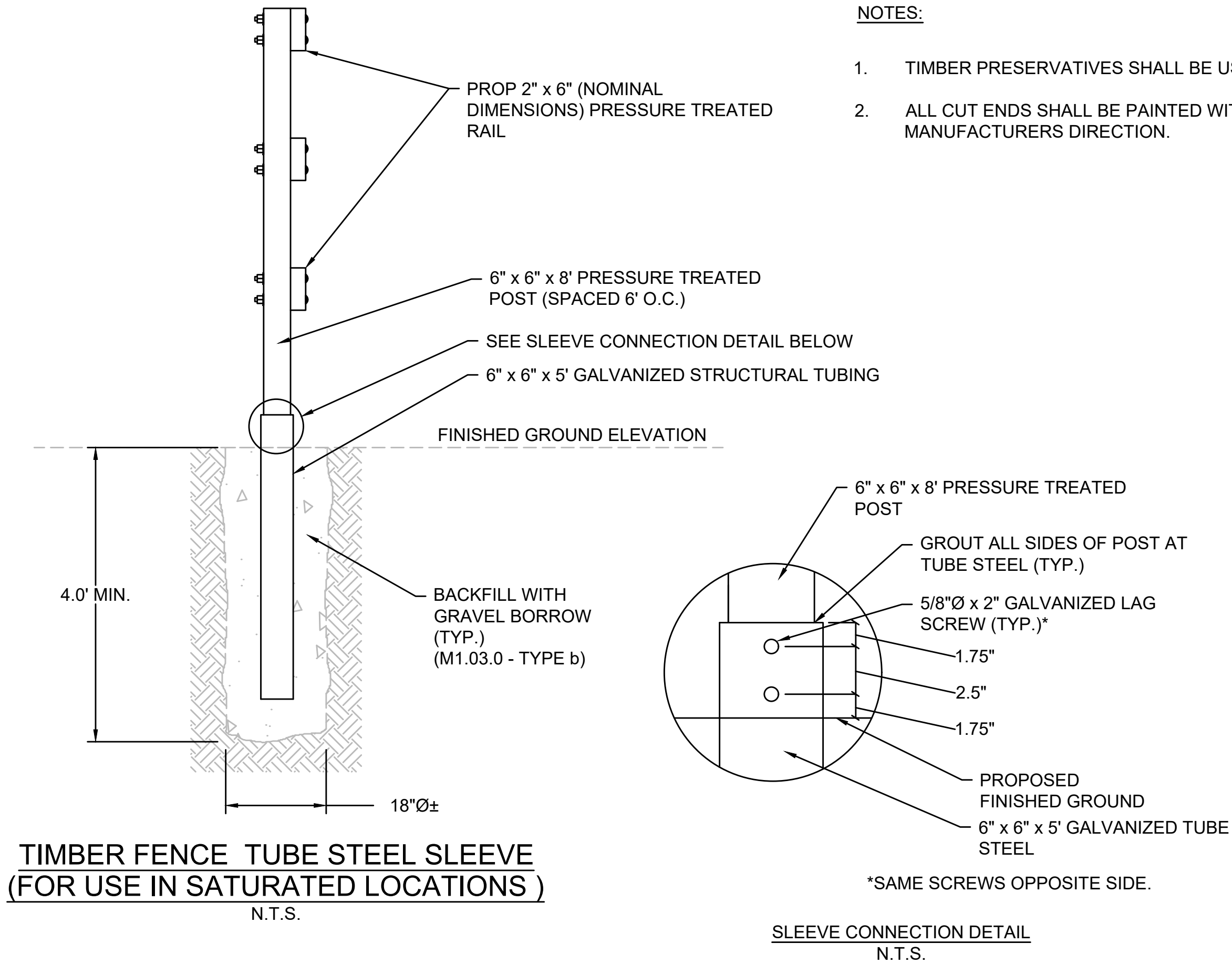
- NOTES:
- 1) THE REINFORCED CATTLE CROSSING FOUNDATION SHALL EXTEND 4' BEYOND THE LIMITS OF THE EXISTING CATTLE CROSSING STRUCTURE.
 - 2) SPECIFIED STATIONING APPLIES TO BOTH SIDES OF TRAIL.

23 REINFORCED TIMBER CONNECTION AT CATTLE CROSSING
SCALE: N.T.S.



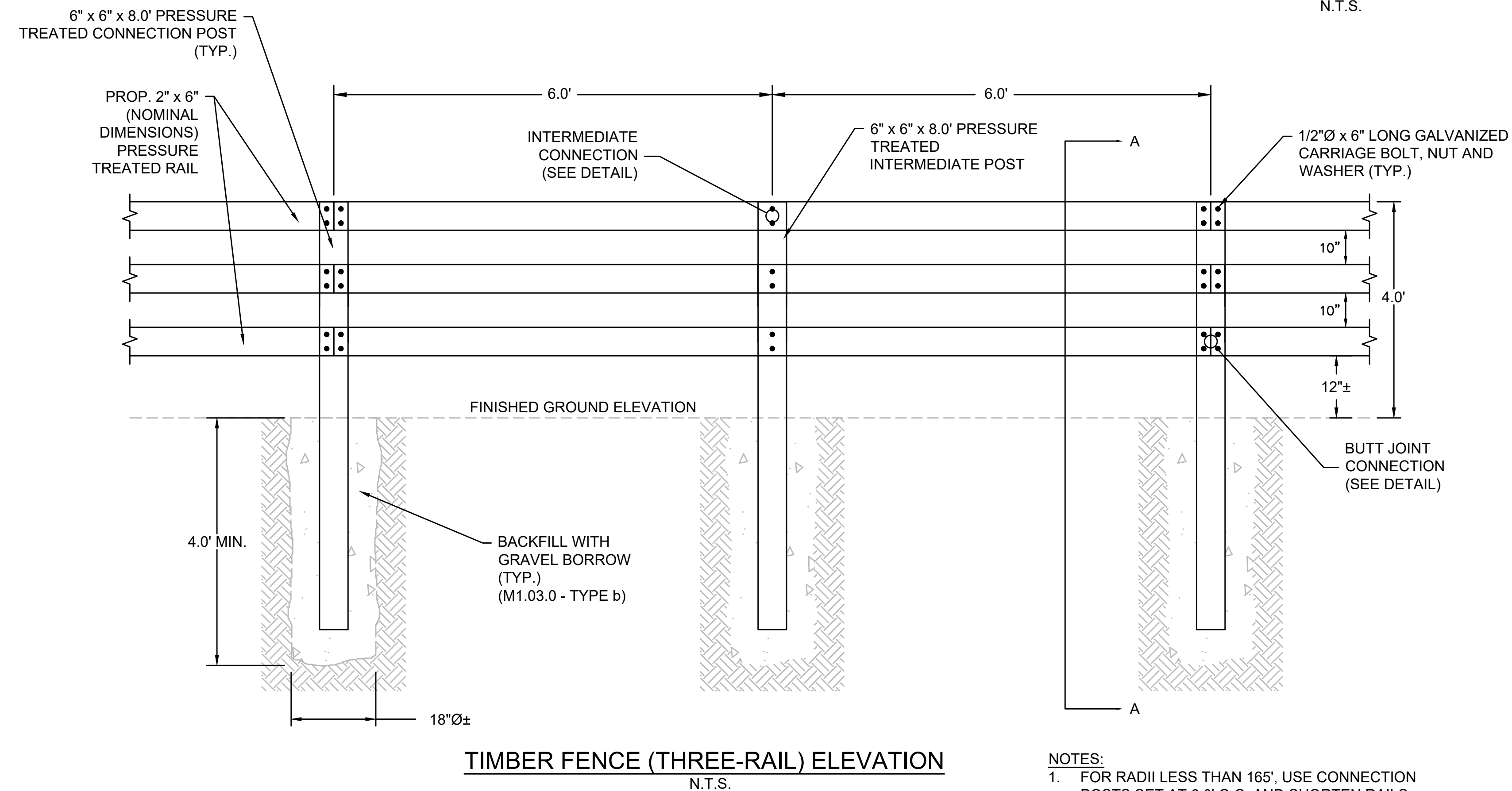
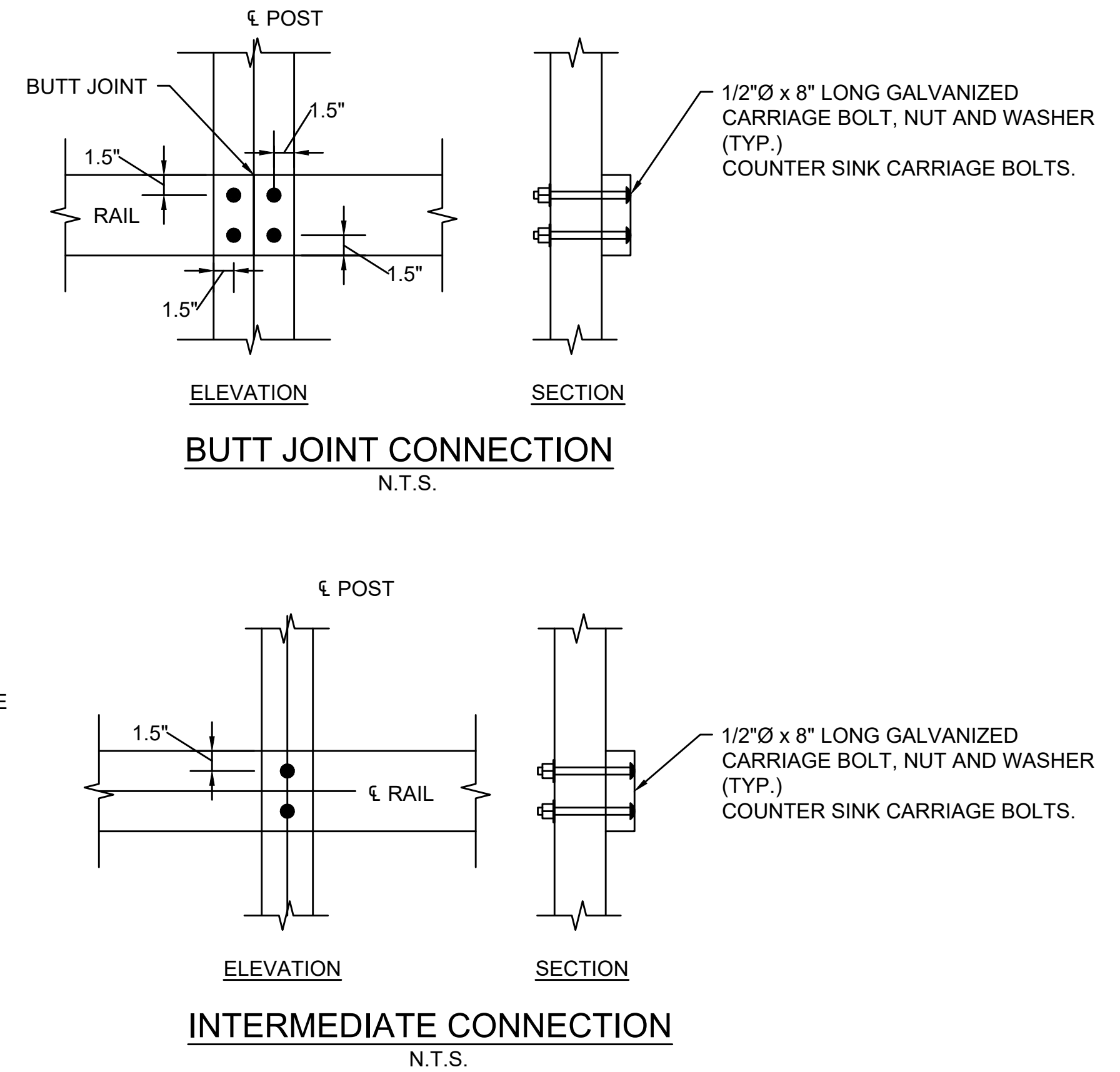
SUGGESTED TIMBER RAIL FENCE CONSTRUCTION SEQUENCE

1. AUGER OR DIG POST HOLE TO REQUIRED DIMENSIONS.
2. IF GROUND IS SATURATED, USE TUBE STEEL SLEEVE. SEE DETAIL ON THIS SHEET.
3. BACKFILL BOTTOM 6"± OF HOLE WITH GRAVEL AND COMPACT THOROUGHLY.
4. SET POST AND HOLD PLUMB DURING BACKFILLING.
5. BACKFILL WITH GRAVEL IN 12" LIFTS. COMPACT EACH LIFT THOROUGHLY.
6. CLAMP RAILS TO POSTS AND FIELD DRILL BOLT HOLES.
7. SET BOLTS, WASHERS AND NUTS.



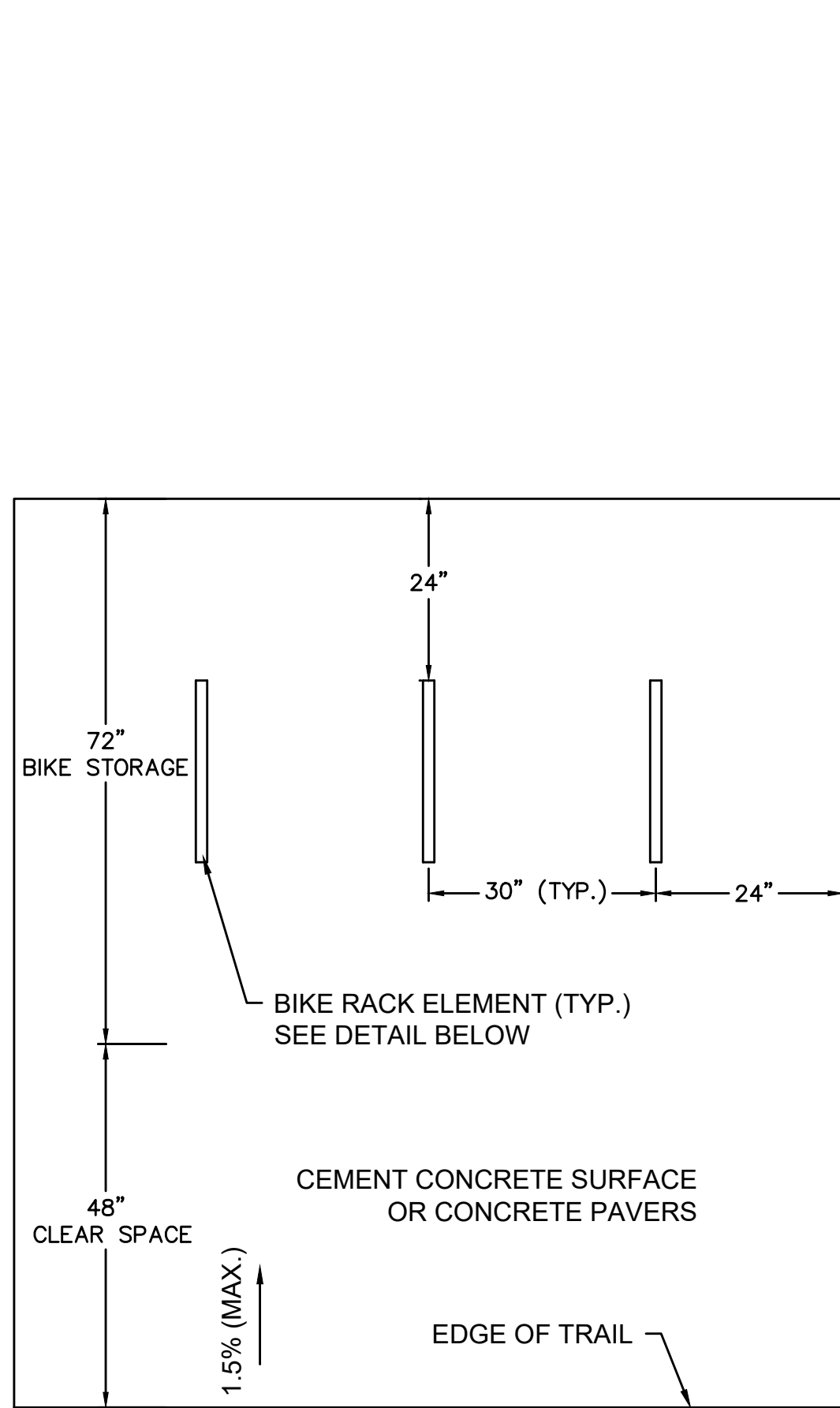
NOTES:

1. TIMBER PRESERVATIVES SHALL BE USED ON ALL WOOD TIMBER.
2. ALL CUT ENDS SHALL BE PAINTED WITH PRESERVATIVE IN THE FIELD PER MANUFACTURERS DIRECTION.



NOTES:

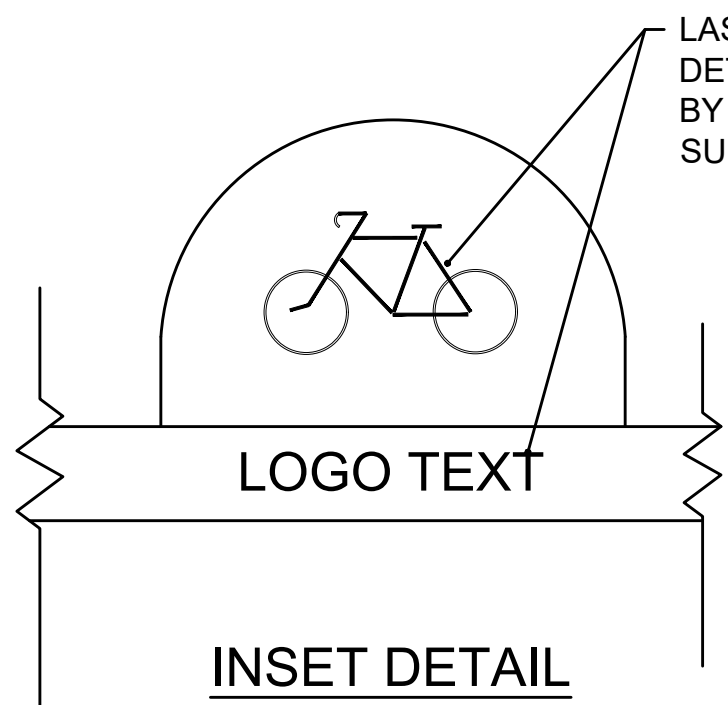
1. FOR RADII LESS THAN 165', USE CONNECTION POSTS SET AT 6.0' O.C. AND SHORTEN RAILS ACCORDINGLY.



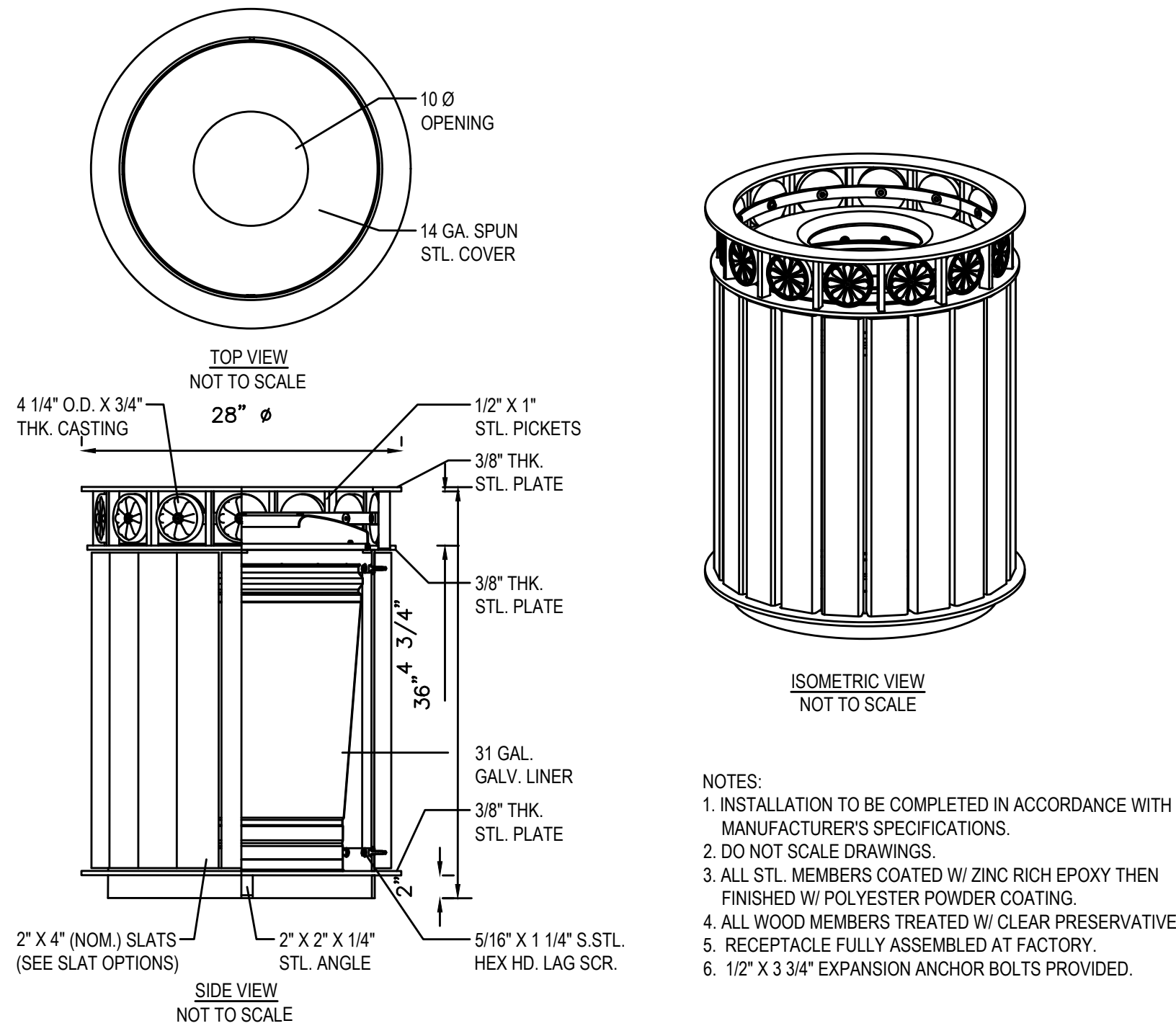
NOTES:

- SEE PLANS FOR QUANTITY OF BIKE RACK ELEMENTS

BIKE RACK PLACEMENT

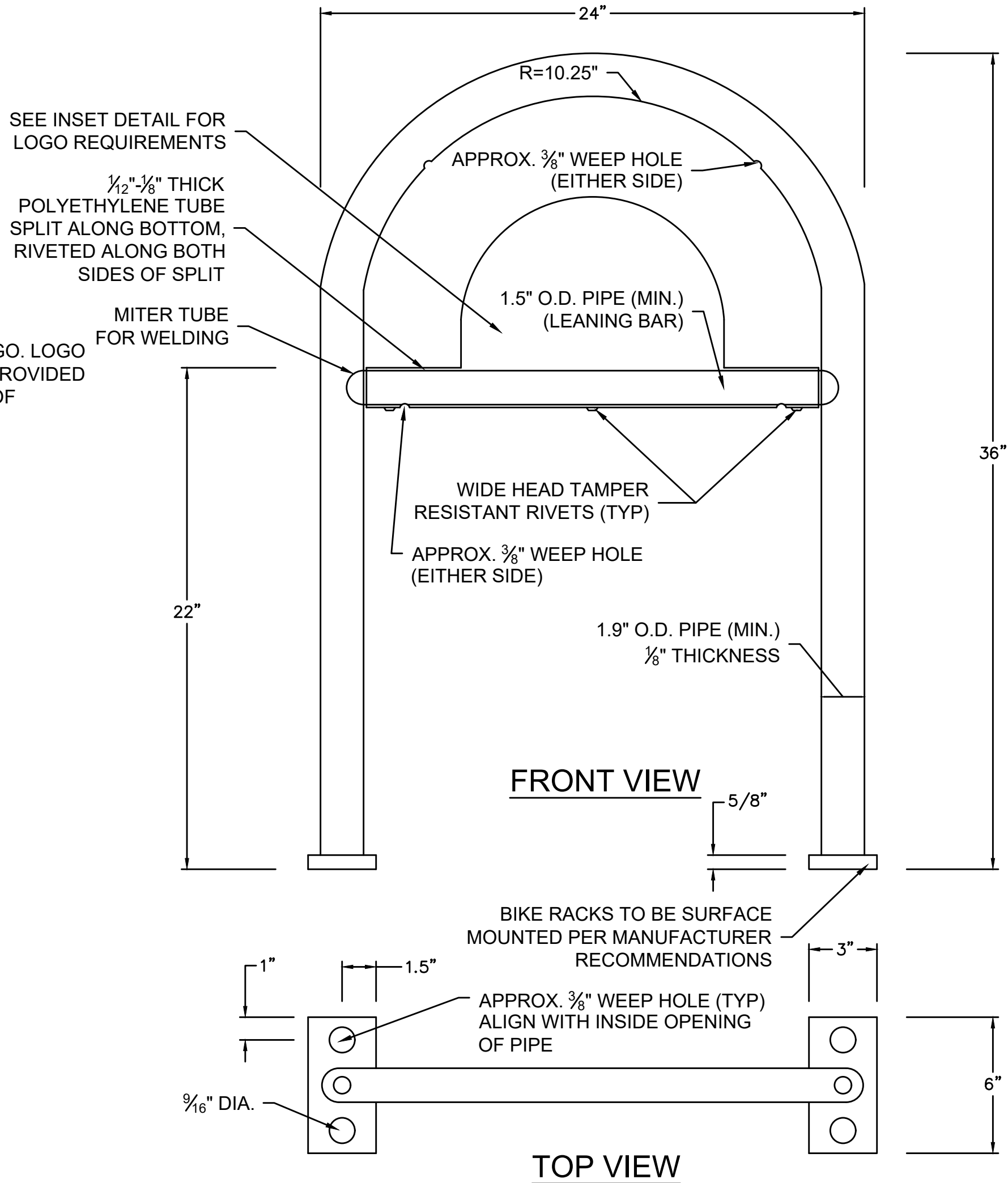


- NOTES:
- EACH BIKE RACK SHALL INCLUDE A LASER-CUT LOGO. LOGO DETAIL TO BE PROVIDED BY THE TOWN OF SUDBURY.
 - DIMENSIONS ARE APPROXIMATE AND WILL BE DETERMINED IN COORDINATION WITH THE MANUFACTURER. BIKE RACK ELEMENTS TO BE OF THE INVERTED "U".
 - EACH BIKE RACK SHALL ACCOMMODATE TWO BICYCLES.
 - ALL POSTS AND HARDWARE SHALL BE FACTORY COATED FEDERAL GREEN (SEE SPECIAL PROVISIONS)



TRASH RECEPTACLE

SCALE: N.T.S.

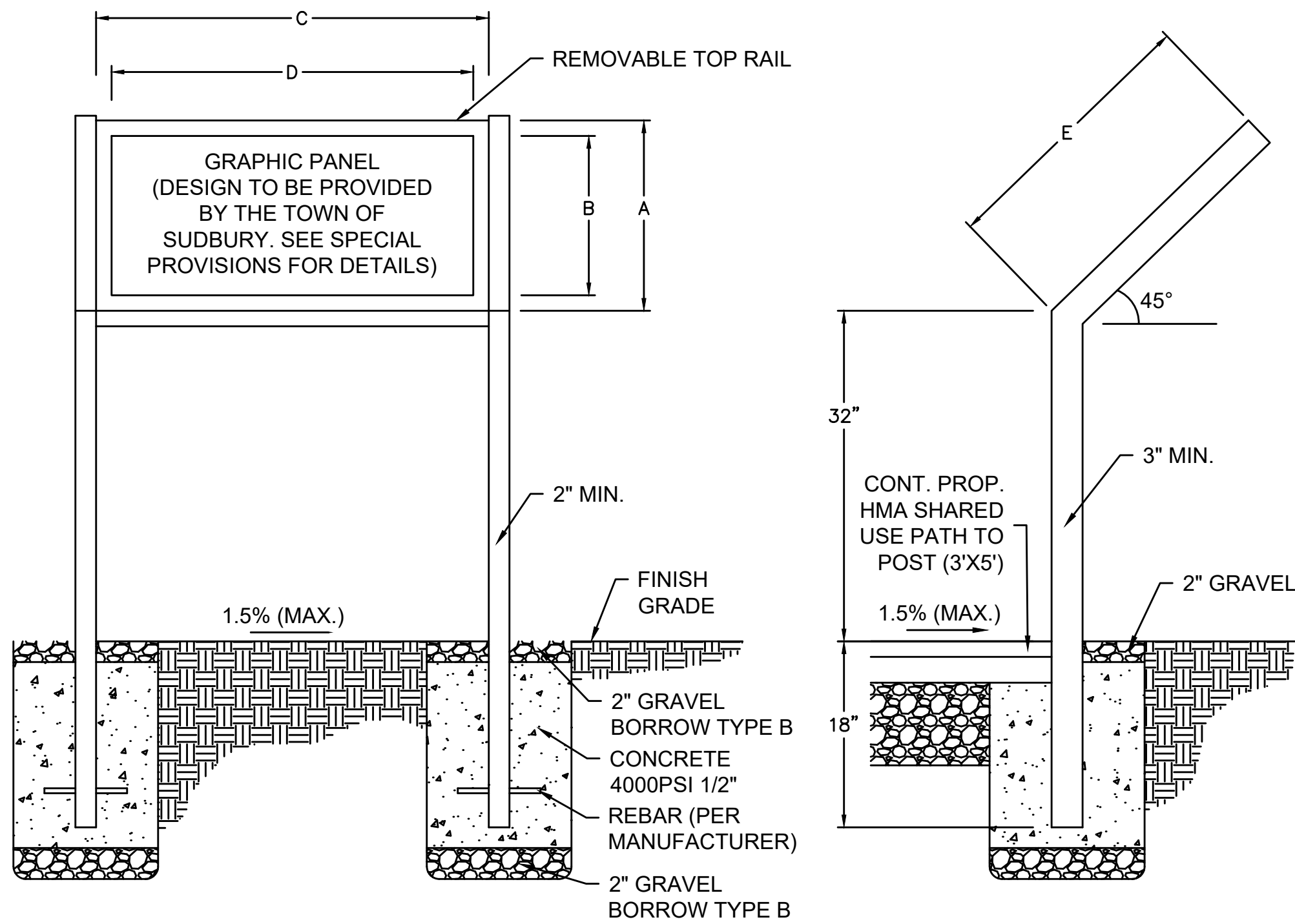


BIKE RACK

SCALE: N.T.S.

NOTE:

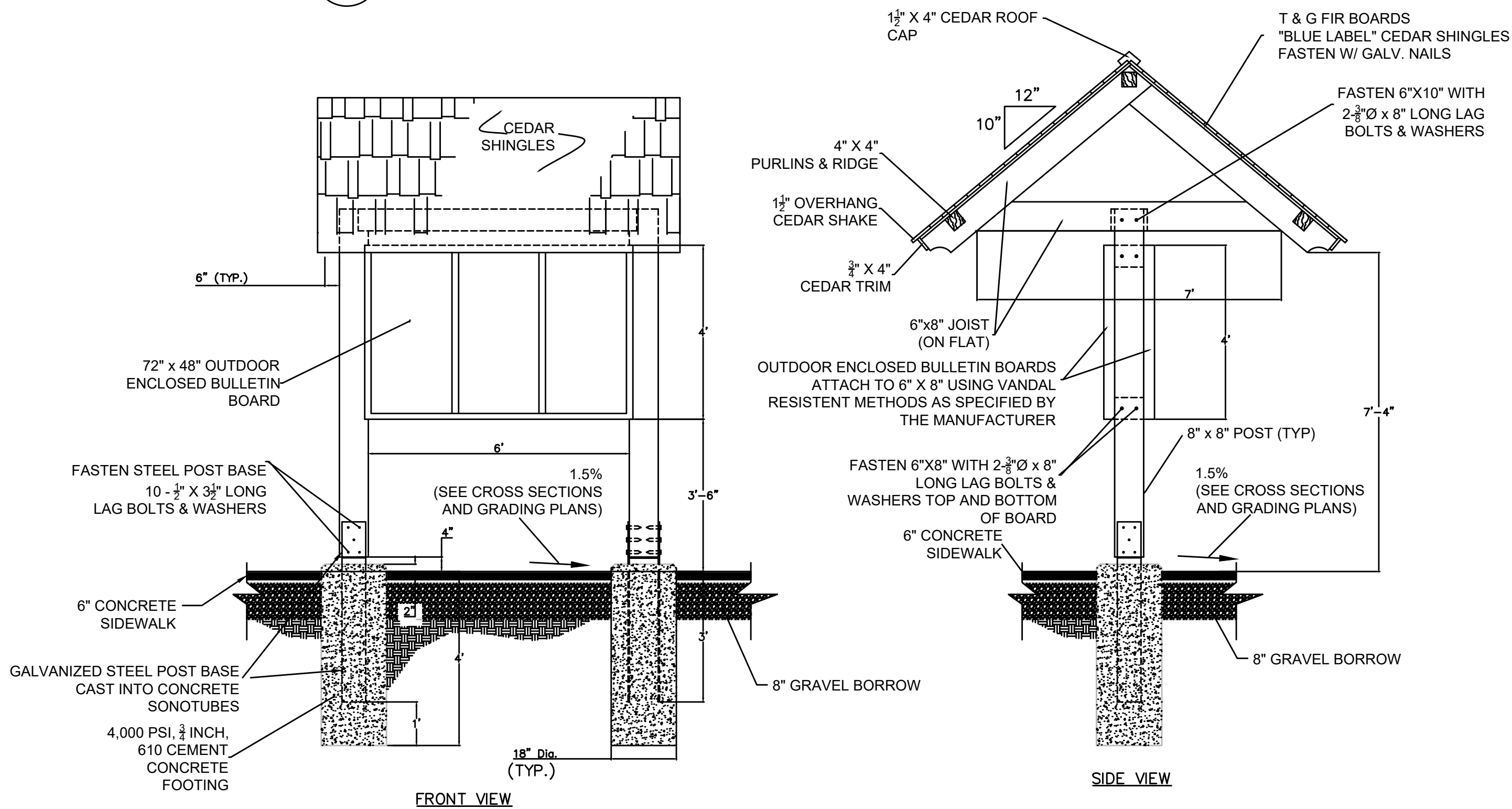
INTERPRETATIVE PANEL SHALL BE SQUARE METAL POSTS AND IS INTENDED TO MATCH THE MASSACHUSETTS DCR STANDARDS.



SIGN TYPE	DIMENSION TABLE				
	HEIGHT	WIDTH		DEPTH	
	A	B	C	D	E
26" x 38"	26"	23"	38"	35"	26.5"

INTERPRETATIVE SIGN

SCALE: N.T.S.

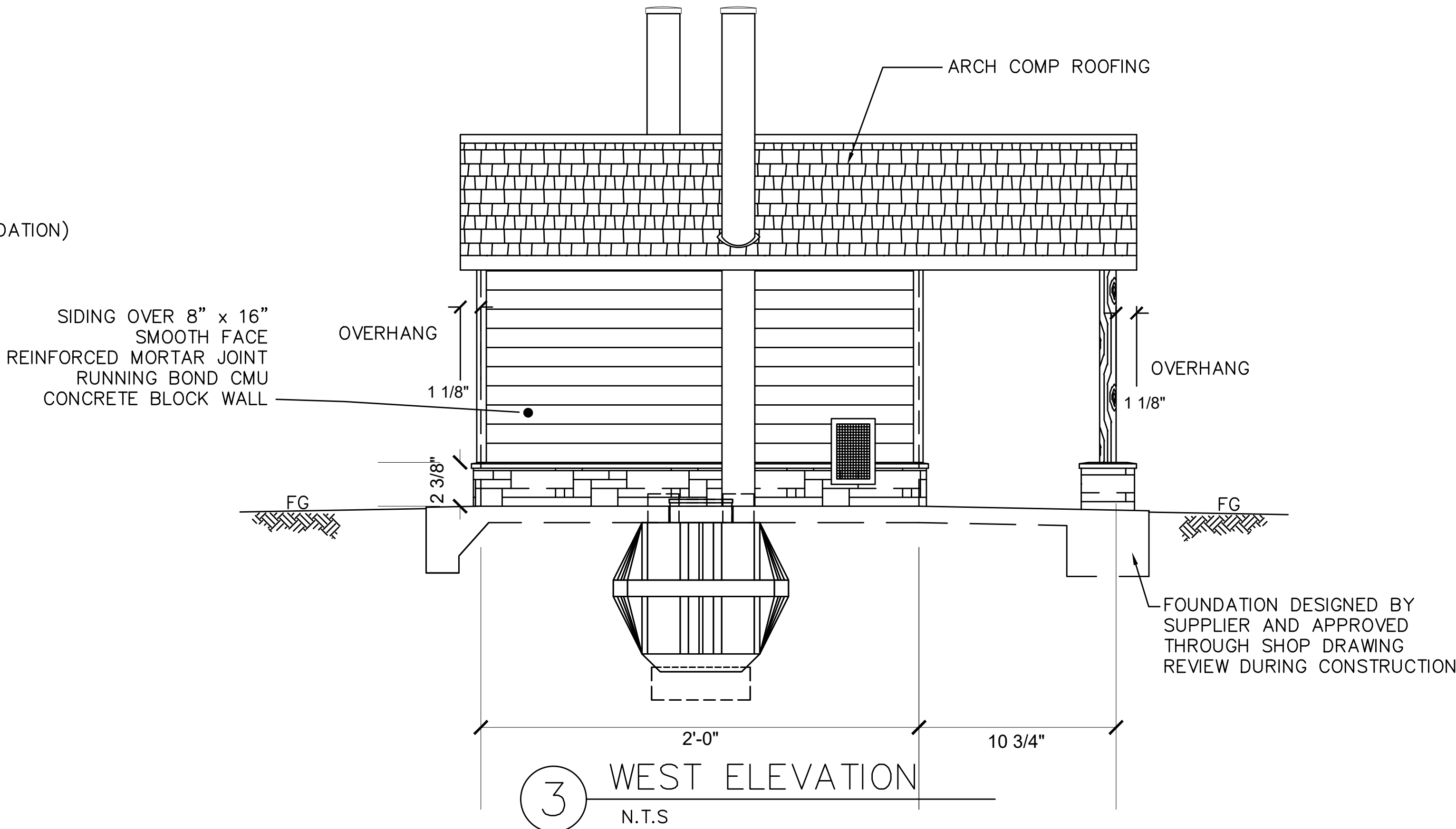
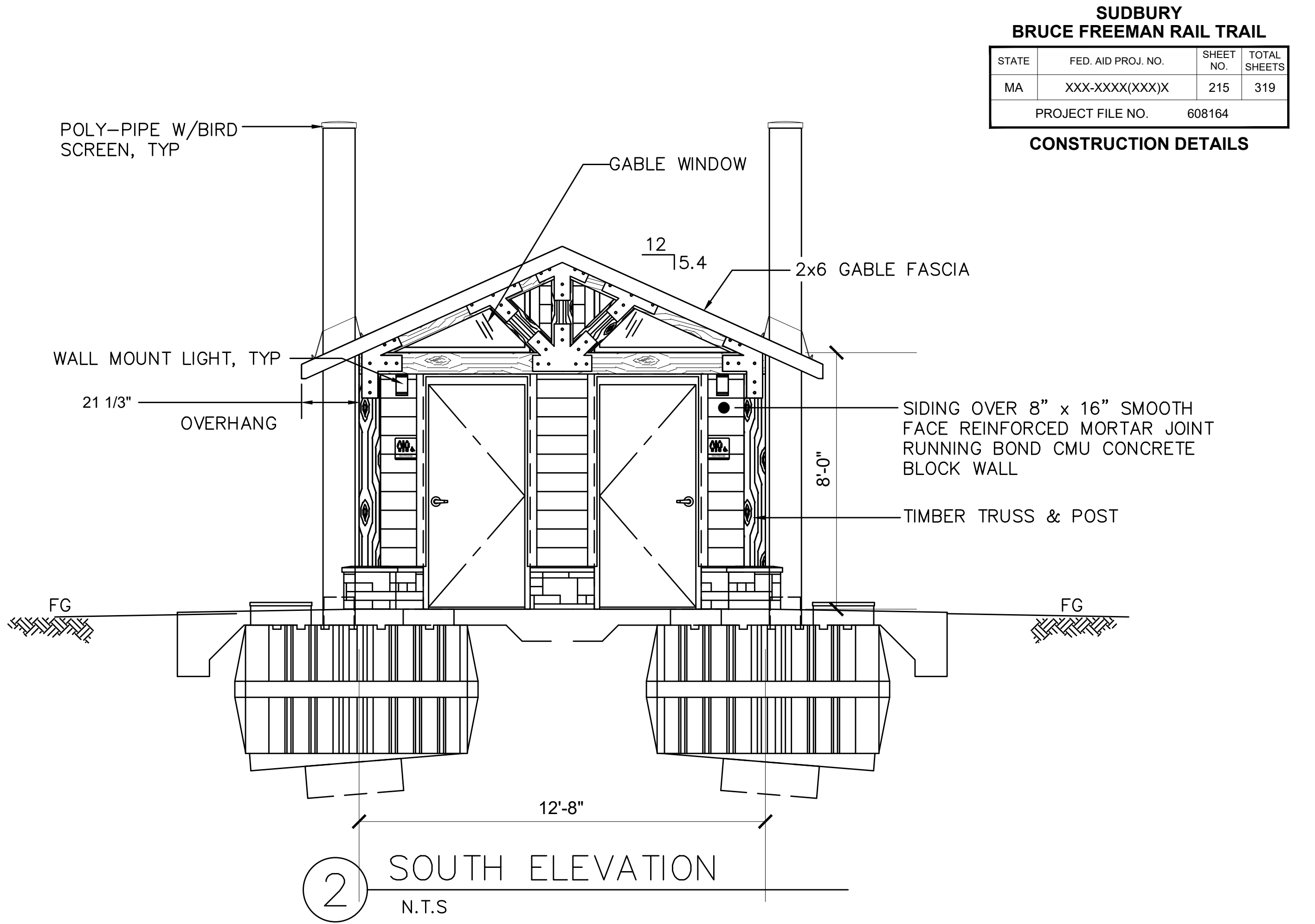
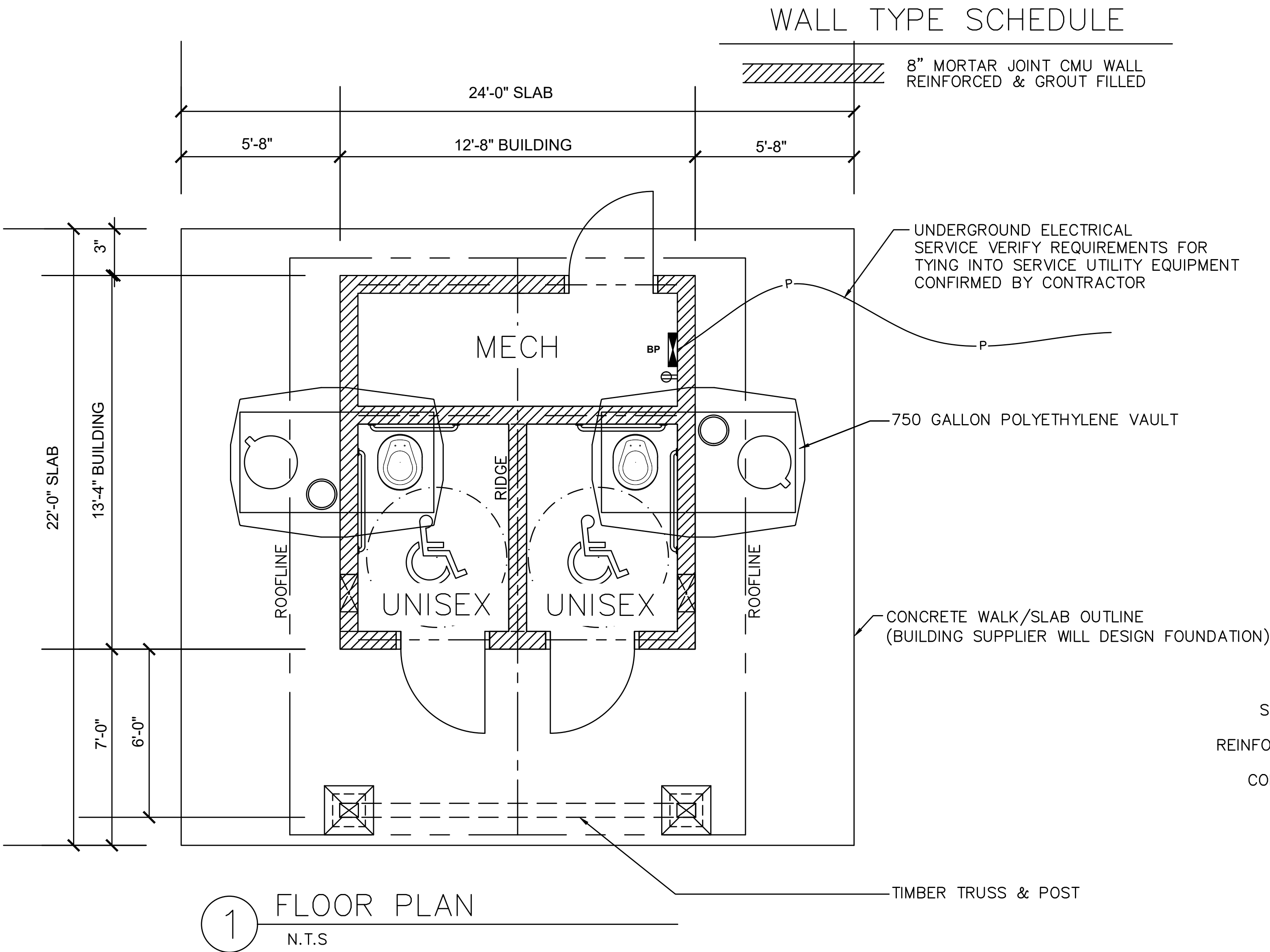


DISPLAY BOARD

SCALE: N.T.S.

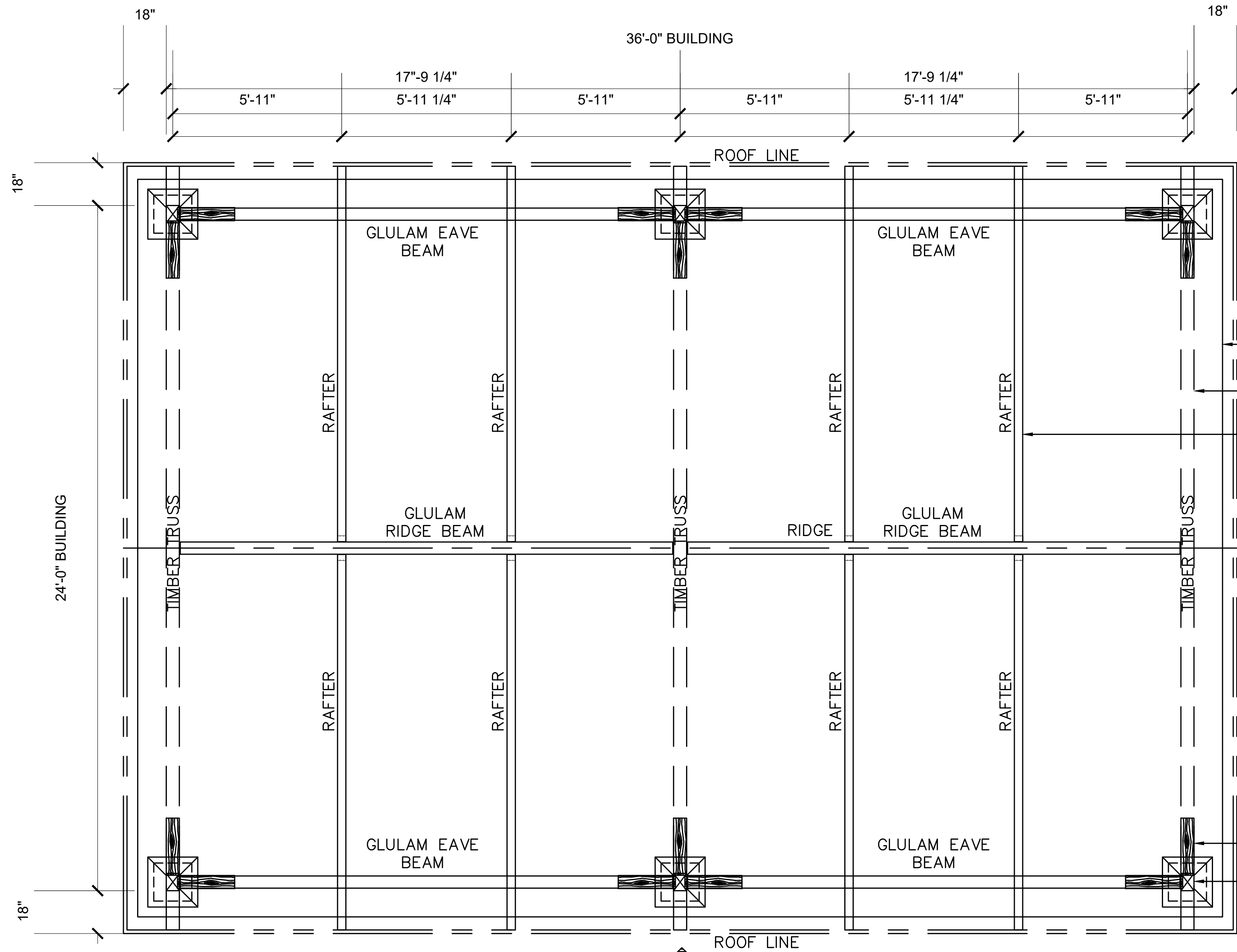
LEGEND		
SYMBOL	DESCRIPTION	AREA/ QUANTITY
	GABLE WINDOW	6
	16" x 24" EXTERIOR WALL VENT LOCATED IN CMU WALL	2
	EXTERIOR WALL LIGHTS	3
	INTERIOR CEILING LIGHTS	3

NOTE:
 THESE PLAN VIEW AND ELEVATION DRAWINGS ARE A PRELIMINARY ARCHITECTURAL REPRESENTATION OF THE BUILDING.



NOTE:

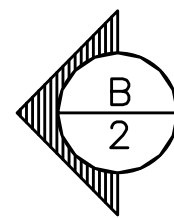
THESE PLAN VIEW AND ELEVATION DRAWINGS ARE A PRELIMINARY ARCHITECTURAL REPRESENTATION OF THE BUILDING. ALL DIMENSIONS, FEATURES AND COMPONENTS SHOWN ON THESE PRELIMINARY DRAWINGS SHALL BE APPROVED BY THE TOWN DURING CONSTRUCTION/SUBMISSION OF SHOP DRAWINGS.



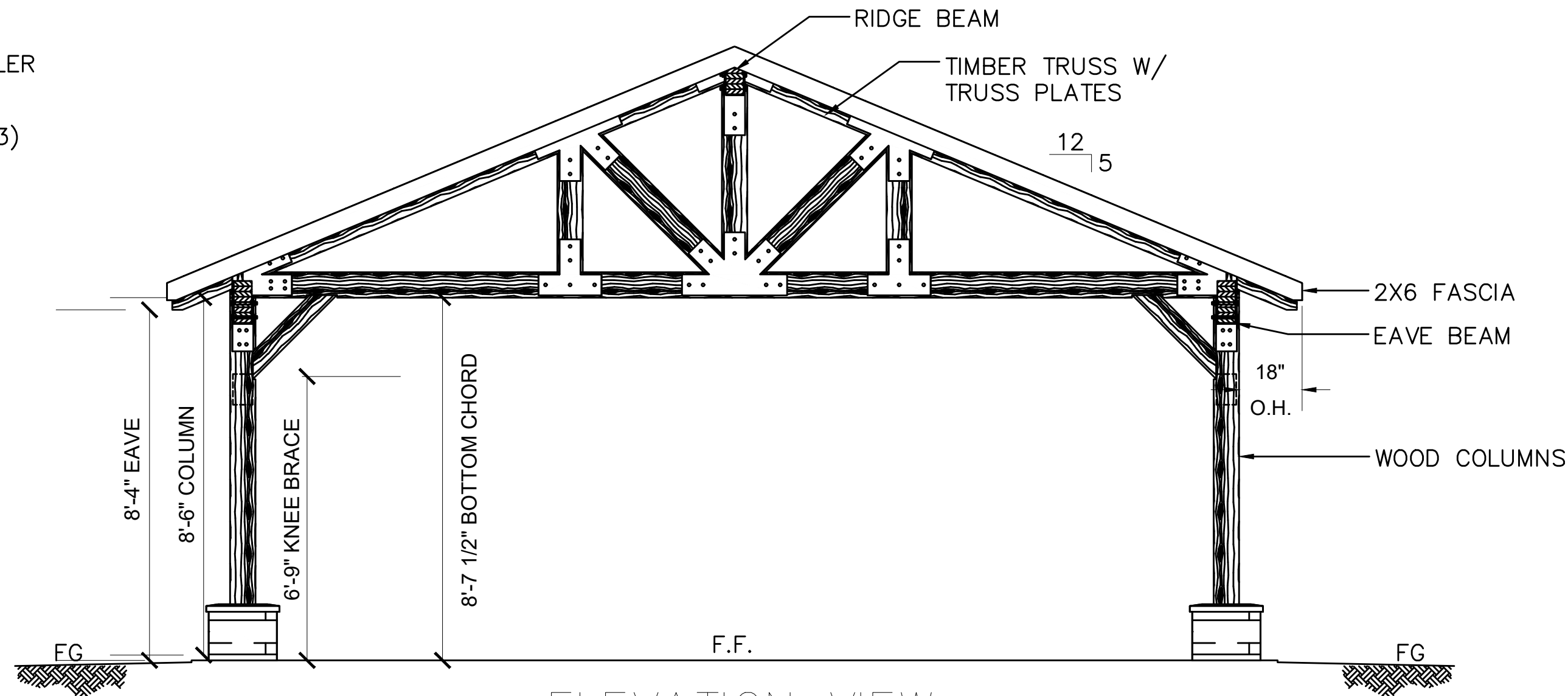
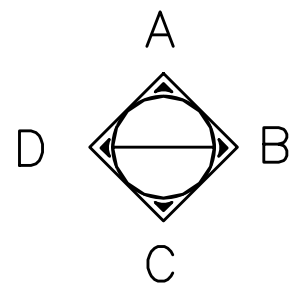
1 FLOOR PLAN
N.T.S

LEGEND		
SYMBOL	DESCRIPTION	AREA/QUANTITY
	WOOD TRUSS	3
	GLU-LAM BEAMS	6

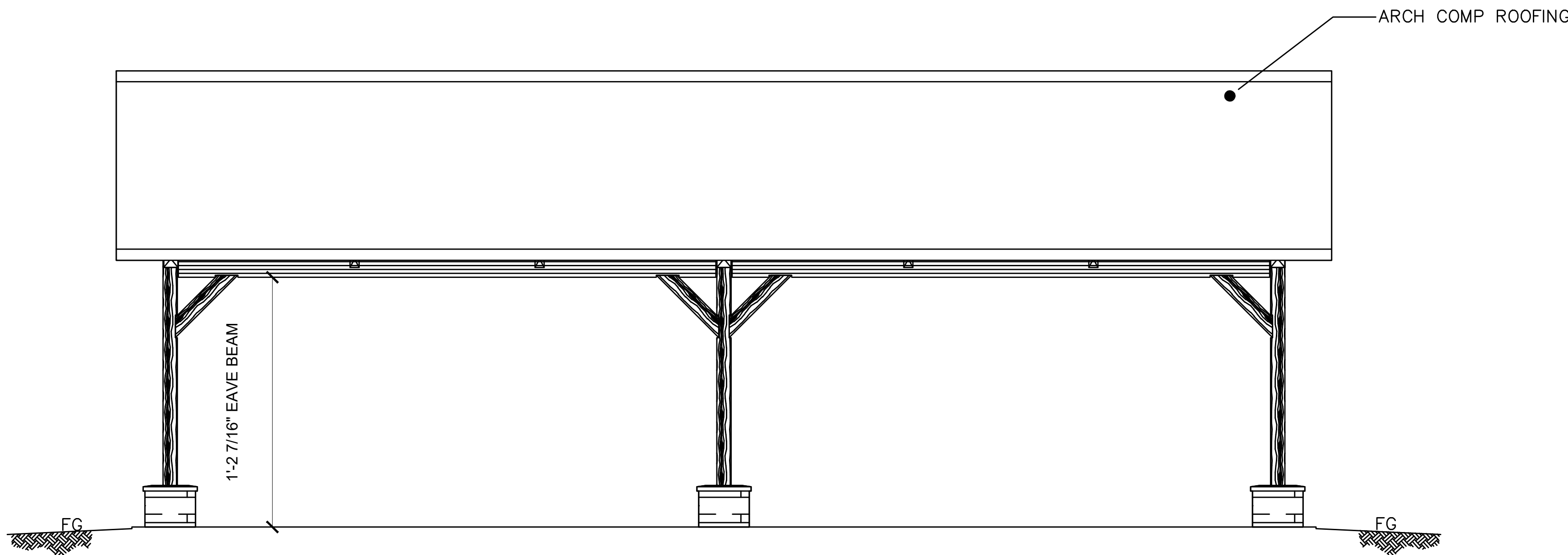
CONCRETE BY INSTALLER
TIMBER TRUSS, TYP (3)
RAFTER, TYP (8)



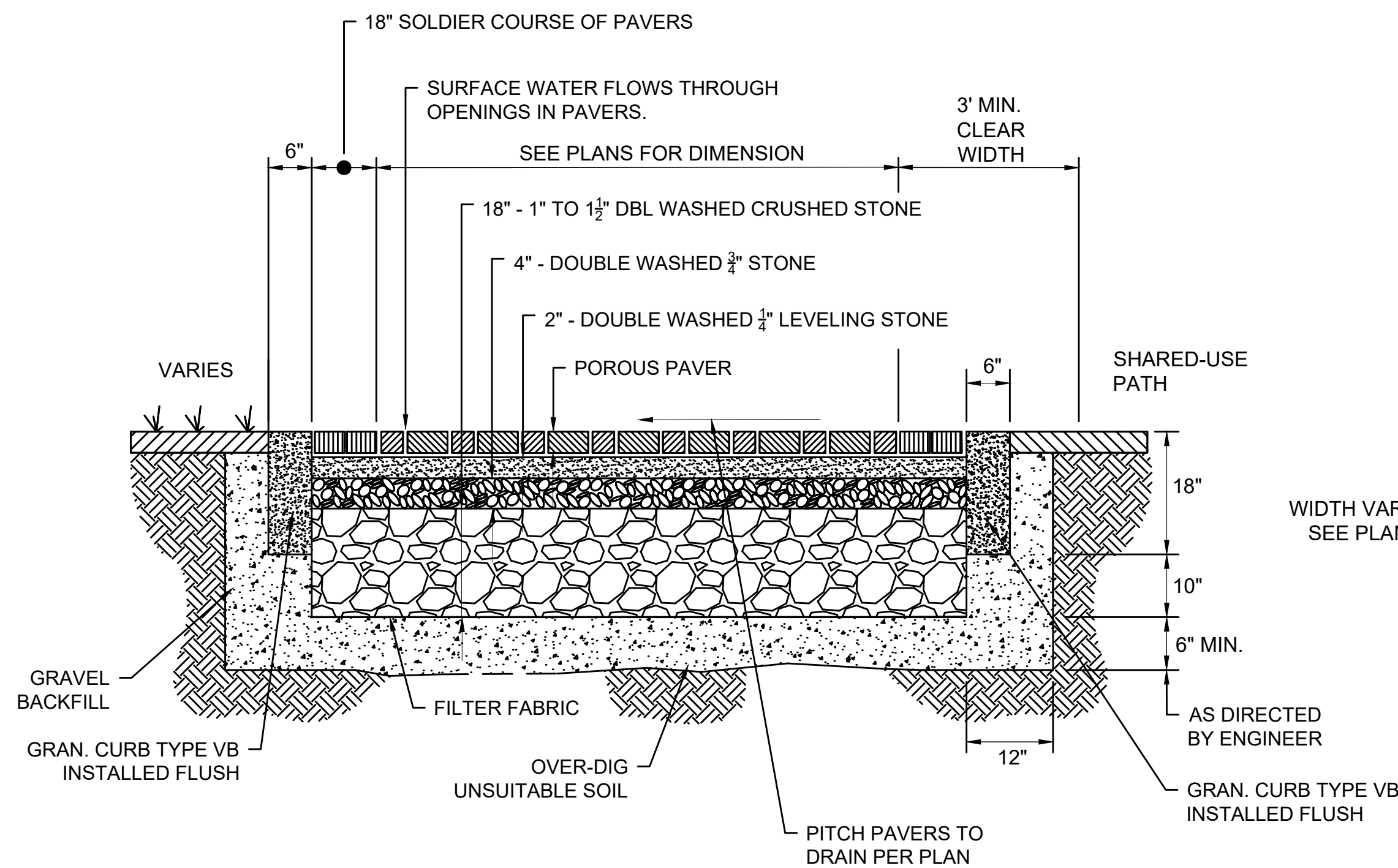
WOOD KNEE BRACES, TYP (14)
WOOD COLUMNS, TYP (6)



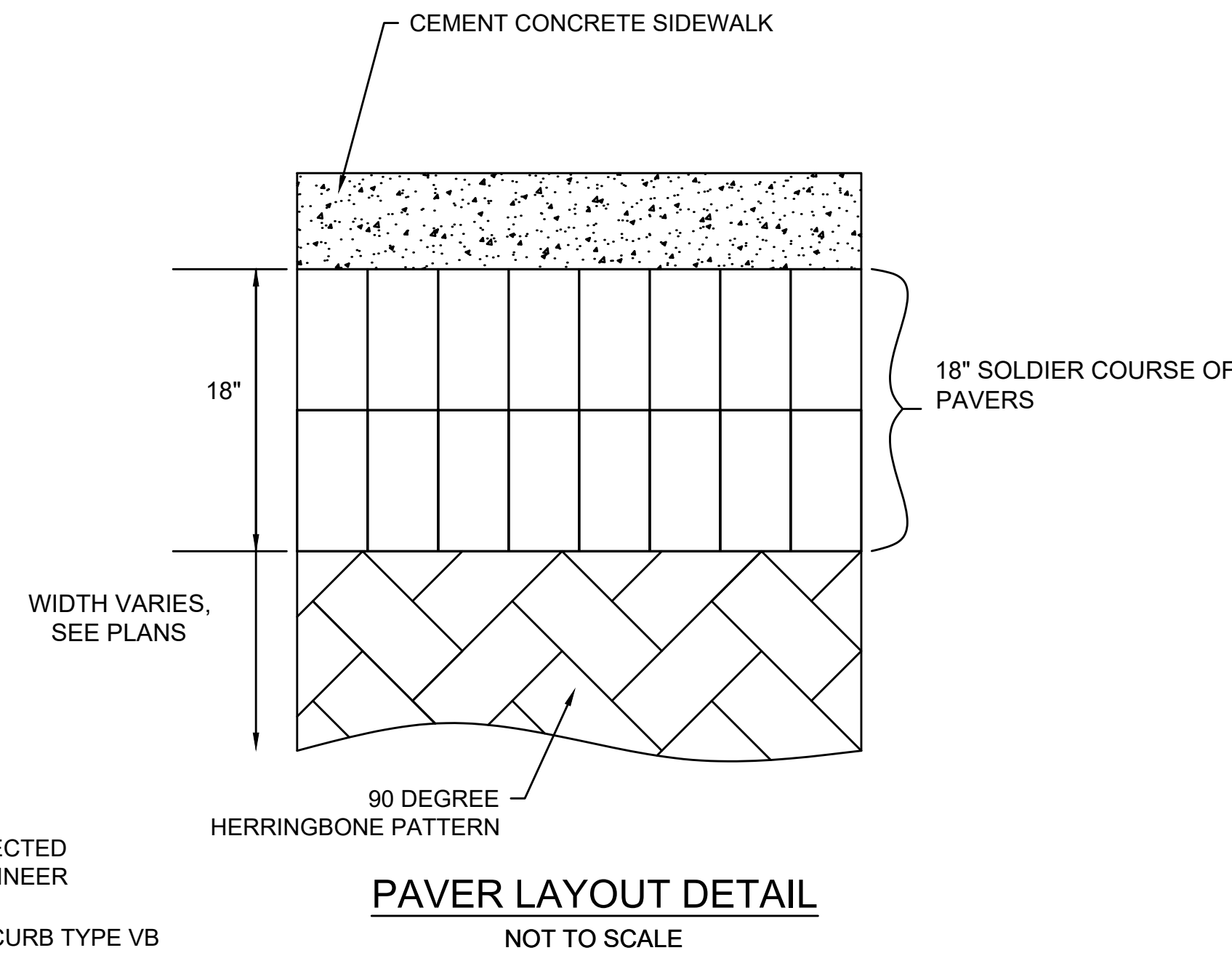
B ELEVATION VIEW
N.T.S



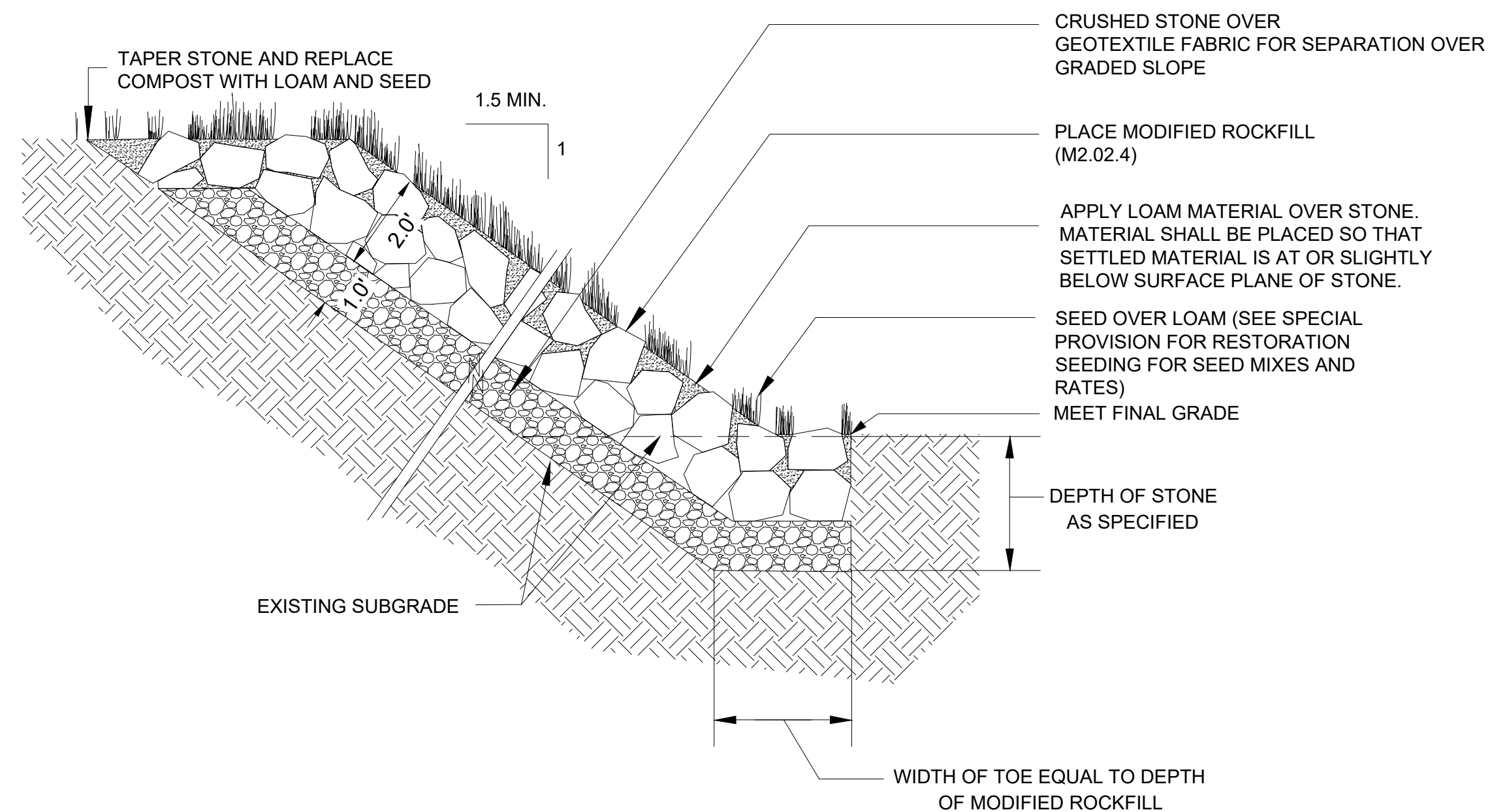
C ELEVATION VIEW
N.T.S



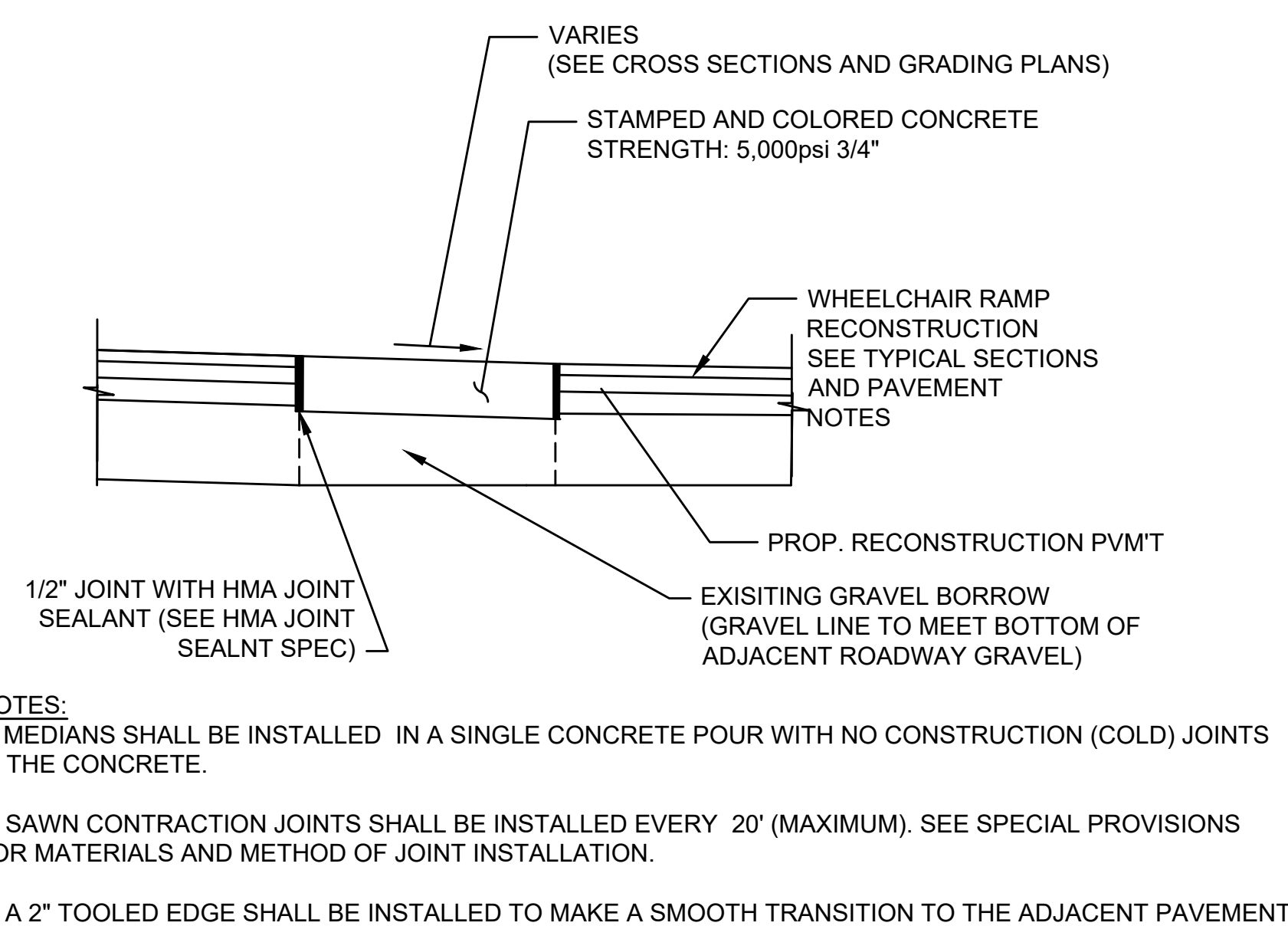
35 PERVIOUS PAVER TYPICAL SECTION
SCALE: N.T.S.



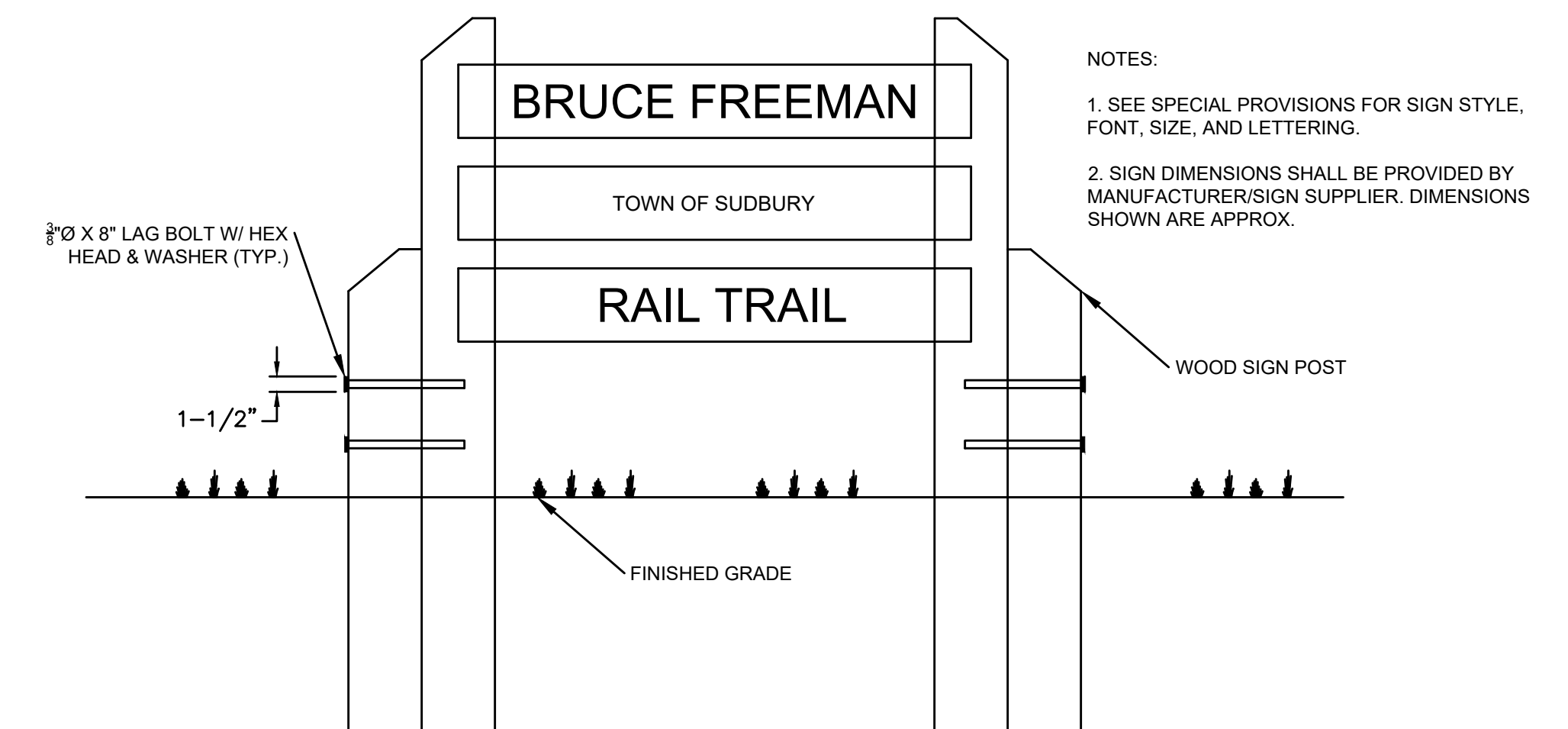
36 CONCRETE ART DISPLAY BASE
SCALE: N.T.S.



37 LOAM AND SEED OVER MODIFIED ROCKFILL
SCALE: N.T.S.

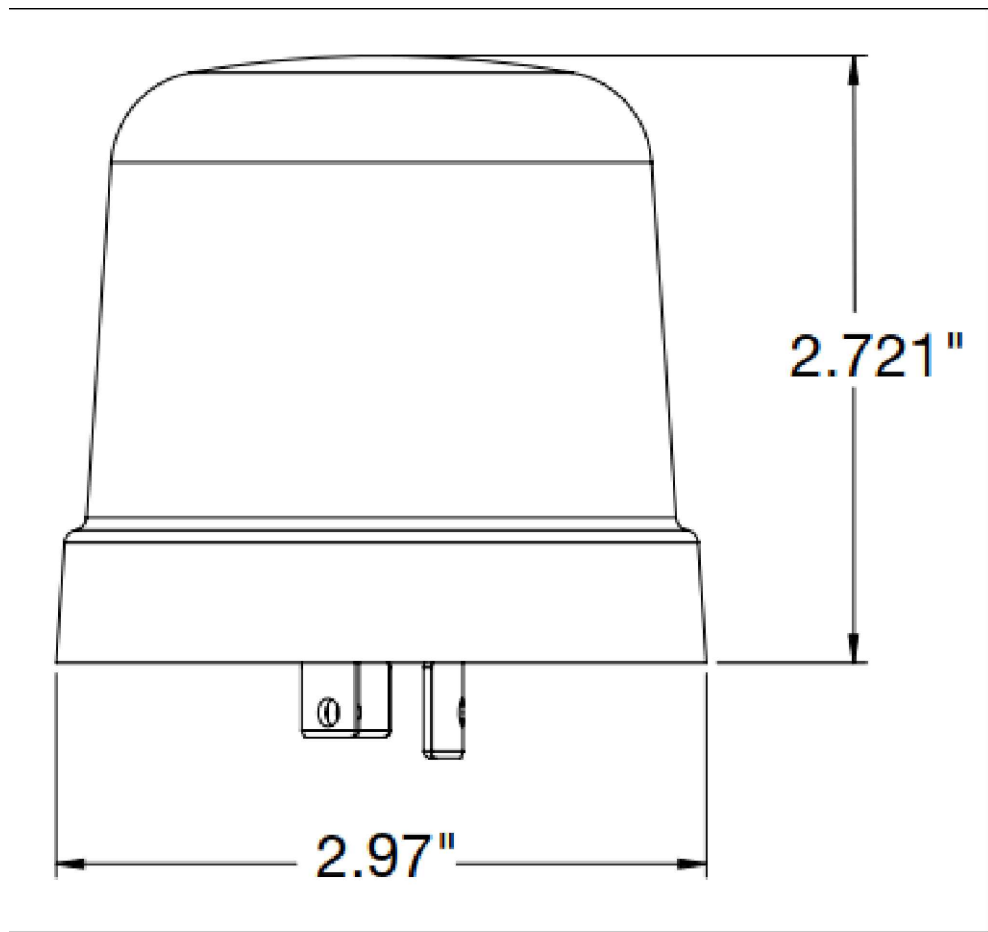


38 STAMPED & COLORED CONCRETE MEDIAN
- COLONIAL RED
SCALE: N.T.S.

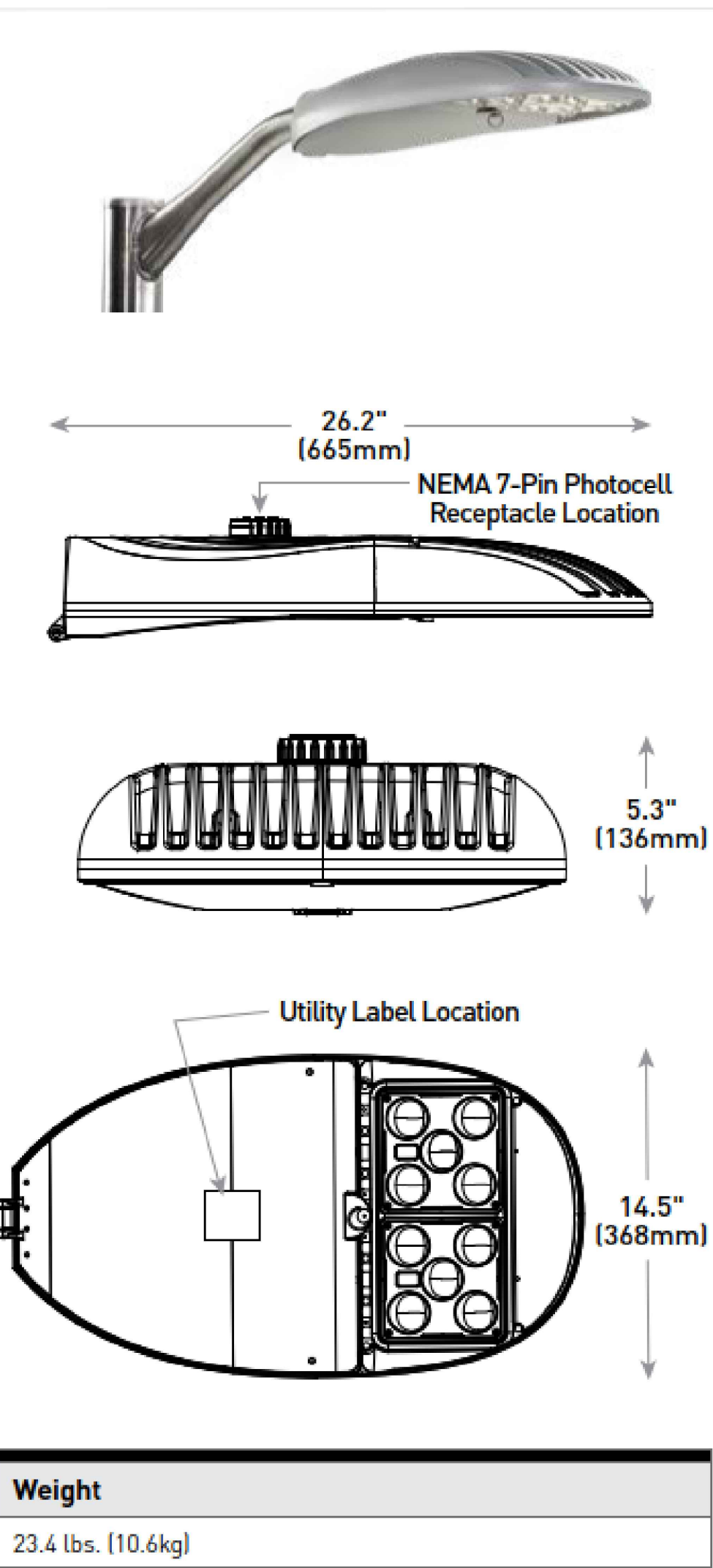


39 BRUCE FREEMAN RAIL TRAIL ENTRANCE SIGN
SCALE: N.T.S.

120-277 VOLT ELECTRIC PHOTO CONTROL
LOCKING TYPE MOUNTING



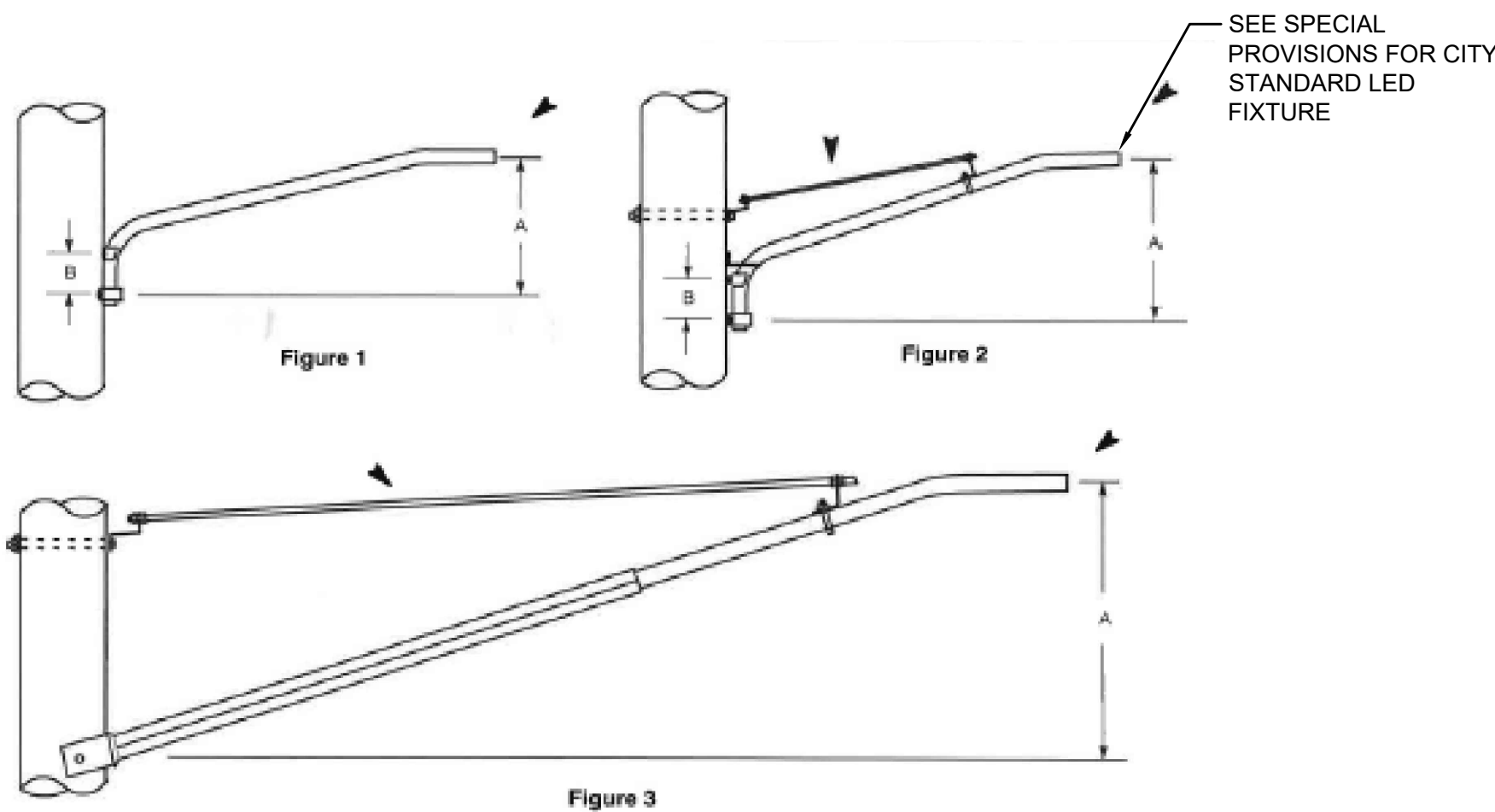
LED STREET/AREA LUMINARE



NOTES:

1. TO BE INSTALLED PER CITY STANDARD
2. HORIZONTAL TENSION MOUNTING
3. DIE CAST ALUMINUM HOUSING
4. INPUT VOLTAGE 120V - 277V
5. TO MEET ANSI C136.31-2001 AND 3G BRIDGE AND OVERPASS VIBRATION STANDARDS
6. TO DELIVER UP TO 23,800 LUMENS
7. WITH EFFICACY UP TO 139 LPW
8. CCT: 2700K, 3000K, 4000K, 5000K, 5700K

40 LED STREET/AREA LUMINARE (CITY STANDARD)
SCALE: N.T.S.

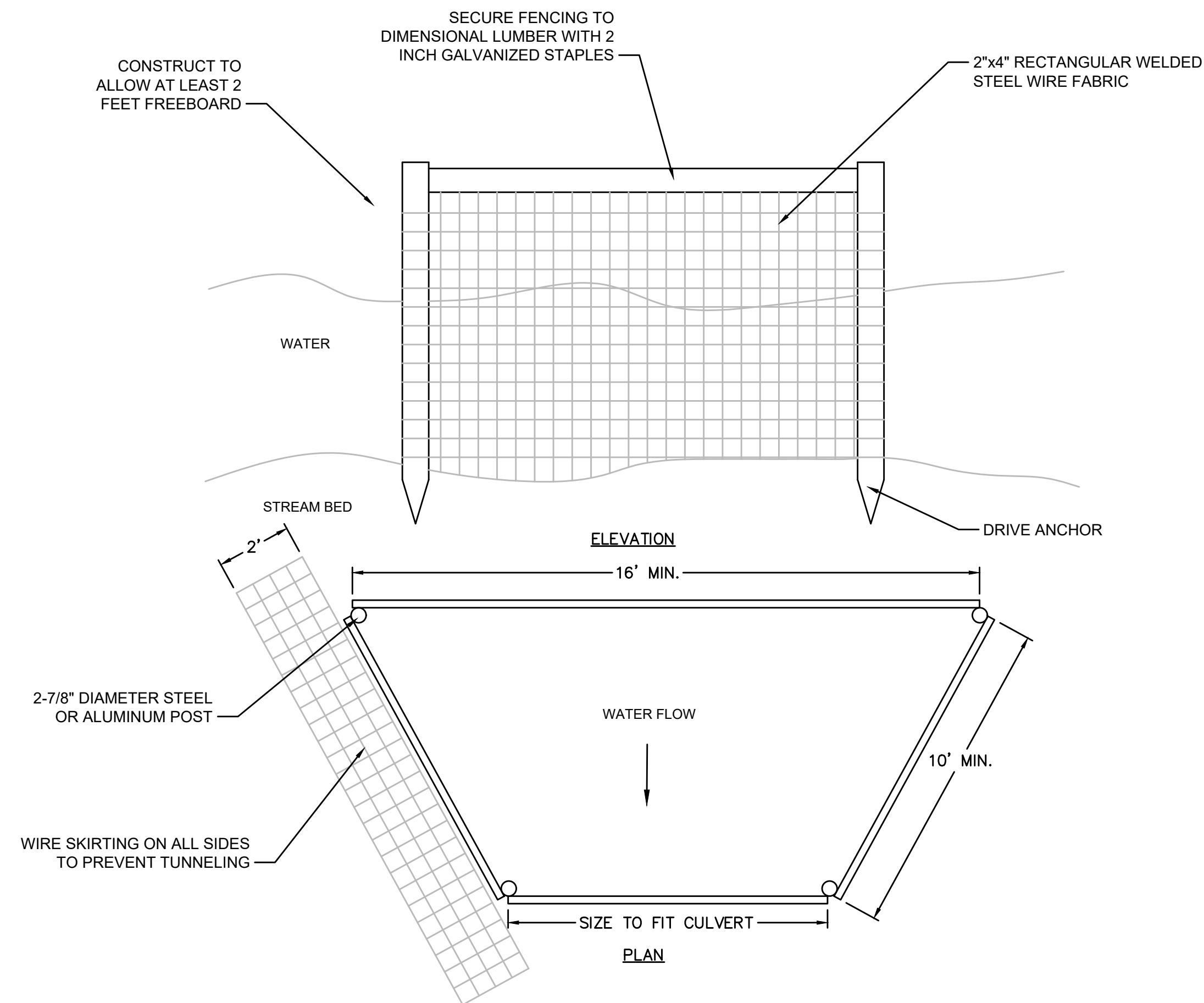


Bracket Size	Bracket Style Figure No.	Approximate Dimensions in Inches		Item Number	DTR 21.112 Pageback Variations
		A	B		
1 1/4" x 4"	1	18-19	11	511567	A thru C
1 1/4" x 6"	2	24-30	8-11	511568	D thru F
1 1/4" x 8"	2	19-31	8-13	511569	G thru I
1 1/4" x 10"	2	35-48	12-13	511570	J thru L
1 1/4" x 12"	3	40-43	—	511571	M thru O
1 1/4" x 16"	3	56-58	—	511572	P thru R
2" x 20"	3	67-73	—	511573	S thru U
2" x 8"	2	30	9	511498	V thru X

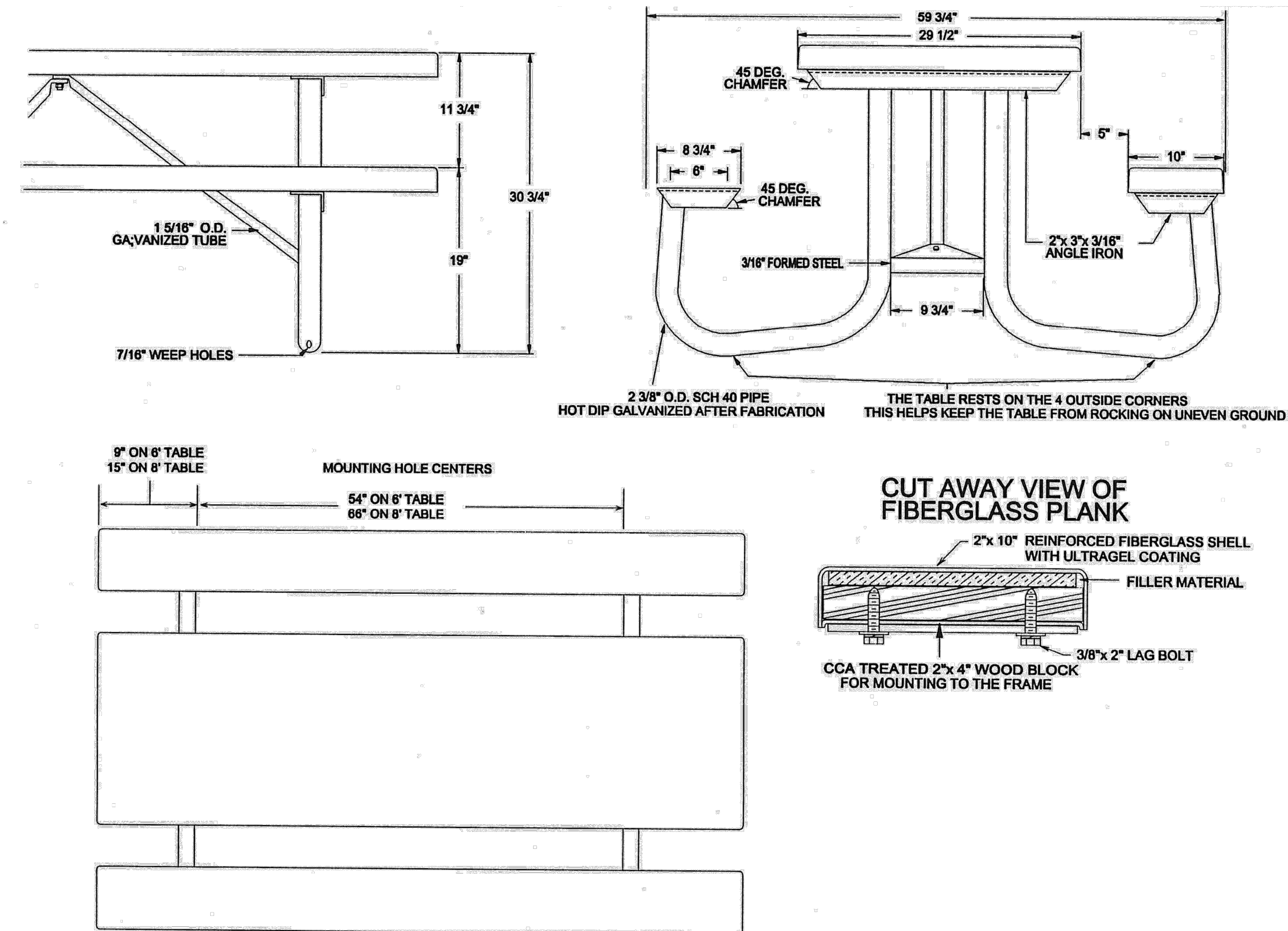
- Notes
1. Dimensions shown do not necessarily apply to brackets purchased before 1967.
 2. Variations shown depend on application.

AREA AND MUNICIPAL - GALVANIZED STEEL STREET LIGHT BRACKET FOR WOOD POLES				
ORIGINAL	DESIGN	APPROVED	DATE	BY
EVERSOURCE ENERGY	DESIGN & APPLICATION STANDARD	DTR 21.111	9	

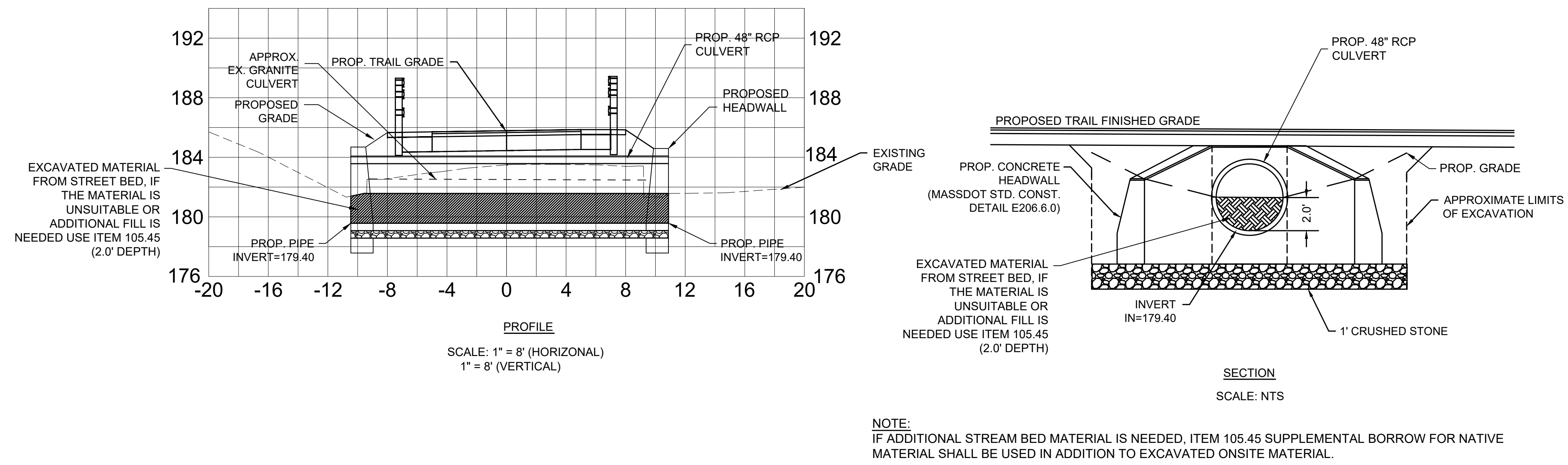
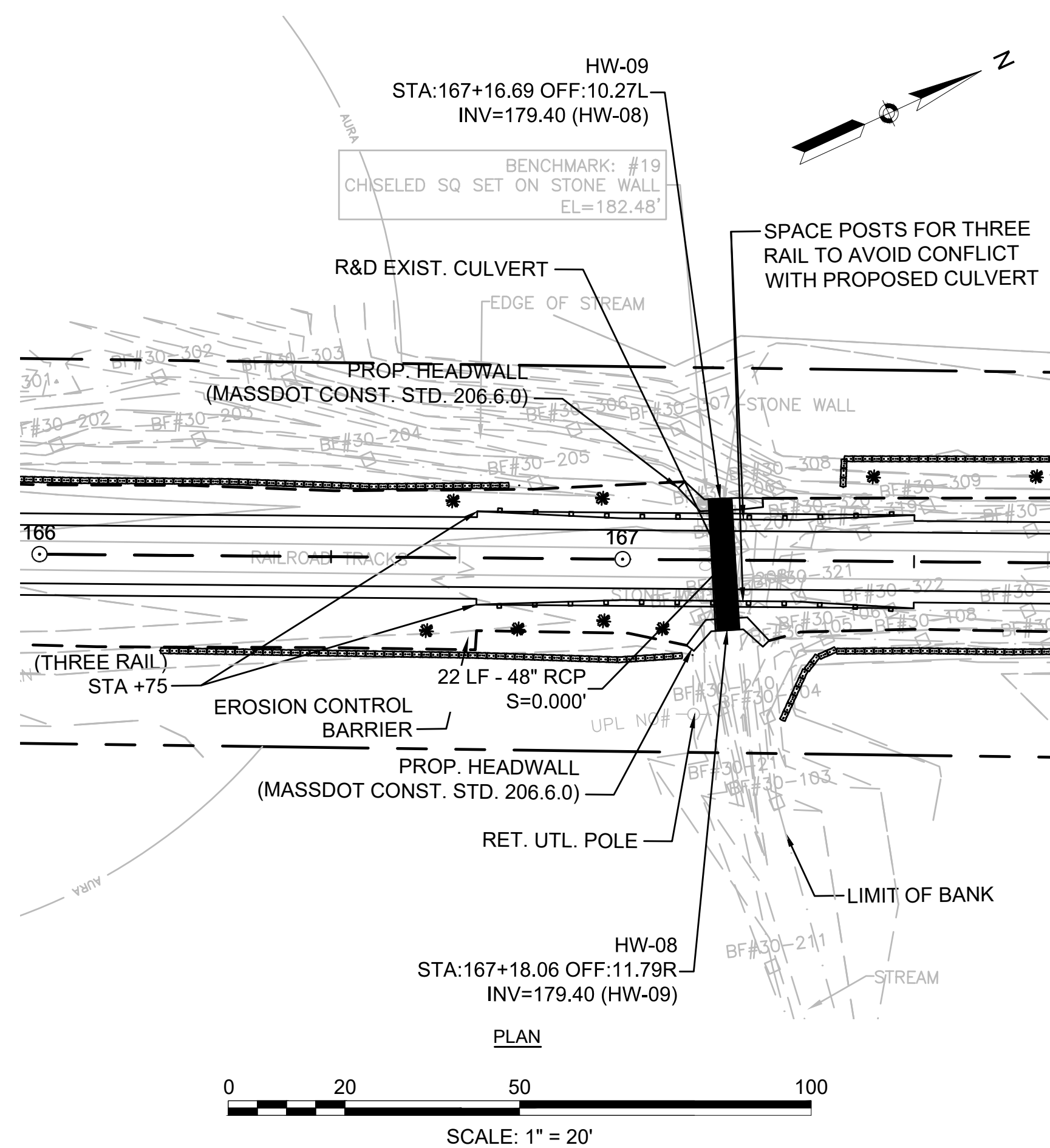
41 HIGHWAY LIGHTING FIXTURE ARM
SCALE: N.T.S.



42 TRAPAZOIDAL AQUATIC EXCLUSIONARY FENCING
SCALE: N.T.S.



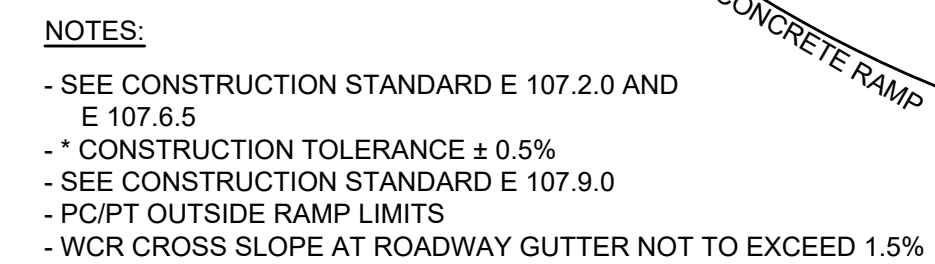
43 PICNIC TABLE
SCALE: AS NOTED



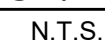
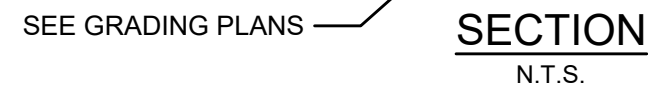
44 CONCRETE CULVERT REPLACEMENT – STA 167+17
SCALE: AS NOTED

1. ALL RAMPS ARE TO BE CONSTRUCTED WITH 6" THICKNESS OF CEMENT CONCRETE.
2. DETECTABLE WARNING PANELS SHALL BE PLASTIC - COLORED BRICK RED.

WHEELCHAIR RAMP DETAILS

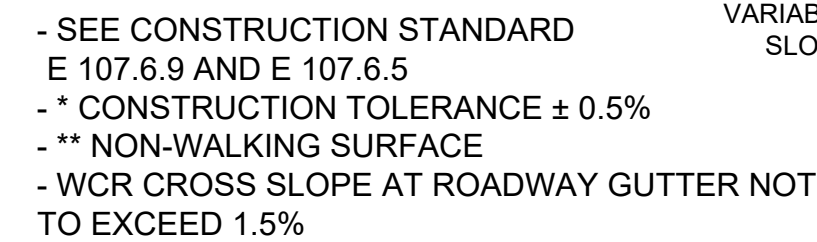


N.T.S.				
WCR#	RAMP REFERENCE POINT	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (W/1)	CORNER RADIUS
	STATION/ ROADWAY			
A1	108+59.82 UNION AVE.	17'-1"	12'-9"	20'
A2	175+53.03 HUDSON RD.	15'-8"	12'-7"	25'

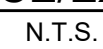


- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
- * CONSTRUCTION TOLERANCE $\pm 0.5\%$
- SEE CONSTRUCTION STANDARD E 107.9.0
- PC/PT OUTSIDE RAMP LIMITS
- WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

WCR#	RAMP REFERENCE POINT	WIDTH OF RAMP (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (WT)
	STATION/ ROADWAY		
B1	108+63.74 UNION AVE.	16'-5"	12'-7"
B2	115+96.13 CODJER LN.	15'-10"	12'-8"
B3	116+20.92 CODJER LN.	15'-1"	12'-7"
B4	142+82.00 OLD LANCASTER RD.	16'-2"	12'-7"
B5	215+94.04 MORSE RD.	16'-0"	12'-7"
B6	274+94.04 HAYNES RD.	15'-0"	12'-8"
B7	275+15.00 HAYNES RD.	15'-0"	12'-3"
B8	307+75.00 NORTH RD.	15'-7"	12'-7"



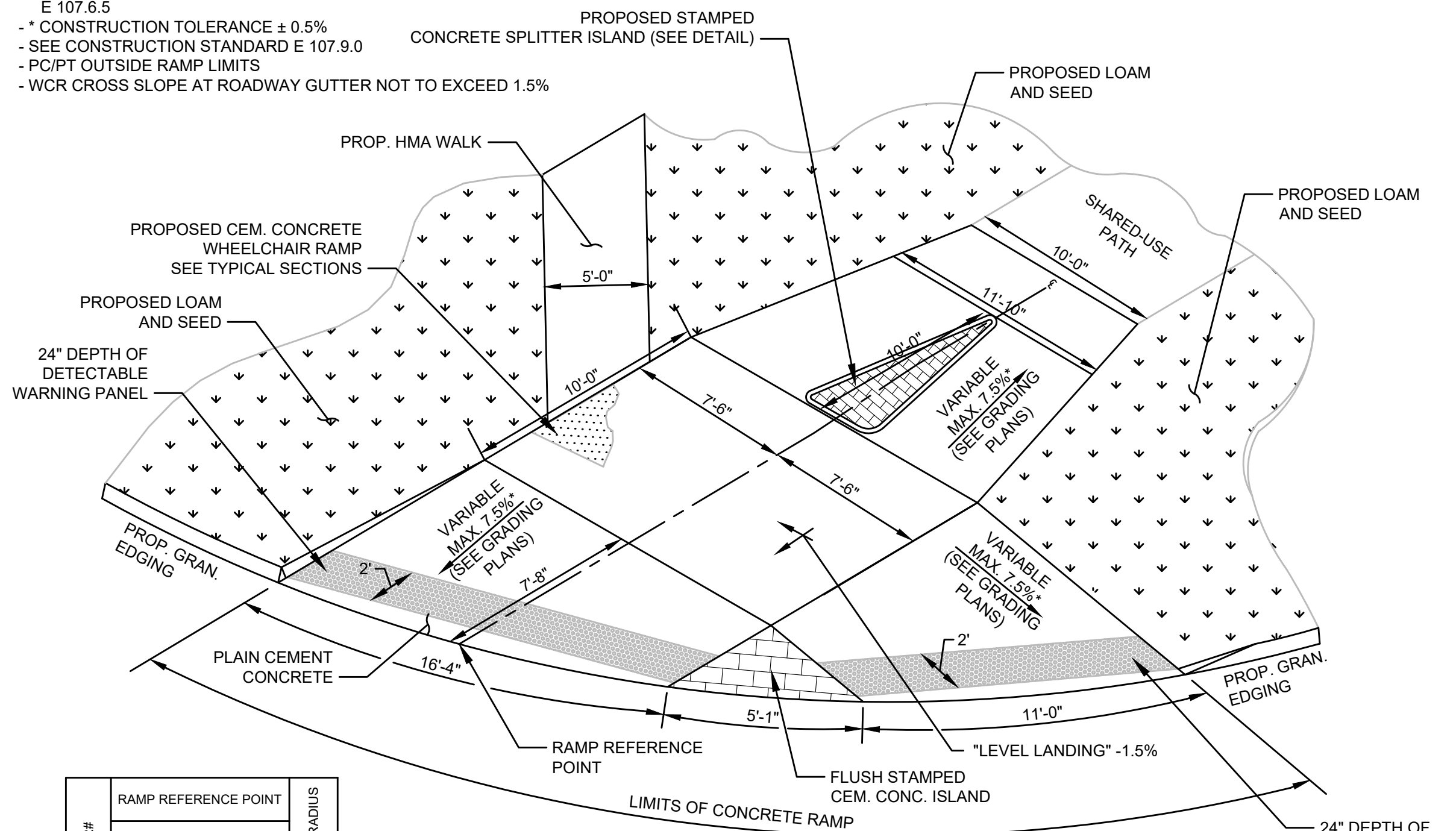
WCR#	RAMP REFERENCE POINT	WIDTH OF SIDEWALK (W)	WIDTH OF BUFFER STRIP (S)	WIDTH OF RAMP (R)	LENGTH OF RAMP (L)	LENGTH OF PRIMARY RAMP (W1)	LENGTH OF SECONDARY RAMP (W2)
	STATION/ ROADWAY						
C1	143+04.71 OLD LANCASTER RD.	4'-6"	4'-7"	15'-00"	11'-00"	10'-00"	
C2	215+73.57 MORSE RD.	5'-0"	5'-6"	15'-11"	15'-9"	10'-00"	
C3	307+48.47 NORTH RD.	8'-0"	4'-4"	15'-6"	19'-0"	10'-0"	



- NOTES:
1. ALL RAMPS ARE TO BE CONSTRUCTED WITH 6" THICKNESS OF CEMENT CONCRETE.
 2. DETECTABLE WARNING PANELS SHALL BE PLASTIC - COLORED BRICK RED.

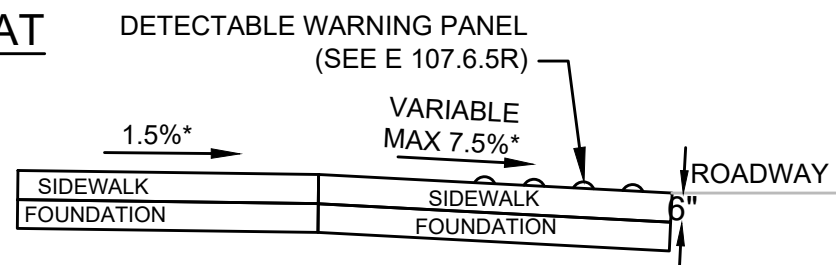
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	222	319
PROJECT FILE NO.		608164	
WHEELCHAIR RAMP DETAILS			

- NOTES:
- SEE CONSTRUCTION STANDARD E 107.2.0 AND E 107.6.5
 - * CONSTRUCTION TOLERANCE $\pm 0.5\%$
 - ** CONSTRUCTION STANDARD E 107.9.0
 - PC/PT OUTSIDE RAMP LIMITS
 - WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

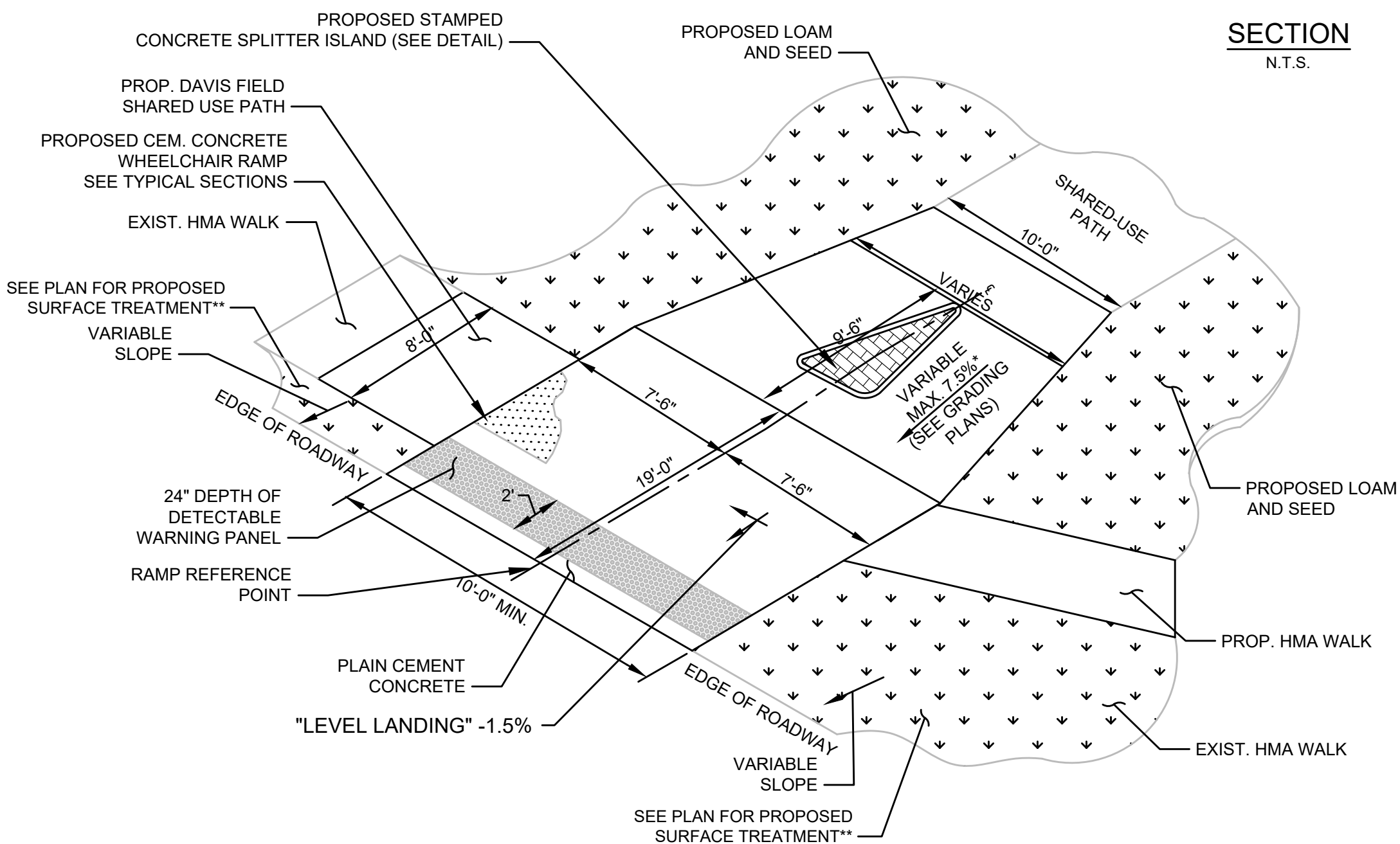


TYPE D SHARED USE PATH
ENTRANCE/EXIT RAMP ON CORNER RADIUS AT
PEAKHAM/HUDSON ROAD INTERSECIOTN
N.T.S.

WCR#	RAMP REFERENCE POINT	CORNER RADIUS
D1	175+09.54 HUDSON RD	40'

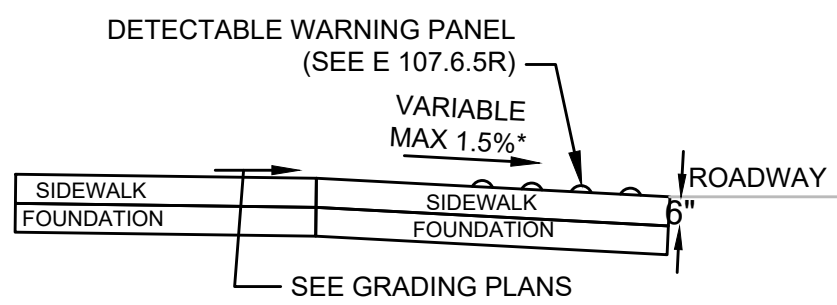


SECTION
N.T.S.



TYPE G SHARED USE PATH
ENTRANCE/EXIT RAMP AT NORTH ROAD
STA. 307+48
N.T.S.

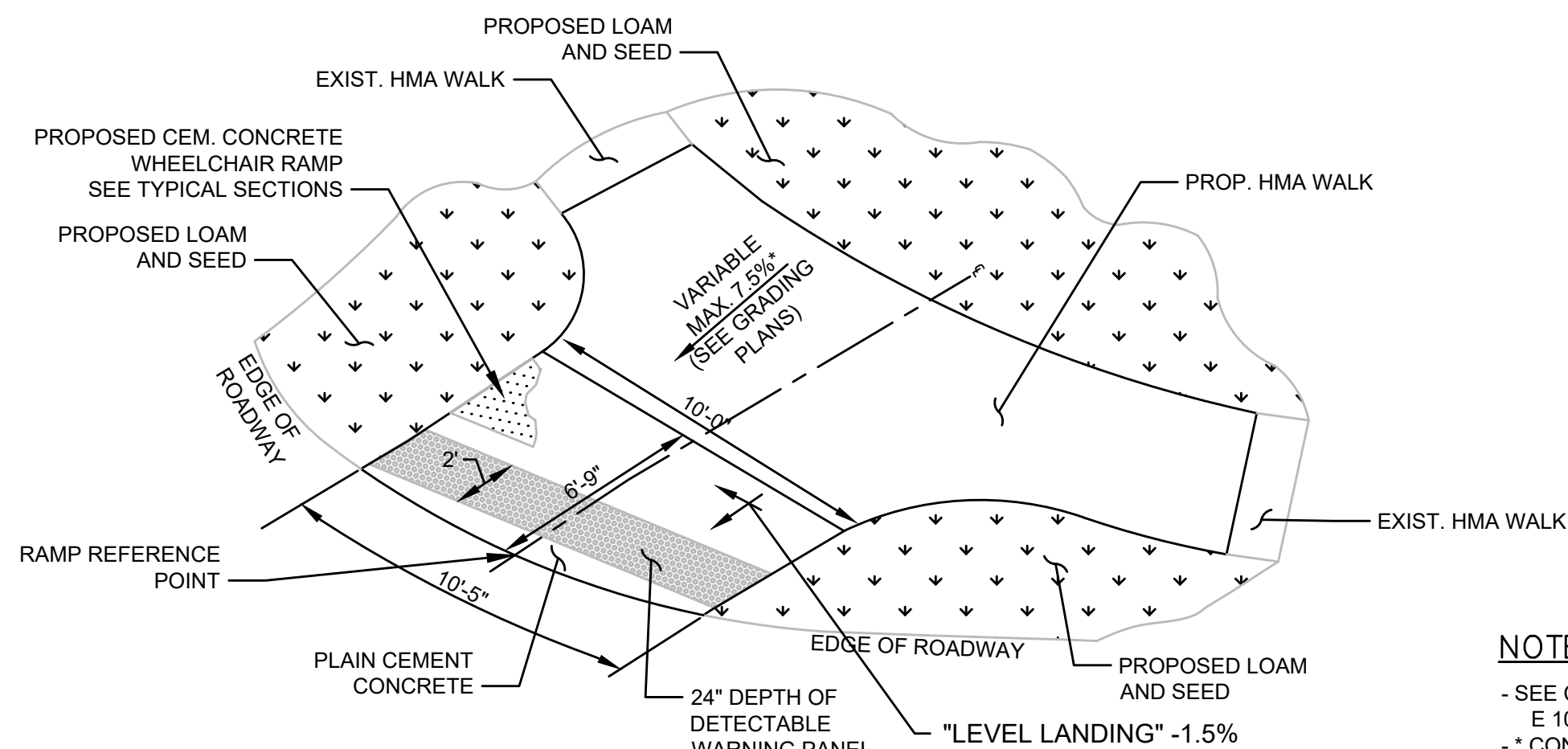
- NOTES:
- SEE CONSTRUCTION STANDARD E 107.6.9 AND E 107.6.5
 - * CONSTRUCTION TOLERANCE $\pm 0.5\%$
 - ** NON-WALKING SURFACE
 - WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%



SECTION
N.T.S.

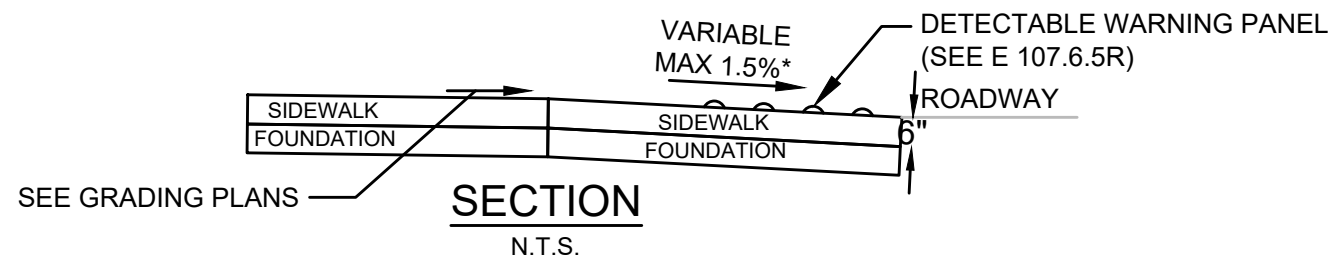
- NOTES:
- SEE CONSTRUCTION STANDARD E 107.6.5
 - * CONSTRUCTION TOLERANCE $\pm 0.5\%$
 - ** SEE CONSTRUCTION STANDARD E 107.9.0
 - WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

WCR#	RAMP REFERENCE POINT	STATION/ROADWAY	OFFSET	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (WT)
H1	1000+80.00 PARKINSON'S LOT	-	-	10'-0"	5'-0"
H2	216+60.31 BROADACRES FARM	51'-94"	-	10'-0"	6'-6"
H3	320+20.22 FAIRVIEW FARMS DRIVEWAY	-	-	10'-0"	10'-0"
H4	320+40.01 FAIRVIEW FARMS DRIVEWAY	-	-	10'-0"	10'-0"
H5	1107+63.72 DAVIS FIELD	-	-	8'-0"	8'-4"
H6	216+60.31 BROADACRES FARM	118'-43"	-	10'-0"	6'-0"

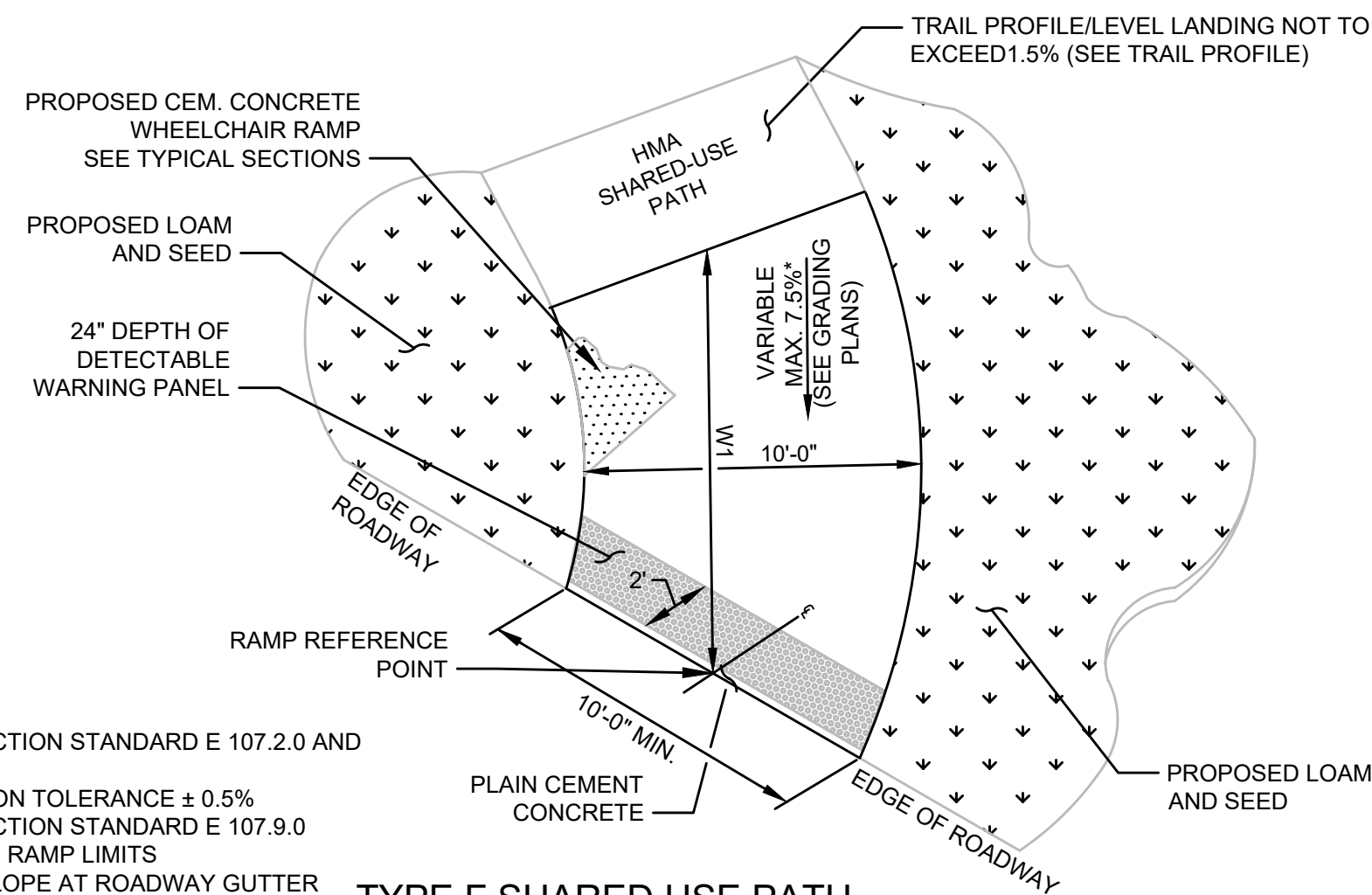


TYPE E WHEELCHAIR RAMP
ON CORNER RADIUS AT
PEAKHAM/HUDSON ROAD INTERSECTION
N.T.S.

WCR#	RAMP REFERENCE POINT	STATION/ROADWAY	OFFSET	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (WT)	CORNER RADIUS
E1	601+76.54 PEAKHAM RD	20.43'	-	10'-5"	6'-10"	40'

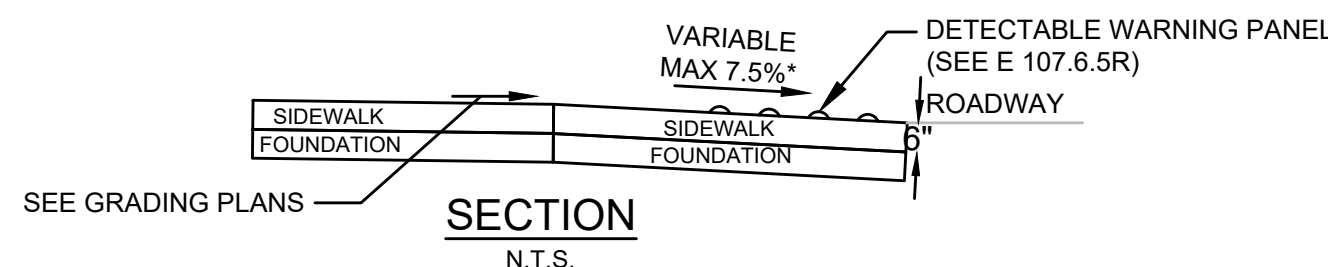


SECTION
N.T.S.



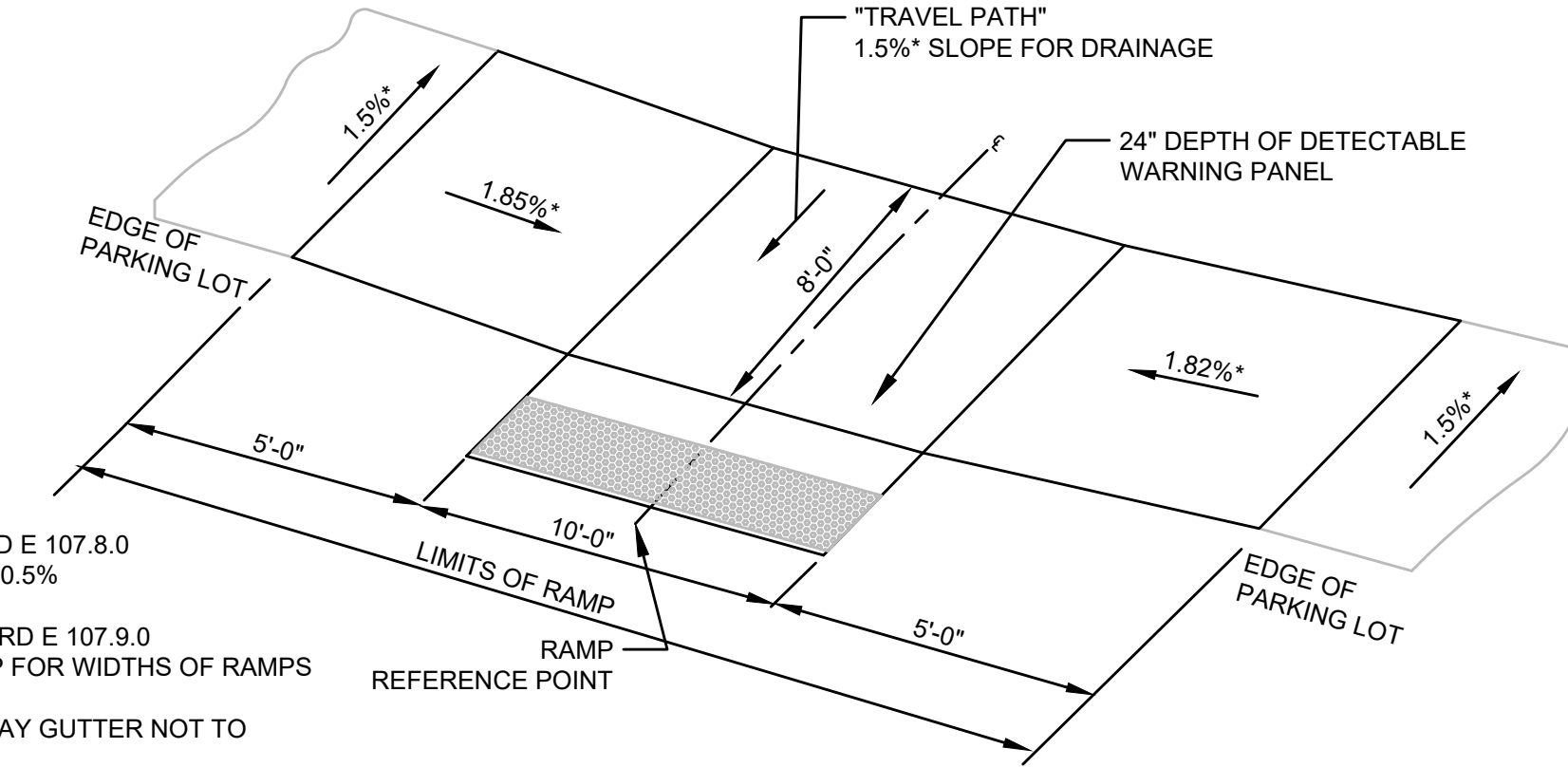
TYPE F SHARED USE PATH
ENTRANCE/EXIT RAMP
N.T.S.

WCR#	RAMP REFERENCE POINT	STATION/ROADWAY	WIDTH OF RAMP ENTRANCE (10'-0" MIN.)	LENGTH OF PRIMARY RAMP (WT)
F1	284+33.98 PANTRY RD.	-	10'-0"	15'-11"
F2	284+60.04 PANTRY RD.	-	10'-0"	15'-7"



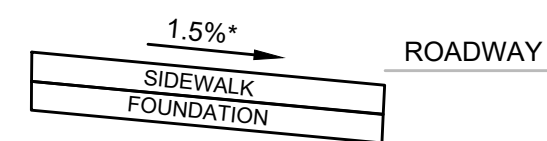
SECTION
N.T.S.

- NOTES:
- SEE CONSTRUCTION STANDARD E 107.8.0
 - * CONSTRUCTION TOLERANCE $\pm 0.5\%$
 - ** SIDEWALK ENDS
 - *** SEE CONSTRUCTION STANDARD E 107.9.0
 - **** MAX. 4" HEIGHT OF DR. RAMP FOR WIDTHS OF RAMPS FROM 2'-4'
 - WCR CROSS SLOPE AT ROADWAY GUTTER NOT TO EXCEED 1.5%

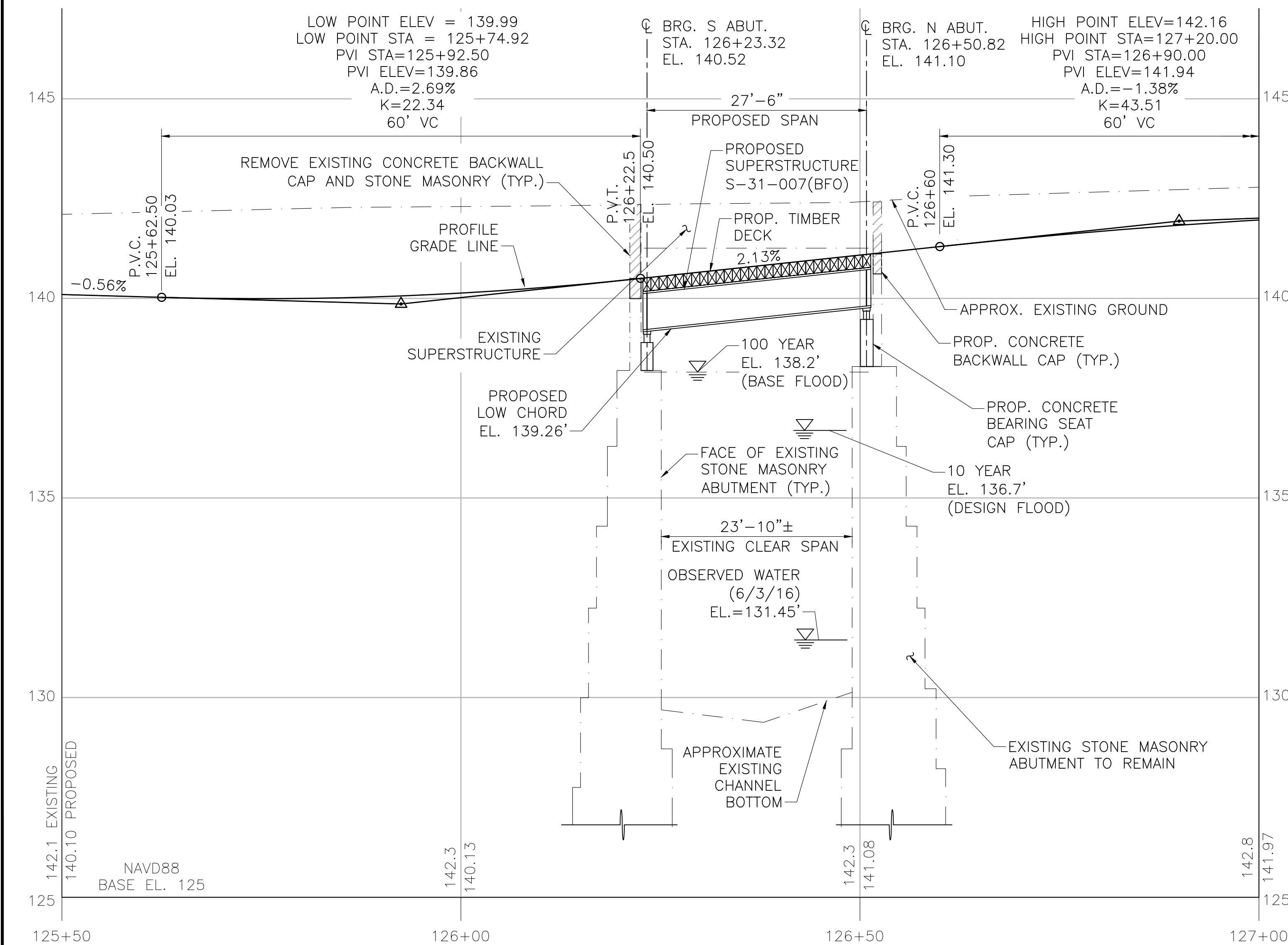
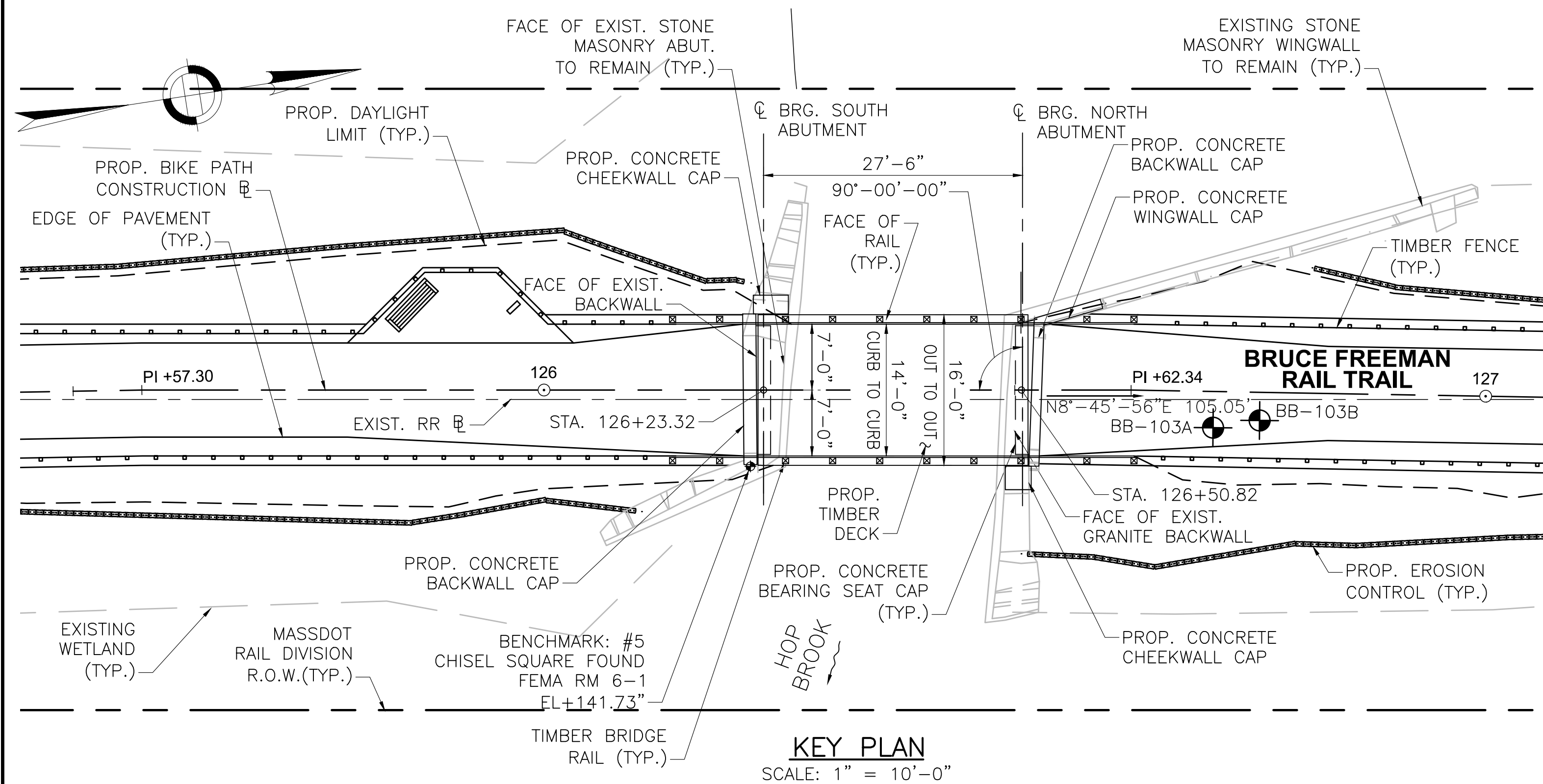


TYPE I WHEELCHAIR RAMP
SHARED-USE PATH ENTRANCE/EXIT AT DAVIS FIELD PARKING LOT
N.T.S.

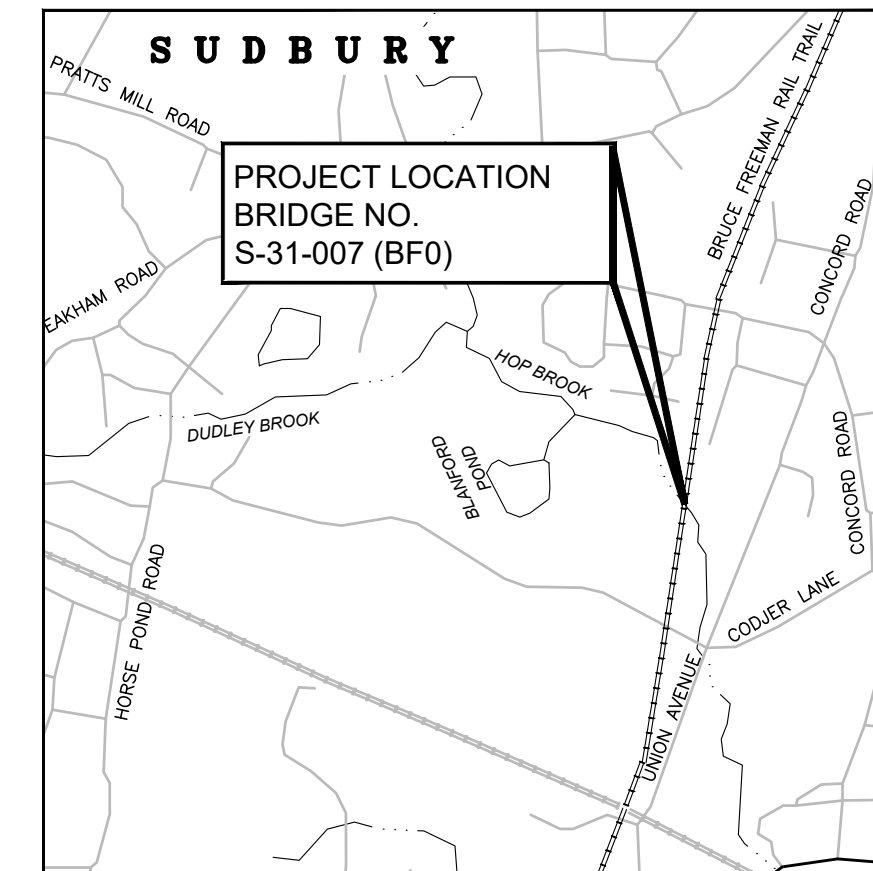
WCR#	DRIVEWAY REFERENCE POINT	STATION/ROADWAY	OFFSET
I-1	1105+91.83 DAVIS FIELD	-	4.00' LT



SECTION
N.T.S.



PROFILE ALONG BIKE PATH
HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"



LOCUS PLAN
SCALE: 1" = 1200'

ITEM NO.:	ITEM:	QUANTITY:
114.1	DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. S-31-007	1 LS
127.1	REINFORCED CONCRETE EXCAVATION	3 CY
140.	BRIDGE EXCAVATION	5 CY
144.	CLASS B ROCK EXCAVATION	5 CY
151.2	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	2 CY
482.20	HOT POURED JOINT SEALER	29 FT
690.	STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR	6 CY
690.91	MASONRY REPOINTING	65 SY
991.1	CONTROL OF WATER - STRUCTURE NO. S-31-007	1 LS
995.	BRIDGE SUPERSTRUCTURE, BRIDGE NO. S-31-007	1 LS

ESTIMATED QUANTITIES:
(NOT GUARANTEED)

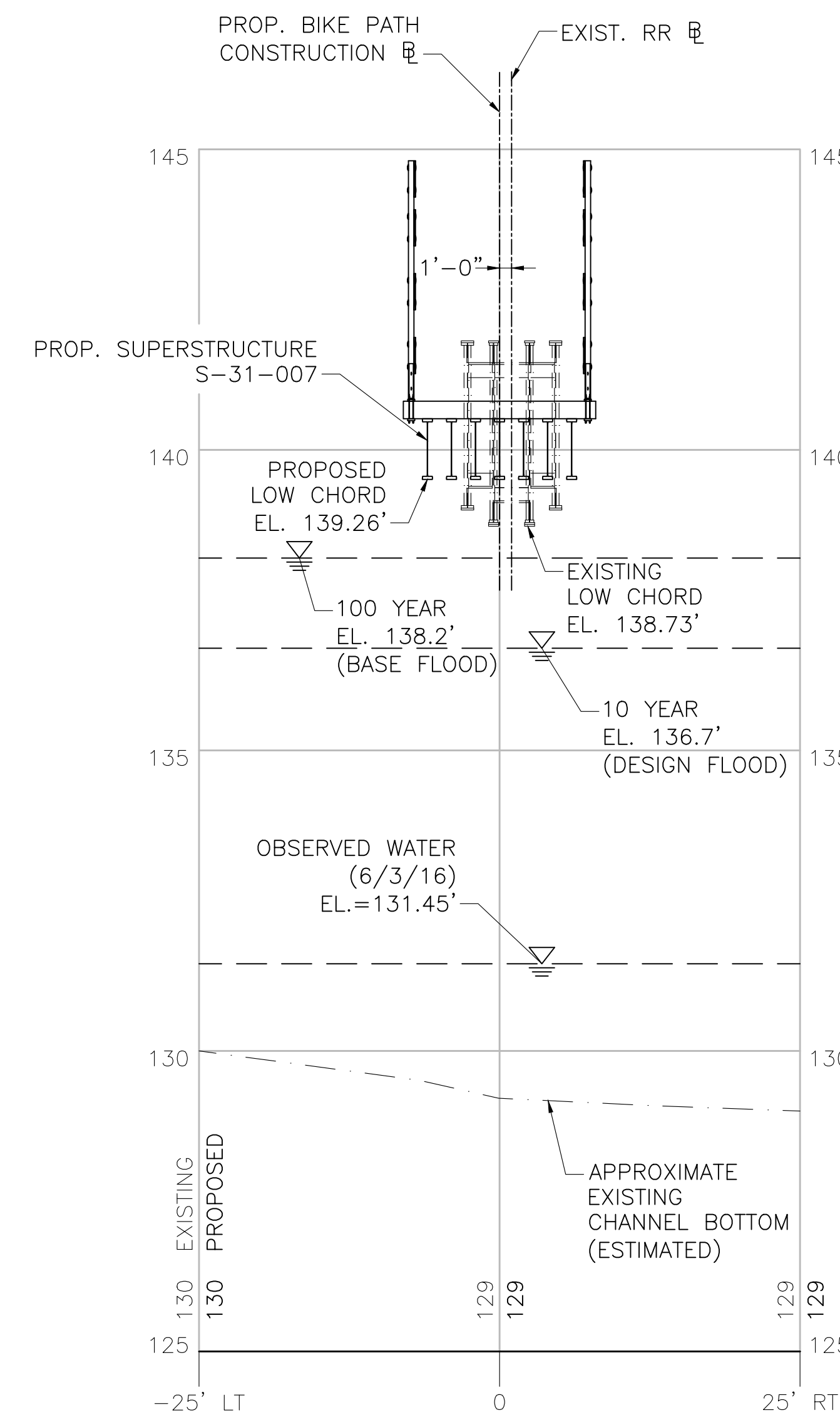
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	223	319
PROJECT FILE NO.		608164	



KEY PLAN & PROFILE

INDEX

SHEET NO.	DESCRIPTION
1	KEY PLAN AND PROFILE
2	GENERAL NOTES
3	BORING LOGS
4	GENERAL PLAN AND ELEVATION
5	ABUTMENT REMOVAL PLANS AND ELEVATIONS
6	SOUTH ABUTMENT PLAN AND ELEVATION
7	NORTH ABUTMENT PLAN AND ELEVATION
8	SUBSTRUCTURE DETAILS
9	BEARING DETAILS
10	FRAMING PLAN AND STRUCTURAL STEEL DETAILS
11	DECK DETAILS AND TYPICAL SECTION
12	TIMBER BRIDGE RAIL DETAILS



PROFILE ALONG HOP BROOK
HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"

P.E. STAMP SIGNATURE	MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
	 PROPOSED SUPERSTRUCTURE REPLACEMENT SUDBURY BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK MASSACHUSETTS DEPARTMENT OF TRANSPORTATION HIGHWAY DIVISION 10 PARK PLAZA BOSTON, MASS	
 FUSS & O'NEILL 1550 MAIN STREET, SUITE 400 SPRINGFIELD, MA 01103 413.452.0445 www.fando.com	TITLE: _____ CHIEF ENGINEER	

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	224	319
PROJECT FILE NO.		608164	

GENERAL NOTES

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2021 AND THE 2009 LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES FOR H-10 VEHICULAR AND 90 PSF PEDESTRIAN LOADINGS.

MASSDOT BENCH MARK:

BM #5 CHISEL SQUARE FOUND
FEMA RM 6-1
ELEV. = 141.73'

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

DATE:

TO BE PLACED ON THE FACE OF THE NORTHEAST AND SOUTHWEST PROPOSED CONCRETE CHEEKWALL CAPS. A DETAIL SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST CONCRETE CHEEKWALL CAP IS CONSTRUCTED. BOTH CONCRETE CHEEKWALL CAPS SHALL FEATURE THE SAME DATE.

SURVEY NOTEBOOKS:

SURVEY PERFORMED BY VANASSE HANGEN BRUSTLIN, INC FIELD NOTEBOOKS SHALL BE OBTAINED FROM FUSS AND O'NEILL, INC. SPRINGFIELD, MA.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS (A3).

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE OF THE PROPOSED STRUCTURE, AS DIRECTED BY THE ENGINEER.

DIMENSIONS:

ALL DIMENSIONS SHOWN ON PLANS ARE FOR STRUCTURES AT 68" F, UNLESS OTHERWISE NOTED.

EXISTING CONSTRUCTION:

DIMENSIONS SHOWN ARE TAKEN FROM SURVEY, VARIOUS FIELD MEASUREMENTS, AND GEOTECHNICAL EXPLORATION AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER. EXISTING BRIDGE PLANS ARE NOT AVAILABLE FOR REFERENCE.

TIMBER:

ALL STRUCTURAL TIMBER FOR DECKING SHALL BE PRESSURE TREATED MIXED SOUTHERN PINE GRADE 1 OR APPROVED EQUAL.

CONCRETE:

4,000 PSI, $\frac{3}{4}$ INCH, 610 CEMENT CONCRETE SHALL BE PROVIDED FOR THE BEARING SEATS, WINGWALL CAPS, BACKWALL RESTORATION, AND CHEEK WALLS.

4,000 PSI $1\frac{1}{2}$ INCH, 565 CEMENT CONCRETE SHALL BE PROVIDED FOR CONCRETE ENCASEMENT OF THE FIRST RAIL POST OFF THE BRIDGE IF MINIMUM EMBEDMENT OF POST CANNOT BE MET.

REINFORCEMENT:

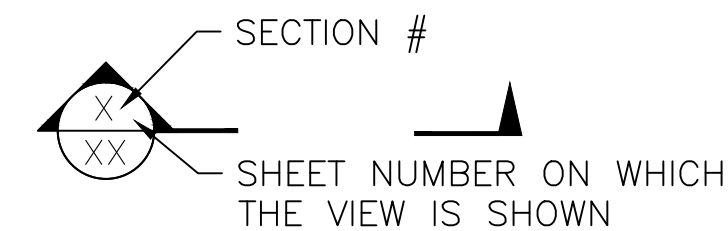
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. EPOXY COATED BARS, COVER < 3d _b , OR CLEAR SPACING < 6d _b	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

ALL OTHER BARS SHOULD BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ALL REINFORCEMENT IN CONCRETE BACKWALL, BEARING SEAT, CHEEKWALL, AND WINGWALL CAPS SHALL BE EPOXY COATED.

SECTION MARK:



TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	N/A	
AVERAGE DAILY TRAFFIC – PRESENT	N/A	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	N/A	
DESIGN HOURLY VOLUME	N/A	
DIRECTIONAL DISTRIBUTION	N/A	
TRUCK PERCENTAGE – AVERAGE DAY	N/A	
TRUCK PERCENTAGE – PEAK HOUR	N/A	
DESIGN SPEED	18 MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	N/A	

SEISMIC DESIGN CRITERIA

DESIGN RETURN PERIOD:	1,000
DESIGN SPECTRA	
As	0.11
SDs	0.23
SD1	0.09
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA

DRAINAGE AREA (SQ. MILES)	14.7
DESIGN FLOOD DISCHARGE (C.F.S.)	452
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S.)	2.66
DESIGN FLOOD ELEVATION (FEET, NAVD)	136.7

BASE (100-YEAR) FLOOD DATA

BASE FLOOD DISCHARGE (C.F.S.)	881
BASE FLOOD ELEVATION (FEET, NAVD)	138.2

DESIGN AND CHECK SCOUR DATA

DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	N/A
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A

FLOOD OF RECORD

DISCHARGE (C.F.S.)	N/A
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	N/A
EVIDENCE OF SCOUR AND EROSION	N/A


MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

**SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK**

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	225	319
PROJECT FILE NO.		608164	

BORING LOGS

LOG OF TEST BORING

				PROJECT LOCATION OWNER JOB NUMBER				Bruce Freeman Rail Trail Sudbury, MA MASSDOT E2X81800				BORING NO.		BB-103A							
INSPECTOR S. Ramesh				CONTRACTOR NEBC				DRILLER DRILL RIG		S. Cooley Acker Soil Scout		ELEVATION DATUM		142.5 NAVD 88							
METHOD OF DRILLING Split Spoon Sample Terminated				GROUNDWATER READINGS DATE/TIME 09-03-2019 /				DEPTH(ft) SPT HAMMER None Encountered		140 lb R&C Safety GRID COORD E		N 2960021 677573		DATE START DATE END		9/3/19 9/3/19					
ELEV (ft) DEPTH (ft) SAMPLE DATA N. VALUE SAMPLE NO. DEPTH INTERVAL (ft) PEN/REC (in)/(in) P/C (ppt) LAYER NAME FILL				SOIL AND ROCK DESCRIPTION												NOTES					
2 3 2 1 3 3 4 5 3 3 3 3 4 3 5 2 8 50/5" 50/0"				5 S1 0 - 2 24/10 6 S2 2 - 4 24/12 6 S3 4 - 6 24/16 7 S4 6 - 8 24/17 50/5" S5 8 - 9.4 17/12 50/0" S6 10 - 10 0/0				S1: (0-4") Topsoil. Dry, black, medium SAND, trace Gravel. (4-10") Dry, brown, fine SAND, trace Silt. S2: Dry, loose, brown, medium to coarse SAND, little Gravel. S3: Dry, loose, brown, fine to medium SAND, some Silt. S4: Dry, loose, brown, fine to coarse SAND, little Silt. S5: Dry, very dense, brown, medium to coarse SAND, little Gravel, trace Silt. Bottom of Borehole at 10 feet.												1 2	
Page 1: 0-35 feet. Each subsequent page displays 40 feet.																					
NOTES																					
1. Boring terminated at 10' due to an obstruction. 2. Boring offset 5' north and continued. See boring log BB-103B.																					

LOG OF TEST BORING

				PROJECT Bruce Freeman Rail Trail LOCATION Sudbury, MA OWNER MASSDOT JOB NUMBER E2X81800				BORING NO.		BB-103B																																																																																																									
INSPECTOR S. Ramesh				CONTRACTOR NEBC				DRILLER S. Cooley DRILL RIG Acker Soil Scout		SHEET 1 OF 2																																																																																																									
METHOD OF DRILLING Split Spoon Sample				GROUNDWATER READINGS				ELEVATION 142.5 DATUM NAVD 88		DATE TIME 09-04-2019 / 7:07 am																																																																																																									
DATE/TIME 09-04-2019 / 7:07 am				DEPTH(ft) 9.4				REMARKS SPT HAMMER 140 lb R&C Safety During Drilling (In Casing)		COORD E 2960026 DATE START 9/3/19																																																																																																									
0.0 Wash Boring w/ 3" Casing				14.0 NX Rock Core				31.5 Terminated		DATE END 9/4/19																																																																																																									
41.5				41.5				41.5		41.5																																																																																																									
<table border="1"> <thead> <tr> <th>ELEV (ft)</th> <th>DEPTH (ft)</th> <th>SAMPLE DATA</th> <th>N. VALUE</th> <th>SAMPLE NO.</th> <th>DEPTH INTERVAL (ft)</th> <th>PEN/REC (in)/(in)</th> <th>PID (ppm)</th> <th>LAYER NAME</th> <th>SOIL AND ROCK DESCRIPTION</th> <th>NOTES</th> </tr> </thead> <tbody> <tr> <td>140</td> <td>5</td> <td></td> <td></td> <td>4</td> <td>S6</td> <td>10 - 12</td> <td>24/18</td> <td rowspan="5">SILT</td> <td>Drill through.</td> <td></td> </tr> <tr> <td>135</td> <td></td> <td></td> <td></td> <td>13</td> <td>S7</td> <td>12 - 14</td> <td>24/22</td> <td>S6: Wet, medium stiff, brownish black SILT and fine SAND, trace roots.</td> <td></td> </tr> <tr> <td>130</td> <td></td> <td></td> <td></td> <td>13</td> <td>S7</td> <td>12 - 14</td> <td>24/22</td> <td>S7: Similar to S6.</td> <td></td> </tr> <tr> <td>125</td> <td></td> <td></td> <td></td> <td>13</td> <td>S8</td> <td>14 - 16</td> <td>24/15</td> <td>S8: Wet, black, non-plastic SILT, some fine Sand, trace wood chips, faint organic odor in sample.</td> <td></td> </tr> <tr> <td>120</td> <td></td> <td></td> <td></td> <td>29</td> <td>S9</td> <td>16 - 18</td> <td>24/21</td> <td>S9: Wet, very stiff, brown, non-plastic SILT, trace fine Sand.</td> <td></td> </tr> <tr> <td>115</td> <td></td> <td></td> <td></td> <td>23</td> <td>S10</td> <td>18 - 20</td> <td>24/16</td> <td rowspan="3">GRAVEL</td> <td>S10: Similar to S9.</td> <td></td> </tr> <tr> <td>110</td> <td></td> <td></td> <td></td> <td>48</td> <td>S11</td> <td>24 - 26</td> <td>24/16</td> <td>S11: Wet, dense, gray, fine to coarse GRAVEL, little medium to coarse Sand.</td> <td></td> </tr> <tr> <td>105</td> <td></td> <td></td> <td></td> <td>85</td> <td>S12</td> <td>29 - 30.9</td> <td>23/14</td> <td>S12: Wet, very dense, gray, medium to coarse SAND and fine GRAVEL, little non-plastic Silt.</td> <td></td> </tr> <tr> <td>100</td> <td></td> <td></td> <td></td> <td colspan="2">RC-1</td> <td>31.5 - 36.5</td> <td>60/57</td> <td>31.5</td> <td>RC-1: Coring time: 3.5, 3, 3.5, 3.5, 3 (mins/ft) Wet, gray, fine grained, slightly weathered, mildly fractured METAVOLCANIC ROCK.</td> <td></td> </tr> </tbody> </table>												ELEV (ft)	DEPTH (ft)	SAMPLE DATA	N. VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (in)/(in)	PID (ppm)	LAYER NAME	SOIL AND ROCK DESCRIPTION	NOTES	140	5			4	S6	10 - 12	24/18	SILT	Drill through.		135				13	S7	12 - 14	24/22	S6: Wet, medium stiff, brownish black SILT and fine SAND, trace roots.		130				13	S7	12 - 14	24/22	S7: Similar to S6.		125				13	S8	14 - 16	24/15	S8: Wet, black, non-plastic SILT, some fine Sand, trace wood chips, faint organic odor in sample.		120				29	S9	16 - 18	24/21	S9: Wet, very stiff, brown, non-plastic SILT, trace fine Sand.		115				23	S10	18 - 20	24/16	GRAVEL	S10: Similar to S9.		110				48	S11	24 - 26	24/16	S11: Wet, dense, gray, fine to coarse GRAVEL, little medium to coarse Sand.		105				85	S12	29 - 30.9	23/14	S12: Wet, very dense, gray, medium to coarse SAND and fine GRAVEL, little non-plastic Silt.		100				RC-1		31.5 - 36.5	60/57	31.5	RC-1: Coring time: 3.5, 3, 3.5, 3.5, 3 (mins/ft) Wet, gray, fine grained, slightly weathered, mildly fractured METAVOLCANIC ROCK.	
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LOG OF TEST BORING

JACOBS				PROJECT LOCATION OWNER JOB NUMBER				Bruce Freeman Rail Trail Sudbury, MA MASSDOT E2X81800				BORING NO.		BB-103B SHEET 2 OF 2	
ELEV. (ft)	DEPTH (ft)	SAMPLE DATA	N. VALUE	SAMPLE NO.	DEPTH INTERVAL (ft)	PEN/REC (ft)/(in)	PIU (gpm)	TEST LOG NAME	SOIL AND ROCK DESCRIPTION	NOTES					
105				RC-2	36.5 - 41.5	60/60		METAVOLCANIC ROCK	RC-2: Coring time: 3, 4, 3.5, 2.5, 4 (mins/ft) Similar to RC-1.						
40		RQD=78						41.5	Bottom of Borehole at 41.5 feet.						
100															
45															
95															
50															
90															
55															
85															
60															
65															
75															
70															

Page 1: 0-35 feet. Each subsequent page displays 40 feet.

NOTES

BORING NOTES:

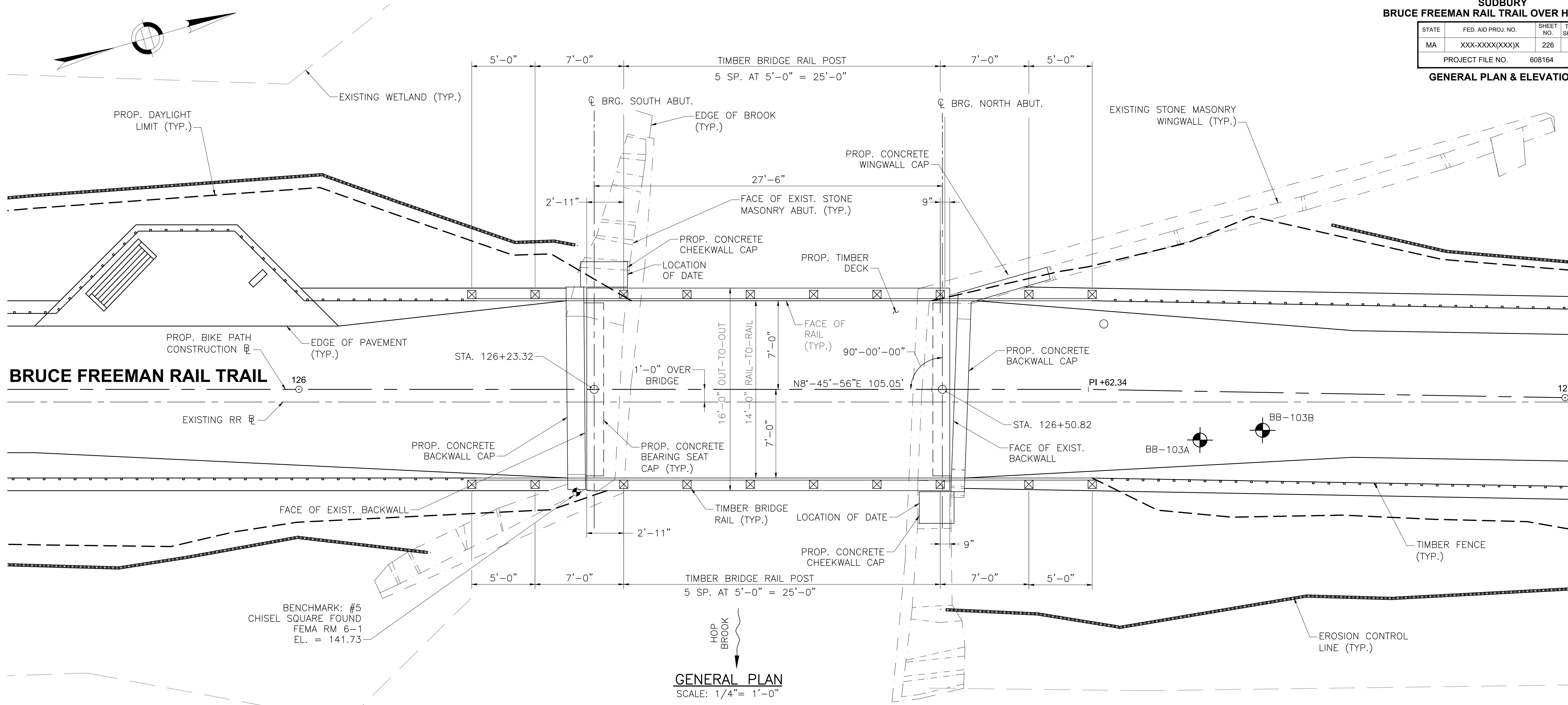
1. LOCATION OF BORINGS SHOWN ON THE PLANS THUS:  BB-#
2. BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
3. WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
4. FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1 1/2" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
5. BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHRUP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
6. ALL BORINGS WERE MADE IN SEPTEMBER 2019.
7. BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTOR, INC., P.O. BOX 165, DERRY, NH 03038.
8. THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

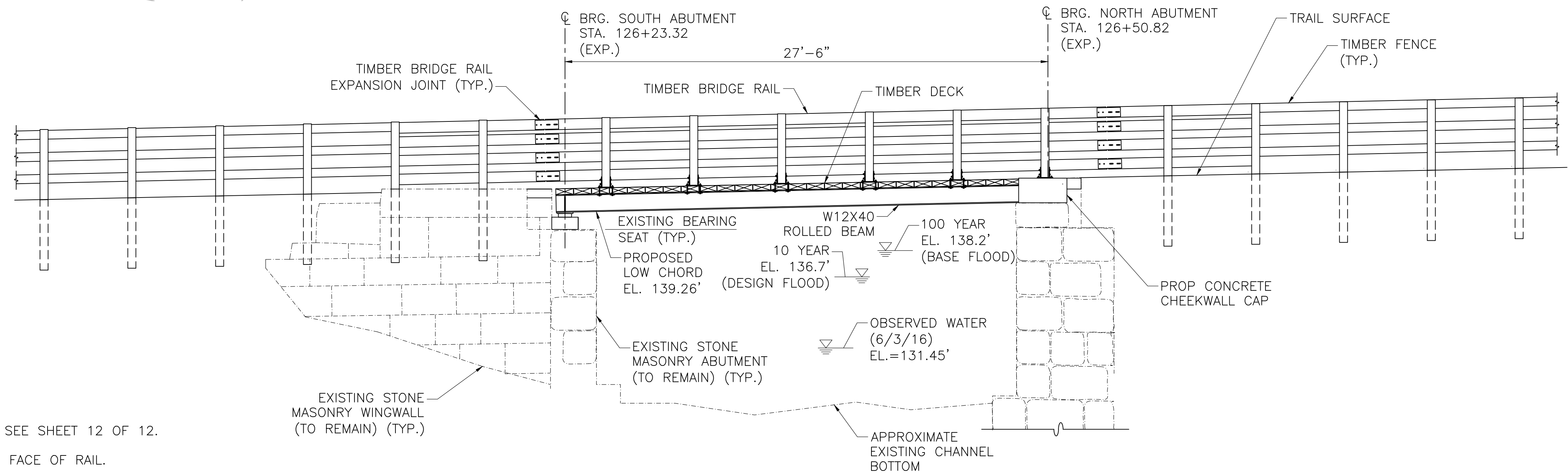
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER HOP BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	226	319
PROJECT FILE NO.		608164	

GENERAL PLAN & ELEVATION



GENERAL PLAN
SCALE: 1/4" = 1'-0"



EAST BRIDGE ELEVATION
SCALE: 1/4" = 1'-0"

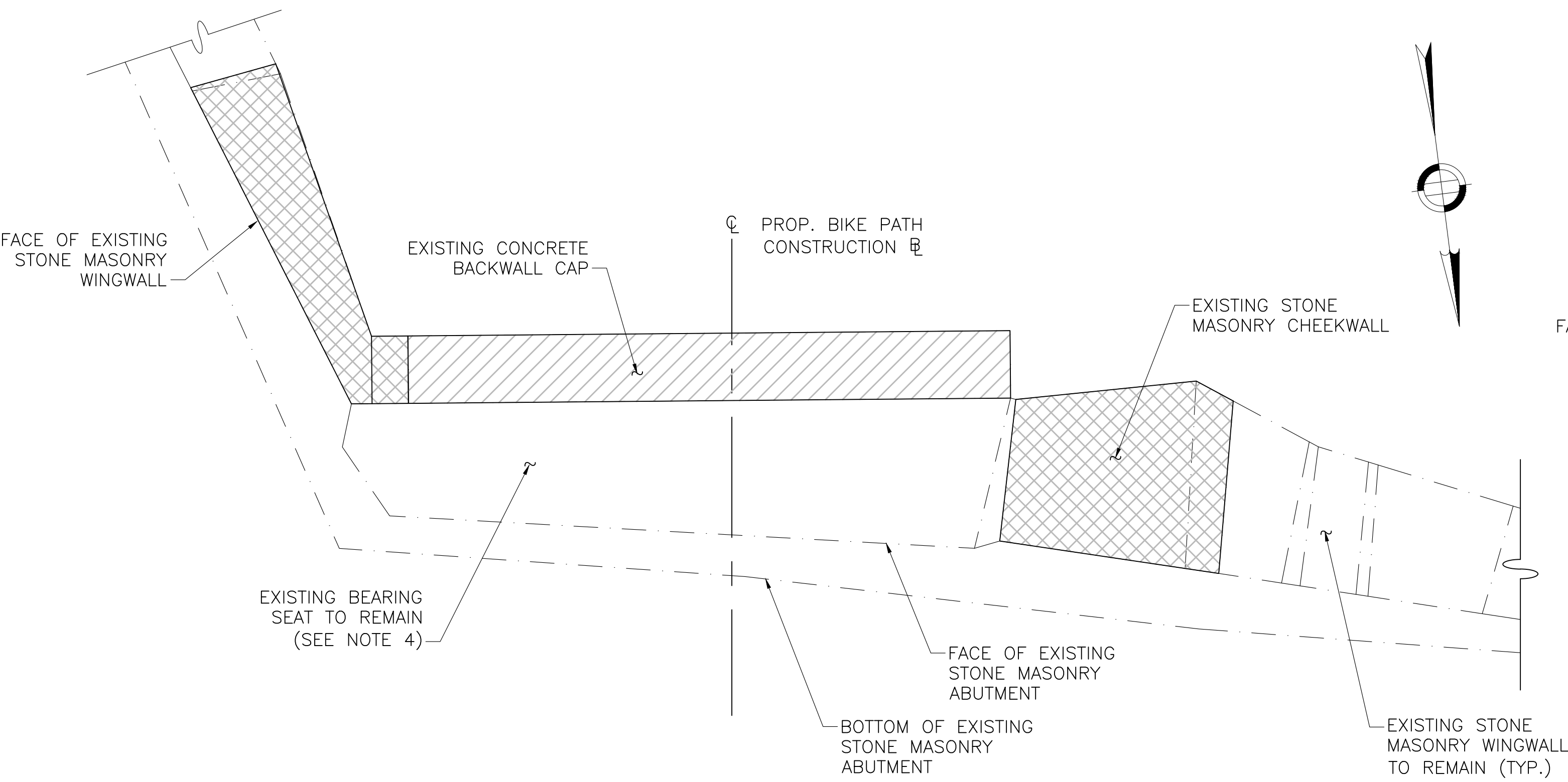
- NOTES:**
- FOR TIMBER BRIDGE RAIL DETAILS, SEE SHEET 12 OF 12.
 - RAIL POSTS ARE MEASURED ALONG FACE OF RAIL.

NOTE:
DECK END PLATE NOT SHOWN FOR CLARITY.
SEE SHEET 11 FOR PLATE DETAILS.

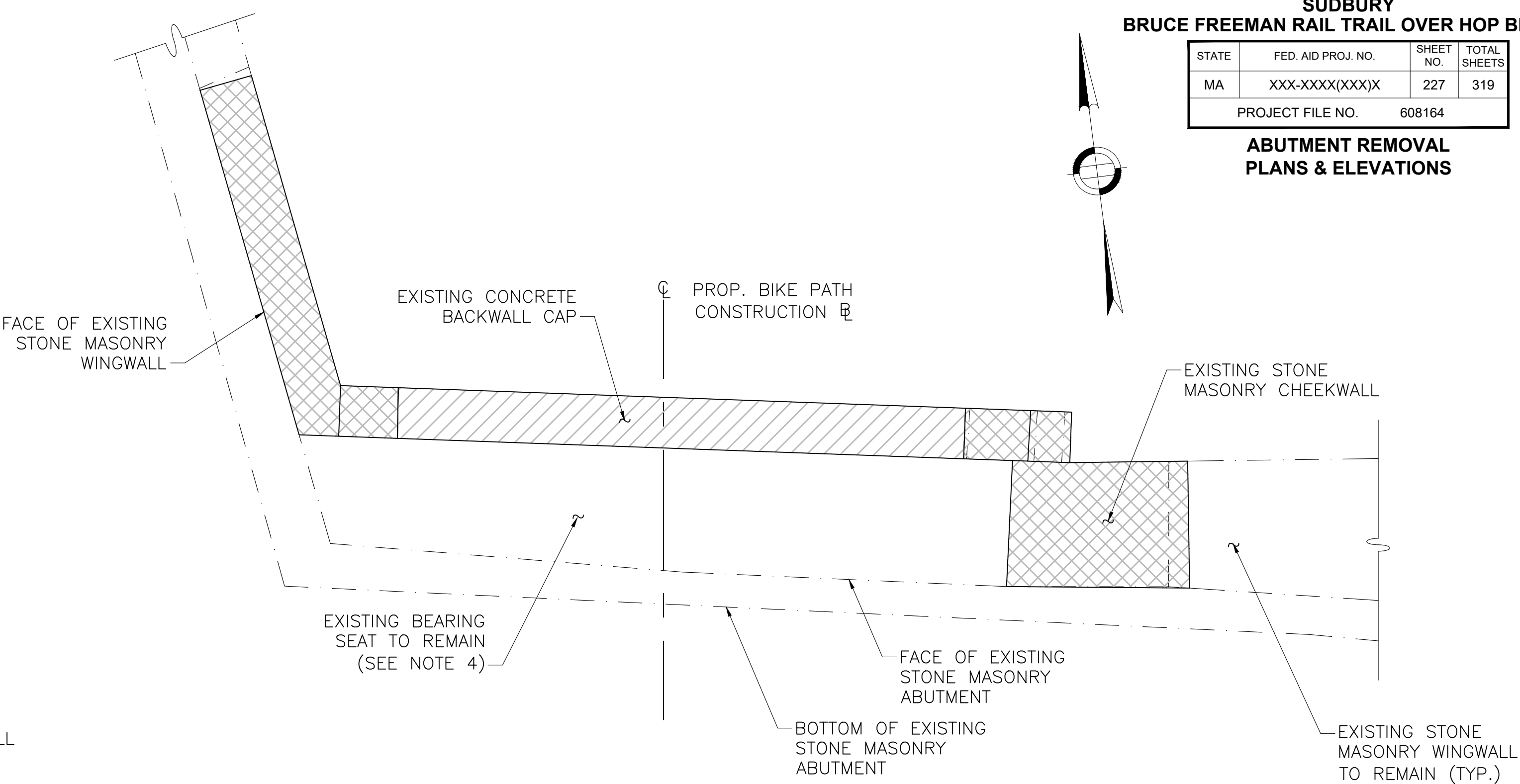
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	227	319
PROJECT FILE NO.		608164	

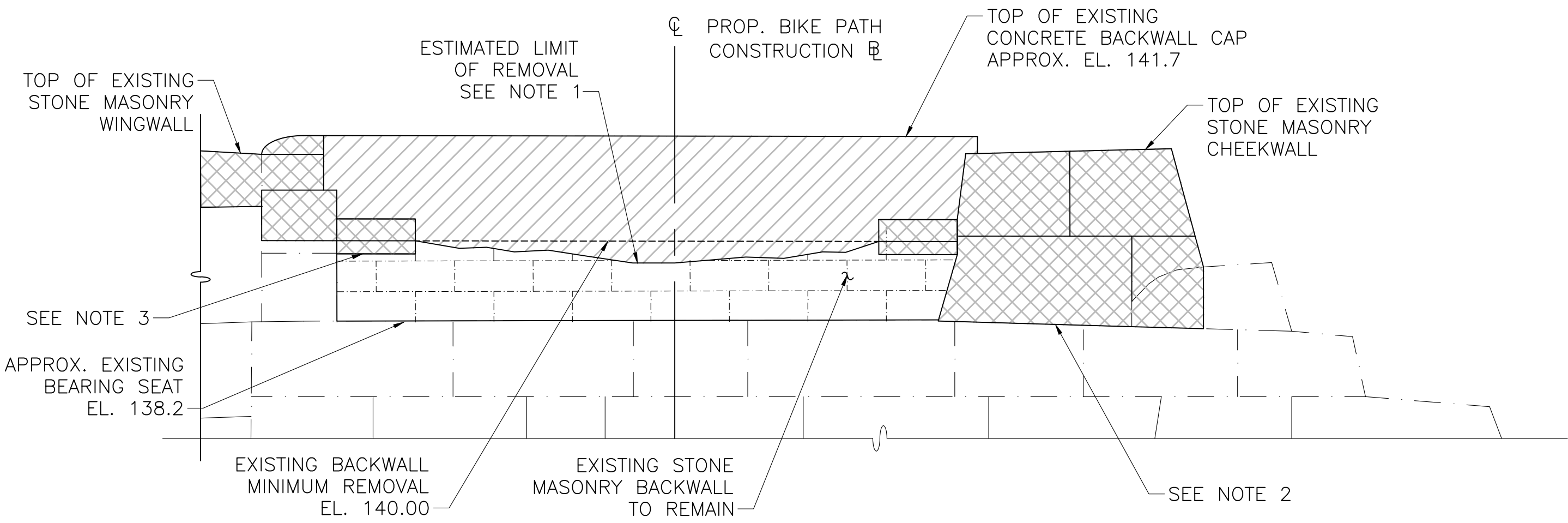
ABUTMENT REMOVAL
PLANS & ELEVATIONS



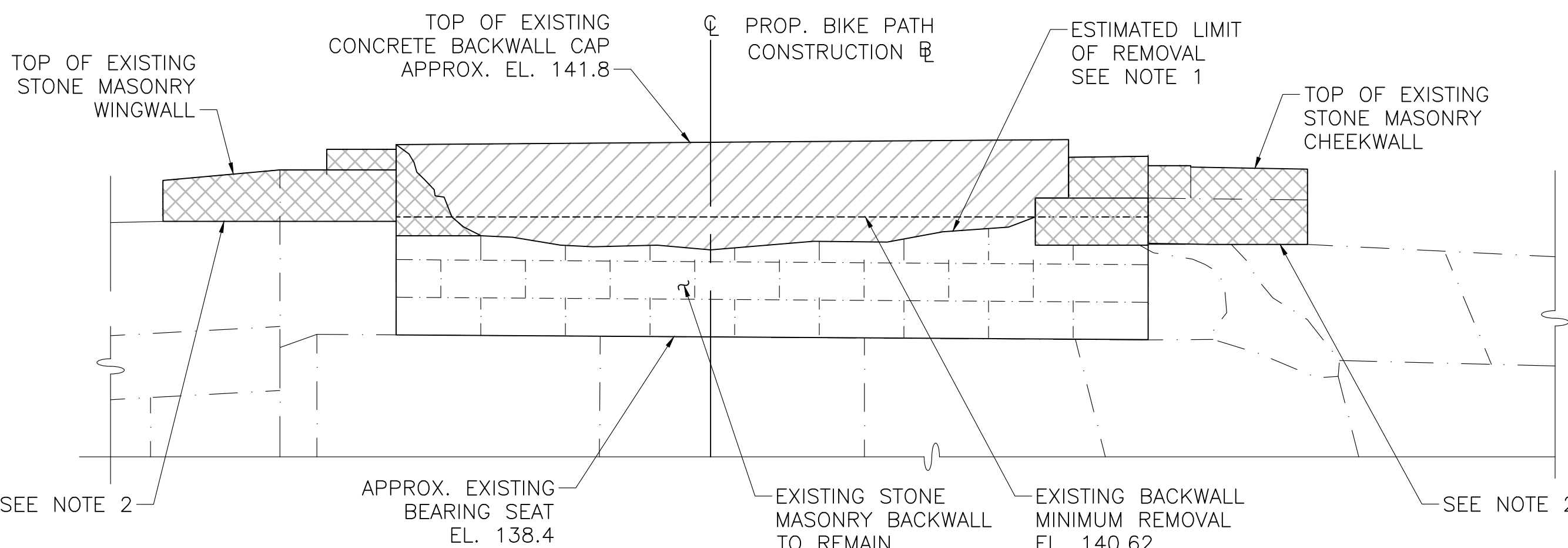
SOUTH ABUTMENT REMOVAL PLAN
SCALE: 1/2"=1'-0"



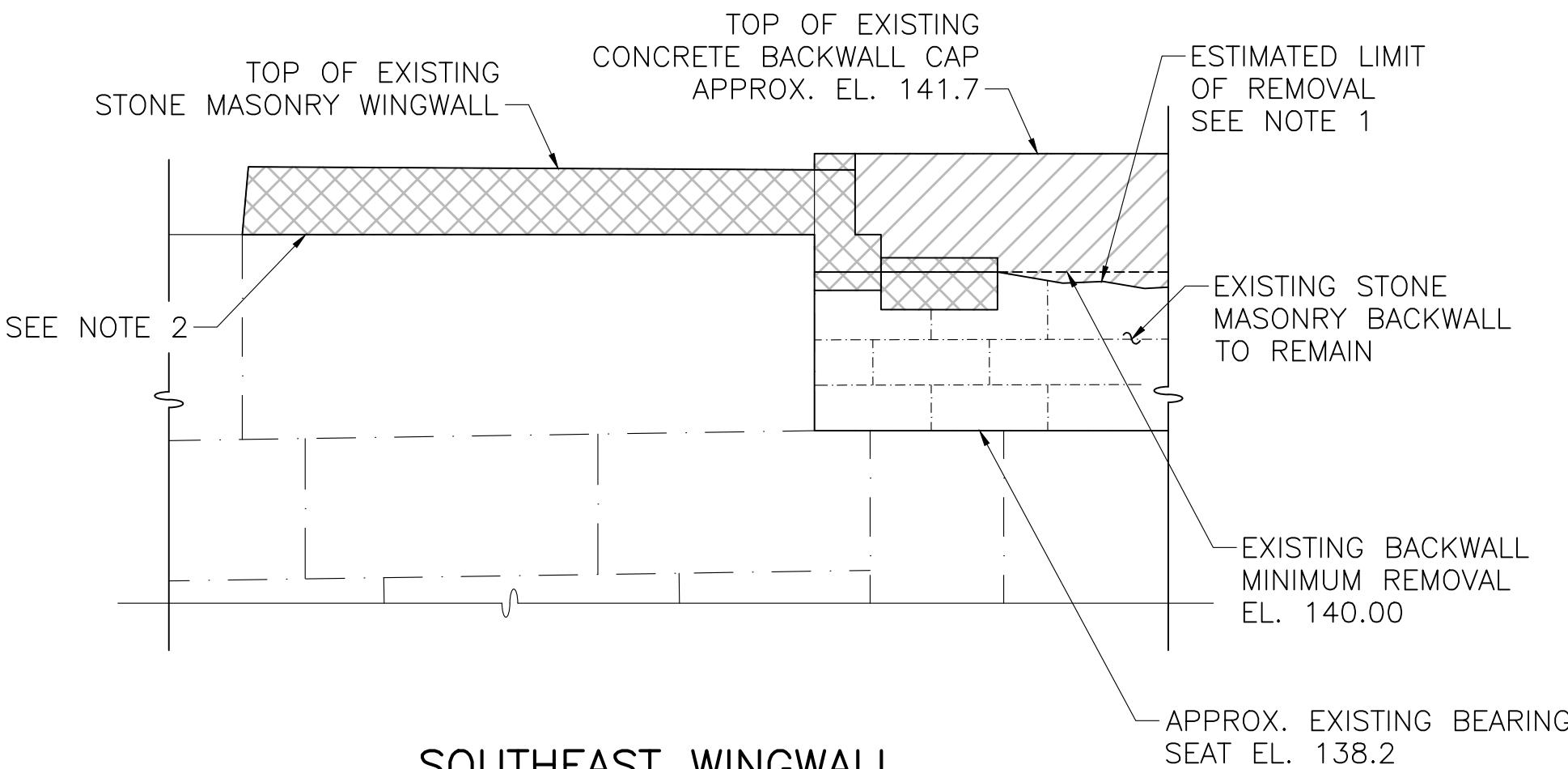
NORTH ABUTMENT REMOVAL PLAN
SCALE: 1/2"=1'-0"



SOUTH ABUTMENT AND SOUTHWEST WINGWALL REMOVAL ELEVATION
SCALE: 1/2"=1'-0"



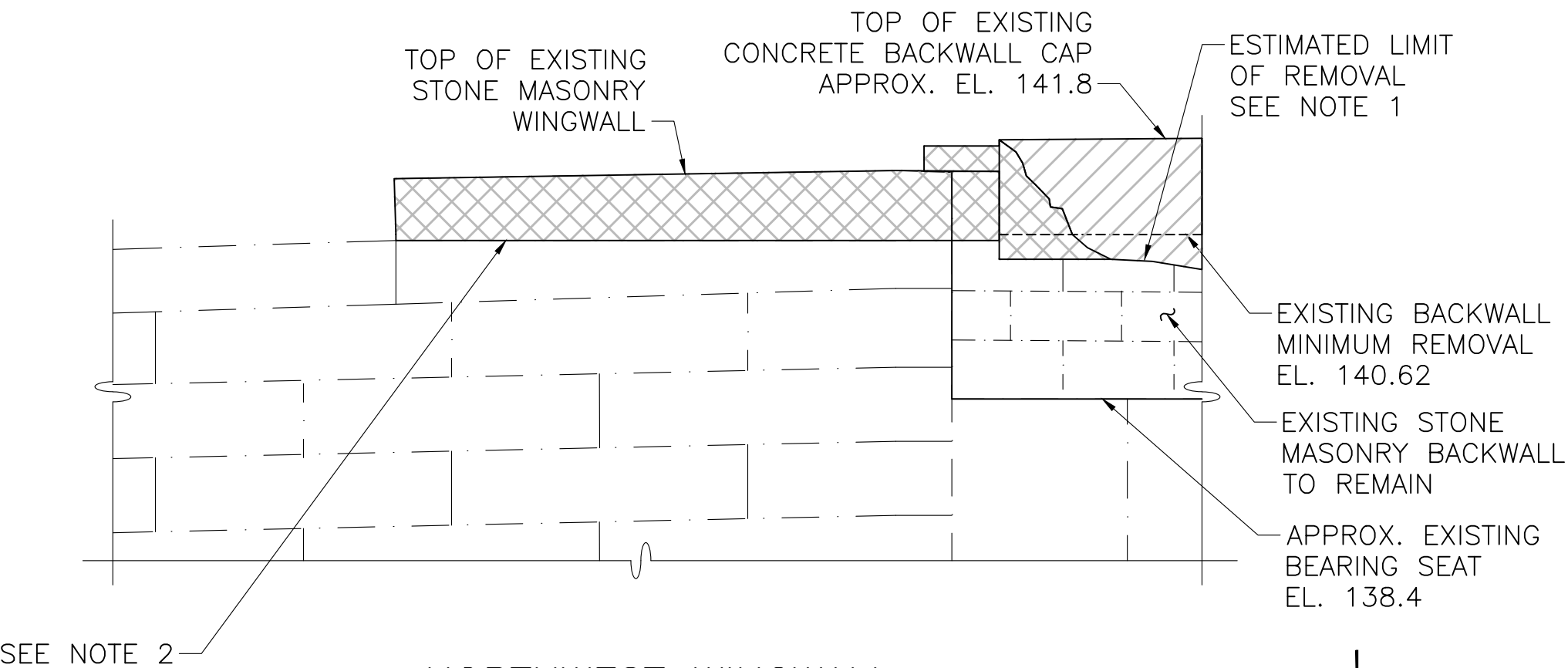
NORTH ABUTMENT AND NORTHEAST WINGWALL REMOVAL ELEVATION
SCALE: 1/2"=1'-0"



**SOUTHEAST WINGWALL
REMOVAL ELEVATION**
SCALE: 1/2"=1'-0"

EXISTING SUBSTRUCTURE REMOVAL NOTES:

1. BOTTOM OF EXISTING CONCRETE BACKWALL CAP VARIES. REMOVAL LIMITS SHALL EXTEND TO AT LEAST THE MINIMUM REMOVAL ELEVATION AS SHOWN ON THIS SHEET. FINAL REMOVAL LIMITS SHALL BE DETERMINED BY THE ENGINEER. PAYMENT FOR EXISTING CONCRETE BACKWALL REMOVAL SHALL BE INCLUDED IN ITEM 127.1, "REINFORCED CONCRETE EXCAVATION".
2. FINAL EXISTING STONE MASONRY CHEEKWALL AND WINGWALL REMOVAL LIMITS SHALL BE DETERMINED BY THE ENGINEER. PAYMENT FOR EXISTING STONE MASONRY REMOVAL, INCLUDING STONE MASONRY PORTIONS OF THE EXISTING ABUTMENT BACKWALLS, SHALL BE INCLUDED UNDER ITEM 144, "CLASS B ROCK EXCAVATION".
3. WHEN THE HORIZONTAL JOINT IN THE STONE FALLS BELOW THE MINIMUM REMOVAL ELEVATION, THE STONES OR PORTIONS OF STONES SHALL BE REMOVED BY MECHANICAL METHODS. WITH APPROVAL OF THE ENGINEER, THE ENTIRE STONE SHALL BE REMOVED AND REPLACED WITH 4,000 PSI, 3/4 INCH, 610 CEMENT CONCRETE IN LIEU OF MECHANICAL METHODS.
4. THE EXISTING ABUTMENT BEARING SEATS SHALL BE BLAST CLEANED OF EFFLORESCENCE AND DEBRIS AS DIRECTED BY THE ENGINEER. PAYMENT SHALL BE INCIDENTAL TO ITEM 995.



**NORTHWEST WINGWALL
REMOVAL ELEVATION**
SCALE: 1/2"=1'-0"

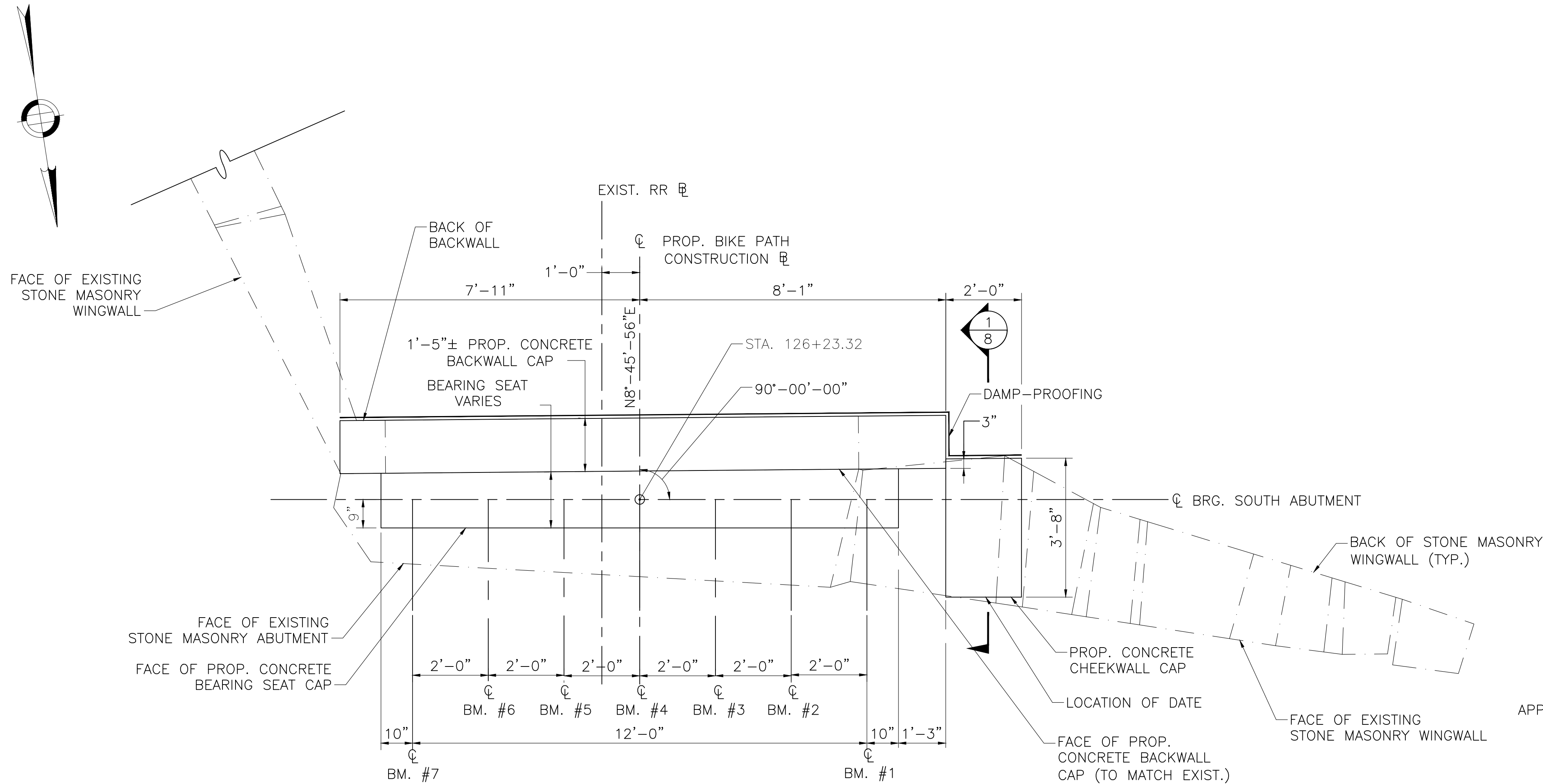
LEGEND

	CONCRETE REMOVAL LIMITS
	MASONRY REMOVAL LIMITS

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

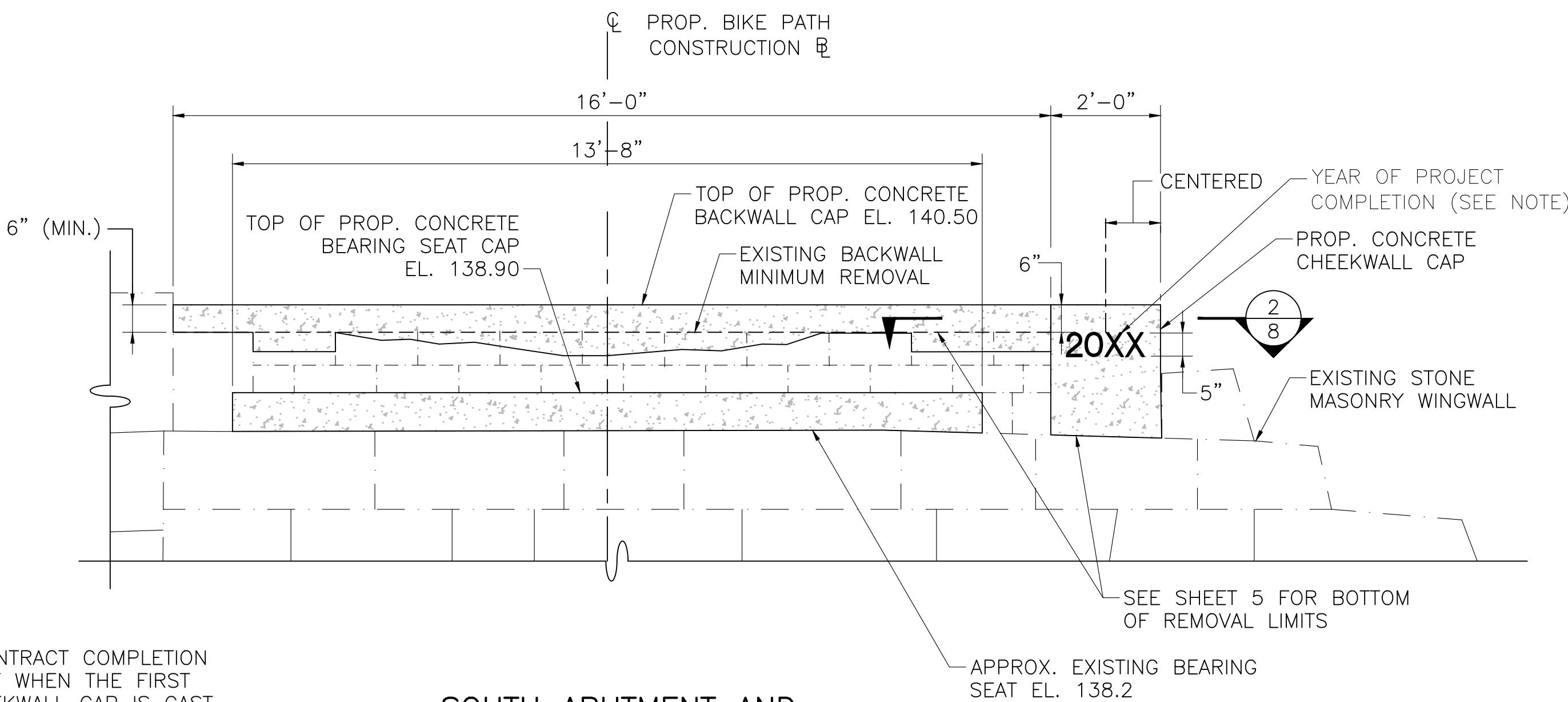
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	228	319
PROJECT FILE NO.		608164	

SOUTH ABUTMENT PLAN & ELEVATION



SOUTH ABUTMENT PLAN

SCALE: 1/2"=1'-0"



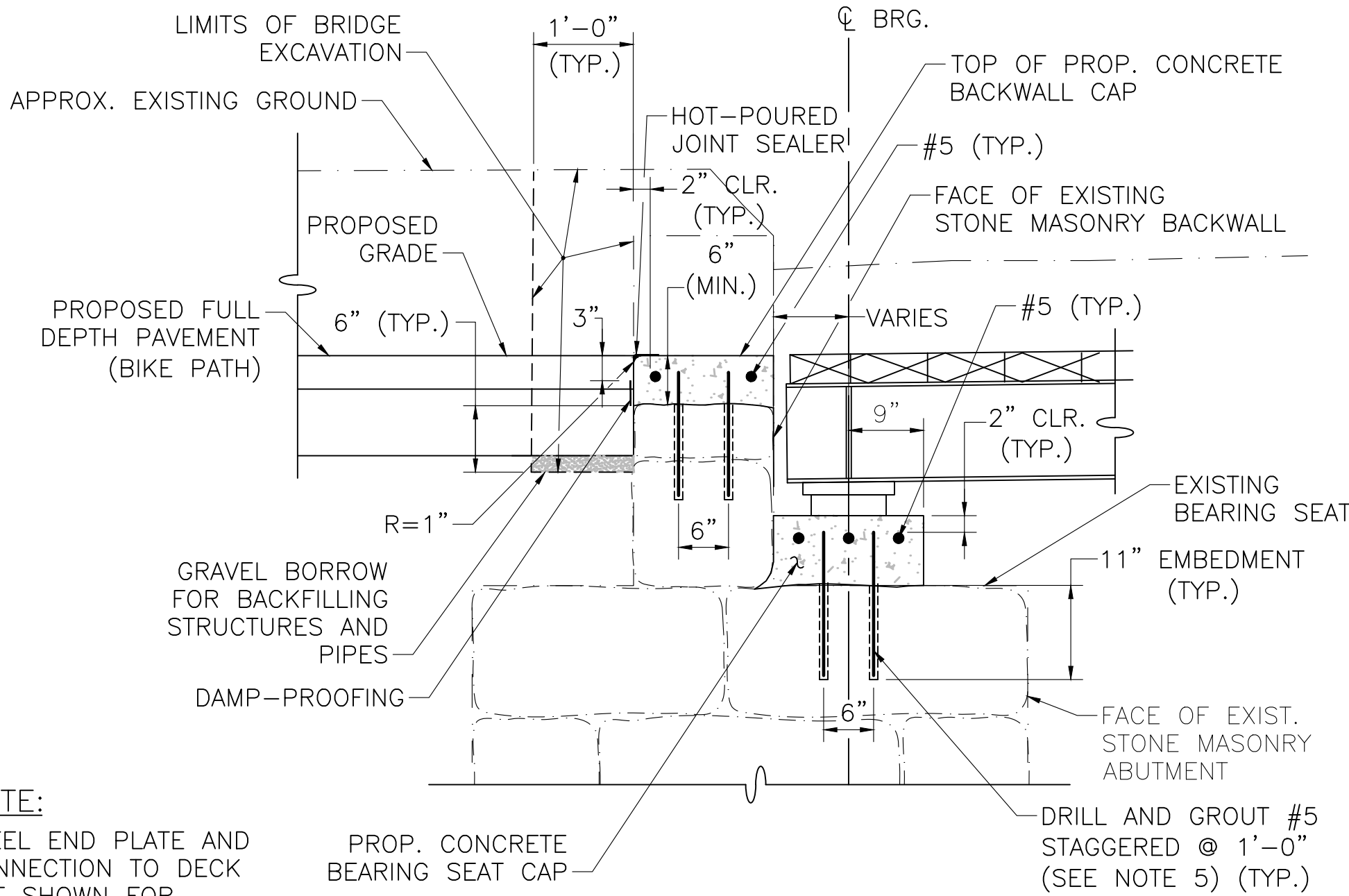
SOUTH ABUTMENT AND
SOUTHWEST WINGWALL ELEVATION

SCALE: 1/2"=1'-0"

NOTE:
USE LATEST CONTRACT COMPLETION
YEAR IN EFFECT WHEN THE FIRST
CONCRETE CHEEKWALL CAP IS CAST.
USE THE YEAR FOR BOTH CONCRETE
CHEEKWALL CAPS.

NOTES:

1. BEARING SEAT ELEVATION IS GIVEN AT \odot BEARING.
2. BACKWALL ELEVATION IS GIVEN AT FACE OF BACKWALL.
3. SEE SHEET 8 FOR EXISTING ABUTMENT REPAIR NOTES.
4. SEE SHEET 8 FOR REINFORCING IN PROPOSED CHEEKWALL CAPS.
5. USE APPROVED NON-SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH F'_c OF 6,200 PSI. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS UNDER ITEM 995.
6. ALL CONCRETE SHALL BE 4000 PSI, $\frac{3}{4}$ INCH, 610 CEMENT CONCRETE.



TYPICAL ABUTMENT SECTION

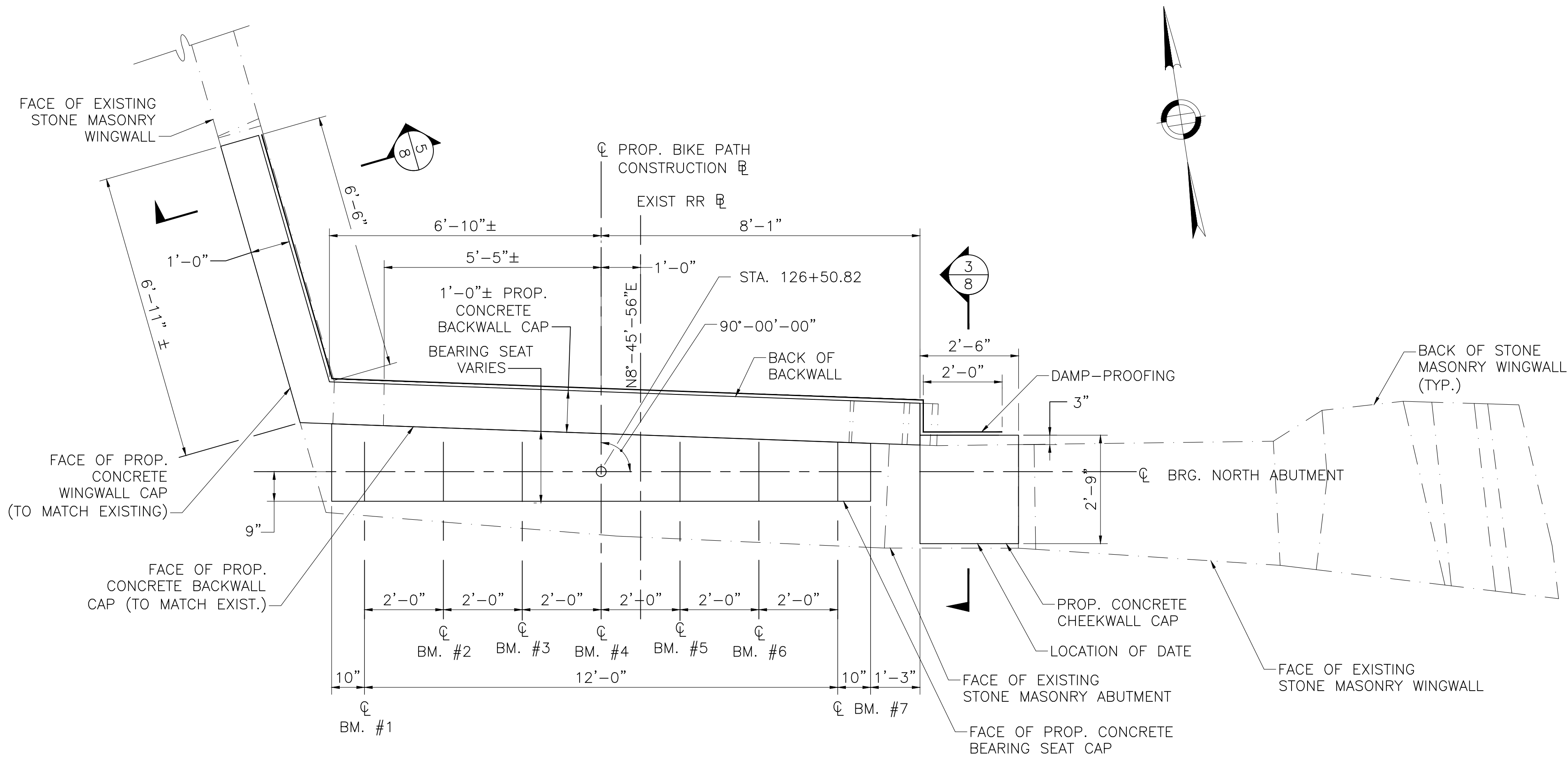
SCALE: 3/4"=1'-0"

NOTE:
STEEL END PLATE AND
CONNECTION TO DECK
NOT SHOWN FOR
CLARITY. SEE SHEET 11.

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

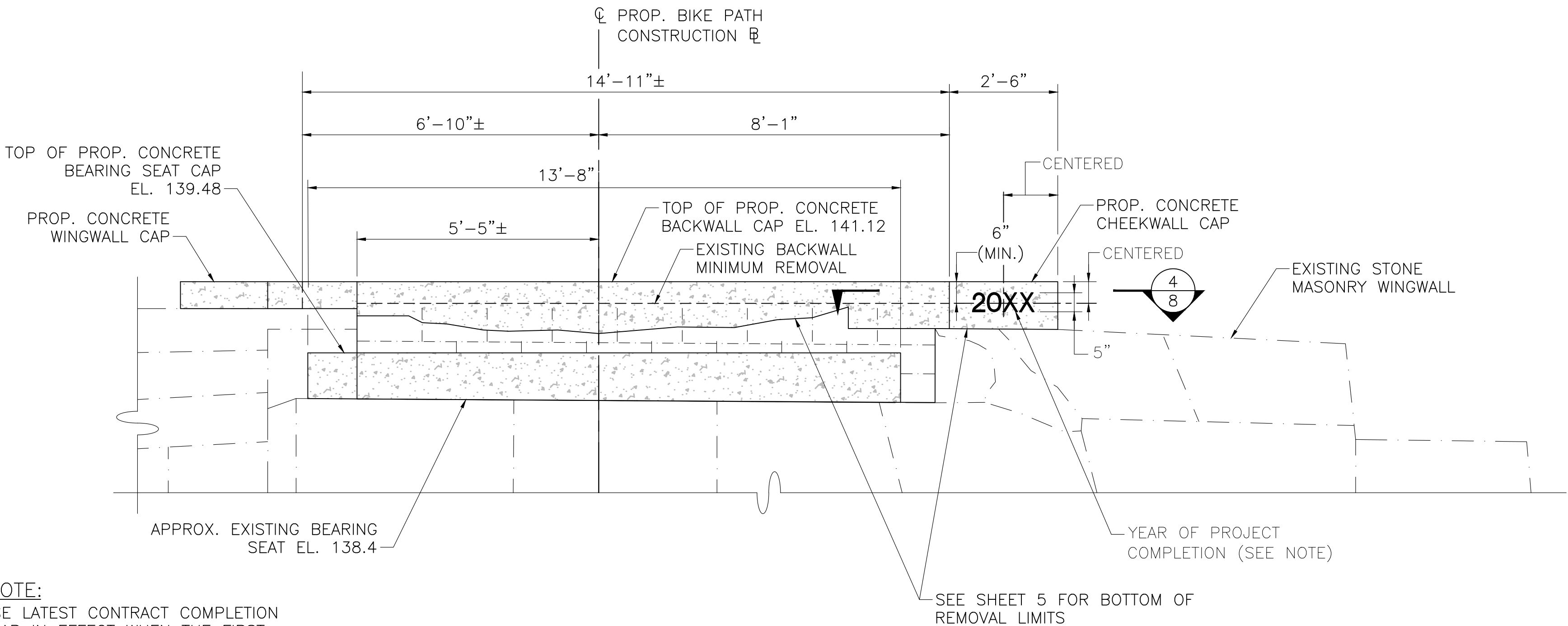
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	229	319
PROJECT FILE NO.		608164	

NORTH ABUTMENT PLAN & ELEVATION



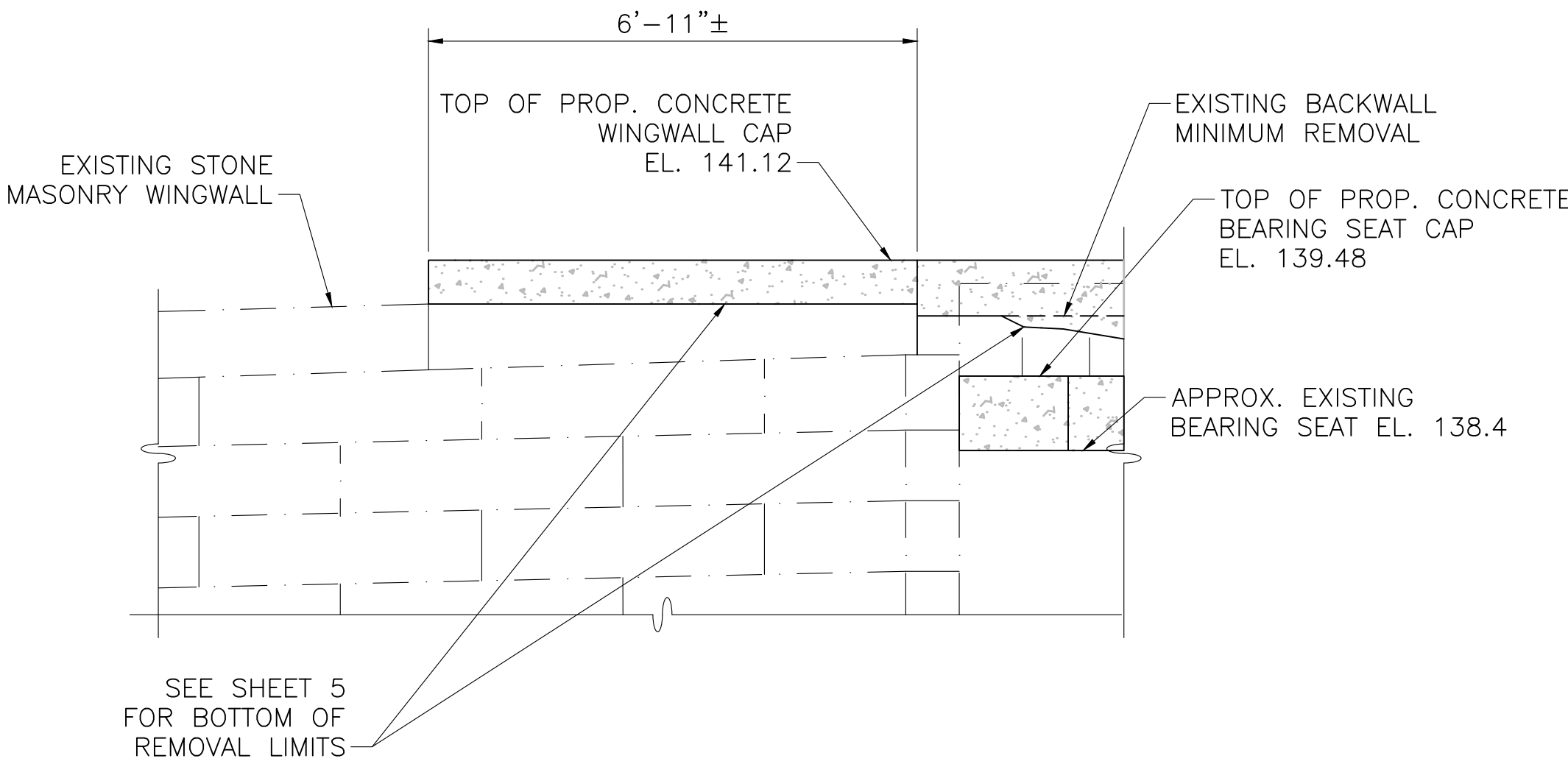
NORTH ABUTMENT PLAN
SCALE: 1/2"=1'-0"

- NOTES:
1. BEARING SEAT ELEVATION IS GIVEN AT \angle BEARING.
 2. BACKWALL ELEVATION IS GIVEN AT FACE OF BACKWALL.
 3. SEE SHEET 8 FOR EXISTING ABUTMENT REPAIR NOTES.
 4. SEE SHEET 8 FOR REINFORCING IN PROPOSED CHEEKWALL CAPS
 5. USE APPROVED NON-SHRINK GROUT WITH MINIMUM COMPRESSIVE STRENGTH F'_c OF 6,200 PSI. SEE SPECIAL PROVISIONS FOR ADDITIONAL REQUIREMENTS UNDER ITEM 995.
 6. SEE SHEET 6 FOR TYPICAL ABUTMENT SECTION.
 7. ALL CONCRETE SHALL BE 4000 PSI, $\frac{3}{4}$ INCH, 610 CEMENT CONCRETE.



NORTH ABUTMENT AND
NORTHEAST WINGWALL ELEVATION
SCALE: 1/2"=1'-0"

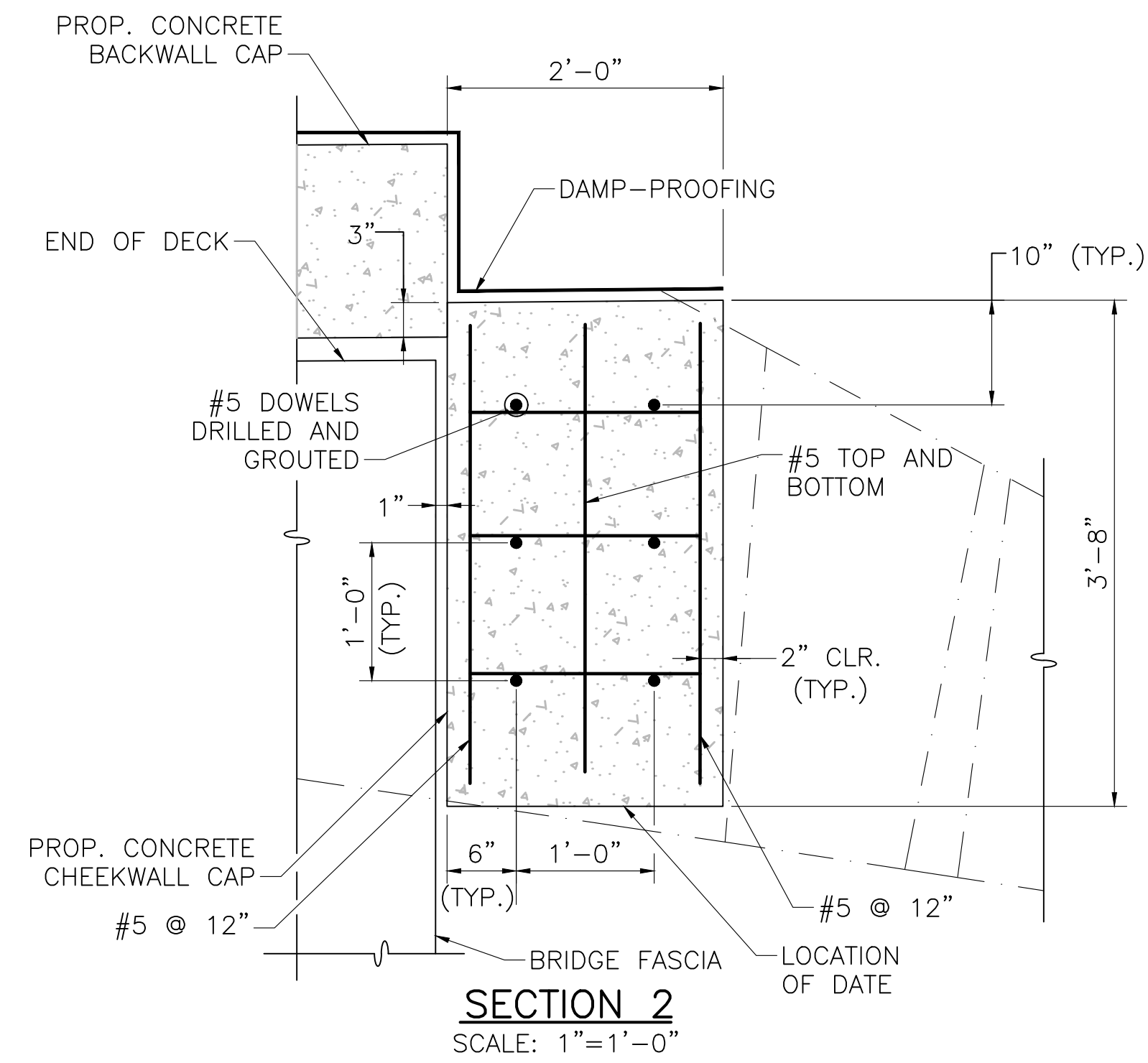
NOTE:
USE LATEST CONTRACT COMPLETION
YEAR IN EFFECT WHEN THE FIRST
CONCRETE CHEEKWALL CAP IS CAST.
USE THIS YEAR FOR BOTH
CONCRETE CHEEKWALL CAPS.



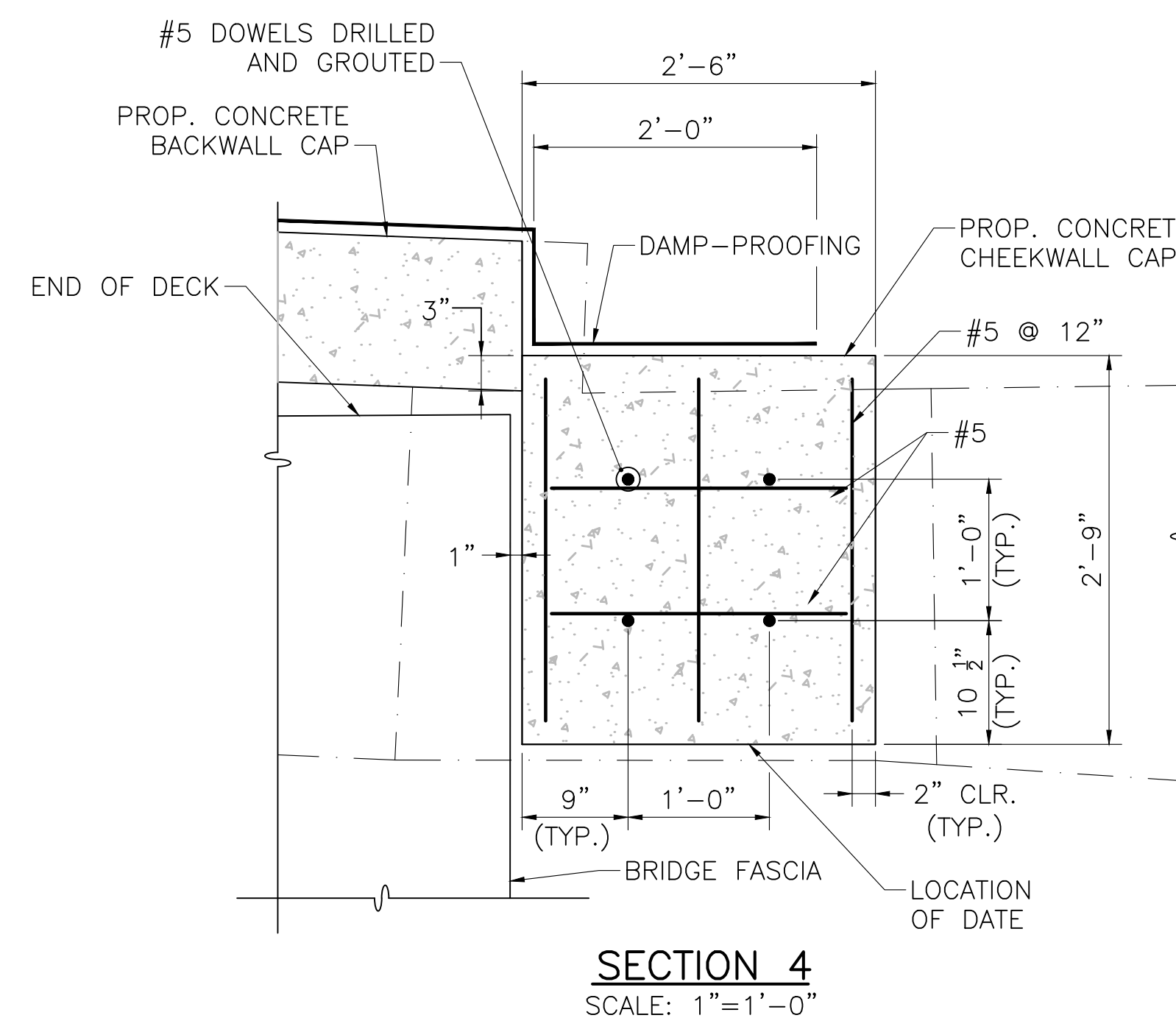
NORTHWEST WINGWALL ELEVATION
SCALE: 1/2"=1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

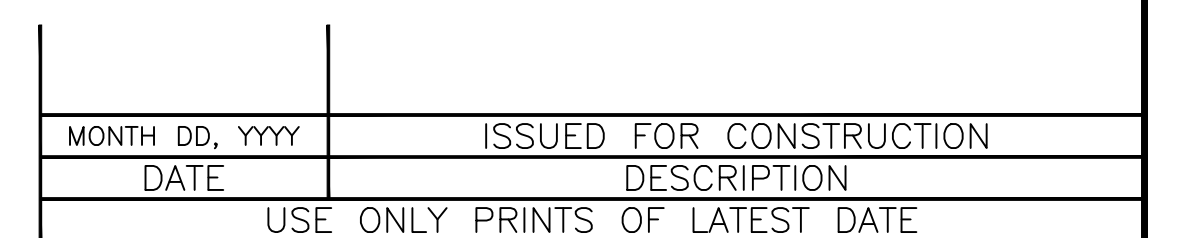
608164_BR9(S-31-007)(ABUT DETAILS).DWG Plotted on 18-Feb-2022 2:41 PM



1. THE NORTH EXISTING STONE MASONRY ABUTMENT HAS A MISSING STONE IN THE FACE. THE CONTRACTOR SHALL REBUILD ANY COLLAPSED PORTIONS OF THE EXISTING WALL ALONG THE LENGTH OF THE ABUTMENT AND WINGWALLS BELOW THE LIMITS OF REMOVAL. THE COST TO REBUILD THE WALL AS REQUIRED SHALL BE INCLUDED IN ITEM 690, "STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR".
2. REPOINTING OF THE EXISTING STONE MASONRY ABUTMENTS SHALL BE REQUIRED PRIOR TO SUPERSTRUCTURE WORK. MASONRY REPOINTING AREAS SHALL BE DETERMINED IN THE FIELD BY THE ENGINEER. THE COST TO REPOINT SHALL BE INCLUDED IN ITEM 690.91, "MASONRY REPOINTING".
3. ANY WATER CONTROL REQUIRED TO REMOVE, REPAIR, REBUILD, OR REPOINT THE EXISTING ABUTMENTS SHALL BE INCLUDED UNDER ITEM 991.1, "CONTROL OF WATER".
4. THE CONFIGURATION OF THE EXISTING ABUTMENT STONE WALLS AND THE ELEVATION OF THE BOTTOM OF THE EXISTING ABUTMENTS SHOWN ON THE PLANS ARE APPROXIMATE.



1. WORK IN THE WATER SHALL BE PERFORMED DURING LOW FLOW SEASON AS DEFINED IN THE SPECIAL PROVISION FOR ITEM 991.1 AND THE FLOW SHALL BE MAINTAINED THROUGH THE USE OF TEMPORARY WATER CONTROL.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SIZING THE BARRIER TO HANDLE THE RIVER FLOW. THE BARRIER SHALL BE OF ADEQUATE SIZE TO DELIVER THE WATER AT THE DISCHARGE END TO THE RIVER WITHOUT DISTURBING THE EXISTING BANKS OR RIVERBED FLOW. THE BARRIER HEIGHT SHALL BE SIZED TO MAINTAIN 1' OF FREEBOARD OVER THE 10-YEAR FLOOD.
3. IN THE EVENT OF HIGH FLOW RATES, THE CONTRACTOR SHALL BE RESPONSIBLE TO DEVELOP AND IMPLEMENT A REASONABLE MEANS NECESSARY TO HANDLE THE ADDITIONAL FLOWS TO PROTECT THE SURROUNDING AREA, AS APPROVED BY THE ENGINEER AND SHALL BE INCIDENTAL TO ITEM 991.1" "CONTROL OF WATER - STRUCTURE NO. S-31-007".

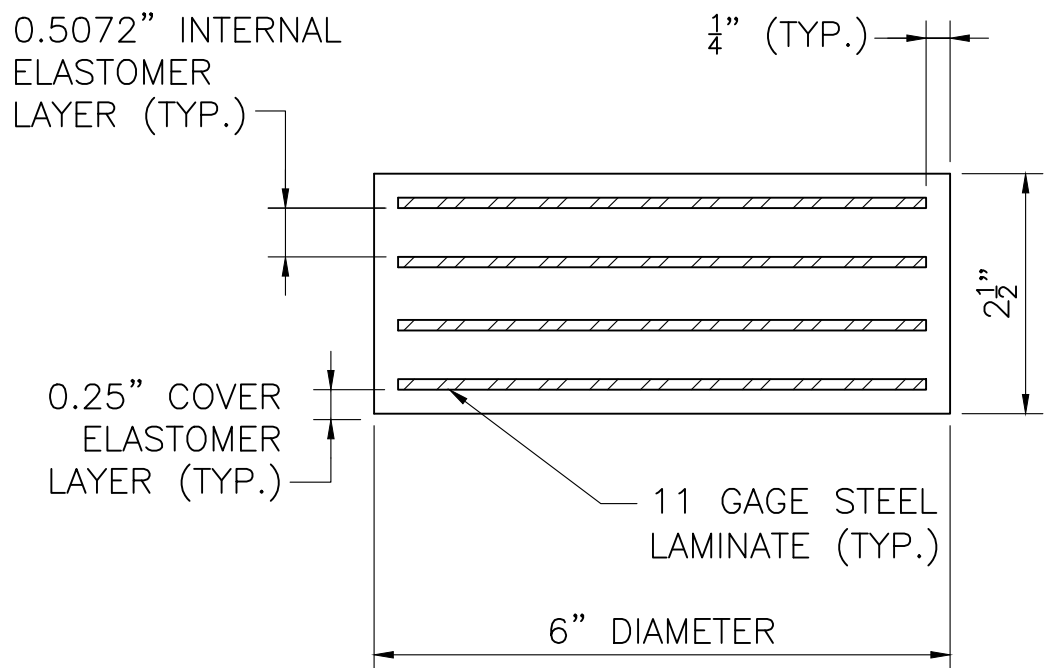
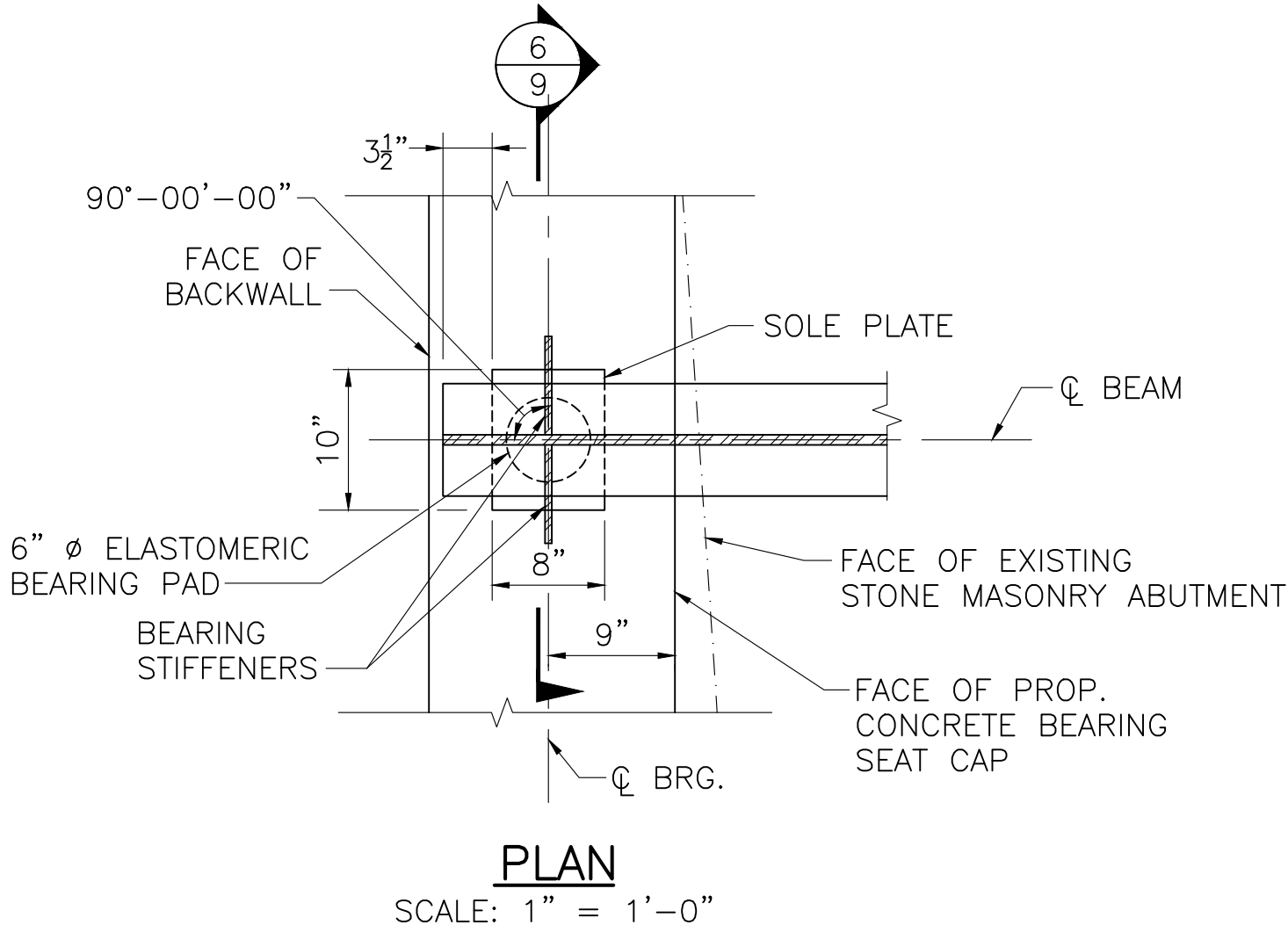


STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	231	319
PROJECT FILE NO.		608164	

BEARING DETAILS

BEARING NOTES:

- STEEL SOLE PLATES SHALL CONFORM TO AASHTO M 270 GRADE 36 AND SHALL BE HOT-DIP GALVANIZED.
- CENTER THE ELASTOMERIC PAD UNDER THE SOLE PLATE DURING BEAM ERECTION.
- BEAMS SHALL BE ERECTED WHEN THE AMBIENT TEMPERATURE IS BETWEEN 50 °F AND 77 °F. IF BEAMS ARE ERECTED AT OTHER AMBIENT TEMPERATURES, THEY WILL HAVE TO BE JACKED AND THE ELASTOMERIC BEARINGS RECENTERED WHEN THE TEMPERATURE RETURNS TO THAT RANGE.

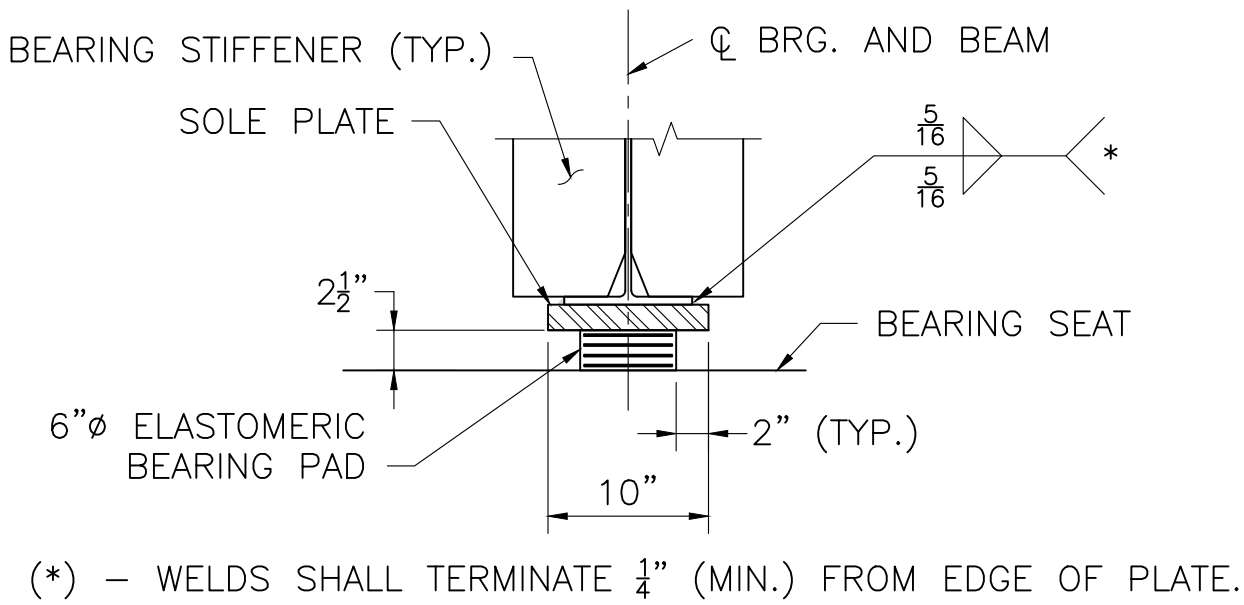


NOTES:

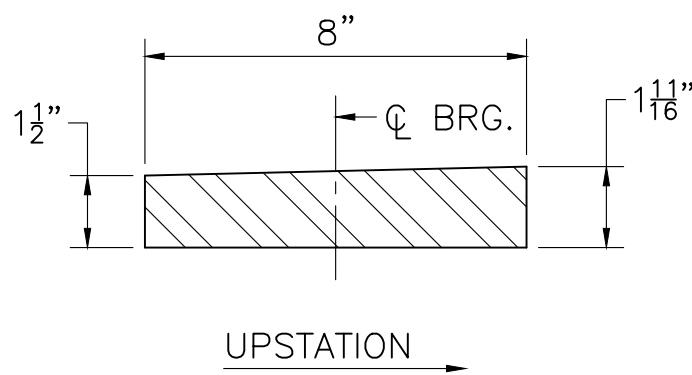
- ELASTOMER SHALL HAVE A SHEAR MODULUS OF 0.160 KSI.
- STEEL LAMINATES SHALL CONFORM TO ASTM A 1011 GRADE 36.
- THE COMPRESSIVE DESIGN LOAD ON THE BEARING PAD IS 8 KIPS. THE COMPRESSIVE DESIGN STRESS IS THE RESULT OF DIVIDING THE COMPRESSIVE DESIGN LOAD BY THE AREA OF THE PAD AND IS EQUAL TO 0.28 KSI.
- ELASTOMERIC BEARING PAD SHALL NOT BE VULCANIZED TO THE SOLE PLATE.
- ELASTOMER SHALL HAVE A HARDNESS OF 60 DUROMETER.

ELASTOMERIC BEARING PAD

6" = 1'-0"

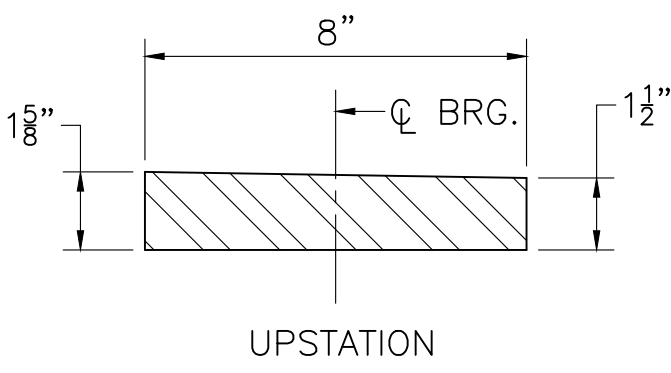
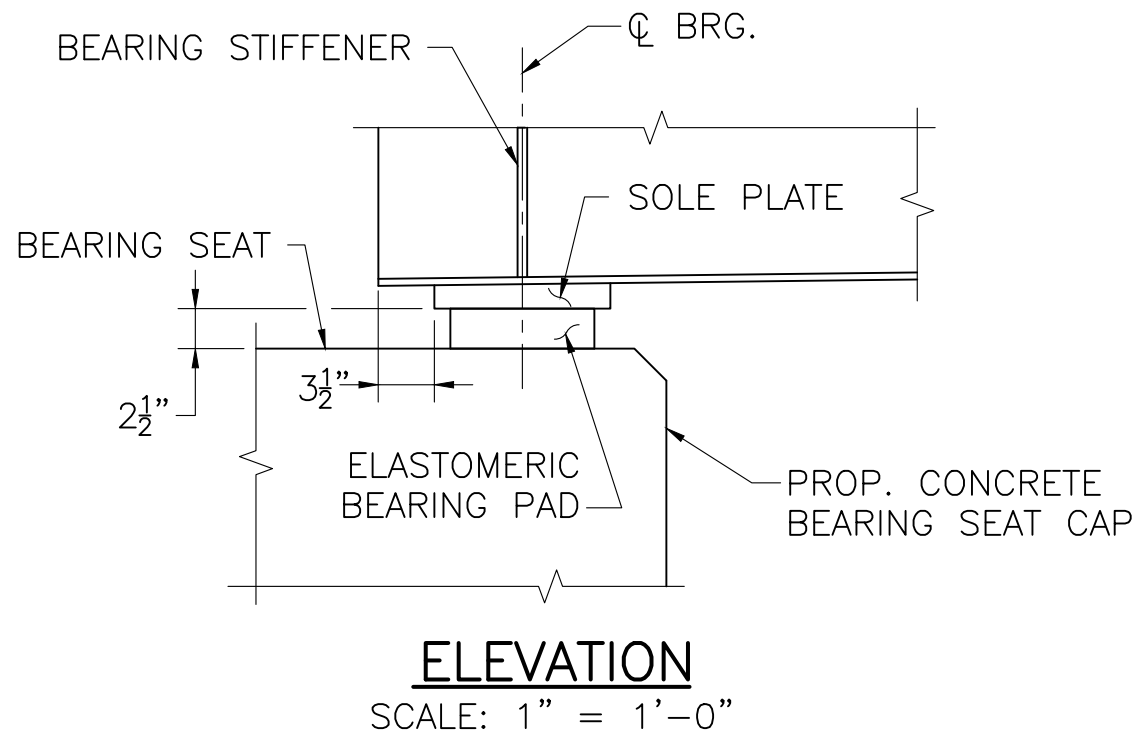


(*) - WELDS SHALL TERMINATE 1/4" (MIN.) FROM EDGE OF PLATE.



SOUTH ABUTMENT SOLE PLATE DETAIL

SCALE: 3" = 1'-0"



NORTH ABUTMENT SOLE PLATE DETAIL

SCALE: 3" = 1'-0"

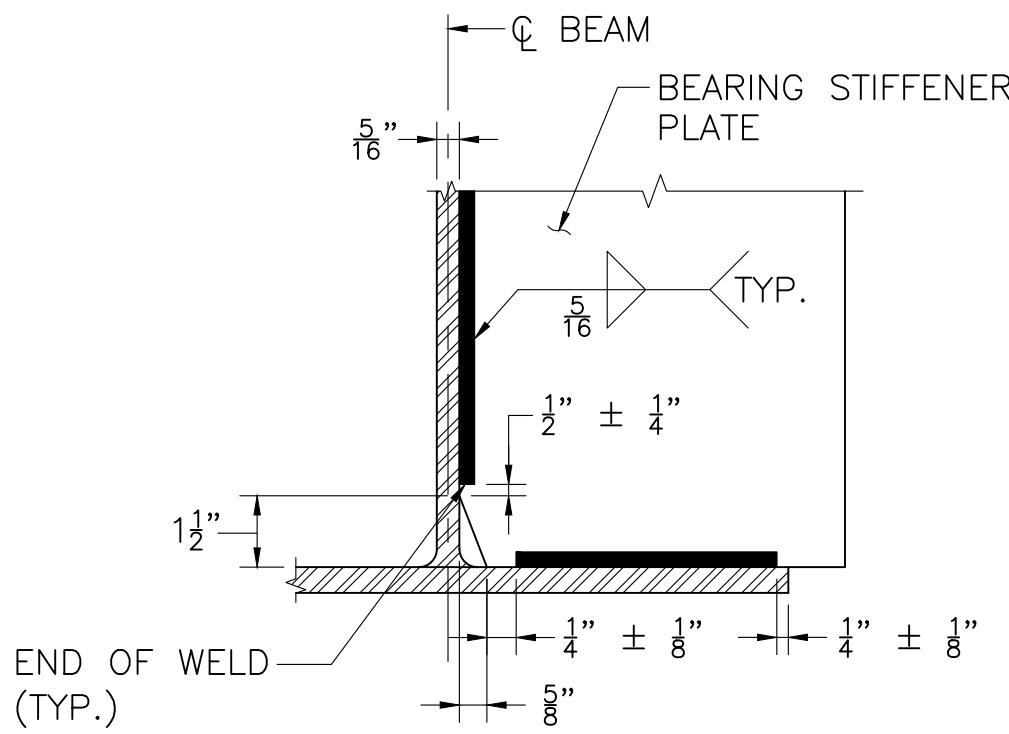
MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
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PROJECT FILE NO.		608164	

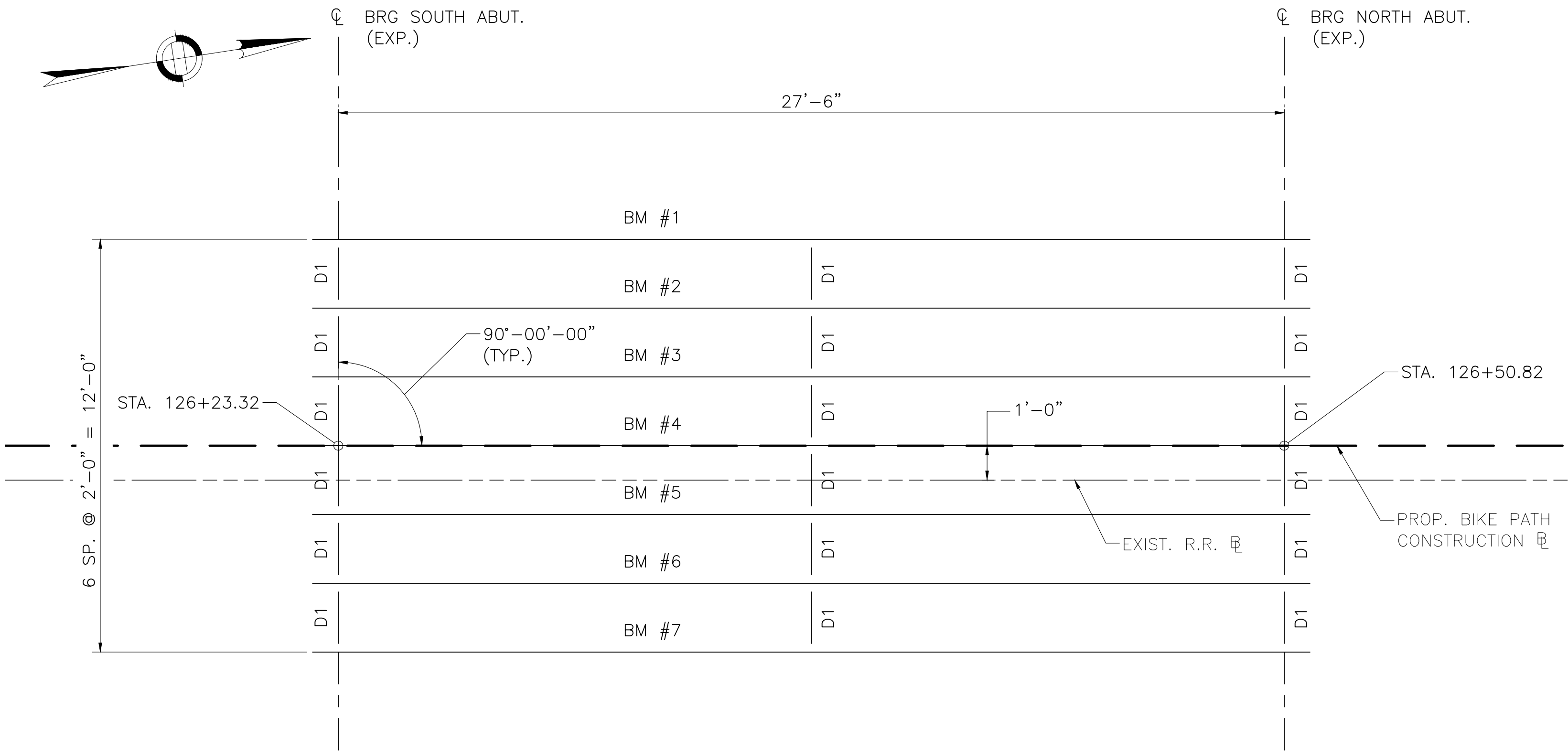
FRAMING PLAN &
STRUCTURAL STEEL DETAILS

NOTES:

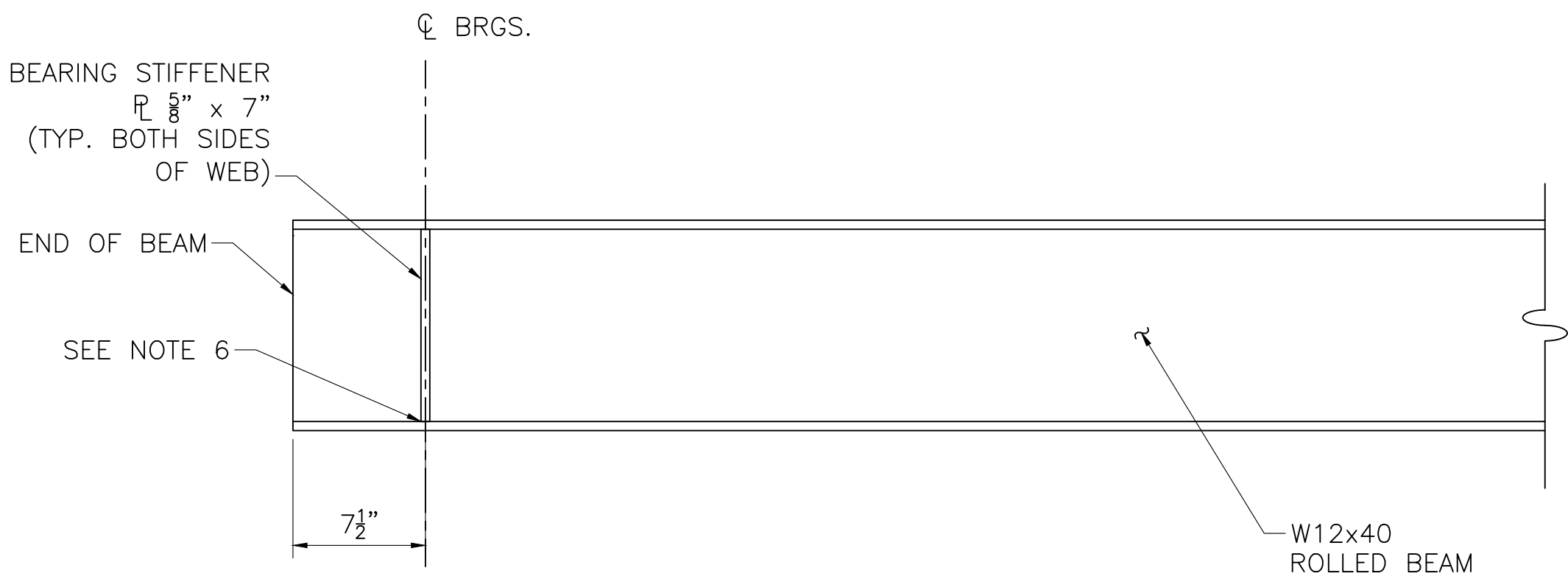
- D1 = C9x15 (TYPICAL DIAPHRAGM)
- THE MAIN LOAD CARRYING MEMBERS ARE BM #1 THROUGH BM #7. ALL BEAMS SHALL BE W12x40.
- ALL STEEL SHALL CONFORM TO AASHTO M270 GRADE 50 HOT-DIP GALVANIZED.
- ALL BEARING STIFFENERS SHALL BE PLUMB.
- ENDS OF BEAMS SHALL BE FABRICATED SO THAT UNDER FULL DEAD LOAD THE ENDS OF THE BEAMS WILL PLUMB.
- BEARING STIFFENER PLATES AT BOTTOM FLANGE SHALL BE MILLED FOR TIGHT FIT AND WELDED WITH $\frac{5}{16}$ " FILLET WELDS, BOTH SIDES OF PLATE.



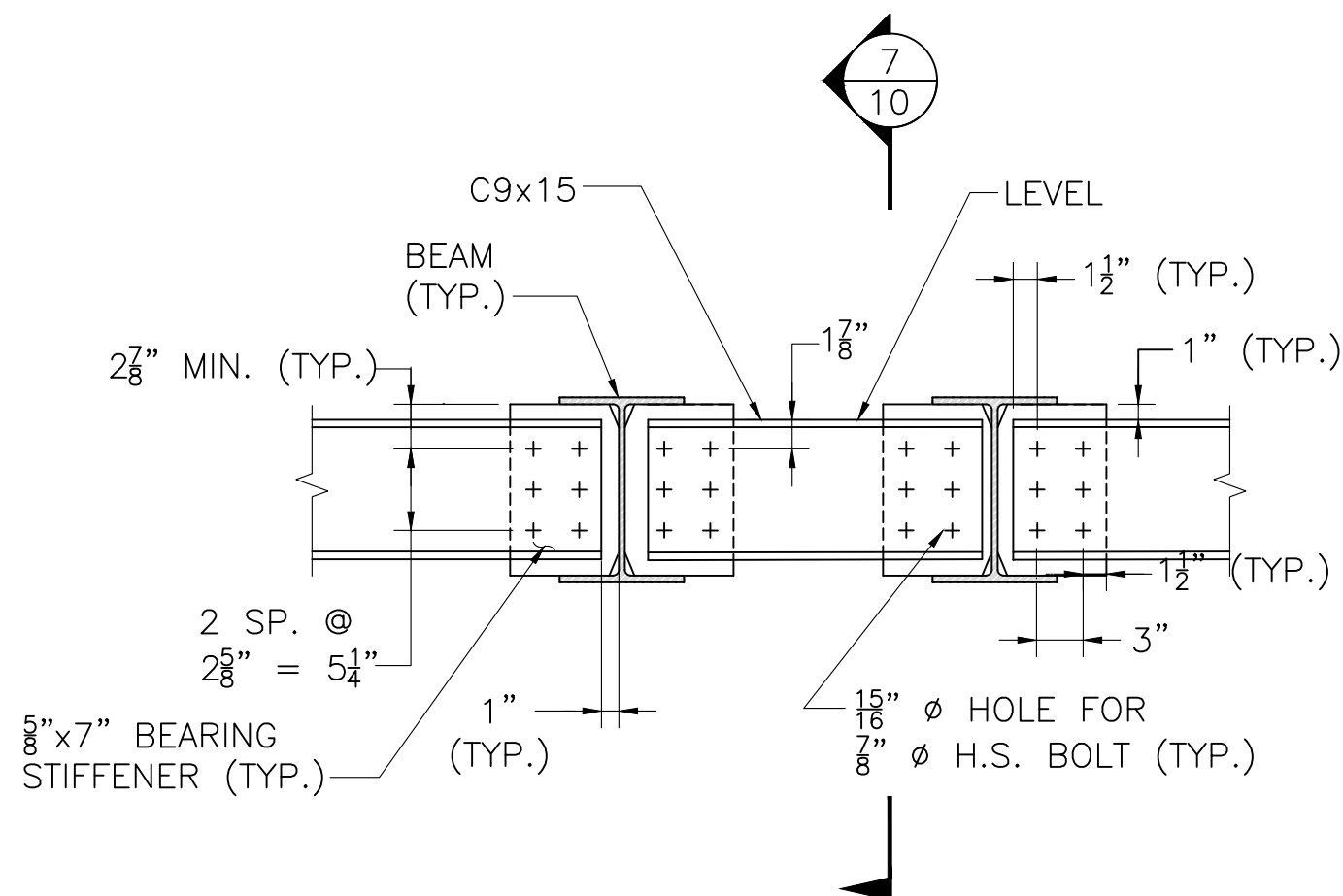
CLIP DETAIL
NOT TO SCALE



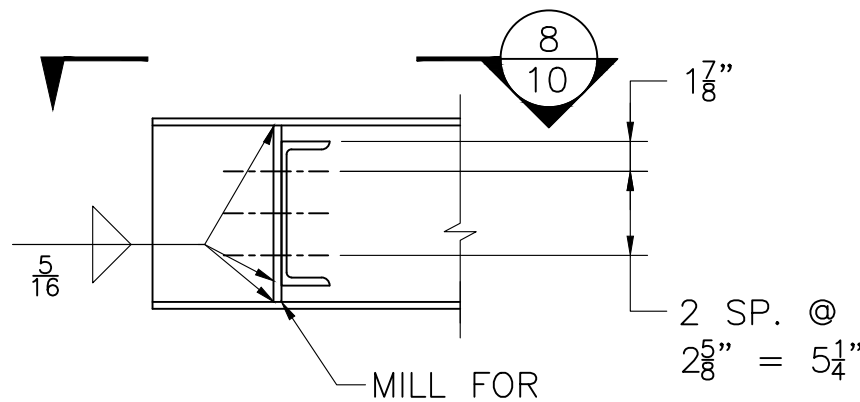
FRAMING PLAN
SCALE: $\frac{3}{8}$ " = 1'-0"



BEAM ELEVATION
SCALE: $1\frac{1}{2}$ " = 1'-0"

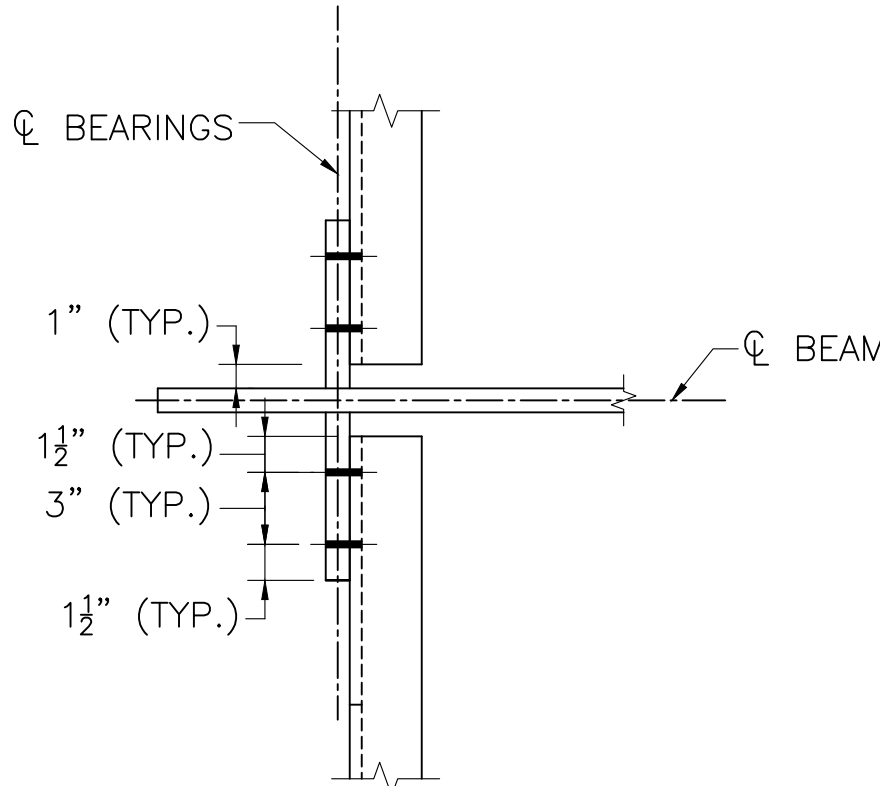


ELEVATION VIEW



SECTION 7

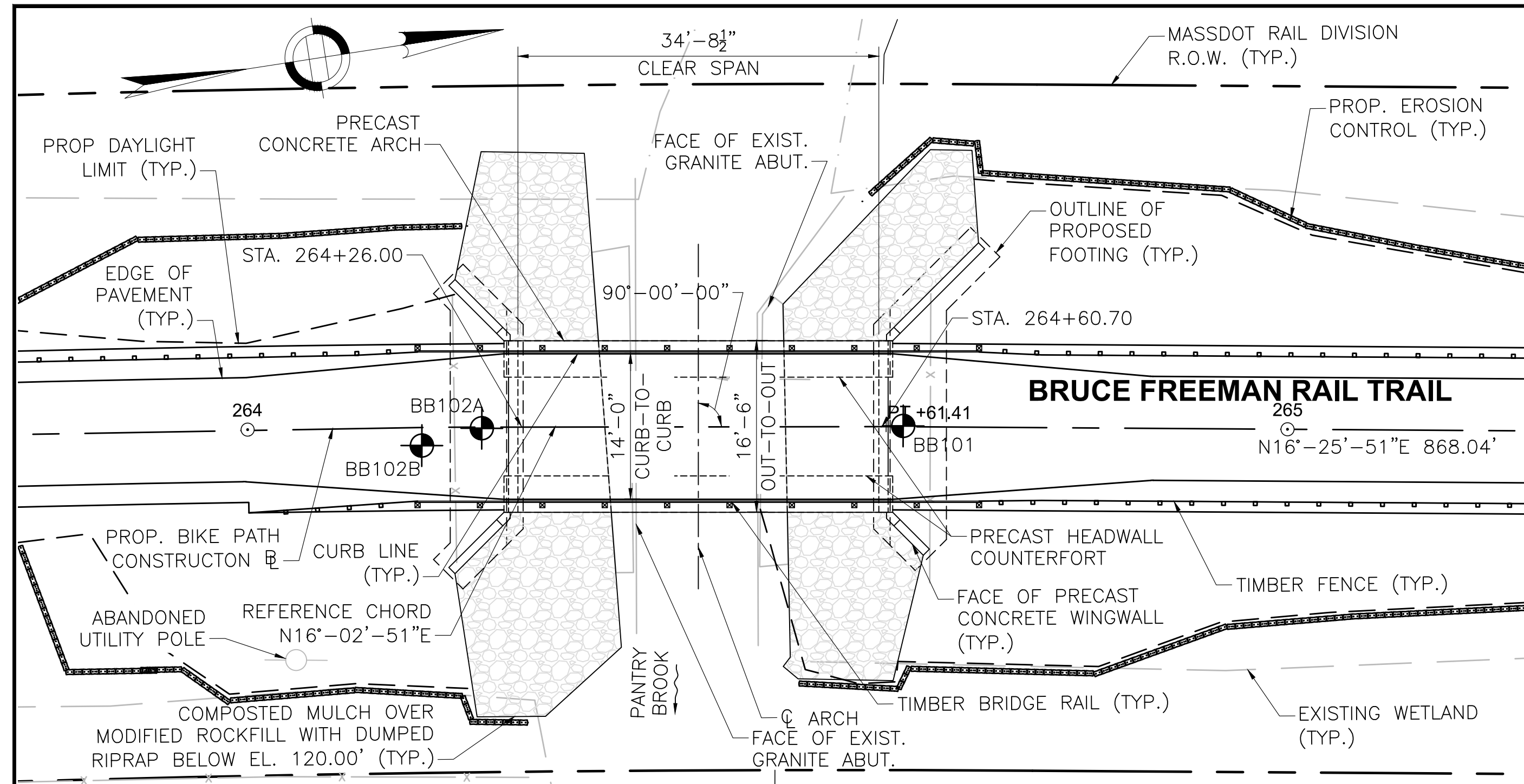
NOTE:
SEE CLIP DETAIL ON THIS SHEET.



SECTION 8
SCALE: $1\frac{1}{2}$ " = 1'-0"

CAMBER TABLE (INCHES)											
	SPAN NO. 1										
	S. ABUT.	0.1L	0.2L	0.3L	0.4L	0.5L	0.6L	0.7L	0.8L	0.9L	N. ABUT.
STEEL DL DEFLECTION	0.00	0.02	0.03	0.05	0.06	0.06	0.06	0.05	0.03	0.02	0.00
NONCOMP. DEFLECTION	0.00	0.03	0.05	0.06	0.07	0.07	0.07	0.06	0.05	0.03	0.00
ADDITIONAL CAMBER	0.00	0.07	0.14	0.21	0.28	0.34	0.28	0.21	0.14	0.07	0.00
TOTAL CAMBER	0.00	0.12	0.22	0.32	0.41	0.47	0.41	0.32	0.22	0.12	0.00

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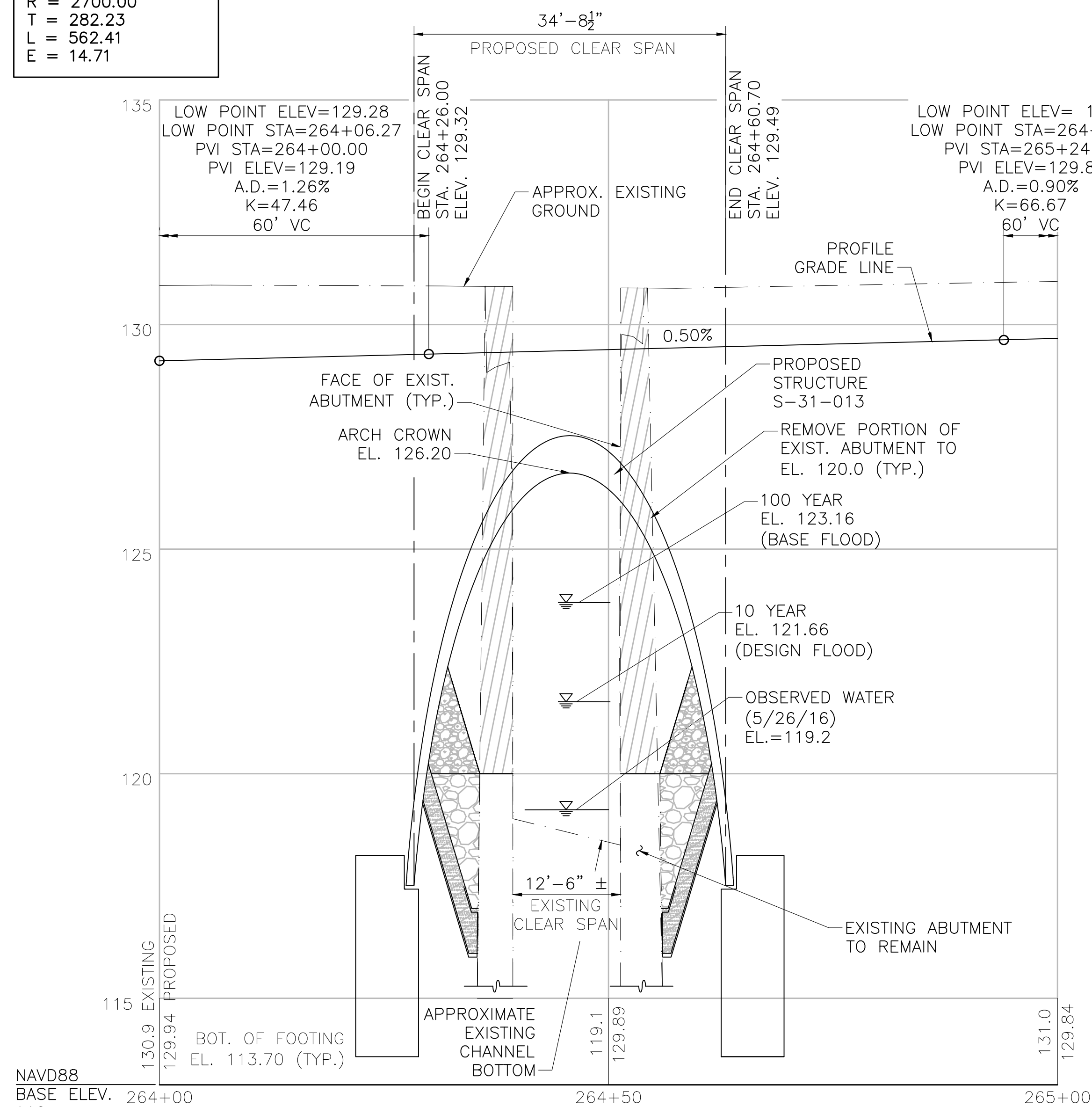


CURVE DATA

PI = 261+81.23
Δ = 11°-56'-04.85"
R = 2700.00
T = 282.23
L = 562.41
E = 14.71

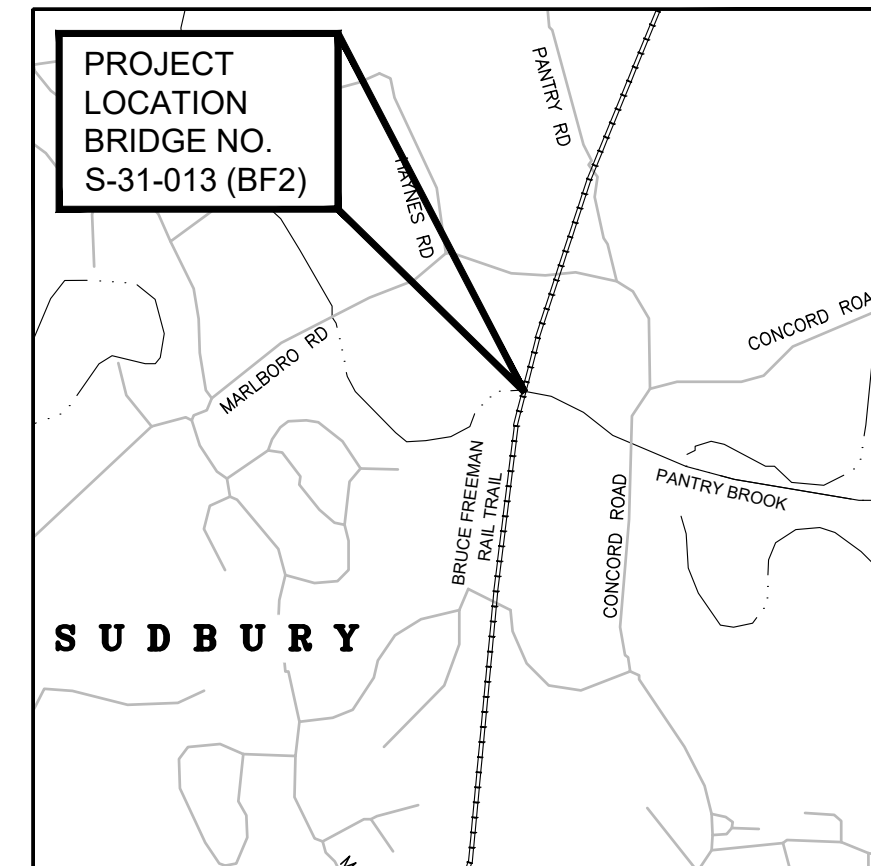
KEY PLAN

SCALE: 1" = 10'-0"



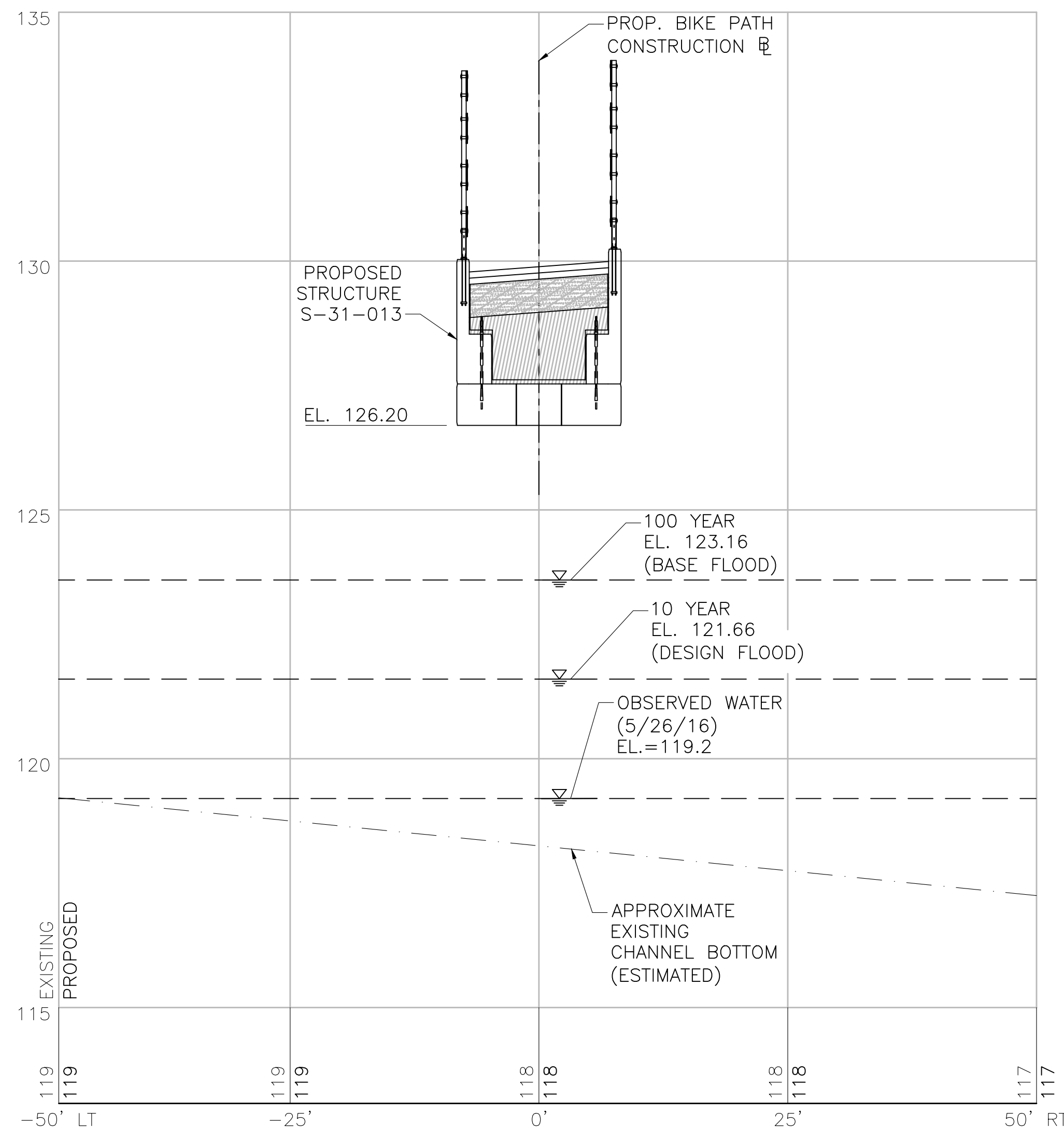
PROFILE ALONG BIKE PATH

HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"



LOCUS PLAN

SCALE: 1" = 1200'



PROFILE ALONG PANTRY BROOK

HORIZONTAL SCALE: 1" = 10'-0"
VERTICAL SCALE: 1" = 2'-0"

SUDBURY BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
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KEY PLAN & PROFILE

ESTIMATED QUANTITIES: (NOT GUARANTEED)

ITEM NO.:	ITEM:	QUANTITY:
114.1	DEMOLITION OF SUPERSTRUCTURE OF BRIDGE NO. S-31-013	1 LS
140.	BRIDGE EXCAVATION	360 CY
143.	CHANNEL EXCAVATION	255 CY
151.2	GRAVEL BORROW FOR BACKFILLING STRUCTURES AND PIPES	270 CY
156.	CRUSHED STONE	85 TON
156.1	CRUSHED STONE FOR BRIDGE FOUNDATIONS	55 TON
665.	CHAIN LINK FENCE REMOVED AND STACKED	55 FT
690.	STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR	10 CY
690.91	MASONRY REPOINTING	10 SY
690.92	MASONRY REMOVED AND STOCKPILED	1 LS
698.4	GEOTEXTILE FABRIC FOR PERMANENT EROSION CONTROL	215 SY
707.4	PANTRY BROOK BLOCKS REMOVED AND RELOCATED	1 LS
767.78	COMPOSTED MULCH OVER MODIFIED ROCK	120 SY
983.	DUMPED RIPRAP	60 TON
986.	MODIFIED ROCKFILL	145 TON
991.2	CONTROL OF WATER - STRUCTURE NO. S-31-013	1 LS
995.01	BRIDGE STRUCTURE, BRIDGE NO. S-31-013	1 LS

INDEX

SHEET NO.	DESCRIPTION
1	KEY PLAN AND PROFILE
2	GENERAL NOTES
3-4	BORING LOGS
5	GENERAL PLAN AND ELEVATION
6	EARTHWORK DETAILS
7	TYPICAL SECTIONS AND ELEVATIONS
8	FOUNDATION PLAN AND DETAILS
9	PRECAST ARCH DETAILS AND NOTES
10	TIMBER BRIDGE RAIL DETAILS

P.E.
STAMP
SIGNATURE

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

MONTH DD, YYYY

ISSUED FOR CONSTRUCTION

massDOT
Massachusetts Department of Transportation
Highway Division

PROPOSED BRIDGE

SUDBURY

BRUCE FREEMAN RAIL TRAIL
OVER PANTRY BROOK

MASSACHUSETTS DEPARTMENT OF TRANSPORTATION
HIGHWAY DIVISION
10 PARK PLAZA BOSTON, MASS

TITLE: _____ CHIEF ENGINEER

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

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GENERAL NOTES

GENERAL NOTES:

DESIGN:

IN ACCORDANCE WITH THE 2020 AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS LRFD BRIDGE DESIGN SPECIFICATIONS WITH CURRENT INTERIM SPECIFICATIONS THROUGH 2021 AND THE 2009 LRFD GUIDE SPECIFICATIONS FOR THE DESIGN OF PEDESTRIAN BRIDGES FOR H-10 VEHICULAR AND 90 PSF PEDESTRIAN LOADINGS.

MASSDOT BENCH MARK:

BM #37 LAG SCREW SET 2' UP 7" PINE
ELEV. = 133.50'

ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988.

DATE:

TO BE PLACED ON THE UPSTREAM AND DOWNSTREAM HEADWALL FACES. A DETAIL SHOWING SIZE AND CHARACTER OF NUMERALS WILL BE FURNISHED. THE DATE USED SHALL BE THE LATEST YEAR OF CONTRACT COMPLETION AS OF THE DATE THE FIRST HEADWALL IS CONSTRUCTED. BOTH HEADWALLS SHALL FEATURE THE SAME DATE.

SURVEY NOTEBOOKS:

SURVEY PERFORMED BY VANASSE HANGEN BRUSTLIN, INC. FIELD NOTEBOOKS SHALL BE OBTAINED FROM FUSS AND O'NEILL, INC., SPRINGFIELD, MA.

SCALES:

SCALES NOTED ON THE PLANS ARE NOT APPLICABLE TO REDUCED SIZE PRINTS. DIVIDE SCALES BY 2 FOR HALF-SIZE PRINTS (A3).

FOUNDATIONS:

FOUNDATIONS MAY BE ALTERED, IF NECESSARY, TO SUIT CONDITIONS ENCOUNTERED DURING CONSTRUCTION, WITH THE APPROVAL OF THE ENGINEER.

UNSUITABLE MATERIAL:

ALL UNSUITABLE MATERIAL SHALL BE REMOVED WITHIN THE LIMITS OF THE FOUNDATIONS OF THE STRUCTURE, AS DIRECTED BY THE ENGINEER.

EXISTING CONSTRUCTION:

DIMENSIONS SHOWN ARE TAKEN FROM SURVEY, VARIOUS FIELD MEASUREMENTS, AND GEOTECHNICAL EXPLORATION AND ARE NOT GUARANTEED. THE CONTRACTOR SHALL DETERMINE AND ESTABLISH ALL DIMENSIONS AND DETAILS NECESSARY FOR COMPLETION OF ALL WORK BY FIELD MEASUREMENT AND SURVEY. THE CONTRACTOR SHALL BE RESPONSIBLE AND NOT ORDER ANY MATERIAL OR COMMENCE ANY FABRICATION UNTIL HE HAS MADE THE REQUIRED MEASUREMENTS ON THE ACTUAL STRUCTURE AND THE EXTENT OF THE PROPOSED WORK HAS BEEN APPROVED BY THE ENGINEER. EXISTING BRIDGE PLANS ARE NOT AVAILABLE FOR REFERENCE.

CONCRETE:

5,000 PSI, ¾ INCH, 685 HP CEMENT CONCRETE SHALL BE PROVIDED FOR ALL CONCRETE INCLUDING ARCH, HEADWALLS, WINGWALLS, AND FOOTINGS.

REINFORCEMENT:

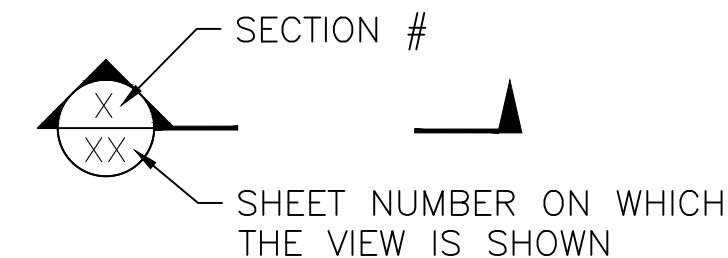
REINFORCING STEEL SHALL CONFORM TO THE REQUIREMENTS OF AASHTO M 31 GRADE 60. UNLESS OTHERWISE NOTED ON THE CONSTRUCTION DRAWINGS, ALL BARS SHALL BE LAPPED AS FOLLOWS:

MODIFICATION CONDITION	#4 BARS	#5 BARS	#6 BARS
1. NONE	16"	19"	23"
2. 12" OF CONCRETE BELOW BAR	20"	25"	30"
3. EPOXY COATED BARS, COVER < 3d _b , OR CLEAR SPACING < 6d _b	23"	29"	34"
4. COATED BARS, ALL OTHER CASES	18"	23"	27"
5. CONDITION 2. AND 3.	26"	32"	39"
6. CONDITION 2. AND 4.	24"	30"	36"

ALL OTHER BARS SHOULD BE LAPPED AS SHOWN ON THE CONSTRUCTION DRAWINGS.

ALL REINFORCEMENT SHALL BE EPOXY COATED.

SECTION MARK:



TRAFFIC DATA		
	ROADWAY OVER	ROADWAY UNDER
DESIGN YEAR	N/A	
AVERAGE DAILY TRAFFIC – PRESENT	N/A	
AVERAGE DAILY TRAFFIC – DESIGN YEAR	N/A	
DESIGN HOURLY VOLUME	N/A	
DIRECTIONAL DISTRIBUTION	N/A	
TRUCK PERCENTAGE – AVERAGE DAY	N/A	
TRUCK PERCENTAGE – PEAK HOUR	N/A	
DESIGN SPEED	18 MPH	
DIRECTIONAL DESIGN HOURLY VOLUME	N/A	

SEISMIC DESIGN CRITERIA

DESIGN RETURN PERIOD:	1,000
DESIGN SPECTRA	
As	0.11
SDs	0.23
SD1	0.09
SITE CLASS	D
SEISMIC DESIGN CATEGORY (SDC)	A

HYDRAULIC DESIGN DATA

DRAINAGE AREA (SQ. MILES)	2.5
DESIGN FLOOD DISCHARGE (C.F.S)	155
DESIGN FLOOD FREQUENCY (YEARS)	10
DESIGN FLOOD VELOCITY (F.P.S)	2.88
DESIGN FLOOD ELEVATION (FEET, NAVD)	121.66

BASE (100-YEAR) FLOOD DATA

BASE FLOOD DISCHARGE (C.F.S)	240
BASE FLOOD ELEVATION (FEET, NAVD)	123.16

DESIGN AND CHECK SCOUR DATA

DESIGN SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	25
DESIGN FLOOD ABUTMENT SCOUR DEPTH (FEET)	0.6
DESIGN FLOOD PIER SCOUR DEPTH (FEET)	N/A
CHECK SCOUR FLOOD EVENT RETURN FREQUENCY (YEARS)	50
CHECK FLOOD ABUTMENT SCOUR DEPTH (FEET)	0.7
CHECK FLOOD PIER SCOUR DEPTH (FEET)	N/A

FLOOD OF RECORD

DISCHARGE (C.F.S.)	N/A
FREQUENCY (IF KNOWN, YEARS)	N/A
MAXIMUM ELEVATION (FEET, NAVD)	N/A
DATE (MM/YYYY)	N/A
HISTORY OF ICE FLOES	N/A
EVIDENCE OF SCOUR AND EROSION	YES

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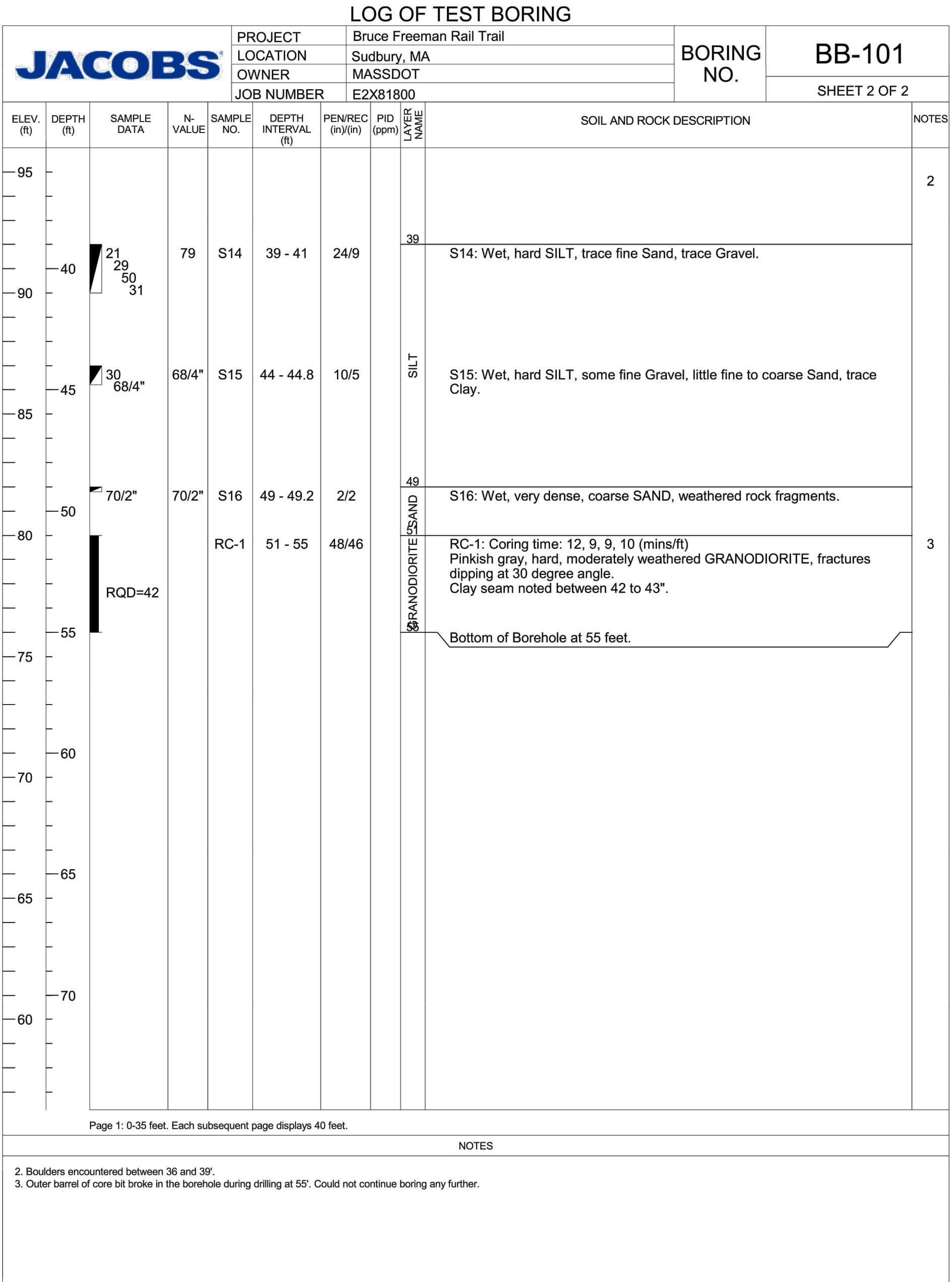
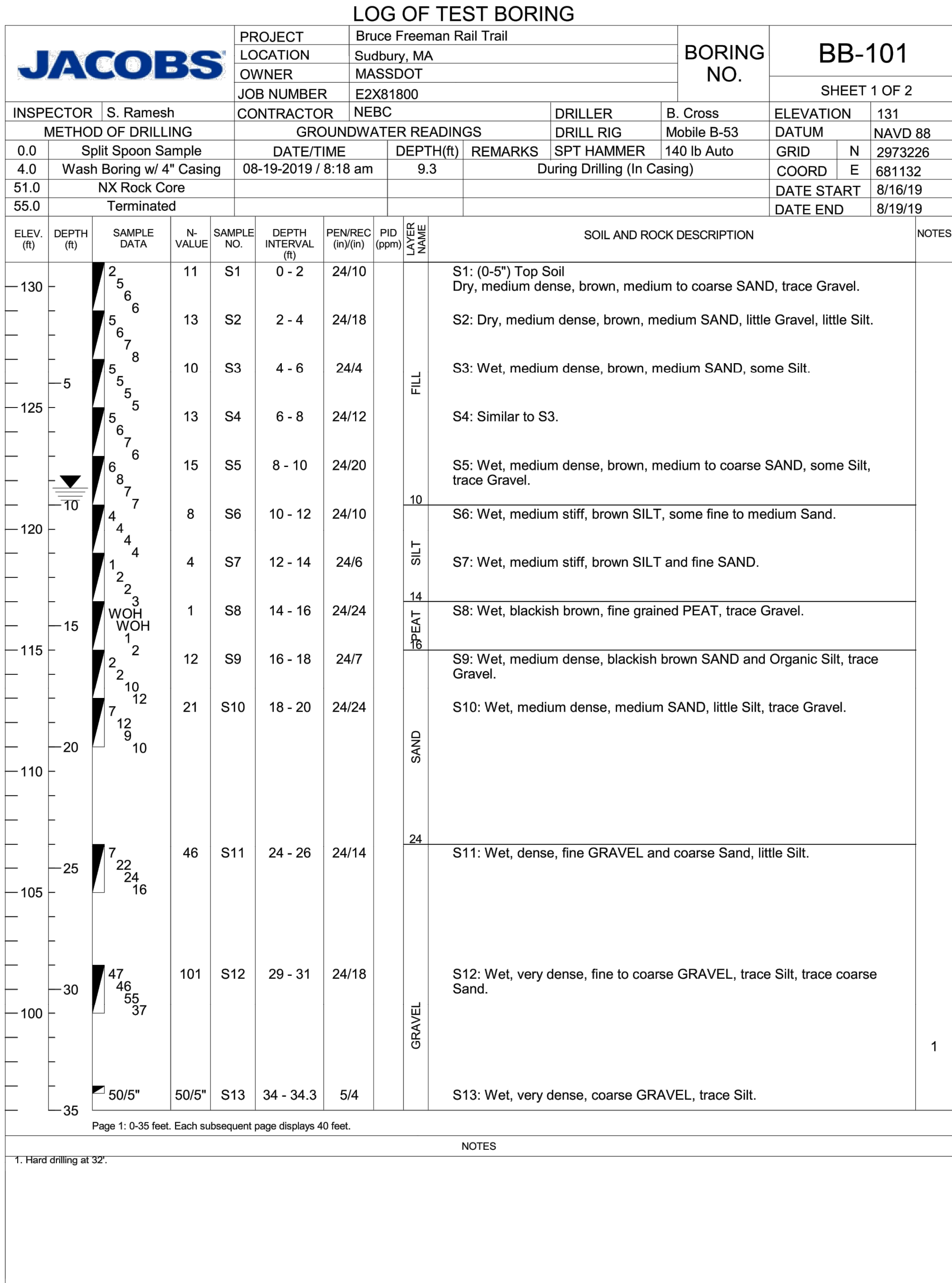
SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

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BORING LOGS

BORING NOTES:

- LOCATION OF BORINGS SHOWN ON THE PLANS THUS: BB-#
- BORINGS ARE TAKEN FOR PURPOSE OF DESIGN AND SHOW CONDITIONS AT BORING POINTS ONLY, BUT DO NOT NECESSARILY SHOW THE NATURE OF THE MATERIALS TO BE ENCOUNTERED DURING CONSTRUCTION.
- WATER LEVELS SHOWN ON THE BORING LOGS WERE OBSERVED AT THE TIME OF TAKING BORINGS AND DO NOT NECESSARILY SHOW THE TRUE GROUND WATER LEVEL.
- FIGURES IN COLUMNS INDICATE NUMBER OF BLOWS REQUIRED TO DRIVE A 1½" I.D. SPLIT SPOON SAMPLER 6" USING A 140 POUND WEIGHT FALLING 30".
- BORING SAMPLES ARE STORED AT A STORAGE FACILITY LOCATED ON ROUTE 114 (219 WINTHROP AVE.) IN LAWRENCE, MA. THE CONTRACTOR MAY EXAMINE THE SOIL AND ROCK SAMPLES BY CONTRACTING THE MASSDOT GEOTECHNICAL SECTION AT 10 PARK PLAZA, BOSTON, MA.
- ALL BORINGS WERE MADE IN AUGUST 2019.
- BORINGS WERE MADE BY NEW ENGLAND BORING CONTRACTOR, INC., P.O. BOX 165, DERRY, NH 03038.
- THE NORTH AMERICAN VERTICAL DATUM (NAVD) OF 1988 IS USED THROUGHOUT.

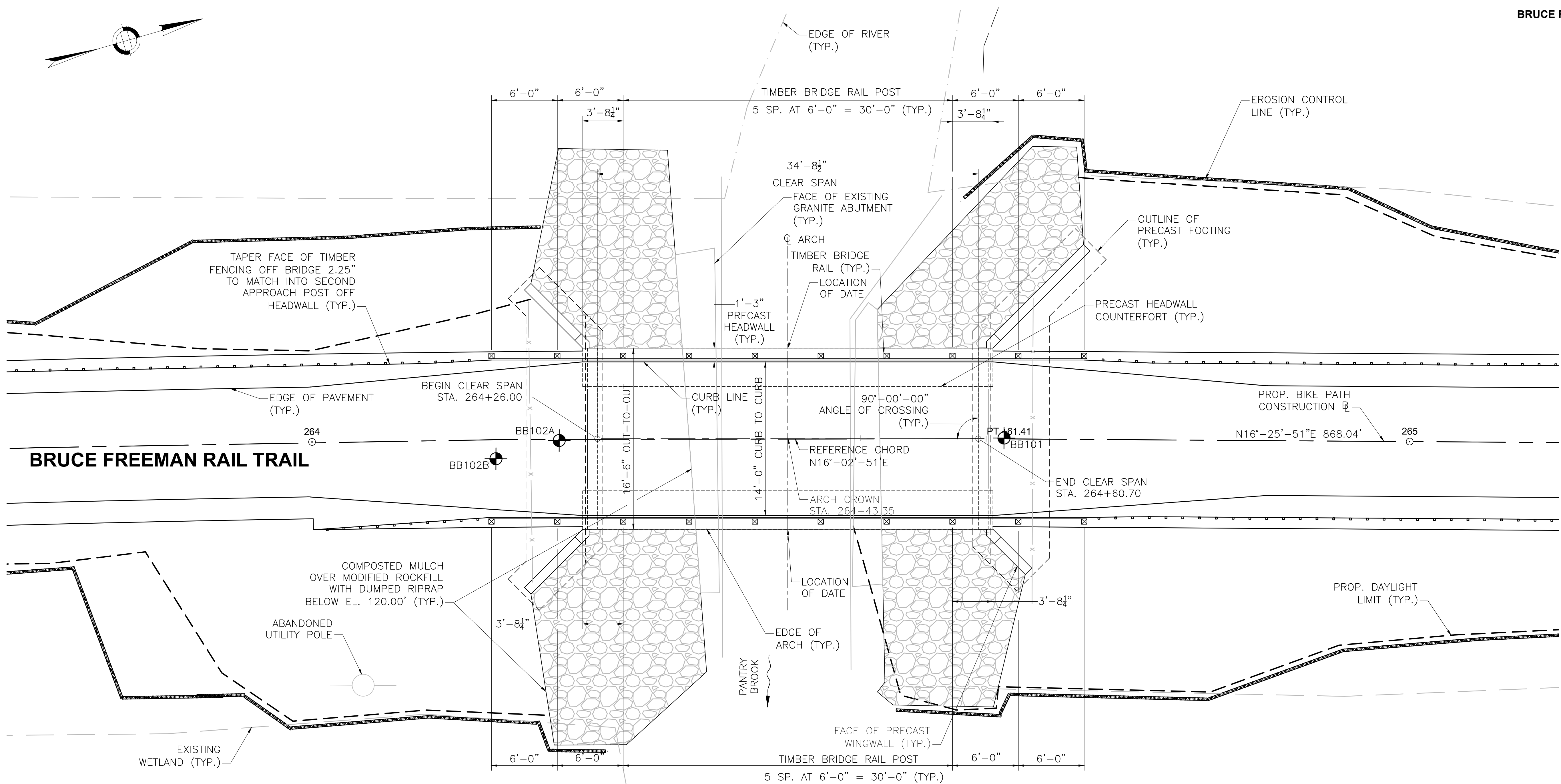


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BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

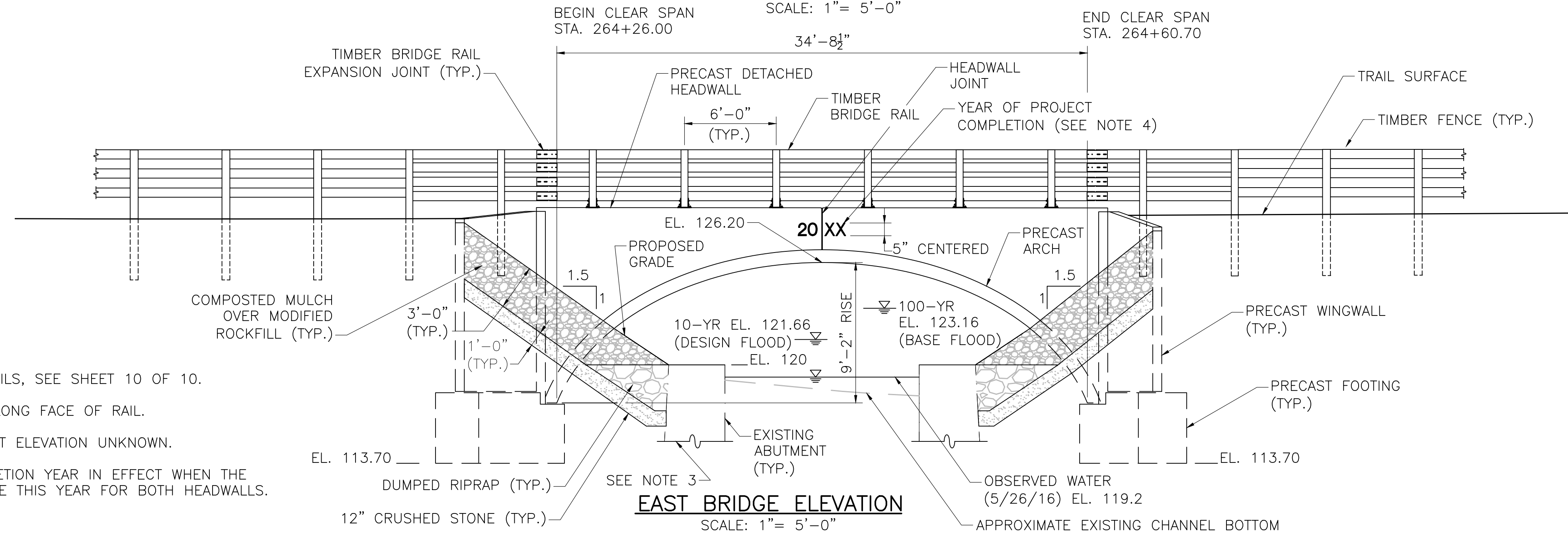
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GENERAL PLAN & ELEVATION



GENERAL PLAN

SCALE: 1"= 5'-0"



- NOTES:**
1. FOR TIMBER BRIDGE RAIL DETAILS, SEE SHEET 10 OF 10.
 2. RAIL POSTS ARE MEASURED ALONG FACE OF RAIL.
 3. BOTTOM OF EXISTING ABUTMENT ELEVATION UNKNOWN.
 4. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST HEADWALL IS CAST. USE THIS YEAR FOR BOTH HEADWALLS.

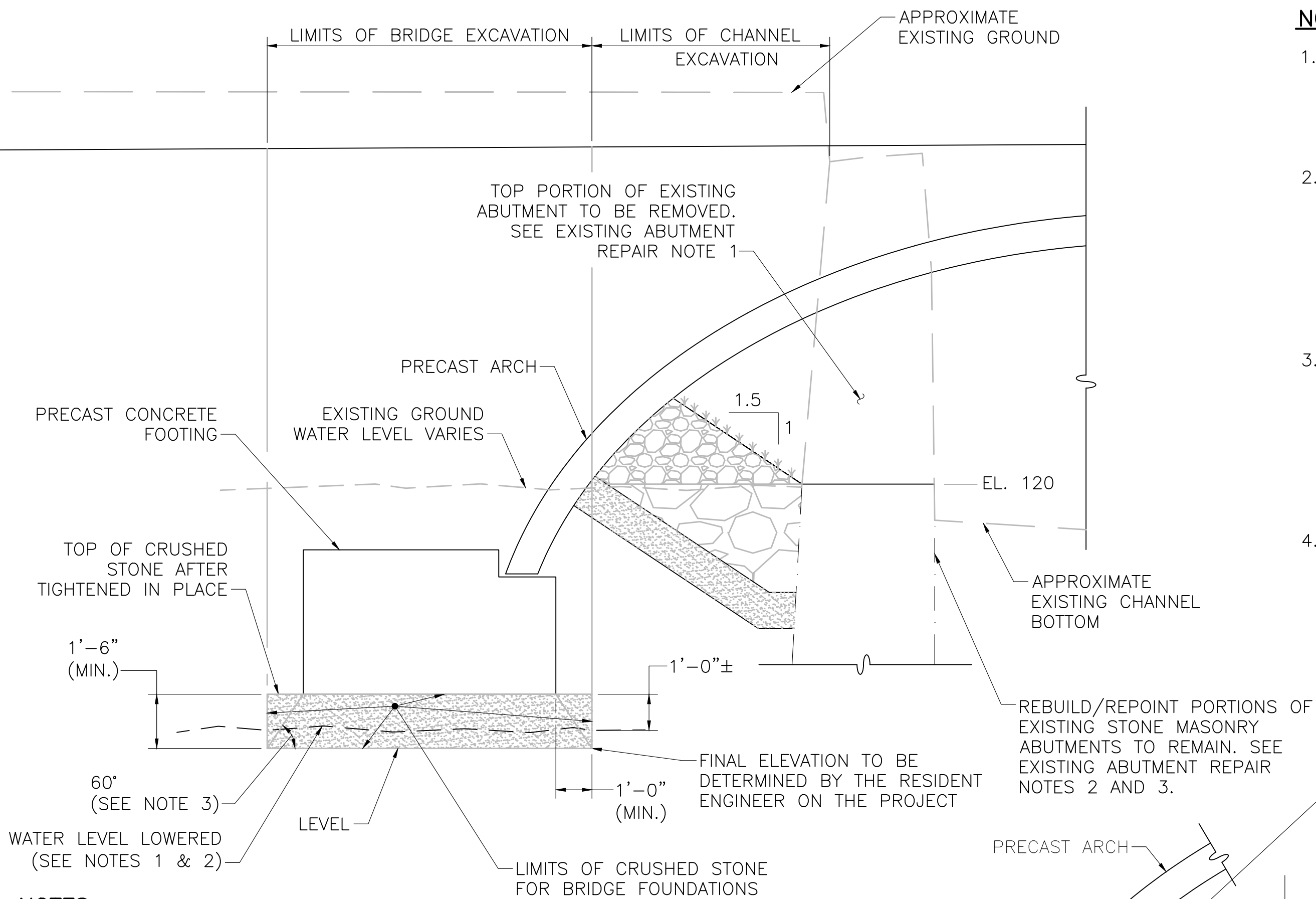
EAST BRIDGE ELEVATION

SCALE: 1"= 5'-0"

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EXISTING ABUTMENT REPAIR NOTES:

1. REMOVE TOPS OF EXISTING STONE MASONRY ABUTMENTS TO ELEVATION 120' OR TO THE NEAREST LONGITUDINAL STONE JOINT, PROVIDED THE JOINT LIES ABOVE THE RIVERBED OR AS DIRECTED BY THE ENGINEER. THE COST TO REMOVE THE EXISTING STONES SHALL BE INCLUDED IN ITEM 690.92, "MASONRY REMOVED AND STOCKPILED". SEVEN (7) OF THESE GRANITE BLOCKS SHALL BE SET ASIDE FOR RE-USE AS BENCHES AND HISTORIC DISPLAY ALONG THE TRAIL. REMOVAL AND RESETTING OF THESE 7 BLOCKS SHALL BE PAID FOR SEPARATELY UNDER ITEM 707.4, "PANTRY BROOK BLOCKS REMOVED AND RELOCATED". SEE SPECIAL PROVISIONS. ALL REMAINING STONES ARE TO BE DELIVERED TO THE TOWN OF SUDBURY PUBLIC WORKS DIVISION.
2. THE SOUTH EXISTING STONE MASONRY ABUTMENT HAS PARTIALLY COLLAPSED. THE CONTRACTOR SHALL REBUILD ANY COLLAPSED PORTIONS OF THE EXISTING WALL ALONG THE LENGTH OF THE ABUTMENT AND WINGWALLS BELOW THE LIMITS OF REMOVAL. THE COST TO REBUILD THE WALL AS REQUIRED SHALL BE INCLUDED IN ITEM 690, "STONE MASONRY WALL REMOVED AND REBUILT IN CEMENT MORTAR".
3. REPOINTING OF THE EXISTING STONE MASONRY ABUTMENTS SHALL BE REQUIRED AFTER THE TOP OF THE EXISTING ABUTMENTS HAVE BEEN REMOVED BUT PRIOR TO EXCAVATION OPERATIONS. THE COST TO REPOINT SHALL BE INCLUDED IN ITEM 690.91, "MASONRY REPOINTING".
4. ANY WATER CONTROL REQUIRED TO REMOVE, REPAIR, REBUILD, SHORE, OR REPOINT THE EXISTING ABUTMENTS SHALL BE INCLUDED UNDER ITEM 991.2, "CONTROL OF WATER - STRUCTURE NO. S-31-013".
5. THE CONFIGURATION OF THE EXISTING ABUTMENT STONE WALLS AND THE ELEVATION OF THE BOTTOM OF THE EXISTING ABUTMENTS SHOWN ON THE PLANS ARE APPROXIMATE. THE CONTRACTOR SHALL ENSURE THE EXISTING ABUTMENT STONE WALLS ARE NOT UNDERMINED OR IN ANY WAY COMPROMISED DURING EXCAVATION OPERATIONS. TEMPORARY SHORING OF THE EXISTING ABUTMENT WALLS MAY BE REQUIRED TO COMPLETE EXCAVATION OPERATIONS. THE COST FOR TEMPORARY SHORING SHALL BE INCLUDED IN ITEM 995.01, "BRIDGE STRUCTURE, BRIDGE NO. S-31-013".

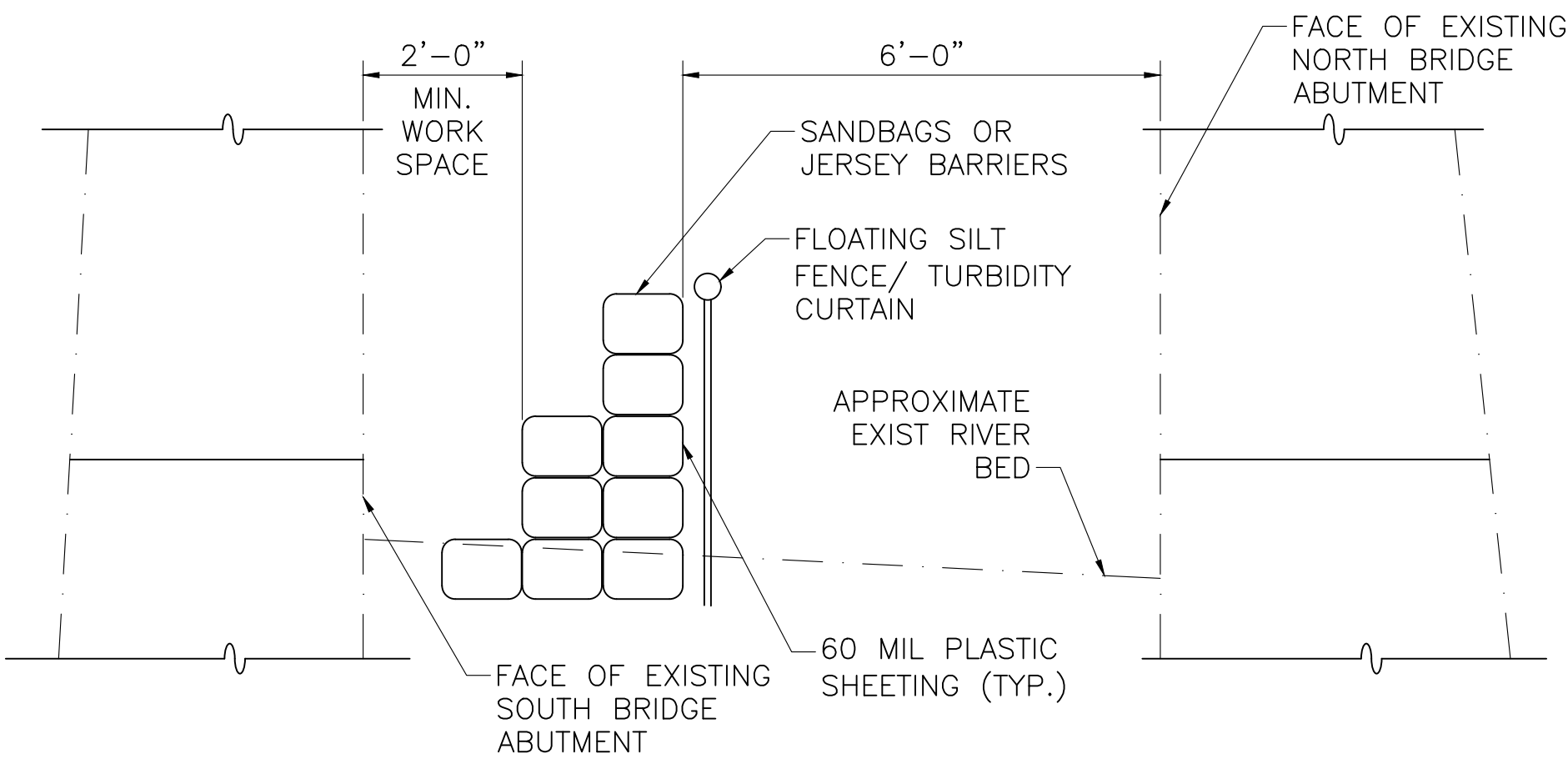


NOTES:

1. LOWER WATER LEVEL AS MUCH AS POSSIBLE WITHOUT DISTURBING THE GRANULAR SOIL (SIDES AND BOTTOM) AND TIGHTEN THE CRUSHED STONE IN PLACE (SEE STANDARD SPEC).
2. WATER CONTROL REQUIREMENTS:
 1. THE CONTRACTOR SHALL SUBMIT THE WATER CONTROL PLAN FOR APPROVAL PRIOR TO REMOVAL OF THE TOPS OF THE EXISTING ABUTMENTS AND WINGWALLS AND PLACEMENT OF THE PRECAST ARCH FOOTINGS.
 2. EXCAVATED FOOTING AREA SHALL CONTINUE TO BE DEWATERED UNTIL THE PRECAST CONCRETE FOOTINGS ARE FULLY INSTALLED.
 3. DUMPED RIPRAP, MODIFIED ROCK FILL, AND COMPOSTED MULCH SHALL BE PLACED IN THE DRY AFTER DEWATERING ALL AREAS.
3. SUPPORT OF EXCAVATION MAY BE REQUIRED BEHIND THE PROPOSED FOOTING TO COMPLETE EXCAVATION OPERATIONS. THE COST FOR SUPPORT OF EXCAVATION SHALL BE INCLUDED IN ITEM 995.01, "BRIDGE STRUCTURE, BRIDGE NO. S-31-013".

LIMITS OF CRUSHED STONE
FOR BRIDGE FOUNDATIONS

SCALE: 3/8"=1'-0"

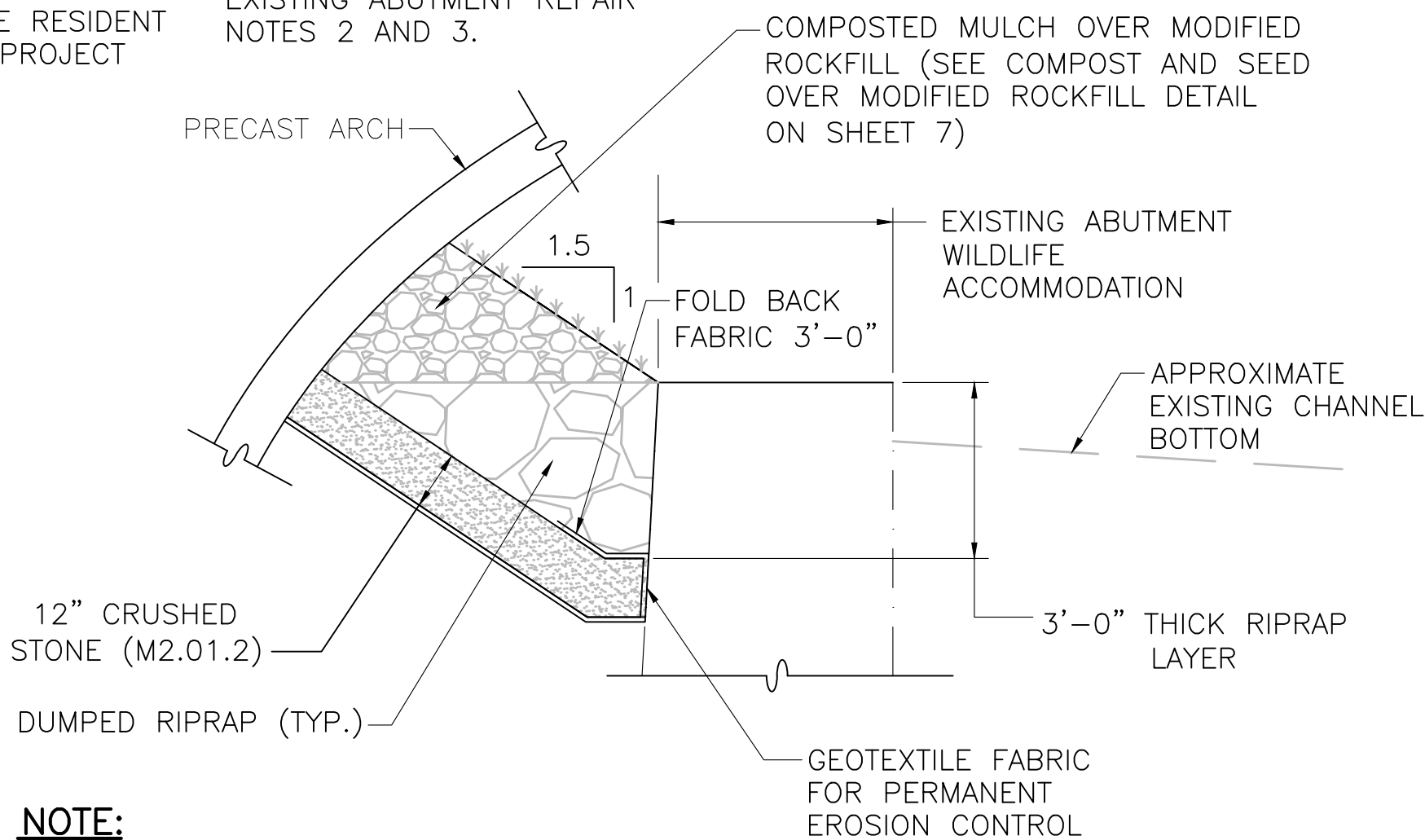


SUGGESTED WATER CONTROL PLAN

SCALE: 1"=1'-0"

NOTES:

1. WORK IN THE WATER SHALL BE PERFORMED DURING LOW FLOW SEASON AS DEFINED IN THE SPECIAL PROVISION FOR ITEM 991.2 AND THE FLOW SHALL BE MAINTAINED THROUGH THE USE OF TEMPORARY WATER CONTROL.
2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SIZING THE BARRIER TO HANDLE THE RIVER FLOW. THE BARRIER SHALL BE OF ADEQUATE SIZE TO DELIVER THE WATER AT THE DISCHARGE END TO THE RIVER WITHOUT DISTURBING THE EXISTING BANKS OR RIVERBED FLOW. THE BARRIER HEIGHT SHALL BE SIZED TO MAINTAIN 1' OF FREEBOARD OVER THE 10-YEAR FLOOD.
3. IN THE EVENT OF HIGH FLOW RATES, THE CONTRACTOR SHALL BE RESPONSIBLE TO DEVELOP AND IMPLEMENT A REASONABLE MEANS NECESSARY TO HANDLE THE ADDITIONAL FLOWS TO PROTECT THE SURROUNDING AREA, AS APPROVED BY THE ENGINEER AND SHALL BE INCIDENTAL TO ITEM 991.2, "CONTROL OF WATER - STRUCTURE NO. S-31-013".
4. WATER CONTROL SHALL BE PHASED. EXISTING CLEAR SPAN IS NOT SUFFICIENT TO ACCOMMODATE SAND BAGS IN FRONT OF BOTH ABUTMENTS SIMULTANEOUSLY WHILE ALLOWING ADEQUATE FLOW.



RIPRAP DETAIL

SCALE: 3/8"=1'-0"

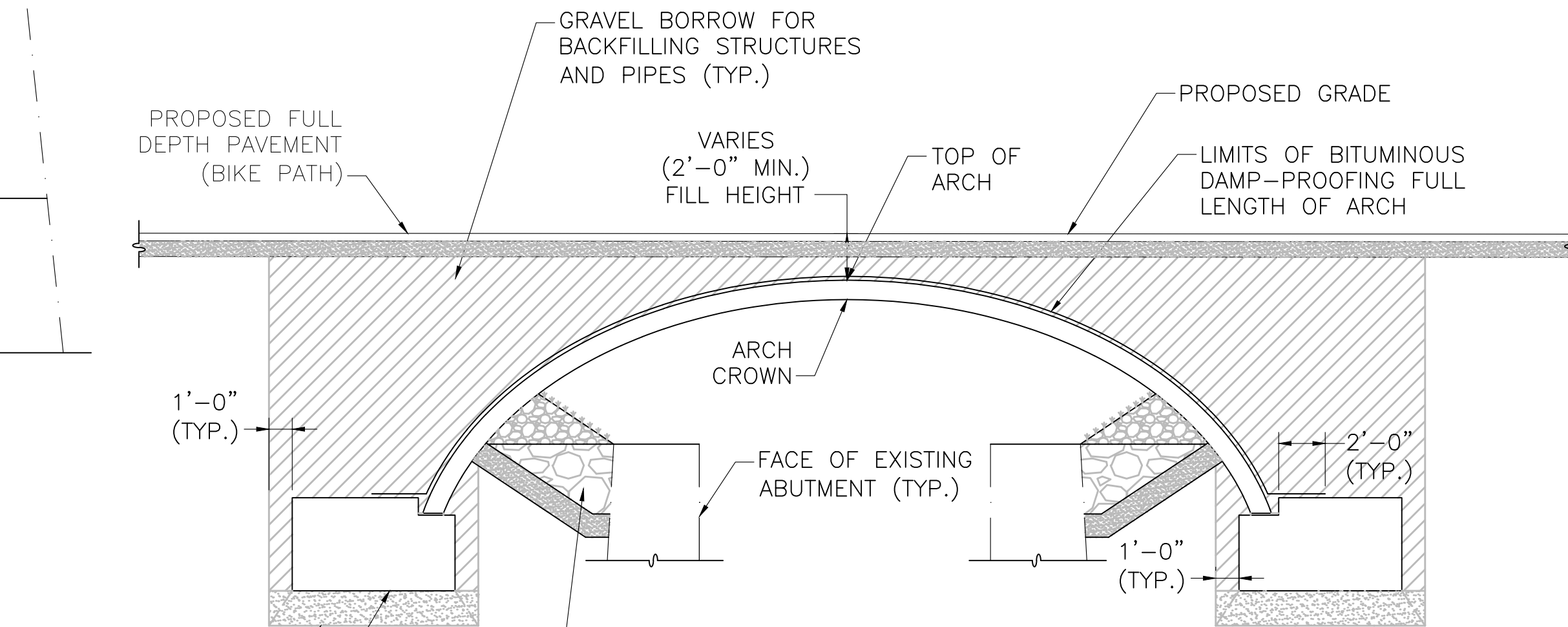
NOTE:

EXCAVATION BETWEEN THE BACK FACE OF THE EXISTING ABUTMENT TO THE VERTICAL LIMIT OF EXCAVATION FOR CRUSHED STONE FOR BRIDGE FOUNDATIONS AND DOWN TO THE BOTTOM OF CRUSHED STONE (M2.01.2) SHALL BE PAID FOR UNDER ITEM 143, "CHANNEL EXCAVATION".

SUDBURY
BRUCE FREEMAN RAIL TRAIL OVER PANTRY BROOK

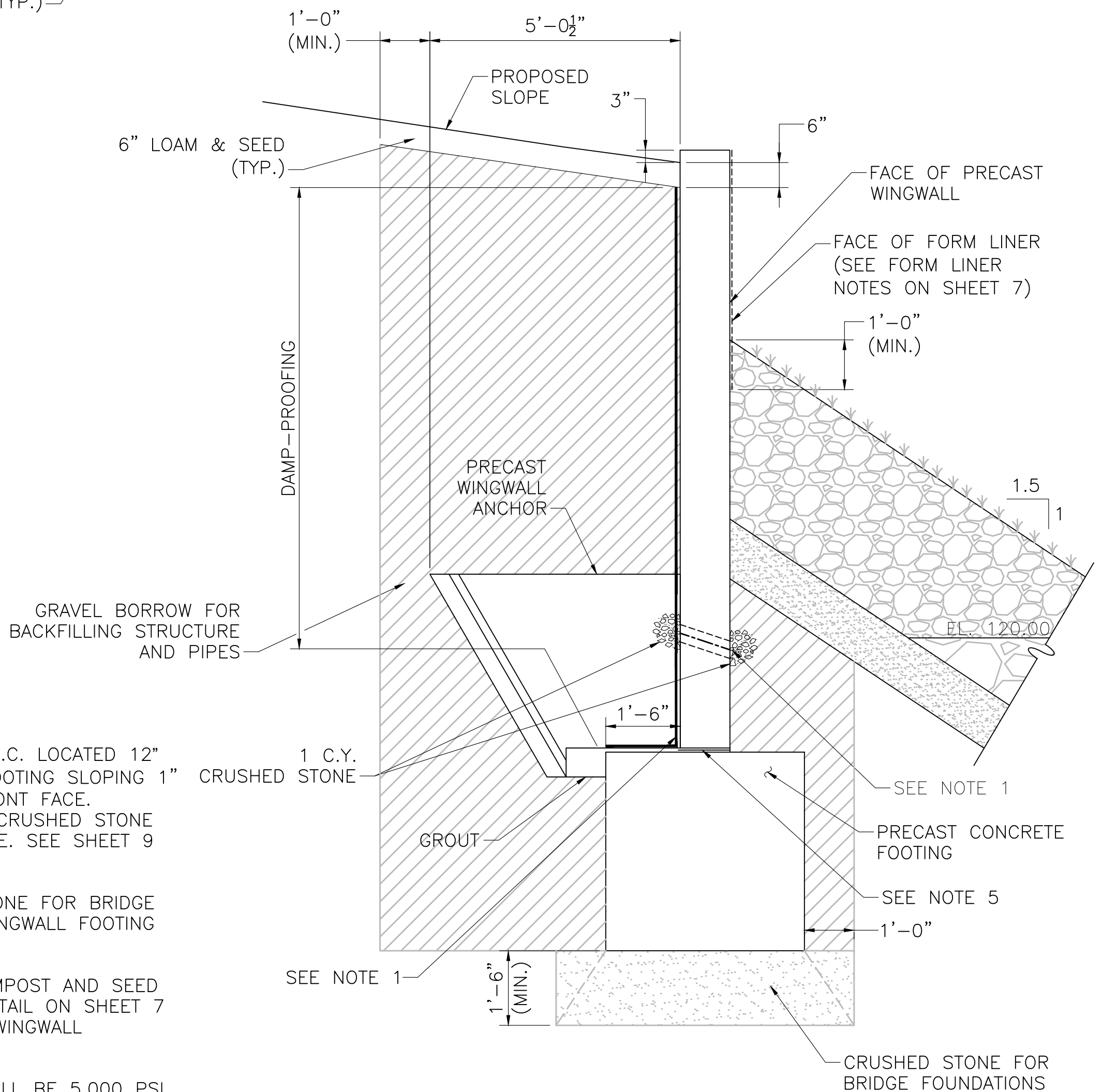
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EARTHWORK DETAILS



ARCH BACKFILL DETAIL

SCALE: 3/16"=1'-0"



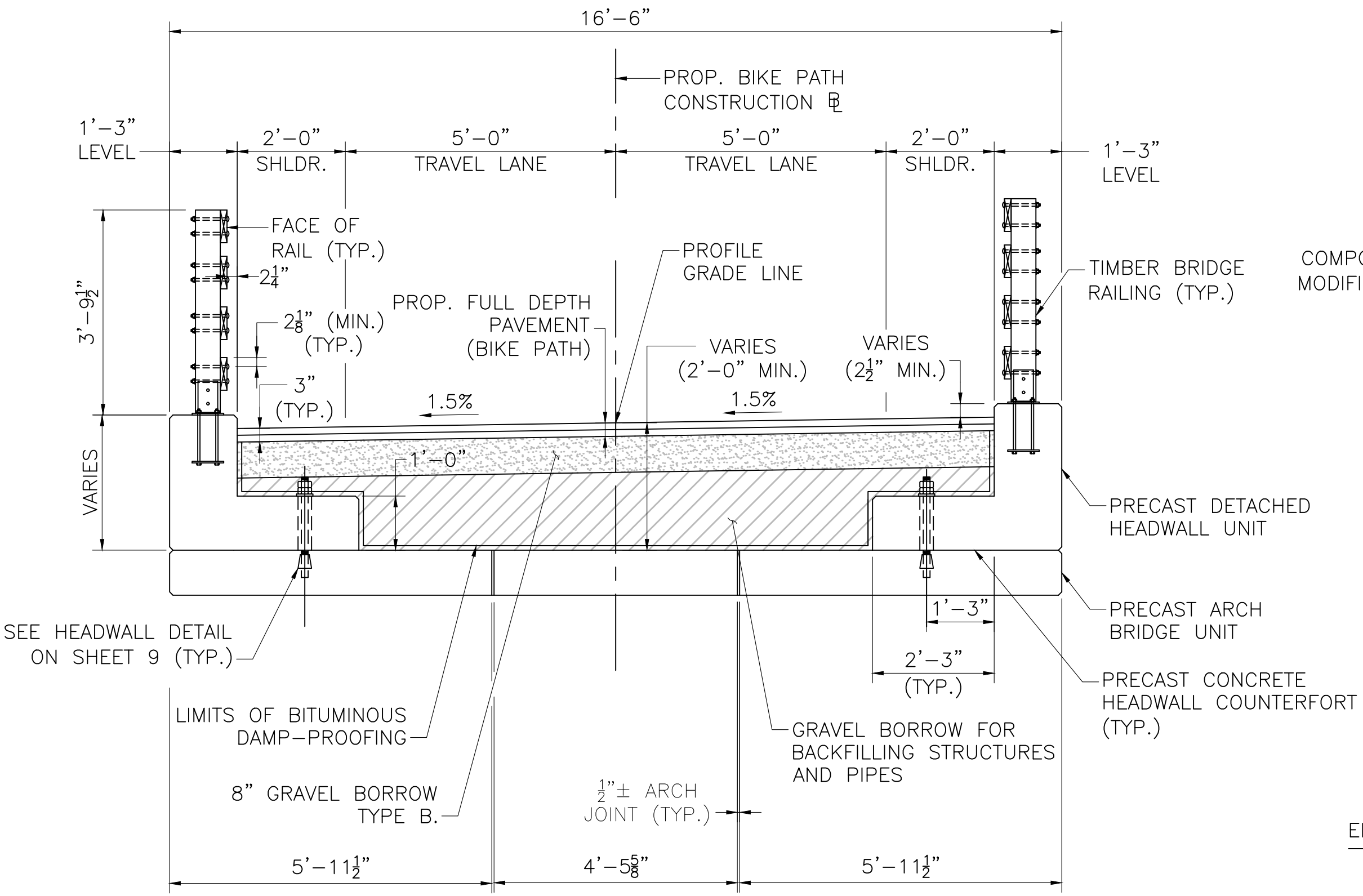
WINGWALL BACKFILL DETAIL

SCALE: 1/2"=1'-0"

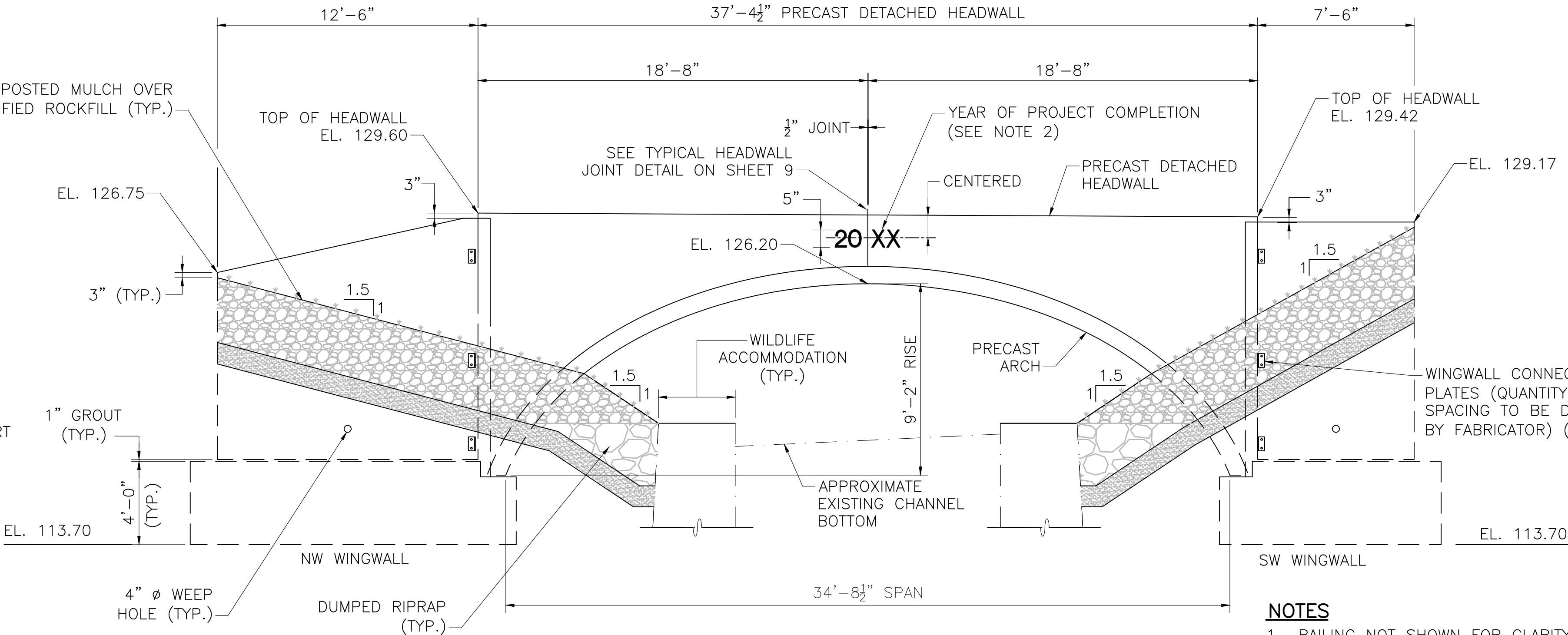
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TYPICAL SECTIONS & ELEVATIONS

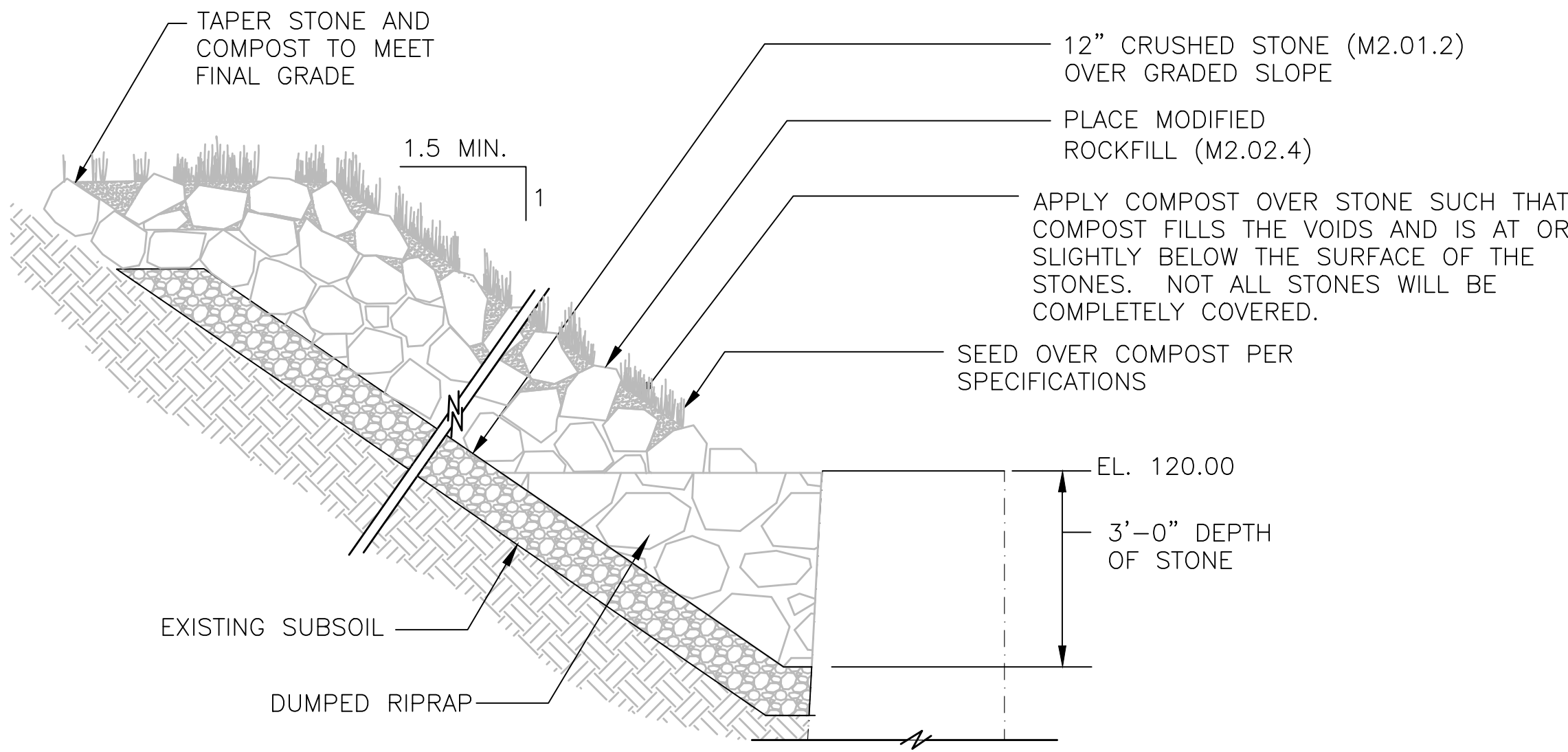


TRANSVERSE SECTION
SCALE: 1/2"=1'-0"

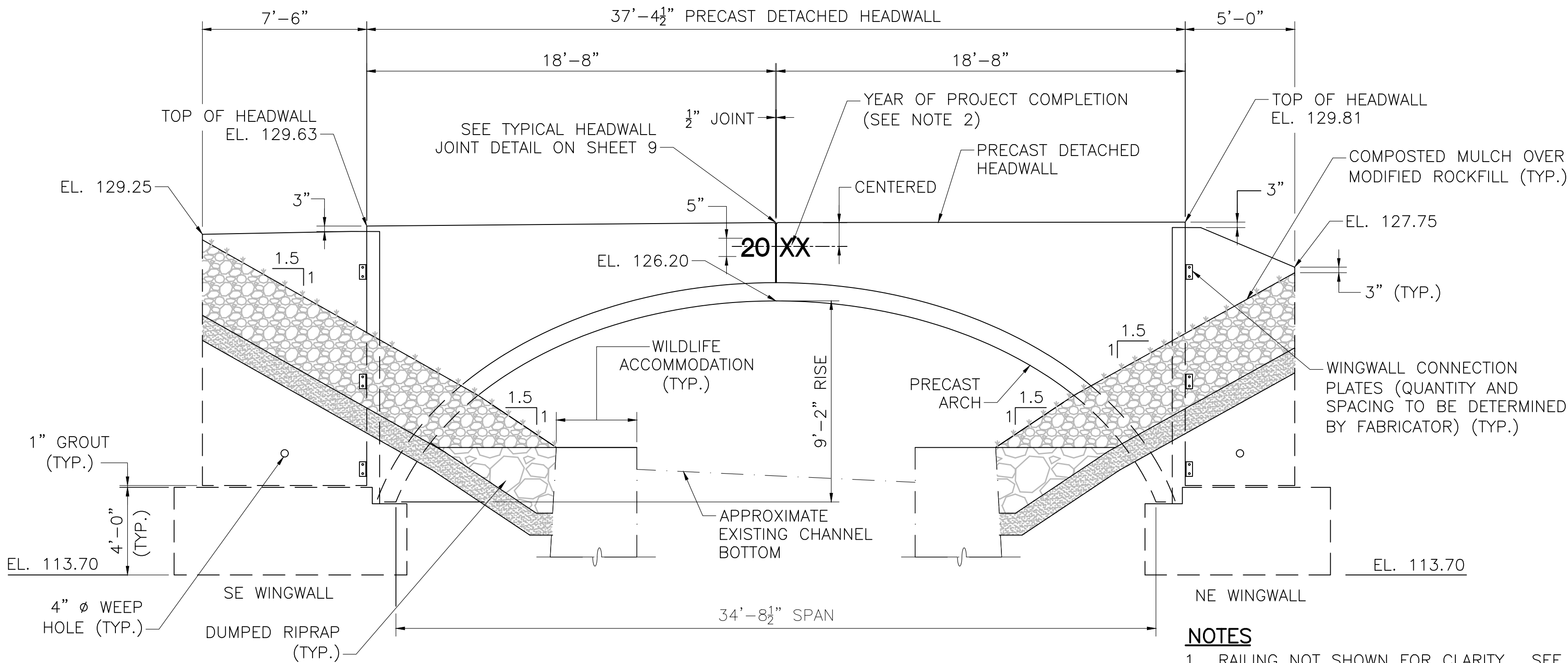


UPSTREAM ELEVATION
SCALE: 1/4"=1'-0"

- NOTES**
1. RAILING NOT SHOWN FOR CLARITY. SEE GENERAL PLAN ON SHEET 5 FOR POST LOCATIONS.
 2. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST HEADWALL IS CAST. USE THIS YEAR FOR BOTH HEADWALLS.



COMPOST AND SEED OVER MODIFIED ROCKFILL
SCALE: 3/8"=1'-0"



DOWNSTREAM ELEVATION
SCALE: 1/4"=1'-0"

- NOTES**
1. RAILING NOT SHOWN FOR CLARITY. SEE GENERAL PLAN ON SHEET 5 FOR POST LOCATIONS.
 2. USE LATEST CONTRACT COMPLETION YEAR IN EFFECT WHEN THE FIRST HEADWALL IS CAST. USE THIS YEAR FOR BOTH HEADWALLS.

WINGWALL AND HEADWALL FORM LINER NOTES:

1. EXPOSED FACES OF HEADWALLS AND WINGWALLS SHALL HAVE A PATTERNED FORM LINER AND SHALL EXTEND A MINIMUM OF 1' BELOW THE PROPOSED GRADE AT THE FACE OF THE WALL.
2. THE FORM LINER PATTERN SHALL BE CUSTOMROCK #1302 - RANDOM RUNNING BOND STONE OR APPROVED EQUAL AND SHALL BE STAINED TO SIMULATE THE APPEARANCE OF THE EXISTING MASONRY ABUTMENTS. THE COST OF THE FORM LINER SHALL BE INCLUDED UNDER ITEM 995.01, "BRIDGE STRUCTURE BRIDGE, NO. S-31-013." SEE SPECIAL PROVISIONS FOR ADDITIONAL INFORMATION.

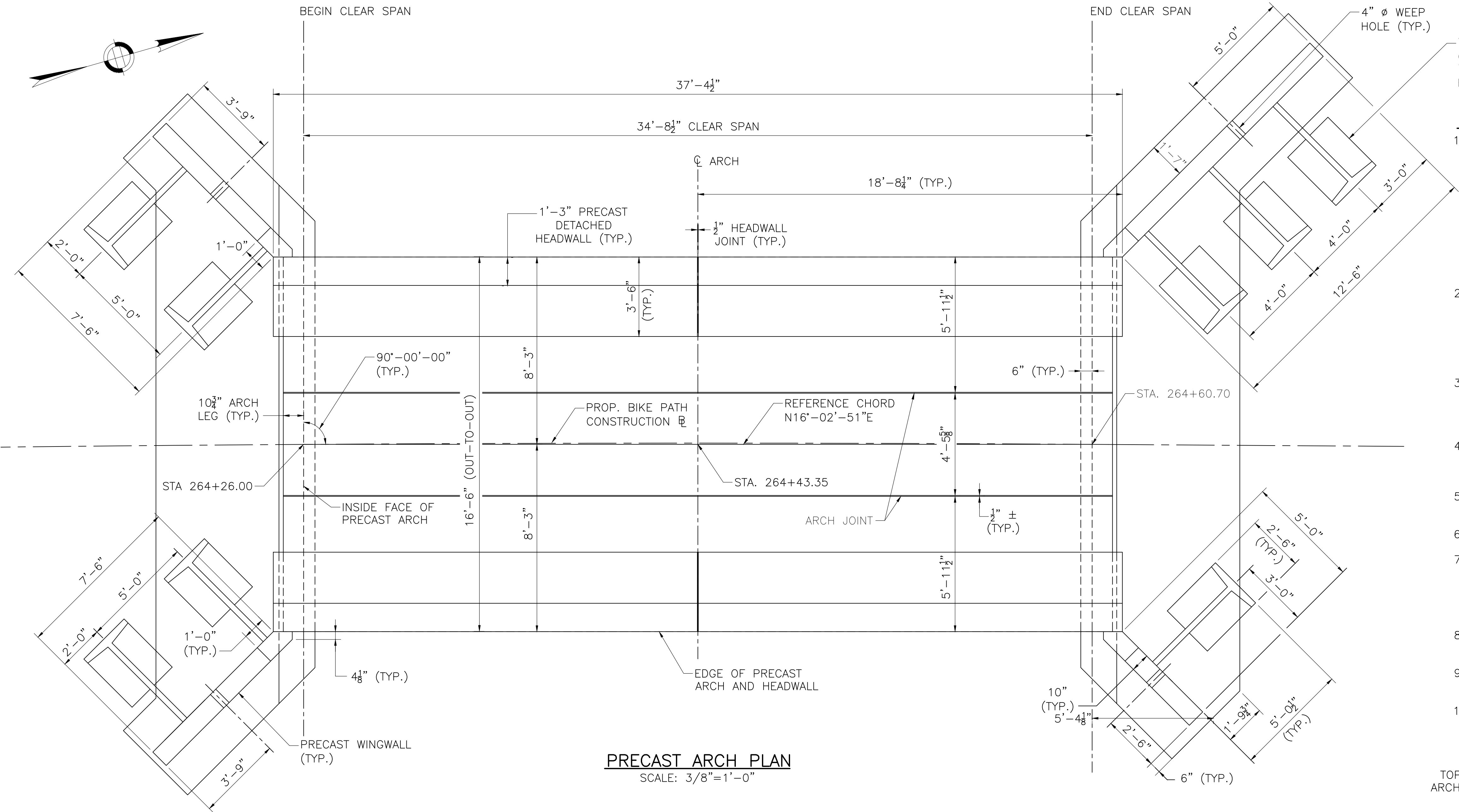
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DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	243	319
PROJECT FILE NO.		608164	

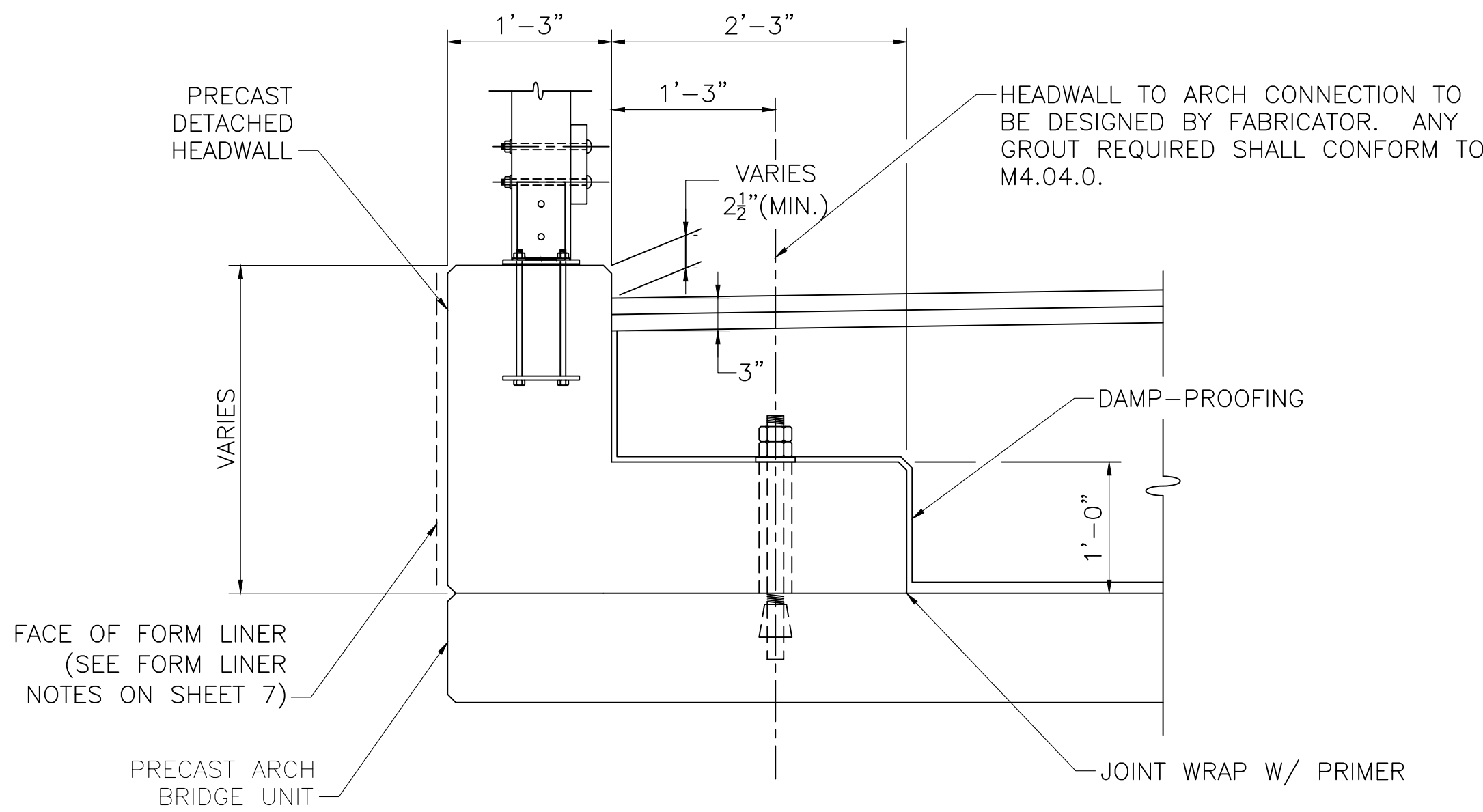
PRECAST ARCH DETAILS & NOTES

PRECAST CONCRETE ELEMENT NOTES:

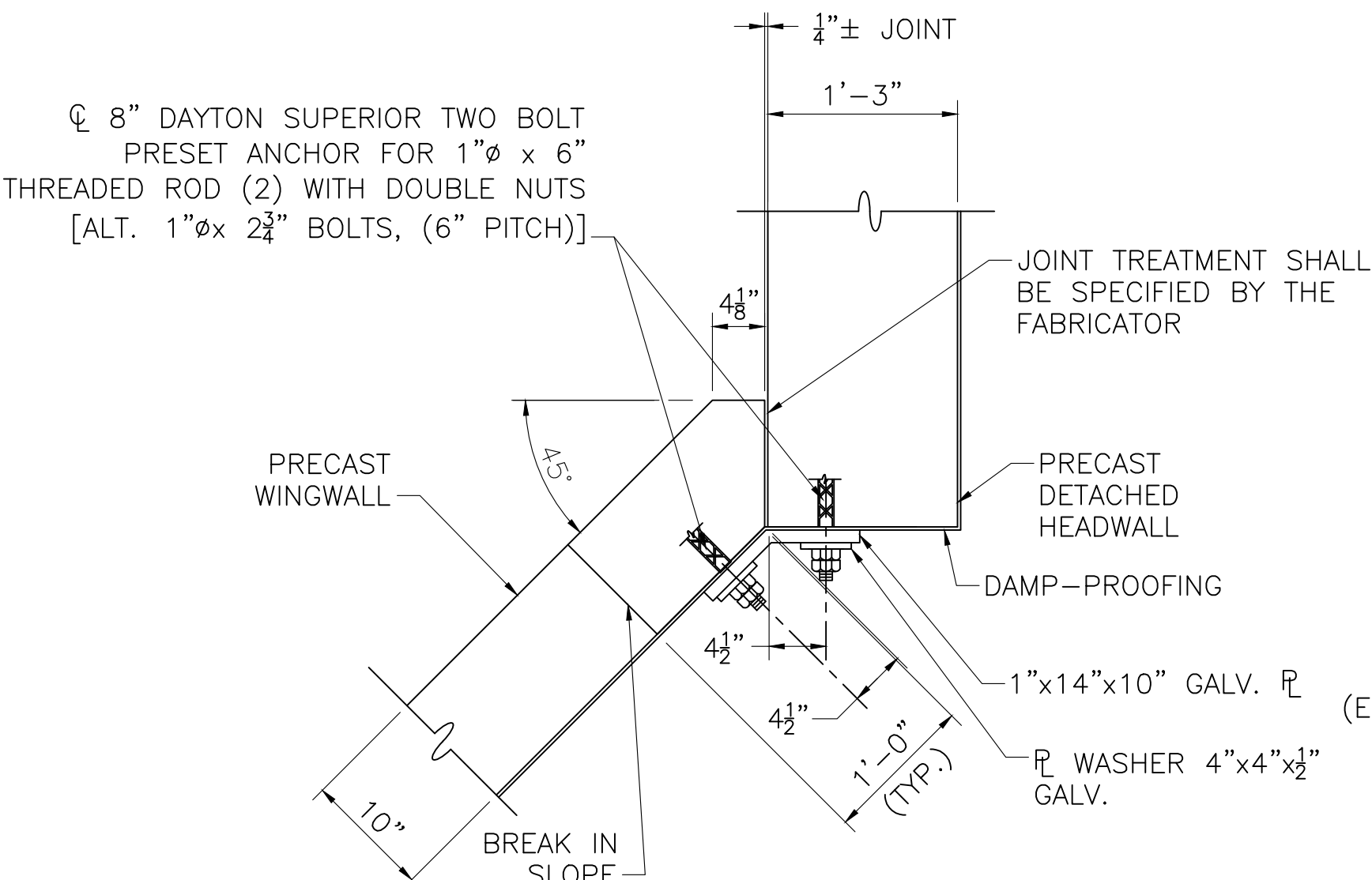
1. THE CONTRACTOR SHALL SUBMIT DESIGN CALCULATIONS FOR THE ARCH BRIDGE AND WINGWALL ELEMENTS, INCLUDING THE HEADWALL CONNECTION TO THE ARCH, THE ARCH AND WINGWALL FOOTINGS, AND THE WINGWALL ANCHORS IN ACCORDANCE WITH THE LATEST AASHTO LRFD DESIGN SPECIFICATIONS AND THE MASSACHUSETTS DEPARTMENT OF TRANSPORTATION'S LRFD BRIDGE DESIGN MANUAL FOR H10 TRUCK LOADING AND PEDESTRIAN LOADING FOR APPROVAL OF THE ENGINEER. THE DESIGN COMPUTATIONS SHALL CONSIDER ALL LOADINGS AS APPROPRIATE DURING FABRICATION, SHIPMENT, ERECTION, CONSTRUCTION, AND AFTER COMPLETION OF CONSTRUCTION BASED ON THESE CONSTRUCTION DRAWINGS. THE RAIL POST ANCHORAGE SPACING SHALL BE DETAILED ON SHOP DRAWINGS FOR REVIEW AND APPROVAL BY THE ENGINEER.
2. THE ARCH DIMENSIONS PROVIDED ARE SHOWN TO ESTABLISH THE SIZE OF THE PROPOSED OPENING OF 141 SQUARE FEET. THE WIDTHS AND THICKNESSES OF EACH ARCH UNIT MAY VARY DEPENDING UPON THE MANUFACTURER'S SPECIFICATIONS. AN ARCH TYPE STRUCTURE SHALL BE REQUIRED. THE CONTRACTOR, AT NO ADDITIONAL COMPENSATION, HAS THE OPTION TO PROPOSE AN ALTERNATE ARCH DESIGN WITH THE SAME OR LARGER OPENING AREA.
3. THE PRECAST FOOTING DESIGN DETAILED HEREIN WAS BASED ON THE GEOMETRY OF THE ARCH SHOWN. SEE FACTORED BEARING RESISTANCES BY SIZE ON SHEET 8. THE FABRICATOR SHALL PREPARE AND THE CONTRACTOR SHALL SUBMIT THE FINAL DESIGN OF THE FOOTING FOR APPROVAL BY THE ENGINEER.
4. THE CONTRACTOR, AT NO ADDITIONAL COMPENSATION, HAS THE OPTION TO PROVIDE CAST-IN-PLACE CONCRETE FOOTINGS, AND SHALL SUBMIT THE FINAL DESIGN OF THE CAST-IN-PLACE CONCRETE FOOTINGS.
5. THE PRECAST ELEMENTS ARE TO BE PARALLEL AND ALIGNED WITH THE REFERENCE LINE AS SHOWN ON THESE CONSTRUCTION DRAWINGS.
6. A MINIMUM OF 4 FEET COVER TO THE BOTTOM OF FOOTING SHALL BE PROVIDED.
7. THE FABRICATOR IS RESPONSIBLE FOR THE DESIGN AND INSTALLATION OF LIFT HOOKS FOR ALL PRECAST ELEMENTS. PLANS PROVIDING SPACING AND LOCATION OF LIFTING DEVICES AND HANDLING STRESS CALCULATIONS SHALL BE PROVIDED TO THE ENGINEER FOR REVIEW AND APPROVAL PRIOR TO FABRICATION OF THE PRECAST ELEMENTS.
8. SHOP DRAWINGS AND DESIGN CALCULATIONS SHALL BE SIGNED AND SEALED BY A PROFESSIONAL ENGINEER REGISTERED IN THE COMMONWEALTH OF MASSACHUSETTS.
9. PRECAST CONCRETE ELEMENTS SHALL CONFORM TO THE APPLICABLE PARTS OF SECTION 901 OF THE SPECIFICATIONS.
10. ALL TOLERANCES FOR JOINTS BETWEEN PRECAST ELEMENTS SHALL BE DETERMINED BY THE CONTRACTOR AND SHALL BE IN ACCORDANCE WITH PCI REQUIREMENTS.



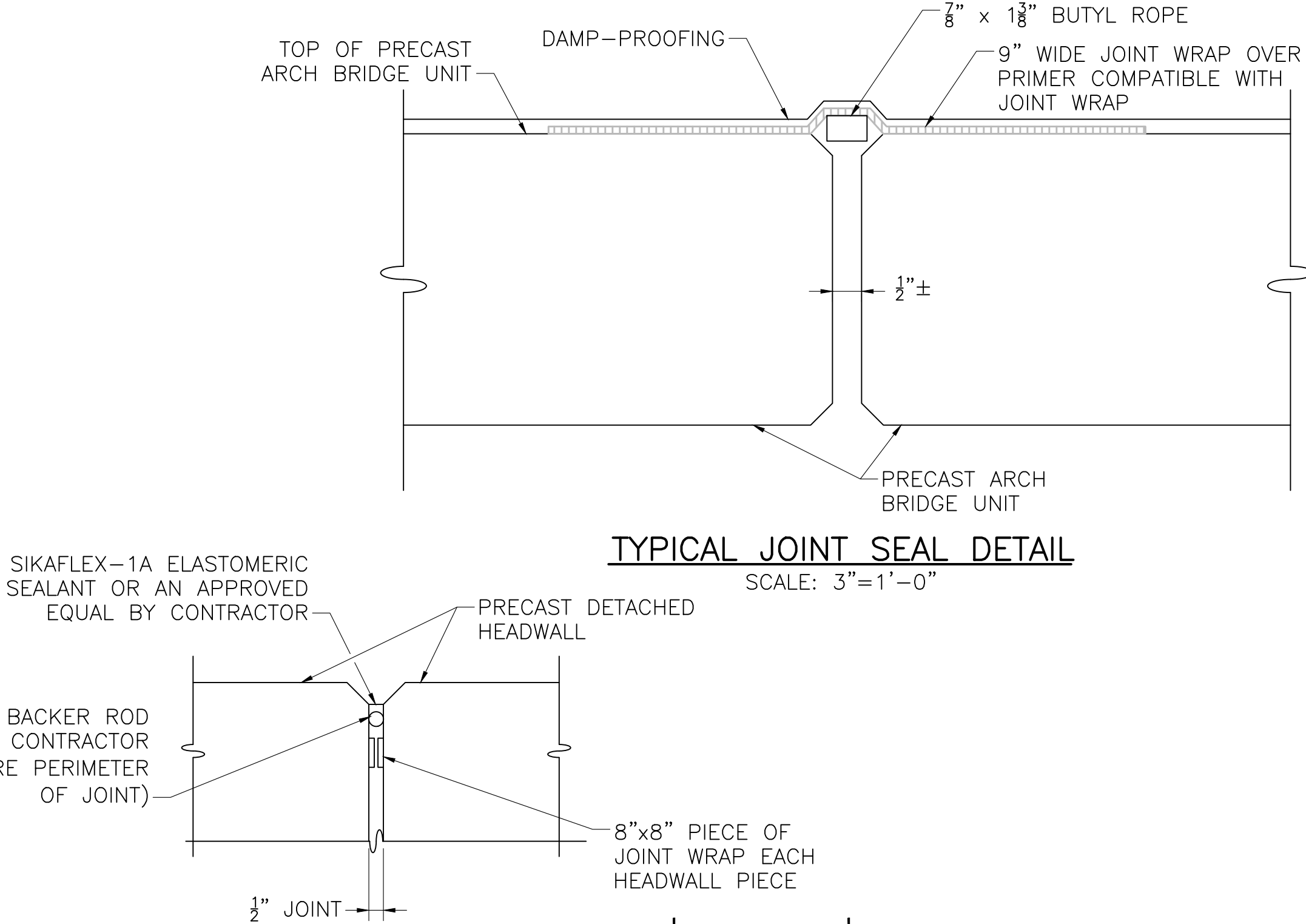
PRECAST ARCH PLAN
SCALE: 3/8"=1'-0"



HEADWALL DETAIL
SCALE: 1"=1'-0"



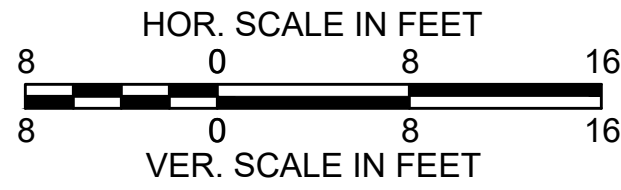
WINGWALL TO HEADWALL JOINT DETAIL
SCALE: 1"=1'-0"



TYPICAL JOINT SEAL DETAIL
SCALE: 3"=1'-0"

TYPICAL HEADWALL JOINT DETAIL
SCALE: 1"=1'-0"

MONTH DD, YYYY	ISSUED FOR CONSTRUCTION
DATE	DESCRIPTION
USE ONLY PRINTS OF LATEST DATE	

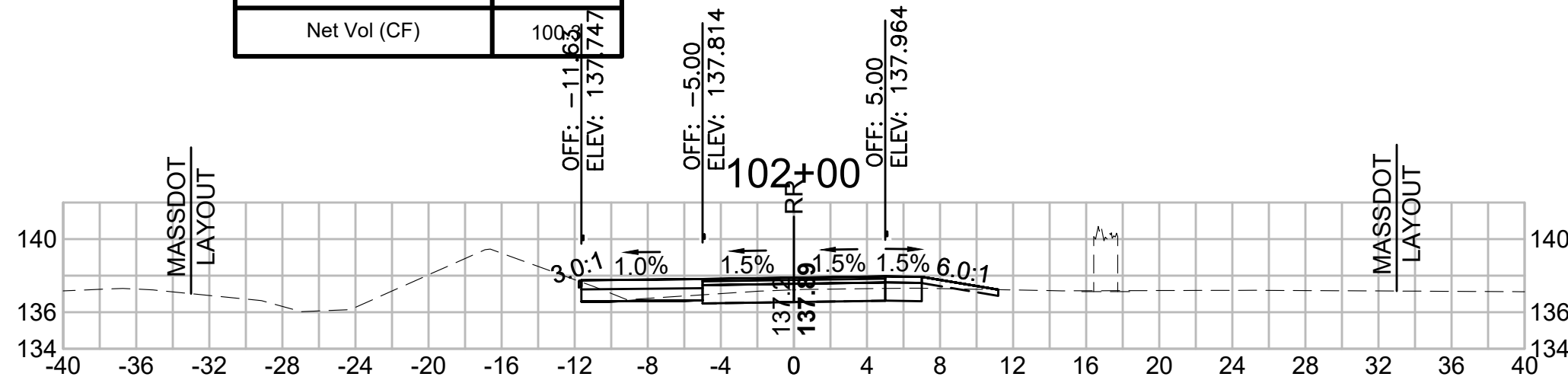


SUDBURY
BRUCE FREEMAN RAIL TRAIL

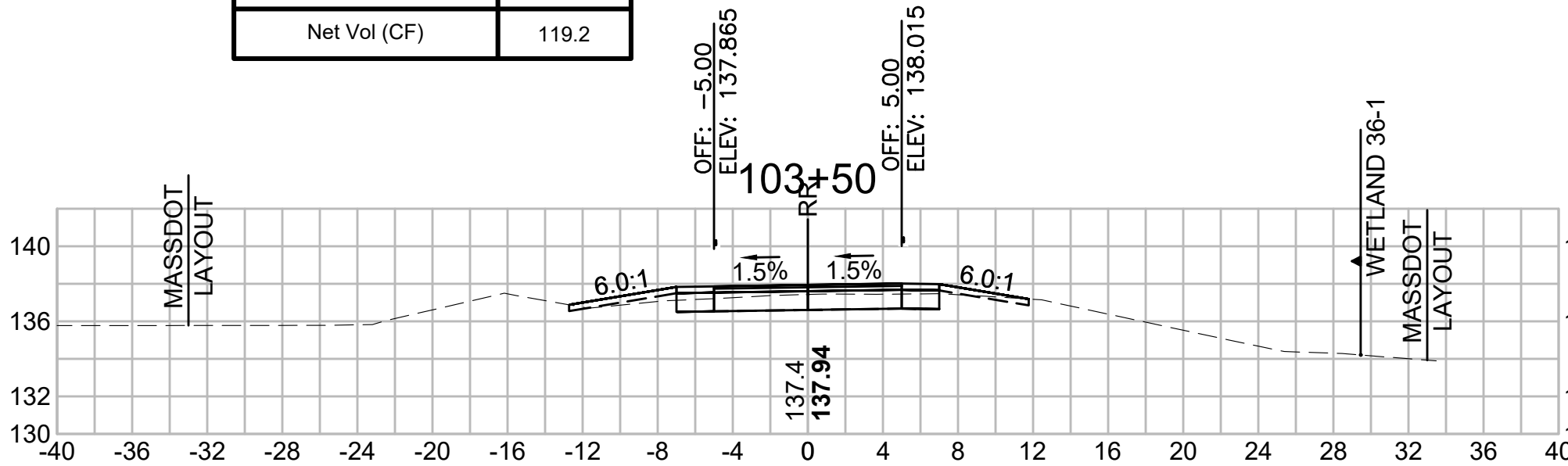
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	245	319
PROJECT FILE NO. 608164			

CROSS SECTIONS

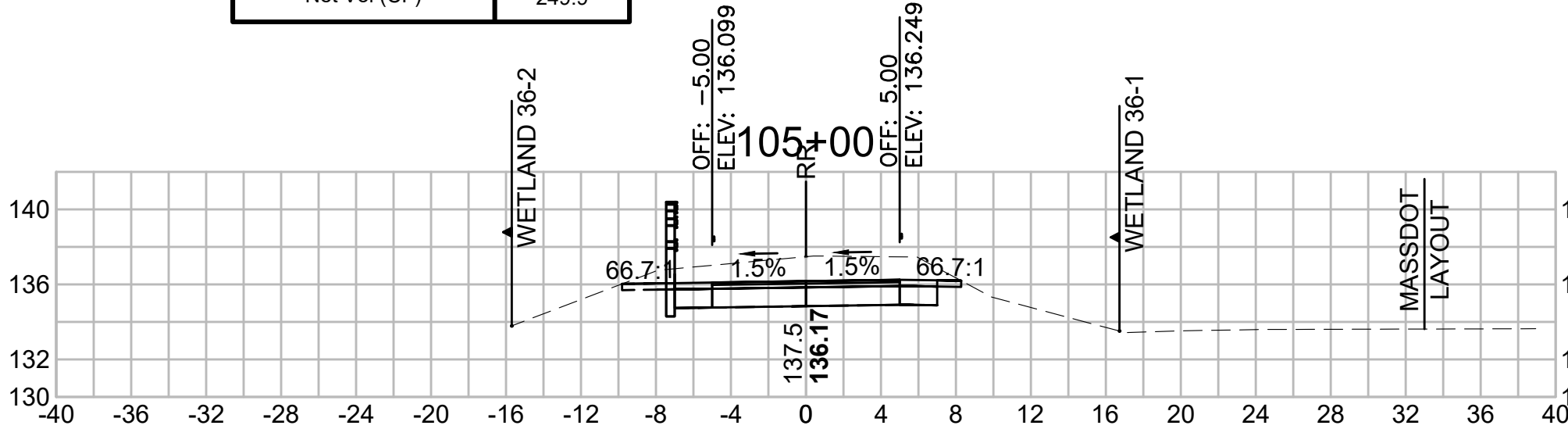
Total Volume at Station 102+00.00	
Cut Area (SF)	9.488
Fill Area (SF)	0.350
Cut Vol (CF)	37.071
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	100.898
Cum Fill Vol (CF)	0.6
Net Vol (CF)	100.297



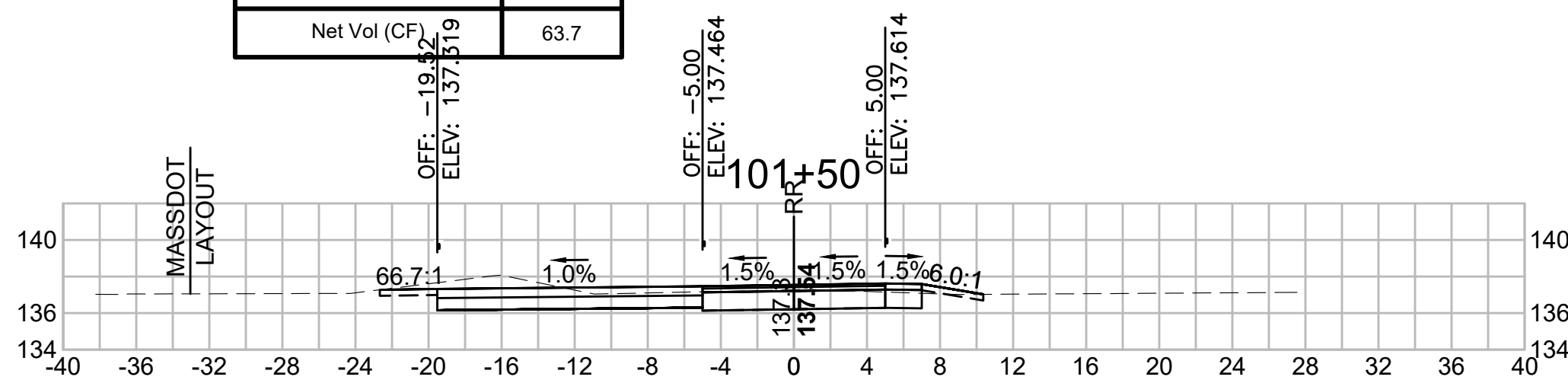
Total Volume at Station 103+50.00	
Cut Area (SF)	11.445
Fill Area (SF)	0.994
Cut Vol (CF)	13.330
Fill Vol (CF)	5.7
Cum Cut Vol (CF)	137.088
Cum Fill Vol (CF)	17.9
Net Vol (CF)	119.2



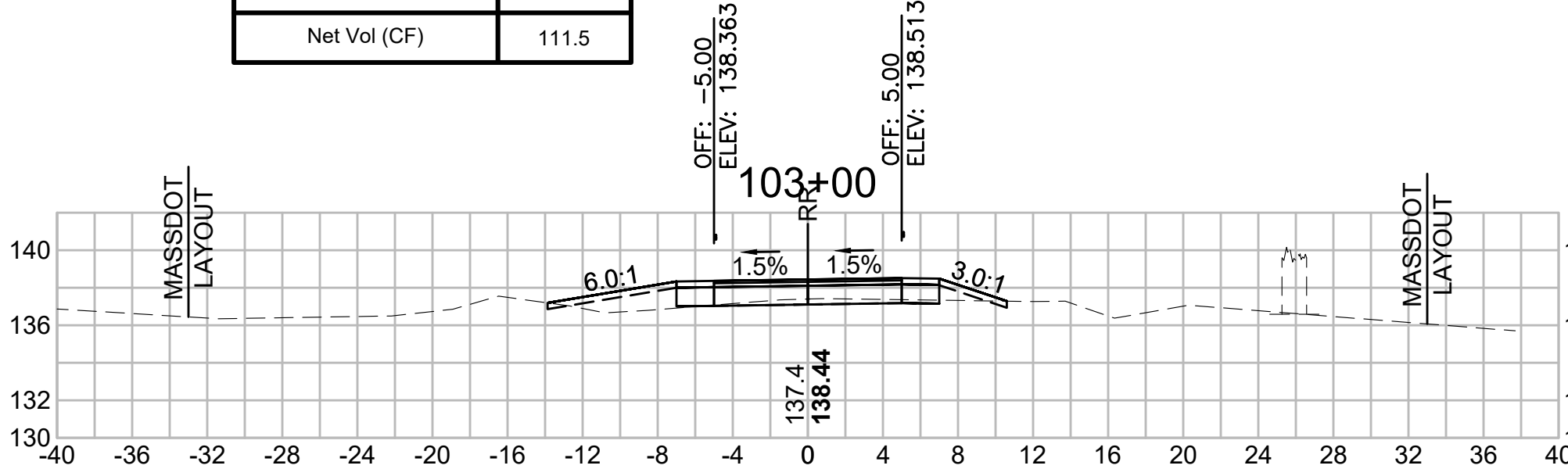
Total Volume at Station 105+00.00	
Cut Area (SF)	37.599
Fill Area (SF)	0.000
Cut Vol (CF)	64.912
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	270.355
Cum Fill Vol (CF)	20.5
Net Vol (CF)	249.9



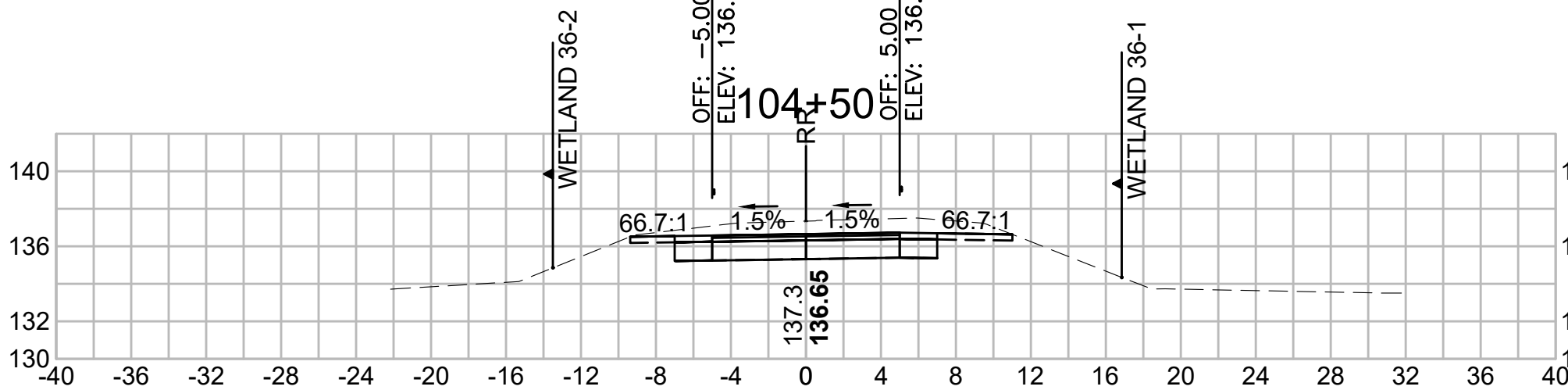
Total Volume at Station 101+50.00	
Cut Area (SF)	30.547
Fill Area (SF)	0.131
Cut Vol (CF)	46.057
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	63.828
Cum Fill Vol (CF)	0.1
Net Vol (CF)	63.7



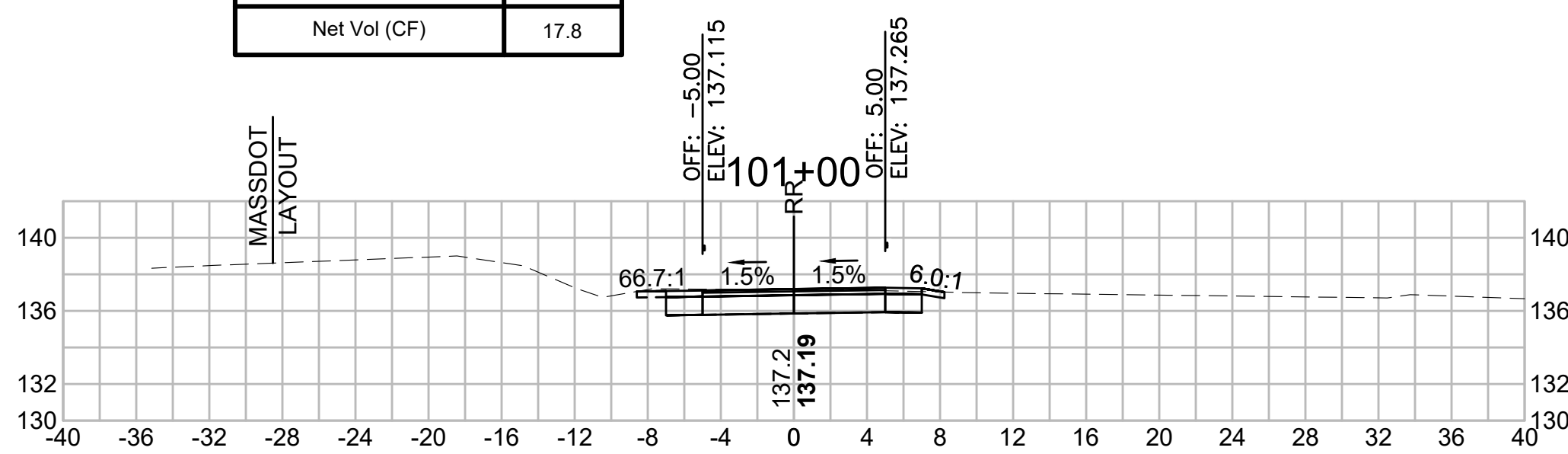
Total Volume at Station 103+00.00	
Cut Area (SF)	2.951
Fill Area (SF)	5.186
Cut Vol (CF)	8.405
Fill Vol (CF)	8.1
Cum Cut Vol (CF)	123.759
Cum Fill Vol (CF)	12.2
Net Vol (CF)	111.5



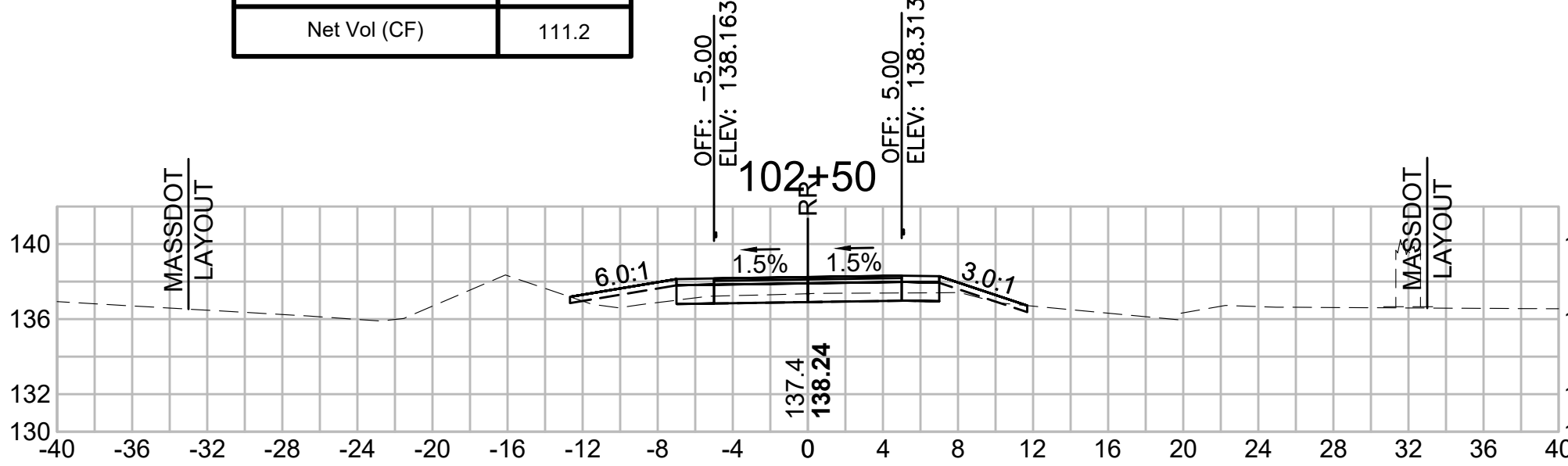
Total Volume at Station 104+50.00	
Cut Area (SF)	32.506
Fill Area (SF)	0.000
Cut Vol (CF)	43.929
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	205.443
Cum Fill Vol (CF)	20.5
Net Vol (CF)	185.0



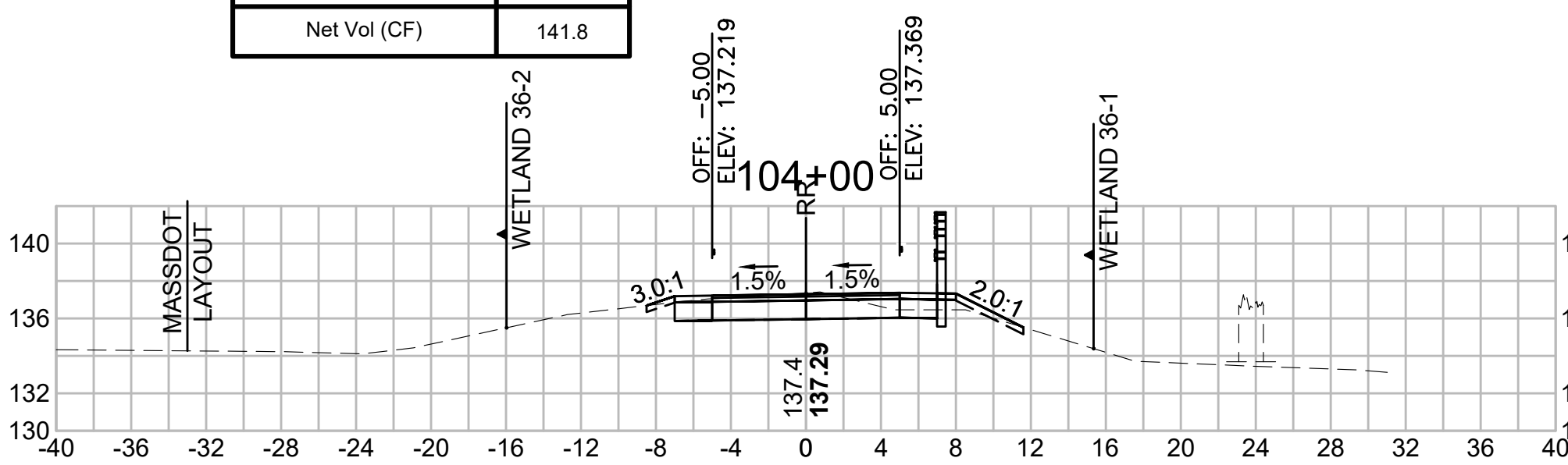
Total Volume at Station 101+00.00	
Cut Area (SF)	19.193
Fill Area (SF)	0.000
Cut Vol (CF)	17.772
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	17.771
Cum Fill Vol (CF)	0.0
Net Vol (CF)	17.8

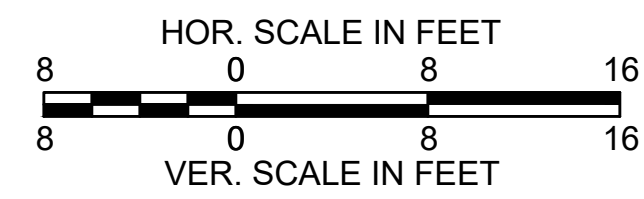


Total Volume at Station 102+50.00	
Cut Area (SF)	6.126
Fill Area (SF)	3.521
Cut Vol (CF)	14.458
Fill Vol (CF)	3.6
Cum Cut Vol (CF)	115.355
Cum Fill Vol (CF)	4.2
Net Vol (CF)	111.2



Total Volume at Station 104+00.00	
Cut Area (SF)	14.937
Fill Area (SF)	0.878
Cut Vol (CF)	24.428
Fill Vol (CF)	1.7
Cum Cut Vol (CF)	161.515
Cum Fill Vol (CF)	19.7
Net Vol (CF)	141.8



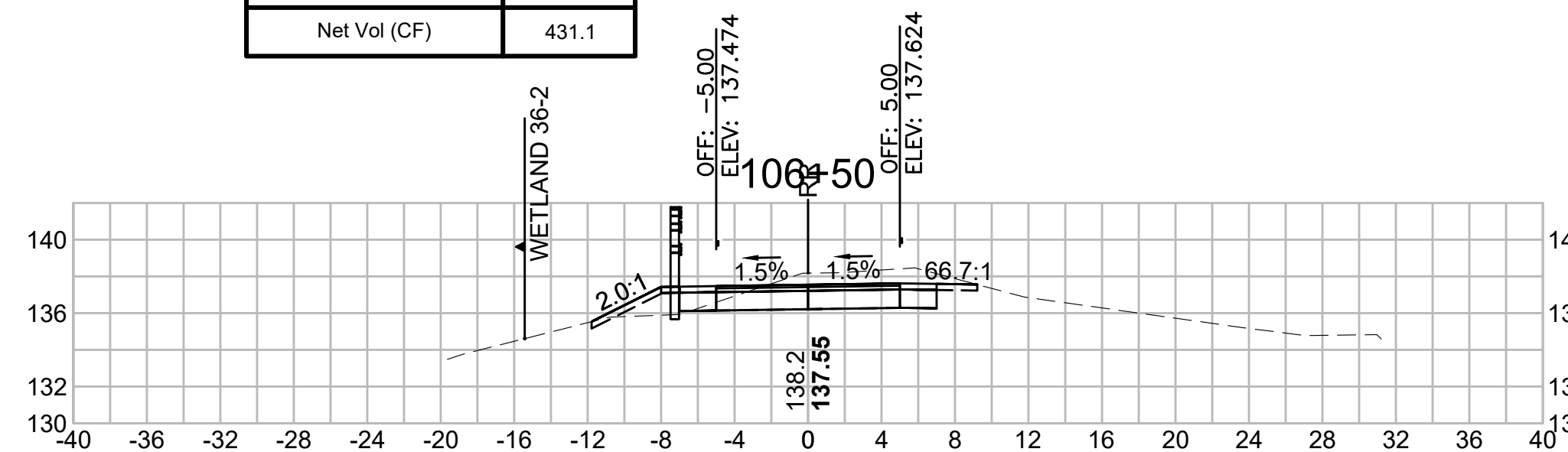


SUDBURY
BRUCE FREEMAN RAIL TRAIL

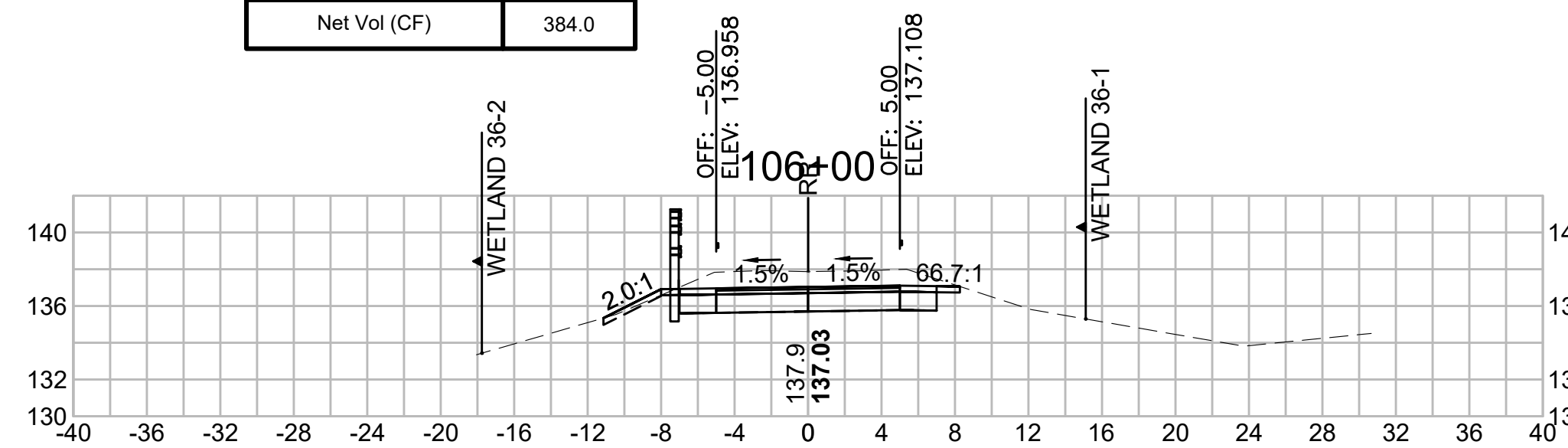
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	246	319
PROJECT FILE NO. 608164			

CROSS SECTIONS

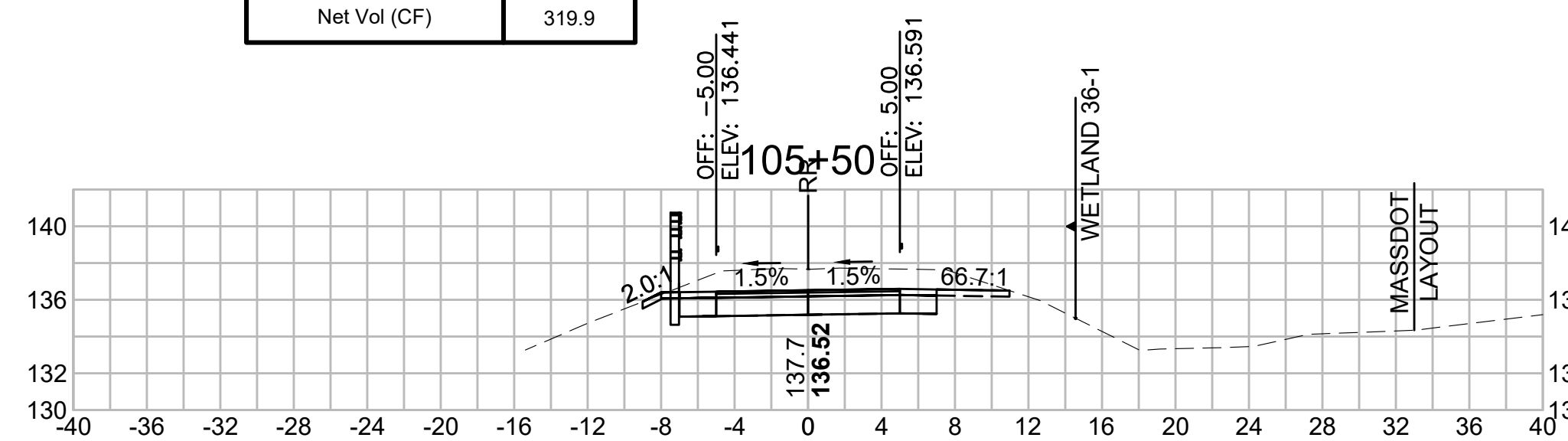
Total Volume at Station 106+50.00	
Cut Area (SF)	22.438
Fill Area (SF)	2.741
Cut Vol (CF)	49.607
Fill Vol (CF)	2.5
Cum Cut Vol (CF)	454.076
Cum Fill Vol (CF)	23.0
Net Vol (CF)	431.1



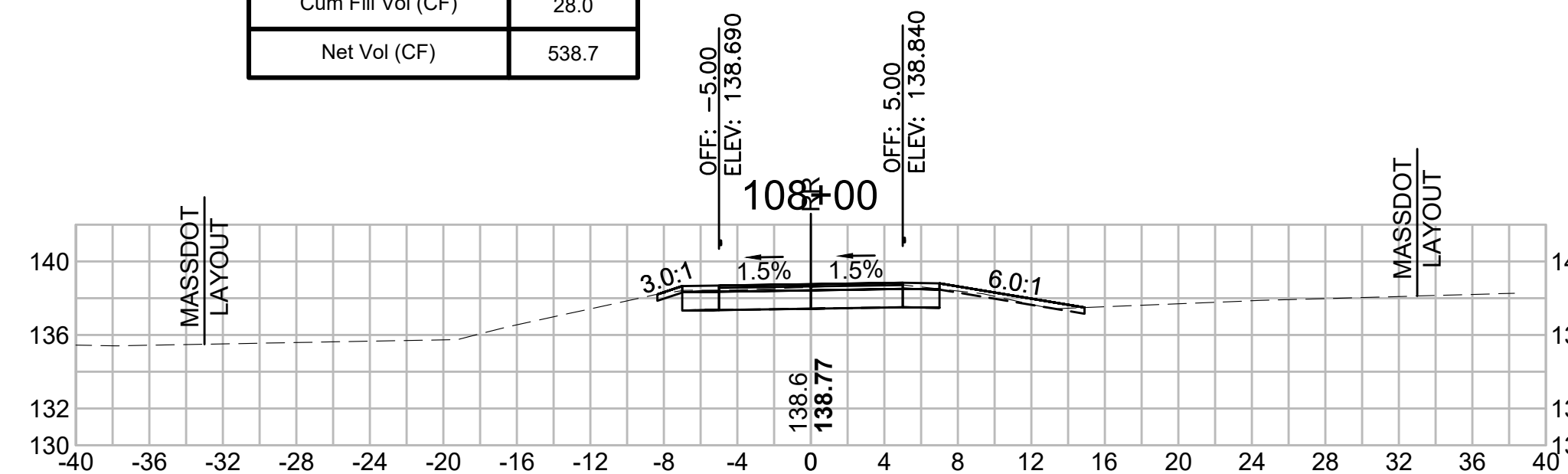
Total Volume at Station 106+00.00	
Cut Area (SF)	31.138
Fill Area (SF)	0.000
Cut Vol (CF)	64.066
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	404.469
Cum Fill Vol (CF)	20.5
Net Vol (CF)	384.0



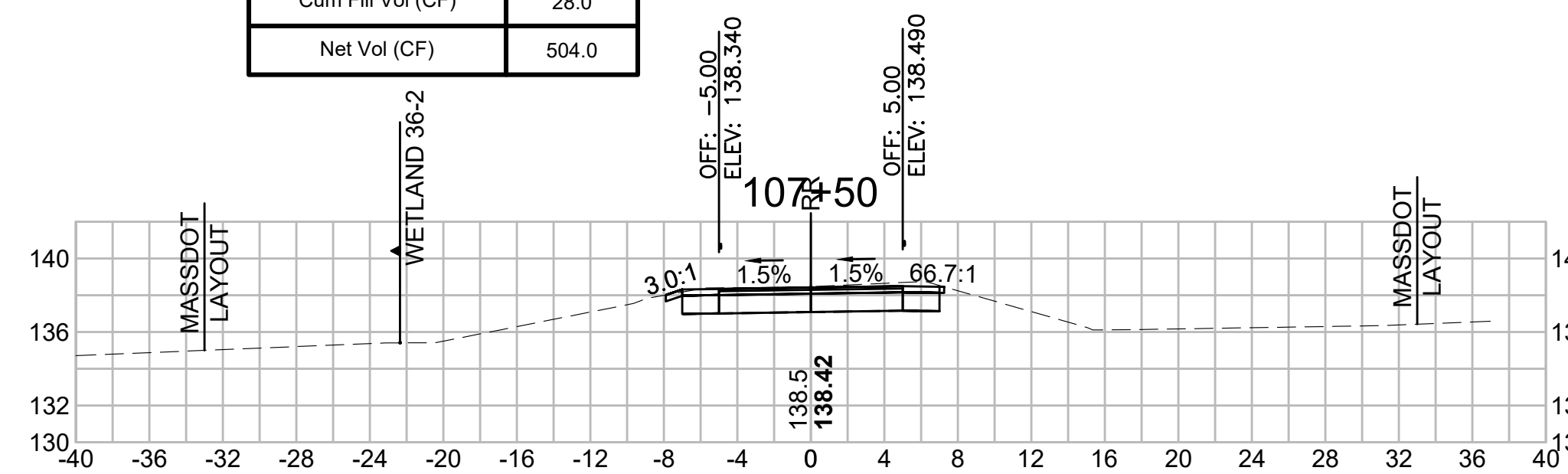
Total Volume at Station 105+50.00	
Cut Area (SF)	38.054
Fill Area (SF)	0.000
Cut Vol (CF)	70.049
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	340.403
Cum Fill Vol (CF)	20.5
Net Vol (CF)	319.9



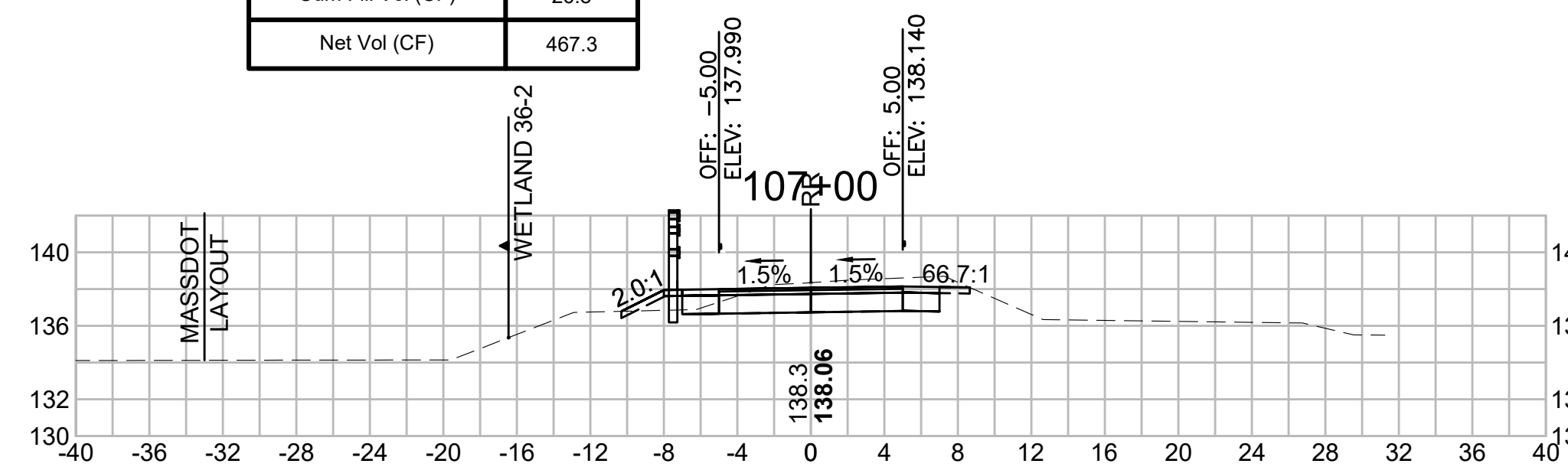
Total Volume at Station 108+00.00	
Cut Area (SF)	17.189
Fill Area (SF)	0.008
Cut Vol (CF)	34.694
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	566.731
Cum Fill Vol (CF)	28.0
Net Vol (CF)	538.7



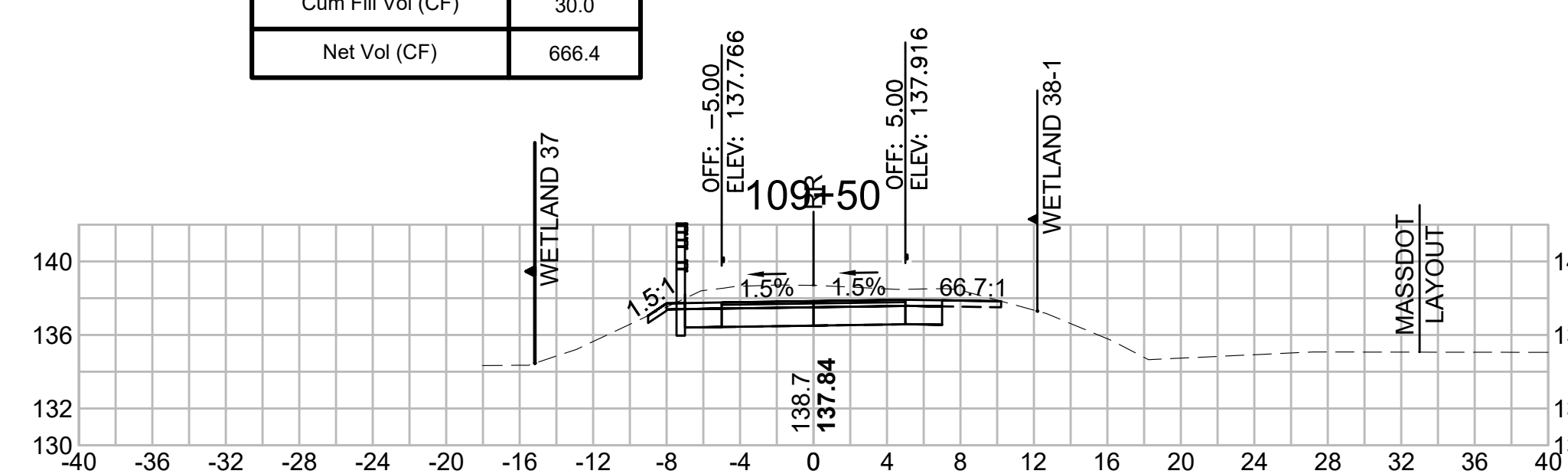
Total Volume at Station 107+50.00	
Cut Area (SF)	20.280
Fill Area (SF)	0.000
Cut Vol (CF)	37.982
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	532.037
Cum Fill Vol (CF)	28.0
Net Vol (CF)	504.0



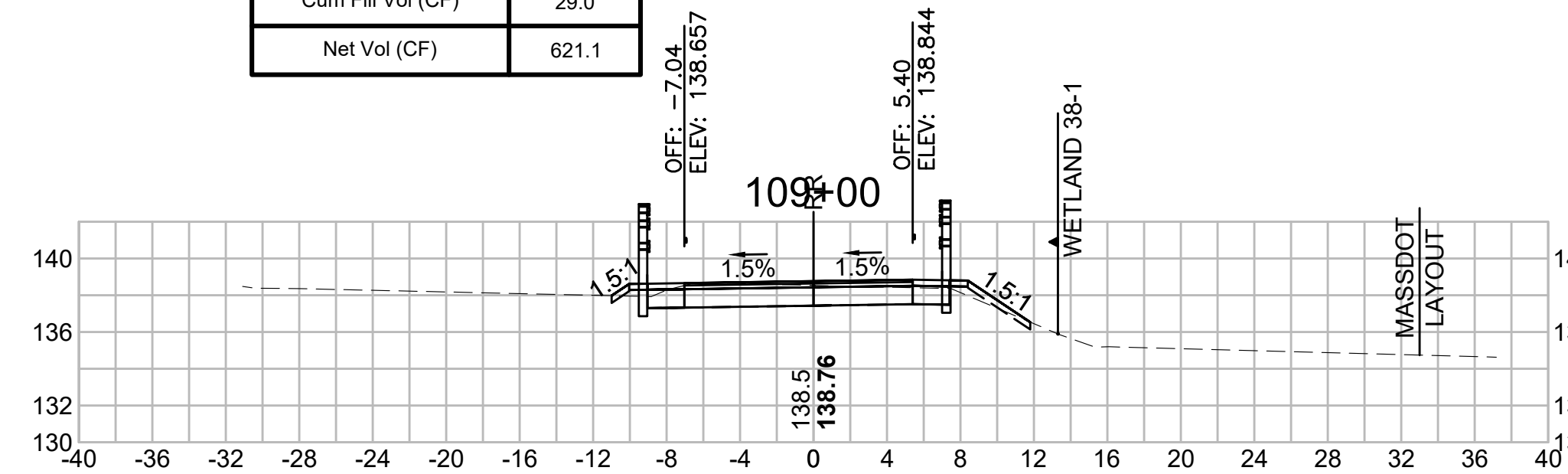
Total Volume at Station 107+00.00	
Cut Area (SF)	20.740
Fill Area (SF)	1.333
Cut Vol (CF)	39.980
Fill Vol (CF)	3.8
Cum Cut Vol (CF)	494.056
Cum Fill Vol (CF)	26.8
Net Vol (CF)	467.3



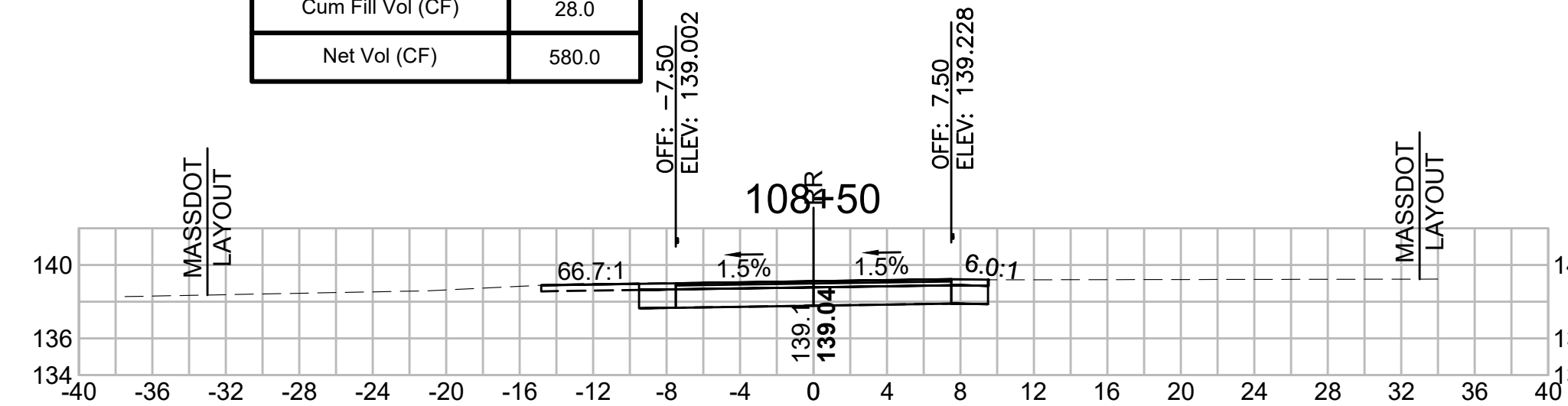
Total Volume at Station 109+50.00	
Cut Area (SF)	31.928
Fill Area (SF)	0.000
Cut Vol (CF)	46.306
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	696.427
Cum Fill Vol (CF)	30.0
Net Vol (CF)	666.4

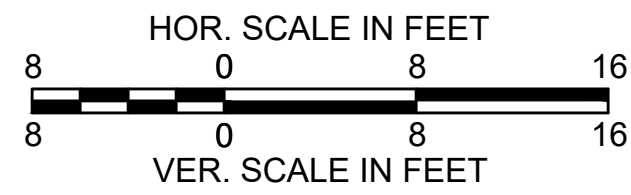


Total Volume at Station 109+00.00	
Cut Area (SF)	18.081
Fill Area (SF)	1.072
Cut Vol (CF)	42.109
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	650.122
Cum Fill Vol (CF)	29.0
Net Vol (CF)	621.1



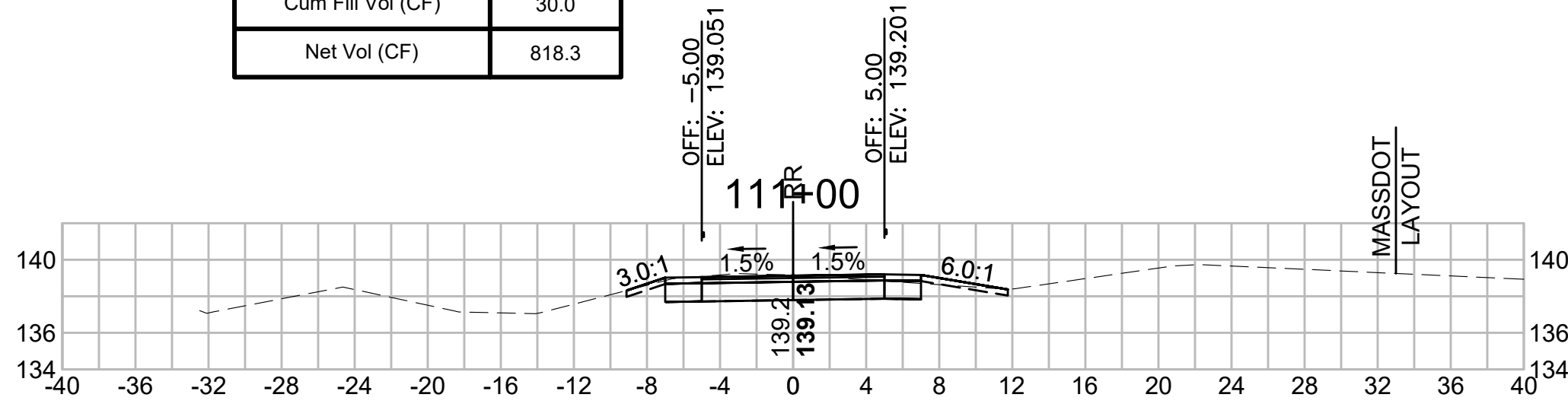
Total Volume at Station 108+50.00	
Cut Area (SF)	27.396
Fill Area (SF)	0.000
Cut Vol (CF)	41.283
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	608.014
Cum Fill Vol (CF)	28.0
Net Vol (CF)	580.0



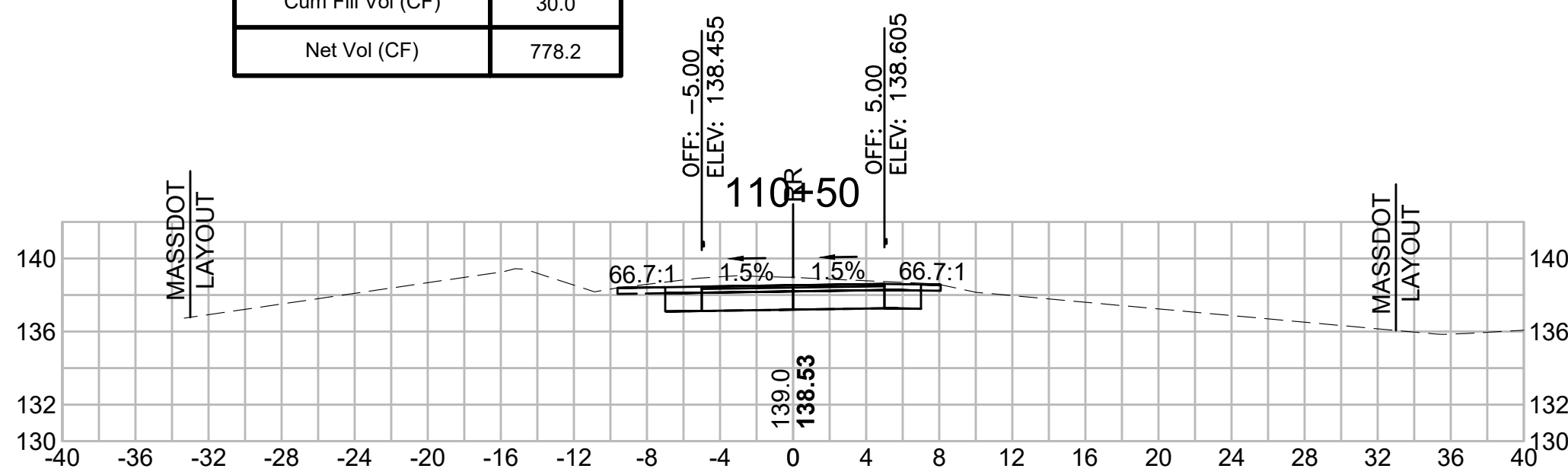


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	247	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

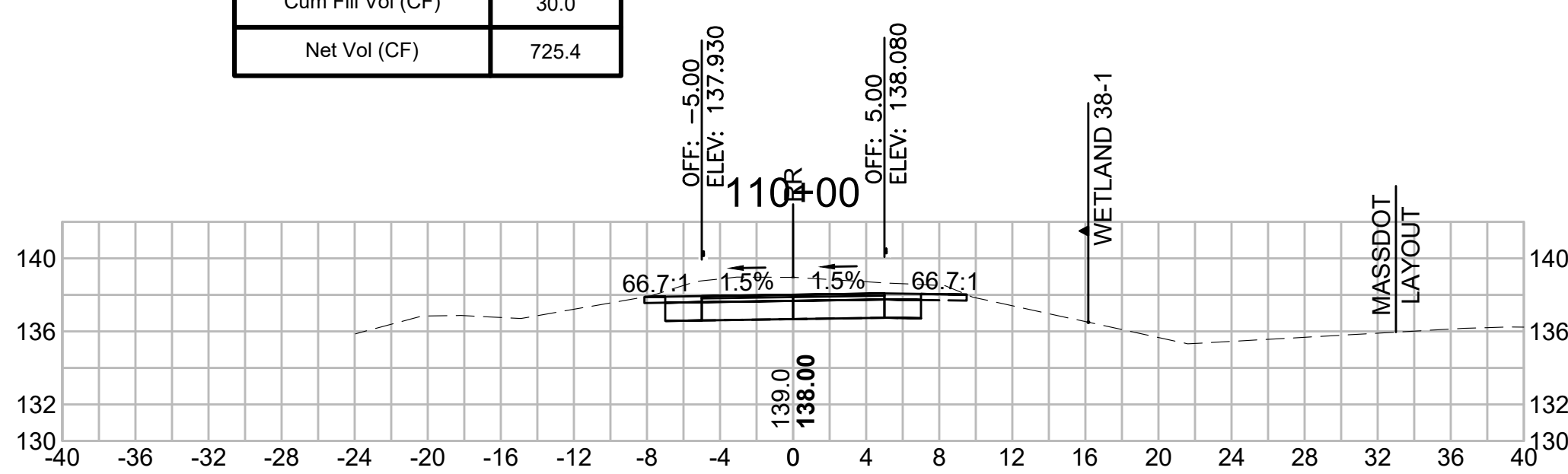
Total Volume at Station 111+00.00	
Cut Area (SF)	18.055
Fill Area (SF)	0.000
Cut Vol (CF)	40.035
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	848.287
Cum Fill Vol (CF)	30.0
Net Vol (CF)	818.3



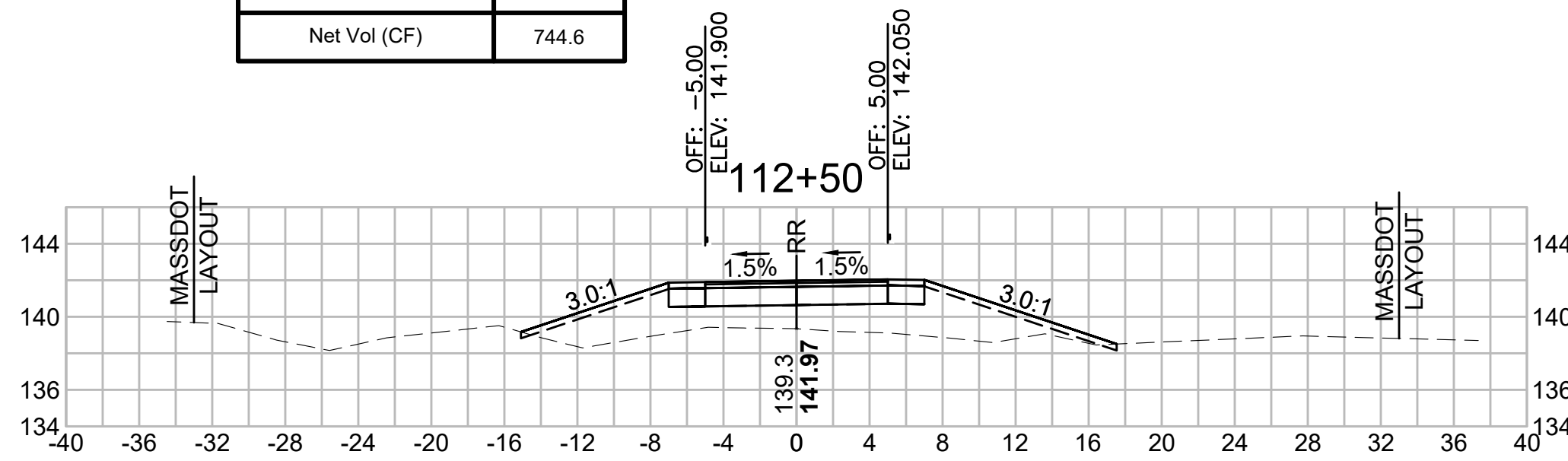
Total Volume at Station 110+50.00	
Cut Area (SF)	25.183
Fill Area (SF)	0.000
Cut Vol (CF)	52.790
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	808.252
Cum Fill Vol (CF)	30.0
Net Vol (CF)	778.2



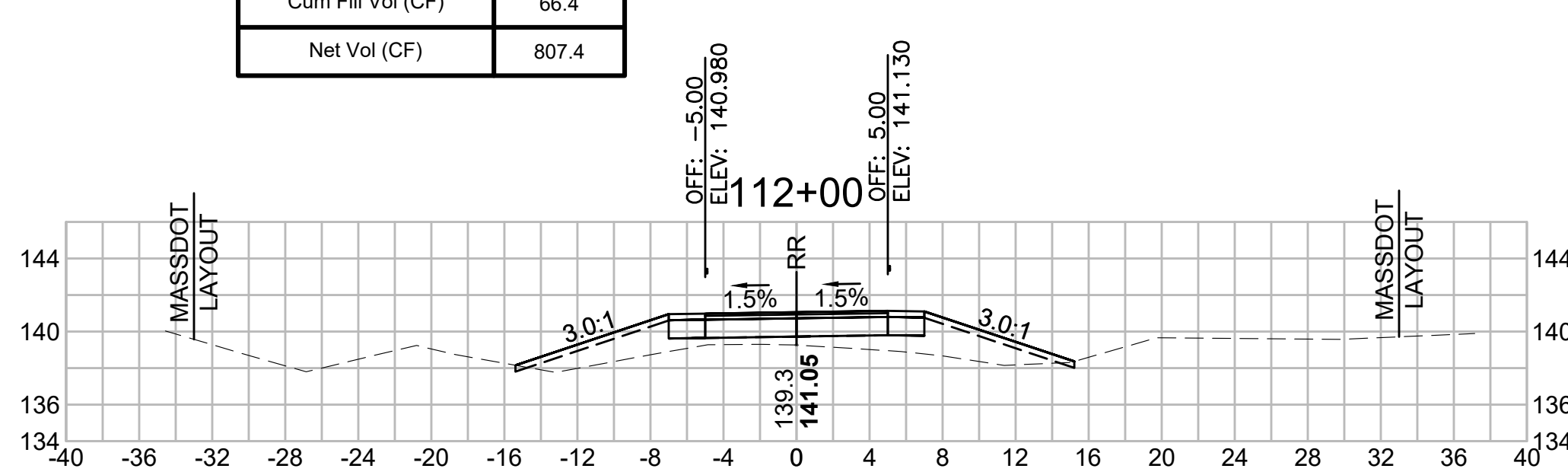
Total Volume at Station 110+00.00	
Cut Area (SF)	31.830
Fill Area (SF)	0.000
Cut Vol (CF)	59.036
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	755.462
Cum Fill Vol (CF)	30.0
Net Vol (CF)	725.4



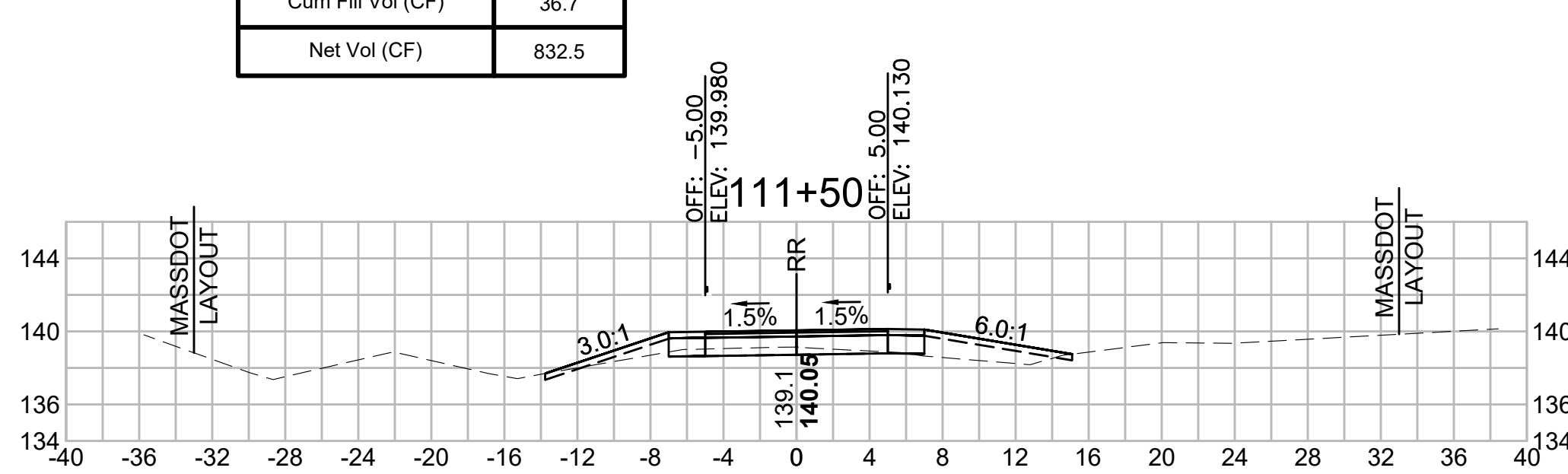
Total Volume at Station 112+50.00	
Cut Area (SF)	0.390
Fill Area (SF)	43.694
Cut Vol (CF)	0.714
Fill Vol (CF)	63.5
Cum Cut Vol (CF)	874.526
Cum Fill Vol (CF)	130.0
Net Vol (CF)	744.6



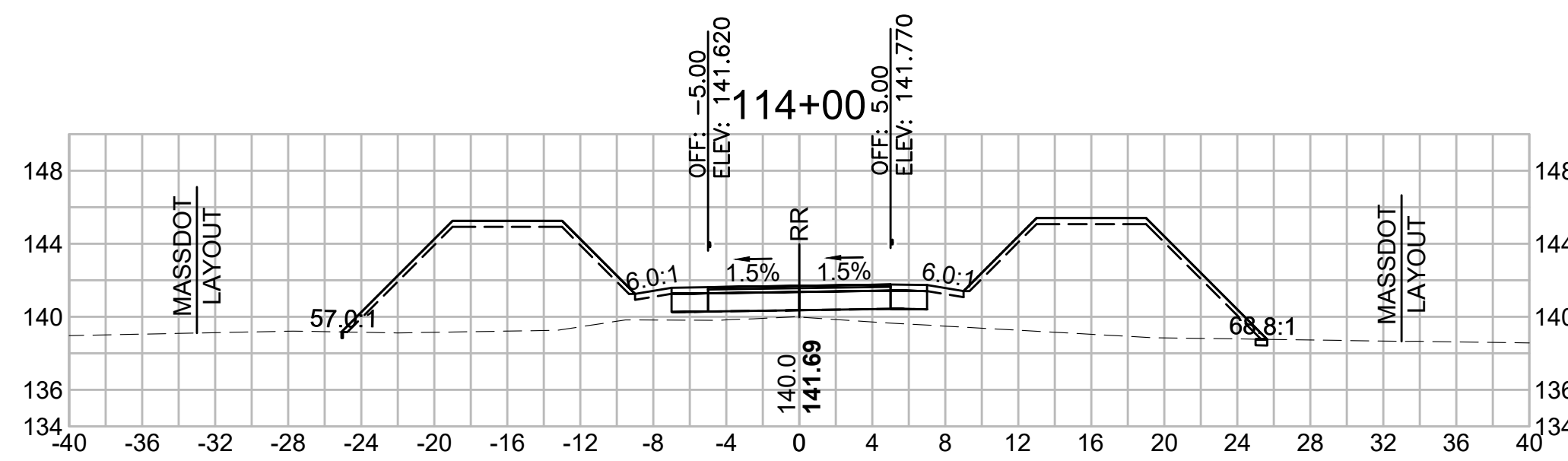
Total Volume at Station 112+00.00	
Cut Area (SF)	0.381
Fill Area (SF)	24.924
Cut Vol (CF)	4.581
Fill Vol (CF)	29.7
Cum Cut Vol (CF)	873.812
Cum Fill Vol (CF)	66.4
Net Vol (CF)	807.4



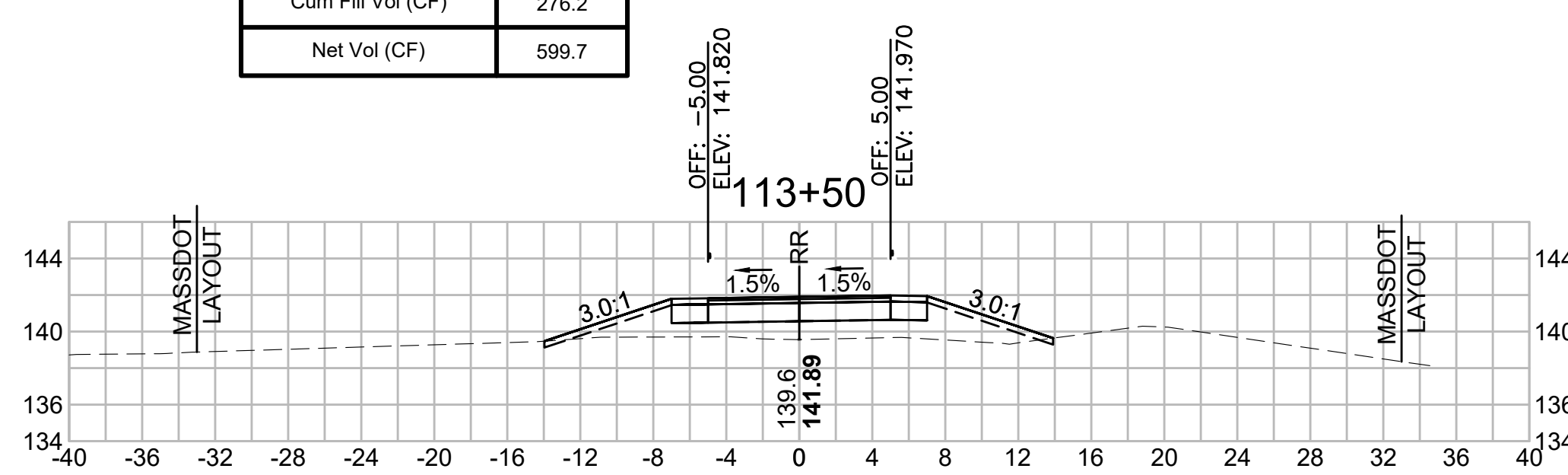
Total Volume at Station 111+50.00	
Cut Area (SF)	4.565
Fill Area (SF)	7.194
Cut Vol (CF)	20.945
Fill Vol (CF)	6.7
Cum Cut Vol (CF)	869.232
Cum Fill Vol (CF)	36.7
Net Vol (CF)	832.5



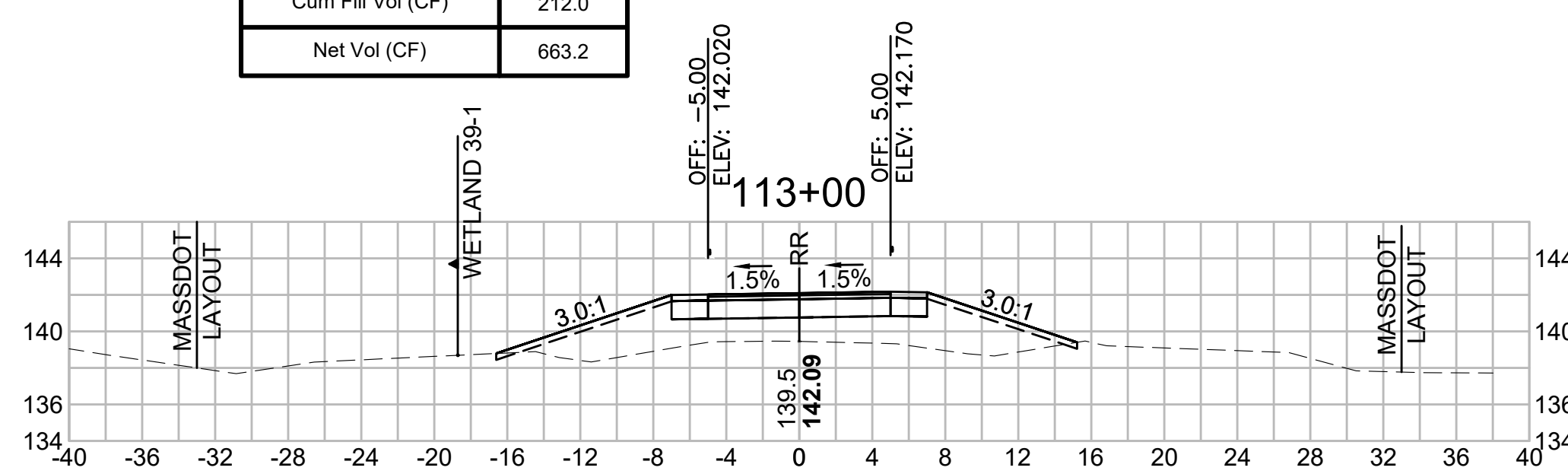
Total Volume at Station 114+00.00	
Cut Area (SF)	0.282
Fill Area (SF)	148.843
Cut Vol (CF)	0.599
Fill Vol (CF)	160.4
Cum Cut Vol (CF)	876.451
Cum Fill Vol (CF)	436.6
Net Vol (CF)	439.8

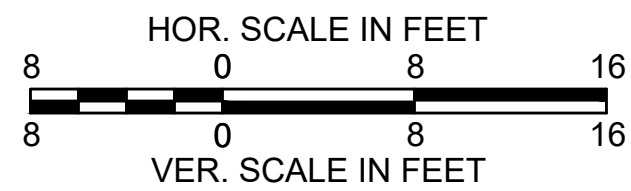


Total Volume at Station 113+50.00	
Cut Area (SF)	0.364
Fill Area (SF)	24.397
Cut Vol (CF)	0.652
Fill Vol (CF)	64.2
Cum Cut Vol (CF)	875.853
Cum Fill Vol (CF)	276.2
Net Vol (CF)	599.7



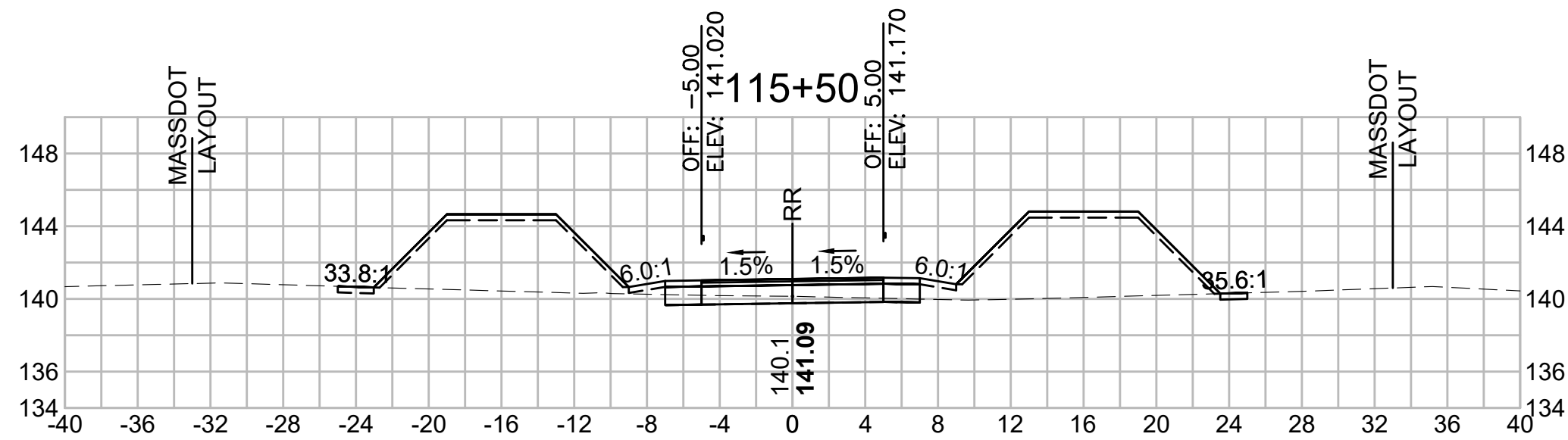
Total Volume at Station 113+00.00	
Cut Area (SF)	0.340
Fill Area (SF)	44.923
Cut Vol (CF)	0.676
Fill Vol (CF)	82.1
Cum Cut Vol (CF)	875.201
Cum Fill Vol (CF)	212.0
Net Vol (CF)	663.2



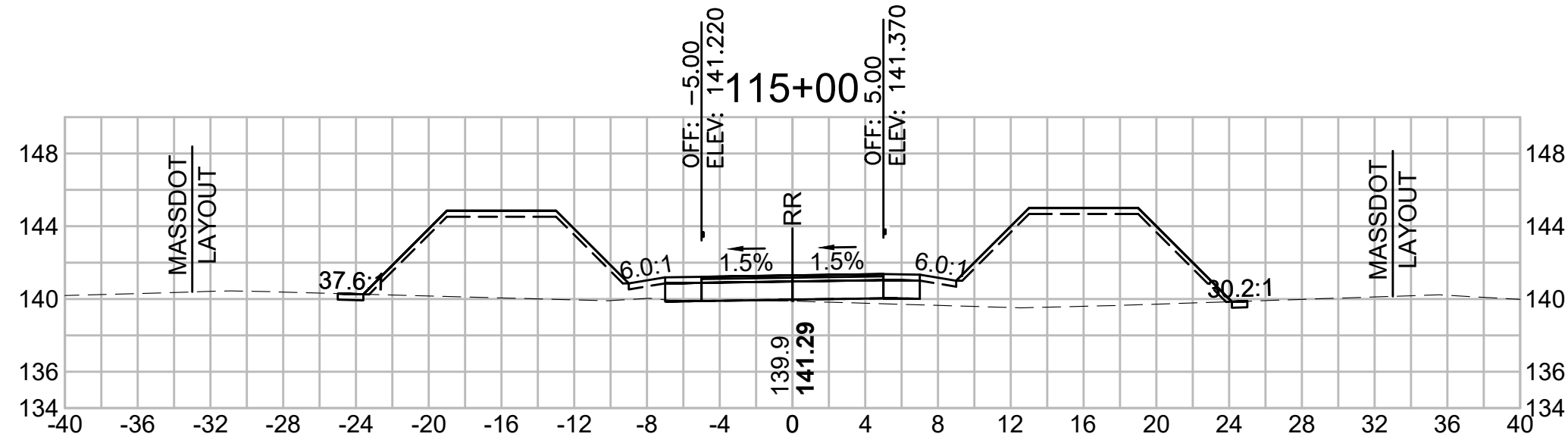


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	248	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

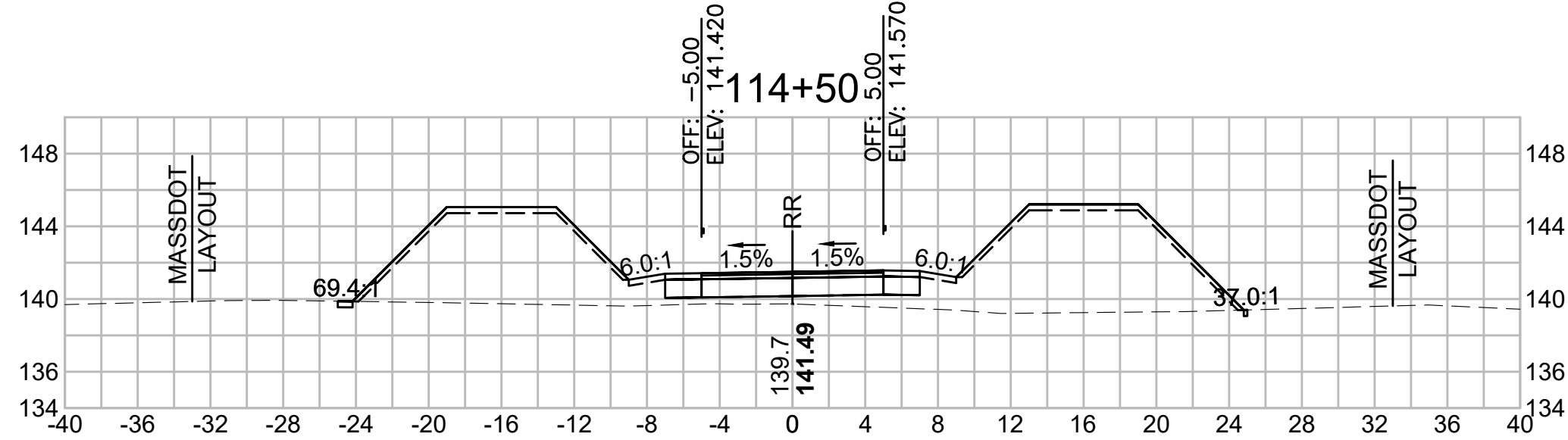
Total Volume at Station 115+50.00	
Cut Area (SF)	6.410
Fill Area (SF)	62.442
Cut Vol (CF)	6.873
Fill Vol (CF)	157.1
Cum Cut Vol (CF)	885.341
Cum Fill Vol (CF)	1072.8
Net Vol (CF)	-187.5



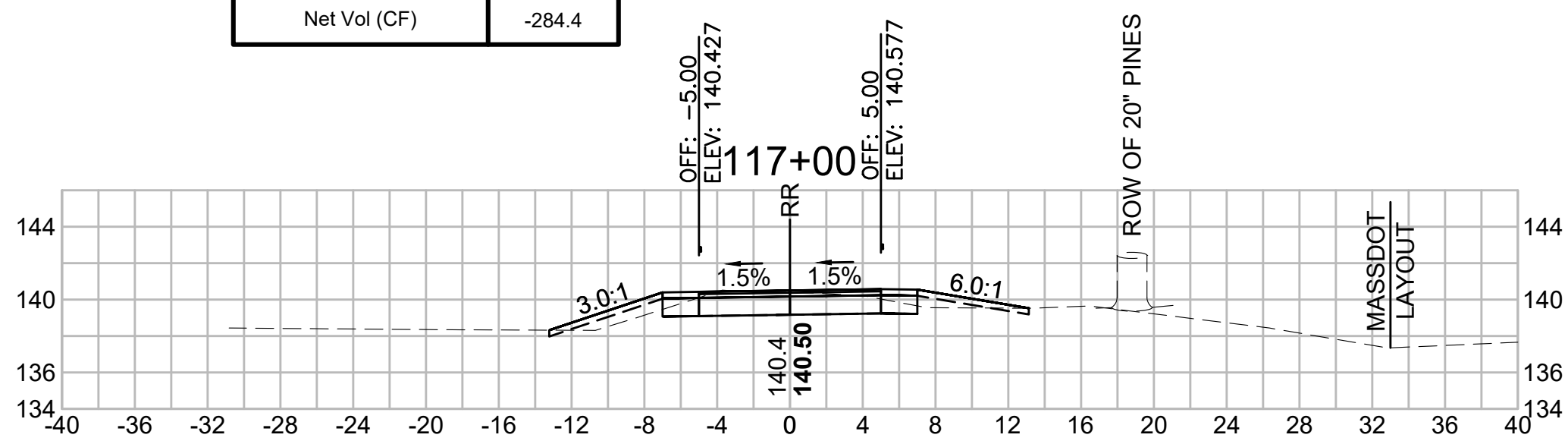
Total Volume at Station 115+00.00	
Cut Area (SF)	1.012
Fill Area (SF)	107.174
Cut Vol (CF)	1.347
Fill Vol (CF)	220.3
Cum Cut Vol (CF)	878.468
Cum Fill Vol (CF)	915.8
Net Vol (CF)	-37.3



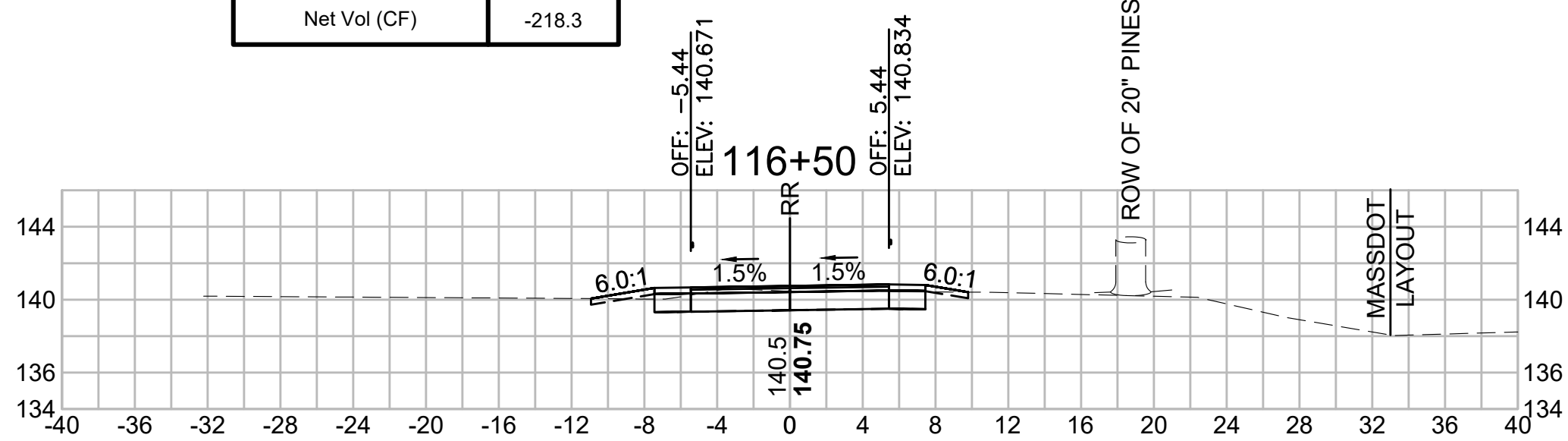
Total Volume at Station 114+50.00	
Cut Area (SF)	0.442
Fill Area (SF)	130.746
Cut Vol (CF)	0.671
Fill Vol (CF)	258.9
Cum Cut Vol (CF)	877.122
Cum Fill Vol (CF)	695.5
Net Vol (CF)	181.6



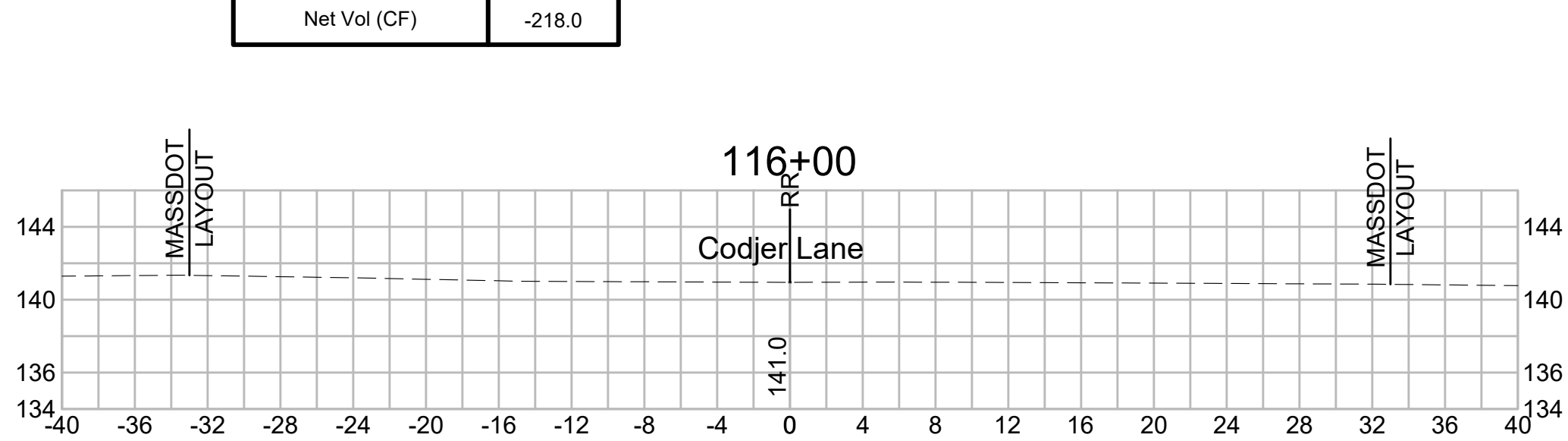
Total Volume at Station 117+00.00	
Cut Area (SF)	14.722
Fill Area (SF)	62.885
Cut Vol (CF)	27.869
Fill Vol (CF)	94.0
Cum Cut Vol (CF)	976.067
Cum Fill Vol (CF)	1260.5
Net Vol (CF)	-284.4



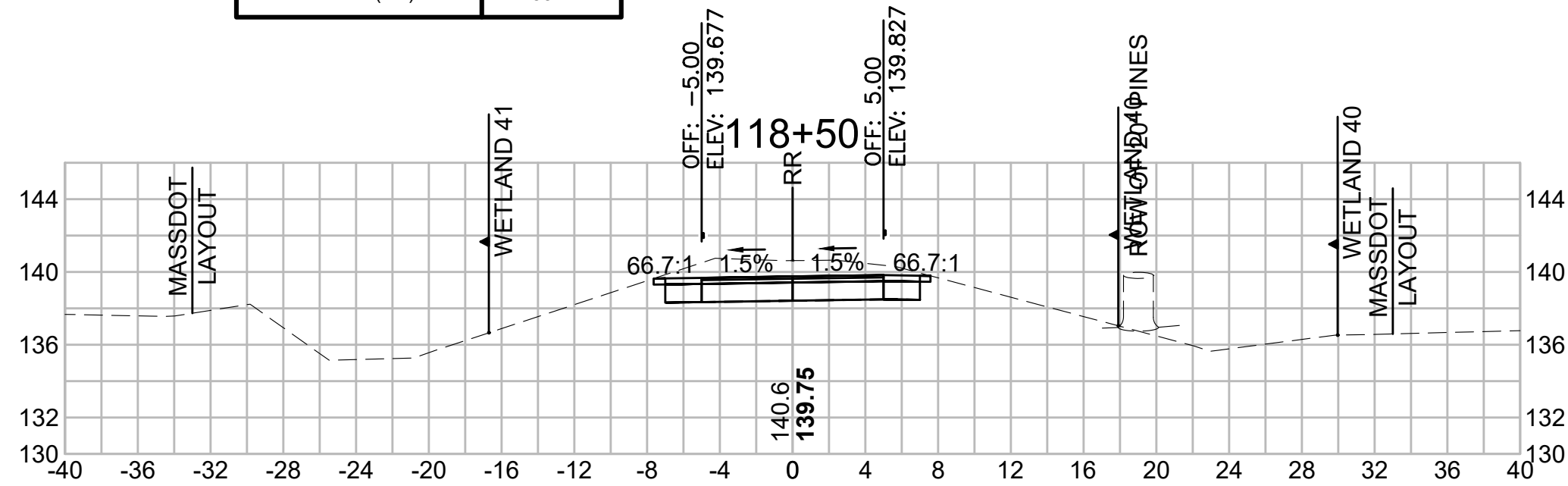
Total Volume at Station 116+50.00	
Cut Area (SF)	15.376
Fill Area (SF)	38.671
Cut Vol (CF)	35.580
Fill Vol (CF)	35.8
Cum Cut Vol (CF)	948.198
Cum Fill Vol (CF)	1166.5
Net Vol (CF)	-218.3



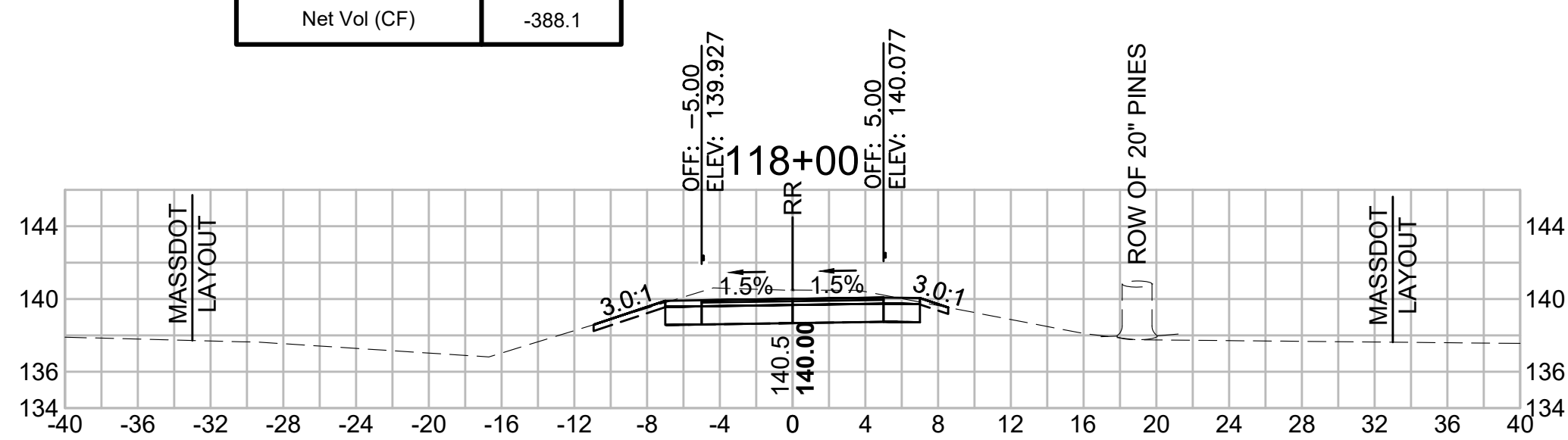
Total Volume at Station 116+00.00	
Cut Area (SF)	23.050
Fill Area (SF)	0.000
Cut Vol (CF)	27.278
Fill Vol (CF)	57.8
Cum Cut Vol (CF)	912.618
Cum Fill Vol (CF)	1130.6
Net Vol (CF)	-218.0



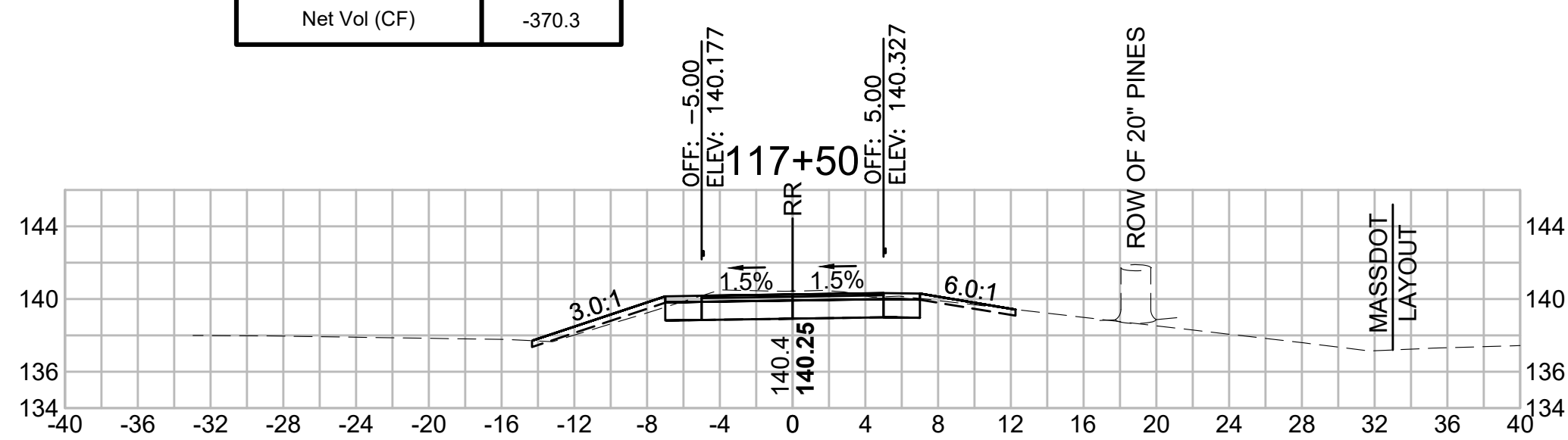
Total Volume at Station 118+50.00	
Cut Area (SF)	29.627
Fill Area (SF)	0.000
Cut Vol (CF)	50.928
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1099.492
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-337.1

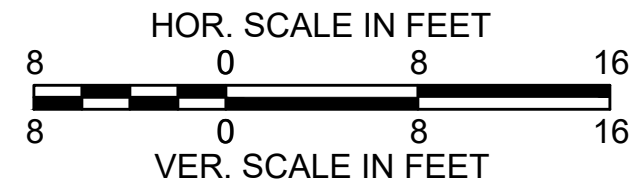


Total Volume at Station 118+00.00	
Cut Area (SF)	25.374
Fill Area (SF)	0.000
Cut Vol (CF)	41.181
Fill Vol (CF)	59.0
Cum Cut Vol (CF)	1048.565
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-388.1



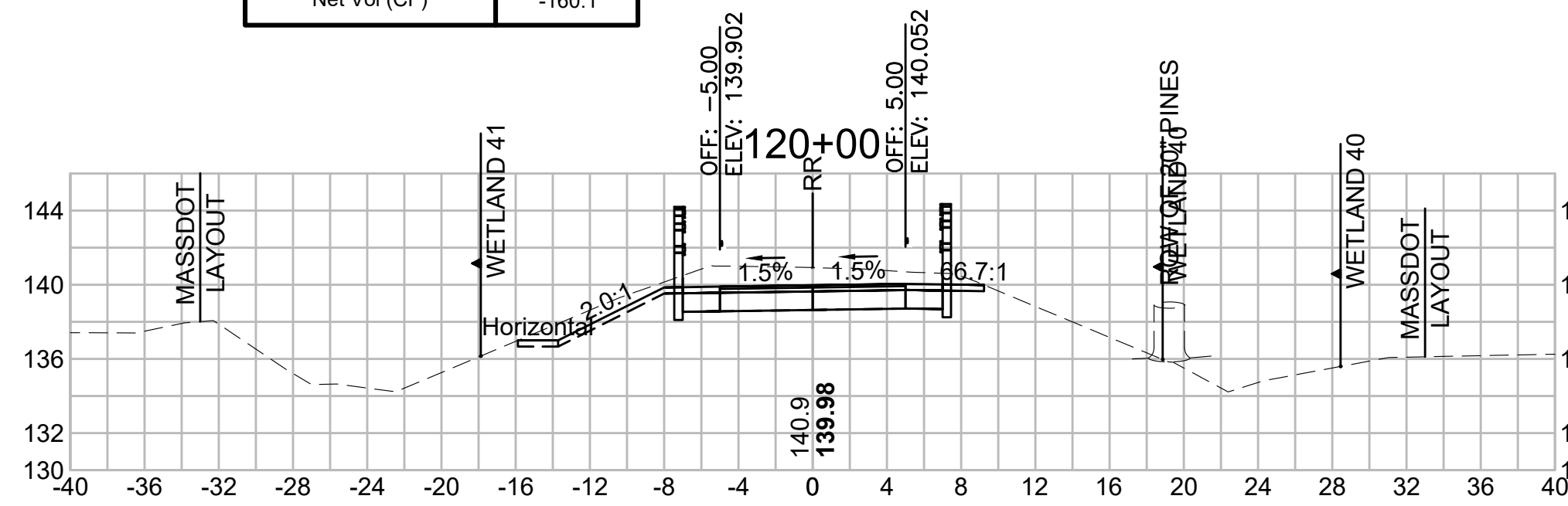
Total Volume at Station 117+50.00	
Cut Area (SF)	19.101
Fill Area (SF)	63.669
Cut Vol (CF)	31.318
Fill Vol (CF)	117.2
Cum Cut Vol (CF)	1007.384
Cum Fill Vol (CF)	1377.7
Net Vol (CF)	-370.3



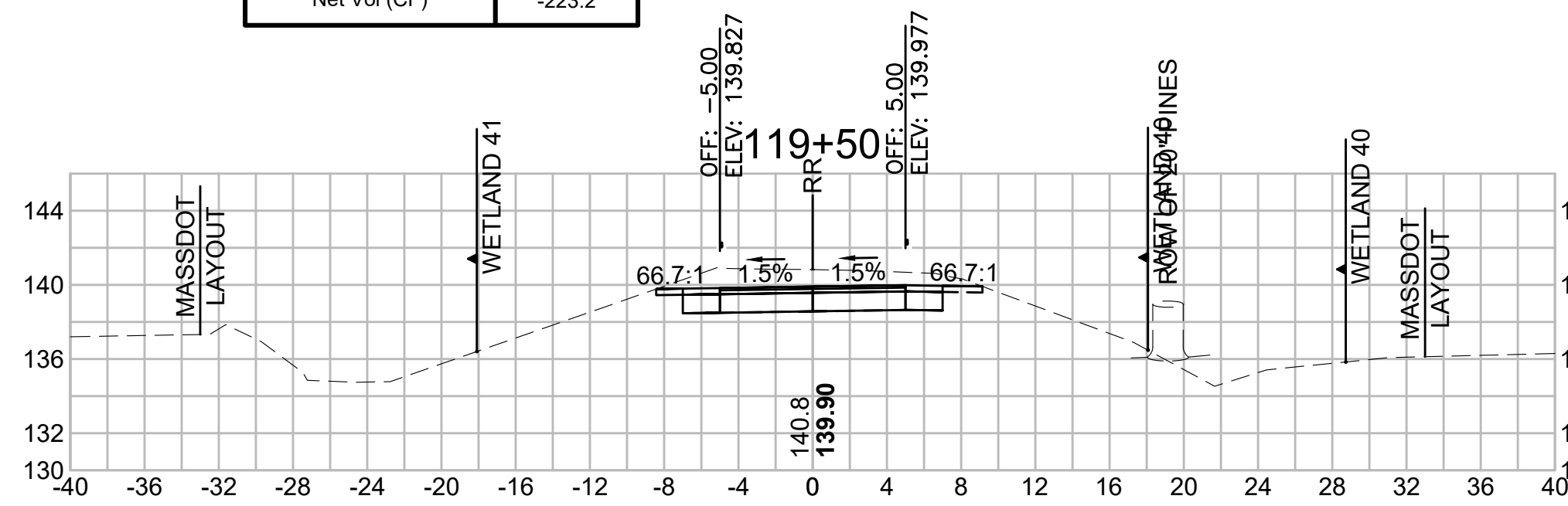


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	249	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

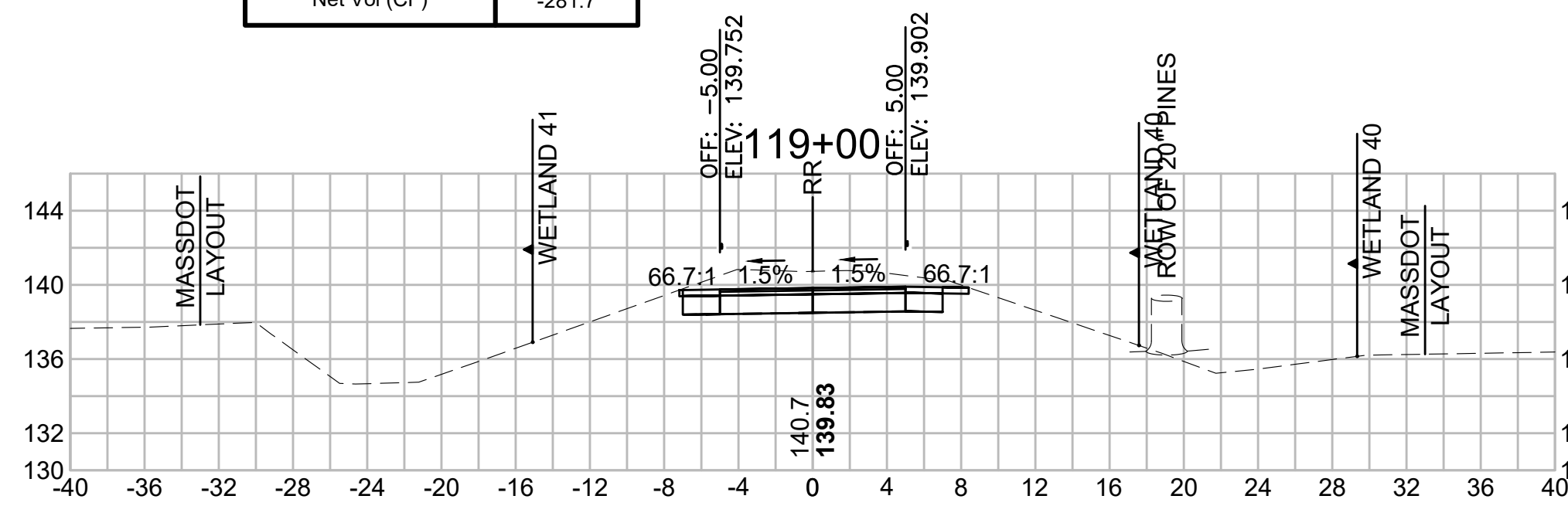
Total Volume at Station 120+00.00	
Cut Area (SF)	35.161
Fill Area (SF)	0.000
Cut Vol (CF)	63.024
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1276.482
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-160.1



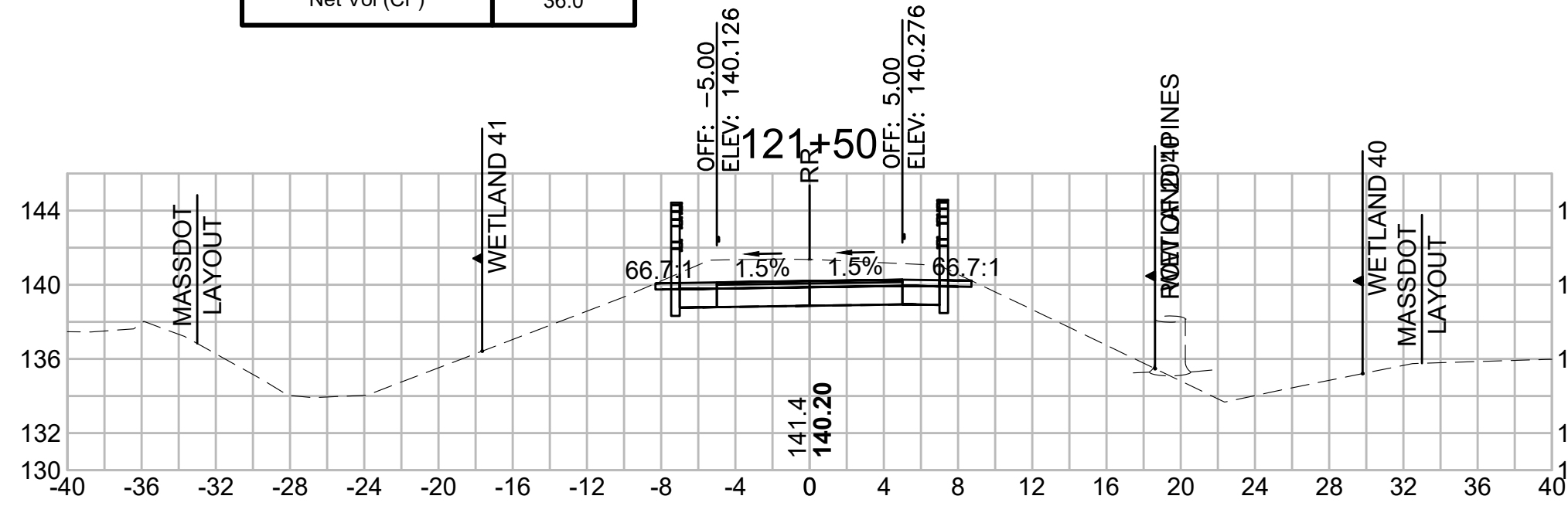
Total Volume at Station 119+50.00	
Cut Area (SF)	32.904
Fill Area (SF)	0.000
Cut Vol (CF)	58.501
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1213.459
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-223.2



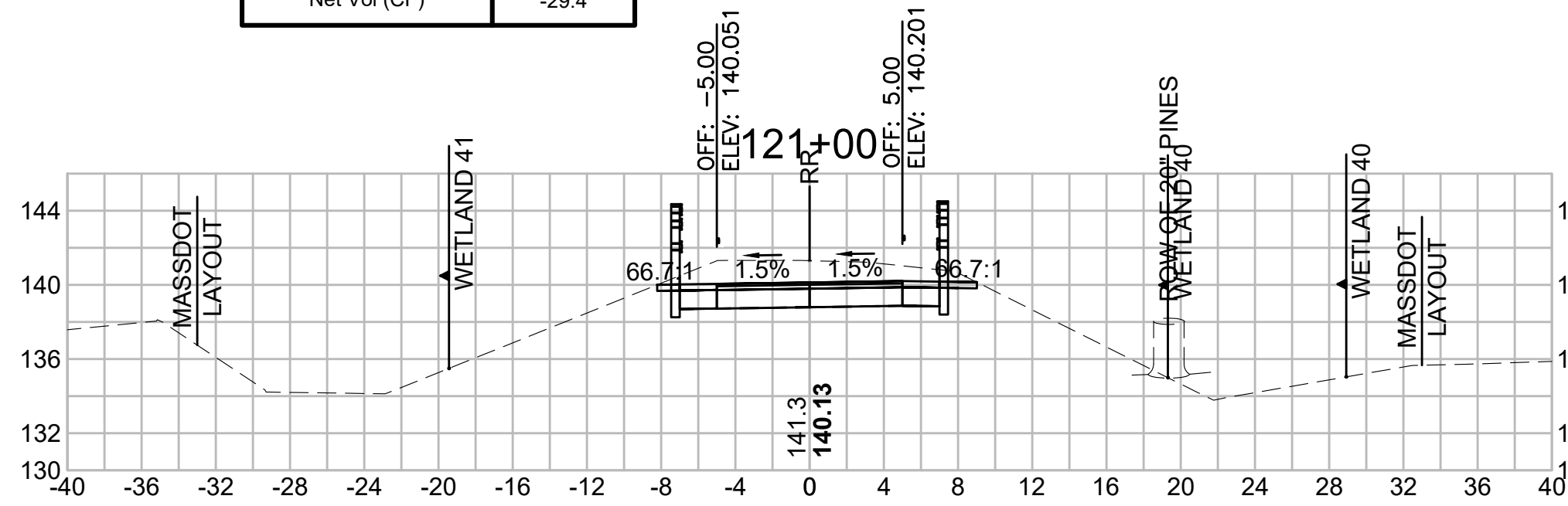
Total Volume at Station 119+00.00	
Cut Area (SF)	30.276
Fill Area (SF)	0.000
Cut Vol (CF)	55.467
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1154.958
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-281.7



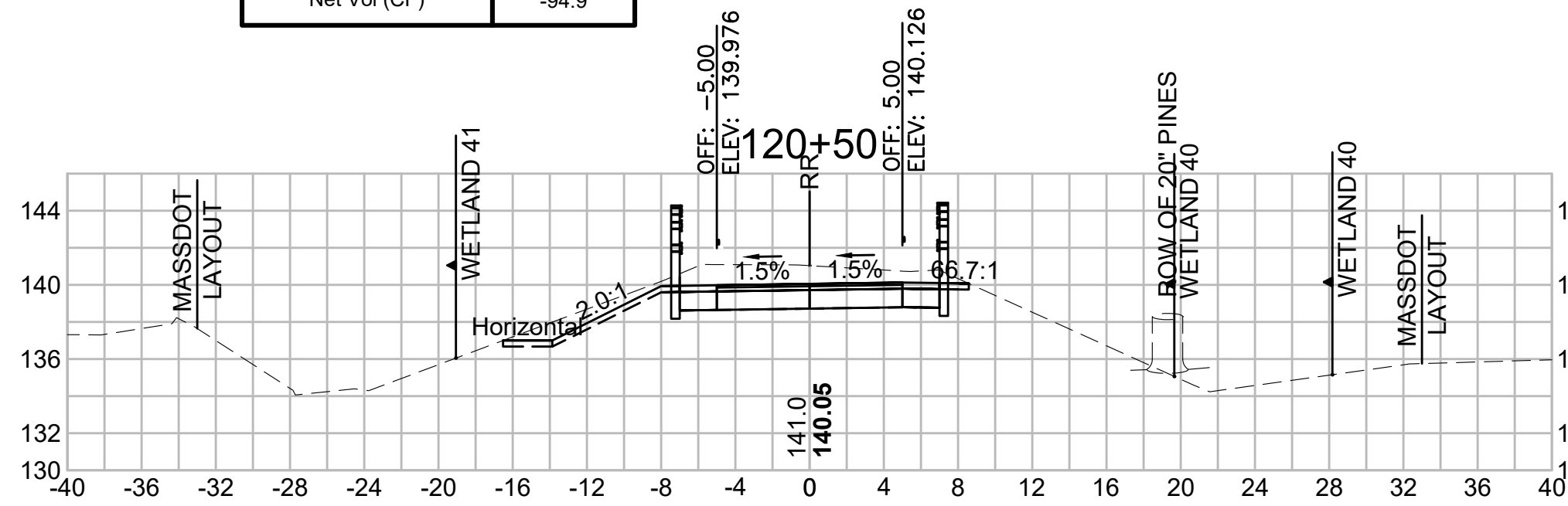
Total Volume at Station 121+50.00	
Cut Area (SF)	35.322
Fill Area (SF)	0.000
Cut Vol (CF)	65.465
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1472.639
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	36.0



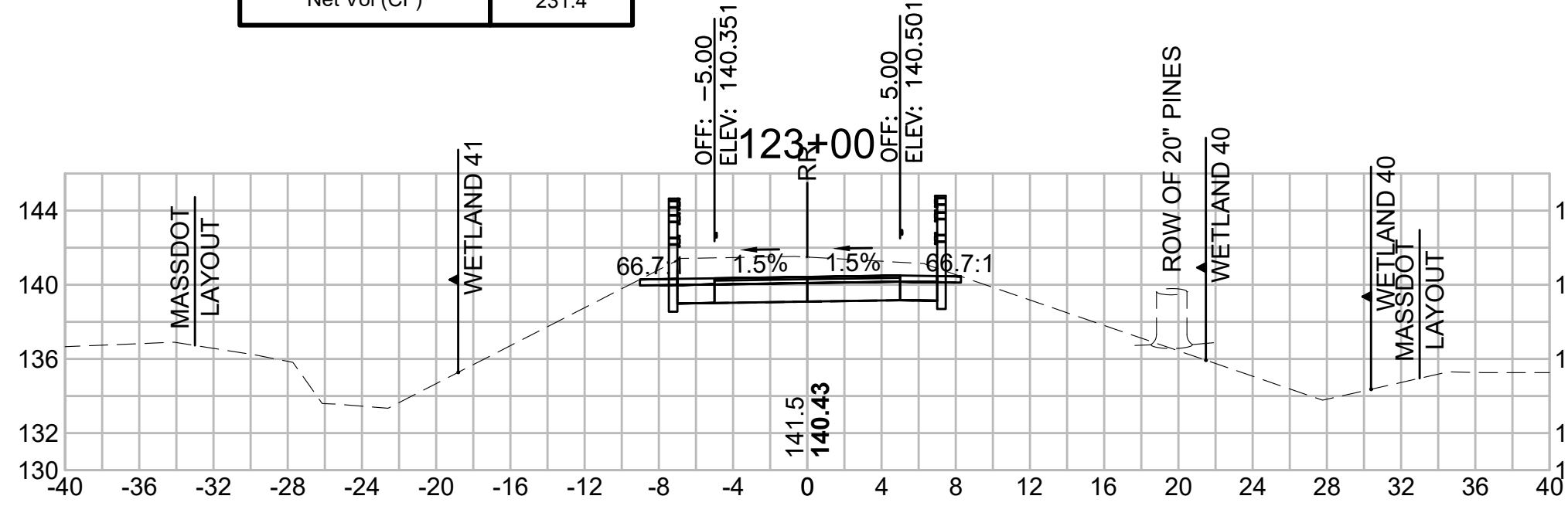
Total Volume at Station 121+00.00	
Cut Area (SF)	35.379
Fill Area (SF)	0.000
Cut Vol (CF)	65.448
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1407.175
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-29.4



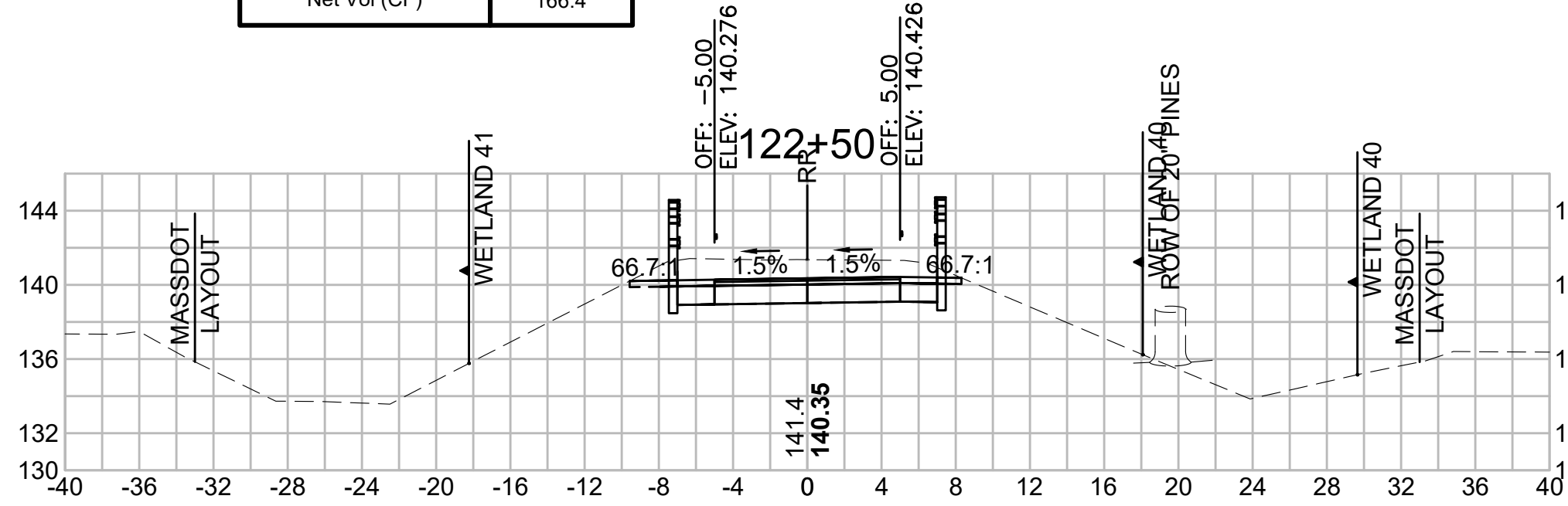
Total Volume at Station 120+50.00	
Cut Area (SF)	35.305
Fill Area (SF)	0.000
Cut Vol (CF)	65.246
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1341.728
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	-94.9



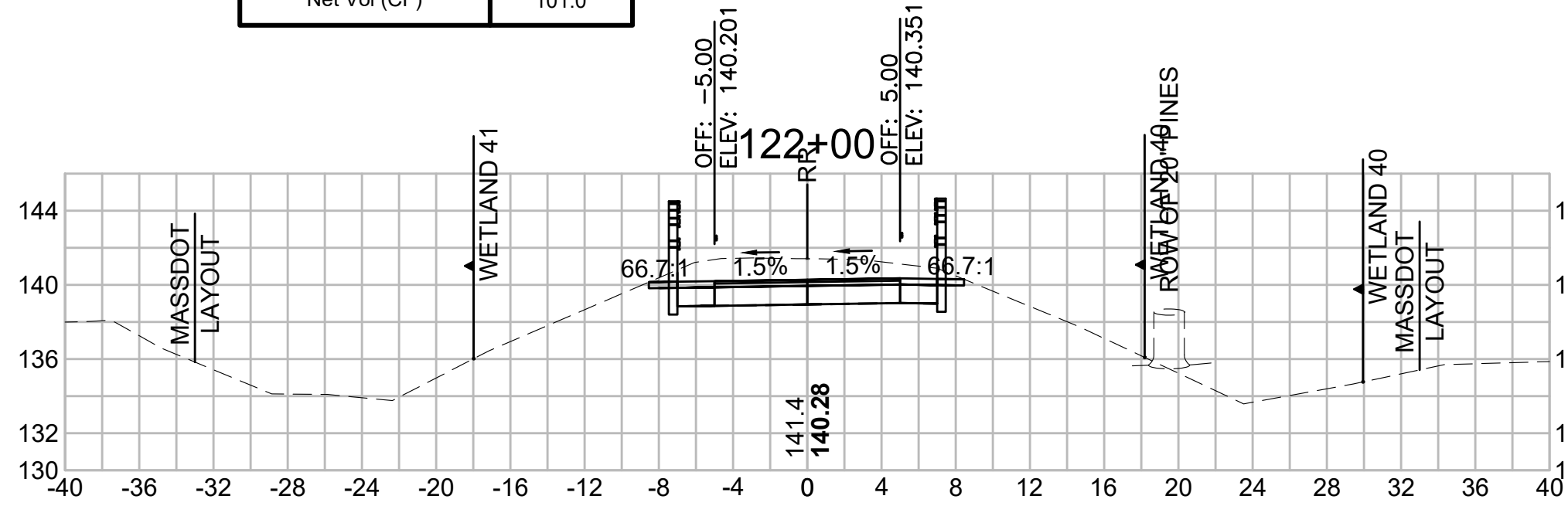
Total Volume at Station 123+00.00	
Cut Area (SF)	34.476
Fill Area (SF)	0.000
Cut Vol (CF)	64.981
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1667.972
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	231.4

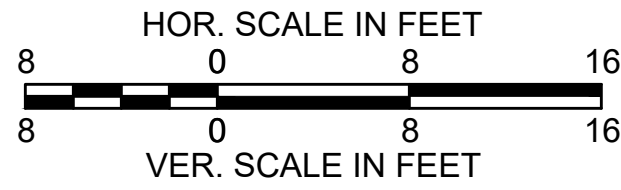


Total Volume at Station 122+50.00	
Cut Area (SF)	35.703
Fill Area (SF)	0.000
Cut Vol (CF)	65.353
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1602.992
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	166.4



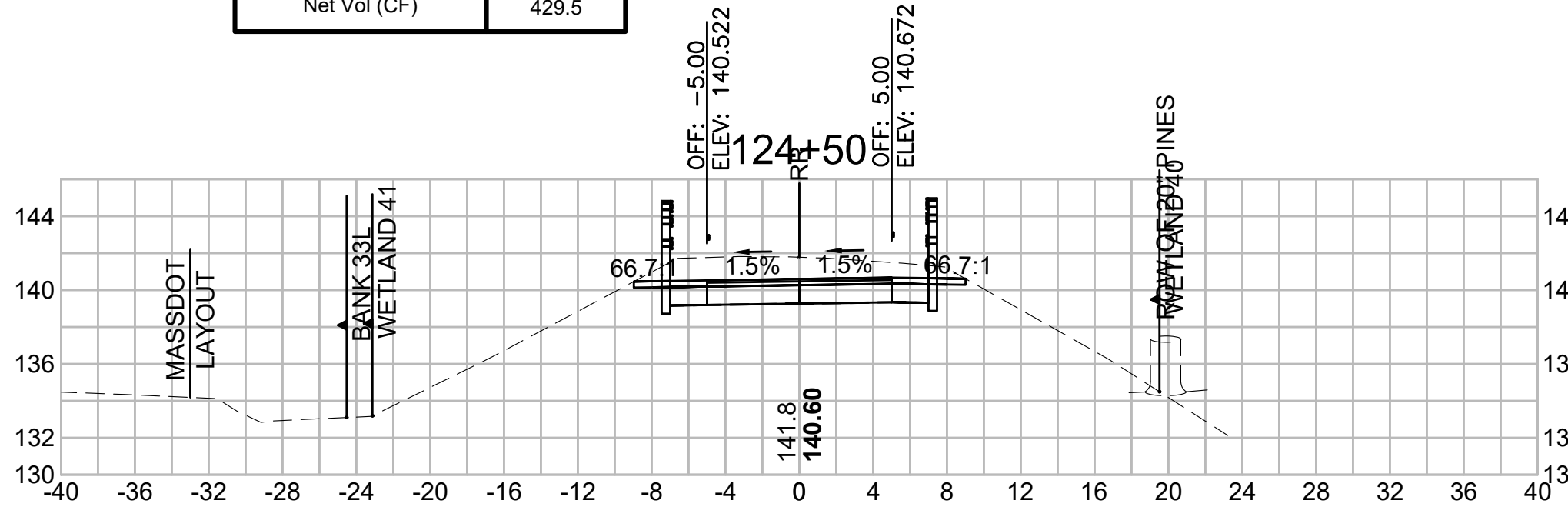
Total Volume at Station 122+00.00	
Cut Area (SF)	34.878
Fill Area (SF)	0.000
Cut Vol (CF)	65.001
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1537.639
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	101.0



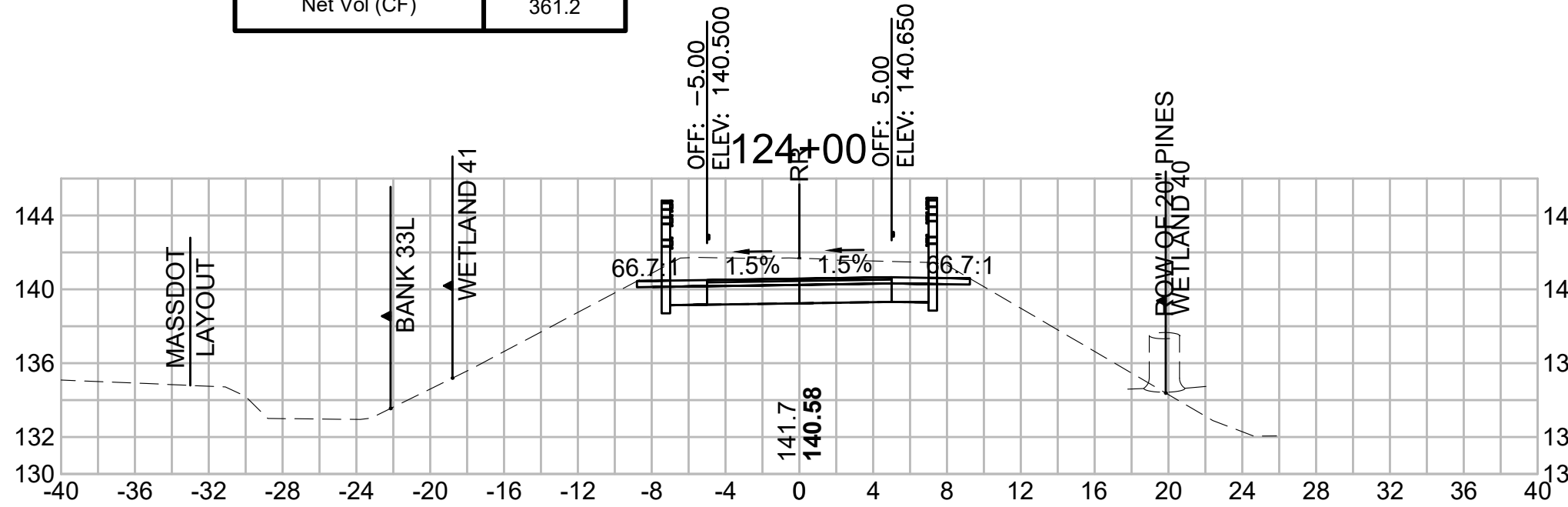


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	250	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

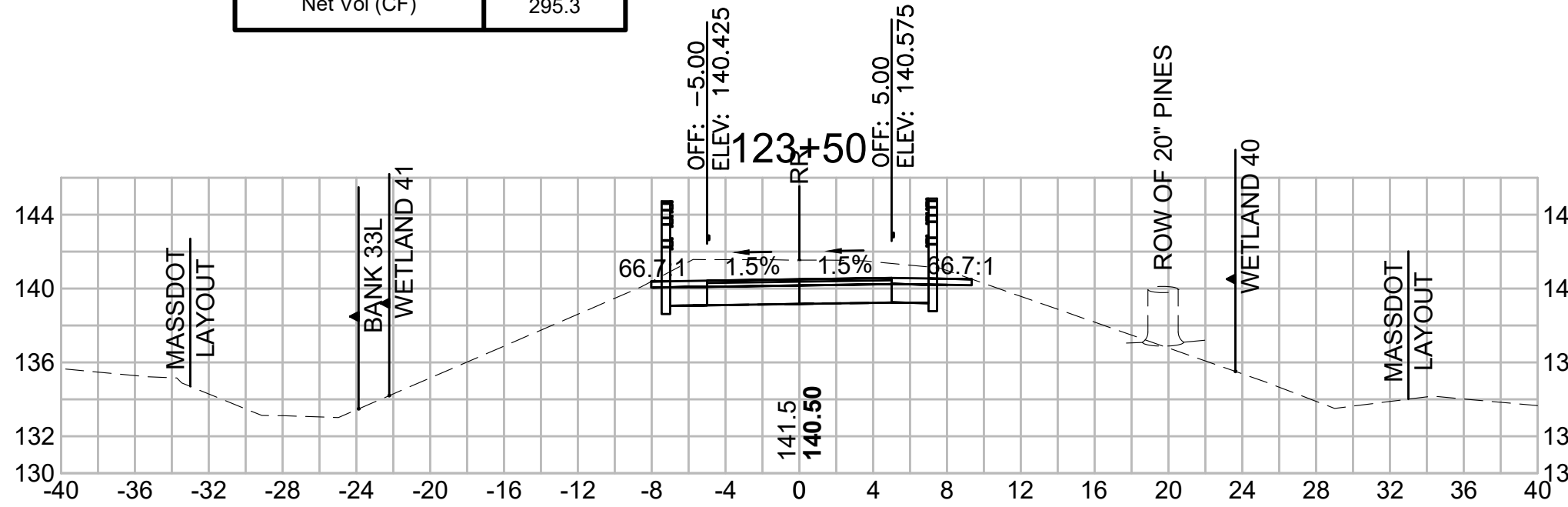
Total Volume at Station 124+50.00	
Cut Area (SF)	37.090
Fill Area (SF)	0.000
Cut Vol (CF)	68.327
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1866.161
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	429.5



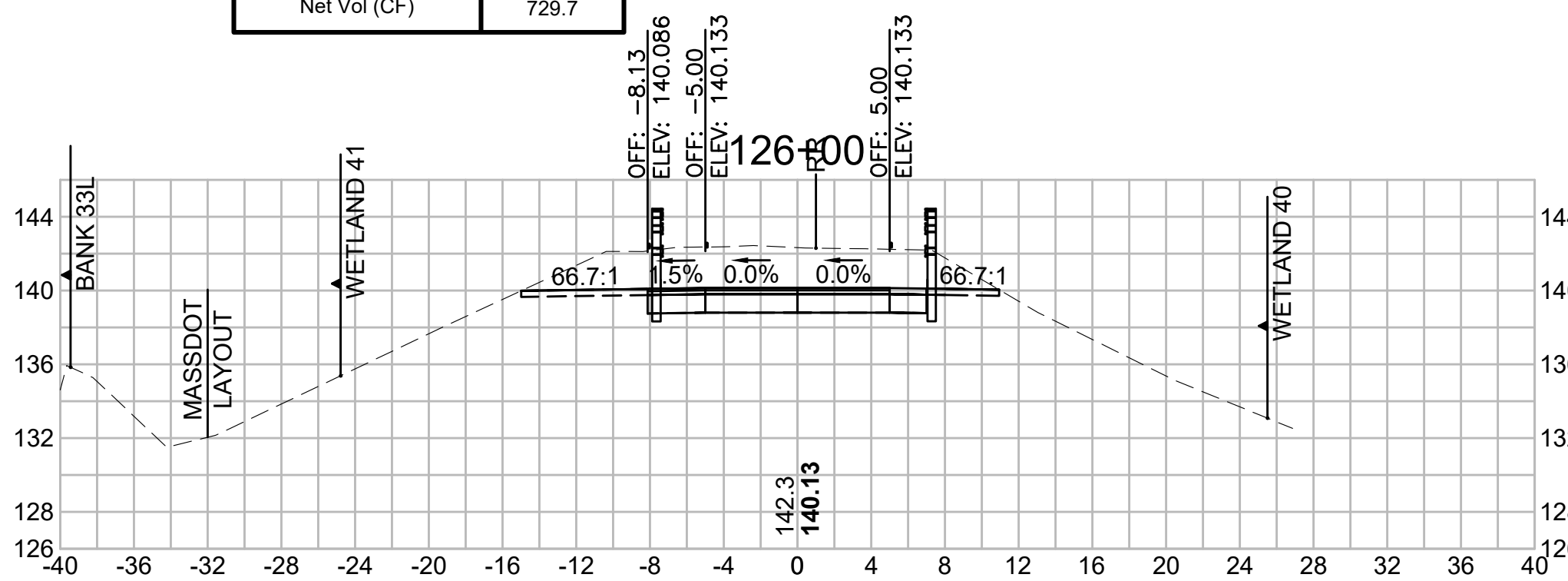
Total Volume at Station 124+00.00	
Cut Area (SF)	36.702
Fill Area (SF)	0.000
Cut Vol (CF)	65.962
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1797.835
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	361.2



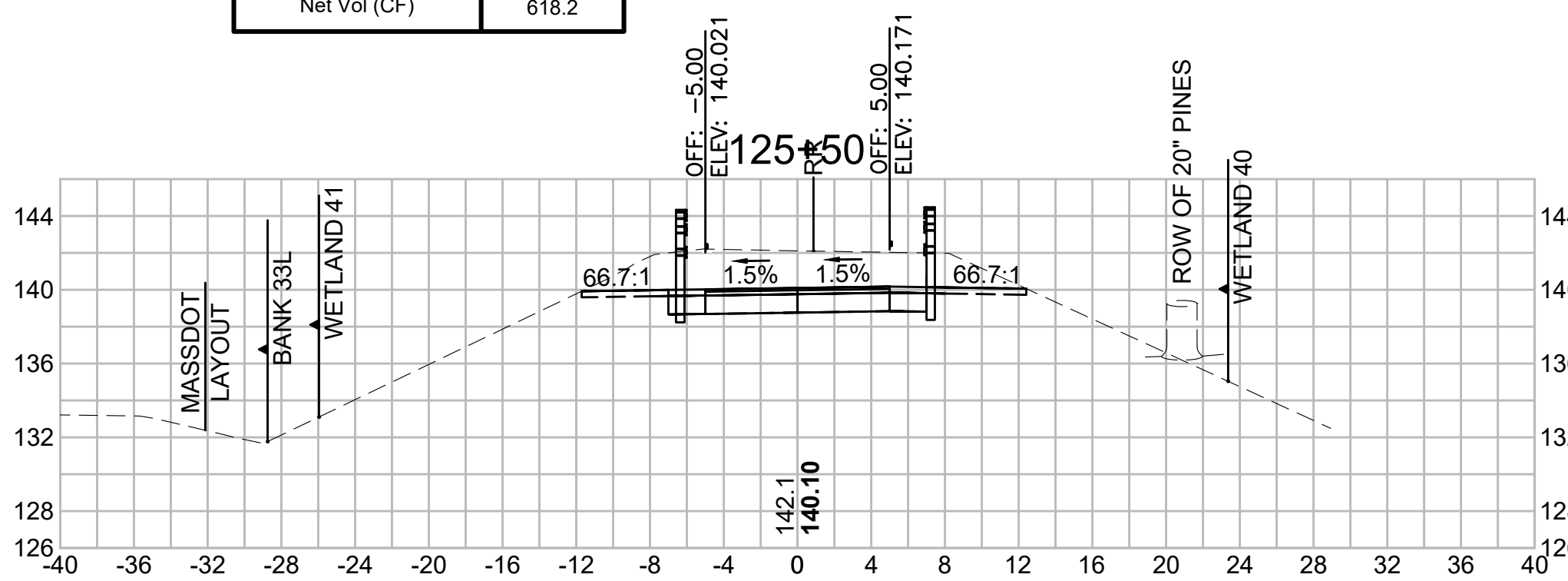
Total Volume at Station 123+50.00	
Cut Area (SF)	34.537
Fill Area (SF)	0.000
Cut Vol (CF)	63.901
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1731.873
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	295.3



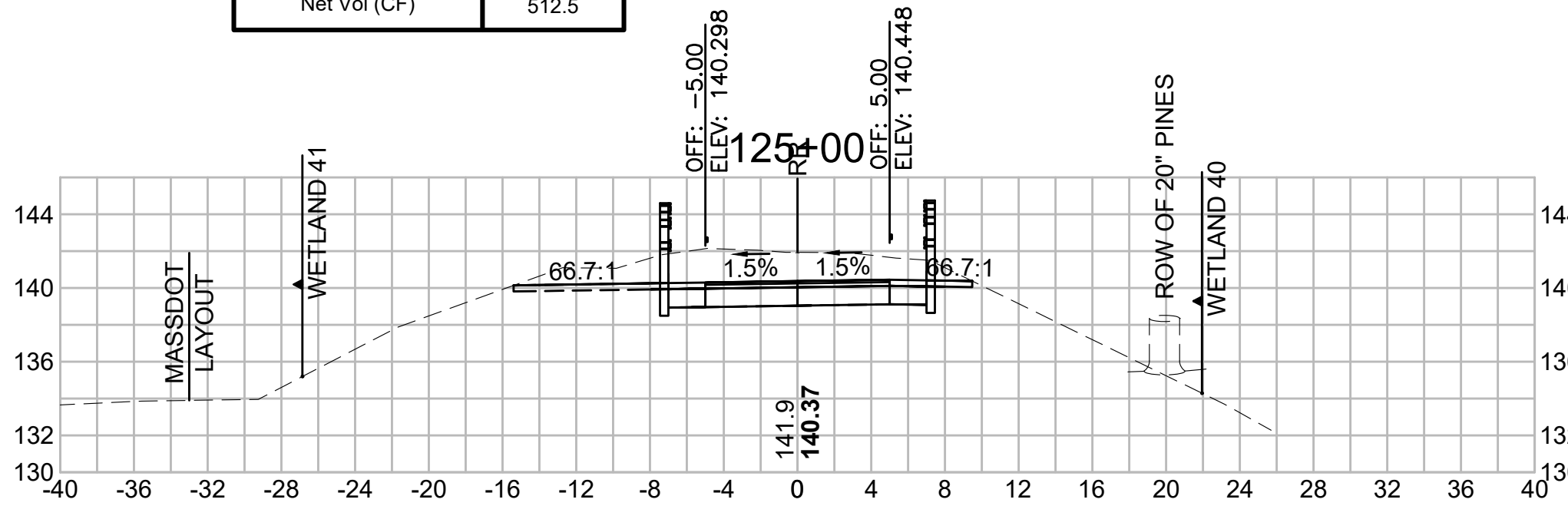
Total Volume at Station 126+00.00	
Cut Area (SF)	58.889
Fill Area (SF)	0.000
Cut Vol (CF)	111.503
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2166.314
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	729.7



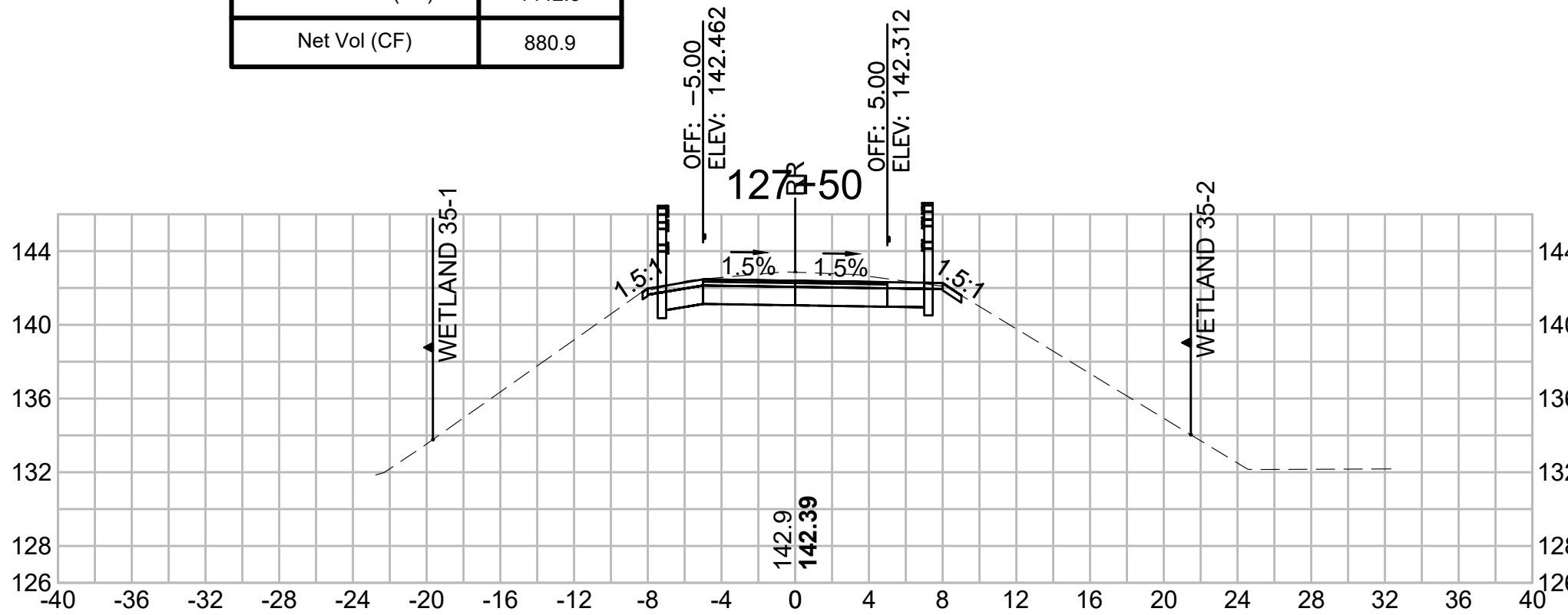
Total Volume at Station 125+50.00	
Cut Area (SF)	61.534
Fill Area (SF)	0.000
Cut Vol (CF)	105.642
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2054.812
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	618.2



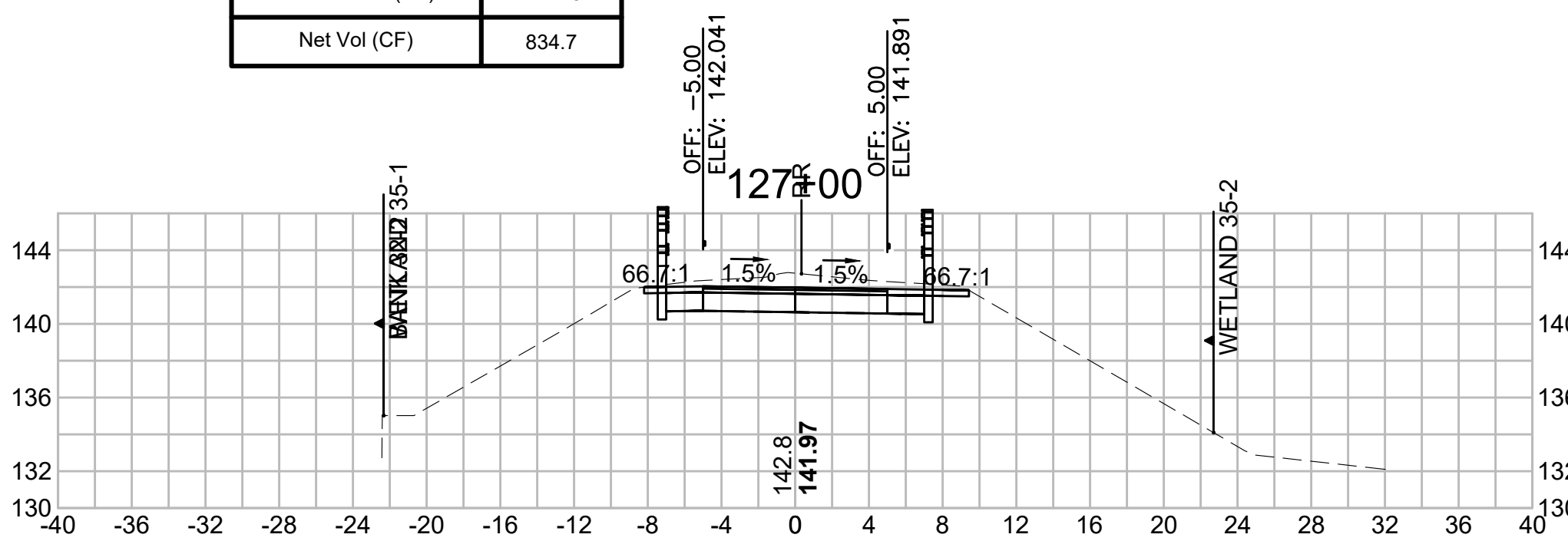
Total Volume at Station 125+00.00	
Cut Area (SF)	52.560
Fill Area (SF)	0.000
Cut Vol (CF)	83.010
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	1949.170
Cum Fill Vol (CF)	1436.6
Net Vol (CF)	512.5



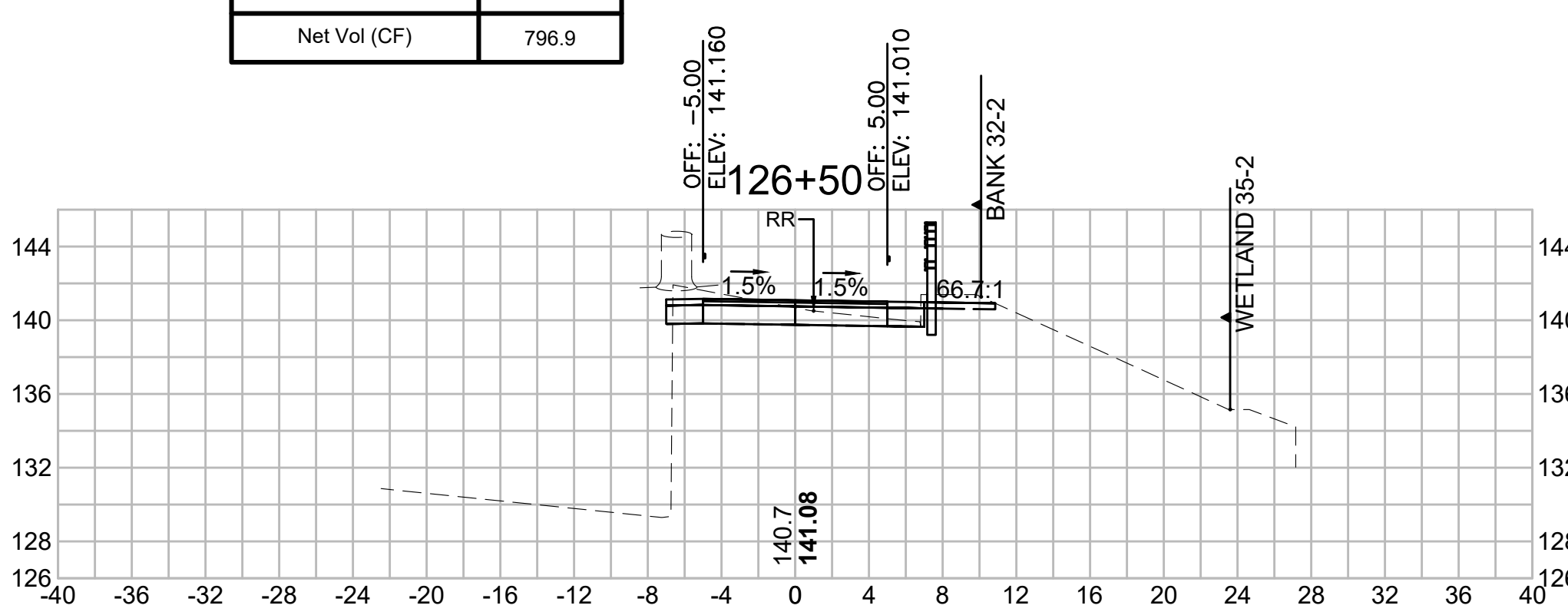
Total Volume at Station 127+50.00	
Cut Area (SF)	22.655
Fill Area (SF)	0.000
Cut Vol (CF)	46.169
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2323.380
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	880.9



Total Volume at Station 127+00.00	
Cut Area (SF)	27.206
Fill Area (SF)	0.000
Cut Vol (CF)	40.781
Fill Vol (CF)	2.9
Cum Cut Vol (CF)	2277.211
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	834.7



Total Volume at Station 126+50.00	
Cut Area (SF)	16.837
Fill Area (SF)	3.166
Cut Vol (CF)	70.117
Fill Vol (CF)	2.9
Cum Cut Vol (CF)	2236.430
Cum Fill Vol (CF)	1439.6
Net Vol (CF)	796.9



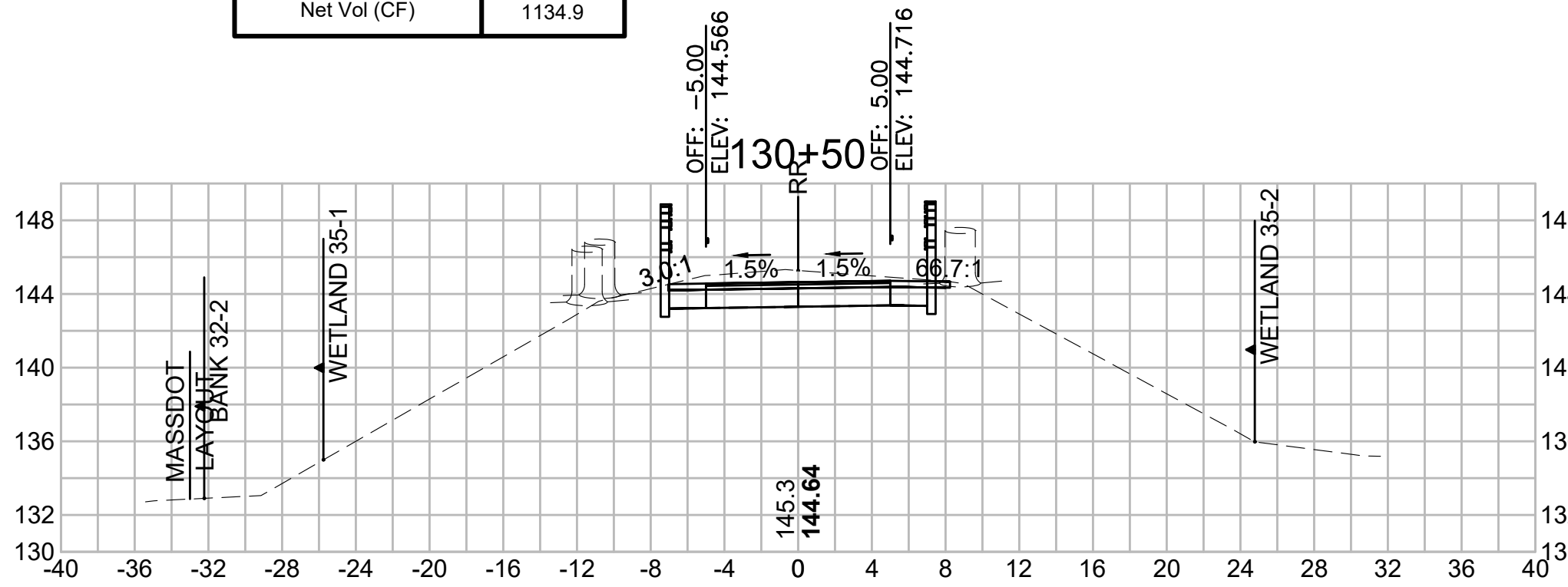
HOR. SCALE IN FEET

0 8 16

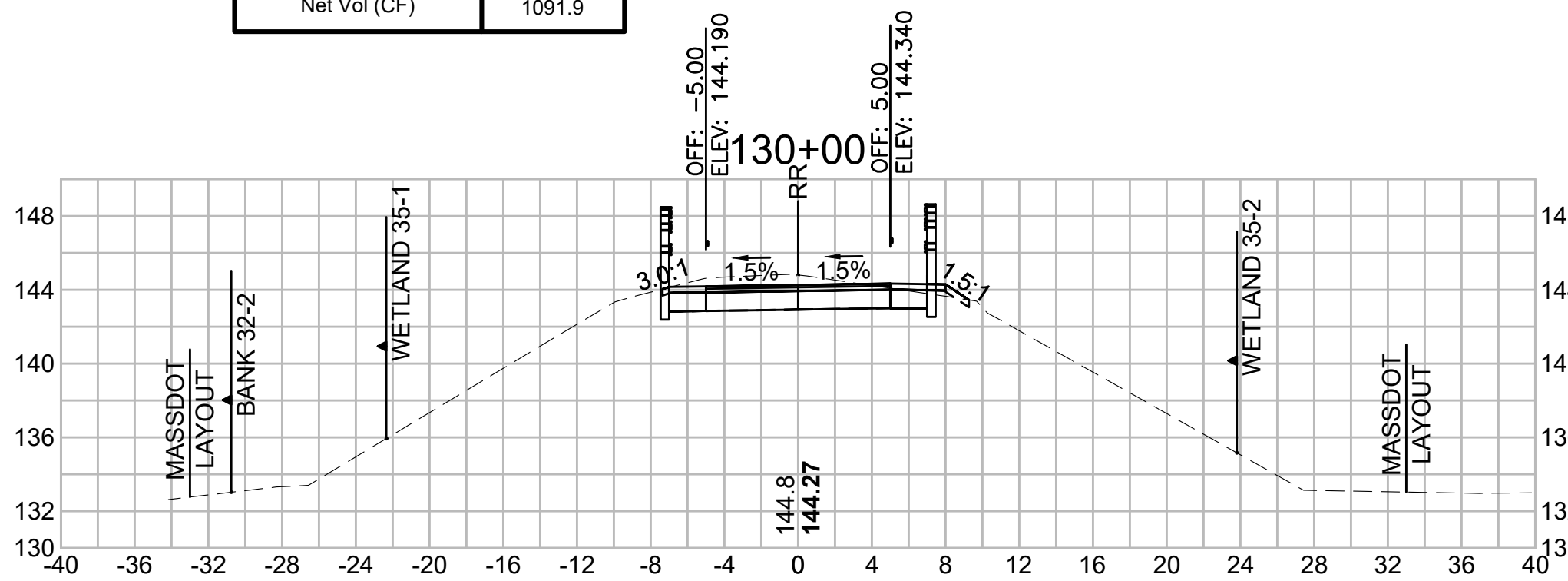
0 8 16

VER. SCALE IN FEET

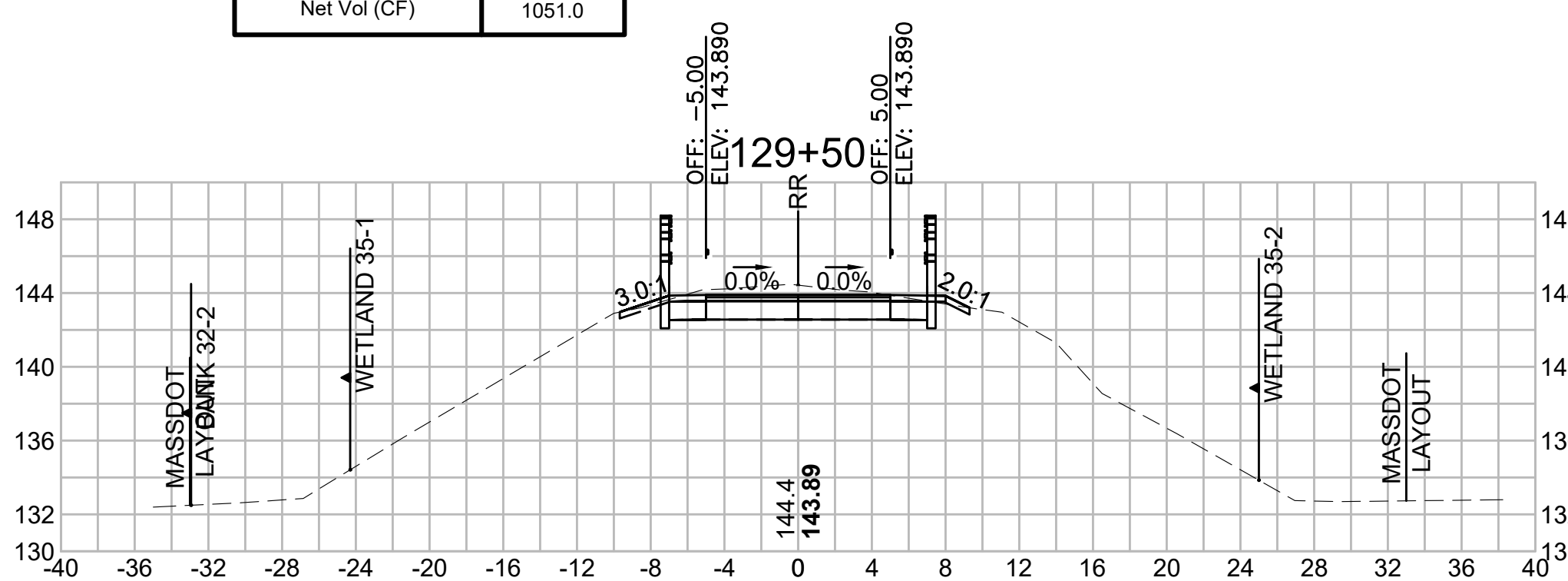
Total Volume at Station 130+50.00	
Cut Area (SF)	24.796
Fill Area (SF)	0.000
Cut Vol (CF)	43.308
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	2578.048
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1134.9



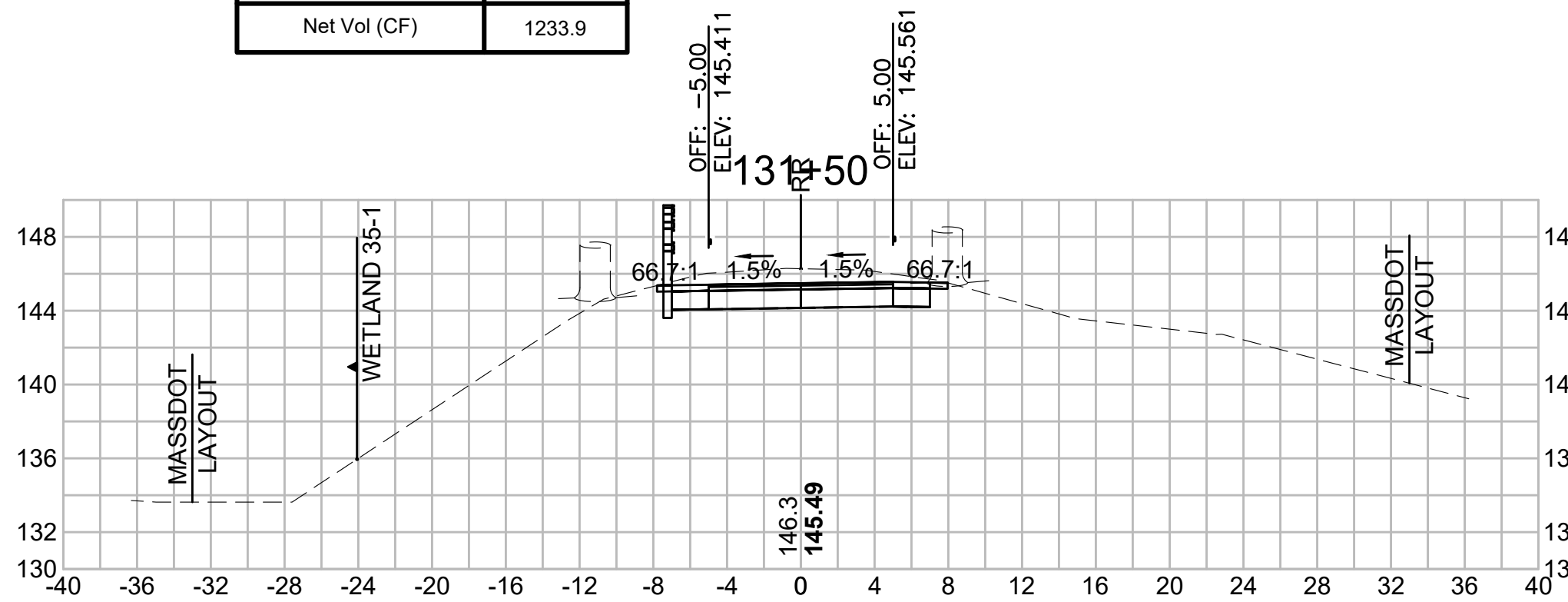
Total Volume at Station 130+00.00	
Cut Area (SF)	21.976
Fill Area (SF)	0.307
Cut Vol (CF)	41.232
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	2534.740
Cum Fill Vol (CF)	1442.9
Net Vol (CF)	1091.9



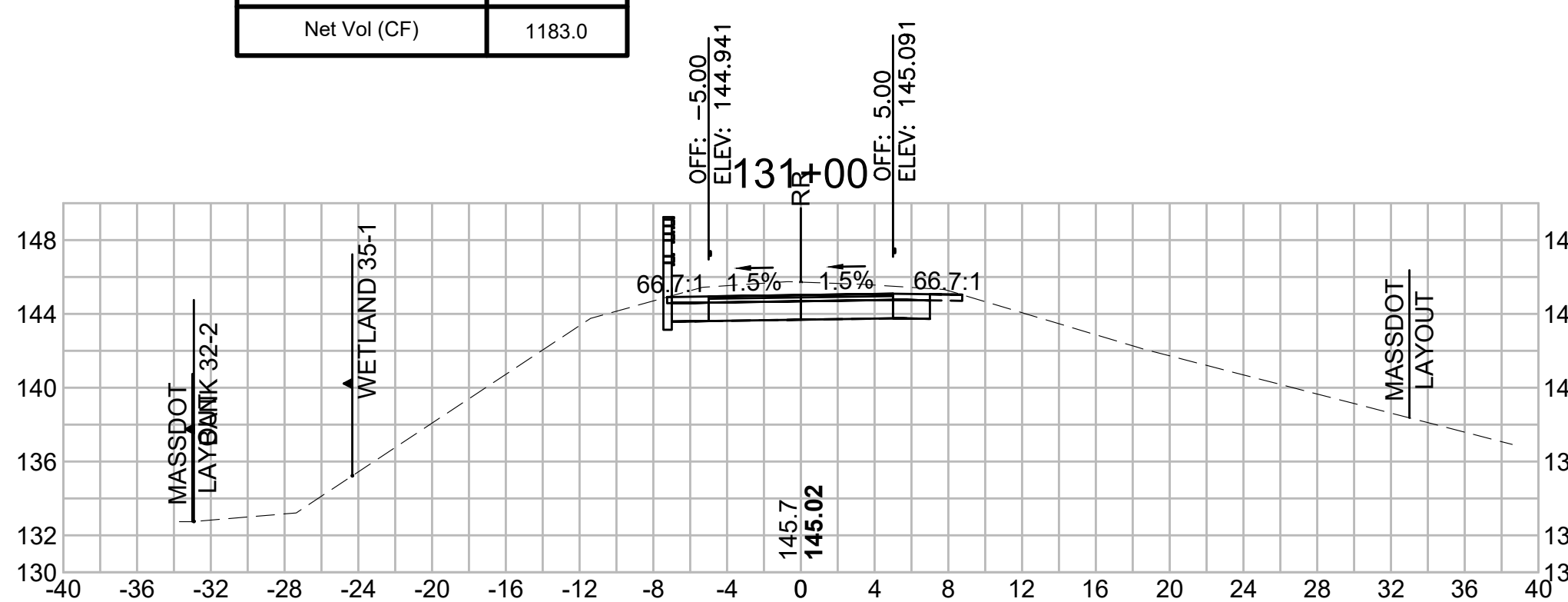
Total Volume at Station 129+50.00	
Cut Area (SF)	22.554
Fill Area (SF)	0.046
Cut Vol (CF)	41.606
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2493.509
Cum Fill Vol (CF)	1442.5
Net Vol (CF)	1051.0

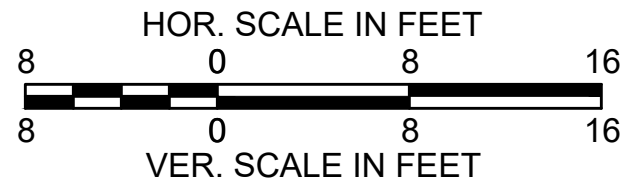


Total Volume at Station 131+50.00	
Cut Area (SF)	27.909
Fill Area (SF)	0.000
Cut Vol (CF)	50.937
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2677.037
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1233.9



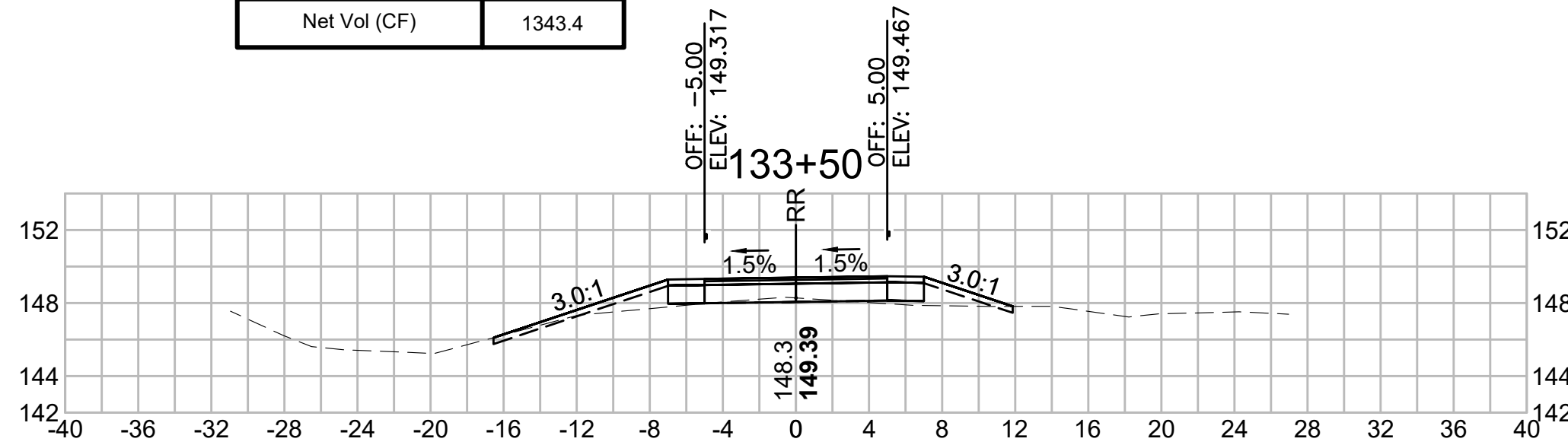
Total Volume at Station 131+00.00	
Cut Area (SF)	27.102
Fill Area (SF)	0.000
Cut Vol (CF)	48.054
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2626.101
Cum Fill Vol (CF)	1443.1
Net Vol (CF)	1183.0



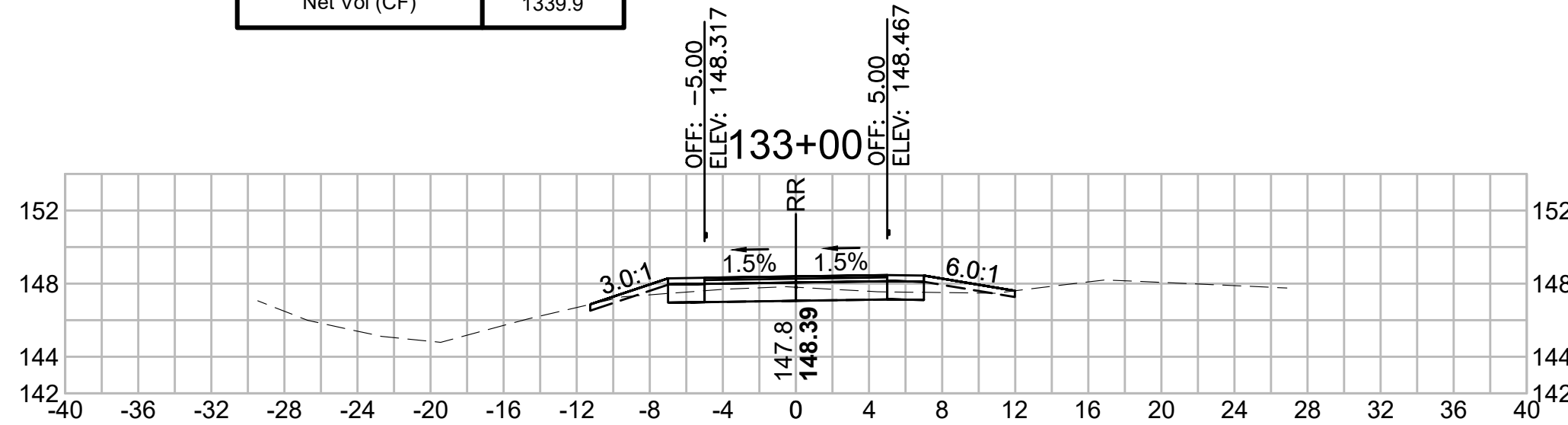


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	252	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

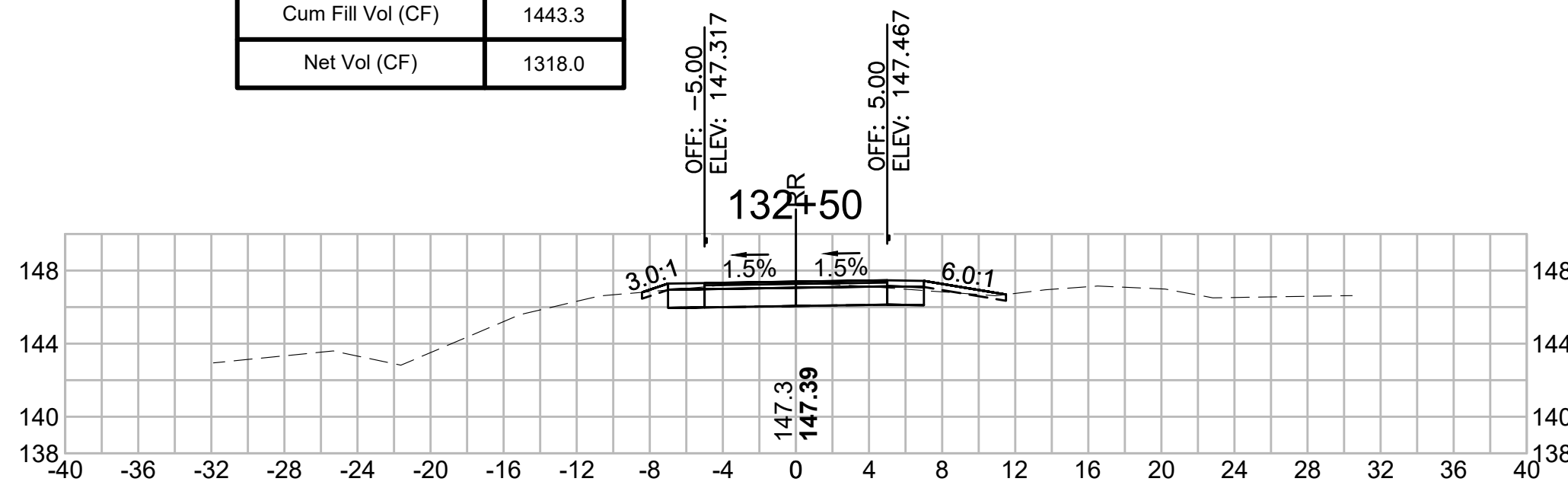
Total Volume at Station 133+50.00	
Cut Area (SF)	2.104
Fill Area (SF)	5.934
Cut Vol (CF)	10.399
Fill Vol (CF)	6.9
Cum Cut Vol (CF)	2795.223
Cum Fill Vol (CF)	1451.8
Net Vol (CF)	1343.4



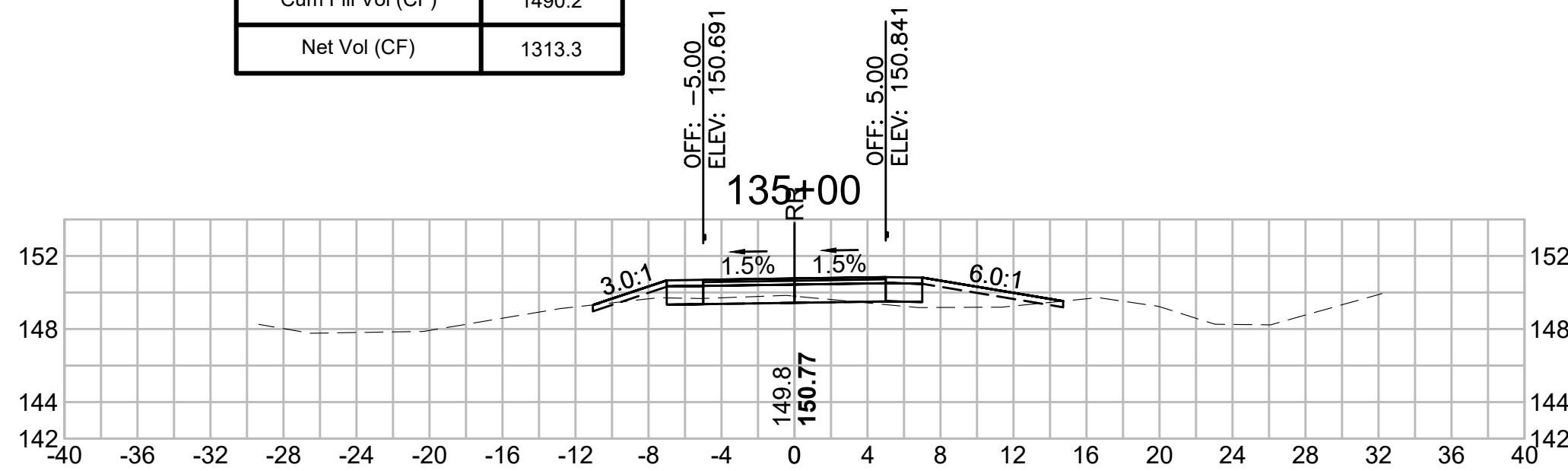
Total Volume at Station 133+00.00	
Cut Area (SF)	9.126
Fill Area (SF)	1.521
Cut Vol (CF)	23.463
Fill Vol (CF)	1.6
Cum Cut Vol (CF)	2784.824
Cum Fill Vol (CF)	1444.9
Net Vol (CF)	1339.9



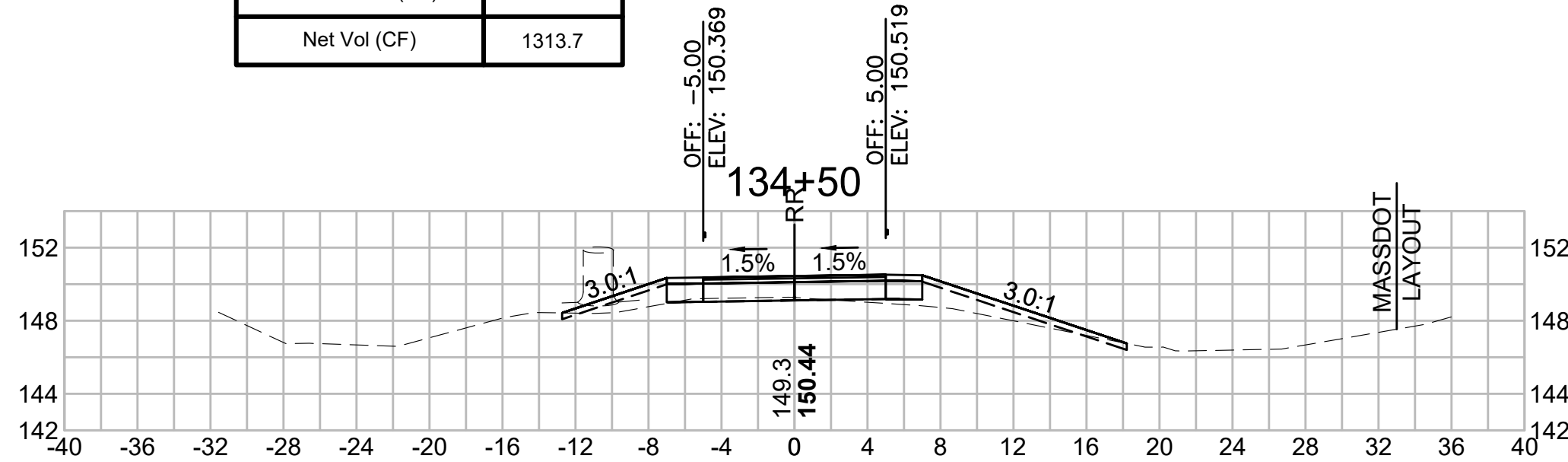
Total Volume at Station 132+50.00	
Cut Area (SF)	16.213
Fill Area (SF)	0.195
Cut Vol (CF)	36.748
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	2761.361
Cum Fill Vol (CF)	1443.3
Net Vol (CF)	1318.0



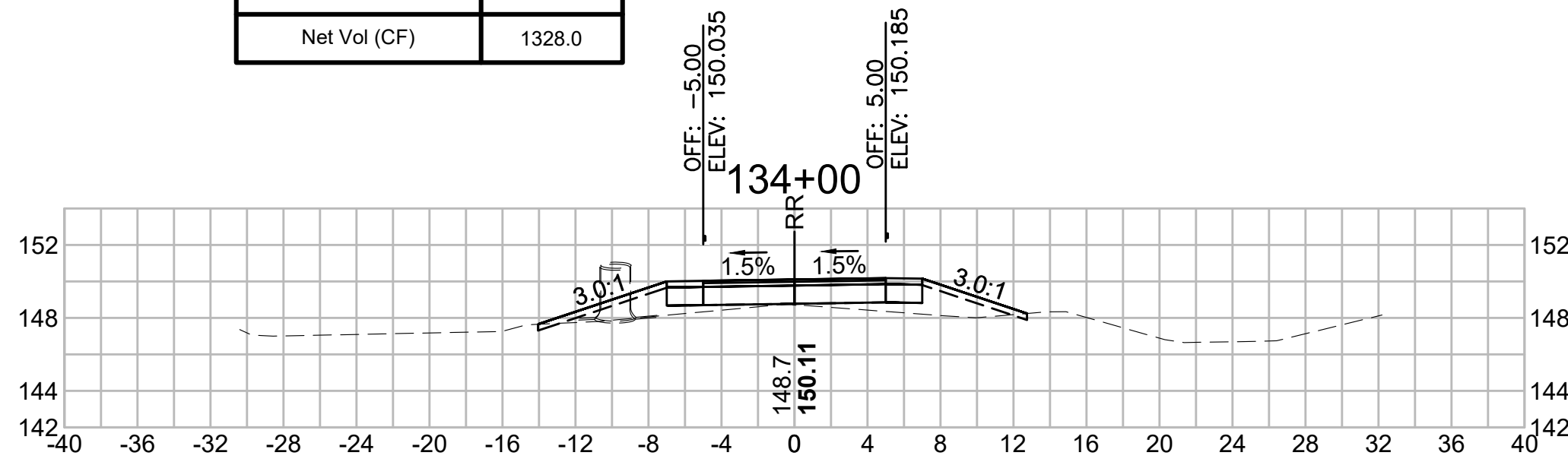
Total Volume at Station 135+00.00	
Cut Area (SF)	3.376
Fill Area (SF)	1.345
Cut Vol (CF)	4.433
Fill Vol (CF)	4.9
Cum Cut Vol (CF)	2803.574
Cum Fill Vol (CF)	1490.2
Net Vol (CF)	1313.3



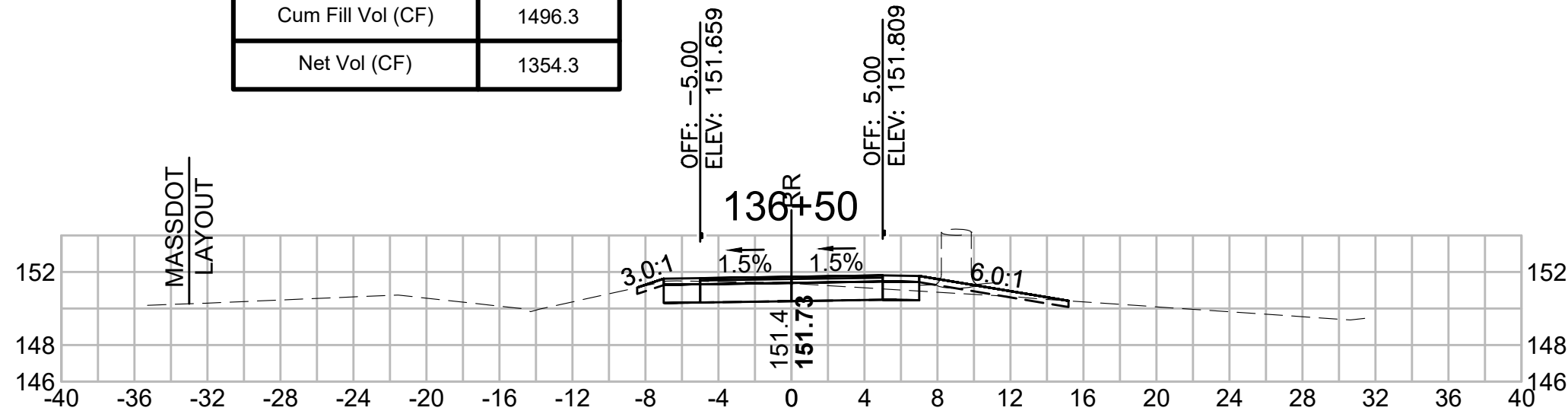
Total Volume at Station 134+50.00	
Cut Area (SF)	1.412
Fill Area (SF)	3.898
Cut Vol (CF)	1.639
Fill Vol (CF)	15.8
Cum Cut Vol (CF)	2799.141
Cum Fill Vol (CF)	1485.4
Net Vol (CF)	1313.7



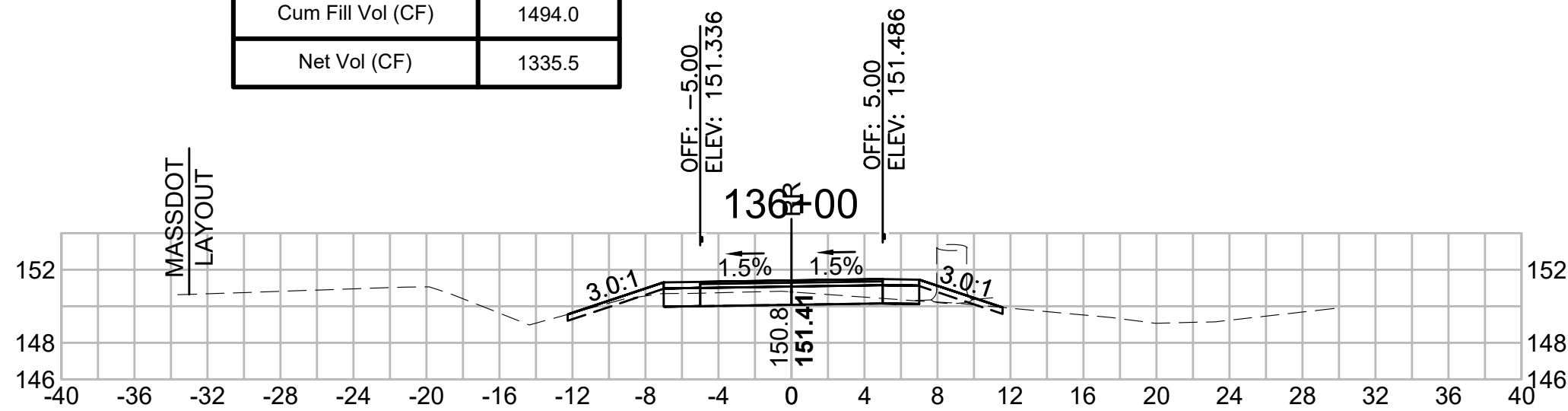
Total Volume at Station 134+00.00	
Cut Area (SF)	0.358
Fill Area (SF)	13.218
Cut Vol (CF)	2.281
Fill Vol (CF)	17.7
Cum Cut Vol (CF)	2797.503
Cum Fill Vol (CF)	1469.5
Net Vol (CF)	1328.0



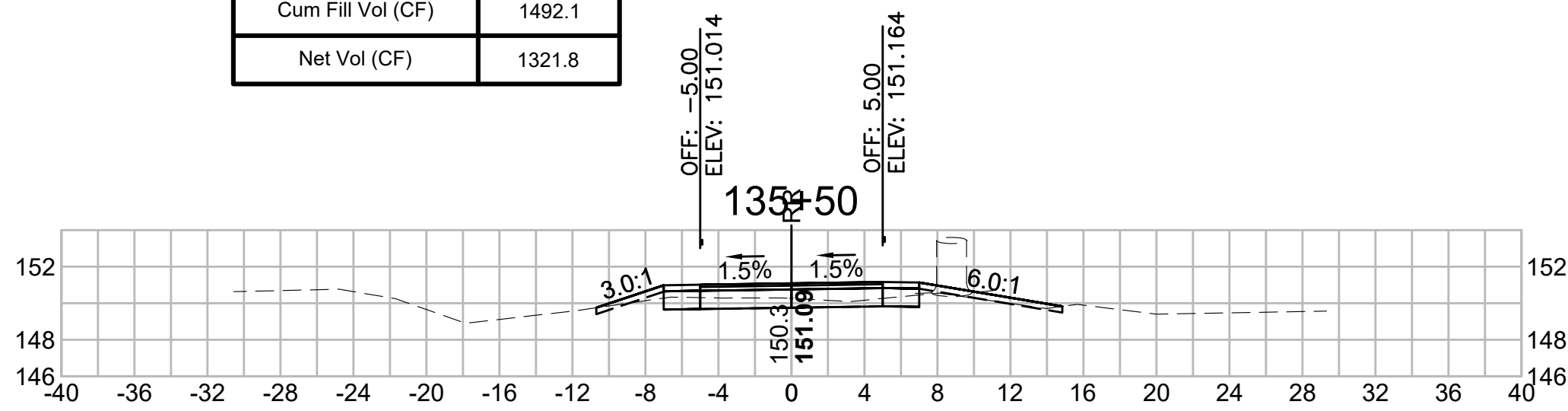
Total Volume at Station 136+50.00	
Cut Area (SF)	13.783
Fill Area (SF)	1.120
Cut Vol (CF)	21.161
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	2850.628
Cum Fill Vol (CF)	1496.3
Net Vol (CF)	1354.3

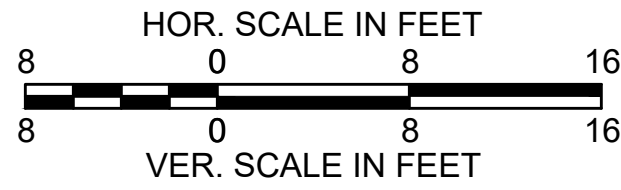


Total Volume at Station 136+00.00	
Cut Area (SF)	9.071
Fill Area (SF)	1.398
Cut Vol (CF)	15.584
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	2829.467
Cum Fill Vol (CF)	1494.0
Net Vol (CF)	1335.5



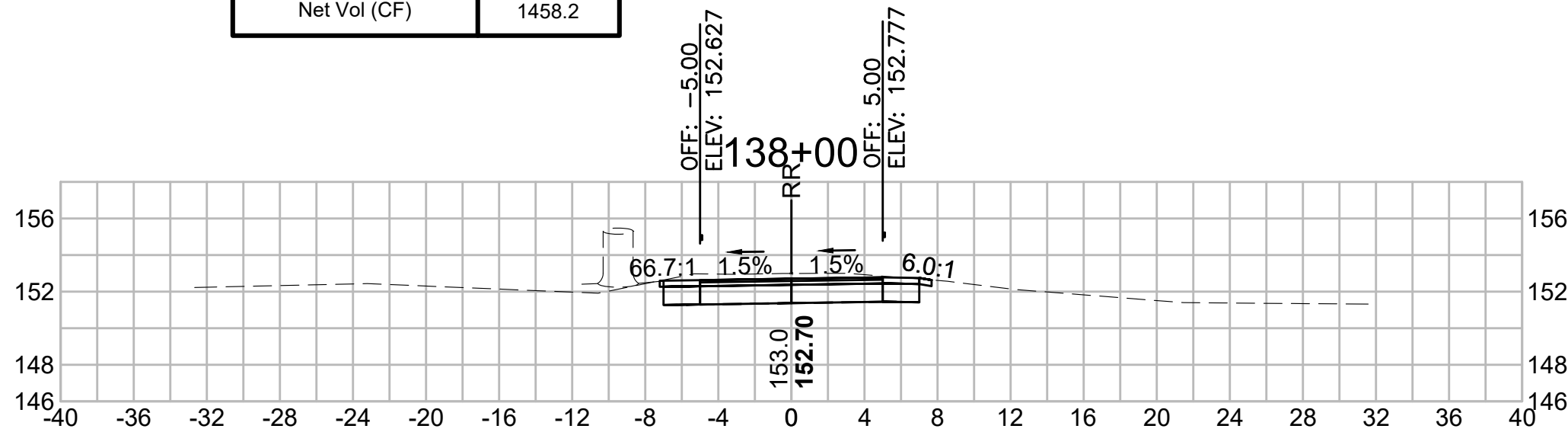
Total Volume at Station 135+50.00	
Cut Area (SF)	7.759
Fill Area (SF)	0.630
Cut Vol (CF)	10.311
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	2813.884
Cum Fill Vol (CF)	1492.1
Net Vol (CF)	1321.8



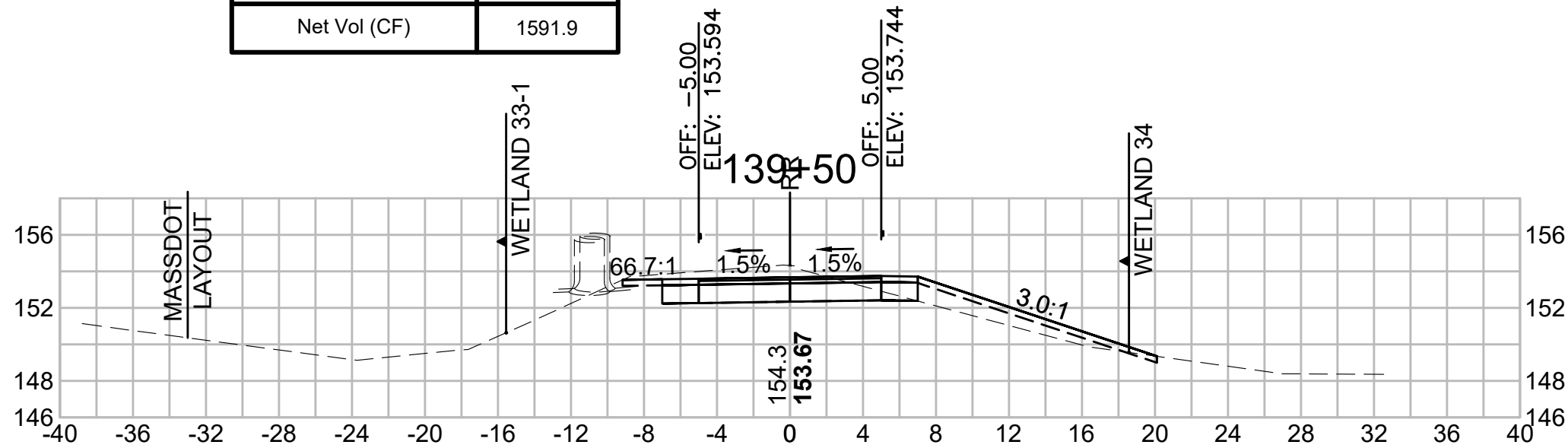


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	253	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

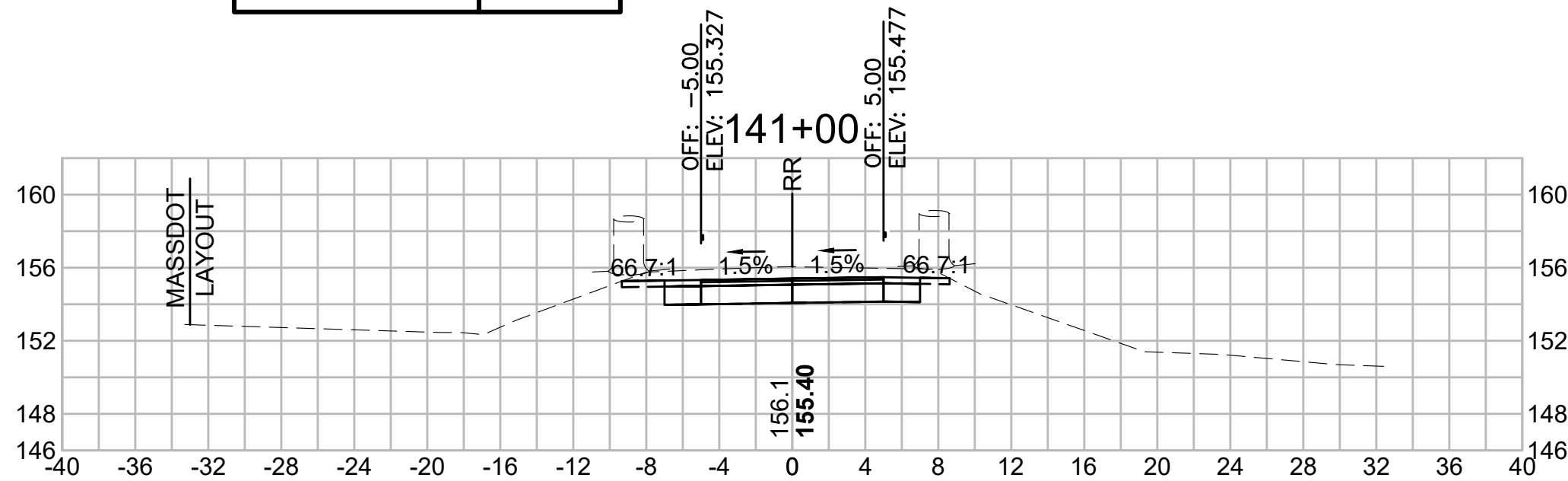
Total Volume at Station 138+00.00	
Cut Area (SF)	22.037
Fill Area (SF)	0.000
Cut Vol (CF)	39.805
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2956.172
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1458.2



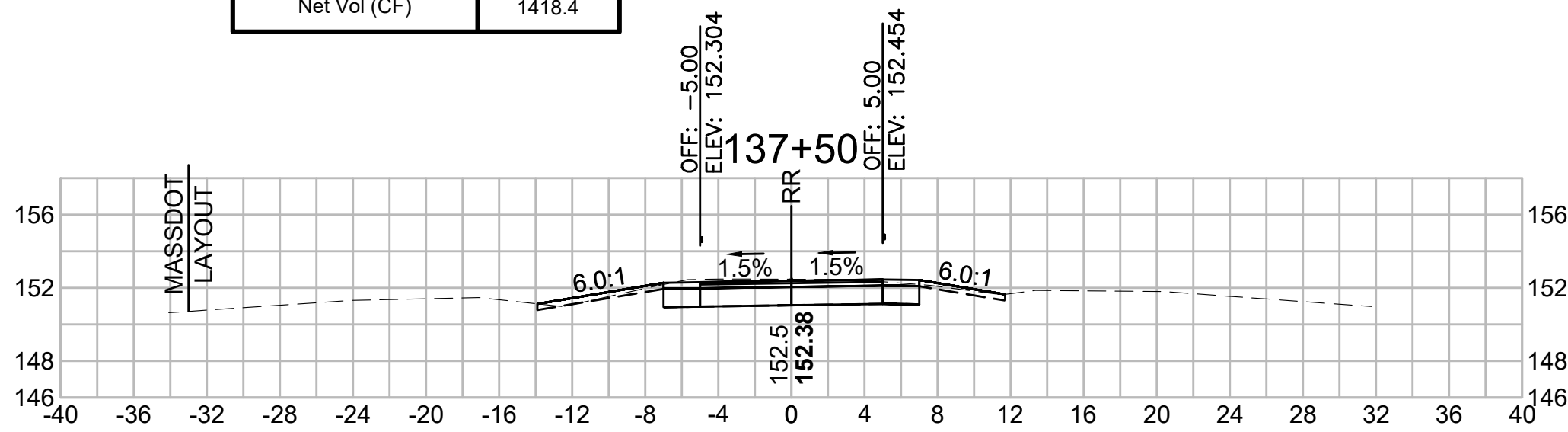
Total Volume at Station 139+50.00	
Cut Area (SF)	20.464
Fill Area (SF)	0.000
Cut Vol (CF)	43.359
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3089.860
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1591.9



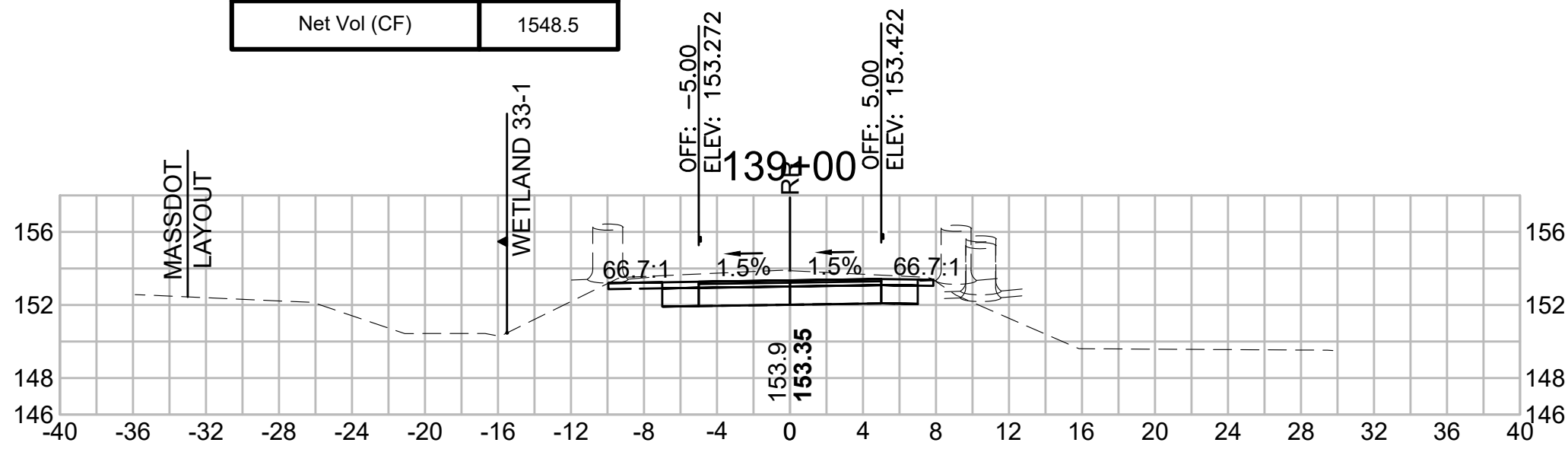
Total Volume at Station 141+00.00	
Cut Area (SF)	29.263
Fill Area (SF)	0.000
Cut Vol (CF)	58.810
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3252.955
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1755.0



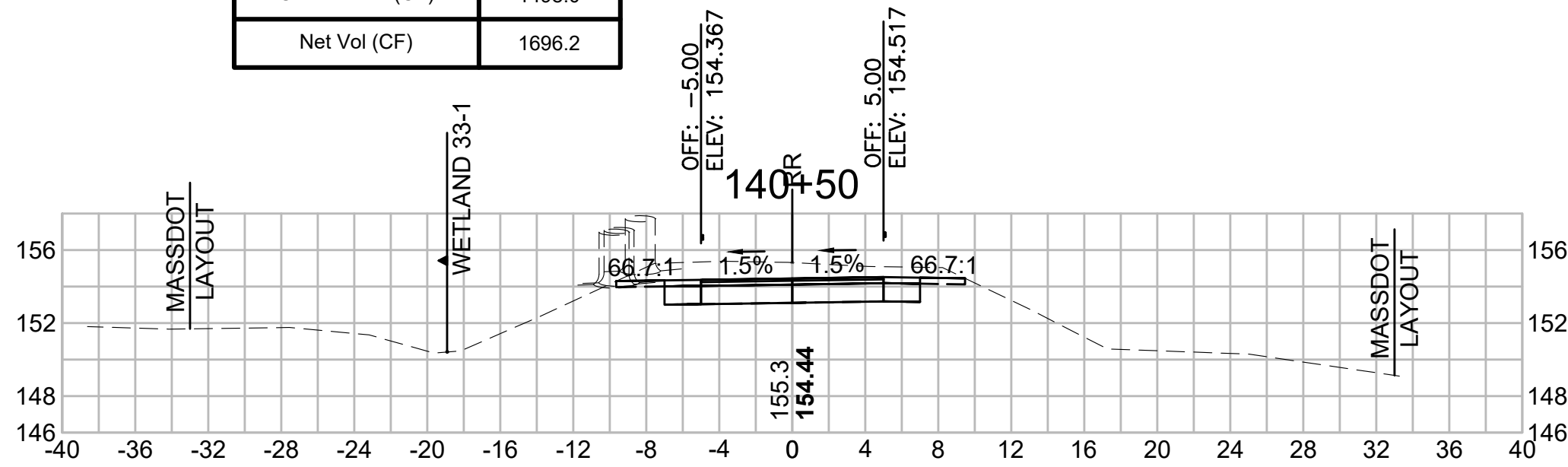
Total Volume at Station 137+50.00	
Cut Area (SF)	20.952
Fill Area (SF)	0.033
Cut Vol (CF)	36.189
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	2916.368
Cum Fill Vol (CF)	1497.9
Net Vol (CF)	1418.4



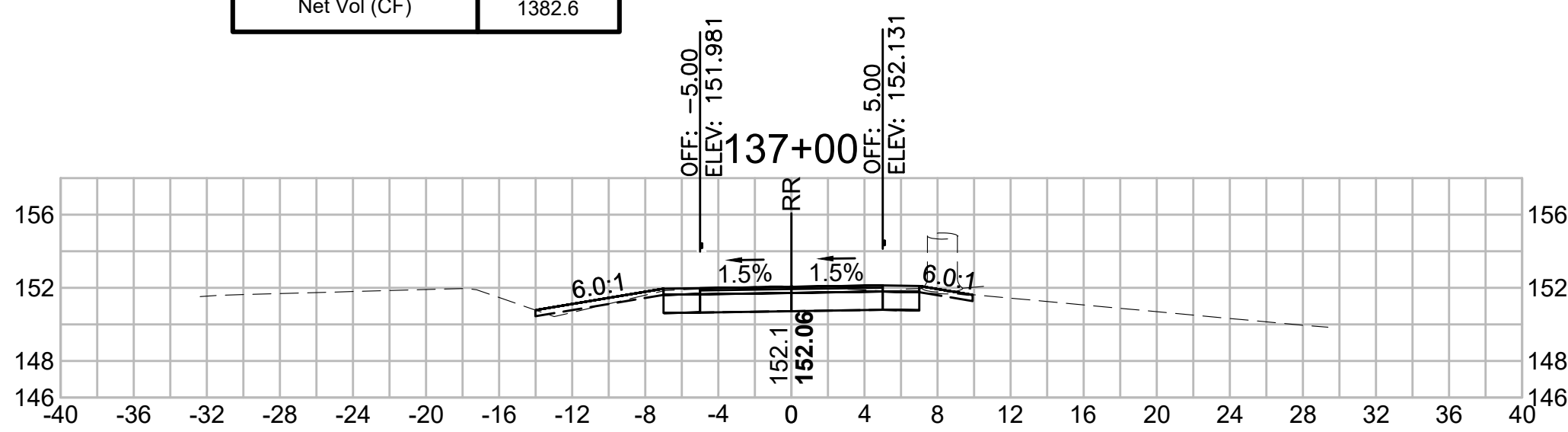
Total Volume at Station 139+00.00	
Cut Area (SF)	26.364
Fill Area (SF)	0.000
Cut Vol (CF)	47.168
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3046.501
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1548.5



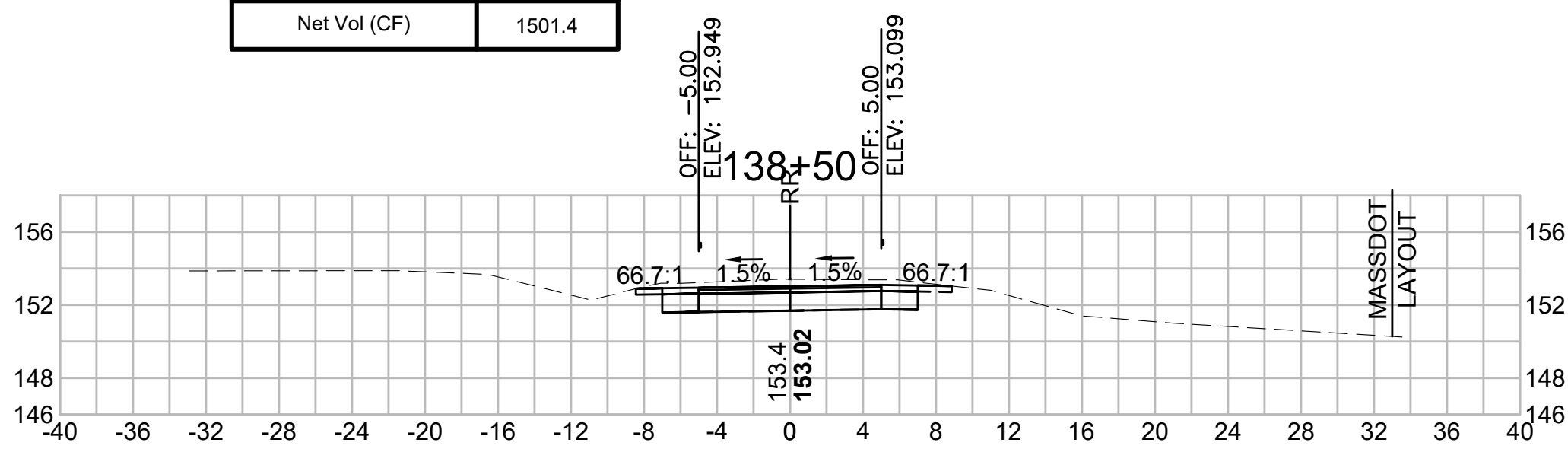
Total Volume at Station 140+50.00	
Cut Area (SF)	34.252
Fill Area (SF)	0.000
Cut Vol (CF)	58.527
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3194.145
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1696.2



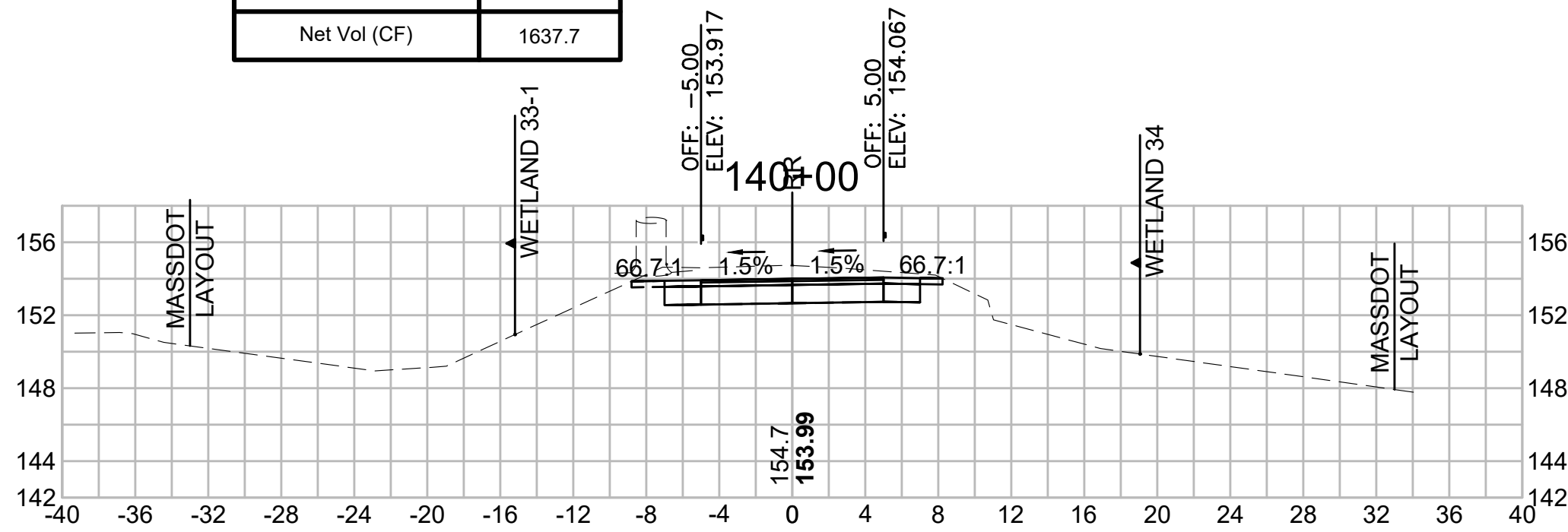
Total Volume at Station 137+00.00	
Cut Area (SF)	18.132
Fill Area (SF)	0.314
Cut Vol (CF)	29.552
Fill Vol (CF)	1.3
Cum Cut Vol (CF)	2880.179
Cum Fill Vol (CF)	1497.6
Net Vol (CF)	1382.6

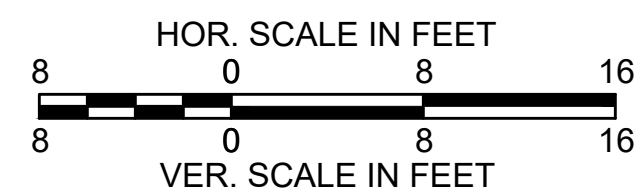


Total Volume at Station 138+50.00	
Cut Area (SF)	24.577
Fill Area (SF)	0.000
Cut Vol (CF)	43.162
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	2999.334
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1501.4



Total Volume at Station 140+00.00	
Cut Area (SF)	28.956
Fill Area (SF)	0.000
Cut Vol (CF)	45.760
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3135.619
Cum Fill Vol (CF)	1498.0
Net Vol (CF)	1637.7



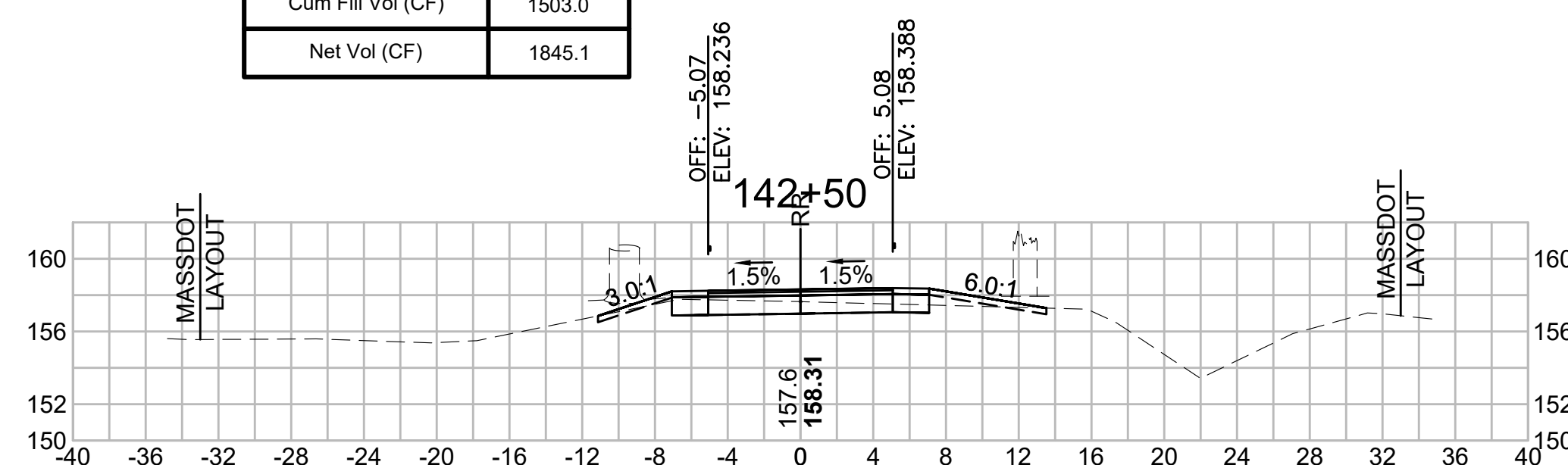


SUDBURY
BRUCE FREEMAN RAIL TRAIL

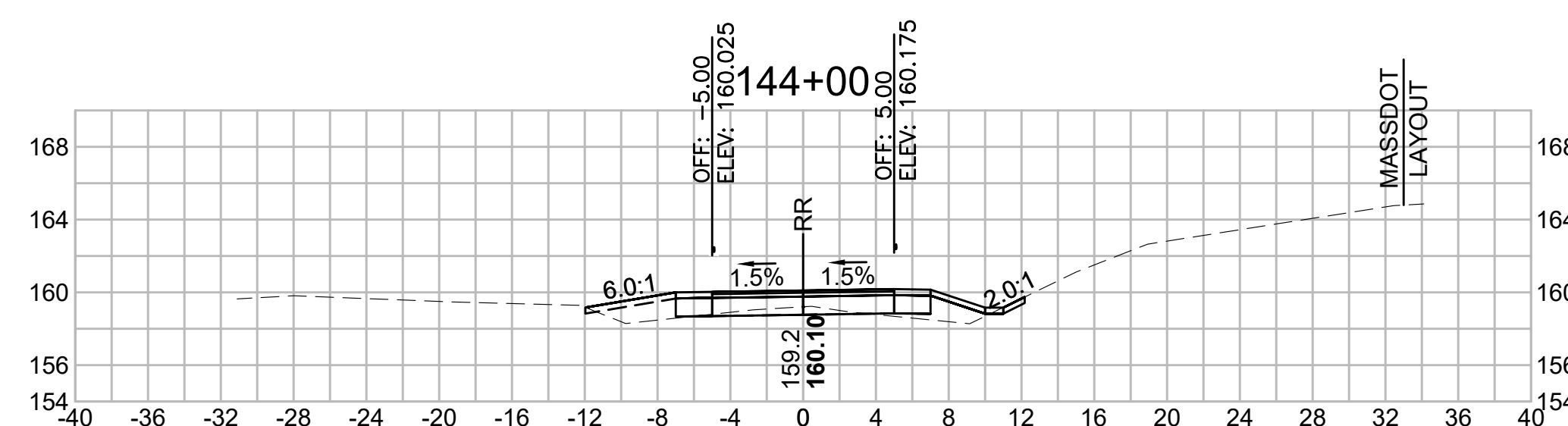
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	254	319
PROJECT FILE NO. 608164			

CROSS SECTIONS

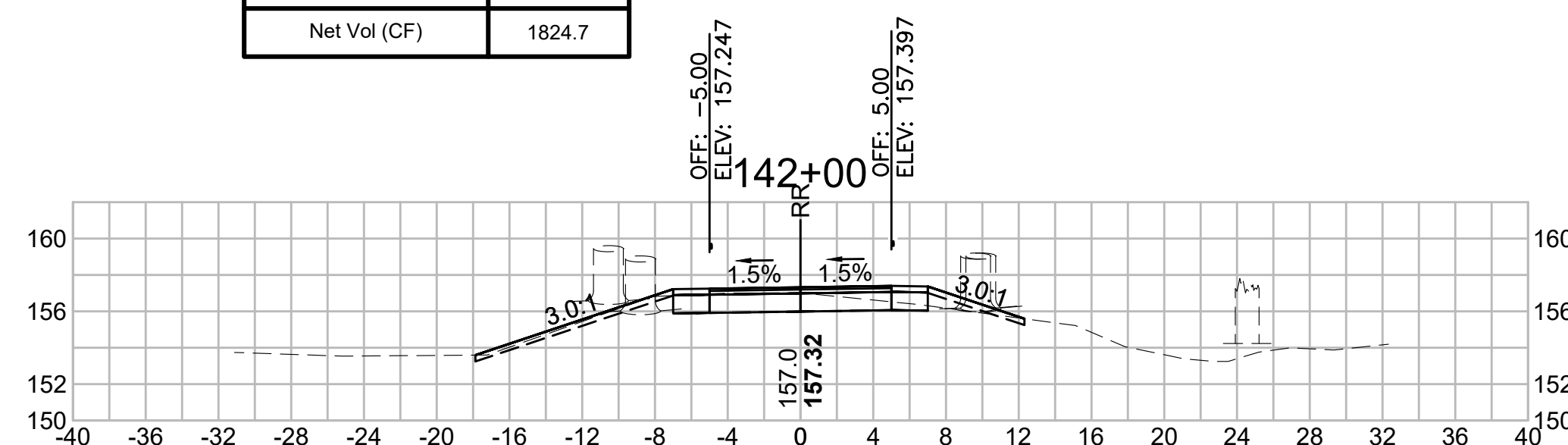
Total Volume at Station 142+50.00	
Cut Area (SF)	10.105
Fill Area (SF)	1.261
Cut Vol (CF)	22.725
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	3348.100
Cum Fill Vol (CF)	1503.0
Net Vol (CF)	1845.1



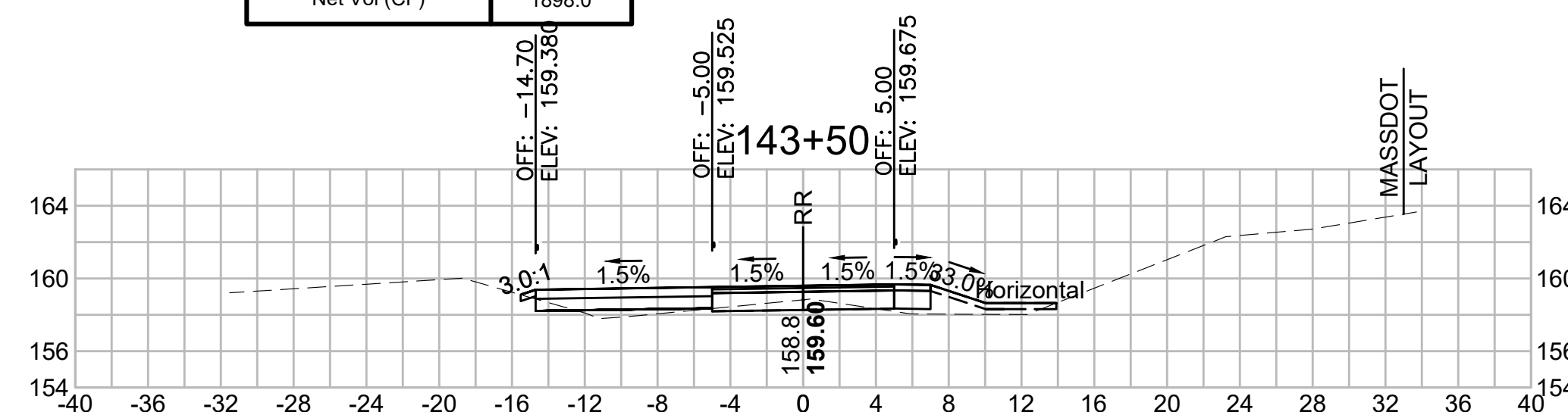
Total Volume at Station 144+00.00	
Cut Area (SF)	3.029
Fill Area (SF)	6.893
Cut Vol (CF)	6.559
Fill Vol (CF)	12.5
Cum Cut Vol (CF)	3414.913
Cum Fill Vol (CF)	1522.9
Net Vol (CF)	1892.0



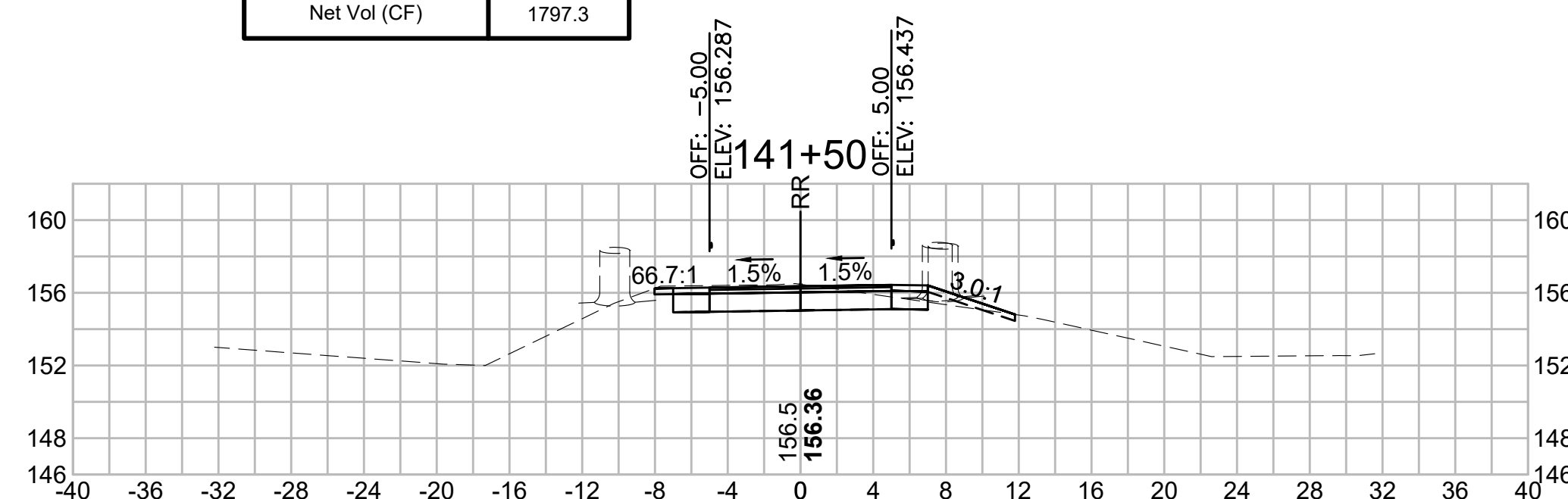
Total Volume at Station 142+00.00	
Cut Area (SF)	14.437
Fill Area (SF)	1.258
Cut Vol (CF)	29.347
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	3325.375
Cum Fill Vol (CF)	1500.7
Net Vol (CF)	1824.7



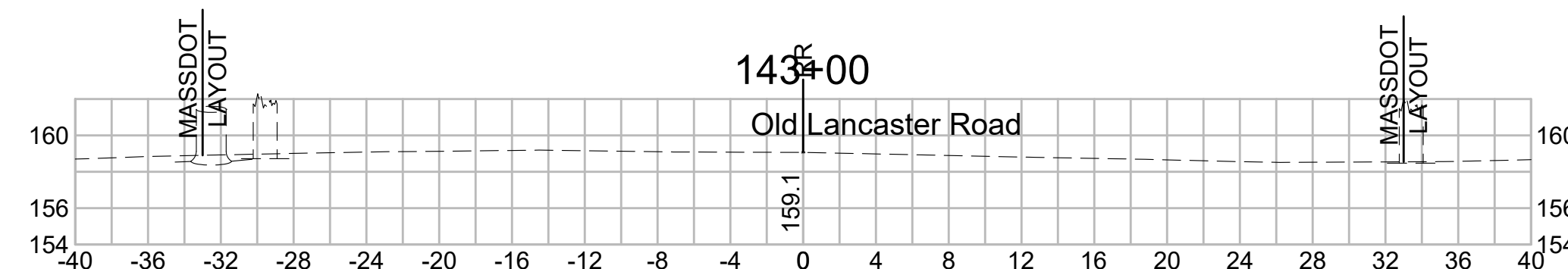
Total Volume at Station 143+50.00	
Cut Area (SF)	4.054
Fill Area (SF)	6.653
Cut Vol (CF)	27.326
Fill Vol (CF)	6.2
Cum Cut Vol (CF)	3408.354
Cum Fill Vol (CF)	1510.3
Net Vol (CF)	1898.0



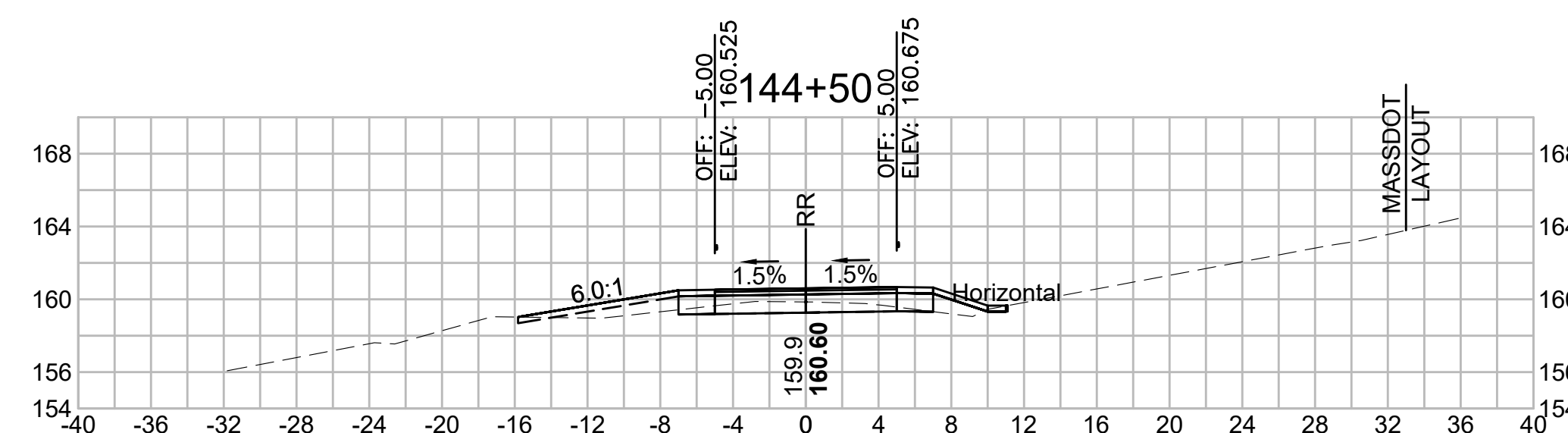
Total Volume at Station 141+50.00	
Cut Area (SF)	17.257
Fill Area (SF)	0.838
Cut Vol (CF)	43.074
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	3296.029
Cum Fill Vol (CF)	1498.7
Net Vol (CF)	1797.3



Total Volume at Station 143+00.00	
Cut Area (SF)	25.458
Fill Area (SF)	0.000
Cut Vol (CF)	32.929
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	3381.029
Cum Fill Vol (CF)	1504.2
Net Vol (CF)	1876.8



Total Volume at Station 144+50.00	
Cut Area (SF)	6.791
Fill Area (SF)	5.125
Cut Vol (CF)	9.093
Fill Vol (CF)	11.1
Cum Cut Vol (CF)	3424.005
Cum Fill Vol (CF)	1534.0
Net Vol (CF)	1890.0



STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	255	319

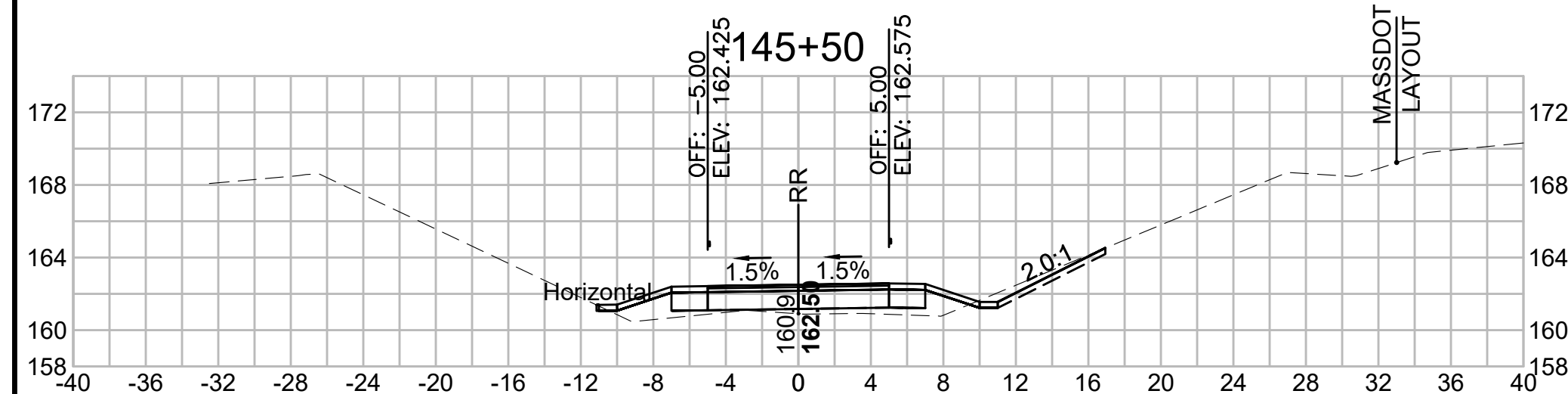
HOR. SCALE IN FEET

8 0 8 16

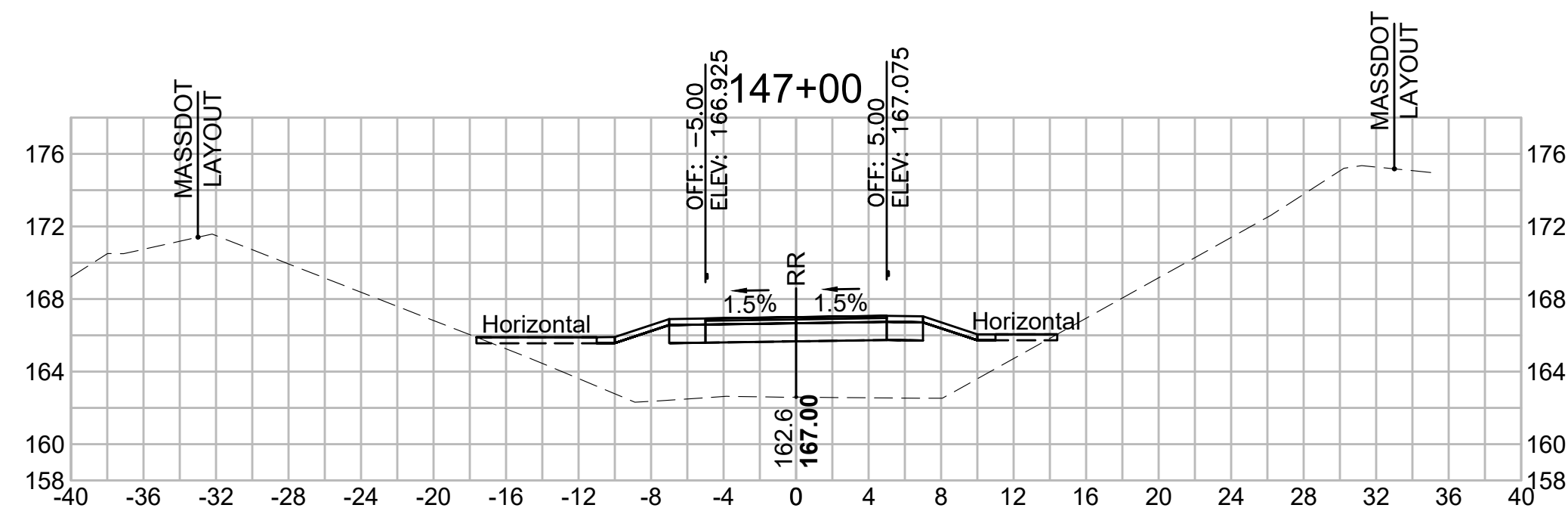
VER. SCALE IN FEET

8 0 8 16

Total Volume at Station 145+50.00	
Cut Area (SF)	4.316
Fill Area (SF)	8.617
Cut Vol (CF)	10.5
Fill Vol (CF)	12.5
Cum Cut Vol (CF)	3441.0
Cum Fill Vol (CF)	1259.1
Net Vol (CF)	2182.0

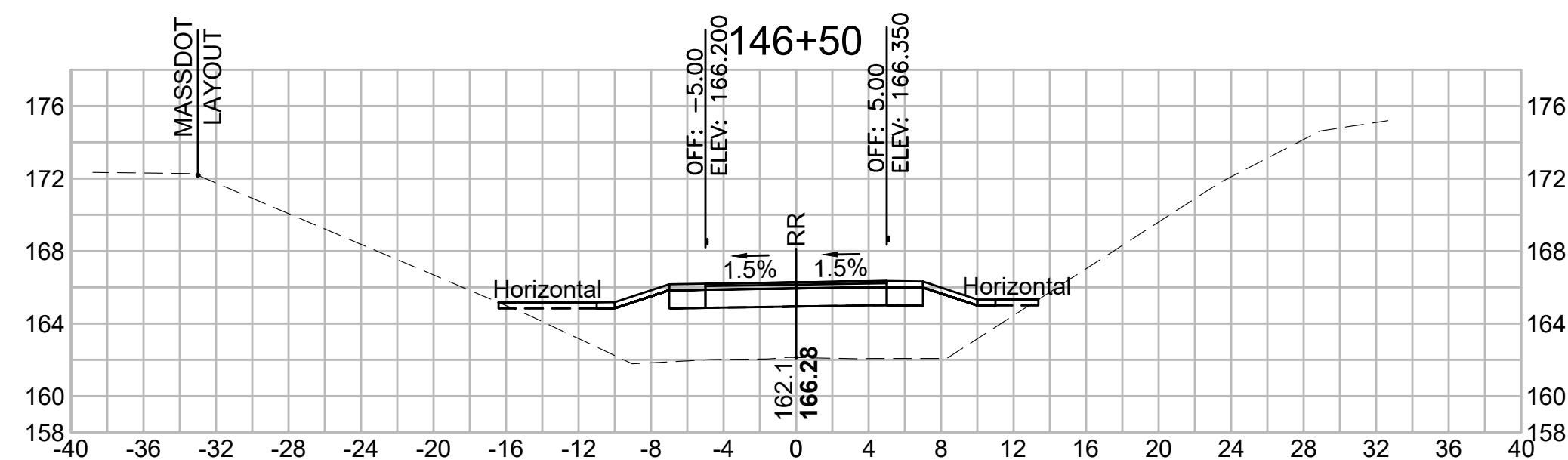


Total Volume at Station 147+50.00	
Cut Area (SF)	0.222
Fill Area (SF)	84.139
Cut Vol (CF)	0.4
Fill Vol (CF)	149.8
Cum Cut Vol (CF)	3453.1
Cum Fill Vol (CF)	1677.5
Net Vol (CF)	1775.5

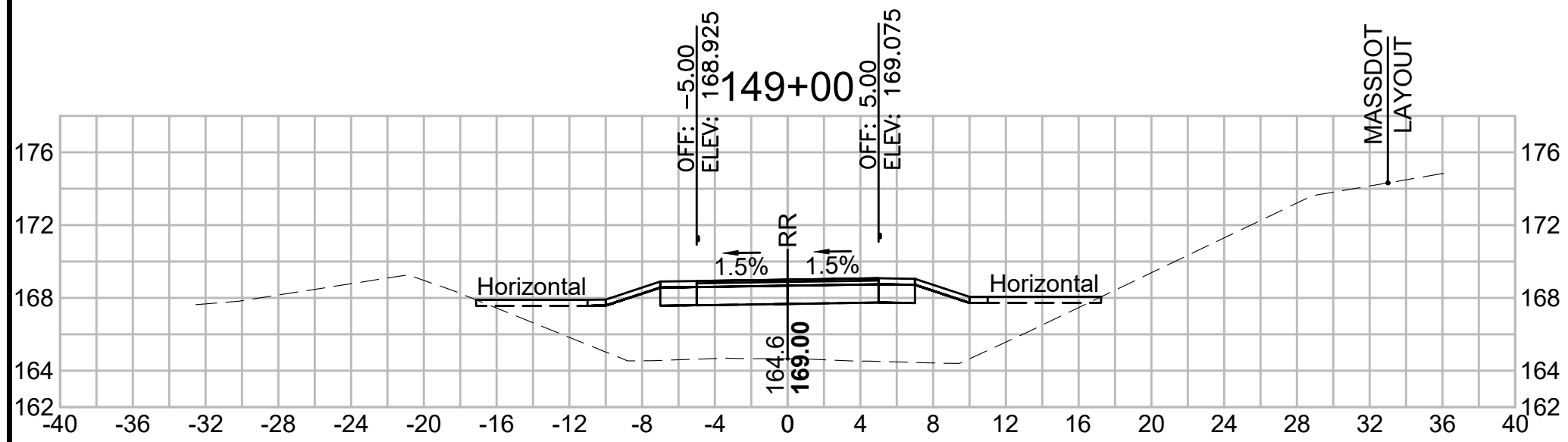


Total Volume at Station 147+00.00	
Cut Area (SF)	0.237
Fill Area (SF)	77.656
Cut Vol (CF)	0.4
Fill Vol (CF)	136.7
Cum Cut Vol (CF)	3452.6
Cum Fill Vol (CF)	1527.7
Net Vol (CF)	1924.9

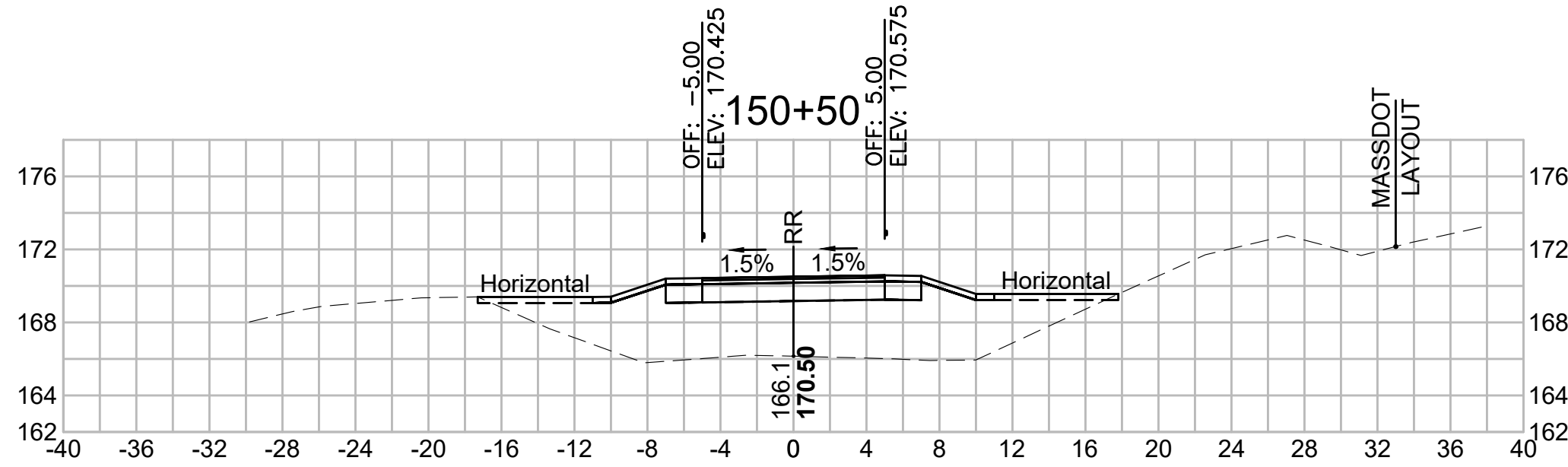
Total Volume at Station 146+50.00	
Cut Area (SF)	0.213
Fill Area (SF)	69.990
Cut Vol (CF)	3.7
Fill Vol (CF)	94.4
Cum Cut Vol (CF)	3452.2
Cum Fill Vol (CF)	1391.0
Net Vol (CF)	2061.2



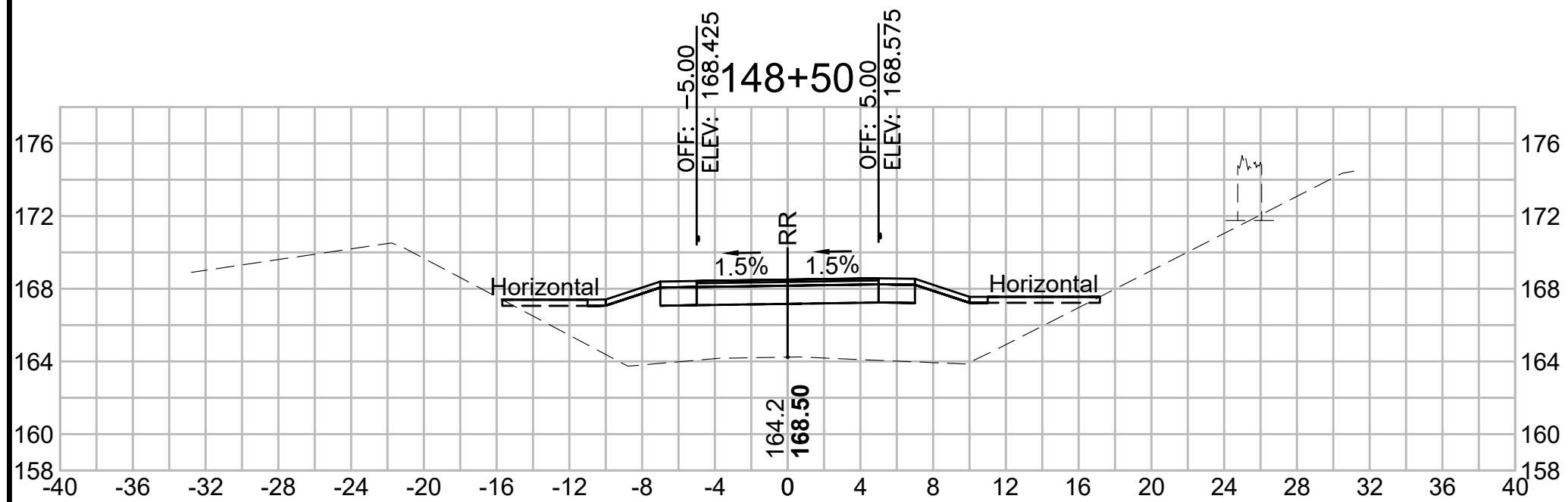
Total Volume at Station 149+00.00	
Cut Area (SF)	0.249
Fill Area (SF)	82.781
Cut Vol (CF)	0.4
Fill Vol (CF)	153.1
Cum Cut Vol (CF)	3454.2
Cum Fill Vol (CF)	2150.8
Net Vol (CF)	1303.5



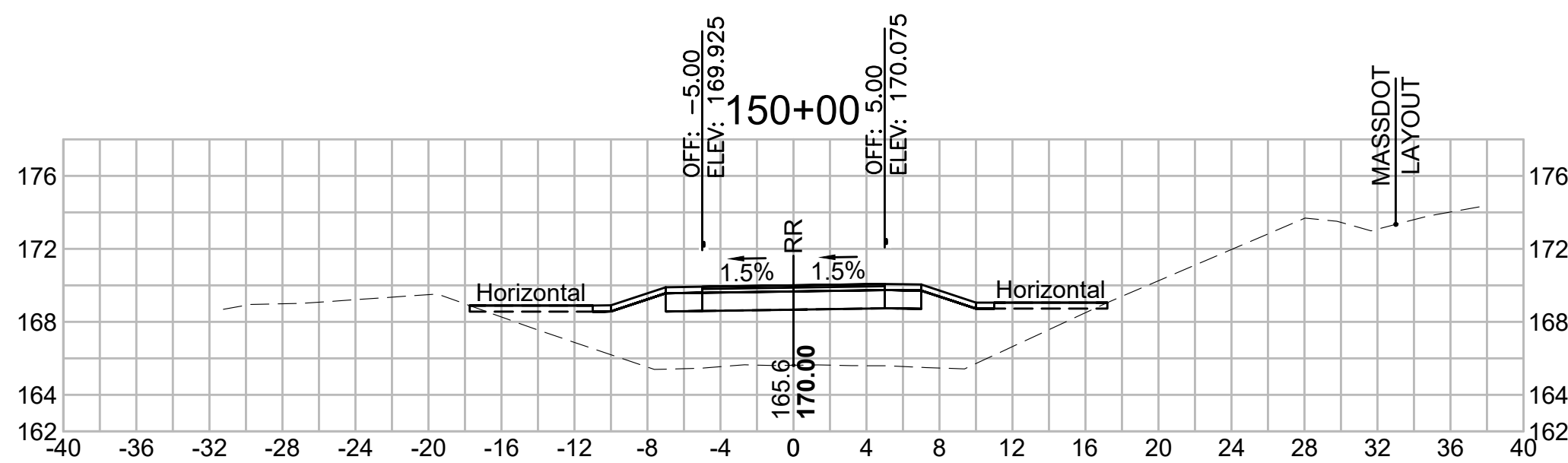
Total Volume at Station 150+50.00	
Cut Area (SF)	0.610
Fill Area (SF)	84.824
Cut Vol (CF)	0.8
Fill Vol (CF)	155.0
Cum Cut Vol (CF)	3456.1
Cum Fill Vol (CF)	2618.4
Net Vol (CF)	837.7



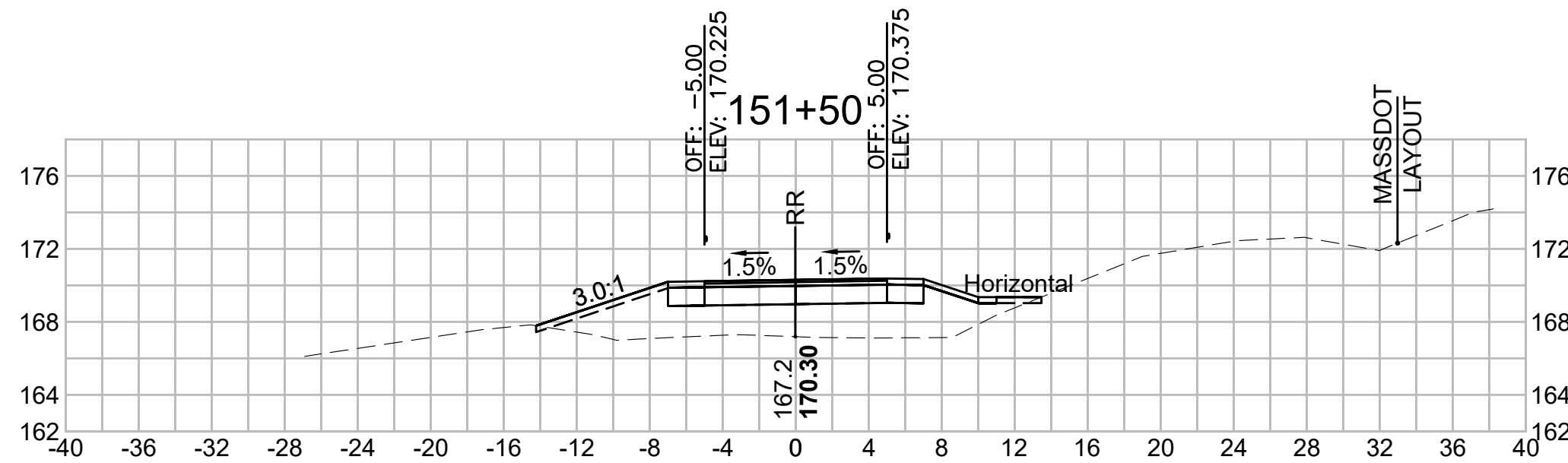
Total Volume at Station 148+50.00	
Cut Area (SF)	0.210
Fill Area (SF)	82.557
Cut Vol (CF)	0.4
Fill Vol (CF)	159.3
Cum Cut Vol (CF)	3453.8
Cum Fill Vol (CF)	1997.7
Net Vol (CF)	1456.2



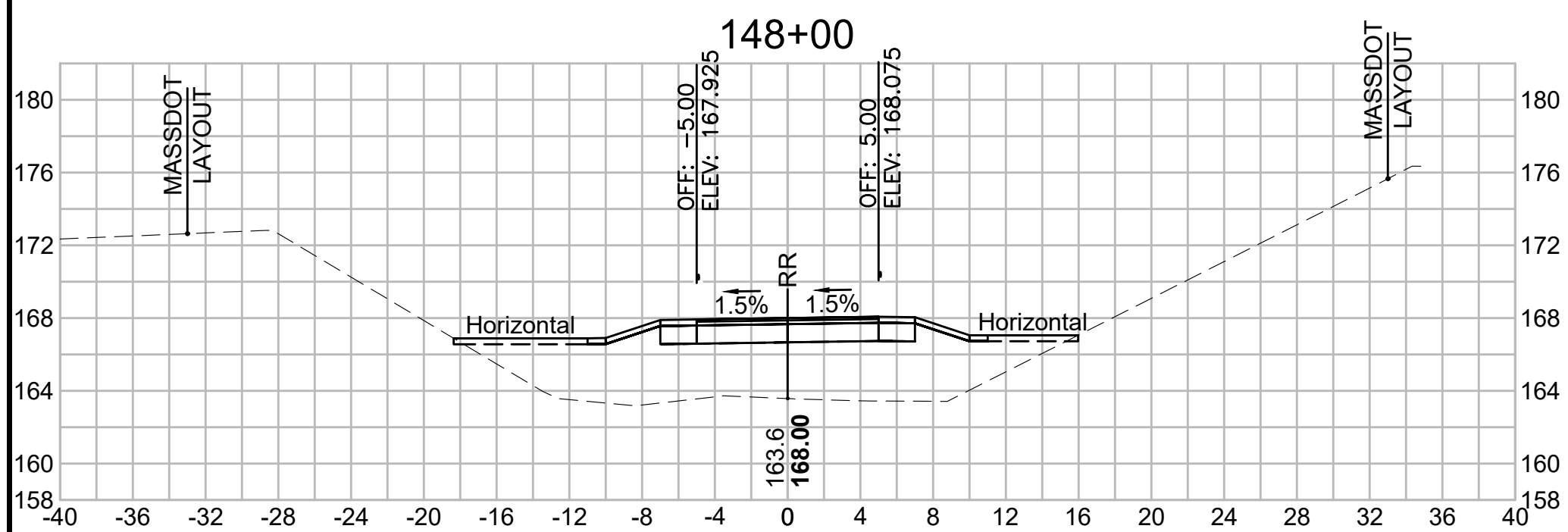
Total Volume at Station 150+00.00	
Cut Area (SF)	0.269
Fill Area (SF)	82.543
Cut Vol (CF)	0.5
Fill Vol (CF)	156.2
Cum Cut Vol (CF)	3455.2
Cum Fill Vol (CF)	2463.4
Net Vol (CF)	991.8



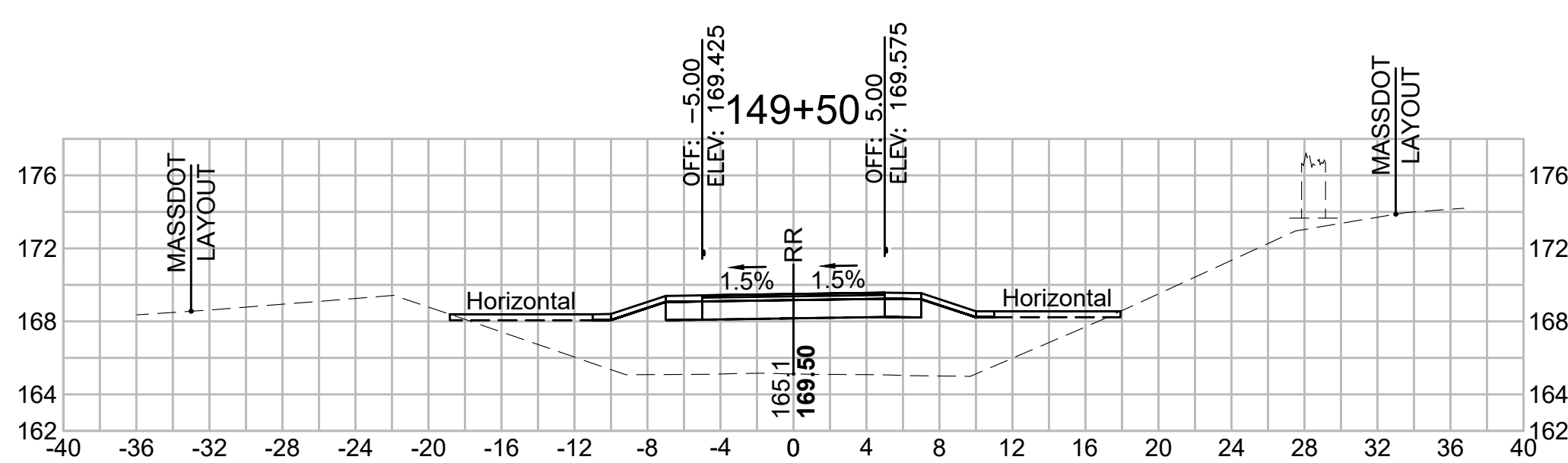
Total Volume at Station 151+50.00	
Cut Area (SF)	0.259
Fill Area (SF)	42.987
Cut Vol (CF)	0.4
Fill Vol (CF)	109.5
Cum Cut Vol (CF)	3457.3
Cum Fill Vol (CF)	2876.0
Net Vol (CF)	581.3



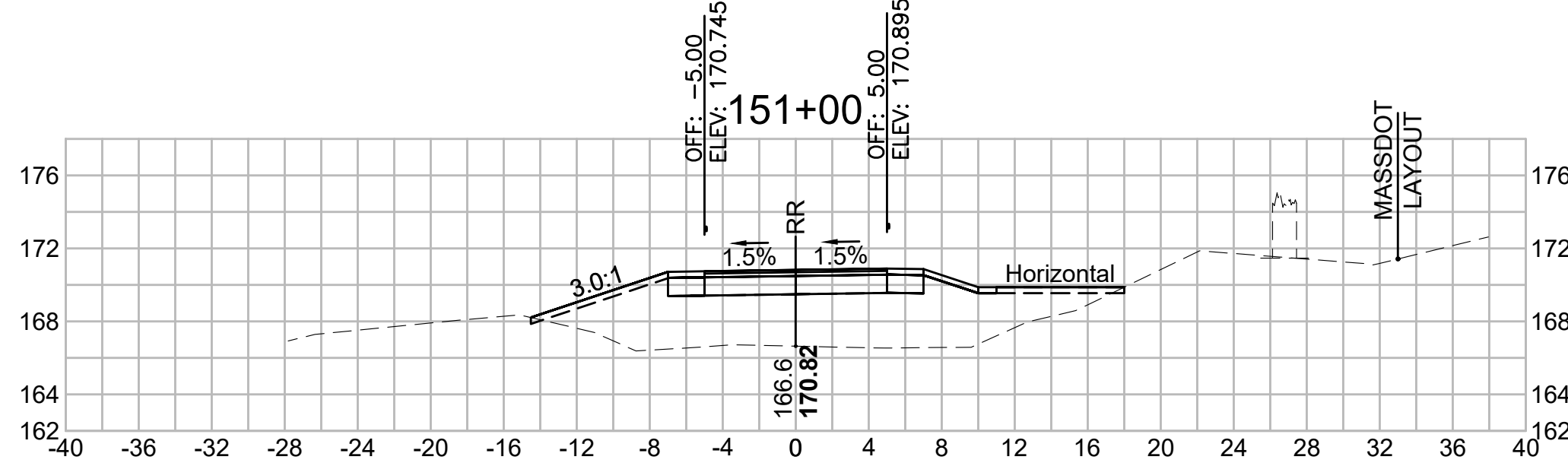
Total Volume at Station 148+00.00	
Cut Area (SF)	0.199
Fill Area (SF)	89.527
Cut Vol (CF)	0.4
Fill Vol (CF)	160.8
Cum Cut Vol (CF)	3453.4
Cum Fill Vol (CF)	1838.3
Net Vol (CF)	1615.1



Total Volume at Station 149+50.00	
Cut Area (SF)	0.280
Fill Area (SF)	86.165
Cut Vol (CF)	0.5
Fill Vol (CF)	156.4
Cum Cut Vol (CF)	3454.7
Cum Fill Vol (CF)	2307.2
Net Vol (CF)	1147.6

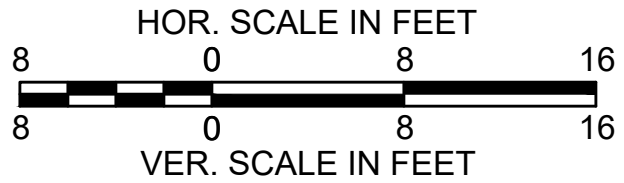


Total Volume at Station 151+00.00	
Cut Area (SF)	0.219
Fill Area (SF)	75.223
Cut Vol (CF)	0.8
Fill Vol (CF)	148.2
Cum Cut Vol (CF)	3456.8
Cum Fill Vol (CF)	2766.6
Net Vol (CF)	690.3

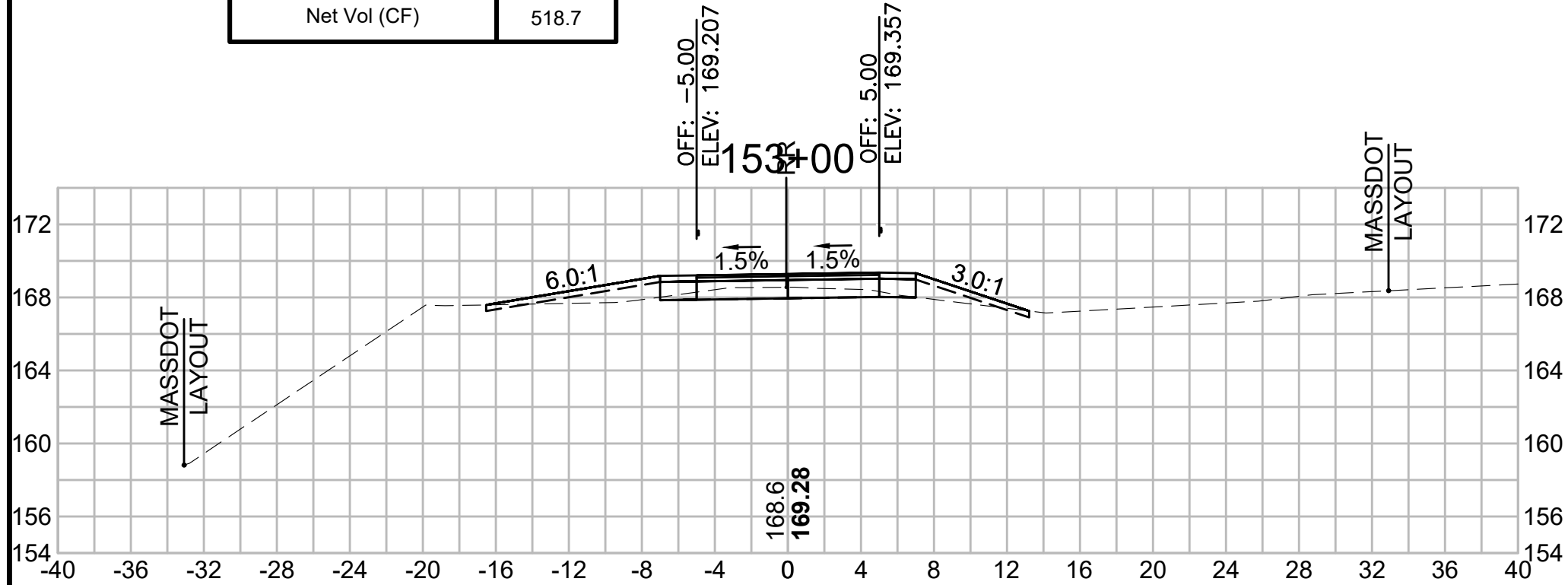


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	256	319
PROJECT FILE NO. 608164			

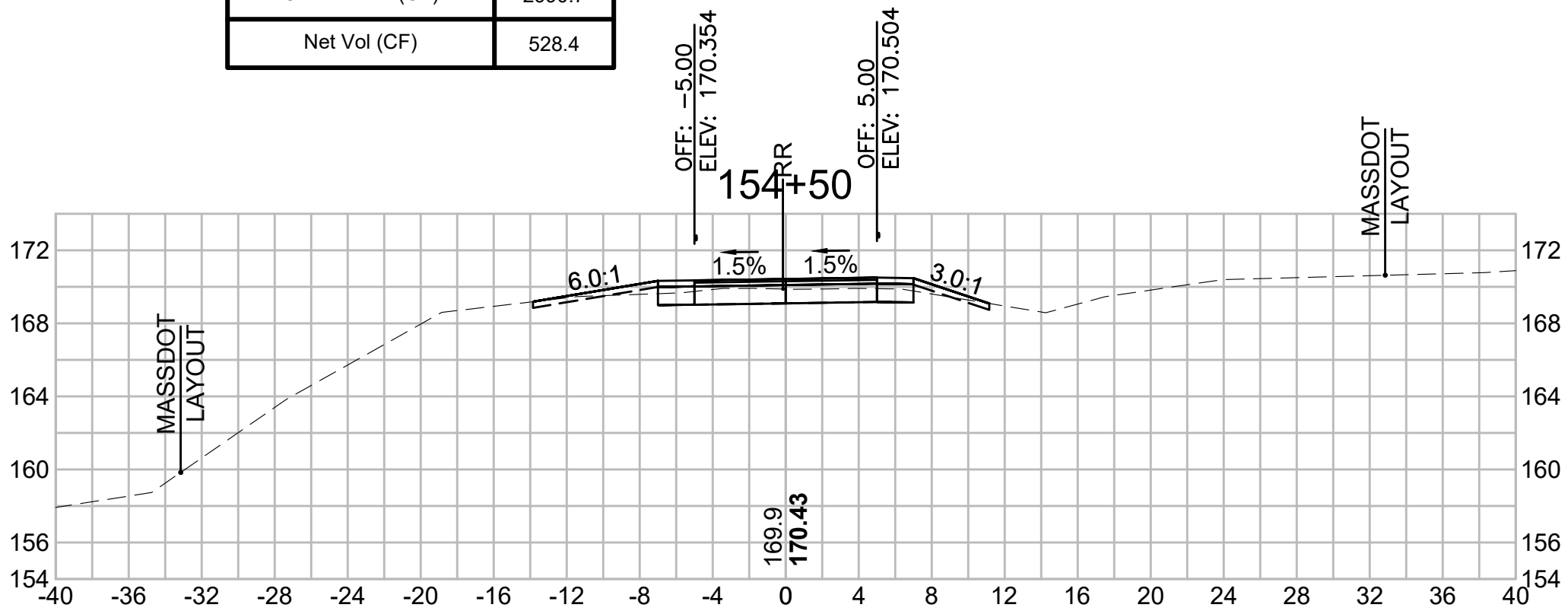
CROSS SECTIONS



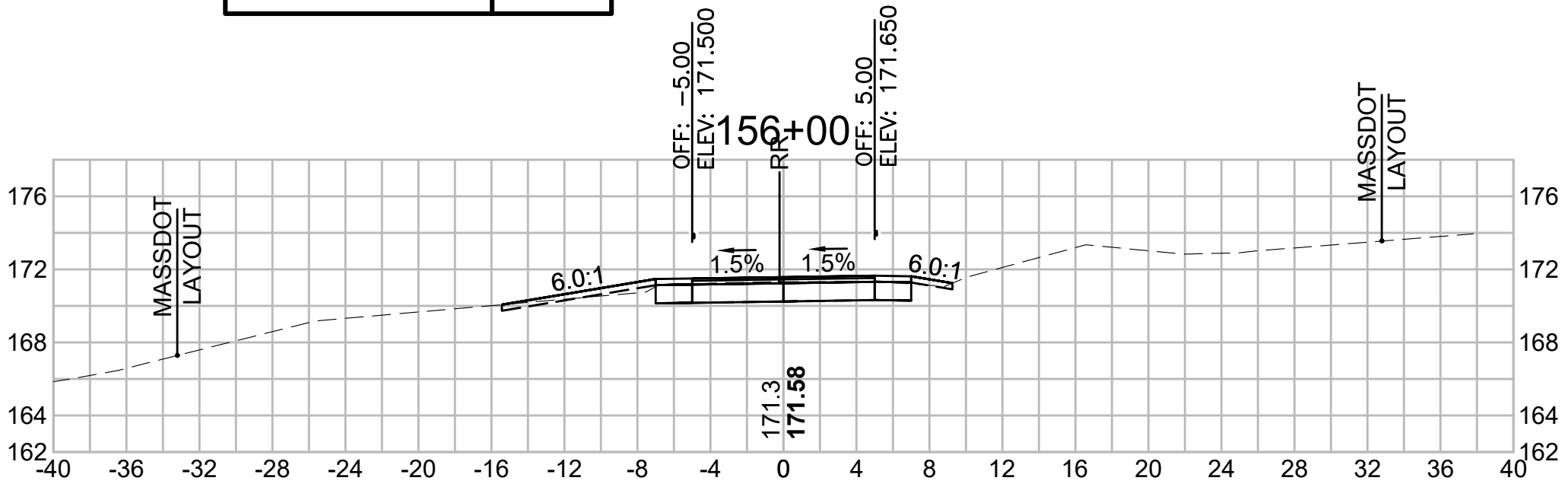
Total Volume at Station 153+00.00	
Cut Area (SF)	6.879
Fill Area (SF)	5.832
Cut Vol (CF)	10.3
Fill Vol (CF)	8.4
Cum Cut Vol (CF)	3472.5
Cum Fill Vol (CF)	2953.8
Net Vol (CF)	518.7



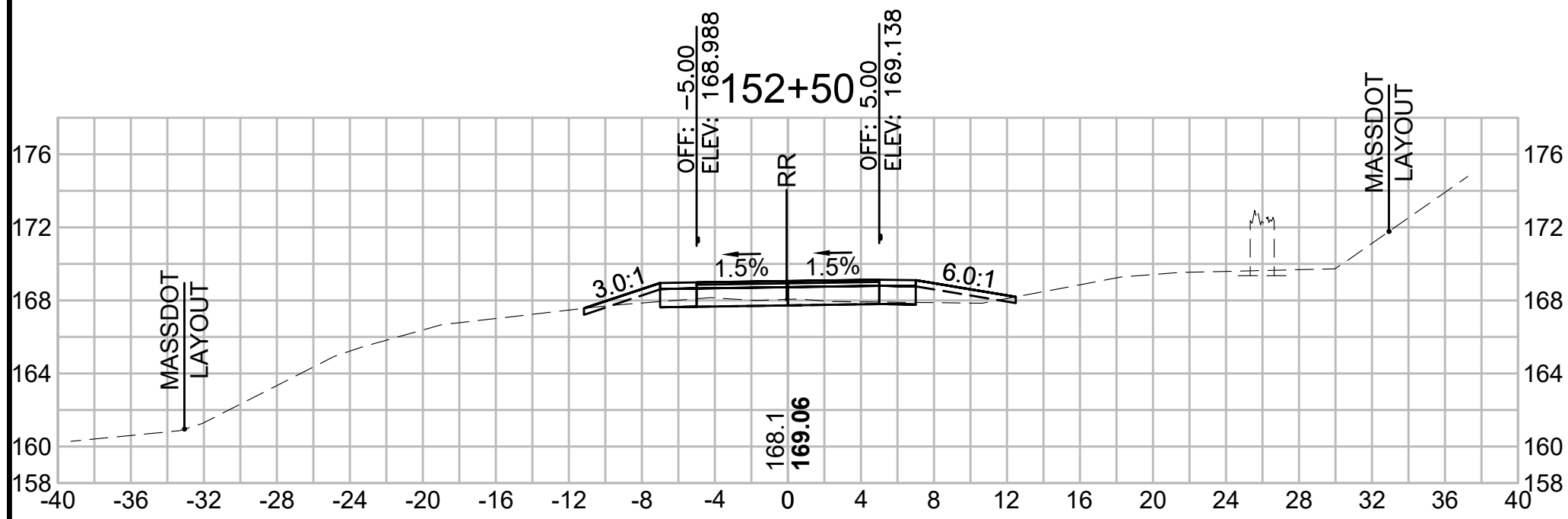
Total Volume at Station 154+50.00	
Cut Area (SF)	11.824
Fill Area (SF)	0.877
Cut Vol (CF)	18.9
Fill Vol (CF)	7.7
Cum Cut Vol (CF)	3519.1
Cum Fill Vol (CF)	2990.7
Net Vol (CF)	528.4



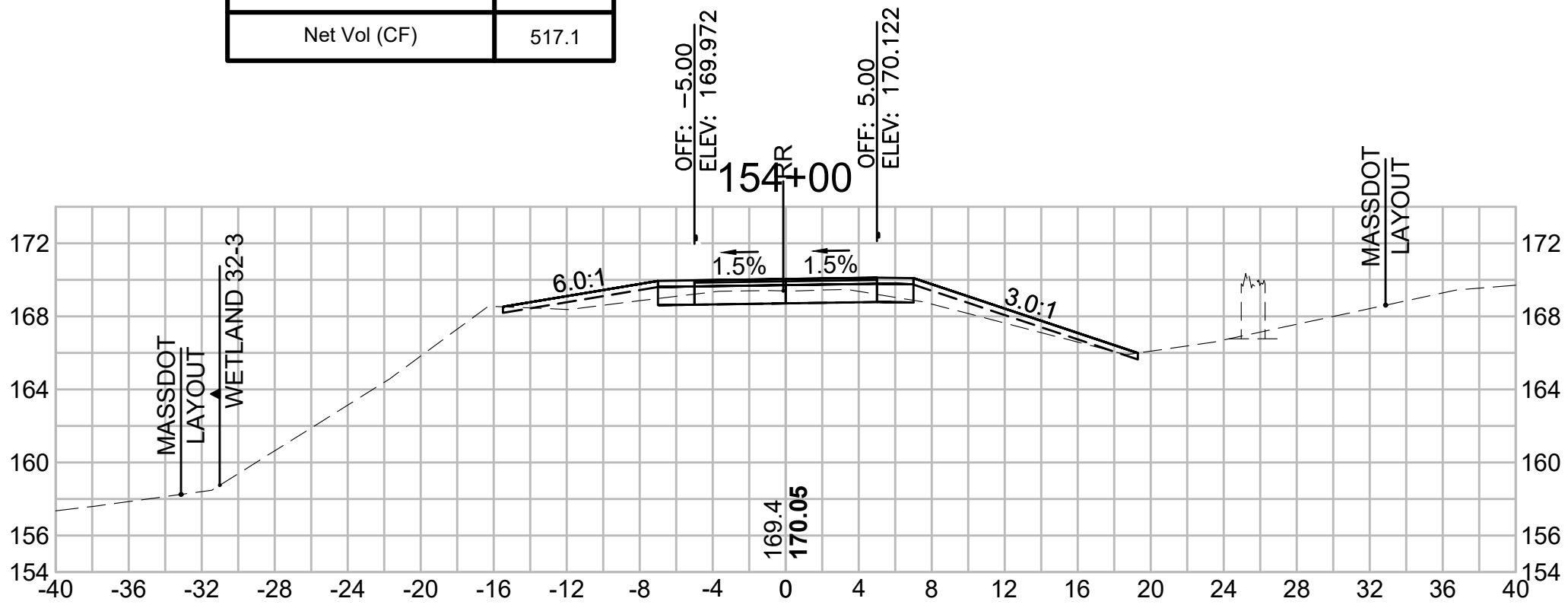
Total Volume at Station 156+00.00	
Cut Area (SF)	15.407
Fill Area (SF)	0.672
Cut Vol (CF)	27.4
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	3592.9
Cum Fill Vol (CF)	2993.4
Net Vol (CF)	599.5



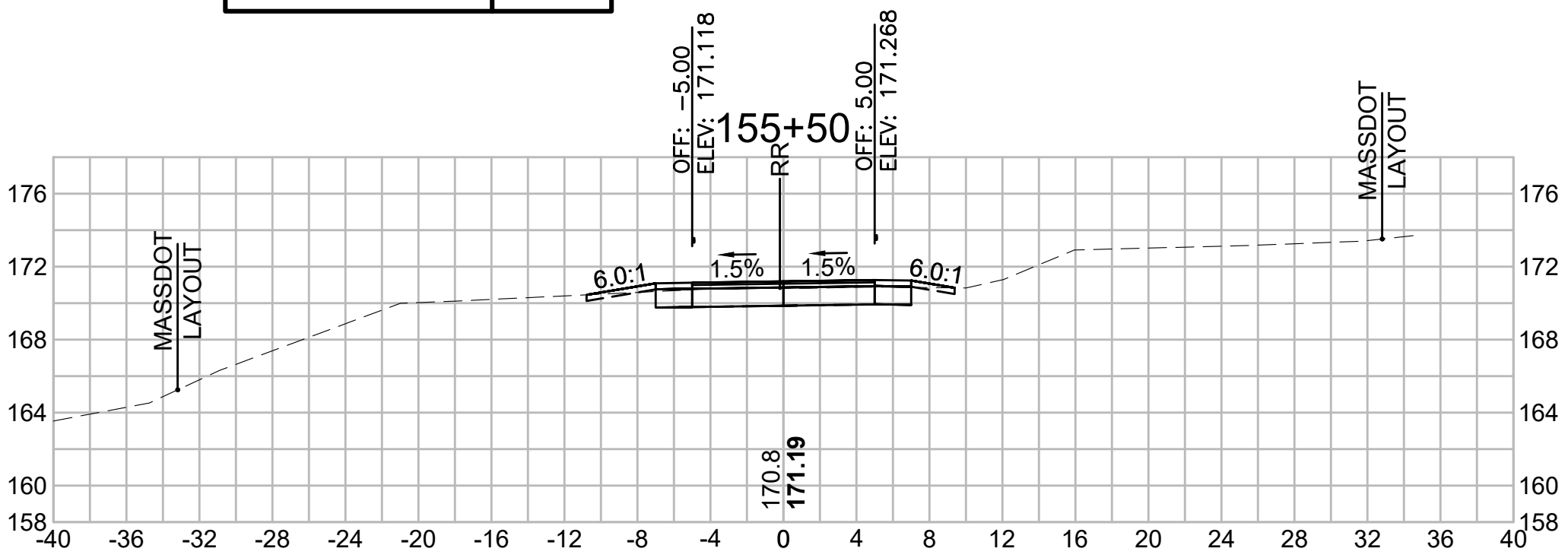
Total Volume at Station 152+50.00	
Cut Area (SF)	4.291
Fill Area (SF)	3.199
Cut Vol (CF)	4.3
Fill Vol (CF)	16.3
Cum Cut Vol (CF)	3462.2
Cum Fill Vol (CF)	2945.4
Net Vol (CF)	516.7



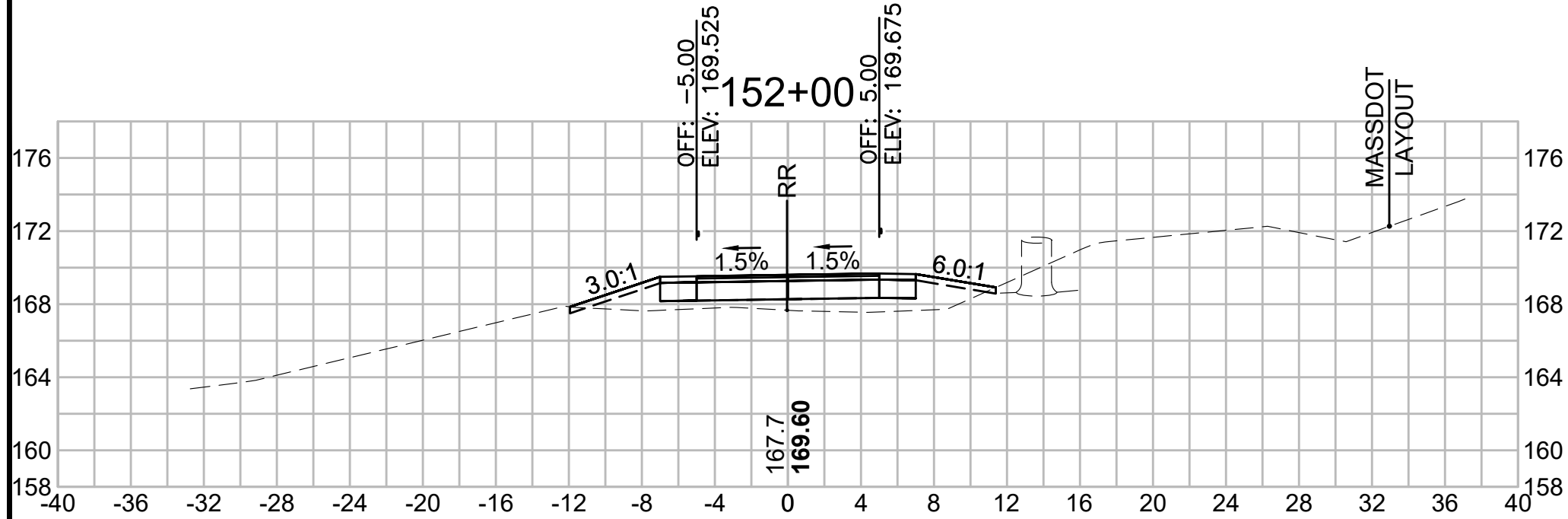
Total Volume at Station 154+00.00	
Cut Area (SF)	8.619
Fill Area (SF)	7.408
Cut Vol (CF)	14.6
Fill Vol (CF)	15.3
Cum Cut Vol (CF)	3500.1
Cum Fill Vol (CF)	2983.0
Net Vol (CF)	517.1



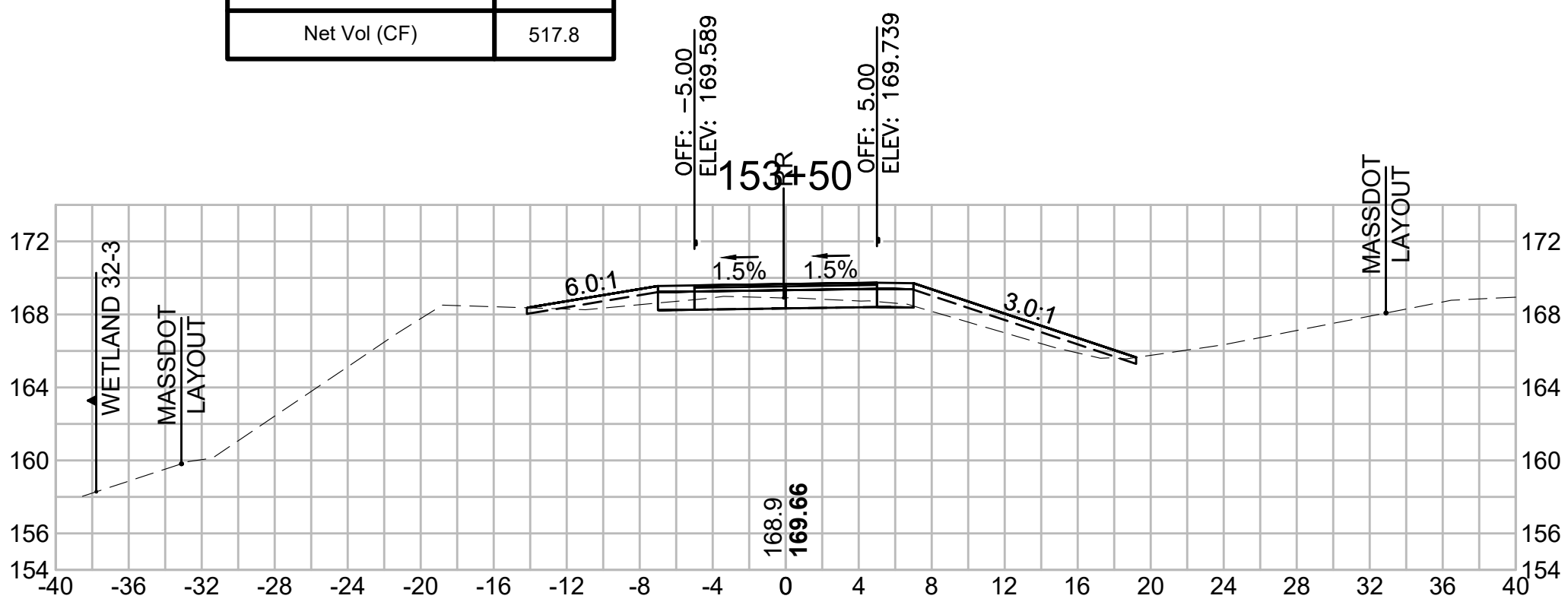
Total Volume at Station 155+50.00	
Cut Area (SF)	14.224
Fill Area (SF)	0.060
Cut Vol (CF)	24.3
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	3565.5
Cum Fill Vol (CF)	2992.7
Net Vol (CF)	572.7



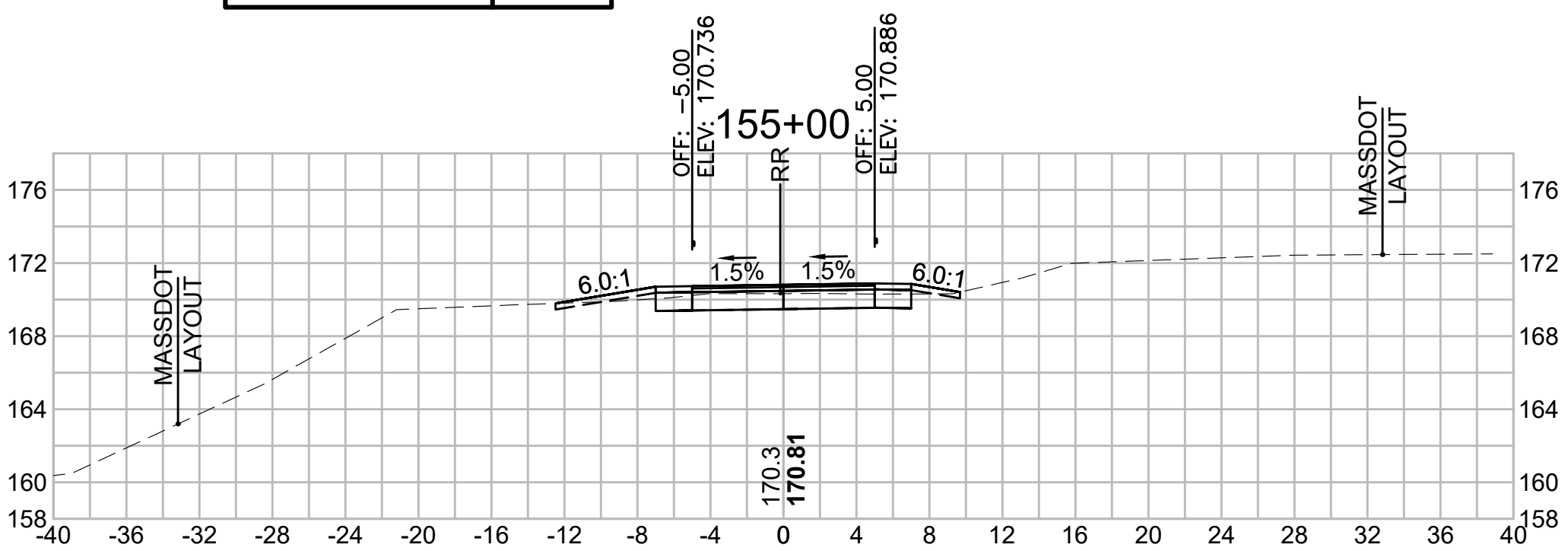
Total Volume at Station 152+00.00	
Cut Area (SF)	0.363
Fill Area (SF)	14.405
Cut Vol (CF)	0.6
Fill Vol (CF)	53.1
Cum Cut Vol (CF)	3457.8
Cum Fill Vol (CF)	2929.1
Net Vol (CF)	528.7



Total Volume at Station 153+50.00	
Cut Area (SF)	7.183
Fill Area (SF)	9.162
Cut Vol (CF)	13.0
Fill Vol (CF)	13.9
Cum Cut Vol (CF)	3485.5
Cum Fill Vol (CF)	2967.7
Net Vol (CF)	517.8

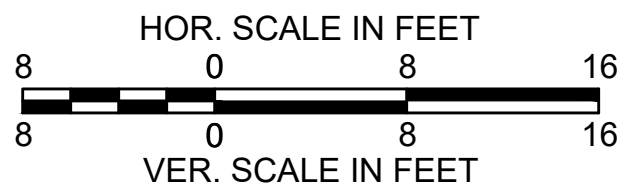


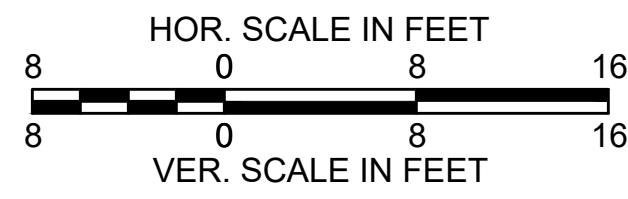
Total Volume at Station 155+00.00	
Cut Area (SF)	12.039
Fill Area (SF)	0.631
Cut Vol (CF)	22.1
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	3541.2
Cum Fill Vol (CF)	2992.1
Net Vol (CF)	549.1



SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	257	319
PROJECT FILE NO. 608164			

CROSS SECTIONS



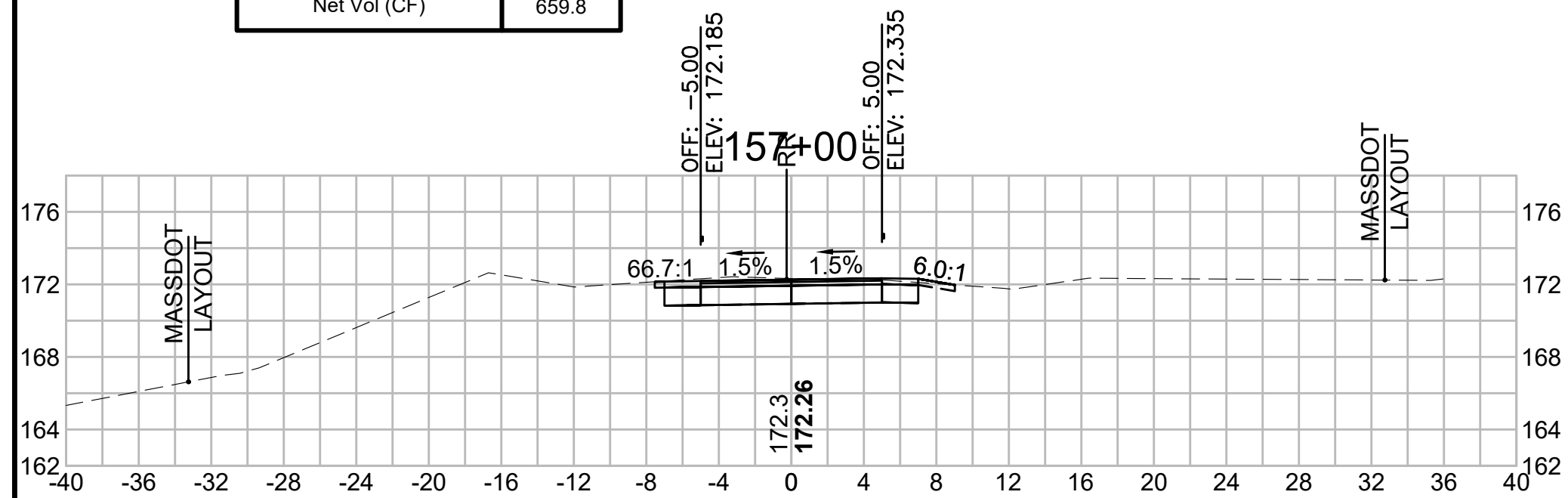


SUDBURY
BRUCE FREEMAN RAIL TRAIL

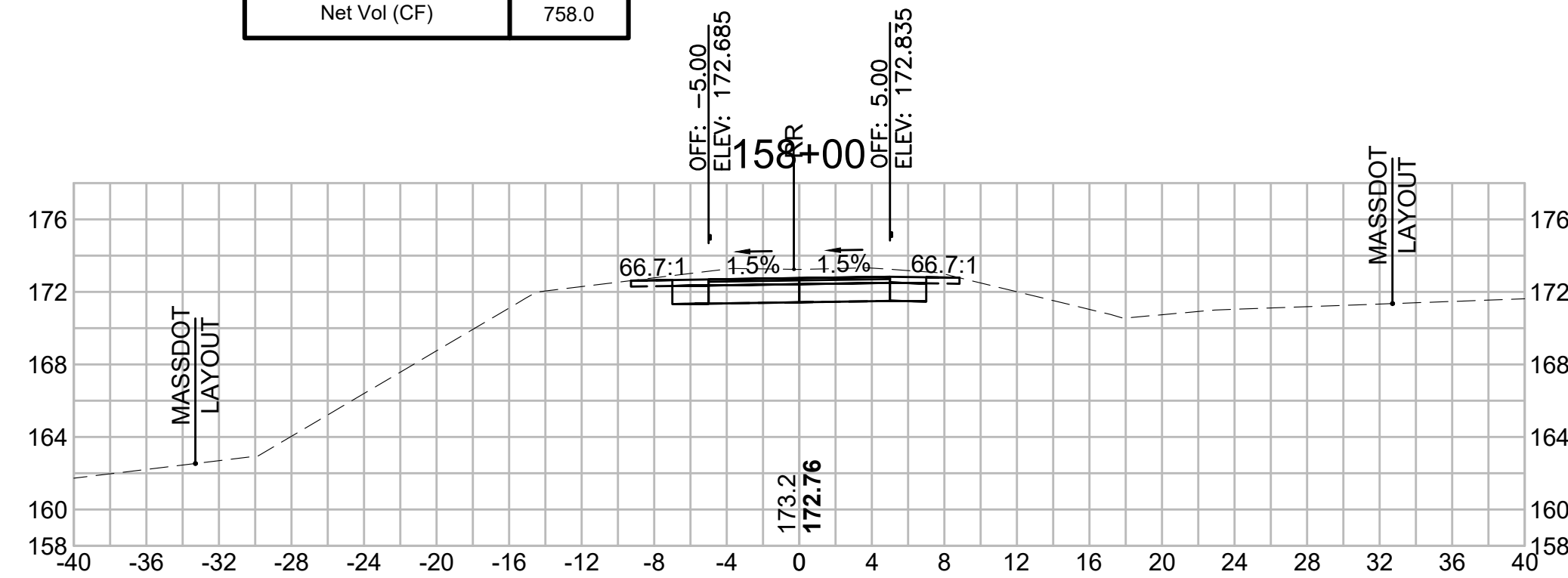
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	258	319

CROSS SECTIONS

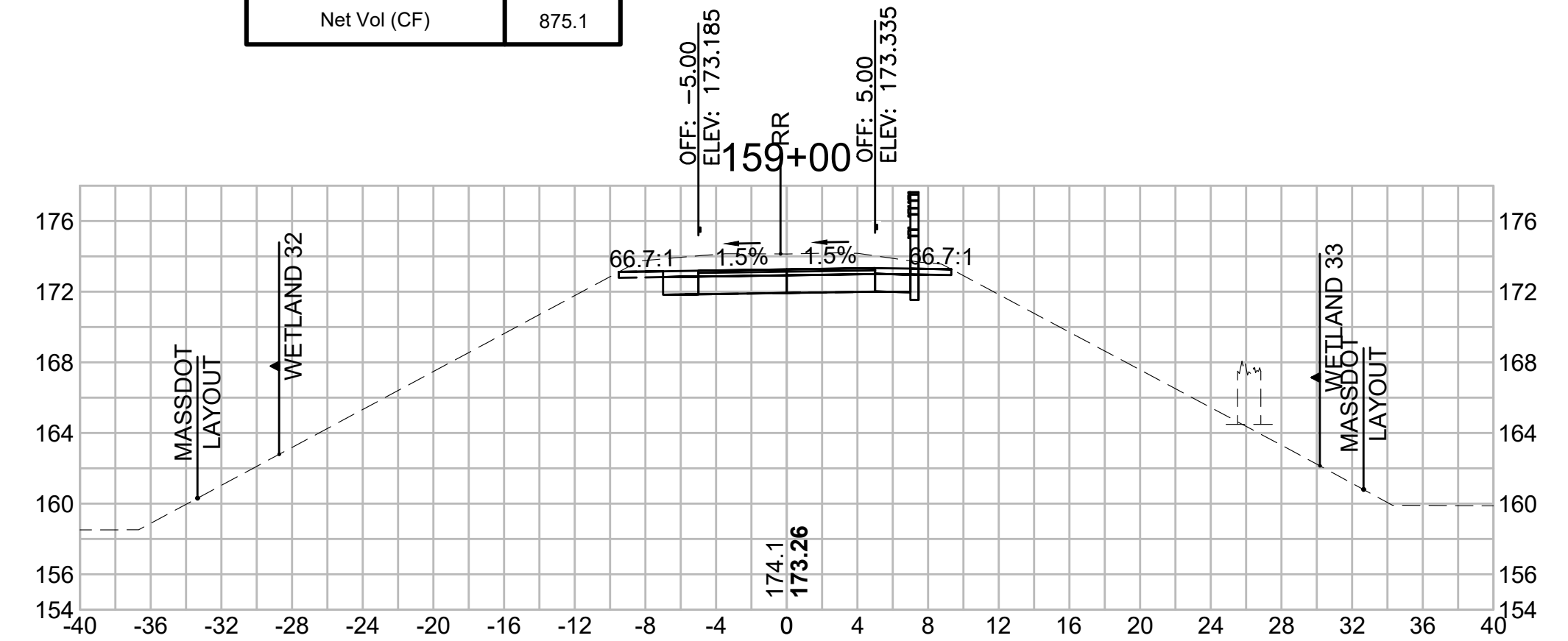
Total Volume at Station 157+00.00	
Cut Area (SF)	19.980
Fill Area (SF)	0.000
Cut Vol (CF)	33.0
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	3654.7
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	659.8



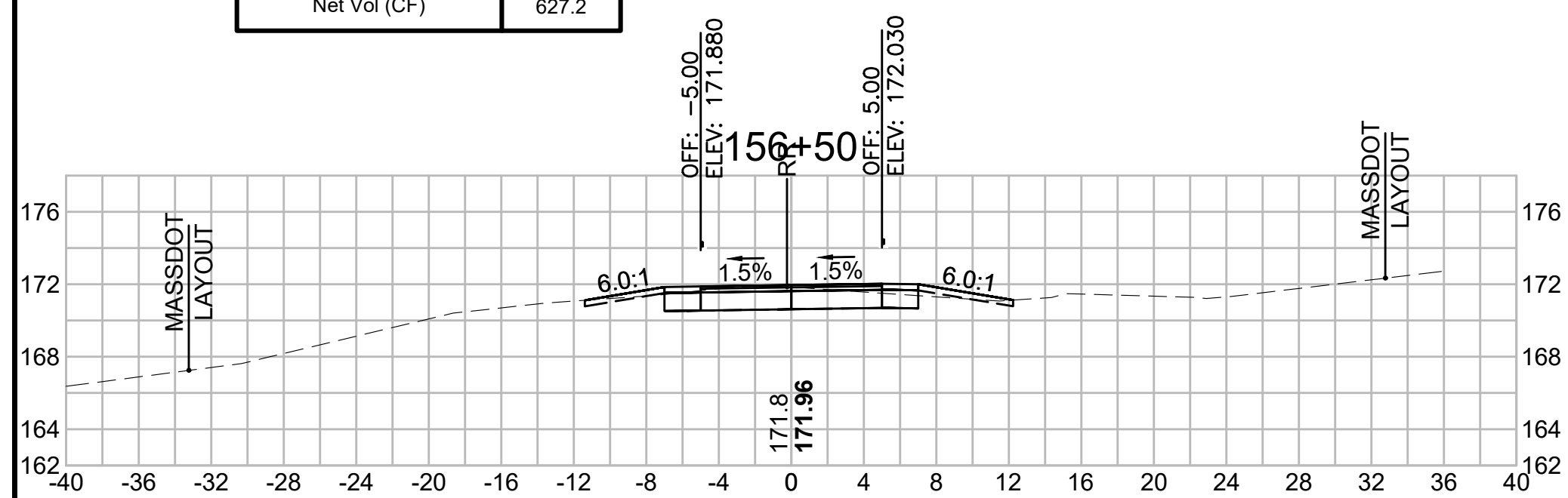
Total Volume at Station 158+00.00	
Cut Area (SF)	27.125
Fill Area (SF)	0.000
Cut Vol (CF)	52.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3752.9
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	758.0



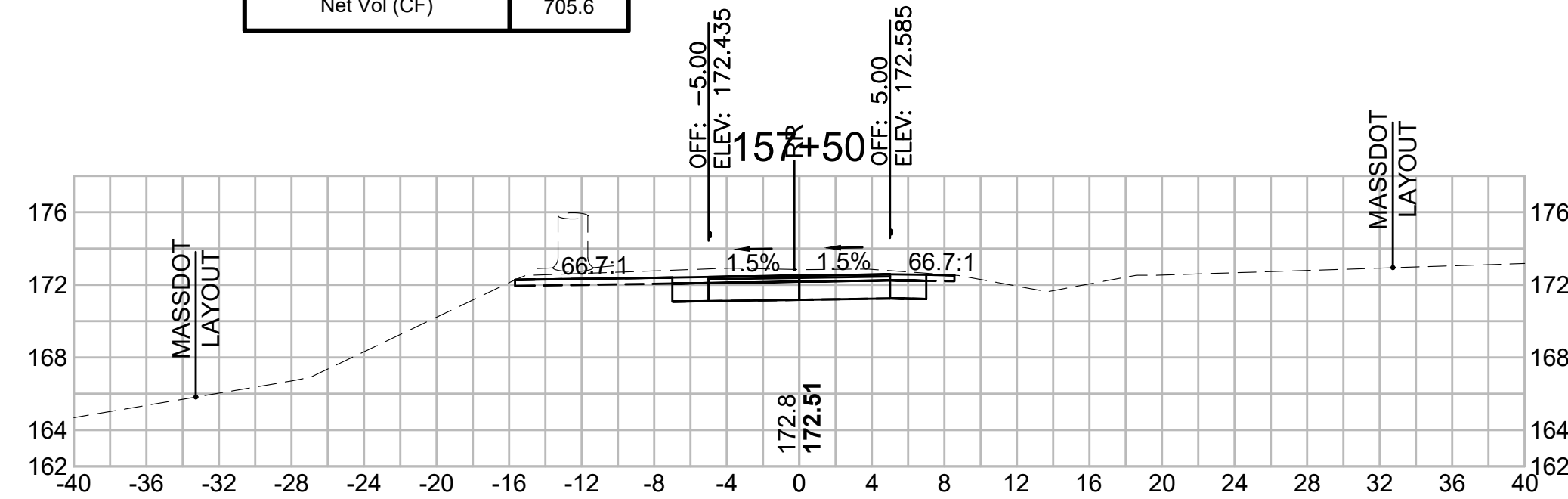
Total Volume at Station 159+00.00	
Cut Area (SF)	33.680
Fill Area (SF)	0.000
Cut Vol (CF)	61.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3870.0
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	875.1



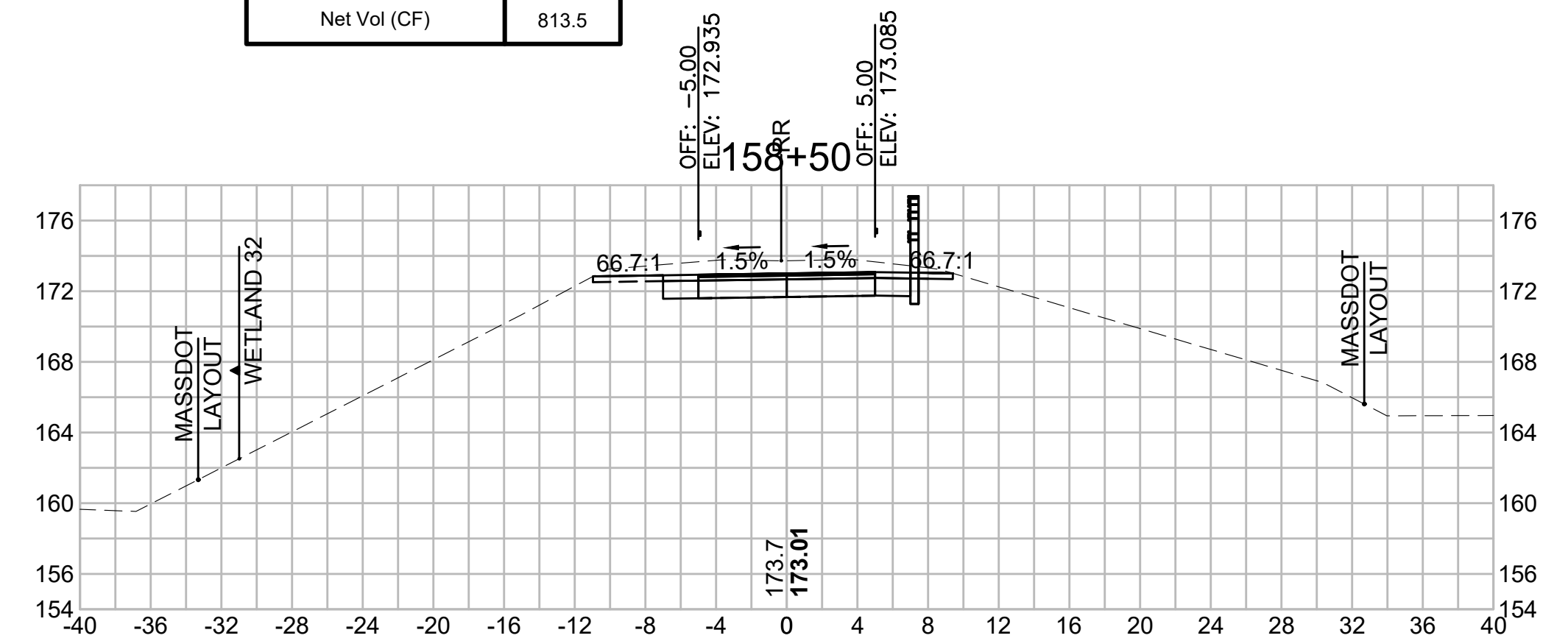
Total Volume at Station 156+50.00	
Cut Area (SF)	15.684
Fill Area (SF)	0.452
Cut Vol (CF)	28.8
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	3621.7
Cum Fill Vol (CF)	2994.5
Net Vol (CF)	627.2

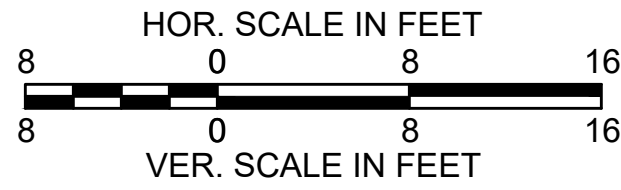


Total Volume at Station 157+50.00	
Cut Area (SF)	29.473
Fill Area (SF)	0.000
Cut Vol (CF)	45.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3700.5
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	705.6



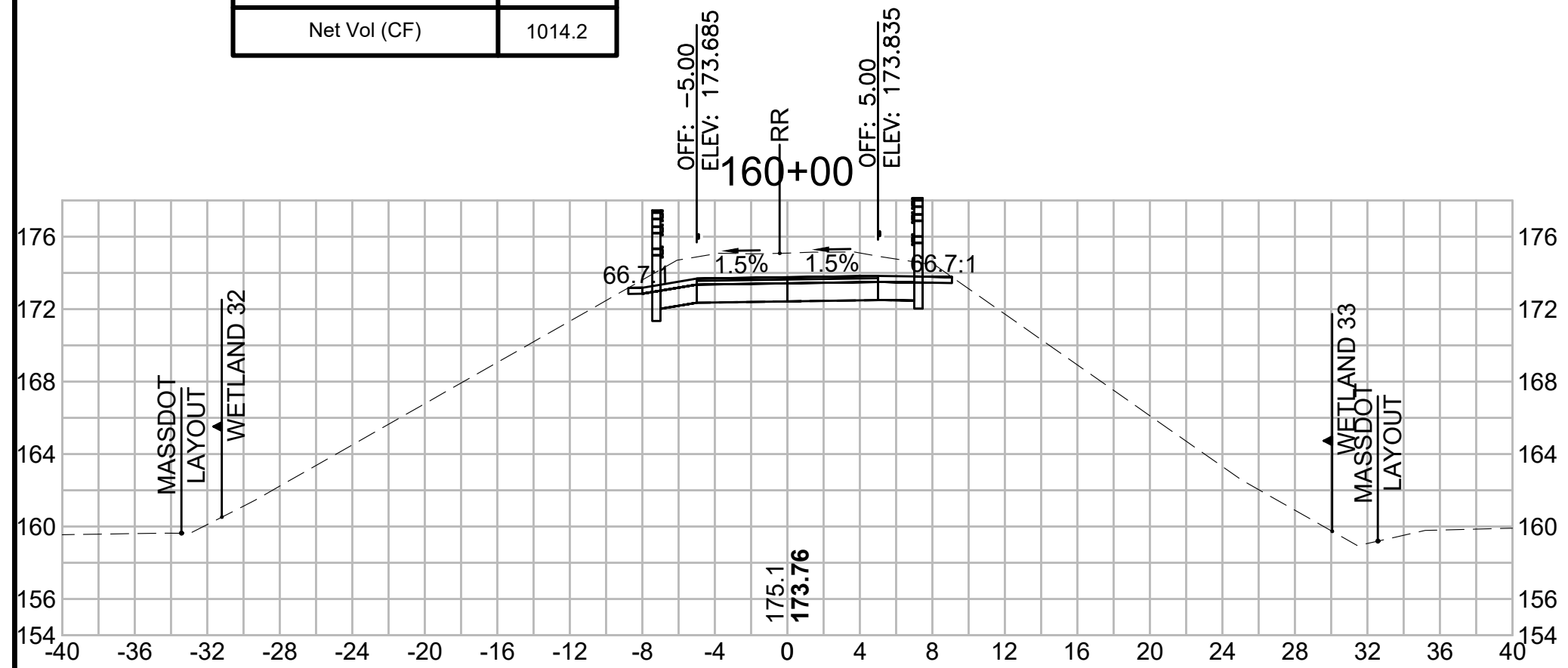
Total Volume at Station 158+50.00	
Cut Area (SF)	32.796
Fill Area (SF)	0.000
Cut Vol (CF)	55.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3808.4
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	813.5



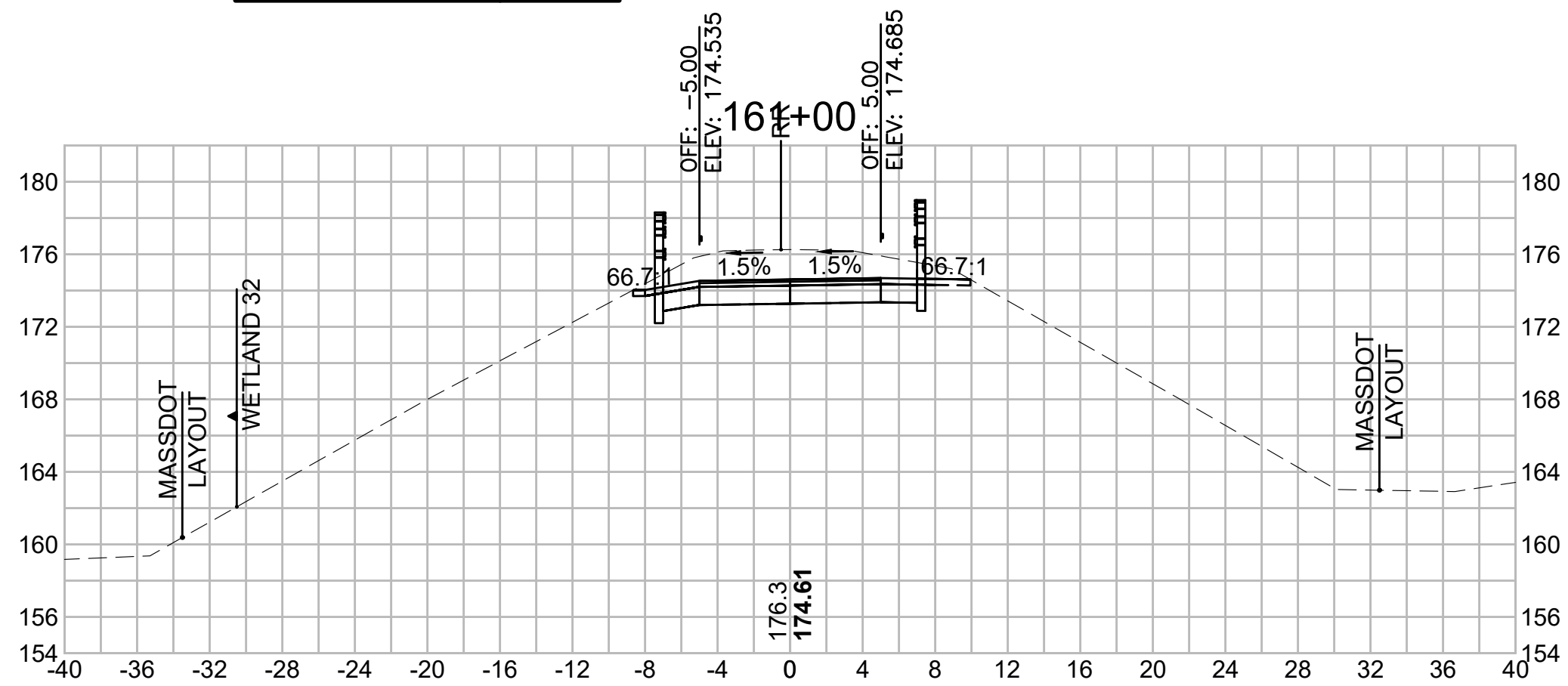


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	259	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

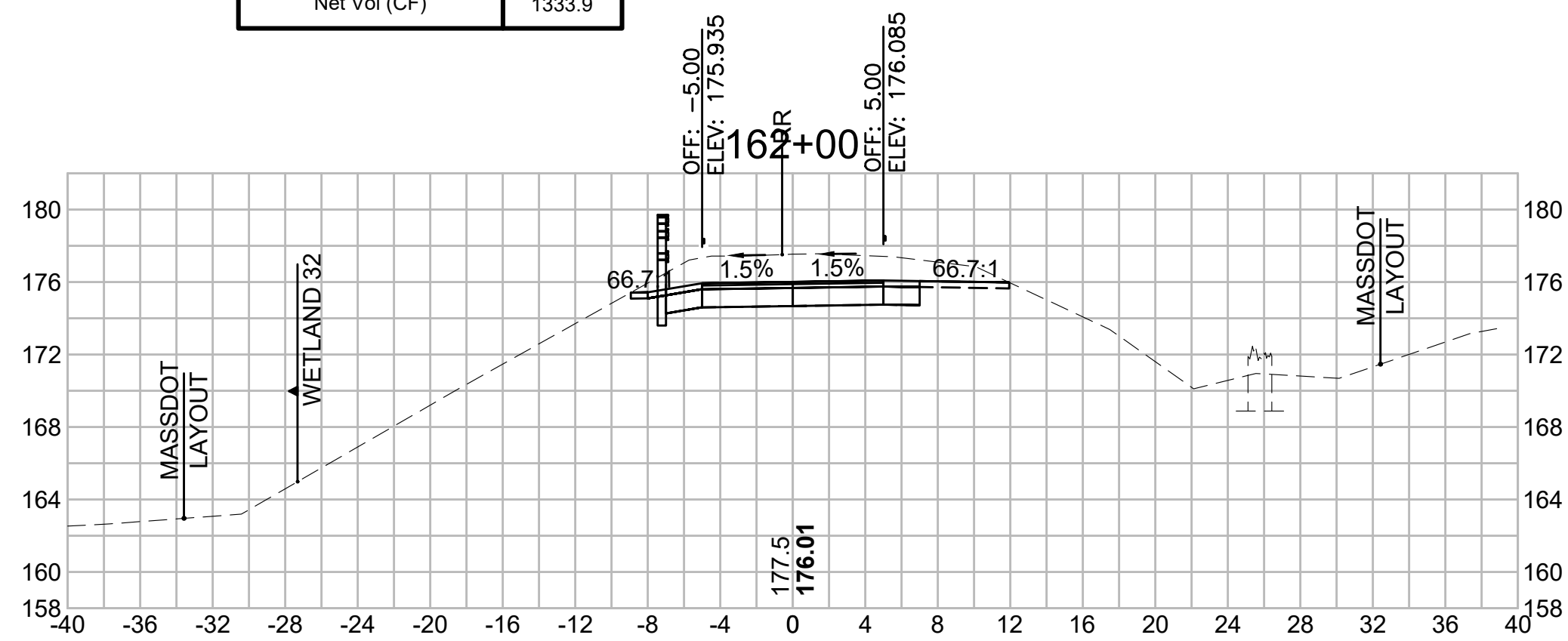
Total Volume at Station 160+00.00	
Cut Area (SF)	39.189
Fill Area (SF)	0.000
Cut Vol (CF)	72.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4009.1
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	1014.2



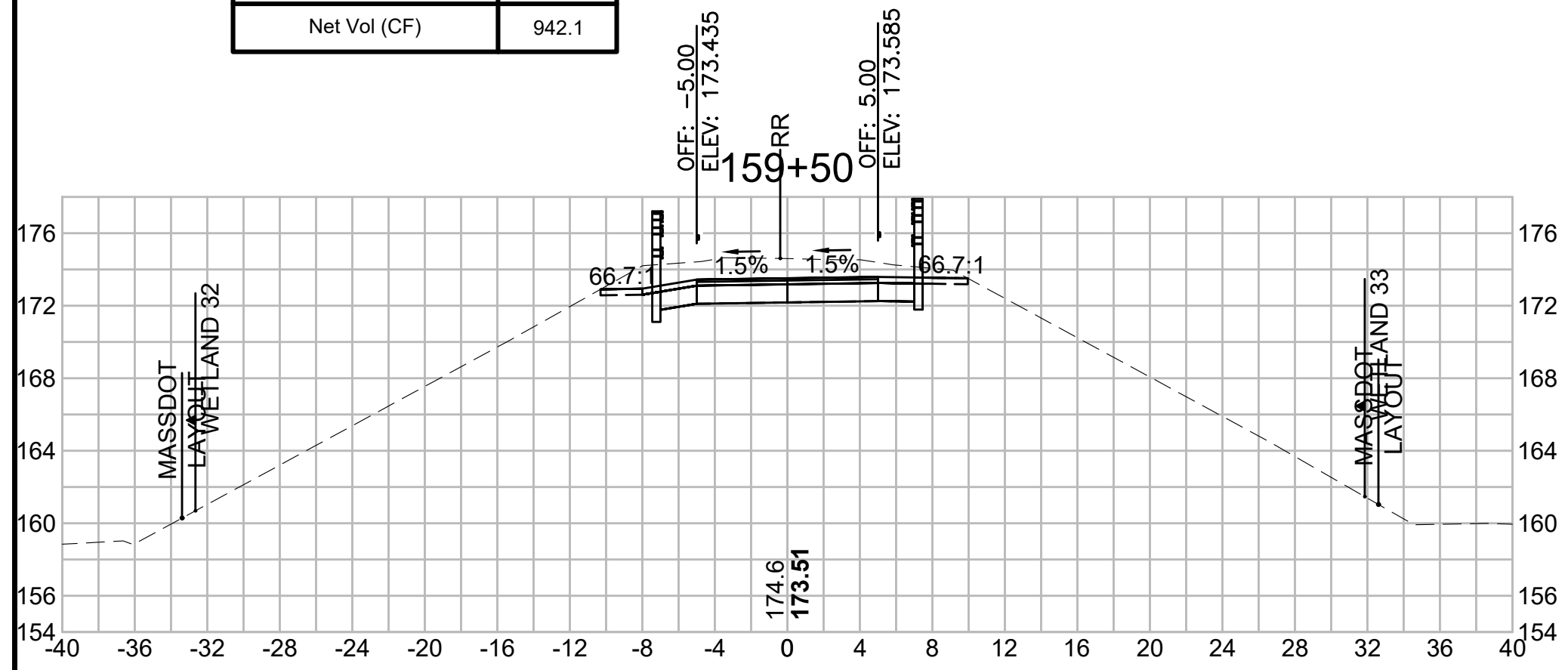
Total Volume at Station 161+00.00	
Cut Area (SF)	42.411
Fill Area (SF)	0.000
Cut Vol (CF)	76.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4159.3
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	1164.4



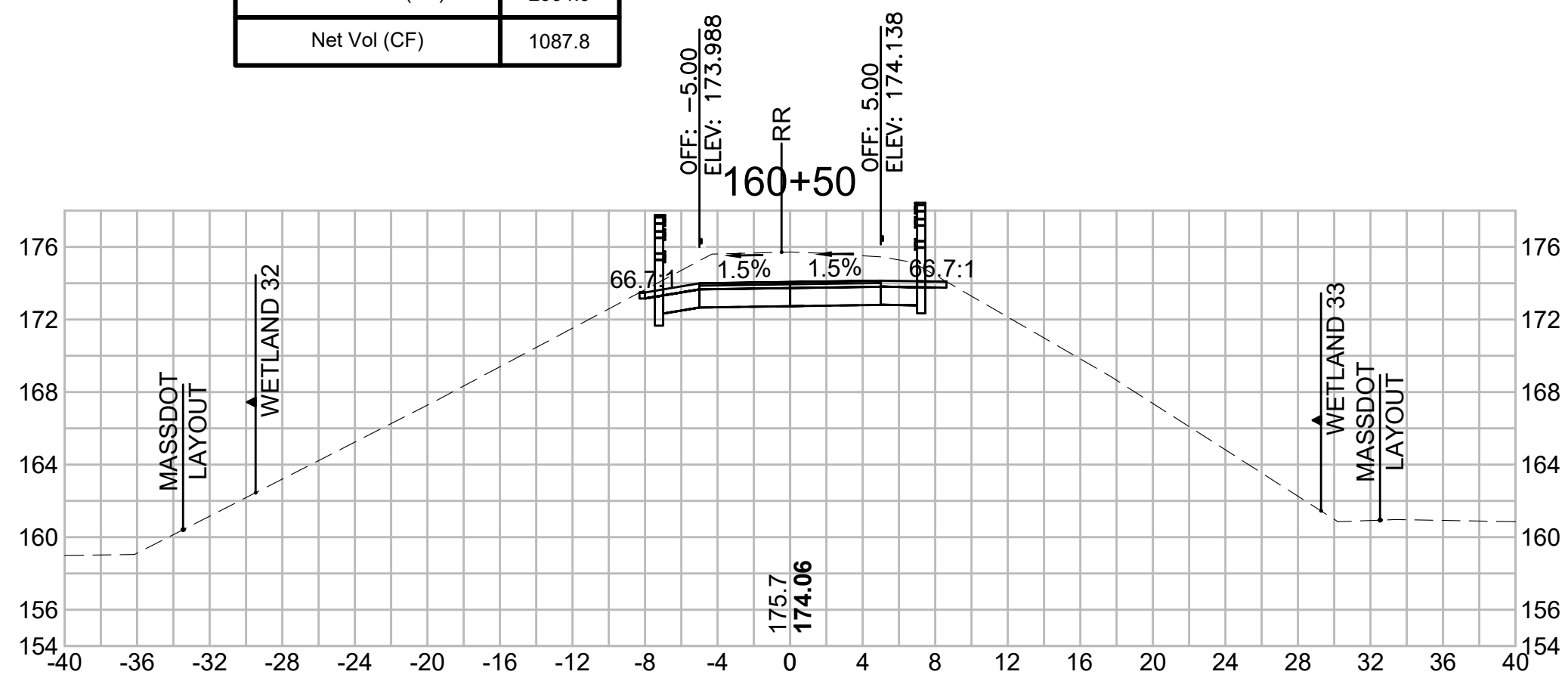
Total Volume at Station 162+00.00	
Cut Area (SF)	45.471
Fill Area (SF)	0.000
Cut Vol (CF)	86.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4328.8
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	1333.9



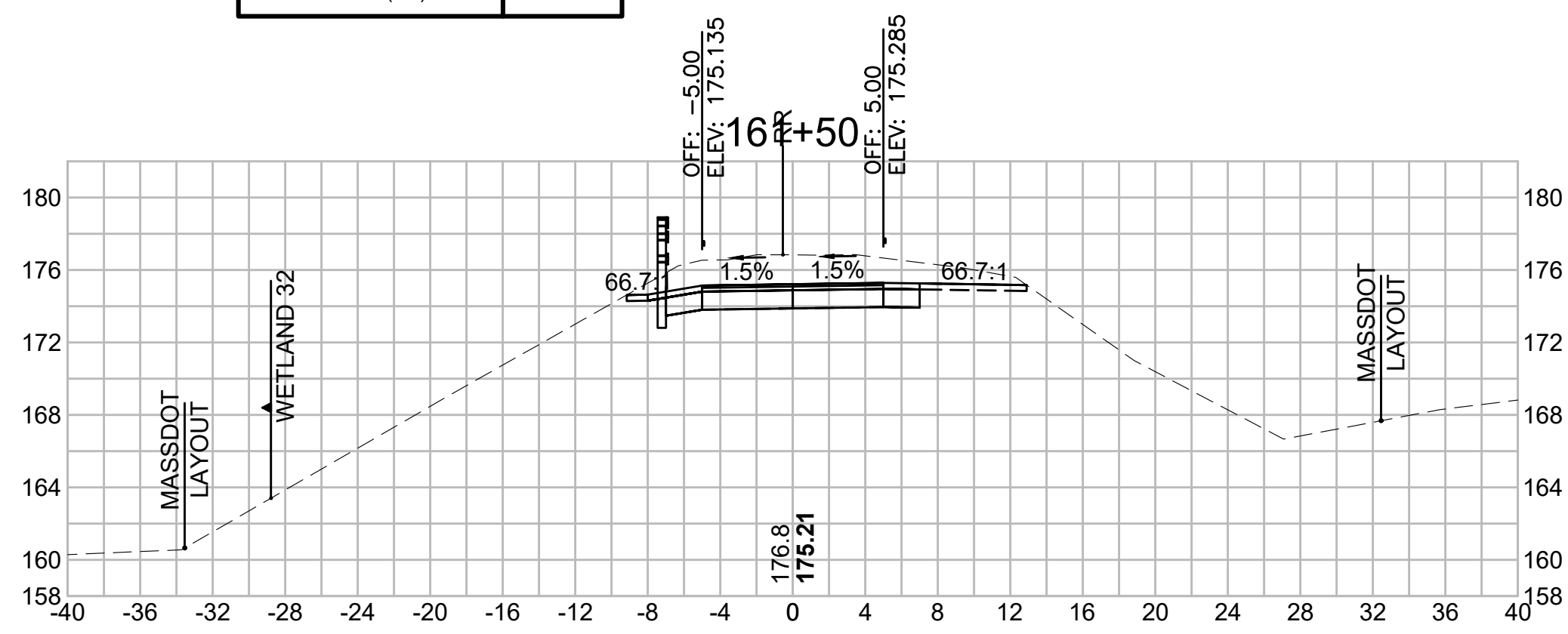
Total Volume at Station 159+50.00	
Cut Area (SF)	38.715
Fill Area (SF)	0.000
Cut Vol (CF)	67.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	3937.0
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	942.1



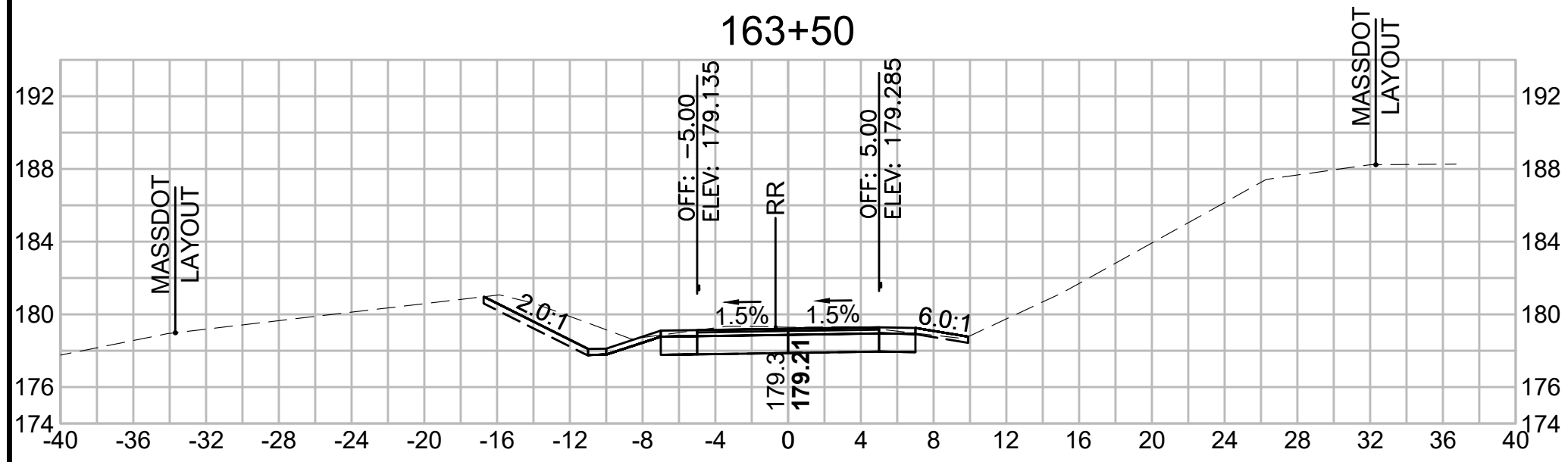
Total Volume at Station 160+50.00	
Cut Area (SF)	40.277
Fill Area (SF)	0.000
Cut Vol (CF)	73.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4082.7
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	1087.8



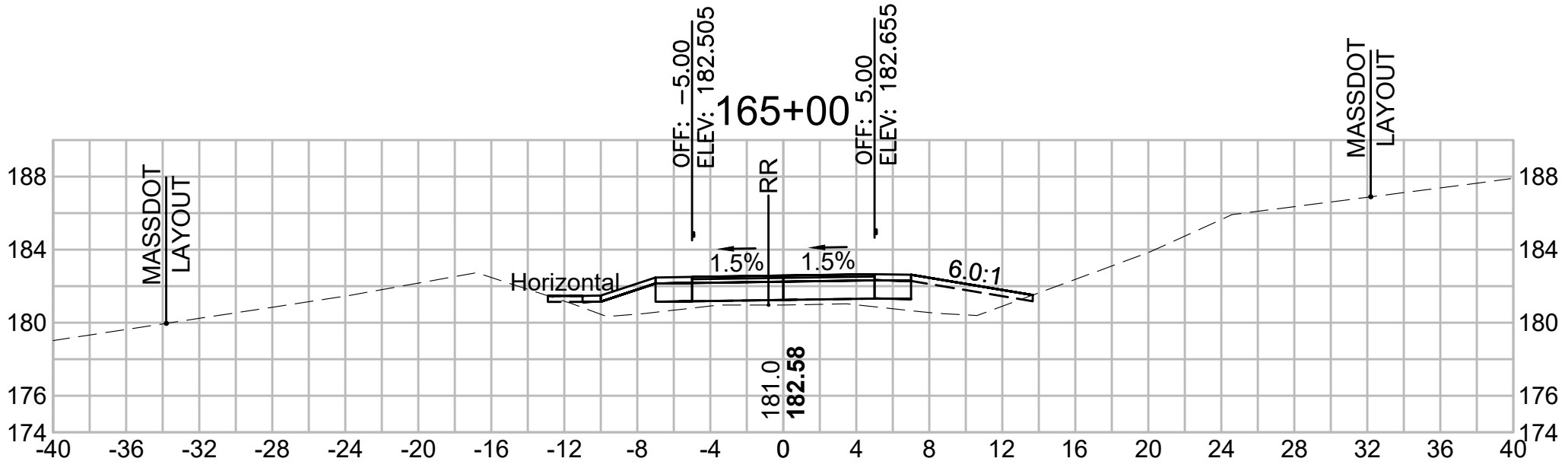
Total Volume at Station 161+50.00	
Cut Area (SF)	47.585
Fill Area (SF)	0.000
Cut Vol (CF)	83.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4242.6
Cum Fill Vol (CF)	2994.9
Net Vol (CF)	1247.7



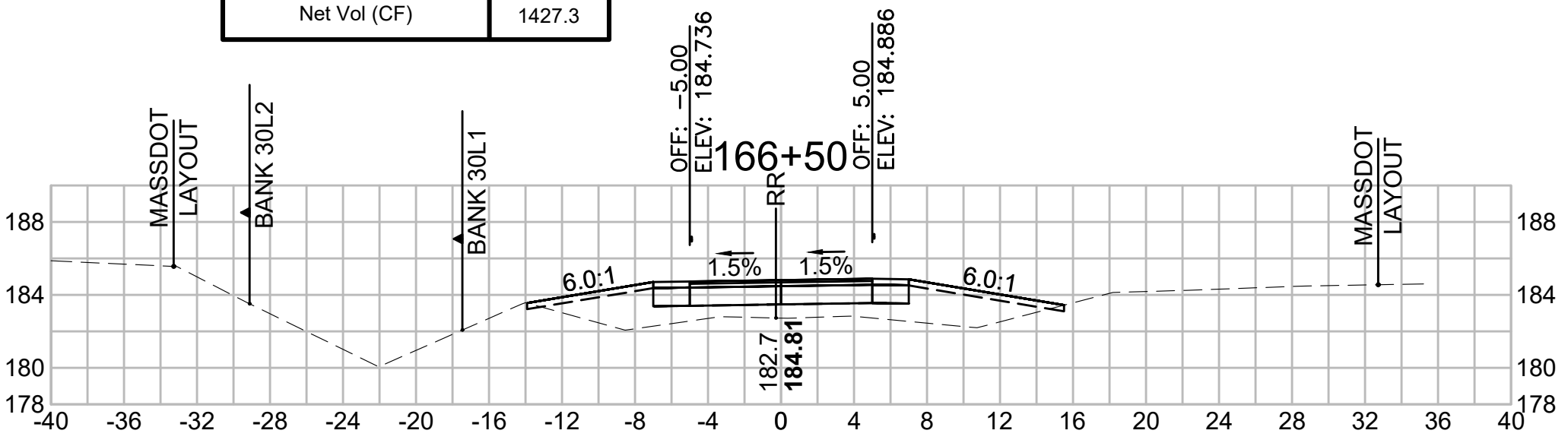
Total Volume at Station 163+50.00	
Cut Area (SF)	29.921
Fill Area (SF)	0.000
Cut Vol (CF)	53.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	4519.6
Cum Fill Vol (CF)	2996.9
Net Vol (CF)	1522.8



Total Volume at Station 165+00.00	
Cut Area (SF)	0.275
Fill Area (SF)	16.030
Cut Vol (CF)	2.3
Fill Vol (CF)	19.8
Cum Cut Vol (CF)	4585.6
Cum Fill Vol (CF)	3024.8
Net Vol (CF)	1560.8

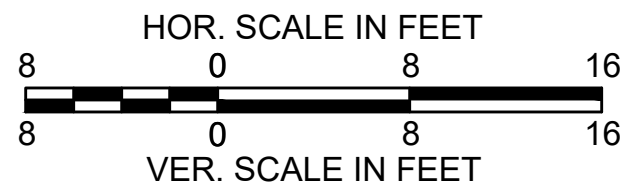


Total Volume at Station 166+50.00	
Cut Area (SF)	0.260
Fill Area (SF)	29.086
Cut Vol (CF)	0.5
Fill Vol (CF)	51.7
Cum Cut Vol (CF)	4587.0
Cum Fill Vol (CF)	3159.7
Net Vol (CF)	1427.3

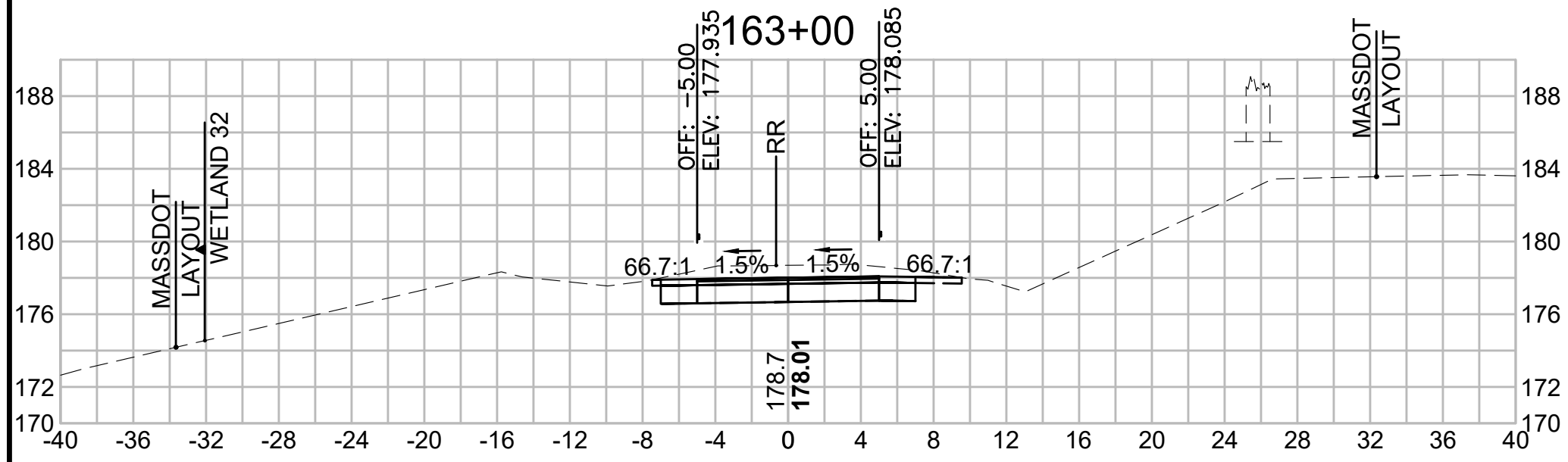


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	260	319
PROJECT FILE NO. 608164			

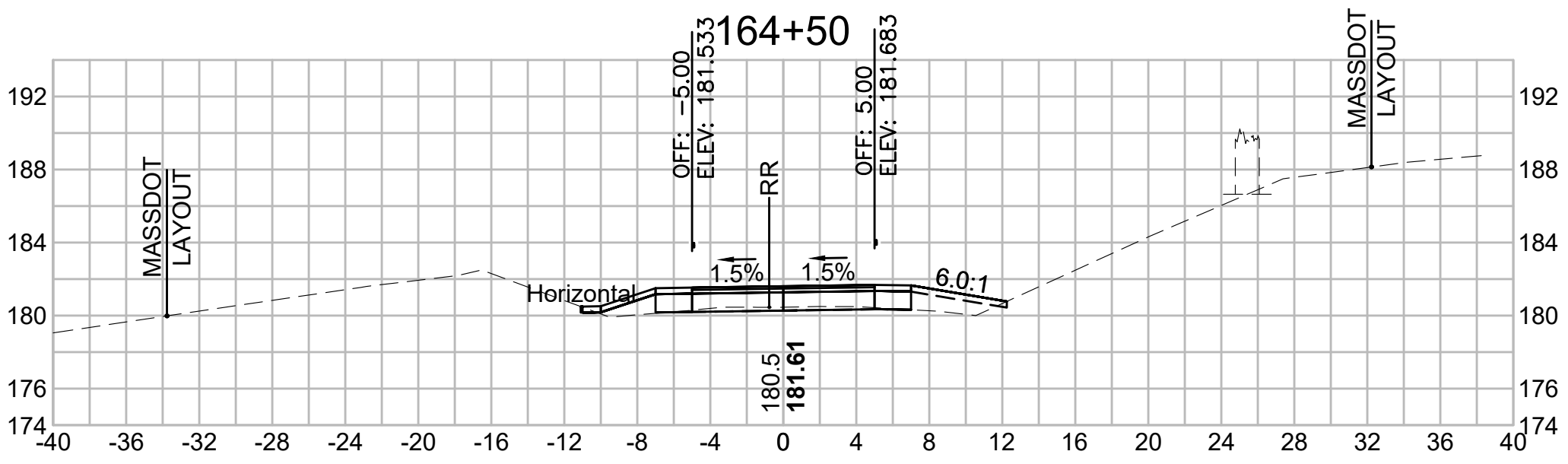
CROSS SECTIONS



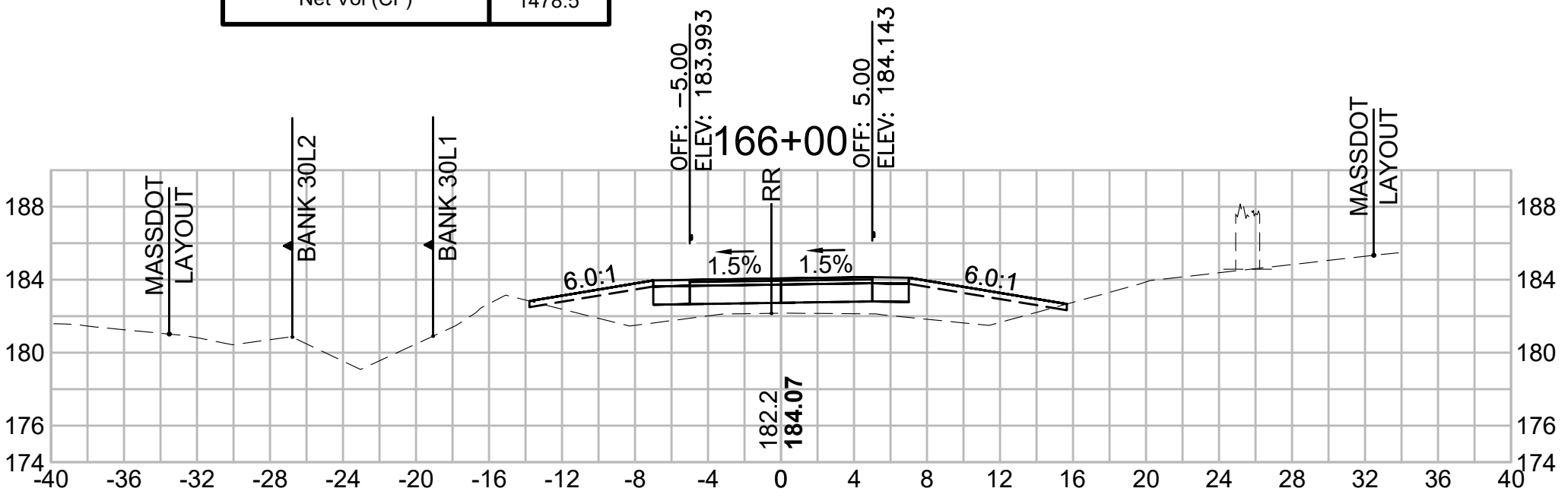
Total Volume at Station 163+00.00	
Cut Area (SF)	28.289
Fill Area (SF)	0.000
Cut Vol (CF)	60.5
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	4465.7
Cum Fill Vol (CF)	2996.9
Net Vol (CF)	1468.9



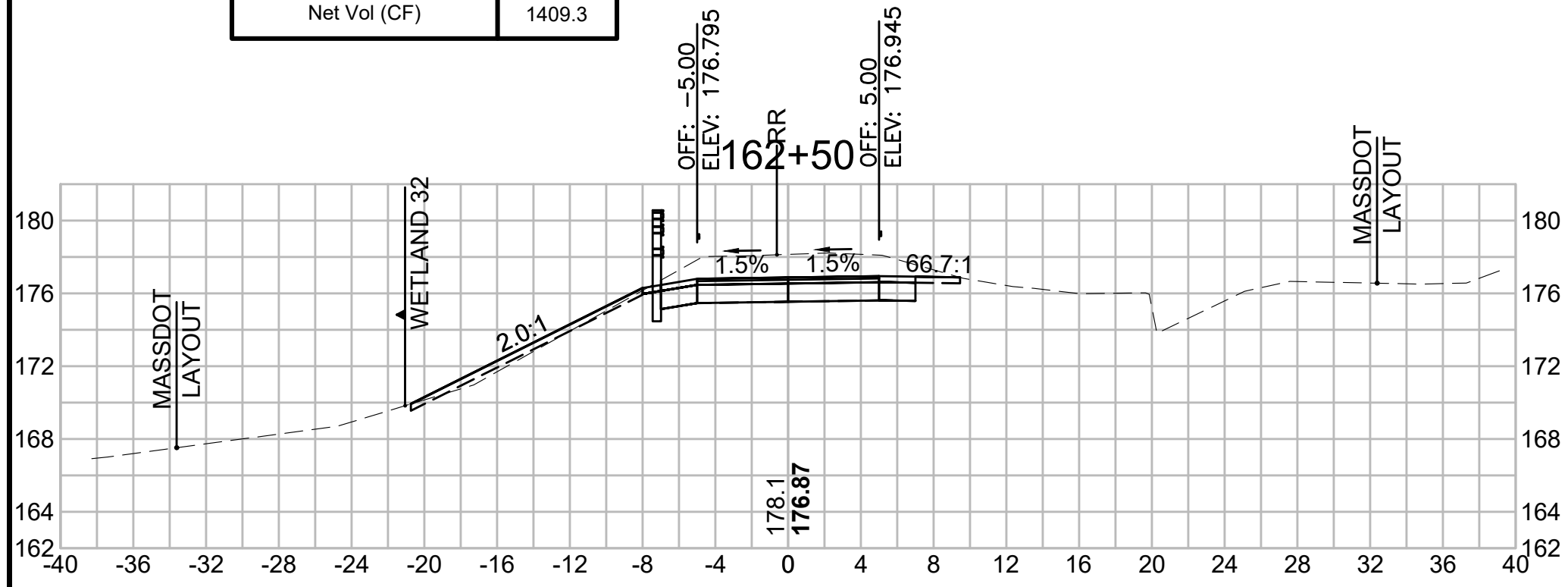
Total Volume at Station 164+50.00	
Cut Area (SF)	2.214
Fill Area (SF)	5.362
Cut Vol (CF)	19.0
Fill Vol (CF)	6.5
Cum Cut Vol (CF)	4583.3
Cum Fill Vol (CF)	3005.0
Net Vol (CF)	1578.3



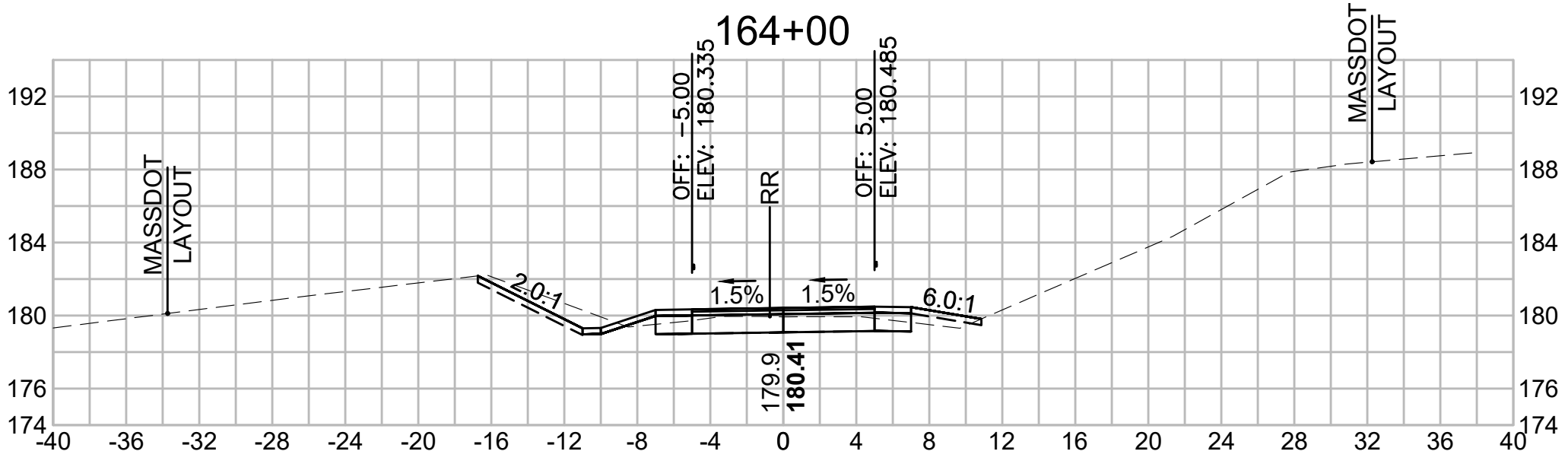
Total Volume at Station 166+00.00	
Cut Area (SF)	0.263
Fill Area (SF)	26.726
Cut Vol (CF)	0.5
Fill Vol (CF)	46.6
Cum Cut Vol (CF)	4586.5
Cum Fill Vol (CF)	3108.1
Net Vol (CF)	1478.5



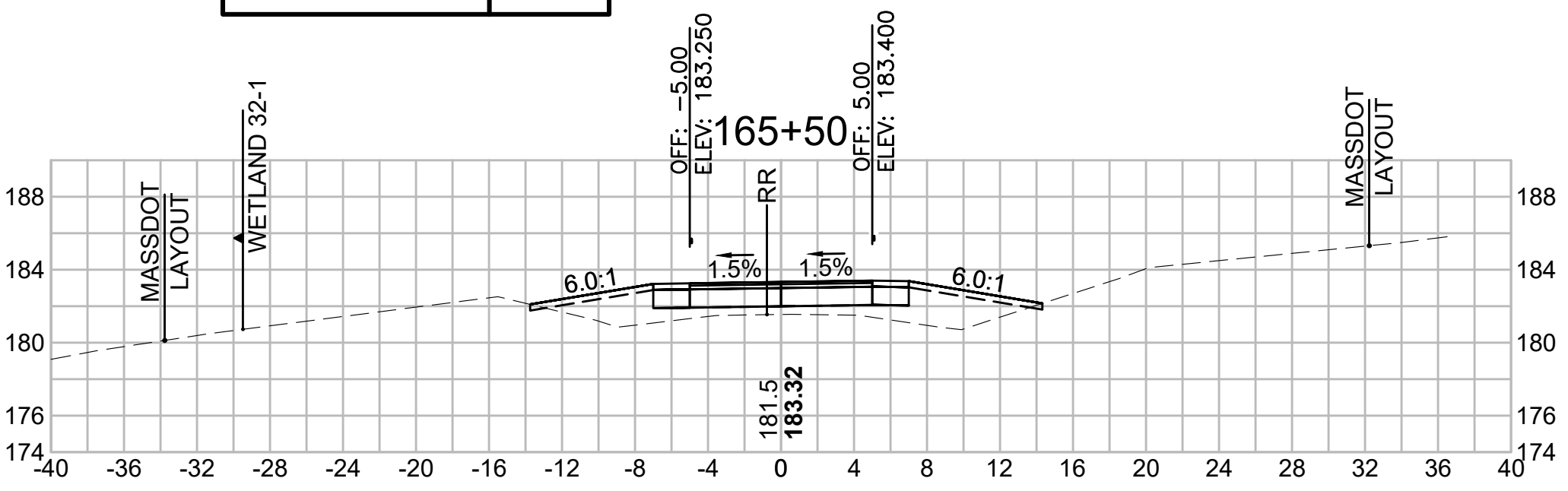
Total Volume at Station 162+50.00	
Cut Area (SF)	37.075
Fill Area (SF)	1.063
Cut Vol (CF)	76.4
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	4405.2
Cum Fill Vol (CF)	2995.9
Net Vol (CF)	1409.3



Total Volume at Station 164+00.00	
Cut Area (SF)	18.294
Fill Area (SF)	1.706
Cut Vol (CF)	44.6
Fill Vol (CF)	1.6
Cum Cut Vol (CF)	4564.3
Cum Fill Vol (CF)	2998.4
Net Vol (CF)	1565.8



Total Volume at Station 165+50.00	
Cut Area (SF)	0.254
Fill Area (SF)	23.589
Cut Vol (CF)	0.5
Fill Vol (CF)	36.7
Cum Cut Vol (CF)	4586.0
Cum Fill Vol (CF)	3061.5
Net Vol (CF)	1524.6



HOR. SCALE IN FEET

8 0 8 16

VER. SCALE IN FEET

8 0 8 16

The profile view shows the road's elevation (178 to 192) against stationing (-40 to 40). Key features include:

- MASSDOT LAYOUT** shown as a dashed line.
- BANK 30:1** slopes on both sides of the road.
- RR** (Railroad) crossing the road.
- OFF. 5.00** (Offset) and **ELEV. 186.425** at the centerline.
- 168+00** stationing mark.
- 184.2** and **186.35** elevation points.

The diagram shows a cross-section of a road project. Key features include:

- WETLAND 31**: Two areas on the left side of the road.
- BANK 30L2**: The left side of the road.
- BANK 30R**: The right side of the road.
- MASSDOT LAYOUT**: The proposed road layout on the right.
- 171+00**: Stationing marker at the center of the road.
- 2.0%**: Slope percentages for the road shoulders.
- 1.5%**: Slope percentages for the road base.
- 187.0**, **187.88**, **187.77**, **187.92**: Elevation markers.
- OFF: -5.00**, **OFF: 5.00**: Offset markers.

Profile view of the proposed road layout. The vertical axis shows elevation in feet (178 to 192), and the horizontal axis shows stationing (-40 to 40). The profile includes a 2.0:1 slope on the left, a 1.5% grade, a 1.5% grade, a 6.0:1 slope on the right, and a 30L/30R bank. Key points include the centerline (CL) at station 169+00, the right-of-way (RR) at station 168+85, and the proposed road layout at station 168+775. The profile also shows the existing ground line and the proposed road layout.

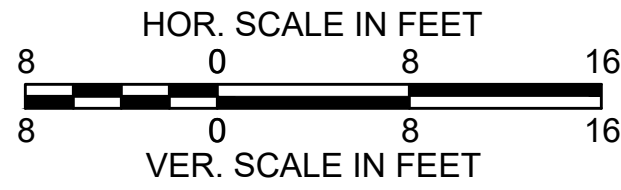
The profile view shows the vertical alignment of the proposed road. The horizontal axis represents stationing from -40 to 40, and the vertical axis represents elevation in feet from 182 to 196. The profile includes a dashed line for the existing ground and a solid line for the proposed road grade. Key features include:

- MASSDOT LAYOUT** at station -36.
- WETLAND 31** at station -16.
- WETLAND 31** at station -8.
- OFF: -5.00** and **ELEV: 187.525** at station -4.
- RR** (Railroad) at station -4.
- 170+50** station marker at station 0.
- BANK 30R** at station 8.
- BANK 30R** at station 12.
- MASSDOT LAYOUT** at station 28.

 The proposed road grade starts at station -8 with an elevation of 186.9, rises to 187.6 at station 0, and then continues with a 1.5% grade to station 12, where it rises to 188.1. The profile also shows a 2.0% grade section between stations 12 and 18.

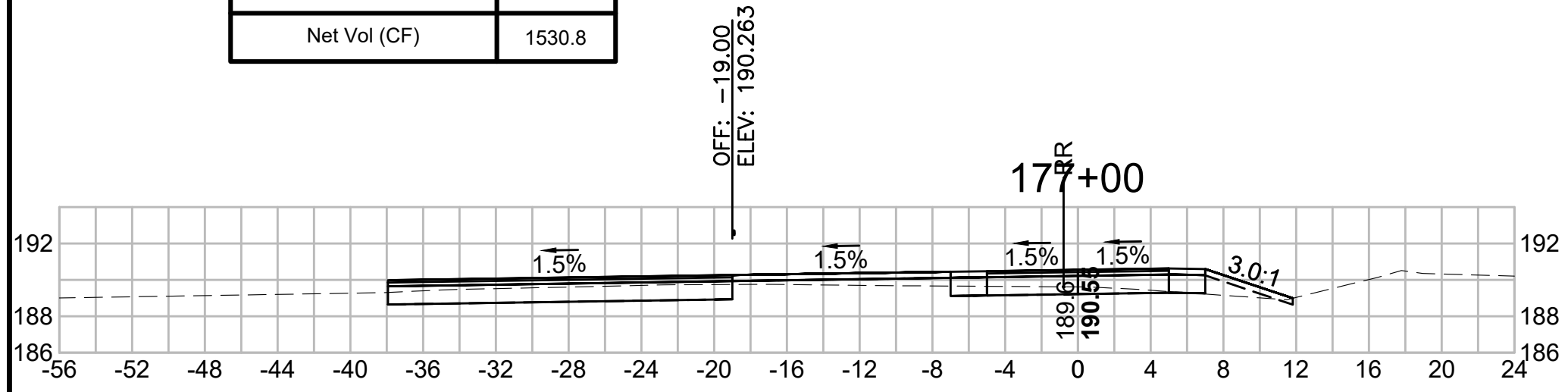
Figure 1 is a plan view of a proposed railroad alignment. The alignment is shown as a solid line with a dashed line indicating a 10-foot offset. The alignment starts at station 167+00 and extends to station 168+62.9. Key points include "MASSDOT LAYOUT" at station 167+00, "BANK 30L2" at station 167+12, "BANK 30L1" at station 167+24, and "OFF: -5.00 ELEV: 185.479" at station 167+36. The alignment is shown with a 2.0% grade on the left, a 1.5% grade on the right, and a 2.0% grade on the far right. The vertical axis shows elevations from 178 to 192 feet.

[illegible]

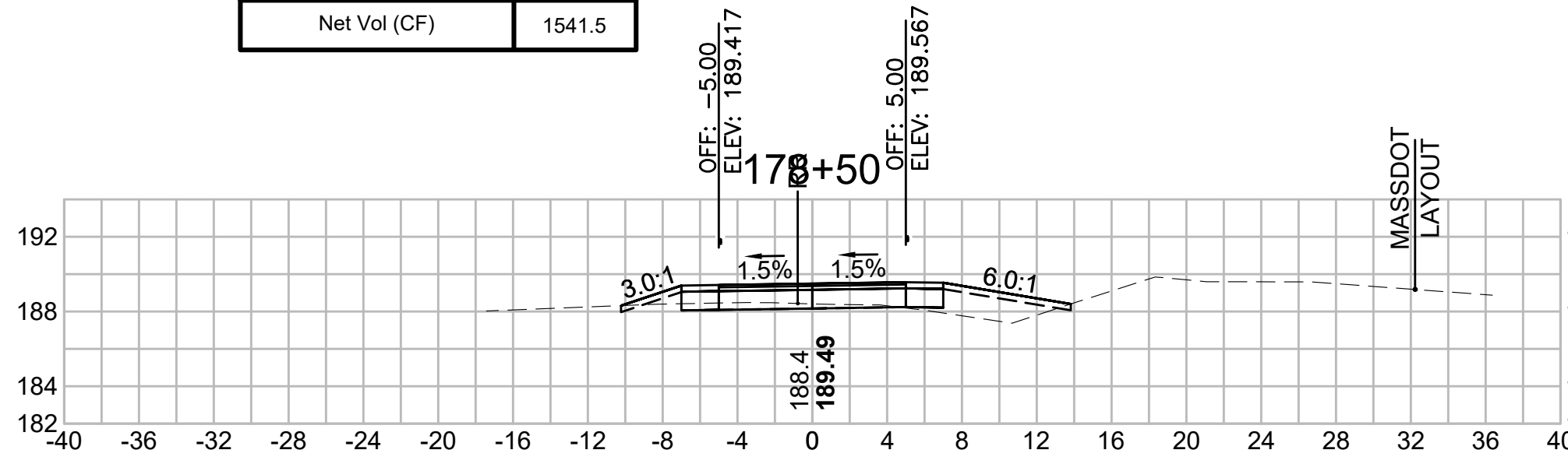


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	263	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

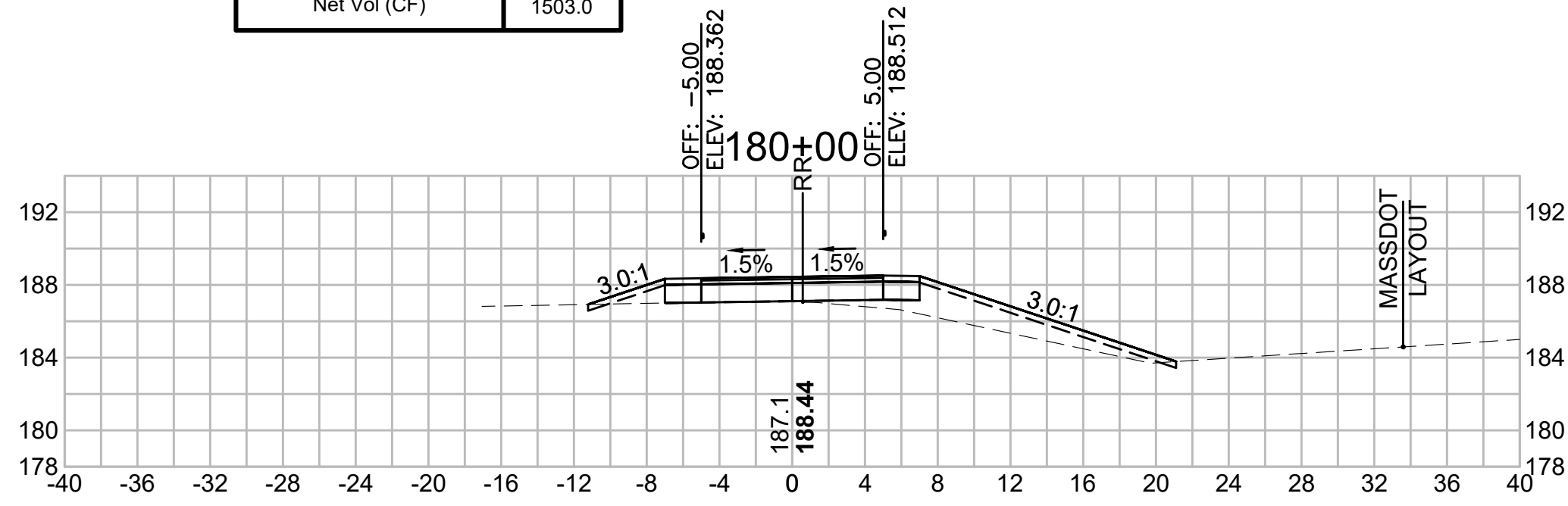
Total Volume at Station 177+00.00	
Cut Area (SF)	19.799
Fill Area (SF)	5.793
Cut Vol (CF)	47.2
Fill Vol (CF)	6.1
Cum Cut Vol (CF)	5094.1
Cum Fill Vol (CF)	3563.4
Net Vol (CF)	1530.8



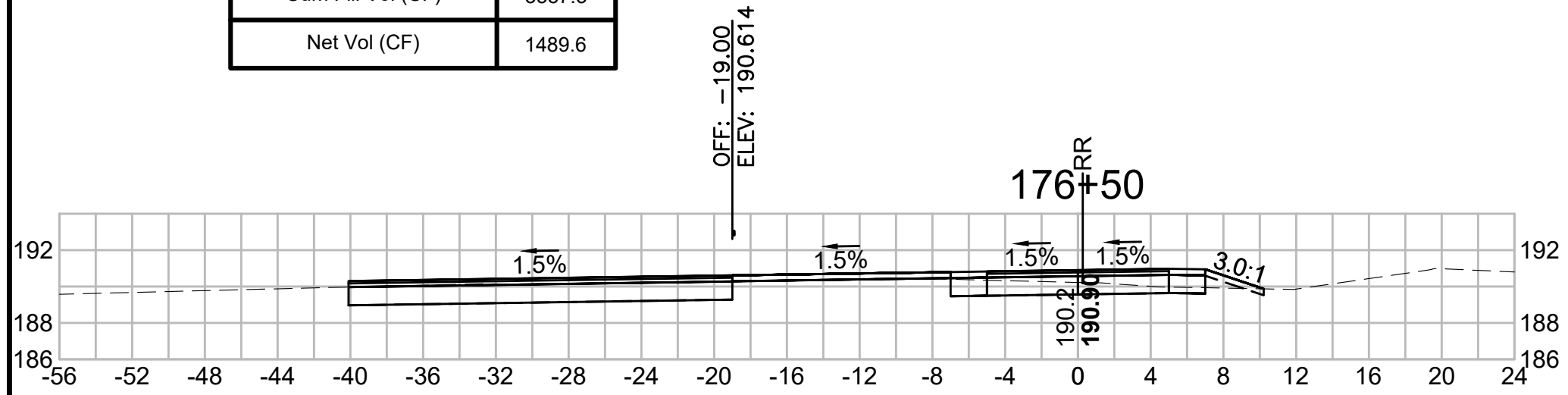
Total Volume at Station 178+50.00	
Cut Area (SF)	3.447
Fill Area (SF)	7.054
Cut Vol (CF)	7.8
Fill Vol (CF)	11.3
Cum Cut Vol (CF)	5134.5
Cum Fill Vol (CF)	3593.0
Net Vol (CF)	1541.5



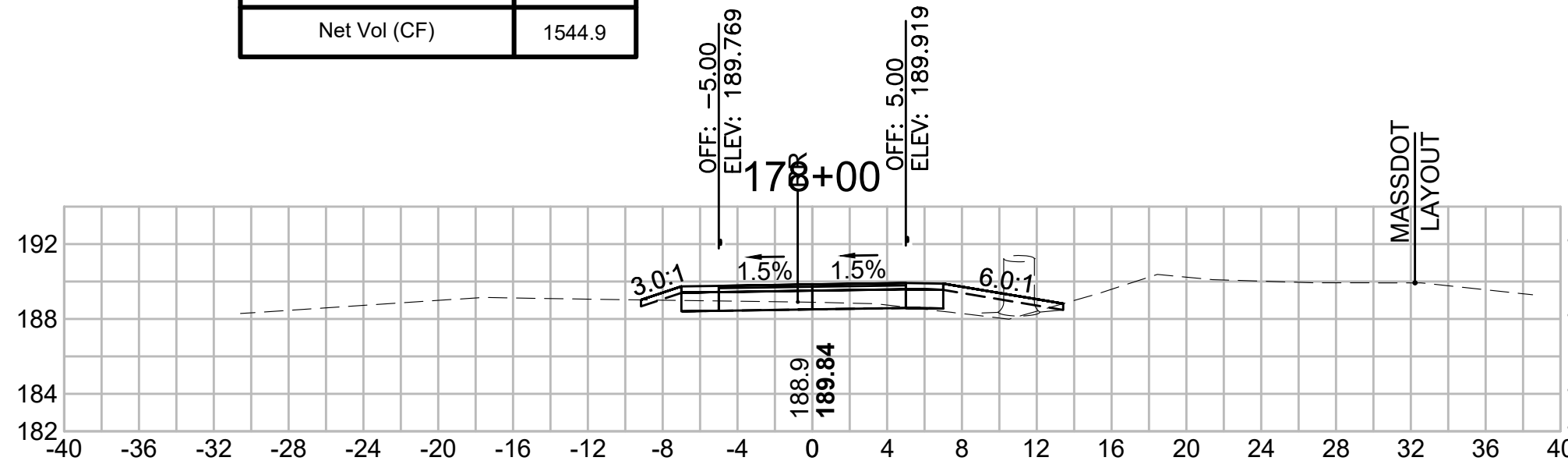
Total Volume at Station 180+00.00	
Cut Area (SF)	0.426
Fill Area (SF)	16.145
Cut Vol (CF)	1.9
Fill Vol (CF)	21.0
Cum Cut Vol (CF)	5146.1
Cum Fill Vol (CF)	3643.1
Net Vol (CF)	1503.0



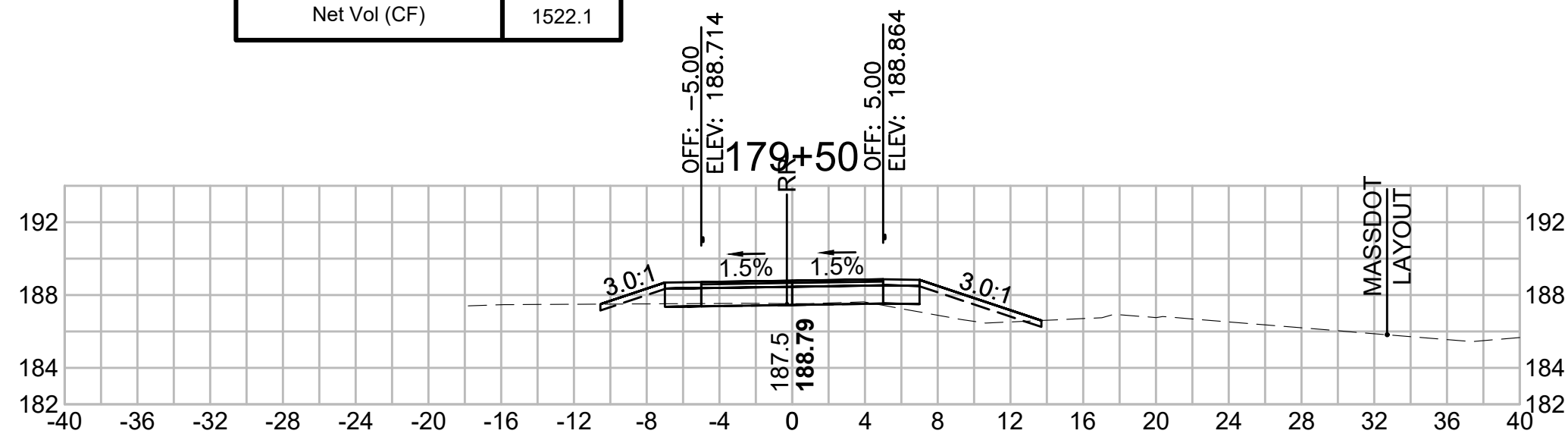
Total Volume at Station 176+50.00	
Cut Area (SF)	31.157
Fill Area (SF)	0.745
Cut Vol (CF)	67.6
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	5047.0
Cum Fill Vol (CF)	3557.3
Net Vol (CF)	1489.6



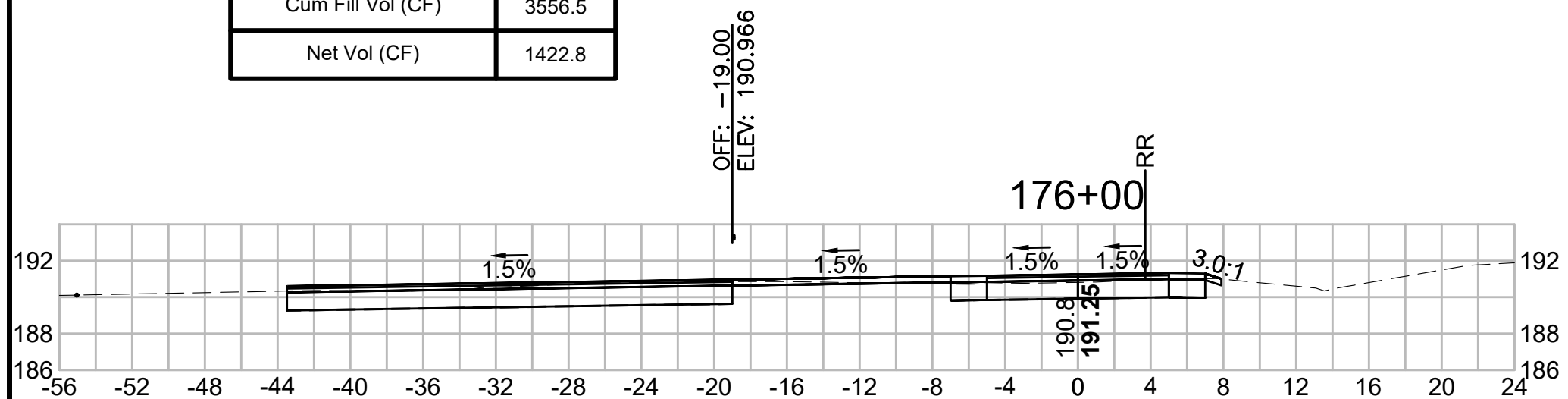
Total Volume at Station 178+00.00	
Cut Area (SF)	5.000
Fill Area (SF)	5.132
Cut Vol (CF)	9.4
Fill Vol (CF)	8.9
Cum Cut Vol (CF)	5126.6
Cum Fill Vol (CF)	3581.7
Net Vol (CF)	1544.9



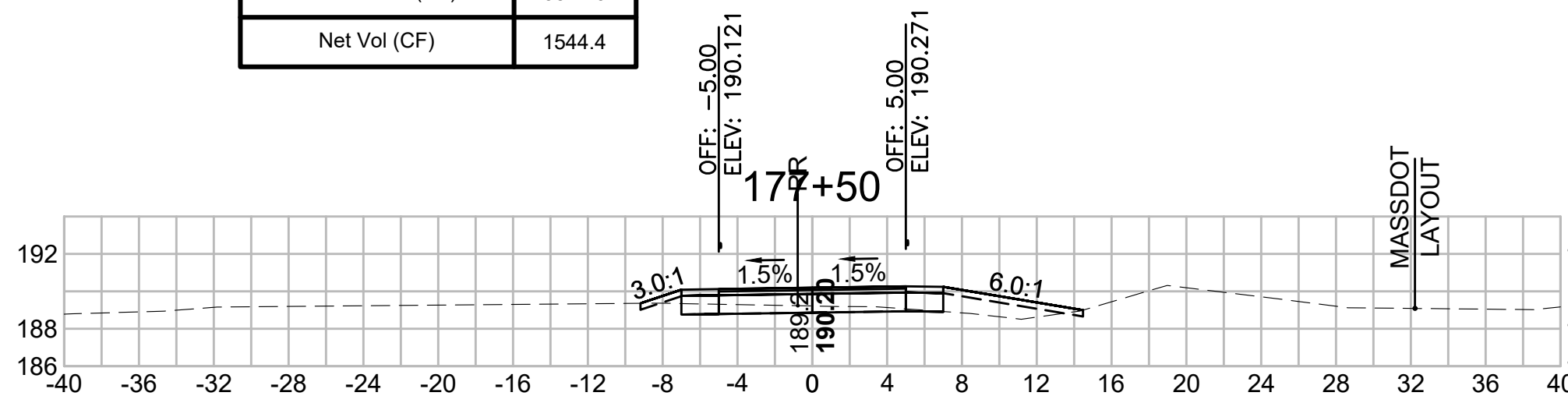
Total Volume at Station 179+50.00	
Cut Area (SF)	1.604
Fill Area (SF)	6.535
Cut Vol (CF)	4.0
Fill Vol (CF)	14.3
Cum Cut Vol (CF)	5144.2
Cum Fill Vol (CF)	3622.1
Net Vol (CF)	1522.1



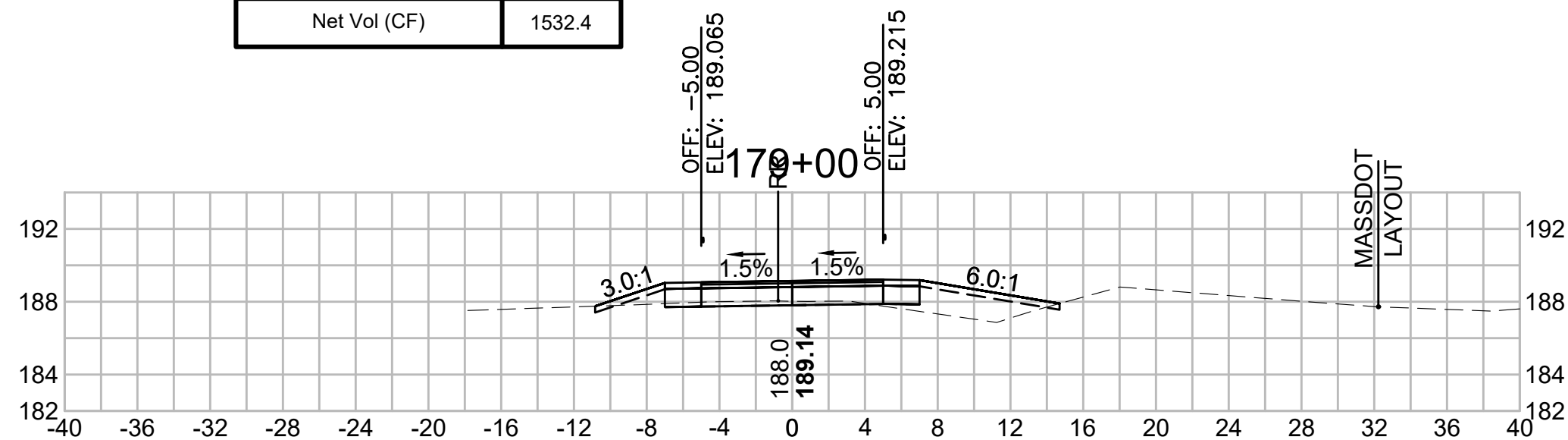
Total Volume at Station 176+00.00	
Cut Area (SF)	41.902
Fill Area (SF)	0.153
Cut Vol (CF)	96.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	4979.3
Cum Fill Vol (CF)	3556.5
Net Vol (CF)	1422.8

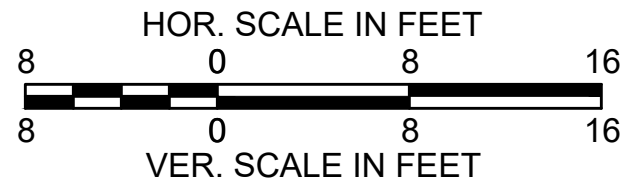


Total Volume at Station 177+50.00	
Cut Area (SF)	5.150
Fill Area (SF)	4.434
Cut Vol (CF)	23.1
Fill Vol (CF)	9.5
Cum Cut Vol (CF)	5117.2
Cum Fill Vol (CF)	3572.9
Net Vol (CF)	1544.4



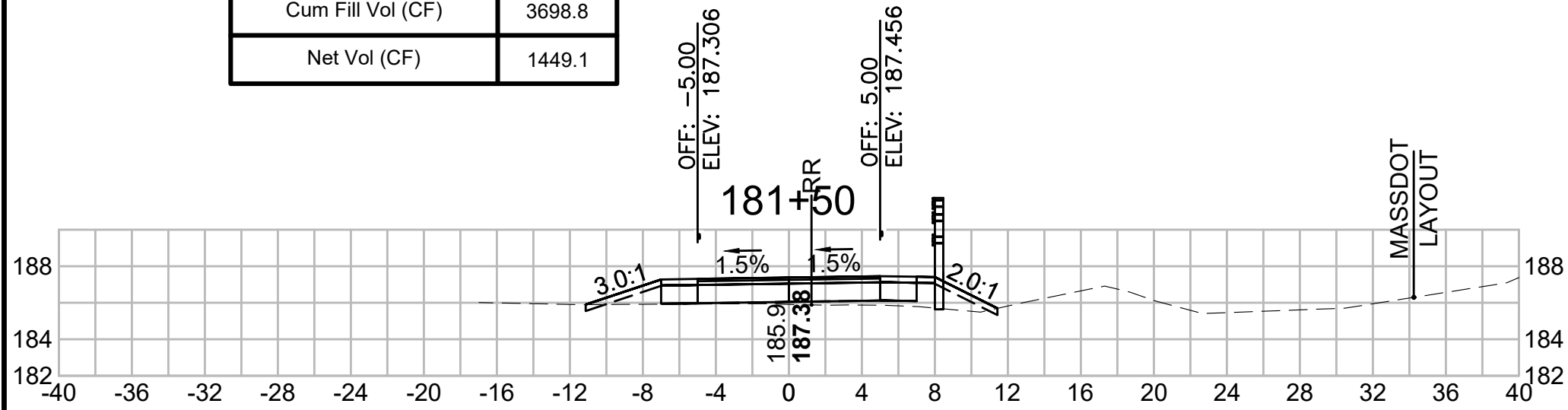
Total Volume at Station 179+00.00	
Cut Area (SF)	2.731
Fill Area (SF)	8.930
Cut Vol (CF)	5.7
Fill Vol (CF)	14.8
Cum Cut Vol (CF)	5140.2
Cum Fill Vol (CF)	3607.8
Net Vol (CF)	1532.4



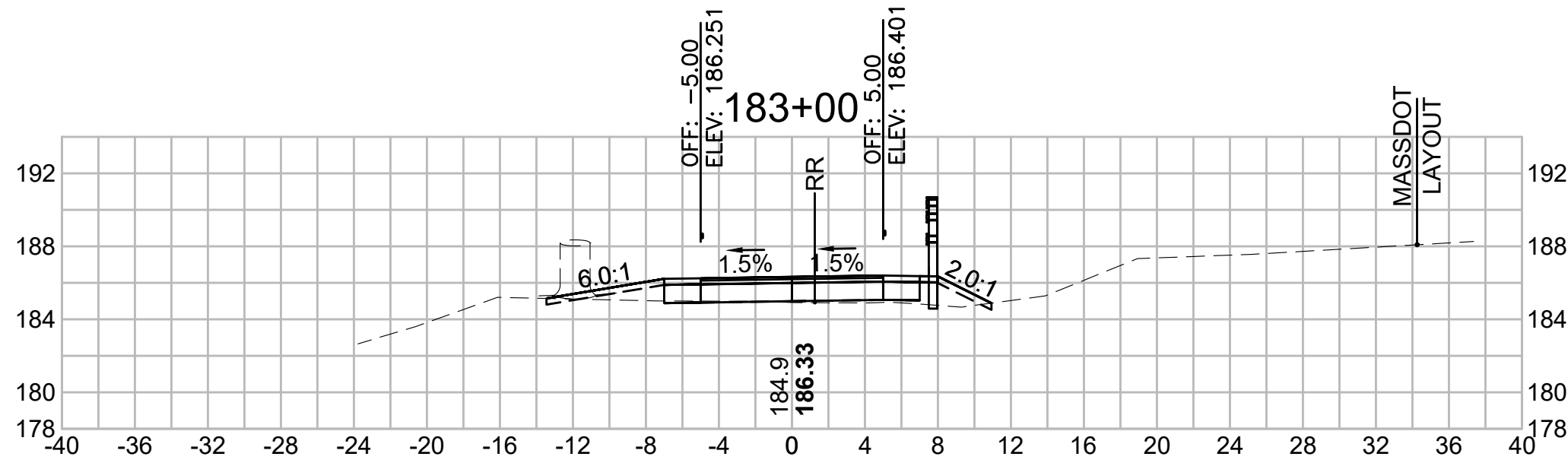


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	264	319
PROJECT FILE NO. 608164			
CROSS SECTIONS			

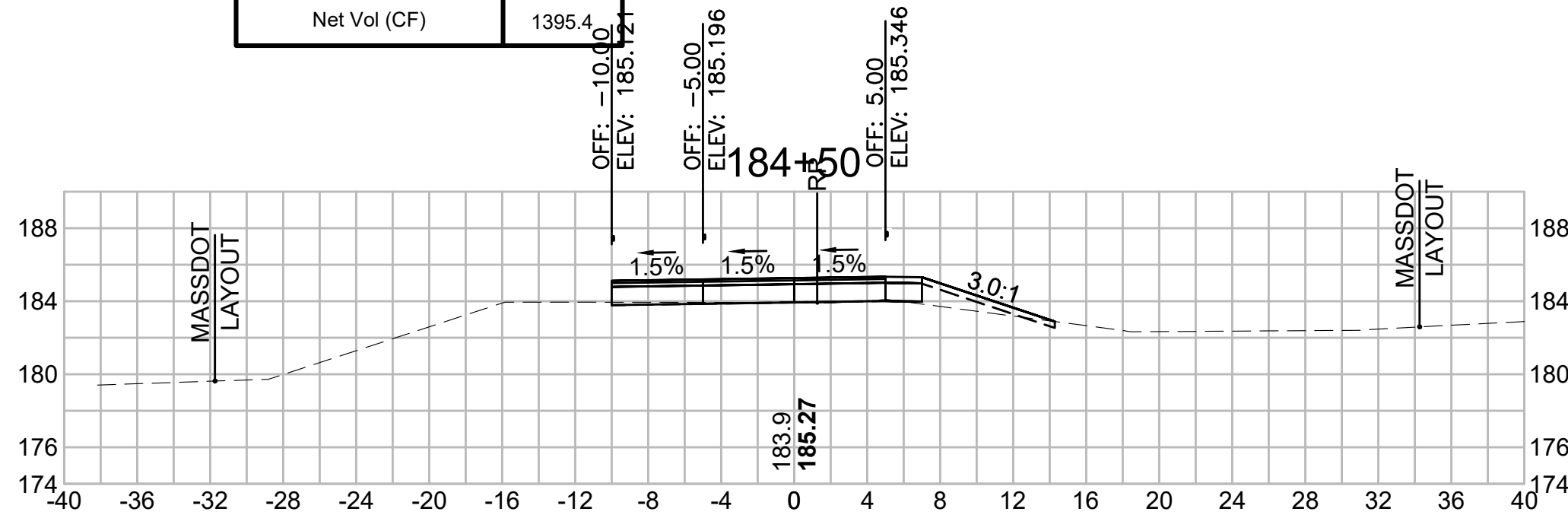
Total Volume at Station 181+50.00	
Cut Area (SF)	0.278
Fill Area (SF)	6.999
Cut Vol (CF)	0.6
Fill Vol (CF)	16.1
Cum Cut Vol (CF)	5148.0
Cum Fill Vol (CF)	3698.8
Net Vol (CF)	1449.1



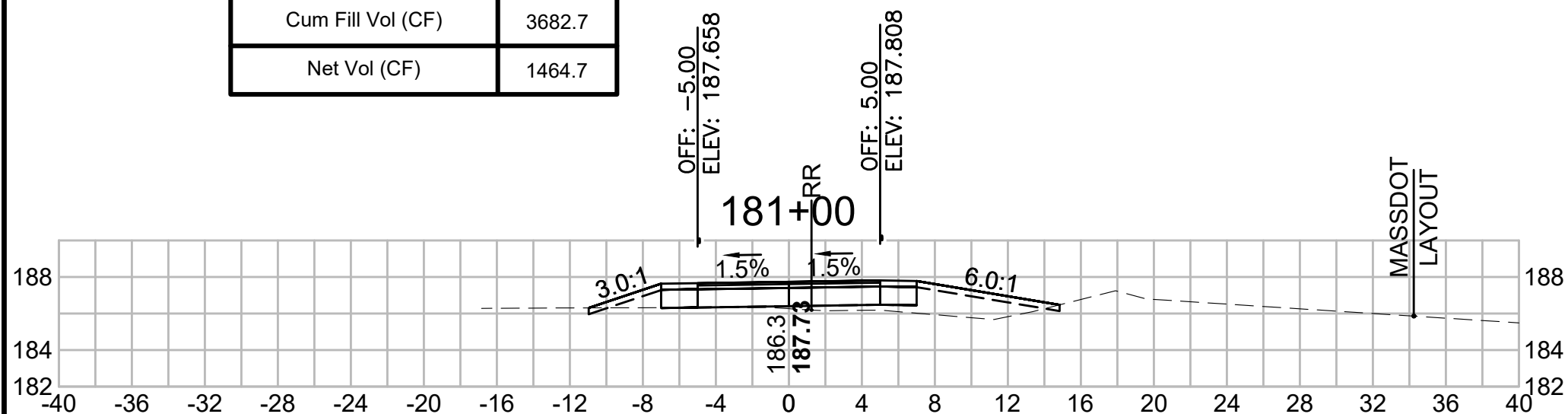
Total Volume at Station 183+00.00	
Cut Area (SF)	0.791
Fill Area (SF)	5.820
Cut Vol (CF)	2.0
Fill Vol (CF)	10.3
Cum Cut Vol (CF)	5152.8
Cum Fill Vol (CF)	3732.4
Net Vol (CF)	1420.4



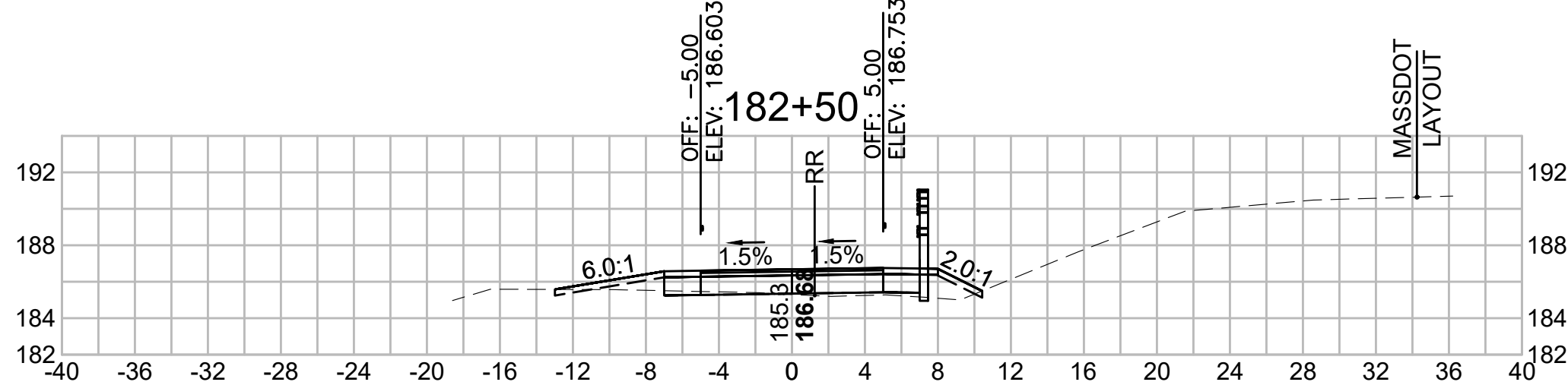
Total Volume at Station 184+50.00	
Cut Area (SF)	1.145
Fill Area (SF)	3.314
Cut Vol (CF)	2.0
Fill Vol (CF)	8.8
Cum Cut Vol (CF)	5158.5
Cum Fill Vol (CF)	3763.1
Net Vol (CF)	1395.4



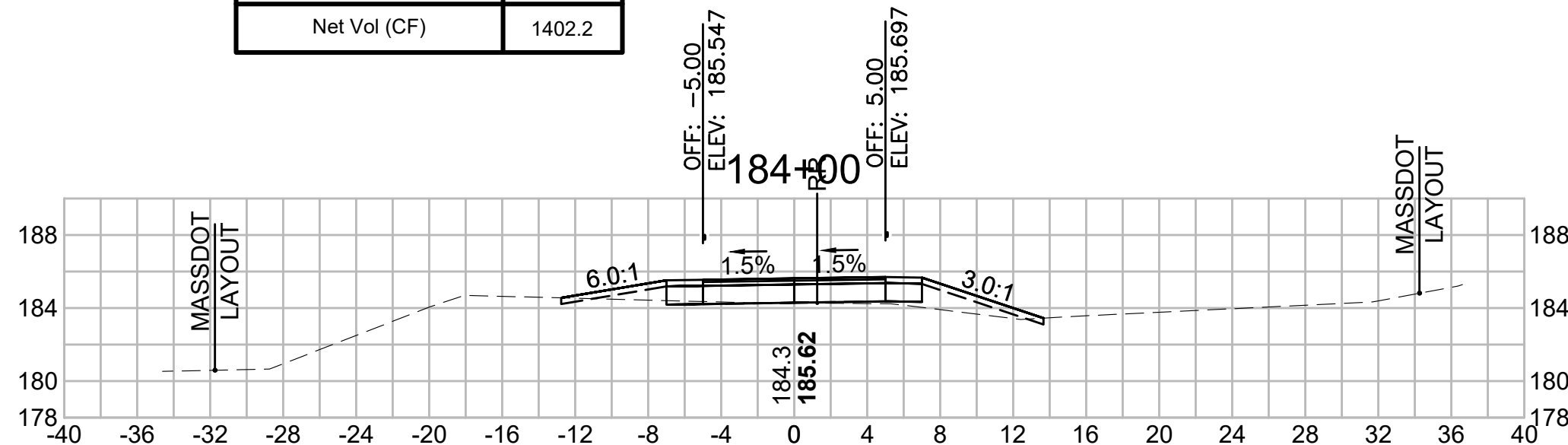
Total Volume at Station 181+00.00	
Cut Area (SF)	0.334
Fill Area (SF)	10.418
Cut Vol (CF)	0.6
Fill Vol (CF)	17.1
Cum Cut Vol (CF)	5147.4
Cum Fill Vol (CF)	3682.7
Net Vol (CF)	1464.7



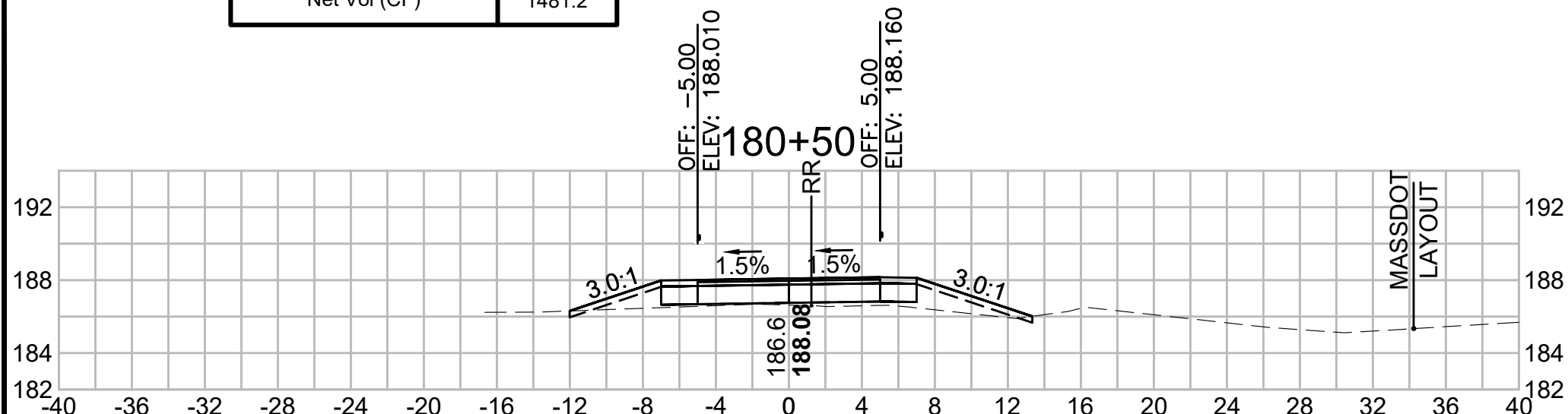
Total Volume at Station 182+50.00	
Cut Area (SF)	1.337
Fill Area (SF)	5.296
Cut Vol (CF)	1.9
Fill Vol (CF)	10.9
Cum Cut Vol (CF)	5150.8
Cum Fill Vol (CF)	3722.2
Net Vol (CF)	1428.7



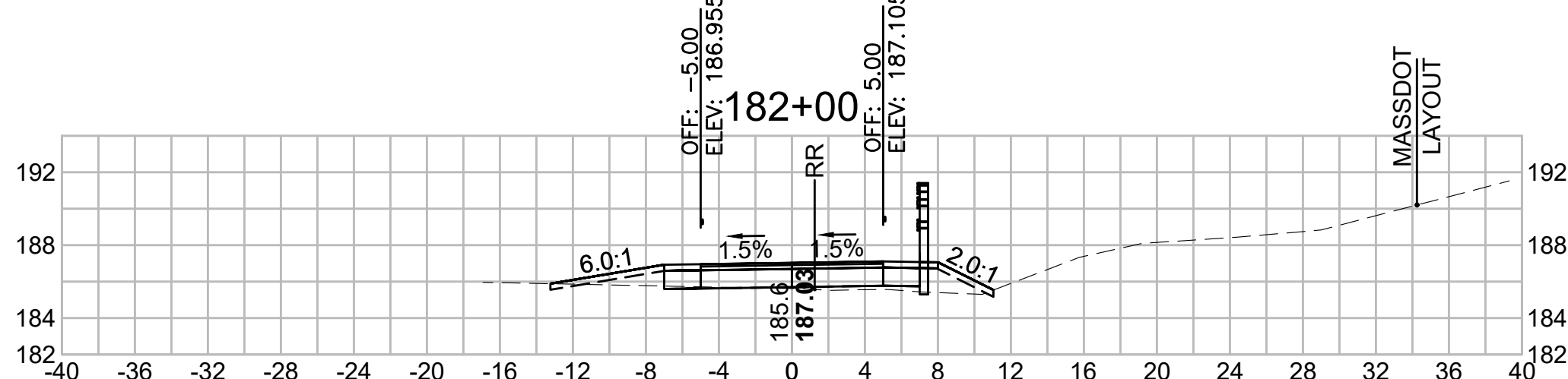
Total Volume at Station 184+00.00	
Cut Area (SF)	1.053
Fill Area (SF)	6.216
Cut Vol (CF)	2.0
Fill Vol (CF)	11.1
Cum Cut Vol (CF)	5156.5
Cum Fill Vol (CF)	3754.3
Net Vol (CF)	1402.2



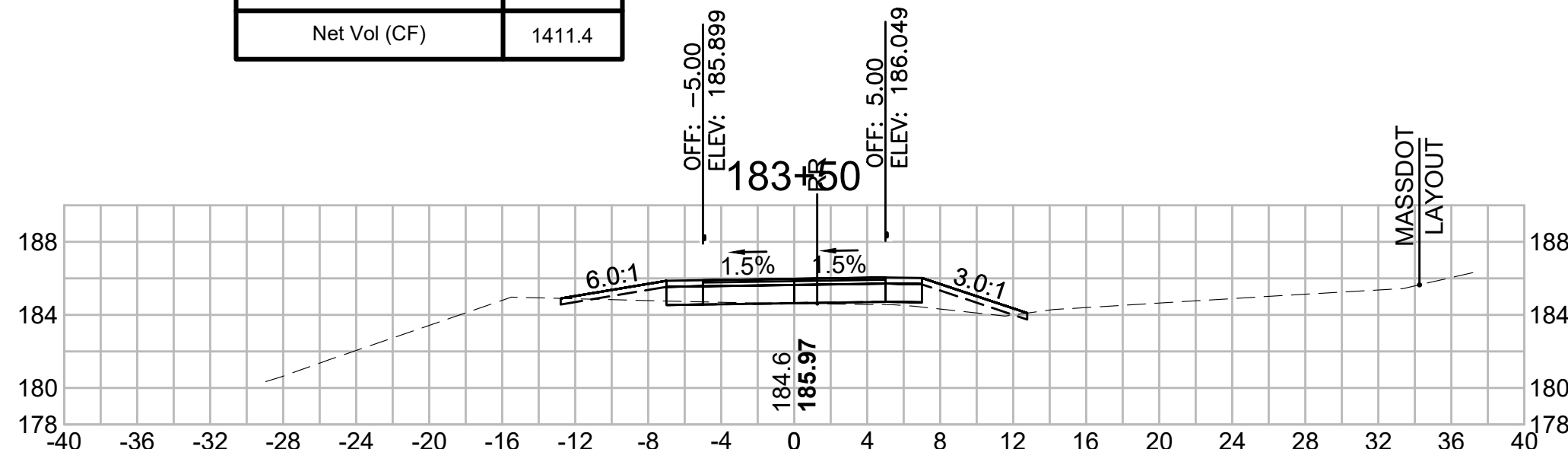
Total Volume at Station 180+50.00	
Cut Area (SF)	0.335
Fill Area (SF)	8.098
Cut Vol (CF)	0.7
Fill Vol (CF)	22.4
Cum Cut Vol (CF)	5146.8
Cum Fill Vol (CF)	3665.6
Net Vol (CF)	1481.2



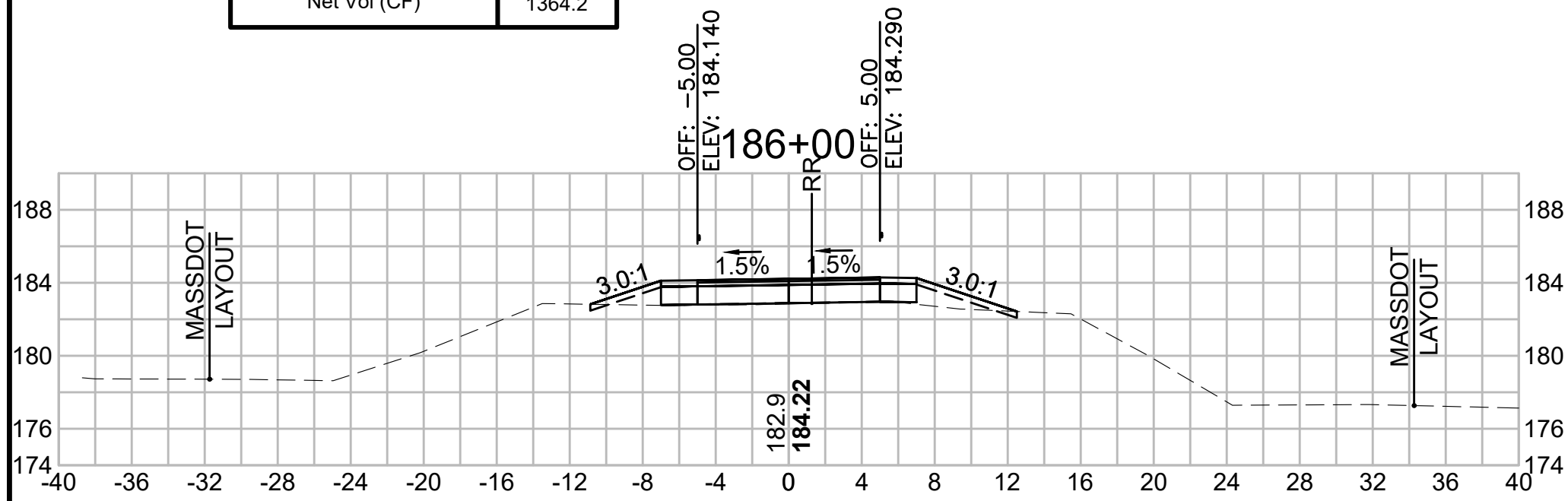
Total Volume at Station 182+00.00	
Cut Area (SF)	0.744
Fill Area (SF)	6.447
Cut Vol (CF)	0.9
Fill Vol (CF)	12.4
Cum Cut Vol (CF)	5148.9
Cum Fill Vol (CF)	3711.3
Net Vol (CF)	1437.6



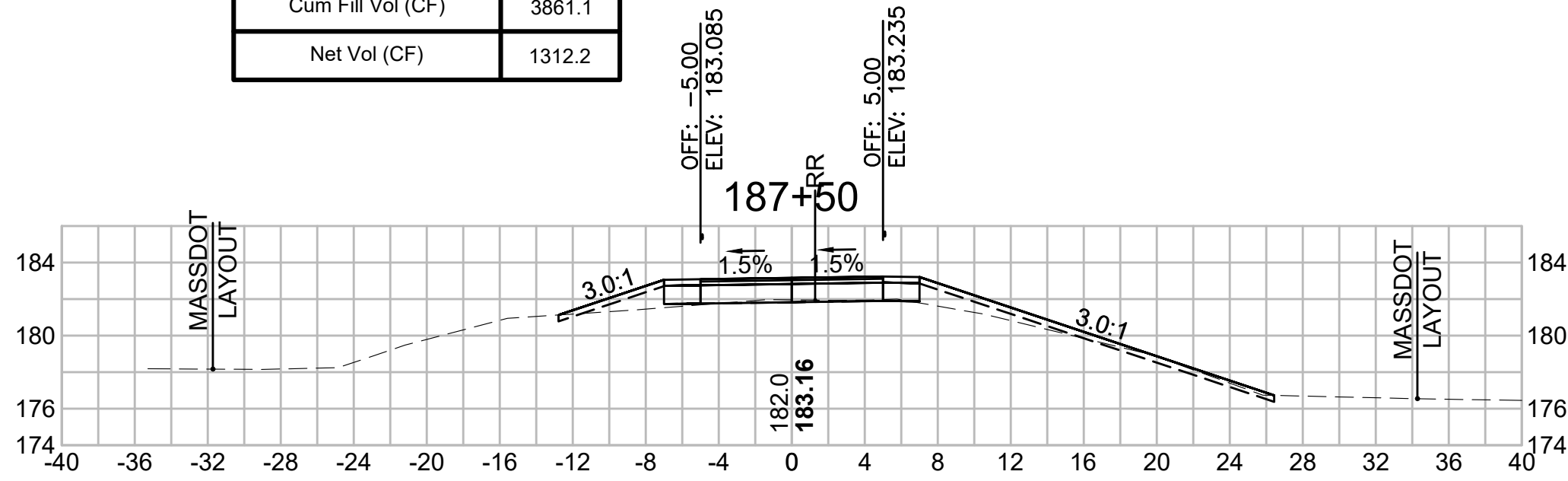
Total Volume at Station 183+50.00	
Cut Area (SF)	1.072
Fill Area (SF)	5.768
Cut Vol (CF)	1.7
Fill Vol (CF)	10.7
Cum Cut Vol (CF)	5154.5
Cum Fill Vol (CF)	3743.2
Net Vol (CF)	1411.4



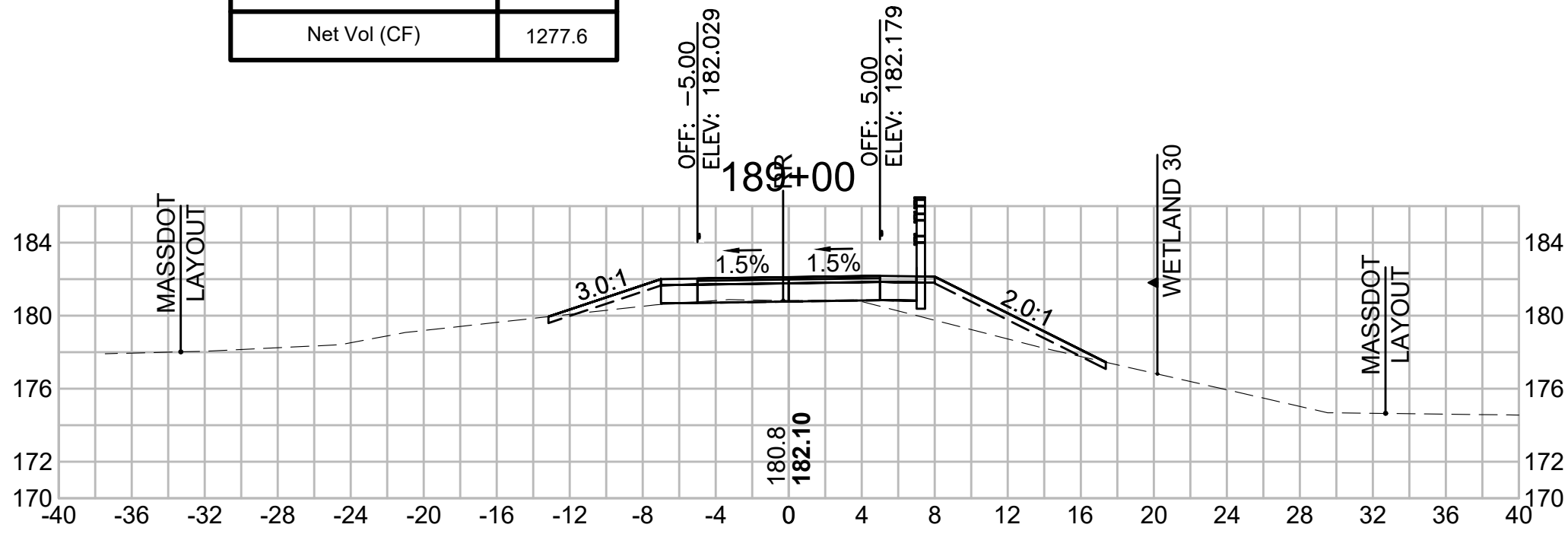
Total Volume at Station 186+00.00	
Cut Area (SF)	0.462
Fill Area (SF)	4.352
Cut Vol (CF)	1.6
Fill Vol (CF)	10.0
Cum Cut Vol (CF)	5166.0
Cum Fill Vol (CF)	3801.8
Net Vol (CF)	1364.2



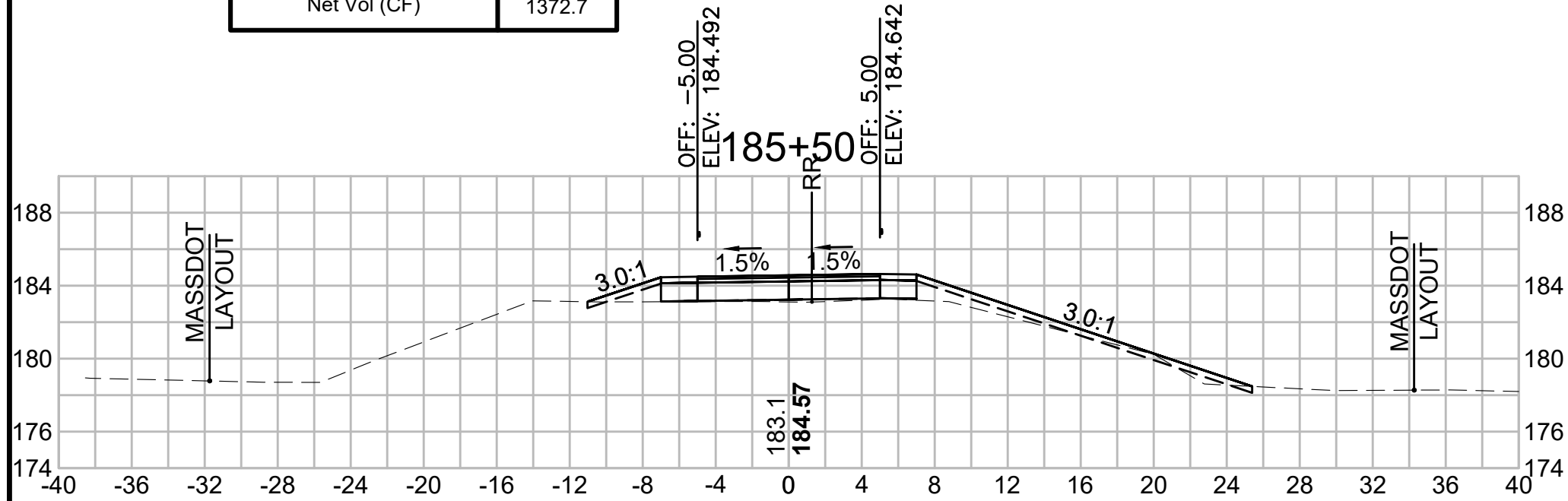
Total Volume at Station 187+50.00	
Cut Area (SF)	3.419
Fill Area (SF)	7.150
Cut Vol (CF)	4.6
Fill Vol (CF)	16.3
Cum Cut Vol (CF)	5173.3
Cum Fill Vol (CF)	3861.1
Net Vol (CF)	1312.2



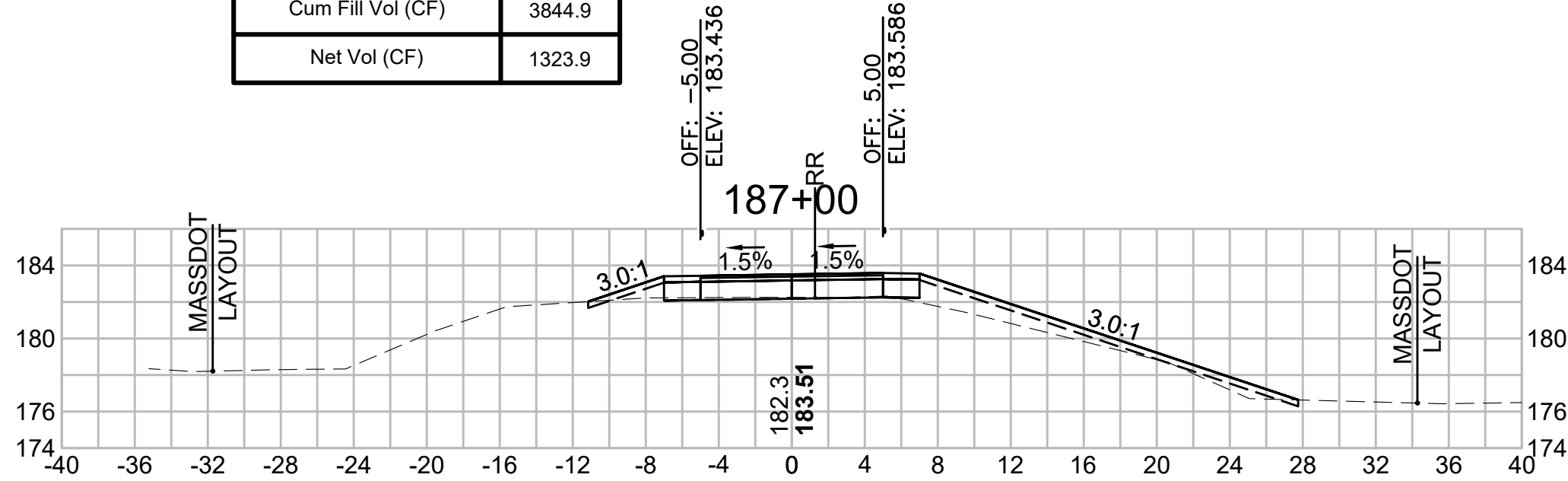
Total Volume at Station 189+00.00	
Cut Area (SF)	1.251
Fill Area (SF)	13.957
Cut Vol (CF)	2.2
Fill Vol (CF)	19.4
Cum Cut Vol (CF)	5182.5
Cum Fill Vol (CF)	3904.9
Net Vol (CF)	1277.6



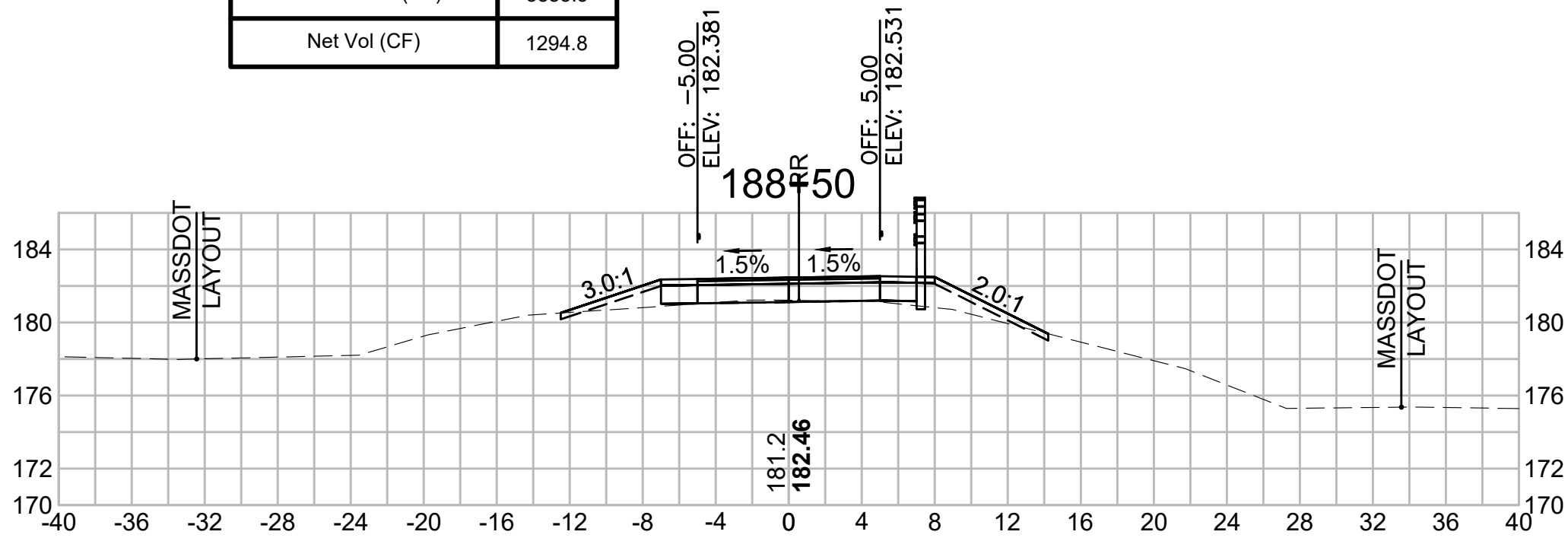
Total Volume at Station 185+50.00	
Cut Area (SF)	1.227
Fill Area (SF)	6.499
Cut Vol (CF)	3.0
Fill Vol (CF)	15.8
Cum Cut Vol (CF)	5164.4
Cum Fill Vol (CF)	3791.7
Net Vol (CF)	1372.7



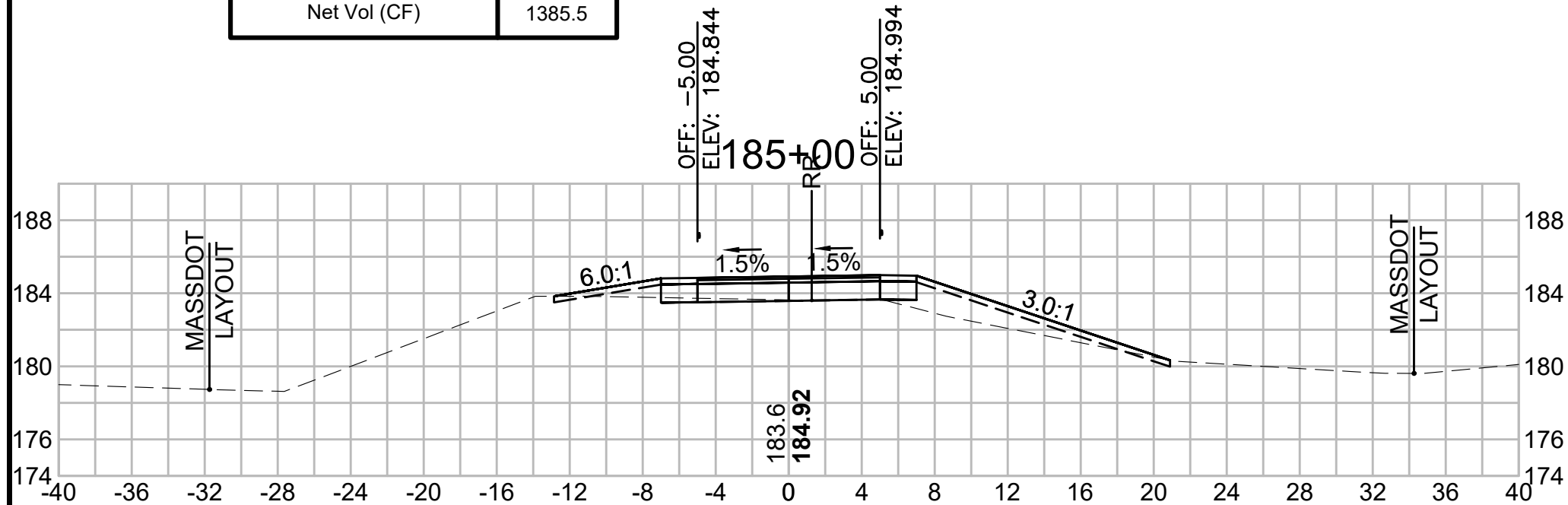
Total Volume at Station 187+00.00	
Cut Area (SF)	1.507
Fill Area (SF)	10.401
Cut Vol (CF)	1.9
Fill Vol (CF)	24.3
Cum Cut Vol (CF)	5168.8
Cum Fill Vol (CF)	3844.9
Net Vol (CF)	1323.9



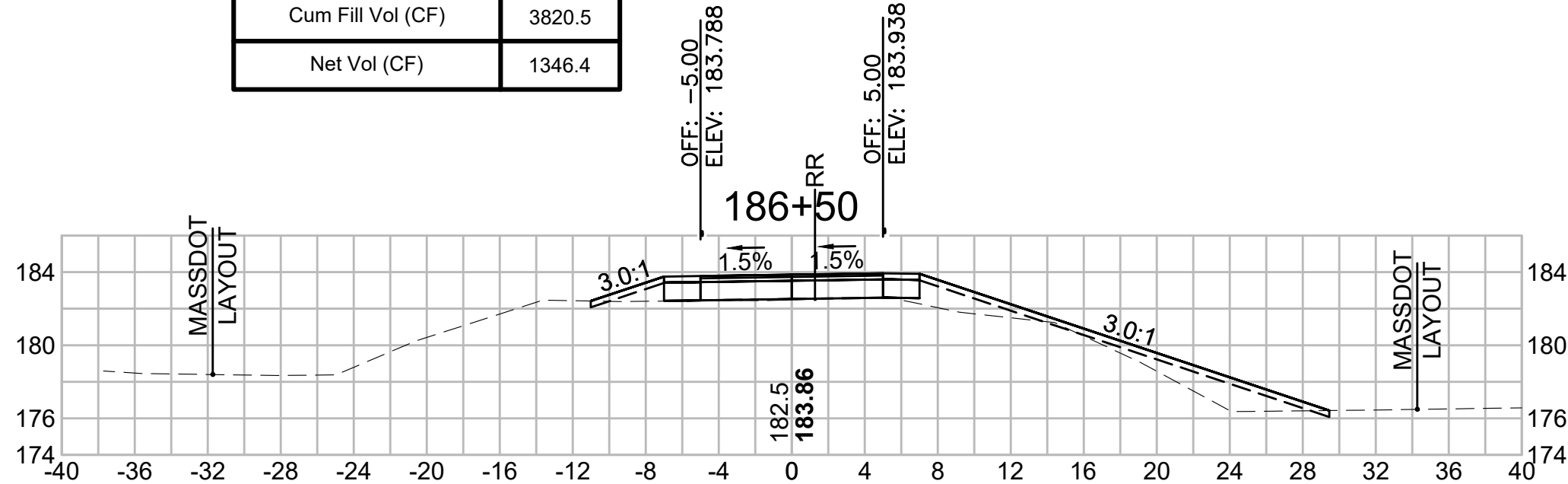
Total Volume at Station 188+50.00	
Cut Area (SF)	1.109
Fill Area (SF)	6.981
Cut Vol (CF)	2.4
Fill Vol (CF)	12.1
Cum Cut Vol (CF)	5180.4
Cum Fill Vol (CF)	3885.5
Net Vol (CF)	1294.8



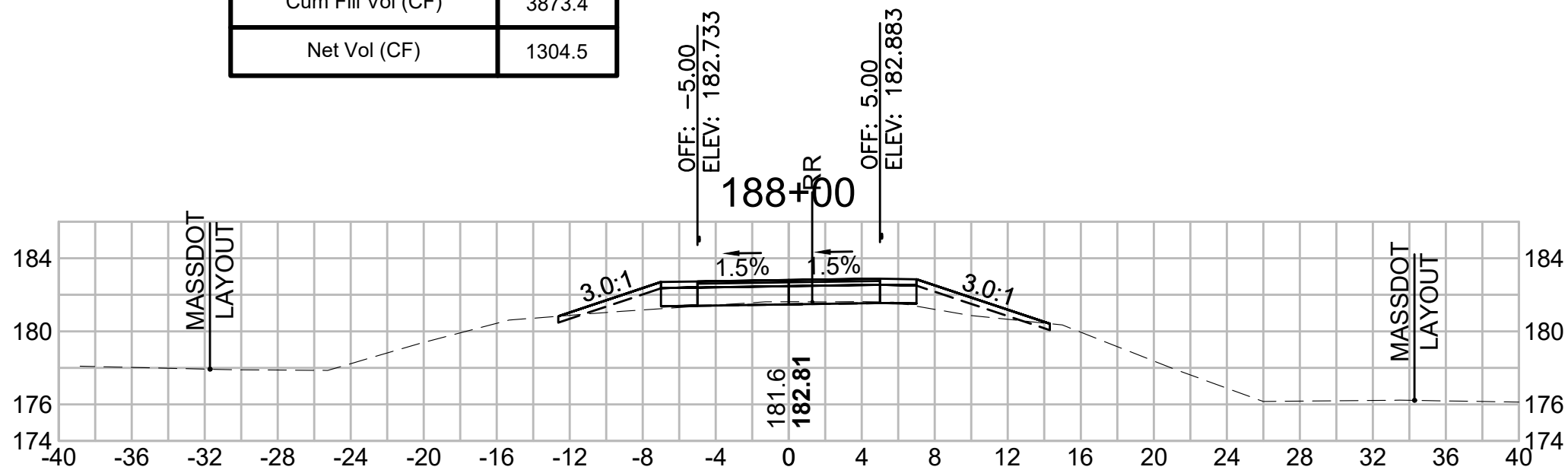
Total Volume at Station 185+00.00	
Cut Area (SF)	1.999
Fill Area (SF)	10.564
Cut Vol (CF)	2.9
Fill Vol (CF)	12.9
Cum Cut Vol (CF)	5161.4
Cum Fill Vol (CF)	3775.9
Net Vol (CF)	1385.5



Total Volume at Station 186+50.00	
Cut Area (SF)	0.508
Fill Area (SF)	15.875
Cut Vol (CF)	0.9
Fill Vol (CF)	18.7
Cum Cut Vol (CF)	5166.9
Cum Fill Vol (CF)	3820.5
Net Vol (CF)	1346.4

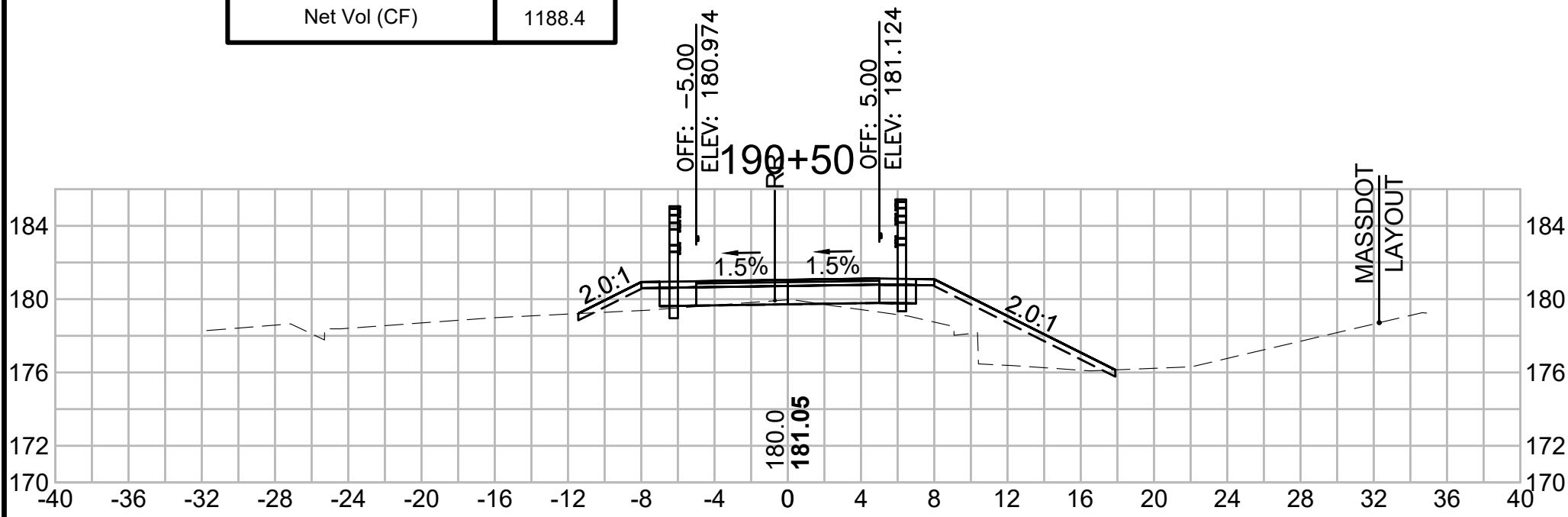


Total Volume at Station 188+00.00	
Cut Area (SF)	1.534
Fill Area (SF)	6.123
Cut Vol (CF)	4.6
Fill Vol (CF)	12.3
Cum Cut Vol (CF)	5177.9
Cum Fill Vol (CF)	3873.4
Net Vol (CF)	1304.5

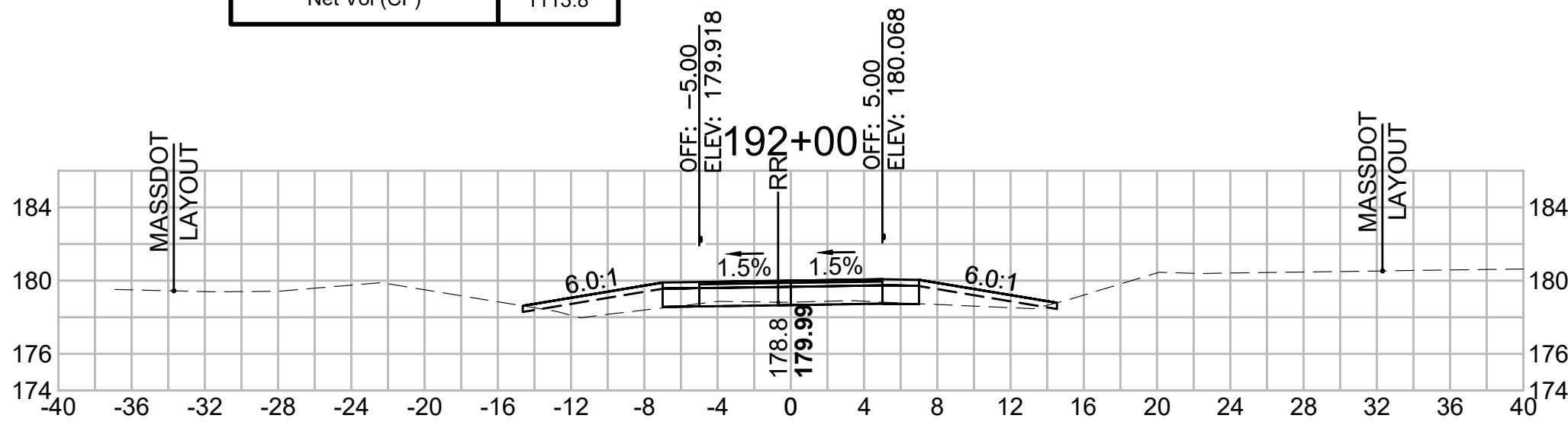


CROSS SECTIONS

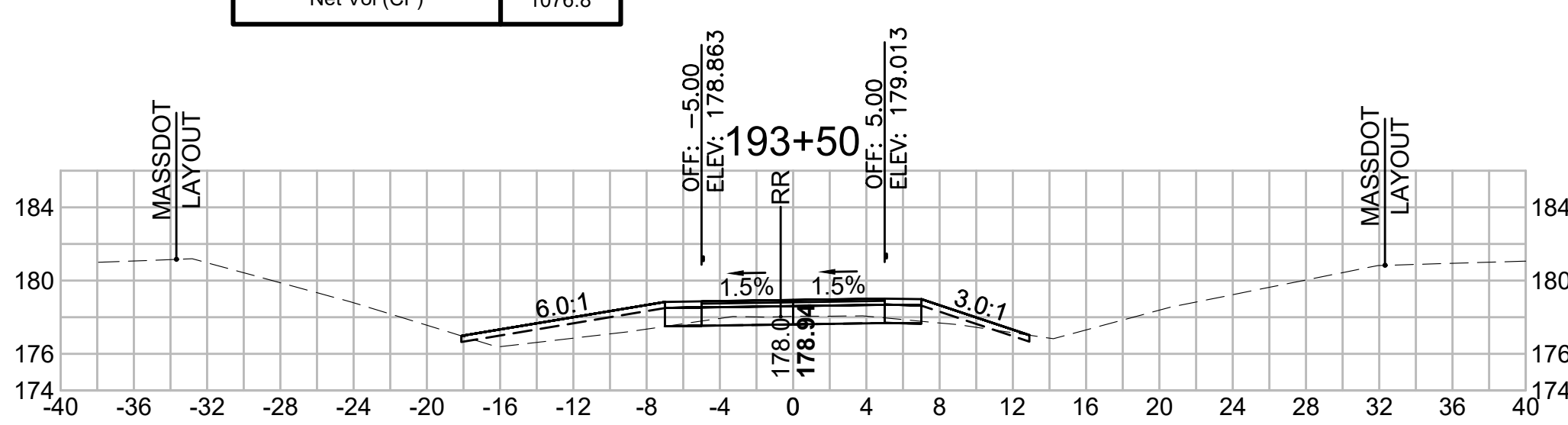
Total Volume at Station 190+50.00	
Cut Area (SF)	1.044
Fill Area (SF)	21.744
Cut Vol (CF)	1.9
Fill Vol (CF)	36.0
Cum Cut Vol (CF)	5188.8
Cum Fill Vol (CF)	4000.5
Net Vol (CF)	1188.4



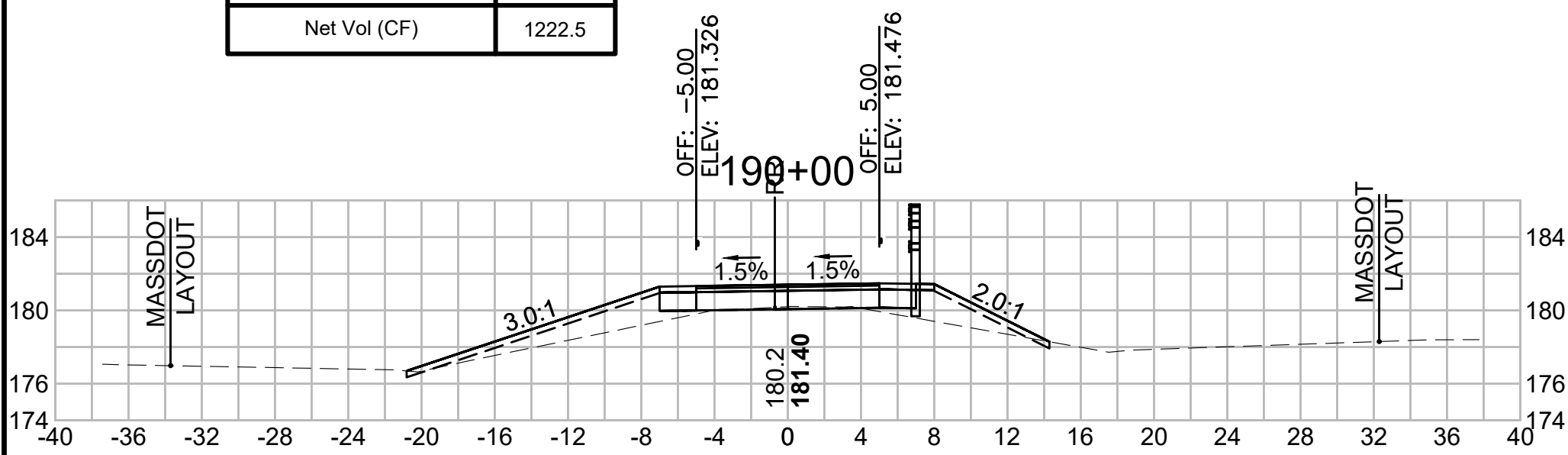
Total Volume at Station 192+00.00	
Cut Area (SF)	2.351
Fill Area (SF)	8.757
Cut Vol (CF)	4.1
Fill Vol (CF)	20.9
Cum Cut Vol (CF)	5199.7
Cum Fill Vol (CF)	4085.8
Net Vol (CF)	1113.8



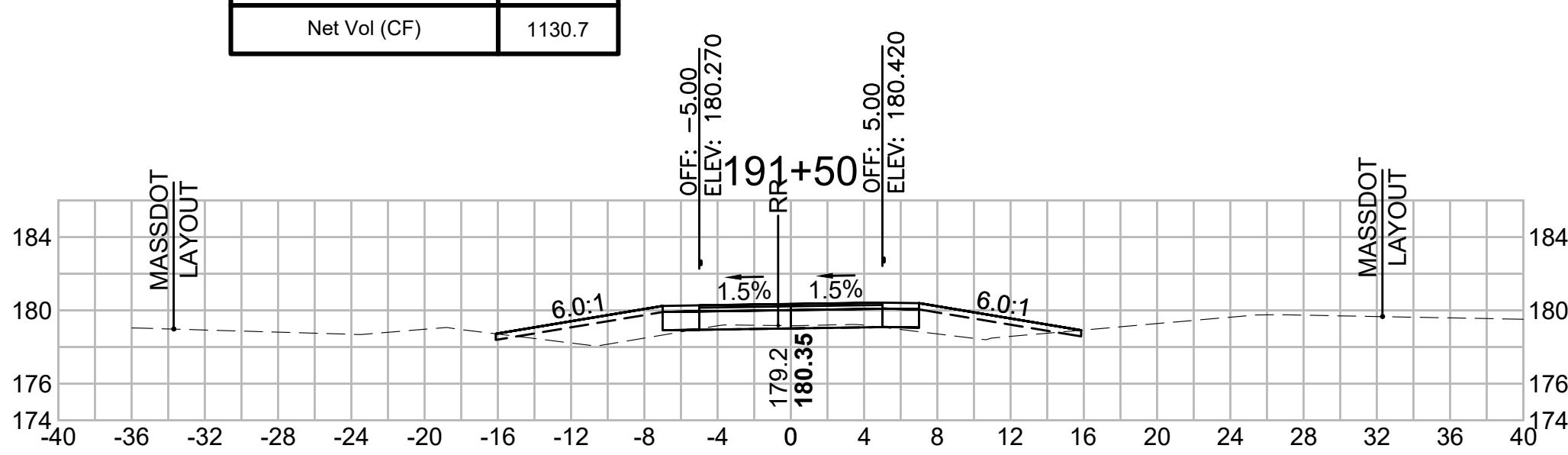
Total Volume at Station 193+50.00	
Cut Area (SF)	5.195
Fill Area (SF)	9.553
Cut Vol (CF)	8.1
Fill Vol (CF)	20.9
Cum Cut Vol (CF)	5220.0
Cum Fill Vol (CF)	4143.2
Net Vol (CF)	1076.8



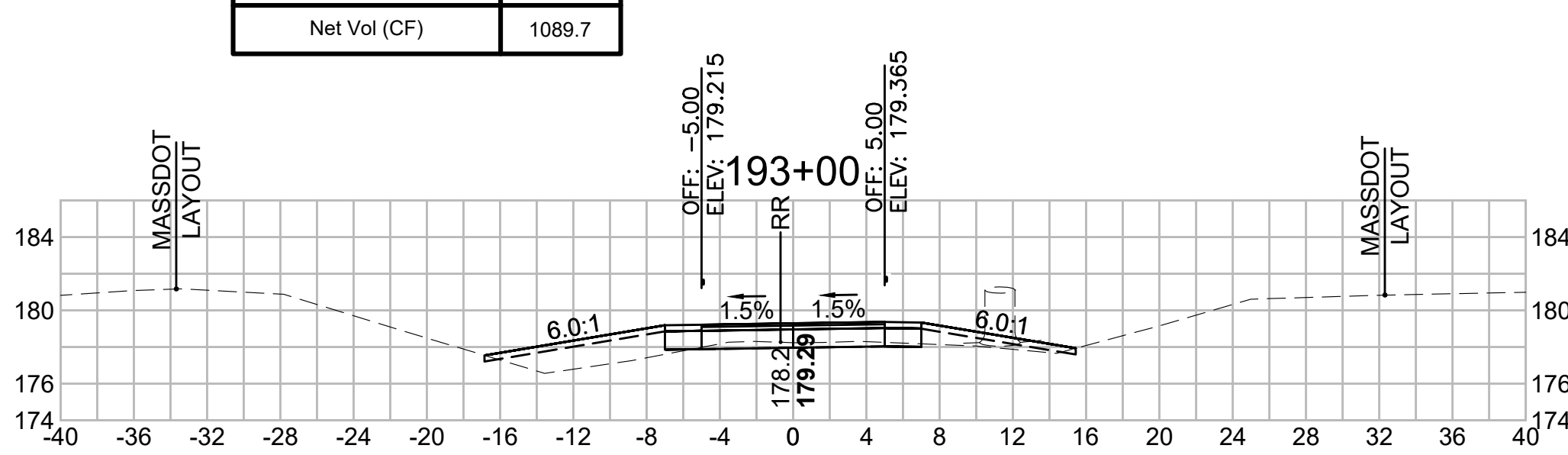
Total Volume at Station 190+00.00	
Cut Area (SF)	0.993
Fill Area (SF)	17.137
Cut Vol (CF)	2.1
Fill Vol (CF)	31.2
Cum Cut Vol (CF)	5186.9
Cum Fill Vol (CF)	3964.5
Net Vol (CF)	1222.5



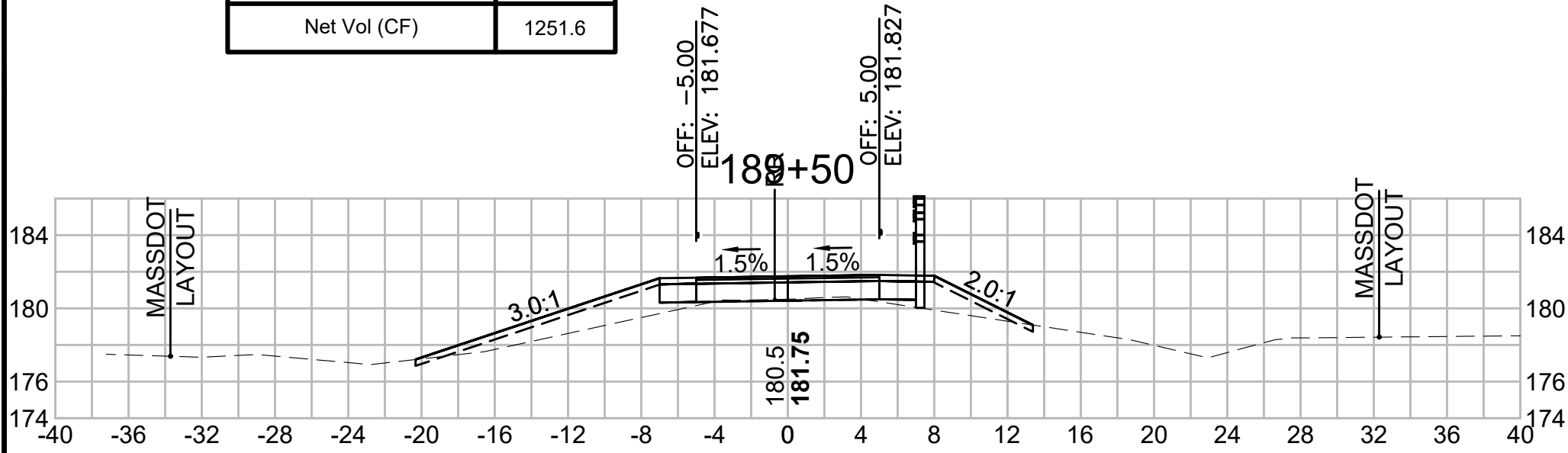
Total Volume at Station 191+50.00	
Cut Area (SF)	2.027
Fill Area (SF)	13.777
Cut Vol (CF)	3.9
Fill Vol (CF)	28.6
Cum Cut Vol (CF)	5195.6
Cum Fill Vol (CF)	4065.0
Net Vol (CF)	1130.7



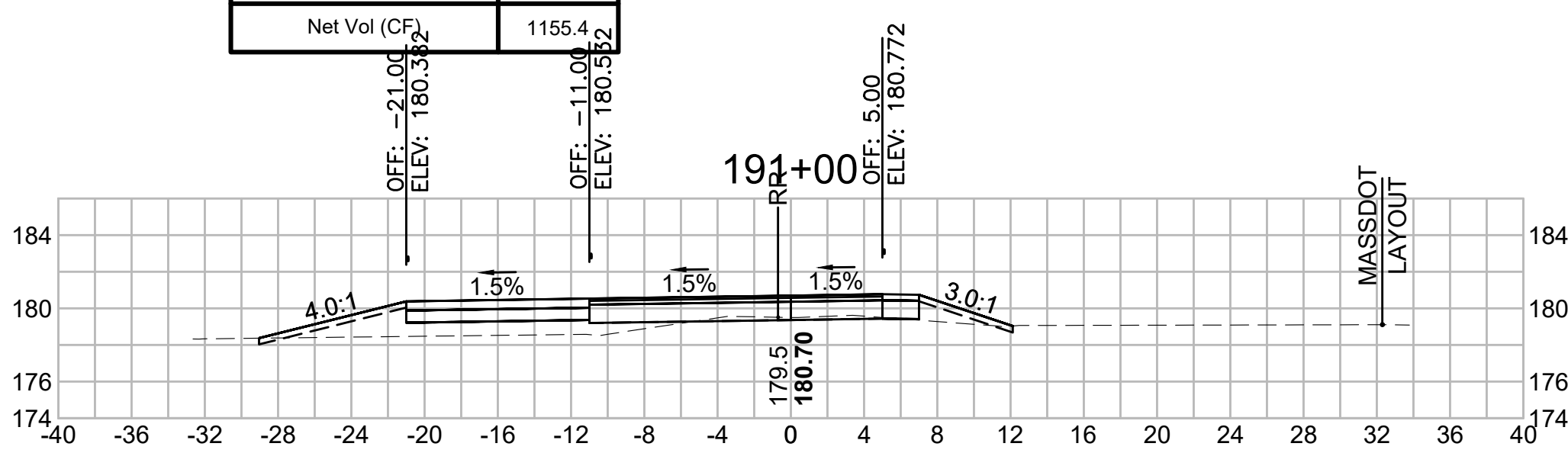
Total Volume at Station 193+00.00	
Cut Area (SF)	3.586
Fill Area (SF)	13.067
Cut Vol (CF)	6.7
Fill Vol (CF)	20.2
Cum Cut Vol (CF)	5211.9
Cum Fill Vol (CF)	4122.2
Net Vol (CF)	1089.7



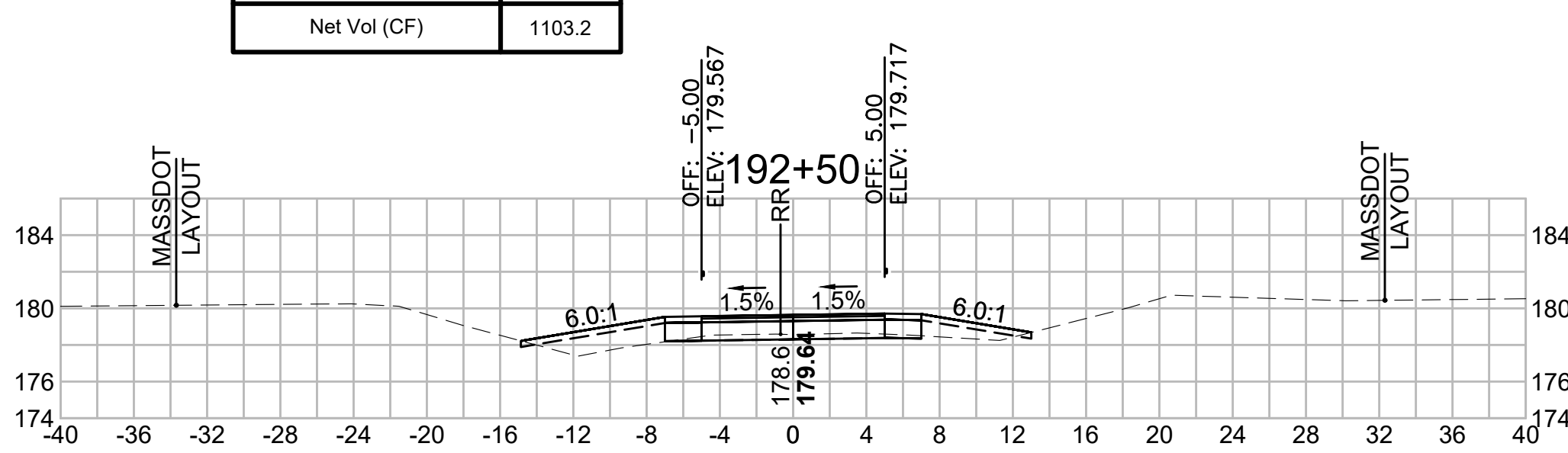
Total Volume at Station 189+50.00	
Cut Area (SF)	1.247
Fill Area (SF)	16.603
Cut Vol (CF)	2.3
Fill Vol (CF)	28.3
Cum Cut Vol (CF)	5184.9
Cum Fill Vol (CF)	3933.2
Net Vol (CF)	1251.6



Total Volume at Station 191+00.00	
Cut Area (SF)	2.143
Fill Area (SF)	17.079
Cut Vol (CF)	3.0
Fill Vol (CF)	35.9
Cum Cut Vol (CF)	5191.8
Cum Fill Vol (CF)	4036.4
Net Vol (CF)	1155.4

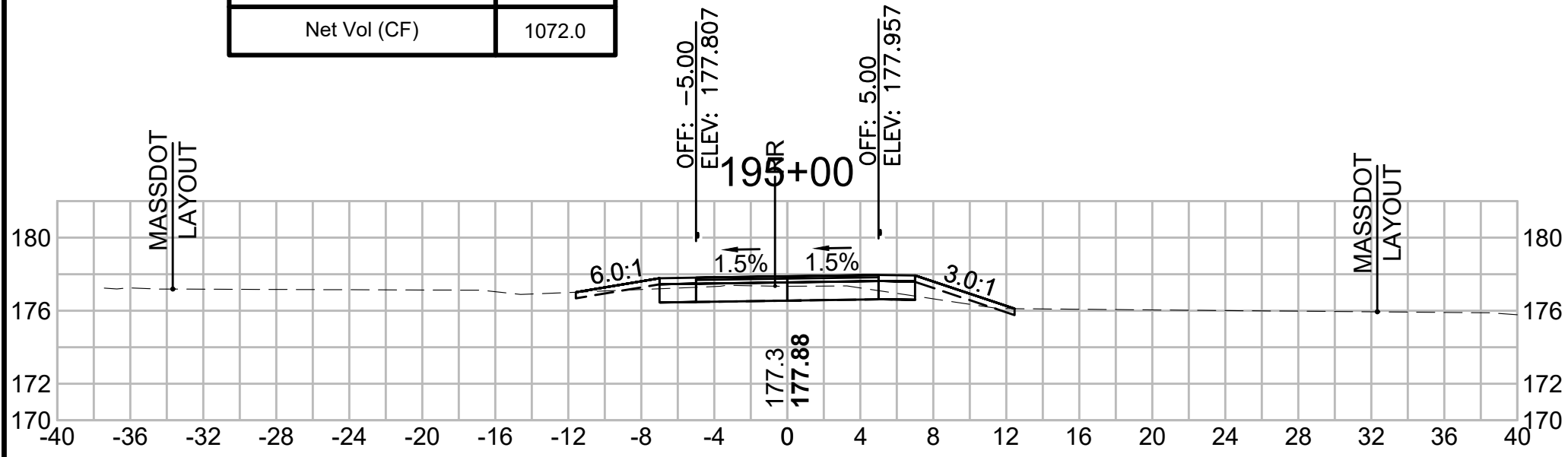


Total Volume at Station 192+50.00	
Cut Area (SF)	3.617
Fill Area (SF)	8.735
Cut Vol (CF)	5.5
Fill Vol (CF)	16.2
Cum Cut Vol (CF)	5205.2
Cum Fill Vol (CF)	4102.0
Net Vol (CF)	1103.2

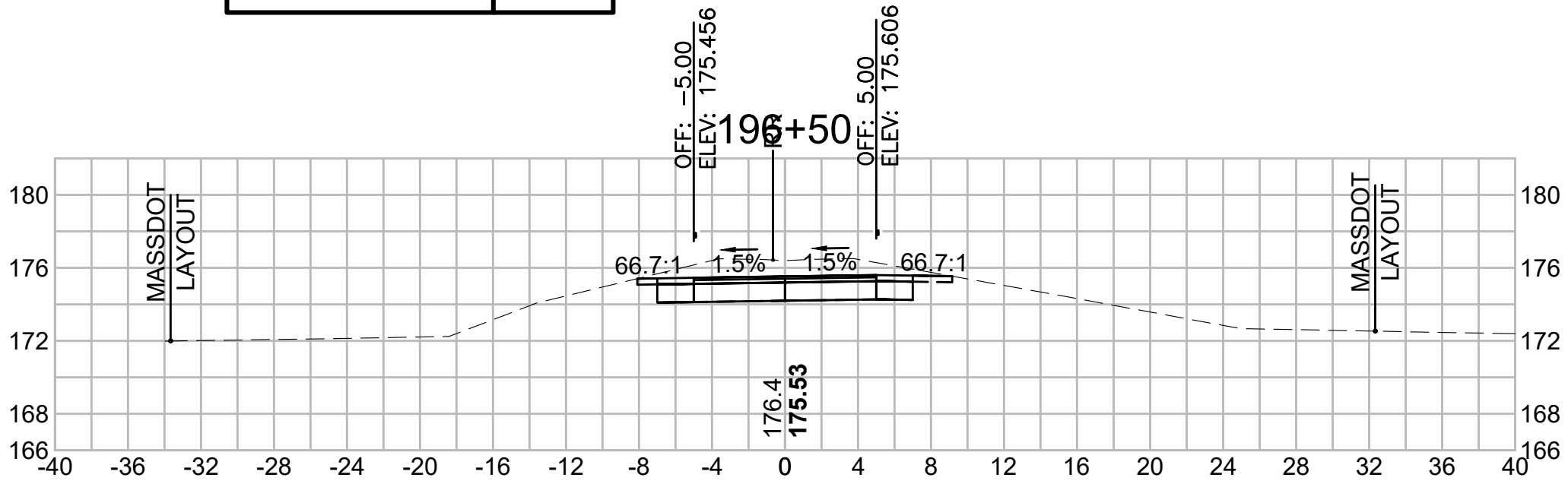


CROSS SECTIONS

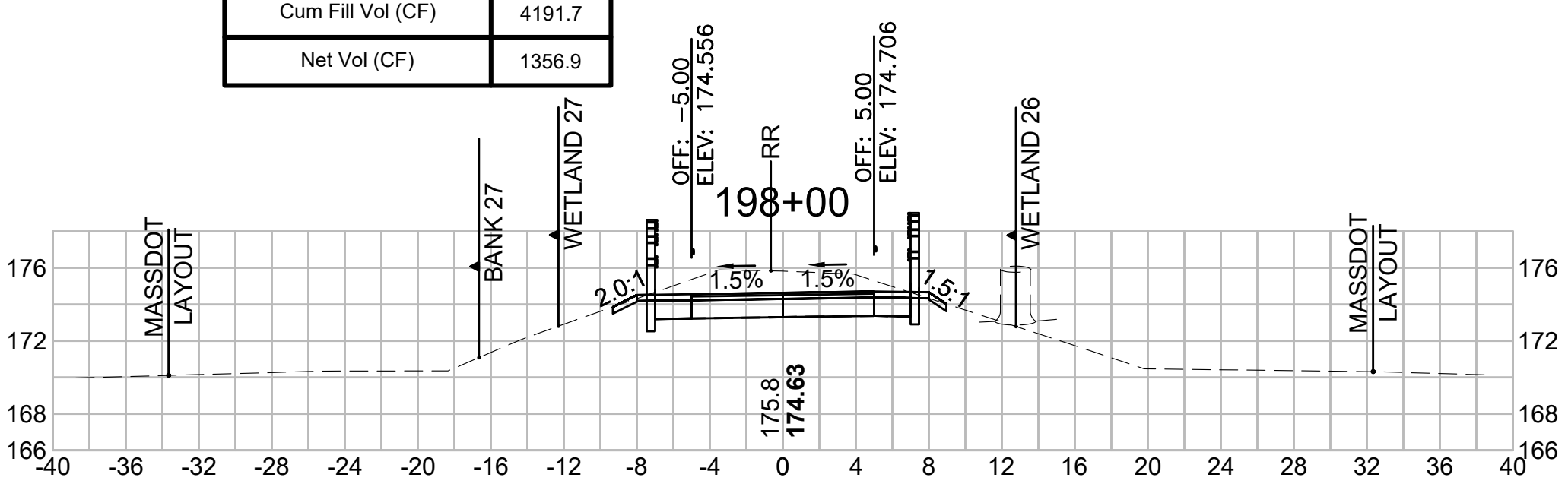
Total Volume at Station 195+00.00	
Cut Area (SF)	10.625
Fill Area (SF)	1.877
Cut Vol (CF)	15.3
Fill Vol (CF)	11.2
Cum Cut Vol (CF)	5257.8
Cum Fill Vol (CF)	4185.8
Net Vol (CF)	1072.0



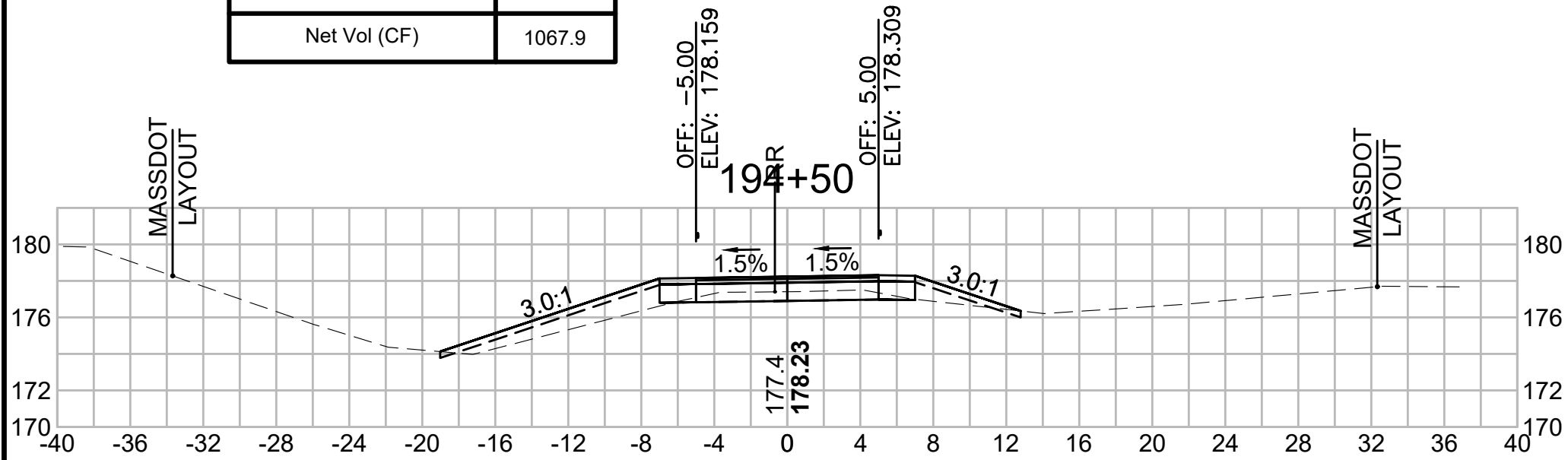
Total Volume at Station 196+50.00	
Cut Area (SF)	31.301
Fill Area (SF)	0.000
Cut Vol (CF)	47.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5354.8
Cum Fill Vol (CF)	4191.7
Net Vol (CF)	1163.1



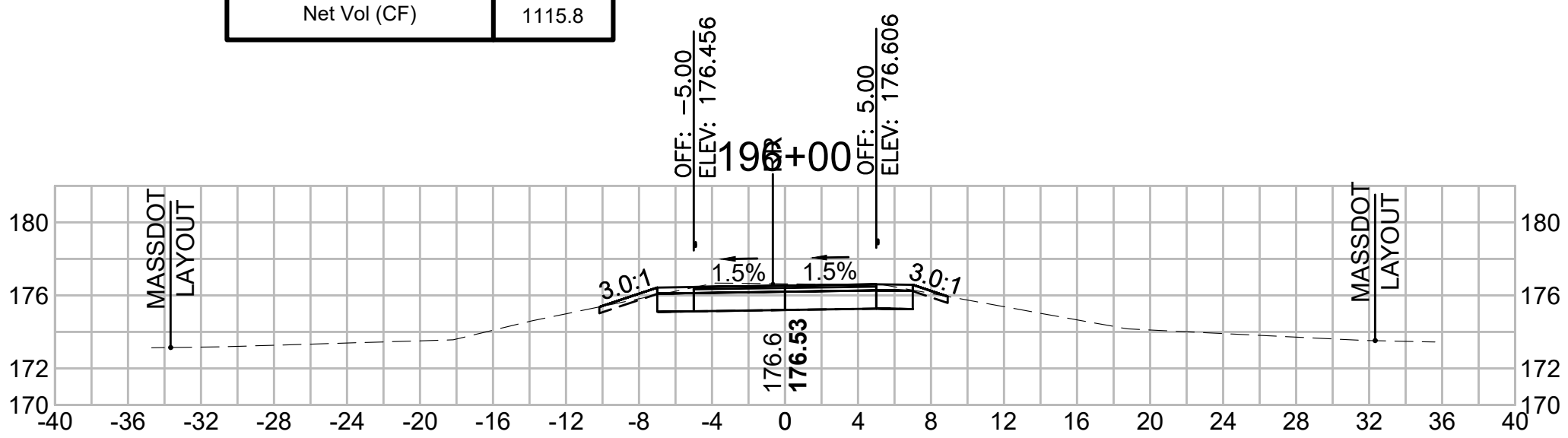
Total Volume at Station 198+00.00	
Cut Area (SF)	32.247
Fill Area (SF)	0.000
Cut Vol (CF)	62.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5548.6
Cum Fill Vol (CF)	4191.7
Net Vol (CF)	1356.9



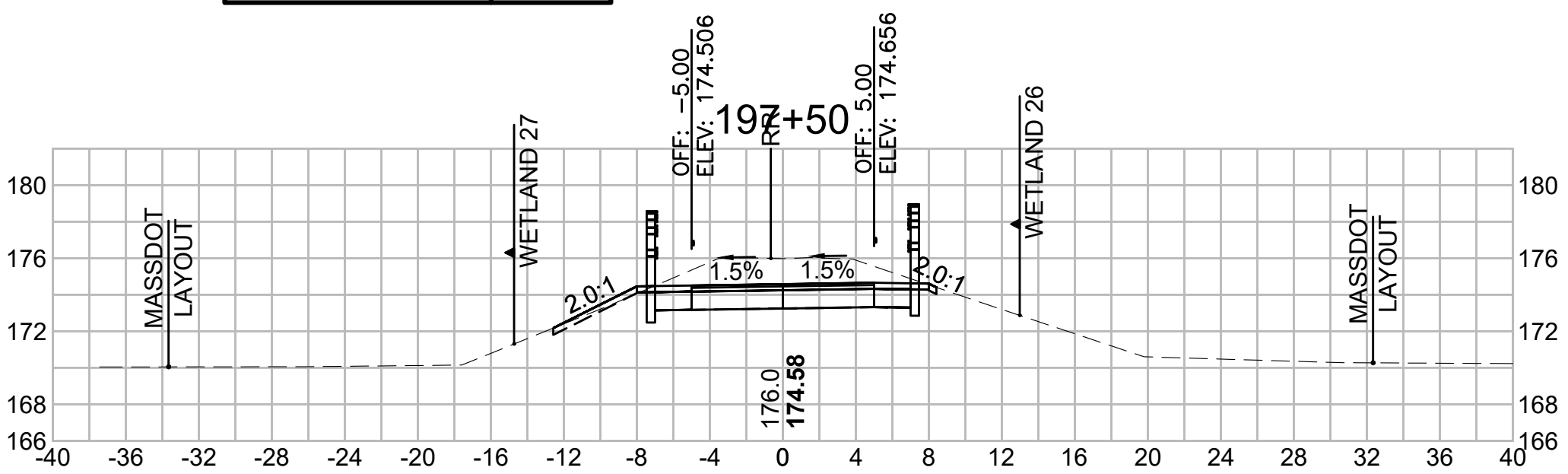
Total Volume at Station 194+50.00	
Cut Area (SF)	5.936
Fill Area (SF)	10.223
Cut Vol (CF)	11.6
Fill Vol (CF)	16.0
Cum Cut Vol (CF)	5242.4
Cum Fill Vol (CF)	4174.6
Net Vol (CF)	1067.9



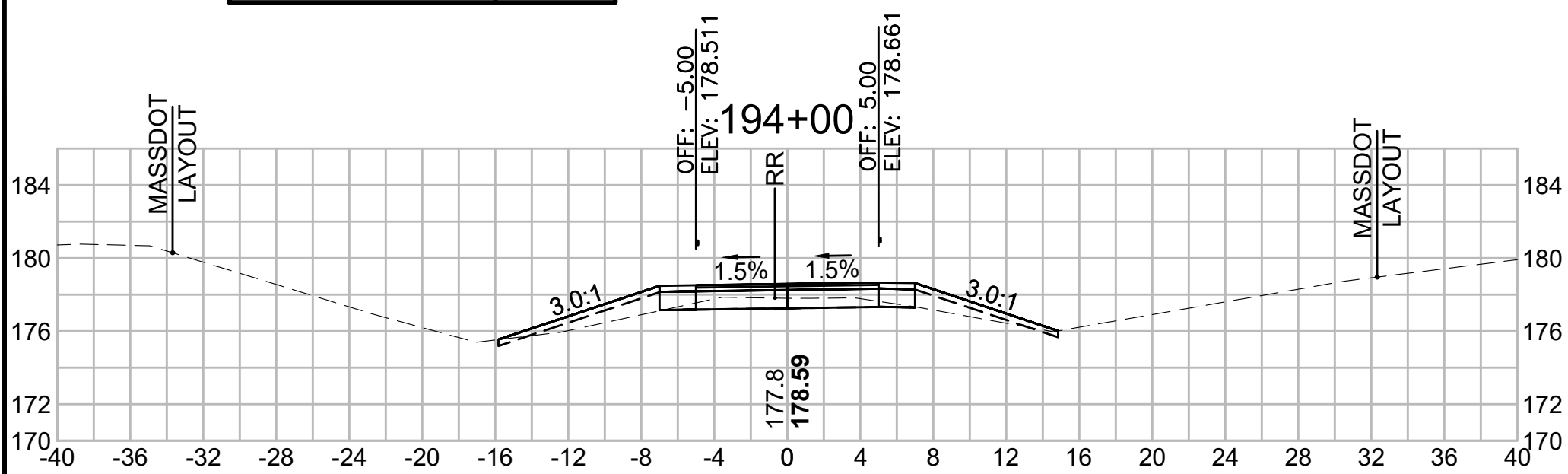
Total Volume at Station 196+00.00	
Cut Area (SF)	19.737
Fill Area (SF)	0.012
Cut Vol (CF)	29.1
Fill Vol (CF)	2.1
Cum Cut Vol (CF)	5307.5
Cum Fill Vol (CF)	4191.7
Net Vol (CF)	1115.8



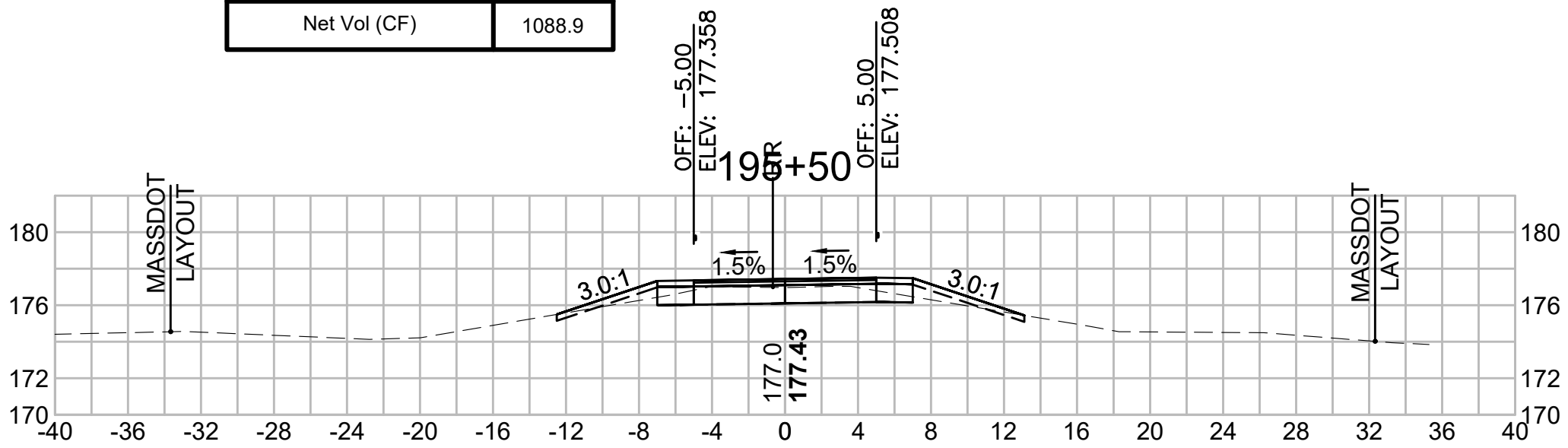
Total Volume at Station 197+50.00	
Cut Area (SF)	35.520
Fill Area (SF)	0.012
Cut Vol (CF)	67.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5485.9
Cum Fill Vol (CF)	4191.7
Net Vol (CF)	1294.2



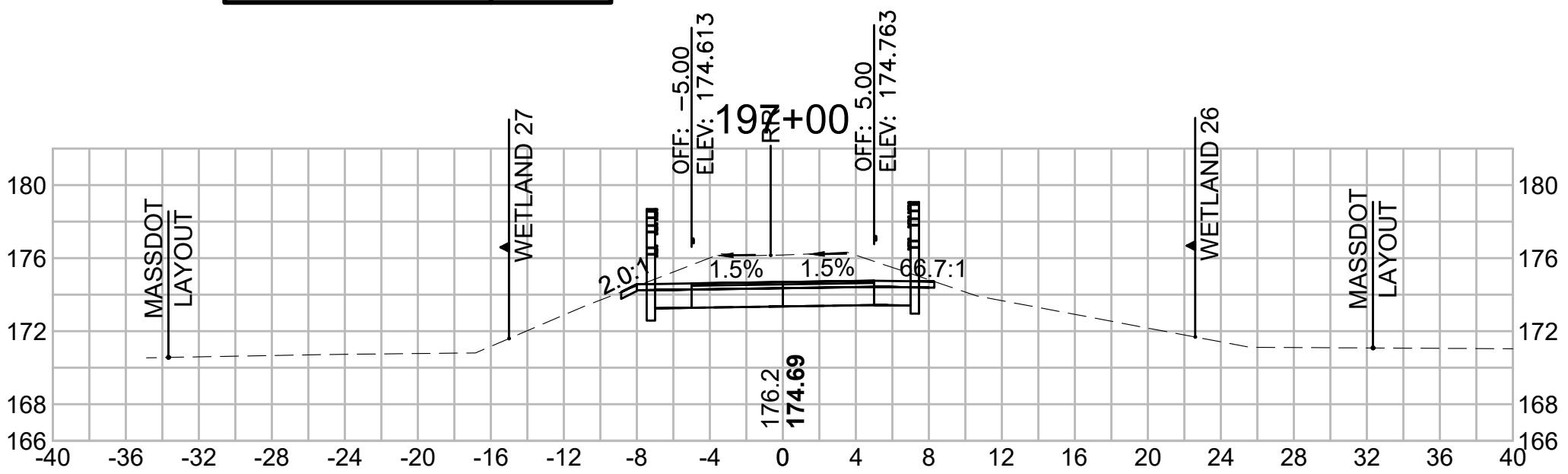
Total Volume at Station 194+00.00	
Cut Area (SF)	6.552
Fill Area (SF)	7.062
Cut Vol (CF)	10.9
Fill Vol (CF)	15.4
Cum Cut Vol (CF)	5230.9
Cum Fill Vol (CF)	4158.5
Net Vol (CF)	1072.3



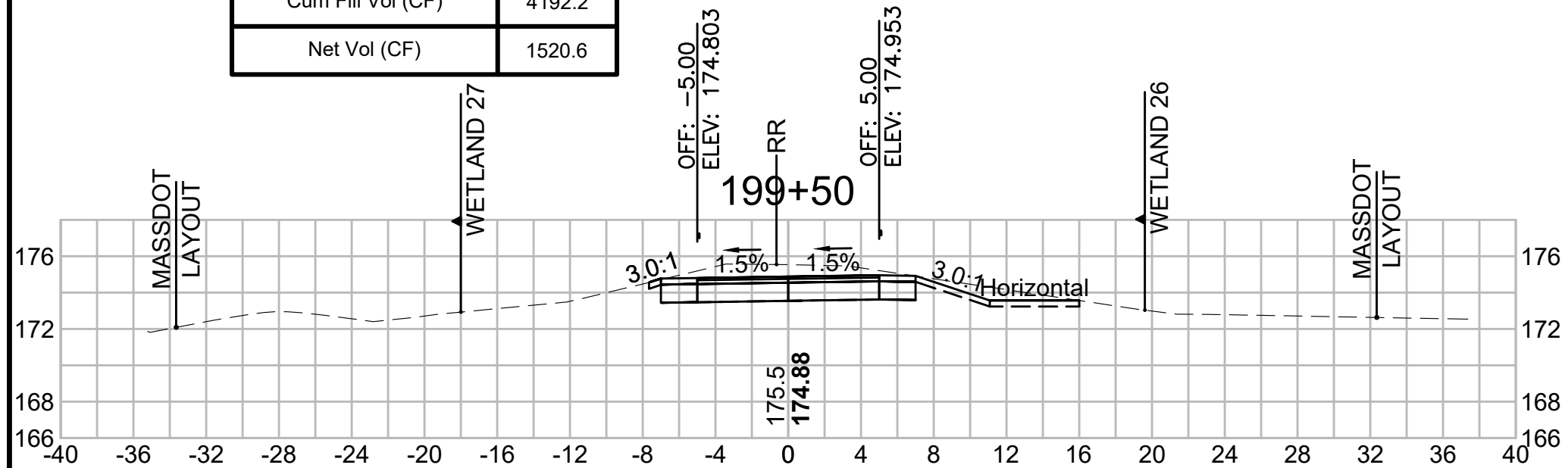
Total Volume at Station 195+50.00	
Cut Area (SF)	11.672
Fill Area (SF)	2.250
Cut Vol (CF)	20.6
Fill Vol (CF)	3.8
Cum Cut Vol (CF)	5278.4
Cum Fill Vol (CF)	4189.6
Net Vol (CF)	1088.9



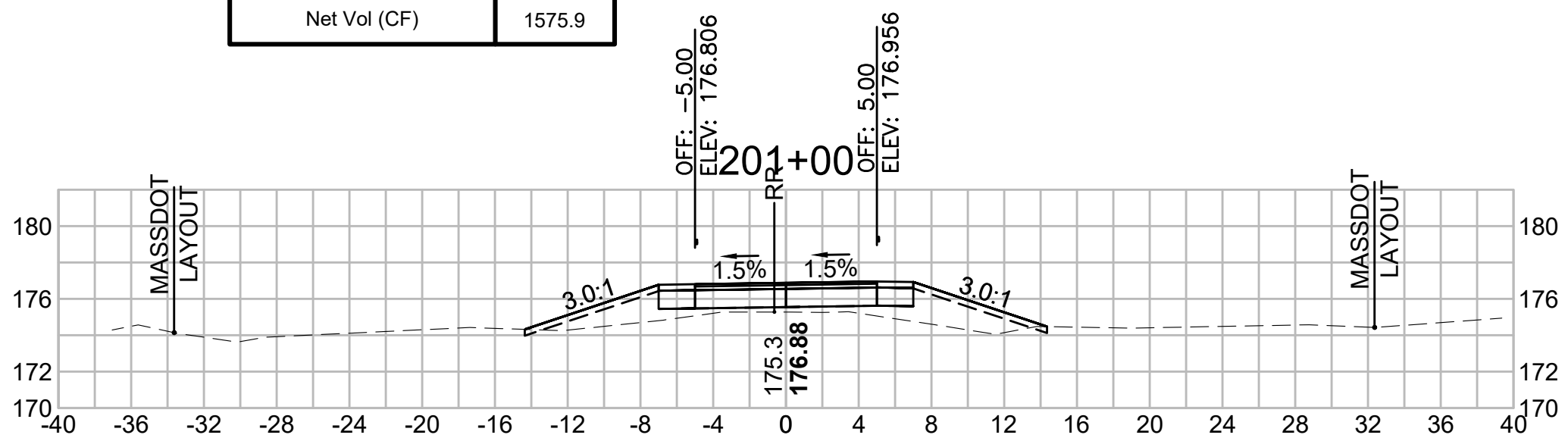
Total Volume at Station 197+00.00	
Cut Area (SF)	37.377
Fill Area (SF)	0.000
Cut Vol (CF)	63.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	5418.4
Cum Fill Vol (CF)	4191.7
Net Vol (CF)	1226.7



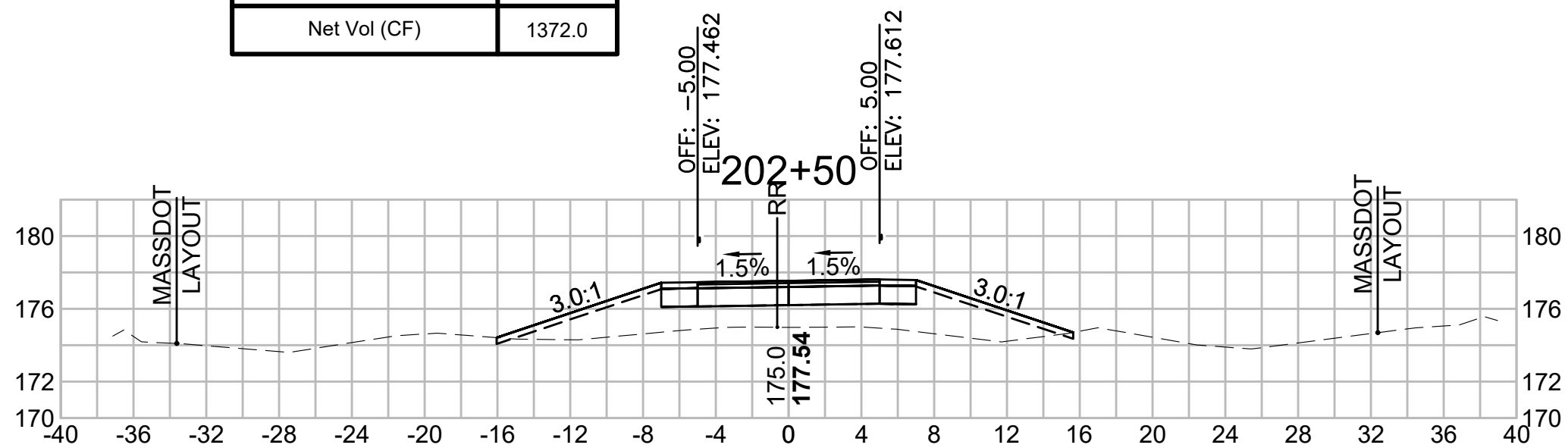
Total Volume at Station 199+50.00	
Cut Area (SF)	28.820
Fill Area (SF)	0.000
Cut Vol (CF)	52.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	5712.9
Cum Fill Vol (CF)	4192.2
Net Vol (CF)	1520.6



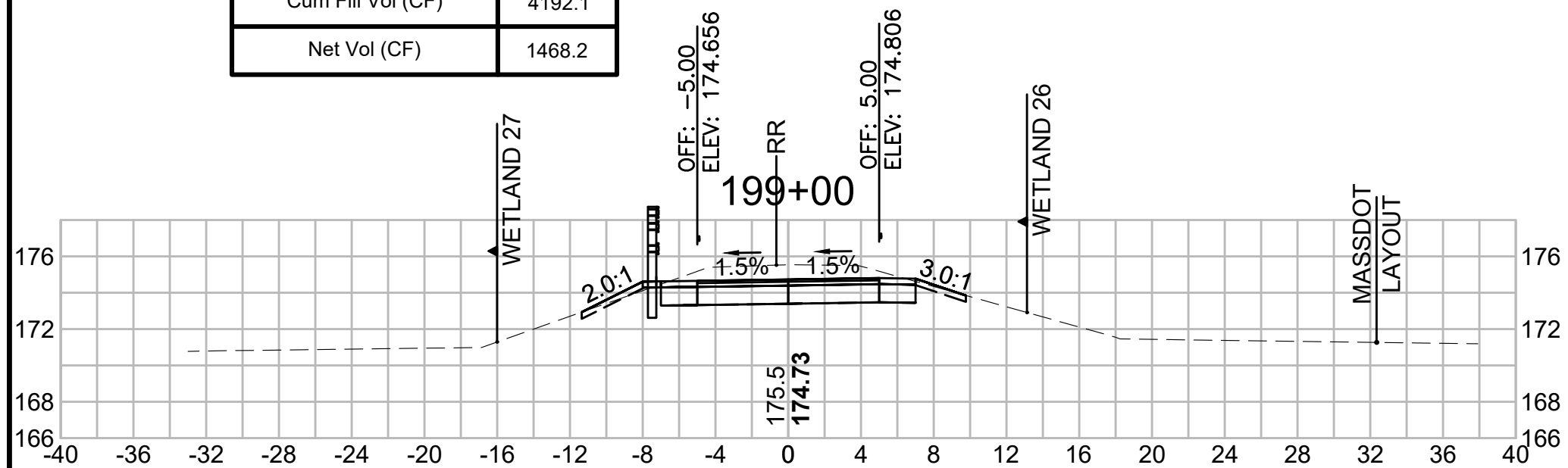
Total Volume at Station 201+00.00	
Cut Area (SF)	0.342
Fill Area (SF)	18.524
Cut Vol (CF)	6.7
Fill Vol (CF)	20.8
Cum Cut Vol (CF)	5794.2
Cum Fill Vol (CF)	4218.3
Net Vol (CF)	1575.9



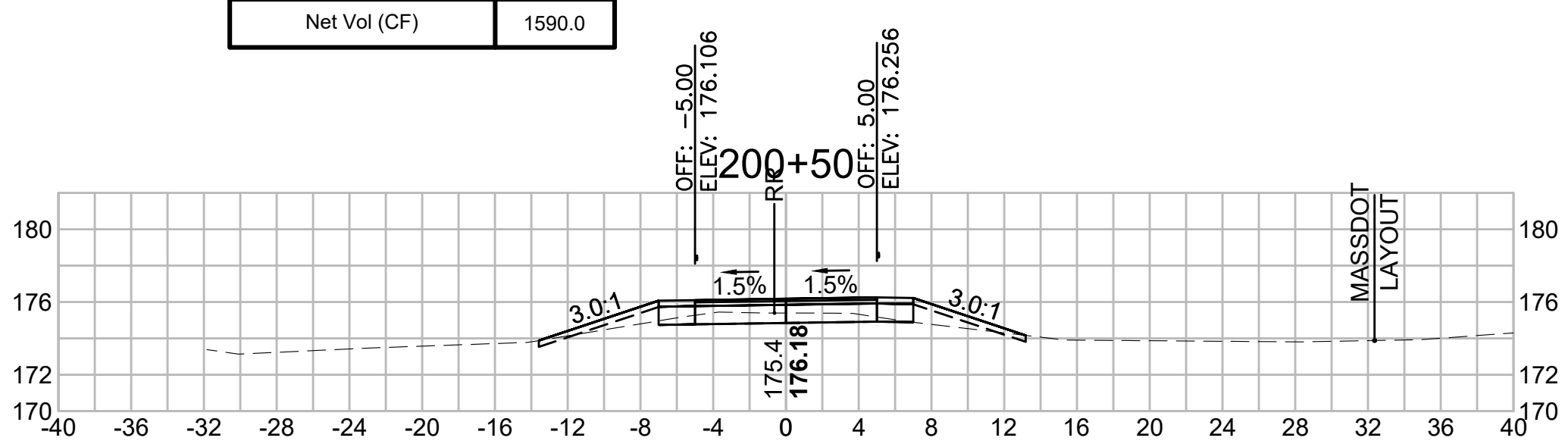
Total Volume at Station 202+50.00	
Cut Area (SF)	0.271
Fill Area (SF)	40.025
Cut Vol (CF)	0.5
Fill Vol (CF)	76.3
Cum Cut Vol (CF)	5795.9
Cum Fill Vol (CF)	4423.8
Net Vol (CF)	1372.0



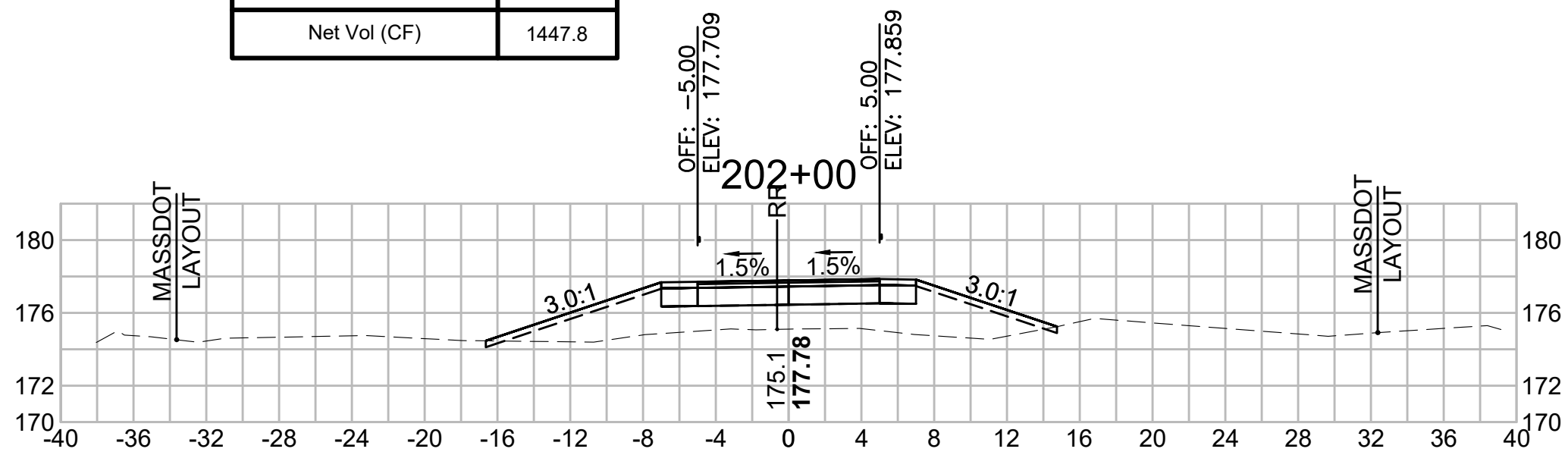
Total Volume at Station 199+00.00	
Cut Area (SF)	27.859
Fill Area (SF)	0.092
Cut Vol (CF)	53.9
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	5660.4
Cum Fill Vol (CF)	4192.1
Net Vol (CF)	1468.2



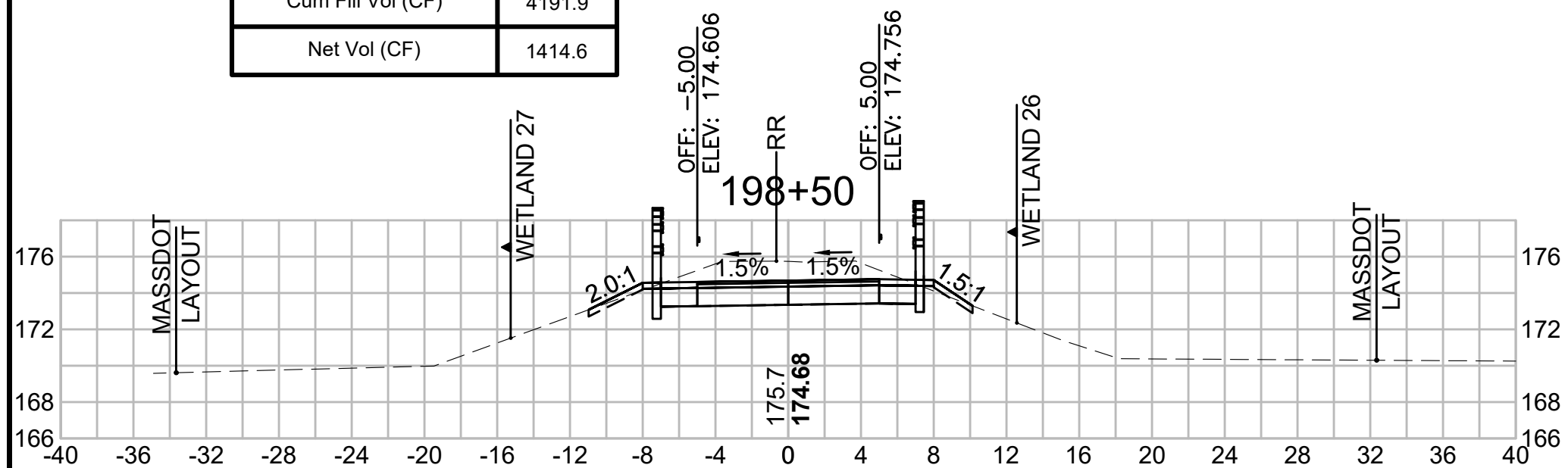
Total Volume at Station 200+50.00	
Cut Area (SF)	6.947
Fill Area (SF)	3.966
Cut Vol (CF)	27.2
Fill Vol (CF)	4.5
Cum Cut Vol (CF)	5787.5
Cum Fill Vol (CF)	4197.5
Net Vol (CF)	1590.0



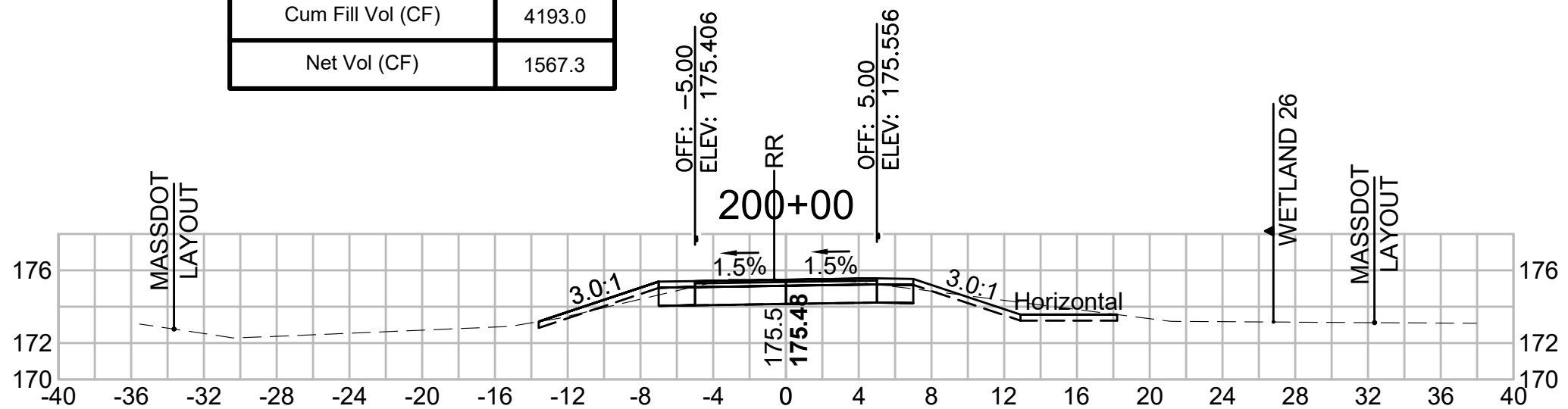
Total Volume at Station 202+00.00	
Cut Area (SF)	0.293
Fill Area (SF)	42.344
Cut Vol (CF)	0.5
Fill Vol (CF)	75.6
Cum Cut Vol (CF)	5795.3
Cum Fill Vol (CF)	4347.6
Net Vol (CF)	1447.8



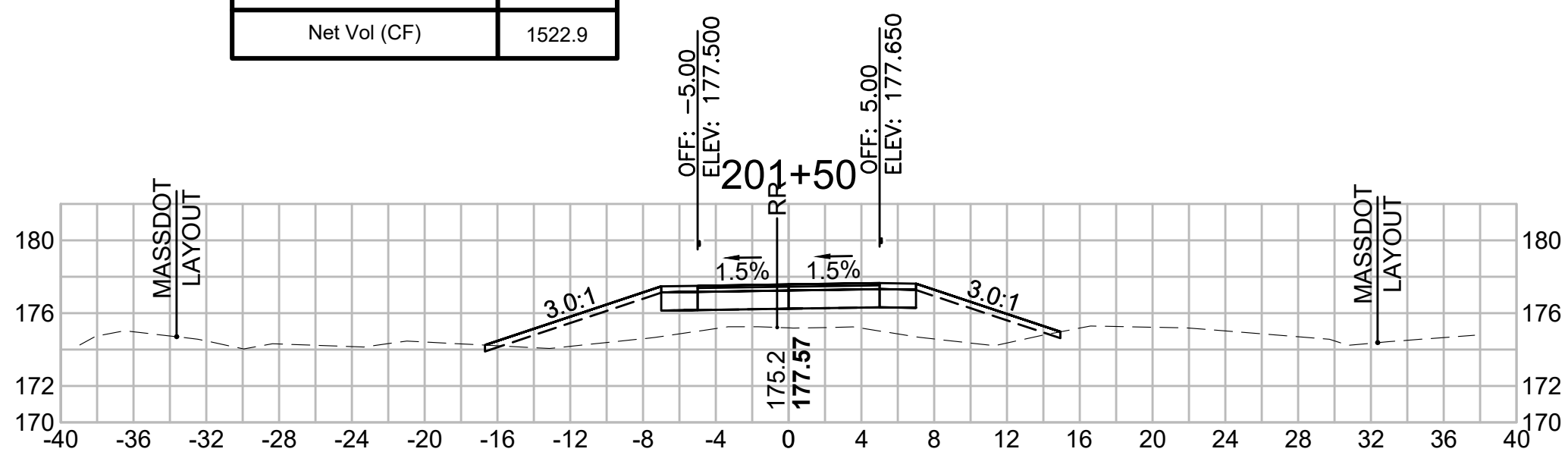
Total Volume at Station 198+50.00	
Cut Area (SF)	30.312
Fill Area (SF)	0.190
Cut Vol (CF)	57.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5606.5
Cum Fill Vol (CF)	4191.9
Net Vol (CF)	1414.6



Total Volume at Station 200+00.00	
Cut Area (SF)	22.409
Fill Area (SF)	0.868
Cut Vol (CF)	47.4
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	5760.3
Cum Fill Vol (CF)	4193.0
Net Vol (CF)	1567.3



Total Volume at Station 201+50.00	
Cut Area (SF)	0.275
Fill Area (SF)	39.345
Cut Vol (CF)	0.6
Fill Vol (CF)	53.6
Cum Cut Vol (CF)	5794.8
Cum Fill Vol (CF)	4271.9
Net Vol (CF)	1522.9



608164_XSEC(CROSS SECTION LAYOUTS).DWG 18-Feb-2022

[illegible][illegible][illegible]

Net Vol (CF)	1237.8
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203+50

OFF: -5.00
ELEV: 176.962

OFF: 5.00
ELEV: 177.112

3:0.1

1.5%

1.5%

3:0.1

MASSDOT LAYOUT

MASSDOT LAYOUT

174.8

177.04

176

172

170

40

36

32

28

24

20

16

12

8

4

0

4

8

12

16

20

24

28

32

36

40

Net Vol (CF) 1082.8

205+00

OFF: -5.00
ELEV: 176.212

RR

OFF: 5.00
ELEV: 176.362

6.0:1

1.5%

1.5%

3.0:1

MASSDOT LAYOUT

MASSDOT LAYOUT

174.5

176.29

176

170

180

40

36

32

28

24

20

16

12

8

4

0

4

8

12

16

20

24

28

32

36

40

Cum Cut Vol (CF)	9800.7
Cum Fill Vol (CF)	4816.4
Net Vol (CF)	984.3

The profile view shows the bridge deck elevation from station -40 to +40. The deck is 20 feet wide at the centerline (CL) and has a 6.0:1 side slope. The centerline elevation is 175.56. The bridge is supported by two piers with a 1.5% slope on each side. The bridge is 20 feet wide at the centerline (CL) and has a 6.0:1 side slope. The bridge is 20 feet wide at the centerline (CL) and has a 6.0:1 side slope. The bridge is 20 feet wide at the centerline (CL) and has a 6.0:1 side slope.

Net Vol (CF)	1130.1
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OFF: -5.00
ELEV: 176.462

204+50

RR

OFF: 5.00
ELEV: 176.612

MASSDOT LAYOUT

MASSDOT LAYOUT

6.0:1

1.5:1

1.5:1

3.0:1

174.6

176.54

176.612

180

176

172

170

40

36

32

28

24

20

16

12

8

4

0

4

8

12

16

20

24

28

32

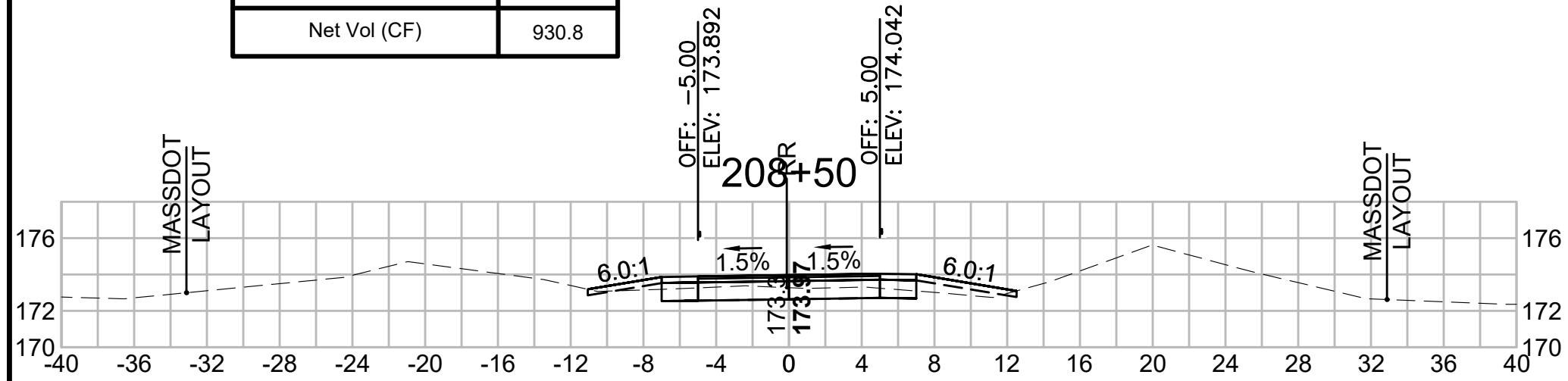
36

40

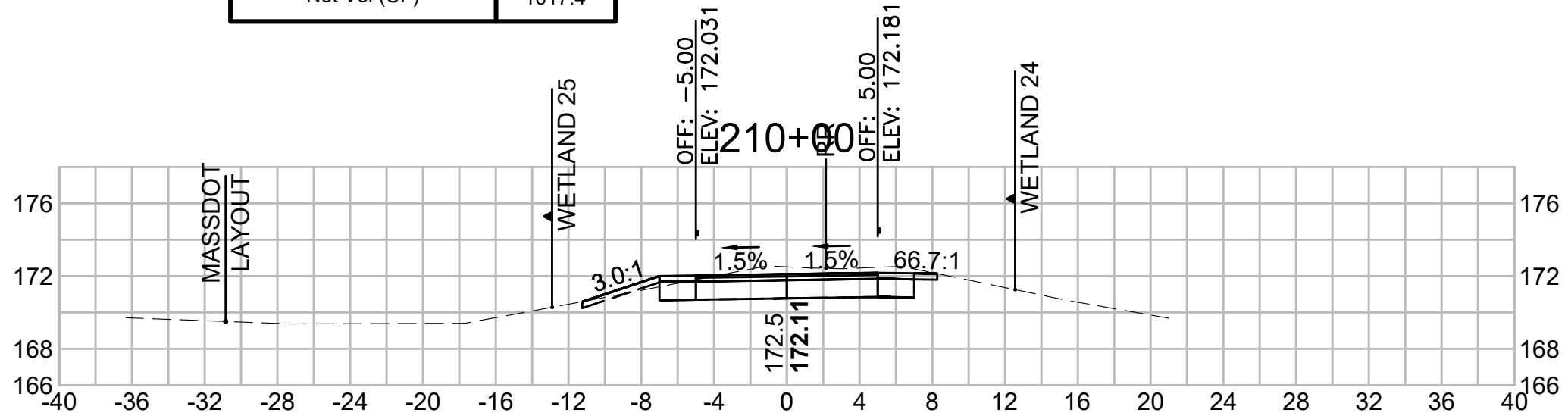
Cum Cut Vol (CF)	5800.0
Cum Fill Vol (CF)	4791.4
Net Vol (CF)	1008.6

Diagram details: The road cross-section is centered at station 20+00 with a centerline elevation of 175.712. The road width is 20 feet. The side slopes are 6.0:1. The grades on either side of the centerline are 15%. The diagram is flanked by 'MASSDOT LAYOUT' on both sides. A table at the top left provides cumulative volumes: Cum Cut Vol (CF) 5800.0, Cum Fill Vol (CF) 4791.4, and Net Vol (CF) 1008.6.

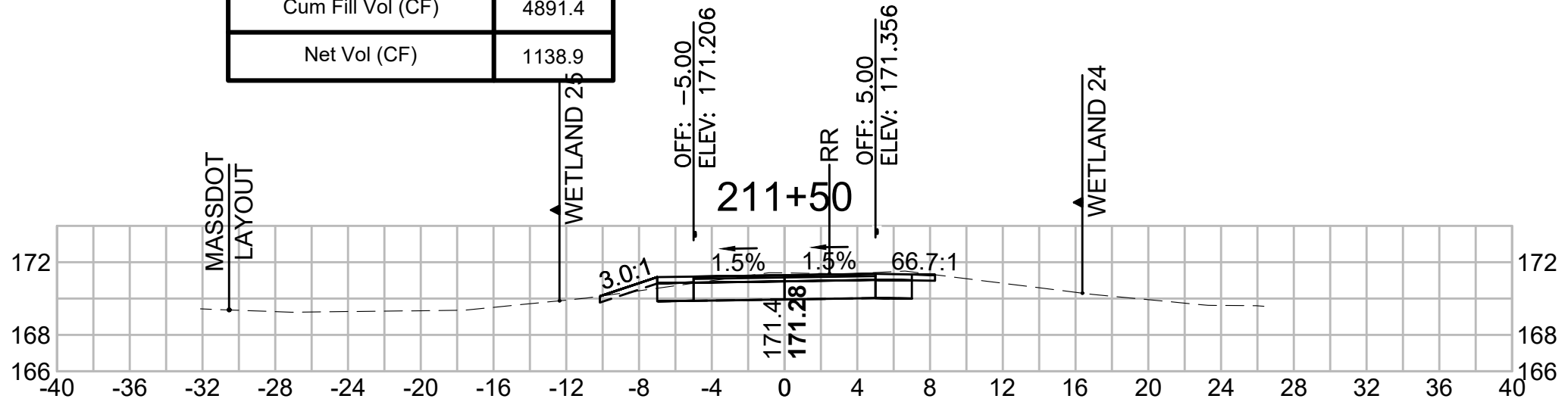
Total Volume at Station 208+50.00	
Cut Area (SF)	9.191
Fill Area (SF)	2.229
Cut Vol (CF)	11.7
Fill Vol (CF)	8.2
Cum Cut Vol (CF)	5818.5
Cum Fill Vol (CF)	4887.7
Net Vol (CF)	930.8



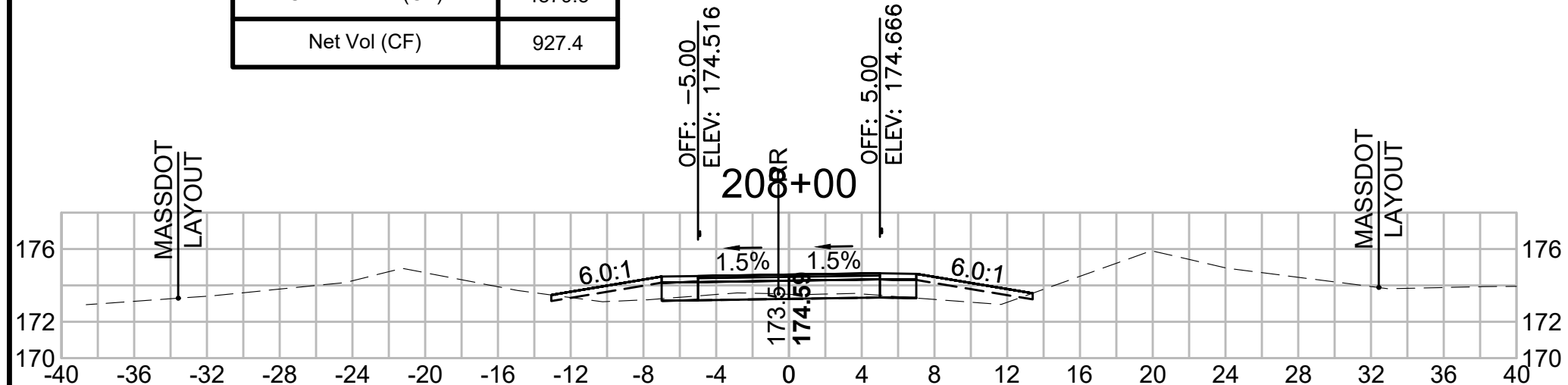
Total Volume at Station 210+00.00	
Cut Area (SF)	21.922
Fill Area (SF)	0.211
Cut Vol (CF)	37.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5908.0
Cum Fill Vol (CF)	4890.6
Net Vol (CF)	1017.4



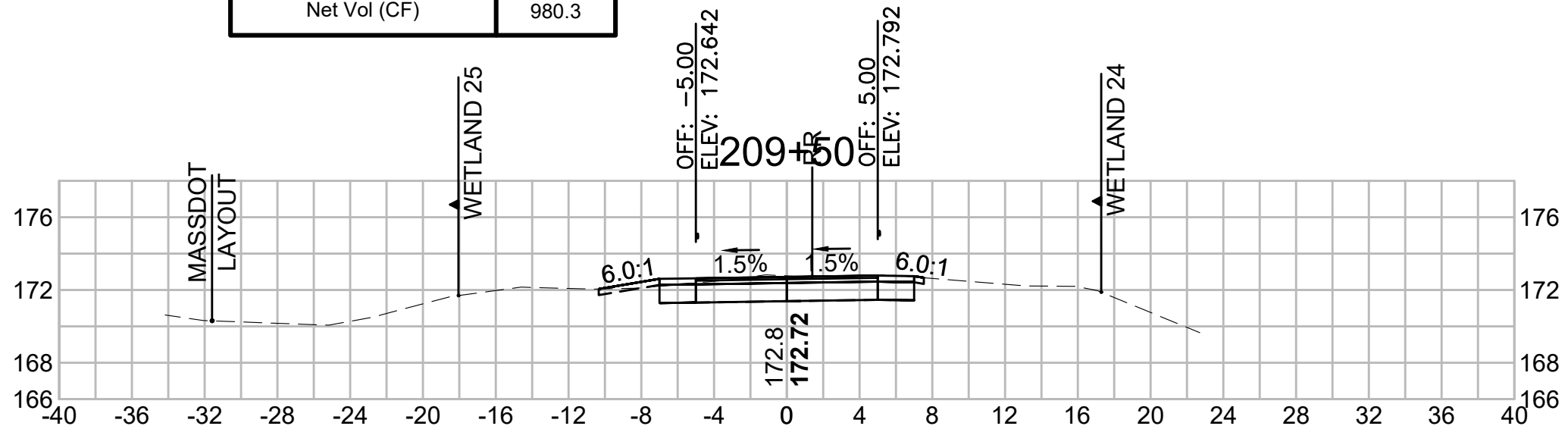
Total Volume at Station 211+50.00	
Cut Area (SF)	18.770
Fill Area (SF)	0.179
Cut Vol (CF)	38.1
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6030.3
Cum Fill Vol (CF)	4891.4
Net Vol (CF)	1138.9



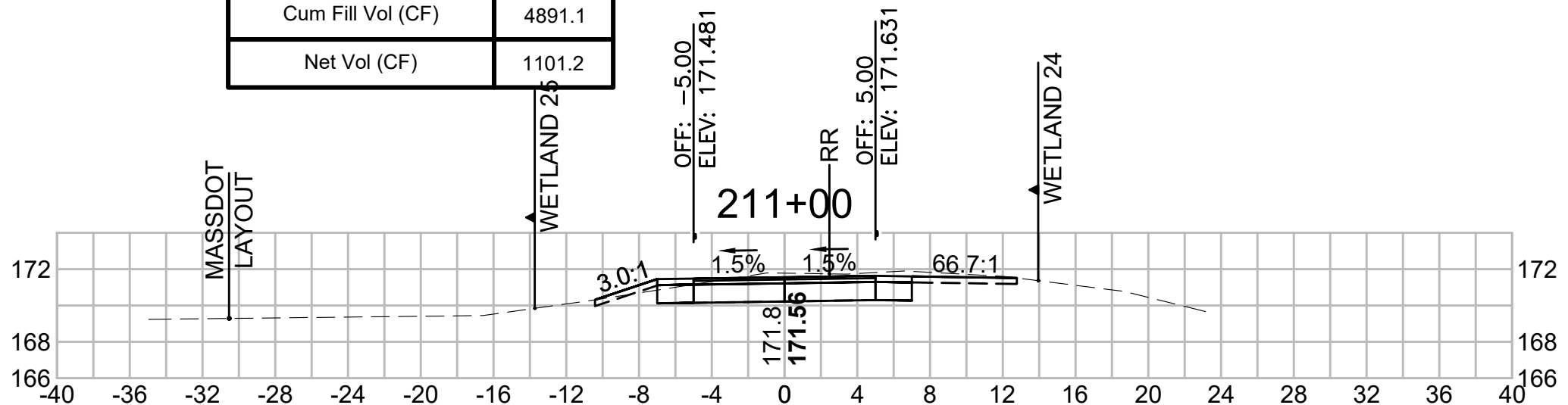
Total Volume at Station 208+00.00	
Cut Area (SF)	3.446
Fill Area (SF)	6.676
Cut Vol (CF)	4.0
Fill Vol (CF)	16.4
Cum Cut Vol (CF)	5806.8
Cum Fill Vol (CF)	4879.5
Net Vol (CF)	927.4



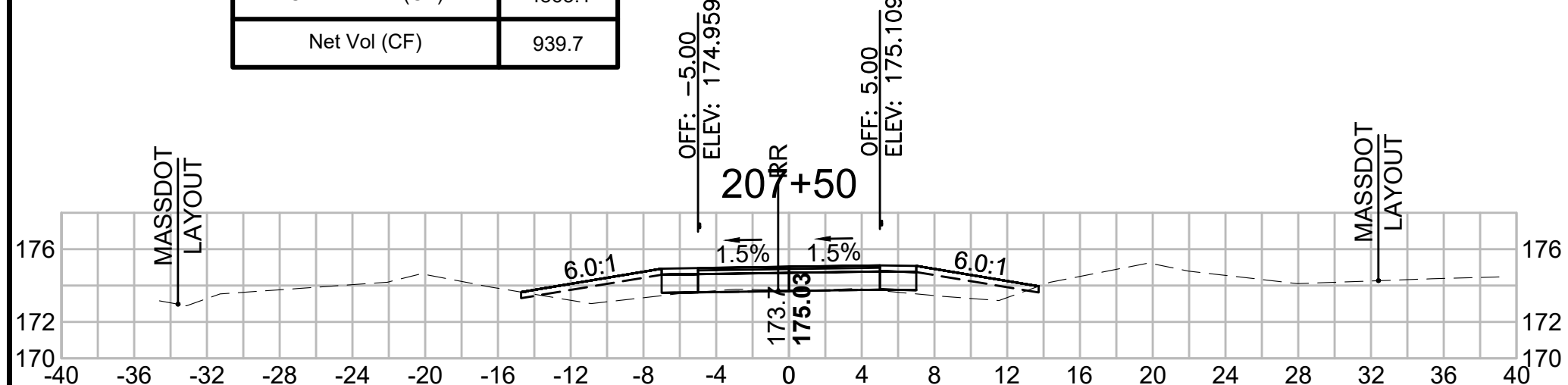
Total Volume at Station 209+50.00	
Cut Area (SF)	18.433
Fill Area (SF)	0.029
Cut Vol (CF)	30.3
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	5870.6
Cum Fill Vol (CF)	4890.4
Net Vol (CF)	980.3



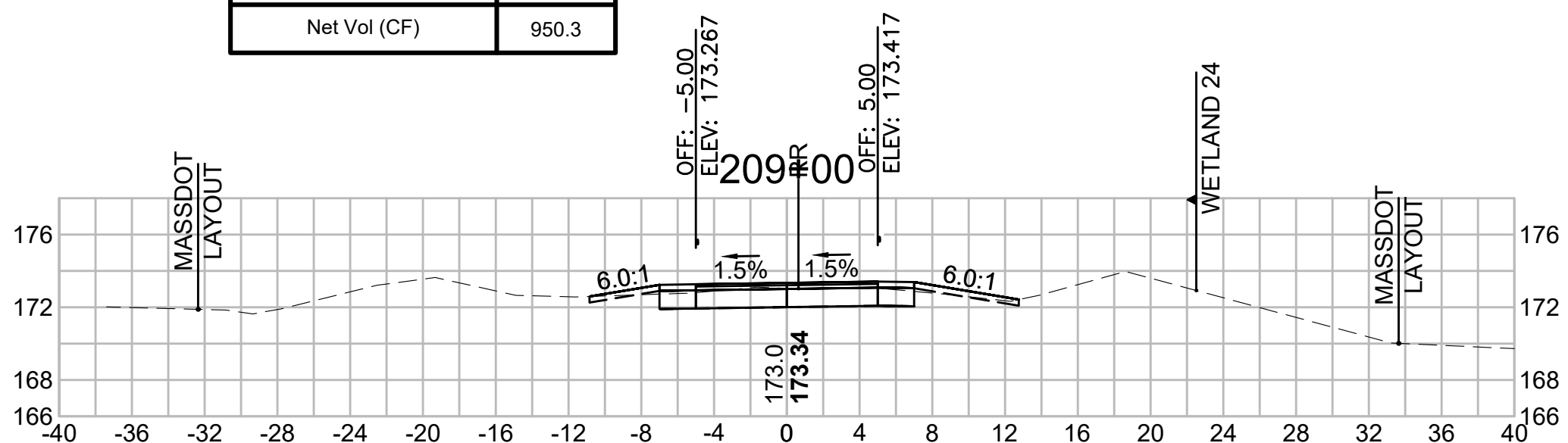
Total Volume at Station 211+00.00	
Cut Area (SF)	22.329
Fill Area (SF)	0.185
Cut Vol (CF)	42.3
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5992.2
Cum Fill Vol (CF)	4891.1
Net Vol (CF)	1101.2



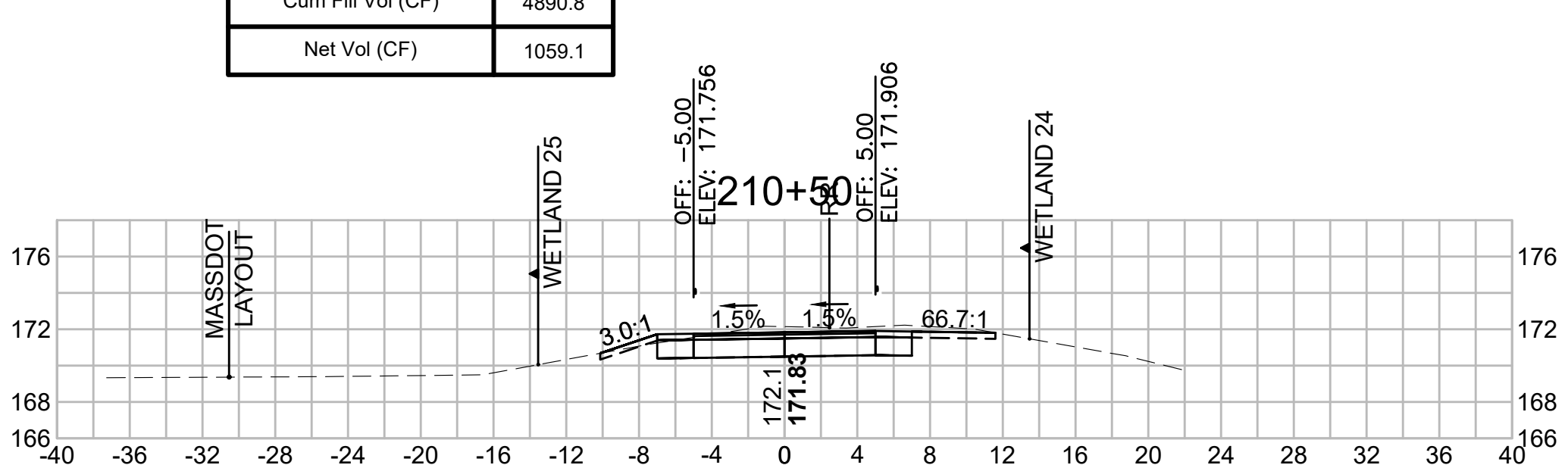
Total Volume at Station 207+50.00	
Cut Area (SF)	0.895
Fill Area (SF)	11.006
Cut Vol (CF)	1.3
Fill Vol (CF)	22.7
Cum Cut Vol (CF)	5802.8
Cum Fill Vol (CF)	4863.1
Net Vol (CF)	939.7



Total Volume at Station 209+00.00	
Cut Area (SF)	14.314
Fill Area (SF)	0.317
Cut Vol (CF)	21.8
Fill Vol (CF)	2.4
Cum Cut Vol (CF)	5840.3
Cum Fill Vol (CF)	4890.1
Net Vol (CF)	950.3



Total Volume at Station 210+50.00	
Cut Area (SF)	23.362
Fill Area (SF)	0.053
Cut Vol (CF)	41.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	5949.9
Cum Fill Vol (CF)	4890.8
Net Vol (CF)	1059.1



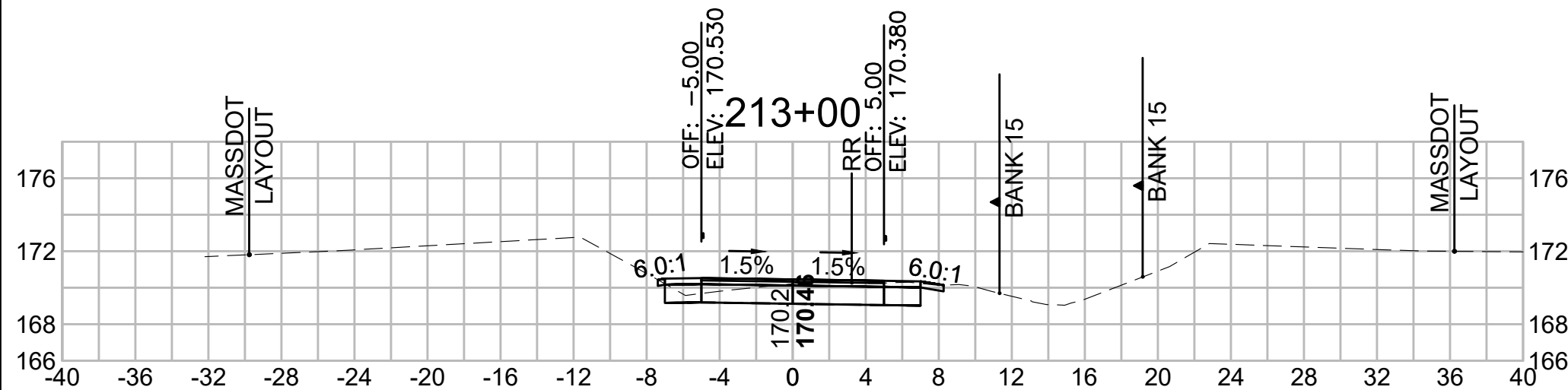
SUDBURY
BRUCE FREEMAN RAIL TRAIL

STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	271	319
PROJECT FILE NO. 608164			

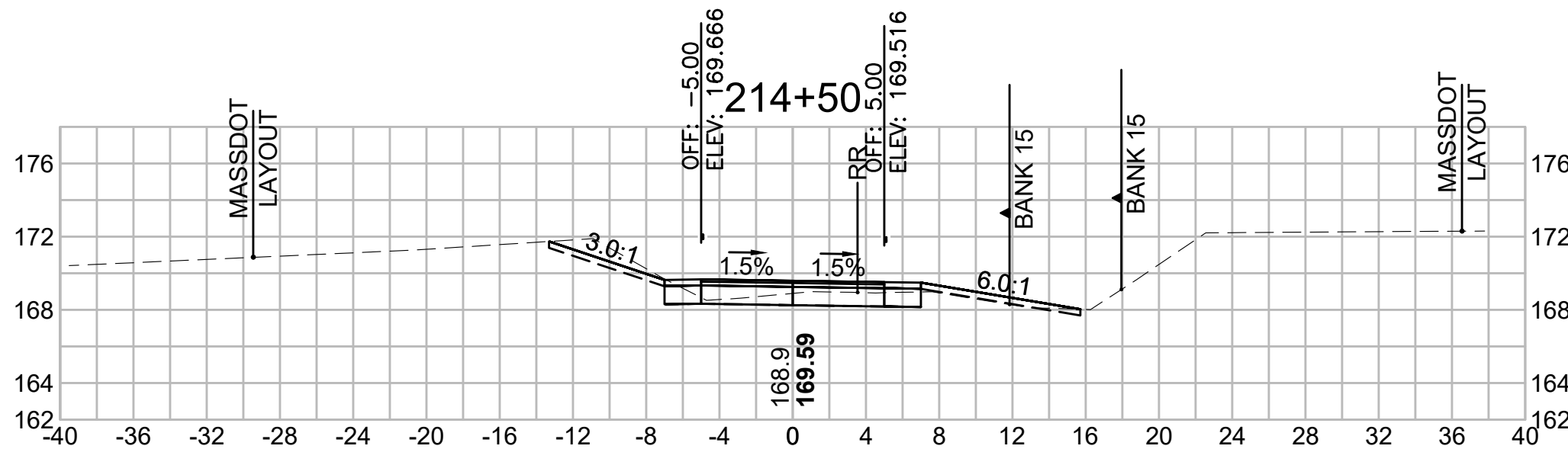
CROSS SECTIONS

608164_XSEC(CROSS SECTION LAYOUTS).DWG 18-Feb-2022

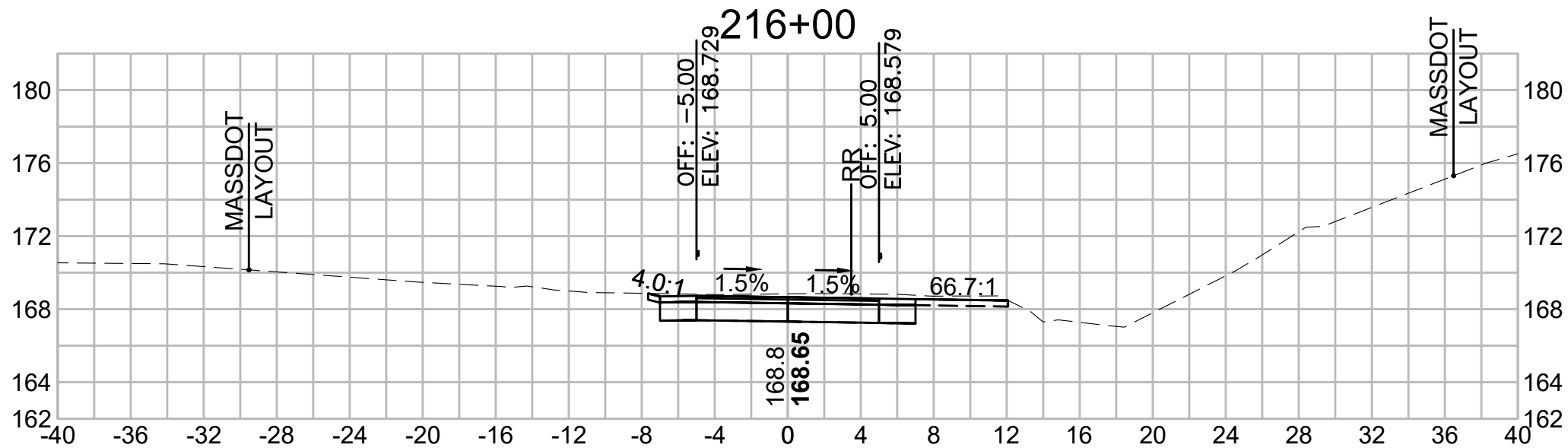
Total Volume at Station 213+00.00	
Cut Area (SF)	14.065
Fill Area (SF)	0.000
Cut Vol (CF)	28.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6124.6
Cum Fill Vol (CF)	4891.6
Net Vol (CF)	1233.0



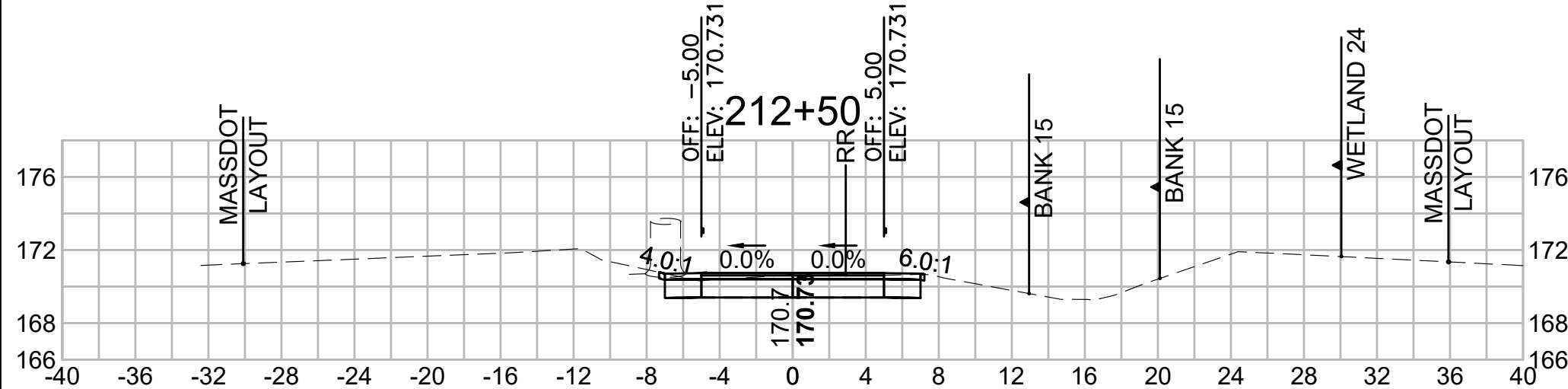
Total Volume at Station 214+50.00	
Cut Area (SF)	14.677
Fill Area (SF)	0.356
Cut Vol (CF)	33.4
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6225.6
Cum Fill Vol (CF)	4891.9
Net Vol (CF)	1333.7



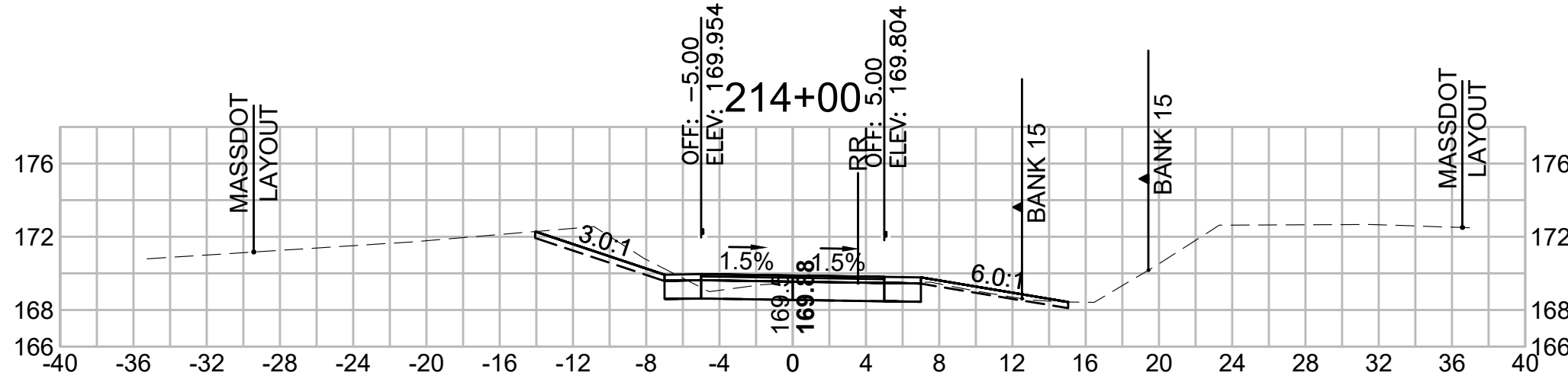
Total Volume at Station 216+00.00	
Cut Area (SF)	24.110
Fill Area (SF)	0.000
Cut Vol (CF)	30.6
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	6292.3
Cum Fill Vol (CF)	4892.7
Net Vol (CF)	1399.6



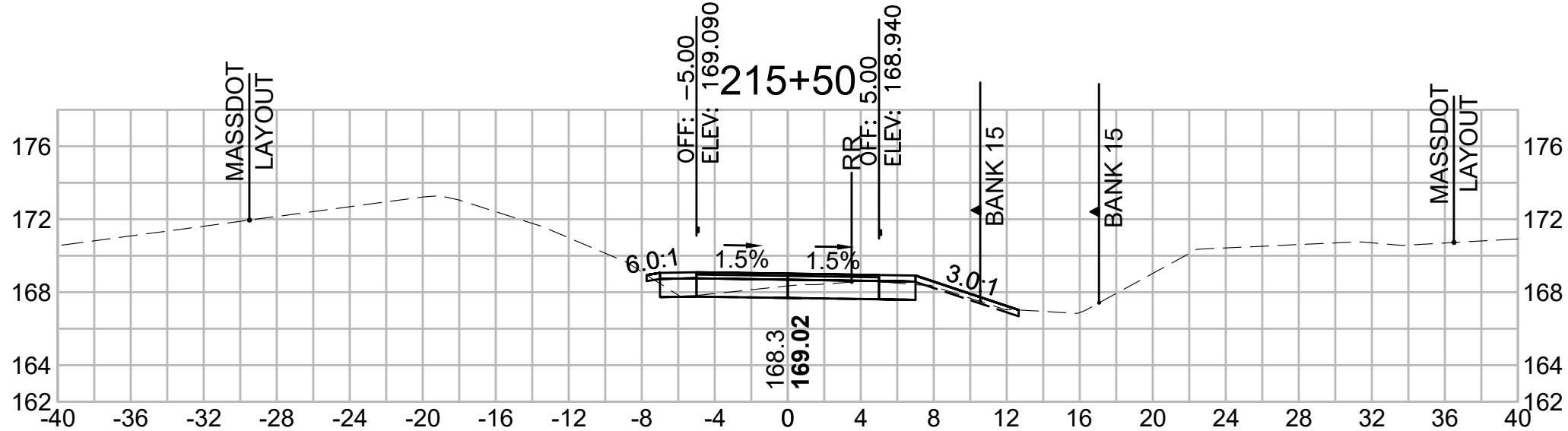
Total Volume at Station 212+50.00	
Cut Area (SF)	16.643
Fill Area (SF)	0.000
Cut Vol (CF)	32.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6096.2
Cum Fill Vol (CF)	4891.6
Net Vol (CF)	1204.6



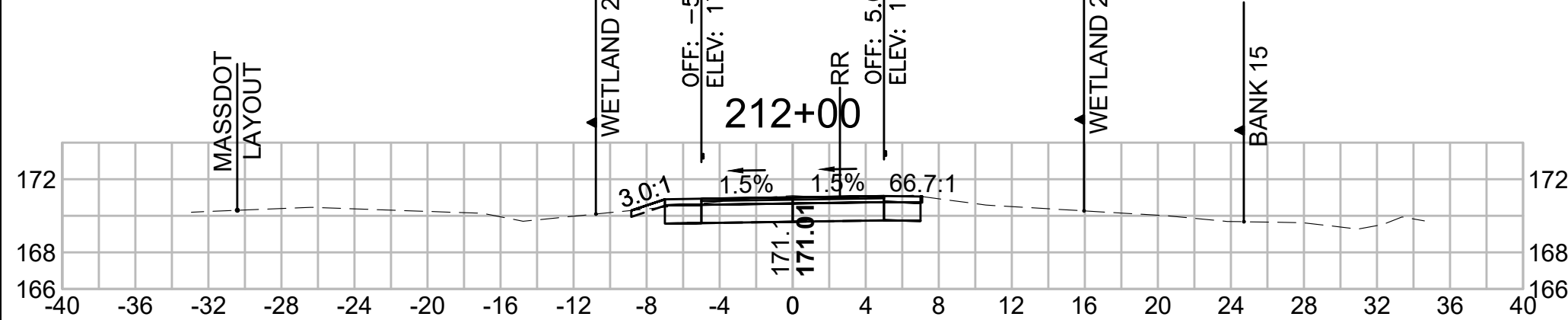
Total Volume at Station 214+00.00	
Cut Area (SF)	21.365
Fill Area (SF)	0.000
Cut Vol (CF)	37.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6192.2
Cum Fill Vol (CF)	4891.6
Net Vol (CF)	1300.6



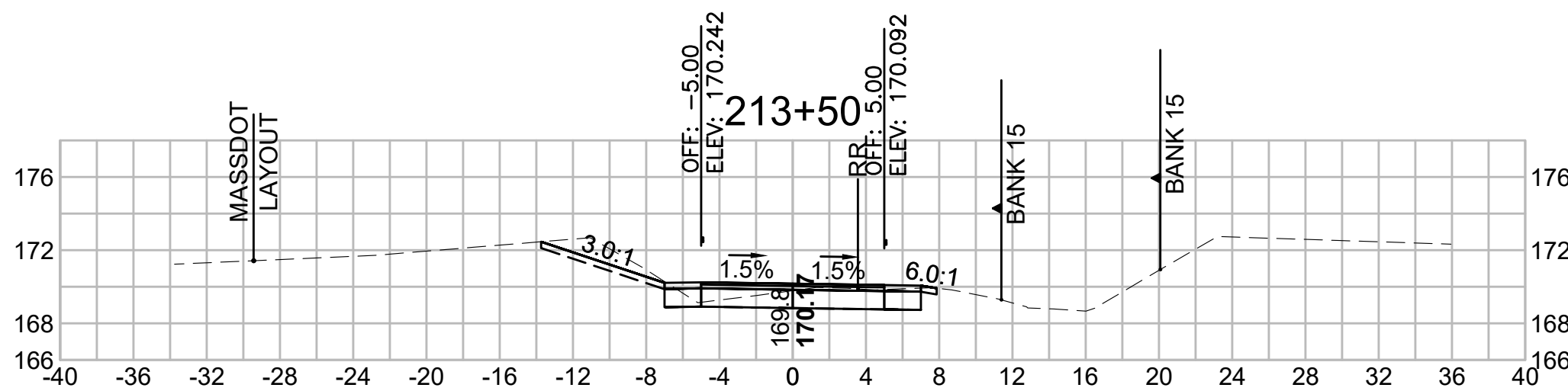
Total Volume at Station 215+00.00	
Cut Area (SF)	8.933
Fill Area (SF)	0.083
Cut Vol (CF)	15.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	6261.7
Cum Fill Vol (CF)	4892.6
Net Vol (CF)	1369.1



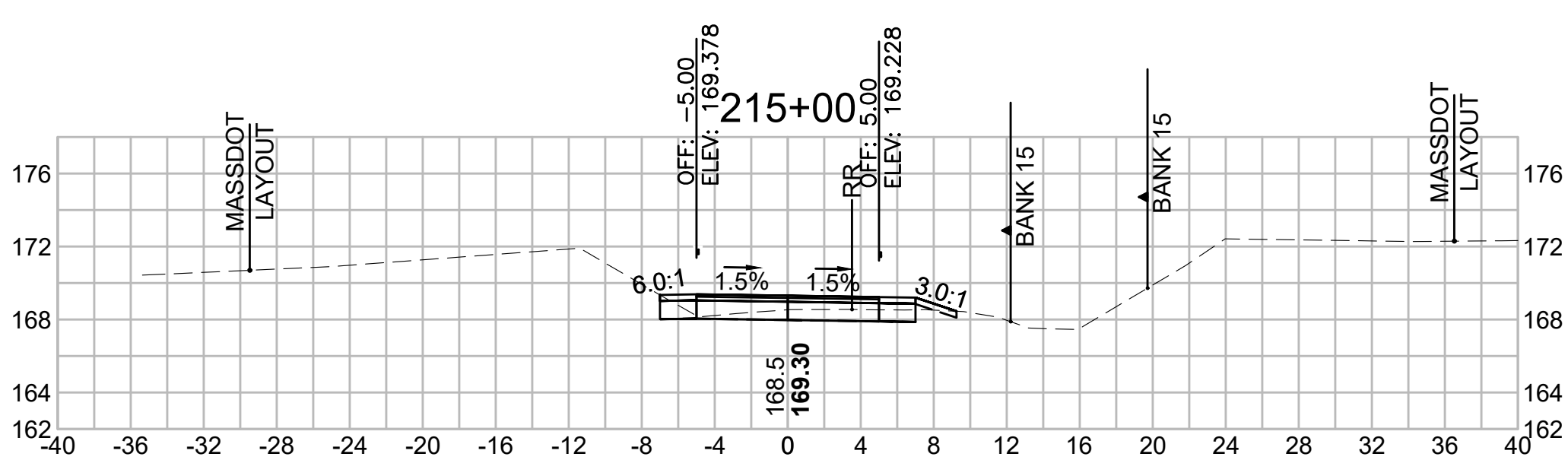
Total Volume at Station 212+00.00	
Cut Area (SF)	17.865
Fill Area (SF)	0.014
Cut Vol (CF)	33.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	6064.2
Cum Fill Vol (CF)	4891.6
Net Vol (CF)	1172.6



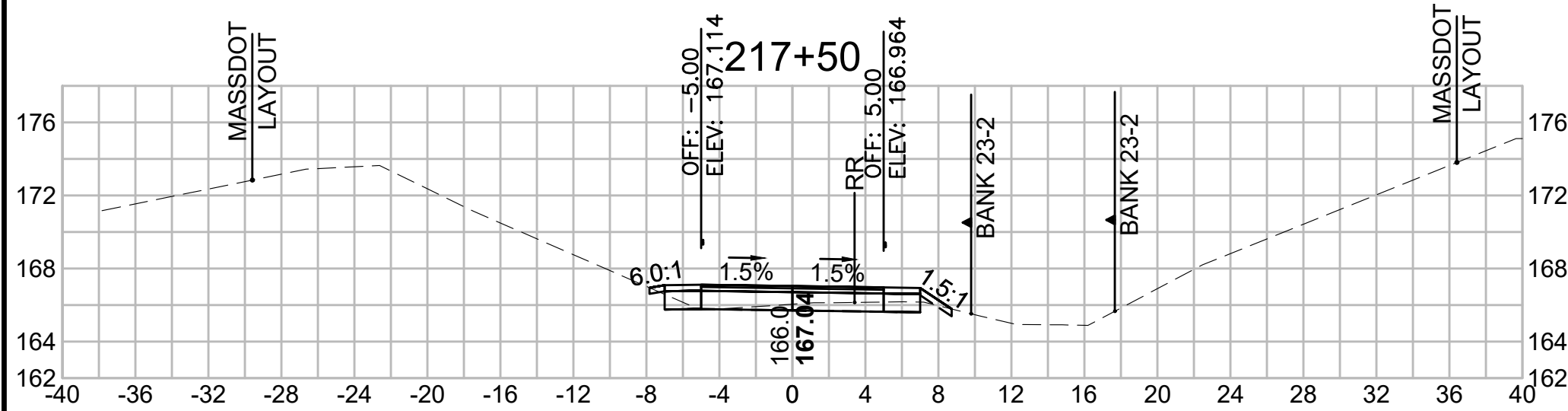
Total Volume at Station 213+50.00	
Cut Area (SF)	18.793
Fill Area (SF)	0.000
Cut Vol (CF)	30.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6155.0
Cum Fill Vol (CF)	4891.6
Net Vol (CF)	1263.4



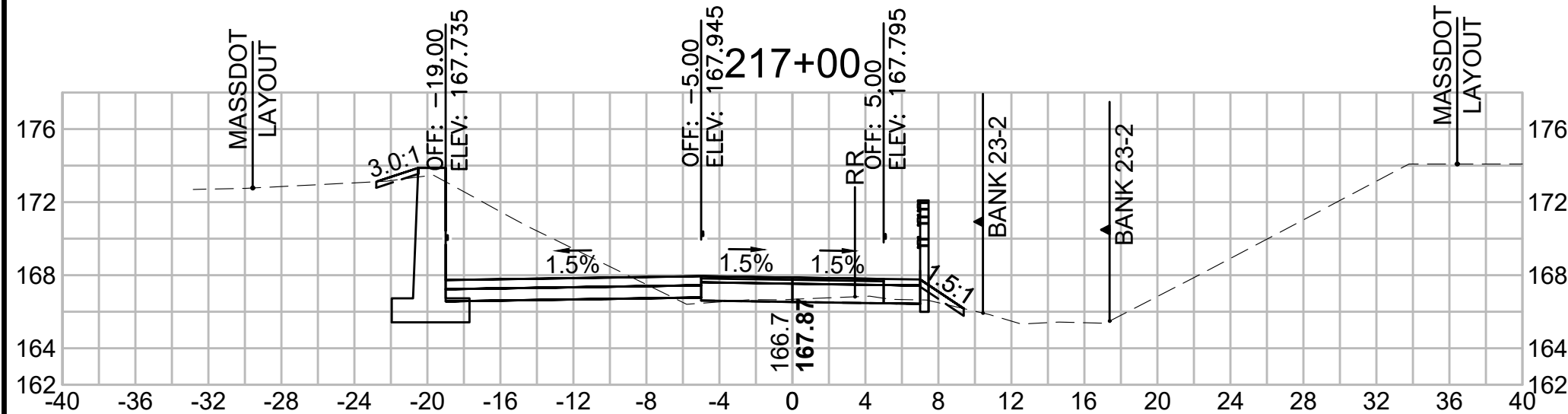
Total Volume at Station 215+00.00	
Cut Area (SF)	7.704
Fill Area (SF)	0.152
Cut Vol (CF)	20.7
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	6246.3
Cum Fill Vol (CF)	4892.4
Net Vol (CF)	1353.9



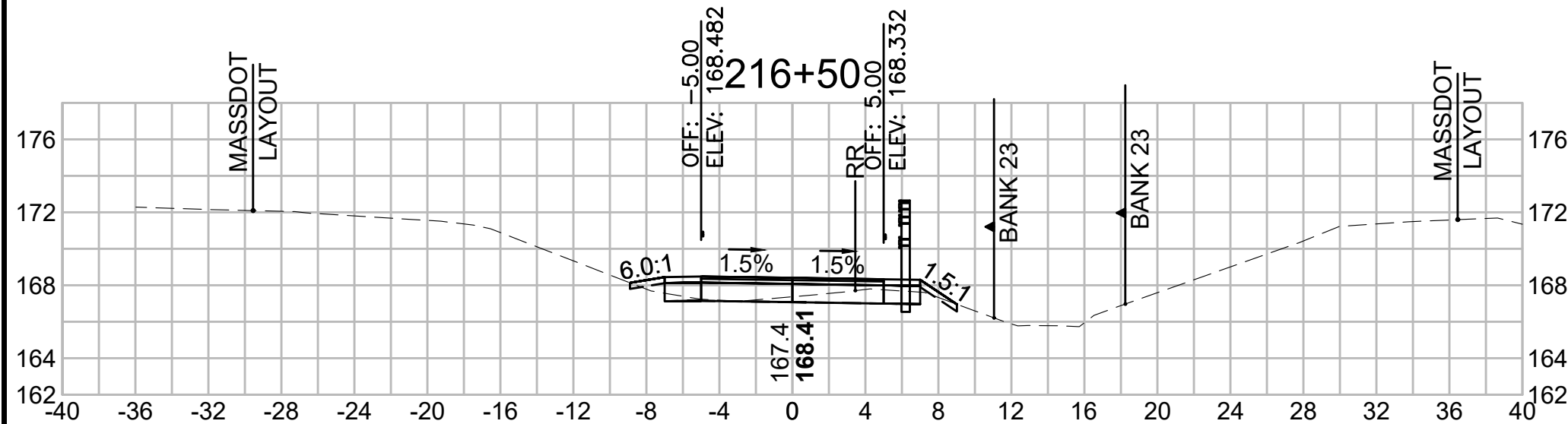
Total Volume at Station 217+50.00	
Cut Area (SF)	5.141
Fill Area (SF)	0.179
Cut Vol (CF)	48.7
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	6417.7
Cum Fill Vol (CF)	4895.7
Net Vol (CF)	1521.9



Total Volume at Station 217+00.00	
Cut Area (SF)	47.403
Fill Area (SF)	1.077
Cut Vol (CF)	49.1
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	6369.0
Cum Fill Vol (CF)	4894.6
Net Vol (CF)	1474.4

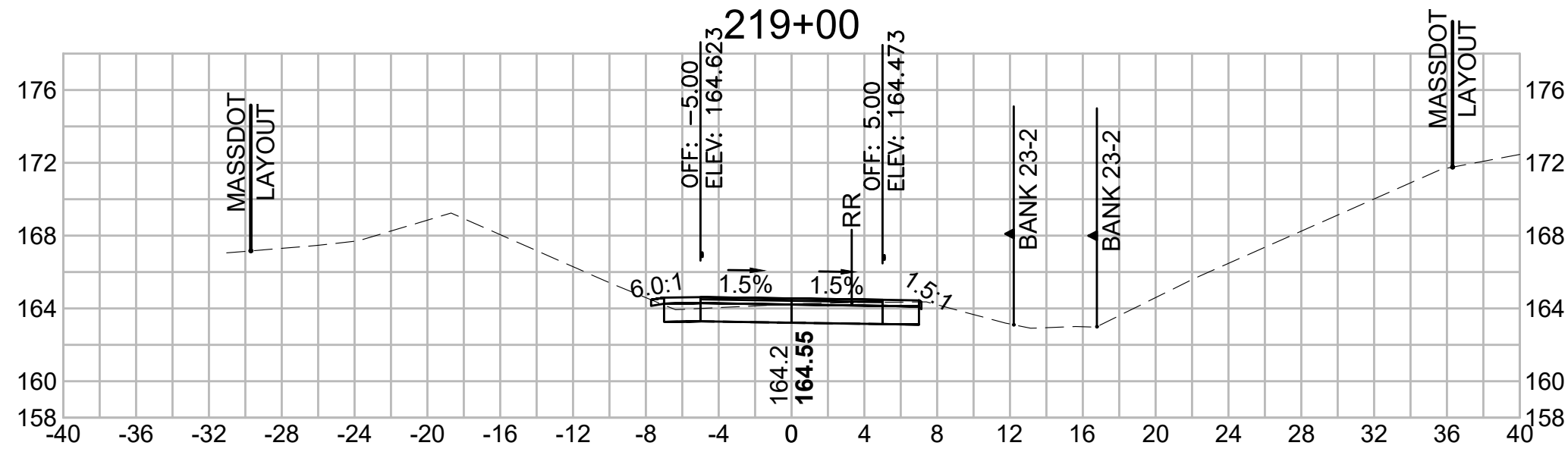


Total Volume at Station 216+50.00	
Cut Area (SF)	5.672
Fill Area (SF)	0.482
Cut Vol (CF)	27.6
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	6319.9
Cum Fill Vol (CF)	4893.1
Net Vol (CF)	1426.7

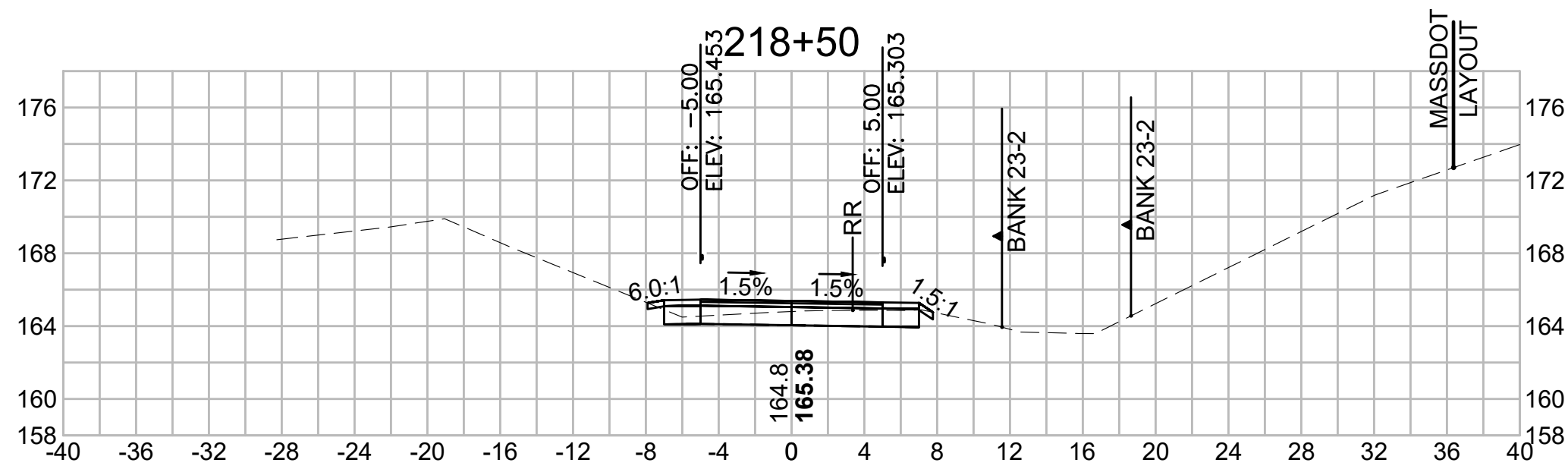


CROSS SECTIONS

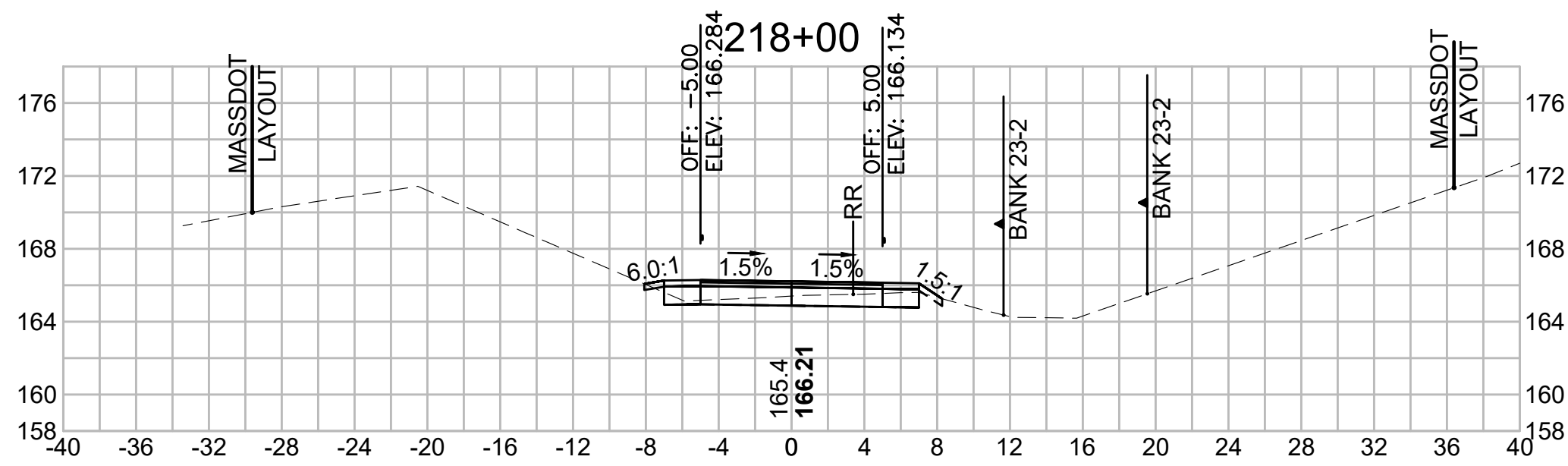
Total Volume at Station 219+00.00	
Cut Area (SF)	13.950
Fill Area (SF)	0.005
Cut Vol (CF)	22.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6463.8
Cum Fill Vol (CF)	4896.1
Net Vol (CF)	1567.7



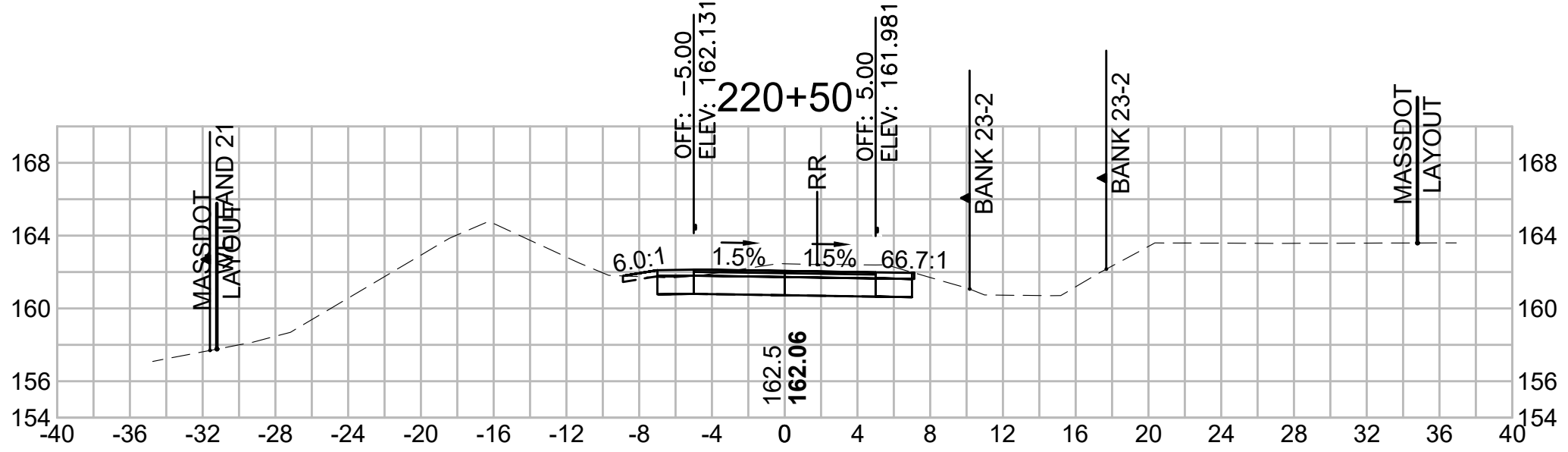
Total Volume at Station 218+50.00	
Cut Area (SF)	10.300
Fill Area (SF)	0.030
Cut Vol (CF)	17.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	6441.4
Cum Fill Vol (CF)	4896.1
Net Vol (CF)	1545.3



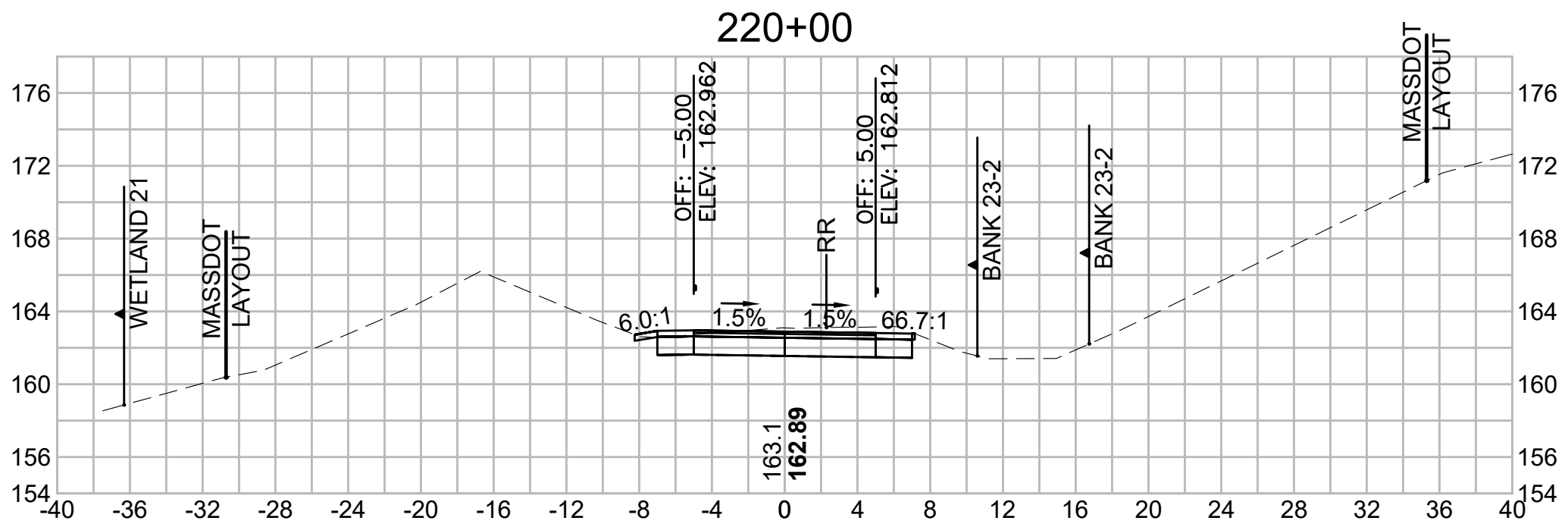
Total Volume at Station 218+00.00	
Cut Area (SF)	8.908
Fill Area (SF)	0.096
Cut Vol (CF)	13.0
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6423.6
Cum Fill Vol (CF)	4896.0
Net Vol (CF)	1527.6



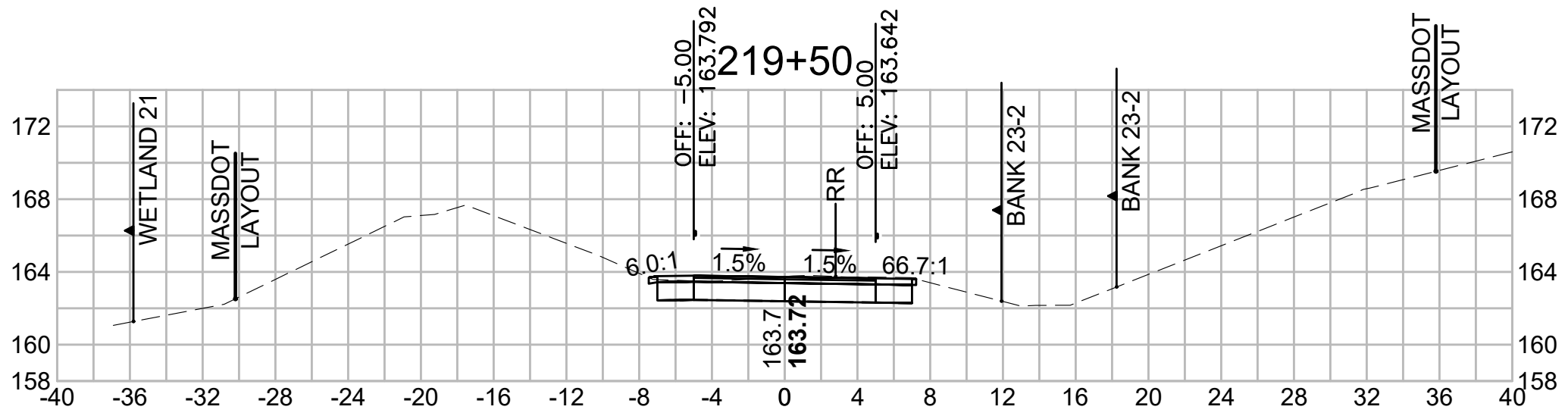
Total Volume at Station 220+50.00	
Cut Area (SF)	20.886
Fill Area (SF)	0.009
Cut Vol (CF)	38.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6566.7
Cum Fill Vol (CF)	4896.2
Net Vol (CF)	1670.5



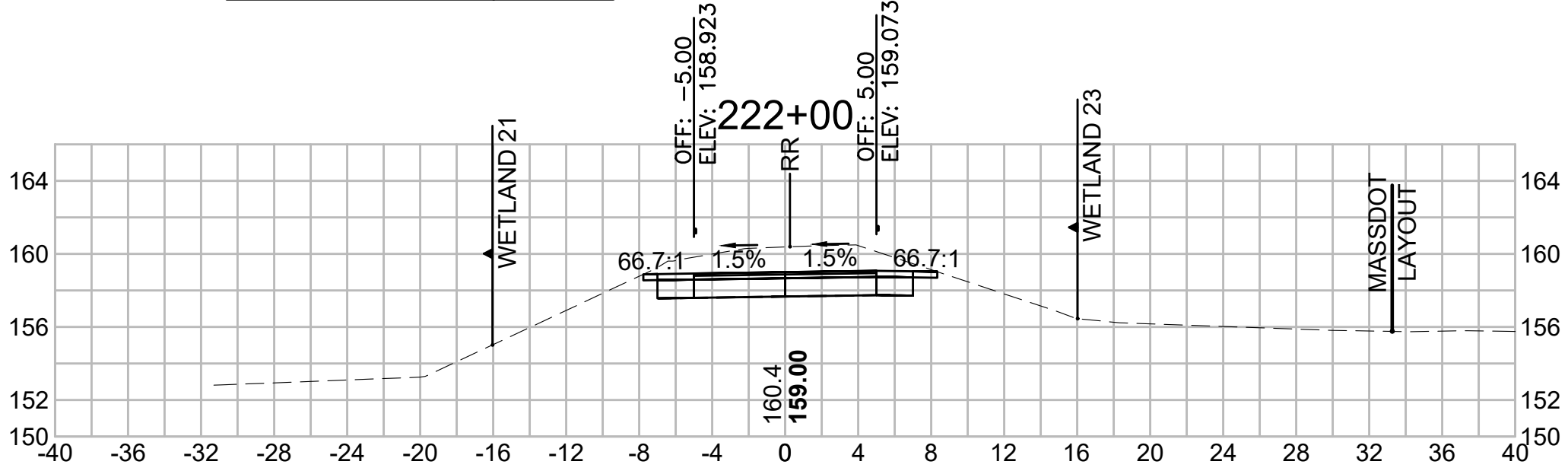
Total Volume at Station 220+00.00	
Cut Area (SF)	20.136
Fill Area (SF)	0.001
Cut Vol (CF)	35.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6528.7
Cum Fill Vol (CF)	4896.2
Net Vol (CF)	1632.5



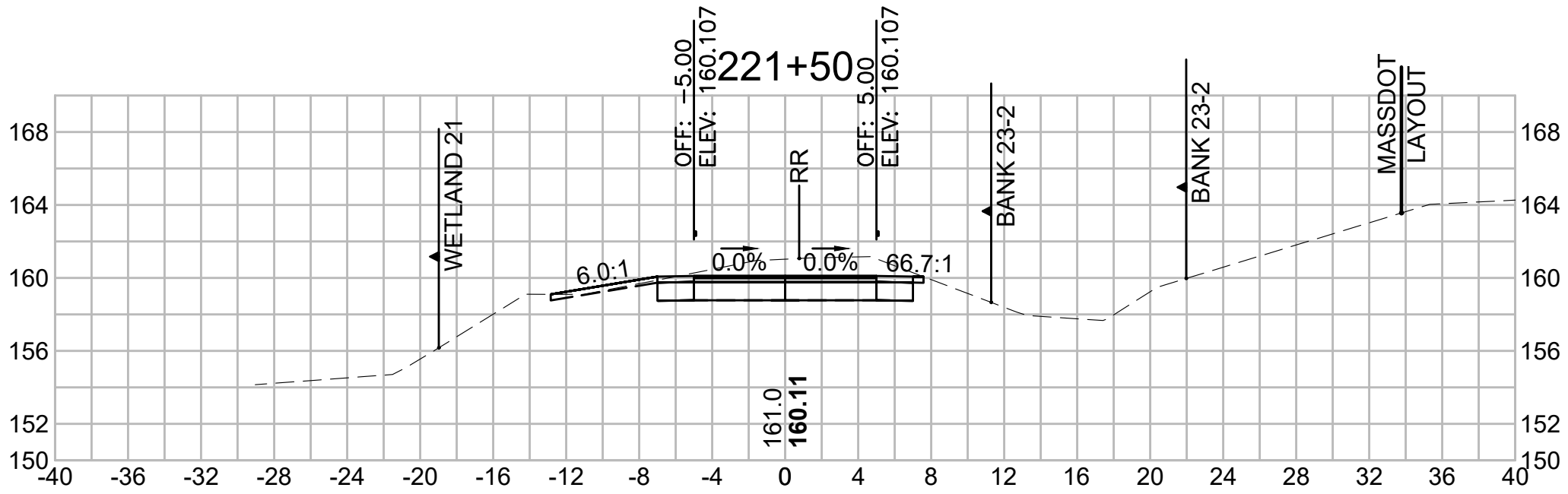
Total Volume at Station 219+50.00	
Cut Area (SF)	17.969
Fill Area (SF)	0.000
Cut Vol (CF)	29.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6493.4
Cum Fill Vol (CF)	4896.2
Net Vol (CF)	1597.2



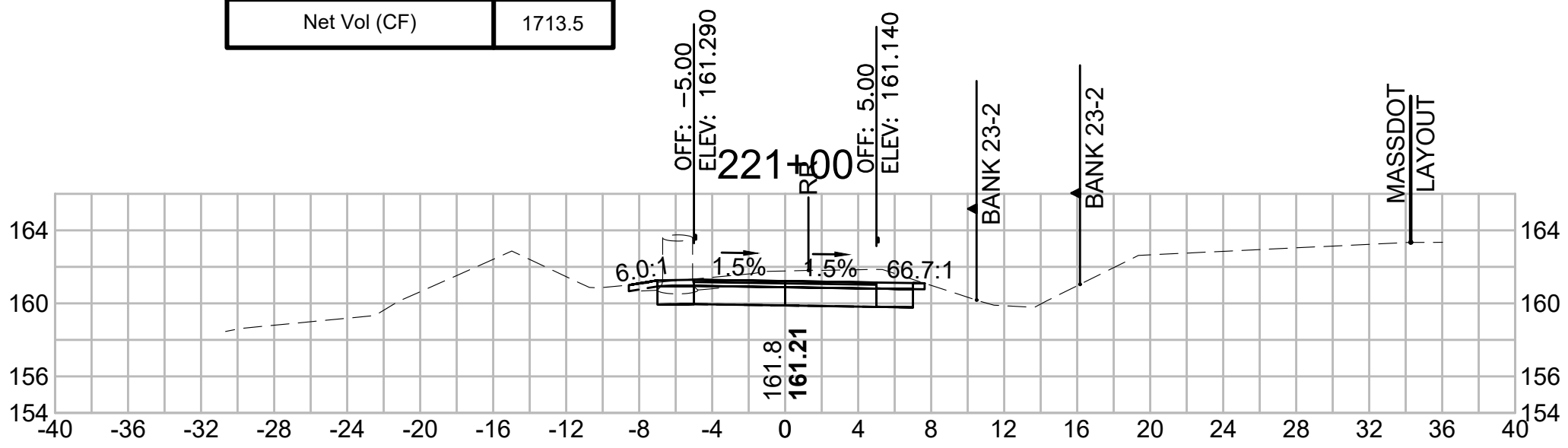
Total Volume at Station 222+00.00	
Cut Area (SF)	36.279
Fill Area (SF)	0.043
Cut Vol (CF)	60.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6720.3
Cum Fill Vol (CF)	4896.2
Net Vol (CF)	1824.1



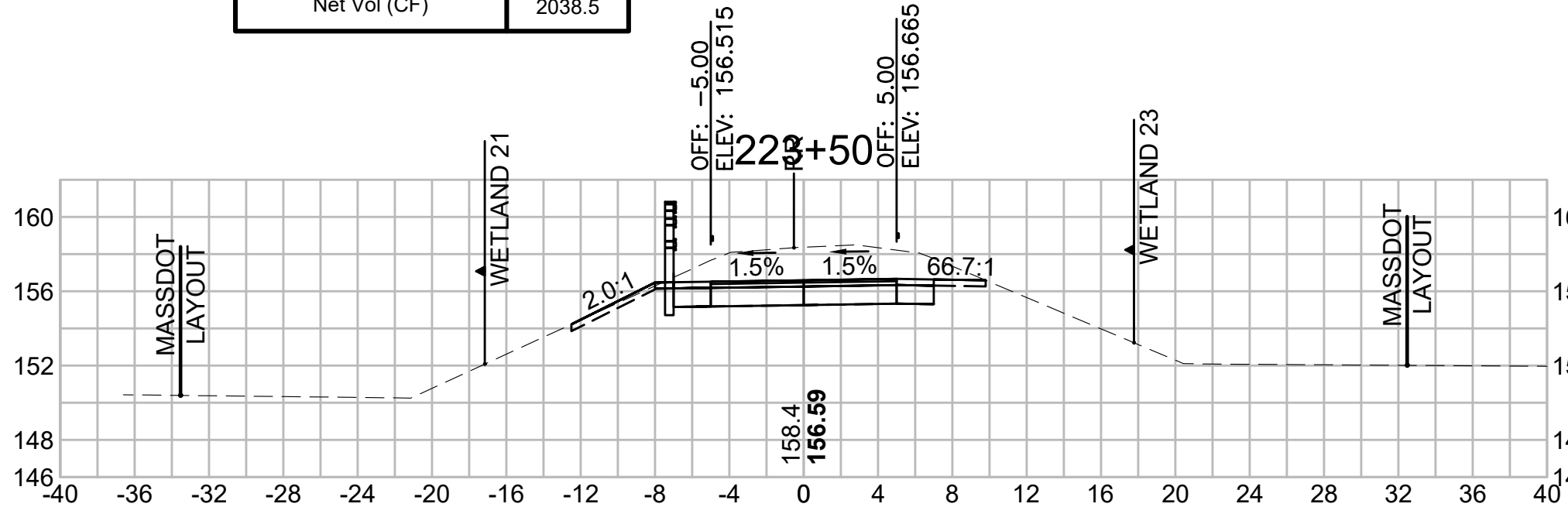
Total Volume at Station 221+50.00	
Cut Area (SF)	28.856
Fill Area (SF)	0.000
Cut Vol (CF)	50.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6660.0
Cum Fill Vol (CF)	4896.2
Net Vol (CF)	1763.8



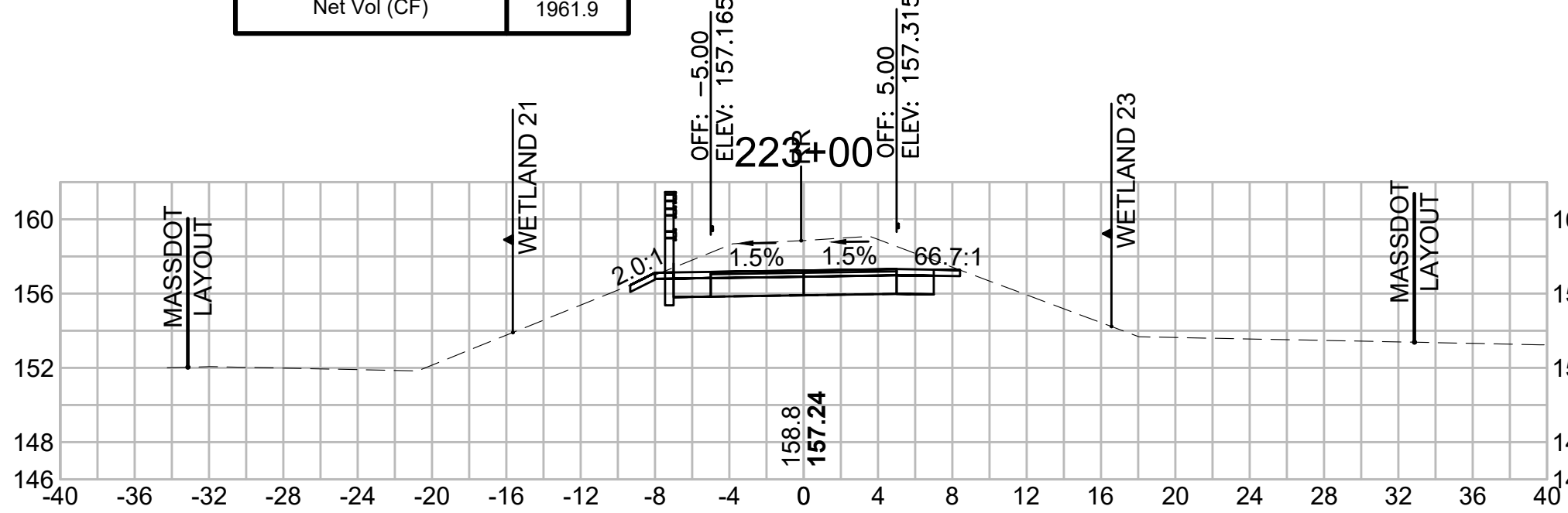
Total Volume at Station 221+00.00	
Cut Area (SF)	25.513
Fill Area (SF)	0.000
Cut Vol (CF)	43.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6609.6
Cum Fill Vol (CF)	4896.2
Net Vol (CF)	1713.5



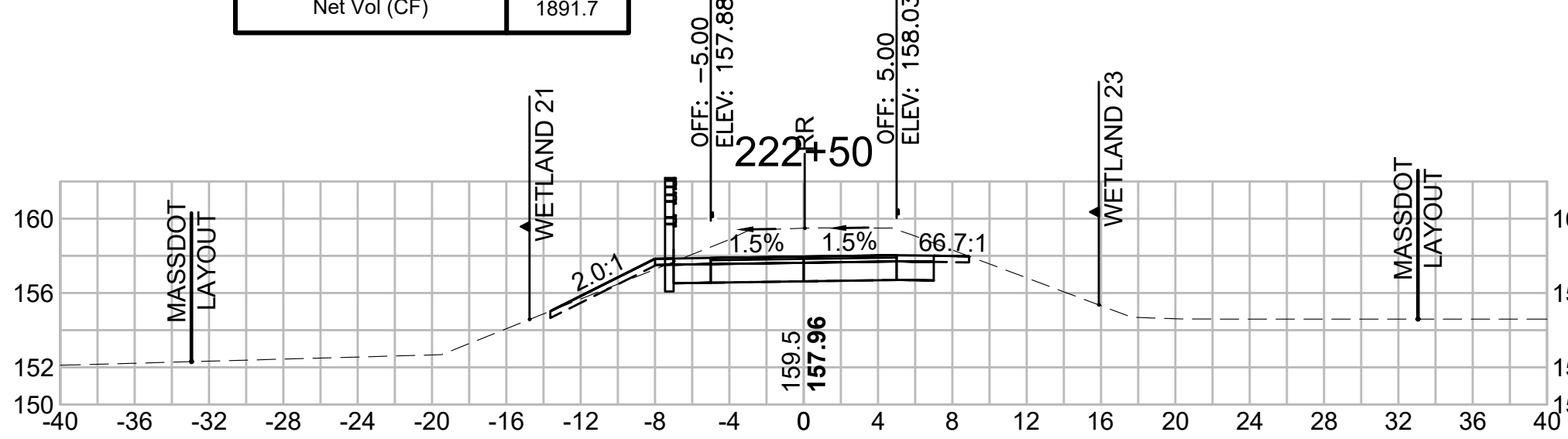
Total Volume at Station 223+50.00	
Cut Area (SF)	43.892
Fill Area (SF)	0.000
Cut Vol (CF)	76.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	6935.3
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2038.5



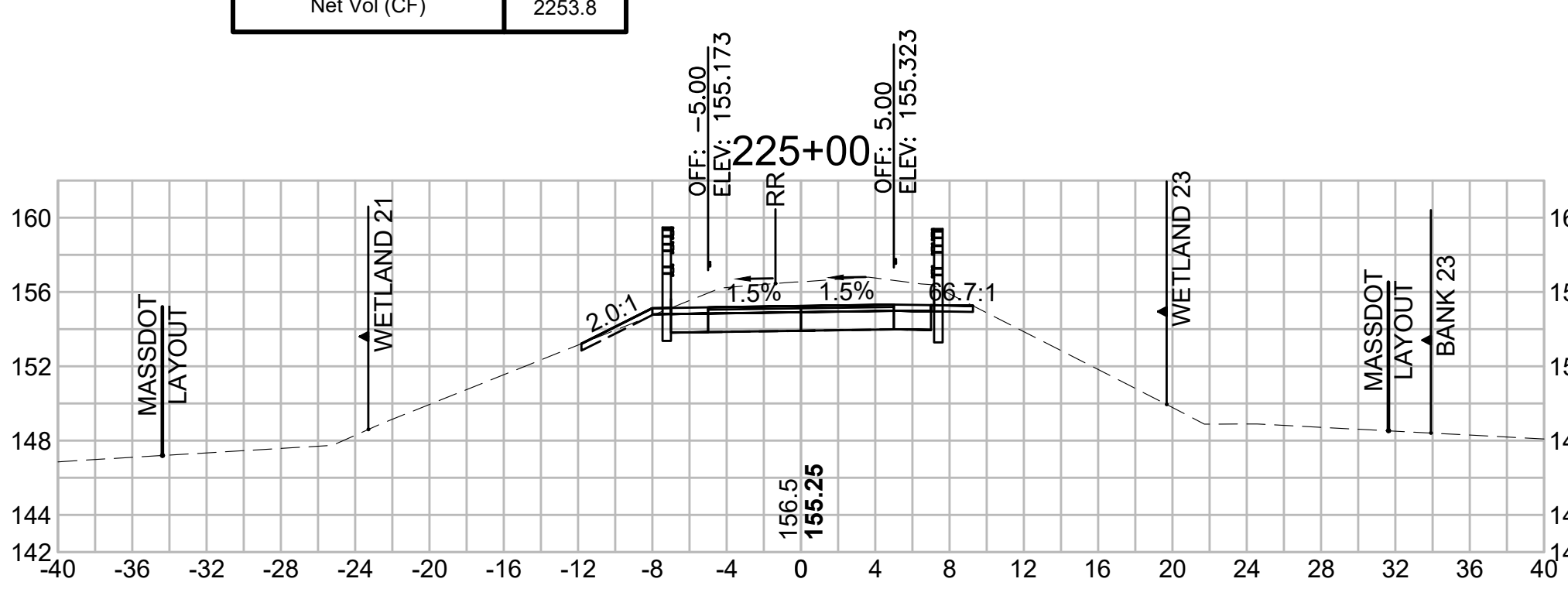
Total Volume at Station 223+00.00	
Cut Area (SF)	38.930
Fill Area (SF)	0.000
Cut Vol (CF)	70.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	6858.6
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	1961.9



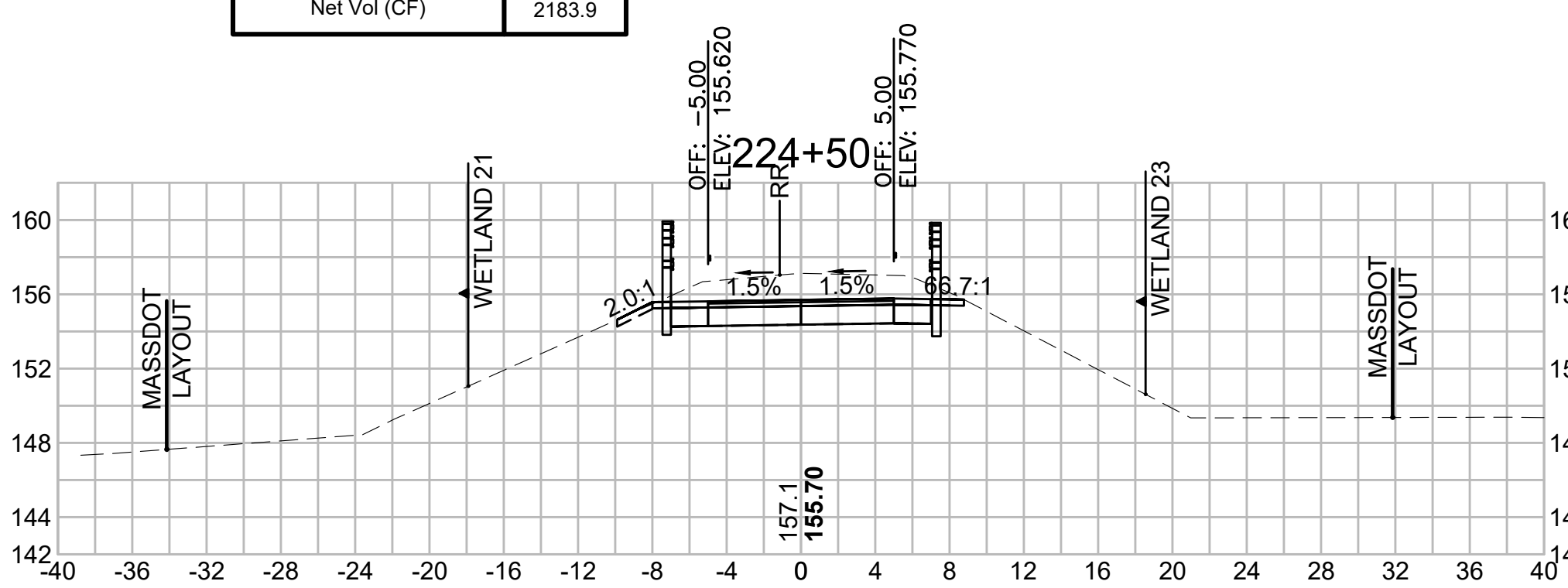
Total Volume at Station 222+50.00	
Cut Area (SF)	37.086
Fill Area (SF)	0.261
Cut Vol (CF)	67.9
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	6788.2
Cum Fill Vol (CF)	4896.5
Net Vol (CF)	1891.7



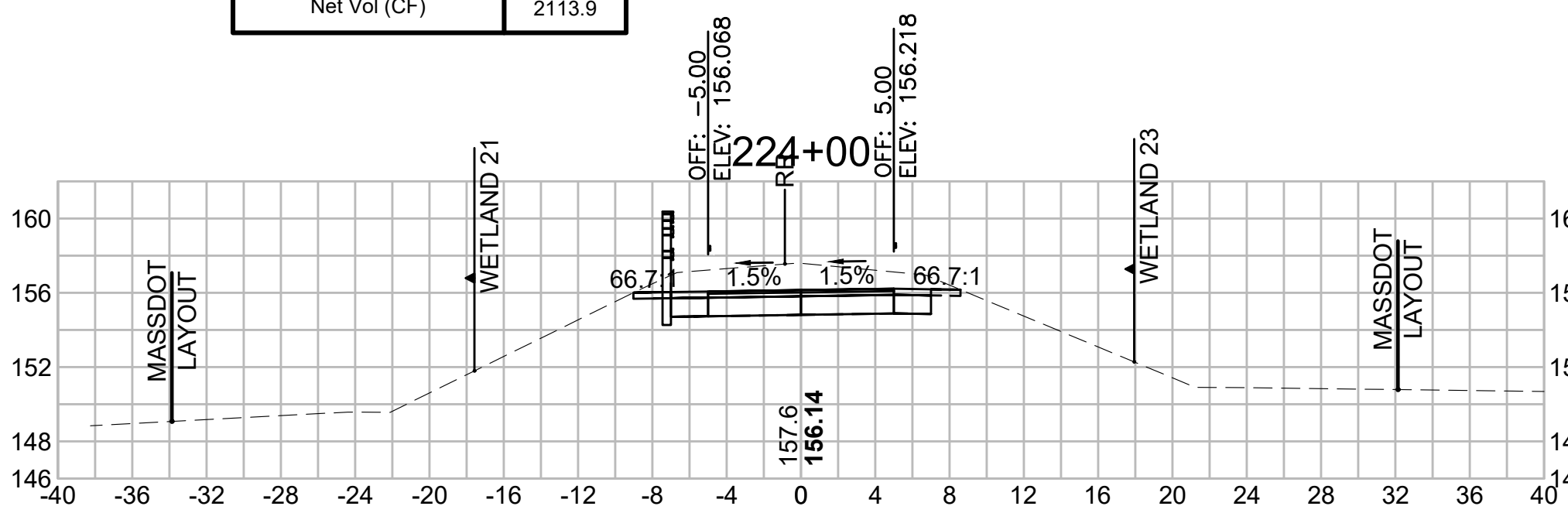
Total Volume at Station 225+00.00	
Cut Area (SF)	37.322
Fill Area (SF)	0.005
Cut Vol (CF)	69.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7150.5
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2253.8



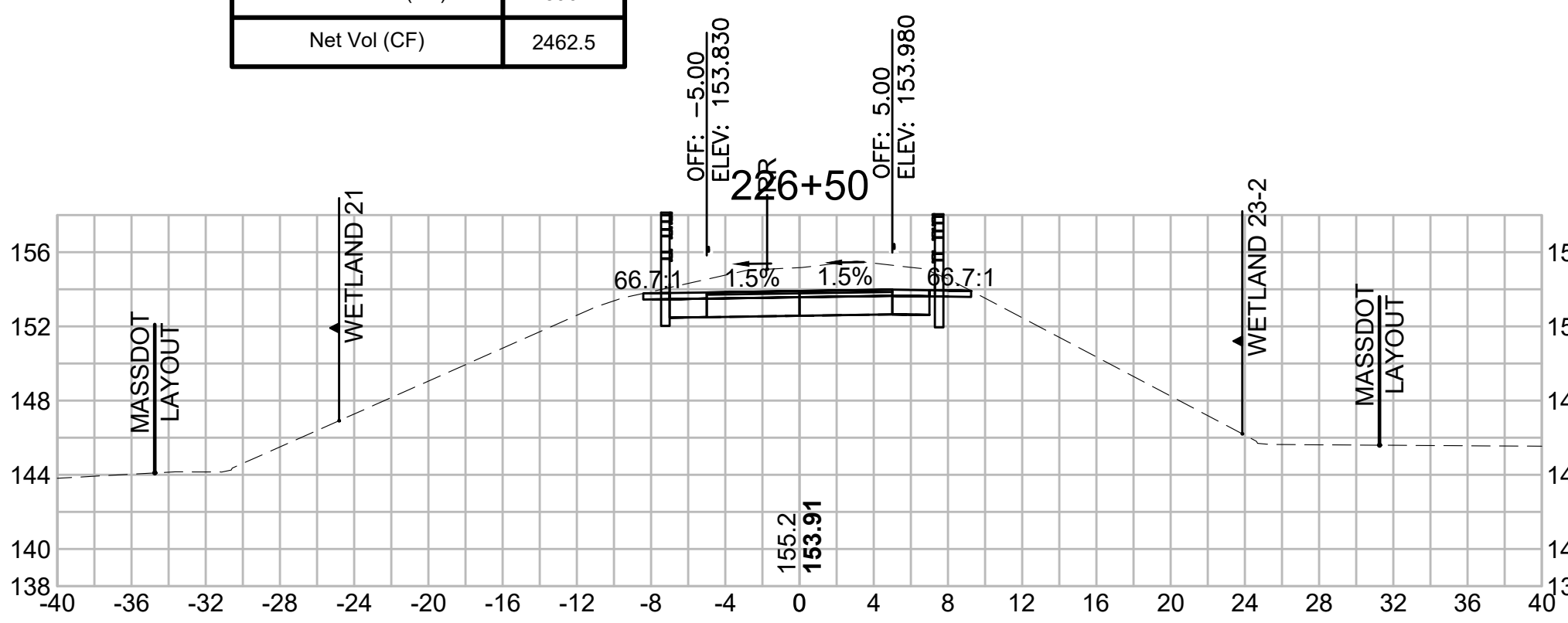
Total Volume at Station 224+50.00	
Cut Area (SF)	38.133
Fill Area (SF)	0.000
Cut Vol (CF)	70.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7080.7
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2183.9



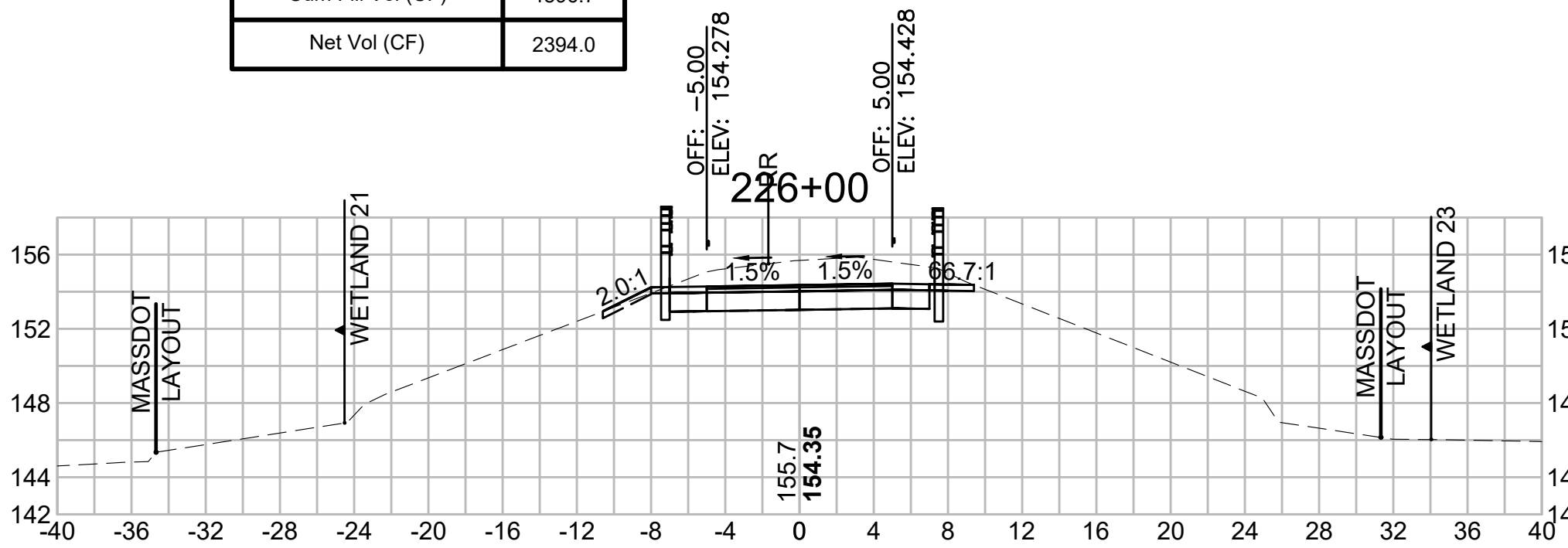
Total Volume at Station 224+00.00	
Cut Area (SF)	37.492
Fill Area (SF)	0.000
Cut Vol (CF)	75.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7010.6
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2113.9



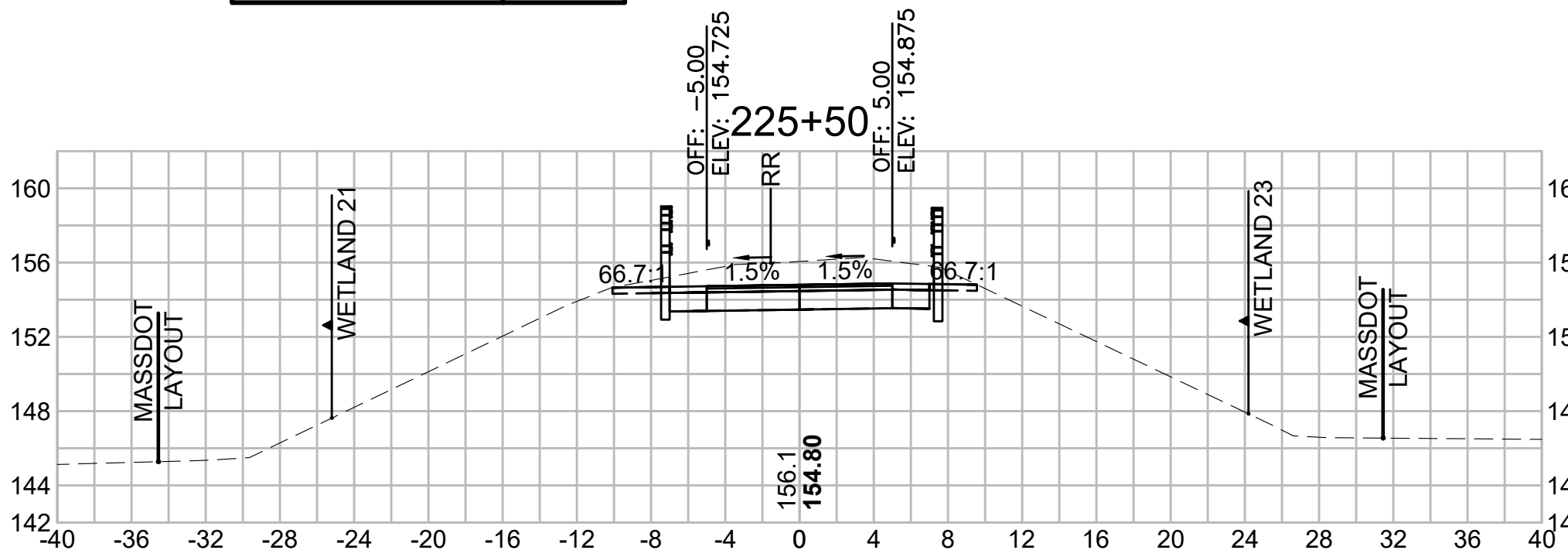
Total Volume at Station 226+50.00	
Cut Area (SF)	37.298
Fill Area (SF)	0.000
Cut Vol (CF)	68.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7359.2
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2462.5



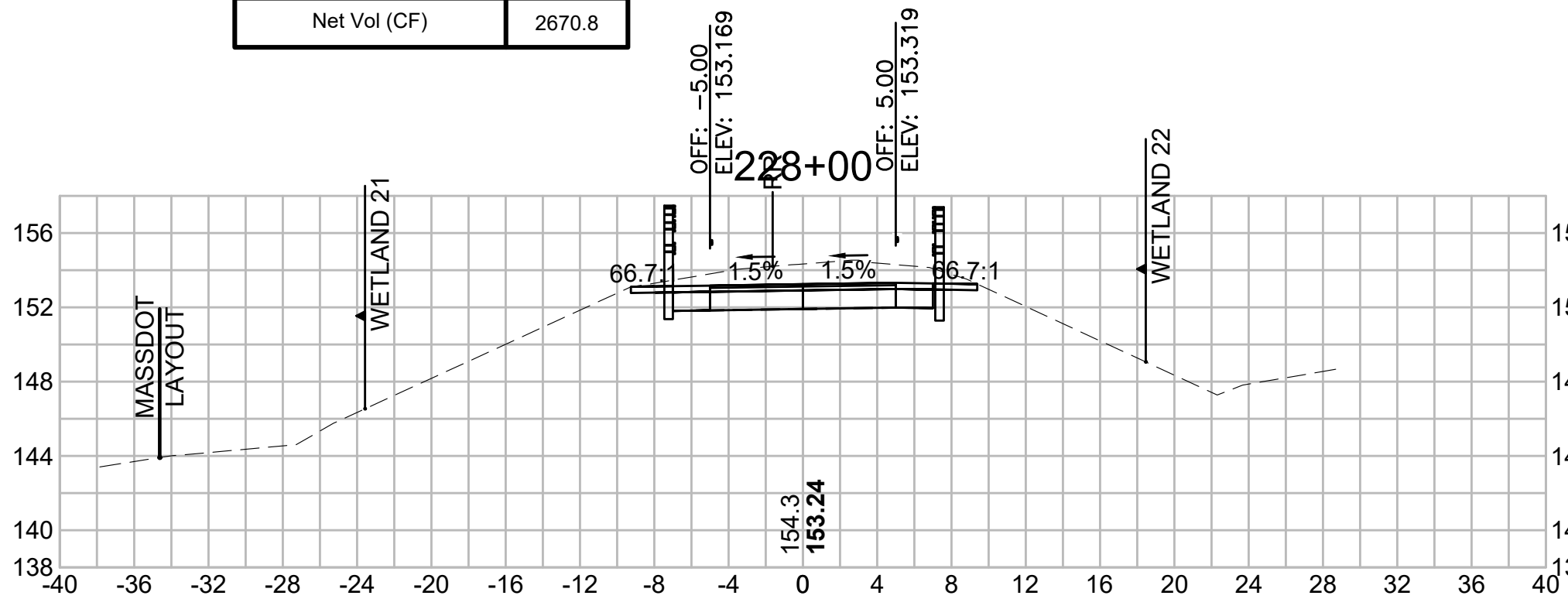
Total Volume at Station 226+00.00	
Cut Area (SF)	36.682
Fill Area (SF)	0.000
Cut Vol (CF)	69.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7290.7
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2394.0



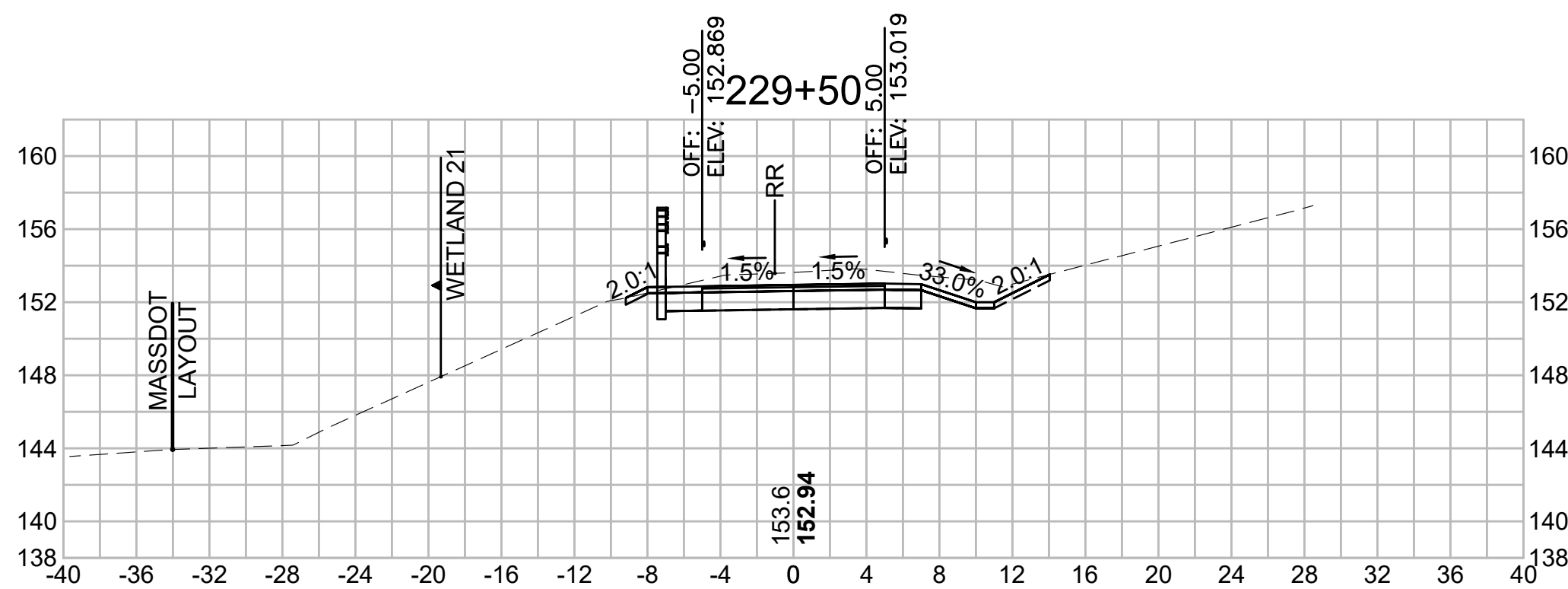
Total Volume at Station 225+50.00	
Cut Area (SF)	38.695
Fill Area (SF)	0.000
Cut Vol (CF)	70.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7220.9
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2324.2



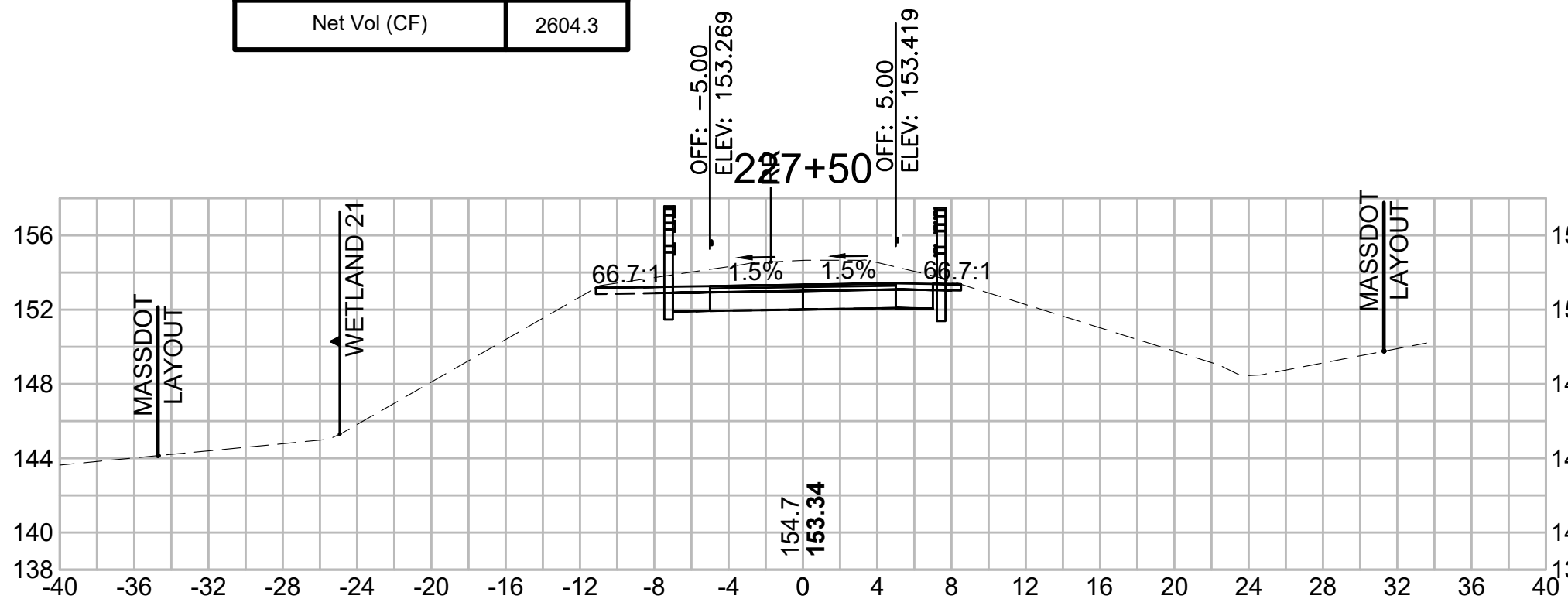
Total Volume at Station 228+00.00	
Cut Area (SF)	34.618
Fill Area (SF)	0.000
Cut Vol (CF)	66.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7567.6
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2670.8



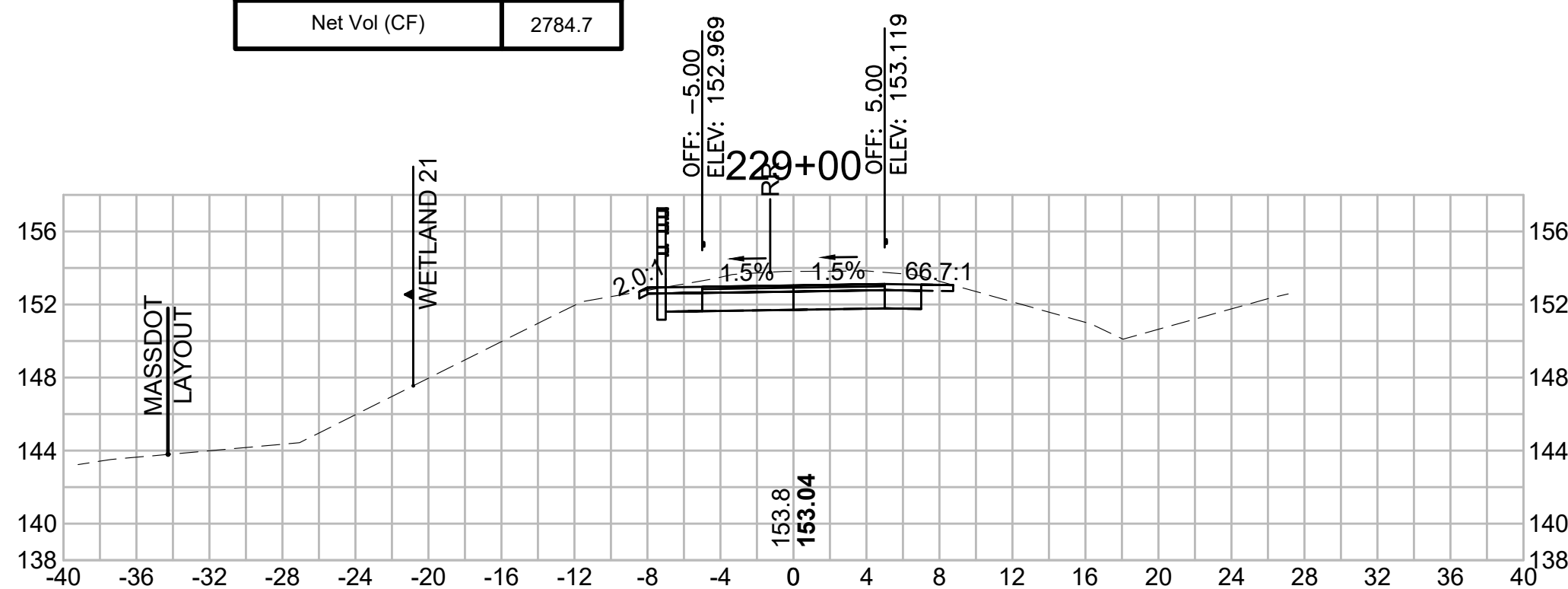
Total Volume at Station 229+50.00	
Cut Area (SF)	34.762
Fill Area (SF)	0.000
Cut Vol (CF)	58.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7740.0
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2843.2



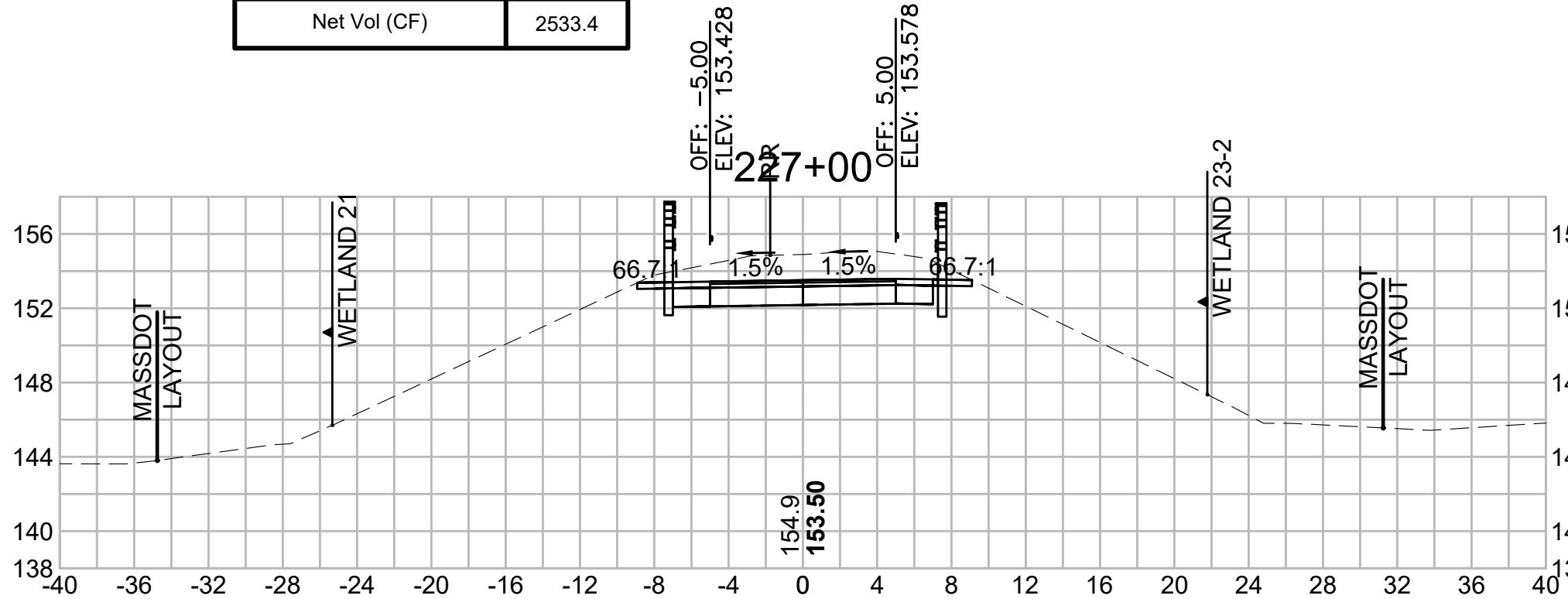
Total Volume at Station 227+50.00	
Cut Area (SF)	37.191
Fill Area (SF)	0.000
Cut Vol (CF)	70.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7501.1
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2604.3



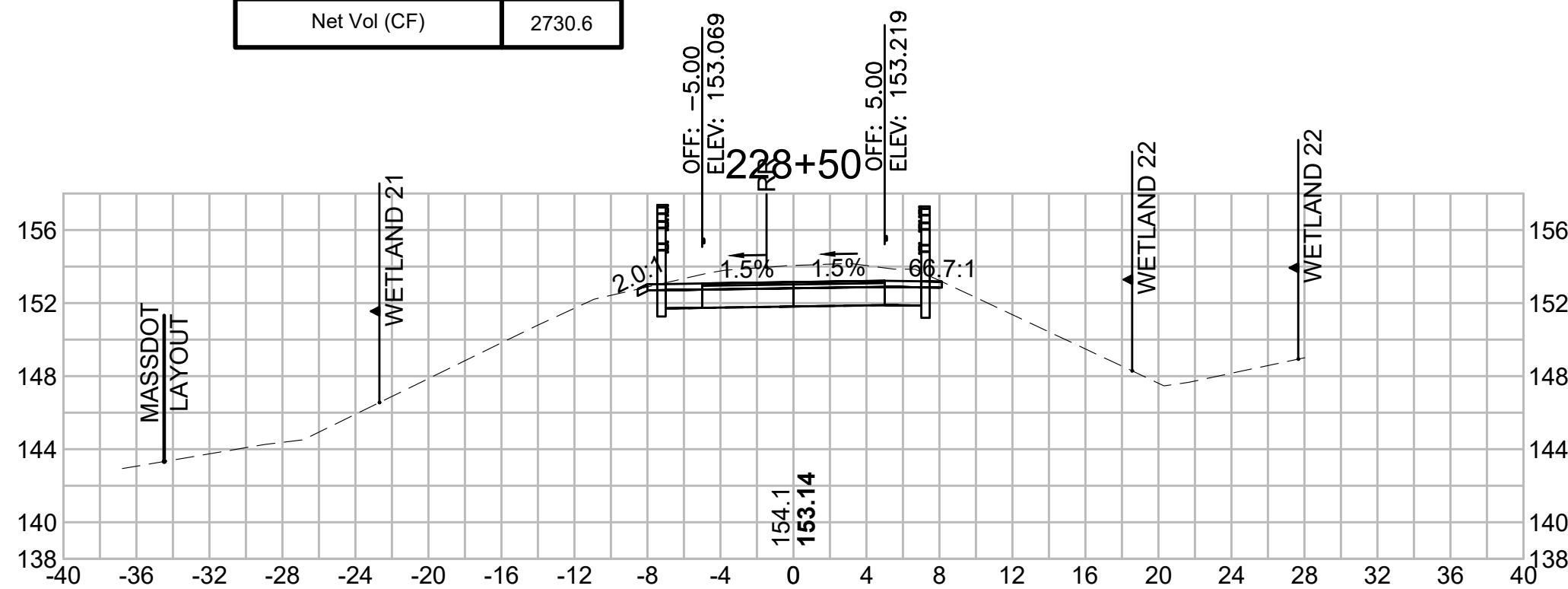
Total Volume at Station 229+00.00	
Cut Area (SF)	28.437
Fill Area (SF)	0.000
Cut Vol (CF)	54.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7681.5
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2784.7



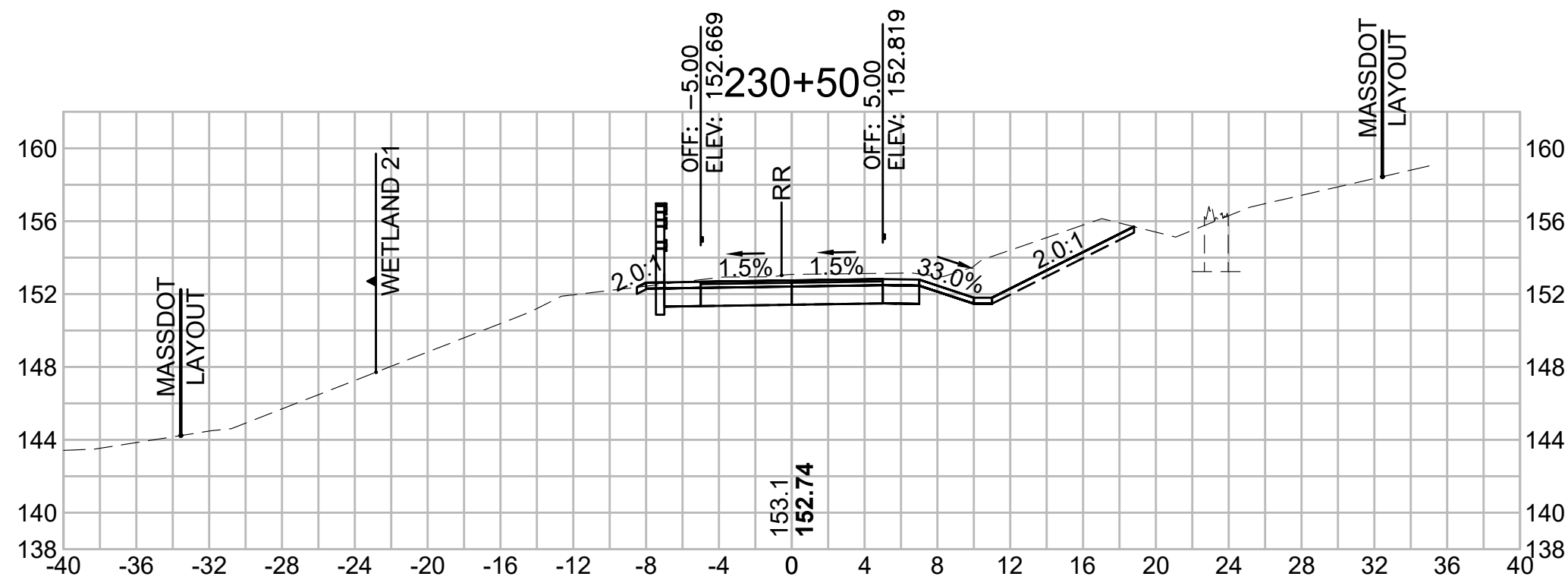
Total Volume at Station 227+00.00	
Cut Area (SF)	39.361
Fill Area (SF)	0.000
Cut Vol (CF)	71.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7430.2
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2533.4



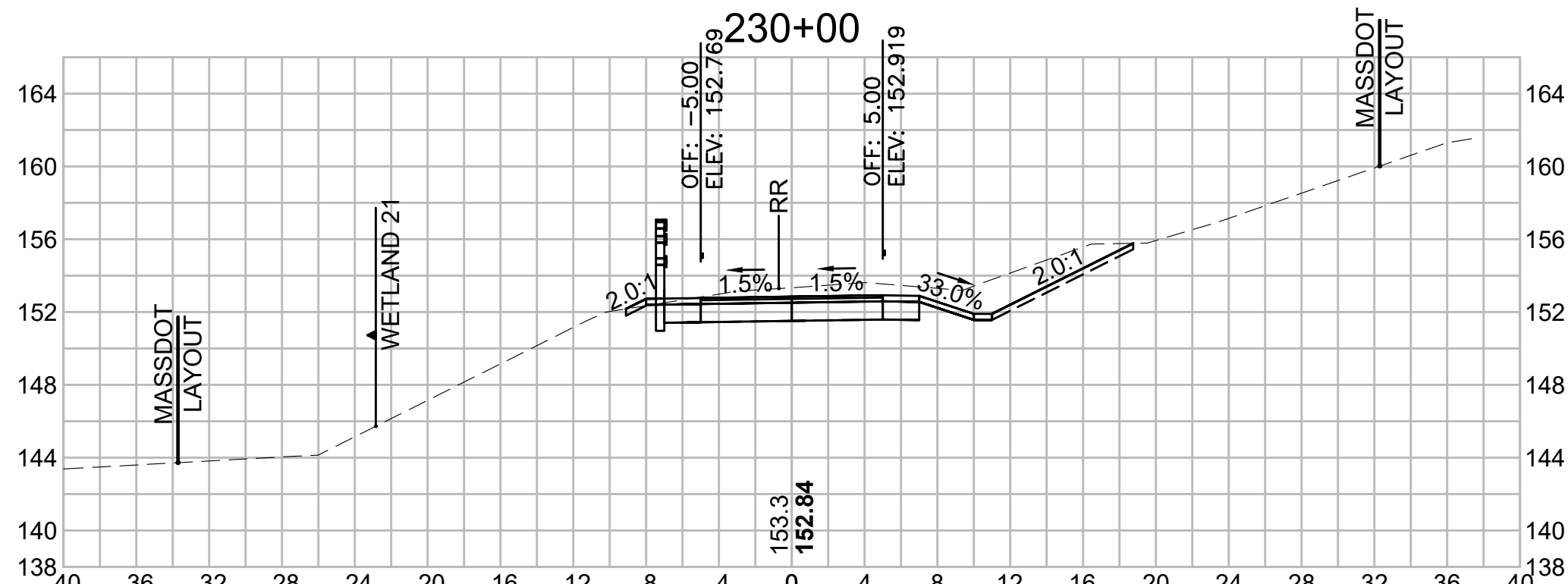
Total Volume at Station 228+50.00	
Cut Area (SF)	29.980
Fill Area (SF)	0.000
Cut Vol (CF)	59.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7627.4
Cum Fill Vol (CF)	4896.7
Net Vol (CF)	2730.6



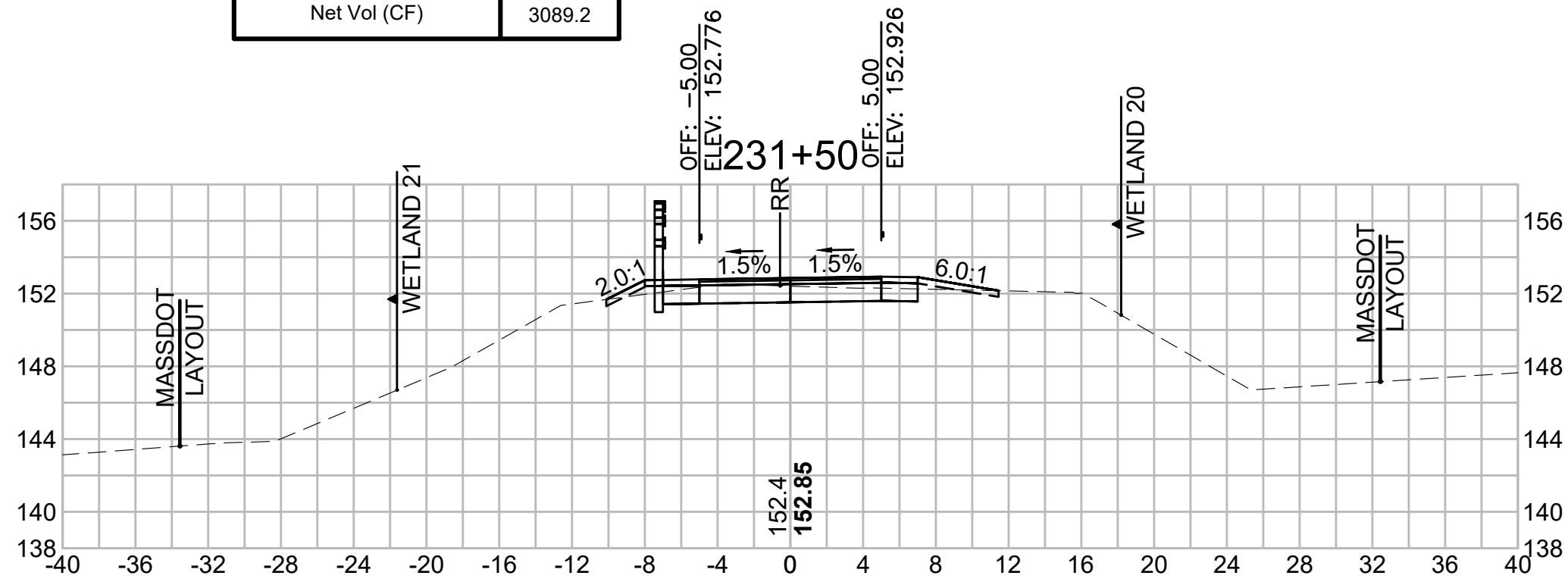
Total Volume at Station 230+50.00	
Cut Area (SF)	42.910
Fill Area (SF)	0.000
Cut Vol (CF)	79.0
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	7890.3
Cum Fill Vol (CF)	4897.2
Net Vol (CF)	2993.2



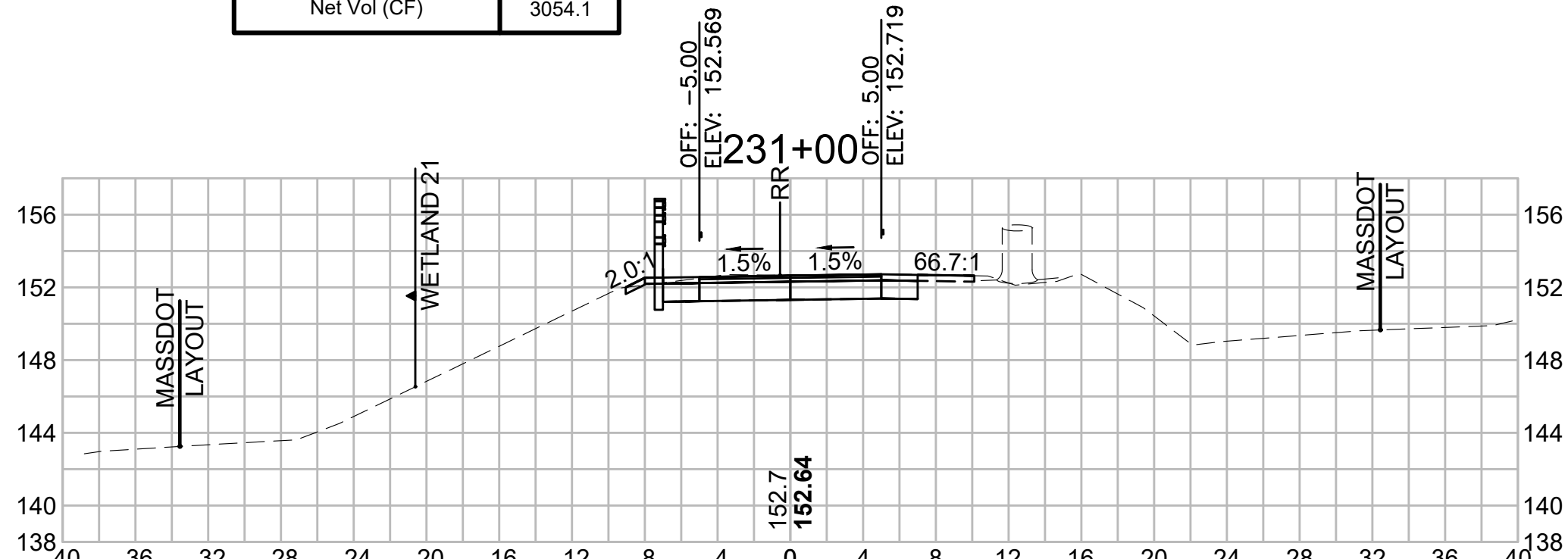
Total Volume at Station 230+00.00	
Cut Area (SF)	42.357
Fill Area (SF)	0.240
Cut Vol (CF)	71.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	7811.4
Cum Fill Vol (CF)	4897.0
Net Vol (CF)	2914.4



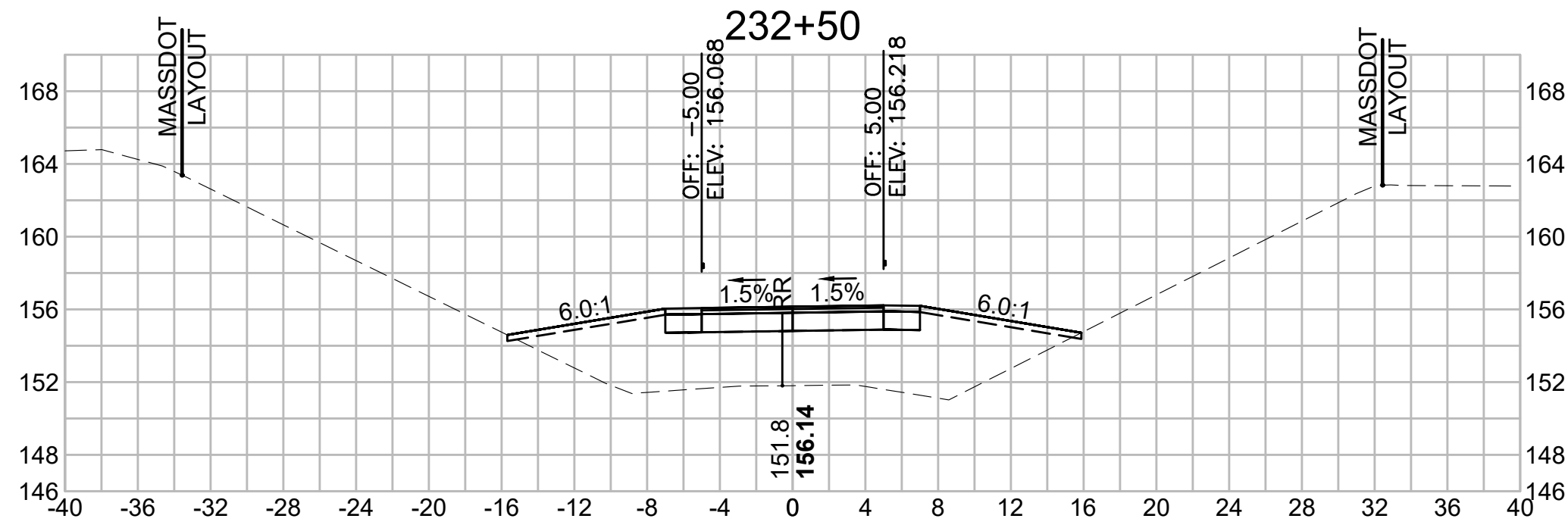
Total Volume at Station 231+50.00	
Cut Area (SF)	15.865
Fill Area (SF)	0.944
Cut Vol (CF)	35.9
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	7987.3
Cum Fill Vol (CF)	4898.1
Net Vol (CF)	3089.2



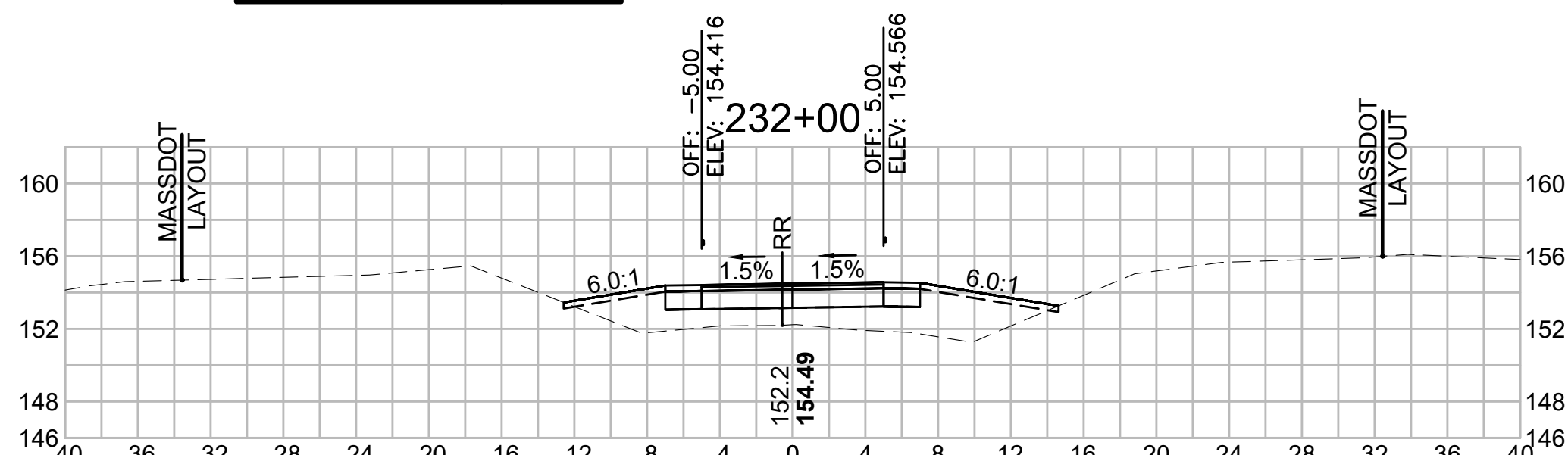
Total Volume at Station 231+00.00	
Cut Area (SF)	22.956
Fill Area (SF)	0.022
Cut Vol (CF)	61.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	7951.3
Cum Fill Vol (CF)	4897.2
Net Vol (CF)	3054.1



Total Volume at Station 232+50.00	
Cut Area (SF)	0.170
Fill Area (SF)	84.794
Cut Vol (CF)	1.8
Fill Vol (CF)	107.0
Cum Cut Vol (CF)	8005.5
Cum Fill Vol (CF)	5034.5
Net Vol (CF)	2971.0



Total Volume at Station 232+00.00	
Cut Area (SF)	1.819
Fill Area (SF)	30.775
Cut Vol (CF)	16.4
Fill Vol (CF)	29.4
Cum Cut Vol (CF)	8003.6
Cum Fill Vol (CF)	4927.5
Net Vol (CF)	3076.2



608164 XSEC(CROSS SECTION LAYOUTS).DWG 18-Feb-2022

Profile view of the proposed road section. The horizontal axis represents stationing from -40 to 40, and the vertical axis represents elevation in feet from 146 to 164. The profile shows a road with a central section at station 234+00. Key features include:

- Station 234+00: ELEV: 153.792, OFF: -5.00
- Station 234+42: ELEV: 153.942, OFF: 5.00
- Grades: Horizontal, 3.0%, 1.5% (L), 1.5% (R), 3.0%, Horizontal
- Vertical curve data: 150.6, 153.87

233+50

Horizontal 33.0% 1.5% 1.5% 33.0% Horizontal

151.1

155.292

155.442

OFF: -5.00

OFF: 5.00

ELEV: 155.292

ELEV: 155.442

233+00

OFF: 12.00
ELEV: 156.272

6.0:1

1.5%

156.45

151.4

1.5%

6.0:1

OFF: 12.00
ELEV: 156.632

[illegible]

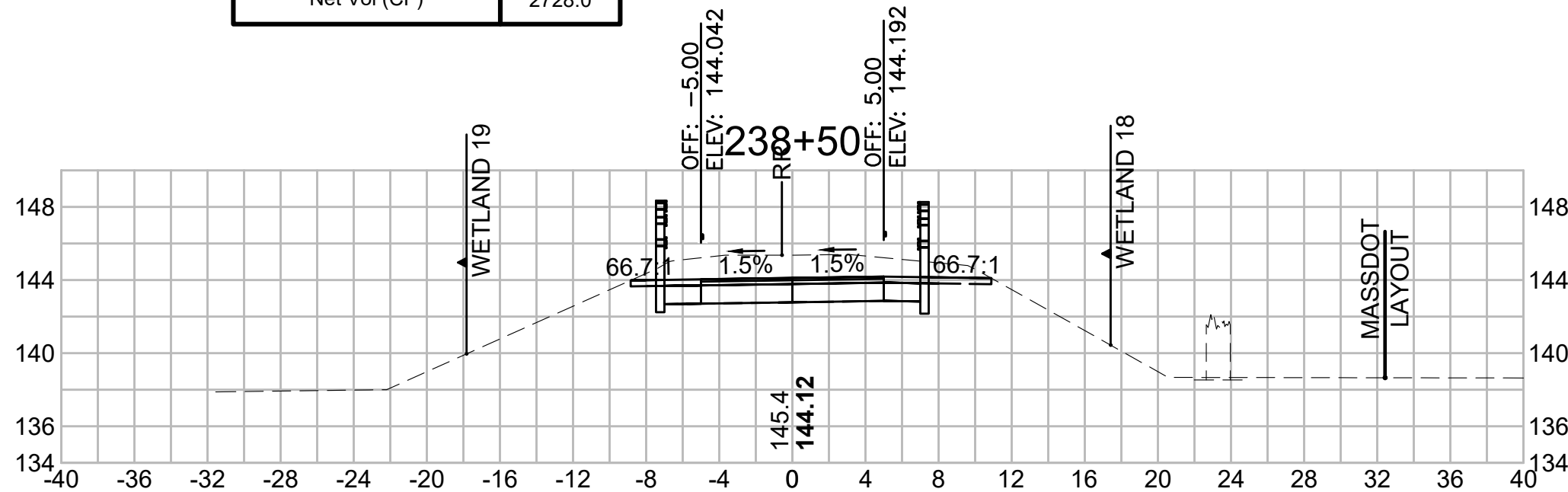
Profile view of the proposed road layout. The vertical axis shows elevation from 146 to 156. The horizontal axis shows stationing from -40 to 36. The profile includes a horizontal section, a 3.0% grade, a 1.5% grade, a 1.5% grade, and a 33.0% horizontal section. Key points include 'OFF: -5.00 ELEV: 150.717' and 'OFF: 3.00 ELEV: 150.867'. A 'MASSDOT LAYOUT' is indicated on the right.

The profile view diagram shows a cross-section of the site. Key features include:

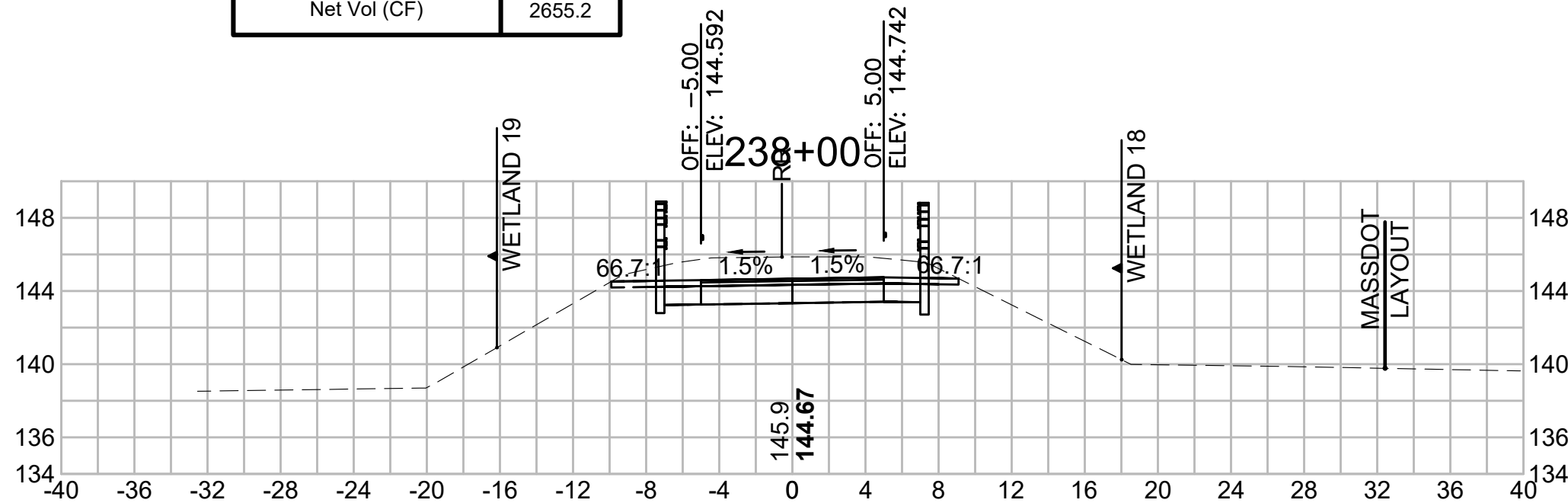
- WETLAND 19**: Located on the left side of the profile.
- WETLAND 18**: Located on the right side of the profile.
- MASSDOT LAYOUT**: Indicated by a vertical line on the far right.
- Elevations and Slopes**:
 - At station **23+00**, there are two points labeled "OFF: -5.00" and "ELEV: 145.692".
 - At station **23+00**, there are two points labeled "OFF: 5.00" and "ELEV: 145.842".
 - Slopes are indicated as **15:1** on the left and **66:7:1** on the right.
 - Intermediate elevations shown are **146.7** and **145.77**.

[illegible]

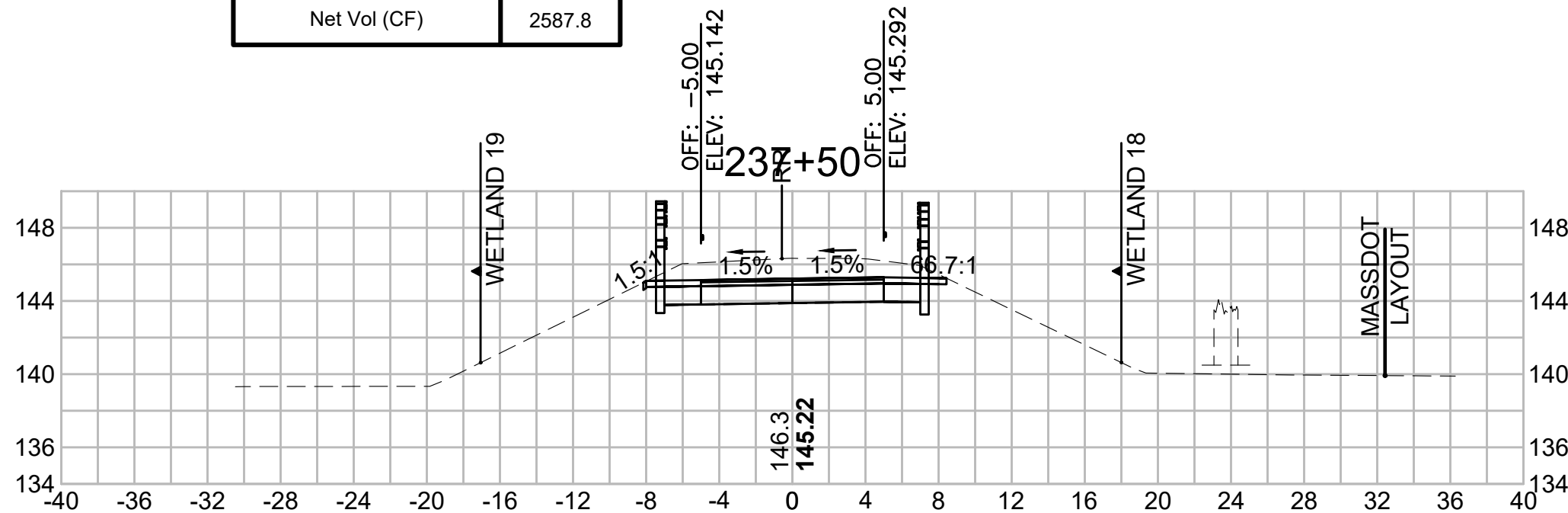
Total Volume at Station 238+50.00	
Cut Area (SF)	40.123
Fill Area (SF)	0.000
Cut Vol (CF)	72.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8408.5
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	2728.0



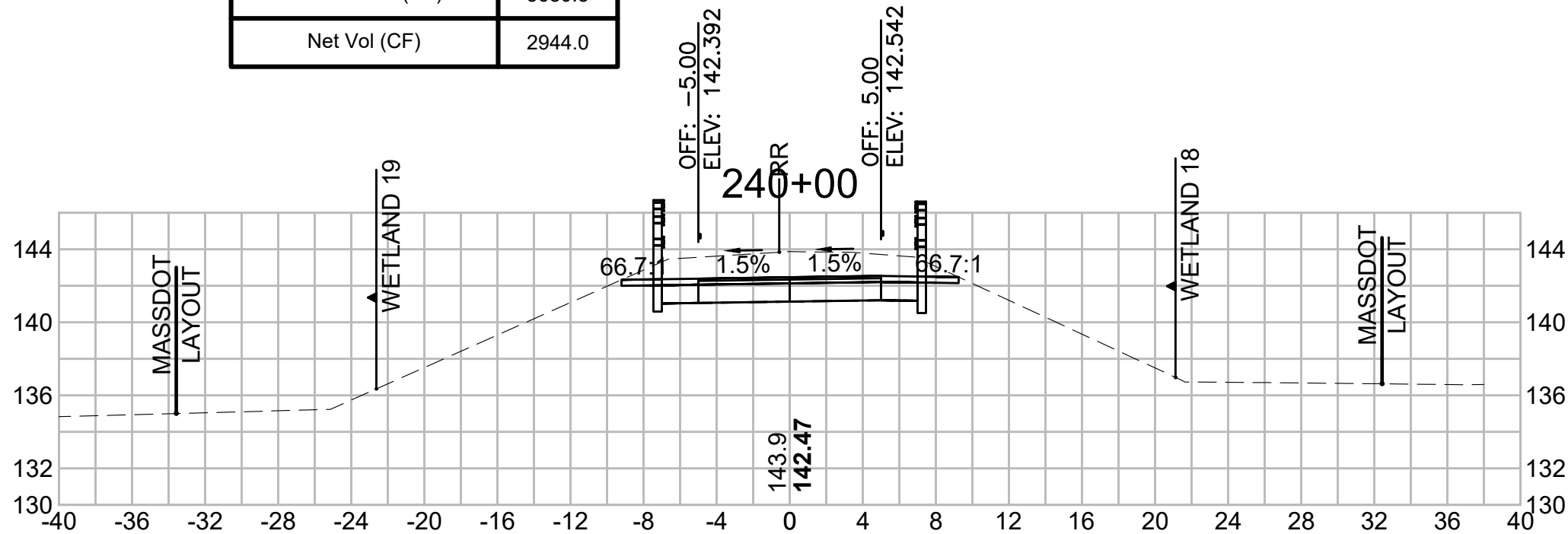
Total Volume at Station 238+00.00	
Cut Area (SF)	38.481
Fill Area (SF)	0.000
Cut Vol (CF)	67.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8335.7
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	2655.2



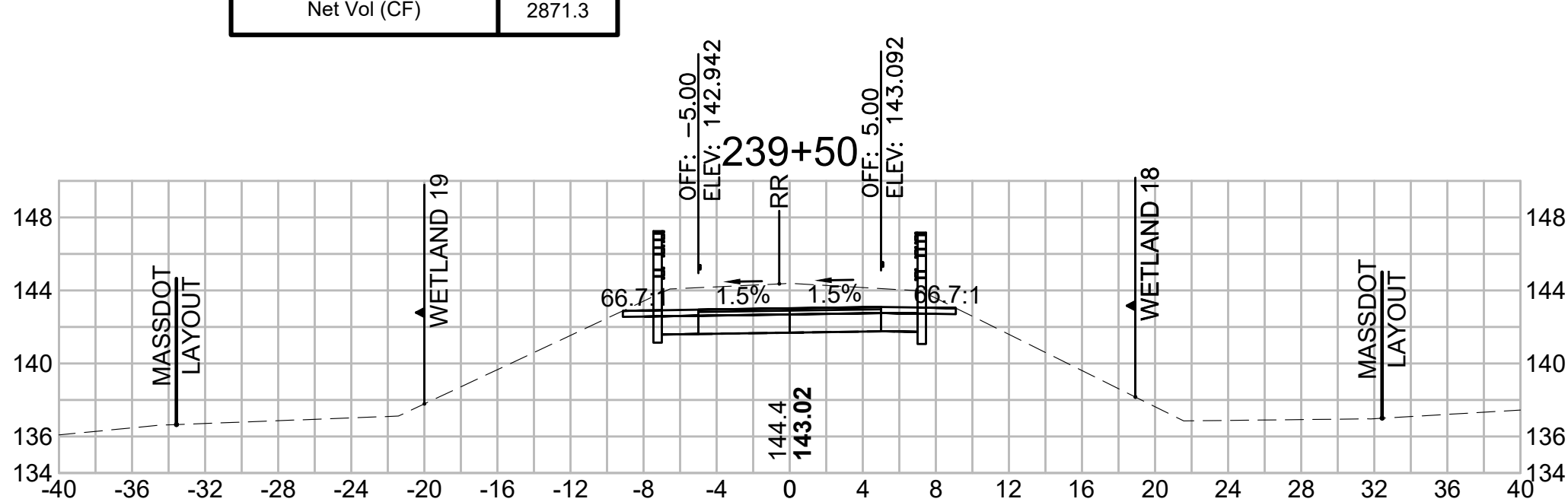
Total Volume at Station 237+50.00	
Cut Area (SF)	34.340
Fill Area (SF)	0.000
Cut Vol (CF)	61.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8268.3
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	2587.8



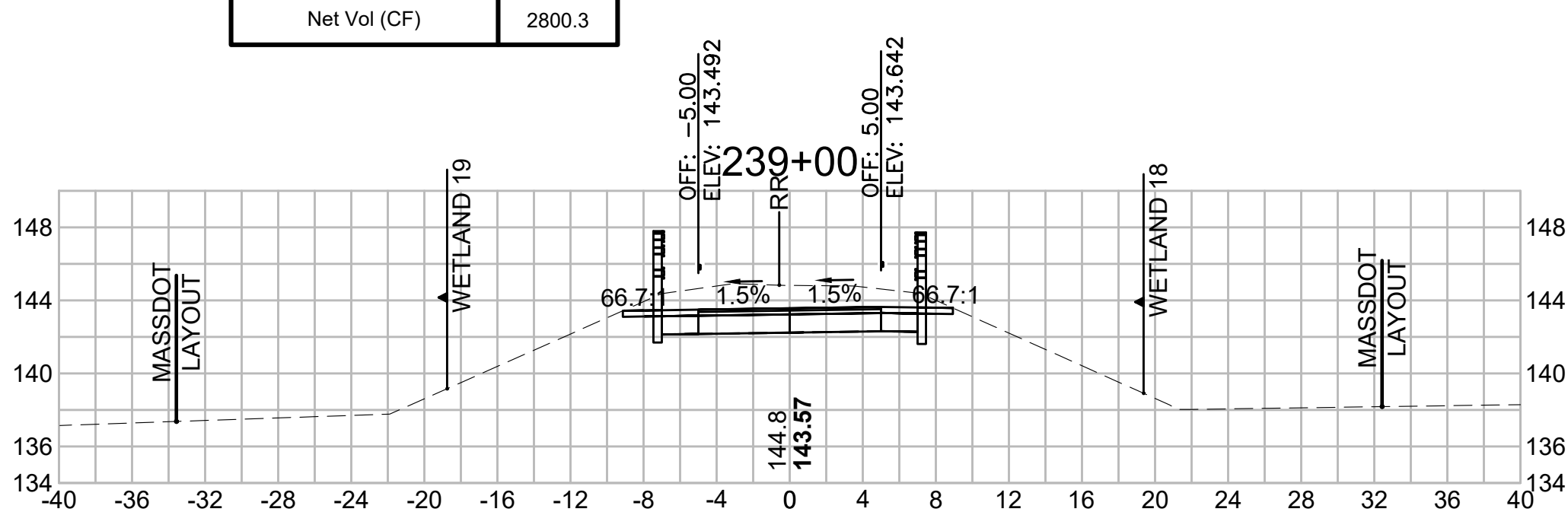
Total Volume at Station 240+00.00	
Cut Area (SF)	39.826
Fill Area (SF)	0.000
Cut Vol (CF)	72.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8624.5
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	2944.0



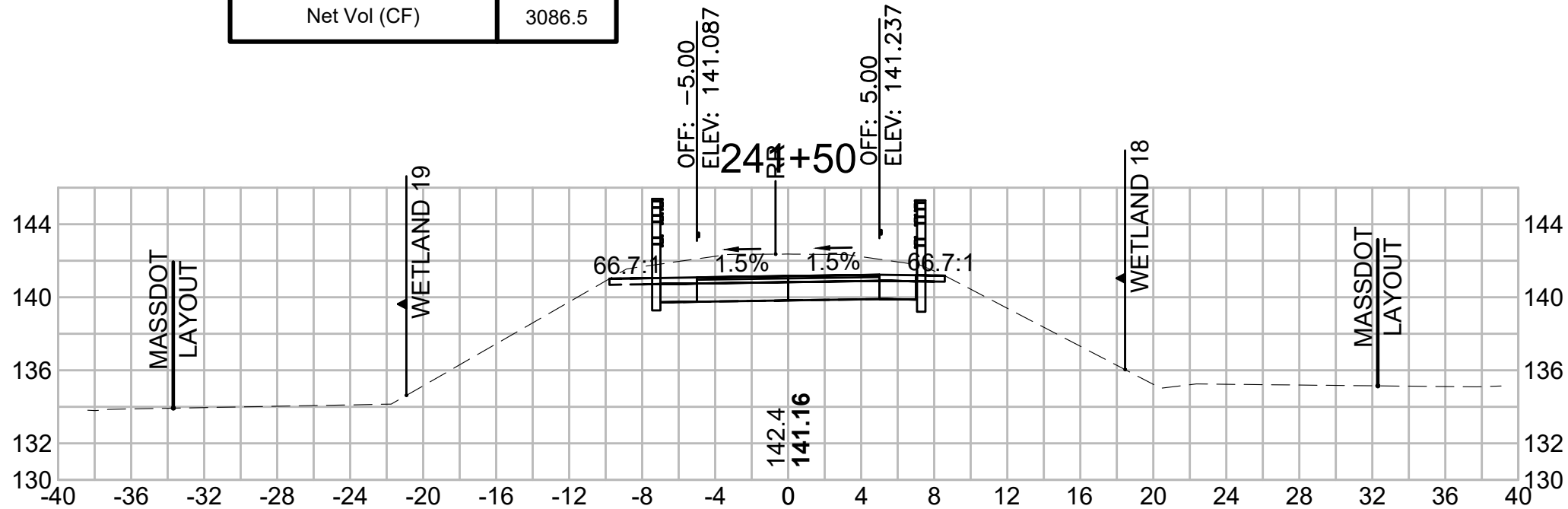
Total Volume at Station 239+50.00	
Cut Area (SF)	38.714
Fill Area (SF)	0.000
Cut Vol (CF)	71.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8551.8
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	2871.3



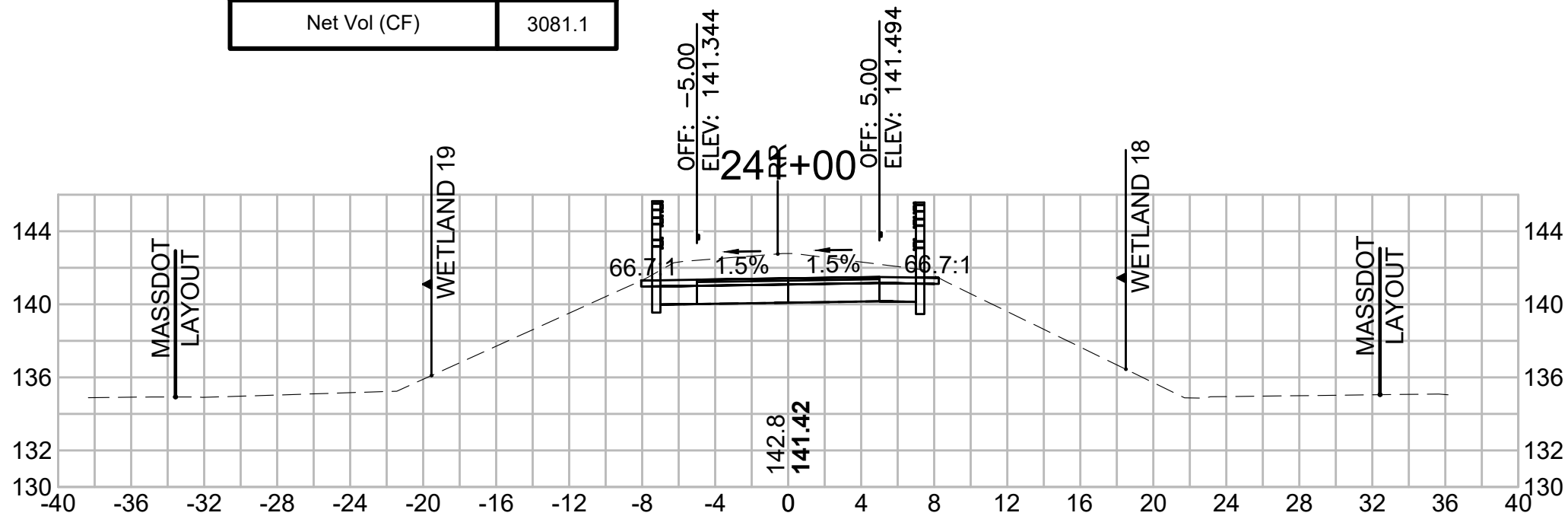
Total Volume at Station 239+00.00	
Cut Area (SF)	37.978
Fill Area (SF)	0.000
Cut Vol (CF)	72.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8480.8
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	2800.3



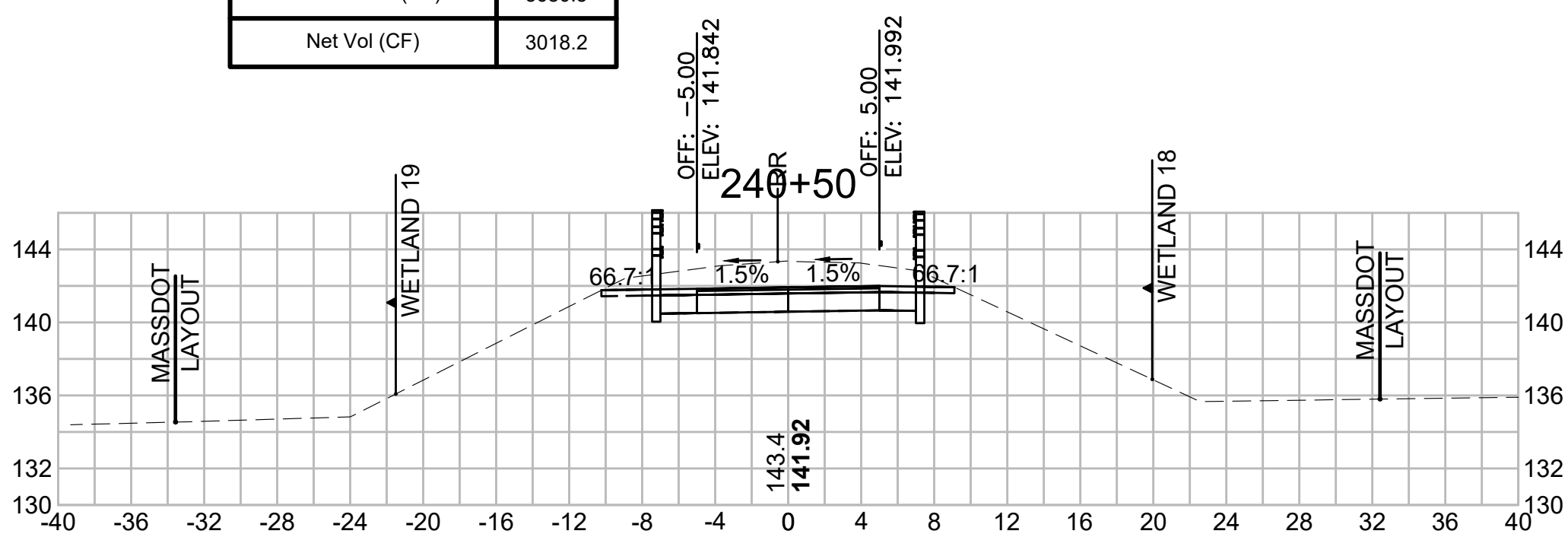
Total Volume at Station 241+50.00	
Cut Area (SF)	36.860
Fill Area (SF)	58.543
Cut Vol (CF)	66.2
Fill Vol (CF)	60.7
Cum Cut Vol (CF)	8834.3
Cum Fill Vol (CF)	5747.8
Net Vol (CF)	3086.5



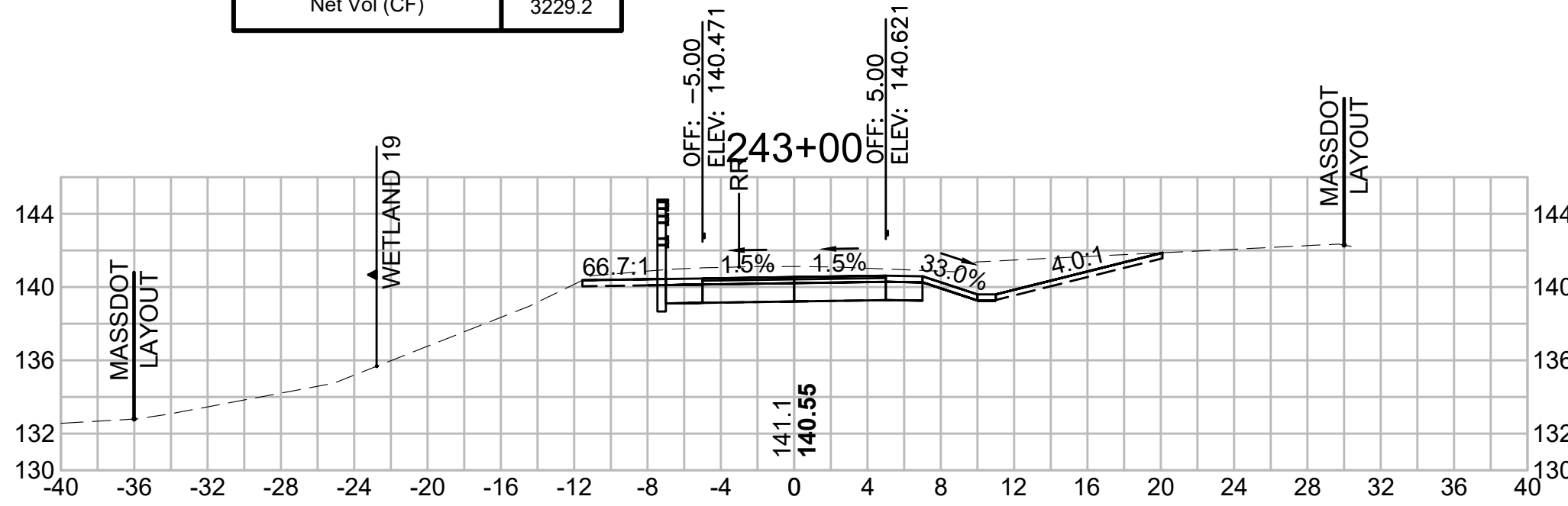
Total Volume at Station 241+00.00	
Cut Area (SF)	34.587
Fill Area (SF)	7.031
Cut Vol (CF)	69.4
Fill Vol (CF)	6.5
Cum Cut Vol (CF)	8768.1
Cum Fill Vol (CF)	5687.0
Net Vol (CF)	3081.1



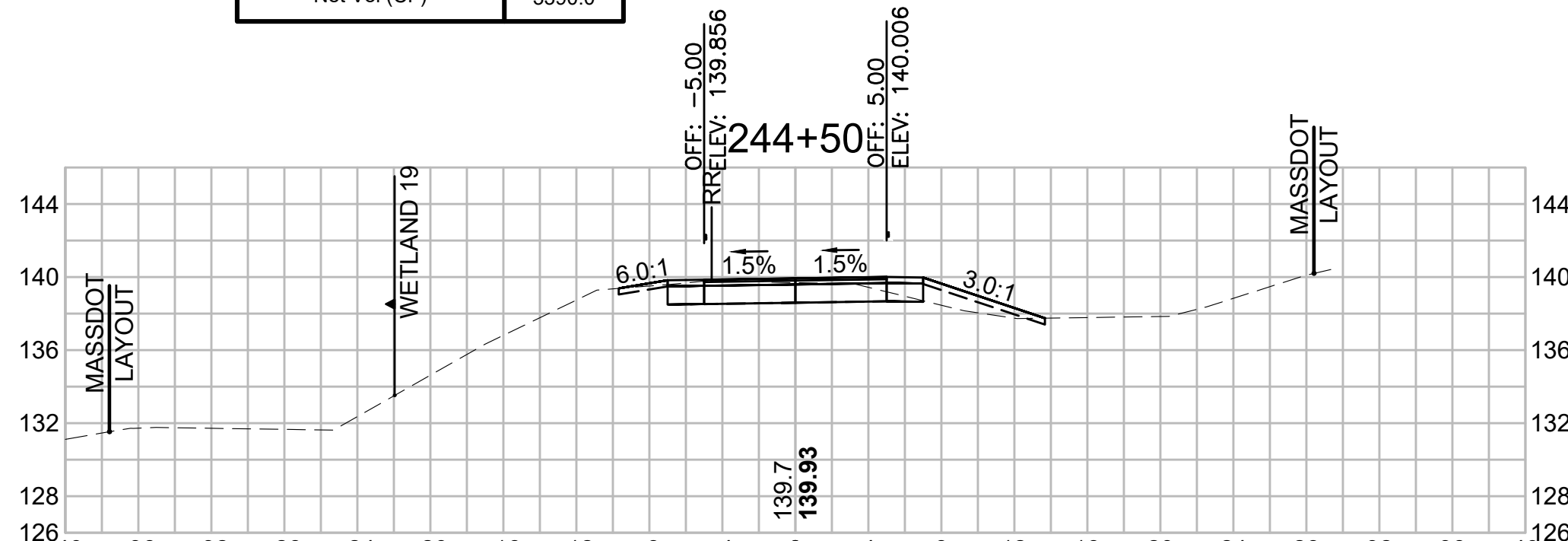
Total Volume at Station 240+50.00	
Cut Area (SF)	40.318
Fill Area (SF)	0.000
Cut Vol (CF)	74.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	8698.7
Cum Fill Vol (CF)	5680.5
Net Vol (CF)	3018.2



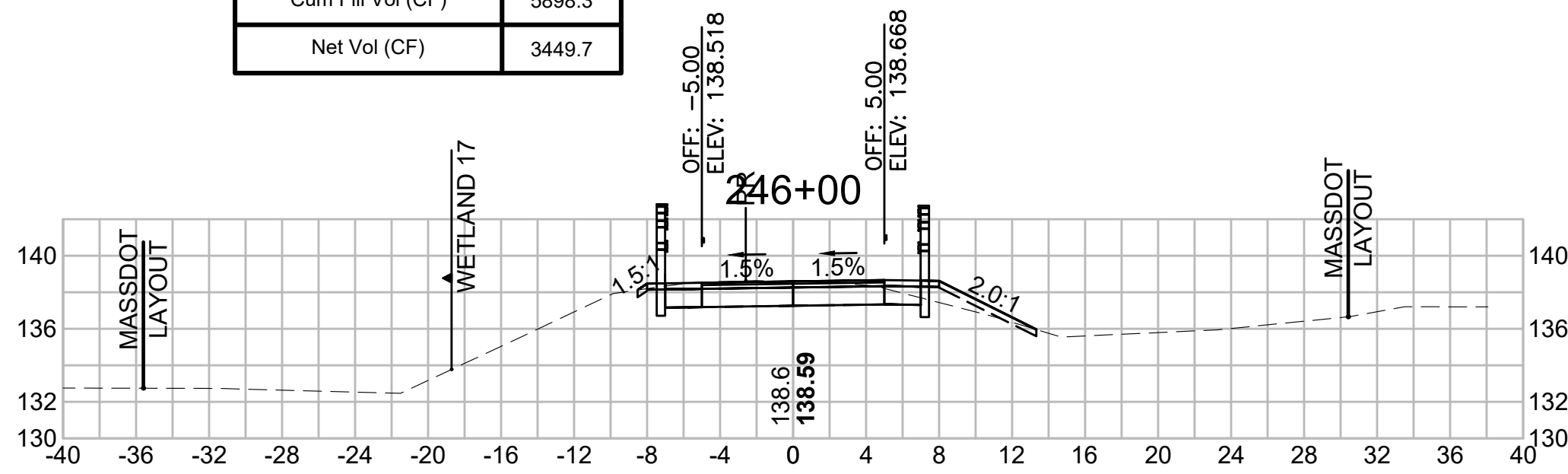
Total Volume at Station 243+00.00	
Cut Area (SF)	46.014
Fill Area (SF)	9.458
Cut Vol (CF)	95.3
Fill Vol (CF)	18.8
Cum Cut Vol (CF)	9091.5
Cum Fill Vol (CF)	5862.3
Net Vol (CF)	3229.2



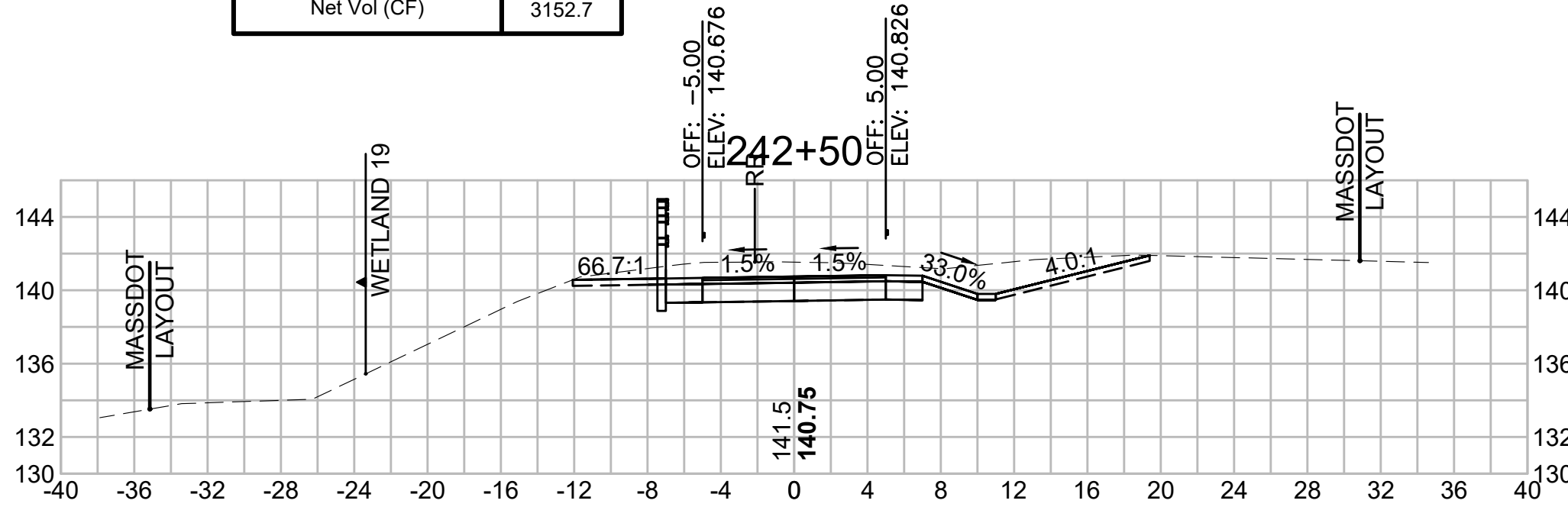
Total Volume at Station 244+50.00	
Cut Area (SF)	14.460
Fill Area (SF)	3.195
Cut Vol (CF)	32.6
Fill Vol (CF)	3.1
Cum Cut Vol (CF)	9264.2
Cum Fill Vol (CF)	5874.2
Net Vol (CF)	3390.0



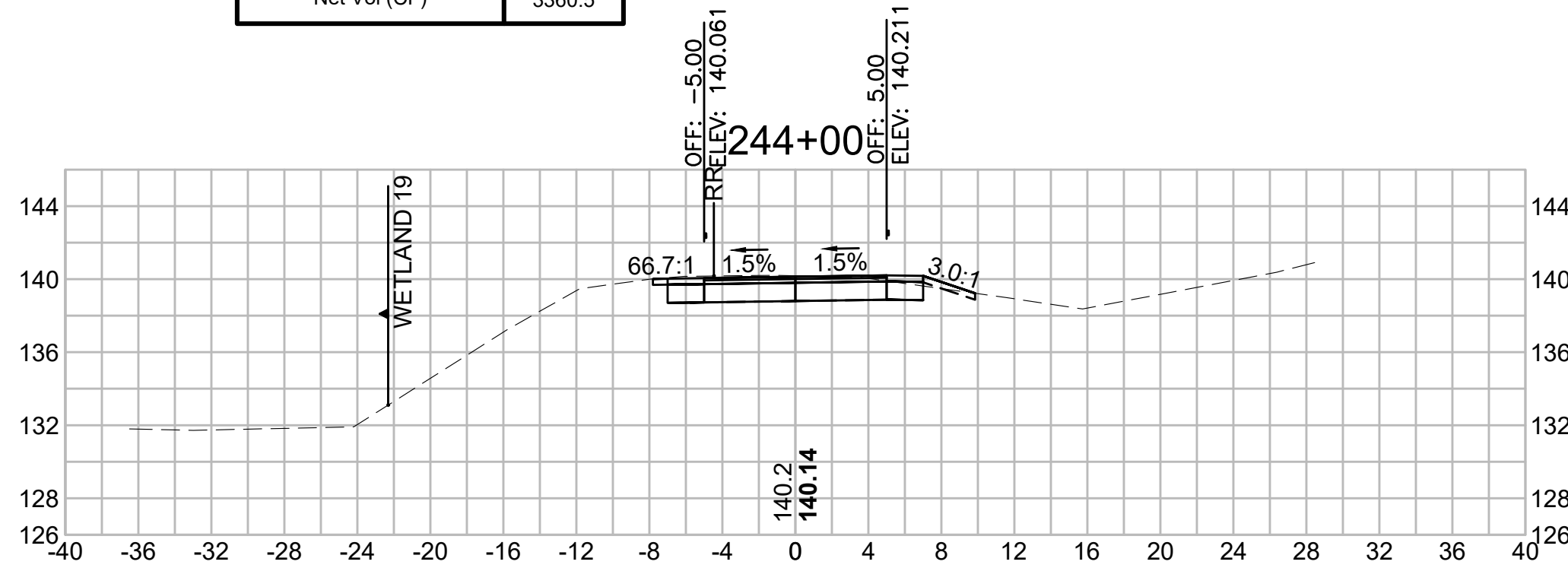
Total Volume at Station 246+00.00	
Cut Area (SF)	17.273
Fill Area (SF)	2.105
Cut Vol (CF)	27.2
Fill Vol (CF)	10.7
Cum Cut Vol (CF)	9348.1
Cum Fill Vol (CF)	5898.3
Net Vol (CF)	3449.7



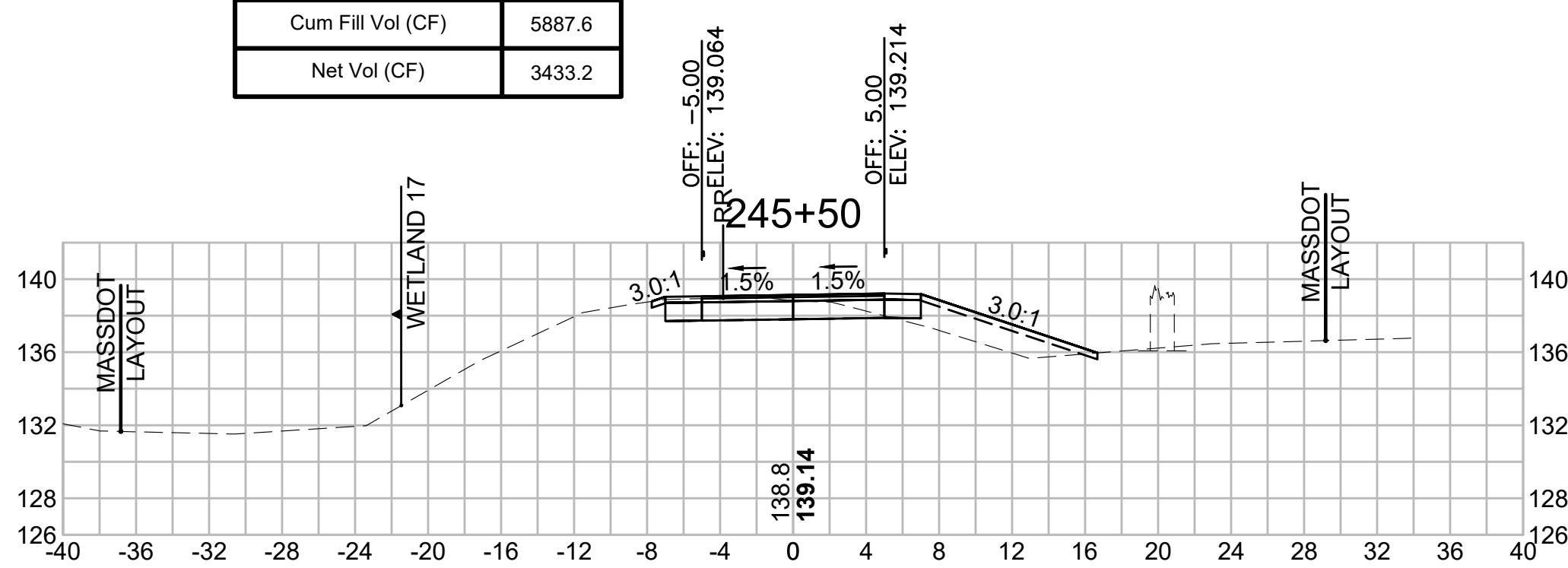
Total Volume at Station 242+50.00	
Cut Area (SF)	56.932
Fill Area (SF)	10.847
Cut Vol (CF)	90.3
Fill Vol (CF)	25.8
Cum Cut Vol (CF)	8996.2
Cum Fill Vol (CF)	5843.5
Net Vol (CF)	3152.7



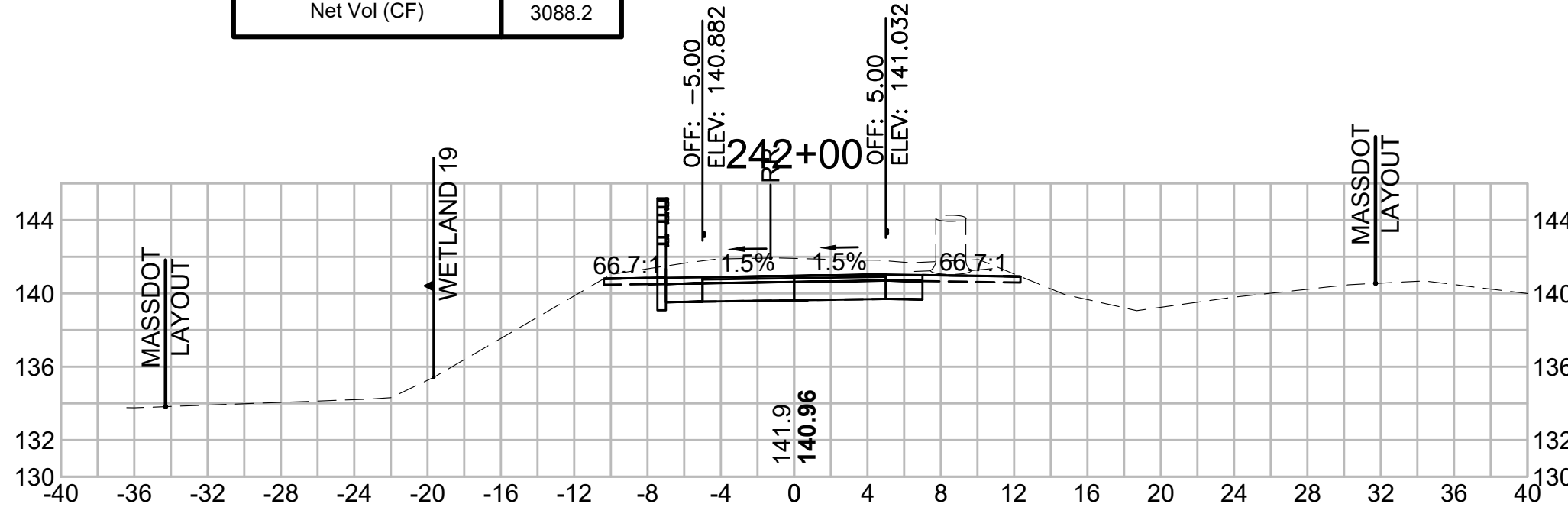
Total Volume at Station 244+00.00	
Cut Area (SF)	20.739
Fill Area (SF)	0.105
Cut Vol (CF)	58.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	9231.6
Cum Fill Vol (CF)	5871.1
Net Vol (CF)	3360.5



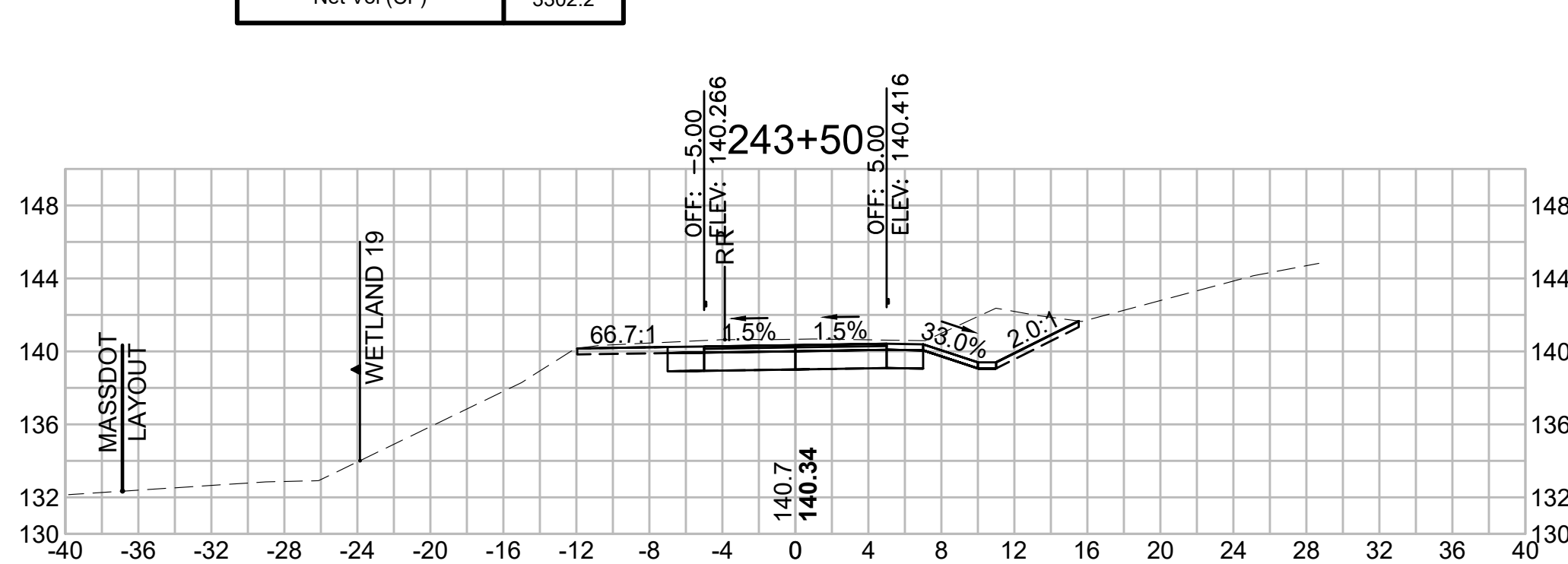
Total Volume at Station 245+50.00	
Cut Area (SF)	12.126
Fill Area (SF)	9.499
Cut Vol (CF)	27.3
Fill Vol (CF)	9.6
Cum Cut Vol (CF)	9320.8
Cum Fill Vol (CF)	5887.6
Net Vol (CF)	3433.2



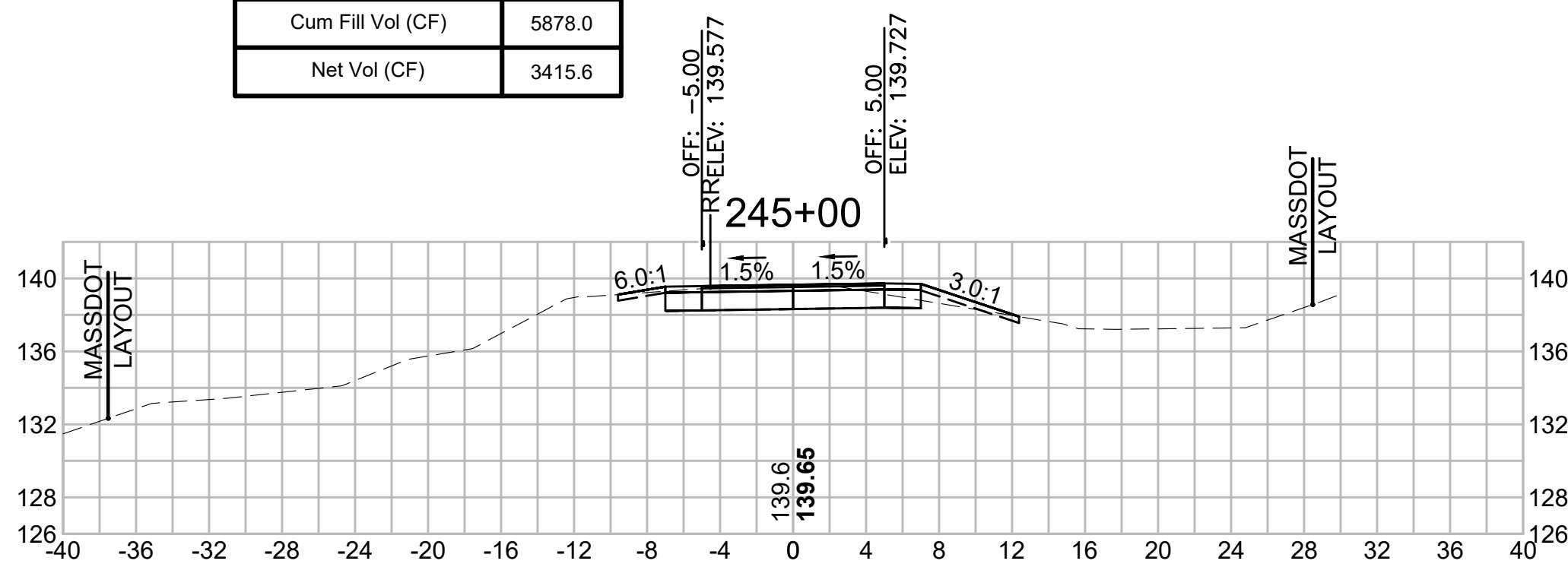
Total Volume at Station 242+00.00	
Cut Area (SF)	40.540
Fill Area (SF)	16.985
Cut Vol (CF)	71.7
Fill Vol (CF)	69.9
Cum Cut Vol (CF)	8905.9
Cum Fill Vol (CF)	5817.7
Net Vol (CF)	3088.2



Total Volume at Station 243+50.00	
Cut Area (SF)	42.264
Fill Area (SF)	0.003
Cut Vol (CF)	81.7
Fill Vol (CF)	8.8
Cum Cut Vol (CF)	9173.2
Cum Fill Vol (CF)	5871.0
Net Vol (CF)	3302.2



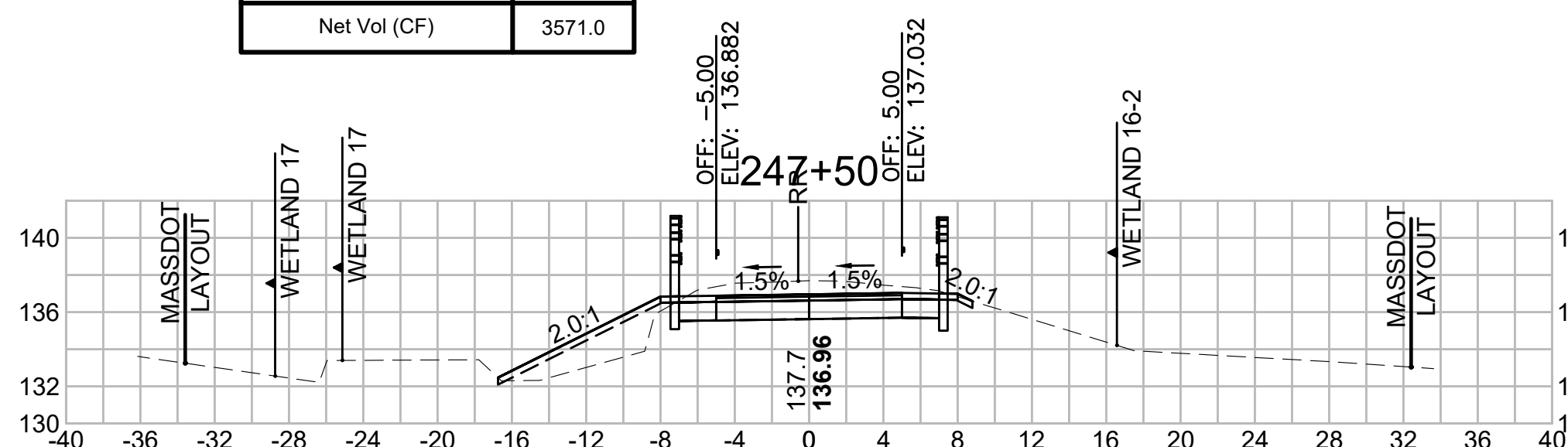
Total Volume at Station 245+00.00	
Cut Area (SF)	17.312
Fill Area (SF)	0.900
Cut Vol (CF)	29.4
Fill Vol (CF)	3.8
Cum Cut Vol (CF)	9293.6
Cum Fill Vol (CF)	5878.0
Net Vol (CF)	3415.6



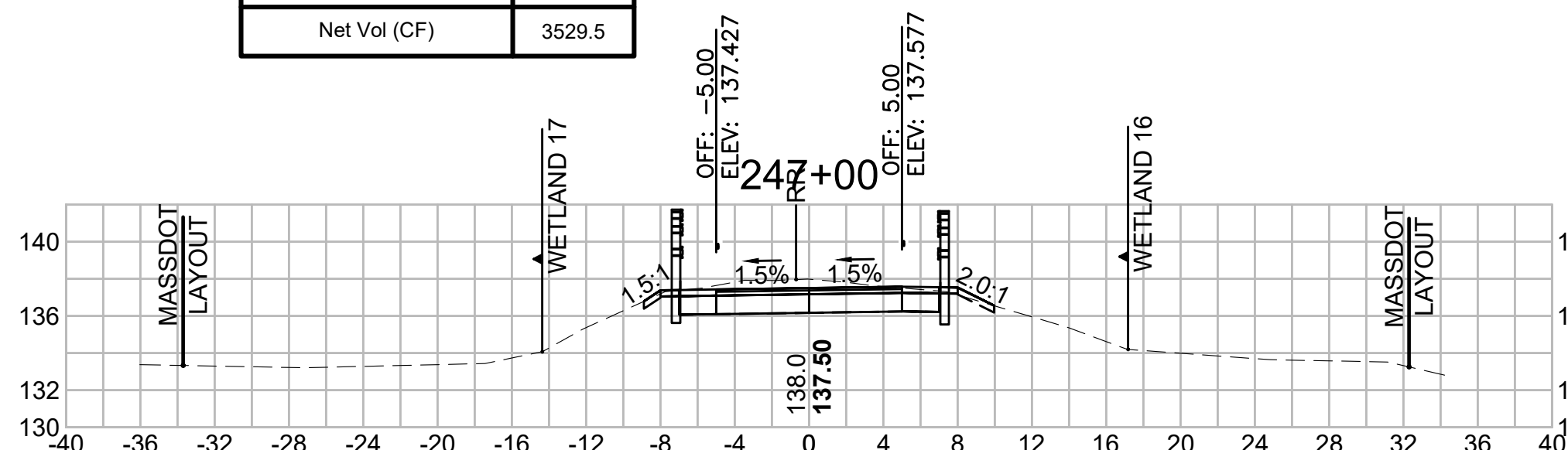
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	280	319

CROSS SECTIONS

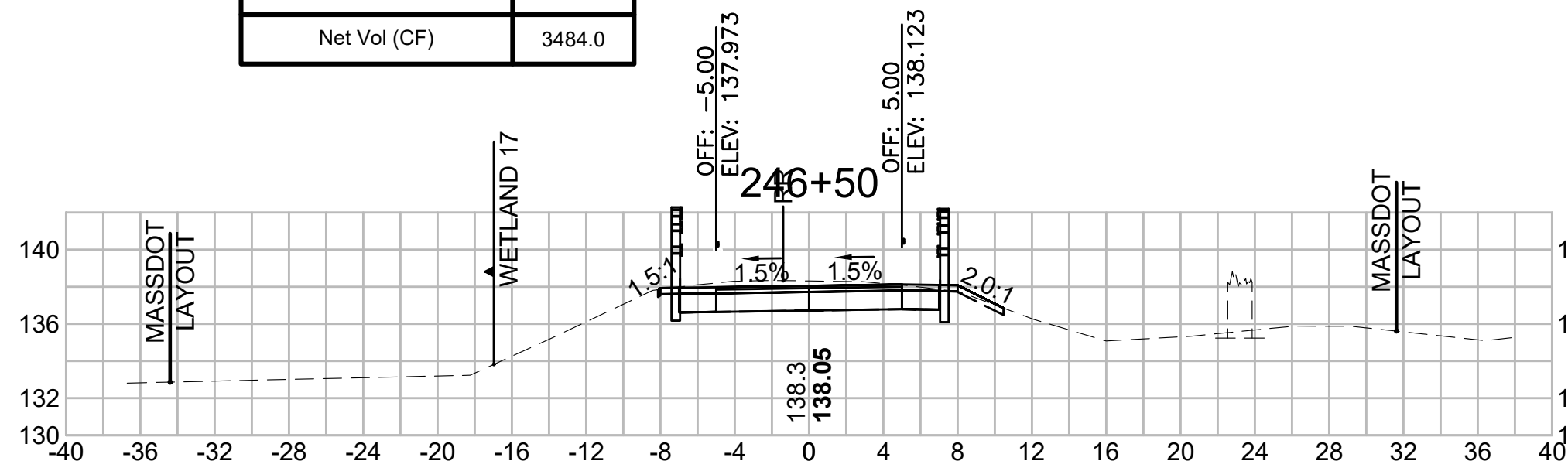
Total Volume at Station 247+50.00	
Cut Area (SF)	27.970
Fill Area (SF)	10.437
Cut Vol (CF)	51.2
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	9480.9
Cum Fill Vol (CF)	5910.0
Net Vol (CF)	3571.0



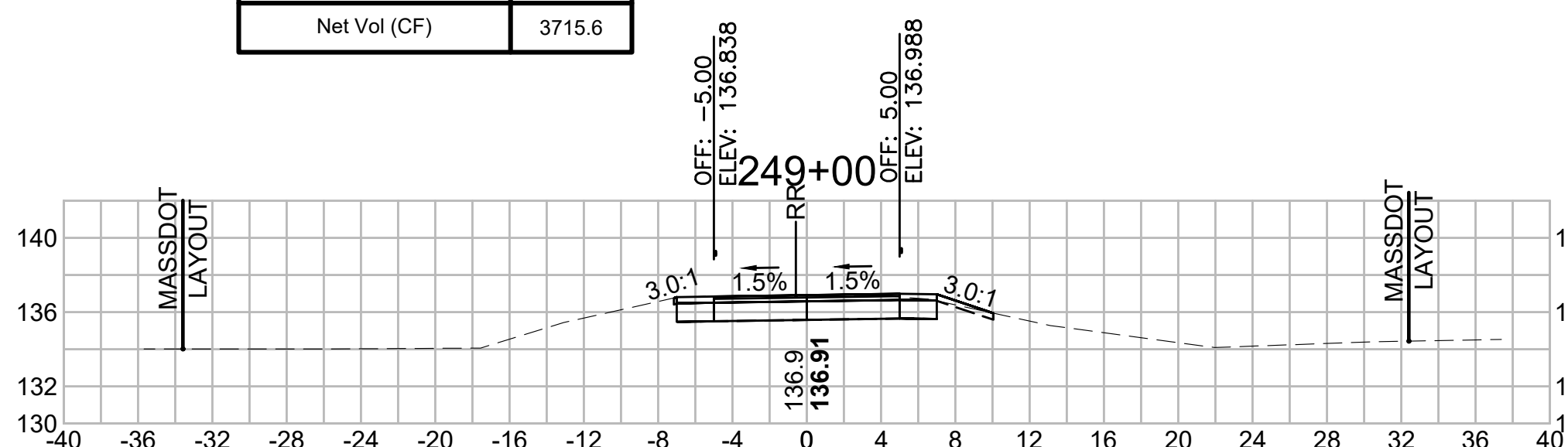
Total Volume at Station 247+00.00	
Cut Area (SF)	27.272
Fill Area (SF)	0.011
Cut Vol (CF)	45.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9429.8
Cum Fill Vol (CF)	5900.3
Net Vol (CF)	3529.5



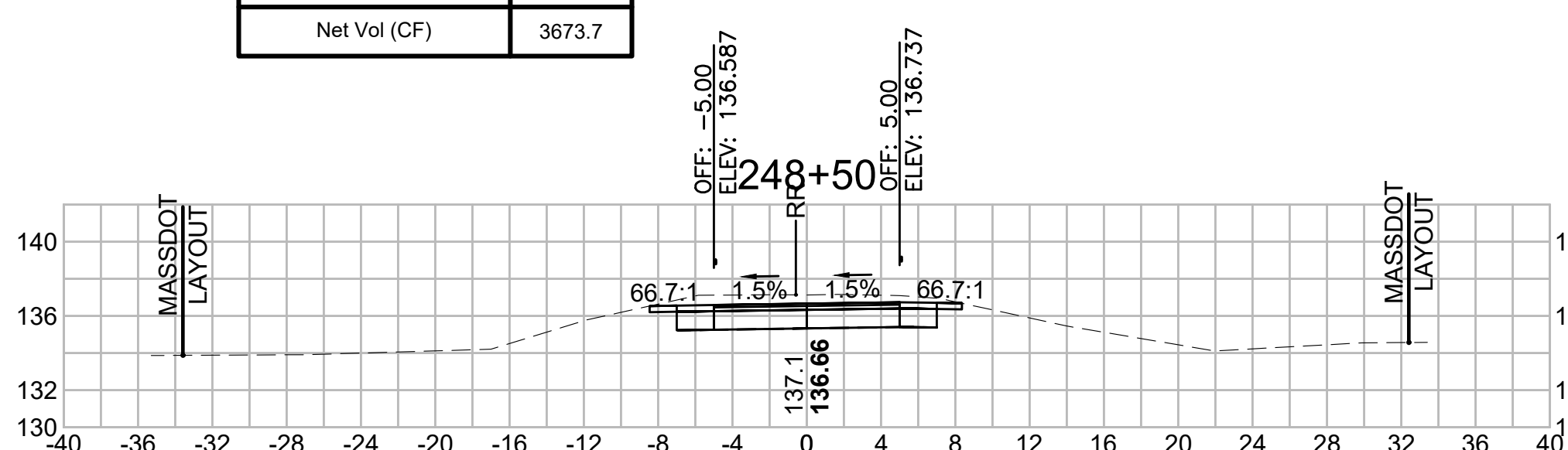
Total Volume at Station 246+50.00	
Cut Area (SF)	21.860
Fill Area (SF)	0.001
Cut Vol (CF)	36.2
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	9384.3
Cum Fill Vol (CF)	5900.3
Net Vol (CF)	3484.0



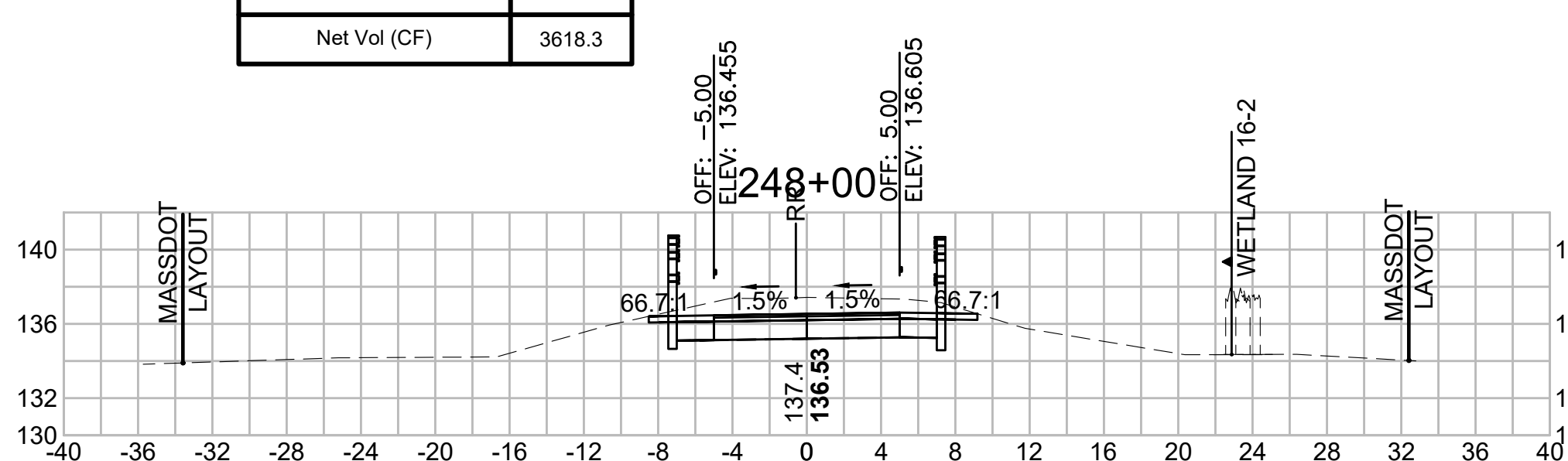
Total Volume at Station 249+00.00	
Cut Area (SF)	19.014
Fill Area (SF)	0.000
Cut Vol (CF)	41.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9635.3
Cum Fill Vol (CF)	5919.6
Net Vol (CF)	3715.6



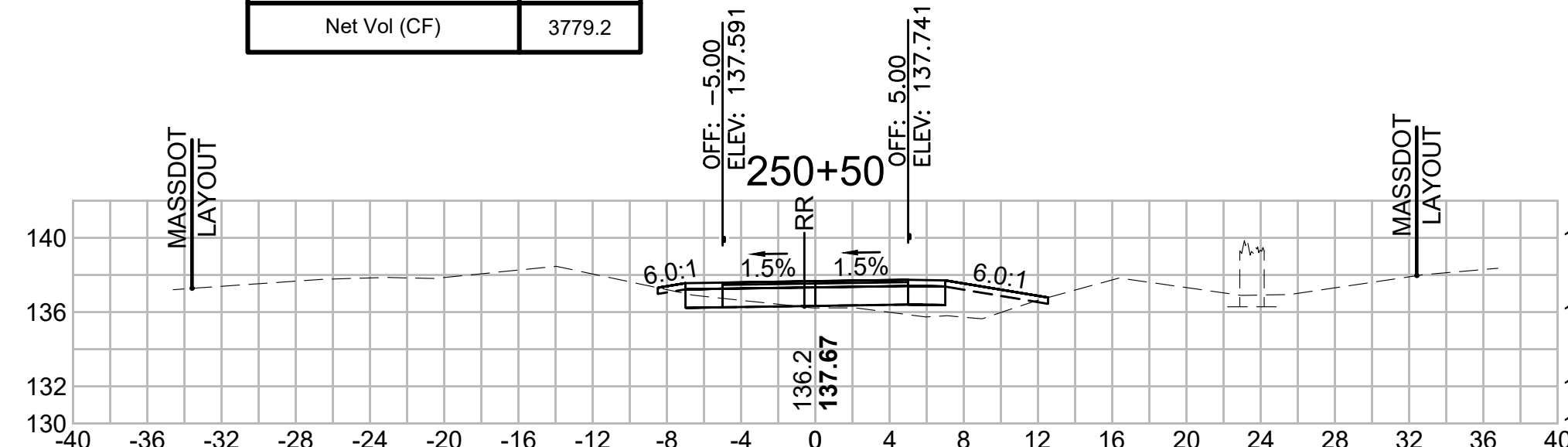
Total Volume at Station 248+50.00	
Cut Area (SF)	26.248
Fill Area (SF)	0.000
Cut Vol (CF)	55.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9593.4
Cum Fill Vol (CF)	5919.6
Net Vol (CF)	3673.7



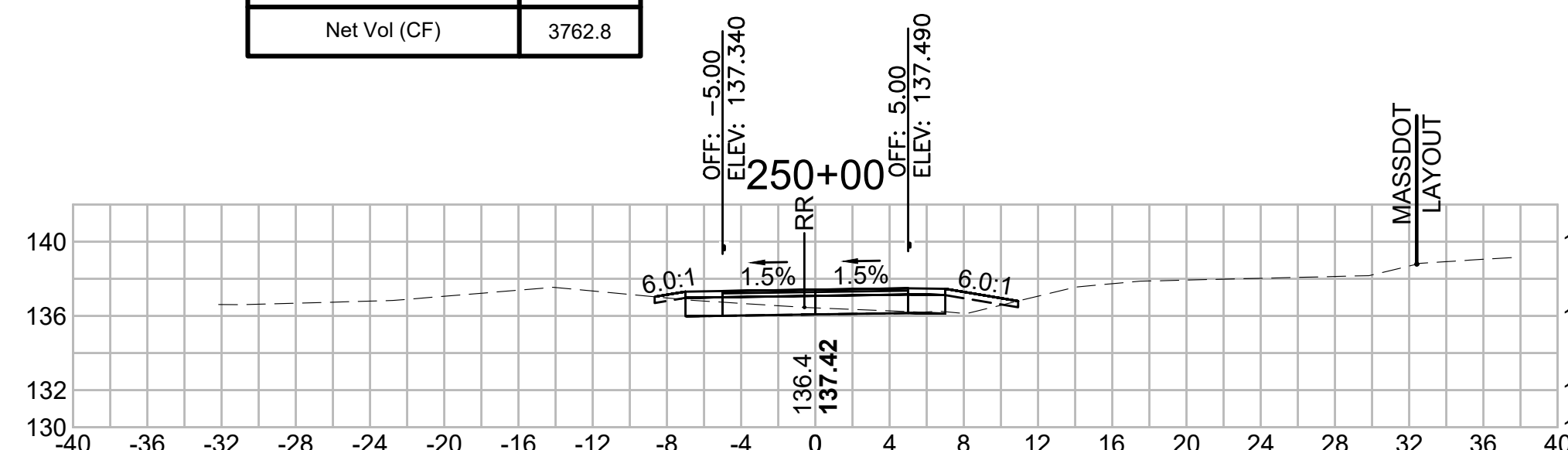
Total Volume at Station 248+00.00	
Cut Area (SF)	33.601
Fill Area (SF)	0.000
Cut Vol (CF)	57.0
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	9537.9
Cum Fill Vol (CF)	5919.6
Net Vol (CF)	3618.3



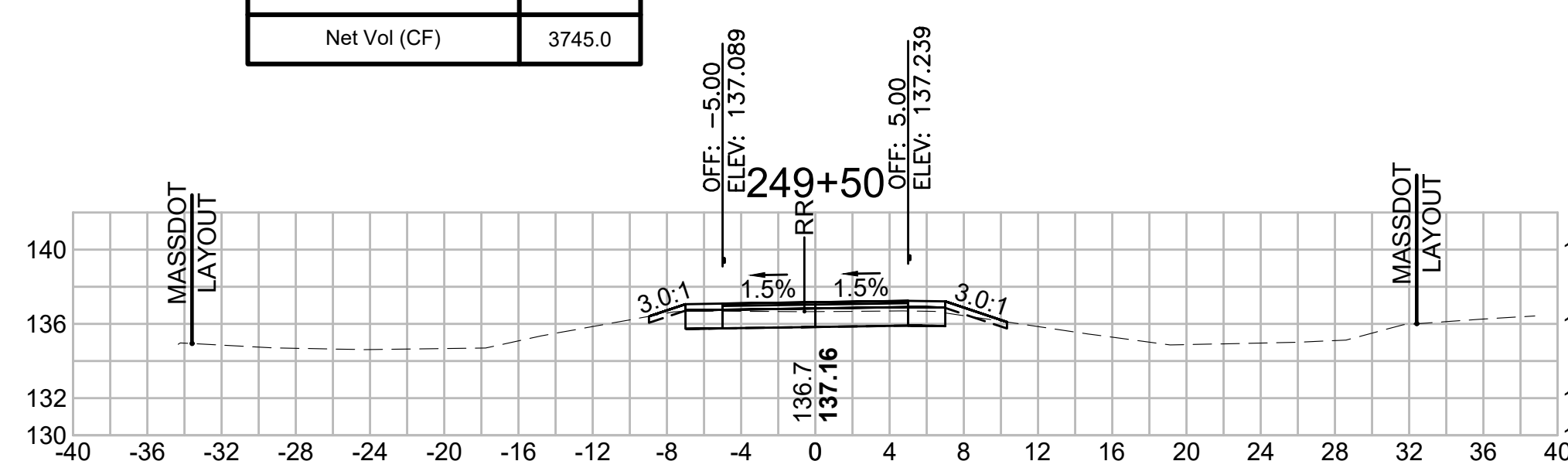
Total Volume at Station 250+50.00	
Cut Area (SF)	18.871
Fill Area (SF)	7.482
Cut Vol (CF)	25.1
Fill Vol (CF)	8.6
Cum Cut Vol (CF)	9709.5
Cum Fill Vol (CF)	5930.2
Net Vol (CF)	3779.2



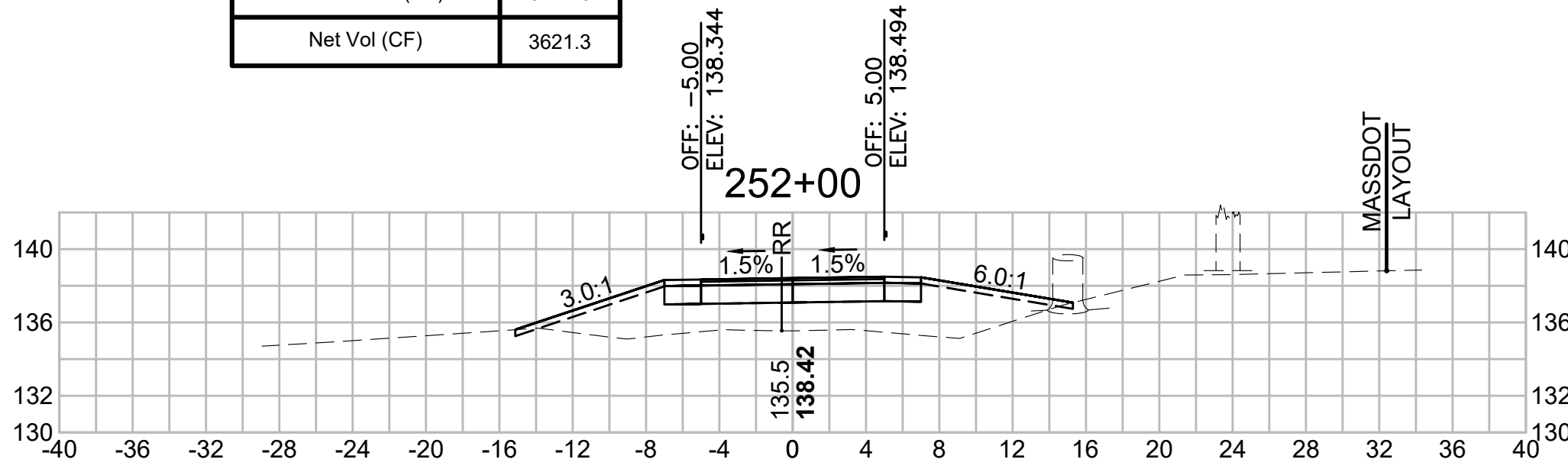
Total Volume at Station 250+00.00	
Cut Area (SF)	8.194
Fill Area (SF)	1.778
Cut Vol (CF)	19.6
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	9684.4
Cum Fill Vol (CF)	5921.6
Net Vol (CF)	3762.8



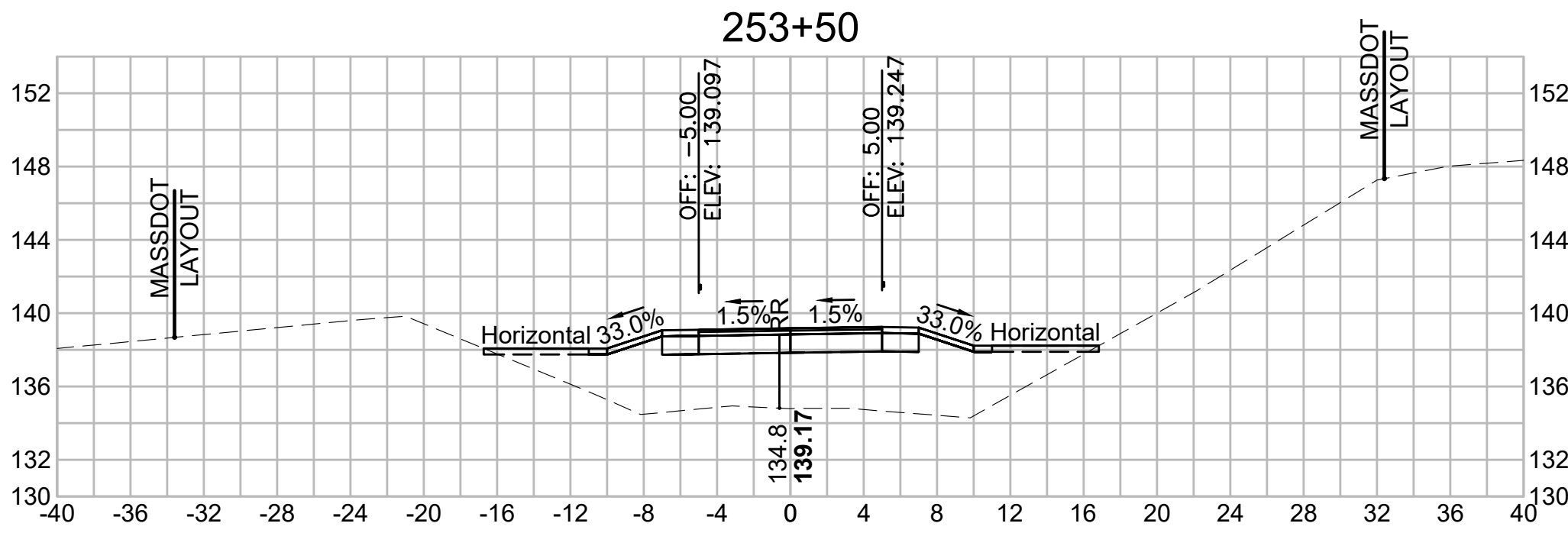
Total Volume at Station 249+50.00	
Cut Area (SF)	12.926
Fill Area (SF)	0.194
Cut Vol (CF)	29.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	9664.8
Cum Fill Vol (CF)	5919.8
Net Vol (CF)	3745.0



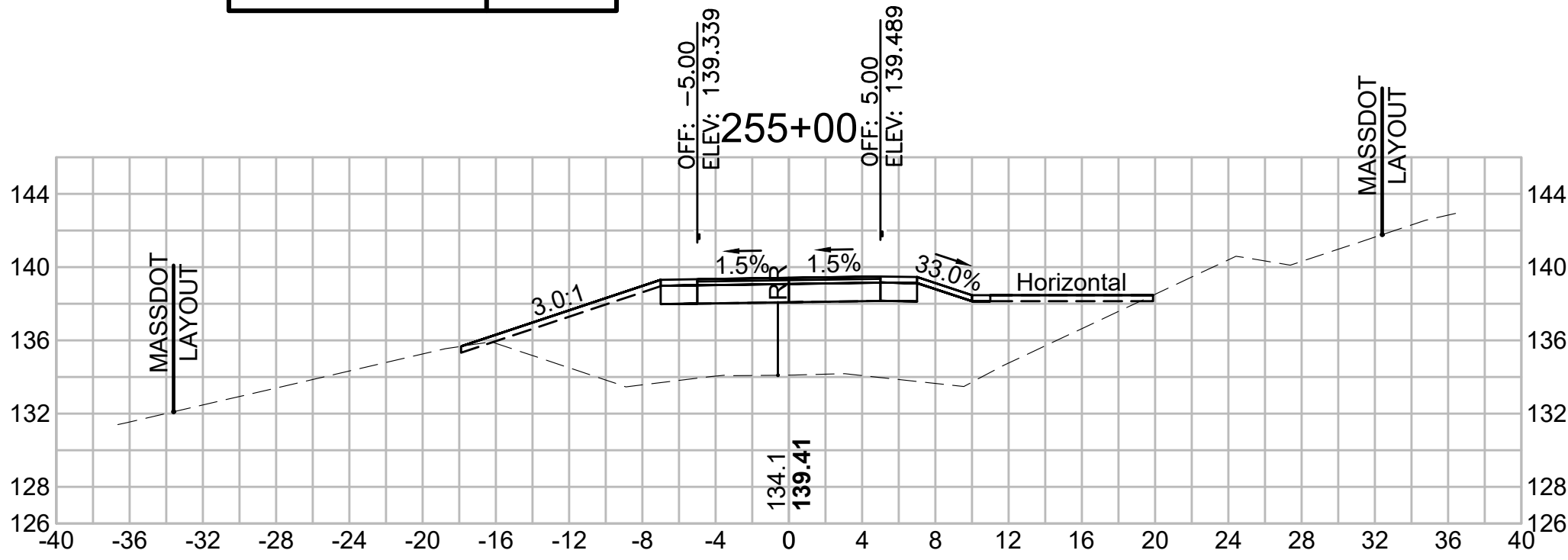
Total Volume at Station 252+00.00	
Cut Area (SF)	0.630
Fill Area (SF)	45.112
Cut Vol (CF)	3.5
Fill Vol (CF)	76.7
Cum Cut Vol (CF)	9735.9
Cum Fill Vol (CF)	6114.6
Net Vol (CF)	3621.3



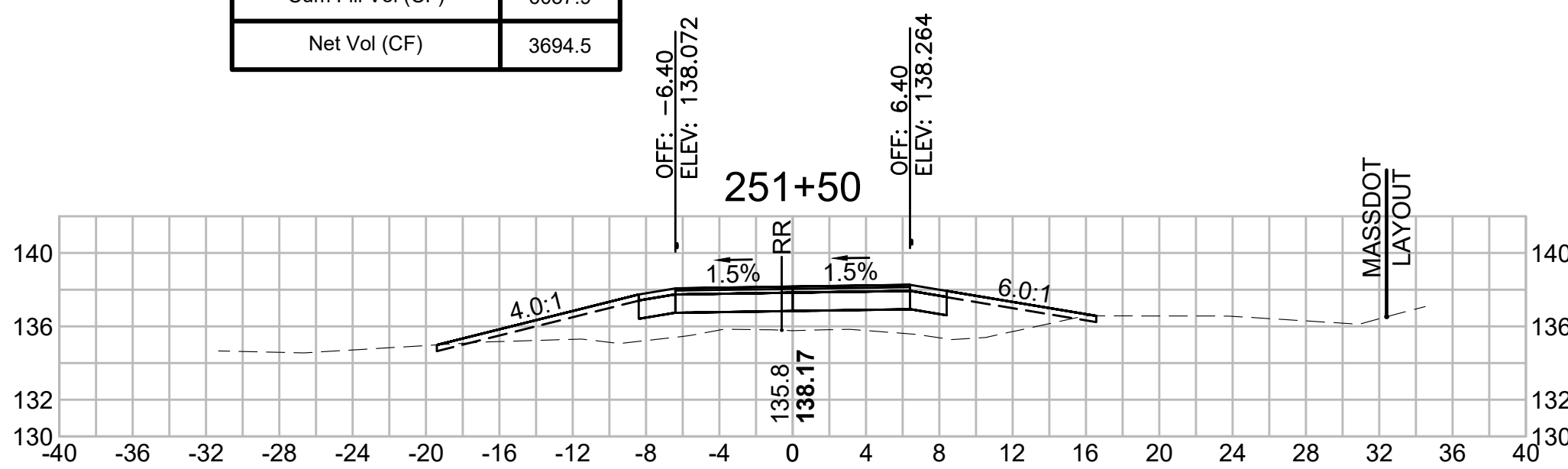
Total Volume at Station 253+50.00	
Cut Area (SF)	0.229
Fill Area (SF)	83.655
Cut Vol (CF)	0.5
Fill Vol (CF)	144.9
Cum Cut Vol (CF)	9738.9
Cum Fill Vol (CF)	6469.4
Net Vol (CF)	3269.4



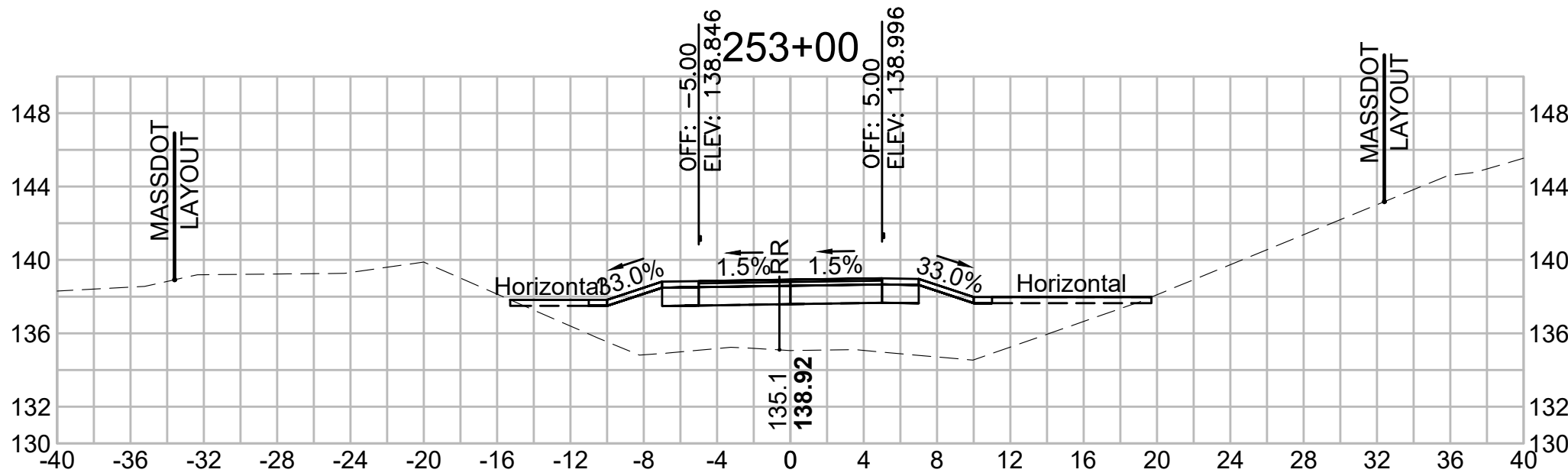
Total Volume at Station 255+00.00	
Cut Area (SF)	0.858
Fill Area (SF)	119.067
Cut Vol (CF)	1.0
Fill Vol (CF)	219.6
Cum Cut Vol (CF)	9740.6
Cum Fill Vol (CF)	7065.1
Net Vol (CF)	2675.6



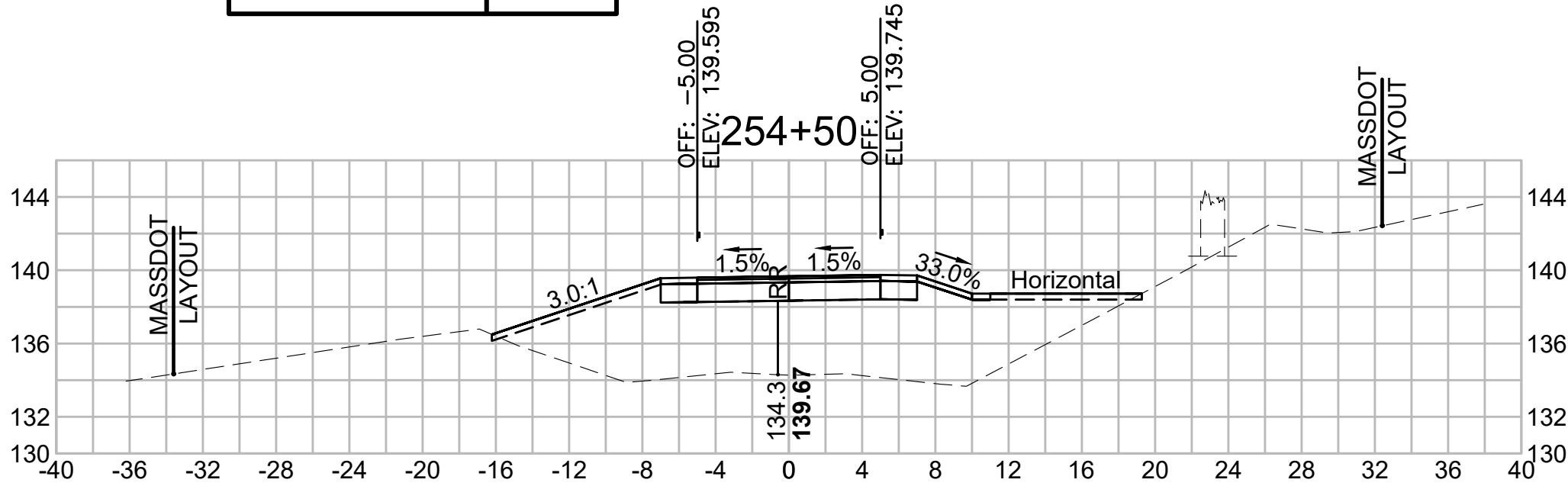
Total Volume at Station 251+50.00	
Cut Area (SF)	3.142
Fill Area (SF)	37.729
Cut Vol (CF)	4.2
Fill Vol (CF)	67.9
Cum Cut Vol (CF)	9732.4
Cum Fill Vol (CF)	6037.9
Net Vol (CF)	3694.5



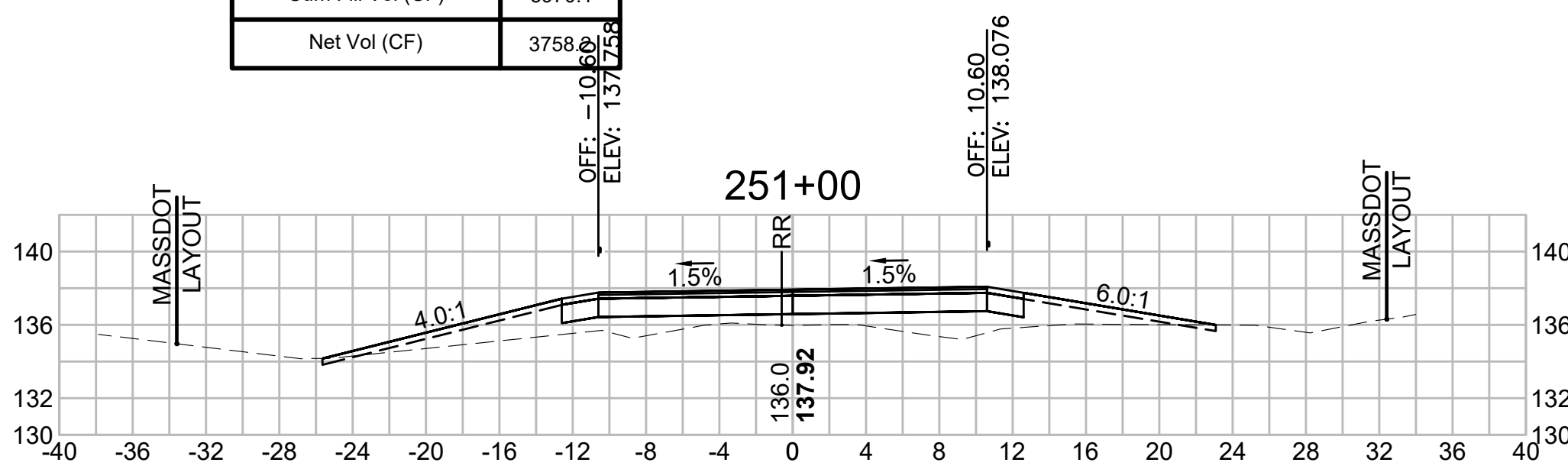
Total Volume at Station 253+00.00	
Cut Area (SF)	0.259
Fill Area (SF)	72.794
Cut Vol (CF)	1.1
Fill Vol (CF)	117.8
Cum Cut Vol (CF)	9738.4
Cum Fill Vol (CF)	6324.6
Net Vol (CF)	3413.8



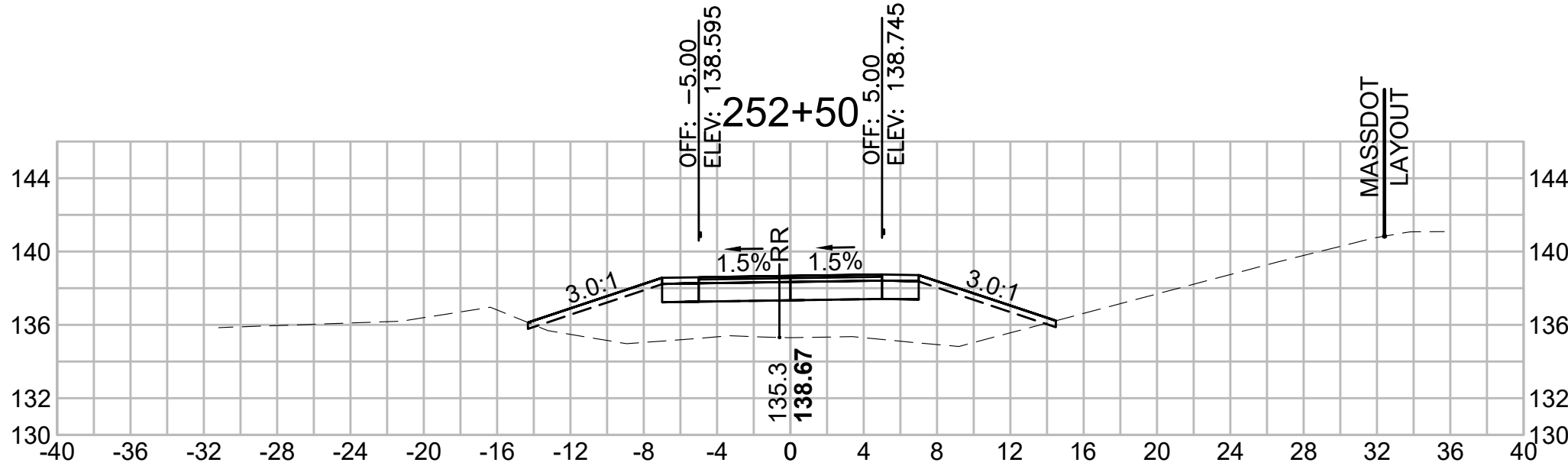
Total Volume at Station 254+50.00	
Cut Area (SF)	0.182
Fill Area (SF)	118.086
Cut Vol (CF)	0.4
Fill Vol (CF)	204.0
Cum Cut Vol (CF)	9739.7
Cum Fill Vol (CF)	6845.5
Net Vol (CF)	2894.2



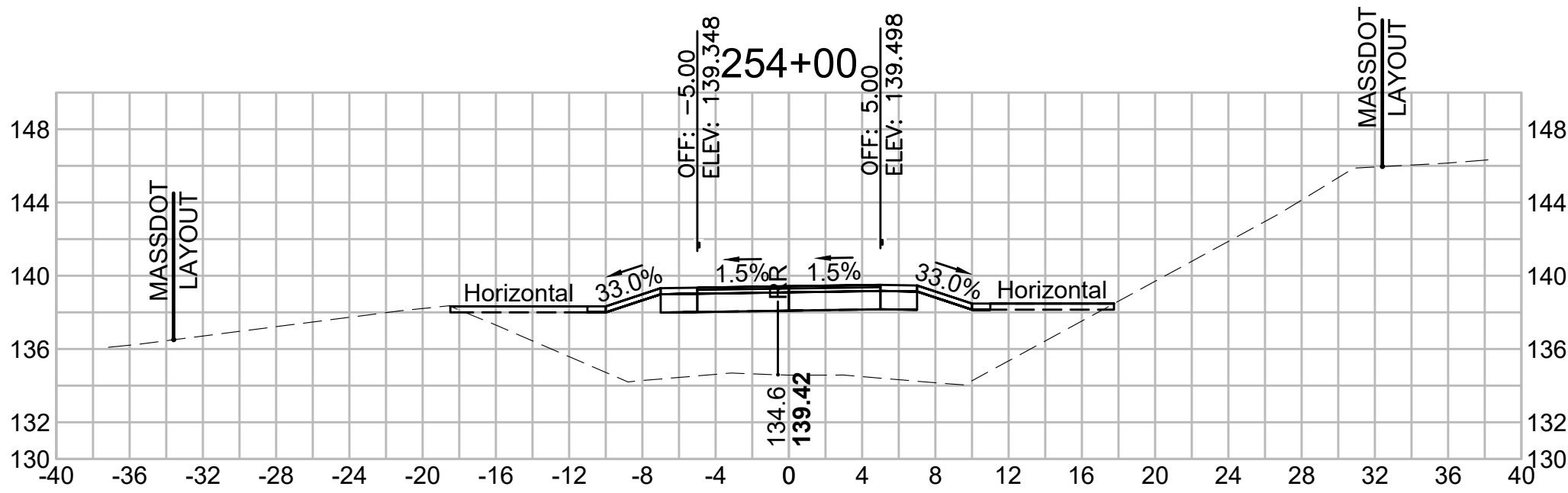
Total Volume at Station 251+00.00	
Cut Area (SF)	1.399
Fill Area (SF)	35.563
Cut Vol (CF)	18.8
Fill Vol (CF)	39.9
Cum Cut Vol (CF)	9728.2
Cum Fill Vol (CF)	5970.1
Net Vol (CF)	3758.1



Total Volume at Station 252+50.00	
Cut Area (SF)	0.898
Fill Area (SF)	54.414
Cut Vol (CF)	1.4
Fill Vol (CF)	92.2
Cum Cut Vol (CF)	9737.3
Cum Fill Vol (CF)	6206.8
Net Vol (CF)	3530.5

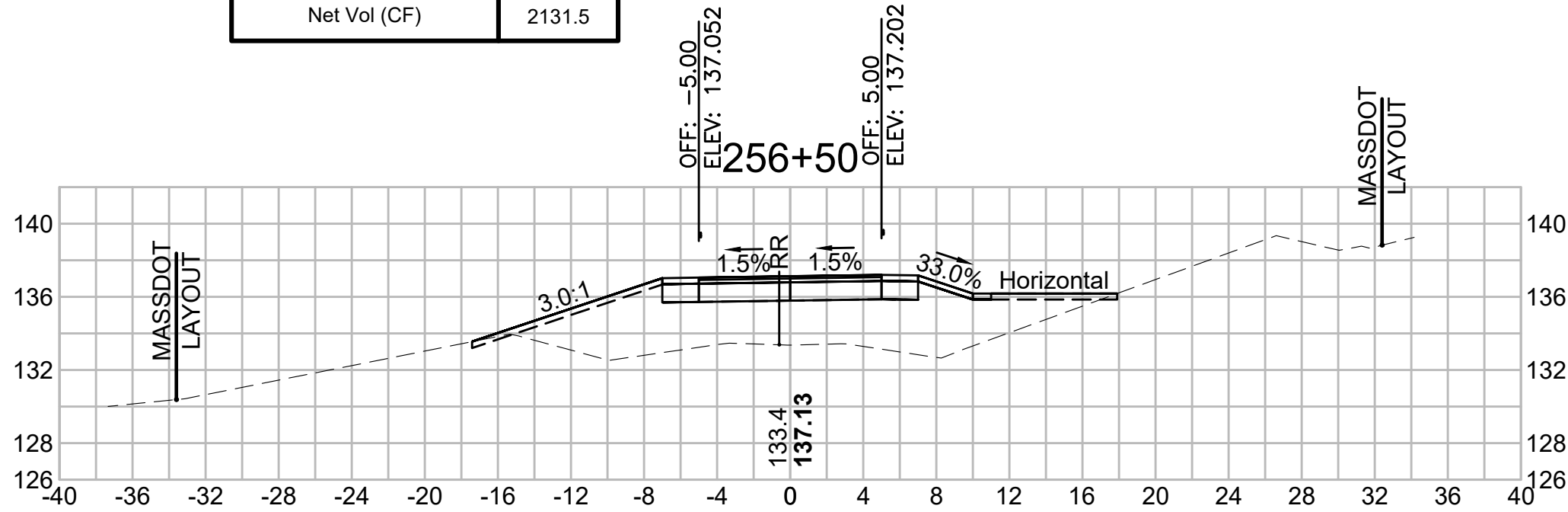


Total Volume at Station 254+00.00	
Cut Area (SF)	0.232
Fill Area (SF)	102.202
Cut Vol (CF)	0.4
Fill Vol (CF)	172.1
Cum Cut Vol (CF)	9739.3
Cum Fill Vol (CF)	6641.5
Net Vol (CF)	3097.8

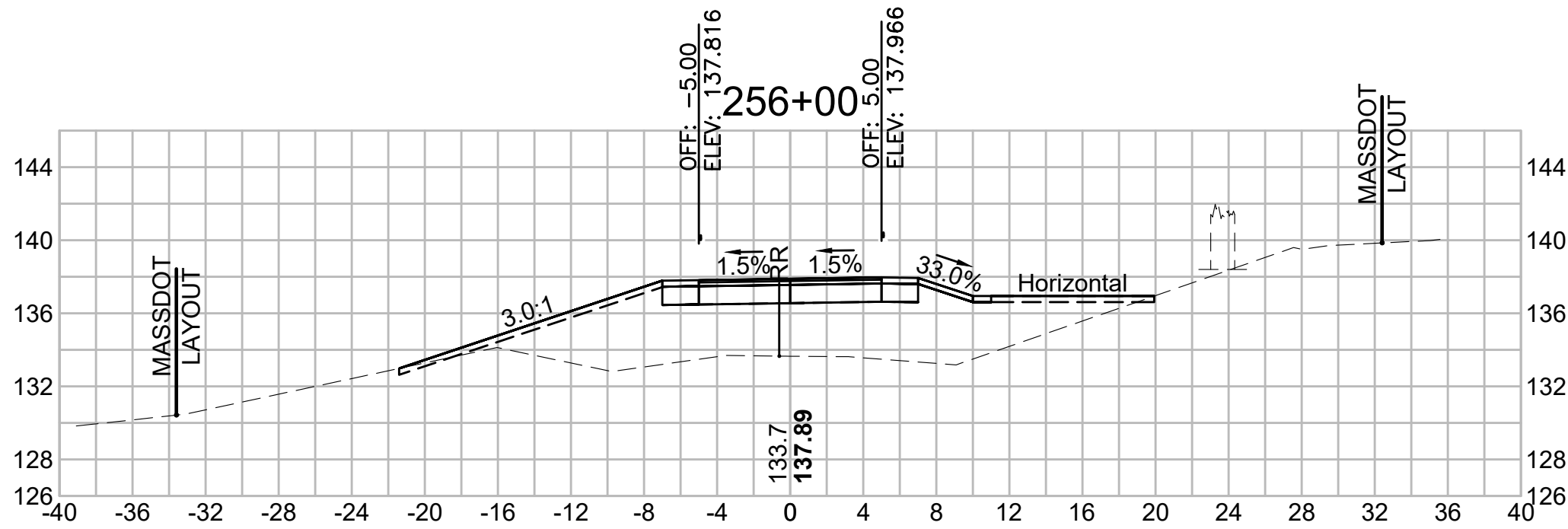


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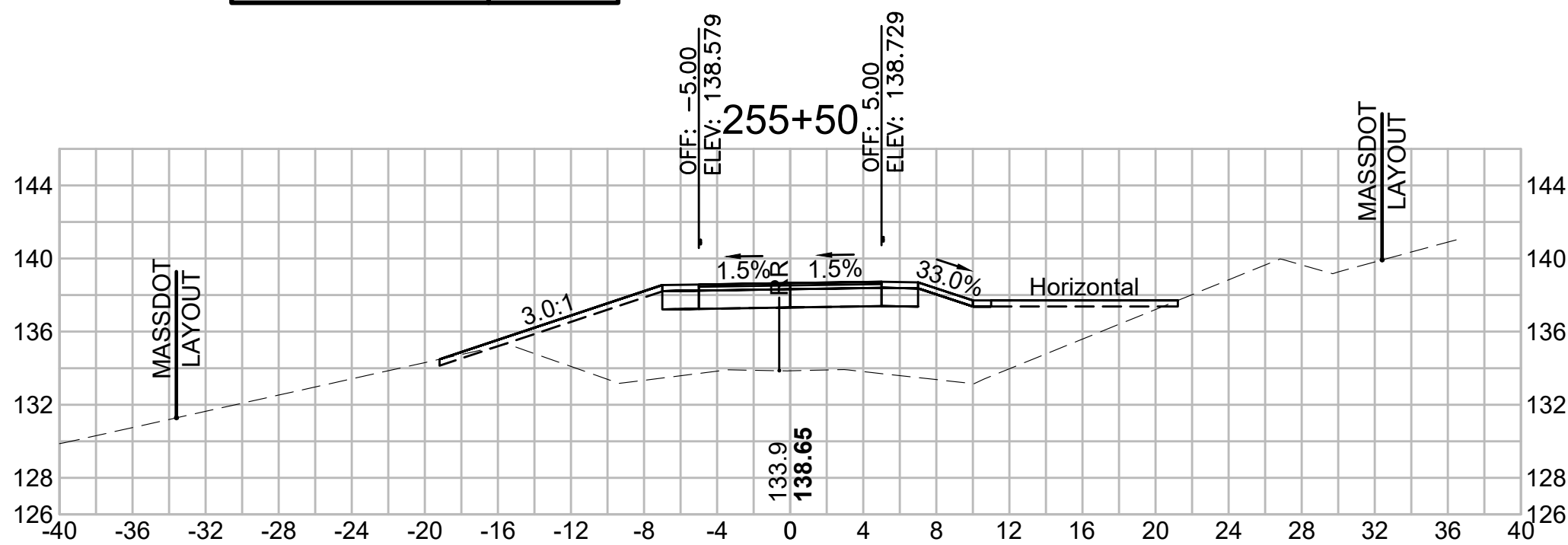
Total Volume at Station 256+50.00	
Cut Area (SF)	0.588
Fill Area (SF)	72.871
Cut Vol (CF)	1.2
Fill Vol (CF)	152.0
Cum Cut Vol (CF)	9745.2
Cum Fill Vol (CF)	7613.7
Net Vol (CF)	2131.5



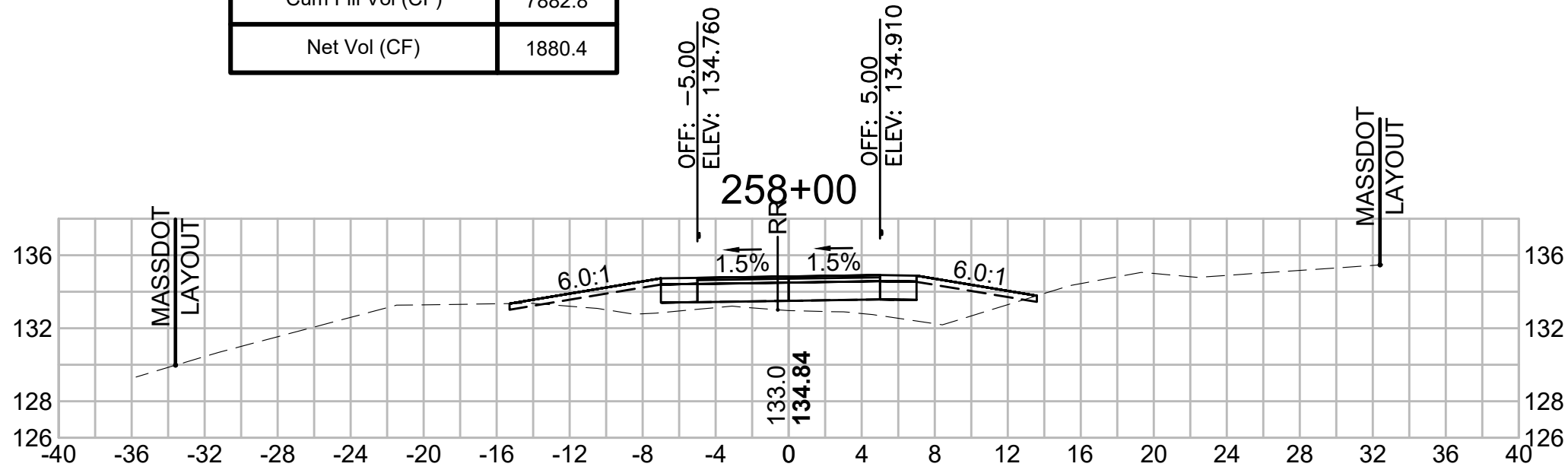
Total Volume at Station 256+00.00	
Cut Area (SF)	0.663
Fill Area (SF)	91.311
Cut Vol (CF)	1.6
Fill Vol (CF)	185.4
Cum Cut Vol (CF)	9744.0
Cum Fill Vol (CF)	7461.6
Net Vol (CF)	2282.4



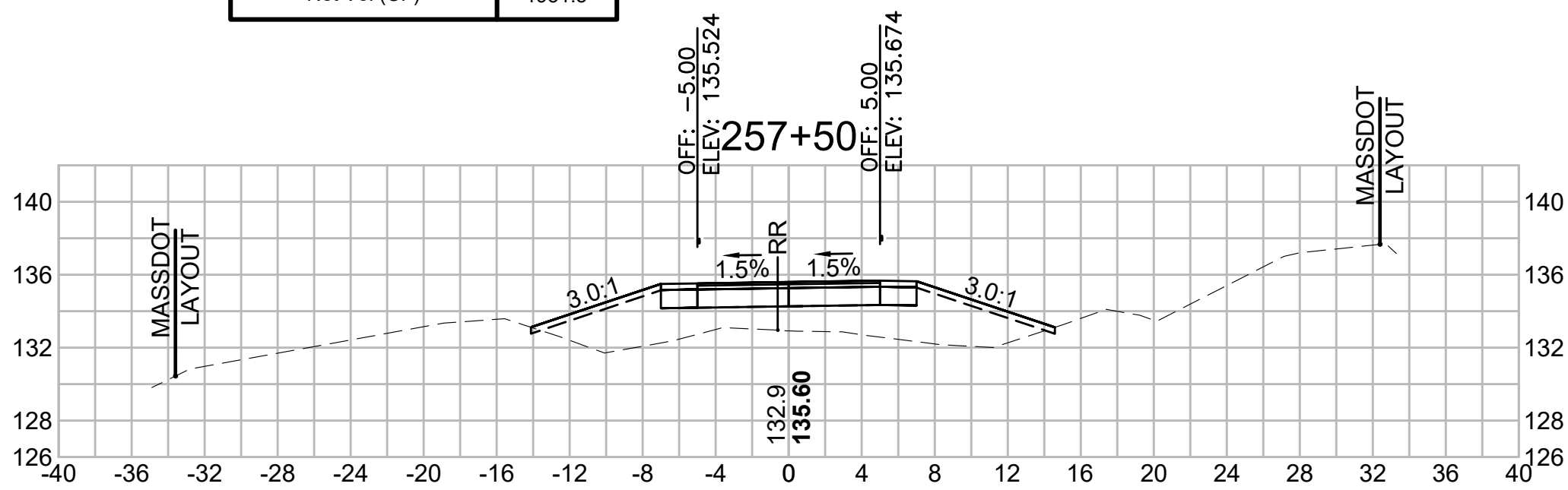
Total Volume at Station 255+50.00	
Cut Area (SF)	1.054
Fill Area (SF)	108.950
Cut Vol (CF)	1.8
Fill Vol (CF)	211.1
Cum Cut Vol (CF)	9742.4
Cum Fill Vol (CF)	7276.2
Net Vol (CF)	2466.2



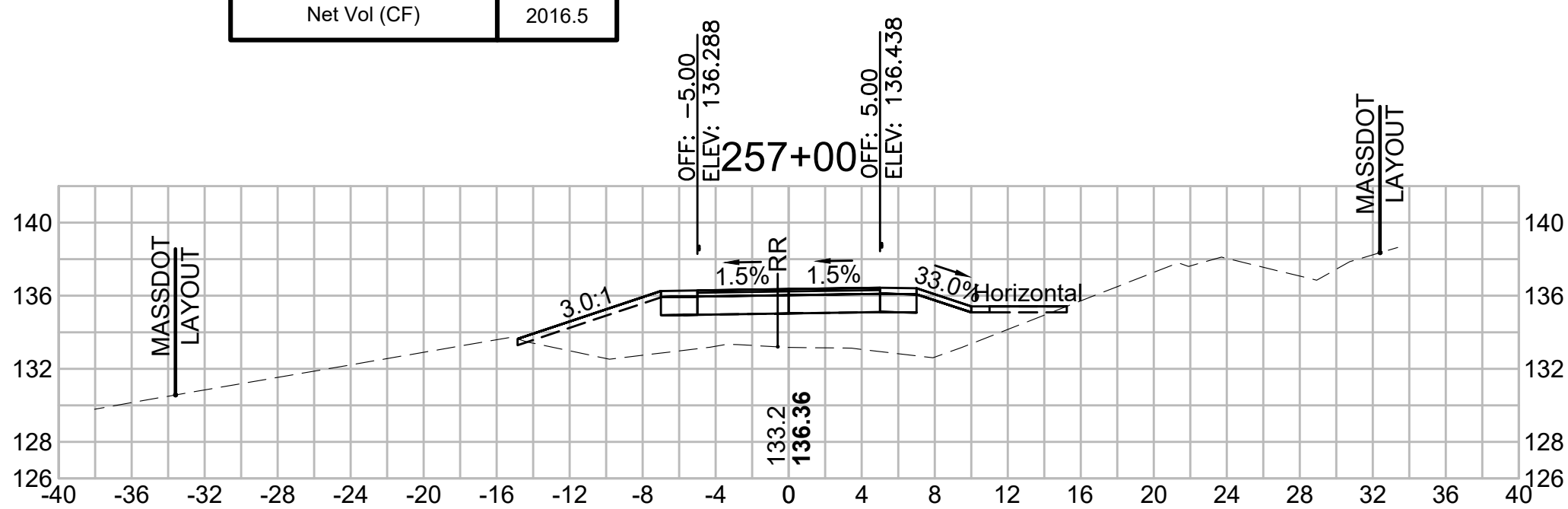
Total Volume at Station 258+00.00	
Cut Area (SF)	6.007
Fill Area (SF)	21.248
Cut Vol (CF)	11.3
Fill Vol (CF)	62.4
Cum Cut Vol (CF)	9763.2
Cum Fill Vol (CF)	7882.8
Net Vol (CF)	1880.4



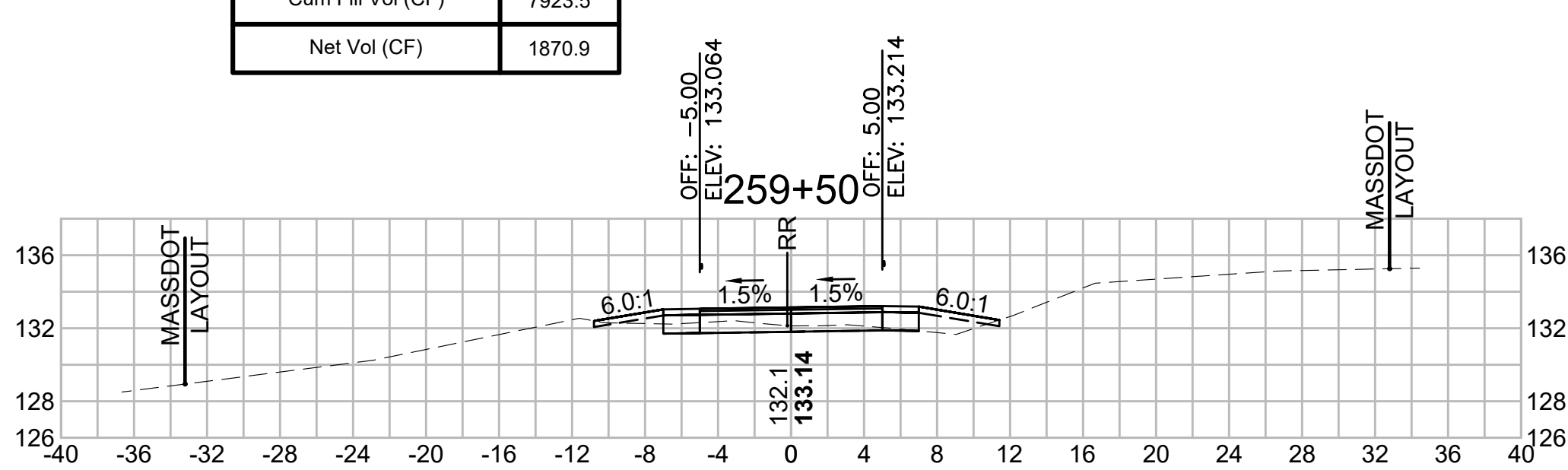
Total Volume at Station 257+50.00	
Cut Area (SF)	6.216
Fill Area (SF)	46.159
Cut Vol (CF)	6.0
Fill Vol (CF)	91.0
Cum Cut Vol (CF)	9751.9
Cum Fill Vol (CF)	7820.4
Net Vol (CF)	1931.5



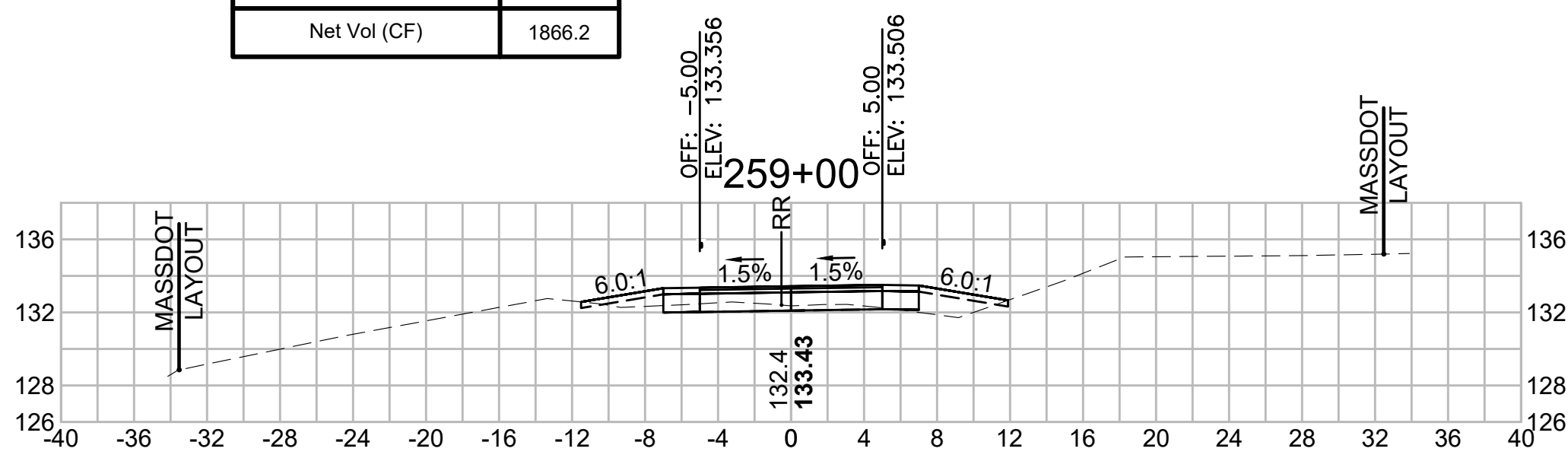
Total Volume at Station 257+00.00	
Cut Area (SF)	0.231
Fill Area (SF)	52.096
Cut Vol (CF)	0.8
Fill Vol (CF)	115.7
Cum Cut Vol (CF)	9745.9
Cum Fill Vol (CF)	7729.4
Net Vol (CF)	2016.5



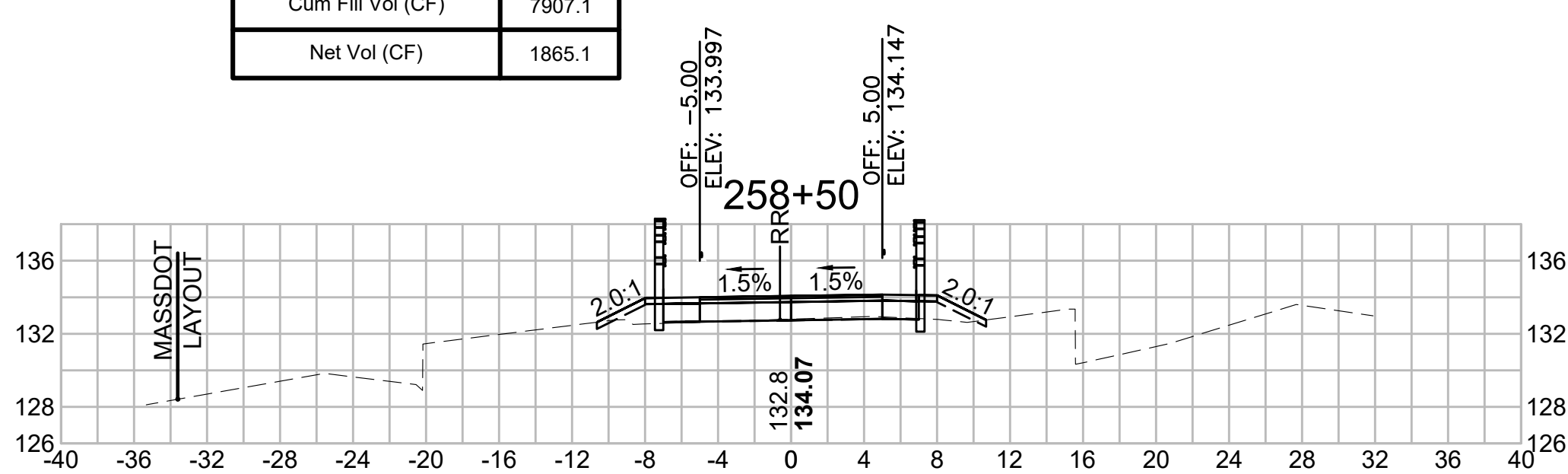
Total Volume at Station 259+50.00	
Cut Area (SF)	5.628
Fill Area (SF)	3.161
Cut Vol (CF)	12.0
Fill Vol (CF)	7.4
Cum Cut Vol (CF)	9794.4
Cum Fill Vol (CF)	7923.5
Net Vol (CF)	1870.9



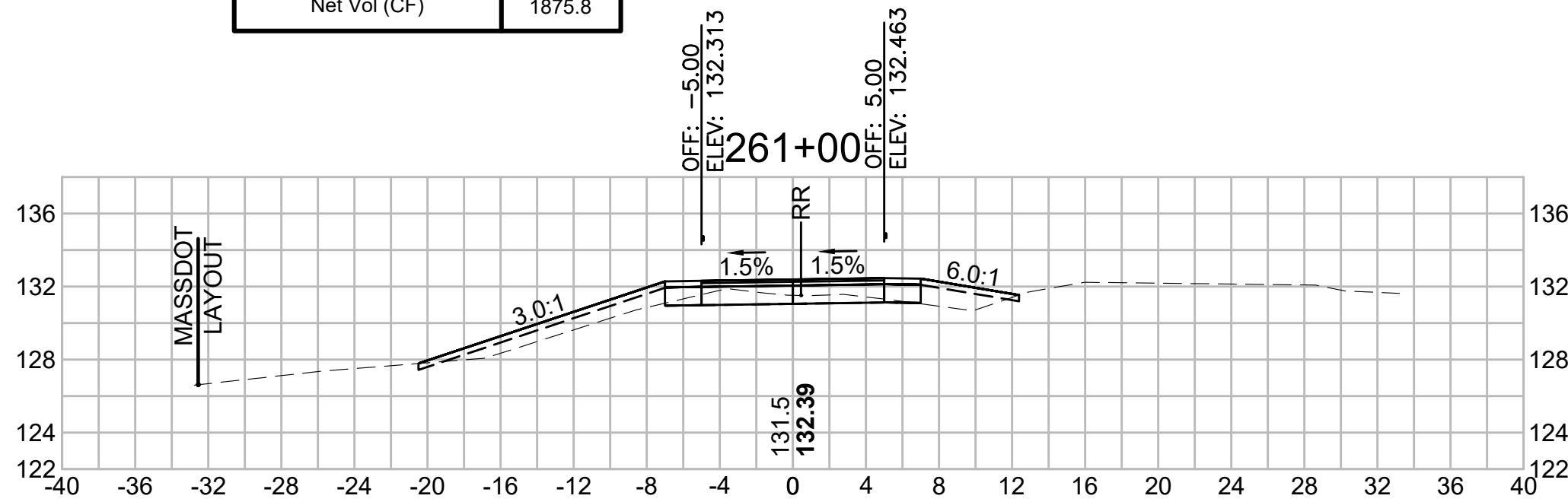
Total Volume at Station 259+00.00	
Cut Area (SF)	7.382
Fill Area (SF)	4.819
Cut Vol (CF)	10.2
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	9782.4
Cum Fill Vol (CF)	7916.2
Net Vol (CF)	1866.2



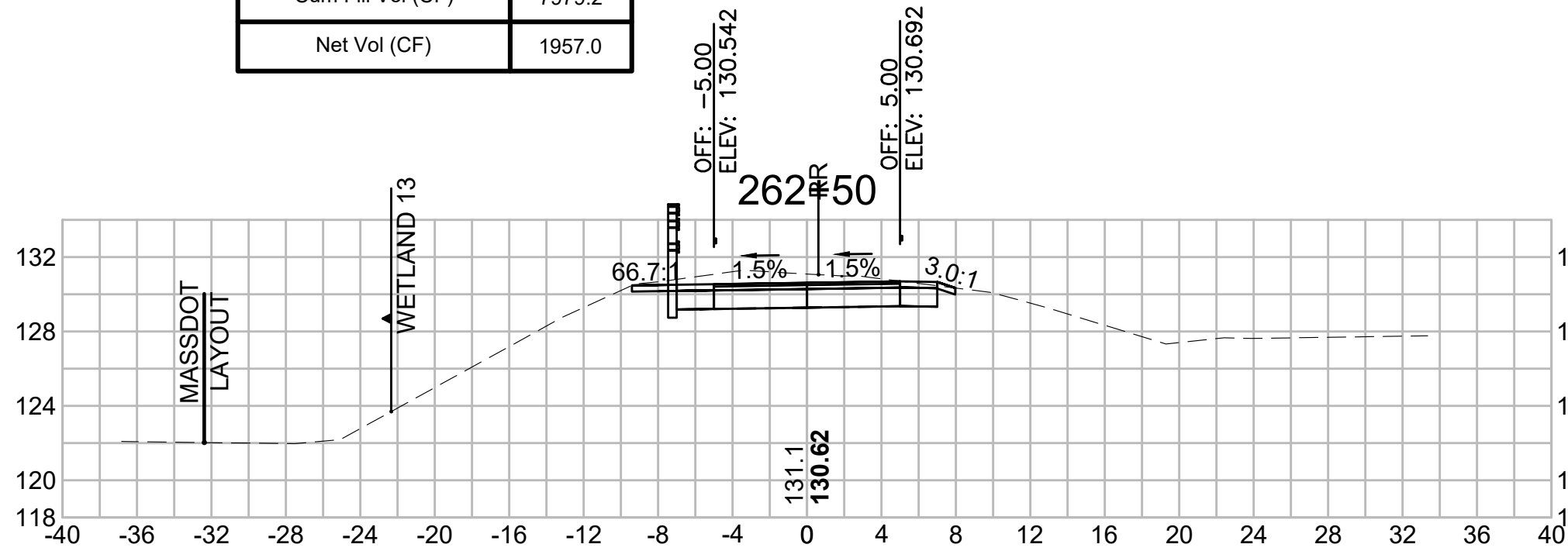
Total Volume at Station 258+50.00	
Cut Area (SF)	3.667
Fill Area (SF)	4.995
Cut Vol (CF)	9.0
Fill Vol (CF)	24.3
Cum Cut Vol (CF)	9772.2
Cum Fill Vol (CF)	7907.1
Net Vol (CF)	1865.1



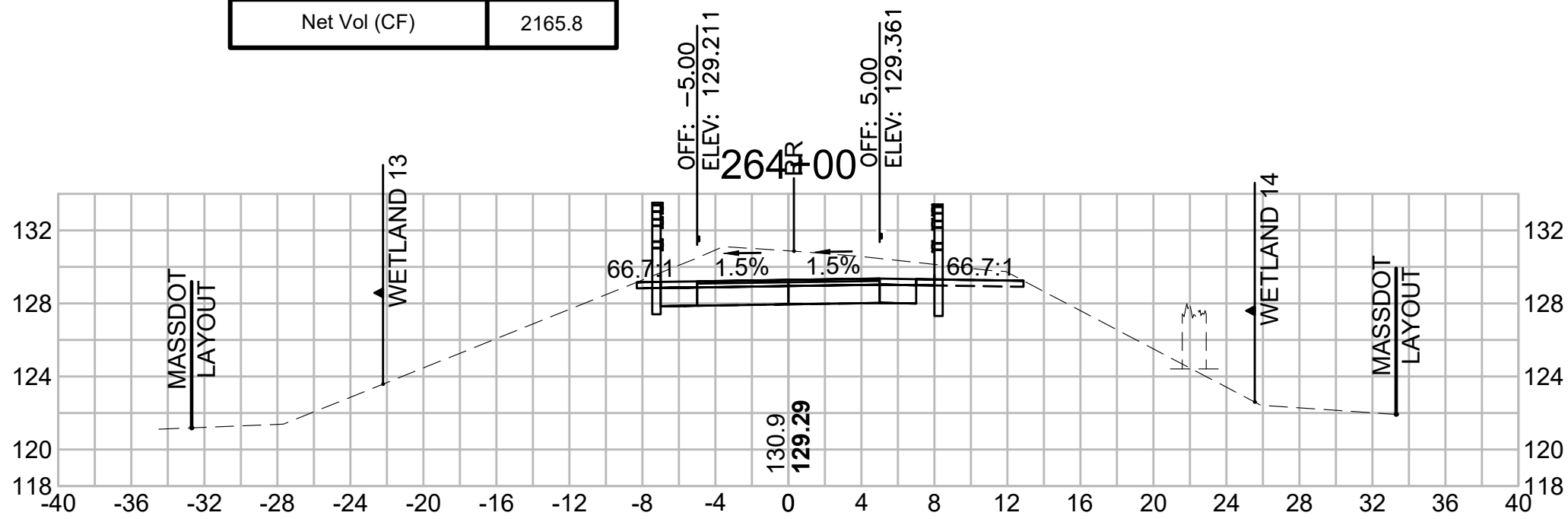
Total Volume at Station 261+00.00	
Cut Area (SF)	6.614
Fill Area (SF)	10.801
Cut Vol (CF)	11.9
Fill Vol (CF)	16.6
Cum Cut Vol (CF)	9831.5
Cum Fill Vol (CF)	7955.7
Net Vol (CF)	1875.8



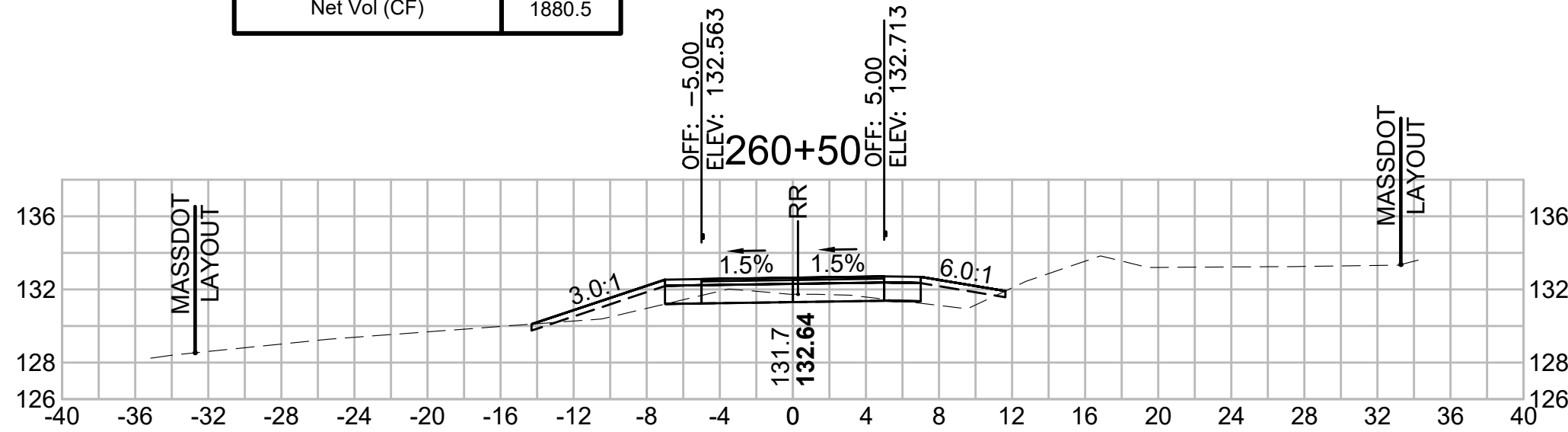
Total Volume at Station 262+50.00	
Cut Area (SF)	34.753
Fill Area (SF)	0.000
Cut Vol (CF)	53.7
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	9936.3
Cum Fill Vol (CF)	7979.2
Net Vol (CF)	1957.0



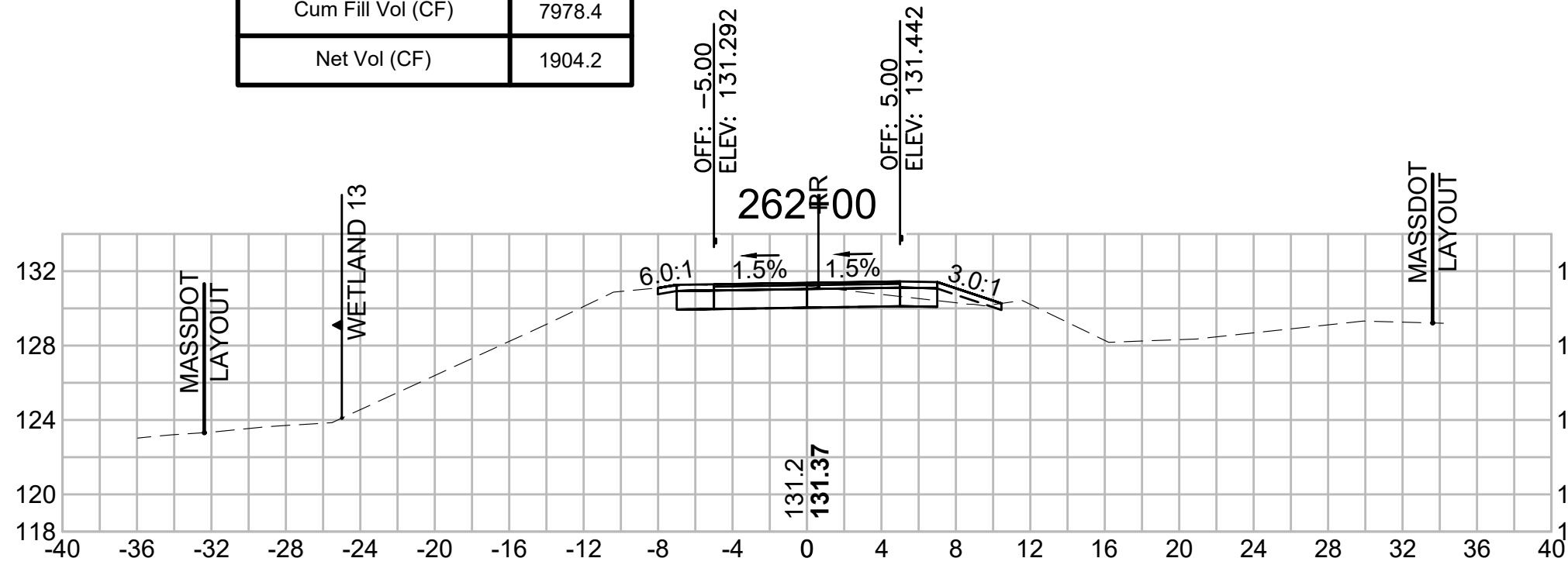
Total Volume at Station 264+00.00	
Cut Area (SF)	44.515
Fill Area (SF)	2.235
Cut Vol (CF)	77.6
Fill Vol (CF)	2.1
Cum Cut Vol (CF)	10147.2
Cum Fill Vol (CF)	7981.4
Net Vol (CF)	2165.8



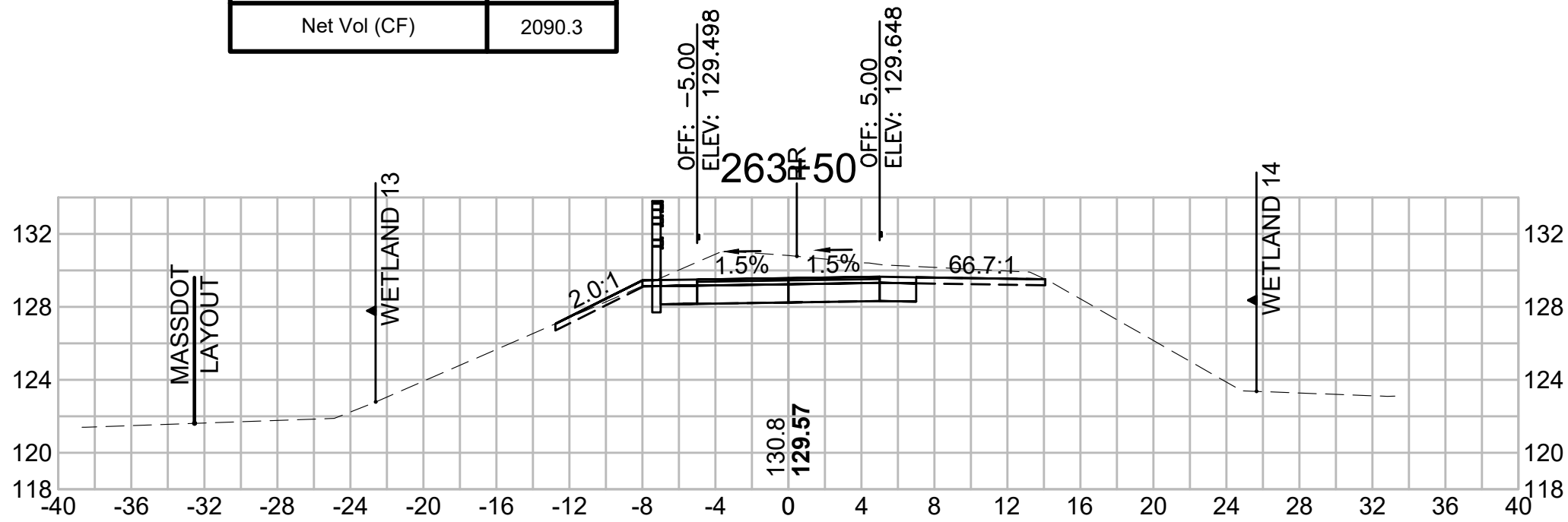
Total Volume at Station 260+50.00	
Cut Area (SF)	6.241
Fill Area (SF)	7.127
Cut Vol (CF)	12.8
Fill Vol (CF)	9.6
Cum Cut Vol (CF)	9819.6
Cum Fill Vol (CF)	7939.1
Net Vol (CF)	1880.5



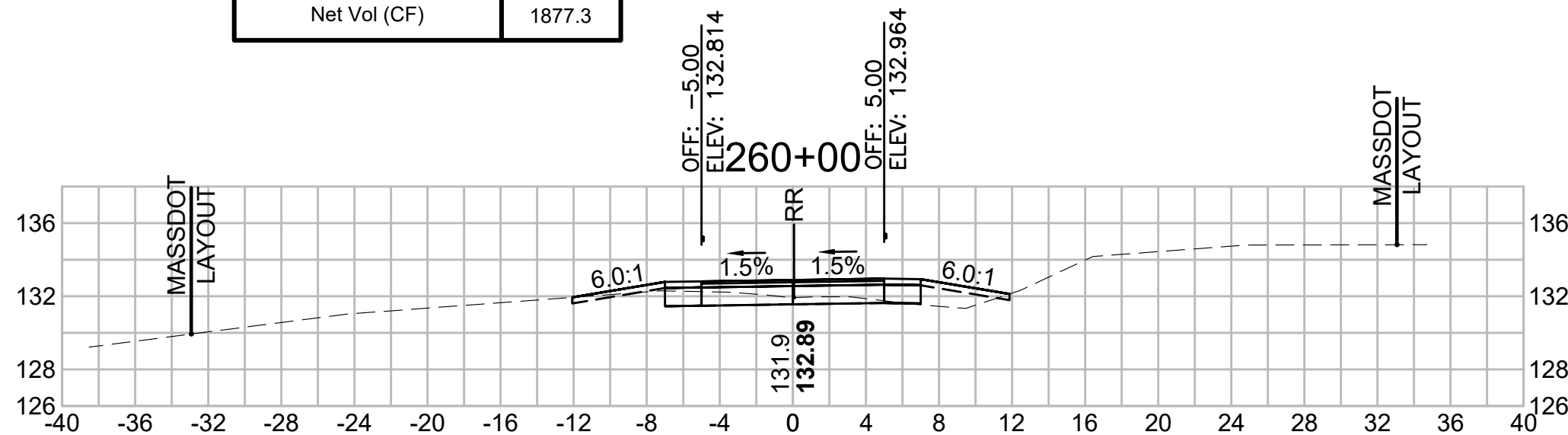
Total Volume at Station 262+00.00	
Cut Area (SF)	23.243
Fill Area (SF)	0.932
Cut Vol (CF)	33.3
Fill Vol (CF)	6.8
Cum Cut Vol (CF)	9882.6
Cum Fill Vol (CF)	7978.4
Net Vol (CF)	1904.2



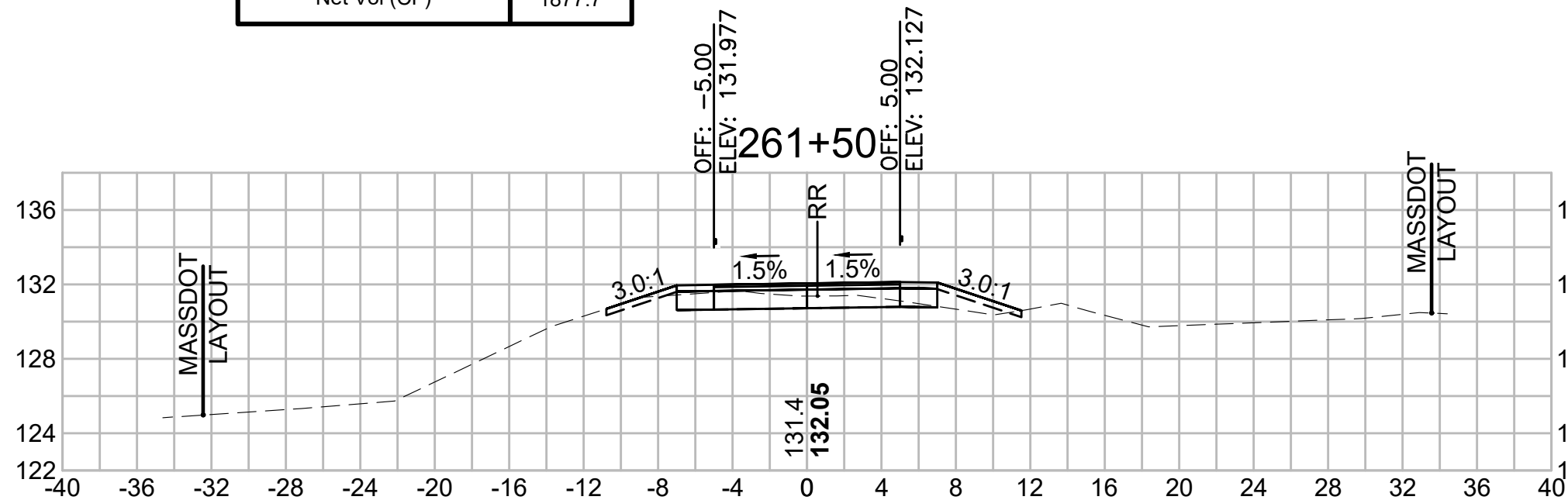
Total Volume at Station 263+50.00	
Cut Area (SF)	39.330
Fill Area (SF)	0.000
Cut Vol (CF)	68.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	10069.6
Cum Fill Vol (CF)	7979.4
Net Vol (CF)	2090.3



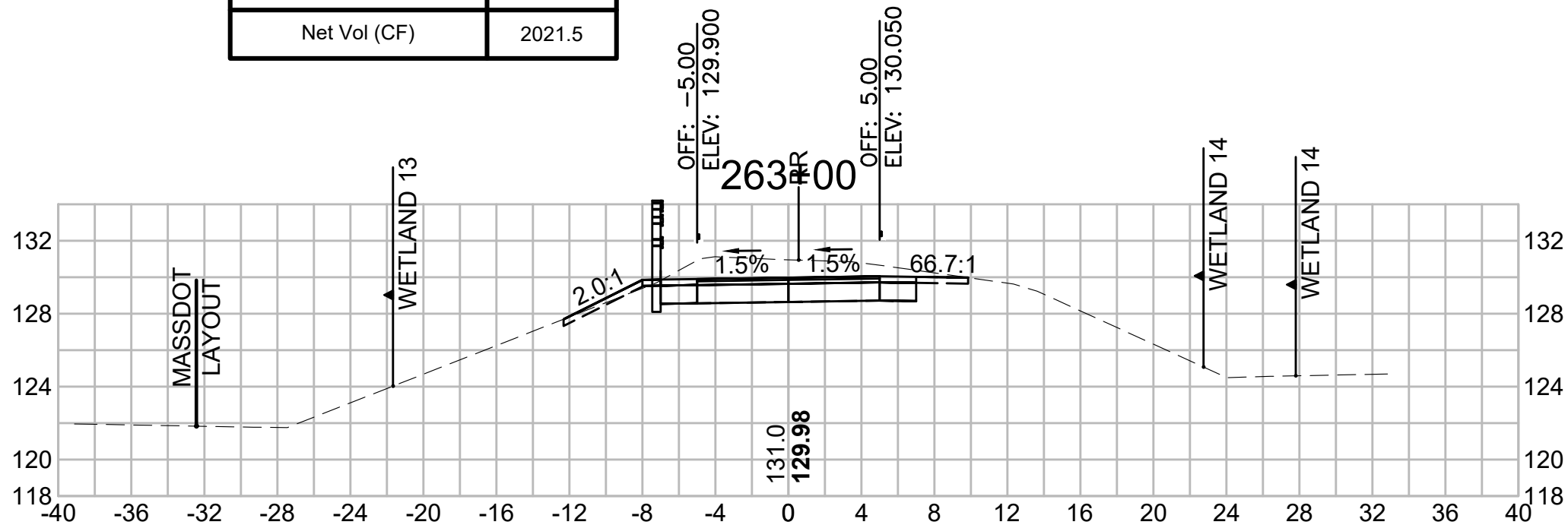
Total Volume at Station 260+00.00	
Cut Area (SF)	7.630
Fill Area (SF)	3.238
Cut Vol (CF)	12.3
Fill Vol (CF)	5.9
Cum Cut Vol (CF)	9806.7
Cum Fill Vol (CF)	7929.5
Net Vol (CF)	1877.3



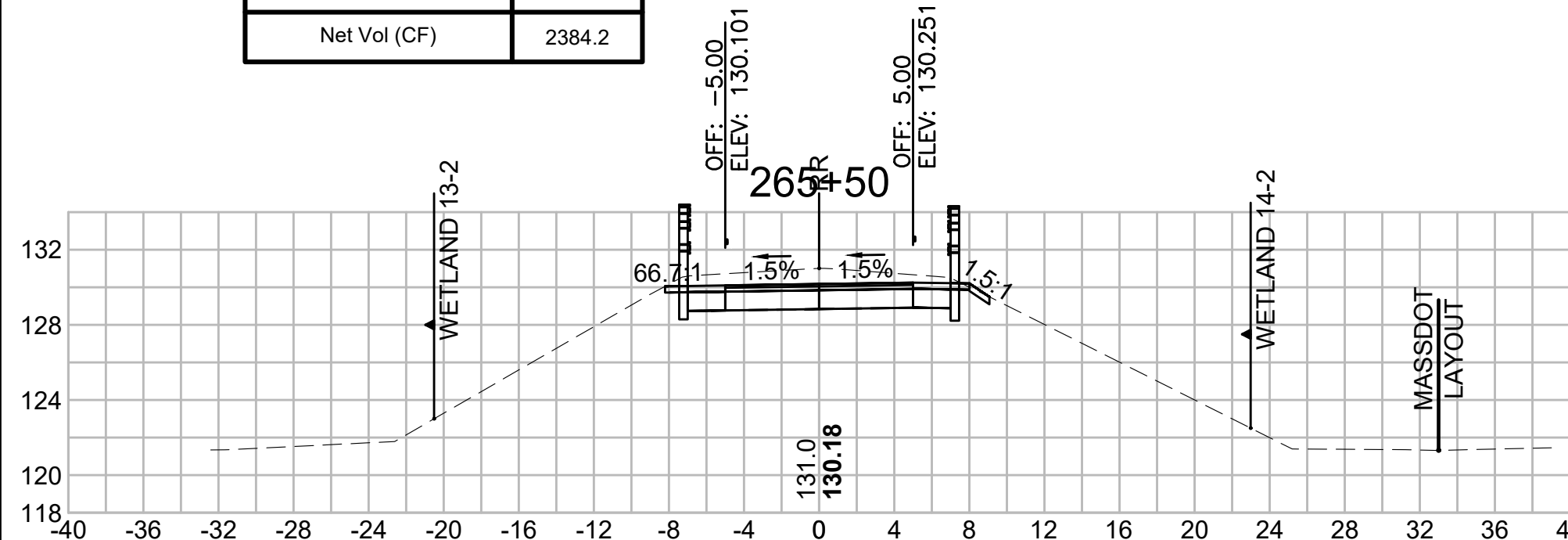
Total Volume at Station 261+50.00	
Cut Area (SF)	12.670
Fill Area (SF)	6.395
Cut Vol (CF)	17.9
Fill Vol (CF)	15.9
Cum Cut Vol (CF)	9849.3
Cum Fill Vol (CF)	7971.6
Net Vol (CF)	1877.7



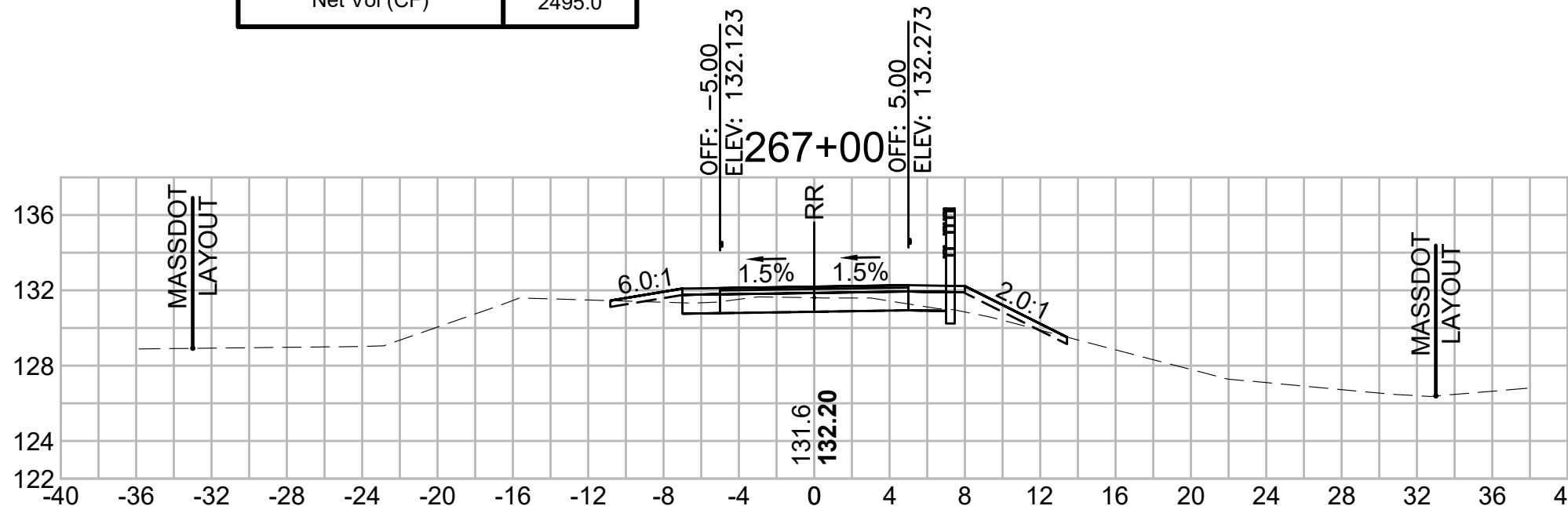
Total Volume at Station 263+00.00	
Cut Area (SF)	34.961
Fill Area (SF)	0.066
Cut Vol (CF)	64.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	10000.8
Cum Fill Vol (CF)	7979.3
Net Vol (CF)	2021.5



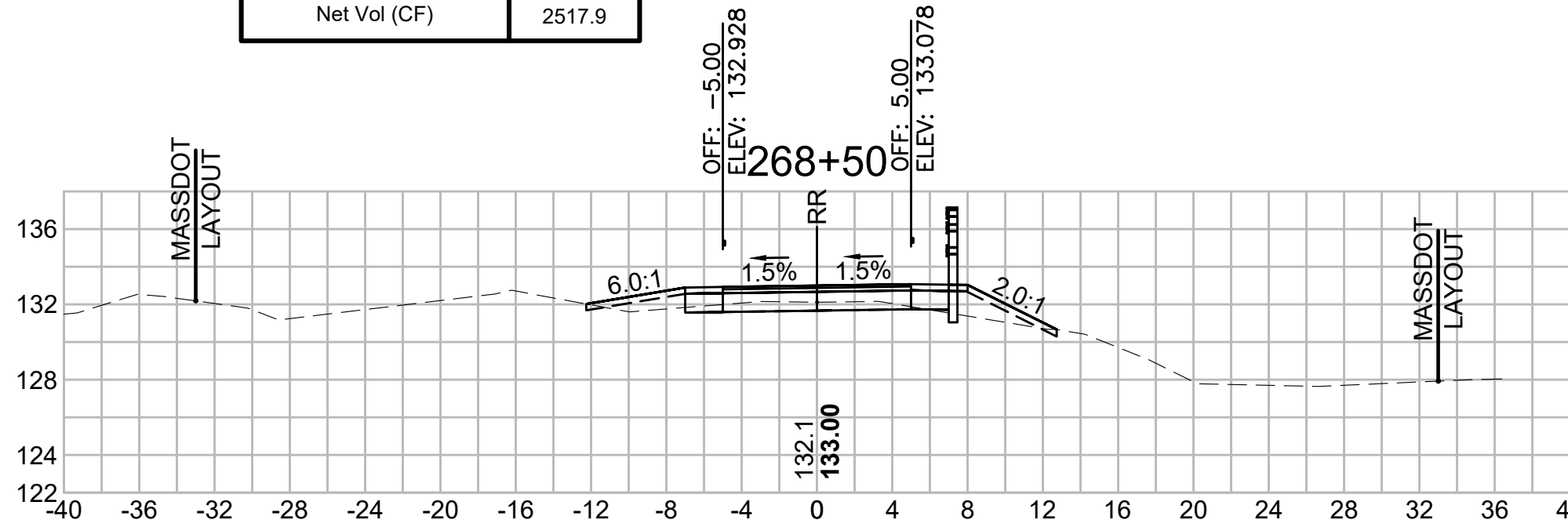
Total Volume at Station 265+50.00	
Cut Area (SF)	28.952
Fill Area (SF)	0.000
Cut Vol (CF)	61.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	10369.1
Cum Fill Vol (CF)	7984.9
Net Vol (CF)	2384.2



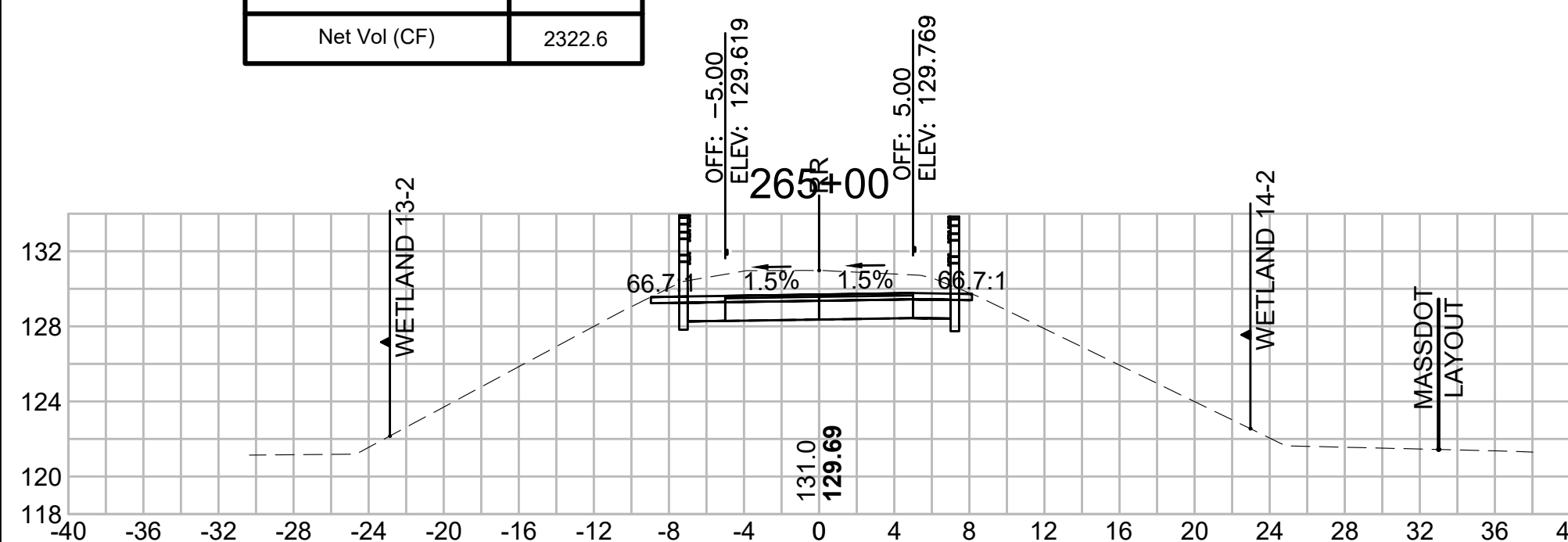
Total Volume at Station 267+00.00	
Cut Area (SF)	9.594
Fill Area (SF)	3.254
Cut Vol (CF)	28.3
Fill Vol (CF)	4.9
Cum Cut Vol (CF)	10486.7
Cum Fill Vol (CF)	7991.7
Net Vol (CF)	2495.0



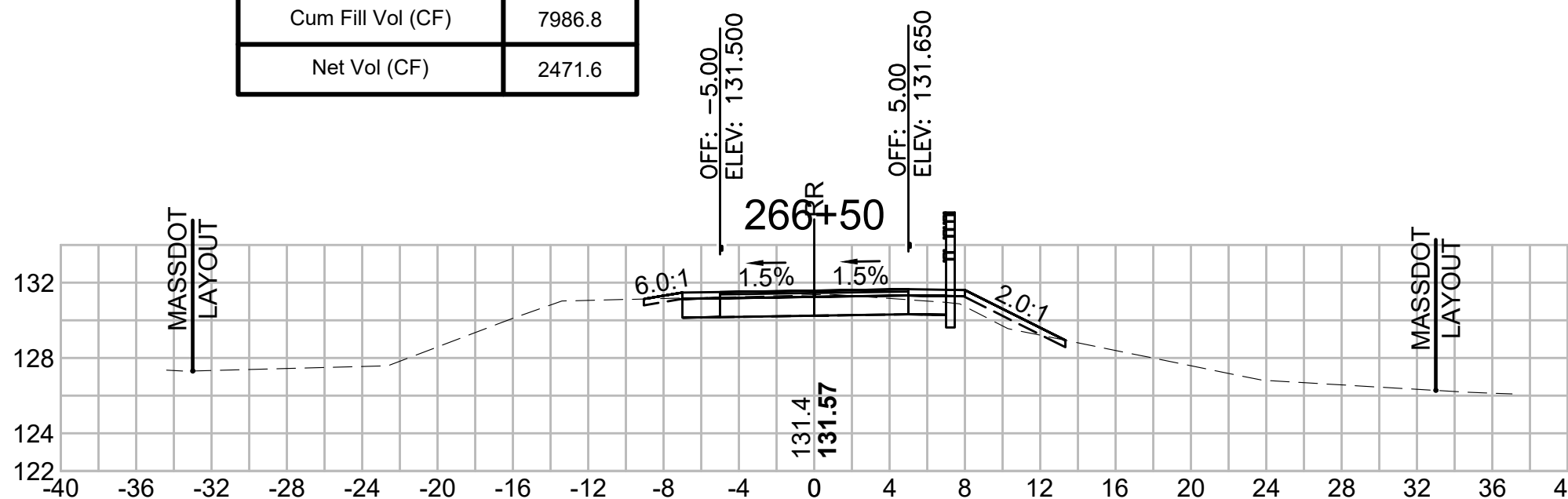
Total Volume at Station 268+50.00	
Cut Area (SF)	6.922
Fill Area (SF)	5.881
Cut Vol (CF)	14.0
Fill Vol (CF)	8.7
Cum Cut Vol (CF)	10532.1
Cum Fill Vol (CF)	8014.2
Net Vol (CF)	2517.9



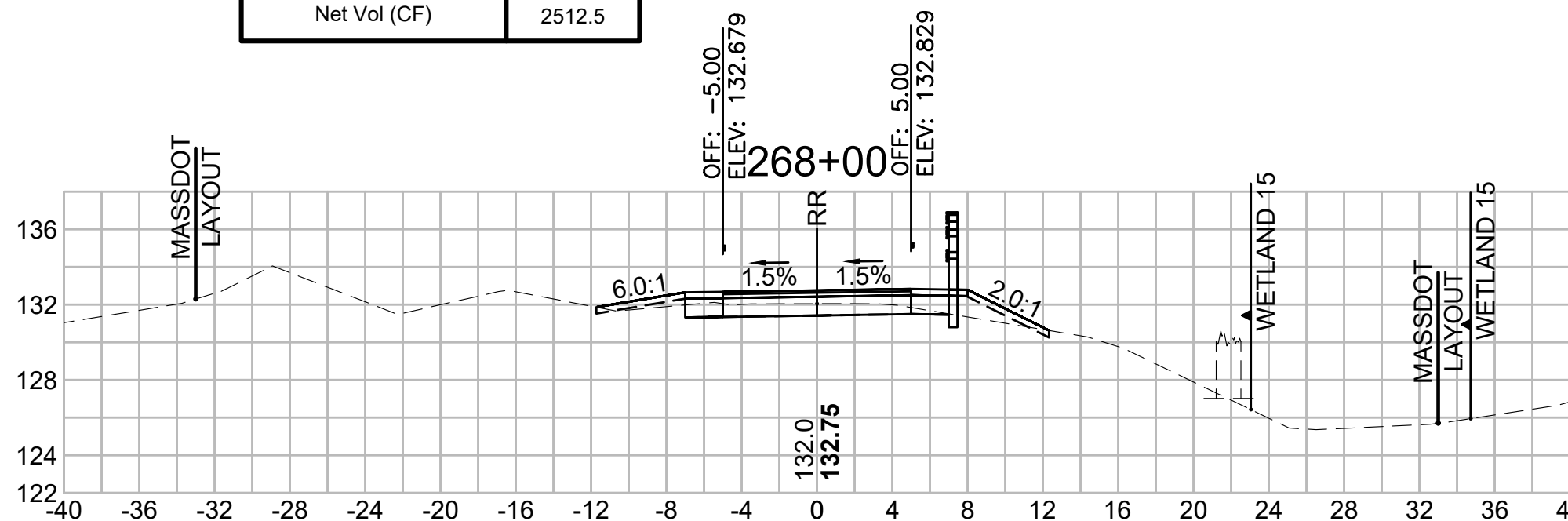
Total Volume at Station 265+00.00	
Cut Area (SF)	37.581
Fill Area (SF)	0.000
Cut Vol (CF)	76.9
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	10307.5
Cum Fill Vol (CF)	7984.9
Net Vol (CF)	2322.6



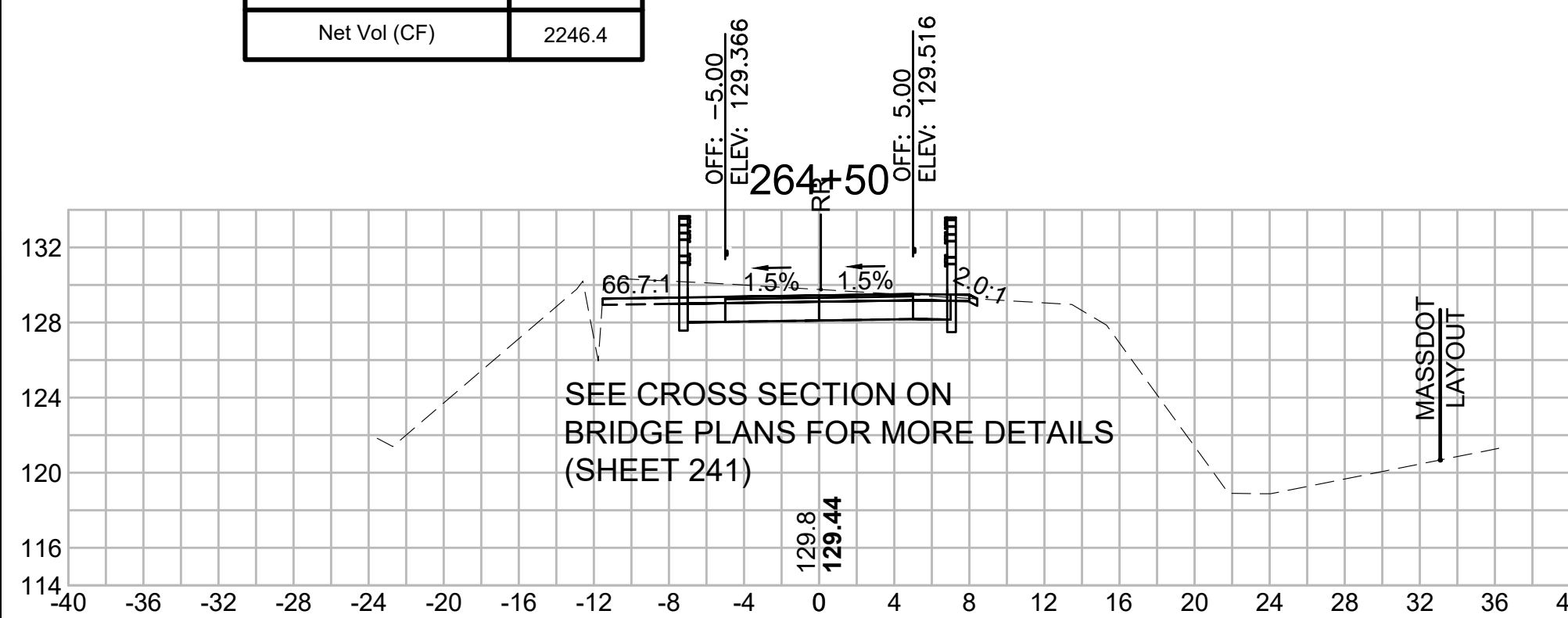
Total Volume at Station 266+50.00	
Cut Area (SF)	20.963
Fill Area (SF)	2.079
Cut Vol (CF)	41.0
Fill Vol (CF)	1.9
Cum Cut Vol (CF)	10458.4
Cum Fill Vol (CF)	7986.8
Net Vol (CF)	2471.6



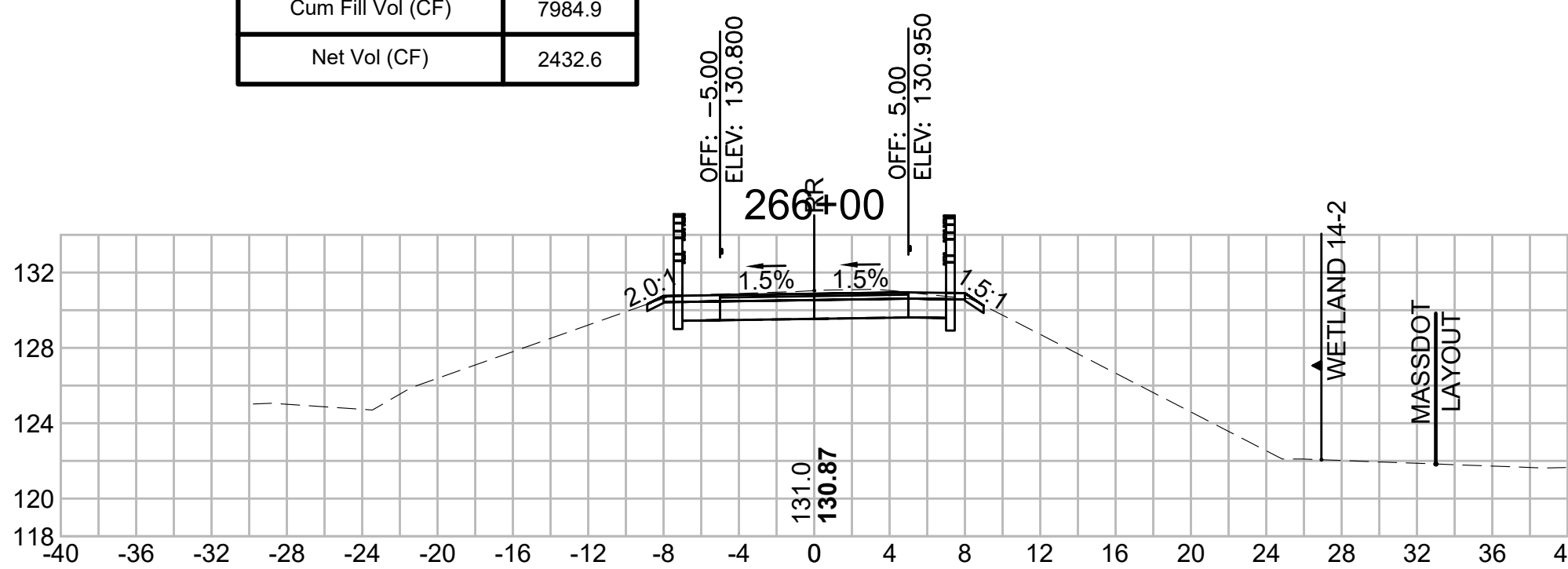
Total Volume at Station 268+00.00	
Cut Area (SF)	8.250
Fill Area (SF)	3.461
Cut Vol (CF)	15.0
Fill Vol (CF)	7.0
Cum Cut Vol (CF)	10518.0
Cum Fill Vol (CF)	8005.6
Net Vol (CF)	2512.5



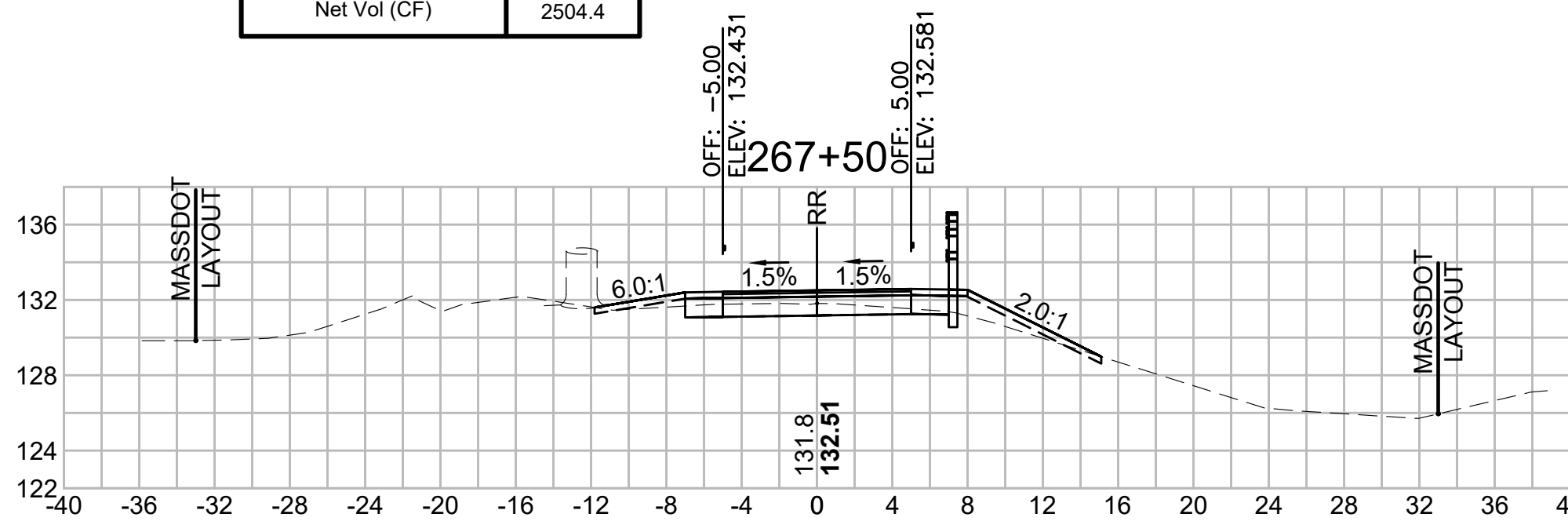
Total Volume at Station 264+50.00	
Cut Area (SF)	45.493
Fill Area (SF)	0.745
Cut Vol (CF)	83.3
Fill Vol (CF)	2.8
Cum Cut Vol (CF)	10230.6
Cum Fill Vol (CF)	7984.2
Net Vol (CF)	2246.4



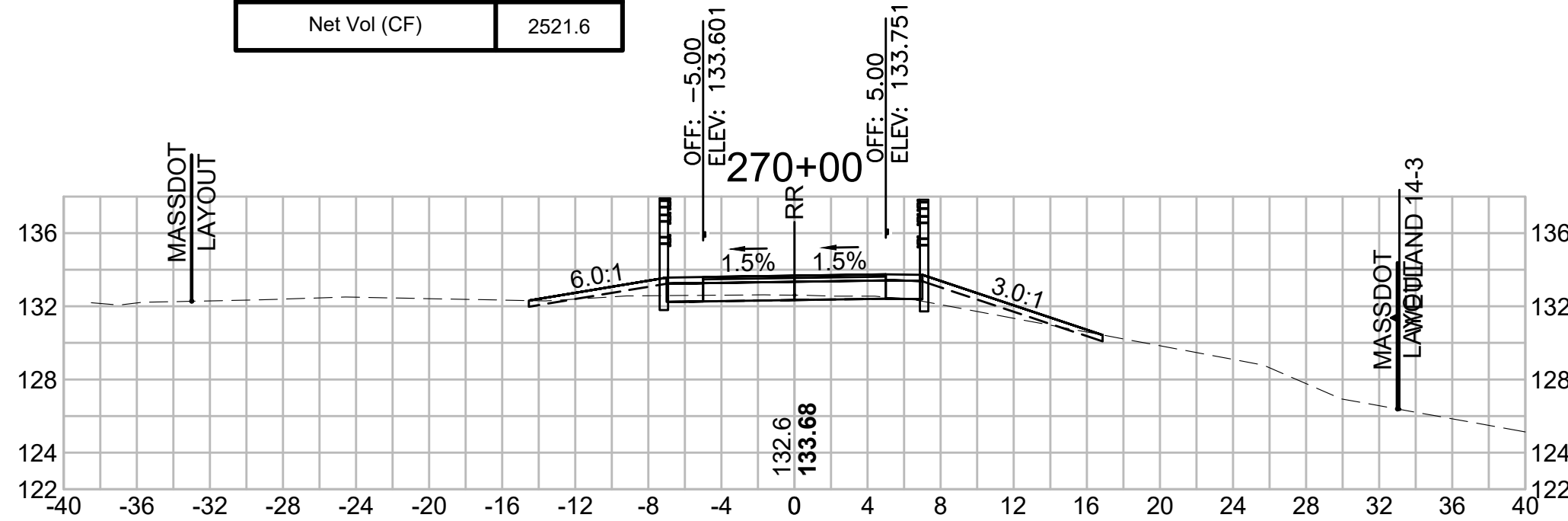
Total Volume at Station 266+00.00	
Cut Area (SF)	23.271
Fill Area (SF)	0.000
Cut Vol (CF)	48.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	10417.5
Cum Fill Vol (CF)	7984.9
Net Vol (CF)	2432.6



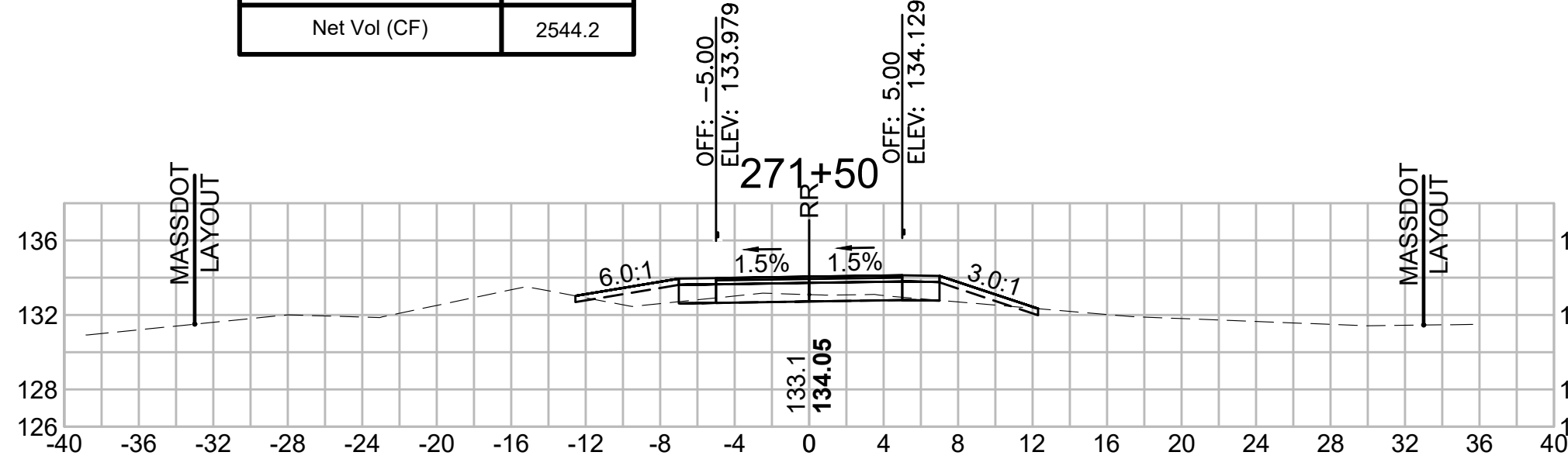
Total Volume at Station 267+50.00	
Cut Area (SF)	7.984
Fill Area (SF)	4.106
Cut Vol (CF)	16.3
Fill Vol (CF)	6.8
Cum Cut Vol (CF)	10503.0
Cum Fill Vol (CF)	7998.5
Net Vol (CF)	2504.4



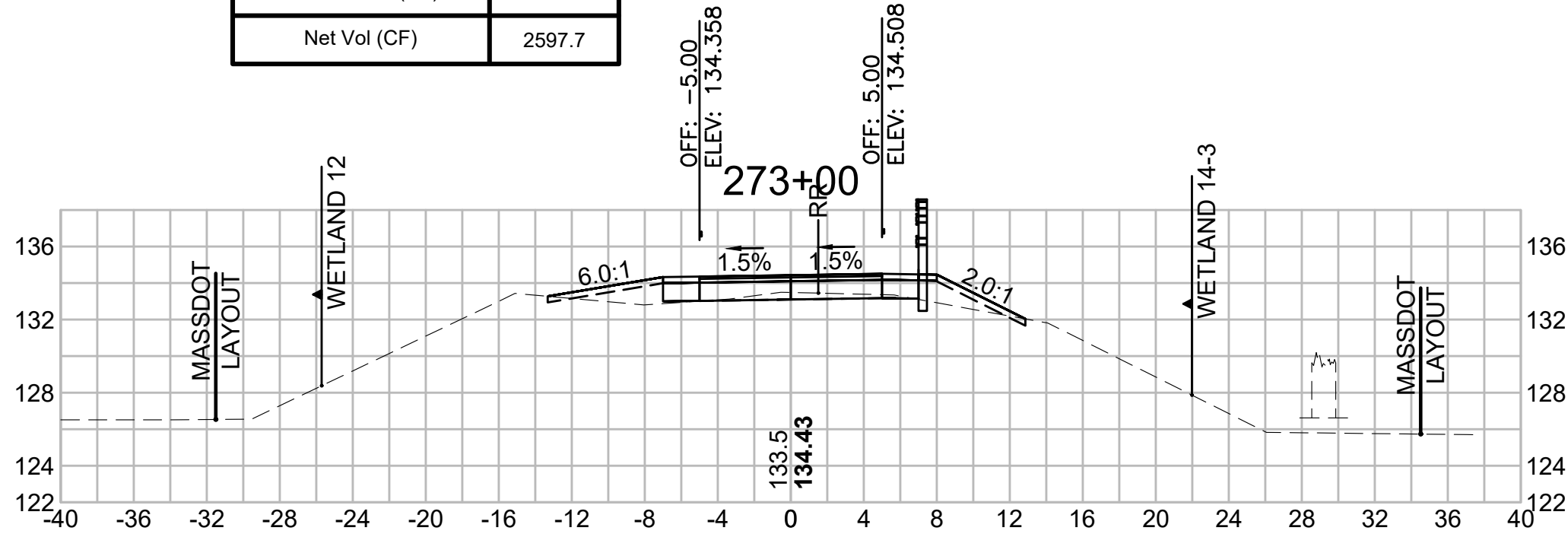
Total Volume at Station 270+00.00	
Cut Area (SF)	16.801
Fill Area (SF)	5.138
Cut Vol (CF)	26.2
Fill Vol (CF)	14.4
Cum Cut Vol (CF)	10586.1
Cum Fill Vol (CF)	8064.4
Net Vol (CF)	2521.6



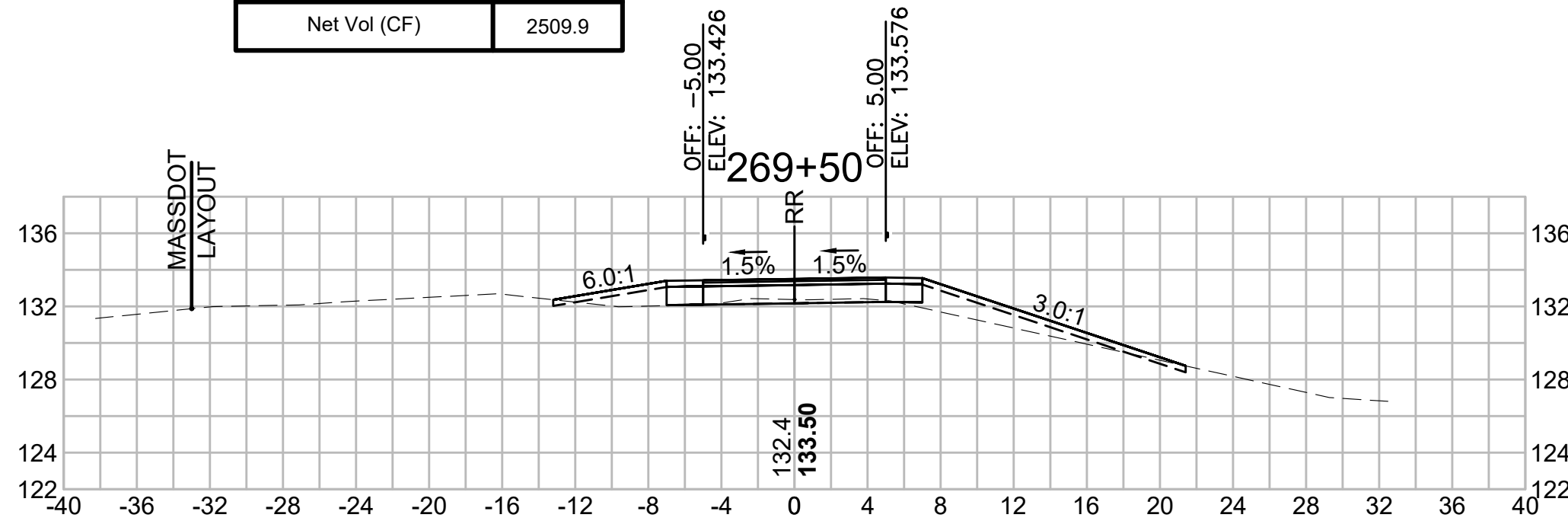
Total Volume at Station 271+50.00	
Cut Area (SF)	15.888
Fill Area (SF)	3.101
Cut Vol (CF)	19.2
Fill Vol (CF)	10.0
Cum Cut Vol (CF)	10639.5
Cum Fill Vol (CF)	8095.3
Net Vol (CF)	2544.2



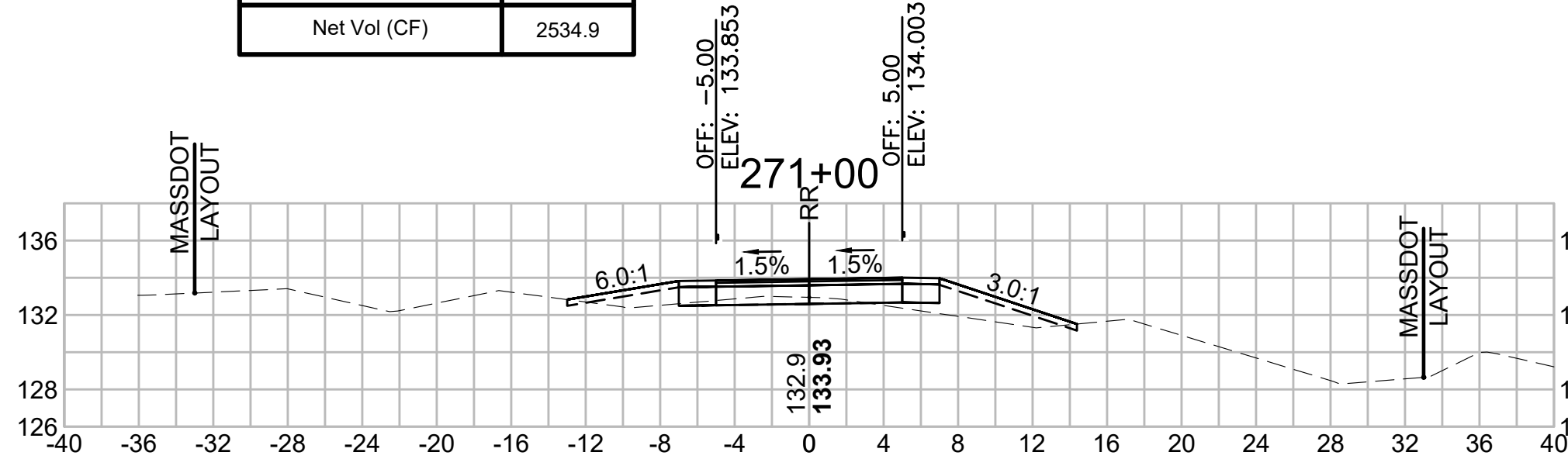
Total Volume at Station 273+00.00	
Cut Area (SF)	8.276
Fill Area (SF)	3.215
Cut Vol (CF)	16.3
Fill Vol (CF)	8.6
Cum Cut Vol (CF)	10717.0
Cum Fill Vol (CF)	8119.4
Net Vol (CF)	2597.7



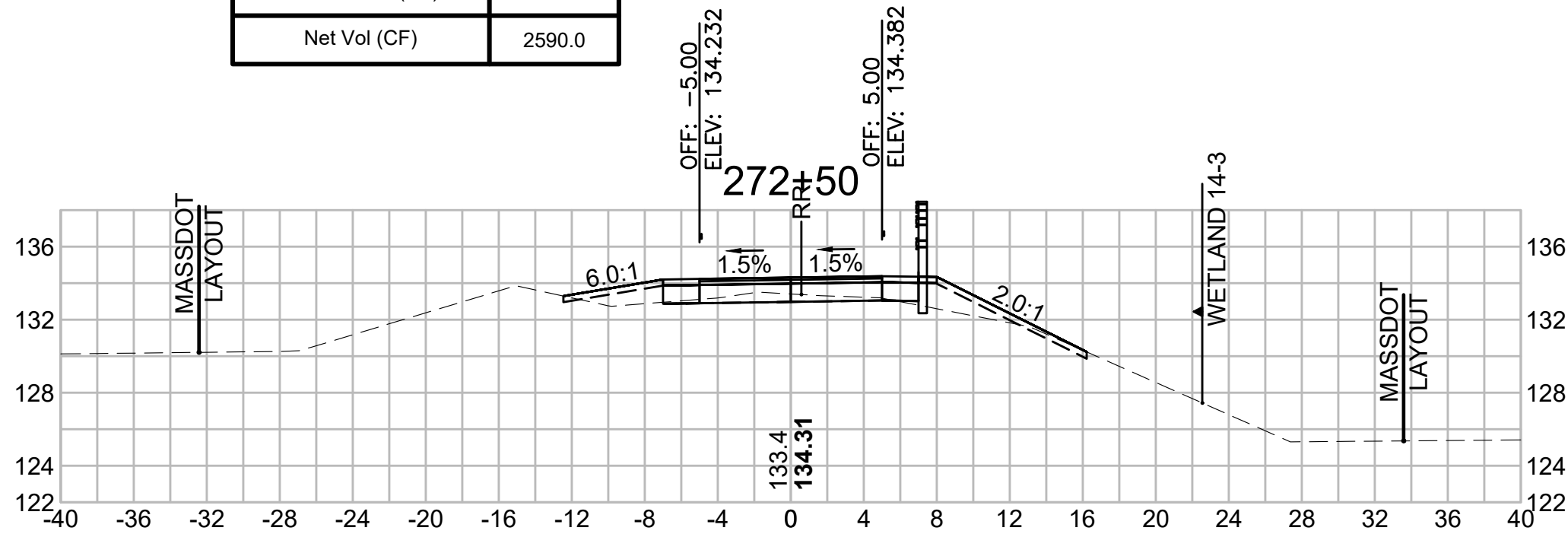
Total Volume at Station 269+50.00	
Cut Area (SF)	11.450
Fill Area (SF)	10.431
Cut Vol (CF)	16.0
Fill Vol (CF)	20.0
Cum Cut Vol (CF)	10559.9
Cum Fill Vol (CF)	8050.0
Net Vol (CF)	2509.9



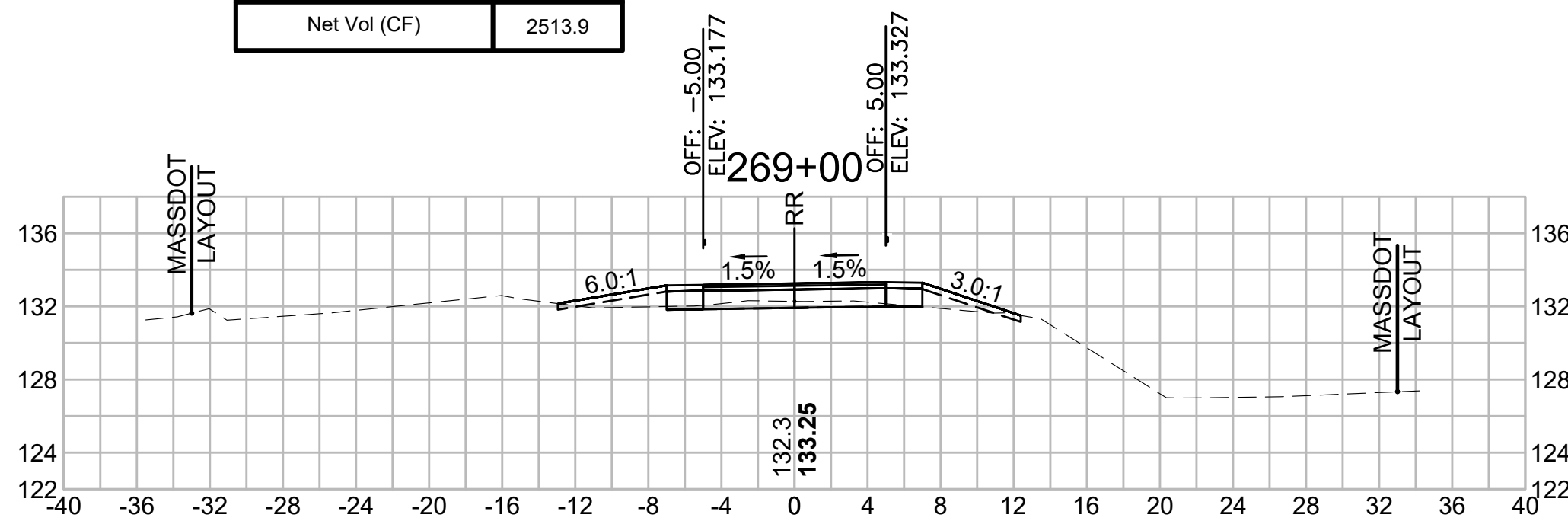
Total Volume at Station 271+00.00	
Cut Area (SF)	4.887
Fill Area (SF)	7.726
Cut Vol (CF)	11.6
Fill Vol (CF)	11.6
Cum Cut Vol (CF)	10620.2
Cum Fill Vol (CF)	8085.3
Net Vol (CF)	2534.9



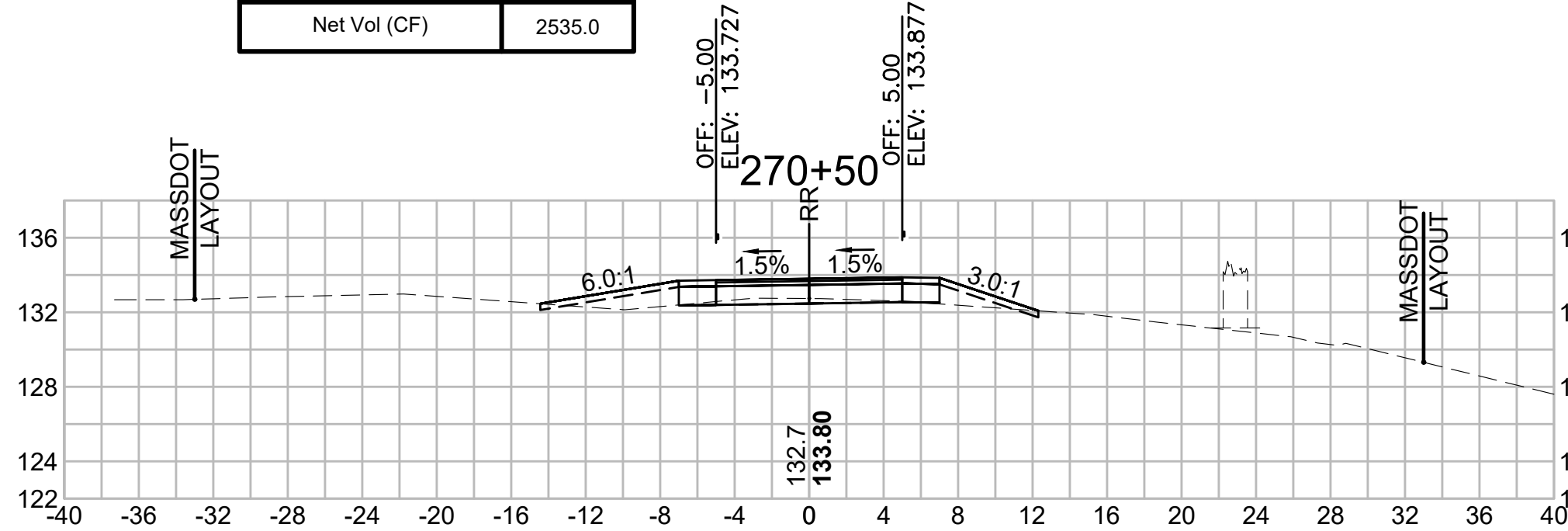
Total Volume at Station 272+50.00	
Cut Area (SF)	9.303
Fill Area (SF)	6.077
Cut Vol (CF)	27.6
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	10700.8
Cum Fill Vol (CF)	8110.8
Net Vol (CF)	2590.0



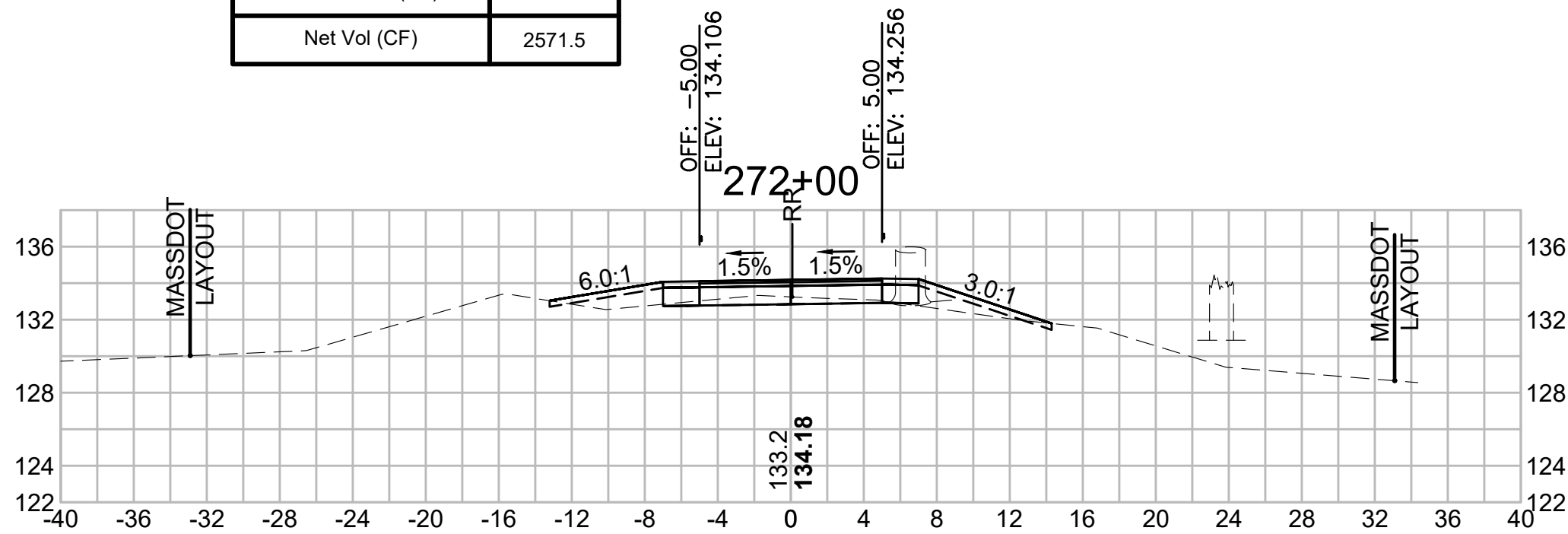
Total Volume at Station 269+00.00	
Cut Area (SF)	5.848
Fill Area (SF)	11.181
Cut Vol (CF)	11.8
Fill Vol (CF)	15.8
Cum Cut Vol (CF)	10543.9
Cum Fill Vol (CF)	8030.0
Net Vol (CF)	2513.9



Total Volume at Station 270+50.00	
Cut Area (SF)	7.611
Fill Area (SF)	4.837
Cut Vol (CF)	22.6
Fill Vol (CF)	9.2
Cum Cut Vol (CF)	10608.7
Cum Fill Vol (CF)	8073.7
Net Vol (CF)	2535.0



Total Volume at Station 272+00.00	
Cut Area (SF)	20.499
Fill Area (SF)	3.749
Cut Vol (CF)	33.7
Fill Vol (CF)	6.3
Cum Cut Vol (CF)	10673.2
Cum Fill Vol (CF)	8101.7
Net Vol (CF)	2571.5



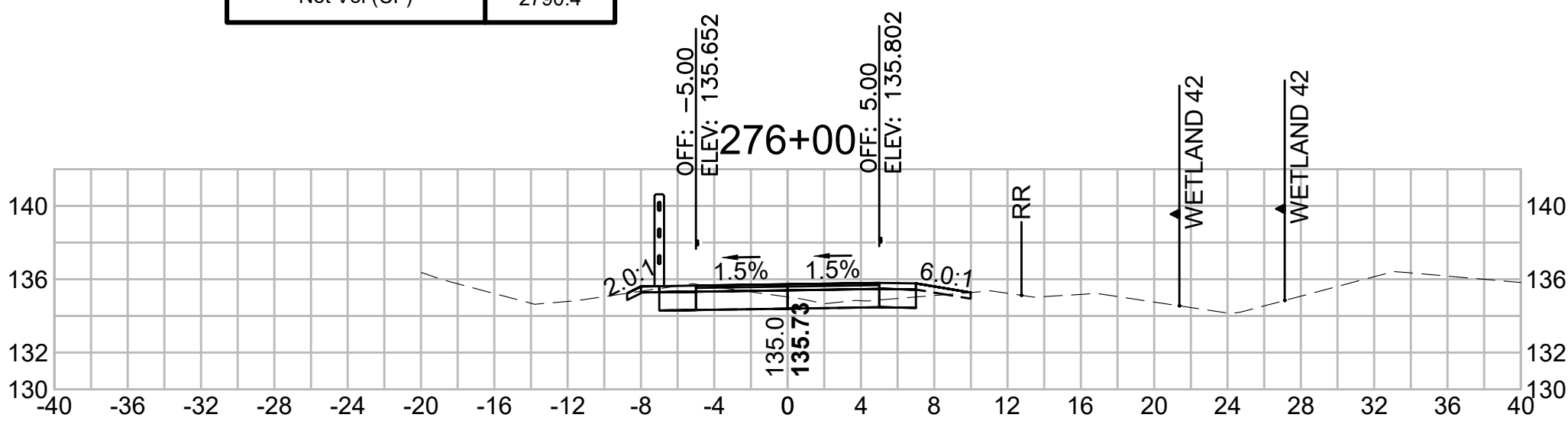
SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	286	319
PROJECT FILE NO. 608164			

CROSS SECTIONS

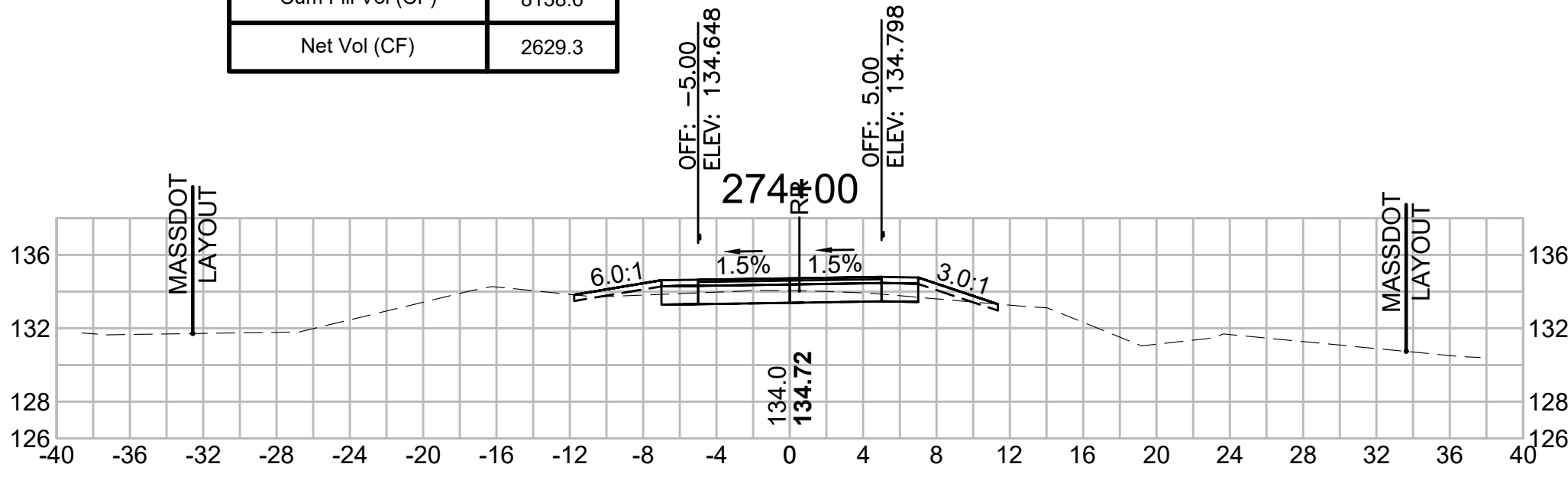
Total Volume at Station 274+50.00	
Cut Area (SF)	24.549
Fill Area (SF)	6.144
Cut Vol (CF)	40.8
Fill Vol (CF)	18.1
Cum Cut Vol (CF)	10808.6
Cum Fill Vol (CF)	8156.7
Net Vol (CF)	2651.9



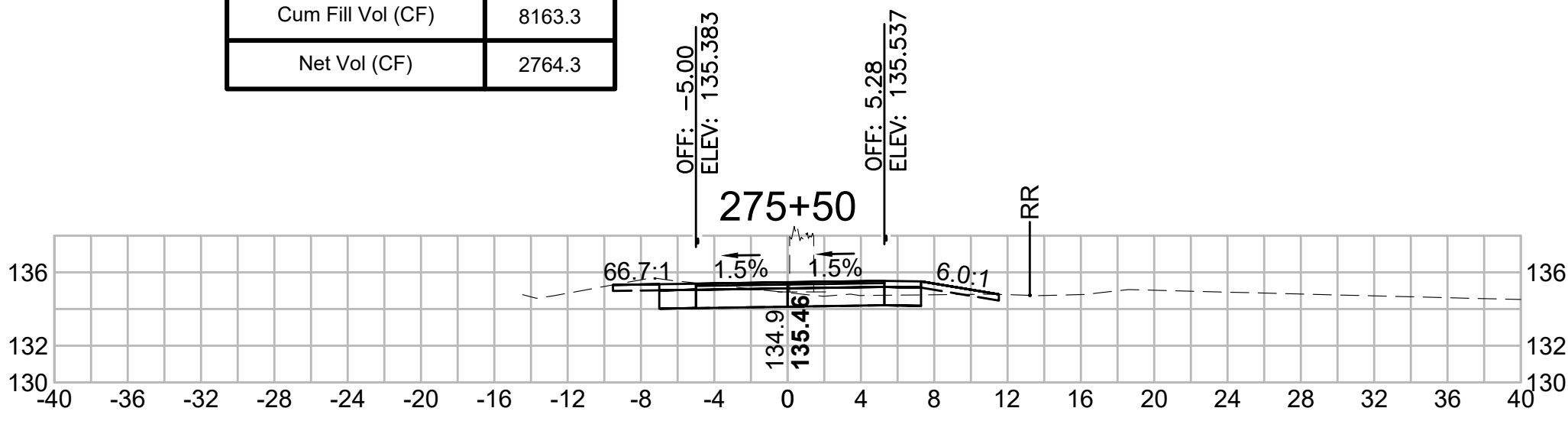
Total Volume at Station 276+00.00	
Cut Area (SF)	12.654
Fill Area (SF)	0.620
Cut Vol (CF)	27.6
Fill Vol (CF)	1.5
Cum Cut Vol (CF)	10955.2
Cum Fill Vol (CF)	8164.8
Net Vol (CF)	2790.4



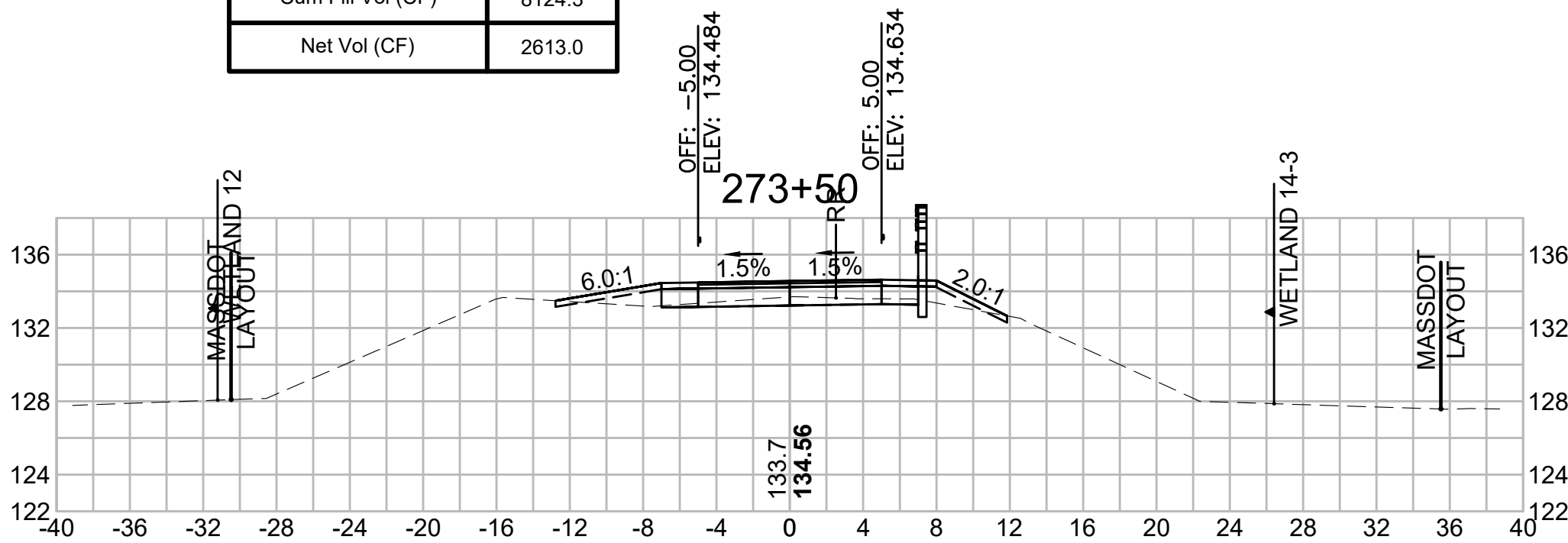
Total Volume at Station 274+00.00	
Cut Area (SF)	19.468
Fill Area (SF)	13.388
Cut Vol (CF)	30.6
Fill Vol (CF)	14.3
Cum Cut Vol (CF)	10767.9
Cum Fill Vol (CF)	8138.6
Net Vol (CF)	2629.3



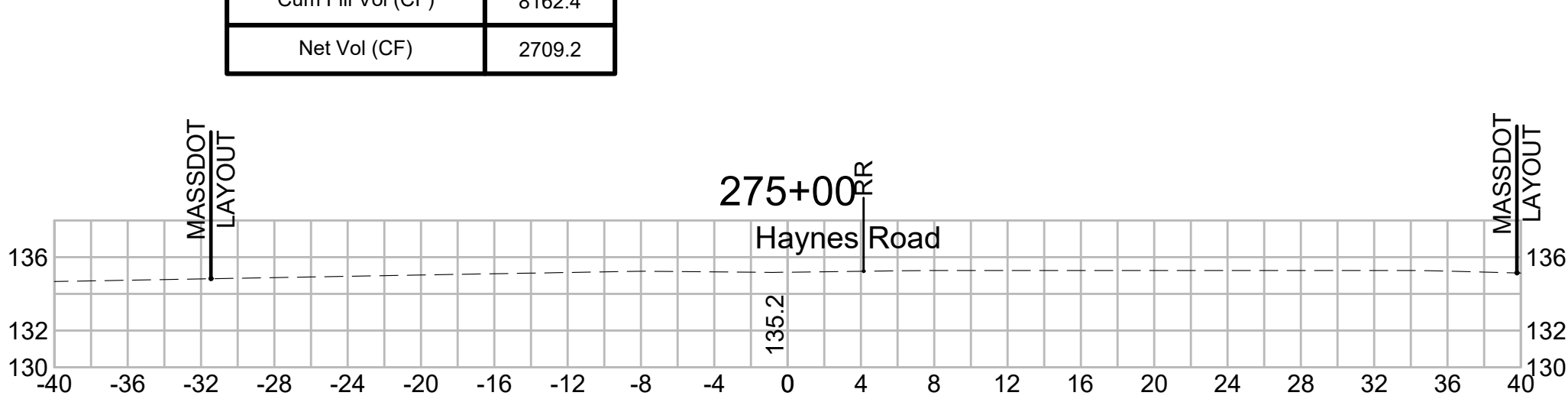
Total Volume at Station 275+50.00	
Cut Area (SF)	17.120
Fill Area (SF)	1.005
Cut Vol (CF)	56.1
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	10927.6
Cum Fill Vol (CF)	8163.3
Net Vol (CF)	2764.3



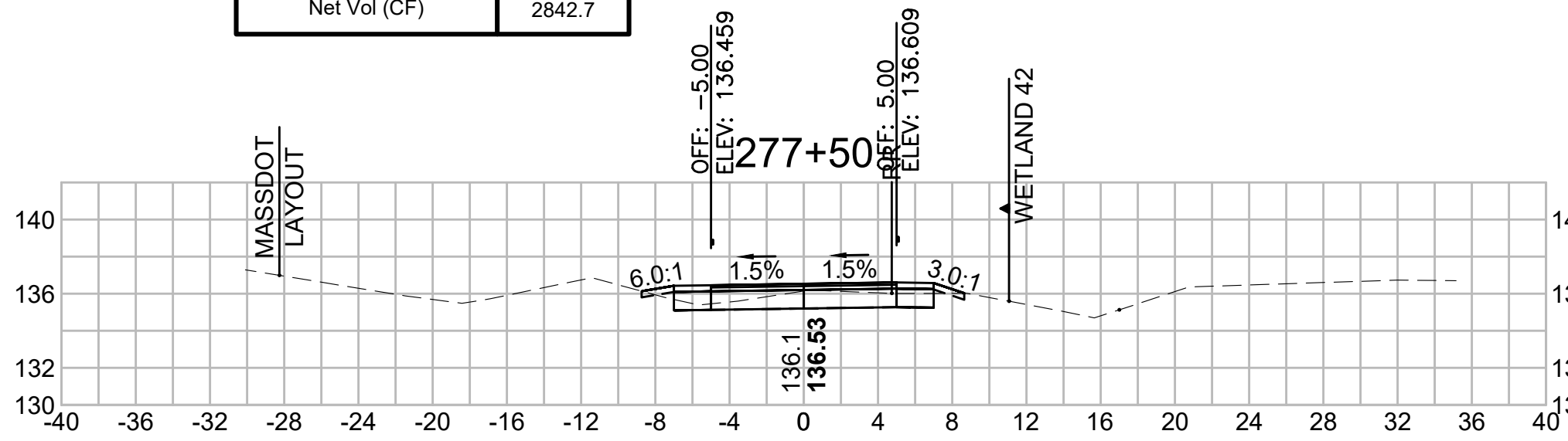
Total Volume at Station 273+50.00	
Cut Area (SF)	13.567
Fill Area (SF)	2.075
Cut Vol (CF)	20.2
Fill Vol (CF)	4.9
Cum Cut Vol (CF)	10737.3
Cum Fill Vol (CF)	8124.3
Net Vol (CF)	2613.0



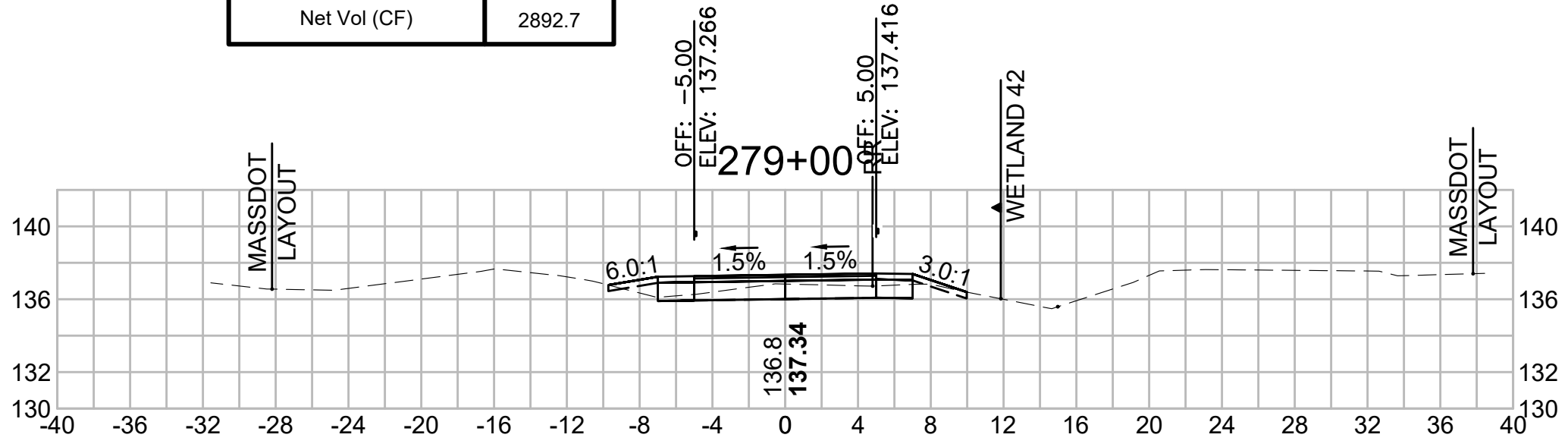
Total Volume at Station 275+00.00	
Cut Area (SF)	43.439
Fill Area (SF)	0.000
Cut Vol (CF)	63.0
Fill Vol (CF)	5.7
Cum Cut Vol (CF)	10871.6
Cum Fill Vol (CF)	8162.4
Net Vol (CF)	2709.2



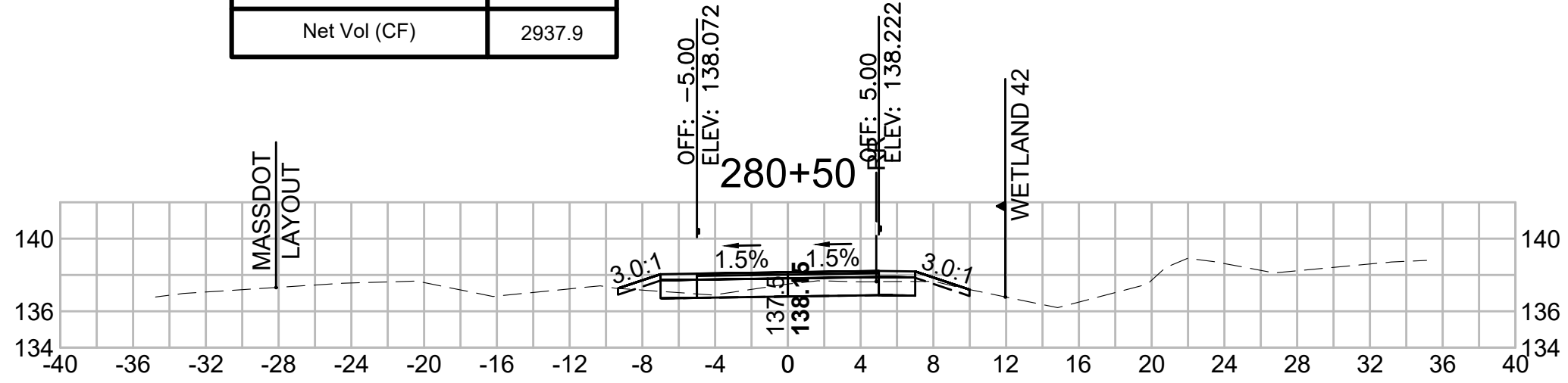
Total Volume at Station 277+50.00	
Cut Area (SF)	9.978
Fill Area (SF)	0.269
Cut Vol (CF)	15.8
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	11008.5
Cum Fill Vol (CF)	8165.8
Net Vol (CF)	2842.7



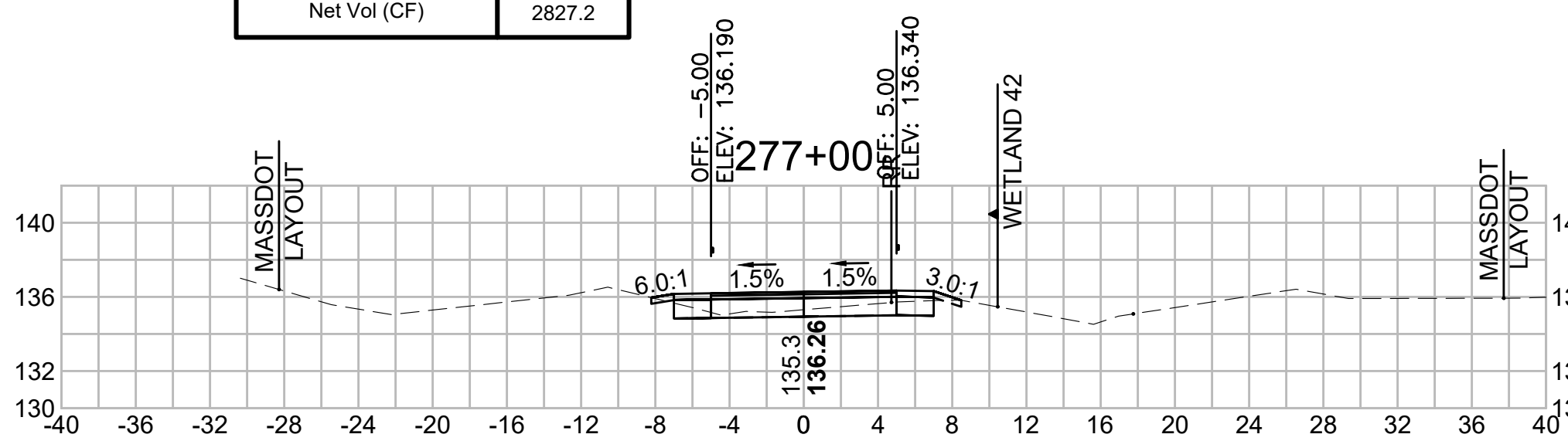
Total Volume at Station 279+00.00	
Cut Area (SF)	9.292
Fill Area (SF)	0.846
Cut Vol (CF)	17.6
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	11061.7
Cum Fill Vol (CF)	8168.9
Net Vol (CF)	2892.7



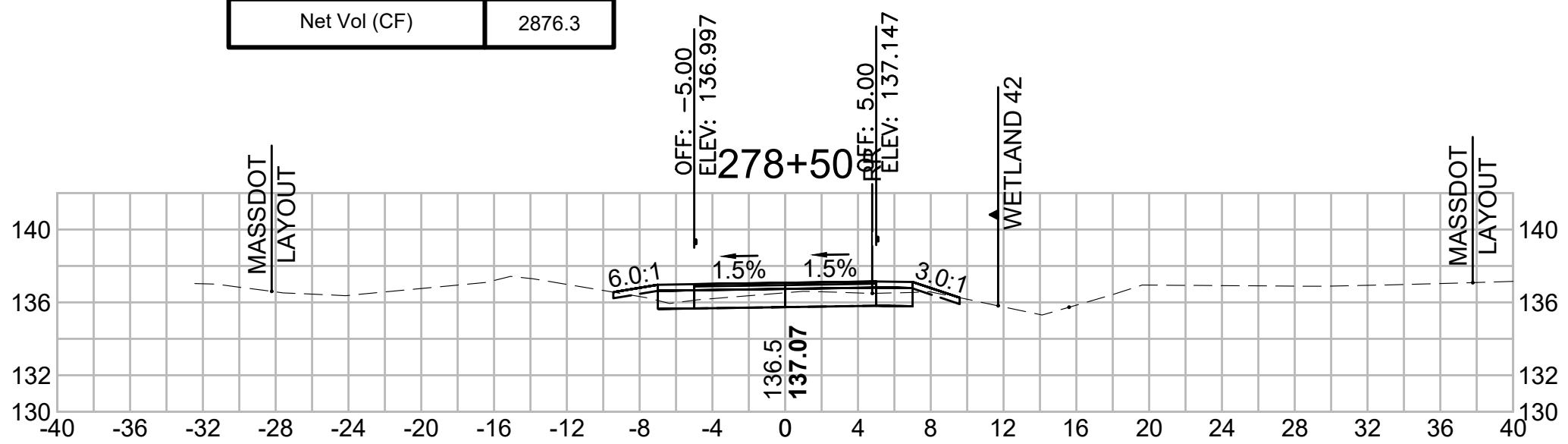
Total Volume at Station 280+50.00	
Cut Area (SF)	8.526
Fill Area (SF)	0.500
Cut Vol (CF)	15.8
Fill Vol (CF)	1.5
Cum Cut Vol (CF)	11111.5
Cum Fill Vol (CF)	8173.5
Net Vol (CF)	2937.9



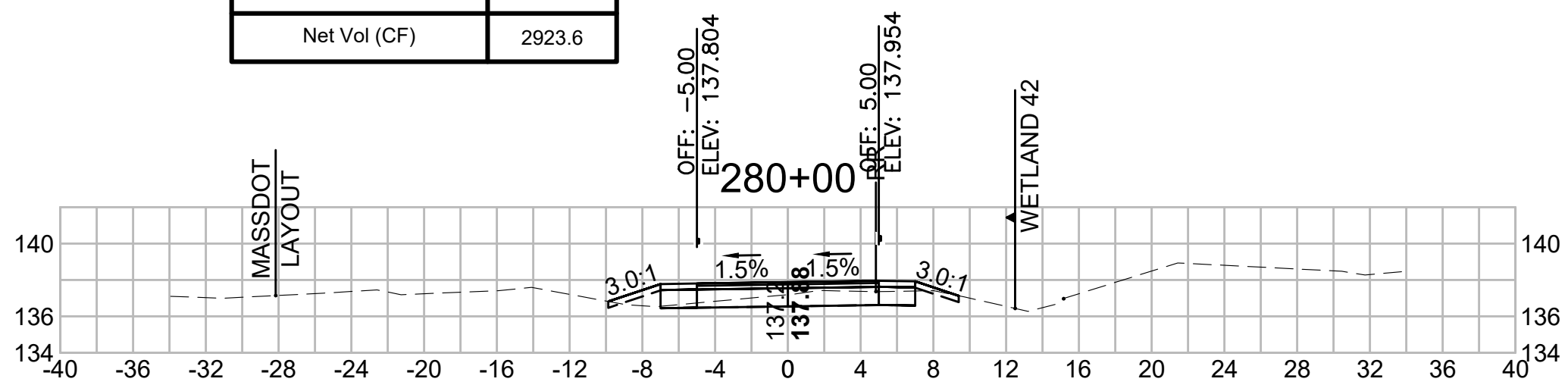
Total Volume at Station 277+00.00	
Cut Area (SF)	7.093
Fill Area (SF)	0.066
Cut Vol (CF)	16.2
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	10992.7
Cum Fill Vol (CF)	8165.5
Net Vol (CF)	2827.2



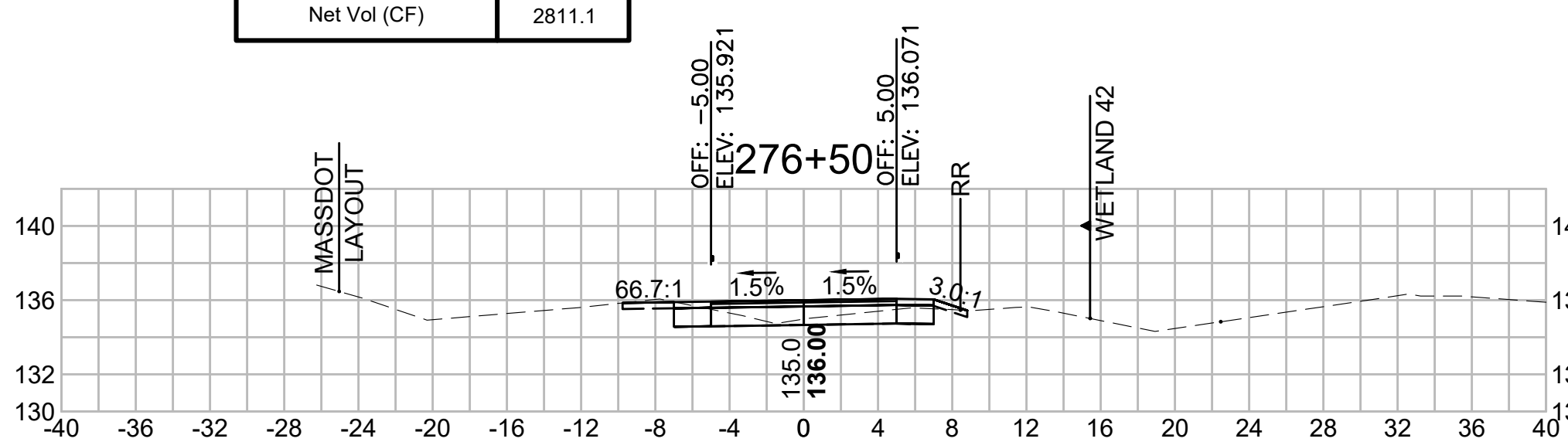
Total Volume at Station 278+50.00	
Cut Area (SF)	9.760
Fill Area (SF)	0.426
Cut Vol (CF)	17.7
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	11044.0
Cum Fill Vol (CF)	8167.8
Net Vol (CF)	2876.3



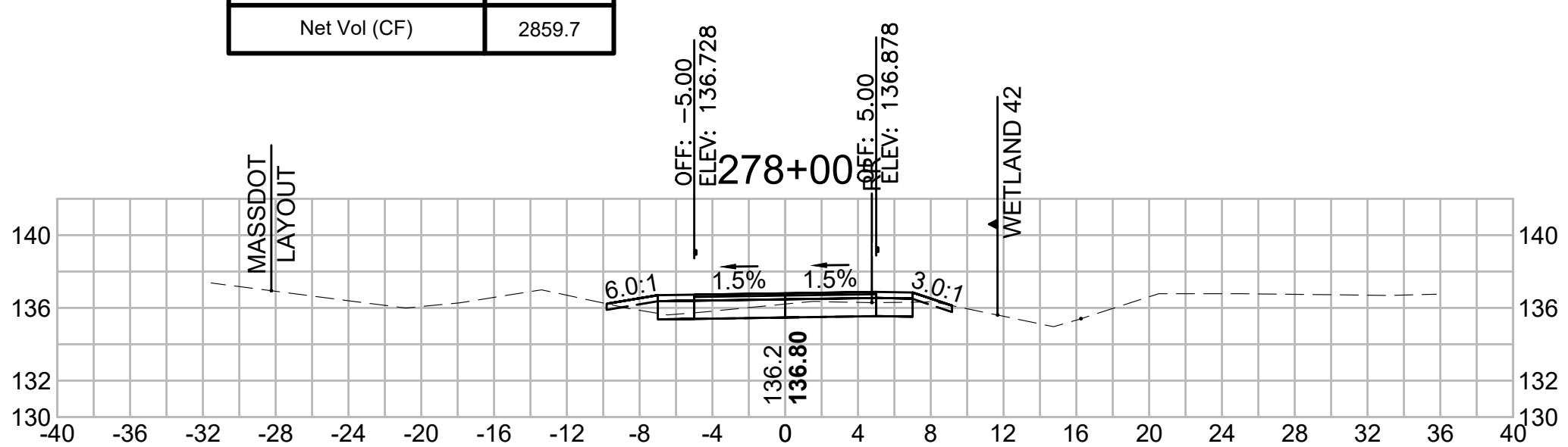
Total Volume at Station 280+00.00	
Cut Area (SF)	8.550
Fill Area (SF)	1.082
Cut Vol (CF)	16.6
Fill Vol (CF)	1.7
Cum Cut Vol (CF)	11095.6
Cum Fill Vol (CF)	8172.0
Net Vol (CF)	2923.6



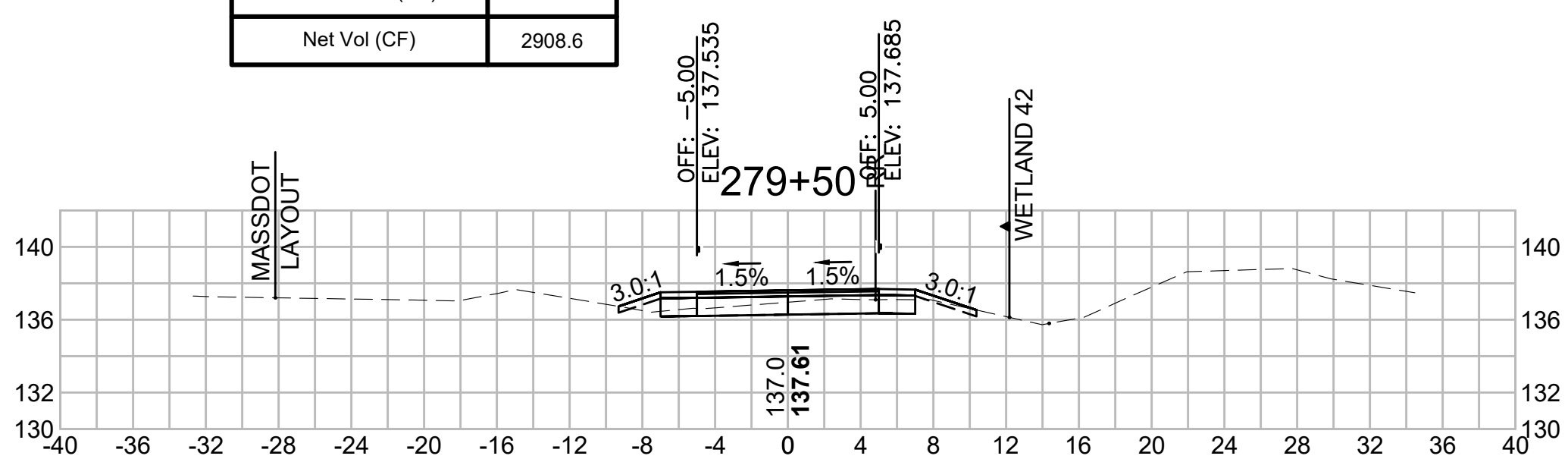
Total Volume at Station 276+50.00	
Cut Area (SF)	10.381
Fill Area (SF)	0.043
Cut Vol (CF)	21.3
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	10976.5
Cum Fill Vol (CF)	8165.4
Net Vol (CF)	2811.1



Total Volume at Station 278+00.00	
Cut Area (SF)	9.312
Fill Area (SF)	0.703
Cut Vol (CF)	17.9
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	11026.4
Cum Fill Vol (CF)	8166.7
Net Vol (CF)	2859.7

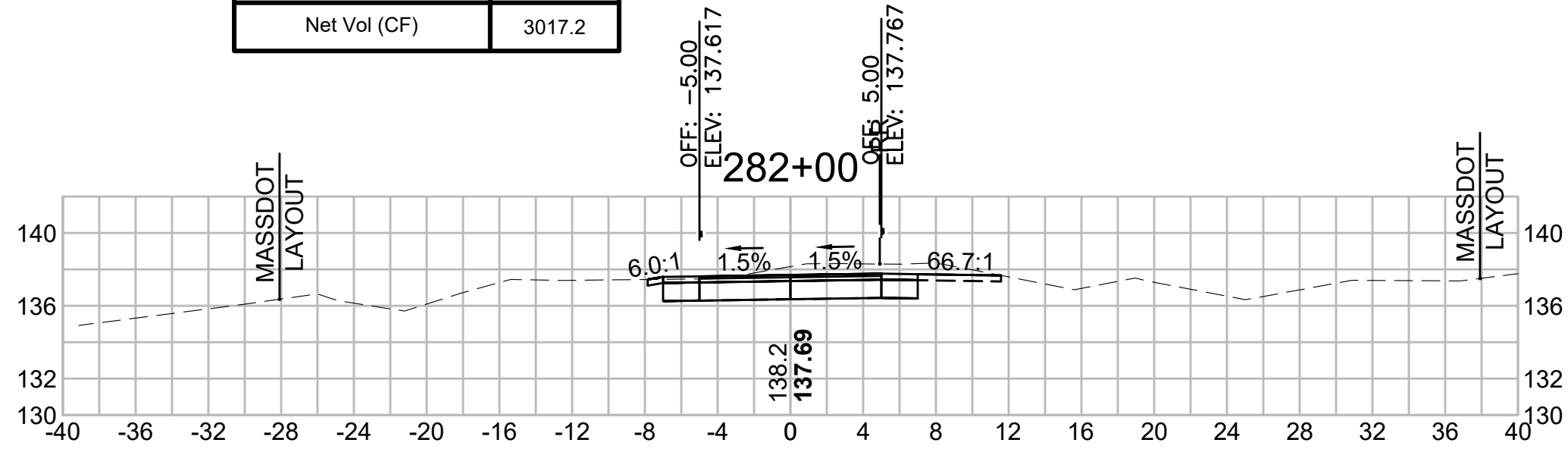


Total Volume at Station 279+50.00	
Cut Area (SF)	9.420
Fill Area (SF)	0.707
Cut Vol (CF)	17.3
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	11079.0
Cum Fill Vol (CF)	8170.4
Net Vol (CF)	2908.6

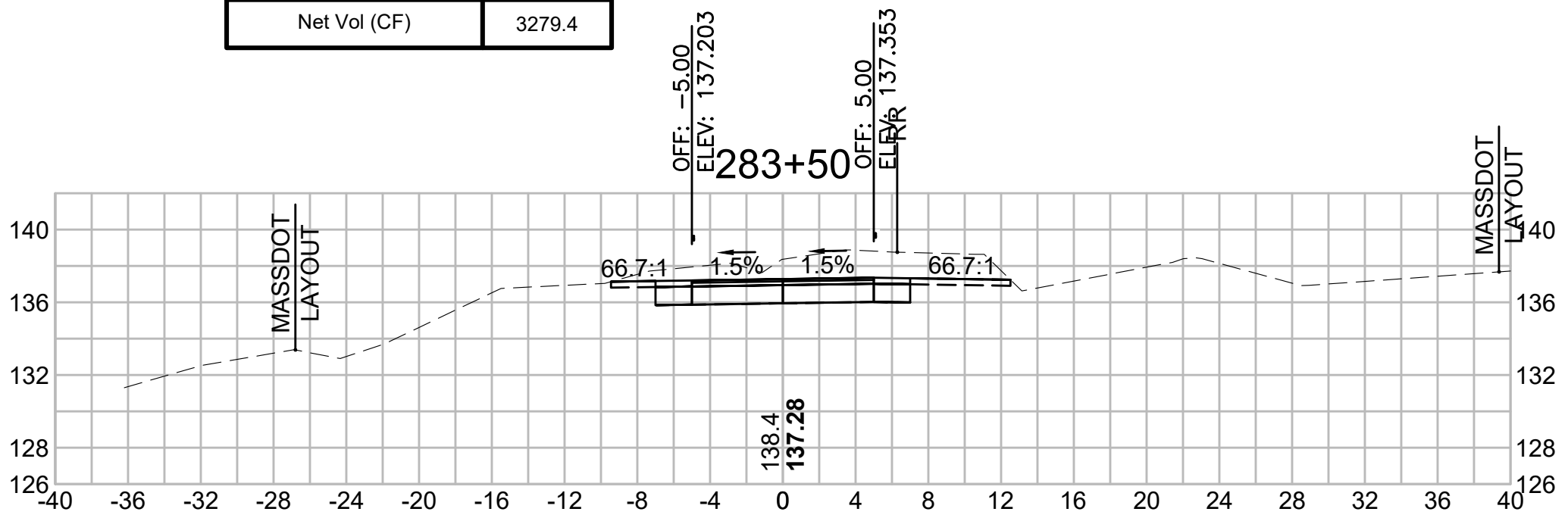


CROSS SECTIONS

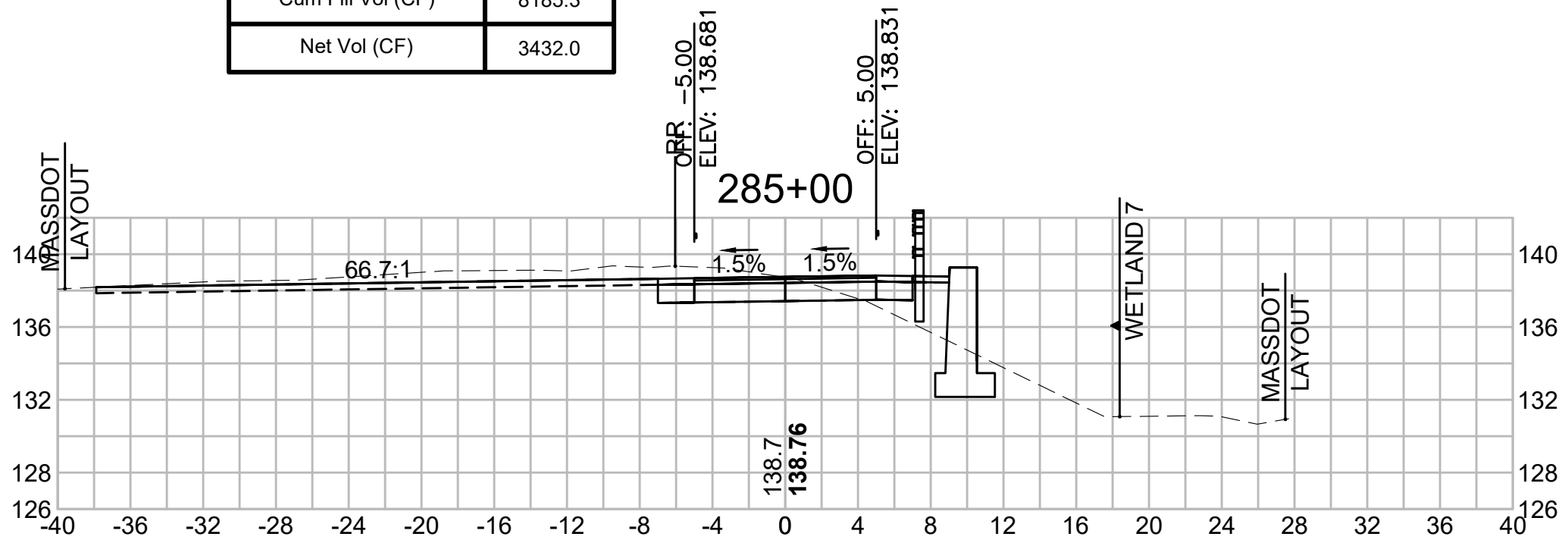
Total Volume at Station 282+00.00	
Cut Area (SF)	28.258
Fill Area (SF)	0.000
Cut Vol (CF)	40.9
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	11192.0
Cum Fill Vol (CF)	8174.8
Net Vol (CF)	3017.2



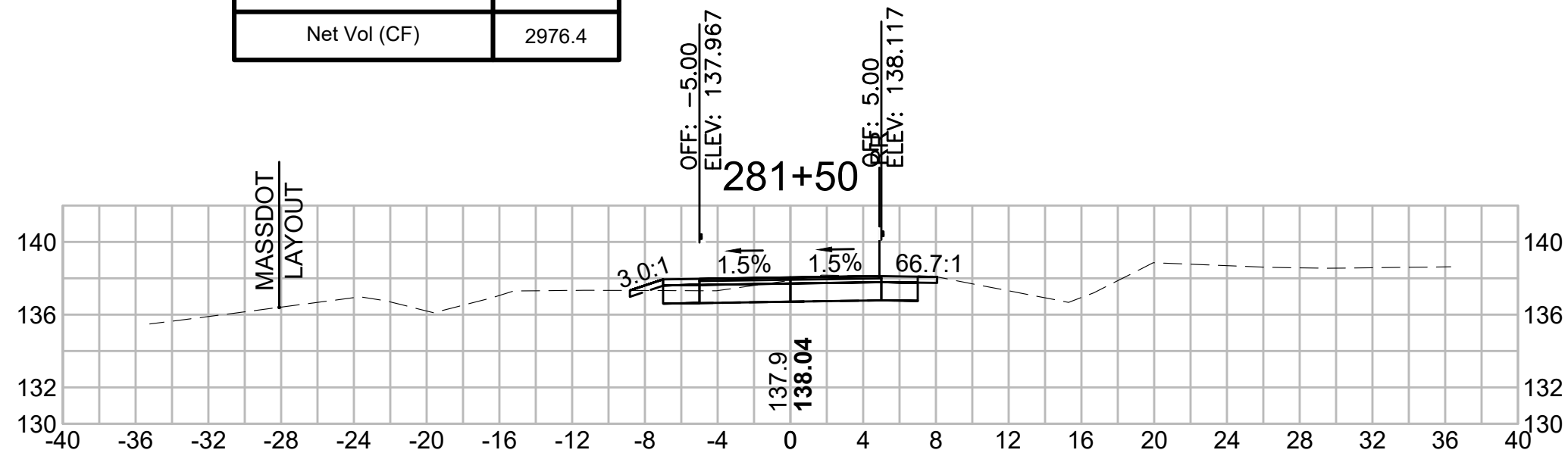
Total Volume at Station 283+50.00	
Cut Area (SF)	59.185
Fill Area (SF)	0.222
Cut Vol (CF)	105.4
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	11454.4
Cum Fill Vol (CF)	8175.0
Net Vol (CF)	3279.4



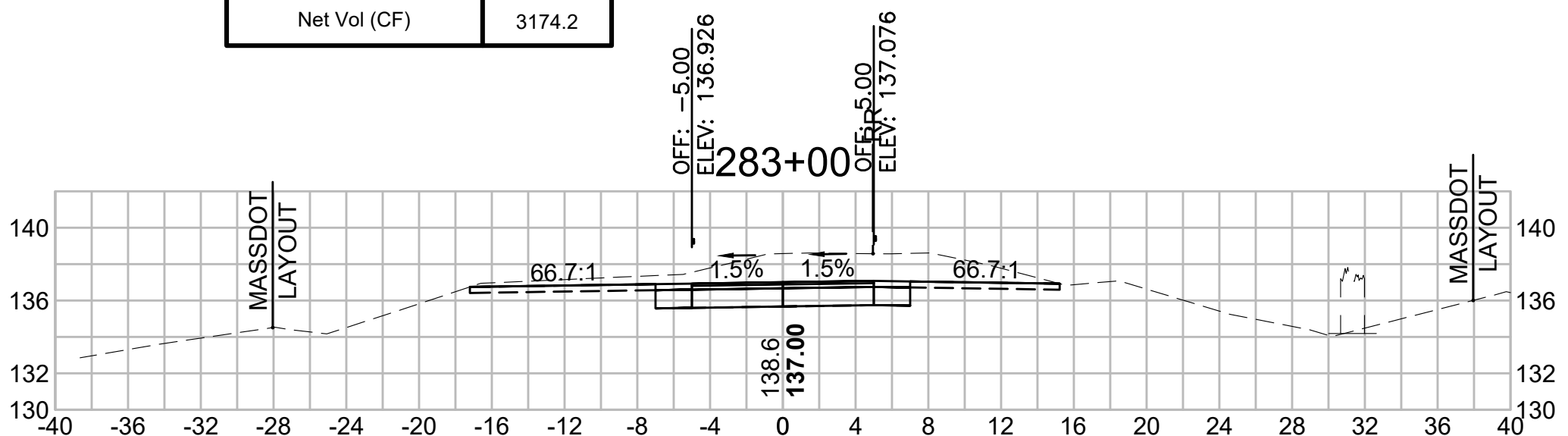
Total Volume at Station 285+00.00	
Cut Area (SF)	51.764
Fill Area (SF)	6.023
Cut Vol (CF)	47.9
Fill Vol (CF)	5.6
Cum Cut Vol (CF)	11617.4
Cum Fill Vol (CF)	8185.3
Net Vol (CF)	3432.0



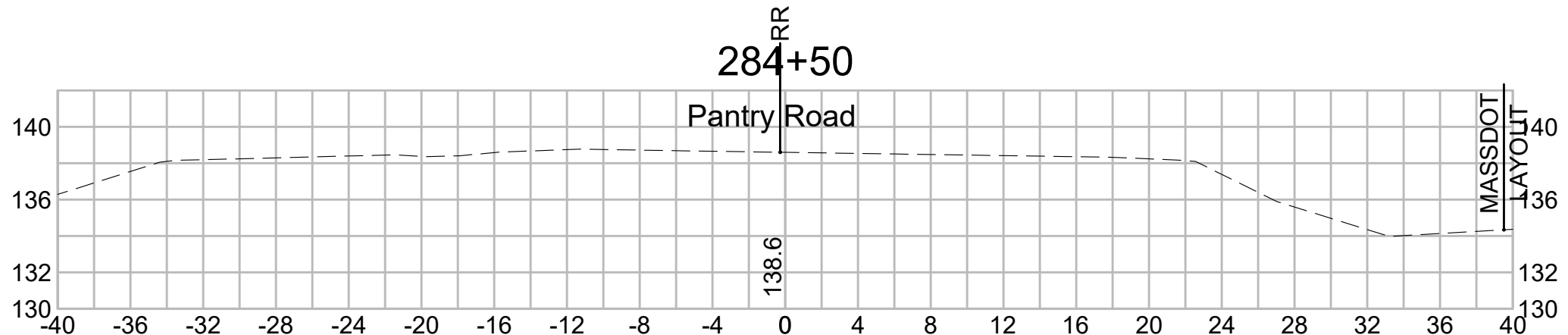
Total Volume at Station 281+50.00	
Cut Area (SF)	15.927
Fill Area (SF)	0.106
Cut Vol (CF)	23.2
Fill Vol (CF)	0.4
Cum Cut Vol (CF)	11151.1
Cum Fill Vol (CF)	8174.7
Net Vol (CF)	2976.4



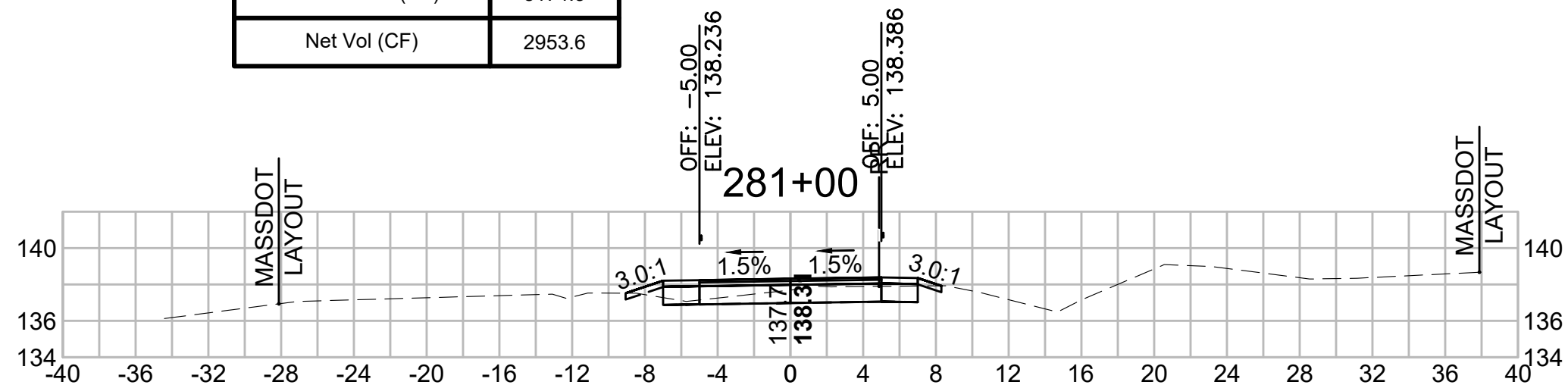
Total Volume at Station 283+00.00	
Cut Area (SF)	54.652
Fill Area (SF)	0.000
Cut Vol (CF)	90.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11349.0
Cum Fill Vol (CF)	8174.8
Net Vol (CF)	3174.2



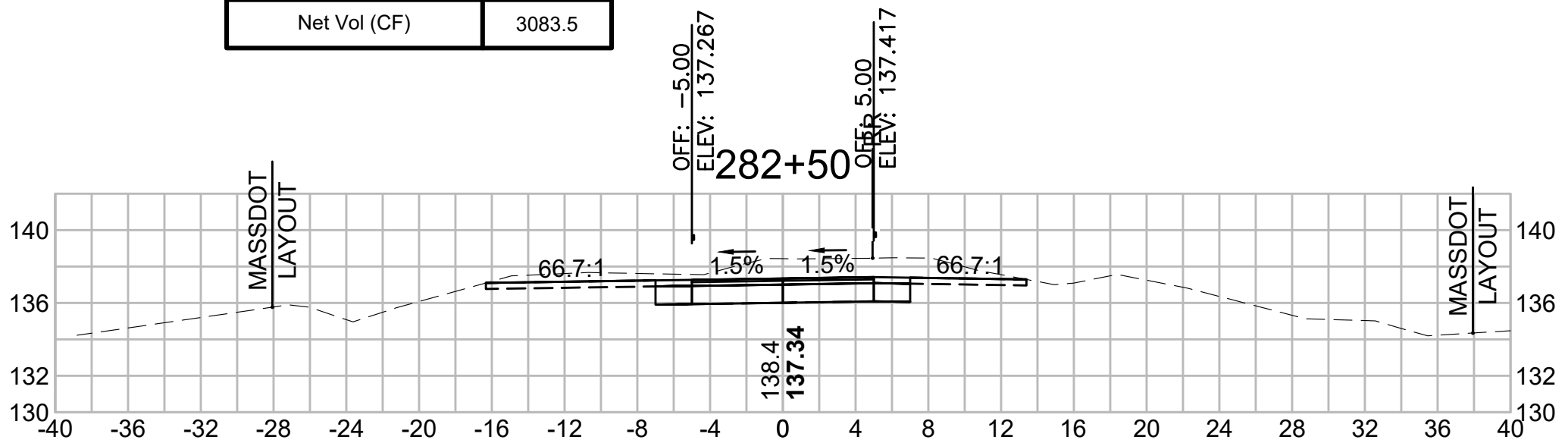
Total Volume at Station 284+50.00	
Cut Area (SF)	0.000
Fill Area (SF)	0.000
Cut Vol (CF)	30.1
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	11569.5
Cum Fill Vol (CF)	8179.8
Net Vol (CF)	3389.7



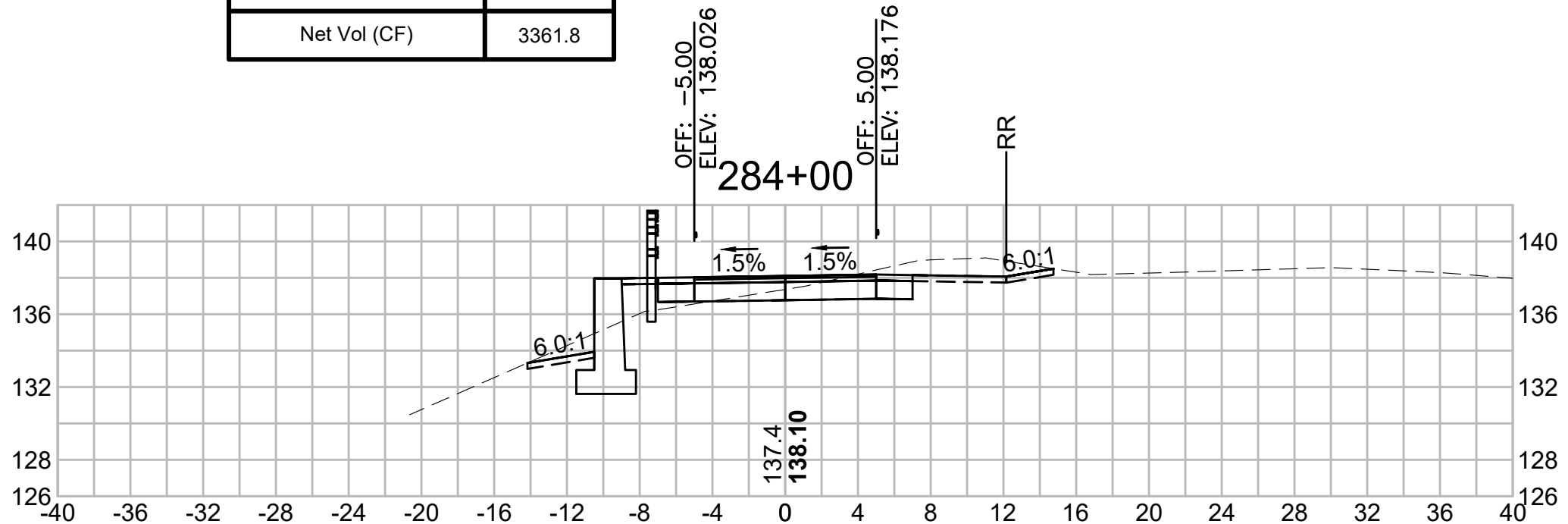
Total Volume at Station 281+00.00	
Cut Area (SF)	9.182
Fill Area (SF)	0.352
Cut Vol (CF)	16.4
Fill Vol (CF)	0.8
Cum Cut Vol (CF)	11127.9
Cum Fill Vol (CF)	8174.3
Net Vol (CF)	2953.6



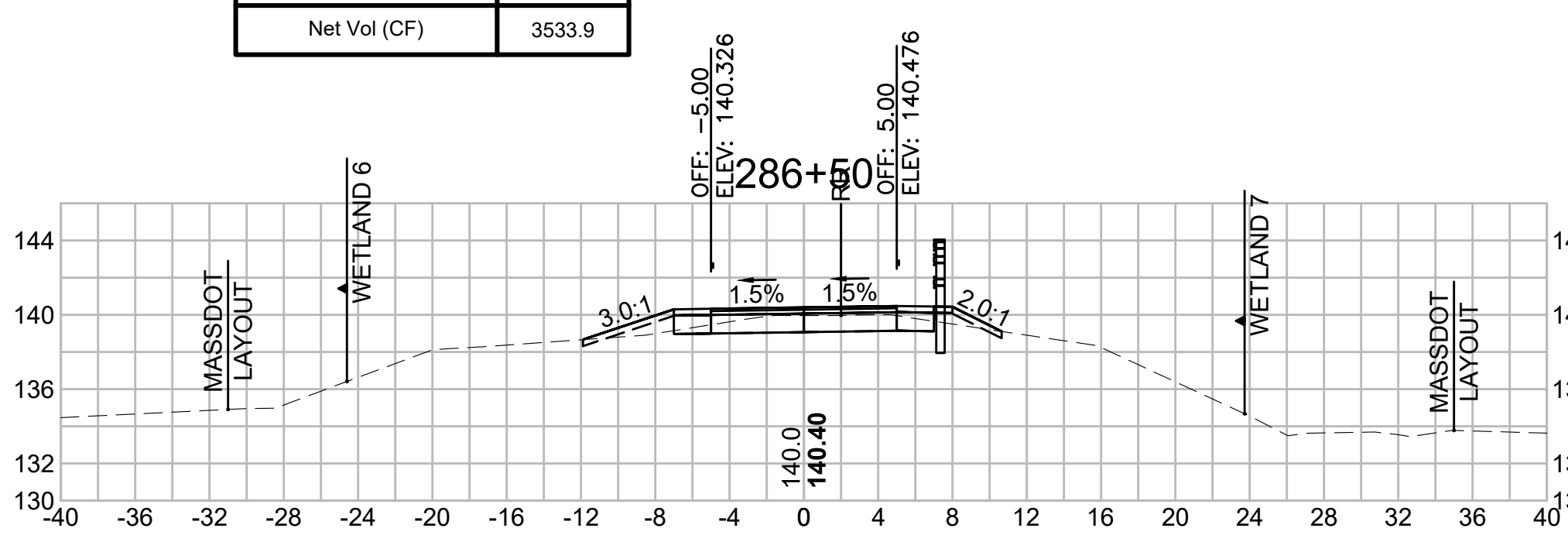
Total Volume at Station 282+50.00	
Cut Area (SF)	43.320
Fill Area (SF)	0.000
Cut Vol (CF)	66.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11258.3
Cum Fill Vol (CF)	8174.8
Net Vol (CF)	3083.5



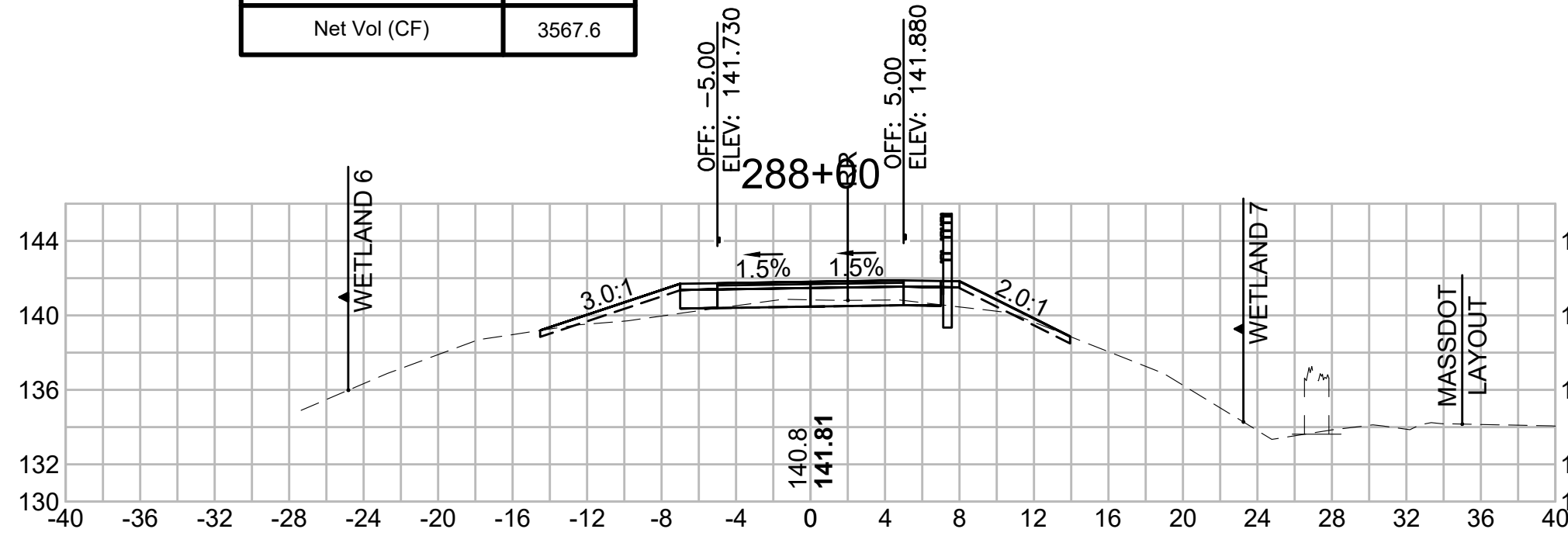
Total Volume at Station 284+00.00	
Cut Area (SF)	32.535
Fill Area (SF)	2.450
Cut Vol (CF)	84.9
Fill Vol (CF)	2.5
Cum Cut Vol (CF)	11539.3
Cum Fill Vol (CF)	8177.5
Net Vol (CF)	3361.8



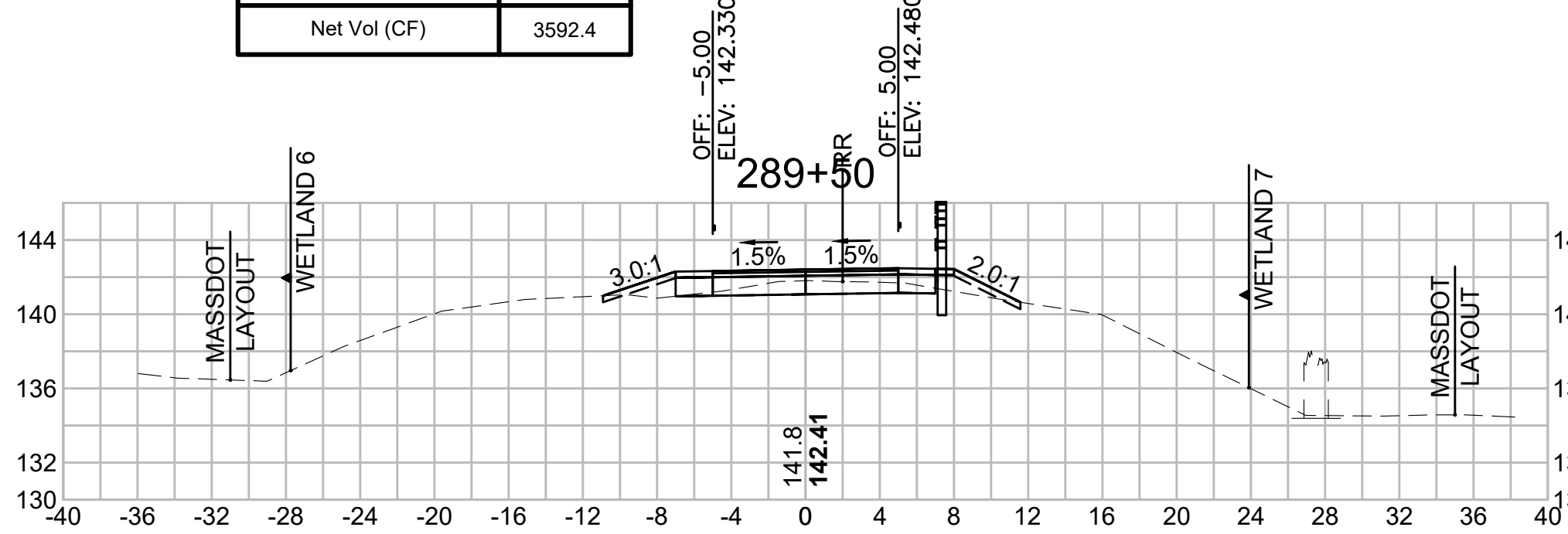
Total Volume at Station 286+50.00	
Cut Area (SF)	10.652
Fill Area (SF)	2.537
Cut Vol (CF)	22.5
Fill Vol (CF)	3.7
Cum Cut Vol (CF)	11735.8
Cum Fill Vol (CF)	8201.9
Net Vol (CF)	3533.9



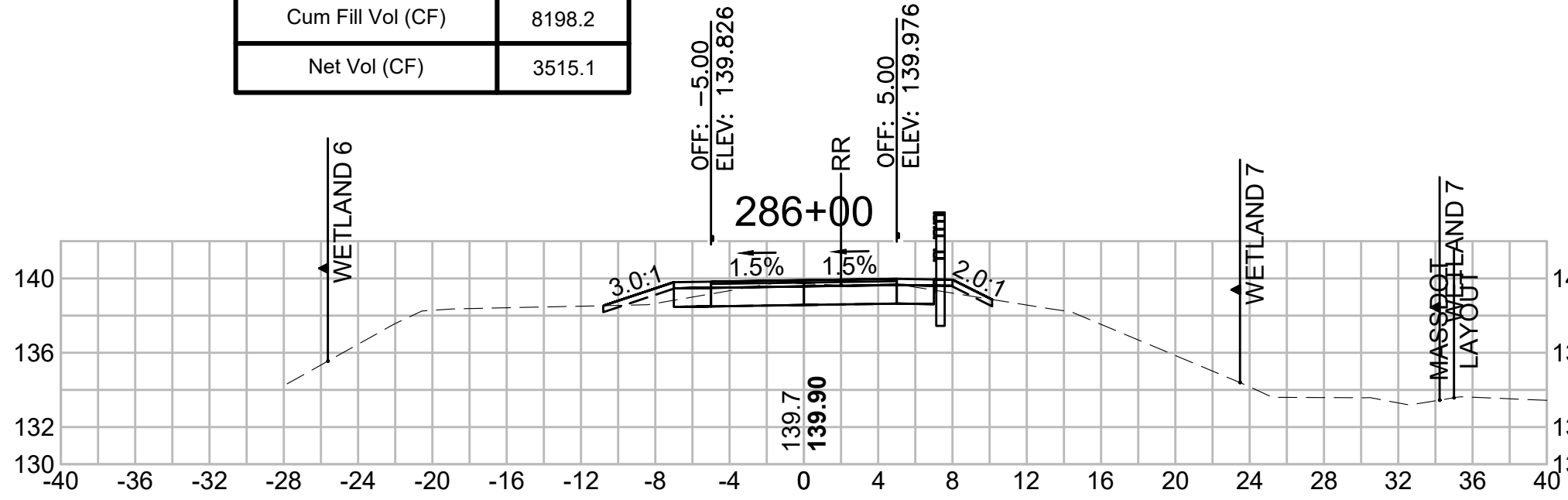
Total Volume at Station 288+00.00	
Cut Area (SF)	10.395
Fill Area (SF)	6.320
Cut Vol (CF)	22.4
Fill Vol (CF)	11.9
Cum Cut Vol (CF)	11796.0
Cum Fill Vol (CF)	8228.4
Net Vol (CF)	3567.6



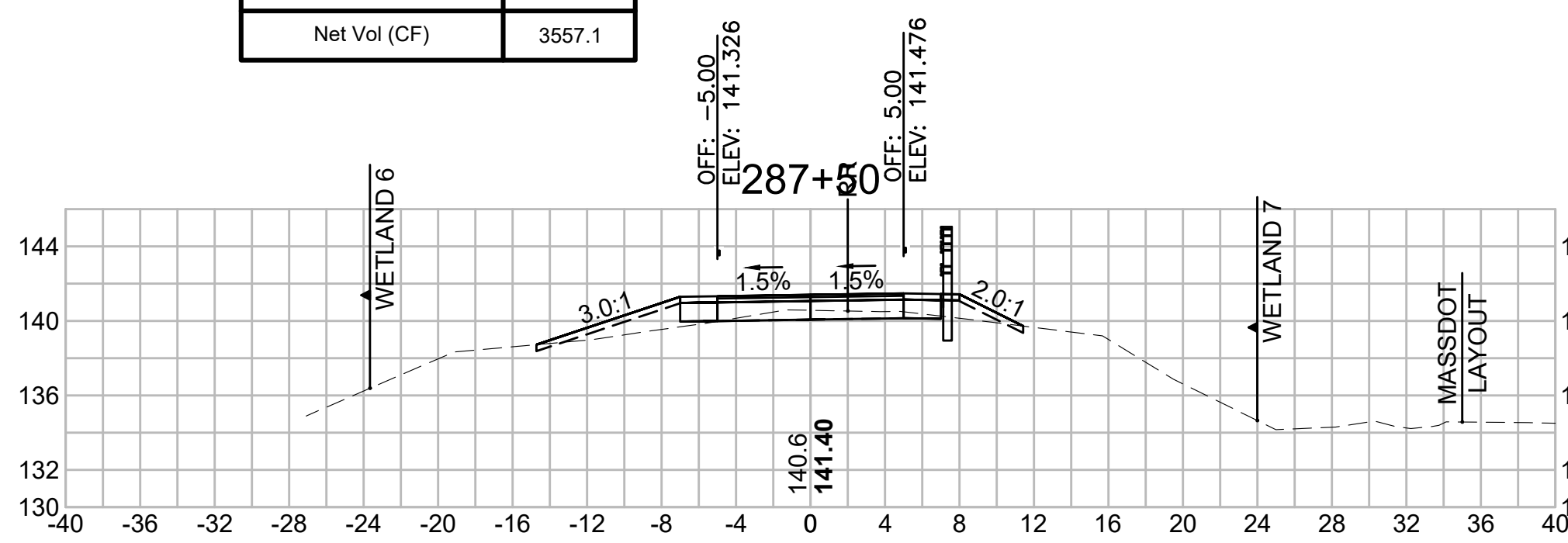
Total Volume at Station 289+50.00	
Cut Area (SF)	7.485
Fill Area (SF)	3.349
Cut Vol (CF)	12.2
Fill Vol (CF)	7.5
Cum Cut Vol (CF)	11850.3
Cum Fill Vol (CF)	8257.9
Net Vol (CF)	3592.4



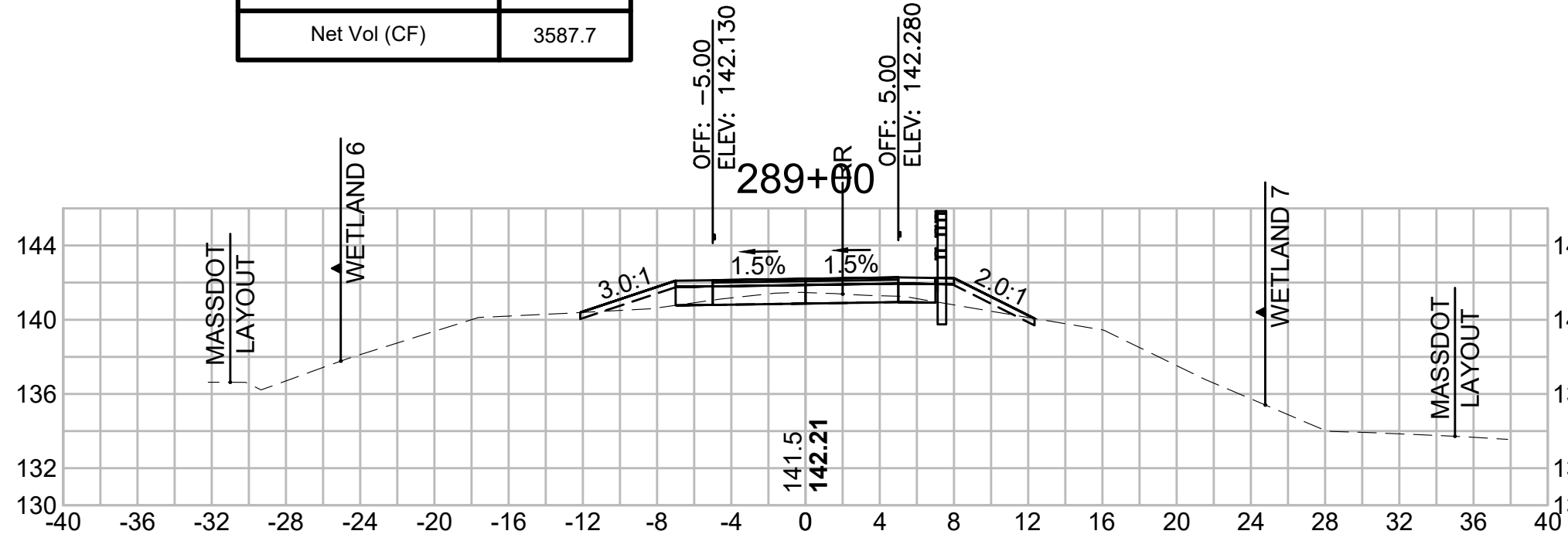
Total Volume at Station 286+00.00	
Cut Area (SF)	13.658
Fill Area (SF)	1.480
Cut Vol (CF)	30.3
Fill Vol (CF)	4.3
Cum Cut Vol (CF)	11713.3
Cum Fill Vol (CF)	8198.2
Net Vol (CF)	3515.1



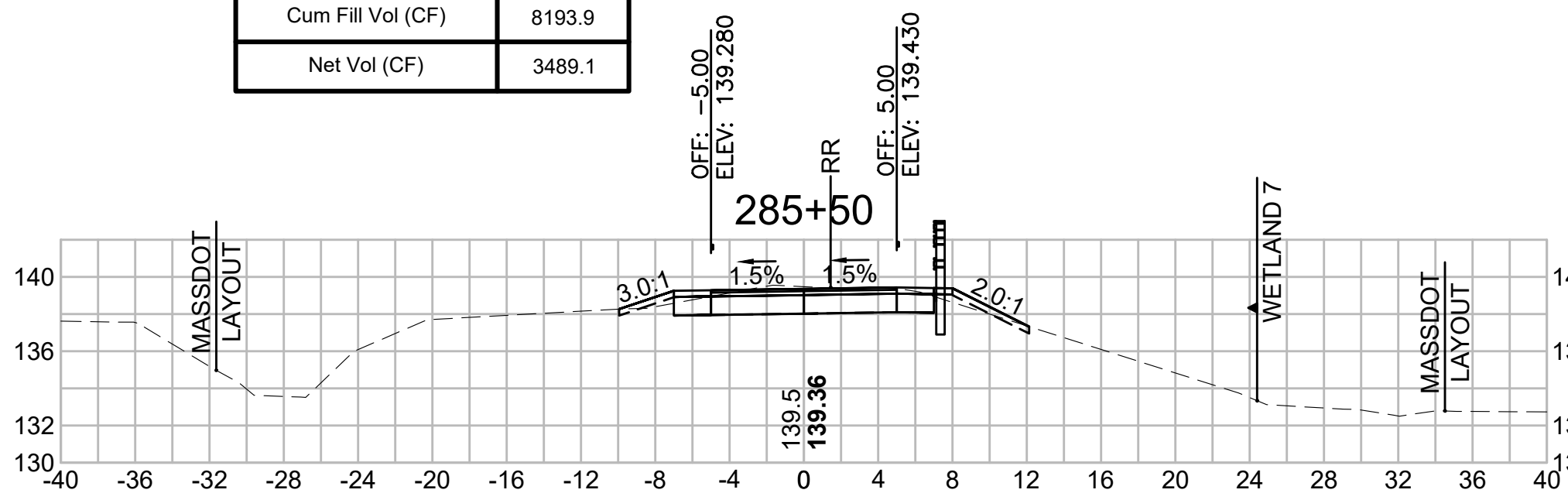
Total Volume at Station 287+50.00	
Cut Area (SF)	13.780
Fill Area (SF)	6.505
Cut Vol (CF)	20.4
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	11773.6
Cum Fill Vol (CF)	8216.5
Net Vol (CF)	3557.1



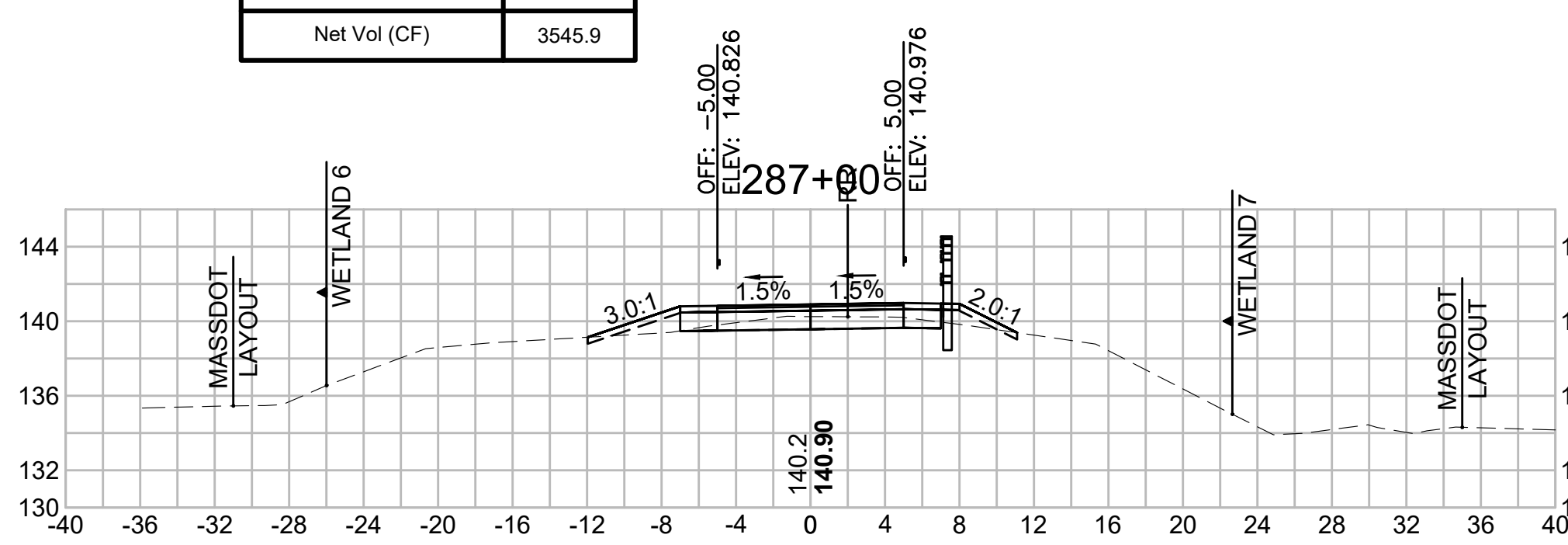
Total Volume at Station 289+00.00	
Cut Area (SF)	5.738
Fill Area (SF)	4.803
Cut Vol (CF)	18.9
Fill Vol (CF)	10.3
Cum Cut Vol (CF)	11838.0
Cum Fill Vol (CF)	8250.4
Net Vol (CF)	3587.7



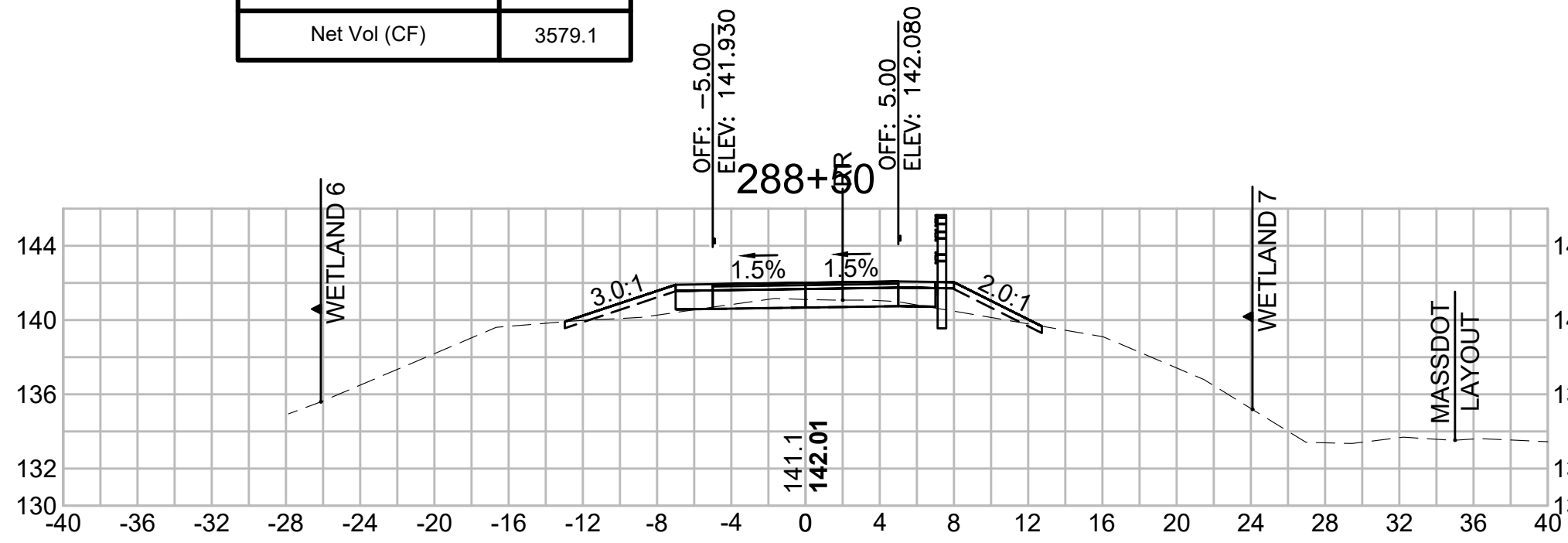
Total Volume at Station 285+50.00	
Cut Area (SF)	19.066
Fill Area (SF)	3.194
Cut Vol (CF)	65.6
Fill Vol (CF)	8.5
Cum Cut Vol (CF)	11683.0
Cum Fill Vol (CF)	8193.9
Net Vol (CF)	3489.1



Total Volume at Station 287+00.00	
Cut Area (SF)	8.206
Fill Area (SF)	3.343
Cut Vol (CF)	17.5
Fill Vol (CF)	5.4
Cum Cut Vol (CF)	11753.2
Cum Fill Vol (CF)	8207.4
Net Vol (CF)	3545.9

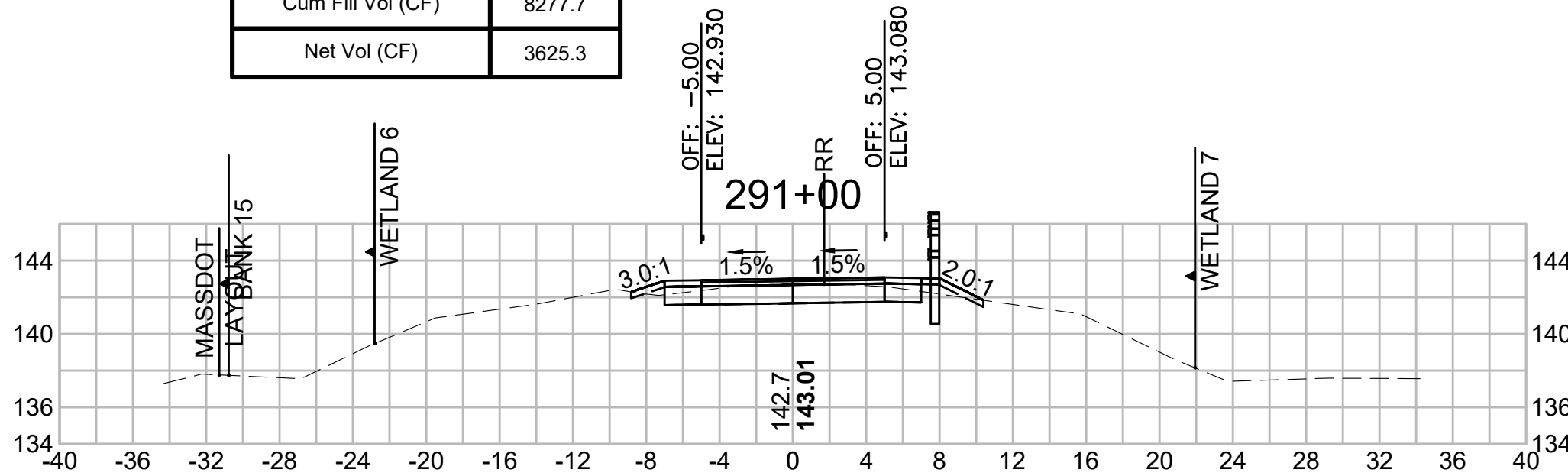


Total Volume at Station 288+50.00	
Cut Area (SF)	14.651
Fill Area (SF)	6.327
Cut Vol (CF)	23.2
Fill Vol (CF)	11.7
Cum Cut Vol (CF)	11819.2
Cum Fill Vol (CF)	8240.1
Net Vol (CF)	3579.1

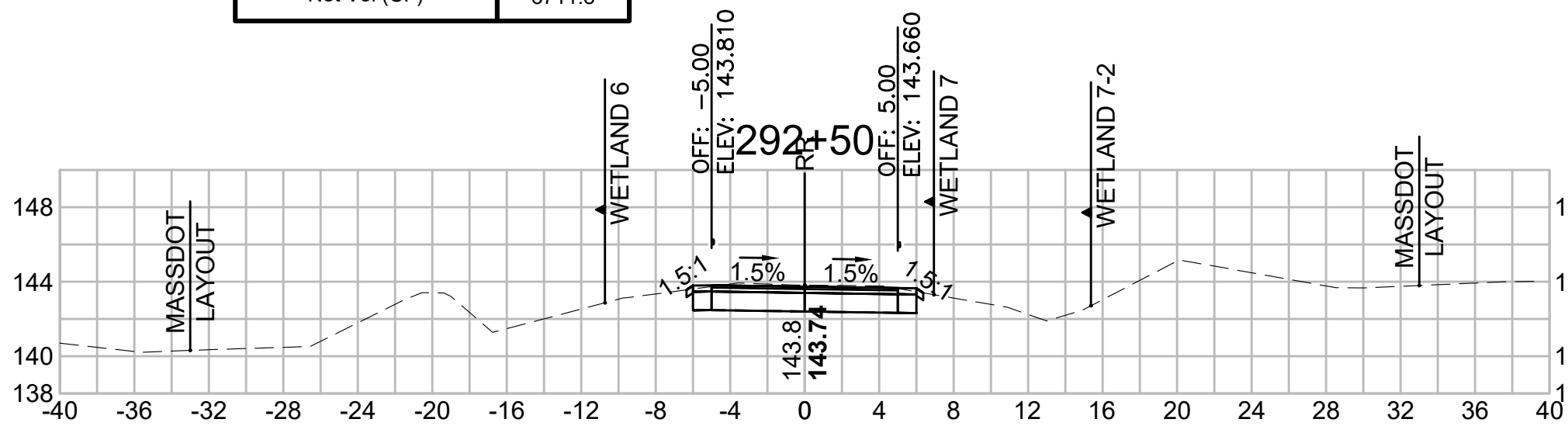


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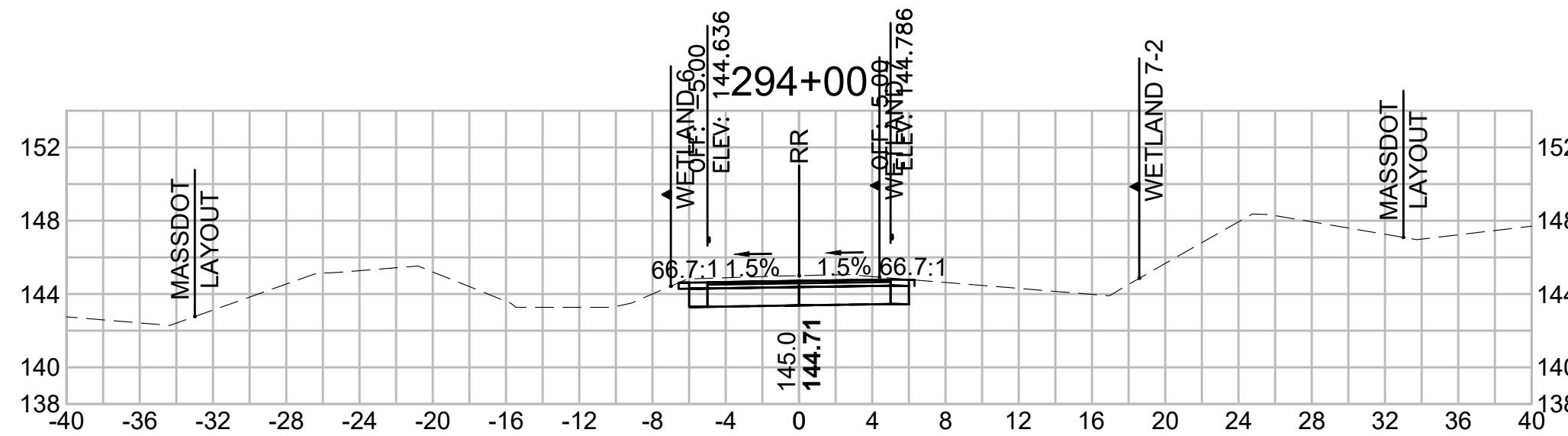
Total Volume at Station 291+00.00	
Cut Area (SF)	13.191
Fill Area (SF)	1.057
Cut Vol (CF)	21.9
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	11903.0
Cum Fill Vol (CF)	8277.7
Net Vol (CF)	3625.3



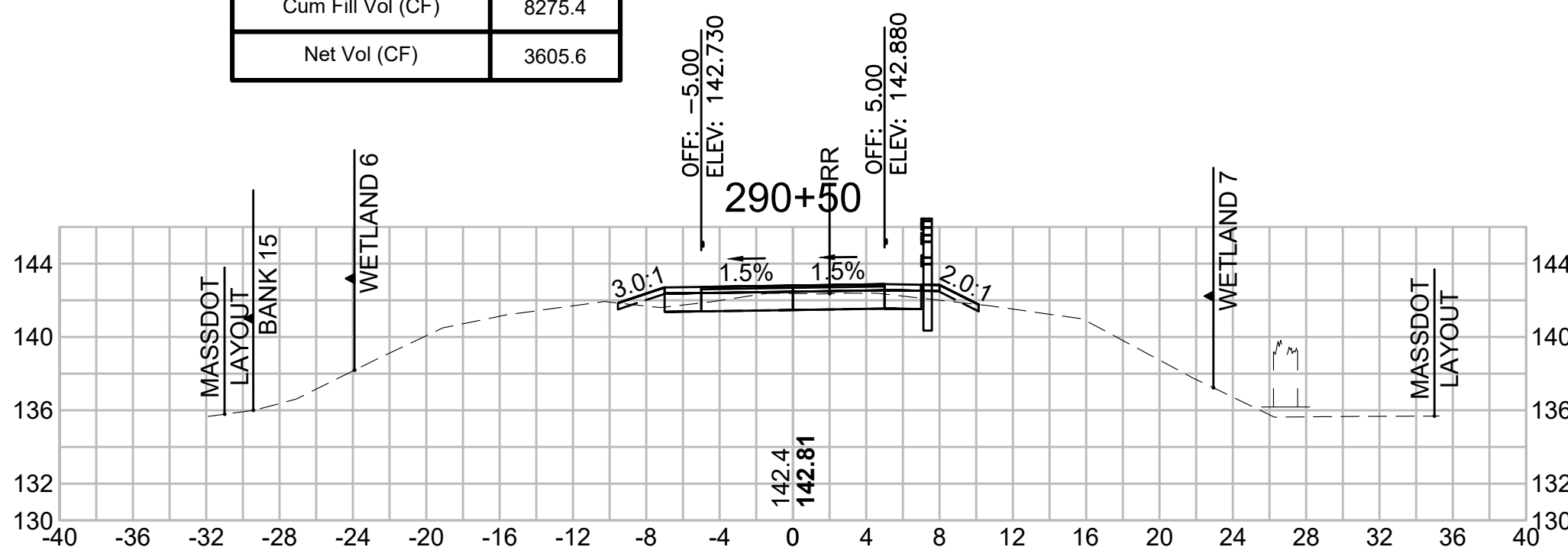
Total Volume at Station 292+50.00	
Cut Area (SF)	16.886
Fill Area (SF)	0.000
Cut Vol (CF)	30.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11990.5
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3711.8



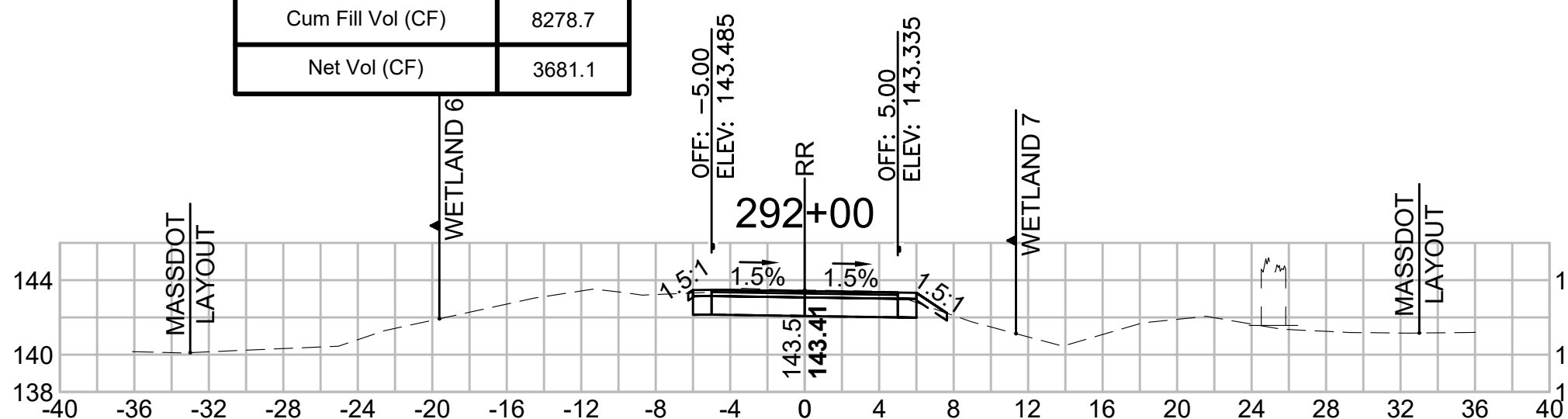
Total Volume at Station 294+00.00	
Cut Area (SF)	19.091
Fill Area (SF)	0.000
Cut Vol (CF)	35.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12093.3
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3814.6



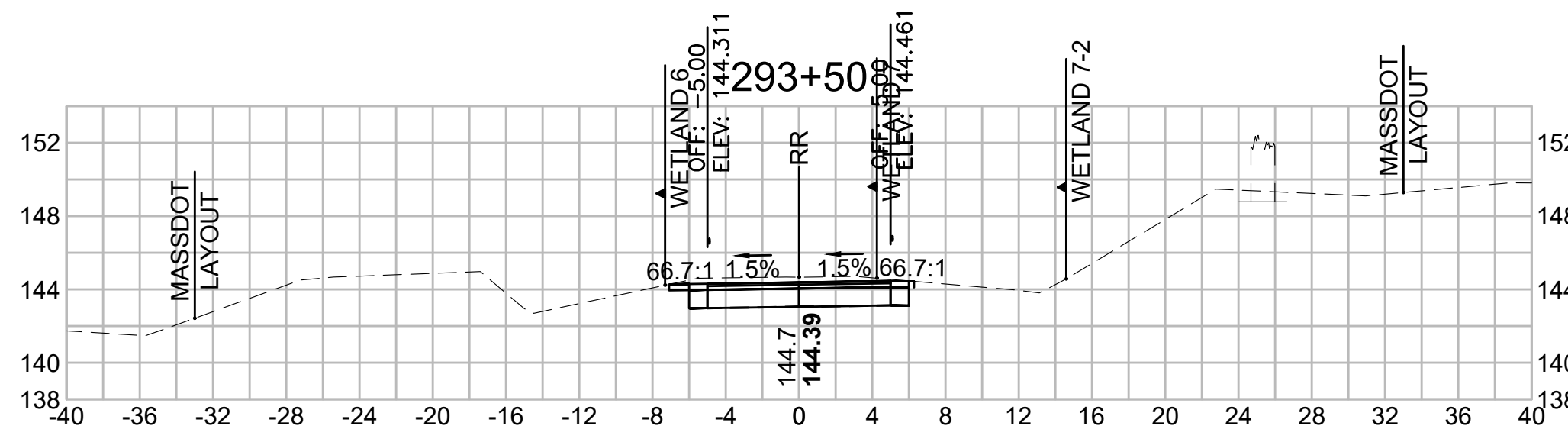
Total Volume at Station 290+50.00	
Cut Area (SF)	10.501
Fill Area (SF)	1.398
Cut Vol (CF)	16.8
Fill Vol (CF)	7.9
Cum Cut Vol (CF)	11881.0
Cum Fill Vol (CF)	8275.4
Net Vol (CF)	3605.6



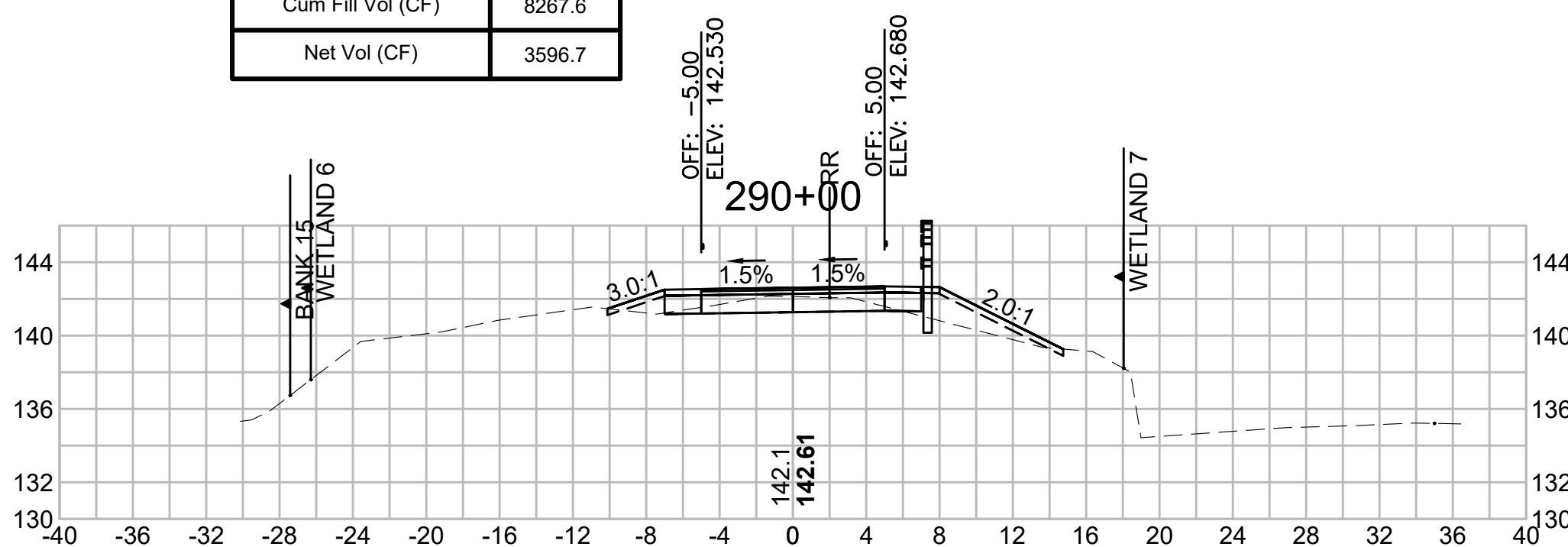
Total Volume at Station 292+00.00	
Cut Area (SF)	16.290
Fill Area (SF)	0.024
Cut Vol (CF)	29.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	11959.8
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3681.1



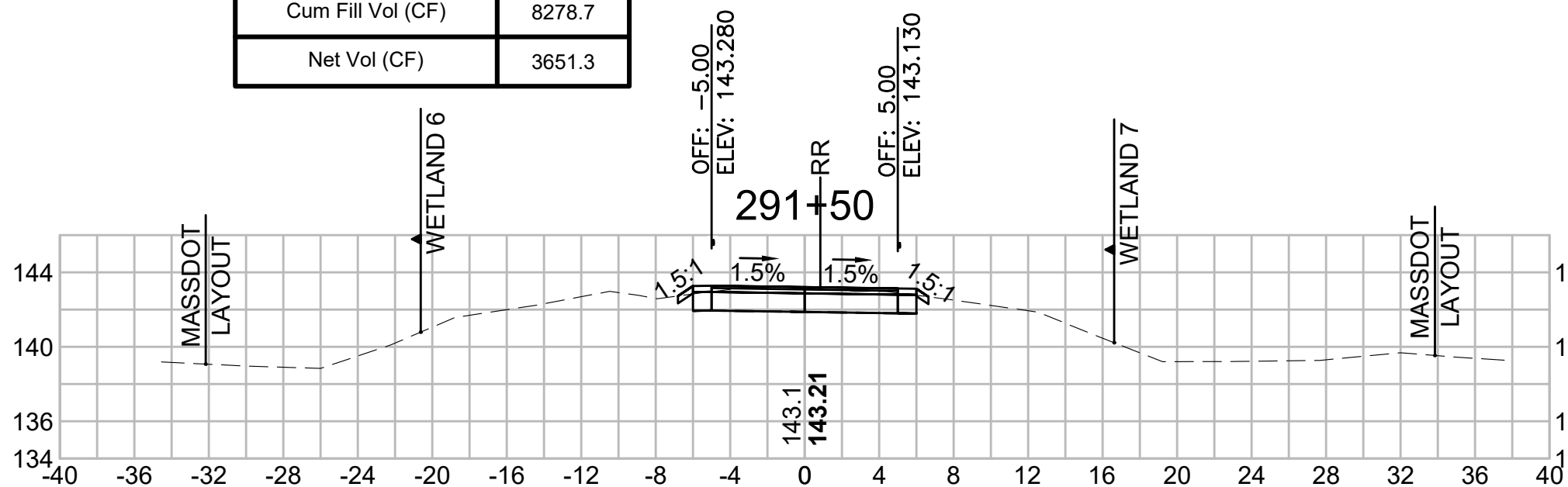
Total Volume at Station 293+50.00	
Cut Area (SF)	19.542
Fill Area (SF)	0.000
Cut Vol (CF)	34.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12057.5
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3778.8



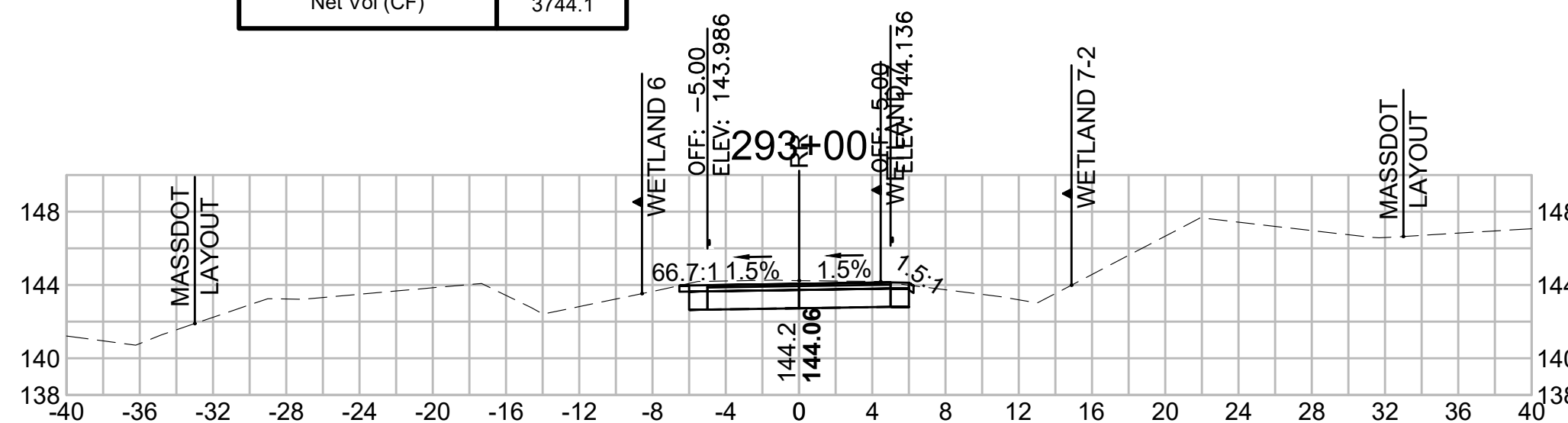
Total Volume at Station 290+00.00	
Cut Area (SF)	7.605
Fill Area (SF)	7.084
Cut Vol (CF)	14.0
Fill Vol (CF)	9.7
Cum Cut Vol (CF)	11864.3
Cum Fill Vol (CF)	8267.6
Net Vol (CF)	3596.7



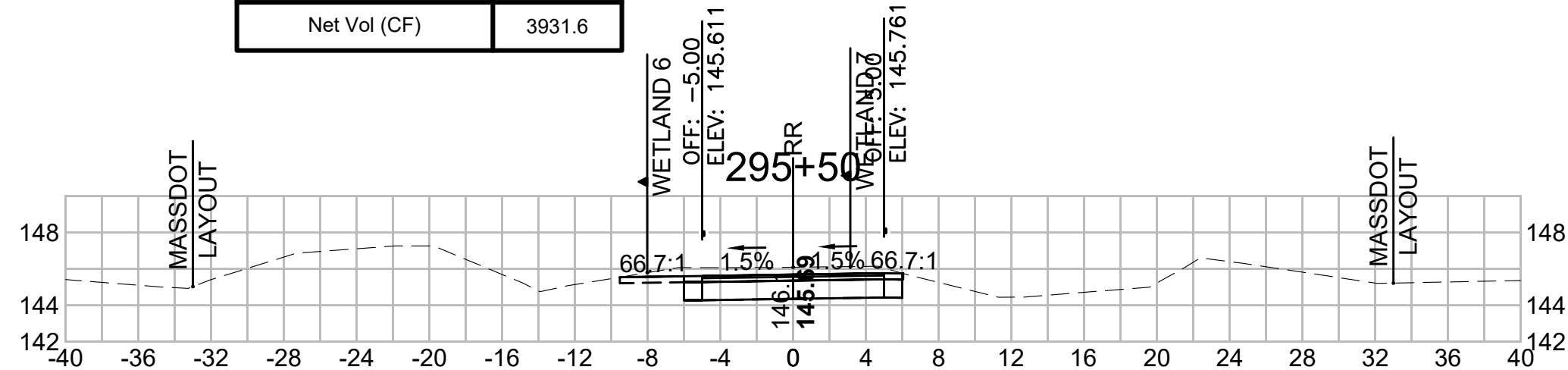
Total Volume at Station 291+50.00	
Cut Area (SF)	15.952
Fill Area (SF)	0.001
Cut Vol (CF)	27.0
Fill Vol (CF)	1.0
Cum Cut Vol (CF)	11929.9
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3651.3



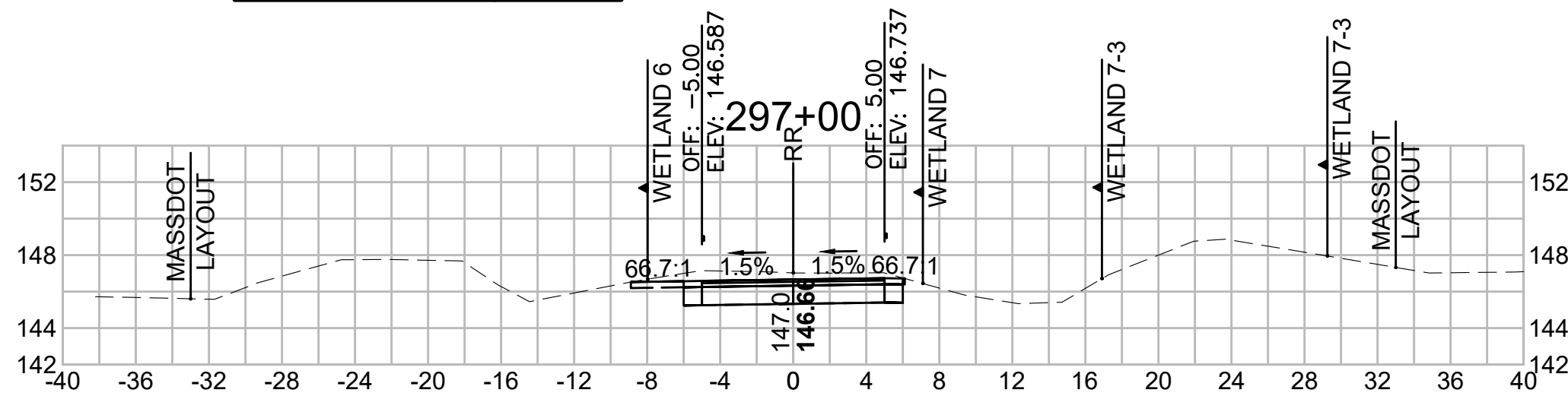
Total Volume at Station 293+00.00	
Cut Area (SF)	17.971
Fill Area (SF)	0.000
Cut Vol (CF)	32.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12022.8
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3744.1



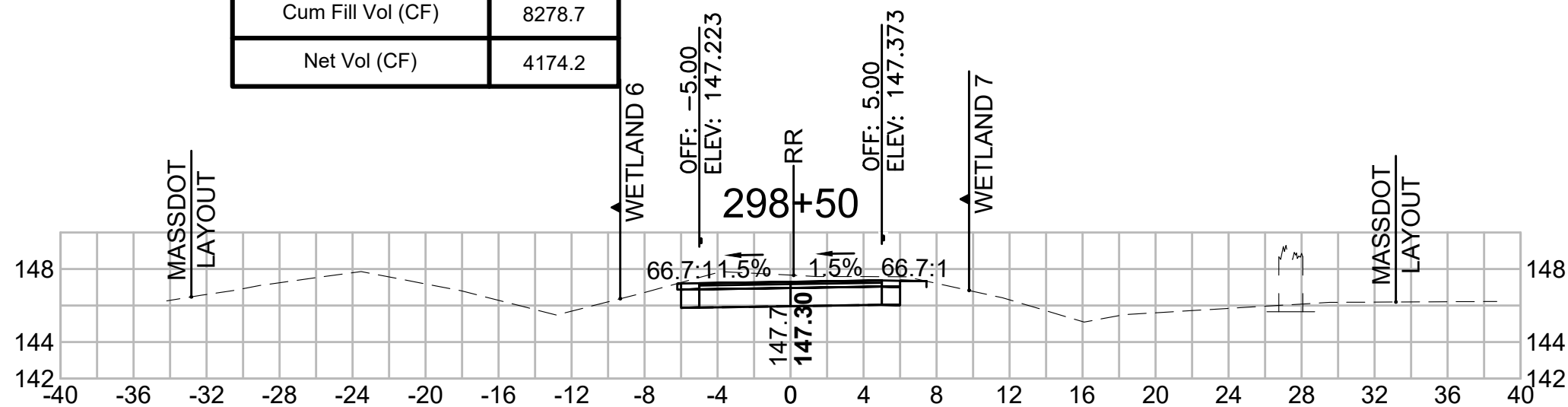
Total Volume at Station 295+50.00	
Cut Area (SF)	22.788
Fill Area (SF)	0.000
Cut Vol (CF)	41.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12210.4
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3931.6



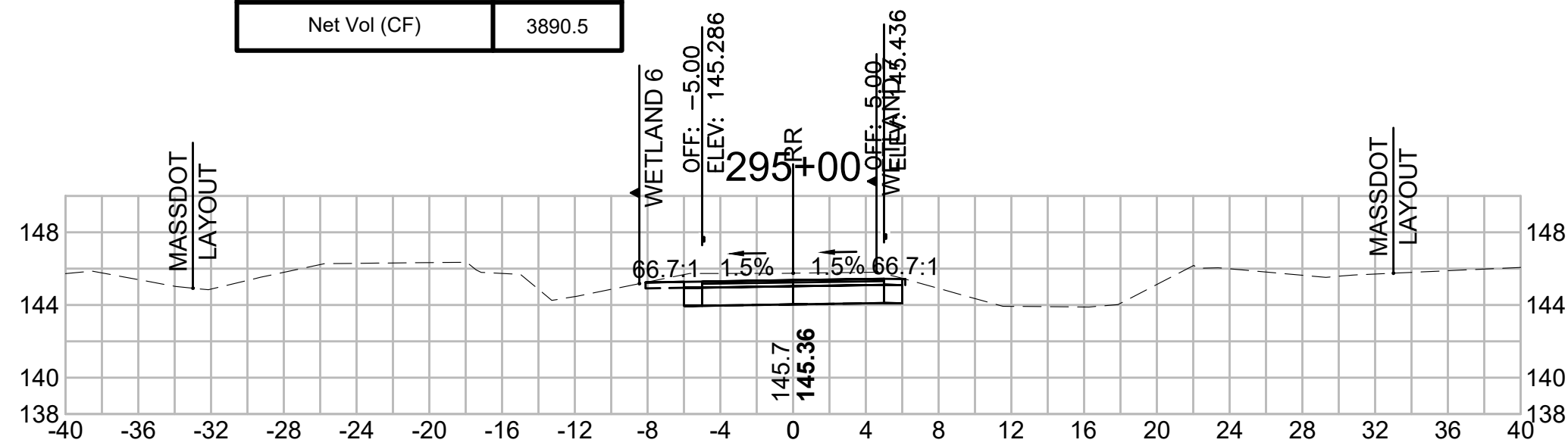
Total Volume at Station 297+00.00	
Cut Area (SF)	22.246
Fill Area (SF)	0.000
Cut Vol (CF)	41.3
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12335.1
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4056.4



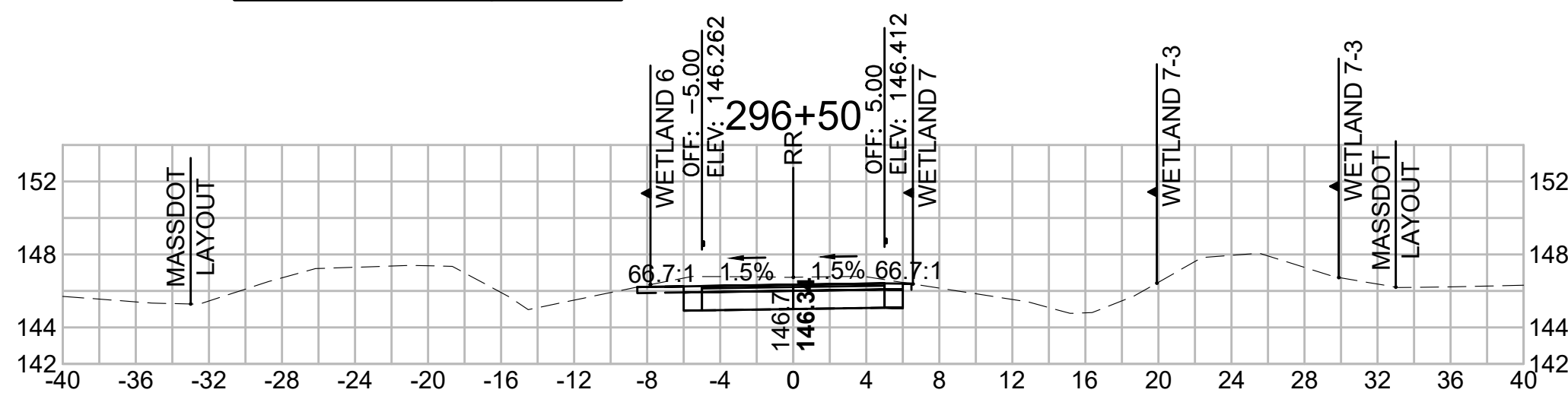
Total Volume at Station 298+50.00	
Cut Area (SF)	20.555
Fill Area (SF)	0.000
Cut Vol (CF)	39.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12453.0
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4174.2



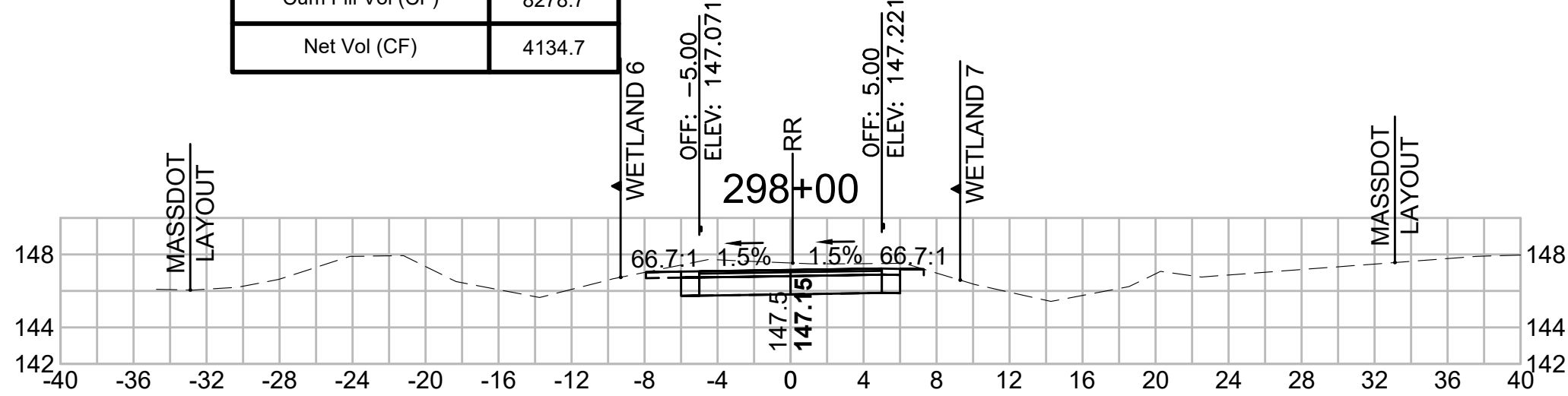
Total Volume at Station 295+00.00	
Cut Area (SF)	21.649
Fill Area (SF)	0.000
Cut Vol (CF)	39.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12169.2
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3890.5



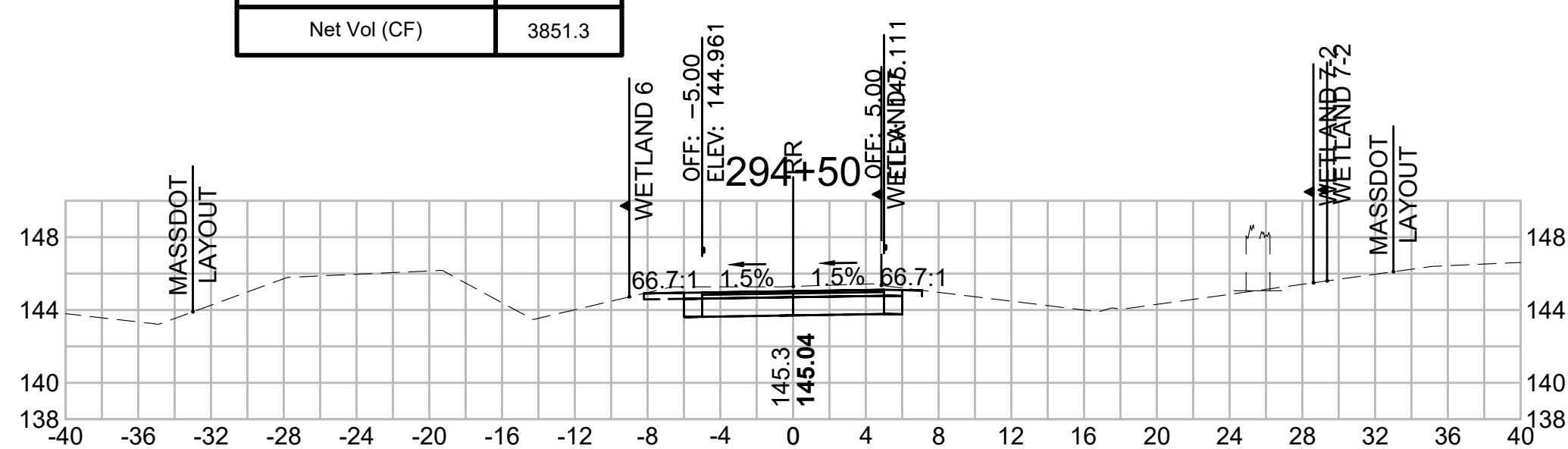
Total Volume at Station 296+50.00	
Cut Area (SF)	22.352
Fill Area (SF)	0.000
Cut Vol (CF)	41.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12293.8
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4015.1



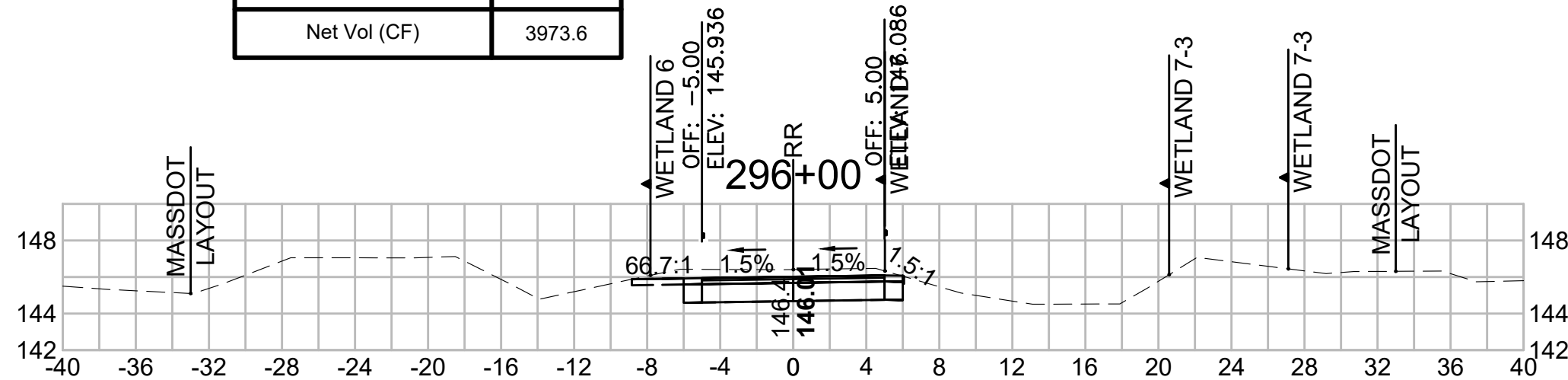
Total Volume at Station 298+00.00	
Cut Area (SF)	22.100
Fill Area (SF)	0.000
Cut Vol (CF)	39.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12413.5
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4134.7



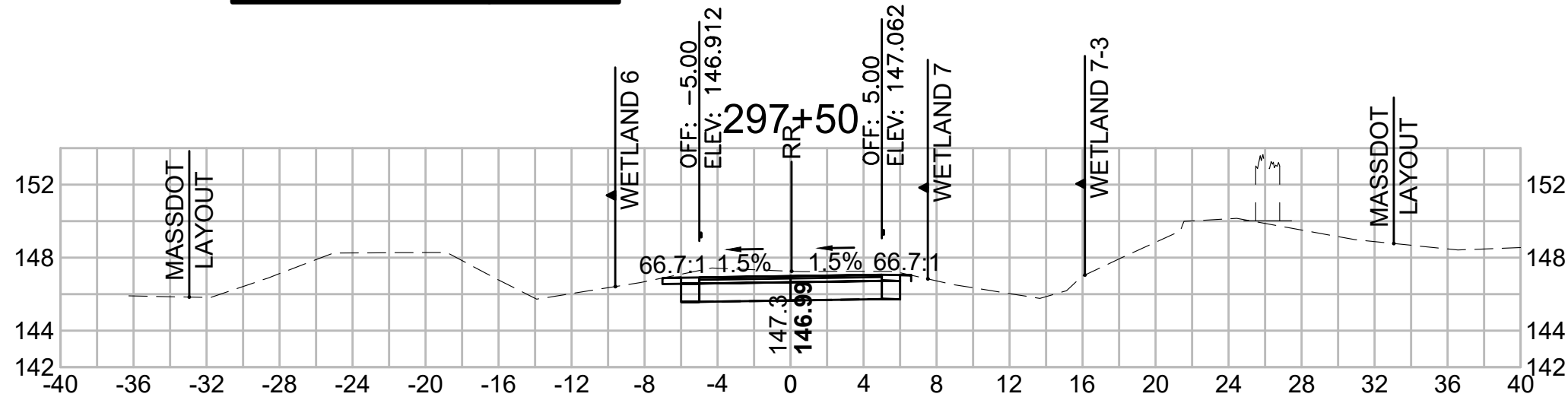
Total Volume at Station 294+50.00	
Cut Area (SF)	20.627
Fill Area (SF)	0.000
Cut Vol (CF)	36.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12130.1
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3851.3



Total Volume at Station 296+00.00	
Cut Area (SF)	22.498
Fill Area (SF)	0.000
Cut Vol (CF)	41.9
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12252.3
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	3973.6



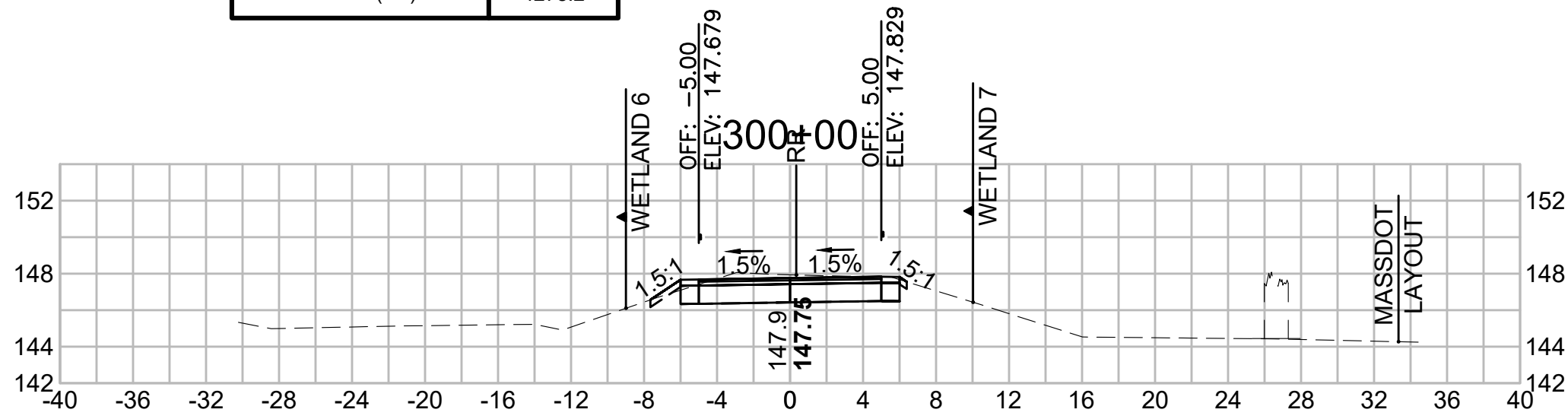
Total Volume at Station 297+50.00	
Cut Area (SF)	20.129
Fill Area (SF)	0.000
Cut Vol (CF)	39.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12374.4
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4095.6



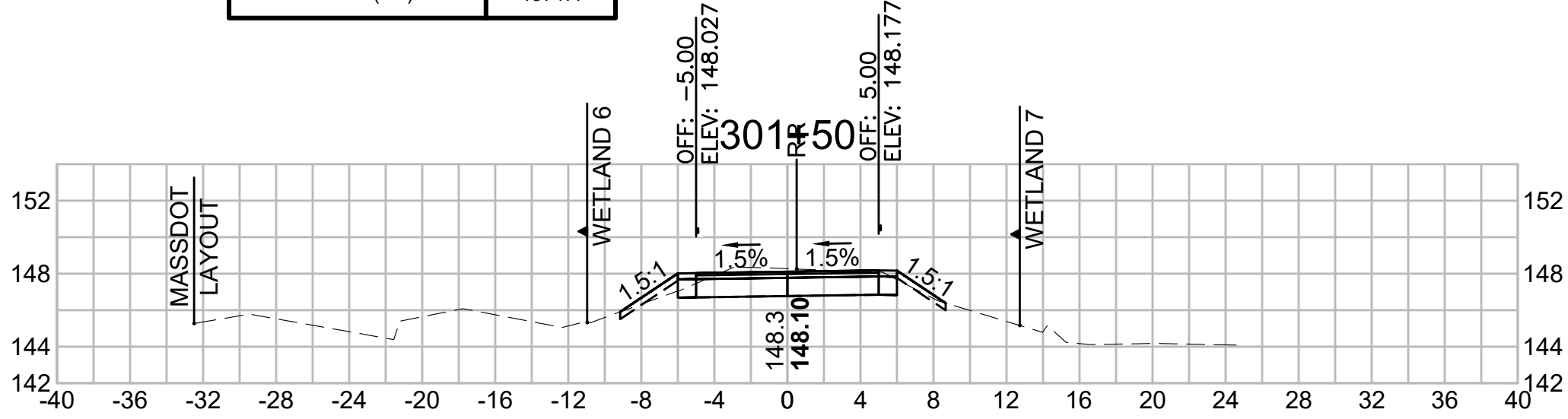
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608164_XSEC(CROSS SECTION LAYOUTS).DWG 18-Feb-2022

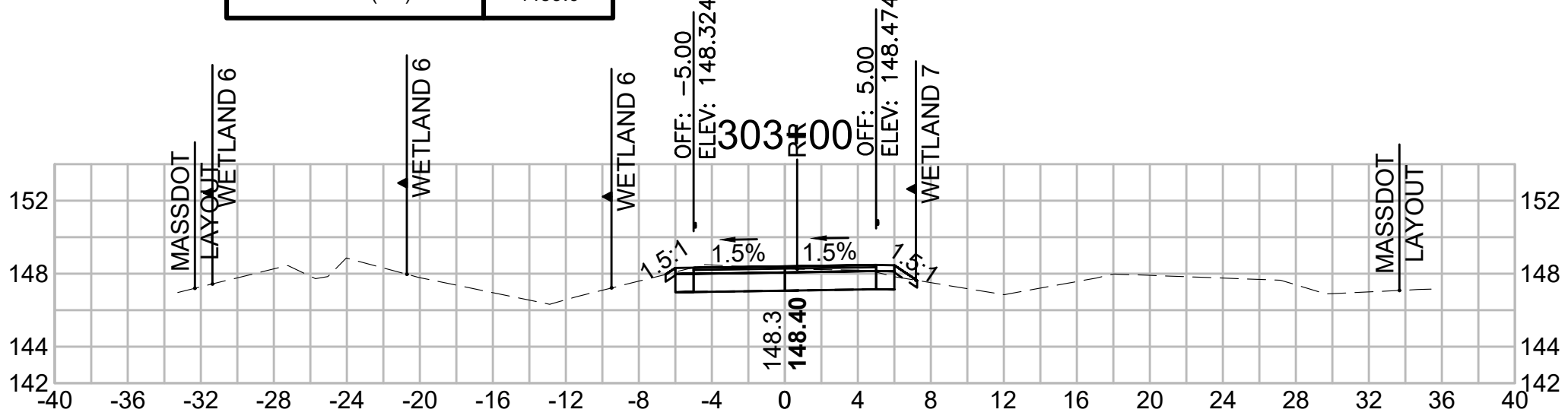
Total Volume at Station 300+00.00	
Cut Area (SF)	17.154
Fill Area (SF)	0.043
Cut Vol (CF)	32.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12557.0
Cum Fill Vol (CF)	8278.8
Net Vol (CF)	4278.2



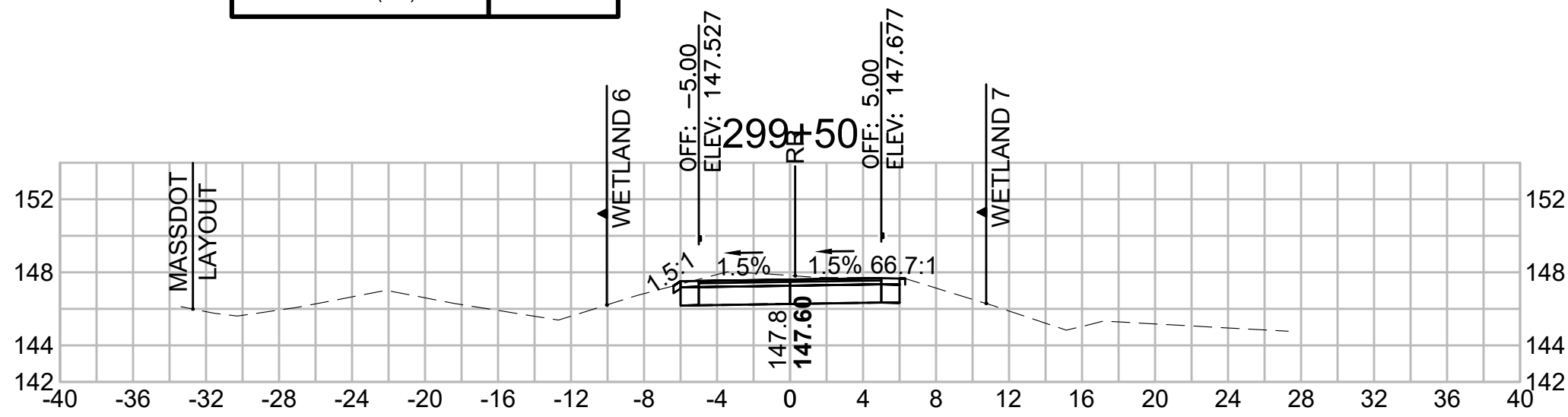
Total Volume at Station 301+50.00	
Cut Area (SF)	16.144
Fill Area (SF)	0.556
Cut Vol (CF)	30.8
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	12651.0
Cum Fill Vol (CF)	8279.6
Net Vol (CF)	4371.4



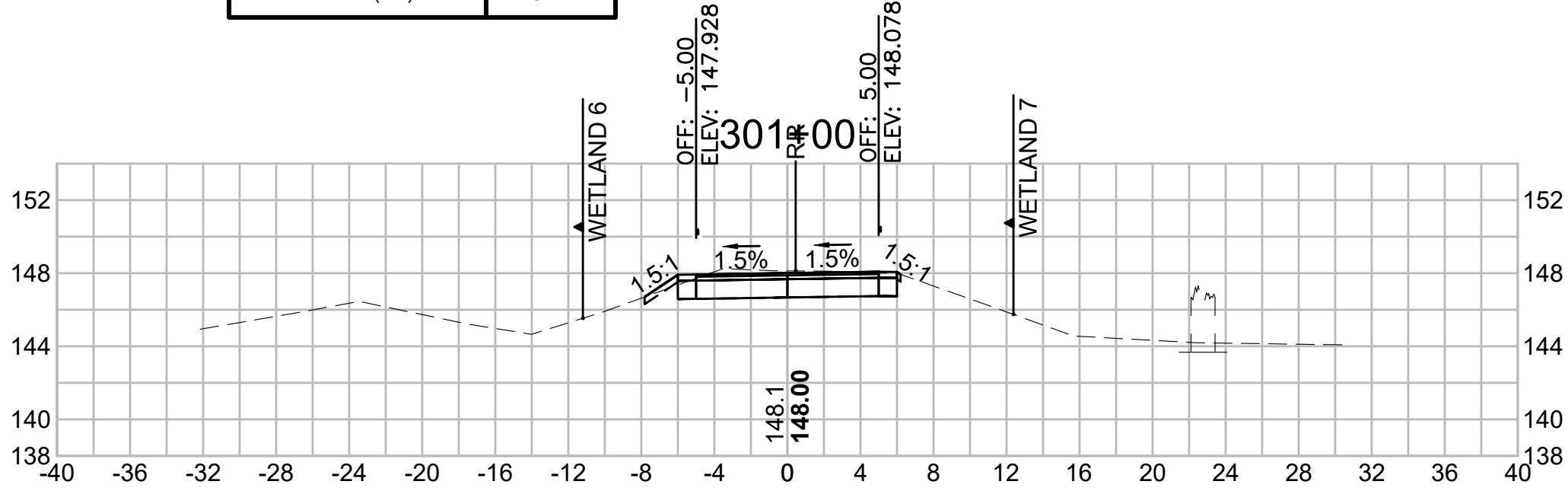
Total Volume at Station 303+00.00	
Cut Area (SF)	14.693
Fill Area (SF)	0.053
Cut Vol (CF)	28.2
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12739.4
Cum Fill Vol (CF)	8280.4
Net Vol (CF)	4459.0



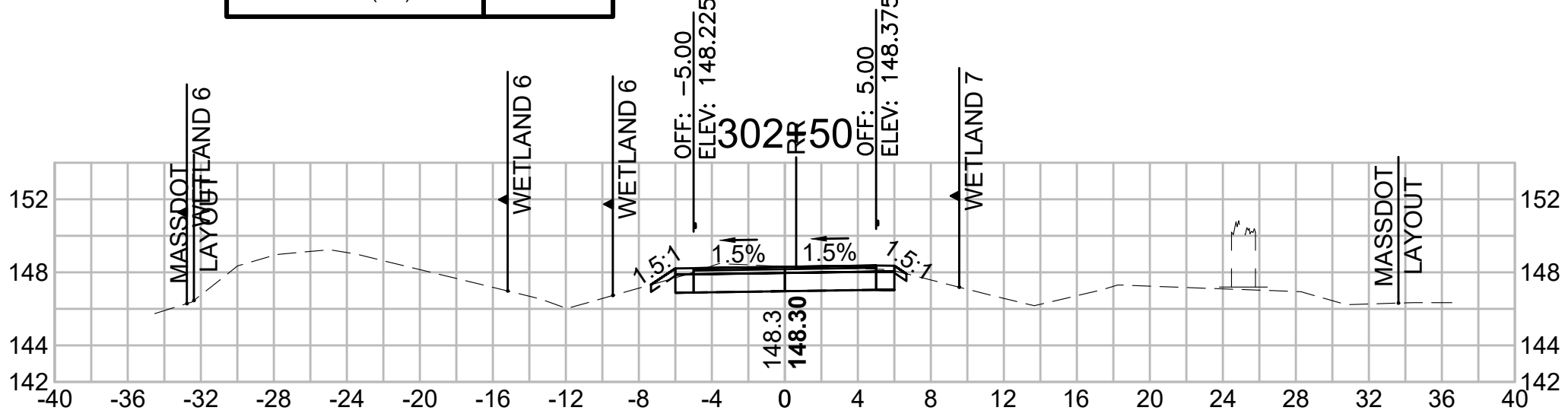
Total Volume at Station 299+50.00	
Cut Area (SF)	18.190
Fill Area (SF)	0.000
Cut Vol (CF)	34.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12524.3
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4245.5



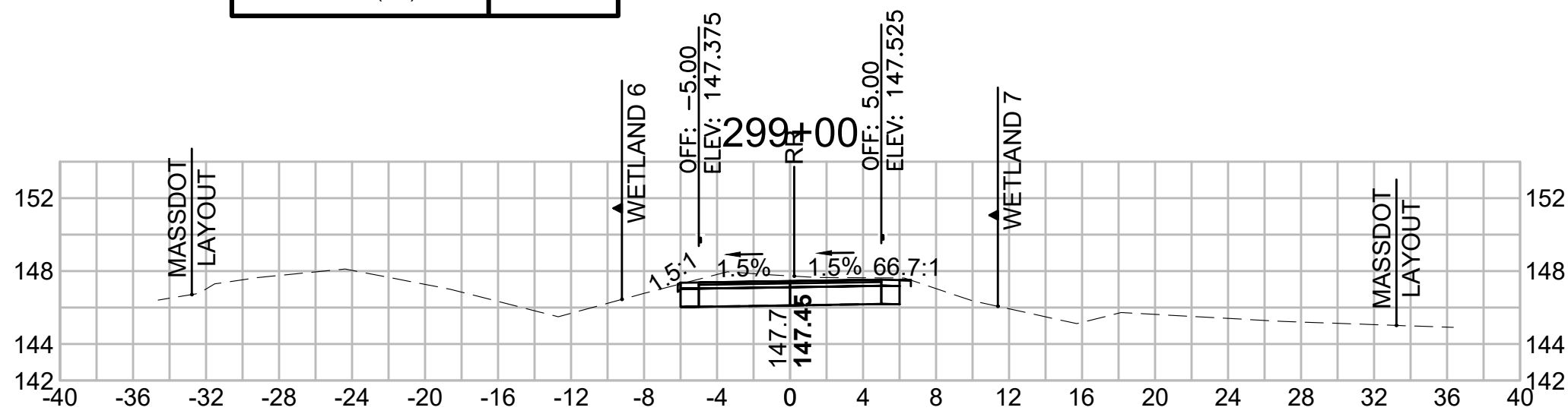
Total Volume at Station 301+00.00	
Cut Area (SF)	17.105
Fill Area (SF)	0.042
Cut Vol (CF)	31.6
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12620.2
Cum Fill Vol (CF)	8279.0
Net Vol (CF)	4341.2



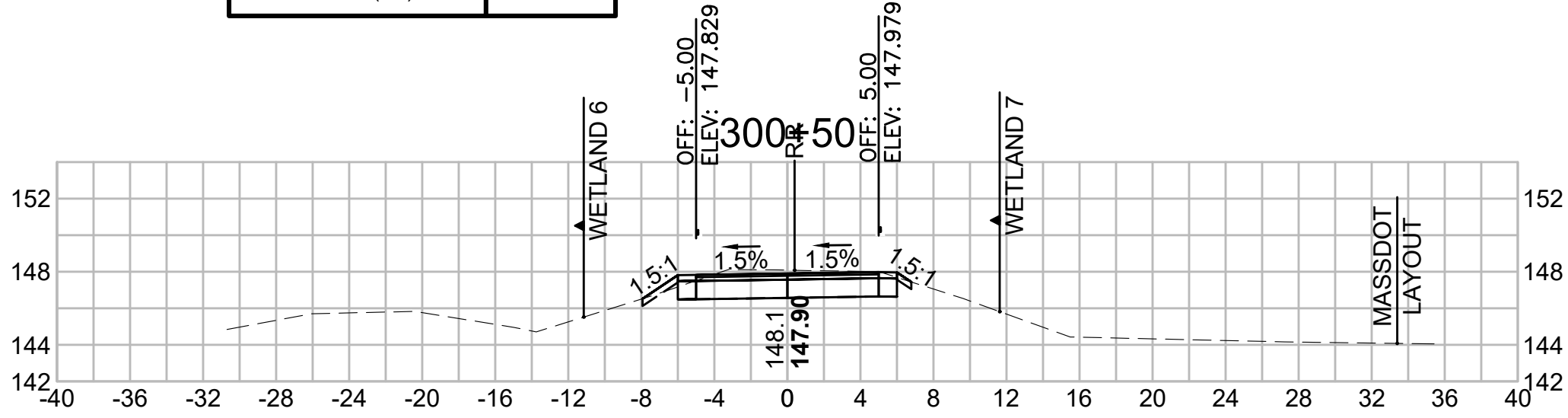
Total Volume at Station 302+50.00	
Cut Area (SF)	15.798
Fill Area (SF)	0.017
Cut Vol (CF)	29.9
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12711.2
Cum Fill Vol (CF)	8280.3
Net Vol (CF)	4430.9



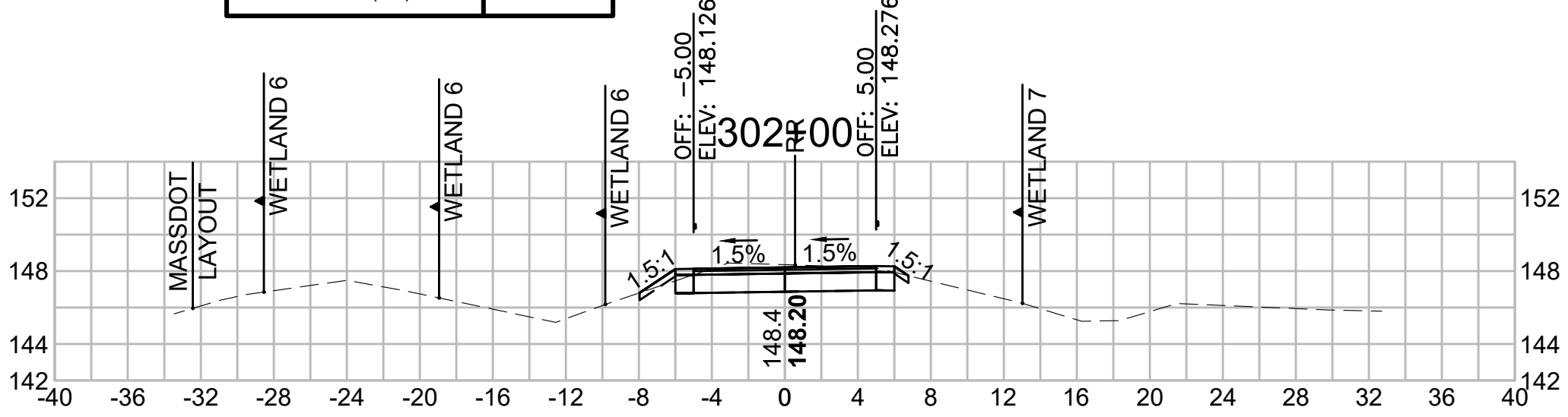
Total Volume at Station 299+00.00	
Cut Area (SF)	19.134
Fill Area (SF)	0.000
Cut Vol (CF)	36.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	12489.7
Cum Fill Vol (CF)	8278.7
Net Vol (CF)	4211.0



Total Volume at Station 300+50.00	
Cut Area (SF)	17.029
Fill Area (SF)	0.093
Cut Vol (CF)	31.7
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12588.6
Cum Fill Vol (CF)	8278.9
Net Vol (CF)	4309.7

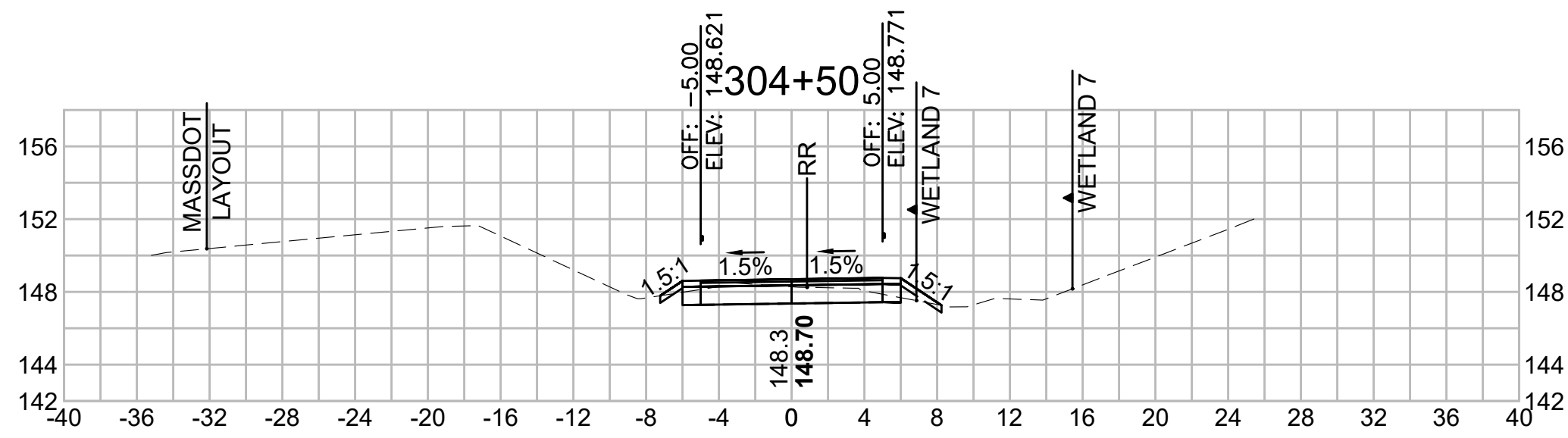


Total Volume at Station 302+00.00	
Cut Area (SF)	16.496
Fill Area (SF)	0.094
Cut Vol (CF)	30.2
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	12681.3
Cum Fill Vol (CF)	8280.2
Net Vol (CF)	4401.1

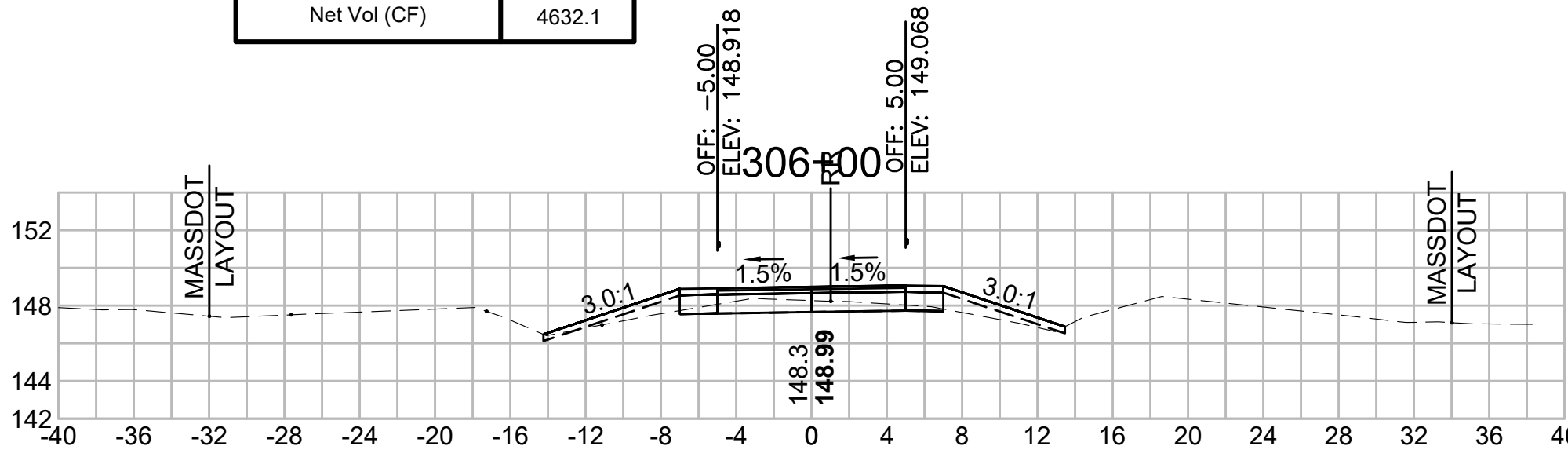


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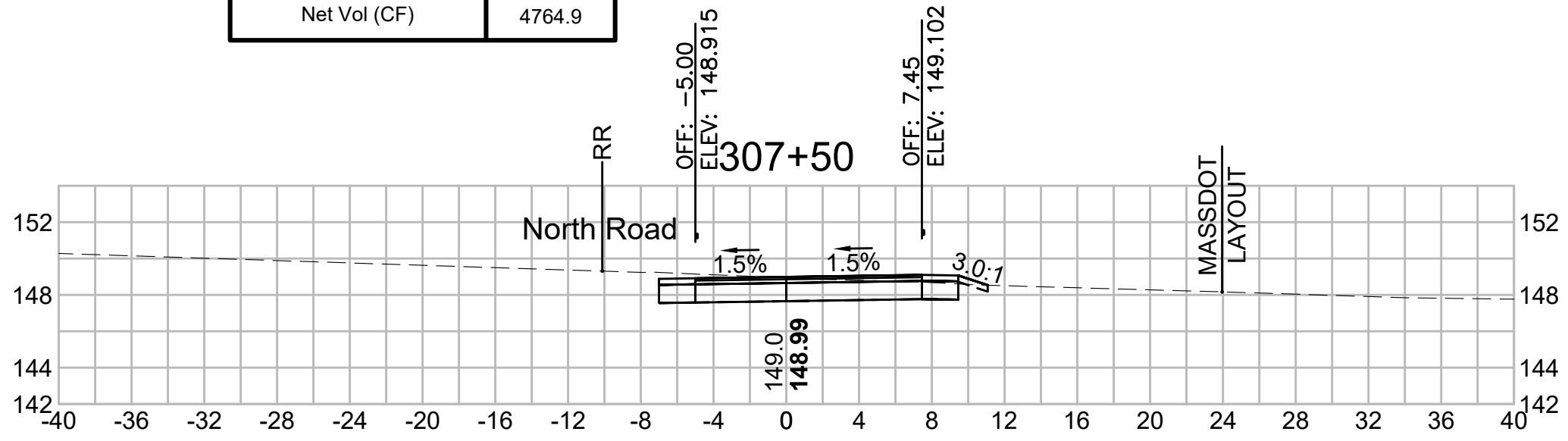
Total Volume at Station 304+50.00	
Cut Area (SF)	12.695
Fill Area (SF)	0.527
Cut Vol (CF)	22.7
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	12810.9
Cum Fill Vol (CF)	8281.0
Net Vol (CF)	4529.9



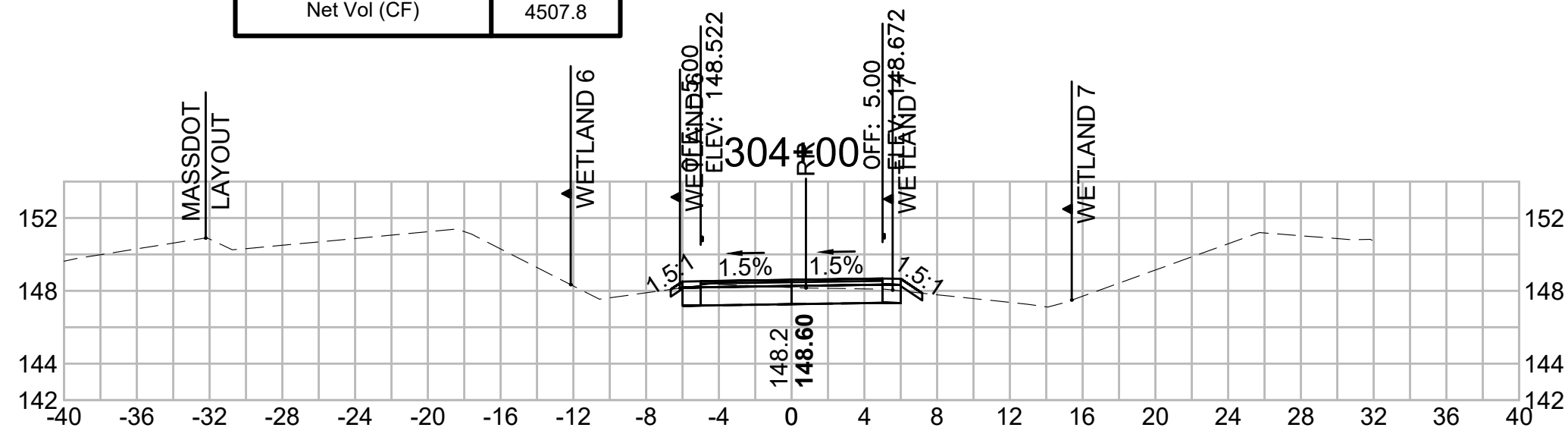
Total Volume at Station 306+00.00	
Cut Area (SF)	18.518
Fill Area (SF)	4.761
Cut Vol (CF)	41.9
Fill Vol (CF)	8.9
Cum Cut Vol (CF)	12927.5
Cum Fill Vol (CF)	8295.4
Net Vol (CF)	4632.1



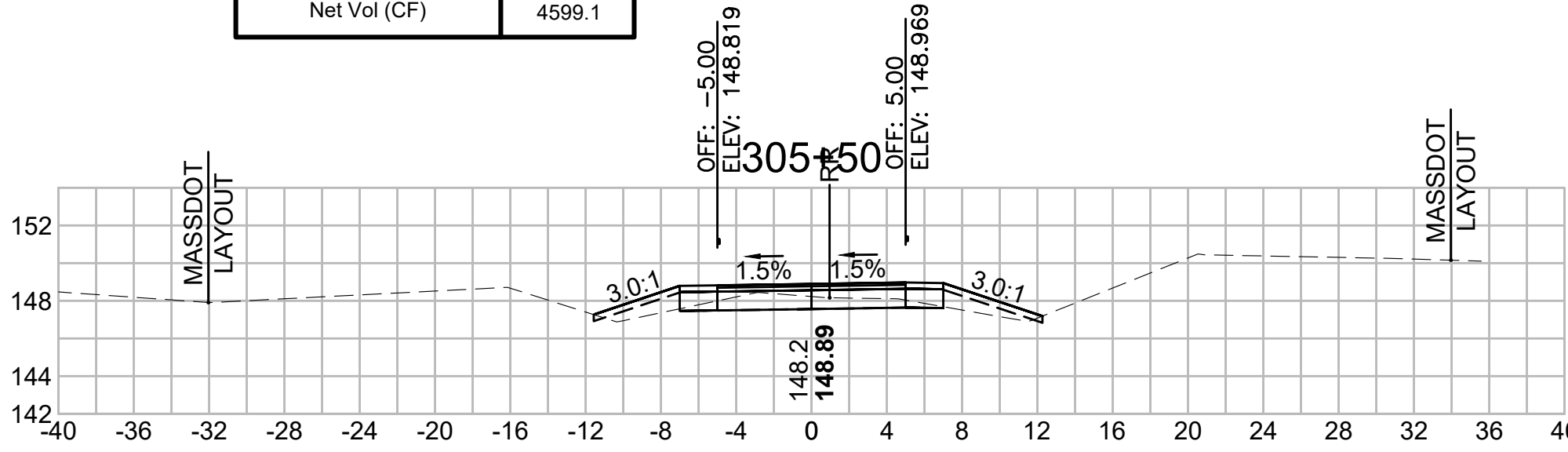
Total Volume at Station 307+50.00	
Cut Area (SF)	79.732
Fill Area (SF)	0.024
Cut Vol (CF)	101.4
Fill Vol (CF)	12.3
Cum Cut Vol (CF)	13098.9
Cum Fill Vol (CF)	8334.0
Net Vol (CF)	4764.9



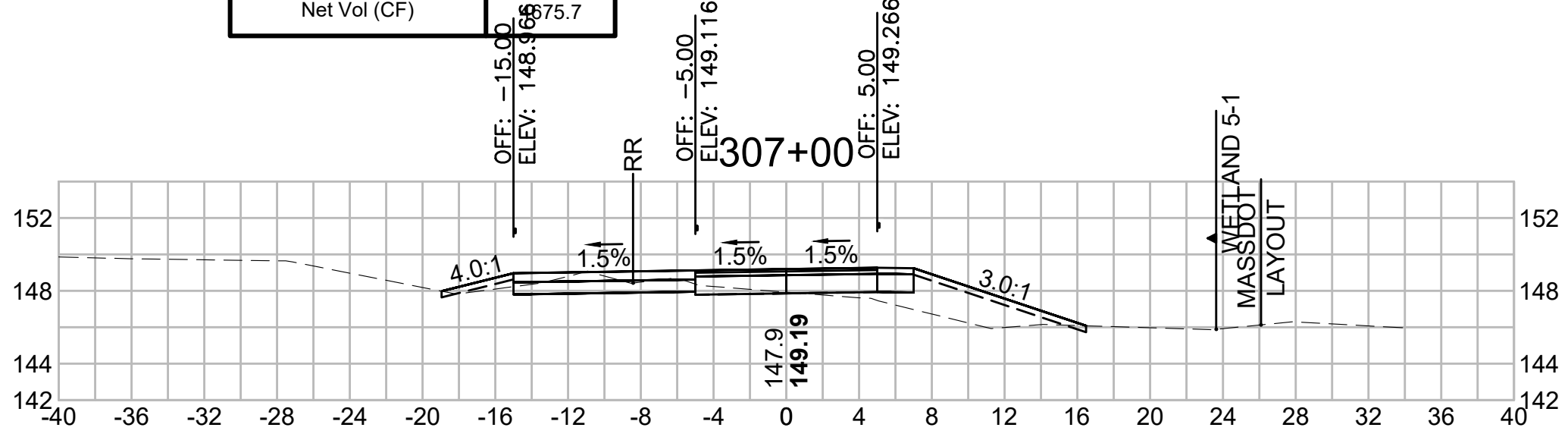
Total Volume at Station 304+00.00	
Cut Area (SF)	11.791
Fill Area (SF)	0.064
Cut Vol (CF)	23.1
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12788.3
Cum Fill Vol (CF)	8280.5
Net Vol (CF)	4507.8



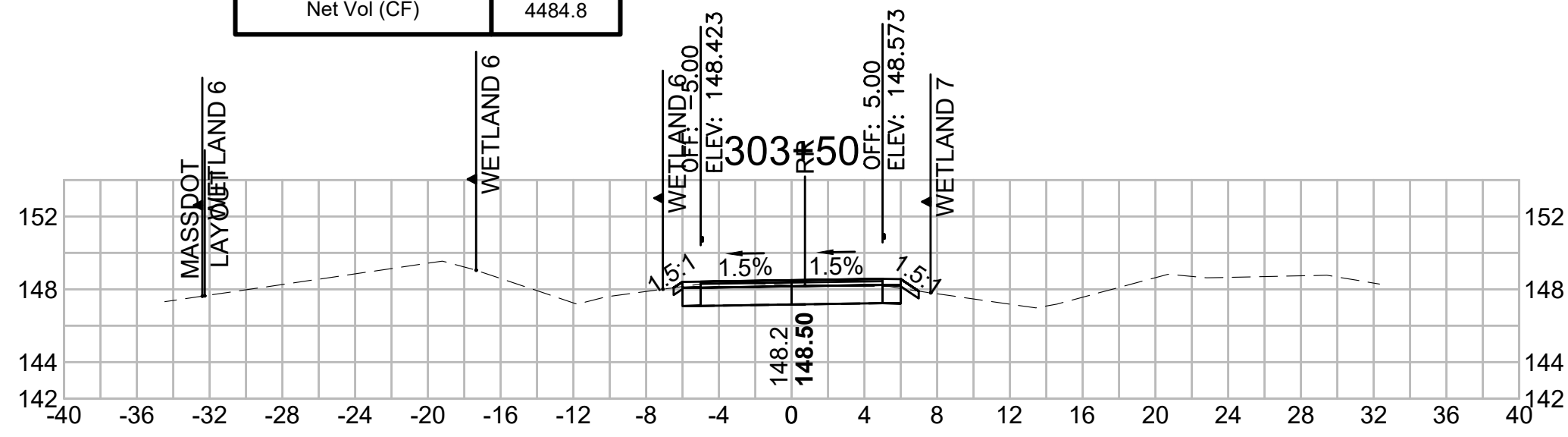
Total Volume at Station 305+50.00	
Cut Area (SF)	26.728
Fill Area (SF)	4.848
Cut Vol (CF)	43.8
Fill Vol (CF)	4.7
Cum Cut Vol (CF)	12885.6
Cum Fill Vol (CF)	8286.5
Net Vol (CF)	4599.1



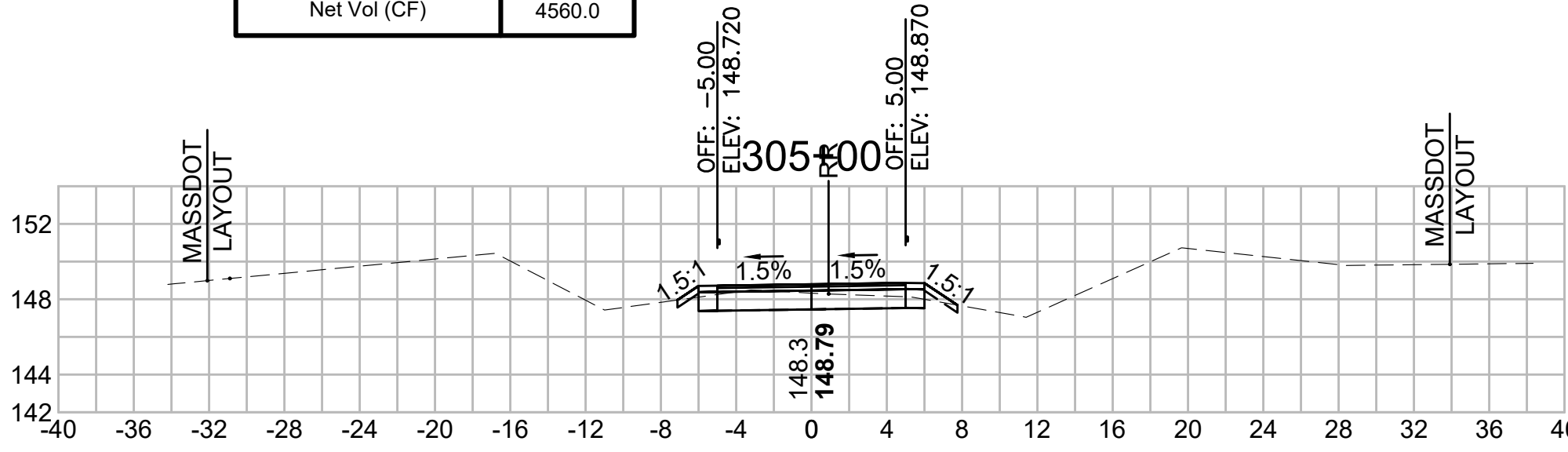
Total Volume at Station 307+00.00	
Cut Area (SF)	29.756
Fill Area (SF)	13.211
Cut Vol (CF)	40.2
Fill Vol (CF)	17.1
Cum Cut Vol (CF)	12997.5
Cum Fill Vol (CF)	8321.7
Net Vol (CF)	4675.7



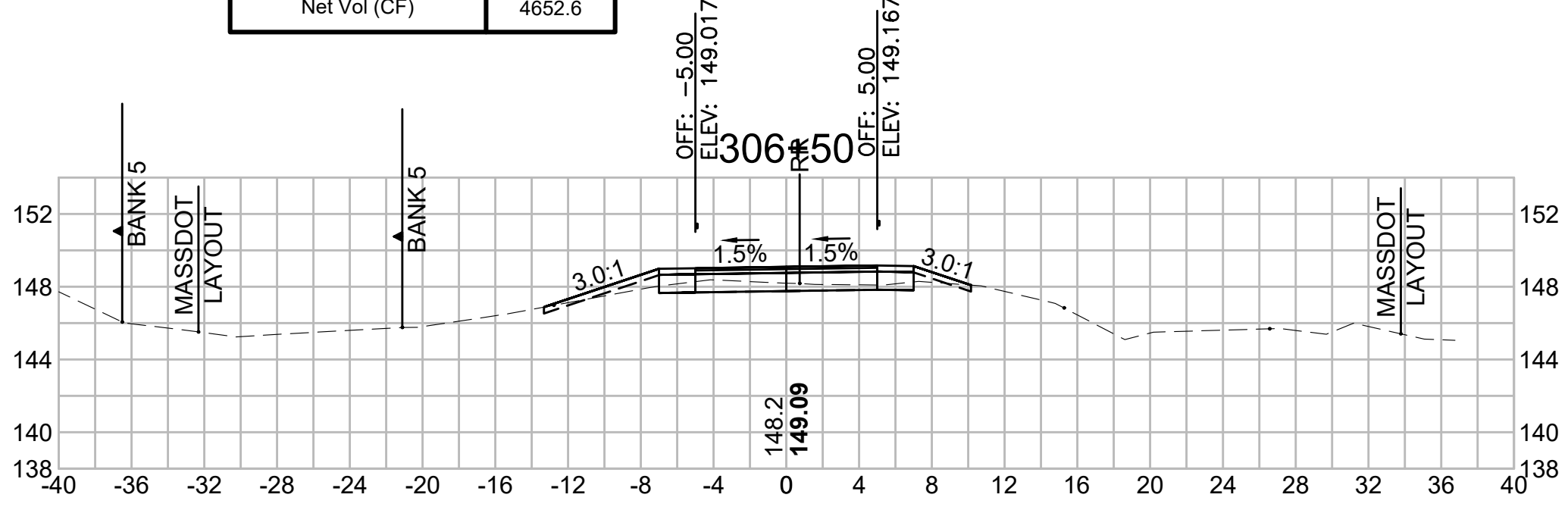
Total Volume at Station 303+50.00	
Cut Area (SF)	13.145
Fill Area (SF)	0.011
Cut Vol (CF)	25.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	12765.2
Cum Fill Vol (CF)	8280.4
Net Vol (CF)	4484.8



Total Volume at Station 305+00.00	
Cut Area (SF)	20.597
Fill Area (SF)	0.254
Cut Vol (CF)	30.8
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	12841.7
Cum Fill Vol (CF)	8281.8
Net Vol (CF)	4560.0

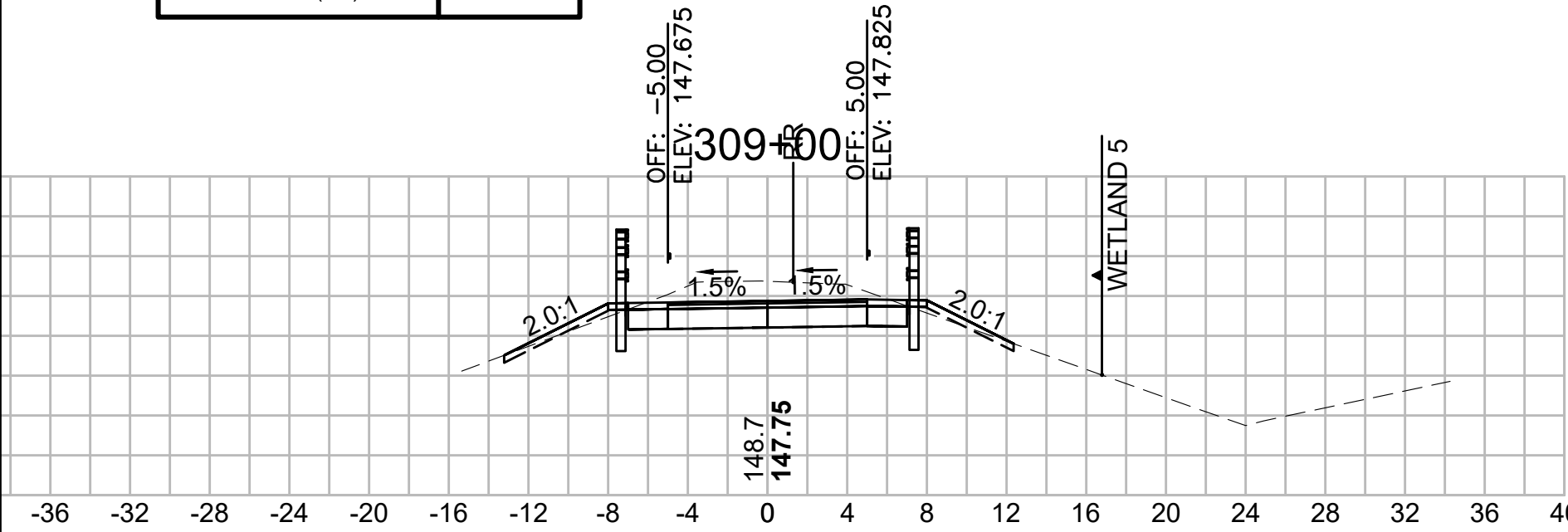


Total Volume at Station 306+50.00	
Cut Area (SF)	13.675
Fill Area (SF)	5.256
Cut Vol (CF)	29.8
Fill Vol (CF)	9.3
Cum Cut Vol (CF)	12957.3
Cum Fill Vol (CF)	8304.6
Net Vol (CF)	4652.6

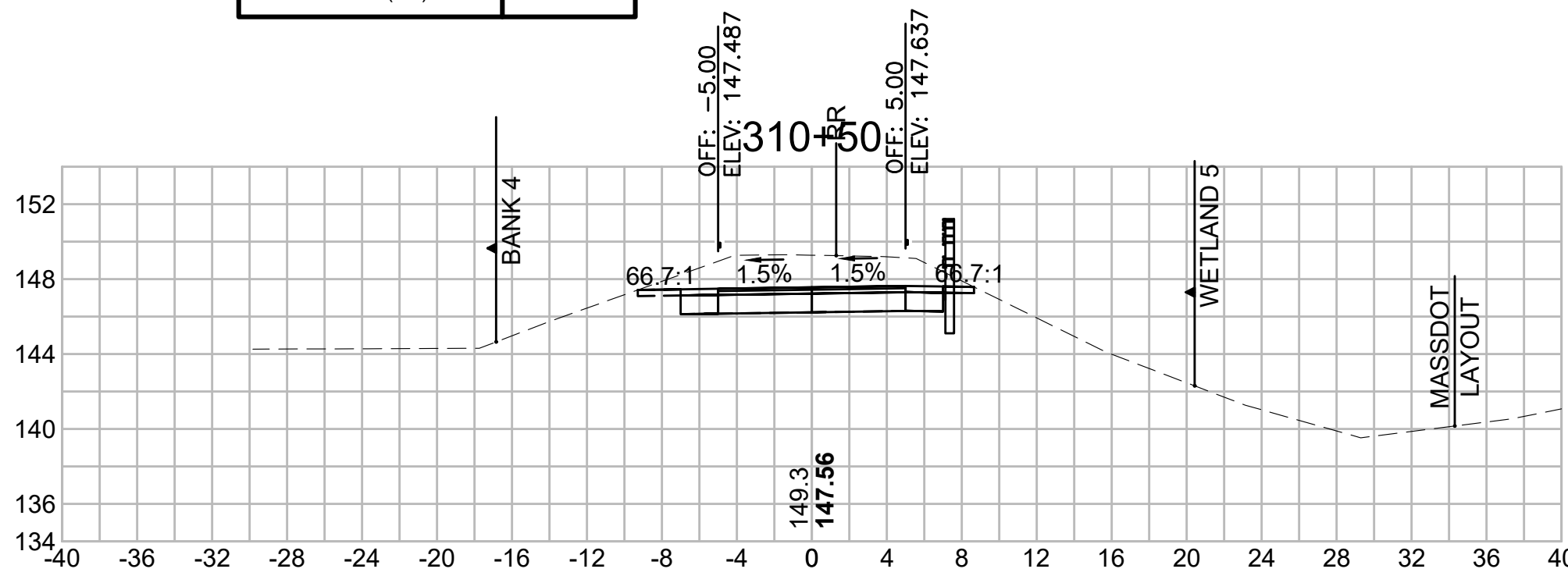


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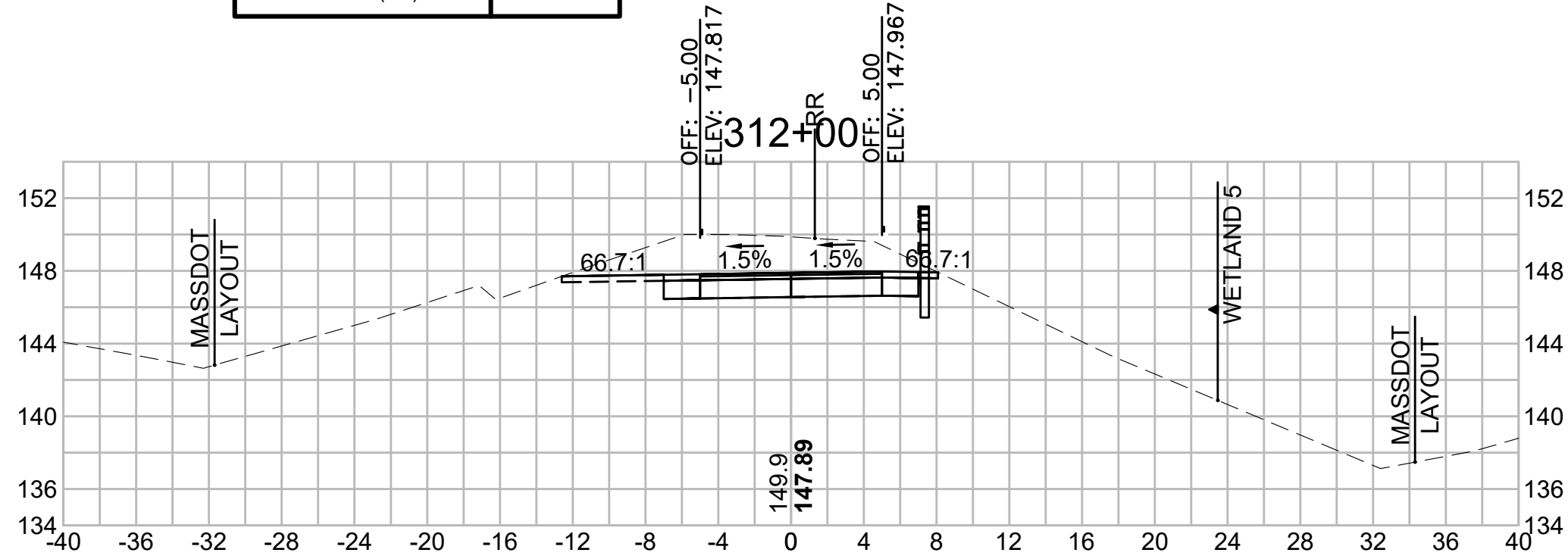
Total Volume at Station 309+00.00	
Cut Area (SF)	28.856
Fill Area (SF)	1.518
Cut Vol (CF)	50.9
Fill Vol (CF)	1.5
Cum Cut Vol (CF)	13281.6
Cum Fill Vol (CF)	8365.4
Net Vol (CF)	4916.2



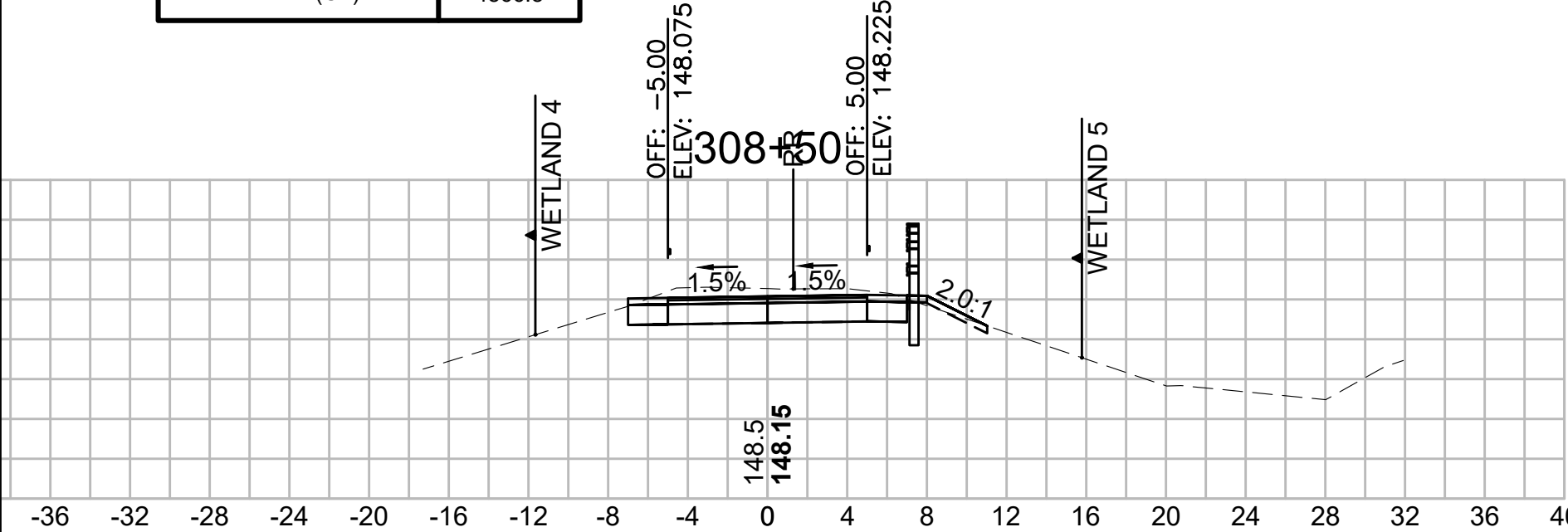
Total Volume at Station 310+50.00	
Cut Area (SF)	47.202
Fill Area (SF)	0.000
Cut Vol (CF)	87.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	13516.5
Cum Fill Vol (CF)	8377.3
Net Vol (CF)	5139.3



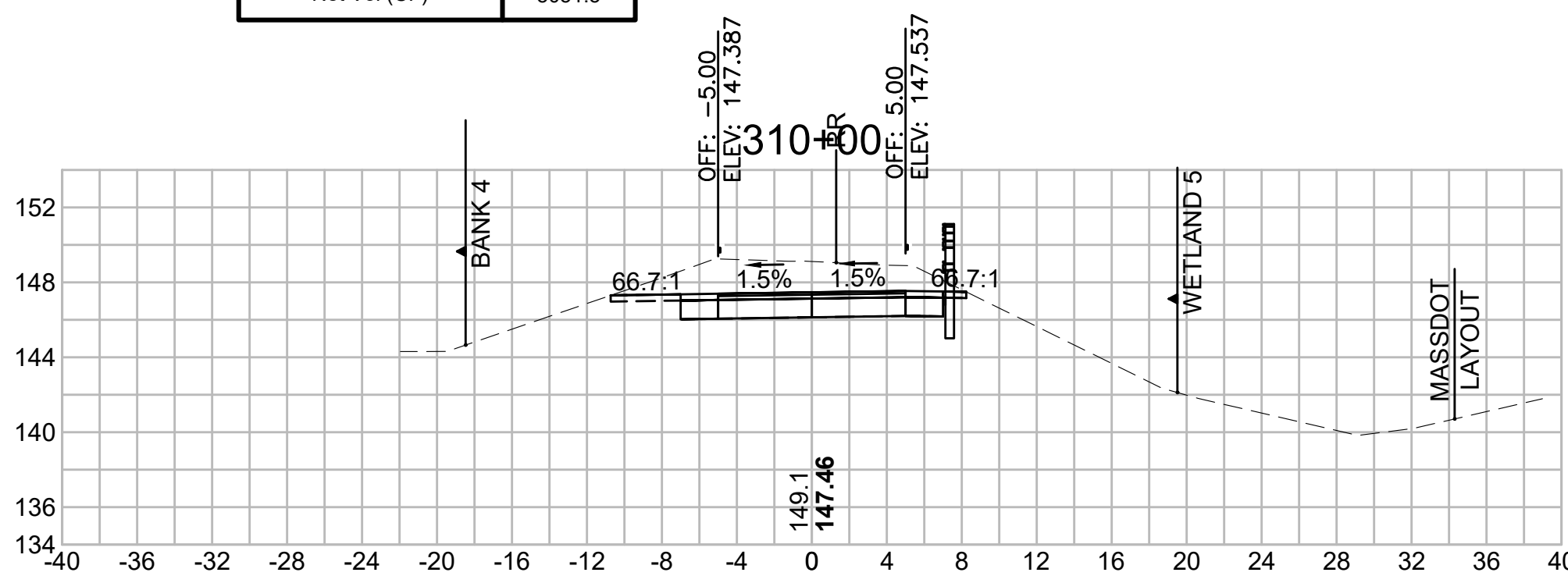
Total Volume at Station 312+00.00	
Cut Area (SF)	59.214
Fill Area (SF)	0.123
Cut Vol (CF)	118.2
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	13856.2
Cum Fill Vol (CF)	8377.7
Net Vol (CF)	5478.5



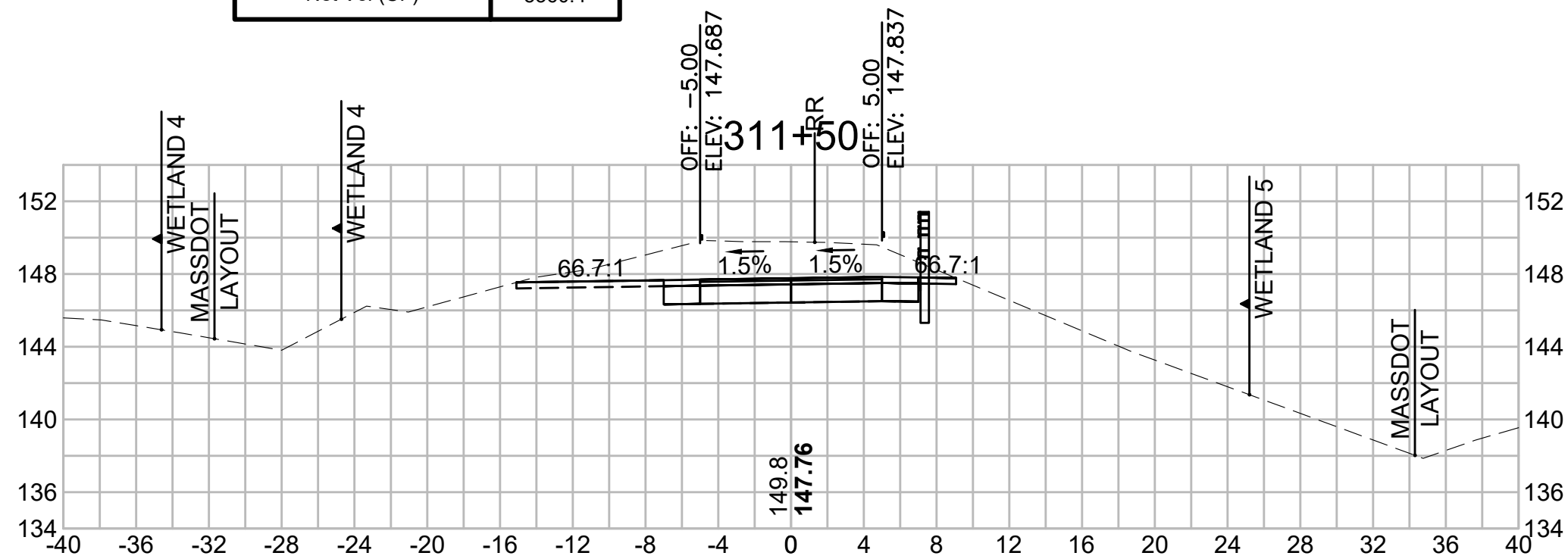
Total Volume at Station 308+50.00	
Cut Area (SF)	26.103
Fill Area (SF)	0.096
Cut Vol (CF)	41.1
Fill Vol (CF)	15.0
Cum Cut Vol (CF)	13230.7
Cum Fill Vol (CF)	8363.9
Net Vol (CF)	4866.8



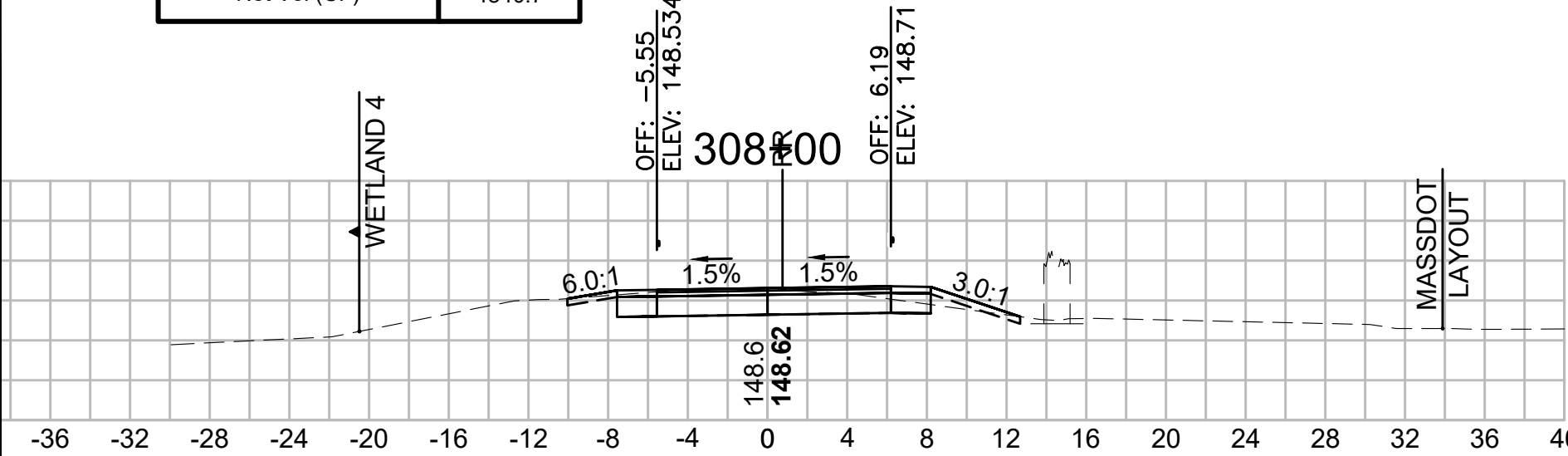
Total Volume at Station 310+00.00	
Cut Area (SF)	47.665
Fill Area (SF)	0.000
Cut Vol (CF)	82.3
Fill Vol (CF)	5.2
Cum Cut Vol (CF)	13428.7
Cum Fill Vol (CF)	8377.3
Net Vol (CF)	5051.5



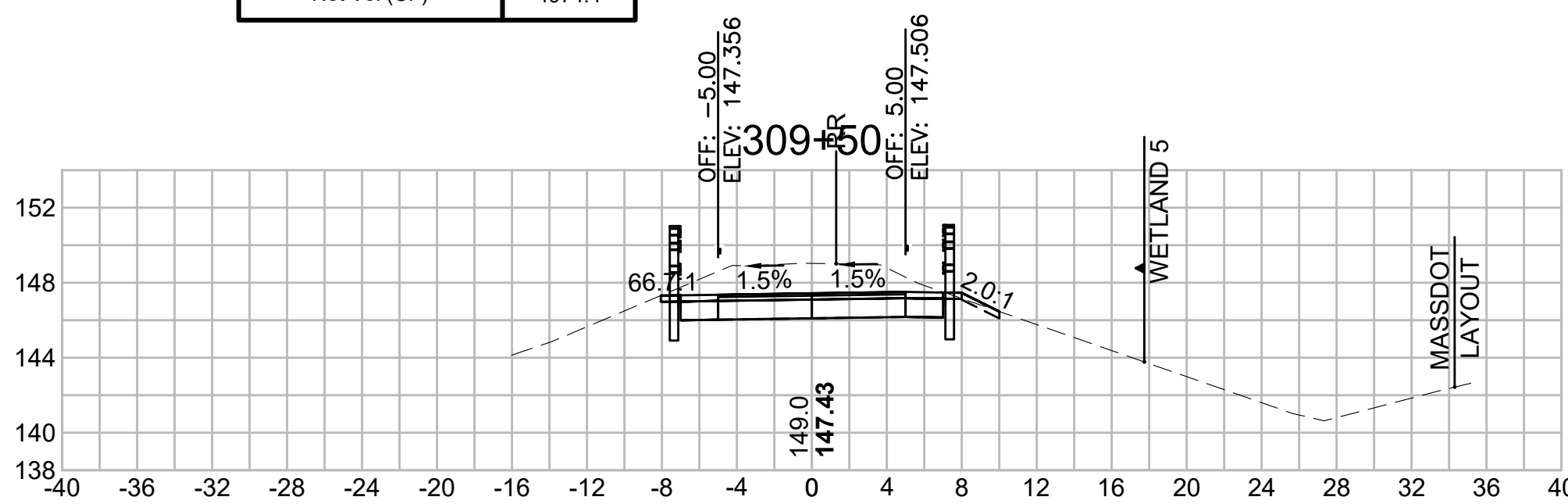
Total Volume at Station 311+50.00	
Cut Area (SF)	68.474
Fill Area (SF)	0.000
Cut Vol (CF)	120.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	13738.0
Cum Fill Vol (CF)	8377.6
Net Vol (CF)	5360.4



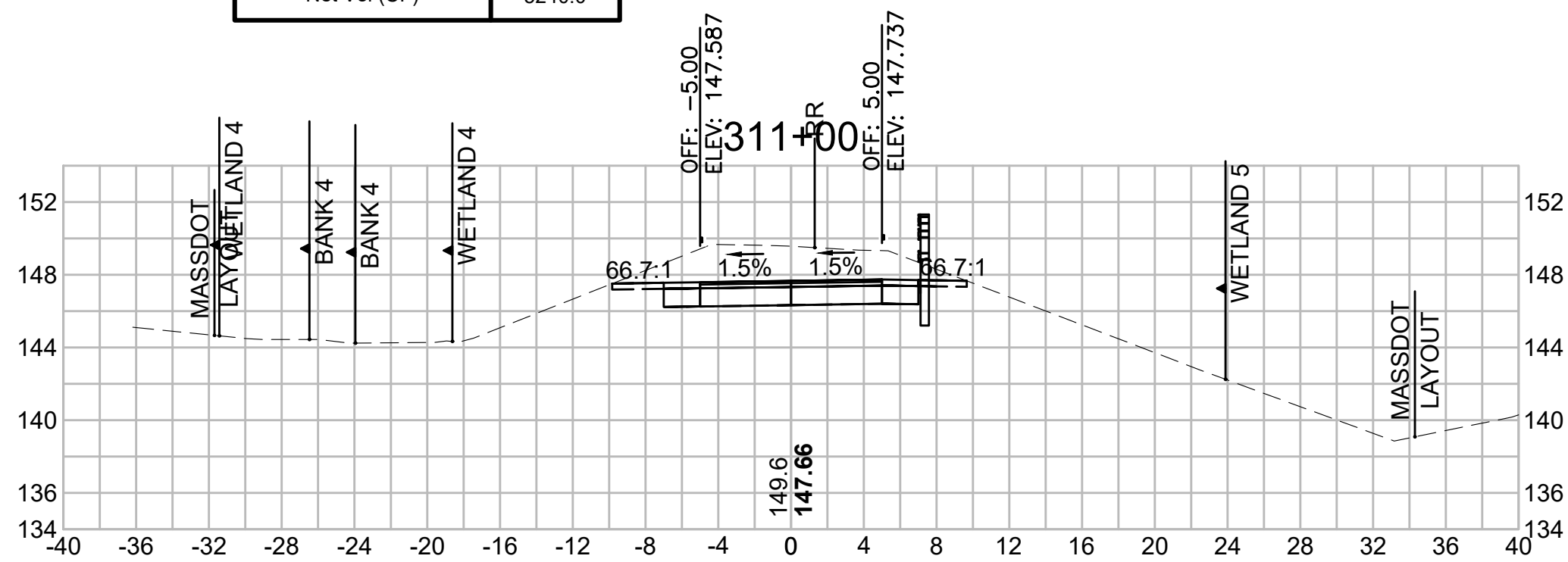
Total Volume at Station 308+00.00	
Cut Area (SF)	18.272
Fill Area (SF)	16.066
Cut Vol (CF)	90.7
Fill Vol (CF)	14.9
Cum Cut Vol (CF)	13189.6
Cum Fill Vol (CF)	8348.9
Net Vol (CF)	4840.7



Total Volume at Station 309+50.00	
Cut Area (SF)	41.186
Fill Area (SF)	5.665
Cut Vol (CF)	64.9
Fill Vol (CF)	6.7
Cum Cut Vol (CF)	13346.4
Cum Fill Vol (CF)	8372.0
Net Vol (CF)	4974.4



Total Volume at Station 311+00.00	
Cut Area (SF)	61.726
Fill Area (SF)	0.185
Cut Vol (CF)	100.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	13617.4
Cum Fill Vol (CF)	8377.4
Net Vol (CF)	5240.0



608164_XSEC(CROSS SECTION LAYOUTS).DWG 18-Feb-2022

Profile view of the proposed road layout. The vertical axis represents elevation in feet (130 to 152), and the horizontal axis represents stationing (40 to 40). The profile shows a road with a 1.5% grade, a 150.3' wetland area, and a 148.79' wetland area. Key points include: OFF: -5.00, ELEV: 148.717; PVI: 313+00; OFF: 5.00, ELEV: 148.667. The road is labeled 'MASSDOT LAYOUT' and 'WETLAND 5'.

[illegible]

Cum Fill Vol (CF)	8377.9
Net Vol (CF)	5959.4

OFF: -5.00
ELEV: 151.140

RR

OFF: 5.00
ELEV: 151.290

315+00

152.0
151.22

MASSDOT LAYOUT

MASSDOT LAYOUT

Profile view of the proposed road layout. The vertical axis shows elevation in feet (130 to 152). The horizontal axis shows stationing (40 to 40). The profile includes a dashed line for the ground surface and a solid line for the proposed road grade. Key features include:

- MassDOT Layout labels at stations 32 and 36.
- Wetland 5 area between stations 24 and 28.
- Proposed road grade with a 1.5% slope.
- Vertical curve data: OFF: -5.00, ELEV: 148.217, 312+50, OFF: 5.00, ELEV: 148.367.
- Stationing markers: 150.0, 148.29.

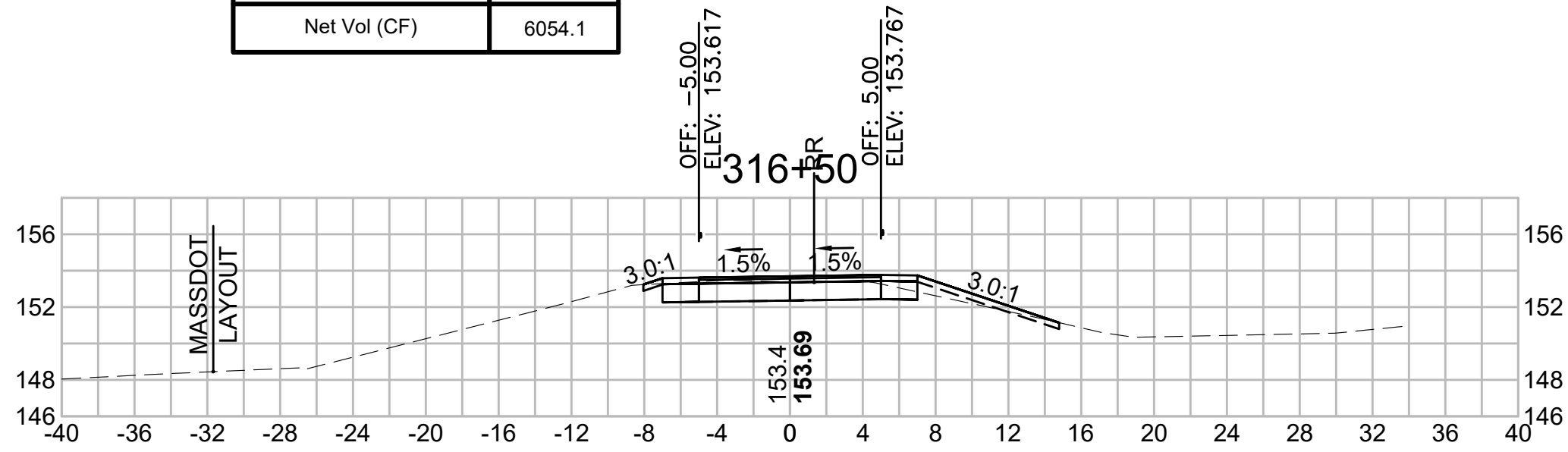
The profile view shows the vertical alignment of the proposed road. The horizontal axis represents stationing from -40 to 40, and the vertical axis represents elevation in feet from 130 to 152. The profile includes a dashed line for the existing ground and a solid line for the proposed road grade. Key features include:

- WETLAND 3:** Indicated by a vertical line and arrow on the left side of the profile.
- Proposed Road Grade:** Shown as a solid line with a 1.5% slope indicated between stations -8 and 8.
- Vertical Curve Data:**
 - Station -8: ELEV: 149.217, OFF: -5.00
 - Station 0: ELEV: 149.29, OFF: -5.00
 - Station 8: ELEV: 149.367, OFF: -5.00
- Cross-sections:** Shown at stations -8 and 8, indicating a 66.7:1 slope on both sides.
- MassDOT LAYOUT:** Indicated by a vertical line and arrow on the right side of the profile.

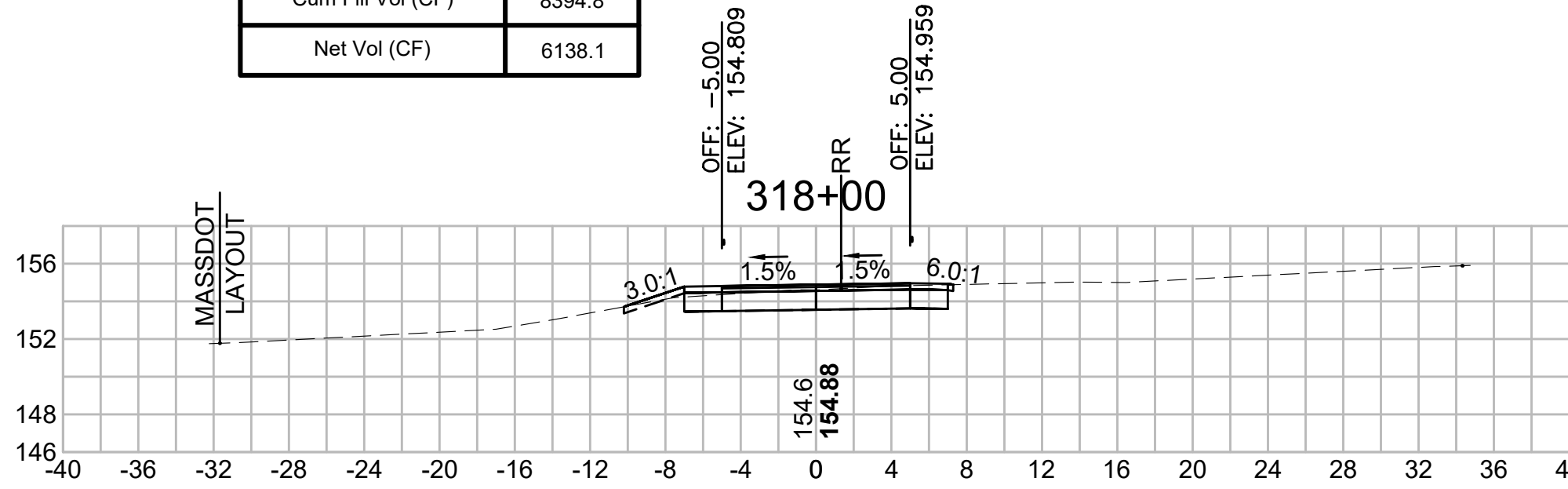
[illegible]

CROSS SECTIONS

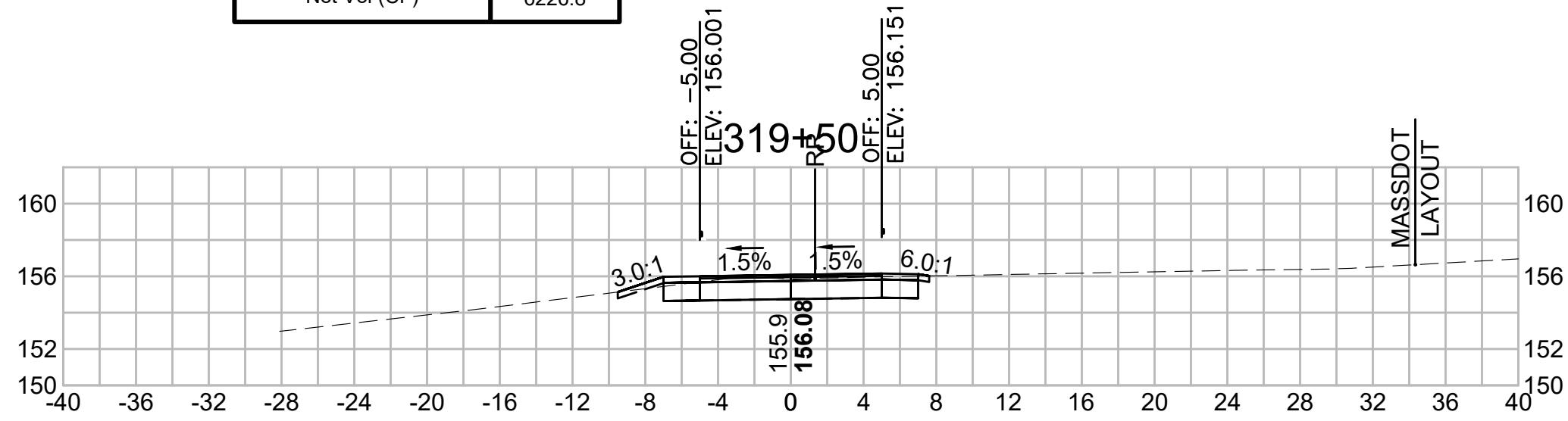
Total Volume at Station 316+50.00	
Cut Area (SF)	18.222
Fill Area (SF)	1.292
Cut Vol (CF)	30.0
Fill Vol (CF)	5.5
Cum Cut Vol (CF)	14446.4
Cum Fill Vol (CF)	8392.3
Net Vol (CF)	6054.1



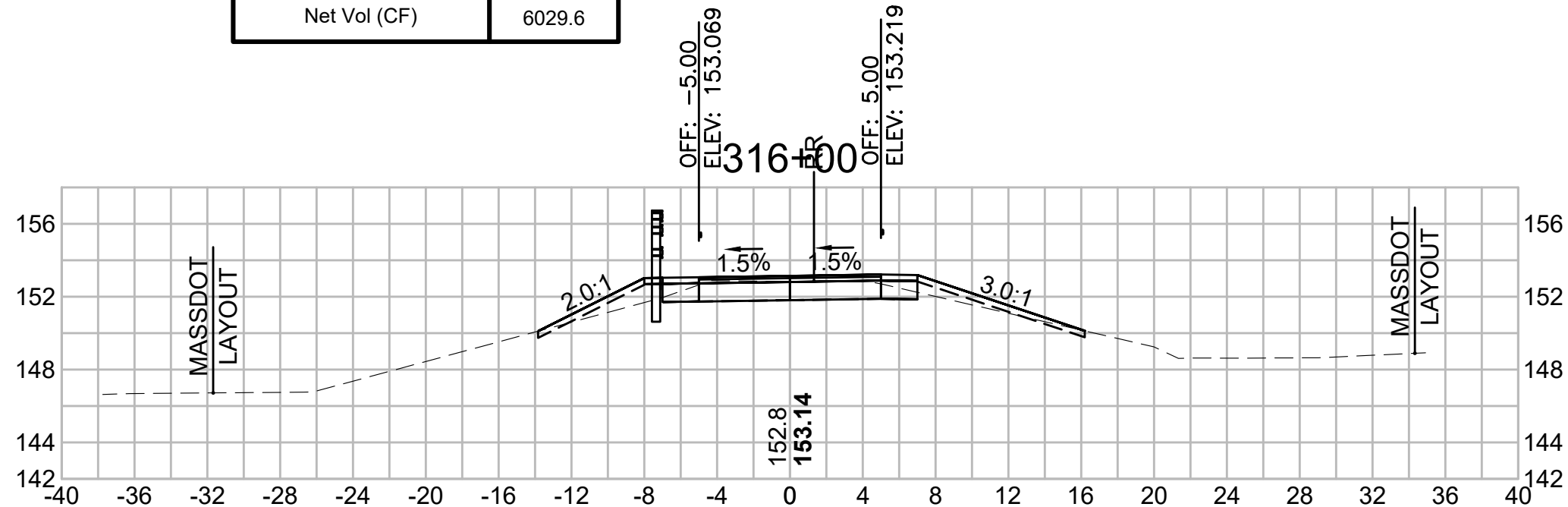
Total Volume at Station 318+00.00	
Cut Area (SF)	15.594
Fill Area (SF)	0.080
Cut Vol (CF)	28.5
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	14532.8
Cum Fill Vol (CF)	8394.8
Net Vol (CF)	6138.1



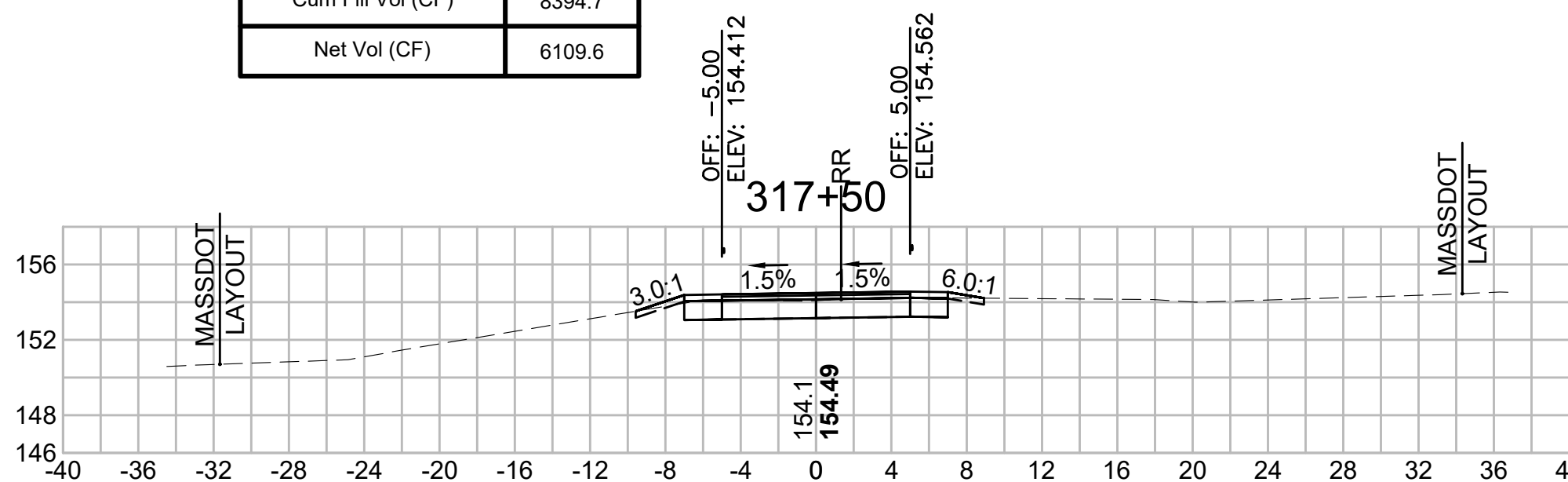
Total Volume at Station 319+50.00	
Cut Area (SF)	24.589
Fill Area (SF)	0.078
Cut Vol (CF)	36.6
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	14626.9
Cum Fill Vol (CF)	8400.1
Net Vol (CF)	6226.8



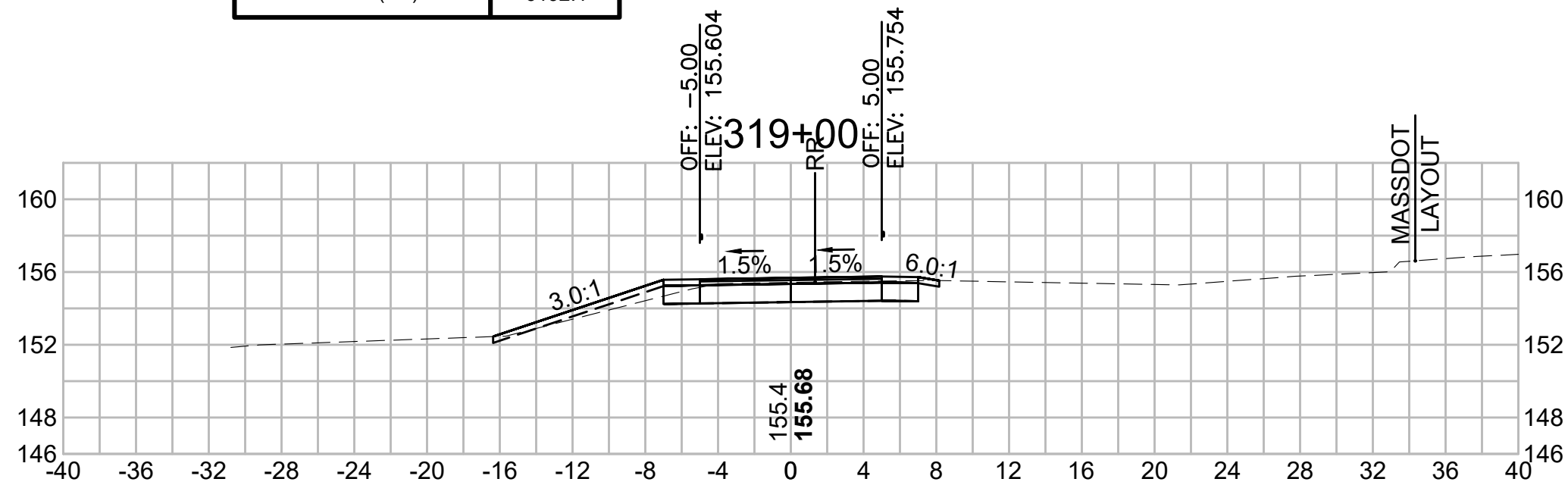
Total Volume at Station 316+00.00	
Cut Area (SF)	14.228
Fill Area (SF)	4.661
Cut Vol (CF)	32.5
Fill Vol (CF)	6.6
Cum Cut Vol (CF)	14416.4
Cum Fill Vol (CF)	8386.8
Net Vol (CF)	6029.6



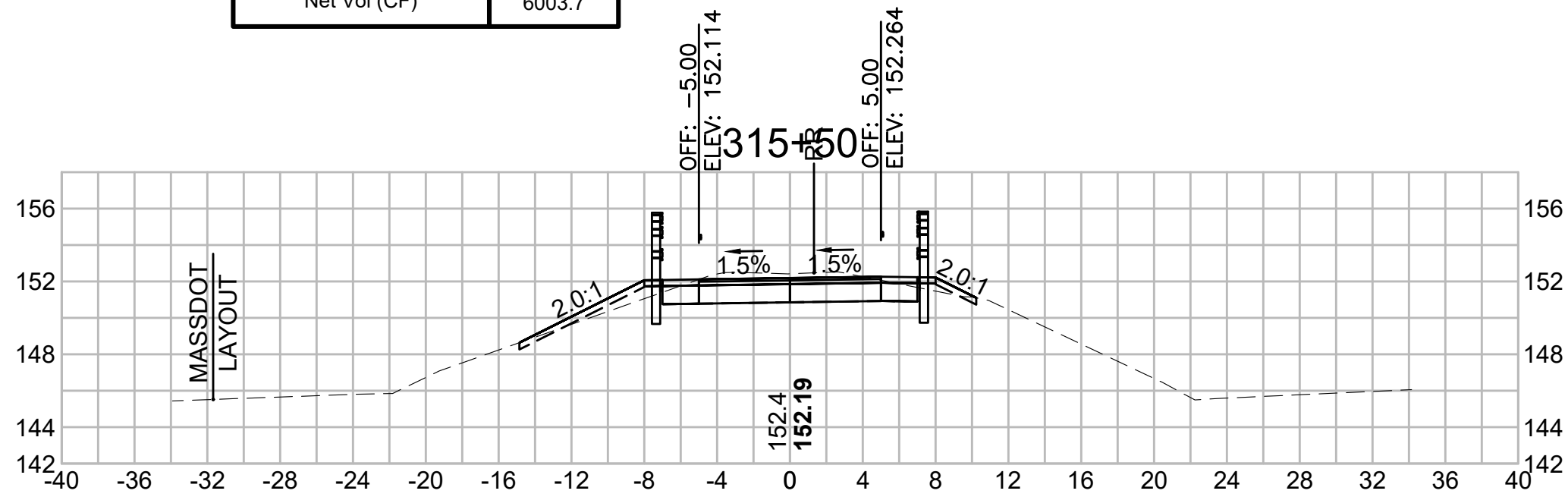
Total Volume at Station 317+50.00	
Cut Area (SF)	15.227
Fill Area (SF)	0.021
Cut Vol (CF)	27.6
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	14504.3
Cum Fill Vol (CF)	8394.7
Net Vol (CF)	6109.6



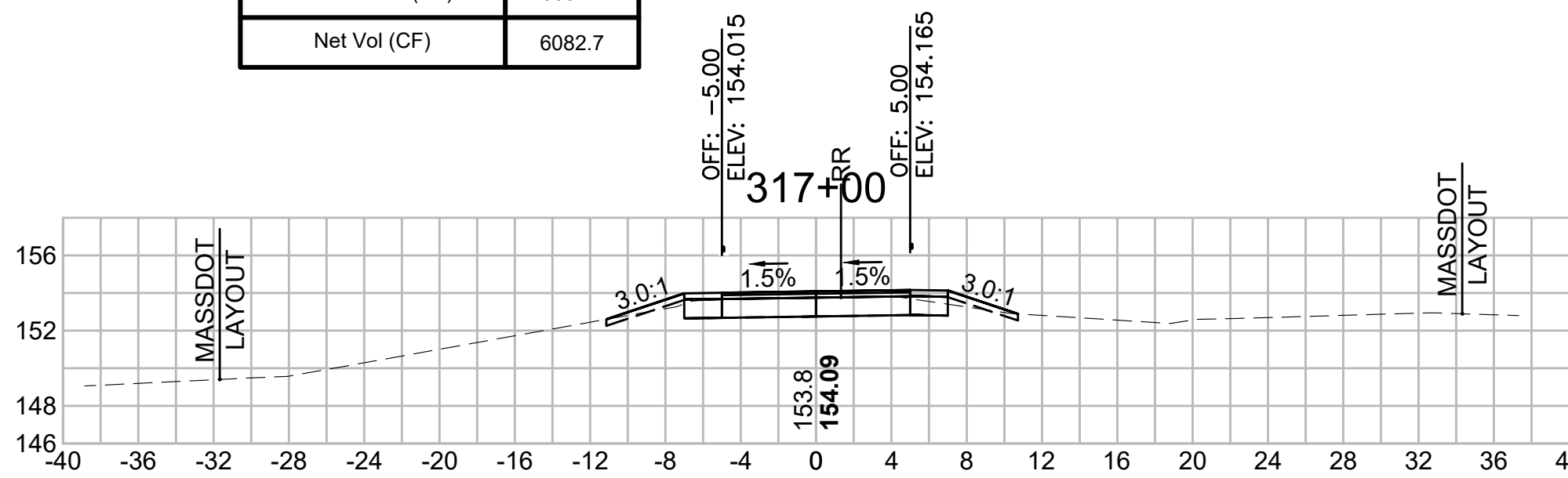
Total Volume at Station 319+00.00	
Cut Area (SF)	14.916
Fill Area (SF)	1.909
Cut Vol (CF)	28.4
Fill Vol (CF)	2.6
Cum Cut Vol (CF)	14590.3
Cum Fill Vol (CF)	8398.2
Net Vol (CF)	6192.1



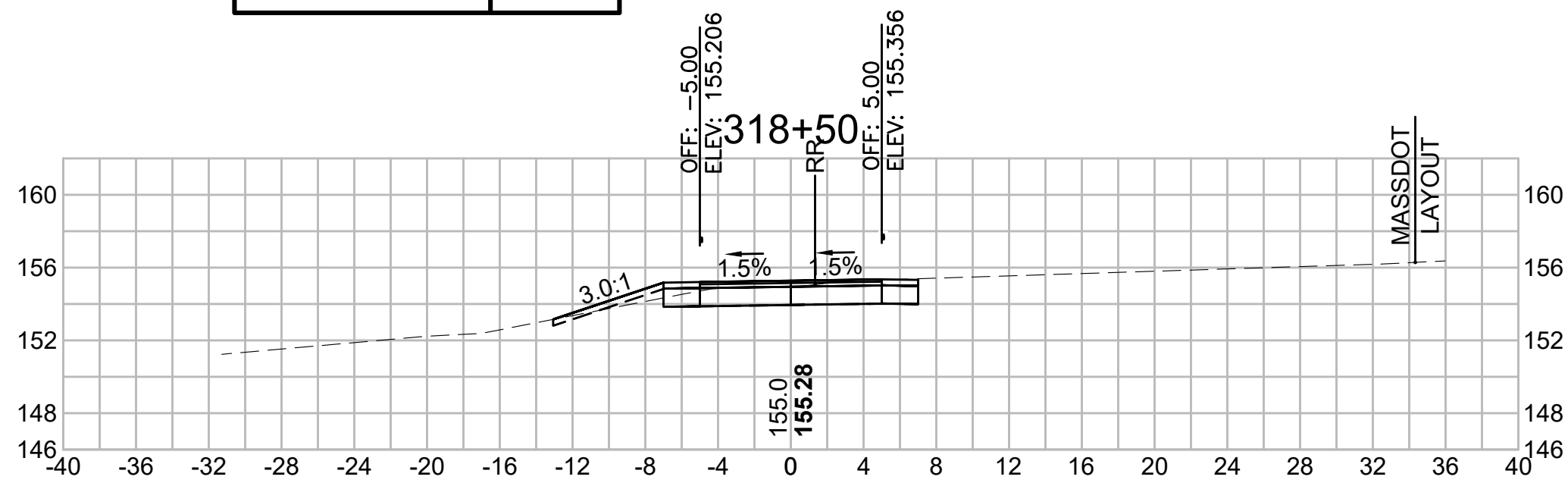
Total Volume at Station 315+50.00	
Cut Area (SF)	20.826
Fill Area (SF)	2.479
Cut Vol (CF)	46.6
Fill Vol (CF)	2.3
Cum Cut Vol (CF)	14383.9
Cum Fill Vol (CF)	8380.2
Net Vol (CF)	6003.7



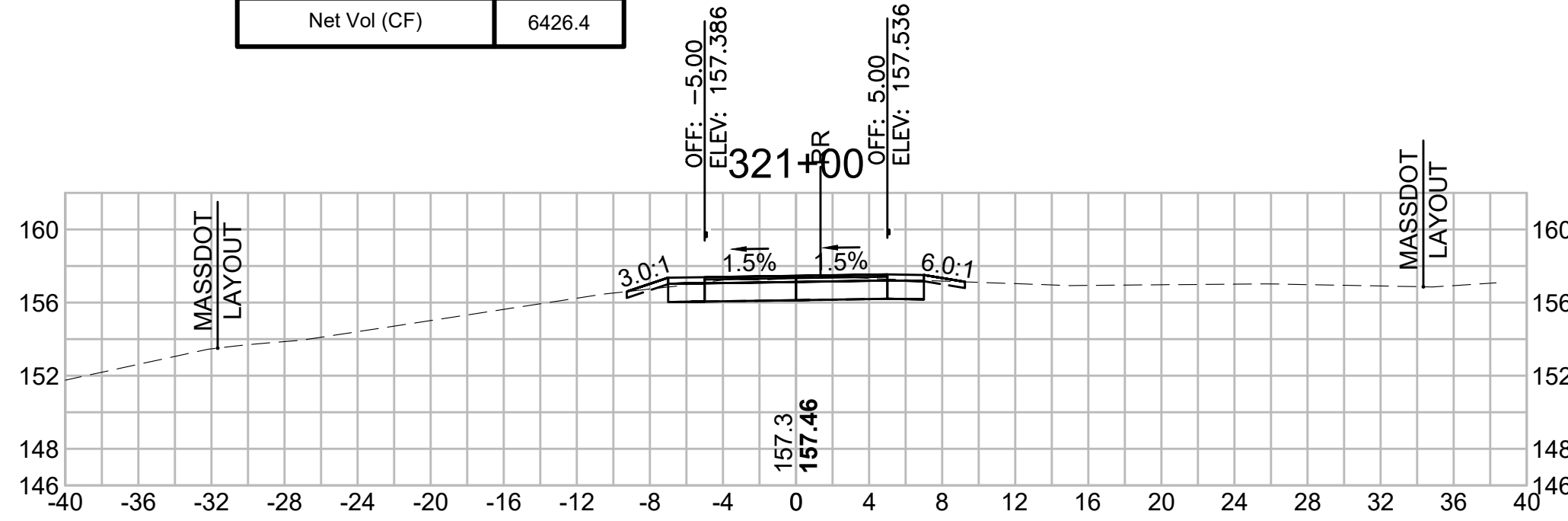
Total Volume at Station 317+00.00	
Cut Area (SF)	14.546
Fill Area (SF)	0.634
Cut Vol (CF)	30.3
Fill Vol (CF)	1.8
Cum Cut Vol (CF)	14476.7
Cum Fill Vol (CF)	8394.1
Net Vol (CF)	6082.7



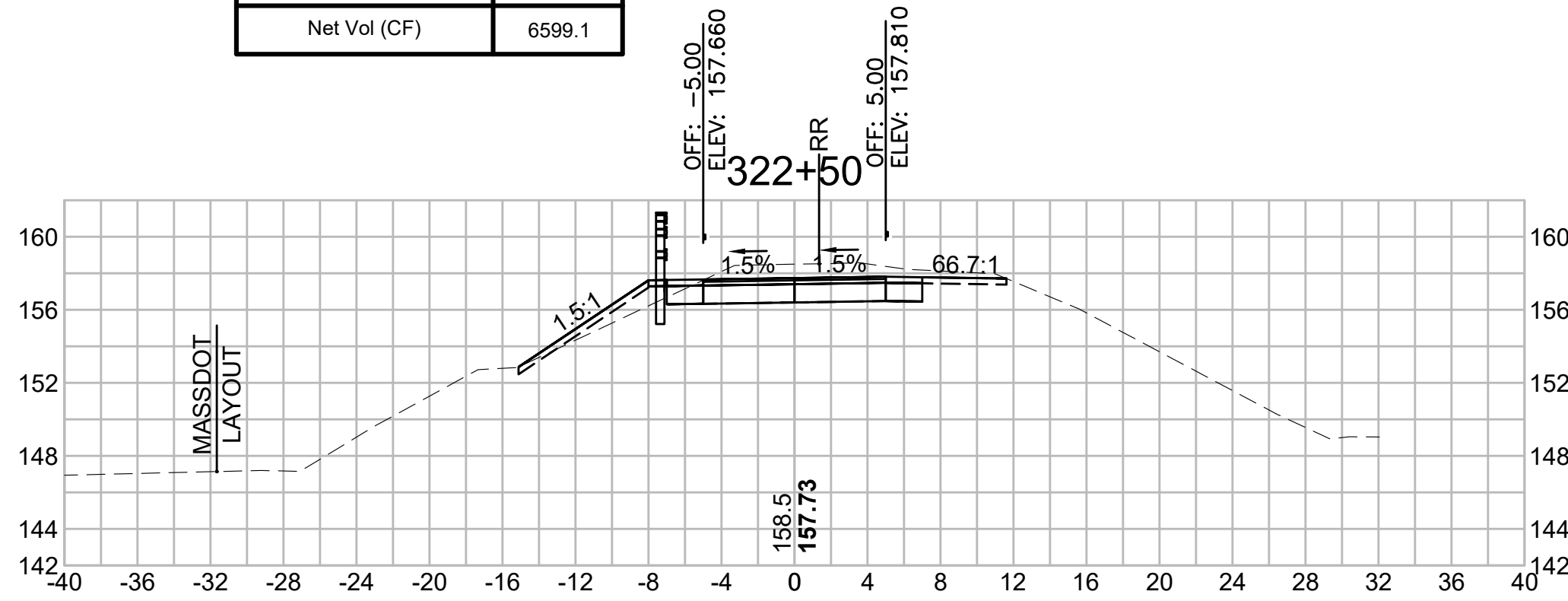
Total Volume at Station 318+50.00	
Cut Area (SF)	15.772
Fill Area (SF)	0.874
Cut Vol (CF)	29.0
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	14561.9
Cum Fill Vol (CF)	8395.6
Net Vol (CF)	6166.2



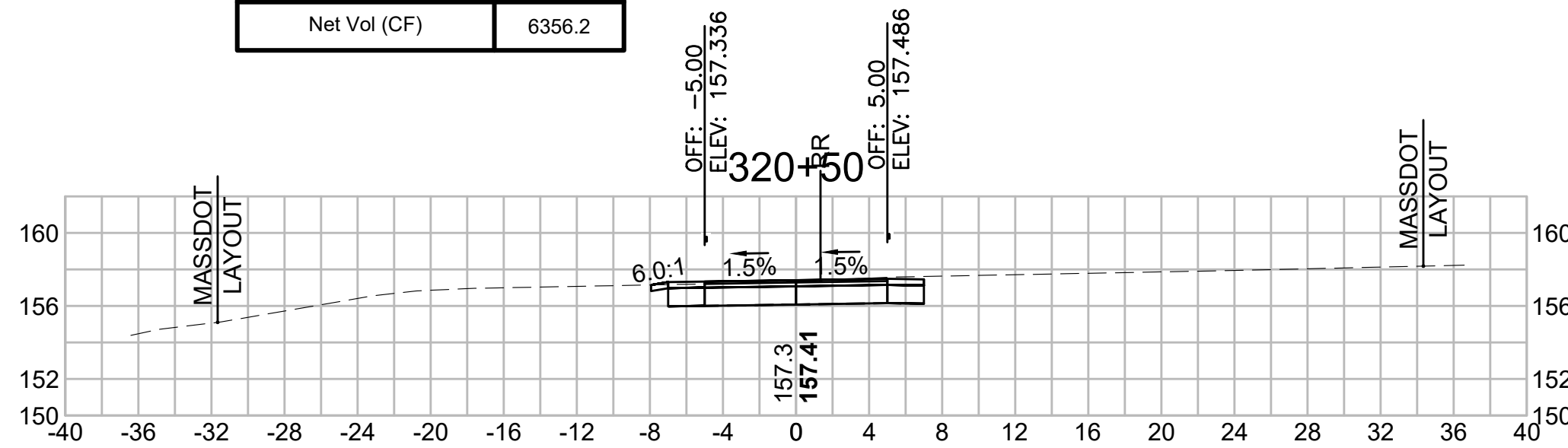
Total Volume at Station 321+00.00	
Cut Area (SF)	26.648
Fill Area (SF)	0.057
Cut Vol (CF)	70.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	14826.6
Cum Fill Vol (CF)	8400.2
Net Vol (CF)	6426.4



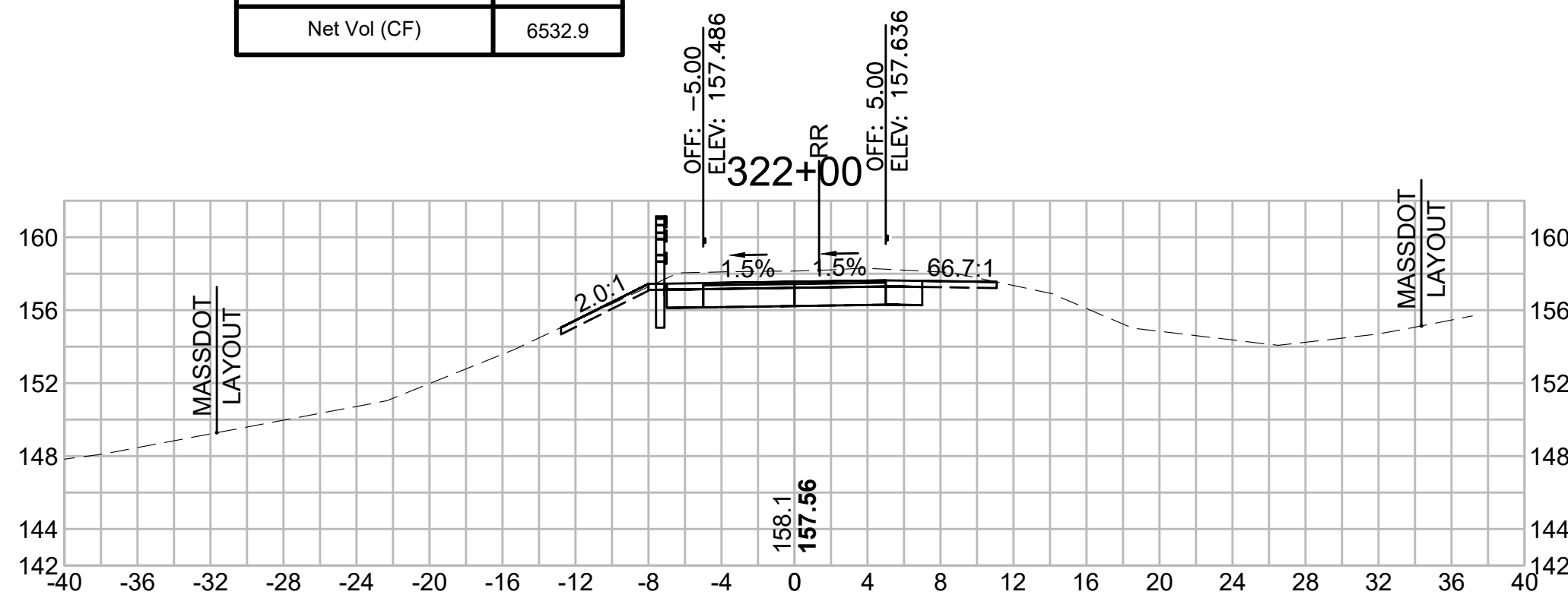
Total Volume at Station 322+50.00	
Cut Area (SF)	37.507
Fill Area (SF)	3.438
Cut Vol (CF)	71.9
Fill Vol (CF)	5.7
Cum Cut Vol (CF)	15010.8
Cum Fill Vol (CF)	8411.7
Net Vol (CF)	6599.1



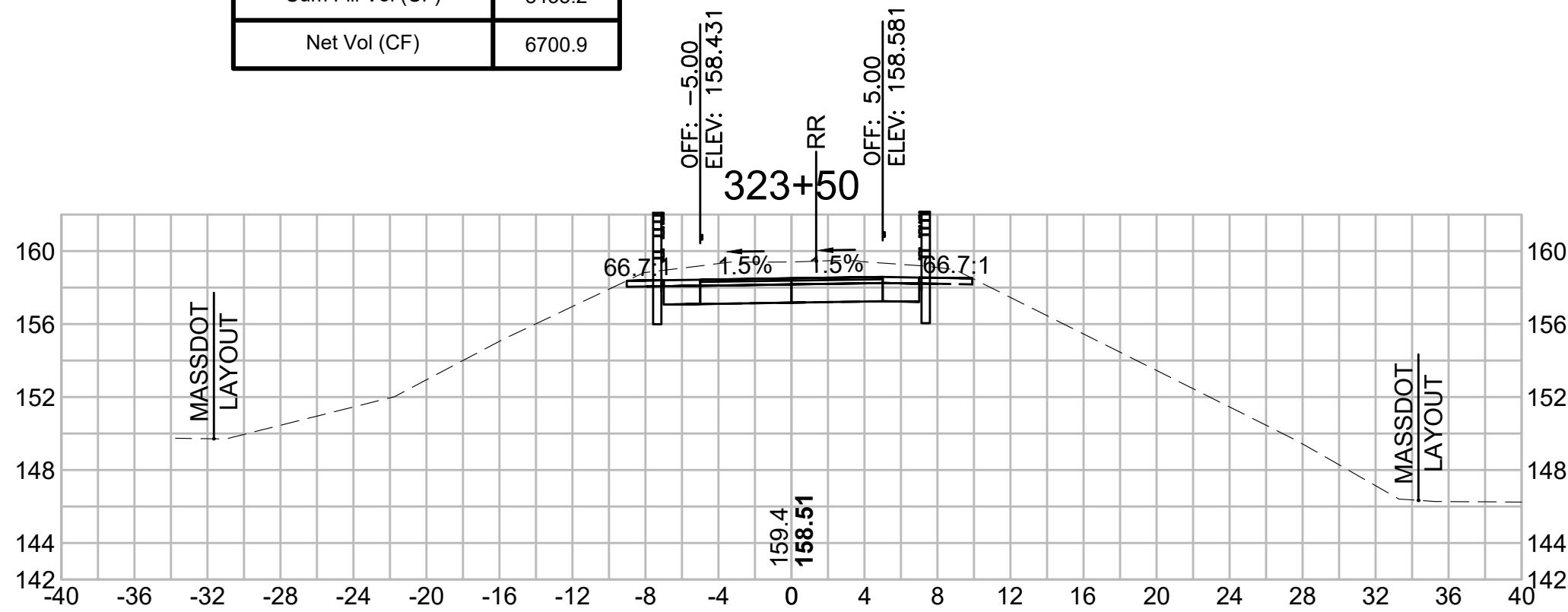
Total Volume at Station 320+50.00	
Cut Area (SF)	49.256
Fill Area (SF)	0.000
Cut Vol (CF)	76.1
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	14756.3
Cum Fill Vol (CF)	8400.1
Net Vol (CF)	6356.2



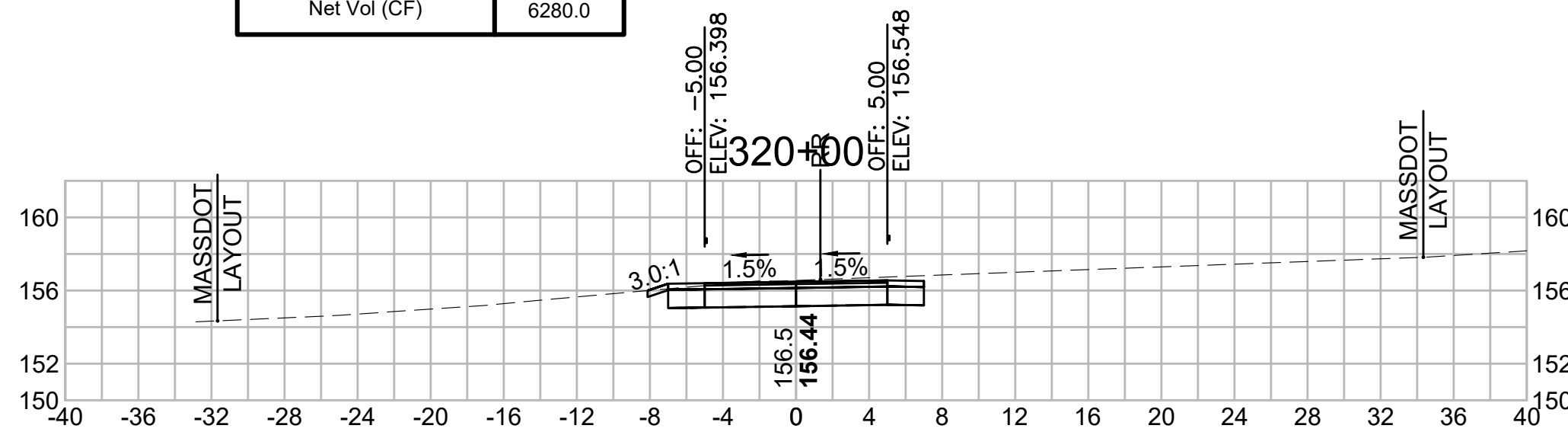
Total Volume at Station 322+00.00	
Cut Area (SF)	40.113
Fill Area (SF)	2.705
Cut Vol (CF)	62.4
Fill Vol (CF)	4.2
Cum Cut Vol (CF)	14938.9
Cum Fill Vol (CF)	8406.0
Net Vol (CF)	6532.9



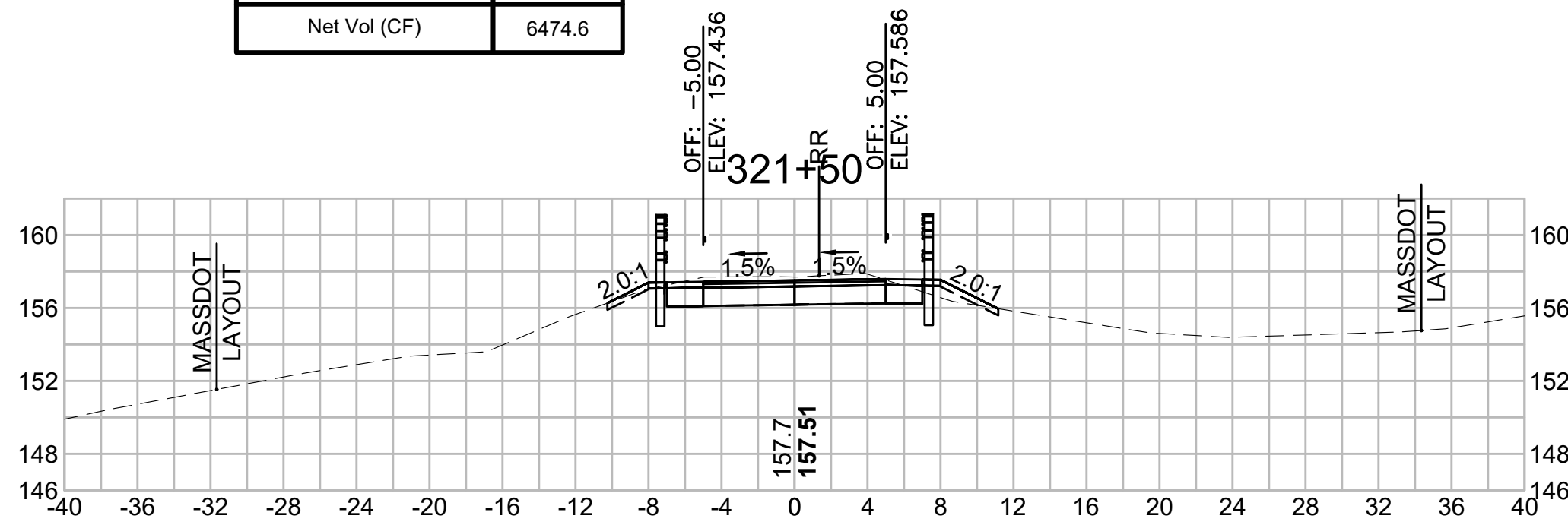
Total Volume at Station 323+50.00	
Cut Area (SF)	45.108
Fill Area (SF)	0.000
Cut Vol (CF)	66.2
Fill Vol (CF)	10.1
Cum Cut Vol (CF)	15136.1
Cum Fill Vol (CF)	8435.2
Net Vol (CF)	6700.9



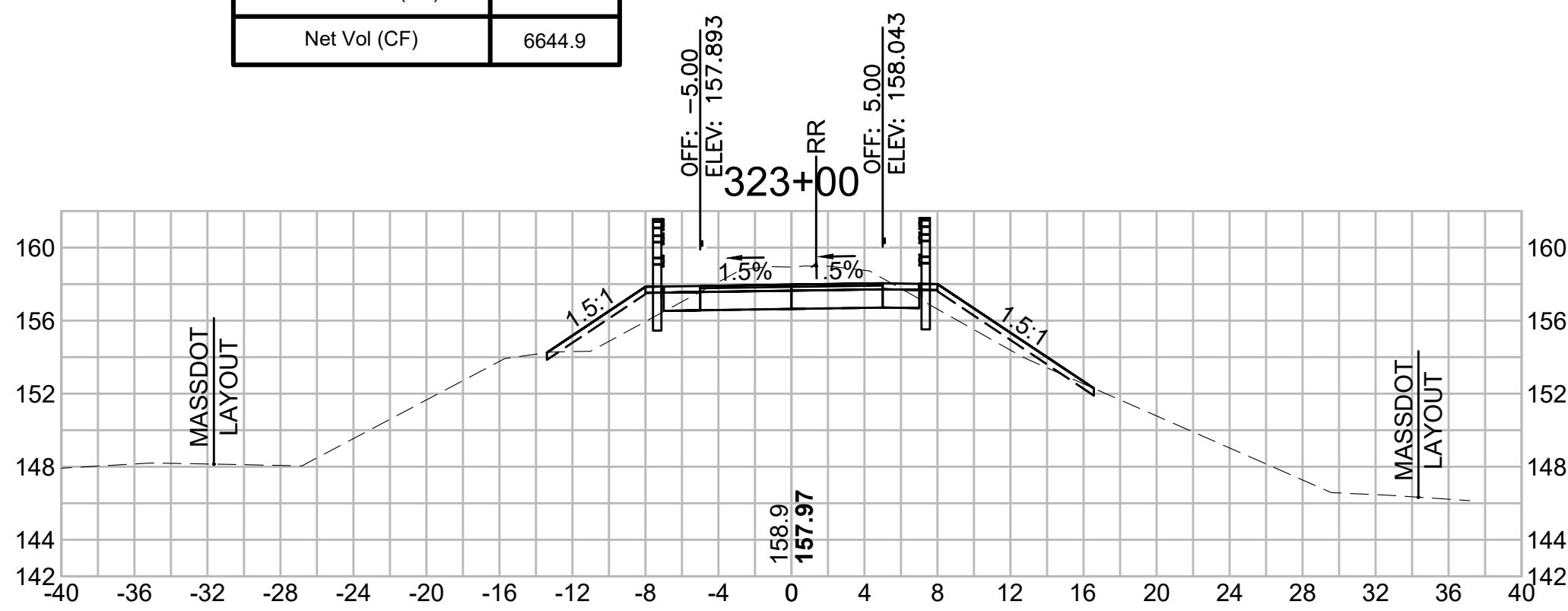
Total Volume at Station 320+00.00	
Cut Area (SF)	32.967
Fill Area (SF)	0.000
Cut Vol (CF)	53.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	14680.2
Cum Fill Vol (CF)	8400.1
Net Vol (CF)	6280.0



Total Volume at Station 321+50.00	
Cut Area (SF)	27.287
Fill Area (SF)	1.779
Cut Vol (CF)	49.9
Fill Vol (CF)	1.7
Cum Cut Vol (CF)	14876.5
Cum Fill Vol (CF)	8401.9
Net Vol (CF)	6474.6



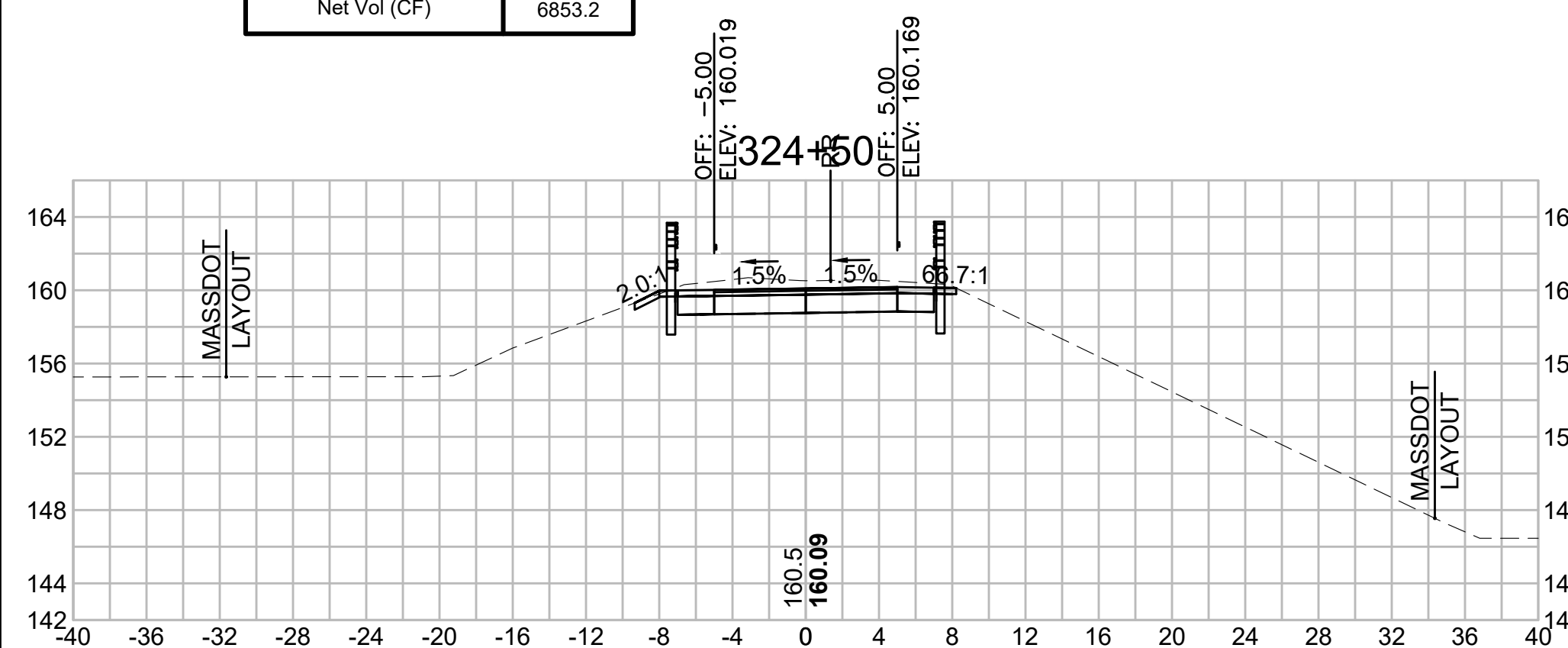
Total Volume at Station 323+00.00	
Cut Area (SF)	26.338
Fill Area (SF)	10.961
Cut Vol (CF)	59.1
Fill Vol (CF)	13.3
Cum Cut Vol (CF)	15069.9
Cum Fill Vol (CF)	8425.1
Net Vol (CF)	6644.9



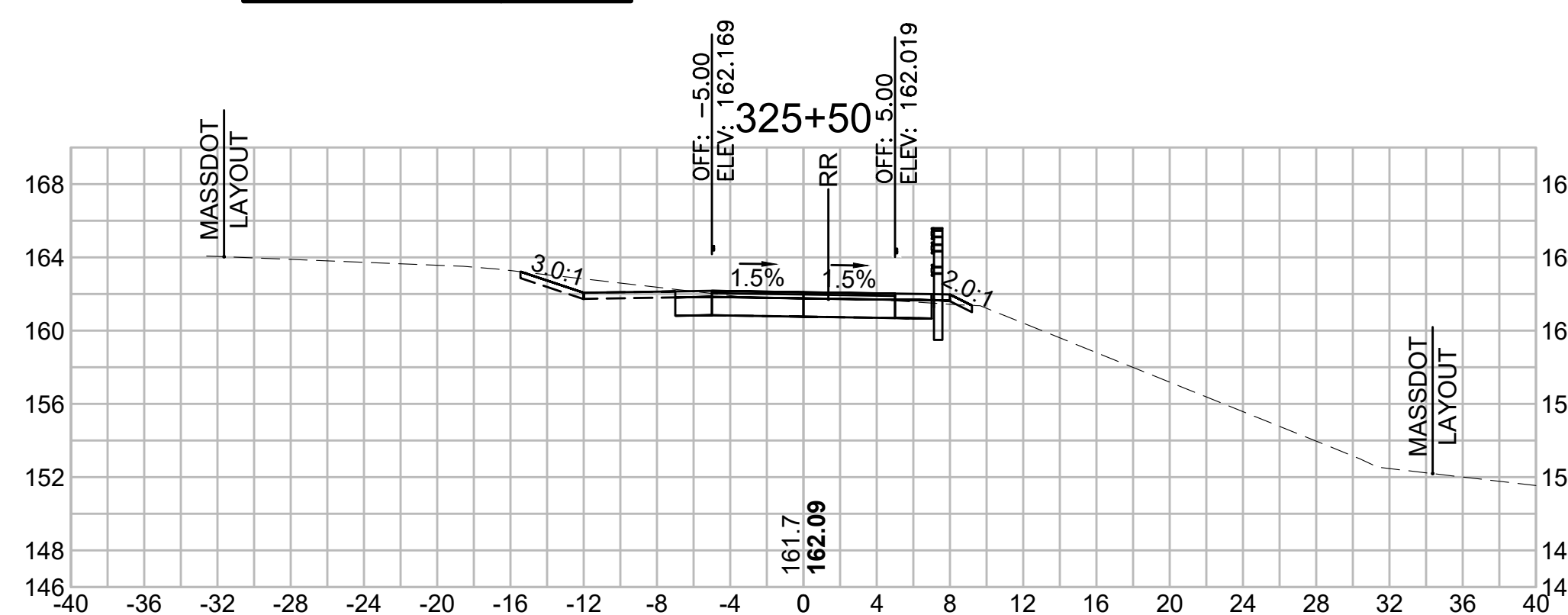
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	298	319

CROSS SECTIONS

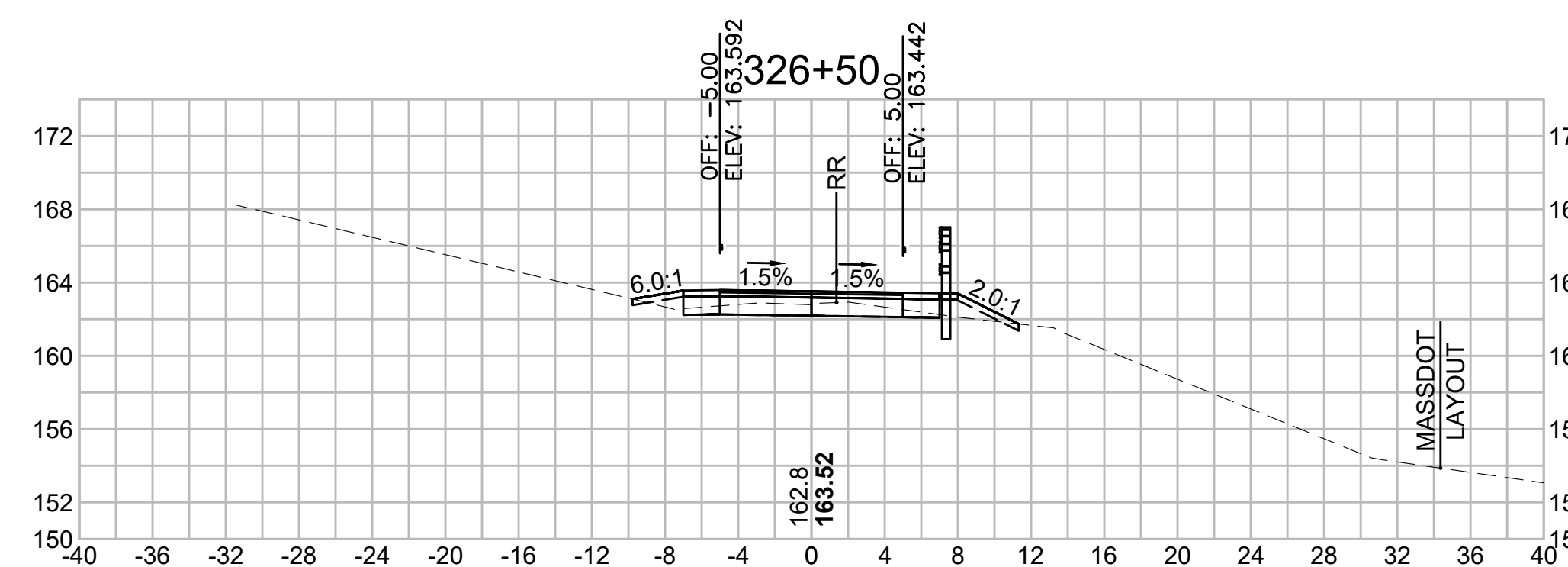
Total Volume at Station 324+50.00	
Cut Area (SF)	35.553
Fill Area (SF)	0.000
Cut Vol (CF)	71.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15288.5
Cum Fill Vol (CF)	8435.2
Net Vol (CF)	6853.2



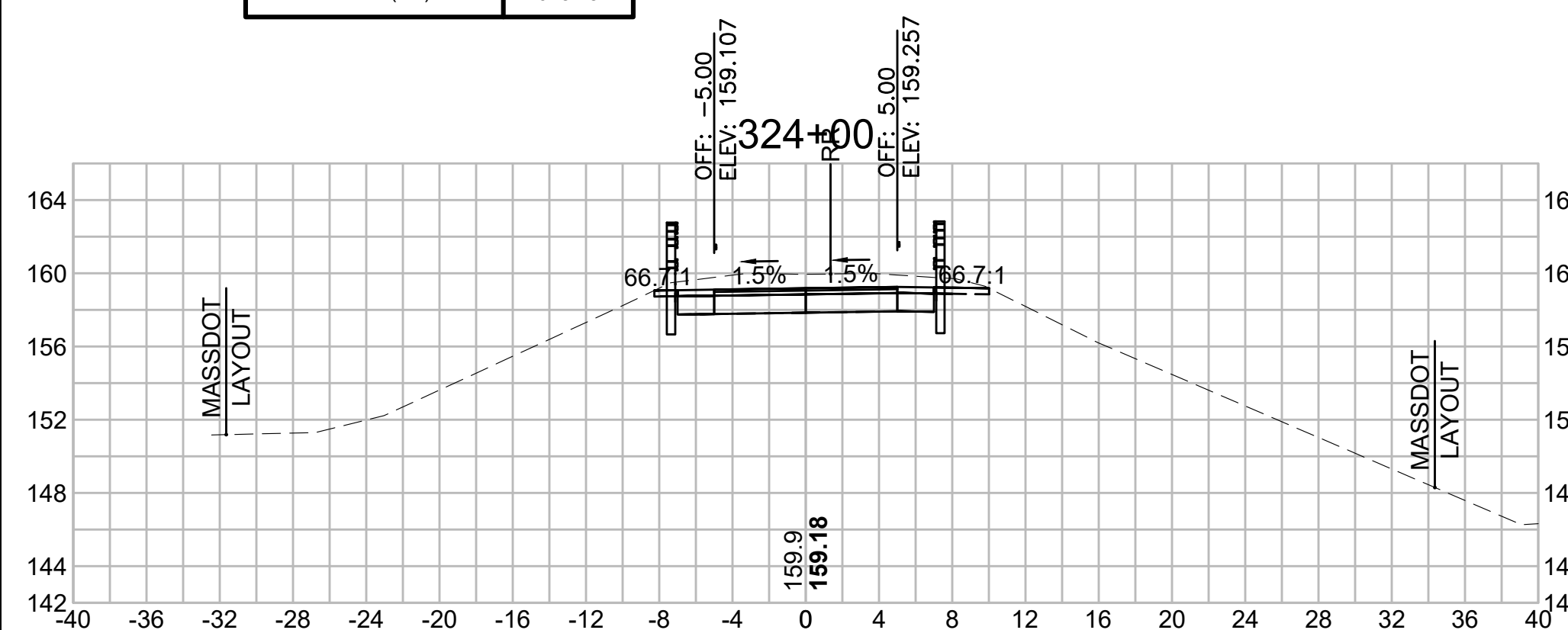
Total Volume at Station 325+50.00	
Cut Area (SF)	21.576
Fill Area (SF)	0.211
Cut Vol (CF)	51.3
Fill Vol (CF)	0.5
Cum Cut Vol (CF)	15404.0
Cum Fill Vol (CF)	8435.9
Net Vol (CF)	6968.1



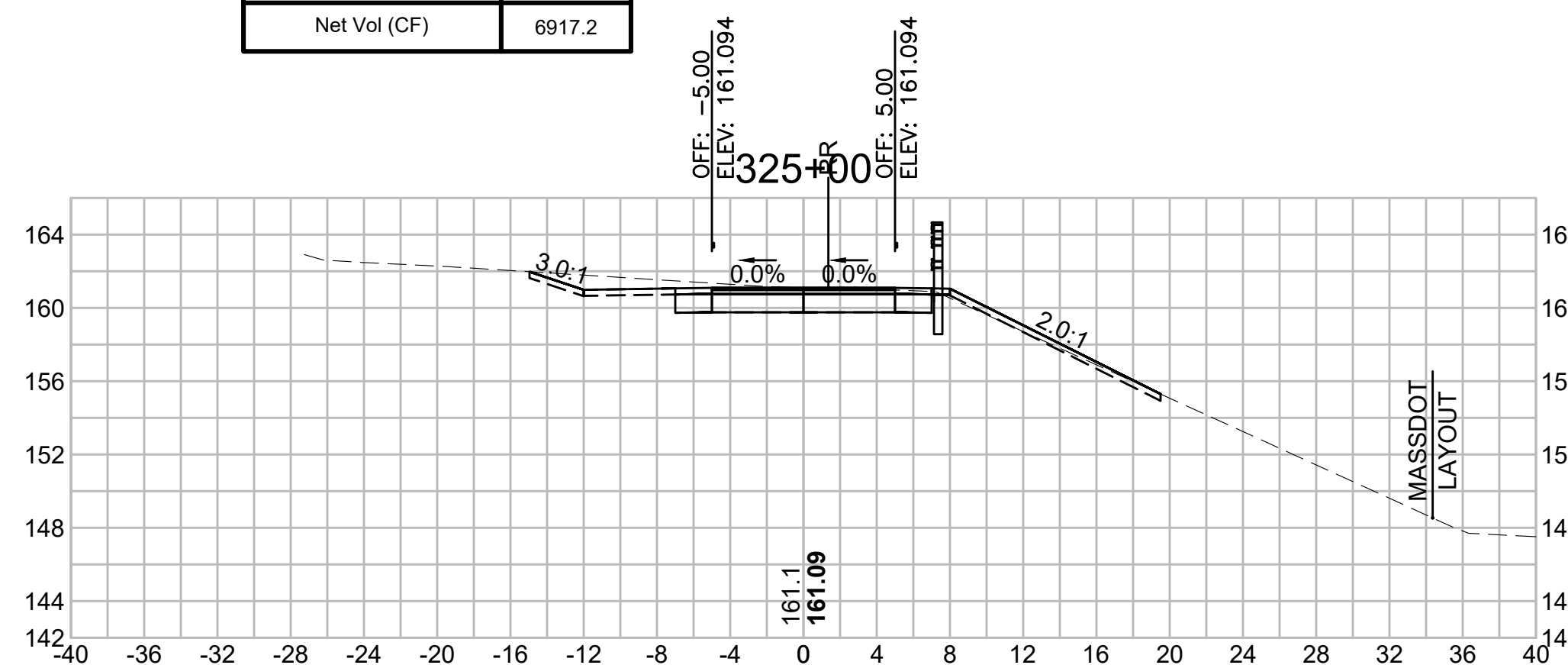
Total Volume at Station 326+50.00	
Cut Area (SF)	10.360
Fill Area (SF)	2.731
Cut Vol (CF)	18.9
Fill Vol (CF)	3.4
Cum Cut Vol (CF)	15452.2
Cum Fill Vol (CF)	8440.4
Net Vol (CF)	7011.8



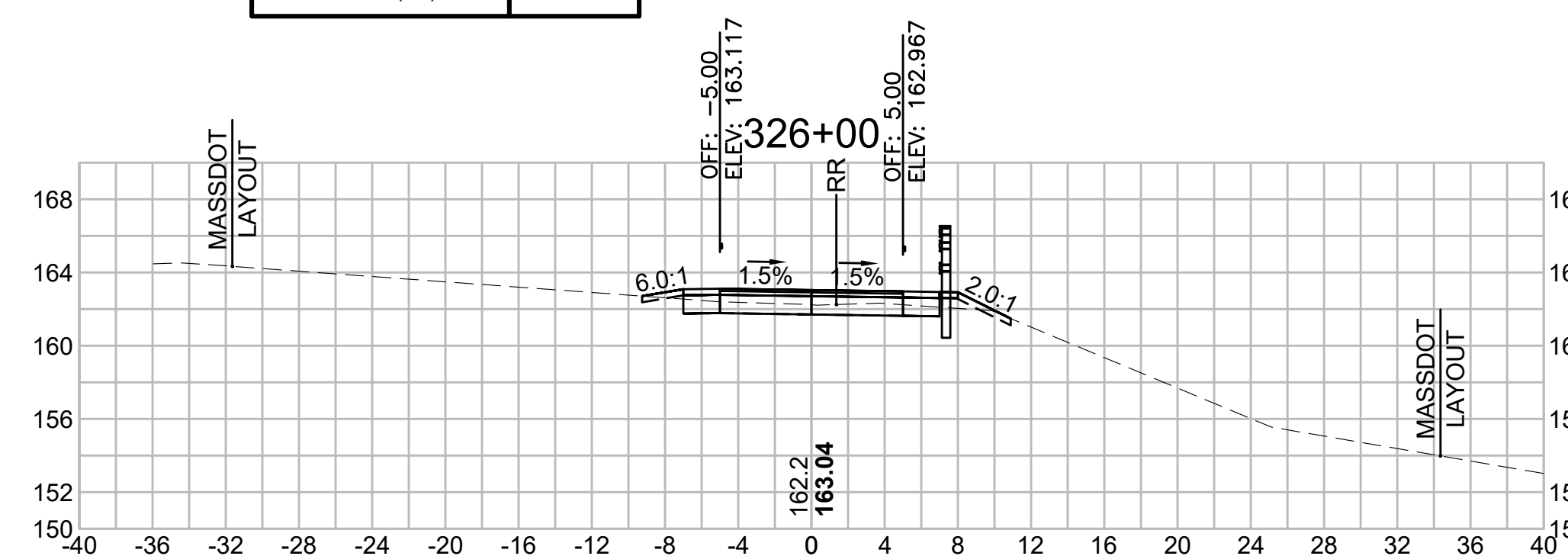
Total Volume at Station 324+00.00	
Cut Area (SF)	41.953
Fill Area (SF)	0.000
Cut Vol (CF)	80.6
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15216.7
Cum Fill Vol (CF)	8435.2
Net Vol (CF)	6781.5



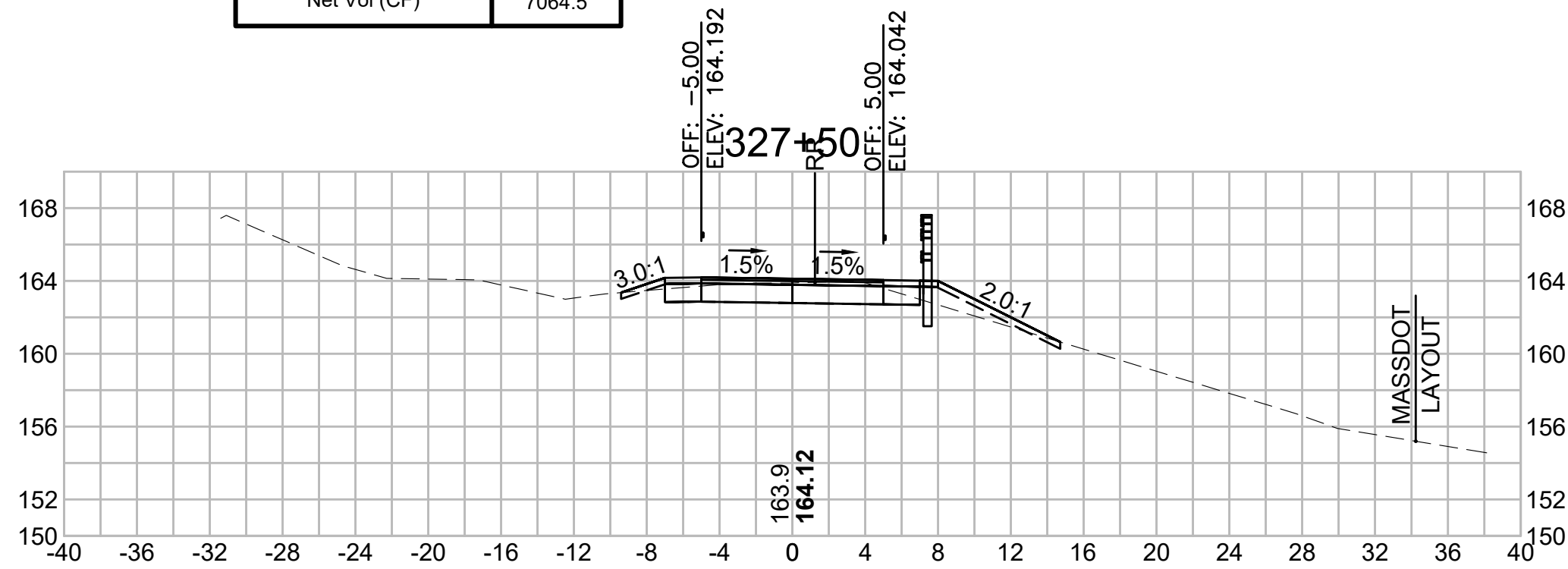
Total Volume at Station 325+00.00	
Cut Area (SF)	33.840
Fill Area (SF)	0.281
Cut Vol (CF)	64.3
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	15352.7
Cum Fill Vol (CF)	8435.5
Net Vol (CF)	6917.2



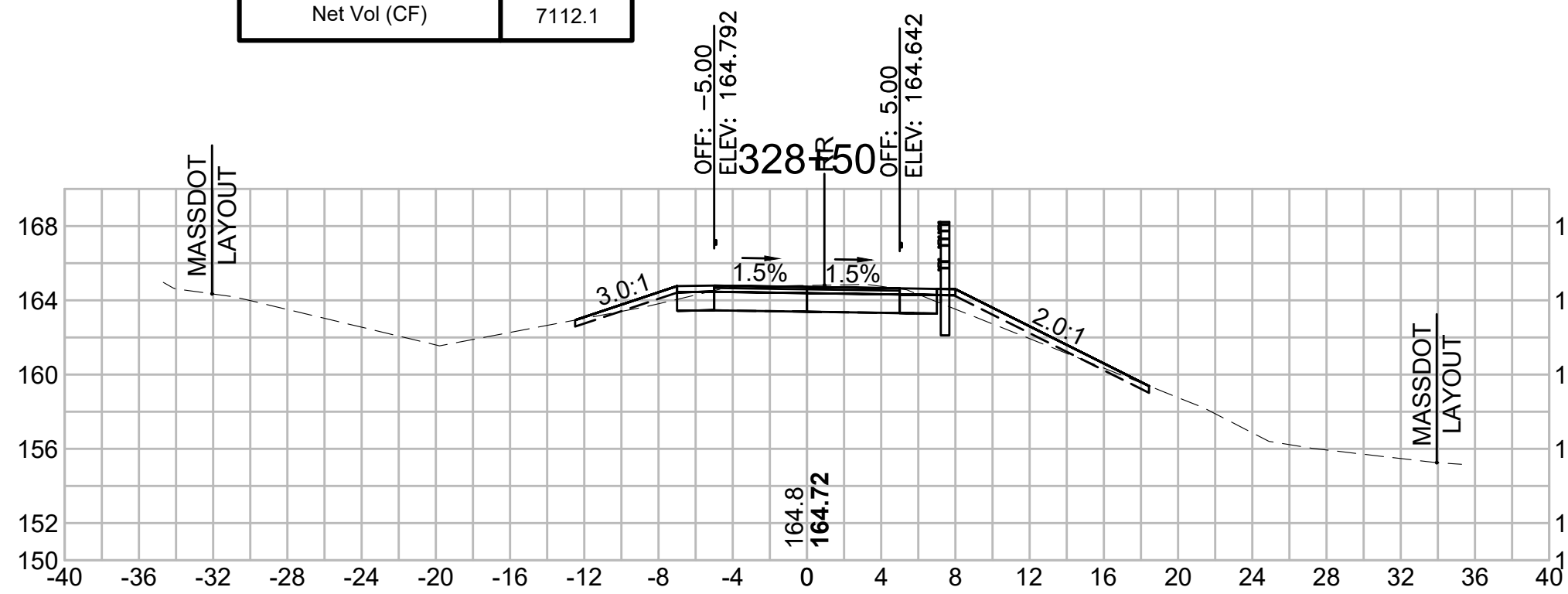
Total Volume at Station 326+00.00	
Cut Area (SF)	10.046
Fill Area (SF)	0.925
Cut Vol (CF)	29.3
Fill Vol (CF)	1.1
Cum Cut Vol (CF)	15433.3
Cum Fill Vol (CF)	8437.0
Net Vol (CF)	6996.3



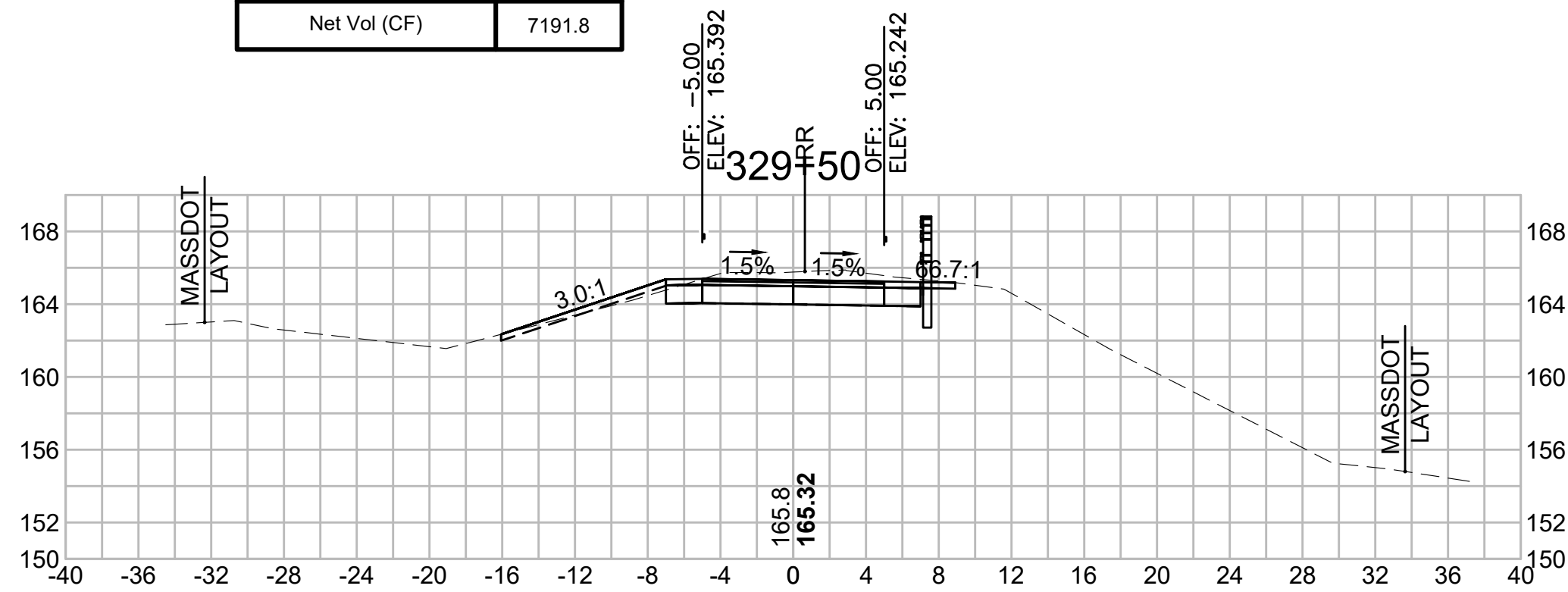
Total Volume at Station 327+50.00	
Cut Area (SF)	18.077
Fill Area (SF)	3.265
Cut Vol (CF)	33.9
Fill Vol (CF)	4.2
Cum Cut Vol (CF)	15512.8
Cum Fill Vol (CF)	8448.2
Net Vol (CF)	7064.5



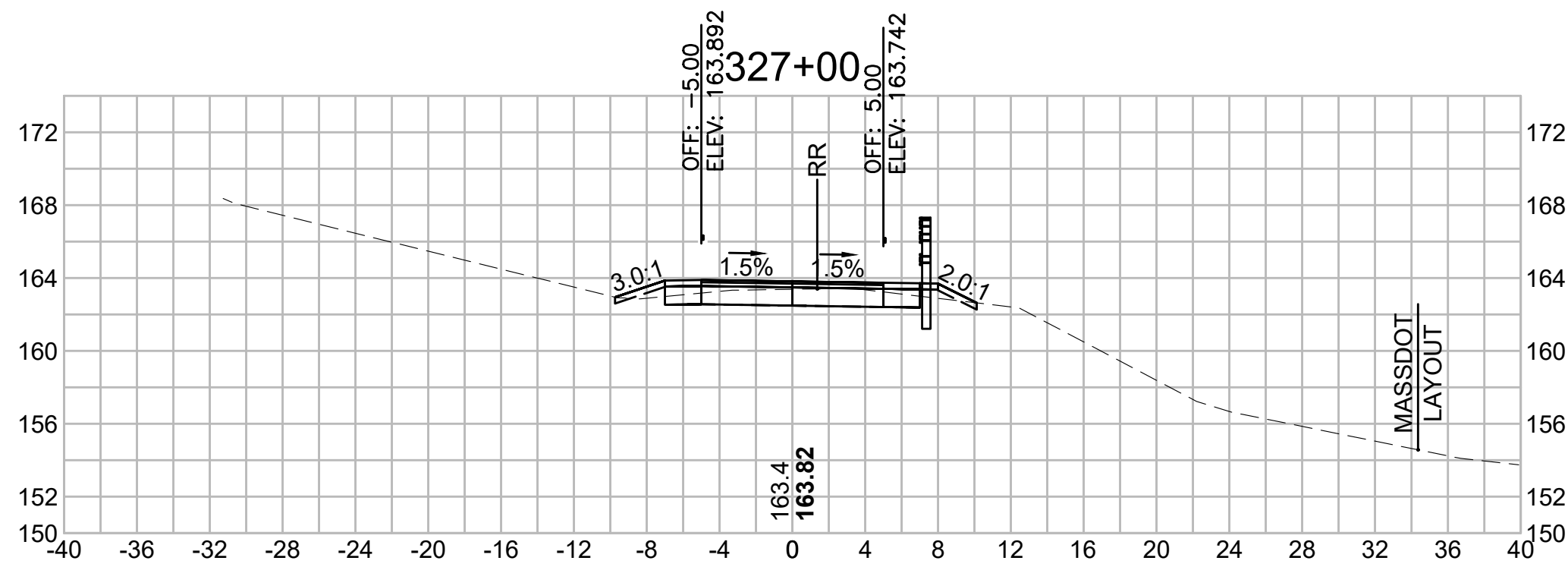
Total Volume at Station 328+50.00	
Cut Area (SF)	18.666
Fill Area (SF)	3.588
Cut Vol (CF)	33.0
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	15578.3
Cum Fill Vol (CF)	8466.2
Net Vol (CF)	7112.1



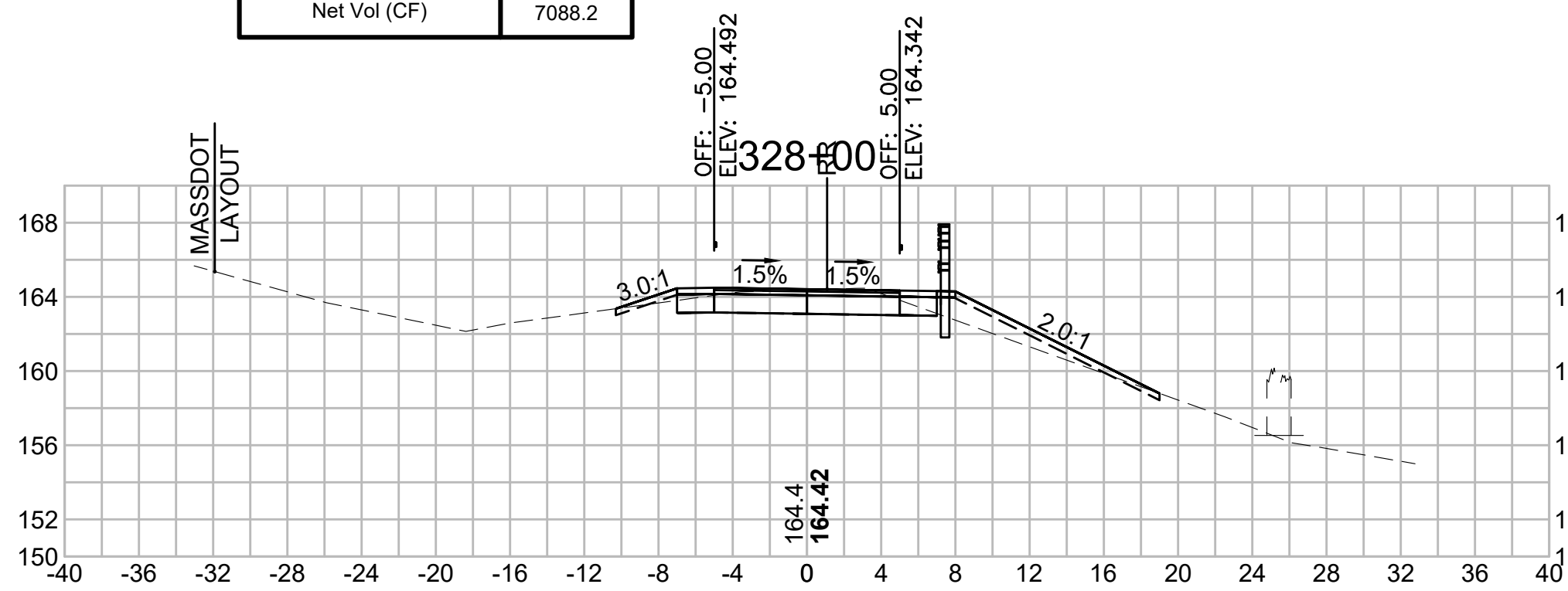
Total Volume at Station 329+50.00	
Cut Area (SF)	24.875
Fill Area (SF)	0.622
Cut Vol (CF)	44.8
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	15662.1
Cum Fill Vol (CF)	8470.4
Net Vol (CF)	7191.8



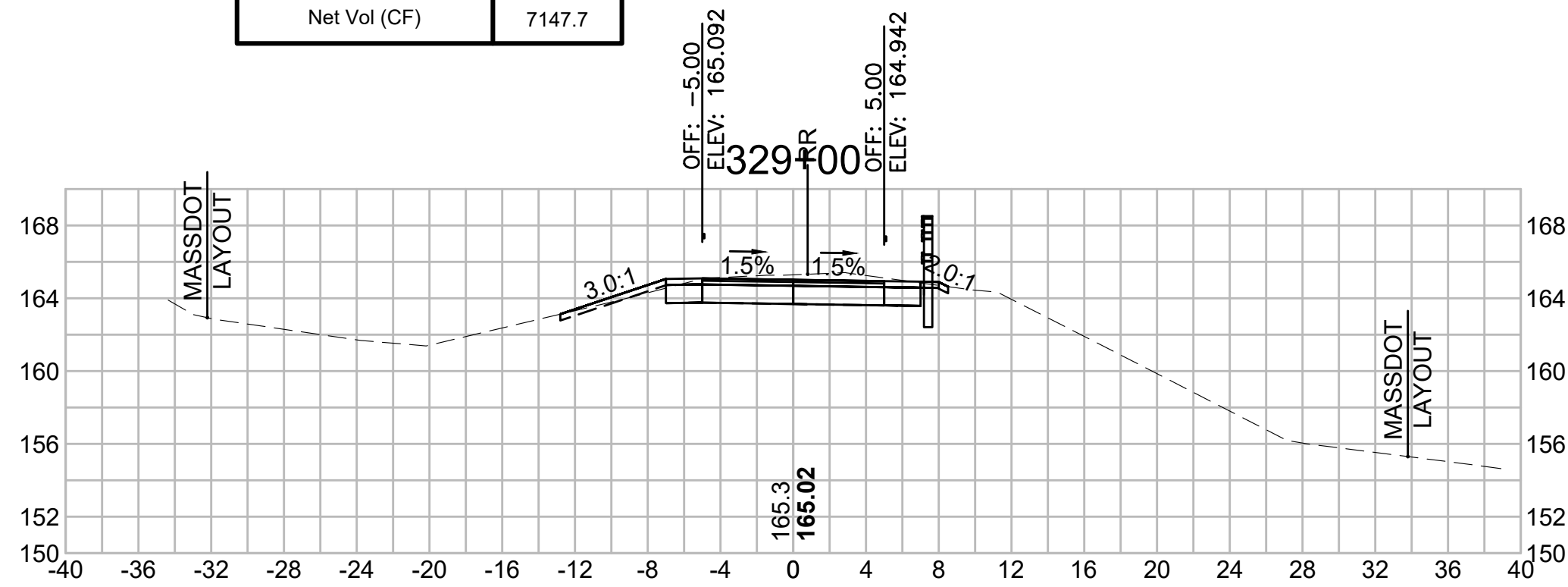
Total Volume at Station 327+00.00	
Cut Area (SF)	18.500
Fill Area (SF)	1.258
Cut Vol (CF)	26.7
Fill Vol (CF)	3.7
Cum Cut Vol (CF)	15478.9
Cum Fill Vol (CF)	8444.1
Net Vol (CF)	7034.9



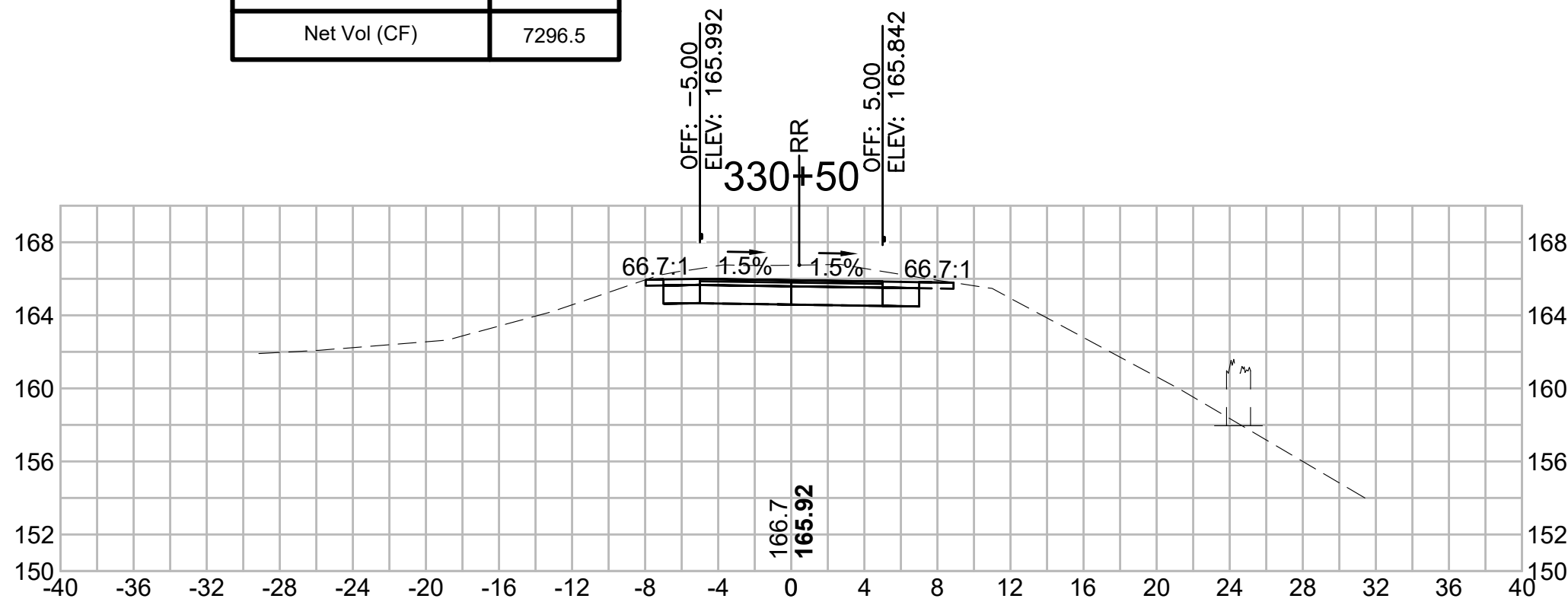
Total Volume at Station 328+00.00	
Cut Area (SF)	16.999
Fill Area (SF)	6.252
Cut Vol (CF)	32.5
Fill Vol (CF)	8.8
Cum Cut Vol (CF)	15545.3
Cum Fill Vol (CF)	8457.1
Net Vol (CF)	7088.2



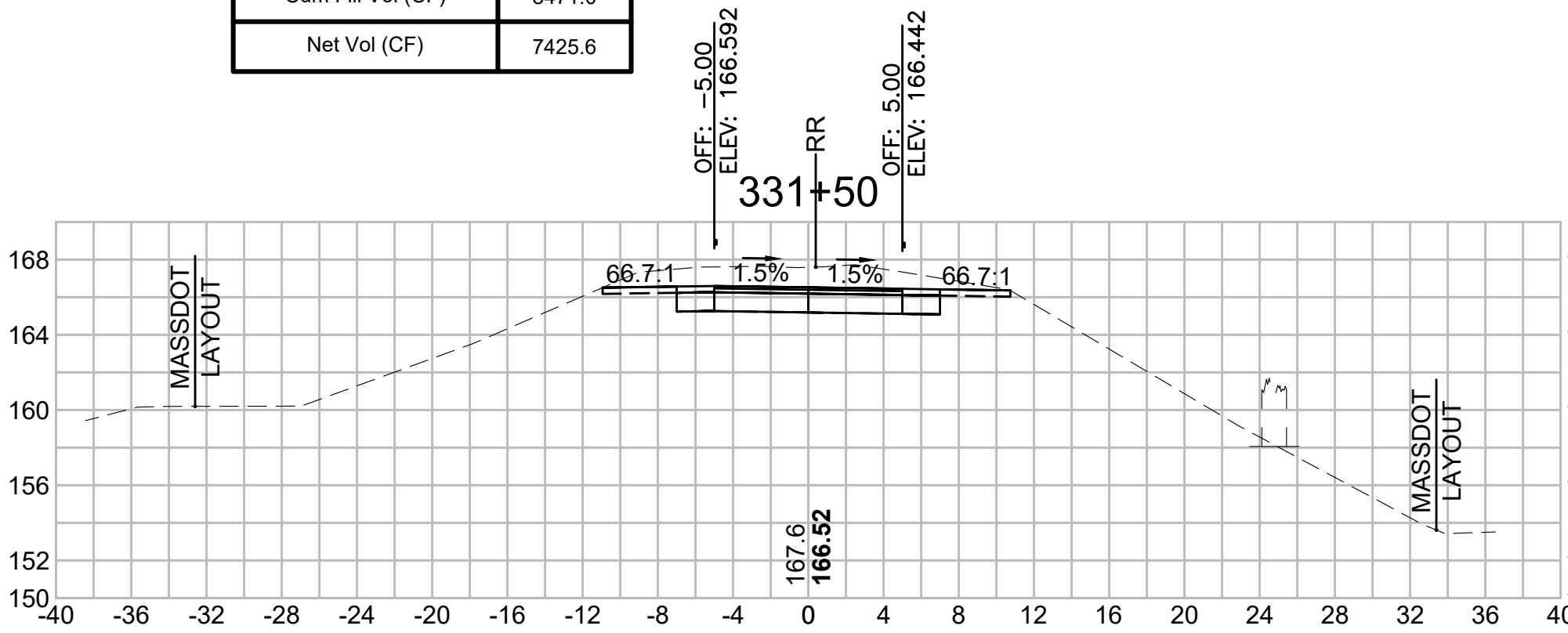
Total Volume at Station 329+00.00	
Cut Area (SF)	23.511
Fill Area (SF)	0.168
Cut Vol (CF)	39.1
Fill Vol (CF)	3.5
Cum Cut Vol (CF)	15617.3
Cum Fill Vol (CF)	8469.6
Net Vol (CF)	7147.7



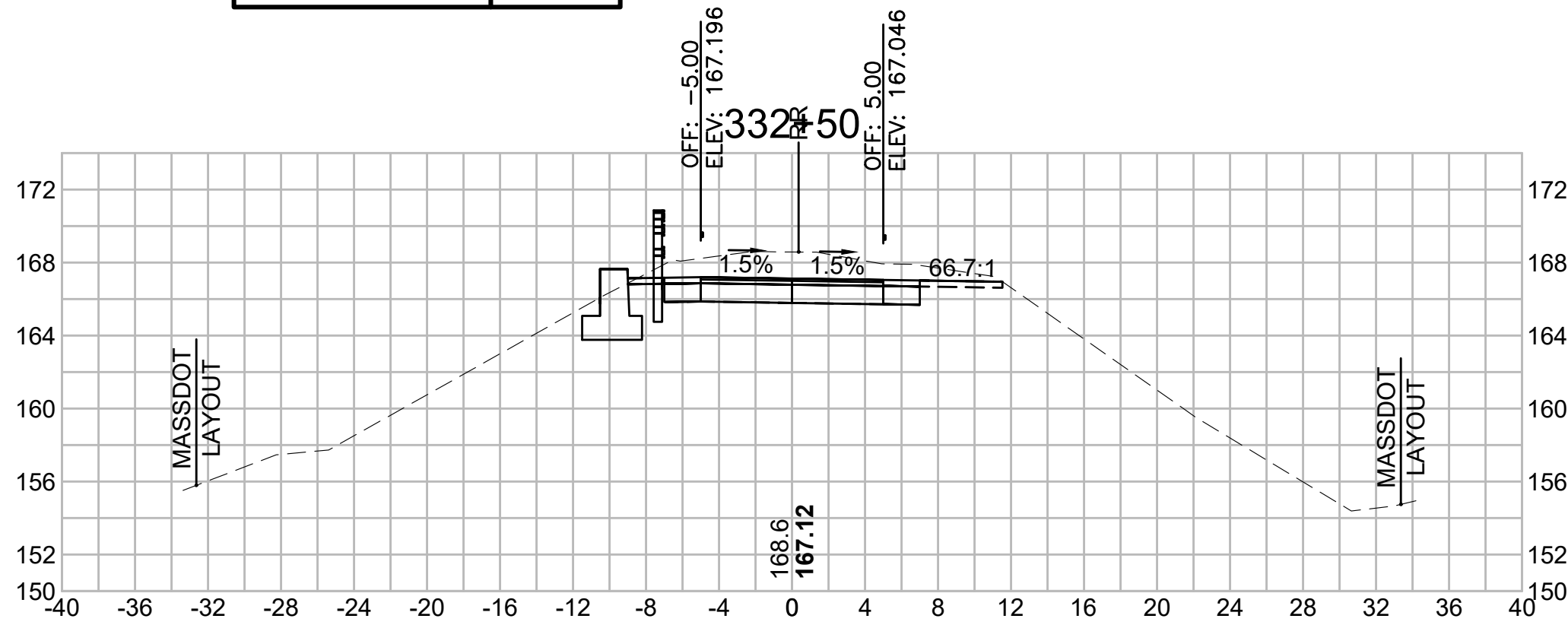
Total Volume at Station 330+50.00	
Cut Area (SF)	31.474
Fill Area (SF)	0.000
Cut Vol (CF)	55.7
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15767.4
Cum Fill Vol (CF)	8471.0
Net Vol (CF)	7296.5



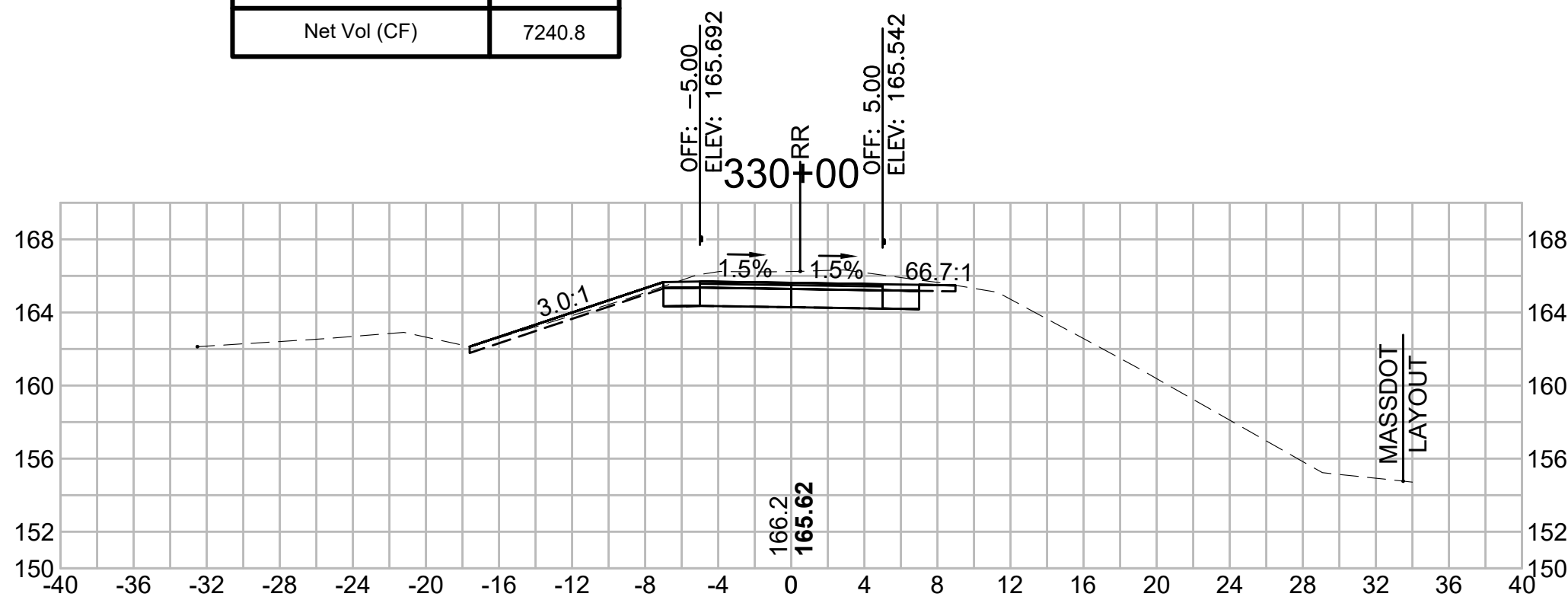
Total Volume at Station 331+50.00	
Cut Area (SF)	39.244
Fill Area (SF)	0.000
Cut Vol (CF)	68.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15896.6
Cum Fill Vol (CF)	8471.0
Net Vol (CF)	7425.6



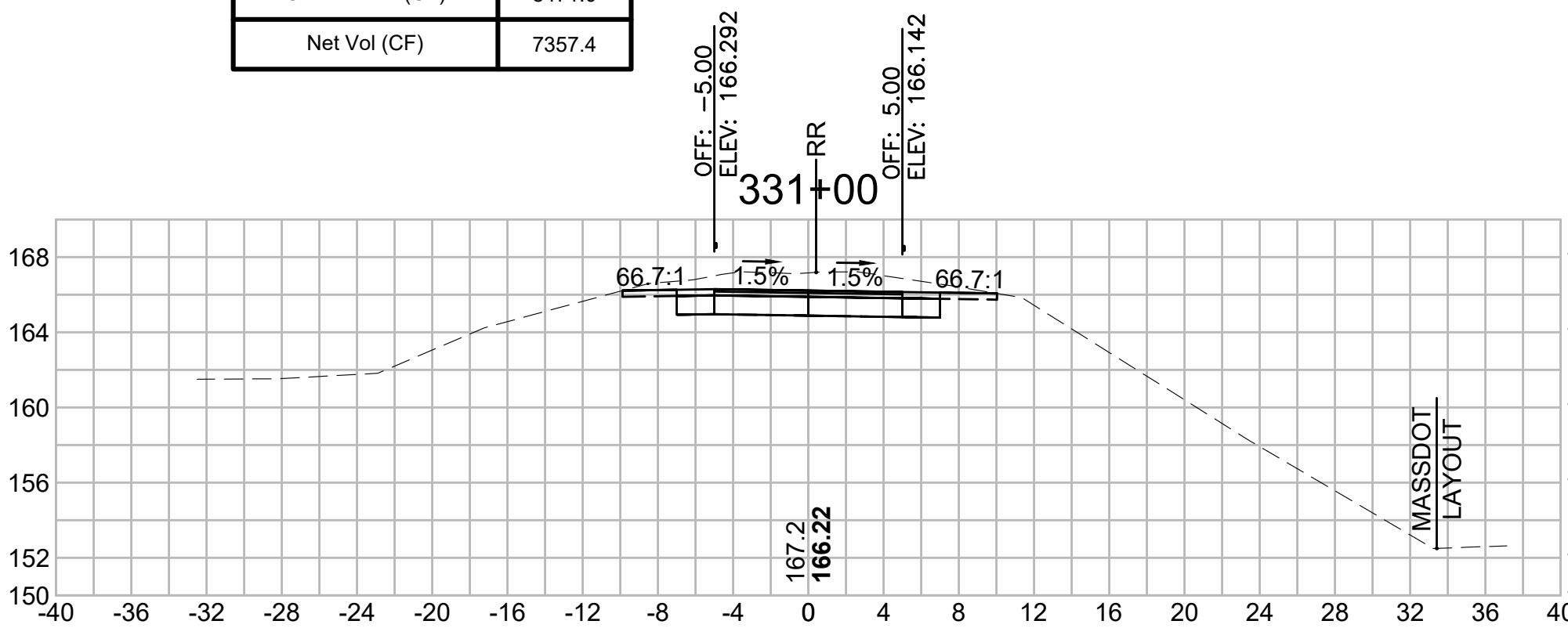
Total Volume at Station 332+50.00	
Cut Area (SF)	49.165
Fill Area (SF)	0.634
Cut Vol (CF)	85.6
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	16058.6
Cum Fill Vol (CF)	8471.5
Net Vol (CF)	7587.0



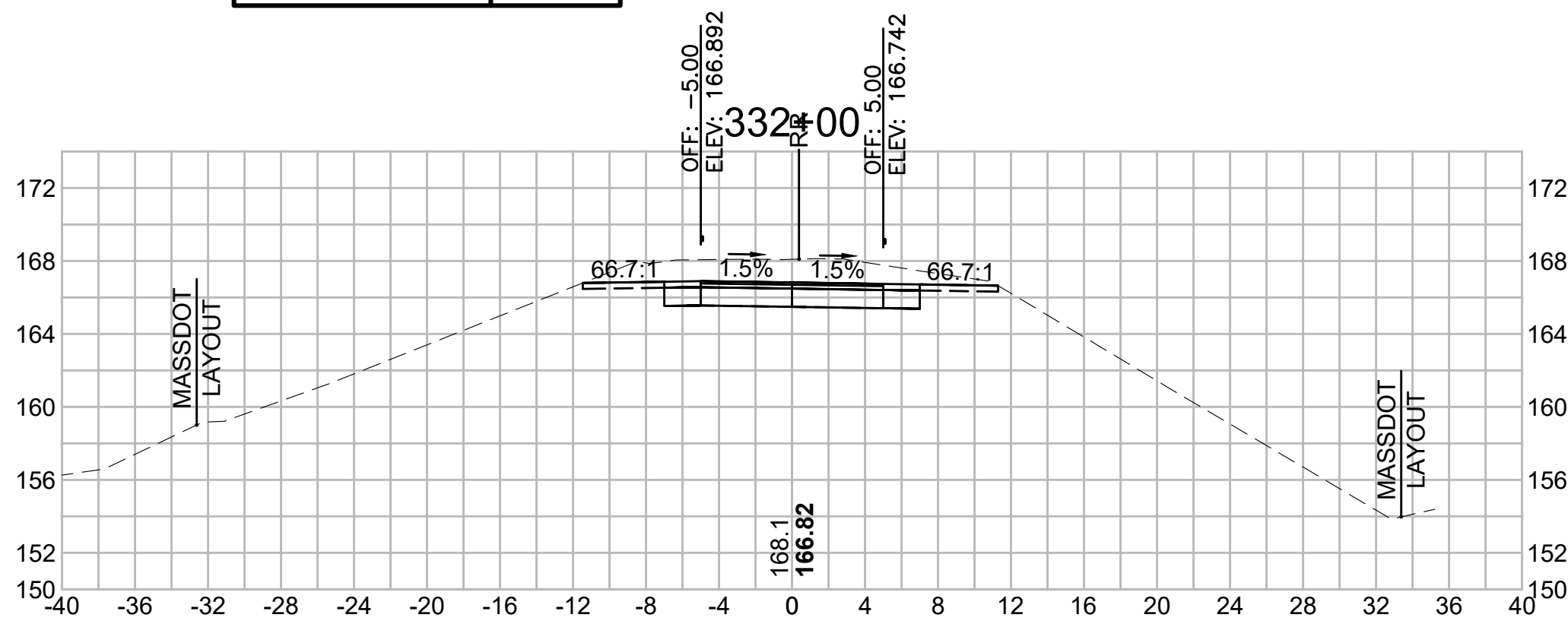
Total Volume at Station 330+00.00	
Cut Area (SF)	28.671
Fill Area (SF)	0.000
Cut Vol (CF)	49.6
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	15711.7
Cum Fill Vol (CF)	8471.0
Net Vol (CF)	7240.8



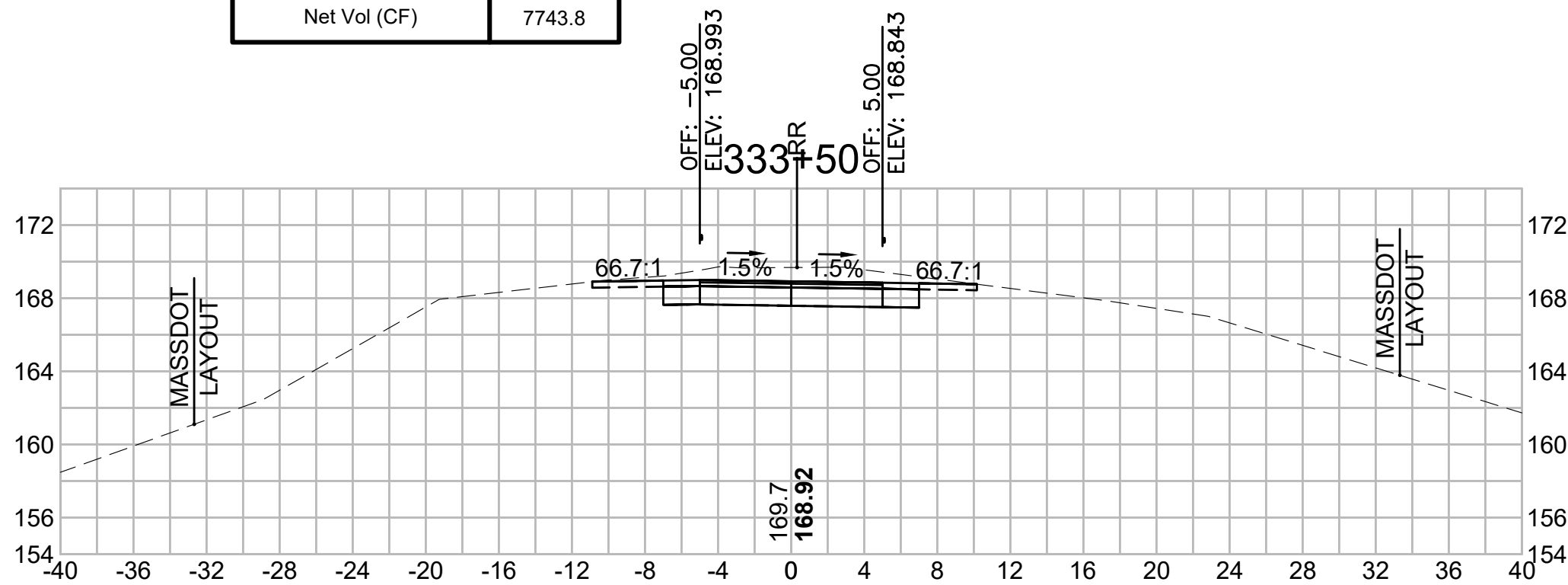
Total Volume at Station 331+00.00	
Cut Area (SF)	34.386
Fill Area (SF)	0.000
Cut Vol (CF)	61.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15828.4
Cum Fill Vol (CF)	8471.0
Net Vol (CF)	7357.4



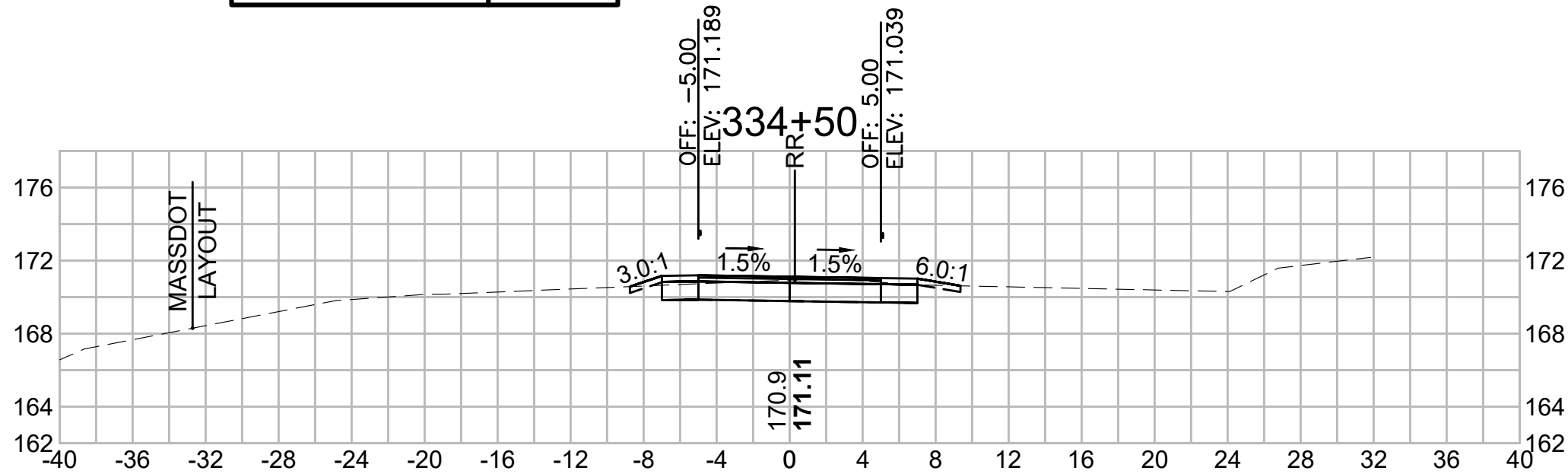
Total Volume at Station 332+00.00	
Cut Area (SF)	43.286
Fill Area (SF)	0.000
Cut Vol (CF)	76.4
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	15973.0
Cum Fill Vol (CF)	8471.0
Net Vol (CF)	7502.0



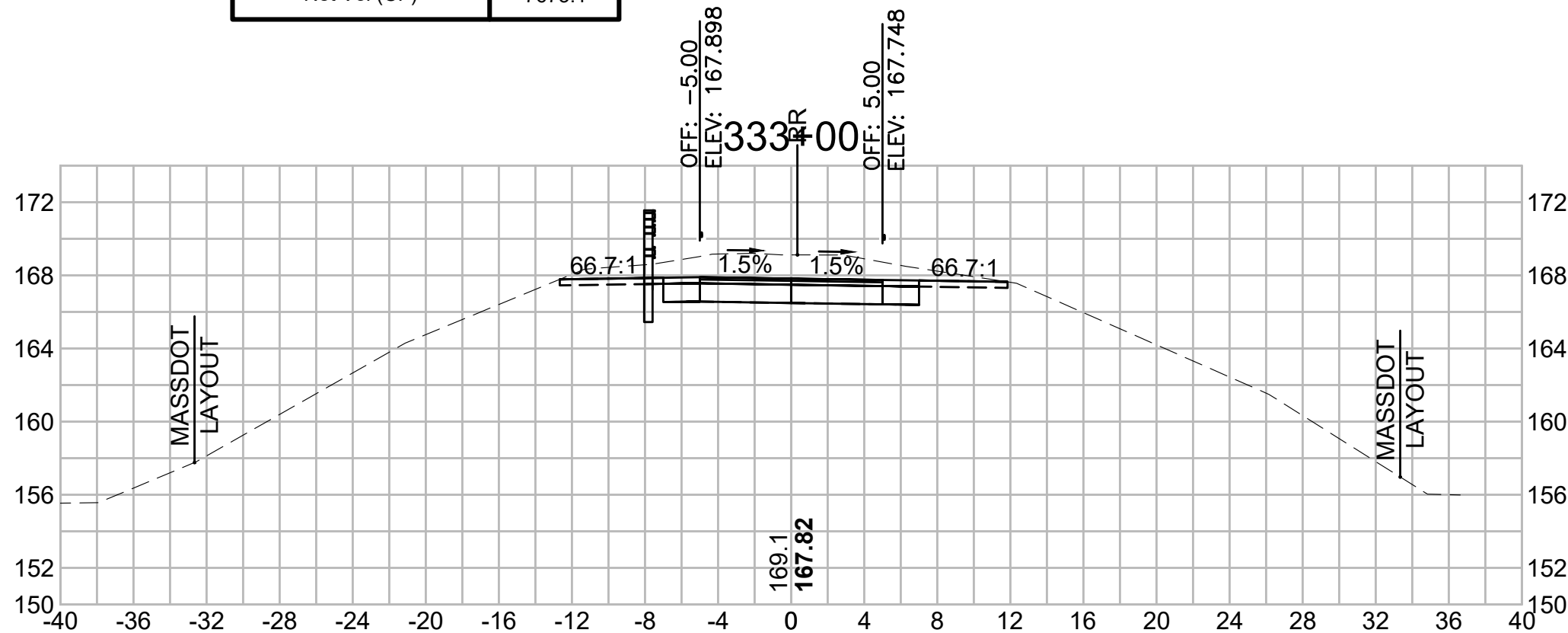
Total Volume at Station 333+50.00	
Cut Area (SF)	31.997
Fill Area (SF)	0.000
Cut Vol (CF)	70.8
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	16216.0
Cum Fill Vol (CF)	8472.2
Net Vol (CF)	7743.8



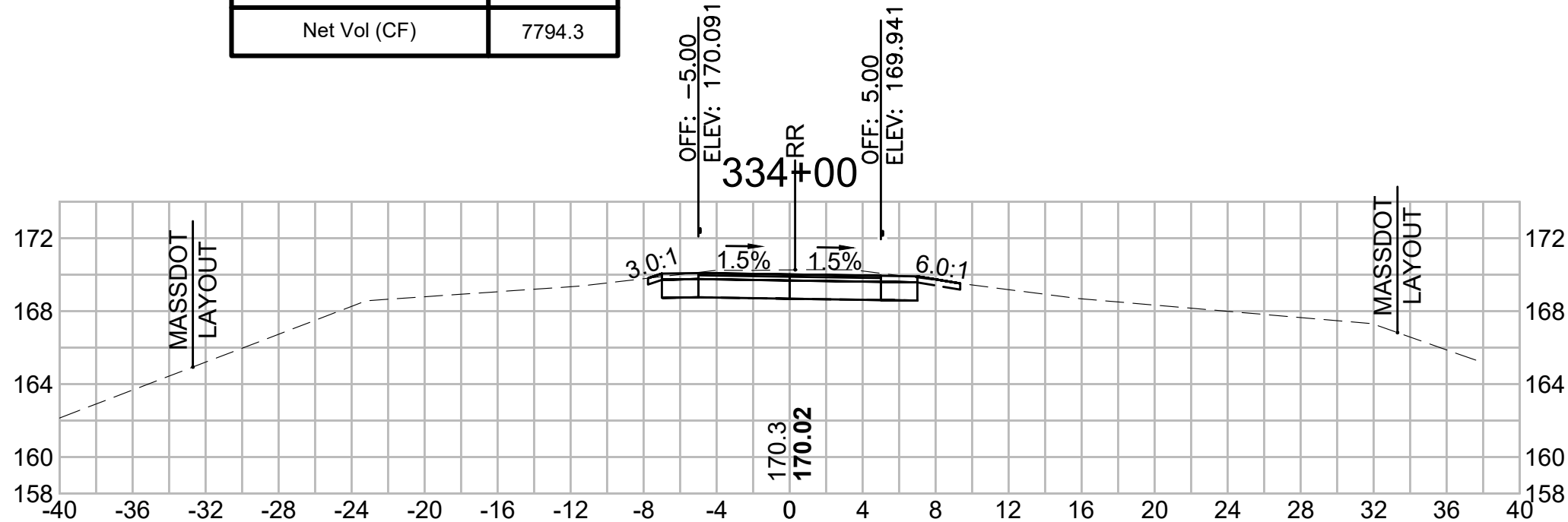
Total Volume at Station 334+50.00	
Cut Area (SF)	18.660
Fill Area (SF)	0.046
Cut Vol (CF)	38.3
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	16305.0
Cum Fill Vol (CF)	8472.7
Net Vol (CF)	7832.3



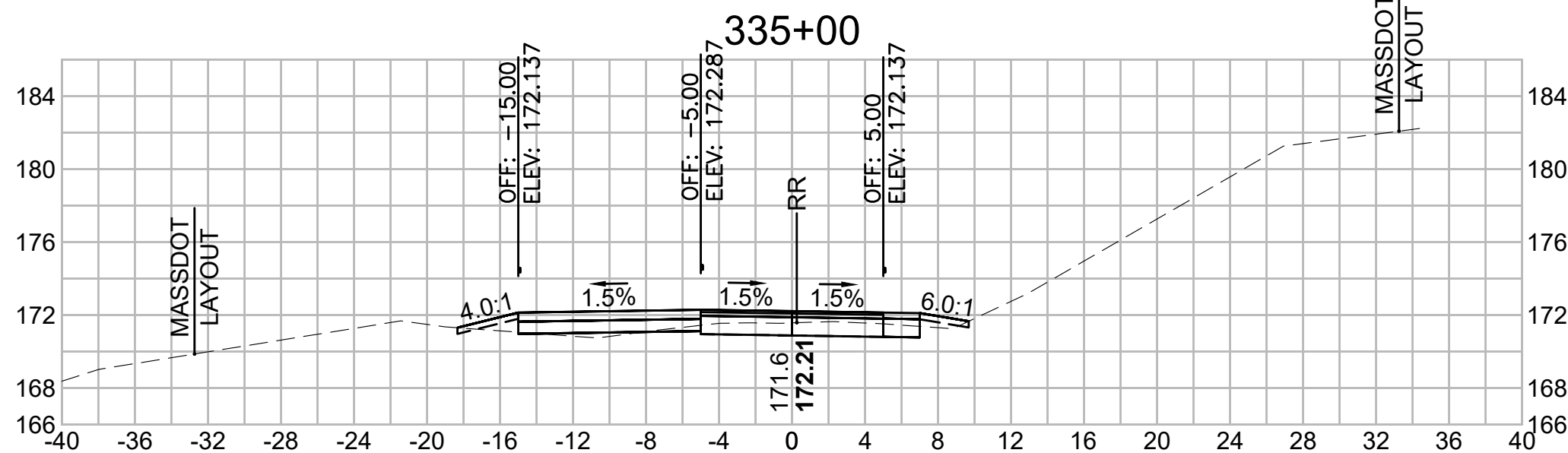
Total Volume at Station 333+00.00	
Cut Area (SF)	44.440
Fill Area (SF)	0.040
Cut Vol (CF)	86.7
Fill Vol (CF)	0.6
Cum Cut Vol (CF)	16145.3
Cum Fill Vol (CF)	8472.2
Net Vol (CF)	7673.1

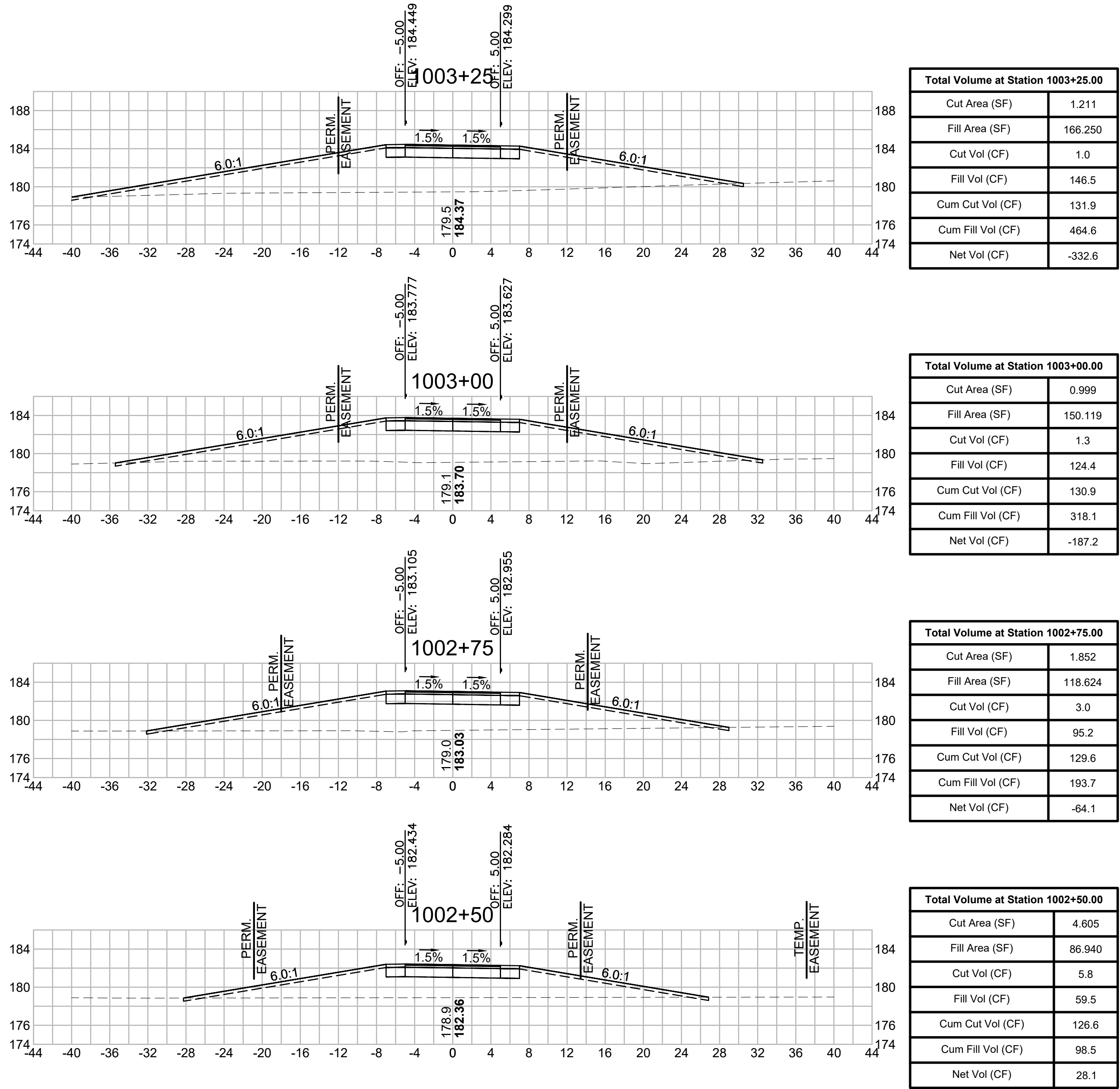
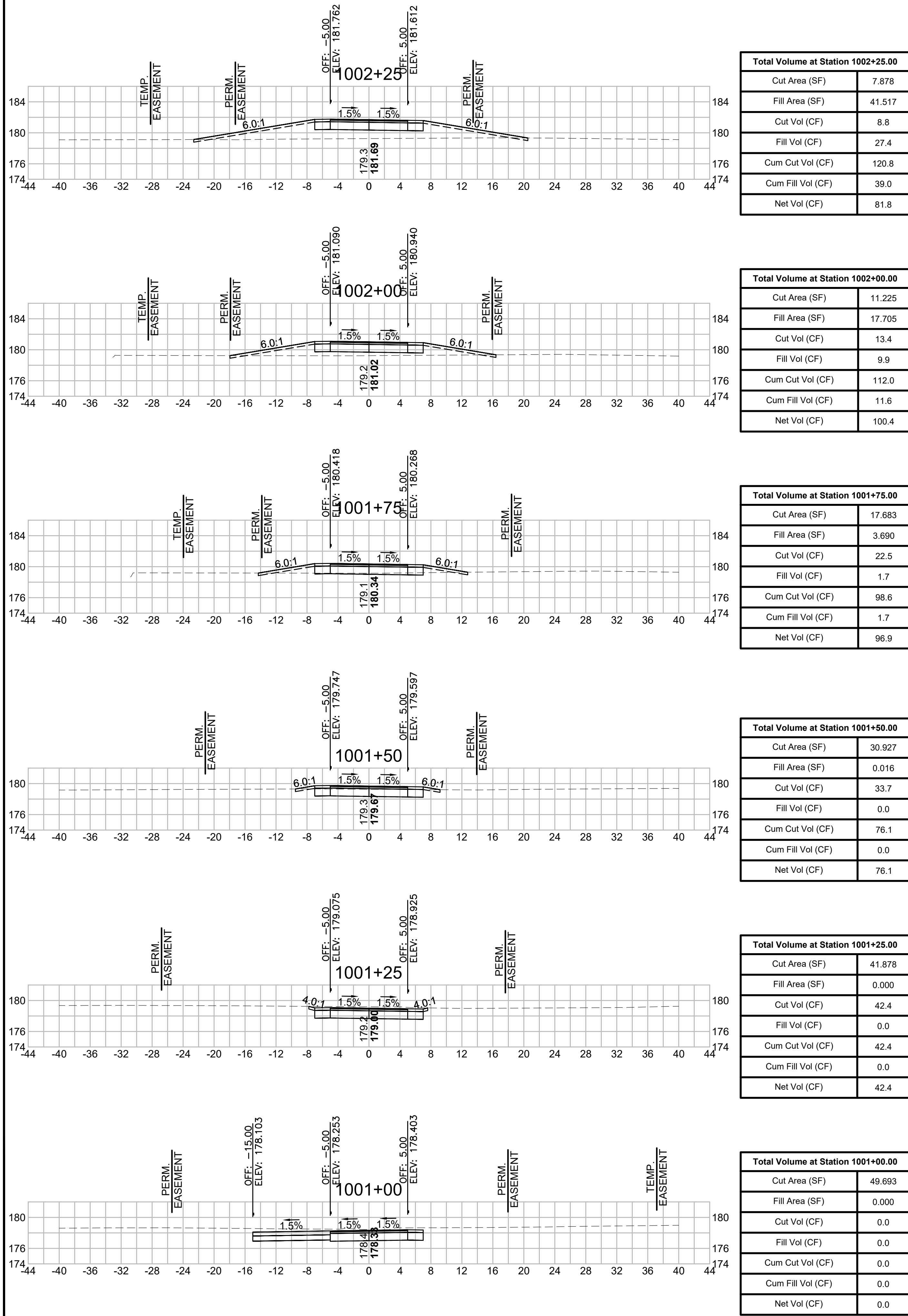


Total Volume at Station 334+00.00	
Cut Area (SF)	22.718
Fill Area (SF)	0.248
Cut Vol (CF)	50.7
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	16266.7
Cum Fill Vol (CF)	8472.4
Net Vol (CF)	7794.3



Total Volume at Station 335+00.00	
Cut Area (SF)	9.103
Fill Area (SF)	2.279
Cut Vol (CF)	25.7
Fill Vol (CF)	2.2
Cum Cut Vol (CF)	16330.7
Cum Fill Vol (CF)	8474.9
Net Vol (CF)	7855.9

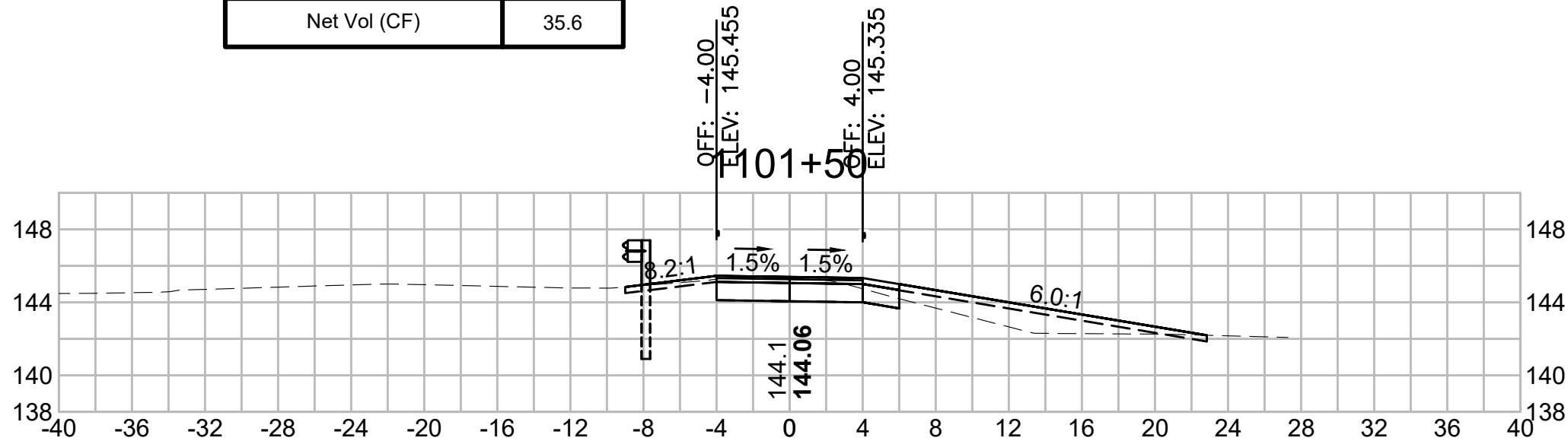




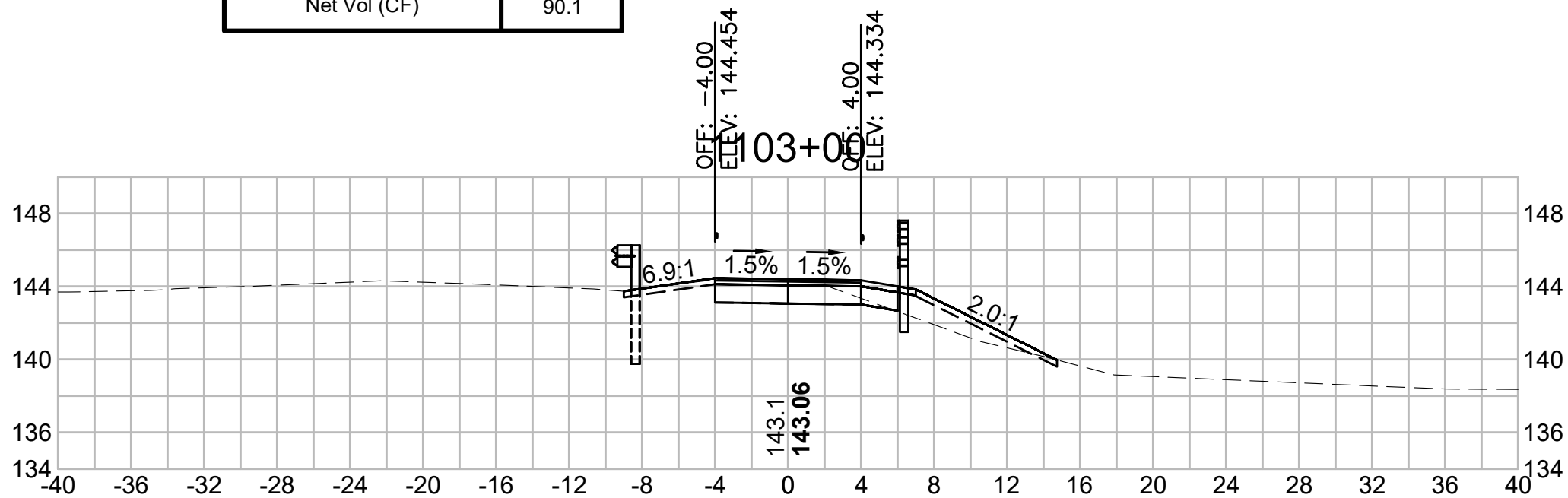
CROSS SECTIONS

DAVIS FIELD ACCESS PATH

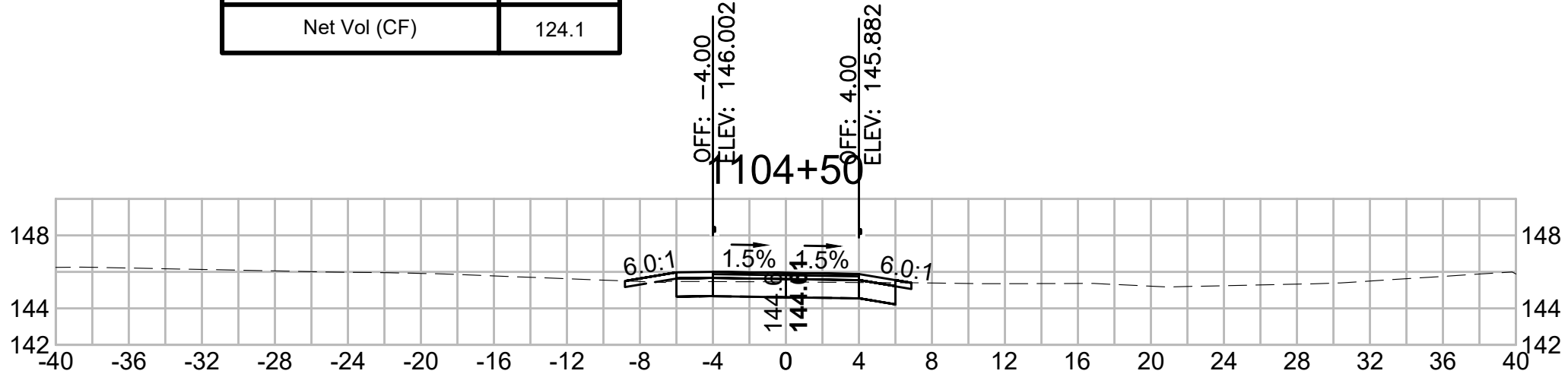
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Cut Area (SF)	12.344
Fill Area (SF)	9.860
Cut Vol (CF)	23.6
Fill Vol (CF)	9.1
Cum Cut Vol (CF)	45.0
Cum Fill Vol (CF)	9.5
Net Vol (CF)	35.6



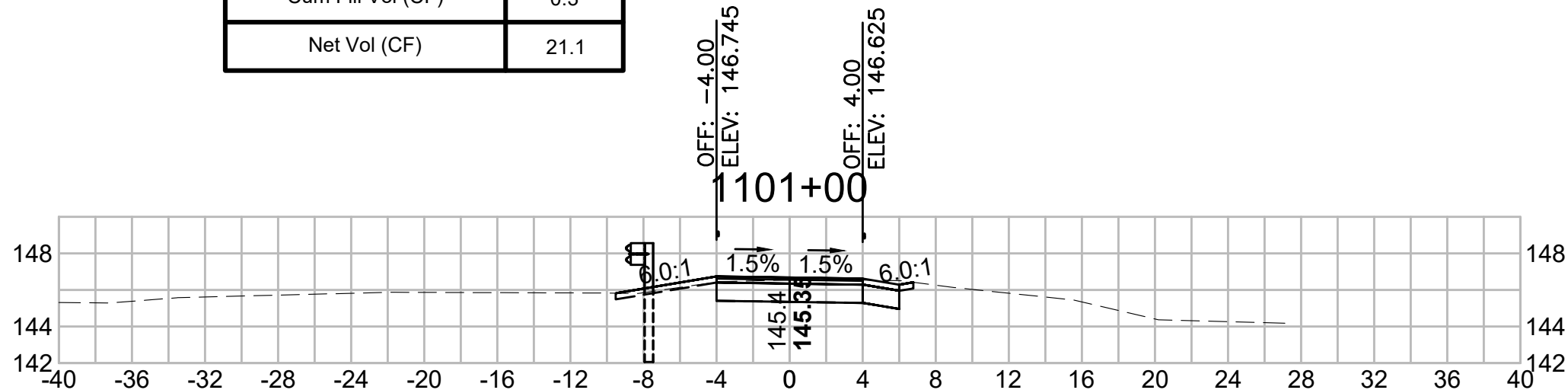
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Cut Area (SF)	11.283
Fill Area (SF)	5.526
Cut Vol (CF)	22.2
Fill Vol (CF)	7.1
Cum Cut Vol (CF)	124.4
Cum Fill Vol (CF)	34.4
Net Vol (CF)	90.1



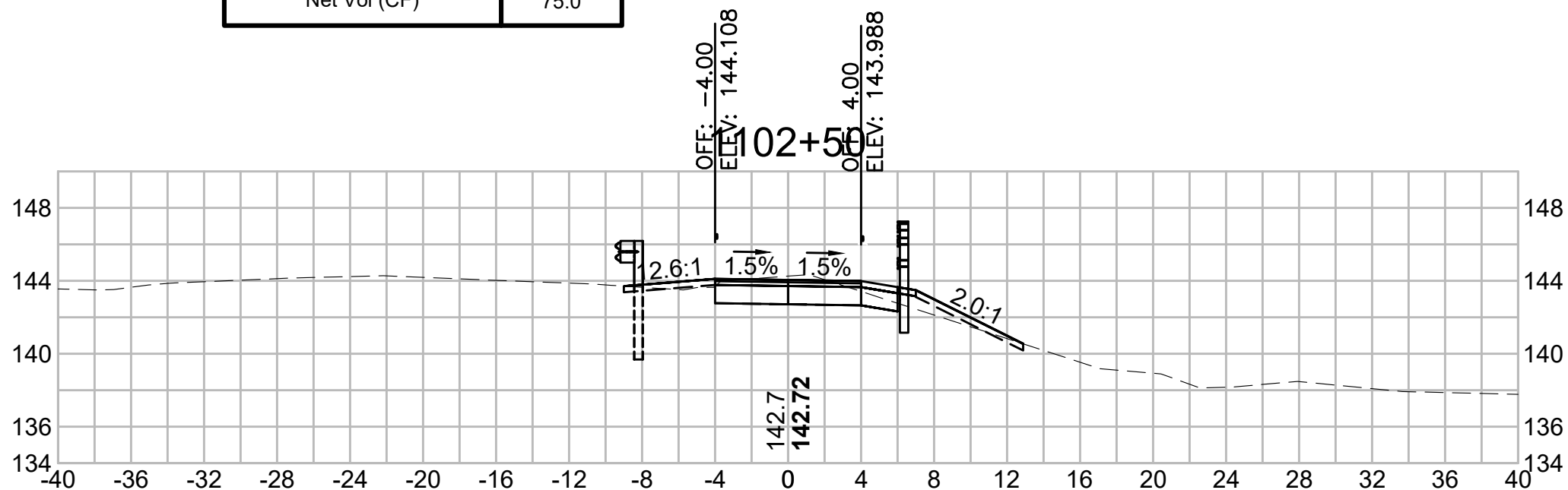
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Cut Area (SF)	10.903
Fill Area (SF)	0.099
Cut Vol (CF)	19.2
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Cum Cut Vol (CF)	178.0
Cum Fill Vol (CF)	54.0
Net Vol (CF)	124.1



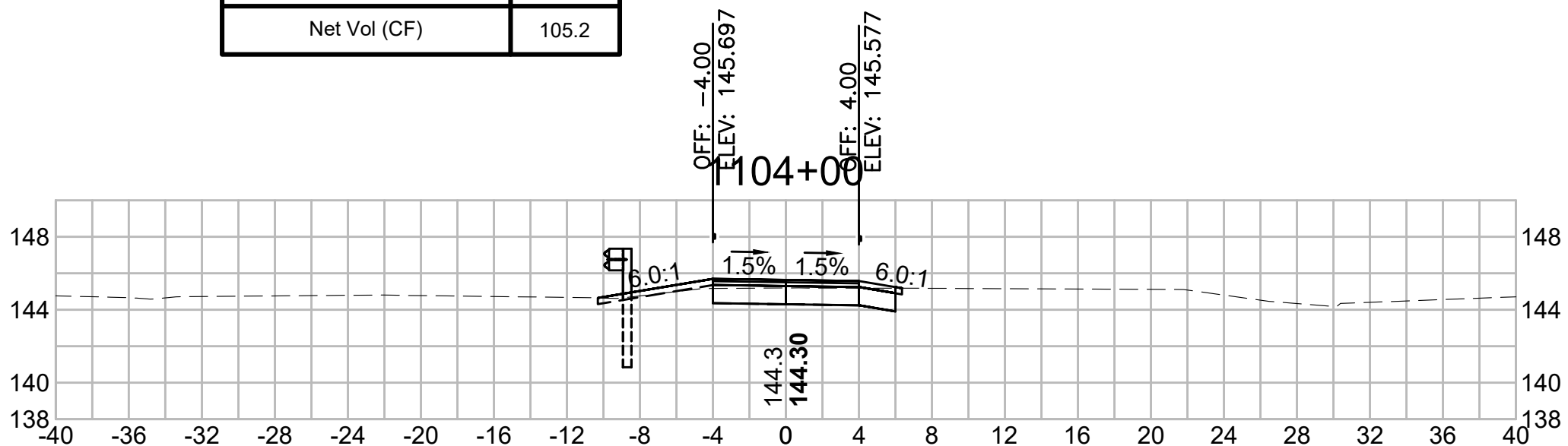
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Cut Area (SF)	13.171
Fill Area (SF)	0.000
Cut Vol (CF)	21.4
Fill Vol (CF)	0.3
Cum Cut Vol (CF)	21.4
Cum Fill Vol (CF)	0.3
Net Vol (CF)	21.1



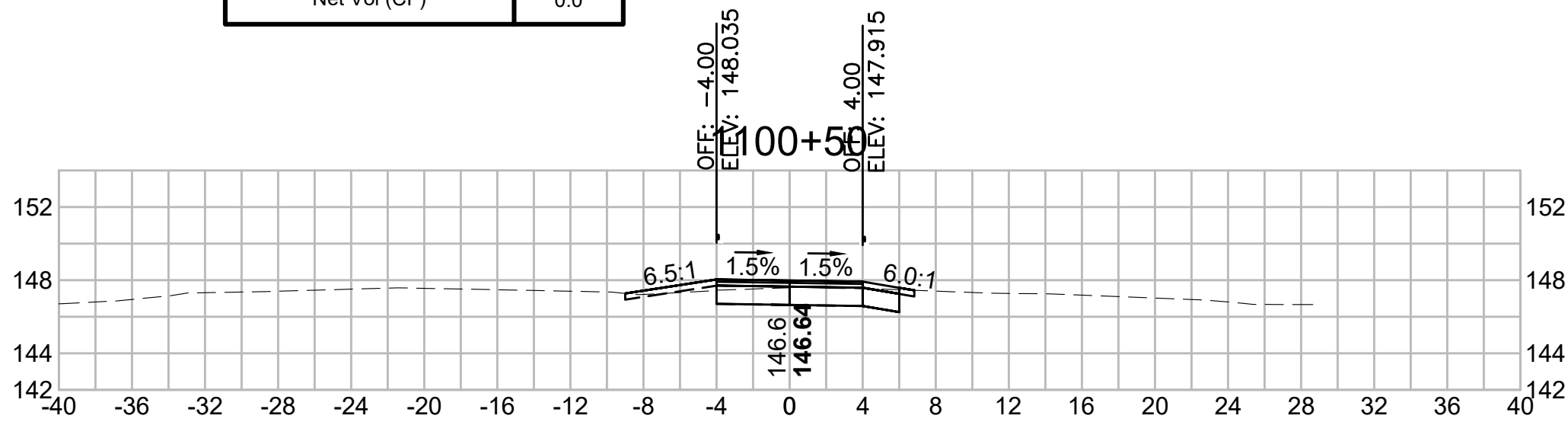
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Fill Area (SF)	2.123
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Cum Cut Vol (CF)	102.2
Cum Fill Vol (CF)	27.3
Net Vol (CF)	75.0



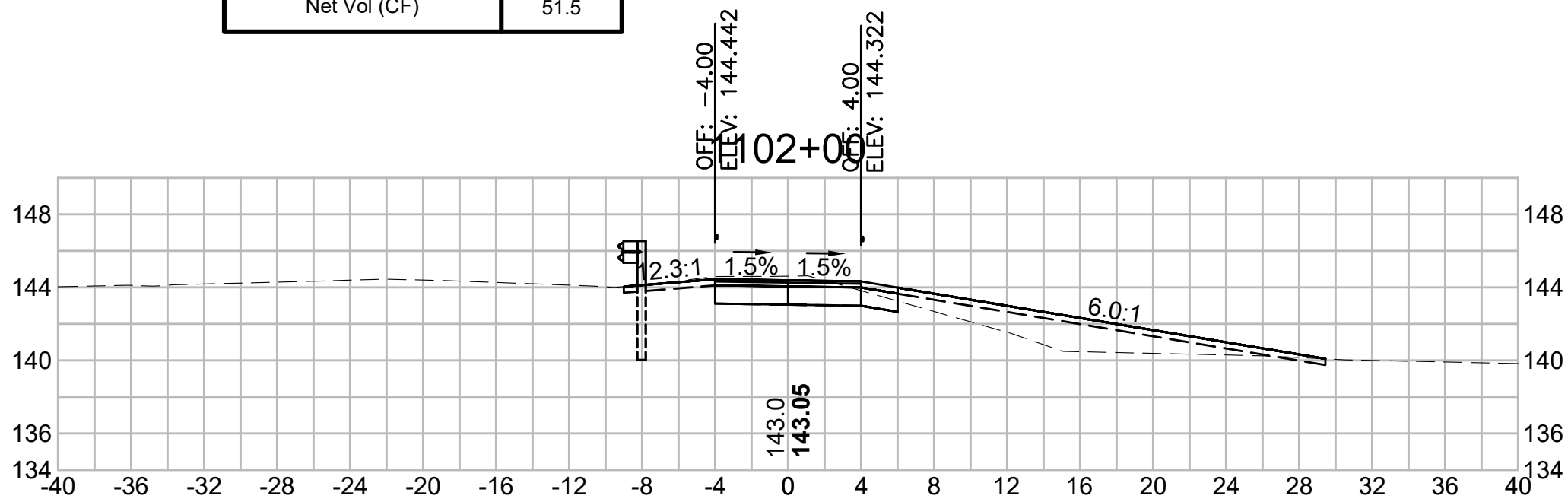
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Fill Area (SF)	0.185
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Fill Vol (CF)	7.2
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Cum Fill Vol (CF)	53.7
Net Vol (CF)	105.2



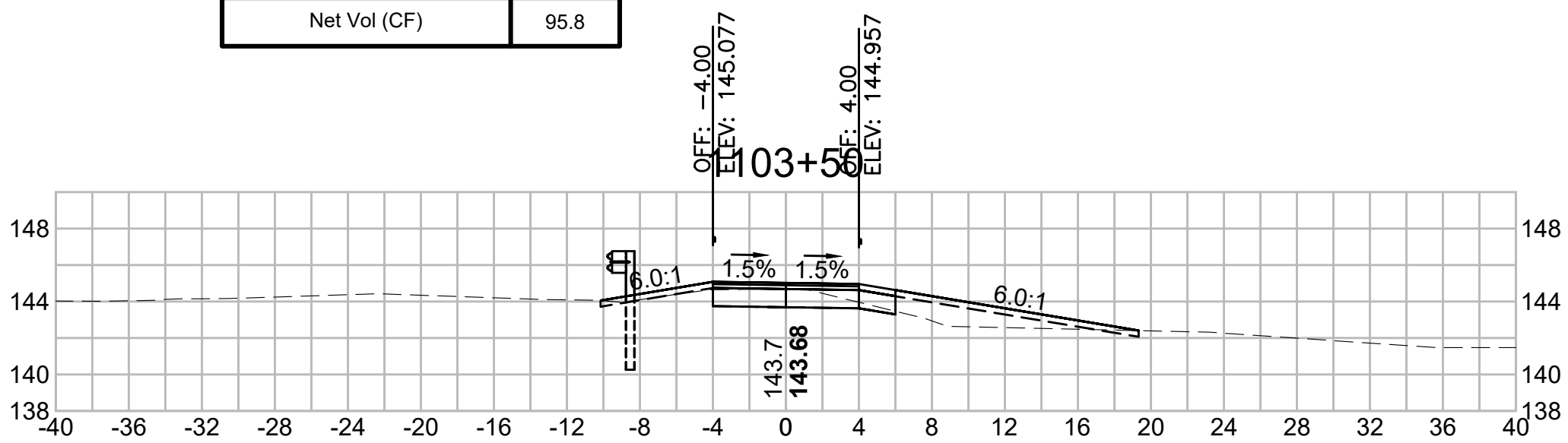
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Cut Area (SF)	9.964
Fill Area (SF)	0.368
Cut Vol (CF)	0.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	0.0
Cum Fill Vol (CF)	0.0
Net Vol (CF)	0.0



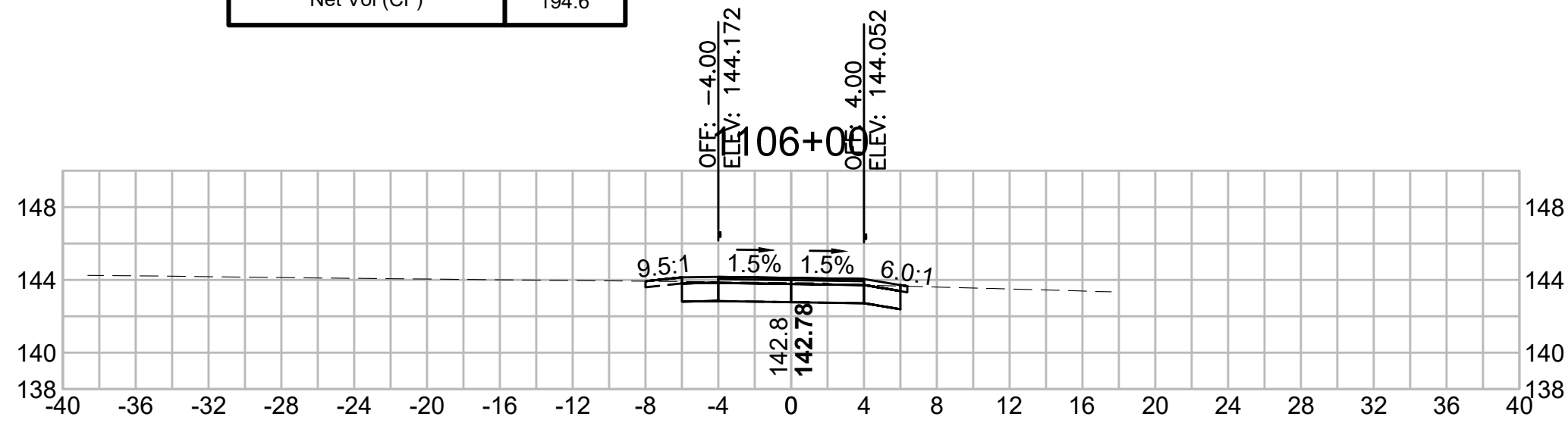
Total Volume at Station 1102+00.00	
Cut Area (SF)	18.374
Fill Area (SF)	3.620
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Cum Cut Vol (CF)	73.5
Cum Fill Vol (CF)	22.0
Net Vol (CF)	51.5



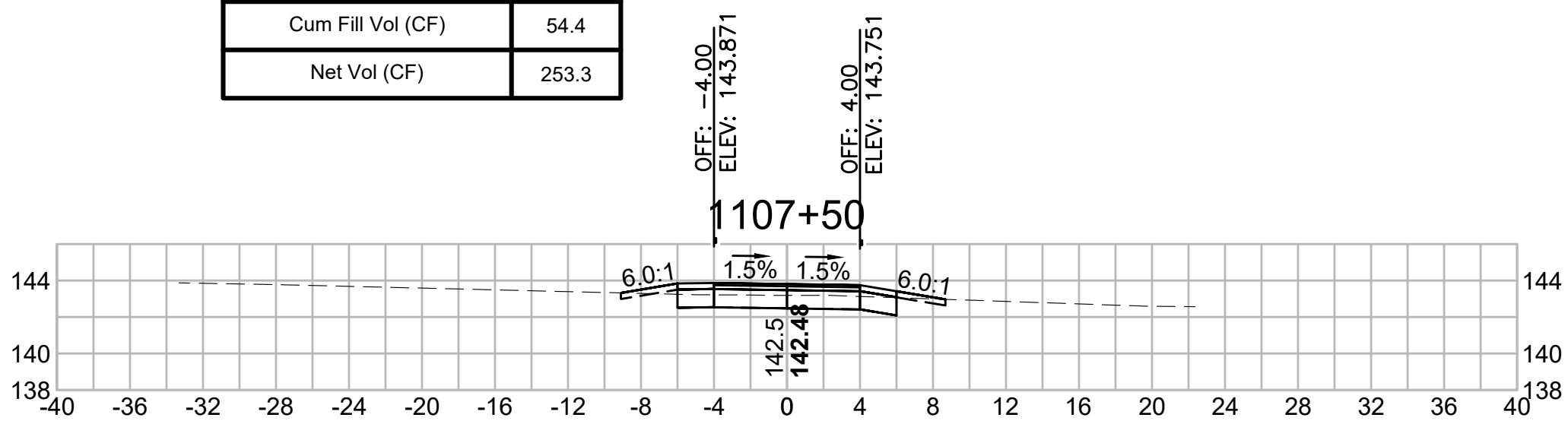
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Cut Area (SF)	8.037
Fill Area (SF)	7.586
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Cum Cut Vol (CF)	142.3
Cum Fill Vol (CF)	46.5
Net Vol (CF)	95.8



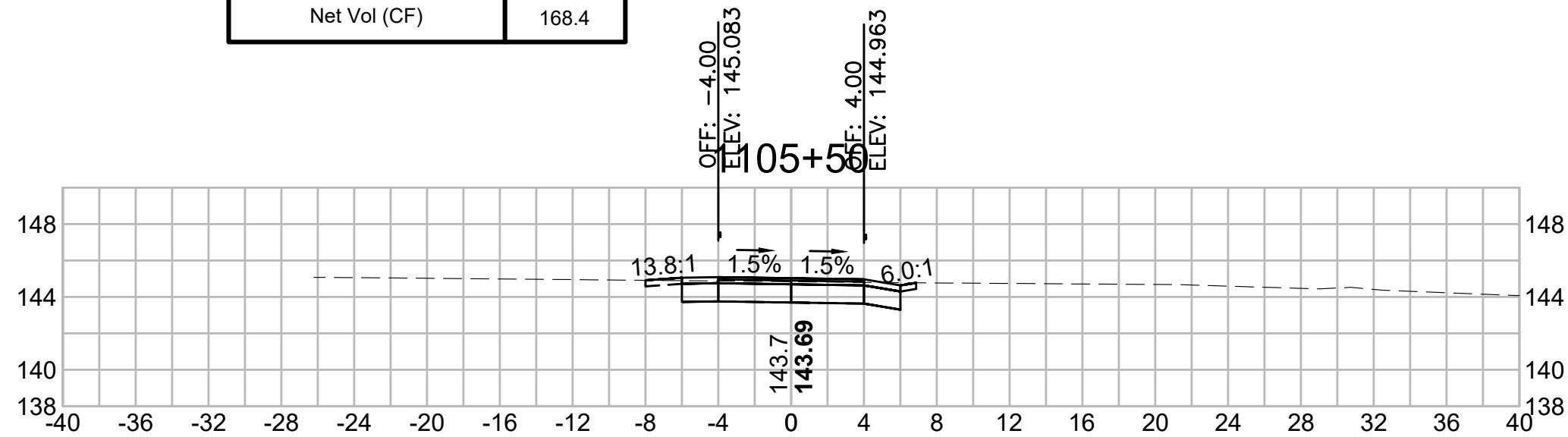
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Cut Area (SF)	13.425
Fill Area (SF)	0.000
Cut Vol (CF)	26.2
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	248.7
Cum Fill Vol (CF)	54.1
Net Vol (CF)	194.6



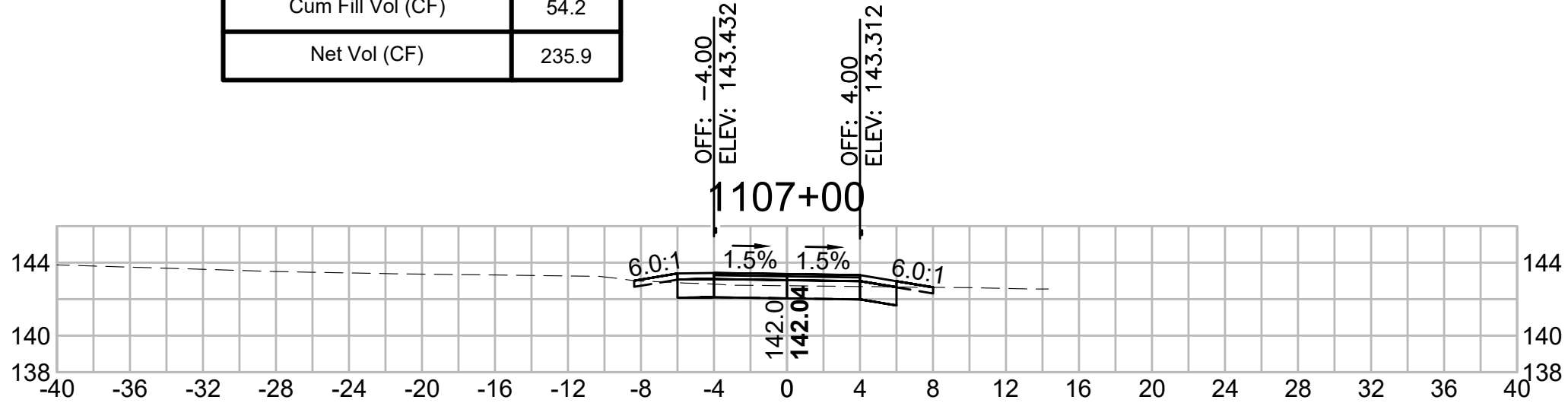
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Fill Area (SF)	0.169
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Fill Vol (CF)	0.2
Cum Cut Vol (CF)	307.6
Cum Fill Vol (CF)	54.4
Net Vol (CF)	253.3



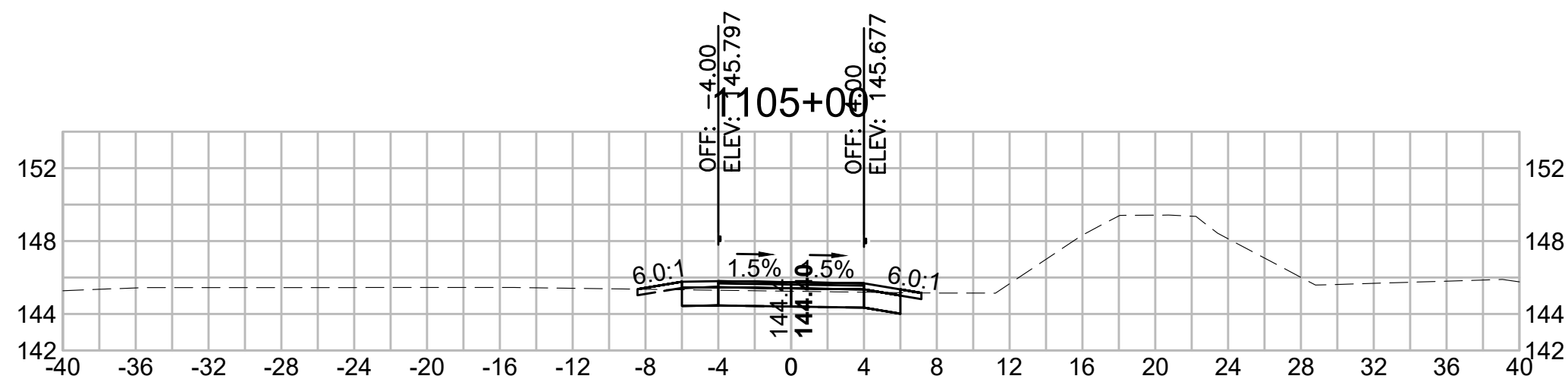
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Cut Area (SF)	14.923
Fill Area (SF)	0.000
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Fill Vol (CF)	0.0
Cum Cut Vol (CF)	222.5
Cum Fill Vol (CF)	54.1
Net Vol (CF)	168.4



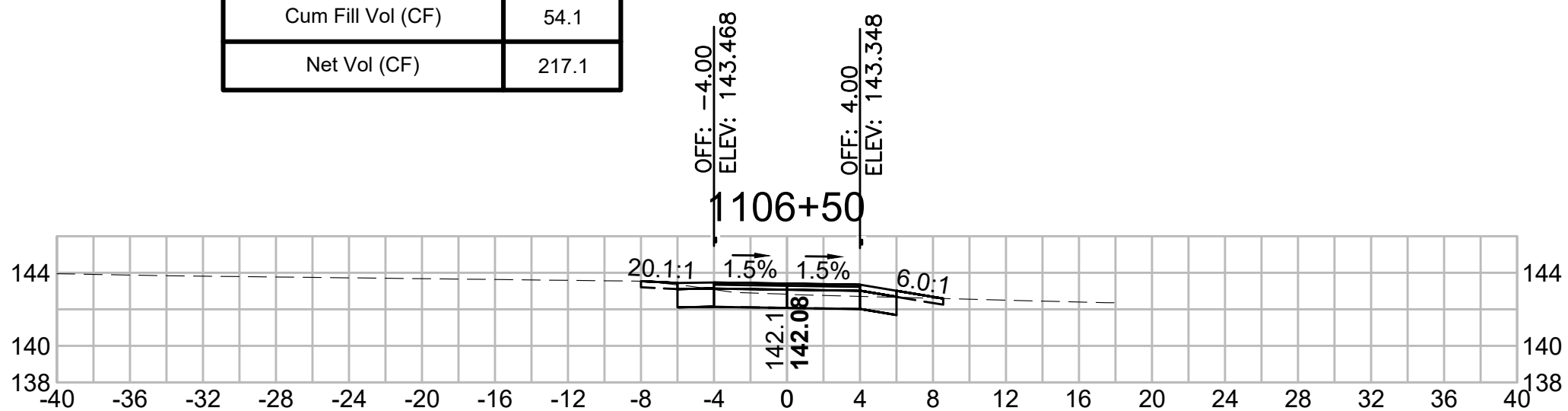
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Cut Area (SF)	9.448
Fill Area (SF)	0.063
Cut Vol (CF)	18.8
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	290.1
Cum Fill Vol (CF)	54.2
Net Vol (CF)	235.9

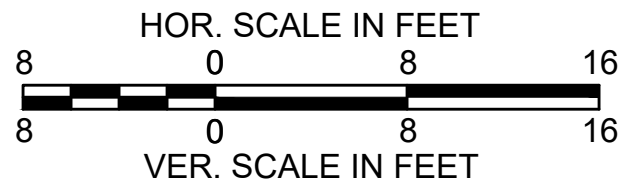


Total Volume at Station 1105+00.00	
Cut Area (SF)	11.073
Fill Area (SF)	0.028
Cut Vol (CF)	20.3
Fill Vol (CF)	0.1
Cum Cut Vol (CF)	198.4
Cum Fill Vol (CF)	54.1
Net Vol (CF)	144.3



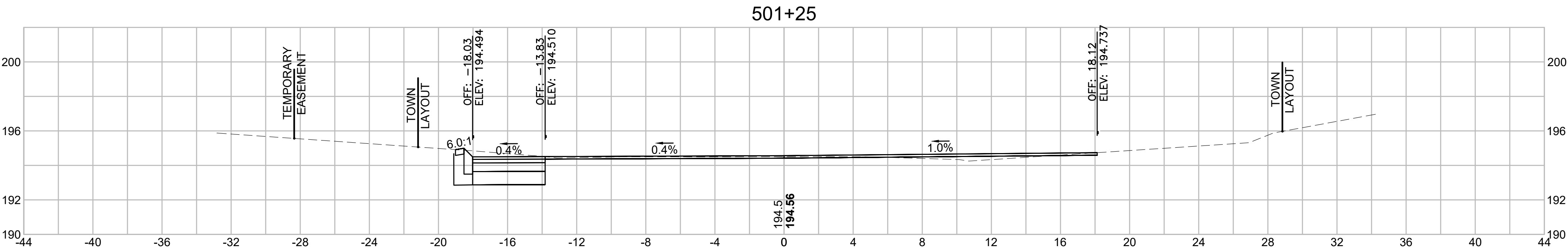
Total Volume at Station 1106+50.00	
Cut Area (SF)	10.901
Fill Area (SF)	0.002
Cut Vol (CF)	22.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	271.2
Cum Fill Vol (CF)	54.1
Net Vol (CF)	217.1



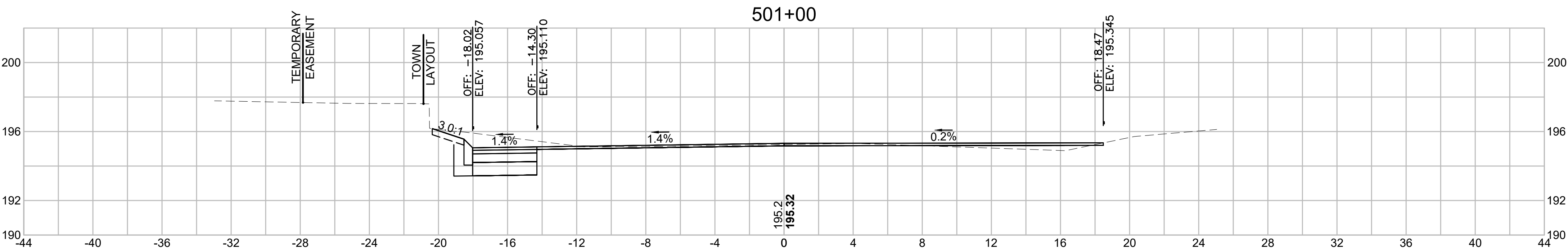


SUDBURY BRUCE FREEMAN RAIL TRAIL			
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MA	XXX-XXXX(XXX)X	305	319
PROJECT FILE NO. 608164			

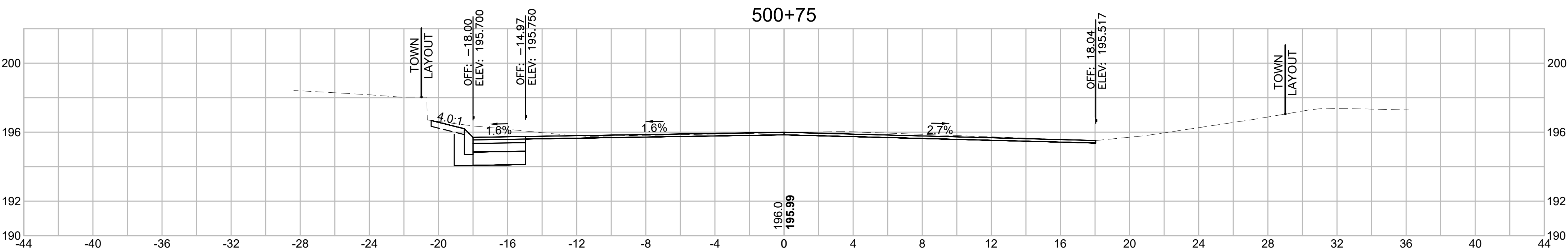
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HUDSON ROAD



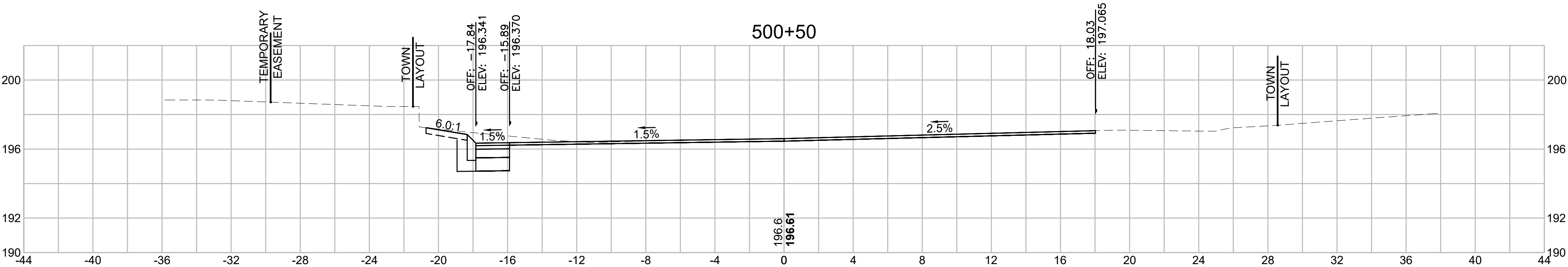
Total Volume at Station 501+25.00	
Cut Area (SF)	19.339
Fill Area (SF)	1.373
Cut Vol (CF)	18.8
Fill Vol (CF)	1.3
Cum Cut Vol (CF)	43.3
Cum Fill Vol (CF)	2.0
Net Vol (CF)	41.3



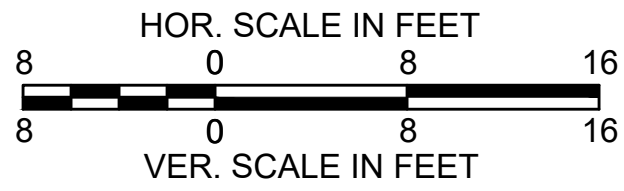
Total Volume at Station 501+00.00	
Cut Area (SF)	21.351
Fill Area (SF)	1.499
Cut Vol (CF)	15.0
Fill Vol (CF)	0.7
Cum Cut Vol (CF)	24.4
Cum Fill Vol (CF)	0.7
Net Vol (CF)	23.7



Total Volume at Station 500+75.00	
Cut Area (SF)	11.018
Fill Area (SF)	0.000
Cut Vol (CF)	9.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	9.5
Cum Fill Vol (CF)	0.0
Net Vol (CF)	9.5

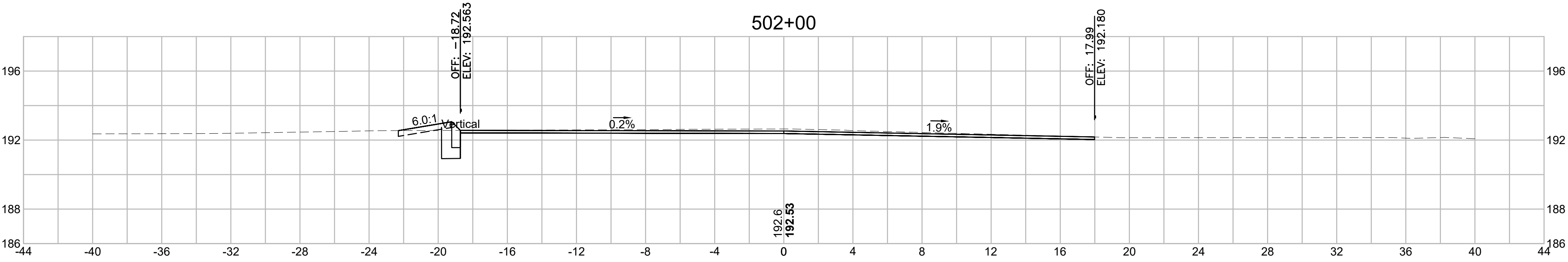


Total Volume at Station 500+50.00	
Cut Area (SF)	9.404
Fill Area (SF)	0.000
Cut Vol (CF)	0.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	0.0
Cum Fill Vol (CF)	0.0
Net Vol (CF)	0.0

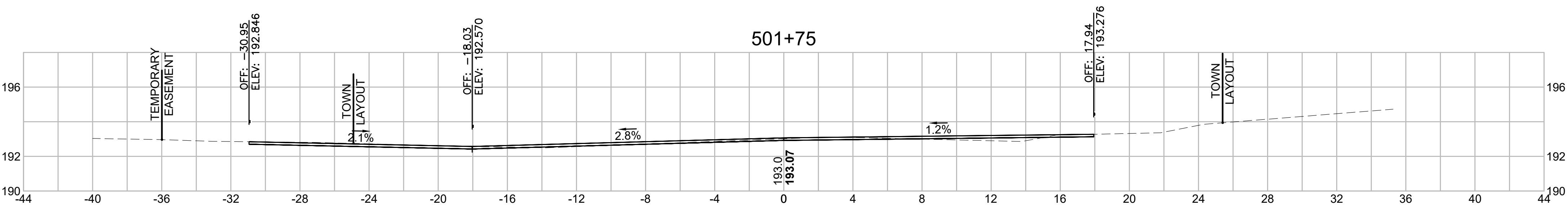


SUDBURY BRUCE FREEMAN RAIL TRAIL			
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MA	XXX-XXXX(XXX)X	306	319
PROJECT FILE NO. 608164			

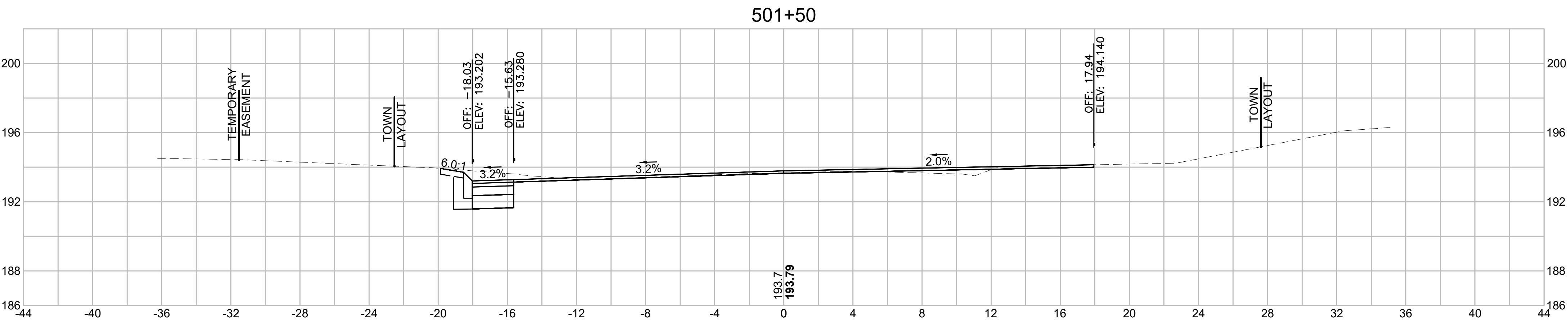
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HUDSON ROAD



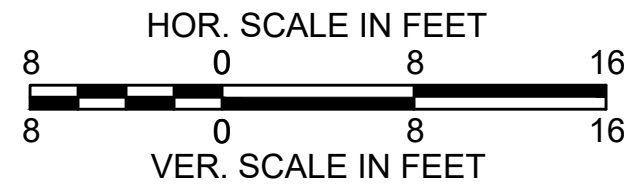
Total Volume at Station 502+00.00	
Cut Area (SF)	22.126
Fill Area (SF)	0.086
Cut Vol (CF)	11.4
Fill Vol (CF)	0.9
Cum Cut Vol (CF)	85.2
Cum Fill Vol (CF)	5.4
Net Vol (CF)	79.8



Total Volume at Station 501+75.00	
Cut Area (SF)	2.528
Fill Area (SF)	1.892
Cut Vol (CF)	11.4
Fill Vol (CF)	1.4
Cum Cut Vol (CF)	73.8
Cum Fill Vol (CF)	4.5
Net Vol (CF)	69.3

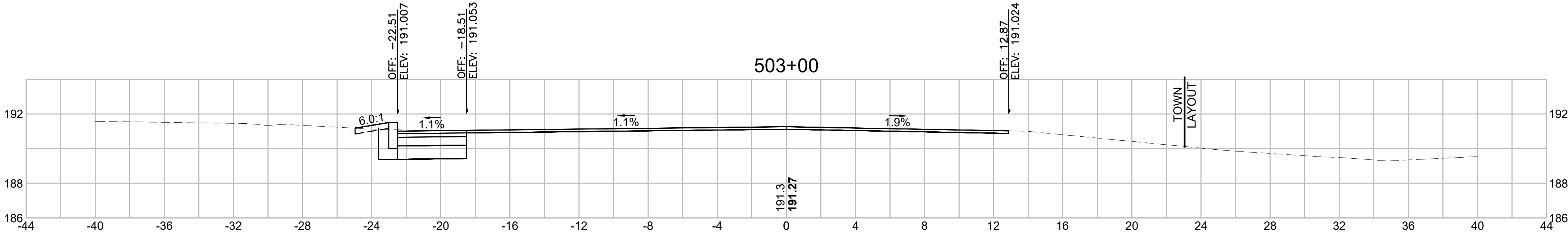


Total Volume at Station 501+50.00	
Cut Area (SF)	22.022
Fill Area (SF)	1.027
Cut Vol (CF)	19.1
Fill Vol (CF)	1.1
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Cum Fill Vol (CF)	3.1
Net Vol (CF)	59.3

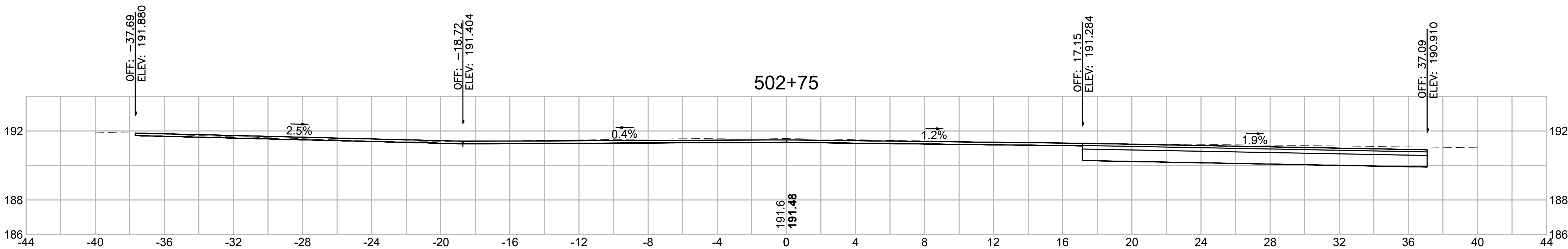


SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	307	319
PROJECT FILE NO. 608164			

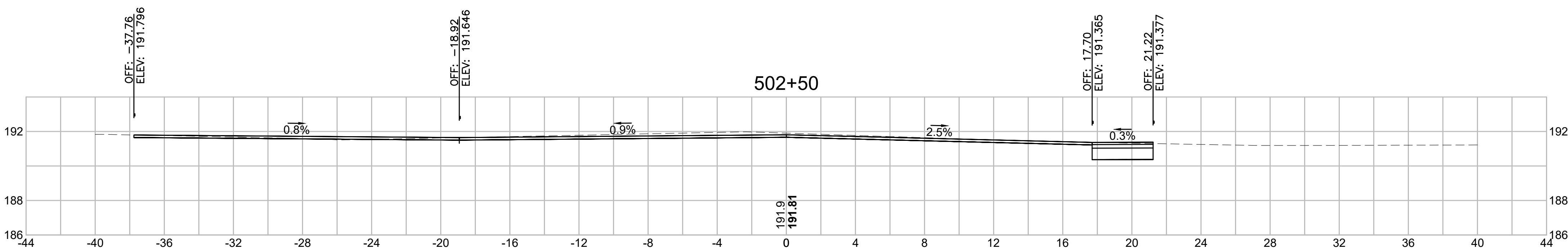
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HUDSON ROAD



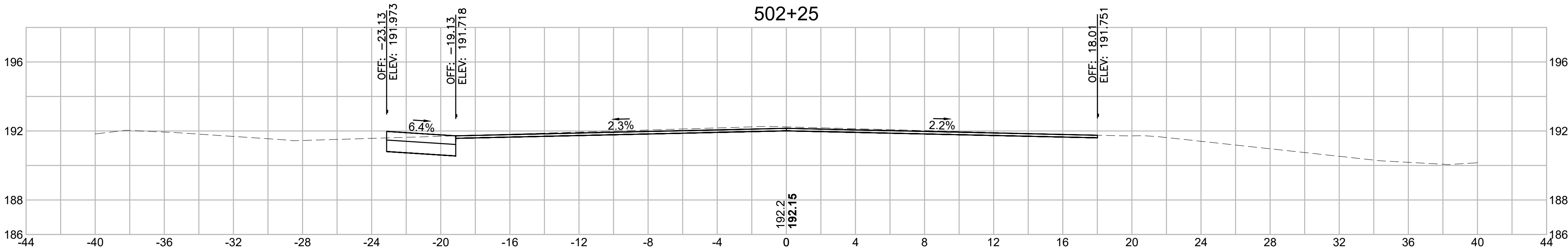
Total Volume at Station 503+00.00	
Cut Area (SF)	29.184
Fill Area (SF)	5.560
Cut Vol (CF)	29.8
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Cum Fill Vol (CF)	8.8
Net Vol (CF)	166.4



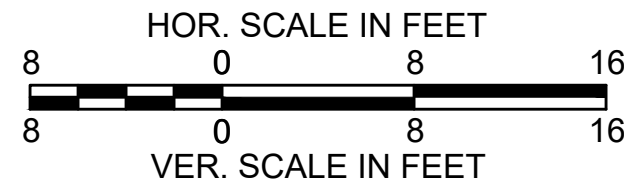
Total Volume at Station 502+75.00	
Cut Area (SF)	35.160
Fill Area (SF)	0.535
Cut Vol (CF)	26.6
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	145.5
Cum Fill Vol (CF)	6.0
Net Vol (CF)	139.5



Total Volume at Station 502+50.00	
Cut Area (SF)	22.276
Fill Area (SF)	0.000
Cut Vol (CF)	16.9
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	118.9
Cum Fill Vol (CF)	5.8
Net Vol (CF)	113.1

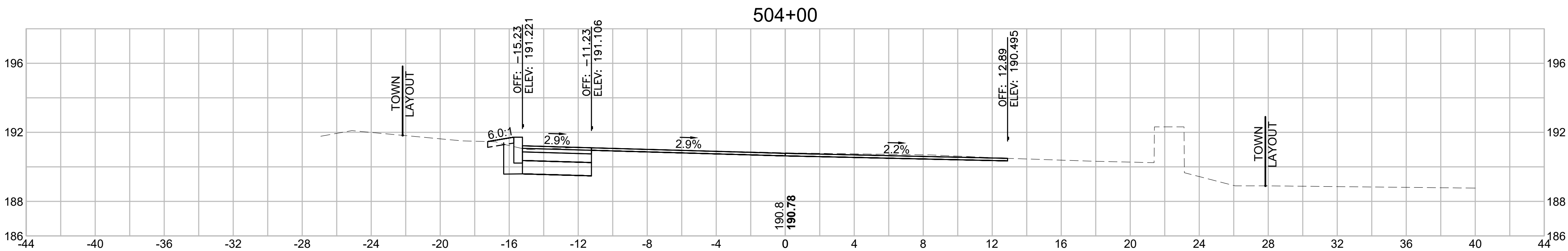


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Cut Area (SF)	14.164
Fill Area (SF)	0.336
Cut Vol (CF)	16.8
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	102.0
Cum Fill Vol (CF)	5.6
Net Vol (CF)	96.4

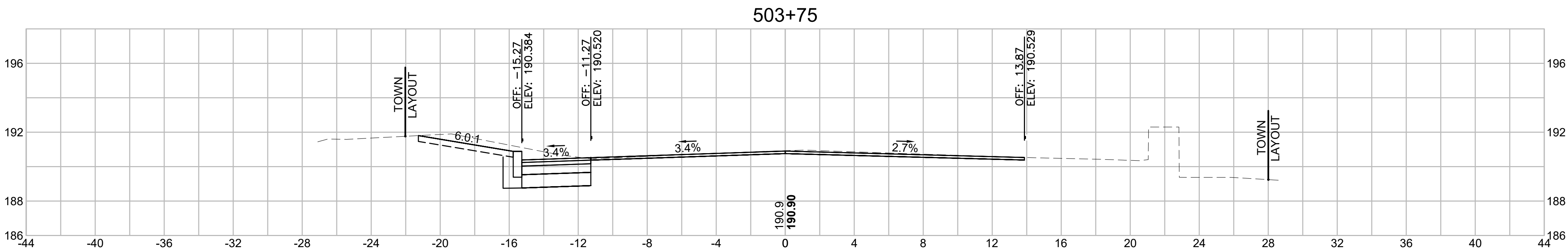


SUDBURY BRUCE FREEMAN RAIL TRAIL			
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MA	XXX-XXXX(XXX)X	308	319
PROJECT FILE NO. 608164			

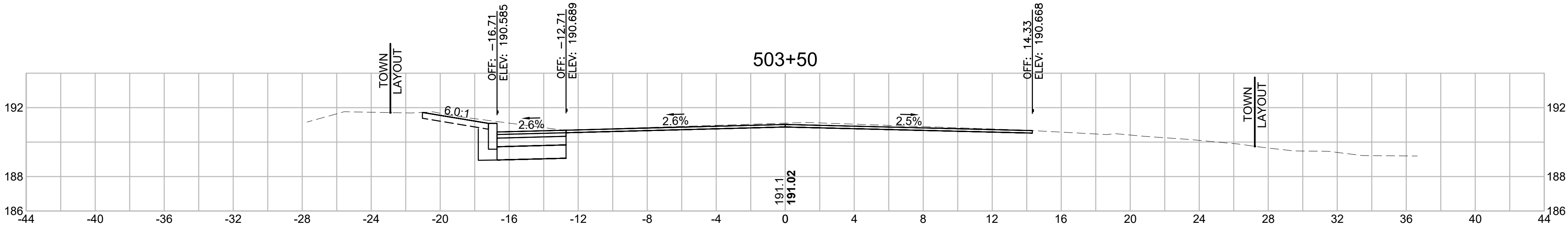
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HUDSON ROAD



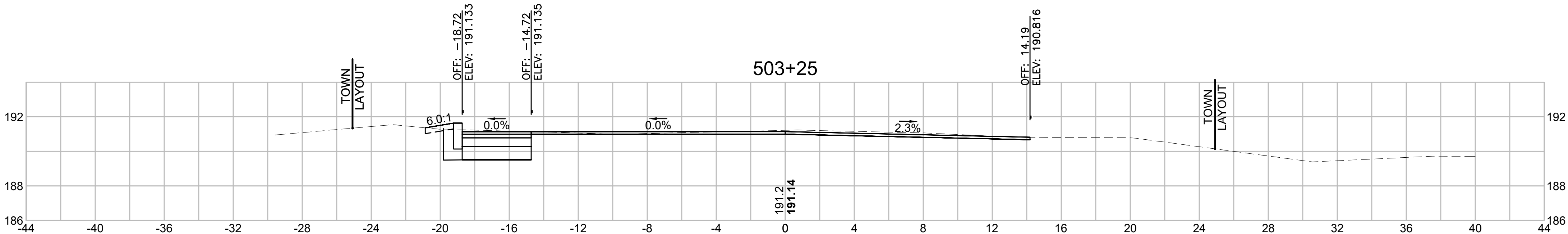
Total Volume at Station 504+00.00	
Cut Area (SF)	9.026
Fill Area (SF)	0.055
Cut Vol (CF)	16.0
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	239.4
Cum Fill Vol (CF)	13.8
Net Vol (CF)	225.6



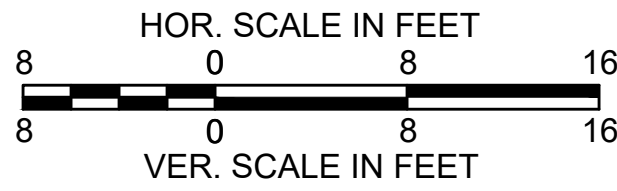
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Cut Area (SF)	25.454
Fill Area (SF)	0.000
Cut Vol (CF)	17.7
Fill Vol (CF)	0.2
Cum Cut Vol (CF)	223.4
Cum Fill Vol (CF)	13.8
Net Vol (CF)	209.6



Total Volume at Station 503+50.00	
Cut Area (SF)	12.869
Fill Area (SF)	0.405
Cut Vol (CF)	11.4
Fill Vol (CF)	1.2
Cum Cut Vol (CF)	205.7
Cum Fill Vol (CF)	13.6
Net Vol (CF)	192.1

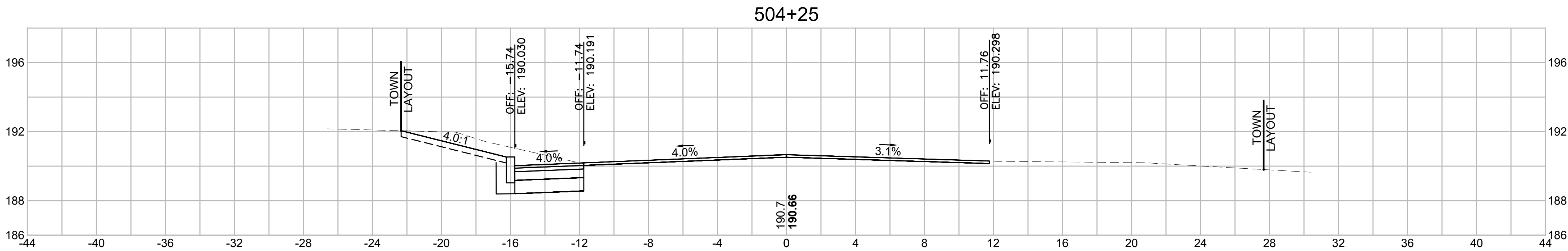


Total Volume at Station 503+25.00	
Cut Area (SF)	11.807
Fill Area (SF)	2.169
Cut Vol (CF)	19.0
Fill Vol (CF)	3.6
Cum Cut Vol (CF)	194.2
Cum Fill Vol (CF)	12.4
Net Vol (CF)	181.8



SUDBURY BRUCE FREEMAN RAIL TRAIL			
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXXX(XXX)X	309	319
PROJECT FILE NO. 608164			

CROSS SECTIONS
HUDSON ROAD



Total Volume at Station 504+25.00	
Cut Area (SF)	15.866
Fill Area (SF)	0.000
Cut Vol (CF)	11.5
Fill Vol (CF)	0.0
Cum Cut Vol (CF)	250.9
Cum Fill Vol (CF)	13.8
Net Vol (CF)	237.1

Appendix G

Stormwater Report & Checklist

Stormwater Management Report
Broadacres Farm Parking Lot
(Part of the Bruce Freeman Rail Trail Project)

Owner
Town of Sudbury
322 Concord Road
Sudbury, MA 01776

February 3, 2022
REVISED February 17, 2022



1550 Main Street, Suite 400
Springfield, MA 01089

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3.2	Proposed Watershed Summary	2
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3 Existing Watershed Map	
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A Plans (bound separately)	
B Subsurface Investigation Memorandum with NRCS Web Soil Mapping	
C Sediment Forebay Sizing Calculations	
D Pre-Development Hydrological Analysis	
E Post-Development Hydrological Analysis	
F Stormwater Management Checklist & Illicit Discharged Compliance Statement	
G Water Quality Treatment Calculations	
H TSS Removal Calculations	
I Groundwater Recharge Calculations, 72 Hour Drawdown, Mounding Calculations & Bedrock Memorandum	
J Construction Operation and Maintenance Plan	
K Long Term Operation and Maintenance Plan	
L Riprap Sizing Calculation for Overflow Weir	

1 Executive Summary

The Town of Sudbury is proposing to construct a parking lot on Town-owned property off of Morse Road and adjacent to the proposed Bruce Freeman Rail Trail in Sudbury, Massachusetts. The project includes a new parking lot containing 32 parking spaces, approximately 9,770 square feet in size, with a walkway connection to the west to provide connectivity to the new trail. A pavilion, restrooms, and other amenities will be located to the east of the new parking area.

The proposed stormwater basins were designed in accordance with the guidelines of the Massachusetts Stormwater Handbook (Stormwater Handbook). Existing and proposed hydrologic conditions for the developed area were evaluated to ensure stormwater peak discharges are maintained or reduced as a result of the proposed development for the 2-, 10-, 25-, and 100-year storm events. Maintenance or reduction in stormwater peak discharges was achieved through the utilization of two proposed stormwater bioretention basins with pretreatment forebays.

2 Project Description

2.1 Existing Conditions

The project site is located off Morse Road, in Sudbury, Massachusetts, as shown on *Figure 1, Site Location Map*. The proposed parking lot improvements are part of a 9.5 acre site owned by the Town of Sudbury. The existing site is undeveloped and mostly grass and wooded.

Existing grades allow stormwater to sheet flow to a swale adjacent to the former railroad right-of-way to the west of the site. The existing site does not contain any stormwater management systems. Existing conditions information is included with the plans located in *Appendix A*.

Soil types at the site consist of Windsor Loamy Sands, which are hydrologic soil group (HSG) type A soils with high permeability. Soil mapping generated from the Natural Resources Conservation Service (NRCS) website is included in the Subsurface Investigation Memo provided in *Appendix B*. Test pits were completed at the site as part of an overall soil investigation in 2022 and are also included in the Subsurface Investigation Memo provided in *Appendix B*. Based on the test pits conducted in the area of the proposed infiltration basin, groundwater elevations are estimated at elevation to be 7' below the grade at approximate elevation 166. All recharge volumes are designed to be above the 2' separation from groundwater.

2.2 Proposed Conditions

The proposed development includes the construction of a new parking lot to contain 32 parking spaces, approximately 9,770 square feet in size, with a walkway connection to the west to provide connectivity to the new trail. A pavilion, restrooms, and other amenities will be located to the east of the new parking area. Proposed conditions are depicted on the plans located in *Appendix A*.

On-site stormwater management systems have been designed to maintain existing stormwater flow patterns and meet the requirements of the stormwater management standards (Standards) outlined in the Stormwater Handbook. The systems have been designed to reduce peak flows between pre- and post-development conditions. Post-construction stormwater runoff from the new parking area will be directed to an infiltration basin with forebay pre-treatment area along the west side of the proposed parking lot which will ultimately discharge to the existing drainage swales along the railroad right-of-way.

The proposed infiltration basin forebay provide storage greater than that required of the Massachusetts Stormwater Handbook; forebay sizing calculations are included in Appendix F. The infiltration basin also provides storage in excess of the Water Quality Volume. Water quality volume calculations are included in *Appendix G*. Total Suspended Solids (TSS) removal provided by the infiltration basin with pretreatment forebays is 80%. TSS Removal calculations are provided in *Appendix H*. Groundwater recharge is also provided by the proposed basin and calculations indicate that the proposed infiltration basin areas will drawdown in approximately 21 hours. Groundwater recharge, drawdown calculations, and mounding calculations are provided in *Appendix I*. The elevation of bedrock used in the mounding calculations is from the Bedrock Memorandum also provided in *Appendix I*.

3 Hydrologic Analysis

Peak flows for existing and proposed conditions were determined using the Natural Resources Conservation Service (NRCS) Technical Release 20 and Technical Release 55 (TR-55) hydrologic methods. The hydrologic analyses for existing and proposed conditions were completed using a computer software program, HydroCAD version 10.00-20, to determine peak runoff flow rates and total runoff volumes for each of the watersheds. Runoff curve numbers were developed based on a combination of land cover use and existing site soil types acquired from the NRCS website. Time of concentration runs were developed based on the methods in the NRCS TR55 manual.

Peak flows for the 2-, 10-, 25-, and 100-year frequency storm events were determined by using a 24-hour type III storm, standard for the New England area. Rainfall depths were obtained from published rainfall information in the Town of Sudbury Stormwater Regulations.

3.1 Existing Watershed Summary

Stormwater from the site is generally conveyed by sheet flow and shallow concentrated flow to the design point described above. One (1) subcatchment area has been established for the pre-development, existing conditions, and watershed modeling. *Figure 3* illustrates existing conditions, pre-development watershed area, and time of concentration (T_c) paths. A schematic watershed diagram showing discharge point and the breakdown of the ground cover characteristics for the watershed area can be found in the pre-development hydrological analysis provided in *Appendix D*.

3.2 Proposed Watershed Summary

The proposed development has been designed to maintain overall existing drainage patterns directing post-construction stormwater runoff to the infiltration basin with the pretreatment forebay located to the west of the proposed parking lot which then discharge to the existing drainage swales within the

railroad right-of-way. Two (2) subcatchment areas have been established for the post-development, proposed conditions, watershed modeling. *Figure 4* illustrates proposed conditions, post-development watershed areas, and Tc paths. A schematic watershed diagram showing discharge points and a breakdown of the ground cover characteristics for each watershed area can be found in the post-development hydrological analysis provided in *Appendix E*.

3.3 Hydrologic Analysis Results

Proposed Best Management Practices (BMPs) have been designed to approximately maintain peak flows for the site from pre to post-development conditions. A summary of the pre- and post-development peak flows at the site for the 2-year, 10-year, 25-year, 50-year, and 100-year storm events are summarized in *Table 1* below.

Table 1
Peak Discharge Summary

Design Year Storm Event	Existing Peak Flows (cfs)	Proposed Peak Flows (cfs)	Change in Peak Flows (cfs)
2-year (3.2")	0.00	0.00	0.00
10-year (4.8")	0.01	0.00	-0.01
25-year (6.0")	0.03	0.03	0.00
100-year (8.6")	0.47	0.24	-0.23

4 Soil Erosion and Sedimentation Control

Soil erosion and sedimentation control plans, including construction phasing, construction details and notes are provided on the plans located in *Appendix A*. Soil erosion and sedimentation control details and procedures are consistent with the "Massachusetts Erosion and Sediment Control Guideline for Urban and Suburban Areas," and with state, local, and federal requirements.

Erosion and sedimentation controls used on the site during construction will include construction entrances pads, silt fence, straw bales, and water for dust control. Additional erosion and sediment controls will be utilized as required. Silt fence and straw bales will be placed down-gradient of disturbed areas and up-gradient of resource areas. A construction entrance will be installed at the entrance of the site at Morse Road. Water will be applied to exposed soils to provide dust control as needed.

Prior to the start of construction the Contractor will be required to obtain coverage under the National Pollutant Discharge Elimination System (NPDES) Construction General Permit and prepare a formal Stormwater Pollution Prevention Plan (SWPPP), further specifying the details of construction phasing, limits of soil disturbance, erosion and sediment controls and other stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures during construction activities.

5 Construction Sequence

The Contractor will be responsible for finalizing the proposed construction sequencing for construction of the project, however construction sequencing shall generally be as follows:

1. Install erosion & sedimentation control measures.
2. Clear and grub project area.
3. Construct stormwater infiltration basins and rough grade site.
4. Install base materials for parking lot and building pads.
5. Install asphalt paving and construction buildings.
6. Loam and seed disturbed areas.
7. Clean site and remove any accumulated sediment from stormwater basins.
8. Remove erosion & sedimentation controls upon site stabilization.

6 Massachusetts Stormwater Handbook Standards

The following is a description of how the proposed project conforms to the Standards outlined in the Stormwater Handbook. The Stormwater Management Checklist is included in *Appendix F*.

LID Measures

Standard 1: No Untreated Discharge or Erosion to Wetlands

Perimeter erosion controls will be installed during construction to protect resource areas from sedimentation until construction is completed and the site is stabilized.

There are no new untreated conveyances proposed. Proposed conveyances have been designed to ensure no erosion will occur to existing resource areas. Post-construction stormwater flows and water quality will be managed by the infiltration basin which ultimately discharge into the existing drainage swales along the railroad right-of-way, mimicking existing drainage patterns at the site.

Standard 2: Peak Rate Attenuation

Post-development discharge rates will be reduced in post-development conditions. Stormwater Hydrologic Analyses have been provided in *Appendix D* and *Appendix E* and a summary of pre- versus post-development peak discharge rates have been provided in *Table 1* under Section 3.3. Mitigation of post-development peak runoff flows are achieved through stormwater storage provided by the proposed infiltration basins.

Standard 3: Stormwater Recharge

The infiltration basin has been designed to provide groundwater recharge and drawdown within 72 hours. Calculations found in *Appendix I* show that the infiltration basin has been designed to provide the required groundwater recharge for all the proposed impervious area. Due to groundwater separation being less the 4 feet, *Appendix I* also includes mounding calculations to show groundwater mounding will not have an effect on the basin or surrounding area.

Standard 4: Water Quality

Water quality treatment and removal of suspended solids will be provided by the new infiltration basin with pretreatment forebays and during overland flow to the existing swales and within the existing swales. Water quality volume calculations are included in *Appendix G*. TSS Removal calculations are included in *Appendix H*. Pretreatment removal calculations are also included in *Appendix H*.

Standard 5: Land Uses with Higher Potential Pollutant Loads

This project does not include areas which would be classified as having higher potential pollutant loading as the proposed parking area will have low intensity use and as the trail is anticipated to see 275 users per day.

Standard 6: Critical Areas

This project does not contain any critical areas as defined by the Massachusetts Stormwater Handbook.

Standard 7: Redevelopment

The proposed project is not considered a redevelopment project per the Stormwater Handbook.

Standard 8: Construction Period Controls

It is anticipated that there will be no proposed pollution created during the construction of the proposed development. 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.

Prior to the start of construction, the Contractor will be required to obtain coverage under the NPDES Construction General Permit and prepare a formal SWPPP, further specifying the details of construction phasing, limits of soil disturbance, erosion and sediment controls and other stabilization measures, stockpile locations, construction waste management procedures, and hazardous materials storage procedures during construction activities.

Standard 9: Operation and Maintenance Plan

A suggested Construction Operation and Maintenance (O&M) Plan has been developed for the development of the site and is included in *Appendix J*. The contractor shall be responsible for construction operation and maintenance of the site.

A suggested Long Term O&M Plan, which includes recommended maintenance activities and schedule of maintenance as outlined within the Stormwater Handbook, is included in *Appendix K*. The owner will be responsible for long term operation and maintenance of the site.

Standard 10: Illicit Discharge to Drainage System

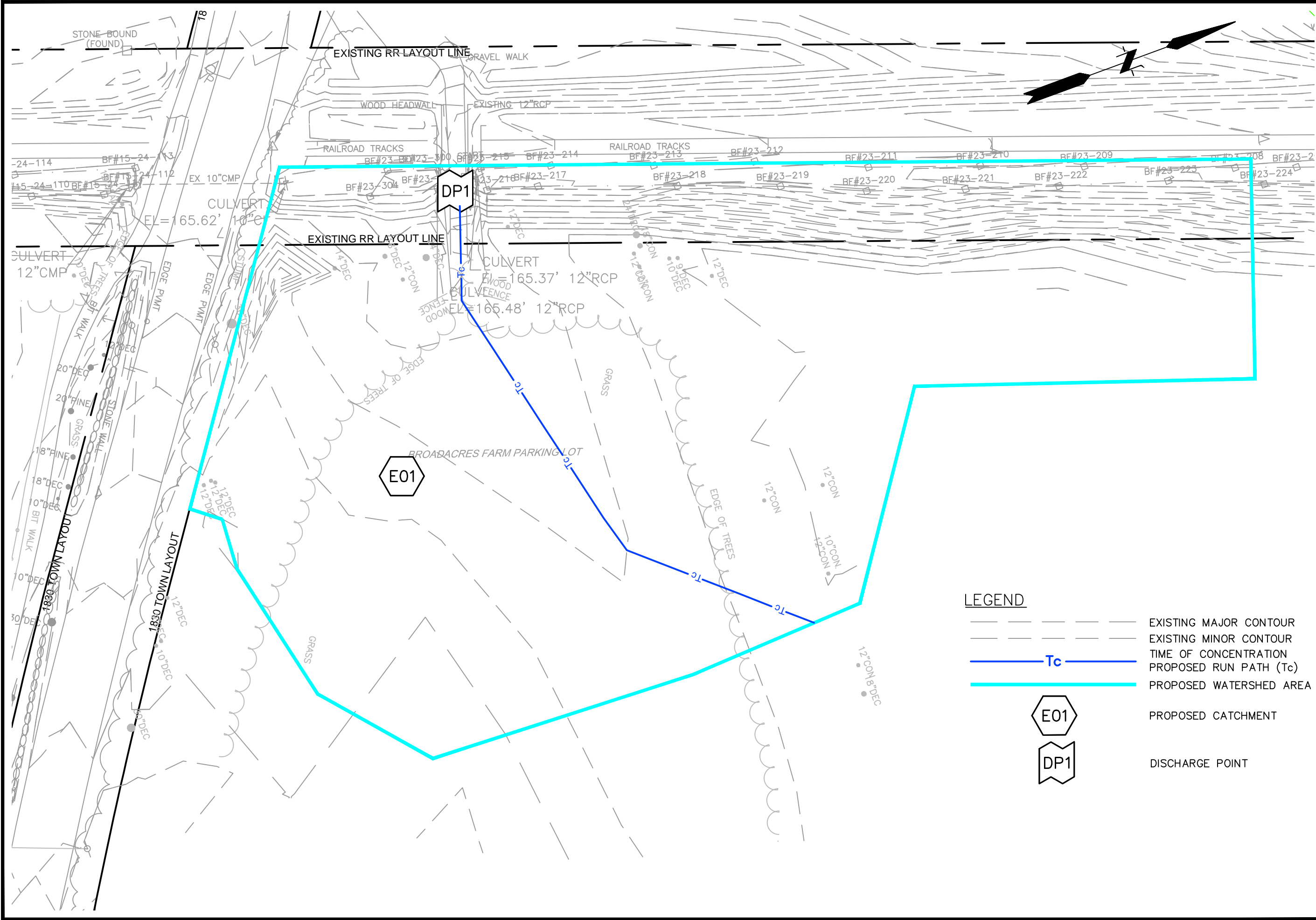
The project does not include any proposed illicit discharges to Stormwater Management Systems as defined in the Stormwater Handbook.

7 Summary

This Stormwater Management Report demonstrates the proposed stormwater management system for proposed parking lot improvements at the Broadacres Farm site, have been designed to mitigate or

reduce post-construction stormwater flows from the site and meet the requirements of the Massachusetts Stormwater Standards.

Figures



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- TIME OF CONCENTRATION
- PROPOSED RUN PATH (Tc)
- PROPOSED WATERSHED AREA
- PROPOSED CATCHMENT
- DISCHARGE POINT

SCALE: 1" = 30'

HORIZ.: 1" = 30'

VERT.:

DATUM:

HORIZ.: NAD 1983

VERT.: NAVD 1988

0 15 30

GRAPHIC SCALE

FUSS & O'NEILL

1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
www.fussdo.com

TOWN OF SUDBURY

EXISTING WATERSHED MAPPING

BROADACRES FARM PARKING LOT
(PART OF BRUCE FREEMAN RAIL TRAIL PROJECT)

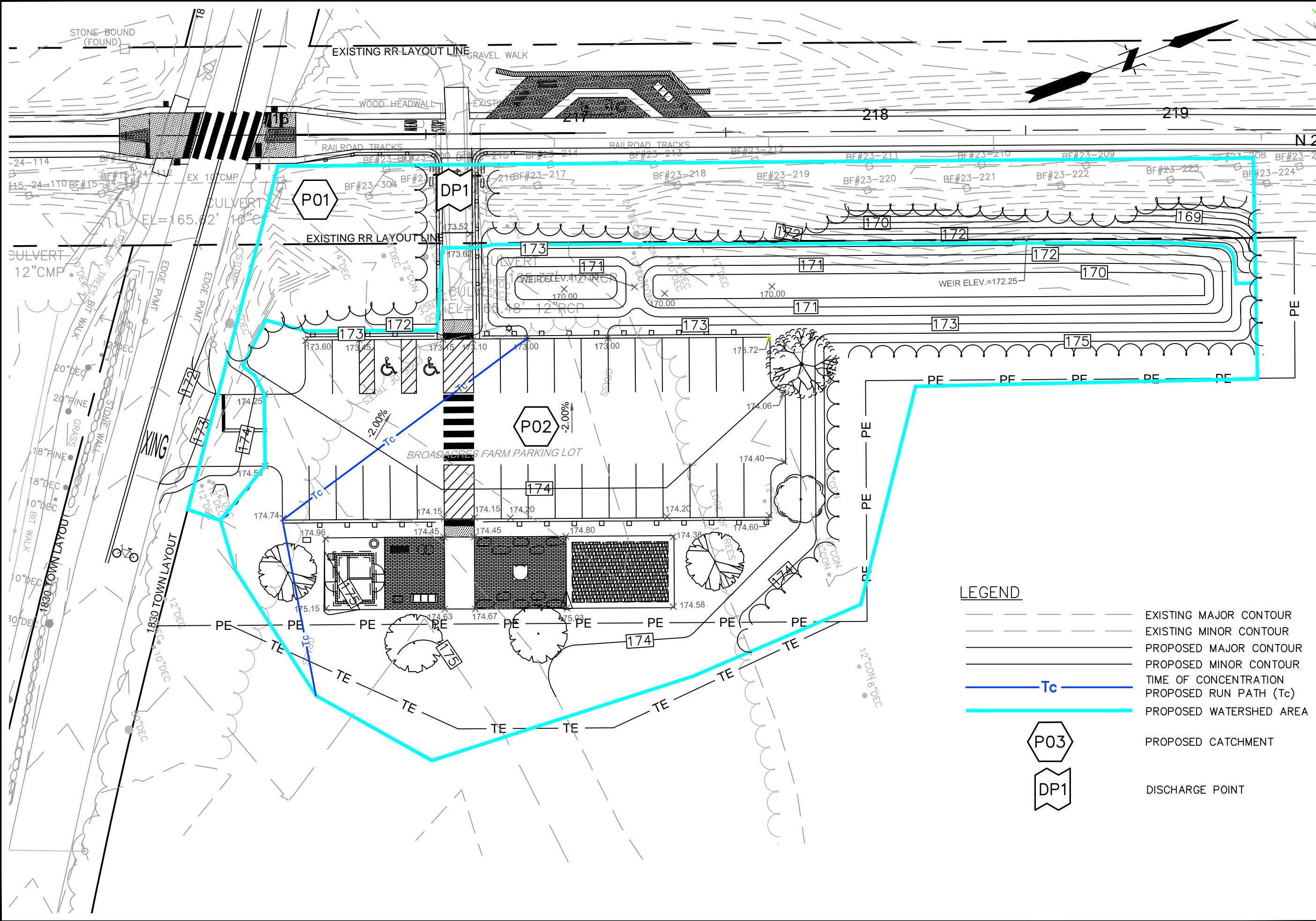
SUDBURY

PROJ. No.: 20200785.A10

DATE: 02/04/2022

FIG. 3

File Path: J:\DWG\20200785A\10608164\DWG\Environmental Plans\608164_STRM_CALC.MTC_REV.dwg Layout: FIG_4_PROP Plotted: Wed, February 16, 2022 - 4:00 PM User: mcorssotti
MS VIEW: Plotter: AUTOCAD PDF (SMALLEST FILE).PC3 CTB File: FO STB



LEGEND

- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- TIME OF CONCENTRATION
- PROPOSED RUN PATH (Tc)
- PROPOSED WATERSHED AREA
- PROPOSED CATCHMENT
- DISCHARGE POINT

SCALE: HORIZ.: 1" = 30'
VERT.: 1" = 10'

DATUM: HORIZ.: NAD 1983
VERT.: NAVD 1988

GRAPHIC SCALE

FUSS & O'NEILL

1550 MAIN STREET, SUITE 400
SPRINGFIELD, MA 01103
413.452.0445
www.fussandoneill.com

TOWN OF SUDBURY

PROPOSED WATERSHED MAPPING

BROADACRES FARM PARKING LOT
(PART OF BRUCE FREEMAN RAIL TRAIL PROJECT)

MASSACHUSETTS

SUDBURY

PROJ. No.: 20200785.A10
DATE: 02/16/2022

FIG. 4

Appendix A

Plans (bound separately)

Appendix B

Subsurface Investigation Memorandum with NRCS Web Soil Mapping

MEMORANDUM

TO: Beth Suedmeyer
Environmental Planner, Town of Sudbury
278 Old Sudbury Road
Sudbury, MA 01776

FROM: Nicholas Lapointe, PE
Project Manager, Fuss & O'Neill

Eric Bernardin, PE
Vice President, Fuss & O'Neill

Matthew Kissane, MS
Geologist, Fuss & O'Neill

DATE: January 25, 2022

RE: Broadacre Farm Parking Lot - January 2022 Subsurface Investigation Memorandum
Fuss & O'Neill Reference: 20200785.A10

Project Background

Fuss & O'Neill understands that the Town of Sudbury ("the Town") is planning construction of a parking lot off Broadacre Farm as part of the Bruce Freeman Rail Trail Project. Fuss & O'Neill has been contracted to provide the Town with site/civil engineering consulting services for the proposed parking lot. Part of these services includes the design of stormwater handling features within and adjacent to the parking lot. Soils in the proposed project area are mapped by the Natural Resources Conservation Service (NRSC) of the United States Department of Agriculture (USDA) as Windsor Loam Sand and are given an A soil group rating. Group A soils have a high infiltration rate (low runoff potential) when thoroughly wet. The NRSC report for the project area is included as *Attachment A*. To better understand real-world subsurface soil and groundwater conditions in the vicinity of the proposed stormwater handling features, Fuss & O'Neill oversaw the excavation of two (2) soil test pits in the project area.

Objectives

Fuss & O'Neill mobilized on January 13, 2022 and oversaw the excavation of two (2) test pits in an unnamed field situated between Morse Road and Featherland Park, located at Broadacres Farm in Sudbury, Massachusetts (see *Figure 1*). The objective of the test pits was to characterize subsurface soil lithology and to identify both current and seasonal high groundwater depths.

Ms. Beth Suedmeyer
January 25, 2022
Page 2 of 2

Test Pits

Fuss & O'Neill oversaw the excavation of two (2) test pits at locations TP-1 and TP-2 (see *Figure 1*) between Featherland Park and Morse Road in Sudbury, Massachusetts. Test pits TP-1 and TP-2 were excavated to depths of 9 feet below ground surface (ft bgs) and 12 ft bgs, respectively. Soils observed generally consisted of loam with organics in the the uppermost ~1.5 ft, with fine sands and silt to seasonal groundwater high, and silt with some clay to depth. Weeping groundwater was observed at 5.4 ft bgs at location TP-1, with seasonal high groundwater indicators evident at ~5 ft bgs. Weeping groundwater was observed at 7.4 ft bgs at location TP-2, with seasonal high groundwater indicators evident at ~7 ft bgs. The test pit logs with representative photos are included in *Attachment B*.

Findings

Observations collected during the excavation of test pits TP-1 and TP-2 generally show the subsurface composition in the project area to be fine sands and silt with some clay below the groundwater table. Field observations indicate that subsurface soils observed should be classified as Group A soils, as defined in the NRSC mapping. Group A soils have a high infiltration rate (low runoff potential) when thoroughly wet. Groundwater encountered as a part of this investigation ranges from 5.4 ft bgs at test pit TP-1 to 7.4 ft bgs at test pit TP-2, with seasonal high groundwater table indicators (coloration of the soils) evident at 5 ft bgs at test pit TP-1 and 7 ft bgs at test pit TP-2.

/SS

FIGURE

NOTES:

1. PROP. MILLING MULCH TO BE PLACED UNDER GUARDRAIL (SEE TYPICAL SECTIONS & MASSDOT STD. SPEC. ITEM 769)

FENCING DETAILS

TIMBER FENCE (THREE-RAIL)
STA. 216+25 RT TO STA. 216+53 RT
TIMBER FENCE (THREE-RAIL)
STA. 216+89 RT TO STA. 217+00 RT

HIGHWAY GUARD DETAILS

TIMBER GUARDRAIL STA. 216+09 RT TO STA. 216+53 RT
TIMBER GUARDRAIL STA. 216+68 RT TO STA. 217+64 RT
TIMBER GUARDRAIL STA. 216+01 RT TO STA. 216+52 RT
TIMBER GUARDRAIL STA. 216+68 RT TO STA. 217+64 RT

TRAFFIC SIGNAL CONDUIT

NONE

WATER SUPPLY ALTERATIONS

SHEET 182

DRAINAGE DETAILS

SHEET 182

LEGEND:

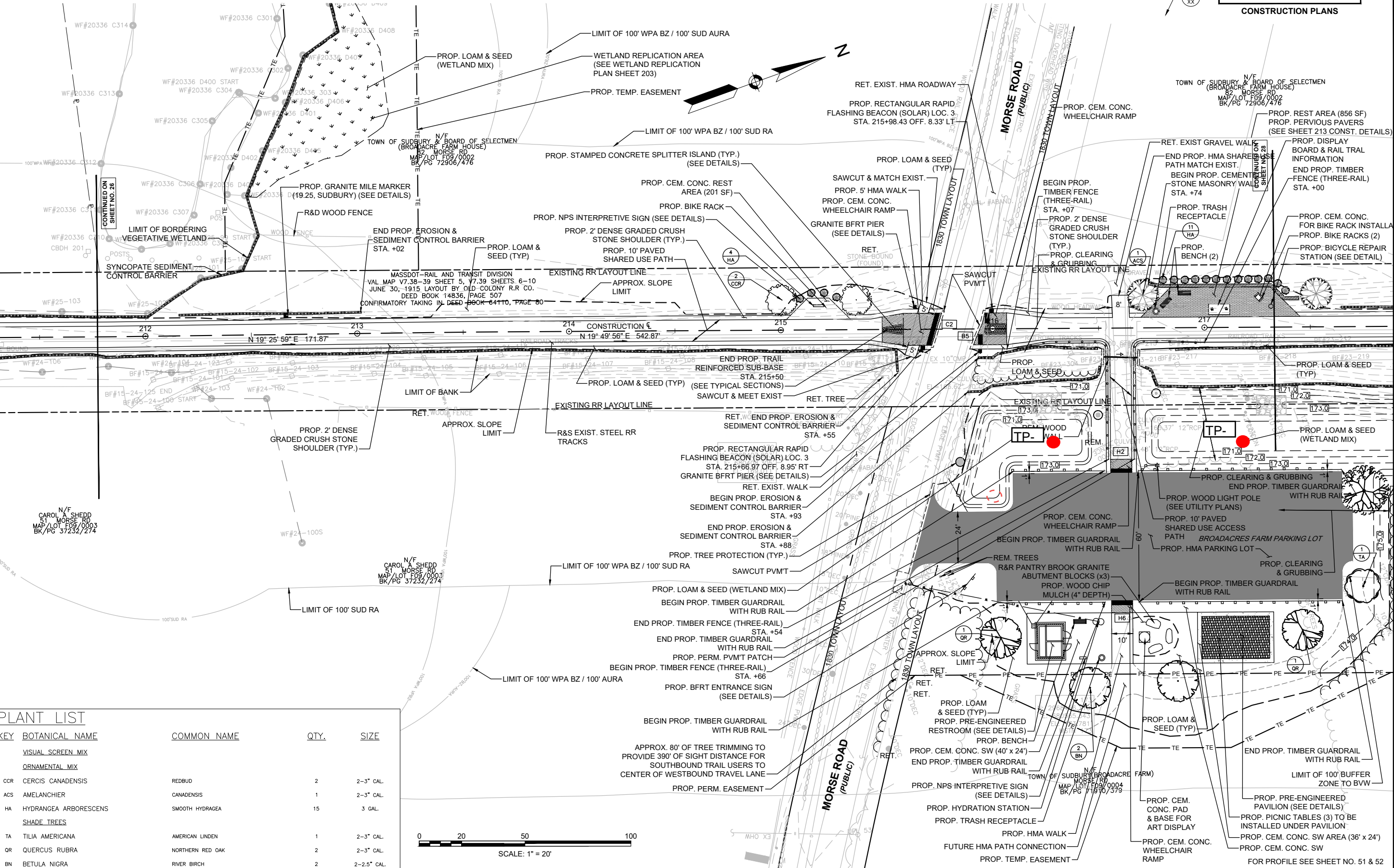
PROPOSED WHEELCHAIR
RAMP DETAIL #
PLANT QUANTITY AND SPECIES

X#
X
XX

SUDBURY
BRUCE FREEMAN RAIL TRAIL

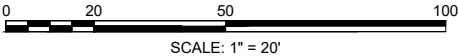
STATE	FED. AID PROJ. NO.	SHEET NO.	TOTAL SHEETS
MA	XXX-XXX(XXX)X	27	316
PROJECT FILE NO.		608164	

CONSTRUCTION PLANS



PLANT LIST

KEY	BOTANICAL NAME	COMMON NAME	QTY.	SIZE
	VISUAL SCREEN MIX			
	ORNAMENTAL MIX			
CCR	CERCIS CANADENSIS	REDBUD	2	2-3" CAL.
ACS	AMELANCHIER	CANADENSIS	1	2-3" CAL.
HA	HYDRANGEA ARBORESCENS	SMOOTH HYDRAGEA	15	3 GAL.
	SHADE TREES			
TA	TILIA AMERICANA	AMERICAN LINDEN	1	2-3" CAL.
QR	QUERCUS RUBRA	NORTHERN RED OAK	2	2-3" CAL.
BN	BETULA NIGRA	RIVER BIRCH	2	2-2.5" CAL.



ATTACHMENT A



United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

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

Custom Soil Resource Report for **Middlesex County, Massachusetts**

**Sudbury - Broadacres Farm test
pits**



January 21, 2022

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/>) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (<https://offices.sc.egov.usda.gov/locator/app?agency=nrcs>) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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255B—Windsor loamy sand, 3 to 8 percent slopes.....	14
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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

Custom Soil Resource Report

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report Soil Map



Map Scale: 1:706 if printed on A landscape (11" x 8.5") sheet.

0 10 20 40 60 Meters


0 30 60 120 180 Feet

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

Custom Soil Resource Report

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 1:25,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
Survey Area Data: Version 21, Sep 2, 2021

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

Date(s) aerial images were photographed: Aug 31, 2020—Oct 22, 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
255A	Windsor loamy sand, 0 to 3 percent slopes	1.1	92.8%
255B	Windsor loamy sand, 3 to 8 percent slopes	0.1	7.2%
Totals for Area of Interest		1.1	100.0%

Map Unit Descriptions

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

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

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

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

onsite investigation is needed to define and locate the soils and miscellaneous areas.

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

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

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

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

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

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

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

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

Middlesex County, Massachusetts

255A—Windsor loamy sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svkg

Elevation: 0 to 990 feet

Mean annual precipitation: 36 to 71 inches

Mean annual air temperature: 39 to 55 degrees F

Frost-free period: 140 to 240 days

Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Outwash plains, outwash terraces, deltas, dunes

Landform position (three-dimensional): Tread, riser

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material

A - 1 to 3 inches: loamy sand

Bw - 3 to 25 inches: loamy sand

C - 25 to 65 inches: sand

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 3.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Deerfield, loamy sand

Percent of map unit: 10 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, tal
Down-slope shape: Linear
Across-slope shape: Linear
Hydric soil rating: No

Hinckley, loamy sand

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svkf
Elevation: 0 to 1,210 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Windsor, loamy sand, and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Windsor, Loamy Sand

Setting

Landform: Dunes, outwash plains, deltas, outwash terraces
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or loose sandy glaciofluvial deposits derived from schist and/or loose sandy glaciofluvial deposits derived from gneiss

Typical profile

O - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand

Custom Soil Resource Report

Bw - 3 to 25 inches: loamy sand

C - 25 to 65 inches: sand

Properties and qualities

Slope: 3 to 8 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Excessively drained

Runoff class: Low

Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)

Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2s

Hydrologic Soil Group: A

Ecological site: F144AY022MA - Dry Outwash

Hydric soil rating: No

Minor Components

Hinckley, loamy sand

Percent of map unit: 10 percent

Landform: Deltas, kames, eskers, outwash plains

Landform position (two-dimensional): Summit, shoulder, backslope

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

Down-slope shape: Convex

Across-slope shape: Convex, linear

Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent

Landform: Deltas, terraces, outwash plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, talf

Down-slope shape: Linear

Across-slope shape: Linear

Hydric soil rating: No

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Custom Soil Resource Report

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ATTACHMENT B

Test Pit # TP-1

Location: Broadacre Farm, Sudbury, MA

Project Name:	Broadacres Farm Test Pits
Project Number:	20200785.A10
Date:	1/13/2022
Time:	
Sample Prefix:	
Logged By:	Matthew Kissane

Contractor:	Sudbury DPW	 FUSS & O'NEILL
Operator:	Adam Kulik	
Backfill:	original material	

LOGGING		USCS		SAMPLE	
DEPTH	SOIL DESCRIPTION	CODE	NUMBER	DEPTH	TIME
from -- to				from -- to	
0' - 1.5'	ORGANICS and LOAM	PT	--	--	--
1.5' - 5.4'	SAND, F-M, some SILT, light brown, wet @ 5.4' bgs, loose, no odor.	SM	--	--	--
5.4' - 9'	SILT w/ some light gray CLAY, wet loose, no odor	ML	--	--	--
--				--	
--				--	
--				--	
--				--	
--				--	

General Test pit Description

	Native Soil	Clean Fill (i.e. brick concrete, asphalt)	Dimension lumber	Metals	Tires	Other
Description						
Percentage						

APPROX. SURFACE ELE. (FT-MSL)	
DIMENSIONS OF PIT:	~ 4' x 10'
TOTAL DEPTH	9'
DEPTH TO BEDROCK	n/a
DEPTH TO MOTTLING	n/a
DEPTH TO ROOTS	n/a
DEPTH TO WATER	5.4'
WERE PHOTOS TAKEN?	yes
SAMPLING METHOD	n/a
FIELD INSTRUMENT	n/a

COMMENTS:

Weeping GW at 5.4'

TEST PIT PHOTO:



Average = "/15 mins = "/hour

Test Pit # TP-2
Location: Broadacre Farm, Sudbury, MA

Project Name:	Broadacre Farm Test Pits
Project Number:	20200785.A10
Date:	1/13/2022
Time:	
Sample Prefix:	TP-2
Logged By:	Matthew Kissane

Contractor:	Sudbury DPW	 FUSS & O'NEILL
Operator:	Adam Kulik	
Backfill:	original material	

LOGGING		USCS CODE	SAMPLE NUMBER	SAMPLE DEPTH	
DEPTH from -- to	SOIL DESCRIPTION			from -- to	TIME
0' - 1.5'	ORGANICS and LOAM	PT	--	--	--
1.5' - 3.5'	SAND, F, light brown, moist	SP	TP-2	--	1030
3.5' - 7.4'	SAND, F, and SILT, light gray	SM	TP-2 (4.5' - 6.5')	--	1030
7.4' - 12'	SAA, wet, no standing or mottling water end TP @ 11'9" bgs	SM	--	--	--
--				--	
--				--	
--				--	
--				--	

General Test pit Description

	Native Soil	Clean Fill (i.e. brick concrete, asphalt)	Dimension lumber	Metals	Tires	Other
Description						
Percentage						

APPROX. SURFACE ELE. (FT-MSL)	
DIMENSIONS OF PIT:	~ 4' x 10'
TOTAL DEPTH	12'
DEPTH TO BEDROCK	n/a
DEPTH TO MOTTLING	n/a
DEPTH TO ROOTS	n/a
DEPTH TO WATER	n/a
WERE PHOTOS TAKEN?	yes
SAMPLING METHOD	Hand
FIELD INSTRUMENT	n/a

COMMENTS:

Weeping GW at 7.4'

Average = "/15 mins = "/hour

TEST PIT PHOTO:



Appendix C

Sediment Forebay Sizing Calculations



Project: Broadacres Farm Parking Lot
Sudbury, MA

Prepared By: MTC
Date: 2/4/2021

SEDIMENT FOREBAY SIZING

Forebay=0.1*(Impervious Area)

FOREBAY FOR STORMWATER INFILTRATION BASIN #1
CONTRIBUTING IMPERVIOUS= 14,034 SF

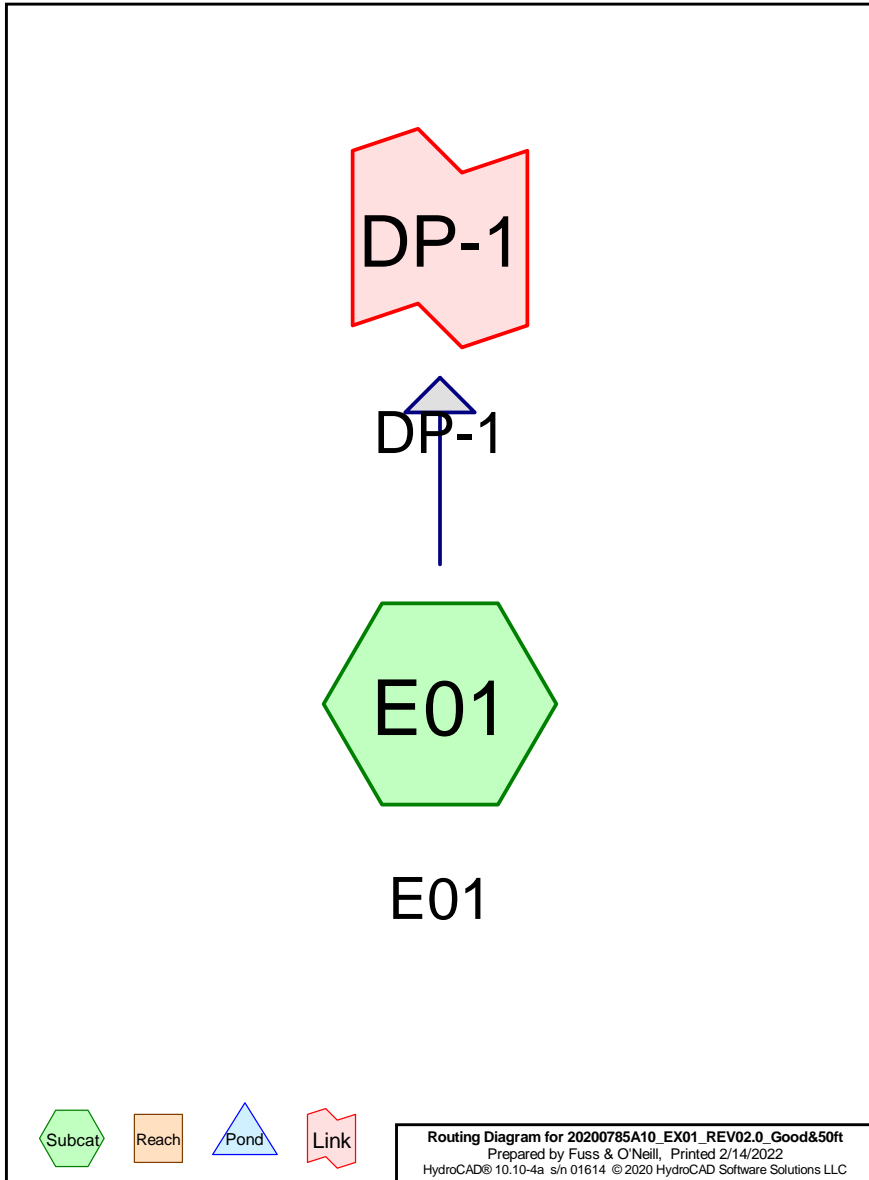
REQUIRED FOREBAY SIZE= 117 CF

STAGE (FT)	ELEV (FT)	CONTOUR AREA (SF)	INC STORAGE (CF)	TOTAL STORAGE (CF)
0	170	264	0	0
1	171	552	408	408

PROVIDED FOREBAY STORAGE= 408 CF > 117 CF

Appendix D

Pre-Development Hydrological Analysis



20200785A10_EX01_REV02.0_Good&50ft

Prepared by Fuss & O'Neill

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Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.00	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.60	2

20200785A10_EX01_REV02.0_Good&50ft

Prepared by Fuss & O'Neill

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
17,249	39	>75% Grass cover, Good, HSG A (E01)
147	96	Gravel surface, HSG A (E01)
29,707	30	Woods, Good, HSG A (E01)
47,103	34	TOTAL AREA

20200785A10_EX01_REV02.0_Good&50ft

Prepared by Fuss & O'Neill

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
47,103	HSG A	E01
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
47,103		TOTAL AREA

Ground Covers (all nodes)							Subcatcl Numbers
HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	
17,249	0	0	0	0	17,249	>75% Grass cover, Good	
147	0	0	0	0	147	Gravel surface	
29,707	0	0	0	0	29,707	Woods, Good	
47,103	0	0	0	0	47,103	TOTAL AREA	

Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points	
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN	
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method	
Subcatchment E01: E01	Runoff Area=47,103 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=222' Tc=15.0 min CN=34 Runoff=0.00 cfs 0 cf
Link DP-1: DP-1	Inflow=0.00 cfs 0 cf Primary=0.00 cfs 0 cf
Total Runoff Area = 47,103 sf Runoff Volume = 0 cf Average Runoff Depth = 0.00"	
100.00% Pervious = 47,103 sf 0.00% Impervious = 0 sf	

Summary for Subcatchment E01: E01

[45] Hint: Runoff=Zero

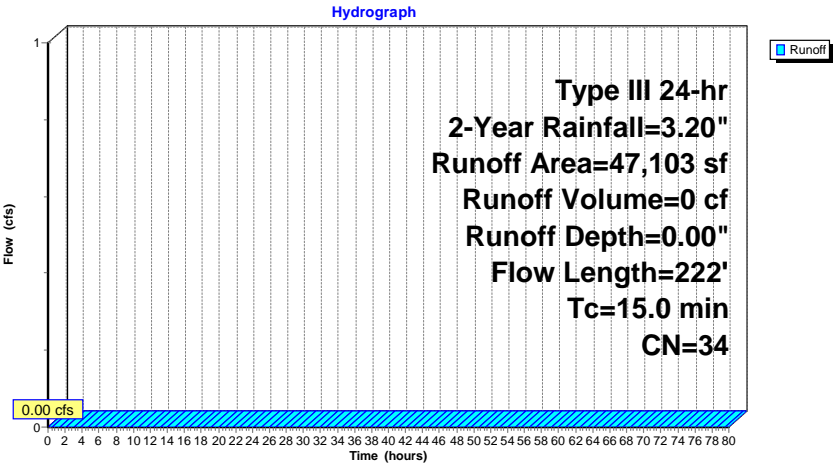
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)		CN	Description		
17,249	39		>75% Grass cover, Good, HSG A		
29,707	30		Woods, Good, HSG A		
147	96		Gravel surface, HSG A		
47,103	34		Weighted Average		
47,103			100.00% Pervious Area		

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		Sheet Flow, Sheet Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	51	0.0224	1.05		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	88	0.0160	0.89		Shallow Concentrated Flow, Shallow 1 Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		Shallow Concentrated Flow, Shallow 2 Woodland Kv= 5.0 fps
15.0	222	Total			

Subcatchment E01: E01

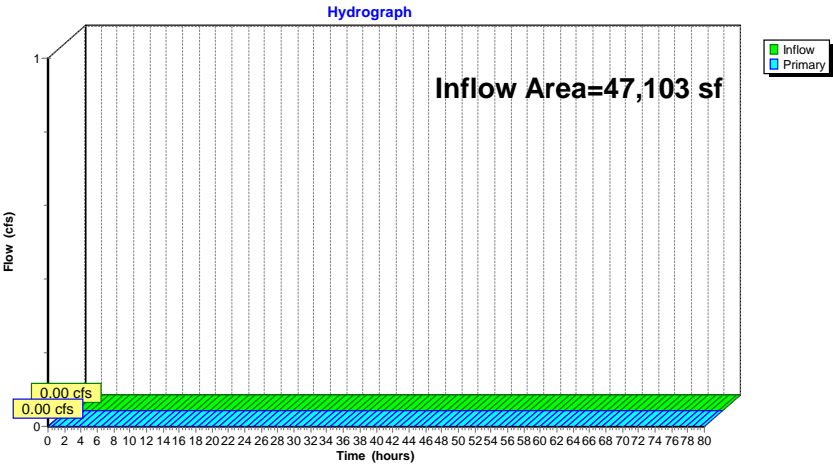


Summary for Link DP-1: DP-1

Inflow Area = 47,103 sf, 0.00% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01
Runoff Area=47,103 sf 0.00% Impervious Runoff Depth=0.04"
Flow Length=222' Tc=15.0 min CN=34 Runoff=0.01 cfs 163 cf

Link DP-1: DP-1
Inflow=0.01 cfs 163 cf
Primary=0.01 cfs 163 cf

Total Runoff Area = 47,103 sf Runoff Volume = 163 cf Average Runoff Depth = 0.04"
100.00% Pervious = 47,103 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E01: E01

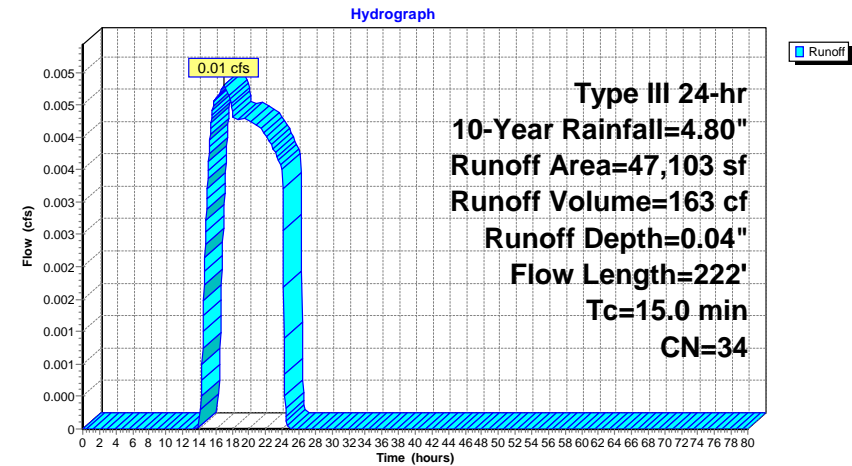
Runoff = 0.01 cfs @ 17.00 hrs, Volume= 163 cf, Depth= 0.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
17,249	39	>75% Grass cover, Good, HSG A
29,707	30	Woods, Good, HSG A
147	96	Gravel surface, HSG A
47,103	34	Weighted Average
47,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		Sheet Flow, Sheet
					Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	51	0.0224	1.05		Shallow Concentrated Flow,
					Short Grass Pasture Kv= 7.0 fps
1.7	88	0.0160	0.89		Shallow Concentrated Flow, Shallow 1
					Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		Shallow Concentrated Flow, Shallow 2
					Woodland Kv= 5.0 fps
15.0	222	Total			

Subcatchment E01: E01

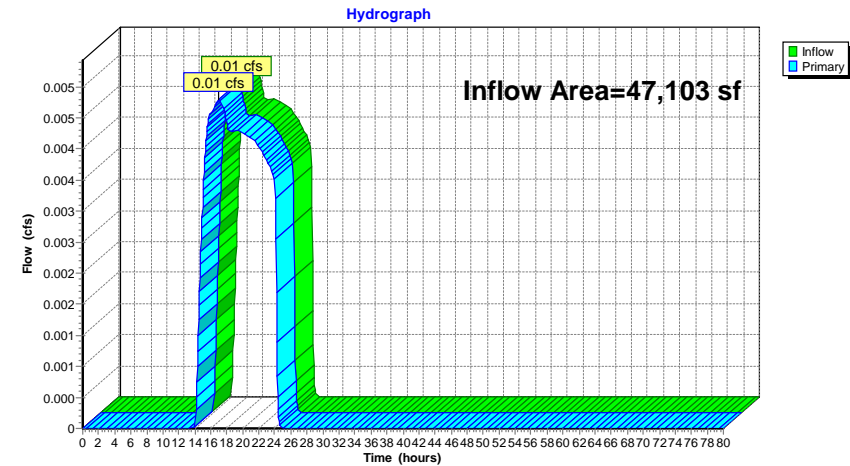


Summary for Link DP-1: DP-1

Inflow Area = 47,103 sf, 0.00% Impervious, Inflow Depth = 0.04" for 10-Year event
Inflow = 0.01 cfs @ 17.00 hrs, Volume= 163 cf
Primary = 0.01 cfs @ 17.00 hrs, Volume= 163 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01

Runoff Area=47,103 sf 0.00% Impervious Runoff Depth=0.21"
Flow Length=222' Tc=15.0 min CN=34 Runoff=0.03 cfs 818 cf

Link DP-1: DP-1

Inflow=0.03 cfs 818 cf
Primary=0.03 cfs 818 cf

Total Runoff Area = 47,103 sf Runoff Volume = 818 cf Average Runoff Depth = 0.21"
100.00% Pervious = 47,103 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E01: E01

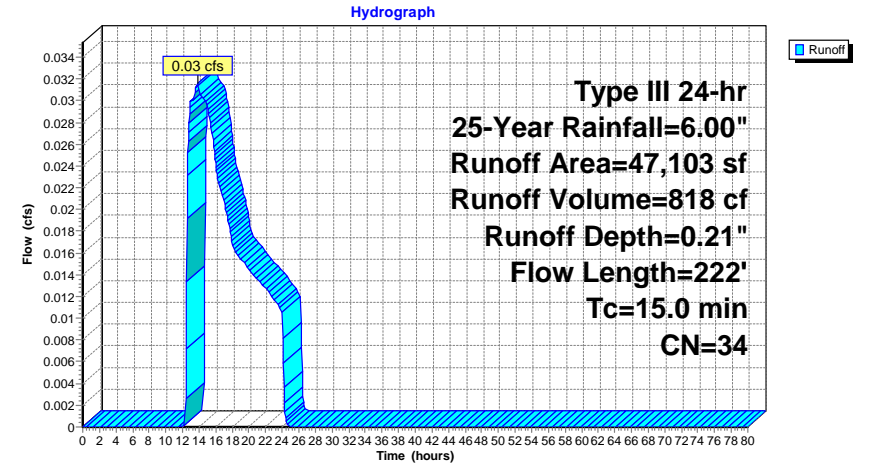
Runoff = 0.03 cfs @ 13.79 hrs, Volume= 818 cf, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
17,249	39	>75% Grass cover, Good, HSG A
29,707	30	Woods, Good, HSG A
147	96	Gravel surface, HSG A
47,103	34	Weighted Average
47,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		Sheet Flow, Sheet Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	51	0.0224	1.05		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	88	0.0160	0.89		Shallow Concentrated Flow, Shallow 1 Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		Shallow Concentrated Flow, Shallow 2 Woodland Kv= 5.0 fps
15.0	222	Total			

Subcatchment E01: E01

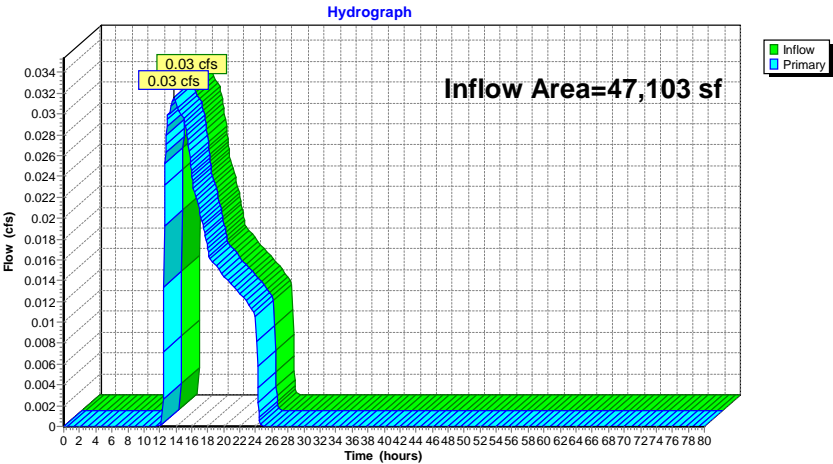


Summary for Link DP-1: DP-1

Inflow Area = 47,103 sf, 0.00% Impervious, Inflow Depth = 0.21" for 25-Year event
Inflow = 0.03 cfs @ 13.79 hrs, Volume= 818 cf
Primary = 0.03 cfs @ 13.79 hrs, Volume= 818 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Time span=0.00-80.00 hrs, dt=0.05 hrs, 1601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E01: E01
Runoff Area=47,103 sf 0.00% Impervious Runoff Depth=0.92"
Flow Length=222' Tc=15.0 min CN=34 Runoff=0.47 cfs 3,621 cf

Link DP-1: DP-1
Inflow=0.47 cfs 3,621 cf
Primary=0.47 cfs 3,621 cf

Total Runoff Area = 47,103 sf Runoff Volume = 3,621 cf Average Runoff Depth = 0.92"
100.00% Pervious = 47,103 sf 0.00% Impervious = 0 sf

Summary for Subcatchment E01: E01

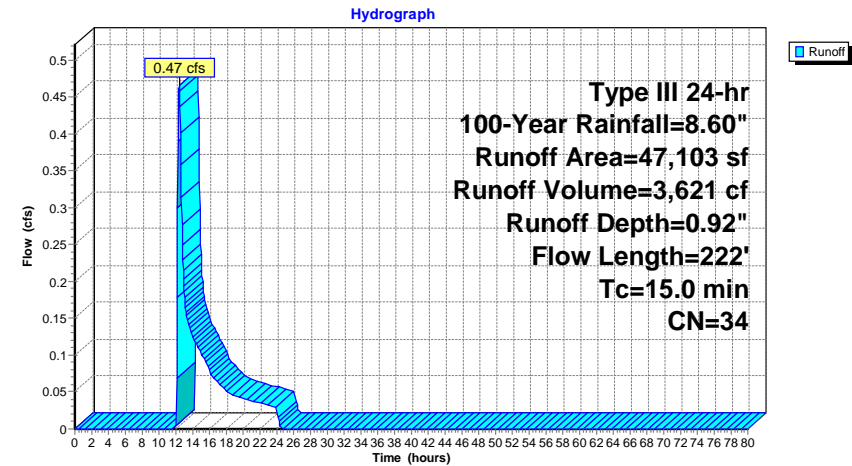
Runoff = 0.47 cfs @ 12.40 hrs, Volume= 3,621 cf, Depth= 0.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
17,249	39	>75% Grass cover, Good, HSG A
29,707	30	Woods, Good, HSG A
147	96	Gravel surface, HSG A
47,103	34	Weighted Average
47,103		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.2	49	0.0196	0.07		Sheet Flow, Sheet Woods: Light underbrush n= 0.400 P2= 3.20"
0.8	51	0.0224	1.05		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
1.7	88	0.0160	0.89		Shallow Concentrated Flow, Shallow 1 Short Grass Pasture Kv= 7.0 fps
0.3	34	0.1324	1.82		Shallow Concentrated Flow, Shallow 2 Woodland Kv= 5.0 fps
15.0	222	Total			

Subcatchment E01: E01

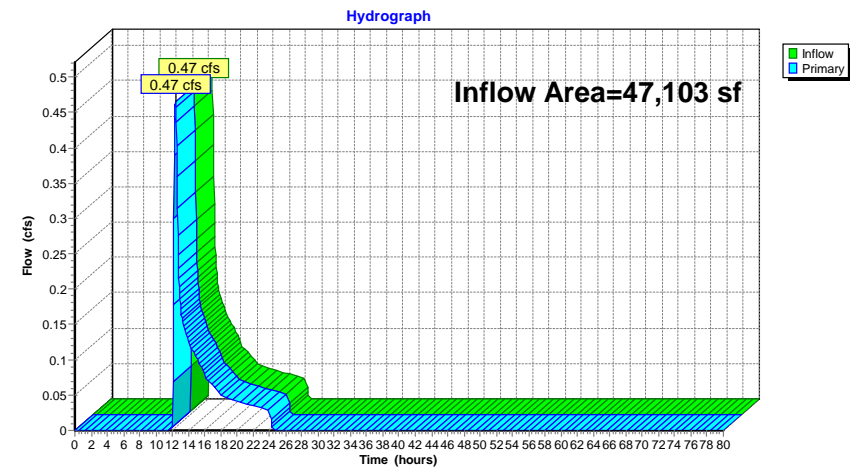


Summary for Link DP-1: DP-1

Inflow Area = 47,103 sf, 0.00% Impervious, Inflow Depth = 0.92" for 100-Year event
Inflow = 0.47 cfs @ 12.40 hrs, Volume= 3,621 cf
Primary = 0.47 cfs @ 12.40 hrs, Volume= 3,621 cf, Atten= 0%, Lag= 0.0 min

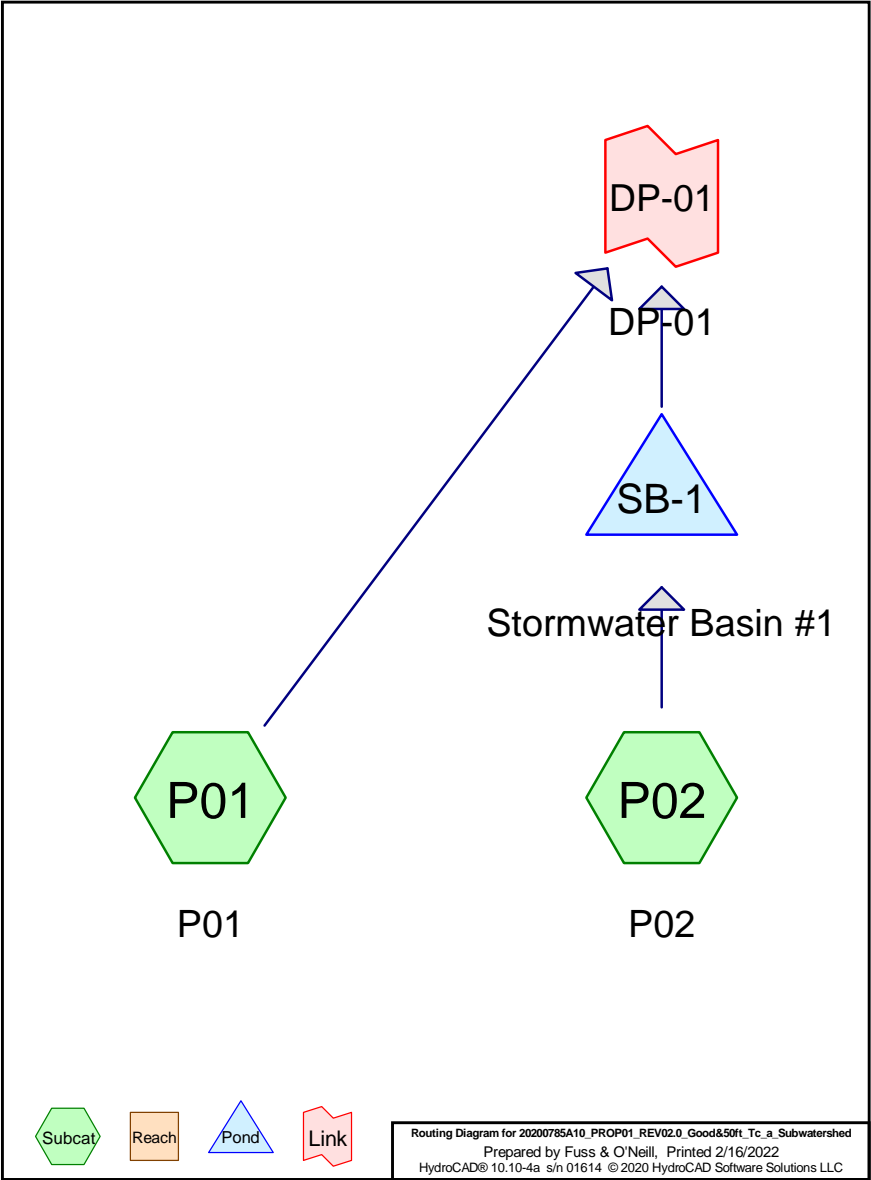
Primary outflow = Inflow, Time Span= 0.00-80.00 hrs, dt= 0.05 hrs

Link DP-1: DP-1



Appendix E

Post-Development Hydrological Analysis



Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.20	2
2	10-Year	Type III 24-hr		Default	24.00	1	4.80	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.00	2
4	100-Year	Type III 24-hr		Default	24.00	1	8.60	2

20200785A10_PROP01_REV02.0_Good&50ft_Tc_a_Subwatershed

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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
15,074	39	>75% Grass cover, Good, HSG A (P01, P02)
14,037	98	Paved parking, HSG A (P01, P02)
6,388	98	Water Surface, 0% imp, HSG A (P02)
7,880	30	Woods, Good, HSG A (P01)
3,724	32	Woods/grass comb., Good, HSG A (P02)
47,103	63	TOTAL AREA

20200785A10_PROP01_REV02.0_Good&50ft_Tc_a_Subwatershed

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Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
47,103	HSG A	P01, P02
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
47,103		TOTAL AREA

20200785A10_PROP01_REV02.0_Good&50ft_Tc_a_Subwatershed

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Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcat Numbe
15,074	0	0	0	0	15,074	>75% Grass cover, Good	
14,037	0	0	0	0	14,037	Paved parking	
6,388	0	0	0	0	6,388	Water Surface, 0% imp	
7,880	0	0	0	0	7,880	Woods, Good	
3,724	0	0	0	0	3,724	Woods/grass comb., Good	
47,103	0	0	0	0	47,103	TOTAL AREA	

20200785A10_PROP01_REV02.0_Good&50ft_Tc_a_Subw Type III 24-hr 2-Year Rainfall=3.20"

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Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN

Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01Runoff Area=11,840 sf 7.33% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=37 Runoff=0.00 cfs 0 cf**Subcatchment P02: P02**Runoff Area=35,263 sf 37.35% Impervious Runoff Depth=0.88"
Flow Length=161' Tc=15.0 min CN=71 Runoff=0.56 cfs 2,580 cf**Pond SB-1: Stormwater Basin #1**Peak Elev=170.37' Storage=741 cf Inflow=0.56 cfs 2,580 cf
Discarded=0.13 cfs 2,580 cf Primary=0.00 cfs 0 cf Outflow=0.13 cfs 2,580 cf**Link DP-01: DP-01**Inflow=0.00 cfs 0 cf
Primary=0.00 cfs 0 cf**Total Runoff Area = 47,103 sf Runoff Volume = 2,580 cf Average Runoff Depth = 0.66"**
70.20% Pervious = 33,066 sf 29.80% Impervious = 14,037 sf

Summary for Subcatchment P01: P01

[45] Hint: Runoff=Zero

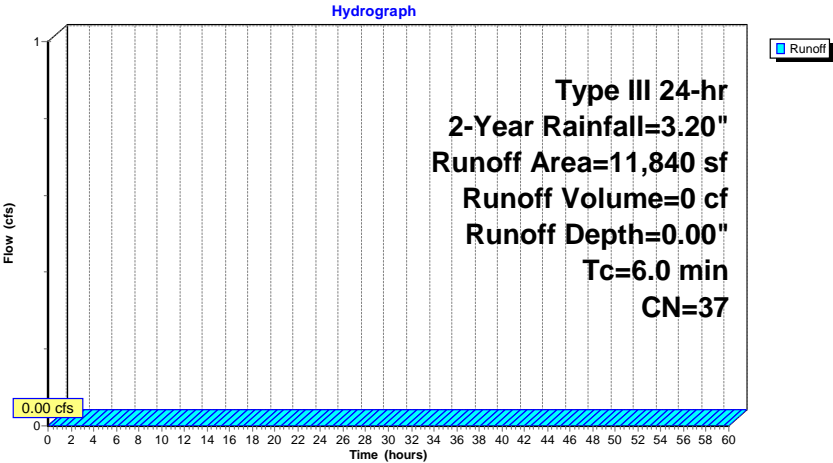
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
3,092	39	>75% Grass cover, Good, HSG A
7,880	30	Woods, Good, HSG A
868	98	Paved parking, HSG A
0	98	Water Surface, 0% imp, HSG A
11,840	37	Weighted Average
10,972		92.67% Pervious Area
868		7.33% Impervious Area

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

Subcatchment P01: P01



Summary for Subcatchment P02: P02

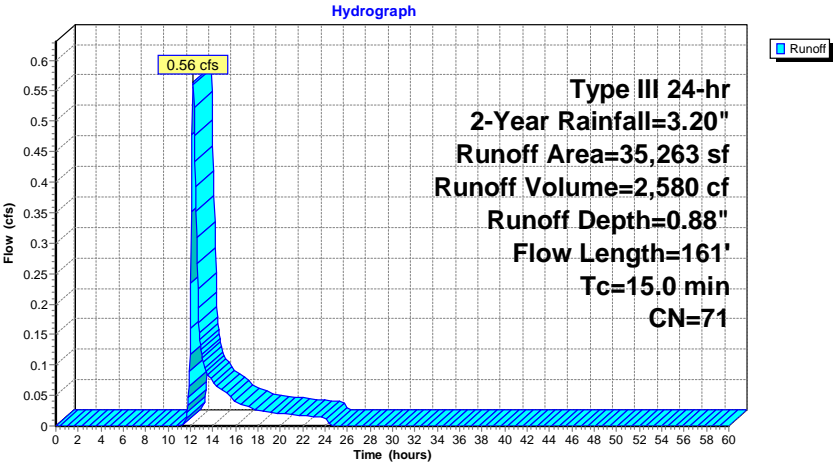
Runoff = 0.56 cfs @ 12.23 hrs, Volume= 2,580 cf, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.20"

Area (sf)	CN	Description
11,982	39	>75% Grass cover, Good, HSG A
3,724	32	Woods/grass comb., Good, HSG A
13,169	98	Paved parking, HSG A
6,388	98	Water Surface, 0% imp, HSG A
35,263	71	Weighted Average
22,094		62.65% Pervious Area
13,169		37.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0020	0.06		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.3	10	0.0060	0.54		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	101	0.0170	2.65		Shallow Concentrated Flow, Paved Kv= 20.3 fps
15.0	161	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 35,263 sf, 37.35% Impervious, Inflow Depth = 0.88" for 2-Year event
Inflow = 0.56 cfs @ 12.23 hrs, Volume= 2,580 cf
Outflow = 0.13 cfs @ 12.93 hrs, Volume= 2,580 cf, Atten= 78%, Lag= 42.1 min
Discarded = 0.13 cfs @ 12.93 hrs, Volume= 2,580 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 170.37' @ 12.93 hrs Surf.Area= 2,268 sf Storage= 741 cf

Plug-Flow detention time= 50.8 min calculated for 2,578 cf (100% of inflow)
Center-of-Mass det. time= 50.7 min (931.3 - 880.5)

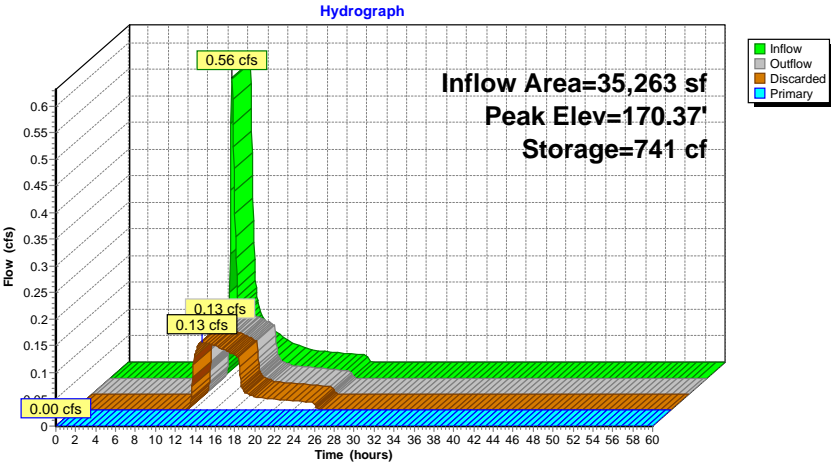
Volume	Invert	Avail.Storage	Storage Description
#1	170.00'	12,023 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
170.00	1,727	0	0
171.00	3,185	2,456	2,456
172.00	4,780	3,983	6,439
173.00	6,388	5,584	12,023

Device	Routing	Invert	Outlet Devices
#1	Primary	172.25'	10.0' long x 1.0' breadth Broad-Crested Rectangular Weir 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 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
#2	Discarded	170.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.13 cfs @ 12.93 hrs HW=170.37' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=170.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond SB-1: Stormwater Basin #1

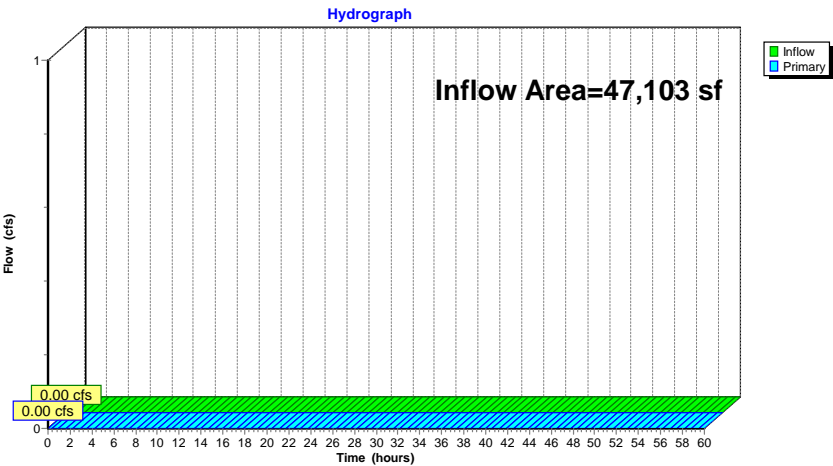


Summary for Link DP-01: DP-01

Inflow Area = 47,103 sf, 29.80% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=11,840 sf 7.33% Impervious Runoff Depth=0.11"
Tc=6.0 min CN=37 Runoff=0.00 cfs 104 cf

Subcatchment P02: P02 Runoff Area=35,263 sf 37.35% Impervious Runoff Depth=1.97"
Flow Length=161' Tc=15.0 min CN=71 Runoff=1.38 cfs 5,779 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=170.96' Storage=2,332 cf Inflow=1.38 cfs 5,779 cf
Discarded=0.17 cfs 5,779 cf Primary=0.00 cfs 0 cf Outflow=0.17 cfs 5,779 cf

Link DP-01: DP-01 Inflow=0.00 cfs 104 cf
Primary=0.00 cfs 104 cf

Total Runoff Area = 47,103 sf Runoff Volume = 5,883 cf Average Runoff Depth = 1.50"
70.20% Pervious = 33,066 sf 29.80% Impervious = 14,037 sf

Summary for Subcatchment P01: P01

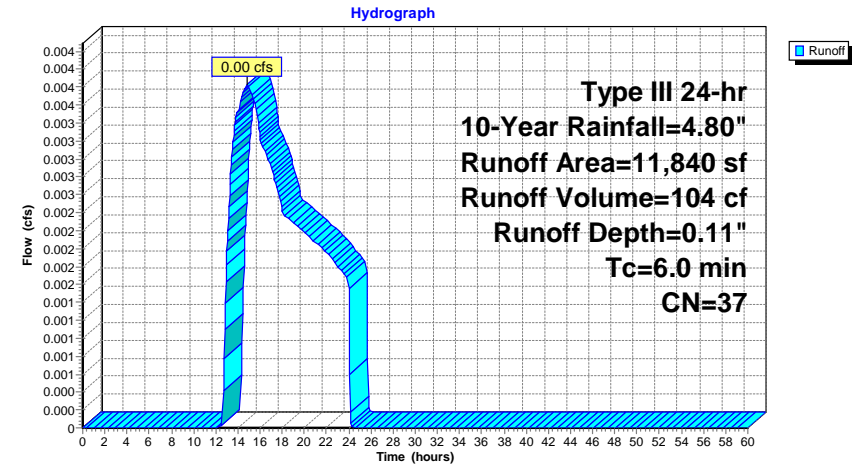
Runoff = 0.00 cfs @ 14.83 hrs, Volume= 104 cf, Depth= 0.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
3,092	39	>75% Grass cover, Good, HSG A
7,880	30	Woods, Good, HSG A
868	98	Paved parking, HSG A
0	98	Water Surface, 0% imp, HSG A
11,840	37	Weighted Average
10,972		92.67% Pervious Area
868		7.33% Impervious Area

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

Subcatchment P01: P01



Summary for Subcatchment P02: P02

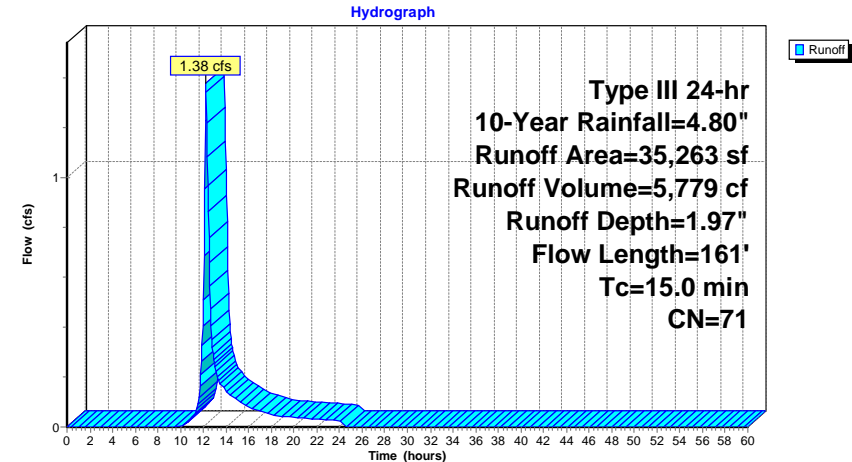
Runoff = 1.38 cfs @ 12.22 hrs, Volume= 5,779 cf, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=4.80"

Area (sf)	CN	Description
11,982	39	>75% Grass cover, Good, HSG A
3,724	32	Woods/grass comb., Good, HSG A
13,169	98	Paved parking, HSG A
6,388	98	Water Surface, 0% imp, HSG A
35,263	71	Weighted Average
22,094		62.65% Pervious Area
13,169		37.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0020	0.06		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.3	10	0.0060	0.54		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	101	0.0170	2.65		Shallow Concentrated Flow, Paved Kv= 20.3 fps
15.0	161	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 35,263 sf, 37.35% Impervious, Inflow Depth = 1.97" for 10-Year event
Inflow = 1.38 cfs @ 12.22 hrs, Volume= 5,779 cf
Outflow = 0.17 cfs @ 13.45 hrs, Volume= 5,779 cf, Atten= 87%, Lag= 73.8 min
Discarded = 0.17 cfs @ 13.45 hrs, Volume= 5,779 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 170.96' @ 13.45 hrs Surf.Area= 3,127 sf Storage= 2,332 cf

Plug-Flow detention time= 142.4 min calculated for 5,774 cf (100% of inflow)
Center-of-Mass det. time= 142.3 min (997.9 - 855.6)

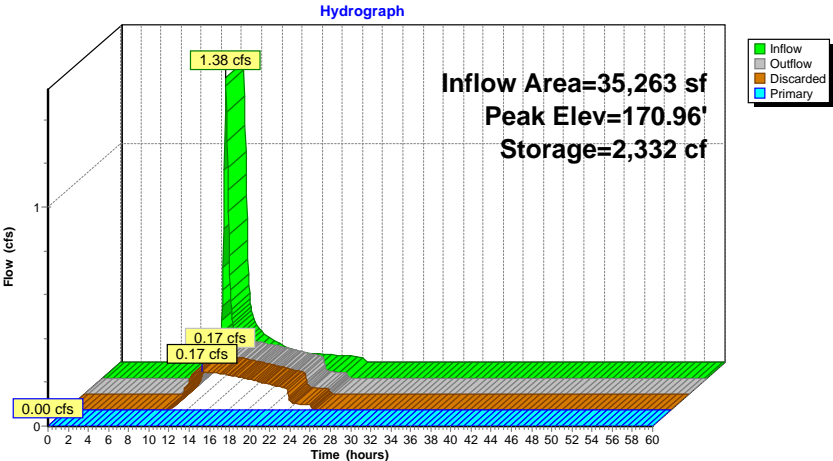
Volume	Invert	Avail.Storage	Storage Description
#1	170.00'	12,023 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
170.00	1,727	0	0
171.00	3,185	2,456	2,456
172.00	4,780	3,983	6,439
173.00	6,388	5,584	12,023

Device	Routing	Invert	Outlet Devices
#1	Primary	172.25'	10.0' long x 1.0' breadth Broad-Crested Rectangular Weir 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 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
#2	Discarded	170.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.17 cfs @ 13.45 hrs HW=170.96' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.17 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=170.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond SB-1: Stormwater Basin #1

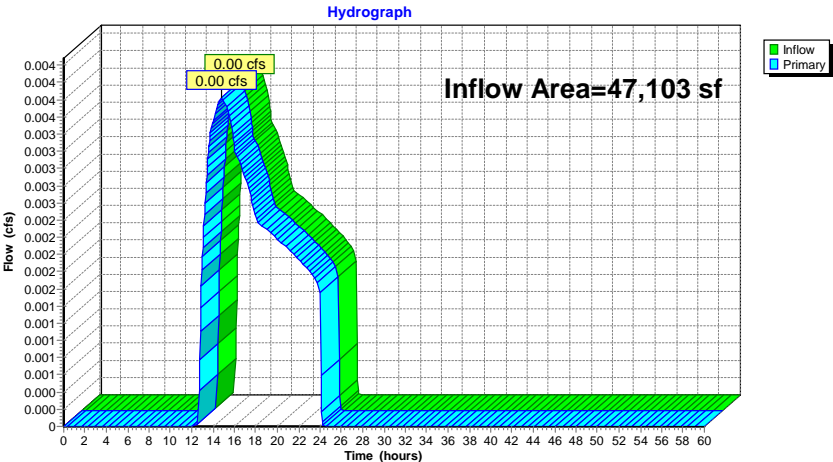


Summary for Link DP-01: DP-01

Inflow Area = 47,103 sf, 29.80% Impervious, Inflow Depth = 0.03" for 10-Year event
Inflow = 0.00 cfs @ 14.83 hrs, Volume= 104 cf
Primary = 0.00 cfs @ 14.83 hrs, Volume= 104 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=11,840 sf 7.33% Impervious Runoff Depth=0.34"
Tc=6.0 min CN=37 Runoff=0.03 cfs 339 cf

Subcatchment P02: P02 Runoff Area=35,263 sf 37.35% Impervious Runoff Depth=2.90"
Flow Length=161' Tc=15.0 min CN=71 Runoff=2.06 cfs 8,518 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=171.39' Storage=3,827 cf Inflow=2.06 cfs 8,518 cf
Discarded=0.21 cfs 8,518 cf Primary=0.00 cfs 0 cf Outflow=0.21 cfs 8,518 cf

Link DP-01: DP-01 Inflow=0.03 cfs 339 cf
Primary=0.03 cfs 339 cf

Total Runoff Area = 47,103 sf Runoff Volume = 8,857 cf Average Runoff Depth = 2.26"
70.20% Pervious = 33,066 sf 29.80% Impervious = 14,037 sf

Summary for Subcatchment P01: P01

Runoff = 0.03 cfs @ 12.40 hrs, Volume= 339 cf, Depth= 0.34"

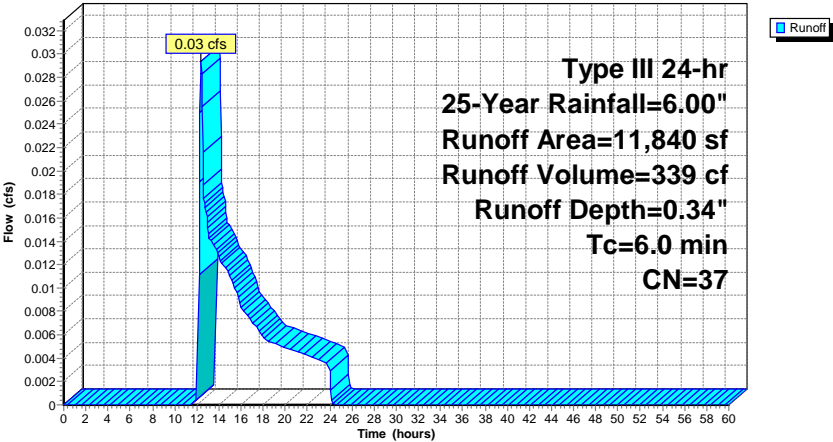
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
3,092	39	>75% Grass cover, Good, HSG A
7,880	30	Woods, Good, HSG A
868	98	Paved parking, HSG A
0	98	Water Surface, 0% imp, HSG A
11,840	37	Weighted Average
10,972		92.67% Pervious Area
868		7.33% Impervious Area

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

Subcatchment P01: P01

Hydrograph



Summary for Subcatchment P02: P02

Runoff = 2.06 cfs @ 12.21 hrs, Volume= 8,518 cf, Depth= 2.90"

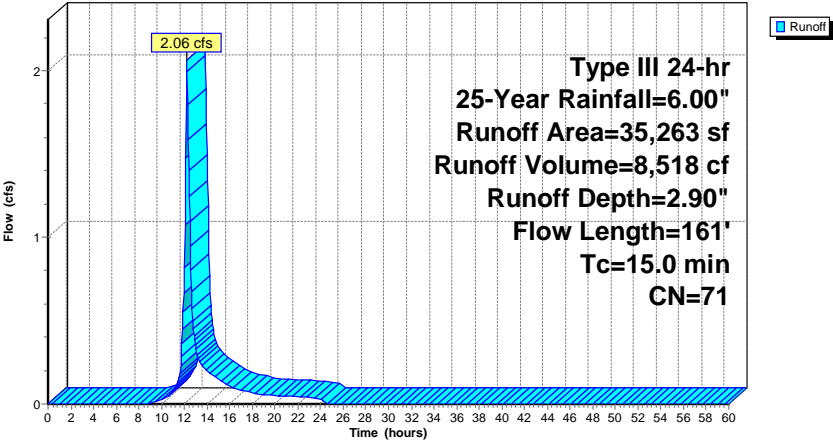
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=6.00"

Area (sf)	CN	Description
11,982	39	>75% Grass cover, Good, HSG A
3,724	32	Woods/grass comb., Good, HSG A
13,169	98	Paved parking, HSG A
6,388	98	Water Surface, 0% imp, HSG A
35,263	71	Weighted Average
22,094		62.65% Pervious Area
13,169		37.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0020	0.06		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.3	10	0.0060	0.54		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	101	0.0170	2.65		Shallow Concentrated Flow, Paved Kv= 20.3 fps
15.0	161	Total			

Subcatchment P02: P02

Hydrograph



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 35,263 sf, 37.35% Impervious, Inflow Depth = 2.90" for 25-Year event
Inflow = 2.06 cfs @ 12.21 hrs, Volume= 8,518 cf
Outflow = 0.21 cfs @ 13.83 hrs, Volume= 8,518 cf, Atten= 90%, Lag= 96.9 min
Discarded = 0.21 cfs @ 13.83 hrs, Volume= 8,518 cf
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 171.39' @ 13.83 hrs Surf.Area= 3,810 sf Storage= 3,827 cf

Plug-Flow detention time= 204.3 min calculated for 8,511 cf (100% of inflow)
Center-of-Mass det. time= 204.2 min (1,048.4 - 844.2)

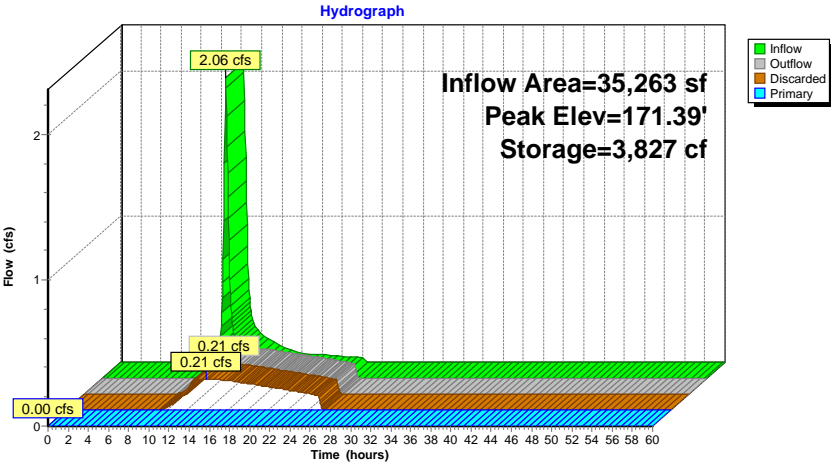
Volume	Invert	Avail.Storage	Storage Description
#1	170.00'	12,023 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
170.00	1,727	0	0
171.00	3,185	2,456	2,456
172.00	4,780	3,983	6,439
173.00	6,388	5,584	12,023

Device	Routing	Invert	Outlet Devices
#1	Primary	172.25'	10.0' long x 1.0' breadth Broad-Crested Rectangular Weir 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 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
#2	Discarded	170.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.21 cfs @ 13.83 hrs HW=171.39' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.21 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=170.00' (Free Discharge)
1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond SB-1: Stormwater Basin #1

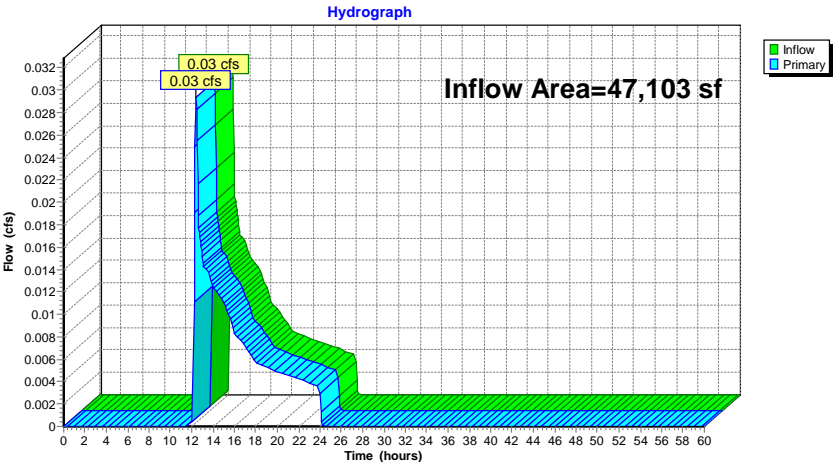


Summary for Link DP-01: DP-01

Inflow Area = 47,103 sf, 29.80% Impervious, Inflow Depth = 0.09" for 25-Year event
Inflow = 0.03 cfs @ 12.40 hrs, Volume= 339 cf
Primary = 0.03 cfs @ 12.40 hrs, Volume= 339 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Time span=0.00-60.00 hrs, dt=0.05 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment P01: P01 Runoff Area=11,840 sf 7.33% Impervious Runoff Depth=1.21"
Tc=6.0 min CN=37 Runoff=0.24 cfs 1,198 cf

Subcatchment P02: P02 Runoff Area=35,263 sf 37.35% Impervious Runoff Depth=5.10"
Flow Length=161' Tc=15.0 min CN=71 Runoff=3.65 cfs 15,000 cf

Pond SB-1: Stormwater Basin #1 Peak Elev=172.25' Storage=7,687 cf Inflow=3.65 cfs 15,000 cf
Discarded=0.29 cfs 14,997 cf Primary=0.00 cfs 2 cf Outflow=0.29 cfs 15,000 cf

Link DP-01: DP-01 Inflow=0.24 cfs 1,200 cf
Primary=0.24 cfs 1,200 cf

Total Runoff Area = 47,103 sf Runoff Volume = 16,198 cf Average Runoff Depth = 4.13"
70.20% Pervious = 33,066 sf 29.80% Impervious = 14,037 sf

Summary for Subcatchment P01: P01

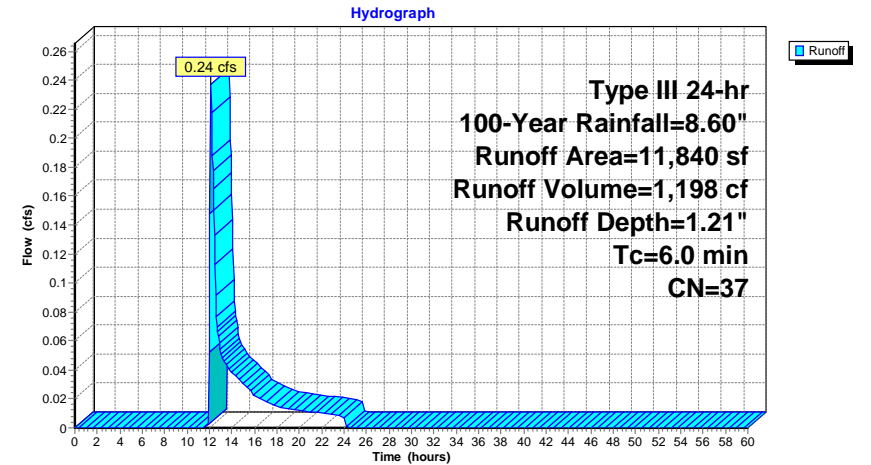
Runoff = 0.24 cfs @ 12.13 hrs, Volume= 1,198 cf, Depth= 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
3,092	39	>75% Grass cover, Good, HSG A
7,880	30	Woods, Good, HSG A
868	98	Paved parking, HSG A
0	98	Water Surface, 0% imp, HSG A
11,840	37	Weighted Average
10,972		92.67% Pervious Area
868		7.33% Impervious Area

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

Subcatchment P01: P01



Summary for Subcatchment P02: P02

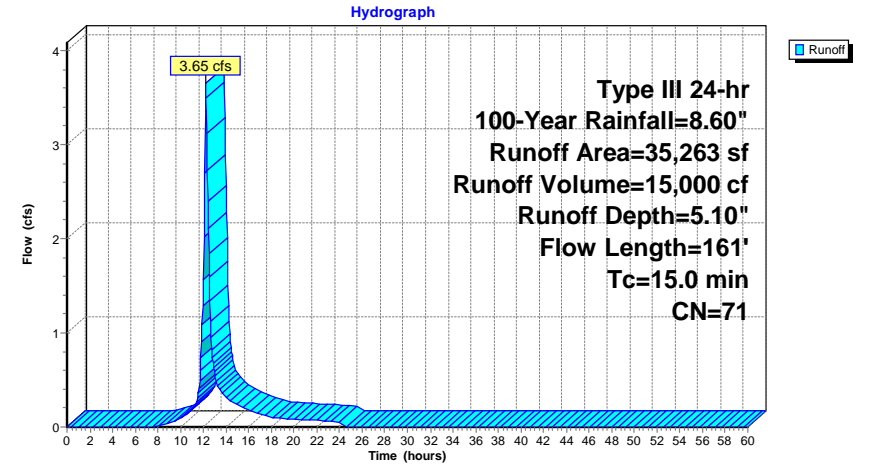
Runoff = 3.65 cfs @ 12.21 hrs, Volume= 15,000 cf, Depth= 5.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.60"

Area (sf)	CN	Description
11,982	39	>75% Grass cover, Good, HSG A
3,724	32	Woods/grass comb., Good, HSG A
13,169	98	Paved parking, HSG A
6,388	98	Water Surface, 0% imp, HSG A
35,263	71	Weighted Average
22,094		62.65% Pervious Area
13,169		37.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.1	50	0.0020	0.06		Sheet Flow, Grass: Short n= 0.150 P2= 3.20"
0.3	10	0.0060	0.54		Shallow Concentrated Flow, Short Grass Pasture Kv= 7.0 fps
0.6	101	0.0170	2.65		Shallow Concentrated Flow, Paved Kv= 20.3 fps
15.0	161	Total			

Subcatchment P02: P02



Summary for Pond SB-1: Stormwater Basin #1

Inflow Area = 35,263 sf, 37.35% Impervious, Inflow Depth = 5.10" for 100-Year event
Inflow = 3.65 cfs @ 12.21 hrs, Volume= 15,000 cf
Outflow = 0.29 cfs @ 14.24 hrs, Volume= 15,000 cf, Atten= 92%, Lag= 121.7 min
Discarded = 0.29 cfs @ 14.24 hrs, Volume= 14,997 cf
Primary = 0.00 cfs @ 14.24 hrs, Volume= 2 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs
Peak Elev= 172.25' @ 14.24 hrs Surf.Area= 5,183 sf Storage= 7,687 cf

Plug-Flow detention time= 312.2 min calculated for 14,987 cf (100% of inflow)
Center-of-Mass det. time= 312.2 min (1,140.1 - 827.9)

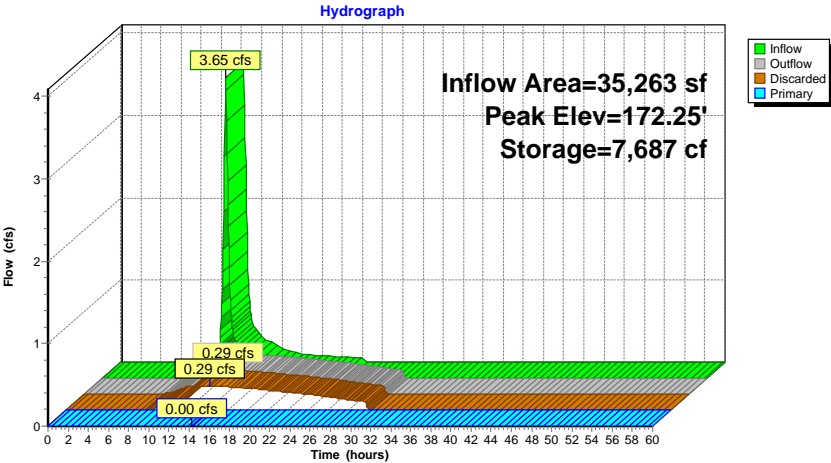
Volume	Invert	Avail.Storage	Storage Description
#1	170.00'	12,023 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
170.00	1,727	0	0
171.00	3,185	2,456	2,456
172.00	4,780	3,983	6,439
173.00	6,388	5,584	12,023

Device	Routing	Invert	Outlet Devices
#1	Primary	172.25'	10.0' long x 1.0' breadth Broad-Crested Rectangular Weir 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 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
#2	Discarded	170.00'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.29 cfs @ 14.24 hrs HW=172.25' (Free Discharge)
2=Exfiltration (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.00 cfs @ 14.24 hrs HW=172.25' (Free Discharge)
1=Broad-Crested Rectangular Weir (Weir Controls 0.00 cfs @ 0.07 fps)

Pond SB-1: Stormwater Basin #1

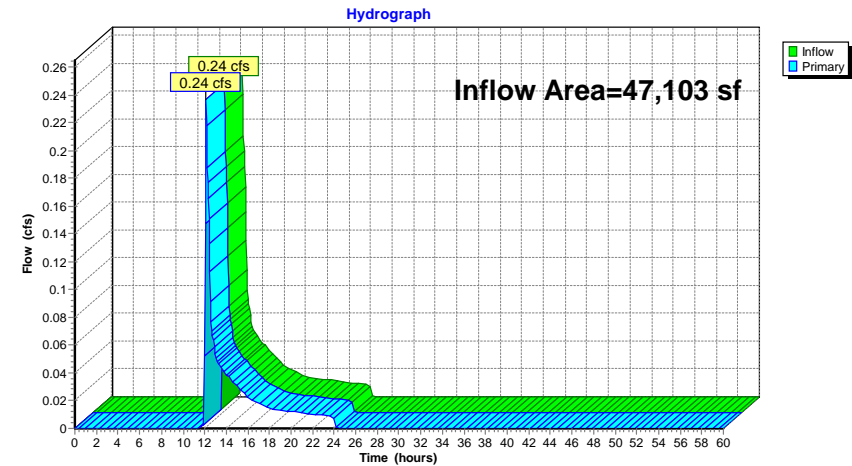


Summary for Link DP-01: DP-01

Inflow Area = 47,103 sf, 29.80% Impervious, Inflow Depth = 0.31" for 100-Year event
Inflow = 0.24 cfs @ 12.13 hrs, Volume= 1,200 cf
Primary = 0.24 cfs @ 12.13 hrs, Volume= 1,200 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-60.00 hrs, dt= 0.05 hrs

Link DP-01: DP-01



Stage-Area-Storage for Pond SB-1: Stormwater Basin #1

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
170.00	1,727	0	172.70	5,906	10,178
170.05	1,800	88	172.75	5,986	10,476
170.10	1,873	180	172.80	6,066	10,777
170.15	1,946	275	172.85	6,147	11,082
170.20	2,019	375	172.90	6,227	11,392
170.25	2,092	477	172.95	6,308	11,705
170.30	2,164	584	173.00	6,388	12,023
170.35	2,237	694			
170.40	2,310	807			
170.45	2,383	925			
170.50	2,456	1,046			
170.55	2,529	1,170			
170.60	2,602	1,299			
170.65	2,675	1,431			
170.70	2,748	1,566			
170.75	2,821	1,705			
170.80	2,893	1,848			
170.85	2,966	1,995			
170.90	3,039	2,145			
170.95	3,112	2,299			
171.00	3,185	2,456			
171.05	3,265	2,617			
171.10	3,344	2,782			
171.15	3,424	2,952			
171.20	3,504	3,125			
171.25	3,584	3,302			
171.30	3,664	3,483			
171.35	3,743	3,668			
171.40	3,823	3,858			
171.45	3,903	4,051			
171.50	3,983	4,248			
171.55	4,062	4,449			
171.60	4,142	4,654			
171.65	4,222	4,863			
171.70	4,301	5,076			
171.75	4,381	5,293			
171.80	4,461	5,514			
171.85	4,541	5,739			
171.90	4,621	5,968			
171.95	4,700	6,201			
172.00	4,780	6,439			
172.05	4,860	6,680			
172.10	4,941	6,925			
172.15	5,021	7,174			
172.20	5,102	7,427			
172.25	5,182	7,684			
172.30	5,262	7,945			
172.35	5,343	8,210			
172.40	5,423	8,479			
172.45	5,504	8,752			
172.50	5,584	9,030			
172.55	5,664	9,311			
172.60	5,745	9,596			
172.65	5,825	9,885			

WEIR ELEVATION

Appendix F

Stormwater Management Checklist & Illicit Discharged Compliance Statement



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

Signature and Date

Checklist

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

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☐ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☐ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☐ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the proprietary 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.

Illicit Discharge Statement
Broadacres Farm Parking Lot
(Part of Bruce Freeman Rail Trail Project)

No illicit discharges are proposed to enter the stormwater system located within the Broadacres Farm Parking Lot area. Inspection procedures outline in the Long-Term Operation and Maintenance Plan will be strictly followed so contaminations 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. Town of Sudbury personnel are informed of the illicit discharge detection and elimination procedures and that no illicit discharges are allowed to enter the stormwater system.

Appendix G

Water Quality Treatment Calculations



Project: Broadacres Farm Parking Lot
Sudbury, MA

Prepared By: MTC
Date: 2/4/2021

REQUIRED WATER QUALITY VOLUME (V_{wq})

$$V_{wq} = (Dwq / 12 \text{ inches/foot}) * (\text{Impervious Area})$$

$$Dwq = 1$$

Infiltration Basin #1

Impervious Area Contributing=

14,034 SF

REQUIRED V_{wq} =	1,170 CF
---------------------------------------	-----------------

PROVIDED WQV STORAGE* =	7,684 CF
--------------------------------	-----------------

*Per HydroCAD, at weir el. 172.25

Appendix H

TSS Removal Calculations



Project: Broadacres Farm Parking Lot
(Part of the Bruce Freeman
Rail Trail Project)
Site Location: Sudbury, MA
Project Number: 20200785.A10

Prepared By: MTC
Date: 2/16/2022

BMP	Pretreatment TSS Removal Efficiency	Starting TSS Load	TSS Removed	TSS Remaining
Street Sweeping - 5%	5%	1.00	0.05	0.95
Sediment Forebay	25%	0.95	0.24	0.71
Vegetated Strip*		0.71	0.00	0.71
		0.71	0.00	0.71

Total Pretreatment TSS Removal Efficiency=	29%
---	------------

* Town will not use sand; will only use salt.

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin #1 w/Forebay Pre-treatment

TSS Removal Calculation Worksheet	B	C	D	E	F
	BMP ¹	TSS Removal Rate ¹	Starting TSS Load*	Amount Removed (C*D)	Remaining Load (D-E)
	Infiltration Basin	0.80	1.00	0.80	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20
		0.00	0.20	0.00	0.20

Total TSS Removal =

80%

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

Project: Broadacres Farm Parking Lot
Prepared By: MTC
Date: 2/16/2022

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

Appendix I

Groundwater Recharge Calculations, 72 Hour Drawdown, Mounding Calculations and Bedrock Memorandum



Project: Broadacres Farm Parking Lot
Sudbury, MA

Prepared By: MTC
Date: 2/15/2022

INFILTRATION BASIN #1

REQUIRED RECHARGE VOLUME

$R_v = F * \text{IMPERVIOUS AREA}$
 $R_v =$ required recharge volume
 $F =$ 0.6 INCH Soil A

Contributing to Infiltration Basin #1
Receives Stormwater From Catch P02

Total Impervious= 14,034 SF
Impervious Soil A= 14,034 SF

Infiltration Basin #1 $R_v =$ 702 CF

Provided Storage Volume* = 7,427 CF > 702 CF
--

* Volume of just Basin

72 HOUR DRAWDOWN

Time drawdown=
$$\frac{R_v}{(K)(\text{Bottom Area})}$$

$R_v =$ storage volume of basin*
Soil A $K =$ 2.41 inch/hour

Bottom Area of System= 1,727 SF
 $R_v =$ 7,427 CF * Volume of just Basin
T drawdown= 21 hours < 72 hours



Project: Broadacres Farm Parking Lot
Sudbury, MA

Prepared By: MTC
Date: 2/16/2021

Basin ONLY Volume for Groundwater Recharge

STAGE (FT)	ELEV (FT)	CONTOUR AREA (SF)	INC STORAGE (CF)	TOTAL STORAGE (CF)
0	170	1,462	0	0
1	171	2,632	2047	2047
2	172	3,852	3242	5289
3	172.25	5,140	7427	7427

PROVIDED FOREBAY STORAGE= 7427 CF

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated. Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

Input Values		use consistent units (e.g. feet & days or inches & hours)	Conversion Table		
			inch/hour	feet/day	
4.8200	R	Recharge (infiltration) rate (feet/day)	0.67	1.33	
0.270	Sy	Specific yield, Sy (dimensionless, between 0 and 1)			
48.20	K	Horizontal hydraulic conductivity, Kh (feet/day)*	2.00	4.00	In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).
4.000	x	1/2 length of basin (x direction, in feet)			
91.500	y	1/2 width of basin (y direction, in feet)	hours	days	
0.875	t	duration of infiltration period (days)	36	1.50	
33.000	hi(0)	initial thickness of saturated zone (feet)			

33.912	h(max)	maximum thickness of saturated zone (beneath center of basin at end of infiltration period)
0.912	Δh(max)	maximum groundwater mounding (beneath center of basin at end of infiltration period)

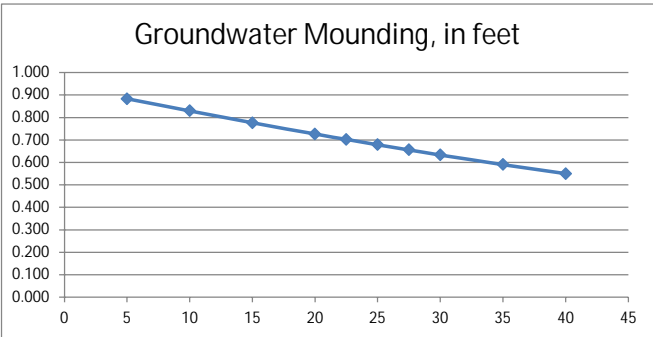
Ground-water Mounding, in feet

Distance from center of basin in x direction, in feet

0.884	5
0.830	10
0.777	15
0.727	20
0.702	22.5
0.679	25
0.656	27.5
0.634	30
0.591	35
0.550	40



Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

MEMORANDUM

TO: Beth Suedmeyer
Environmental Planner, Town of Sudbury
278 Old Sudbury Road
Sudbury, MA 01776

FROM: Matthew Kissane, MS Geologist & Eric Bernardin, PE, Fuss & O'Neill

DATE: February 16, 2022

RE: Broadacre Farm Parking Lot - Bedrock Depth Desktop Review
Fuss & O'Neill Reference: 20200785.A10

Project Background

Fuss & O'Neill understands that the Town of Sudbury ("the Town") is planning construction of a parking lot off Broadacre Farm (the Site) as part of the Bruce Freeman Rail Trail Project. Fuss & O'Neill has been contracted to provide the Town with site/civil engineering consulting services for the proposed parking lot. In support of these services, Fuss & O'Neill completed a review of available historical subsurface investigation data, to approximate the depth to bedrock at the Site.

Review of Historical Data

In support of this assessment, Fuss & O'Neill reviewed the boring logs of a subsurface investigation conducted by Jacobs, a design consultant, in August of 2019 and are included in *Attachment A*. While the August 2019 borings were not installed at the Site, they were installed along the same rail right-of-way to the north and south of the site. The locations of the August 2019 investigation locations are included in the following image:

Ms. Beth Suedmeyer
February 16, 2022
Page 2 of 3



Ms. Beth Suedmeyer
February 16, 2022
Page 3 of 3

The ground elevation, depth to bedrock (if observed) and inferred bedrock elevation derived from these boring logs is included in the following table:

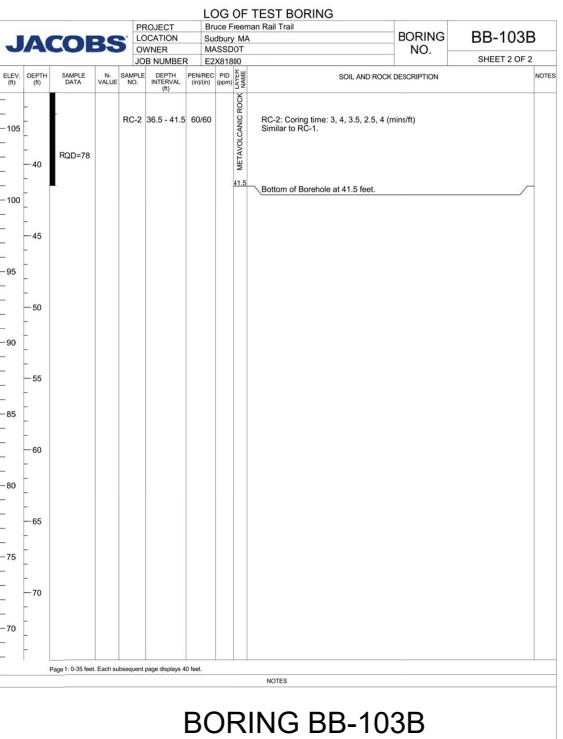
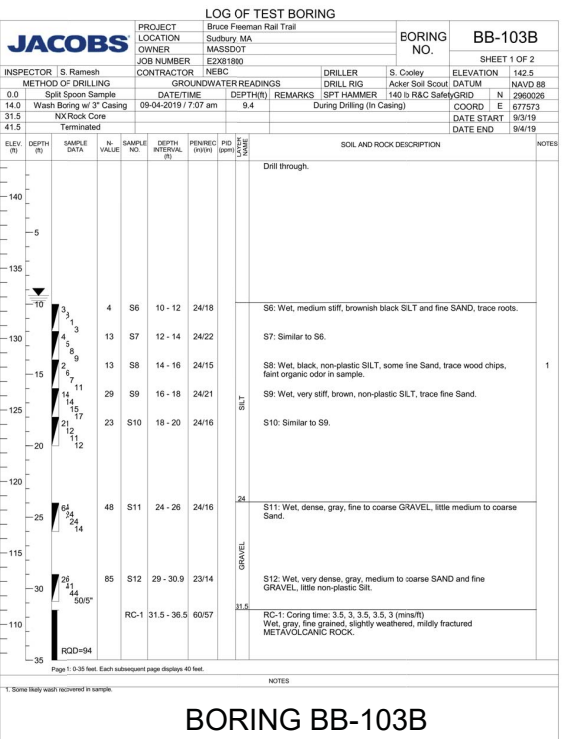
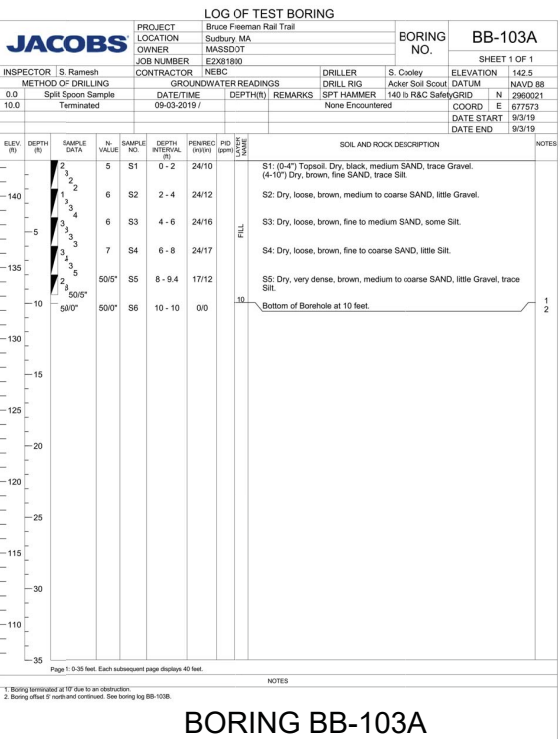
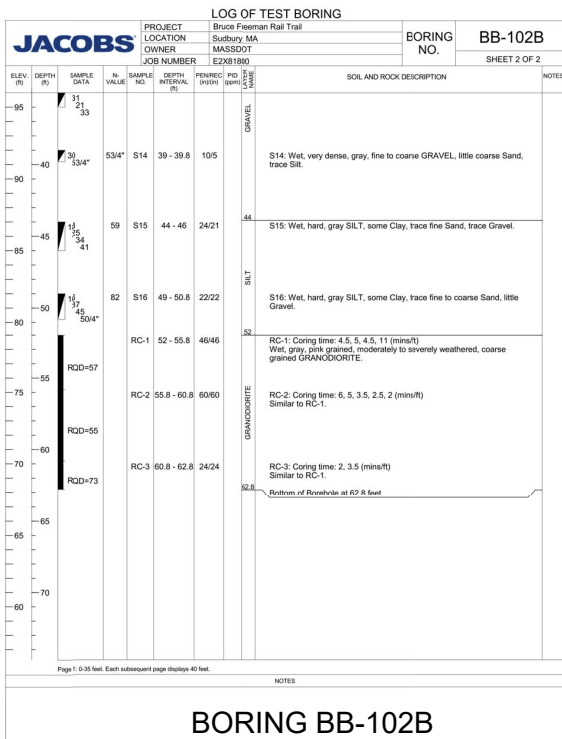
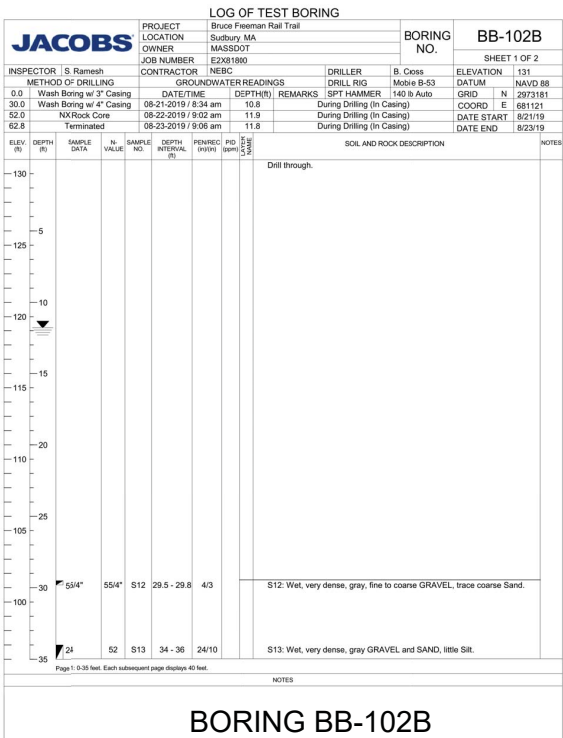
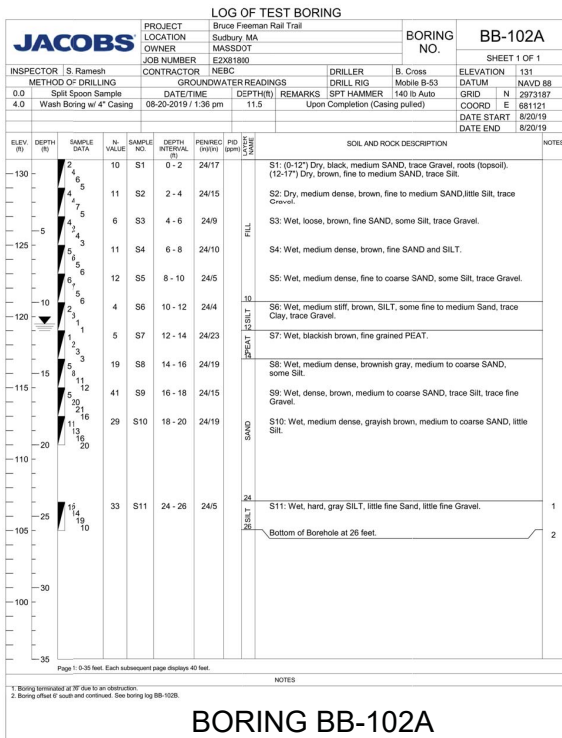
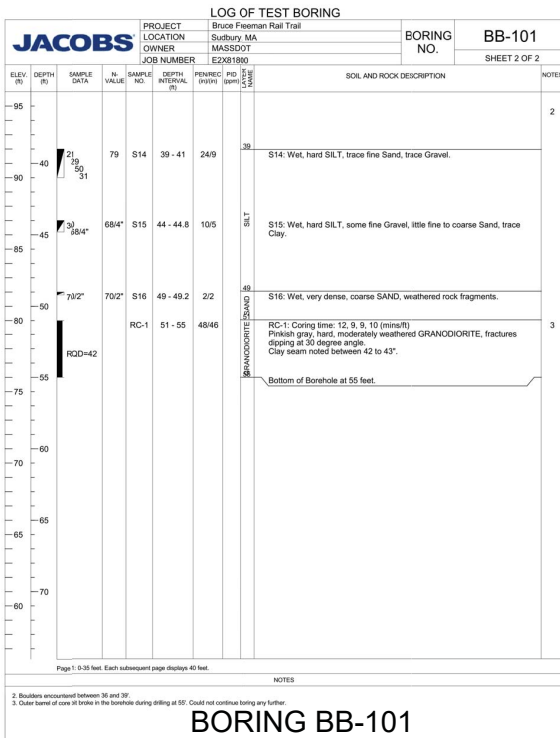
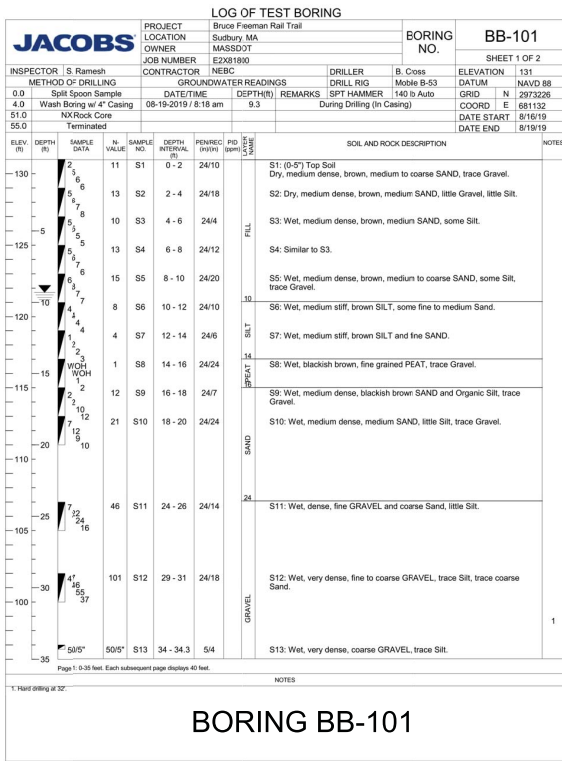
Location	Ground Elevation (ft)	Depth to Bedrock (ft)	Bedrock Elevation (ft)
BB-101	131	49	82
BB-102B	131	52	79
BB-103B	142.5	31.5	111
BB-105	189	N/A	>20.7
BB-106	188	N/A	>20.4
BB-107B	187	N/A	>20
BB-108	185	16	169
BB-109B	184	11	173

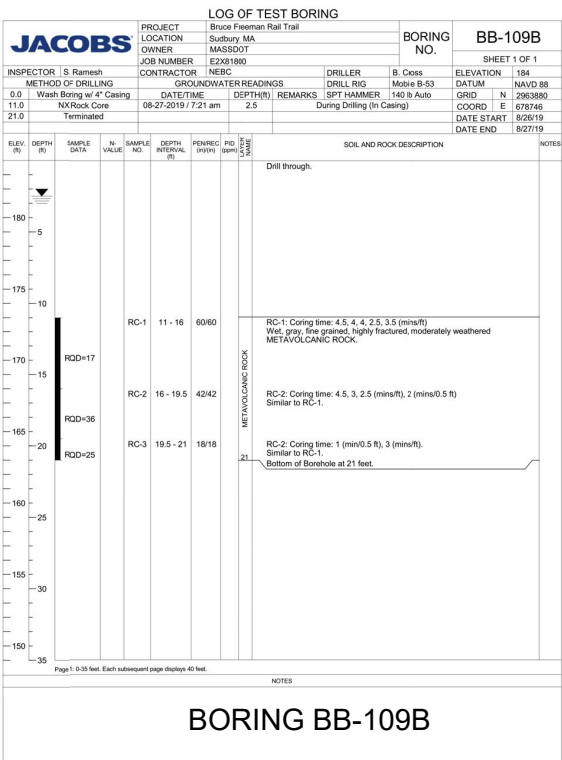
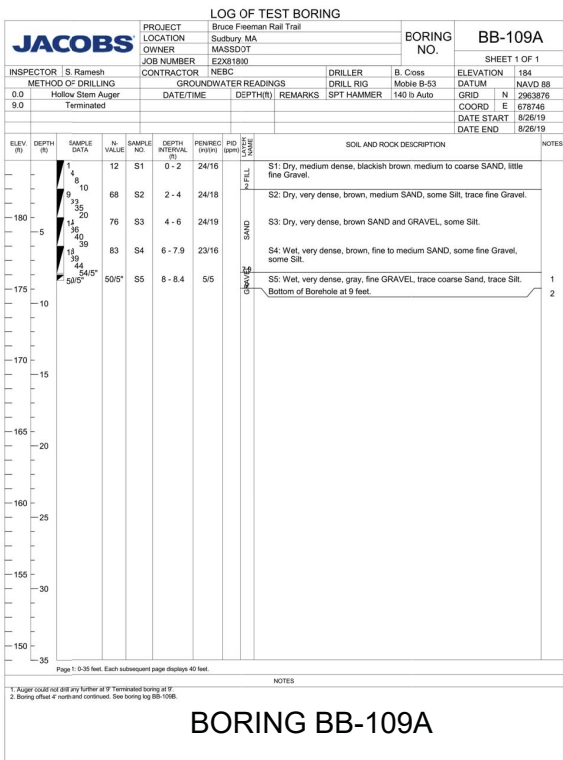
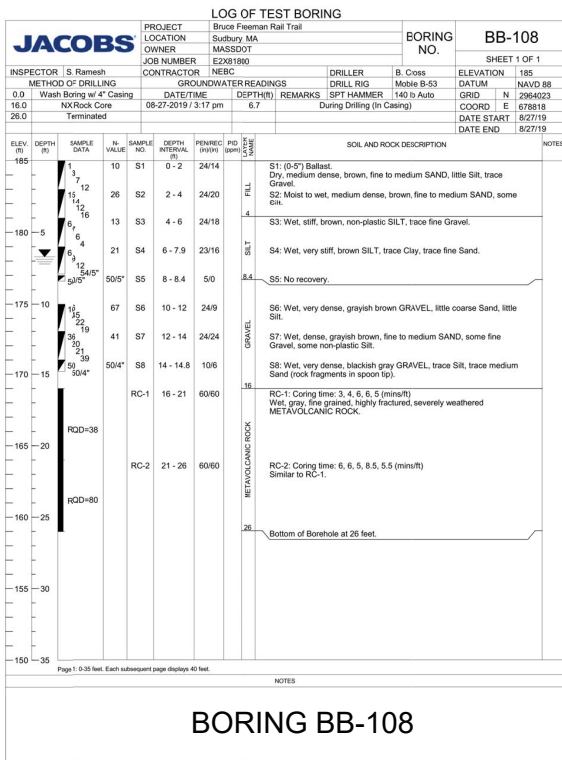
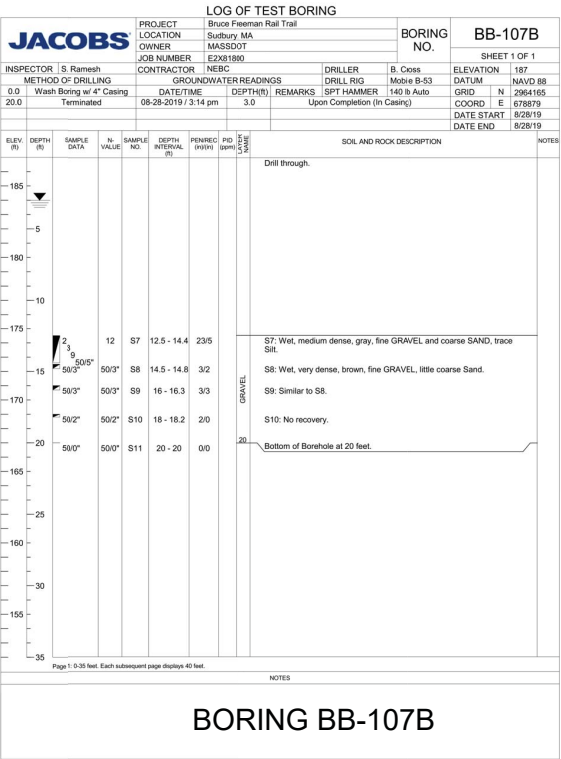
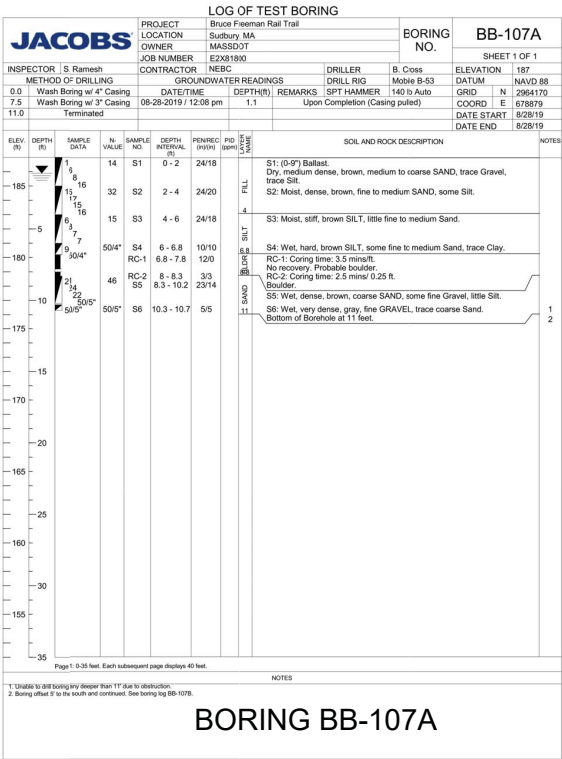
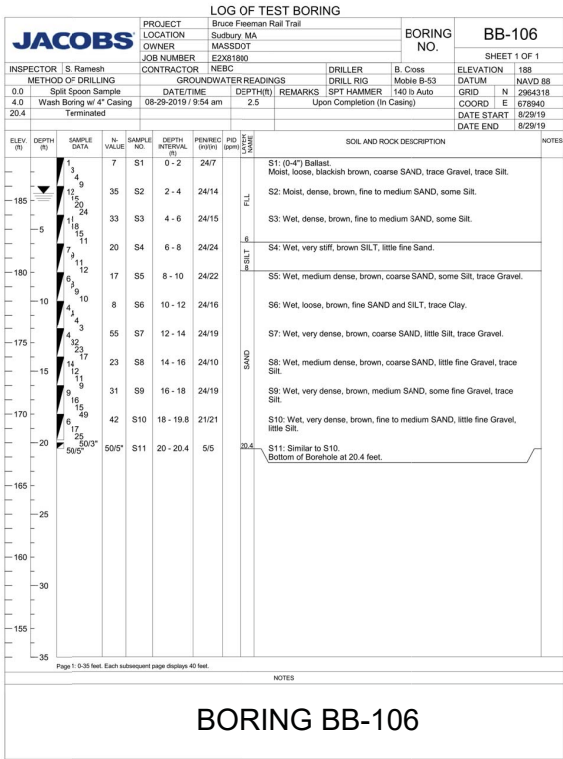
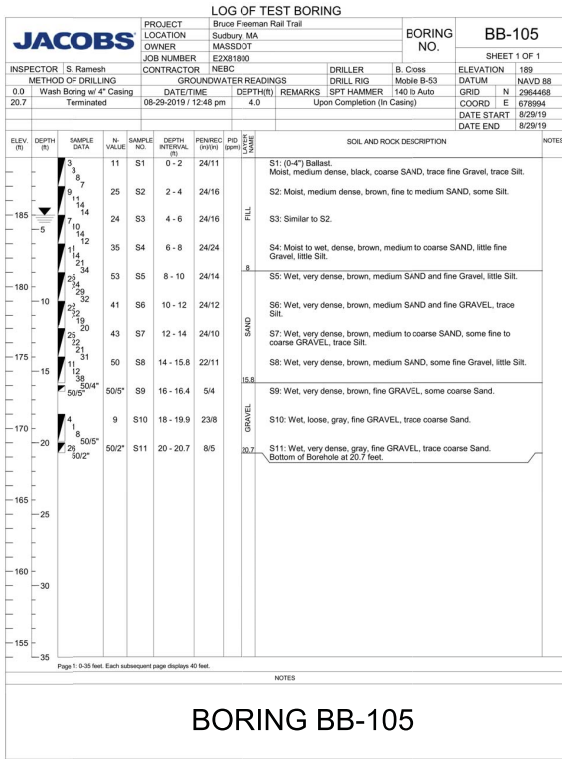
Notes: N/A = Bedrock not encountered during investigation

Findings

Using known bedrock elevation data from two clusters of borings, one ~.8 miles to the north of the Site (locations BB-101 and BB-102B), and another ~.8 miles to the south (BB-108 and BB-109B), one can interpolate bedrock depths between the two clusters and estimate that bedrock would exist at an elevation of ~125 ft at the Site. As the ground elevation at the Site averages ~175 ft, the bedrock depth at the Site would be ~50 ft below grade surface. It should be noted that no investigation to identify the exact depth of bedrock at the Site was conducted. However, Fuss & O'Neill did oversee the excavation of two test pits at the Site extending to a depth of up to 12 ft below grade surface (ft bgs) in January 2022 and did not encounter bedrock, or signs of weather rock, at either location. Additionally, no outcropped bedrock was observed by Fuss & O'Neill field staff at, or around, the Site at the time of the January 2022 subsurface investigation.

/SS





Horsley Witten Group

Sustainable Environmental Solutions

112 Water Street • 6th Floor • Boston, MA 02109
857-263-8193 • horsleywitten.com



February 18, 2022

Ms. Beth Suedmeyer
Environmental Planner
Planning and Community Development
Town of Sudbury
278 Old Sudbury Road
Sudbury, Massachusetts 01776

Re: Second Peer Review Stormwater Management
Bruce Freeman Rail Trail
Broadacres Farm Parking Lot
Morse Road, Sudbury, MA
MassDEP File No. 301-1362

Dear Ms. Suedmeyer and Board Members:

The Horsley Witten Group, Inc. (HW) is pleased to provide the Sudbury Planning Board with this letter report summarizing our second review of the stormwater design for the proposed parking lot off Morse Pond Road. The project consists of a new 32 space parking lot, a walkway connecting to the new rail trail, a pavilion, restrooms, and other associated amenities. Fuss & O'Neill have prepared the stormwater report for the Town of Sudbury. The proposed stormwater management includes an infiltration basin with a sediment forebay. The proposed parking lot is within the 100-foot buffer zone to an intermittent stream.

The following documents and plans, were received by HW in response to our initial review dated February 10, 2022:

- Memorandum Re: Bruce Freeman Rail Trail Stormwater Management, prepared by Fuss & O'Neill, dated February 17, 2022 (6 pages).
- Stormwater Management Report, prepared by Fuss & O'Neill, dated February 3, 2022, revised February 17, 2022 (103 pages).
- Plans: Bruce Freeman Rail Trail, prepared by Fuss & O'Neill, unstamped (9 sheets) including:
 - Construction Plans Sheet No. 28
 - Construction Plans Sheet No. 29
 - Grading Plans Sheet No. 107
 - Grading Plans Sheet No. 108
 - Drainage & Utility Plans Sheet No. 186
 - Drainage & Utility Plans Sheet No. 187
 - Construction Details Sheet No. 210
 - Construction Details Sheet No. 215
 - Construction Details Sheet No. 216

Stormwater Review

HW has reviewed the proposed stormwater management design as per the standards listed in the Massachusetts Stormwater Handbook (MSH) dated February 2008 and the Town of Sudbury Stormwater Management Bylaw Regulations (Stormwater Bylaws), revised January 23, 2013.

In accordance with Section 8.0 of the Stormwater Bylaws, this project is required to comply at a minimum with the performance standards of the MSH. Therefore, we have used the MSH as the basis for organizing our comments. However, in instances where the additional criteria established in Section 8.A.3 of the Stormwater Bylaws requires further recommendations; we have referenced these as well.

The comments below correlate to HW's initial peer review letter dated February 10, 2022. Follow up comments are provided in **bold font**.

1. *Standard 1: No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*
 - a. The Applicant has provided a narrative of the existing drainage paths and proposed drainage paths for the site. Based on the proposed plans, it does not appear that there are any new drainage points of analysis from the site that directly enter any waters of the Commonwealth or wetland areas. The existing and proposed stormwater discharge from the site has one point of analysis (POA):
 - Existing: Sheet flow to a swale adjacent to the former railroad right-of-way
 - Proposed: Sheet and overflow from the infiltration basin to a swale adjacent to the former railroad right-of-way

No further comment needed.

- b. It is not clear if offsite areas contribute to the POA under both existing and proposed conditions. Additionally, it appears that the slope between the proposed infiltration basin and the intermittent stream should be considered a separate catchment area because it will not be routed through the infiltration basin. HW recommends that the Applicant confirm that the watershed that will be captured by the infiltration basin has been accurately delineated.

The Applicant has adjusted the watershed as suggested and confirmed that it has been delineated properly. HW has no further comment.

- c. The Applicant has not provided riprap stabilization sizing calculations for the infiltration basin overflow stone weir. HW recommends that the Applicant confirm that the stone proposed is adequate to avoid any erosion/gully down the side slope.

The Applicant has provided the requested riprap sizing calculations and noted the size of the stone on Sheet 187. HW has no further comment.

2. *Standard 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.*
 - a. One test pit conducted by Fuss & O'Neill in January 2022 that was performed in the area

of the infiltration basin indicates the Estimated Seasonal High Ground Water (ESHGW) to be 7.4-feet below grade. No existing grade elevation is provided on the soil logs and it is difficult to determine the existing grade. It appears that the grade is elevation 175, however HW requests that the Applicant confirm this. Additionally, HW recommends that the elevations be added to the detail of the infiltration basin clearly showing adequate separation to groundwater. Furthermore, HW recommends that the Applicant add a detail of the weirs (with elevations) to the plan set.

The Applicant has added the groundwater elevation to the Infiltration Basin Detail provided on Sheet 210 as requested. HW has no further comment.

- b. The Applicant has used the description of “fair” condition for both existing and proposed calculations. Typically, a description of “good” is used unless there is clear justification for the use of fair. HW recommends that the Applicant adjust the description to good or provide an explanation for the use of fair.

The Applicant has adjusted the HydroCAD model to reflect a surface condition of good. HW has no further comment.

- c. The Applicant has used a length of 100 feet for sheet flow in the proposed calculations. HW recommends limiting sheet flow to 50 feet or justify the use of 100 feet.

The Applicant has adjusted the calculation for the Tc flow path as suggested. HW has no further comment.

3. *Standard 3: The annual recharge from post-development shall approximate annual recharge from pre-development conditions.*

- a. The Applicant has provided recharge calculations. The area for the sediment forebay is being included in the calculations and will likely not be capable of infiltrating in the same manner as it will become clogged with sediment. HW recommends that the Applicant revisit the calculation and remove the area of the forebay. It appears that adequate recharge is still provided without the volume in the forebay.

The Applicant has adjusted the recharge calculation as suggested. HW has no further comment.

- b. Groundwater mounding calculations may be required based on any revisions to the ESHGW (see comment under Standard 2 above). HW recommends that the Applicant confirm the separation to groundwater and provide the required mounding analysis if the separation is less than 4 feet.

The Applicant has provided the mounding calculation as requested. HW has no further comment.

4. *Standard 4: The stormwater system must be designed to remove 80% Total Suspended Solids (TSS) and to treat 1.0-inch of volume from the impervious area for water quality.*

- a. The Applicant has provided TSS calculations for the proposed project. In order for an infiltration basin to meet 80% TSS removal, there must be adequate pretreatment (i.e. a sediment forebay). It appears that the removal rate of 25% for the sediment forebay is being included as a separate item. HW recommends that the Applicant eliminate the 25% removal value for the forebay.

The Applicant has adjusted the TSS removal calculations as suggested. HW has no further comment.

- b. The Applicant is proposing infiltration in a soil with a rapid infiltration rate (greater than 2.4 inches per hour) which requires 44% TSS removal prior to infiltration. HW recommends that the Applicant document how it is achieving the 44% removal prior to discharging into the infiltration basin.

The Applicant has provided a forebay for pretreatment and has agreed to sweep the parking lot four times a year. The Applicant has also proposed a vegetated filter strip at the inlet to the forebay. HW agrees that this filter strip will remove sediment from the system. HW has no further comment.

- 5. *Standard 5: Related to projects with a Land Use of Higher Potential Pollutant Loads (LUHPPL).*

- a. The proposed development is not considered a LUHPPL therefore, Standard 5 is not applicable to this project.

No further comment needed.

- 6. *Standard 6: Related to projects with stormwater discharging into a critical area, a Zone II, or an Interim Wellhead Protection Area of a public water supply.*

- a. The site does not fall within a Zone II, Interim Wellhead Protection Area, or other Critical Area, therefore Standard 6 is not applicable.

No further comment needed.

- 7. *Standard 7: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions*

- a. The proposed development is not considered redevelopment therefore, Standard 7 is not applicable.

No further comment needed.

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

- a. The Applicant is proposing compost filter tubes along the edge of the resource areas. HW recommends that the Applicant clearly label the proposed limit of work.

The Applicant has clarified the limit of work line. HW has no further comment.

- b. HW recommends that the Applicant include construction fence along the perimeter of the stormwater infiltration area on the plans to protect the area from compaction during construction.

The Applicant has added a note to Sheet No 107 to install construction fencing

around the infiltration basin to avoid compaction. HW has no further comment.

- c. The Applicant references a construction entrance in the Stormwater Report but this is not identified on the plans submitted. HW recommends that this location and a detail be added to the plans.

The Applicant has included a construction entrance as suggested. HW has no further comment.

- d. The Applicant has not noted any stockpiles. HW recommends that the Applicant clarify if soil stockpiles will be needed and add the potential location to the construction plans if applicable.

The Applicant stated that if stockpiles are required, they will be placed outside of the buffer zone. Stockpile locations will be included in the Stormwater Pollution Prevention Plan for the project. HW has no further comment.

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

- a. HW recommends that the Applicant provide an estimated O&M budget for maintaining the stormwater practices onsite.

The Applicant has noted that MassDOT will coordinate the overall maintenance with the Town. HW recommends that the Planning Board consider requiring receipt of the O&M Plan prior to land disturbance as a condition of approval.

- b. HW recommends that the Applicant provide a simple map outlining the stormwater practices to be included with the O&M Plan. The O&M Plan should consider maintenance for the entire Bruce Freeman Rail Trail.

The Applicant has noted that MassDOT will coordinate overall maintenance with the Town. HW recommends that the Planning Board consider requiring receipt of the O&M Plan prior to land disturbance as a condition of approval.

- c. A detail for "Matting for Erosion Control" is provided. It is not clear where this is proposed. HW recommends that areas requiring this material be identified on the plans or noted in the detail notes where this is required.

The Detail provided on Sheet No. 210 indicates that erosion control matting will be installed on slopes set at 2:1 or greater. HW has no further comment.

- 10. *Standard 10 requires an Illicit Discharge Compliance Statement be provided.*

- a. The Applicant has not provided an Illicit Discharge Compliance Statement signed by the property owner. HW recommends that this be provided prior to any construction activities.

The Applicant has provided a statement and is coordinating the signature. HW has no further comment.

11. *Additional Comments.*

- a. In accordance with Section 8.1 A.3. b. of the Stormwater Regulations evaluation of Low Impact Development (LID) practices is required. HW recommends that the Applicant describe to the Planning Board other LID measures that were incorporated in the design and/or considered. The Applicant has marked on the Stormwater Management Checklist that bioretention areas are proposed, this should be updated as bioretention is no longer proposed.

The Applicant has stated:

“The proposed design includes LID practices as it includes, minimizing disturbance protecting existing forested area and clustering of activities to preserve larger natural areas, the design incorporates sheet flow and surface storage rather than closed drainage system with catch basins and subsurface infiltration. The Stormwater Management Checklist has been revised.”

HW defers to the Planning Board the adequacy of the LID portion of the design.

Conclusions

HW is satisfied that the Applicant has adequately addressed our comments. The Applicant is advised that provision of these comments does not relieve him/her of the responsibility to comply with all Town of Sudbury Codes and Bylaws, Commonwealth of Massachusetts laws, and federal regulations as applicable to this project. Please contact Janet Carter Bernardo at 857-263-8193 or at jbernardo@horsleywitten.com if you have any questions regarding these comments.

Sincerely,

HORSLEY WITTEN GROUP, INC.



Janet Carter Bernardo, P.E.
Associate Principal

Appendix J

Construction Operation and Maintenance Plan

MEMORANDUM

TO: Town of Sudbury

FROM: Fuss & O'Neill, Inc.

DATE: May 7, 2021

RE: Construction Operation and Maintenance Plan
Broadacres Farm Parking Lot
Sudbury, MA

This suggested Construction Operation and Maintenance Plan (O&M) is for the construction of the Broadacres Farm Parking Lot located off Morse Road in Sudbury, Massachusetts. This O&M Plan has been prepared in accordance with the Massachusetts Stormwater Handbook.

Property Owner: Town of Sudbury
322 Concord Road
Sudbury, MA 01776

Responsible Party: Site Contractor

The contractor shall be responsible for the operation and maintenance of the site during construction. Construction includes construction of a new parking lot to access the rail trail and related site amenities. A suggested operation and maintenance activities plan and proposed schedule for during construction are as follows:

1. No earthwork activities shall commence until erosion and sedimentation control measures are installed. Erosion and sedimentation controls shall be installed as shown on the drawings.
2. Areas left exposed to erosion for more than seven days shall be rough graded and temporarily stabilized. Areas disturbed but inactive for more than thirty days shall be temporarily seeded.
3. Erosion and sedimentation controls shall be maintained until successful establishment of ground cover.
4. No staging of materials or lay down areas shall be located within the resource areas.
5. Paved areas shall be kept free of sediment and shall be cleaned periodically as required by construction activities.
6. Temporary soil stockpiles shall be located within areas consisting of formerly paved or developed surfaces and will be moved as necessary to accommodate ongoing work.

7. Sediment stockpiles shall have a side slope of no greater than 2:1. Stockpiles shall be rough graded or maintain a roughened surface to prevent erosion. Stockpiles that are not to be used within 7 days shall be seeded after formation of stockpile as to prevent erosion. Compost filter tube barrier and silt fence shall be installed around stockpile area approximately 10 feet from toe of slope.
8. The contractor is responsible to inspect and repair erosion and sedimentation control measures as required to prevent damage or sedimentation.
9. 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 stormwater management systems.

Inspections shall be completed a minimum of every seven (7) calendar days and within 24 hours of the end of a storm event of 0.25 inches or greater. Attached is an example Construction Inspection and Maintenance Report Form.

CONSTRUCTION INSPECTION AND MAINTENANCE REPORT FORM

Broadacres Farm Parking Lot Sudbury, MA

*To be completed every 7 calendar days and within 24 hours of the end of a storm event of
0.25 inches or greater*

Inspector: _____ Date: _____

Inspector's Title and Qualifications: _____

Summary of Previous 7-day Rainfall:

Date	Friday Date	Saturday Date	Sunday Date	Monday Date	Tuesday Date	Wednesday Date	Thursday Date
Total Daily Rainfall (in.)							

Stabilization Measures:

Area	Disturbed (Yes/No)	Stabilized (Yes/No)	Stabilized With	Condition
Paved Parking Lot and Access Driveway				
Bioretention Basin #1				
Bioretention Basin #1				
Adjacent Areas within Work Site				

Bioretention Basin #1

Depth of Infiltration Basin	Condition of Side Slopes	Evidence of Overtopping of Embankments	Condition of Outfall

Bioretention Basin #1

Depth of Infiltration Basin	Condition of Side Slopes	Evidence of Overtopping of Embankments	Condition of Outfall

CONSTRUCTION INSPECTION AND MAINTENANCE REPORT FORM

**Broadacres Farm Parking Lot
Sudbury, MA**

Construction Site & Adjacent Areas:

General condition: _____

Maintenance Required for Silt Fence: _____

Is sediment being tracked on to road? _____

Maintenance required? _____

Changes Required to the Pollution Prevention Plan:

Reasons for Changes:

Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature: _____ Date: _____

Appendix K

Long Term Operation and Maintenance Plan

MEMORANDUM

TO: Town of Sudbury

FROM: Fuss & O'Neill, Inc.

DATE: February 16, 2022

RE: Long Term Operation and Maintenance Plan
Broadacres Farm Parking Lot
Sudbury, MA

This Long Term Operation and Maintenance Plan (O&M) is for the long term operation of the Broadacres Farm Parking Lot located off Morse Road in Sudbury, Massachusetts. This Long Term O&M Plan has been prepared in accordance with the Massachusetts Stormwater Handbook.

Property Owner and Responsible Party:

Town of Sudbury
322 Concord Road
Sudbury, MA 01776

It will be the responsibility of the Owner to comply with this Long Term Operation and Maintenance Plan. The owner is responsible for all financing, maintenance and emergency repairs. Should the property or any portion of the property be transferred to another owner, that new owner will be notified of the presence of this Long Term Operation and Maintenance Plan and be held responsible for the implementation of this plan and financing as it pertains to their property.

Operation and Maintenance Plan

The post construction operation and maintenance plan outlined hereafter provides recommendations for periodic inspection and maintenance activities for the stormwater management system. This Long-Term Operation and Maintenance Plan will ensure that the stormwater management system functions as designed throughout the life of the system.

- Paved surfaces will be swept twice annually, April and October, to remove debris.
- Sediment forebay shall be inspected quarterly. This will include checking for signs of riling and gullyng. Also this will include checking for the accumulation of sediments and pollutants. Sediment forebay shall be cleaned annually and when sediment depth is between 3 to 6 inches. When mowing grasses, keep the grass height no greater than six inches.
- Infiltration basin shall be inspected after every major storm event for the first three months and a minimum twice a year thereafter. Basin shall be inspected for, but not limited to, evidence of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, and sediment accumulation and the health of the turf.

Upper-stage, side slopes, embankments, and emergency spillways shall be mowed at least twice a year. Trash and debris shall be removed at least twice a year and accumulated sediment shall be removed at least twice a year from the basin.

- Trash receptacles will be cleared once per week. If use of an individual trash receptacle warrants, twice weekly clearings will be provided.

Snow Removal and Storage

Snow removal and storage shall be performed by the next day after a storm event as follows:

- Snow shall be plowed to snow storage areas located at the northerly end of the parking lot away furthest from Morse Rd. No snow shall be stored within the infiltration basins.
- De-icing chemicals may only be used on pedestrian surfaces. All other paved surfaces may have salt applied.
- Excess snow shall be removed from site or stockpiled only within the paved areas on the site.

Location and Access of Stormwater Management System

All components of the stormwater management system are located within project site area. Access to the site will be provided via Morse Road.

Records of Maintenance and Repair Activities

The responsible parties shall keep records of installation, maintenance and repairs of the stormwater management facilities. These records shall be retained for the most recent five years on site and be provided to the Conservation Commission upon request. An example Operation and Maintenance Log Form is attached.

Attachments:

O&M Log Form

Operation and Maintenance Log Form

Project/Location: Broadacres Farm Parking Lot, Sudbury, MA

"As Built" Plans Available? _____

Date/Time: _____

Days since Previous Rainfall and Rainfall Amount: _____

Inspector: _____

Maintenance Item	Satisfactory	Unsatisfactory	Comments
1. Parking Lot and Paved Areas			
• Evidence of erosion			
Action to be Taken:			
Date to be Completed by:			
2. Sediment Forebay			
• Forebay is free of debris, litter and waste.			
• Grass height is between 3 and 6 inches.			
• Depth of sediments is less than half of the basin.			
Action to be Taken:			
Date to be Completed by:			
3. Infiltration Basin			
• Vegetation coverage adequate			
• Undesirable vegetative growth			
• Undesirable woody vegetation			
• Mowing performed as necessary			
• Embankment in good repair			
• No evidence of erosion			
• Standing water or wet spots			
• Sediment and/or trash accumulation			
• Other (specify)			
Action to be Taken:			
Date to be Completed by:			

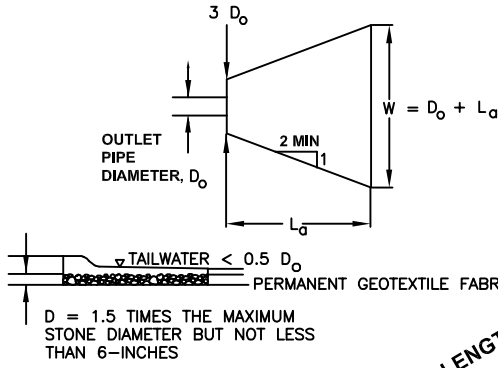
Source: Adapted from Watershed Management Institute, Inc. 1997. *Operation, Maintenance, and Management of Stormwater Management Systems*. In cooperation with U.S. Environmental Protection Agency, Office of Water. Washington, D.C.

Appendix L

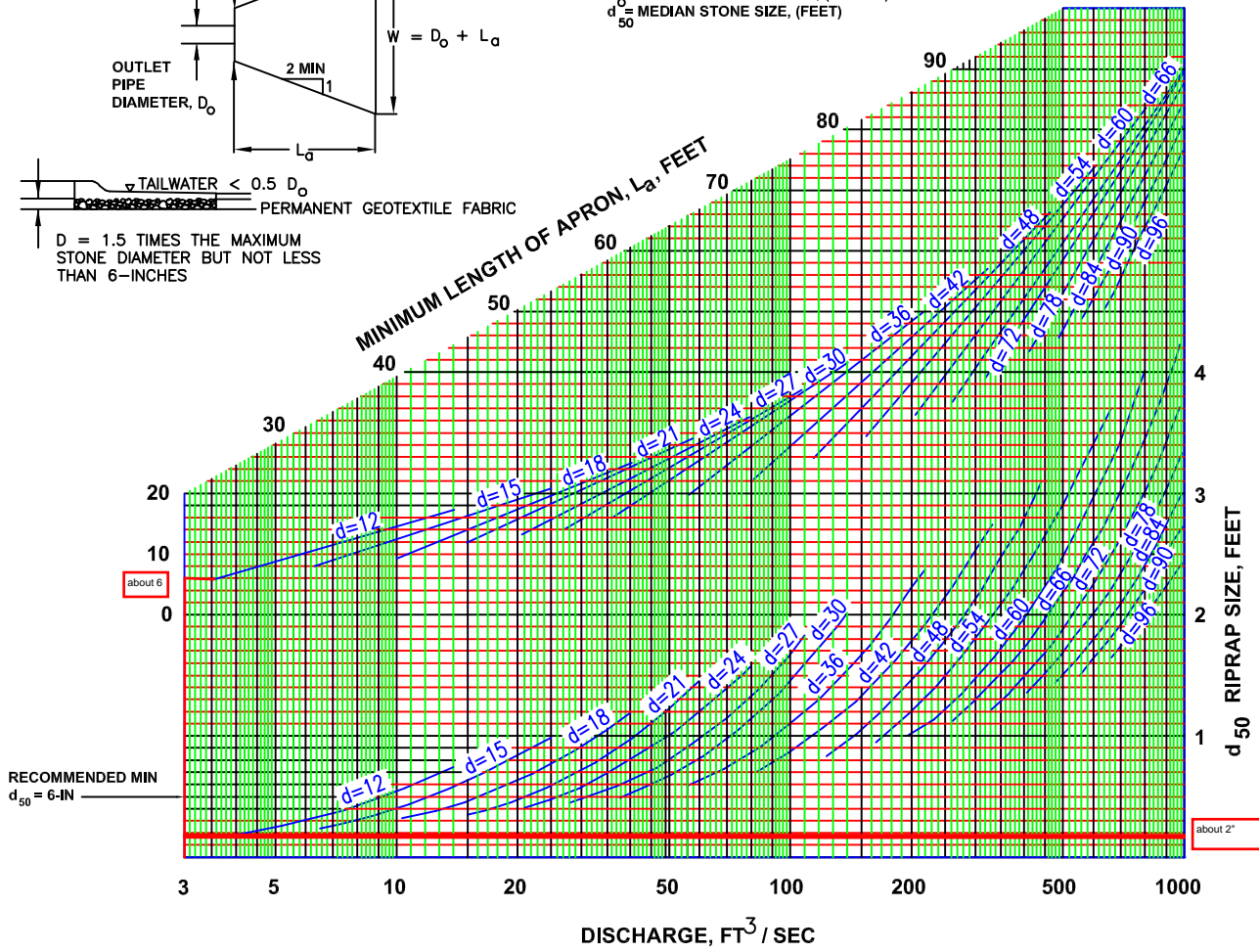
Riprap Sizing Calculation for Overflow Weir

Infiltration Basin

PIPE OUTLET TO FLAT AREA WITH NO DEFINED CHANNEL:



L_a = APRON LENGTH, (FEET)
 D_o = OUTLET PIPE DIAMETER, (INCHES)
 d_{50} = MEDIAN STONE SIZE, (FEET)



References:

- Design Guide MD#6 Riprap Design Methods, NRCS Engineering
- South Carolina DHEC Storm Water Management BMP Handbook

Appendix H

Culvert Design Report

Culvert Design Report
Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook

Owner
Town of Sudbury
322 Concord Road
Sudbury, MA 01776

May 20, 2021



1550 Main Street, Suite 400
Springfield, MA 01089

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Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook

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Culvert Design Report Bruce Freeman Rail Trail Project Crossing at unnamed Tributary to Hop Brook

Appendices

End of Report

- A Plans
- B Photographs
- C USGS StreamStats Report
- D Existing Culvert Analysis (CulvertMaster)
- E Proposed Culvert Analysis (HY-8)

1 Introduction

This Culvert Design Report discusses the design methods used in sizing the proposed replacement culvert at approximately Station 167+20 along the Bruce Freeman Rail Trail in Sudbury, Massachusetts. The existing culvert is a stacked stone and granite culvert box culvert which conveys water from an unnamed intermittent stream tributary to Hop Brook. The replacement culvert proposed is a new 4 ft diameter reinforced concrete pipe, embedded 2 feet to provide a natural stream channel bottom within the new culvert.

The proposed replacement culvert will provide greater hydraulic capacity through the crossing and has been sized to safely convey the 25-year 24-hour precipitation event and to meet Massachusetts River and Stream Crossing Standards (Stream Crossing Standards) to the maximum extent practicable.

2 Project Description

2.1 Existing Conditions

The existing culvert crossing is located at approximately Station 167+20 of the proposed Bruce Freeman Rail Trail in Sudbury, Massachusetts which consists of a stacked stone and granite culvert box culvert which conveys water from an unnamed intermittent stream tributary to Hop Brook under the railroad tracks. The culvert is blocked on the downstream side and erosion has occurred on the downstream side of the culvert as a result of this blockage. The existing culvert is approximately 18 feet in length with an opening on the upstream side approximately 30 inches wide and 9 inches tall above the existing streambed on the upstream side. The location of the existing culvert is shown on the Plans included in [Appendix A](#). Photographs of the existing culvert are included in [Appendix B](#).

Using the StreamStats tool provided by United States Geological Survey (USGS), the drainage area contributing to the stream at this location is approximately 0.16 square miles in size. A copy of the StreamStats report is included as [Appendix C](#).

2.2 Proposed Conditions

The proposed Bruce Freeman Rail Trail Project includes the construction of approximately 4.4 miles of multi-use path along the former rail road tracks. The proposed culvert replacement is a part of this project. The proposed replacement culvert will be a 4 ft diameter reinforced concrete pipe embedded 2 feet within the ground to allow for placement of a natural stream bottom through the culvert. Proposed conditions information is shown on the Plans included in [Appendix A](#).

3 Hydraulic Analysis

The existing culvert was modeled using Bentley's CulvertMaster® program. This modeling indicates that this existing culvert is not adequately sized to convey the 25-year 24-hour precipitation without overtopping the railroad tracks which is evident based on the existing condition of the culvert and downstream erosion which has occurred. If the existing culvert was fully open to provide open flow through the structure, velocities are estimated to be approximately 17.65 feet per second. A copy of the CulvertMaster® report and existing culvert modeling is included in [Appendix D](#).

The proposed new culvert was modeled using a different program, Federal Highway Administration's HY-8 Culvert Hydraulic Analysis Program, which is a more appropriate modeling software for embedded pipe culverts than CulvertMaster®. Input data used included:

- Peak flow data from StreamStats;
- Channel type and size;
- Invert information;
- Culvert shape, material, diameter, embedment depth, Manning's n , length, and culvert configuration; and,
- Roadway profile information.

Modeling of the proposed new culvert through the HY-8 Program, indicates that the proposed culvert will both safely convey the 25-year 24-hour precipitation event without overtopping the new multi-use path as well as reduce velocities to approximately 7 feet per second. The reduction of velocity is deemed beneficial for the area and should reduce further erosion of the downstream side of the culvert.

A copy of the HY-8 Culvert Analysis Program modeling report is included in [Appendix E](#).

4 Massachusetts River & Stream Crossing Standards

The proposed replacement culvert has been designed with the intent to reduce downstream flooding and the potential for erosion and preserve existing habitats both upstream and downstream of the crossing. The following summarizes how the proposed replacement culvert meets the goals of the Stream Crossing Standards to the maximum extent practicable.

1. Type of Crossing – The proposed replacement culvert will be embedded 2 feet within the surrounding area to allow for placement of a natural stream bottom within the culvert.
2. Embedment – The proposed replacement culvert will be embedded 2 feet to provide for the long term stability of the replacement culvert.
3. Crossing Span – Given the recent erosion which has occurred downstream of the existing crossing, bankfull width was determined to be 7 feet based on upstream stream conditions. While, the proposed replacement culvert does not provide a new span of 1.2 times bankfull

width, existing conditions horizontally within the 60 ft railroad right-of-way limits the project's ability to substantially raise grades in the area. Proposed grades are also limited in order to maintain appropriate accessible grade along the multi-use path for pedestrians and bicyclist traffic. The proposed replacement crossing will however still improve conditions for passage of semi-aquatic and terrestrial wildlife at the crossing.

4. Height & Openness – The openness ratio of the proposed replacement culvert is 0.33 however, the crossing conveys an intermittent stream which does not regularly flow and the elevation differential between the culvert invert and proposed top of grade along the multi-use path at the crossing is less than 4 feet which will allow for the passage of wildlife across the multi-use path.
5. Substrate – Substrate to simulate a natural stream bottom will be placed within the 2 ft embedded portion of the replacement culvert.
6. Water Depth and Velocity – A new stream channel with similar slope to that of existing will be provided by the new culvert. The proposed velocities through the new culvert will improve conditions and prevent further erosion of the downstream side of the culvert.
7. Banks – Grading of the stream bank within areas of disturbance has been designed such that slope of the replaced bank does not exceed a ratio 1 to 1.5 (vertical: horizontal).

Appendix A

Plans

Appendix B

Site Photographs

SITE PHOTOGRAPHS
Bruce Freeman Rail Trail Project
Crossing at unnamed Tributary to Hop Brook
Sudbury, MA



Photo 1: Upstream side of culvert



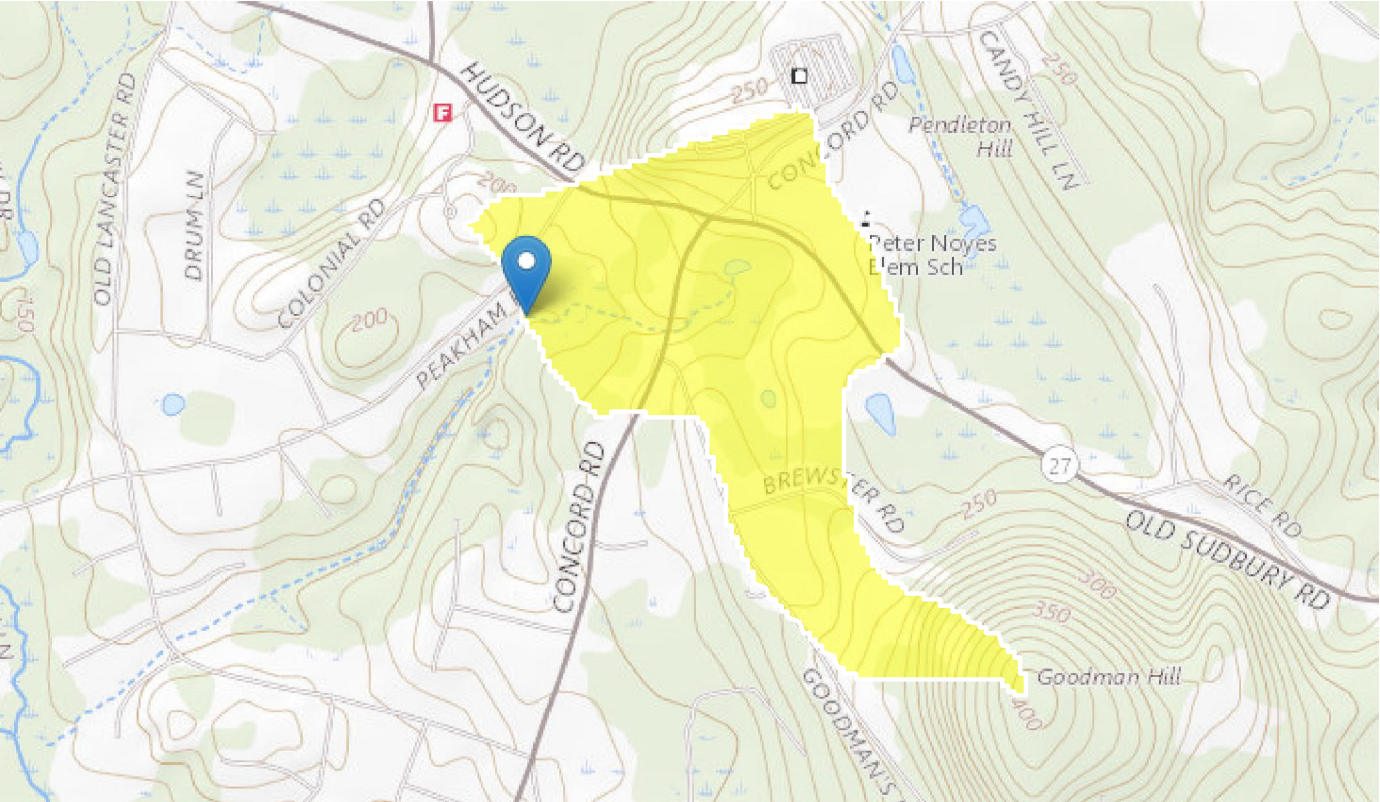
Photo 2: Downstream side of culvert

Appendix C

USGS StreamStats Report

StreamStats Report

Region ID: MA
Workspace ID: MA20210407130130576000
Clicked Point (Latitude, Longitude): 42.38096, -71.41649
Time: 2021-04-07 09:01:46 -0400



Basin Characteristics

Parameter Code	Parameter Description	Value	Unit
DRNAREA	Area that drains to a point on a stream	0.16	square miles
ELEV	Mean Basin Elevation	232	feet
LC06STOR	Percentage of water bodies and wetlands determined from the NLCD 2006	1.12	percent
BSLDEM250	Mean basin slope computed from 1:250K DEM	2.589	percent
DRFTPERSTR	Area of stratified drift per unit of stream length	0.000877	square mile per mile

Parameter Code	Parameter Description	Value	Unit
MAREGION	Region of Massachusetts 0 for Eastern 1 for Western	0	dimensionless
BSLDEM10M	Mean basin slope computed from 10 m DEM	5.769	percent
PCTSNDGRV	Percentage of land surface underlain by sand and gravel deposits	0.15	percent
FOREST	Percentage of area covered by forest	31.22	percent
ACRSDFE	Area underlain by stratified drift	0.00027	square miles
CAT1ROADS	Length of interstates lmt access highways and ramps for lmt access highways, includes cloverleaf interchanges (USGS Ntl Transp Dataset)	0	miles
CAT2ROADS	Length of sec hwy or maj connecting roads; main arteries & hwys not lmt access, usually in the US Hwy or State Hwy systems (USGS Ntl Transp Dataset)	0	miles
CAT3ROADS	Length of local connecting roads; roads that collect traffic from local roads & connect towns, subdivisions & neighborhoods (USGS Nat Transp Dataset)	0.64	miles
CAT4ROADS	Length of local roads; generally paved street, road, or byway that usually have single lane of traffic in each direction (USGS Ntl Transp Dataset)	1	miles
CENTROIDX	Basin centroid horizontal (x) location in state plane coordinates	207259.2	meters
CENTROIDY	Basin centroid vertical (y) location in state plane units	903306.7	meters
CROSCOUNT1	Number of intersections between streams and roads, where the roads are interstate, limited access highway, or ramp (CAT1ROADS)	0	dimensionless
CROSCOUNT2	Number of intersections between streams and roads, where the roads are secondary highway or major connecting road (CAT2ROADS)	0	dimensionless
CROSCOUNT3	Number of intersections between streams and roads, where roads are local connecting roads (CAT3ROADS)	1	dimensionless
CROSCOUNT4	Number of intersections between streams and roads, where roads are local roads (CAT4ROADS)	0	dimensionless

Parameter Code	Parameter Description	Value	Unit
CRSDFT	Percentage of area of coarse-grained stratified drift	0.15	percent
CSL10_85	Change in elevation divided by length between points 10 and 85 percent of distance along main channel to basin divide - main channel method not known	182	feet per mi
LAKEAREA	Percentage of Lakes and Ponds	0	percent
LC11DEV	Percentage of developed (urban) land from NLCD 2011 classes 21-24	66.5	percent
LC11IMP	Average percentage of impervious area determined from NLCD 2011 impervious dataset	22.2	percent
LFPLENGTH	Length of longest flow path	0.88	miles
MAXTEMP	Mean annual maximum air temperature over basin area, in degrees Centigrade	15.2	feet per mi
OUTLETX	Basin outlet horizontal (x) location in state plane coordinates	206875	feet
OUTLETY	Basin outlet vertical (y) location in state plane coordinates	903385	feet
PRECPRI00	Basin average mean annual precipitation for 1971 to 2000 from PRISM	46.9	inches
STRMTOT	total length of all mapped streams (1:24,000-scale) in the basin	0.31	miles
WETLAND	Percentage of Wetlands	3.2	percent

Peak-Flow Statistics Parameters [Peak Statewide 2016 5156]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	0.16	512
ELEV	Mean Basin Elevation	232	feet	80.6	1948
LC06STOR	Percent Storage from NLCD2006	1.12	percent	0	32.3

Peak-Flow Statistics Flow Report [Peak Statewide 2016 5156]

PII: Prediction Interval-Lower, Plu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PII	Plu	SEp
50-percent AEP flood	10.5	ft^3/s	5.25	21	42.3
20-percent AEP flood	18	ft^3/s	8.86	36.6	43.4
10-percent AEP flood	24.1	ft^3/s	11.6	50.3	44.7
4-percent AEP flood	33.1	ft^3/s	15.3	71.6	47.1
2-percent AEP flood	40.7	ft^3/s	18.2	91.2	49.4
1-percent AEP flood	48.8	ft^3/s	21.1	113	51.8
0.5-percent AEP flood	57.8	ft^3/s	24.2	138	54.1
0.2-percent AEP flood	70.8	ft^3/s	28.2	178	57.6

Peak-Flow Statistics Citations

Zarriello, P.J.,2017, Magnitude of flood flows at selected annual exceedance probabilities for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2016–5156, 99 p. (<https://dx.doi.org/10.3133/sir20165156>)

Low-Flow Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

Low-Flow Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Low-Flow Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
7 Day 2 Year Low Flow	0.00395	ft^3/s

Statistic	Value	Unit
7 Day 10 Year Low Flow	0.00102	ft ³ /s

Low-Flow Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6

Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
50 Percent Duration	0.147	ft ³ /s
60 Percent Duration	0.084	ft ³ /s
70 Percent Duration	0.0377	ft ³ /s
75 Percent Duration	0.0261	ft ³ /s
80 Percent Duration	0.0178	ft ³ /s
85 Percent Duration	0.0116	ft ³ /s
90 Percent Duration	0.00692	ft ³ /s
95 Percent Duration	0.00343	ft ³ /s
98 Percent Duration	0.00204	ft ³ /s

Statistic	Value	Unit
99 Percent Duration	0.00132	ft ³ /s

Flow-Duration Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

August Flow-Duration Statistics Parameters [Statewide Low Flow WRIR00 4135]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	1.61	149
BSLDEM250	Mean Basin Slope from 250K DEM	2.589	percent	0.32	24.6
DRFTPERSTR	Stratified Drift per Stream Length	0.000877	square mile per mile	0	1.29
MAREGION	Massachusetts Region	0	dimensionless	0	1

August Flow-Duration Statistics Disclaimers [Statewide Low Flow WRIR00 4135]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

August Flow-Duration Statistics Flow Report [Statewide Low Flow WRIR00 4135]

Statistic	Value	Unit
August 50 Percent Duration	0.0124	ft ³ /s

August Flow-Duration Statistics Citations

Ries, K.G., III, 2000, Methods for estimating low-flow statistics for Massachusetts streams: U.S. Geological Survey Water Resources Investigations Report 00-4135, 81 p. (<http://pubs.usgs.gov/wri/wri004135/>)

Bankfull Statistics Parameters [Bankfull Statewide SIR2013 5155]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
----------------	----------------	-------	-------	-----------	-----------

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	0.6	329
BSLDEM10M	Mean Basin Slope from 10m DEM	5.769	percent	2.2	23.9

Bankfull Statistics Disclaimers [Bankfull Statewide SIR2013 5155]

One or more of the parameters is outside the suggested range. Estimates were extrapolated with unknown errors

Bankfull Statistics Flow Report [Bankfull Statewide SIR2013 5155]

Statistic	Value	Unit
Bankfull Width	7.05	ft
Bankfull Depth	0.545	ft
Bankfull Area	3.77	ft ²
Bankfull Streamflow	7.92	ft ³ /s

Bankfull Statistics Citations

Bent, G.C., and Waite, A.M., 2013, Equations for estimating bankfull channel geometry and discharge for streams in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2013–5155, 62 p., (<http://pubs.usgs.gov/sir/2013/5155/>)

Probability Statistics Parameters [Perennial Flow Probability]

Parameter Code	Parameter Name	Value	Units	Min Limit	Max Limit
DRNAREA	Drainage Area	0.16	square miles	0.01	1.99
PCTSNDGRV	Percent Underlain By Sand And Gravel	0.15	percent	0	100
FOREST	Percent Forest	31.22	percent	0	100
MAREGION	Massachusetts Region	0	dimensionless	0	1

Probability Statistics Flow Report [Perennial Flow Probability]

PII: Prediction Interval-Lower, PIu: Prediction Interval-Upper, SEp: Standard Error of Prediction, SE: Standard Error (other -- see report)

Statistic	Value	Unit	PC
Probability Stream Flowing Perennially	0.567	dim	71

Probability Statistics Citations

Bent, G.C., and Steeves, P.A., 2006, A revised logistic regression equation and an automated procedure for mapping the probability of a stream flowing perennially in Massachusetts: U.S. Geological Survey Scientific Investigations Report 2006-5031, 107 p. (http://pubs.usgs.gov/sir/2006/5031/pdfs/SIR_2006-5031rev.pdf)

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USGS Product Names Disclaimer: Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

Application Version: 4.5.1

StreamStats Services Version: 1.2.22

NSS Services Version: 2.1.1

Appendix D

Existing Culvert Analysis CulvertMaster®

Culvert Calculator Report

Existing at STA 167+20

Solve For: Headwater Elevation

Culvert Summary			
Allowable HW Elevation	180.92 ft	Headwater Depth/Height	18.40
Computed Headwater Elev.	193.97 ft	Discharge	33.10 cfs
Inlet Control HW Elev.	193.97 ft	Tailwater Elevation	0.00 ft
Outlet Control HW Elev.	191.41 ft	Control Type	Inlet Control
Grades			
Upstream Invert	180.17 ft	Downstream Invert	180.17 ft
Length	18.00 ft	Constructed Slope	0.000000 ft/ft
Hydraulic Profile			
Profile	Pressure Profile	Depth, Downstream	0.75 ft
Slope Type	N/A	Normal Depth	N/A ft
Flow Regime	N/A	Critical Depth	0.75 ft
Velocity Downstream	17.65 ft/s	Critical Slope	0.125151 ft/ft
Section			
Section Shape	Box	Mannings Coefficient	0.013
Section Material	Concrete	Span	2.50 ft
Section Size	Box 30 x 9	Rise	0.75 ft
Number Sections	1		
Outlet Control Properties			
Outlet Control HW Elev.	191.41 ft	Upstream Velocity Head	4.84 ft
Ke	0.70	Entrance Loss	3.39 ft
Inlet Control Properties			
Inlet Control HW Elev.	193.97 ft	Flow Control	Submerged
Inlet Type	0° wingwall flares	Area Full	1.9 ft²
K	0.06100	HDS 5 Chart	8
M	0.75000	HDS 5 Scale	3
C	0.04230	Equation Form	1
Y	0.82000		

Appendix E

Proposed Culvert Analysis FHWA HY-8 Program

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 30 cfs

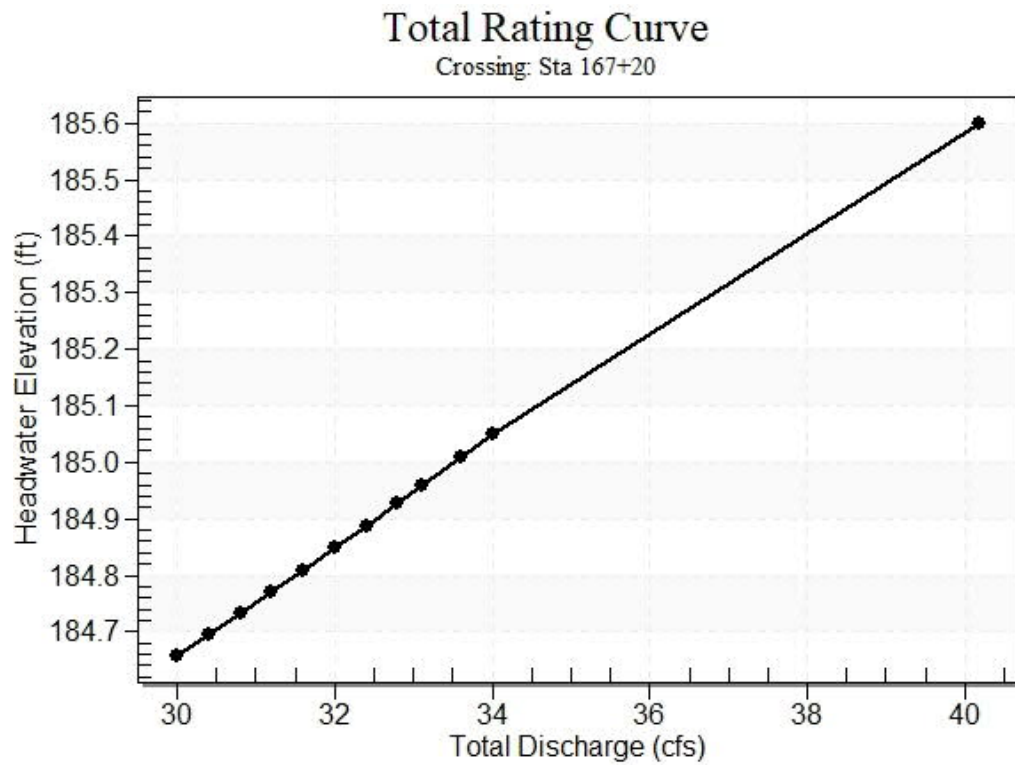
Design Flow: 33.1 cfs

Maximum Flow: 34 cfs

Table 1 - Summary of Culvert Flows at Crossing: Sta 167+20

Headwater Elevation (ft)	Total Discharge (cfs)	BFRT Culvert #32 Sta 167+20 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
184.66	30.00	30.00	0.00	1
184.70	30.40	30.40	0.00	1
184.73	30.80	30.80	0.00	1
184.77	31.20	31.20	0.00	1
184.81	31.60	31.60	0.00	1
184.85	32.00	32.00	0.00	1
184.89	32.40	32.40	0.00	1
184.93	32.80	32.80	0.00	1
184.96	33.10 25-year storm event	33.10	0.00	1
185.01	33.60	33.60	0.00	1
185.05	34.00	34.00	0.00	1
185.60	38.80	38.80	0.00	Overtopping

Rating Curve Plot for Crossing: Sta 167+20

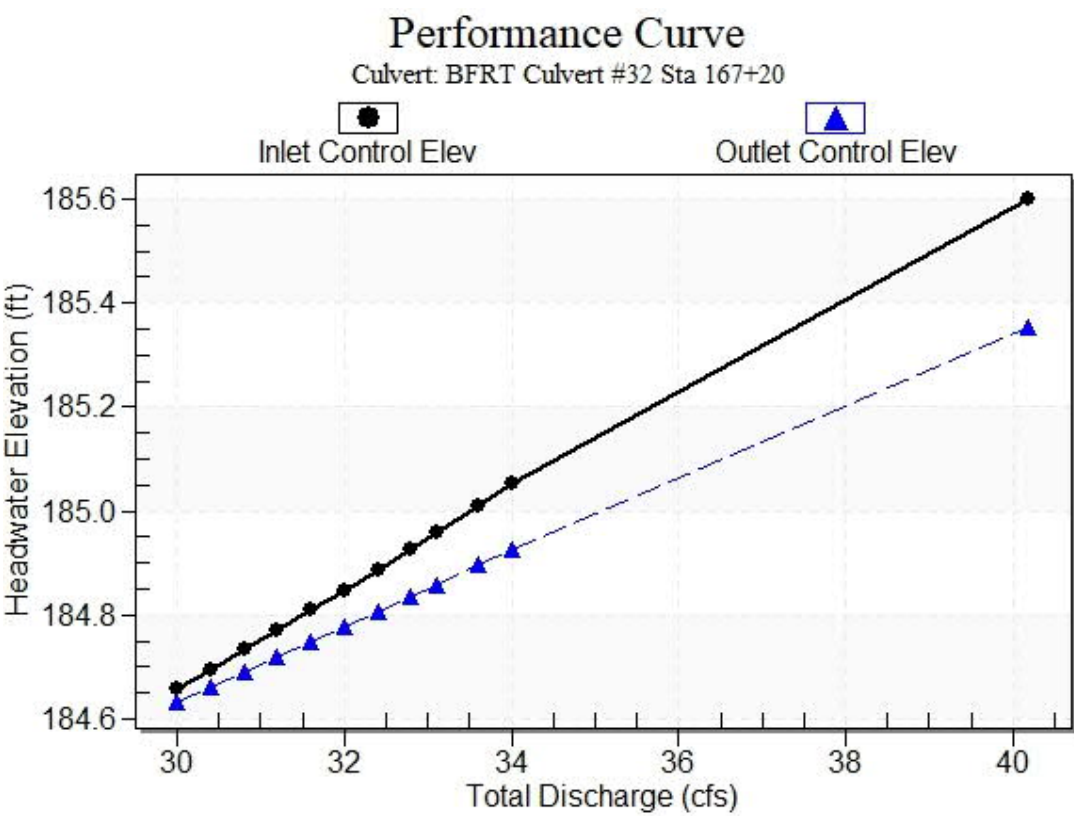


Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
30.00	30.00	184.66	2.559	2.532	7-M2c	2.000	1.196	1.196	0.995	6.716	5.044
30.40	30.40	184.70	2.596	2.560	7-M2c	2.000	1.206	1.206	1.001	6.756	5.062
30.80	30.80	184.73	2.633	2.589	7-M2c	2.000	1.216	1.216	1.006	6.795	5.078
31.20	31.20	184.77	2.671	2.618	7-M2c	2.000	1.227	1.227	1.012	6.835	5.096
31.60	31.60	184.81	2.709	2.647	7-M2c	2.000	1.237	1.237	1.018	6.874	5.112
32.00	32.00	184.85	2.748	2.676	7-M2c	2.000	1.247	1.247	1.024	6.914	5.128
32.40	32.40	184.89	2.787	2.705	7-M2c	2.000	1.257	1.257	1.029	6.953	5.146
32.80	32.80	184.93	2.827	2.735	7-M2c	2.000	1.267	1.267	1.035	6.992	5.161
33.10 25-year storm event	33.10	184.96	2.858	2.757	7-M2c	2.000	1.275	1.275	1.039	7.021	5.173
33.60	33.60	185.01	2.909	2.795	7-M2c	2.000	1.287	1.287	1.046	7.070	5.194
34.00	34.00	185.05	2.951	2.826	7-M2c	2.000	1.296	1.296	1.052	7.113	5.209

Table 2 - Culvert Summary Table: BFRT Culvert #32 Sta 167+20

Straight Culvert	
Inlet Elevation (invert): 182.10 ft,	Outlet Elevation (invert): 182.00 ft
Culvert Length: 24.00 ft,	Culvert Slope: 0.0042

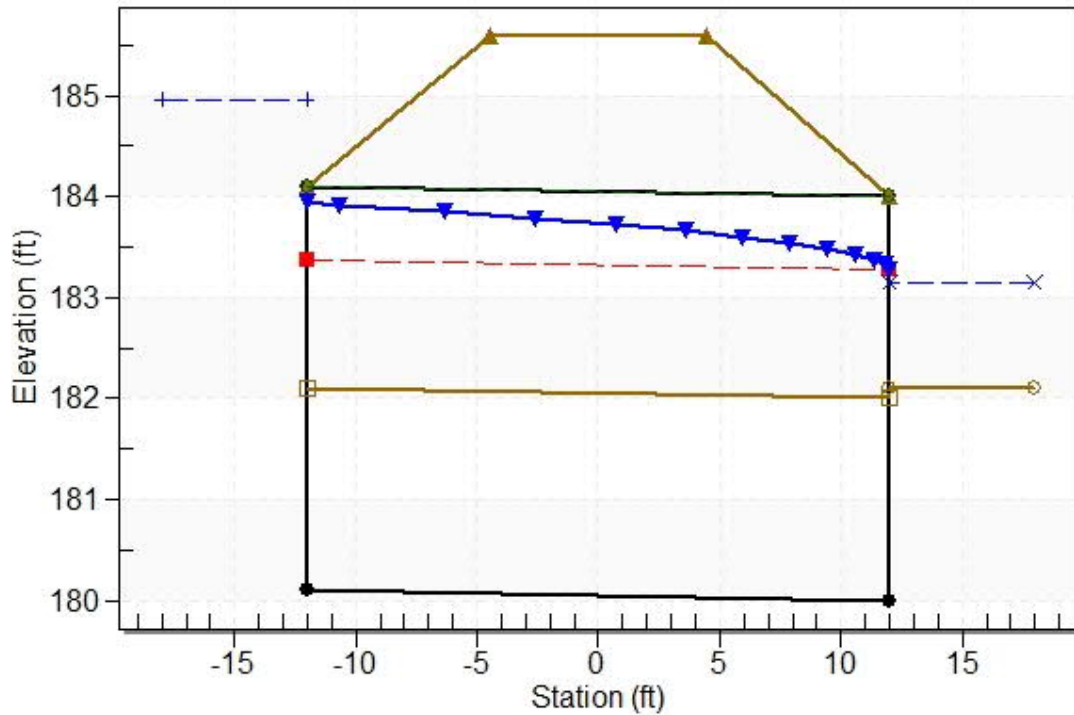
Culvert Performance Curve Plot: BFRT Culvert #32 Sta 167+20



Water Surface Profile Plot for Culvert: BFRT Culvert #32 Sta 167+20

Crossing - Sta 167+20, Design Discharge - 33.1 cfs

Culvert - BFRT Culvert #32 Sta 167+20, Culvert Discharge - 33.1 cfs



Site Data - BFRT Culvert #32 Sta 167+20

Site Data Option: Culvert Invert Data

Inlet Station: -12.00 ft

Inlet Elevation: 180.10 ft

Outlet Station: 12.00 ft

Outlet Elevation: 180.00 ft

Number of Barrels: 1

Culvert Data Summary - BFRT Culvert #32 Sta 167+20

Barrel Shape: Circular

Barrel Diameter: 4.00 ft

Barrel Material: Smooth HDPE

Embedment: 24.00 in

Barrel Manning's n: 0.0120 (top and sides)

Manning's n: 0.0350 (bottom)

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Sta 167+20)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
30.00	183.09	0.99	5.04	0.25	1.15
30.40	183.10	1.00	5.06	0.25	1.15
30.80	183.11	1.01	5.08	0.25	1.15
31.20	183.11	1.01	5.10	0.25	1.15
31.60	183.12	1.02	5.11	0.25	1.15
32.00	183.12	1.02	5.13	0.26	1.15
32.40	183.13	1.03	5.15	0.26	1.16
32.80	183.14	1.04	5.16	0.26	1.16
33.10 25-year storm event	183.14	1.04	5.17	0.26	1.16
33.60	183.15	1.05	5.19	0.26	1.16
34.00	183.15	1.05	5.21	0.26	1.16

Tailwater Channel Data - Sta 167+20

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 2.00 ft

Side Slope (H:V): 4.00 (4:1)

Channel Slope: 0.0040

Channel Manning's n: 0.0130

Channel Invert Elevation: 182.10 ft

Roadway Data for Crossing: Sta 167+20

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 60.00 ft

Crest Elevation: 185.60 ft

Roadway Surface: Paved

Roadway Top Width: 9.00 ft

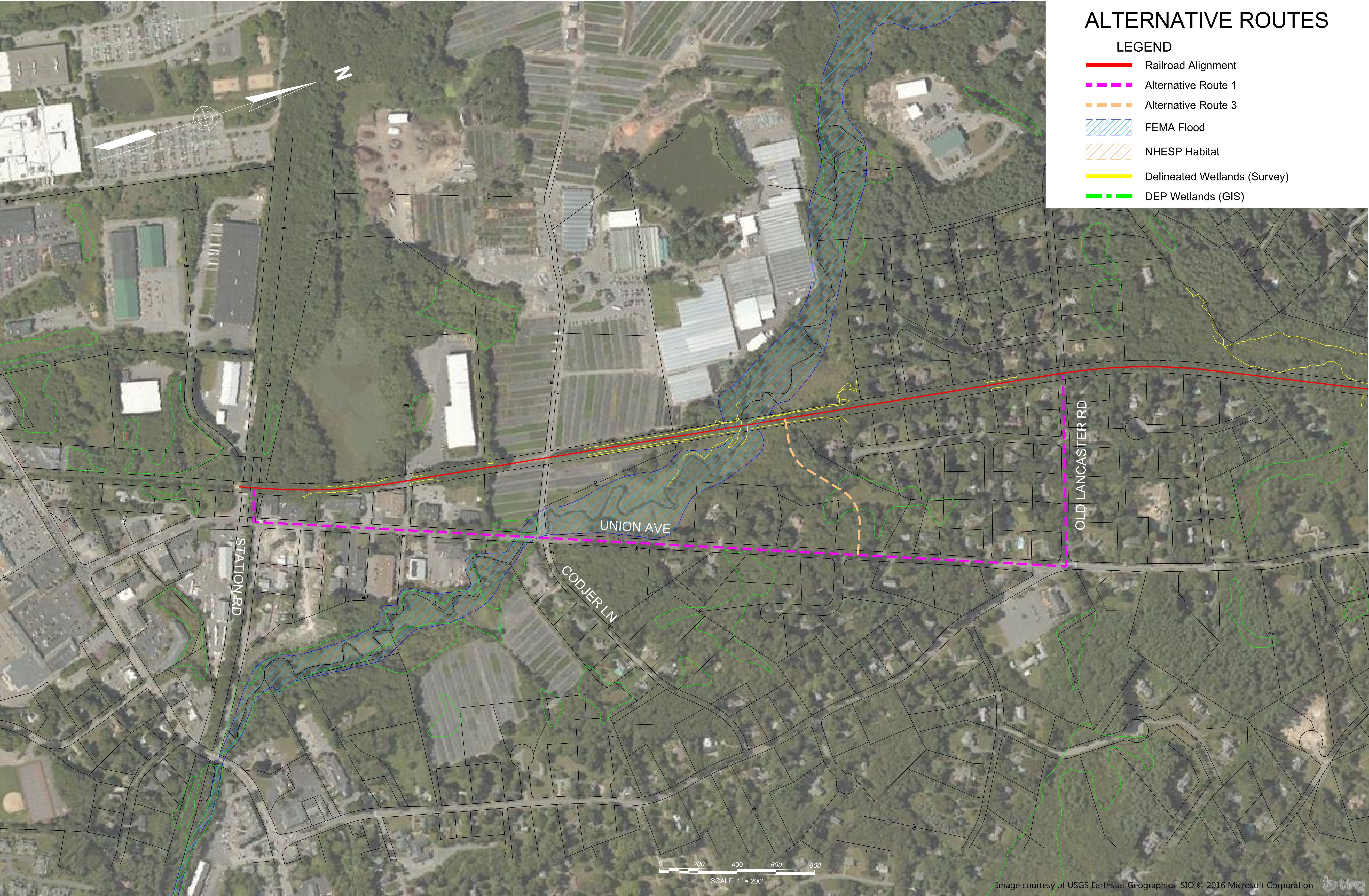
Appendix I

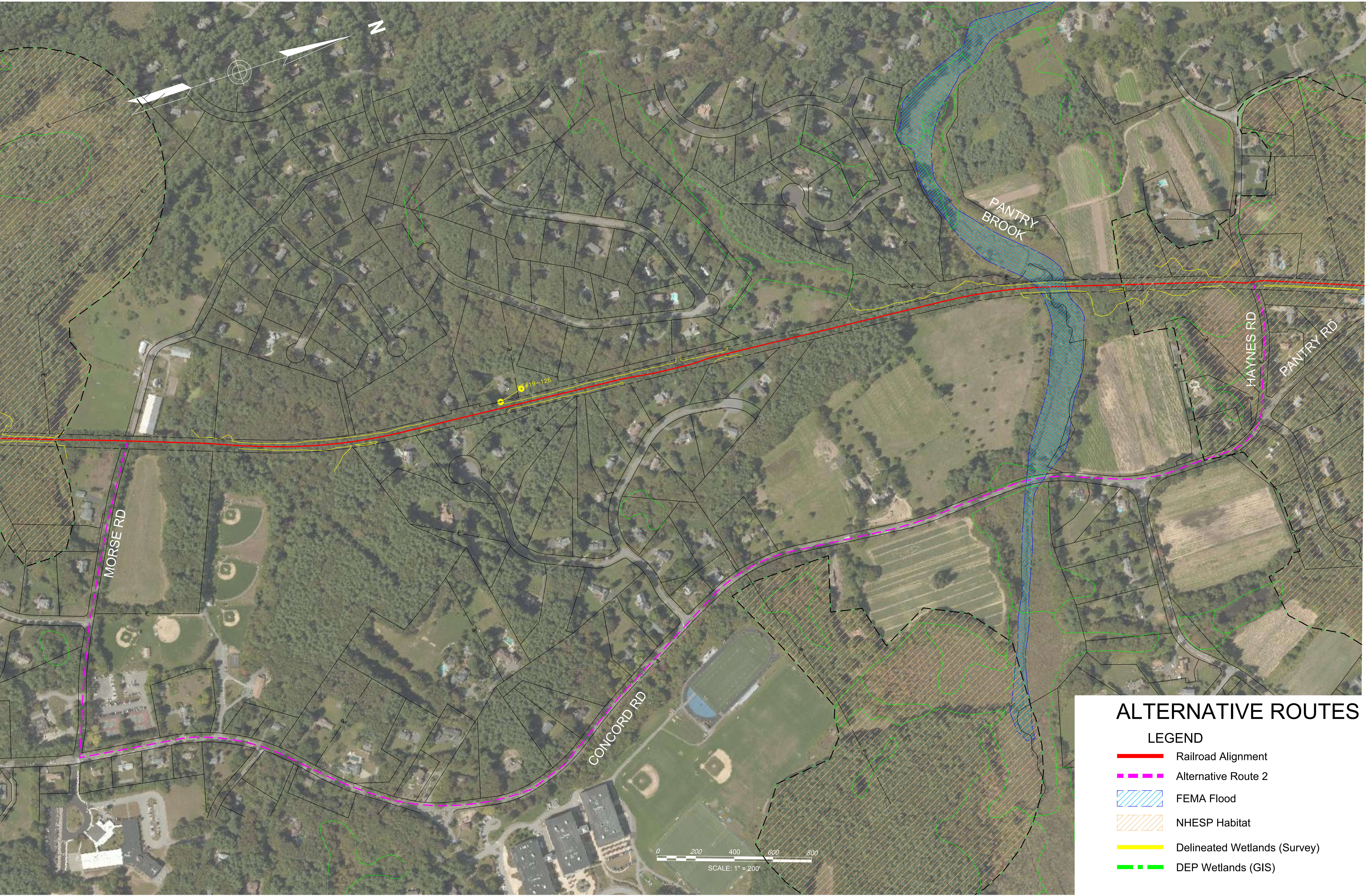
Alternatives Analysis Supporting Documents

ALTERNATIVE ROUTES

LEGEND

- Railroad Alignment
- - - Alternative Route 1
- - - Alternative Route 3
- / / / FEMA Flood
- / / / NHESP Habitat
- Delineated Wetlands (Survey)
- - - DEP Wetlands (GIS)





ALTERNATIVE ROUTES

LEGEND

- Railroad Alignment
- Alternative Route 2
- ▨ FEMA Flood
- ▨ NHESP Habitat
- Delineated Wetlands (Survey)
- DEP Wetlands (GIS)

Appendix J

General Wildlife Habitat Evaluation

Supplemental Wildlife Habitat Evaluation
for Culvert Location 4 at STA 167+17



**General Wildlife Habitat
Assessment Report**

Bruce Freeman Rail Trail
Sudbury, Massachusetts

Wildlife Habitat Assessment Relative to
the 25% Design Submittal dated
November 2016

April 8, 2020

Prepared for:

Massachusetts Department of
Transportation

Prepared by:

Stantec Consulting Services Inc.

April 8, 2020

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GENERAL WILDLIFE HABITAT ASSESSMENT REPORT

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1.0 INTRODUCTION

On behalf of the Massachusetts Department of Transportation (MassDOT), Stantec Consulting Services Inc. (Stantec) performed a general wildlife habitat assessment for the proposed Bruce Freeman Rail Trail (BFRT; Project) located in Sudbury, Massachusetts, between the driveway to Chiswick Park off Union Avenue north to the Concord town line. The approximately 4.6-mile-long trail is proposed along the former Lowell Secondary Track of the Old Colony Rail Road that operated between Lowell and Framingham, Massachusetts (Figure 1). The right of way (ROW) is presently owned by MassDOT. In light of recent efforts in neighboring towns to rehabilitate the former railroad ROW as a rail trail, the Town of Sudbury (Town) is considering rehabilitation of the ROW in Sudbury to interconnect with trails in adjacent towns (Fay, Spofford, and Thorndike 2006).

The wildlife habitat assessment described herein considered the proposed impacts per 25% Design Submittal dated November 16, 2017, to wetland resource areas subject to the Massachusetts Wetlands Protection Act regulations (310 CMR; WPA) and relative to the guidance of the 2006 *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* (Guidance)¹ developed by the Massachusetts Department of Environmental Protection (MassDEP). Stantec Certified Wildlife Biologists (CWB), Daniel Nein and Rodney Kelshaw, performed the wildlife habitat assessment following review and approval of professional qualifications by the Sudbury Conservation Commission.

The assessment included a desktop review of publicly available natural resource data, including Massachusetts Geographic Information Systems (MassGIS), prior to the field survey and a wildlife habitat field assessment conducted October 1–2, 2018. MassDOT Environmental Services staff participated in the field assessment on October 1, 2018.

2.0 METHODOLOGY

Methodology is described below for the data review and field survey associated with the general wildlife habitat assessment at the Project.

2.1 EXISTING DATA REVIEW

Stantec reviewed publicly available natural resource data from MassGIS to evaluate the potential presence or absence of resources and to identify specific areas of potential unique ecological value to target during the field assessment. The MassGIS data review included federal and state wetlands and waterways, open space, aerial photography, Areas of Critical Environmental Concern, Federal Emergency Management Agency (FEMA) flood zones, Coldwater Fisheries Resources, Massachusetts Natural Heritage and Endangered Species data, University of Massachusetts (UMass), and surface and wellhead drinking water supplies. The UMass Conservation Assessment and Prioritization System (CAPS) data for the Town was also reviewed. This wildlife habitat assessment also considered the results

¹ MassDEP. 2006 *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* is available at: <http://umasscaps.org/pdf/wldhab.pdf>.



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of the previous wildlife habitat assessment performed by Call of the Wild Consulting in 2009 (Call of the Wild 2009) and vernal pool surveys performed by Stantec and other consultants between 2015 and 2018 (Stantec 2018), the results of which are summarized herein.

2.1.1 25% Design Submittal and Preliminary Resource Area Impacts

The existing data review also considered the 25% Design Submittal prepared by Vanasse Hangen Brustlin, Inc. (VHB) dated November 17, 2016 (Appendix A), and the associated wetland resource area impact tables for floodplain, Bordering Vegetated Wetland (BVW), and Bank dated September 25, 2017 (Appendix B).

2.2 FIELD ASSESSMENT

Following the completion of the existing data review, Stantec CWBs performed the field assessment along the full length of the proposed BFRT in Sudbury to evaluate general wildlife habitat and potential for Project adverse effect relative to the Guidance. The Guidance was referenced to determine each wetland resource area to assess, followed by a determination of the impact being above or below the “significance” threshold to identify the appropriate field data form (i.e., Guidance’s Appendix A or B). The results of field form for each wetland resource area were used to assess whether or not the Project will adversely affect wildlife habitat.

Based on the preliminary wetland resource area impact calculations prepared by VHB (Appendix B) and our interpretation of the Guidance, Appendix A of the Guidance was used as the field data form when evaluating wetland resource areas where impact was proposed based on the 25% Design Submittal. Appendix A provides a simplified evaluation of small-scale alterations to ensure protection for certain “important habitat features” and identify projects that warrant detailed wildlife habitat evaluations (i.e., Appendix B of the Guidance). Appendix A also was deemed applicable based on the localized nature of proposed impacts based on the 25% Design Submittal. The following is a summary of the proposed wetland resource area impacts that triggered Appendix A of the Guidance.

- The Project proposes 4,681 square feet (sf; 3,670 sf temporary/1,011 sf permanent) of impact to BVW. Appendix A applies when impacts are below 5,000 sf to BVW.
- The Project proposes 1,752 linear ft (lf; 1705 lf temporary/47 lf permanent) of impact to Bank. Appendix A applies when impacts are above 50 lf to Bank.
- The Project proposes to fill approximately 3 cubic yards and cut approximately 73 cubic yards of floodplain/Bordering Land Subject to Flooding. The proposed impacts do not trigger Appendix A, but localized Bank habitat can be important to wildlife, so the wildlife habitat assessment evaluated where impact is proposed to this resource.
- Impacts to Previously Developed Riverfront Areas does not require a wildlife habitat assessment per the Guidance; however, Riverfront can be important to wildlife, so the wildlife habitat assessment considered these areas associated with Hop Brook, the unnamed tributary to Hop Brook, and Pantry Brook.



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Stantec assessed the ROW for the following important habitat features outlined in Appendix A of the Guidance:

- Habitat for state-listed species
- Sphagnum hummocks and pools suitable as nesting habitat for four-toed salamanders
- Trees with large cavities (>18" diameter at entrance)
- Existing beaver, mink, or otter dens
- Areas within 100 feet of existing beaver, mink or otter dens
- Existing nest trees for birds that traditionally reuse nests (bald eagle, osprey, great blue heron)
- Land containing freshwater mussel beds
- Wetland and waterbodies known to contain open water in winter that may serve as waterfowl winter habitat
- Turtle nesting areas
- Vertical sandy banks (bank swallows, rough-winged swallows or kingfishers)

In addition to the above habitat features, the Guidance identifies the following habitat characteristics to evaluate when not commonly encountered in the surrounding area:

- stream bed riffle zones,
- springs,
- gravel stream bottoms (trout and salmon nesting substrate,
- plunge pools (deep holes) in rivers or streams, and;
- medium to large, flat rock substrates in streams.

The activities identified in Appendix A of the Guidance, if proposed within resources areas, that would trigger a detailed wildlife habitat evaluation include:

- Activities located in mapped "Habitat of Potential Regional or Statewide Importance"
- Activities affecting certified or documented vernal pool habitat, including habitat within 100 feet of a certified or documented vernal pool when within another jurisdictional resource area
- Activities in Bank, Land Under Water, Bordering Land Subject to Flooding (presumed significant) where alterations are more than twice the size of thresholds
- Activities affecting vegetated wetlands >5000 sf occurring in source areas other than Bordering Vegetated Wetland
- Activities affecting the sole connector between habitats >50 acres in size



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- Installation of structures that prevent animal movement
- Activities for the purpose of bank stabilization using hard structure solutions that significantly affect ability of stream channel to shift and meander, or disrupt continuity in cover that would inhibit animal passage, and
- Dredging (>5,000 sf)

The evaluation not only considered Appendix A of the Guidance but additional evidence of wildlife use and potential wildlife habitat not identified on Appendix A and general design recommendations that would avoid, minimize, and mitigate impacts, where deemed applicable, to general wildlife habitat interests protected under the WPA.

3.0 RESULTS

The results of the existing data review and field assessment at the Project are presented below.

3.1 EXISTING DATA REVIEW

The BFRT is proposed along an existing ROW in a suburb of Greater Boston where adjacent primary land uses include residential, commercial / industrial, and open space available for conservation and recreation. Several of these larger open space parcels are owned by the Town and occur near the northern extent of the Project. Commercial / industrial uses primarily occur in the southern extent of the ROW, located south of Codjer Lane and near the Hudson Road (Route 27) and North Road (Route 117) road crossings. The ROW crosses several perennial or intermittent waterways, including Hop Brook and Pantry Brook. We understand the determination of whether a stream is perennial or not may be ongoing and is being performed by others. Wetland areas are present in lower lying areas along the ROW, some of which are associated with riparian areas.

Table 1 below summarizes the natural resource desktop data review and identifies resources within, or immediately adjacent to, the ROW. It is noteworthy that unique ecological communities and high value wildlife habitat requiring regulatory review are not present within or proximal to the Project; these include:

- Critical Habitat for federally listed species,
- Priority or Estimated Habitat for state-listed species or BioMap2 Critical Natural Landscape, or
- Area of Critical Environmental Concern.



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Table 1. Existing Natural Resource Data Review, Bruce Freeman Rail Trail, Sudbury, Massachusetts

Resource Type Within or Immediately Adjacent* to Project	Yes	No
NHESP BioMap2 Core Habitat Core Habitat 1920 (mapped for Species of Conservation Concern)	X	
NHESP Critical Natural Landscape		X
NHESP Priority/Estimated Habitat for state listed species		X
NHESP Potential Vernal Pool (8 PVPs) PVPs 24213, 24206, 24192, 24191, 24159, 24158, 24157, 24155	X	
NHESP Certified Vernal Pool CVP 1428 between Route 27 & Morse Road CVP 2504 between Route 27 & Old Lancaster Road	X	
NHESP Natural Community		X
Area of Critical Environmental Concern		X
Critical Habitat for federally listed species		X
UMass CAPS Habitat of Potential Regional or Statewide Significance	X	
MassWildlife Coldwater Fisheries Resource Hop Brook Unnamed Tributary to Hop Brook	X	
Protected Open Space	X	
MassDEP wetlands	X	
Bicycle Trails	X	
Surface Water Protection Area (Zone A, B, or C)		X
Zone II Wellhead Protection Area	X	
Interim Wellhead Protection Area		X
FEMA National Flood Hazard Area	X	

Notes:

Data is derived from MassGIS with the exception of CAPS data from UMass and Critical Habitat data from USFWS.

* For the purposes of the data review, immediately adjacent is considered as present within 500 feet of the Project ROW.

BioMap2 Core Habitat² (for Species of Conservation Concern) as mapped by the NHESP occurs between Hudson Road (Route 27) and Morse Road (Figure 2a). The Project is not mapped as BioMap2 Critical Natural Landscape, which can overlap with BioMap2 Core Habitat. BioMap2 is intended as a strategic conservation planning tool designed by the by the Massachusetts Department of Fish and Game and Massachusetts Nature Conservancy in 2010 to guide strategic biodiversity conservation to focus land protection and stewardship on areas most critical for ensuring long-term persistence of rare and native species and their habitats, exemplary natural communities, and a diversity of ecosystems and includes

² BioMap2 Core Habitat consists of 1,242,000 acres that are critical for the long-term persistence of rare species and other Species of Conservation Concern, as well as a wide diversity of natural communities and intact ecosystems across the Commonwealth. It includes habitats of rare, vulnerable or uncommon species; Priority Natural Communities; high quality wetland, vernal pool, aquatic, and coastal habitats; and intact forest ecosystems.



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the habitats and species of conservation concern identified in the State Wildlife Action Plan. When the NHESP updated Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife mapping in 2017 for the 14th Edition of the Natural Heritage Atlas, which are regulatory maps used for review under Massachusetts Endangered Species Act (MESA and WPA, respectively), the Project was not mapped within or proximal to either habitat. It is possible that the BioMap2 Core Habitat from 2010 overlapping the Project was due to the inclusion of NHESP Priority Habitat mapping that predated the 14th Edition of the Natural Heritage Atlas.

Two generally small areas, which are adjacent to but not within the Project, have been modeled by the UMass Conservation and Assessment Prioritization System (CAPS)³ and are mapped as Habitat of Potential Regional or Statewide Importance⁴. The first is the existing CVP noted above and surrounding forest immediately west of the ROW between Hudson Road and Morse Road, and second is small open water wetland/PVP and shoreline area immediately west of the ROW near the Sudbury-Concord town line (Figure 2a). When areas modeled by CAPS occur within jurisdiction of the WPA, they are subject to the Guidance.

Hop Brook and an unnamed tributary to Hop Brook are designated as Coldwater Fisheries Resources by Massachusetts Division of Fisheries and Wildlife (MassWildlife) (Figure 2b). Wellhead Protection Areas, Zone IIs, occur at the northern and southern extents of the ROW (Figure 2b). The nearest Surface Water Protection Areas associated with Cambridge Reservoir and surrounding waterbodies of the Charles River Watershed are located in the adjacent towns of Lincoln, Weston, and Waltham. FEMA Floodzones can be generally associated with low-lying areas at waterway crossings and wetlands.

There are two National Wildlife Refuges (NWR) (2,480 acres), one state Wildlife Management Area (WMA, 411 acres), two State Forests (~1,630 acres), one municipal state forest (289 acres) and multiple other open space parcels located within 5 miles of the Project. The boundaries of the Pantry Brook State Park WMA and Great Meadows NWR are located approximately 1,100 feet and 2,100 feet east of the ROW, respectively (Figure 2c). The boundary of the Marlborough-Sudbury State Forest, Callahan State Forest, Memorial Forest, and Assabet River NWR are located approximately 2 miles west or southwest of the ROW. Non-federal or state protected open space within a mile of the ROW includes Mineway Brook Corridor, Brues Woods, Gray Reservation, and Emmons Conservation Restriction (Figure 2c). Using data publicly available through MassGIS, greater than 30% and more than 25,000 acres of the land area within a 5-mile buffer of the ROW is currently protected open space.

Mapped vernal pool habitat (Potential or Certified Vernal Pools, PVP and CVP, respectively) are present in low density and scattered along and generally proximal to the ROW. At a landscape scale, vernal pools are more common in other parts of Sudbury and nearby towns. Several PVPs are generally present in the northern extent of the ROW and two CVPs have been identified in the southern extent of the ROW (Figure 2a). Under WPA, vernal pool habitat protection includes the vernal pool and the 100-foot zone around the vernal pool when located within a wetland resource area.

³ CAPS is an ecosystem-based (coarse-filter) approach for assessing the ecological integrity of lands and waters and subsequently identifying and prioritizing land for habitat and biodiversity conservation.

⁴ Areas representing the 40% of the landscape with the highest potential wildlife habitat value as measured by CAPS, and applicable to the MassDEP Guidance when within the jurisdiction of WPA.



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The ROW is mapped as a Bicycle Trail, which is a MassGIS data layer representing trails where bicycles are a permitted use and corridors with conversion potential. The mapping in Sudbury connects with the Bicycle Trail mapping in adjacent towns of Concord and Framingham. The Massachusetts Department of Conservation and Recreation created this data layer for the purpose of regional planning and mapping.

Call of the Wild Consulting performed a wildlife habitat assessment between 2007 and 2008 in response to the Town's request for a comprehensive four-season wildlife habitat assessment (Call of the Wild 2009). Wildlife habitat assessment results, evidence of species use, and recommendations were provided in 2009.

3.2 FIELD ASSESSMENT RESULTS

A two-day field survey was conducted on October 1–2, 2018 to evaluate general wildlife habitat conditions, wildlife use, and direct observations of wildlife species within and near delineated wetland resource areas within the ROW that may be adversely affected by the Project. MassDOT Environmental Services staff participated in the field assessment on October 1, 2018. Stantec's wildlife habitat assessment was subsequent to the wetland delineation conducted by VHB in 2015-2016 that supported development of the 25% Project Design Submittal. This evaluation is based on the 25% Project Design Submittal and proposed impacts at this early stage should continue to be evaluated as the Project design advances in an effort to further avoid and minimize the possibility of adverse effect to not only general wildlife habitat, but the other interests protected under the WPA.

As noted in Section 3.1, the ROW traverses a suburban setting with adjacent areas of protected open space, past/current agricultural use, and commercial/industrial businesses. Representative and dominant ecological communities which were observed adjacent to the ROW included variants of the Mixed Oak Forest/Woodland, White Pine-Oak Forest, and Red Maple Swamp as described in the *Classification of Natural Communities of Massachusetts* (Swain 2016). These communities are widespread and considered common and secure in Massachusetts. The encroachment of commercial and residential land uses within the ROW has occurred over time. The ROW is approximately 65 feet wide for most of its length and is predominantly a wooded corridor passing through multiple wetland areas, including vegetated wetlands, perennial/intermittent streams, and associated floodplain. Wetland areas are previously disturbed or presumed to be an artifact or, at a minimum, influenced hydrologically by the original ROW construction. The vegetated wetlands where temporary or permanent impacts are proposed generally occur at the toe of slope or near the edge of the rail bed. A further description of the wetland resource areas can be found in the VHB wetland report.

Within the ROW, the existing railbed (i.e., the earthen area containing the tracks and ties), is of variable width as a result of adjacent cut and fill slopes among other variables. The track, wooden ties, and ballast are visible along the ground surface over much of the ROW. A buildup of a shallow duff and/or soil layer over areas of ballast has occurred over time, allowing the colonization of some rooted native species; however, the dominant species are predominately invasive plant species within the ROW. It can be inferred that the initial construction of the rail bed involved the use of off-site and on-site fill material, which may have created depressions or lower lying areas and additionally caused soil compaction.



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Portions of the ROW less frequented by pedestrian foot traffic in the northern section are heavily overgrown with dense shrubbery and vines. Overall, invasive species are common throughout, including: glossy buckthorn (*Frangula alnus*), Oriental bittersweet (*Celastrus orbiculatus*), and honeysuckle (*Lonicera spp.*), with occasional occurrences of winged euonymus (*Euonymus alatus*) and Japanese barberry (*Berberis thunbergii*), and with common reed (*Phragmites australis*) frequent in wetland resource areas.

3.2.1 Wildlife Observations

The mosaic of the wooded corridor interfacing with seasonal and permanent wetlands and small waterways represents habitat for a variety of wildlife species and their uses (e.g., foraging, breeding, shelter, nesting), including representative and regionally common species expected for a suburban or urban area. However, less common or rare species are also documented from nearby state WMAs and NWFs and possibly other open space or protected areas noted in section 3.1. For example, Blanding's turtle (*Emydoidea blandingii*), state-listed and candidate for federal listing, and spotted turtle (*Clemmys guttata*), previously state-listed, are known inhabitants at Great Meadows NWF. The closest NHESP documented occurrence of a state-listed rare species to the Project is blue-spotted salamander (*Ambystoma laterale*) observed at the previously certified CVP 1428 located just beyond 100 feet west of station 336+00, which is further described below in the Vernal Pool Survey section as CVP #13. Direct observations of wildlife species presence within the ROW primarily included common or generalist species typical of a suburban and forested landscape such as the conditions present at the Project and those in areas of eastern Massachusetts and the region. No state-listed or federally listed species were observed within the ROW during the assessment.

Mammals

Evidence of the wildlife species at the Project in part included mammals such as white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), and red squirrel (*Tamiasciurus hudsonicus*). Open portions of the ROW provide ease of travel for mammalian species, while overgrown areas provide cover or shelter in addition to functioning as a potential travel corridor.

Evidence of prior beaver (*Castor canadensis*) activity (>5 years) within the ROW was noted in three areas and included stumps of hardwood species with evidence of beaver chew near the existing Hop Brook crossing. Inactive heavily deteriorated bank dens in the embankment close to the toe of slope at stations 264+00 near Pantry Brook and 477+00 near the open wetland modeled by CAPS were likely historically used by beaver or possibly river otter (*Lontra canadensis*). Within the ROW, including areas of proposed wetland impact, there were no observations of evidence of recent or current use by beaver, American mink (*Neovison vison*), or river otter. Riparian and open water habitat that would be considered suitable to support these species is limited at the Project, with the most likely exception of Hop Brook and Pantry Brook.

The presence of small mammal populations and additional larger mammals such as grey fox (*Urocyon cinereoargenteus*), raccoon, and other species using the ROW and adjacent areas, as reported by the Call of the Wild 2009, is anticipated given available suitable habitat to support these species.



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A potential bat roost tree was identified near station 171+30 where an impact is proposed within a wetland resource area; however, potential roost trees were observed beyond the ROW and broader potential bat roost habitat, including mature trees, is expected to be common on the landscape. The spread of White Nose Syndrome has detrimentally impacted bat populations in the northeast United States.

Birds

Representative avian species such as red-tailed hawk (*Buteo jamaicensis*), American crow (*Corvus brachyrhynchos*), blue jay (*Cyanocitta cristata*), turkey (*Meleagris gallopavo*), black-capped chickadee (*Penthestes atricapillus*), gray catbird (*Dumetella carolinensis*), nuthatches (*Sitta* sp.), and several woodpeckers (*Picoides* sp.) were also observed at the Project. A pair of mallard ducks (*Anas platyrhynchos*) were observed in the open water wetland near the Sudbury/Concord town line. This area was modeled by CAPS and represents a small open water habitat for waterfowl and other bird species that is anticipated to freeze annually during winter months, unlike other larger open water habitats less likely to freeze in nearby WMAs and NWFs. Additional avian species anticipated to use the ROW and adjacent landscape include neotropical migrants and resident species typical of suburban forested and partially fragmented landscapes. The ROW provides an open corridor for avian travel and foraging, while overgrown areas provide increased cover, shelter, and nesting habitat, although these habitats are primarily located outside of jurisdictional areas. These types of habitats are not limited to the ROW and are expected to be abundant in the surrounding landscape.

Fisheries and Mussels

Hop Brook and an unnamed tributary to Hop Brook are designated as Coldwater Fisheries Resources by MassWildlife. Attributes of Coldwater Fisheries Resources include high water quality, natural flow regimes, cold water temperatures (less than 68°F), largely intact riparian area, and watershed connectivity. Hop Brook, the unnamed tributary to Hop Brook and additional potential perennial and intermittent streams were evaluated for the presence of fisheries and mussel habitat, including the habitat features and considerations identified in Appendix A.

The in-stream conditions at the existing Hop Brook crossing and nearby unnamed tributary to Hop Brook indicate a perennial condition with a sand and sparse gravel streambed with moderate shoreline and submerged aquatic vegetation. Habitat conditions are anticipated to support coldwater species where the ROW crosses these waterways. Species such as brook trout (*Salvelinus fontinalis*), dace (*Rhinichthys* spp.), and white suckers (*Catostomus commersonii*) may be present in small densities and are examples of species that would need to be documented to designate the waterway as a Coldwater Fisheries Resource by MassWildlife.

In-stream conditions at the Pantry Brook crossing include a higher percentage of muck/organic material in the substrate. Water quality is not expected to be as high in this area compared to Hop Brook and high water quality is needed to support coldwater species; however, habitat could support some warmwater species.



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Conditions at and near each perennial waterway crossing did not appear suitable (e.g., substrate, depth) for mussel beds, nor was there evidence of the predation of mussels, such as empty shells, which is also an indication of species presence.

There is the potential for mussel beds, and plunge pools and gravel dominated substrates suitable for fish spawning to be present further up or downstream of the areas assessed for the Project. The designation of Coldwater Fisheries Resources for waterways at the Project indicates suitable conditions are present for coldwater fish species, which might also be suitable for some mussel species.

Vernal Pool Species

A vernal pool survey at the Project was conducted by Stantec in April 2018 (Stantec 2018) and evaluated eligibility under the NHESP 2009 *Guidelines for the Certification of Vernal Pool Habitat* and the Sudbury Wetlands Administration Bylaw Regulations (Bylaw) revised September 25, 2017. The results of the 2018 survey identified three vernal pools eligible for NHESP certification (PVP 4, PVP 11, and PVP 12a). CVP 13⁵ continues to meet NHESP certification requirements, and PVP 9⁶, PVP 17, and PVP 20 may meet criteria as a vernal pool under the Town's Bylaw. Amphibian species observed during the spring survey included: wood frog (*Lithobates sylvaticus*), spotted salamander (*Ambystoma maculatum*), red-backed salamander (*Plethodon cinereus*), gray treefrog (*Hyla versicolor*), blue-spotted salamander (CVP 13; NHESP CVP# 1428), and spring peeper (*Pseudacris crucifer*).

There was no evidence of turtle nesting (i.e., shell fragments or nests excavated by mammals) or measurable areas of suitable turtle nesting habitat with the ROW or immediate vicinity observed during the 2018 vernal pool survey or wildlife habitat assessment.

4.0 EVALUATION OF ADVERSE EFFECT

The results of the data review and the results of the field survey were used to assess whether or not the Project will result in an adverse effect to wildlife habitat subject to the WPA. None of the important habitat features or other thresholds identified in Appendix A of the MassDEP guidance were observed within or proximal to wetland resource areas where temporary or permanent Project impacts are proposed. Additionally, no other high value habitats or species particularly sensitive to the construction of a rail trail were observed. The trail is not expected to be a barrier to wildlife usage patterns near the Project or at the landscape level, as most species would shift habitat usage patterns, as needed, to carry out their life cycles during construction and post-construction. Therefore, potential habitat impact within jurisdiction of the WPA is generally localized, temporary, occurring previously disturbed area, and would occur to habitat that is not considered critical; or limiting at the Project or the local landscape. As a result, no adverse effect to wildlife habitat within wetland resource areas is anticipated based on the 25% Design

⁵ Obligate vernal pools species observed in 2018 included fairy shrimp (*Eubrachipus* spp.) and blue-spotted salamander (*Ambystoma laterale*) egg masses.

⁶ The NHESP confirmed Stantec's 2018 identification of two dead salamanders as the lead phase for eastern red-backed salamander.



April 8, 2020

Submittal. As the Project design develops further, recommendations are provided below for consideration in consultation with the Sudbury Conservation Commission and other resource agencies, as appropriate.

5.0 ADDITIONAL DESIGN CONSIDERATIONS AND RECOMMENDATIONS

The following additional recommendations relative to the protection of wildlife habitat should be considered as Project planning and design continues.

1. Locate the Project limit of disturbance within existing ROW to the greatest extent practical, including staging areas, construction access, parking, and scenic vistas.
2. Avoid or minimize tree clearing where possible. For example, the forested habitat surrounding high value or productive vernal pools (e.g., certified or certifiable by NHESP), particularly the 100-foot zone surrounding the boundary of the pool breeding habitat.
3. Implement Best Management Practices (BMPs) to avoid/minimize potential impacts to wetland resources areas that support wildlife habitat. For example, avoidance and minimization of erosion and sedimentation into wetland resource areas, use of clean heavy machinery at Project to limit/avoid introduction of invasive non-native plant species, avoidance of machinery refueling in buffer zones, and general housekeeping (including final site cleanup).
4. Establish a robust erosion and sedimentation control program per MassDEP Erosion and Sedimentation Control Guidelines and guidance from the Sudbury Conservation Commission, including monitoring and timely maintenance throughout construction due to the proximity of limits of work near some wetland resource areas.
5. Use plantings and seed from native plant species during restoration of disturbed areas. The selection of species for plantings should consider enhancing or replacing wildlife habitat use (e.g., fruiting shrubs, pollinator habitat, evergreen species for cover, etc.).
6. Incorporate minimum Massachusetts Stream Crossing Standards at perennial waterway crossings to the maximum extent practical. Consider these standards in additional areas that may provide high value wildlife habitat (e.g., intermittent stream). In the case of Hop Brook, the reuse/rehabilitation of the existing bridge to span the brook is being considered for the design.
7. Consider maintaining or creating wildlife crossing passage at strategic locations underneath the trail (e.g., existing cattle crossing used by wildlife, new crossing where amphibians migrate from the forest to high value vernal pools close to the ROW).
8. If scenic vistas or additional parking are proposed, cite these in areas that avoid and minimize the potential impact to wildlife habitat and wildlife behavior.
9. Monitoring of Priority and Estimated Habitat mapping by the NHESP for the potential presence of state-listed species near or at the Project as environmental permitting continues.
10. Avoid or minimize installation of physical barriers that would create impassable conditions across the trail for some smaller wildlife species.



GENERAL WILDLIFE HABITAT ASSESSMENT REPORT

April 8, 2020

11. Consider leash and waste clean-up rules for pets at the Project.
12. Strategically girdling trees (e.g., cottonwood) that are located a safe distance from the ROW (to avoid creating hazard tree to humans). This management practice would increase the number of standing dead trees that could offer natural cavities and crevices for wildlife (e.g., roosting bats, nesting birds and waterfowl, small mammal dens).
13. Beneficially reuse trees and brush cleared during on-site site preparation to create new or enhance existing brush piles near the ROW to serve as wildlife habitat (e.g., refugia for small mammals, amphibians, and reptiles; and nesting habitat for songbirds).
14. Avoid and minimize effects of temporary construction and permanent lighting to the maximum extent practical to minimize the potential for the disruption of wildlife behavior. If permanent lighting is proposed, use full cutoff lens to direct lighting downward toward the trail surface to avoid and minimize the secondary effect to adjacent wildlife habitat.
15. Consider strategically locating signage along the trail (e.g., trail heads or parking areas) to educate trail users about wildlife and wetland ecology.

6.0 REFERENCES

Call of The Wild Consulting. 2009. Comprehensive Four-Season Wildlife Habitat Evaluation Phase II Bruce Freeman Rail Trail Project. Prepared for Sudbury Conservation Commission.

Fay, Spofford, & Thorndike, 2006. Bruce Freeman Rail Trail Environmental & Engineering Assessment. Prepared for Town of Sudbury, Massachusetts.

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Swain, P. 2016. Classification of the Natural Communities of Massachusetts. Version 2.0. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, Massachusetts.

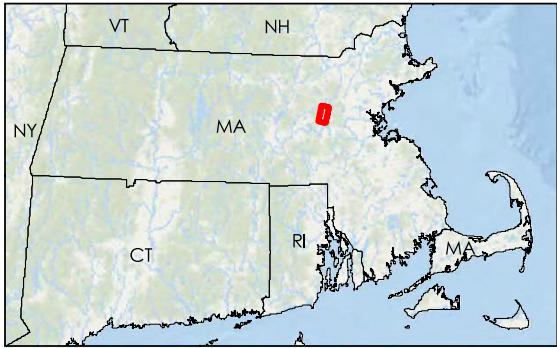


April 8, 2020

FIGURES



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Revised: 2019-04-17 By: rmac



- Legend
- Bruce Freeman Rail Trail
 - Town Boundary

Notes
1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: Administrative boundaries provided by Bureau of Geographic Information (MassGIS). Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

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Project Location
Sudbury, Massachusetts

Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

Client/Project
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

179410498

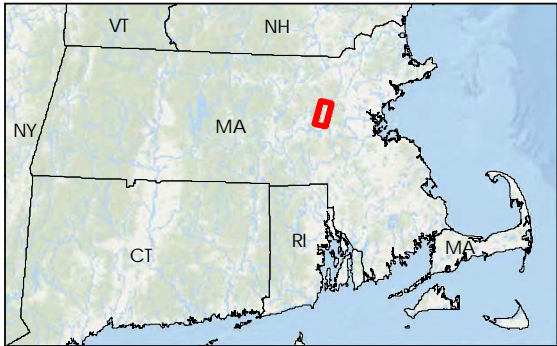
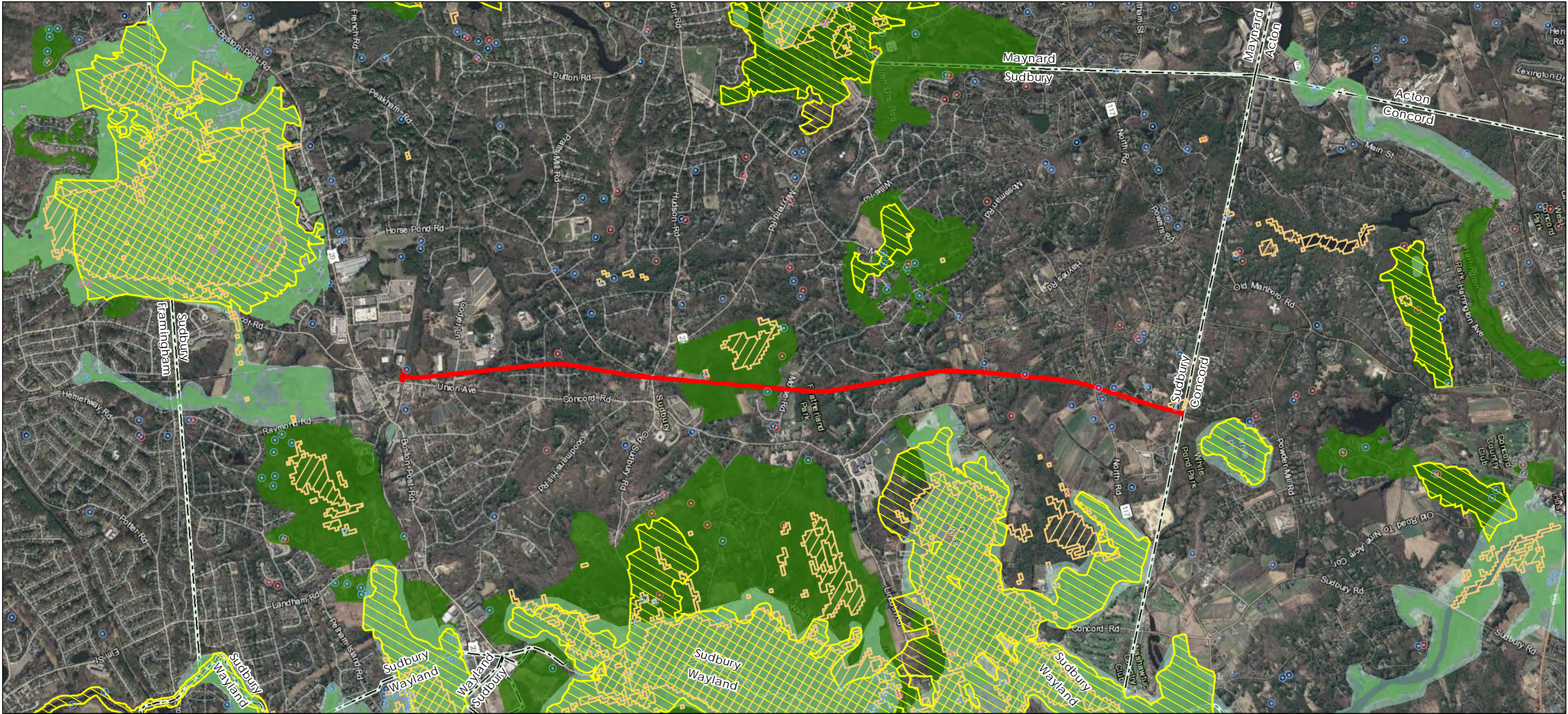
Figure No.

1

Title

Project Location Map

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Revised: 2019-04-17 By: rmac



Notes
1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: Administrative boundaries, NHESP data, and BioMap2 habitat and landscape data provided by Bureau of Geographic Information (MassGIS). CAPS habitat data provided by UMass. Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

Legend

- Bruce Freeman Rail Trail
- NHESP Potential Vernal Pools
- NHESP Certified Vernal Pools
- NHESP Priority Habitats of Rare Species (August 2017)
- UMass CAPS Habitat of Potential Statewide or Regional Importance
- BioMap2 Core Habitat
- BioMap2 Critical Natural Landscape
- Town Boundary

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Project Location
Sudbury, Massachusetts

Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

Client/Project
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

179410498

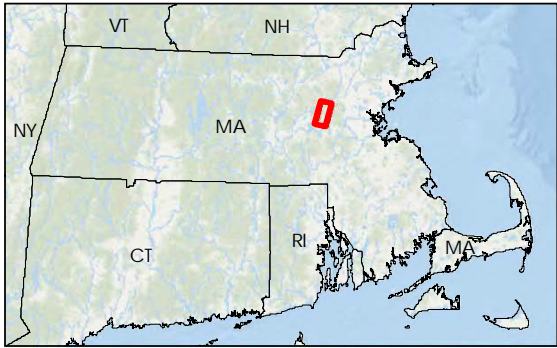
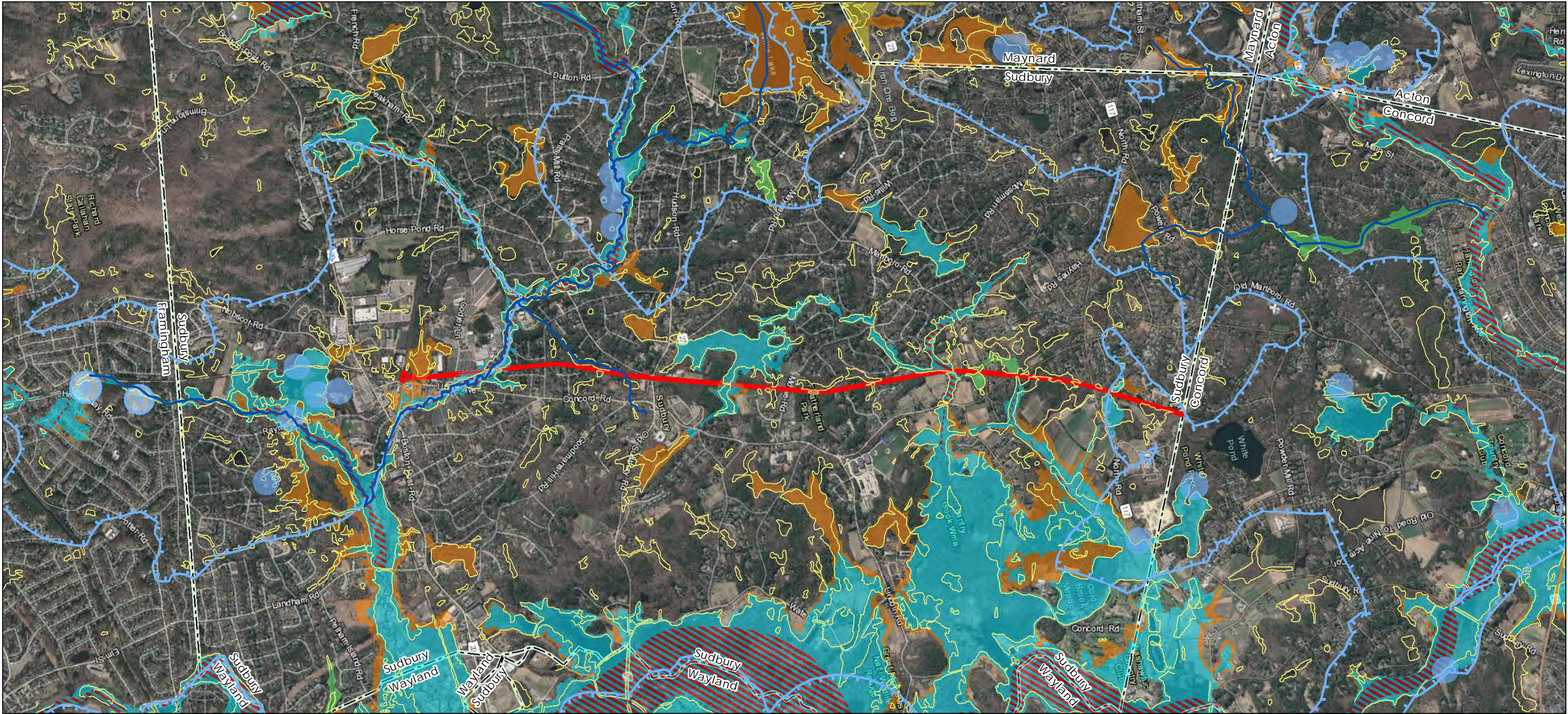
Figure No.

2a

Title

**Natural Resources Data Review
National Heritage Resources**

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Notes
1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: DFW coldwater fisheries resources, WPAs, DEP apparent wetland limit, SWPAs, FEMA National Flood Hazard layer, and administrative boundaries provided by Bureau of Geographic Information (MassGIS). Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery, MassGIS 2013-2014 USGS Color Orthoimagery

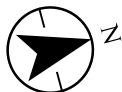
Legend

- Bruce Freeman Rail Trail
- Apparent Wetland Limit (DEP)
- DFW Coldwater Fisheries Resources
- FEMA National Flood Hazard Layer**
- A: 1% Annual Chance of Flooding, no BFE
- AE: 1% Annual Chance of Flooding, with BFE
- AE: Regulatory Floodway
- D: Possible But Undetermined Hazard
- X: 0.2% Annual Chance of Flooding

Surface Water Protection Areas

- Zone A
- Zone B
- Zone C
- Wellhead Protection Area**
- IWPA
- Zone Is
- Zone IIs
- Town Boundary

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Feet
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Project Location
Sudbury, Massachusetts

Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

Client/Project
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

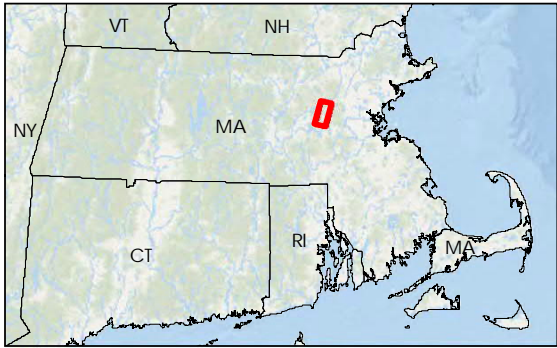
179410498

Figure No.

2b

Title
Natural Resources Data Review
MassDEP Resources and FEMA National
Flood Hazard

\\us124-1-10\workgroup\1956\active\Task Owner and other Non-BC\1956 Jobs\179410498\03_data\gis_cad\gis\MXDs\Sudbury\Fail Trail_Wildlife Habitat\Report\179410498_02c_NaturalResourceReview.mxd
Revised: 2019-04-17 By: rmack



Notes
1. Coordinate System: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001
2. Data Sources: Protected and recreational open space and administrative boundaries provided by Bureau of Geographic Information (MassGIS). Bruce Freeman Rail Trail provided by MassGIS Sudbury parcel data layer.
3. Background: Orthoimagery: MassGIS 2013-2014 USGS Color Orthoimagery

- Legend**
- Bruce Freeman Rail Trail
 - Town Boundary
 - Protected and Recreational OpenSpace**
 - Conservation Organization
 - Land Trust
 - Municipal
 - Other
 - Private
 - Private Non-Profit
 - State

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Feet
(At original document size of 11x17)
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Project Location
Sudbury, Massachusetts

Prepared by REM on 2019-02-20
IR Review by DGN on 2019-02-21

Client/Project
MassDOT
Bruce Freeman Rail Trail
Sudbury, MA

179410498

Figure No.

2c

Title
**Natural Resources Data Review
Open Space**

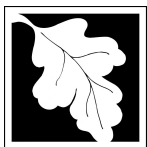


**APPENDIX B WILDLIFE HABITAT
EVALUATION REPORT FOR CULVERT 4**
Bruce Freeman Rail Trail, Sudbury,
Massachusetts

February 4, 2022

Prepared for:
Massachusetts Department of Transportation

Prepared by:
Stantec Consulting Services Inc.



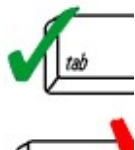
Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 1. Summary Sheet

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



Bruce Freeman Rail Trail -Massachusetts Department of Transportation

Project Name

Sudbury and Concord

Location

Bank 115 LF (100 SF Perm. & 15 Temp. for work in stream)

January 12, 2022

Size of Area Being Impacted

Date

Impact Areas (linear feet, square feet, or acres for each of the impact areas within the site)

Name	Waterbody/ Waterway	Wetland	Upland*	Total Area
1. Stream-LUWW	Intermittent Stream	410 P; 141 T	N/A	410 P; 141 T
2. Stream-Bank	Intermittent Stream	115 LF	N/A	115 LF
3.				
4.				
5.				
6.				
7.				

*Riverfront Area/BLSF

Attach Sketch map and/or photos of the Impact Areas

Narrative Description of Site (attach separate page if necessary)

Culvert 4 is located along the railroad tracks south of the intersection of the rail trail with Hudson Road and Peakham Road at approximately Station 167+20. There is an intermittent stream, an unnamed tributary to Hop Brook, and it is designated by the Massachusetts Division of Fisheries and Wildlife as a Coldwater Fisheries Resource. The stream flows west and southwest in this location. The right Bank (west) is bounded by residential development along Peakham Street, while there is mature upland immediately on the west and south sides of the stream. A wooded swamp lies to the northeast of the Culvert 4 work area and is part of a more extensive wetlands complex in this area.

Certification

I hereby certify that this project has been designed to avoid, minimize, and mitigate adverse effects on wildlife habitat, and that it will not, following two growing seasons of project completion and thereafter, substantially reduce its capacity to provide important wildlife habitat functions.

Michele Simoneaux

Signature of Wildlife Specialist (per 310 CMR 10.60 (1) (b))

Michele Simoneaux

Typed or Printed Name

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4	SUMMARY OF EVALUATION OBSERVATIONS	3
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Figure 1. Project Location Map

LIST OF ATTACHMENTS

ATTACHMENT A DETAILED WILDLIFE HABITAT EVALUATION FORM

ATTACHMENT B PHOTO SHEETS

ATTACHMENT C IMPORTANT HABITAT FEATURES MAP



1 Introduction

On behalf of the Massachusetts Department of Transportation (MassDOT), Stantec Consulting Services Inc. (Stantec) performed a detailed Appendix B Wildlife Habitat Evaluation for the proposed work area associated with the Culvert 4 replacement on the proposed Bruce Freeman Rail Trail (BFRT; Project) located in Sudbury, Massachusetts, between the intersection of Hudson Road and Peakham Road to the Concord town line (Figure 1; Photo 1). The culvert is located approximately at Station 167+20 at the BF#30 flag series (Photo 2 and Photo 3).

The Appendix B Wildlife Habitat Evaluation herein described was conducted on January 12, 2022 by Michele Simoneaux, Professional Wetland Scientist (PWS #2461) of Stantec Consulting, qualified to conduct evaluations per the requirements in 310 CMR 10.60. The evaluation considered the recently proposed impacts per the 100% Submittal Permitting Plan Set included with the Fuss & O'Neill Notice of Intent application package dated December 22, 2021. The assessed temporary and permanent impacts to wetland resource areas proposed in the Plan Set are subject to the Massachusetts Wetlands Protection Act regulations (310 CMR; WPA) and are relative to the guidance of the *2006 Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* (Guidance)¹ developed by the Massachusetts Department of Environmental Protection (MassDEP).

The right of way (ROW) is currently owned by MassDOT. The ROW is approximately 65 feet wide for most of its length and is predominantly a wooded corridor passing through multiple wetland areas, including vegetated wetlands, perennial/intermittent streams, and associated floodplain. The Town of Sudbury (Town) is considering rehabilitation of the ROW in Sudbury to interconnect with trails in adjacent towns (Fay, Spofford, and Thorndike 2006). In April 2020, Stantec performed a General Wildlife Habitat Evaluation for the 25% design phase of the approximately 4.6-mile-long trail that is proposed along the former Lowell Secondary Track of the Old Colony Rail Road that operated between Lowell and Framingham, Massachusetts. Based on the preliminary wetland resource area impact calculations prepared by VHB, the Appendix A forms were used as the field data form when evaluating wetland resource areas where impact was proposed based on the 25% Design Submittal. Appendix A evaluations were deemed applicable based on the localized nature of proposed impacts based on the 25% Design Submittal. The design submittal is now at 100% and impacts have been further evaluated. The need for a detailed Appendix B Wildlife Habitat Evaluation has been identified for the work associated with the Culvert 4 replacement because the impacts are twice the threshold of 50 LF of Bank alteration.

2 Purpose and Need

Based on information in the Fuss & O'Neill NOI (December 22, 2021), we understand that Culvert 4, a mortared stone box culvert with clay pipes has collapsed and the outlet is buried. As a result, the

¹ MassDEP. 2006 *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* is available at: <http://umasscaps.org/pdf/wldhab.pdf>.



APPENDIX B Wildlife Habitat Evaluation Report for Culvert 4

3 Methodology

unnamed tributary to Hop Brook has cut around the collapsed culvert and washed through the existing rail embankment (Photo 7). The culvert will be removed and replaced with 48" diameter reinforced concrete pipe buried 2' with a natural stream channel bottom. The stream alignment will be restored to the former culvert location. There are an estimated 100 LF of permanent impact and 15 LF of temporary impact to Inland Bank associated with this work. The Appendix B Wildlife Habitat Evaluation was performed because the impact to Inland Bank at Culvert 4 is greater than 2 times the threshold for Bank (> 50 LF). The Culvert 4 replacement work is part of a larger project and, for the purposes of this WHE, only the area within 50' of the limit of work was evaluated for this effort.

See Attachment A Detailed Wildlife Habitat Evaluation Form for site description, classification, % cover, soils data and wildlife habitat features. Attachment B contains site photos taken on January 12, 2022, the day of observation associated with this report.

3 Methodology

Methodology is described below for the data review and field survey associated with the Appendix B Wildlife Habitat Evaluation at Culvert 4.

3.1 Existing Data Review

Stantec reviewed the NOI submitted by Fuss & O'Neill to understand the specific areas of proposed impacts to jurisdictional areas, the Abbreviated Notice of Resource Area Delineation (ANRAD) dated July 2016 by VHB and the Amended ORAD filed by MassDOT and VHB, dated June 15, 2020. MassMapper (<https://maps.massgis.digital.mass.gov/MassMapper/MassMapper.html>), and Google Earth (desktop version) were also used to develop an understanding of landscape context and review connectivity of the impact resources to other wetlands systems. USGS WebSoilSurvey (<https://websoilsurvey.sc.egov.usda.gov>) was used to identify the soil type of the general study area in order to address the requirements for information on soils on the form. No supplemental soil evaluations were completed in the field, as the resources being impacted are Inland Bank and Land Under Waterbodies and Waterways.

3.2 Field Assessment

Following the completion of the existing data review, Stantec performed the wildlife habitat evaluation field assessment along the railroad at the Culvert 4 in Sudbury to specifically evaluate potential impacts to wildlife habitat associated with the proposed culvert replacement. For the purposes of the Appendix B Wildlife Habitat Evaluation, the "study area" was identified as the area of proposed temporary and permanent impacts to Inland Bank and Land Under Waterbodies and Waterways, as well as the area within approximately 50' feet radius from the culvert replacement limit of work, which included upland and wetland habitat. The temperature was approximately 31° F and there was 3-5' of snow on the ground. The subject stream was partially ice-covered and the substrate type and conditions could not be fully observed. Herbaceous vegetation was also not able to be assessed due to the time of year and snow cover.



APPENDIX B Wildlife Habitat Evaluation Report for Culvert 4

4 Summary of Evaluation Observations

The Detailed Wildlife Habitat Evaluation Form was completed by hand during the January 12, 2022 observation session and the information transcribed by the PWS to the attached electronic version of the field form (Attachment A). There was a focus on Important Habitat Characteristics that are present and might need to be replaced or restored after the project is complete.

4 Summary of Evaluation Observations

The results of the existing data review and field assessment at the Culvert 4 study area are presented below.

4.1 Field Assessment Results

Portions of the ROW leading to Culvert 4 are somewhat overgrown with dense shrubbery and vines. Overall, invasive species are common throughout, including: glossy buckthorn (*Frangula alnus*), Oriental bittersweet (*Celastrus orbiculatus*), and honeysuckle (*Lonicera* spp.), with occasional occurrences of winged euonymus (*Euonymus alatus*) and Japanese barberry (*Berberis thunbergii*).

4.1.1 WILDLIFE CONSIDERATIONS

Direct observations of wildlife species presence within the ROW primarily included common or generalist species typical of a suburban and forested landscape such as the conditions present at the Project and those in areas of eastern Massachusetts and the region. Observations were limited to seasonal activity of species active in winter. No state-listed or federally listed species were observed within the ROW during the WHE assessment.

Mammals

Evidence of the wildlife species at the Project in part included mammals such as white-tailed deer (*Odocoileus virginianus*), coyote (*Canis latrans*) through direct observations of tracks in the snow or scat. Open portions of the ROW provide ease of travel for mammalian species, while overgrown areas provide cover or shelter in addition to functioning as a potential travel corridor.

Birds

The ROW provides an open corridor for avian travel and foraging, while overgrown areas provide increased cover, shelter, and nesting habitat, although these habitats are primarily located outside of jurisdictional areas. These types of habitats are not limited to the ROW and are expected to be abundant in the surrounding landscape.

Fisheries

Hop Brook and an unnamed tributary to Hop Brook are designated as Coldwater Fisheries Resources by MassWildlife. Attributes of Coldwater Fisheries Resources include high water quality, natural flow regimes, cold water temperatures (less than 68°F), largely intact riparian area, and watershed



APPENDIX B Wildlife Habitat Evaluation Report for Culvert 4

5 Important Habitat Characteristics

connectivity. Hop Brook, the unnamed tributary to Hop Brook and additional potential perennial and intermittent streams were evaluated for the presence of fisheries and mussel habitat, including the habitat features and considerations that were identified in the 2020 Appendix A Wildlife Habitat Evaluation. Given the shallow and intermittent nature of the unnamed tributary, it is unlikely that it provides prime habitat for cold water fish species year around.

The Appendix B WHE biologist did not observe any fish during the evaluation and was unable to directly observe the majority of the stream substrate due to winter-related conditions; however, as presented in the Stantec General Wildlife Habitat Evaluation, the in-stream conditions at the existing Hop Brook crossing and nearby unnamed tributary to Hop Brook indicate a perennial condition with a sand and sparse gravel streambed with moderate shoreline and submerged aquatic vegetation. Habitat conditions are anticipated to support coldwater species where the ROW crosses these waterways. Species such as brook trout (*Salvelinus fontinalis*), dace (*Rhinichthys* spp.), and white suckers (*Catostomus commersonii*) may be present in small densities and are examples of species that would need to be documented to designate the waterway as a Coldwater Fisheries Resource by MassWildlife.

Amphibians and Reptiles

There was no evidence of turtle nesting (i.e., shell fragments or nests excavated by mammals), as winter is not a suitable time of year for turtles in eastern Massachusetts to nest; however, there were no measurable areas of suitable turtle nesting habitat with the study area or immediate vicinity observed during the 1-day assessment. The unnamed stream has potential cover and nesting areas that are suitable for some species of stream salamanders, as noted throughout the form and in this report. There are also multiple areas of large woody debris on the ground that would be suitable for small mammals, amphibians and reptiles within the study area and larger landscape.

5 Important Habitat Characteristics

A number of "Important Habitat Characteristics", as specified within the Guidance, were identified within the limit of work or the 50' radius study area. Please see Part 2 Table VI of the Detailed Wildlife Habitat Evaluation form for a summary and quantification of the observed wildlife habitat features.

Medium to large flat rocks within the stream: There are a number of flat rocks, greater than 6" within the limit of work that could potentially provide cover for stream salamanders and nesting habitat for spring salamander (*Gyrinophilus porphyriticus*) and northern two-lined salamanders (*Eurycea bislineata*); however, spring salamanders may not occur in eastern Massachusetts. (Photo 8).

Flat rocks and logs on Bank: The Bank in this portion of the unnamed tributary to Hop Brook is steep but not high and contains both cut and fallen logs that could potentially serve as cover for stream salamanders. (Photo 7)

Undercut or Overhanging Banks with crevices: There are a number of small areas of Bank within the study area where the Banks have eroded and are undercut, providing potential habitat for small mammals. (Photo 10 and Photo 12)



APPENDIX B Wildlife Habitat Evaluation Report for Culvert 4
6 Evaluation Of Adverse Effect

Mud flats (freshwater): There is a marginal area of exposed mud within the existing stream channel that is approximately 2 feet wide by 3 feet long. It is located at the confluence of the unnamed stream to Hop Brook and the BF#30 series jurisdictional stream under the Sudbury Wetlands Bylaw at the railroad track crossing. This area is not classified as a “Freshwater Mud Flat Community” and likely only serves as marginal habitat value due to its size. (Photo 4)

6 Evaluation Of Adverse Effect

Pursuant to 310 CMR 10.60, the results of the data review and the results of the field survey were used to assess whether the proposed impacts at Culvert 4 will result in an adverse effect to wildlife habitat subject to the WPA. A number of Important Habitat Characteristics were observed in or adjacent to the work footprint for the culvert replacement project. None of the important habitat features identified will be permanently lost on a greater landscape scale as a result of the work associated with Culvert 4, as it is a short-duration project with a limited footprint and will improve stream quality and conditions post-construction (i.e. stabilize existing eroding banks through the railroad bed/fill while improving hydraulic capacity of existing culvert and sediment transport). Photo 2 and Photo 3.

Additionally, no other high value habitats or species particularly sensitive to the construction of a rail trail were observed. The new repaired culvert is not expected to be a barrier to wildlife usage patterns in the Project or at the landscape level, as most species would shift habitat usage patterns, as needed, to carry out their life cycles during construction and post-construction. Therefore, potential habitat impact within jurisdiction of the WPA is localized, temporary, occurring in an area impacted by a collapsed culvert in a previously disturbed area, and would occur to habitat that is not considered critical. As a result, we do not anticipate an adverse effect to wildlife habitat within wetland resource areas based on the 100% Design Submittal.

7 Additional Design Considerations and Recommendations

Some of the following additional recommendations were included with the General Habitat Evaluation conducted in 2020 and are repeated here, as they are relevant to the protection of wildlife habitat associated with the culvert 4 replacement work. The work to repair Culvert 4 will enhance wildlife habitat value and help the railroad embankment material from further erosion and washing sediment into the stream. Additionally, the project is already at 100% design and this work has been designed to meet the Massachusetts Stream Crossing Standards and appropriate BMP's are being proposed at all phases of the project.

1. Preserve larger rocks, especially flat stones from the stream and strategically place back into stream post-construction.
2. Avoid or minimize installation of physical barriers that would create impassable conditions across the trail for some smaller wildlife species.



APPENDIX B Wildlife Habitat Evaluation Report for Culvert 4

8 References

3. Consider an invasive species management plan.
4. Beneficially reuse trees and brush cleared during on-site site preparation to create new or enhance existing brush piles near the ROW and new culvert to serve as wildlife habitat (e.g., refugia for small mammals, amphibians, and reptiles; and nesting habitat for songbirds).

8 References

Fuss & O'Neill, Notice of Intent Sudbury Bike Path Construction (Bruce Freeman Rail Trail); Massachusetts Department of Transportation Highway Division, December 22, 2021

Fuss & O'Neill, Notice of Intent Sudbury Bike Path Construction (Bruce Freeman Rail Trail); Massachusetts Department of Transportation Highway Division, December 22, 2021 (revised)

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Swain, P. 2016. Classification of the Natural Communities of Massachusetts. Version 2.0. Natural Heritage & Endangered Species Program, Massachusetts Division of Fisheries and Wildlife. Westborough, Massachusetts.

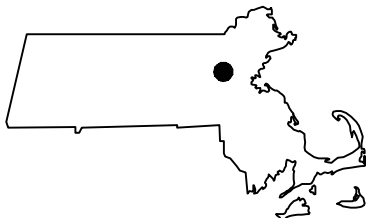
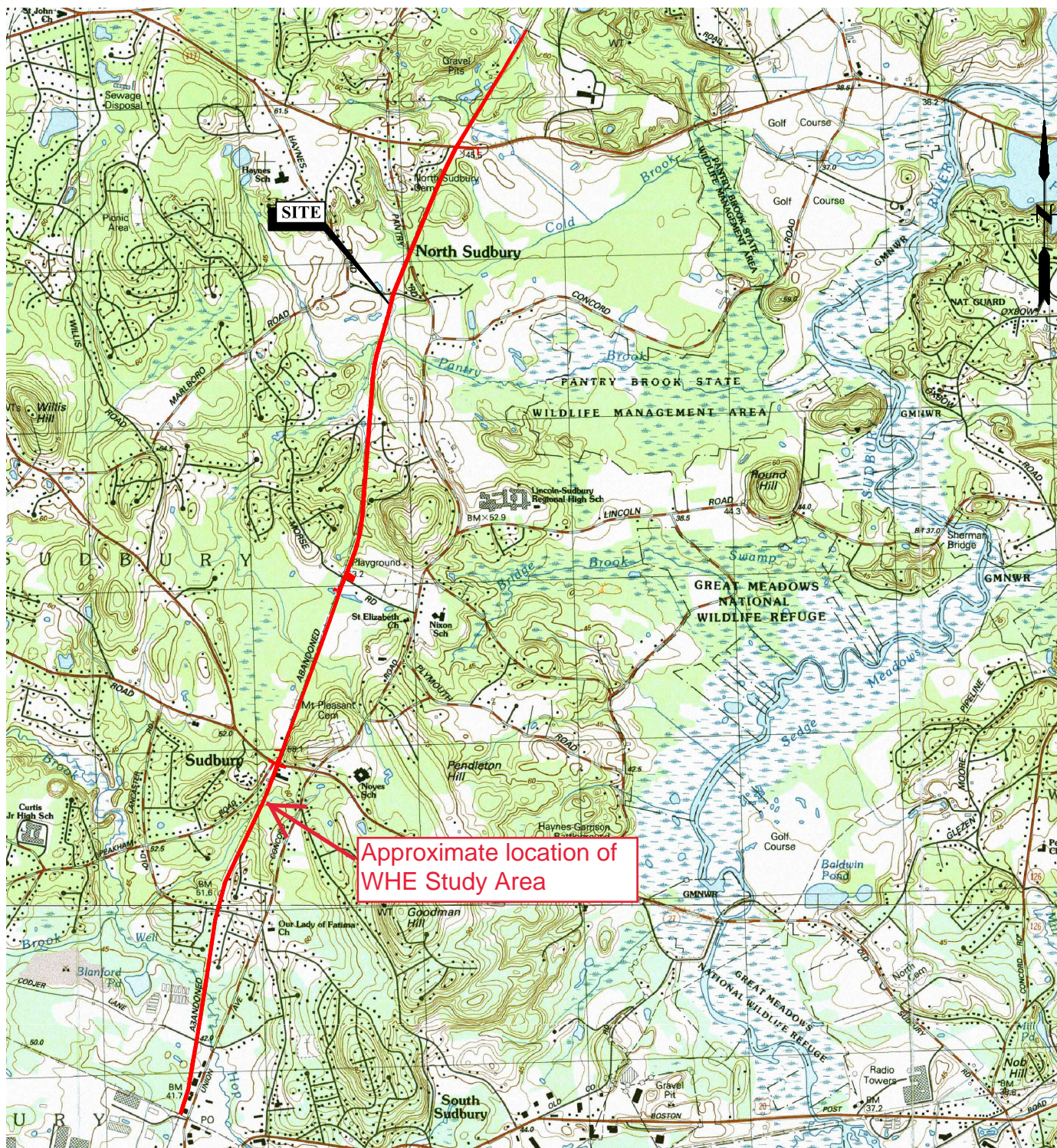
USDA WebSoilSurvey <https://websoilsurvey.sc.egov.usda.gov>



FIGURES



LAYER STATE:



MAP REFERENCE

THIS MAP WAS PREPARED FROM THE FOLLOWING USGS TOPOGRAPHIC QUADRANGLE IMAGES: q209898, q209902, q209906, q209910, q213898, q213902, q213906 AND q213910.

QUADRANGLE IMAGES WERE PREPARED FROM MASS GIS DATA RECEIVED FROM OLIVER GIS ON 04/16/2021. ORIGINAL MAP UNITS IN METERS.

SCALE:	
HORIZ.: 1" = 3000'	
VERT.:	
DATUM:	
HORIZ.:	
VERT.:	
0 1500 3000	
GRAPHIC SCALE	



FUSS & O'NEILL

1550 MAIN STREET, SUITE 400
 SPRINGFIELD, MA 01103
 413.452.0445
 www.fando.com

TOWN OF SUDBURY

SITE LOCATION MAP

BRUCE FREEMAN RAIL TRAIL

SUDBURY

MASSACHUSETTS

PROJ. No.: 20200785.A10
 DATE: 10/27/2021

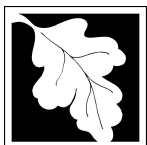
FIG.1

ATTACHMENTS



ATTACHMENT A DETAILED WILDLIFE HABITAT EVALUATION FORM





Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (for each wetland or non-wetland resource area)

I. General Information

Culvert Location 4 (embankment washout; along trail at Station 167 + 20)

Project Location (from NOI page 1)

1 and 2 (combined LUWW and Bank of same stream)

Impact Area (number/name)

January 12, 2022

Date(s) of Site Visit(s) and Data Collection

31 degrees F, approximately 3-5 inches of snow cover

Weather Conditions During Site Visit (if snow cover, include depth)

Michele Simoneaux, MSc., PWS, CESSWI

January 25, 2022

Person completing form per 310 CMR 10.60(1)(b)

Date this form was completed

The information on this data sheet is based on my observations unless otherwise indicated

Michele Simoneaux

Signature

II. Site Description (complete A or B under Classification - see instructions for full description)

A. Classification

1. For Wetland Resource Areas, complete the following:

System: Riverine

Subsystem: Intermittent

Class: Streambed

Subclass: _____

Hydrology/Water Regime

☐ Permanently flooded

☐ Saturated

☒ Intermittently exposed

☐ Temporarily flooded

☐ Semi-permanently flooded

☐ Intermittently flooded

☐ Seasonally flooded

☐ Artificially flooded

2. For Riverfront or Bordering Land Subject to Flooding Resource Areas, complete the following.

Use a terrestrial classification system such as one of the two listed below:

a. "Classification of the Natural Communities of Massachusetts (Draft)" by Patricia C. Swain and Jennifer B. Kearsley, MA DFW NHESP, Westborough, MA. July 2000. ([Department of Fish & Game Website](#))

b. "New England Wildlife: Habitat, Natural History, and Distribution" by Richard M. DeGraaf and Deborah D. Rudis, USDA Forest Service, Northeastern Forest Experiment Station. General Technical Report NE-108. August 1992. 491 pages.

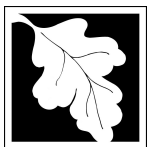
Terrestrial-Forest/Woodland-Mixed Coniferous-Deciduous Forest/Woodland (White Pine-Oak Forest)
Community Name

Upland: White Pine and Northern Red Oak (majority) (only to east of RT; west residential)

Vegetation Description

Mature White Pine and mixed oak community with large downed woody debris

Physical Description



Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (continued)

B. Inventory (Plant community)

% Cover: 90 60 10 Can't assess Can't assess
Trees (> 20') Shrubs (< 20') Woody vines Mosses Herbaceous

Plant Lists (species that comprise 10% or more of the vegetative cover in each strata; "*" designates a dominant plant species for the strata):

Strata	Plant Species	Strata	Plant Species
Tree	<u>Quercus rubra</u>		
Tree	<u>Pinus strobus</u>		
Shrub	<u>Lonicera spp.</u>		
Shrub	<u>Rosa multiflora</u>		

C. Inventory (Soils)

<u>Deerfield 256A</u>	<u>Moderately well-drained</u>
<u>Soil Survey Unit</u>	<u>Drainage Class</u>
<u>Loamy fine sand</u>	<u>up to 60 inches</u>
<u>Texture (upper part)</u>	<u>Depth</u>
<u>15-37 inches</u>	
<u>Depth to Water Table</u>	

III. Important Habitat Features (complete for all resource areas)

If the following habitat characteristics are present, describe & quantify them on a separate sheet & attach.

Wildlife Food

Important Wetland/Aquatic Food Plants (smartweeds, pondweeds, wild rice, bulrush, wild celery)

☐ Abundant ☐ Present ☒ Absent

Important Upland/Wetland Food Plants (hard mast and fruit/berry producers)

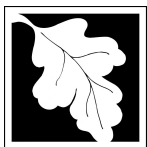
☐ Abundant ☒ Present ☐ Absent

Shrub thickets or streambeds with abundant earthworms (American woodcock)

☐ Present ☒ Absent

Shrub and/or herbaceous vegetation suitable for veery nesting

☒ Present ☐ Absent



Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (continued)

Number of trees (live or dead) > 30" DBH: 2

Number (or density) of Standing Dead Trees (potential for cavities and perches):

1 (outside impact area)	<u>12-18" dbh</u>	<u>18-24" dbh</u>	<u>1 outside impact area > 24" dbh</u>
-------------------------	-------------------	-------------------	---

Number of Tree Cavities in trunks or limbs of:

None identified high enough in tree for suitability for these species

6-12" diameter (e.g., tree swallow, saw whet owl, screech owl, bluebird, other songbirds)

None identified close enough to water for suitability for these species

12-18" diameter (e.g., hooded merganser, wood duck, common goldeneye, mink)

None identified suitable for these species

>18" diameter (e.g., hooded merganser, wood duck, common goldeneye, common merganser, barred owl, mink, raccoon, fisher)

Small mammal burrows

☐ Abundant ☒ Present ☐ Absent

Cover/Perches/Basking/Denning/Nesting Habitat

☐ Dense herbaceous cover (voles, small mammals, amphibians & reptiles)

☒ Large woody debris on the ground (small mammals, mink, amphibians & reptiles)

☒ Rocks, crevices, logs, tree roots or hummocks under water's surface (turtles, snakes, frogs)

☒ Rocks, crevices, fallen logs, overhanging branches or hummocks at, or within 1m above the water's surface (turtles, snakes, frogs, wading birds, wood duck, mink, raccoon)

☐ Rock piles, crevices, or hollow logs suitable for:

☐ otter ☐ mink ☐ porcupine ☐ bear ☐ bobcat ☐ turkey vulture

☐ Live or dead standing vegetation overhanging water or offering good visibility of open water (e.g., osprey, kingfisher, flycatchers, cedar waxwings)

Depressions that may serve as seasonal (vernal/autumnal) pools

☐ Present ☒ Absent

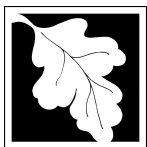
Standing water present at least part of the growing season, suitable for use by

☒ Breeding amphibians ☒ Non-breeding amphibians (foraging, re-hydration)

☒ Turtles ☐ Foraging waterfowl

Sphagnum hummocks or mats, moss-covered logs or saturated logs, overhanging or directly adjacent to pools of standing water in spring (four-toed salamander)

☐ Present ☒ Absent



Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (continued)

Important habitat characteristics (if present, describe and quantify them on a separate sheet)

Medium to large (> 6"), flat rocks within a stream (cover for stream salamanders and nesting habitat for spring & two-lined salamanders)

☒ Present ☐ Absent

Flat rocks and logs on banks or within exposed portions of streambeds (cover for stream salamanders and nesting habitat for dusky salamanders)

☒ Present ☐ Absent

Underwater banks of fine silt and/or clay (beaver, muskrat, otter)

☐ Present ☒ Absent

Undercut or overhanging banks (small mammals, mink, weasels)

☒ Present ☐ Absent

Vertical sandy banks (bank swallow, kingfisher)

☐ Present ☒ Absent

Areas of ice-free open water in winter

☐ Present ☒ Absent

Mud flats

☒ Present ☐ Absent

Exposed areas of well-drained, sandy soil suitable for turtle nesting

☐ Present ☒ Absent

Wildlife dens/nests (if present, describe & quantify them on the back of this sheet)

Turtle nesting sites

☐ Present ☒ Absent

Bank swallow colony

☐ Present ☒ Absent

Nest(s) present of

☐ Bald Eagle

☐ Osprey

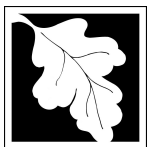
☐ Great Blue Heron

Den(s) present of

☐ Otter

☐ Mink

☐ Beaver



Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (continued)

Project area is within:

- ☐ 100' of beaver, mink or otter den, bank swallow colony or turtle nesting area
- ☐ 200' of Great Blue Heron or osprey nest(s)
- ☐ 1400' of a Bald Eagle nest¹

Emergent Wetlands (if present, describe & quantify them on a separate sheet)

Emergent wetland vegetation at least seasonally flooded during the growing season (wood duck, green heron, black-crowned night heron, king rail, Virginia rail, coot, etc.)

Flooded > 5 cm ☐ Present ☒ Absent

Flooded > 25 cm (pied-billed grebe) ☐ Present ☒ Absent

Persistent emergent wetland vegetation at least seasonally flooded during the growing season (mallard, American bittern, sora, common snipe, red-winged blackbird, swamp sparrow, marsh wren)

Flooded > 5 cm ☐ Present ☒ Absent

Flooded > 25 cm (least bittern, common moorhen) ☐ Present ☒ Absent

Cattail emergent wetland vegetation at least seasonally flooded during the growing season

Flooded > 5 cm (marsh wren) ☐ Present ☒ Absent

Flooded > 25 cm (least bittern, common moorhen) ☐ Present ☒ Absent

Fine-leaved emergent vegetation (grasses and sedges) at least seasonally flooded during the growing season (common snipe, spotted sandpiper, sedge wren)

Flooded > 5 cm ☐ Present ☒ Absent

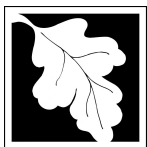
Flooded > 25 cm (least bittern, common moorhen) ☐ Present ☒ Absent

IV. Landscape Context

A. **Habitat Continuity** (if present, describe the landscape context on a separate sheet and its importance for area-sensitive species)

- | | | | |
|---|---------------------|------------------------------|--|
| Is the impact area part of an emergent marsh at least | 1.0 acre in size? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| (marsh and waterbirds) | 2.0 acres in size? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| | 5.0 acres in size? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |
| | 10.0 acres in size? | <input type="checkbox"/> Yes | <input checked="" type="checkbox"/> No |

¹ 1400 feet is the distance used by NHESP for evaluating potential disturbance impacts on eagle nests under MESA. Keep in mind, however, that this doesn't give jurisdiction within 1400' of an eagle's nest; it only identifies it on the checklist so that adverse effects can be avoided if work in a resource area is within 1400 feet.



Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (continued)

Is the impact area part of a wetland complex at least	2.5 acres in size?	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
(turtles, frogs, waterfowl, mammals)	5.0 acres in size?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	10.0 acres in size?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
	25.0 acres in size?	<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
For upland resource areas is the impact area part of contiguous forested habitat at least			
(forest interior nesting birds)	50 acres in size?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	100 acres in size?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	250 acres in size?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
	500 acres in size?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(grassland nesting birds)	> 1.0 acre in size?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
(special habitat such as gallery floodplain forest, alder thicket, etc.)	> 1.0 acre in size?	<input type="checkbox"/> Yes	<input type="checkbox"/> No

B. Connectivity with adjoining natural habitats

- ☐ No direct connections to adjacent areas of wildlife habitat (little connectivity function)
- ☐ Connectors numerous or impact area is embedded in a large area of natural habitat (limited connectivity function)
- ☒ Impact area contributes to a limited number of connectors to adjacent areas of habitat (somewhat important for connectivity function)
- ☐ Impact area serves as *part of* a sole connector to adjacent areas of habitat (important for connectivity function)
- ☐ Impact area serves as *only* connector to adjacent areas of habitat (very important for connectivity function)

V. Habitat Degradation (describe degradation and wildlife impacts on the back of the sheet)

- ☐ Evidence of significant chemical contamination
- ☐ Evidence of significant levels of dumping
- ☐ Evidence of significant erosion or sedimentation problems
- ☒ Significant invasion of exotic plants (e.g., purple loosestrife, *Phragmites*, glossy buckthorn)
- ☒ Disturbance from roads or highways ☒ Other human disturbance
- ☐ Is the site the only resource area in the vicinity of an otherwise developed area

Note: These are not the only important habitat features that may be observed on a site. If the wildlife specialist identifies other features they should be noted in the application.



Wildlife Habitat Protection Guidance

Appendix B: Detailed Wildlife Habitat Evaluation

Part 2. Field Data Form (continued)

VI. Quantification Table for Important Habitat Characteristics

Habitat Characteristic	Amount Impacted in Impact Area	Current (entire site)	Post-Construction (entire site)
Example: standing dead trees 6-12" dbh	4	12	8
Med. to Lg. flat rocks within stream	3	>10*	Unable to assess
Flat rocks/logs on Bank	2	>5*	Unable to assess
Undercut Banks/crevices	1	>2*	Unable to assess
Mud flats (limited area)	estimated 6 SF	estimated 6 SF*	Unable to assess
*Study area was within 50' of LOW			

ATTACHMENT B PHOTO SHEETS



APPENDIX B WILDLIFE HABITAT EVALUATION -CULVERT 4 SITE PHOTOS (JANUARY 12, 2022)



Photo 1. Existing railroad tracks leading to Culvert 4



Photo 2. Overview of railroad tracks over tributary to Hop Brook within proposed work area at Culvert 4



APPENDIX B WILDLIFE HABITAT EVALUATION -CULVERT 4 SITE PHOTOS (JANUARY 12, 2022)



Photo 3. Mortared stone box culvert (#4) near Station 167 + 20 to be replaced



Photo 4. Unnamed tributary to Hop Brook within work footprint



APPENDIX B WILDLIFE HABITAT EVALUATION -CULVERT 4 SITE PHOTOS (JANUARY 12, 2022)



Photo 5. A portion of the Bank *within* limit of work is comprised of small stone and gravel and has washed into the stream



Photo 6. Rocks and boulders are common within the stream



APPENDIX B WILDLIFE HABITAT EVALUATION -CULVERT 4 SITE PHOTOS (JANUARY 12, 2022)



Photo 7. Bank below the railroad track at crossing; stream has cut around the collapsed culvert



Photo 8. Stream has a number of >6" flat stones that would be suitable cover for 2-lined salamanders



APPENDIX B WILDLIFE HABITAT EVALUATION -CULVERT 4 SITE PHOTOS (JANUARY 12, 2022)



Photo 9. Coarse woody debris is present in the stream



Photo 10. A number of undercut banks and tree hollows formed by roots exist along the Bank



APPENDIX B WILDLIFE HABITAT EVALUATION -CULVERT 4 SITE PHOTOS (JANUARY 12, 2022)



Photo 11. Limited cavities observed in trees near limit of work but none suitable for species such as tree swallows, saw whet owls, screech owls, bluebirds, etc., as they are not high enough in the tree

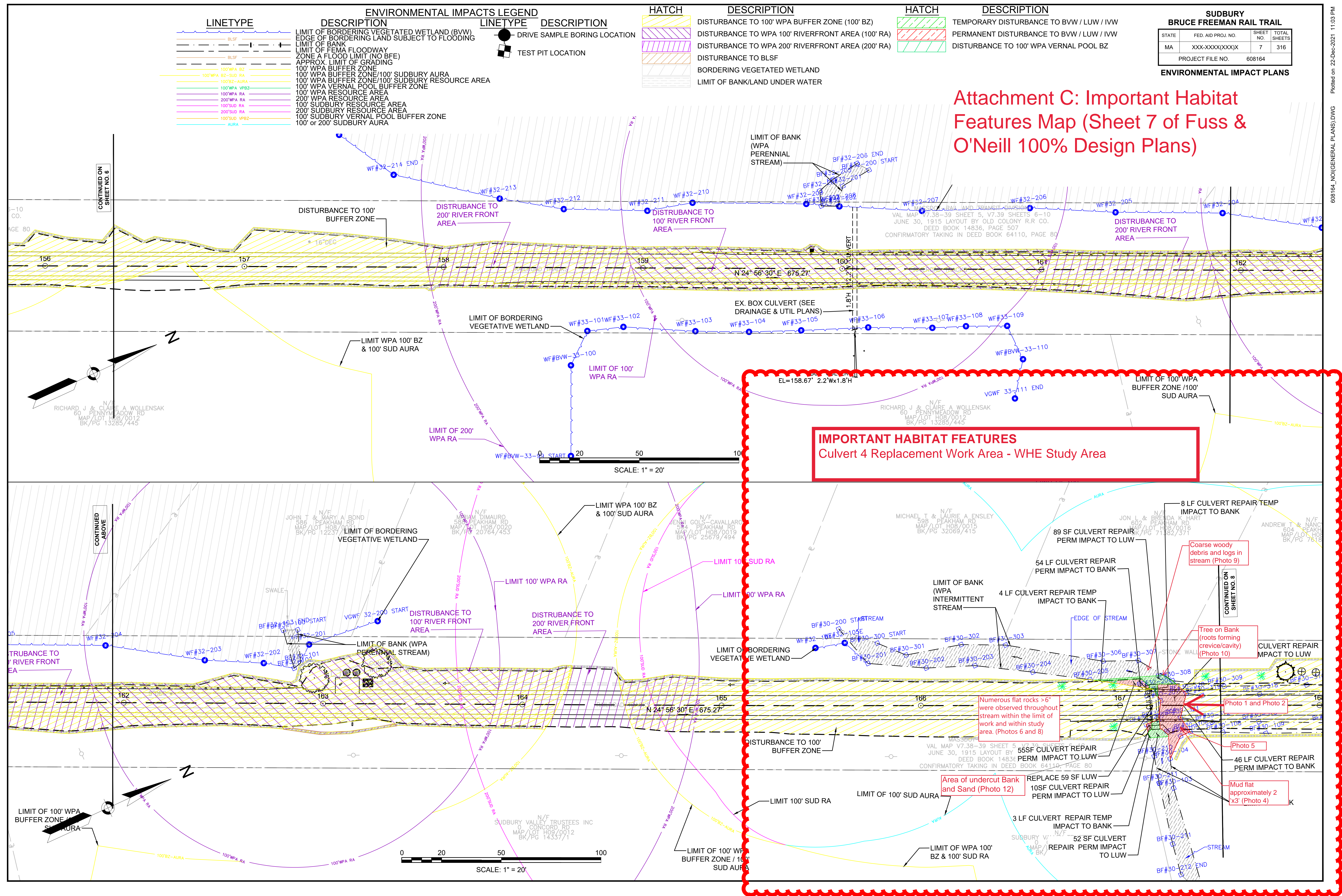


Photo 12. Patch of sand along the Bank of the intermittent stream not large enough or topographically well-positioned to offer turtle nesting habitat



Attachment C IMPORTANT HABITAT FEATURES MAP





Attachment C: Important Habitat Features Map (Sheet 7 of Fuss & O'Neill 100% Design Plans)

Appendix K

Specifications

Item

- 101&101.2 Clearing and Grubbing
 - 102.001 Tree Trimming Crew
- 102.3 Herbicide Treatment for Invasive Plants
 - 102.33 Invasive Plant Management Strategy
 - 102.511 Tree Protection
- 236.01 Precast Concrete Culvert 48x48
- 105.40 Tree Removed (Excluding Stump) Diameter Under 24 Inches
 - 755.35 Inland Wetland Replication
 - 755.45 Wetland Restoration
 - 755.75 Wetland Specialist
 - 755.76 Wetland Monitoring Reports
 - 765.111 Seeding-Low Upland Mix
 - 765.453 Seeding-Woodland Edge Shade Mix
 - 765 Seed Mix Items
 - 767.7 Matting for Erosion Control
 - 756 Stormwater Pollution Prevention Plan
 - 767.78 Composted Mulch for Modified Rock Fill
 - 991.1 Control of Water

DESCRIPTION AND PROSECUTION OF WORK

Work under this item shall conform to the relevant provisions of the MassDOT Standard Specifications Section 100 and Subsection 101: Clearing and Grubbing with the following exceptions:

- a. The method of measurement will not extend beyond the top or bottom of the grading slope limit. The intent of this exception is to ensure that no additional impacts to wetland resource areas are incurred outside of the limit of grading as shown on the plans during clearing and grubbing.
- b. The contractor shall conduct a site walk with a representative from MassDOT and a representative of the Town of Sudbury Conservation Commission prior to the start of work on this Item to gain final approval of the staked-out limits of clearing and grubbing before work on the item is performed.
- c. During the site walk, locations shall be identified by the contractor with the approval of MassDOT and the Town of Sudbury, for brush piles to be placed outside the limits of work, but within the rail corridor right-of-way. The brush piles shall consist of loosely arranged piles of woody debris from the clearing and grubbing work area not to exceed 4ft in height. No invasive plant material shall be included in the brush piles. The purpose of the brush piles is to create opportunities for wildlife habitat. The formation and placement of the brush piles shall be inclusive of the Item since the woody material would otherwise need to be destroyed or disposed of inclusive of the Item.
- d. The contractor must take into account and coordinate work regarding the location of identified invasive plants within the clearing and grubbing work area, as identified in the Invasive Plant Management Strategy (IPMS) plan to be created under Item 102.33. Any invasive plant material removed from within the clearing and grubbing work area shall be destroyed or disposed of according to the relevant provisions of the IPMS plan created under Item 102.33.

METHOD OF MEASUREMENT

The method of measurement under this Item shall conform to the relevant provisions of the MassDOT Standard Specifications Section 100 and Subsection 101: Clearing and Grubbing with the following exception:

Clearing and grubbing shall be measured by the horizontal plane area and will be the number of acres within the limiting stations of the project and the limits of grading work as shown on the plans or as designated upon completion of the site walk. The measurement area shall exclude existing roadway and shoulder surfaces, streams, and or bodies of water. The limits of measurement shall not extend beyond the top or bottom of slopes at the limits of grading as shown on the plans.

BASIS OF PAYMENT

The basis of payment under this Item shall conform to the relevant provisions of the MassDOT Standard Specifications Section 100 and Subsection 101: Clearing and Grubbing with the following exception:

The contractor shall only be paid for clearing and grubbing from slope limit to slope limit as shown on plans or as designated between the limits of work during the site walk. The contractor shall not be paid for any clearing and grubbing outside of the slope limits as shown on the plans or as approved upon completion of the site walk. The contractor will not be allowed to clear outside of the slope limits for his/her convenience without prior approval from the Town of Sudbury or MassDOT Resident Engineer.

Work to identify invasive plants shall be paid for separately under Item 102.33 Invasive Plant Management Strategy.

ITEM 102.001**TREE TRIMMING CREW****HR****DESCRIPTION AND PROSECUTION OF WORK**

The work under this item shall conform to the relevant provisions of Section 101 of the Standard Specifications and the following:

The purpose of this item is to provide tree work separate from and in addition to clearing and selective clearing operations for construction of the path. Work under this item shall occur after installation of the path pavement.

The work to be performed under this item shall consist of trimming/pruning trees not paid for separately and shall include the removal of trees, hanging limbs, downed trees/limbs, and/or any leaning trees which pose a risk to the path user as required by the Engineer.

All pruning and tree work shall be in conformance with the most current version of the American National Standards Institute (ANSI) Standard Z-133.1 and A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance.

Tree work shall be by certified arborists and shall conform to the requirements of the ANSI A300. Submit qualifications to MassDOT Landscape Design. Qualified Arborists shall have a Massachusetts Certified Arborist, or International Society of Arboriculture Tree Worker Certification, or equivalent.

The contractor or certified arborist shall conduct a site walk-through with the representative of MassDOT and a representative of the Town of Sudbury Conservation Commission prior to the start of tree trimming work to establish final approval of tree trimming work area limits.

All cut trees/limbs shall be flush cut at their base or trunk and removed from the State Highway Limits unless otherwise directed. All wood chip material shall be removed from the site and disposed per the Standard Specifications, unless otherwise directed by the Engineer.

The minimum crew shall consist of the following: a supervisor and three tree-trimmers/laborers. The crew shall be equipped with all necessary equipment needed to complete the work including, powered lift equipment/tree truck, pickup trucks, chippers, gas powered chain saws, hand saws, pole saws, brush cutters, loppers, shears, pruners, branch trimmers, ladders, tree-climbing equipment, shovels, dump vehicle with attached box container, log truck, etc.

All work performed under this item shall be supervised by a Massachusetts Certified Arborist, International Society of Arboriculture Tree Worker, or equivalent, with proof of certification submitted to the Engineer prior to the commencement of work.

Work shall be coordinated with Item 102.33 Invasive Plant Management Strategy (IPMS). The IPMS plan paid for separately under that item shall inform the tree trimming crew of the location

of identified invasive plant species in the work area. Any invasive plant or tree material cut under this item shall be disposed of using an approved method in the IPMS plan.

METHOD OF MEASUREMENT

Item 102.001 will be measured for payment by the Hour, for time spent on the project doing actual tree trimming/removal work by the tree trimming crew and shall NOT include travel time to and from the Contractor's place of business.

BASIS OF PAYMENT

Item 102.001 will be paid for at the Contract unit price per Hour, which price shall include all labor, materials, equipment, the offsite transport and disposal of cut trees or other vegetation, the cost of all arrangements and methods required to protect from harm all existing overhead or underground installations, and all incidental costs required to complete the work.

Work to identify invasive plant and tree species and determine an approved method of disposal shall be paid for separately under Item 102.33 Invasive Plant Management Strategy.

CONTRACTS:

- INCLUDE HERBICIDE REPORT FORM IN THE BOOK – SEE PROPOSAL DOCS FOLDER DOCUMENT A00810
- *REV. 2022.01.01 (REV. DATE TO BE REMOVED BY CONTRACTS)*

ITEM 102.3**TREATMENT OF INVASIVE PLANTS****HOURLY**

Work under this item consists of treatment of invasive plants currently existing within the project limits and as directed. An Invasive Plant Management Strategy (IPMS) shall be submitted to the Engineer for review and approval and the IPMS shall be implemented on-site. The IPMS shall be measured and paid for under Item 102.33 Invasive Plant Management Strategy. For the purposes of this item, the method of treatment of invasives may include but not be limited to targeted herbicide spray, cut-and-dab, manual removal, or any other method that is identified to be used under the IPMS. Under no circumstances shall the contractor exceed the number of hours provided in the contract quantity for Item 102.3 without prior approval and authorization from MassDOT Environmental Section.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation items.

Payment is per hour on-site and shall be compensation for a minimum crew of 2 licensed applicators. Depending on the treatment application method specified in the IPMS minimum equipment may include but is not limited to 2 back-pack sprayers and mist-blowers, a properly equipped spray truck with spray hoses, and a tank with sufficient capacity for a full day of work. If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

Management of plants determined to have been introduced to the site via imported loam, compost, mulch, plants, equipment, or other construction activities will be the Contractor's responsibility and at the Contractor's expense.

Herbicide shall be applied during daytime hours only.

Measures to prevent the introduction of invasive plant species to the site and to address introduction due to construction-related activities shall be covered under the Standard Specifications, Division I - Subsections 7.01(D) Plant Pest Control and 7.13 Protection and Restoration of Property as amended in these Special Provisions.

Plant species targeted for management under this item shall be as determined in the field per the site walk and as specified in the IPMS. The site walk shall include a representative from MassDOT Landscape Design and a representative of the Town of Sudbury Conservation Commission.

The definition of invasive plant species shall be as described by Massachusetts Invasive Plant Advisory Group (MIPAG): "non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems."

Control of invasive plants shall begin immediately with the initiation of construction activities and prior to any clearing or site disturbance. Treatment areas shall include stockpile locations and may,

upon approval of the Engineer, extend outside the project limit. Treatment shall be done each consecutive year for the duration of the contract unless specified otherwise in the IMPS or unless directed otherwise by the MassDOT invasive species contact. Work shall be done during the growing season from May – October unless otherwise specified in the IPMS.

Areas identified for vegetation control measures shall be as shown on the plans and as determined in the field by the Engineer, a representative of the Town of Sudbury Conservation Commission, and a MassDOT Landscape Architect. The contact is Stephanie Smoot at MassDOT Landscape Design Section : stephanie.smoot@state.ma.us @dot.state.ma.us.

SUBMITTALS

No work shall begin without approval of the submittals.

Within 15 business days prior to the site walk, the Contractor shall submit all qualifications to the Engineer for approval by MassDOT Landscape Design.

Submittals include the following items.

Qualifications

1. Company must provide proof of qualifications by providing the following:
 - a. Narrative describing company, its expertise and experience with invasive plant control.
 - b. Demonstrate experience with herbicide treatment as part of restorations and in sensitive areas
 - c. Describe company's technical qualifications and past performance.
2. Company must meet licensing requirements:
 - a. All crew applicators must have a Massachusetts Commercial Applicator License (CORE).
 - b. At least one or more applicator must have a ROW certification, if required for work.
 - c. Company must provide name(s) of applicator(s) and Applicator License/Certification number for all contractor crew leaders working on the project.
 - d. Company must provide documentation of any warnings, penalties or fines received in the last three (3) years.
3. Company must provide proof of experience with invasive plant control and include following:
 - a. At least five (5) references from prior invasive plant control work completed in last five (5) years. Provide contact information including address, phone number and email.
 - b. Provide a summary of each of these projects including nature of the problem, specific invasive vegetation treated, dates and period of treatment, methodologies used, and summary of success or not in terms of meeting performance objectives. Include summary of equipment used.
 - c. Photo documentation of these projects.
 - d. GPS coordinates of project locations, if available.
4. Crew leader must have expertise with invasive plant control and provide the following:
 - a. Have held Core license for at least five (5) years.
 - b. Resume listing five (5) or more years of experience applying pesticides with the company or with another company specializing in vegetation management.

The following companies are pre-approved by MassDOT Landscape Design Section:

<i>Groundscapes Express, Inc.</i> P.O. Box 737 Wrentham, MA 02093 Contact: Butch Goodwin Email: butch@groundscapesexpress.com Phone: 508-400-5366	<i>Solitude Lake Management</i> 590 Lake Street Shrewsbury, MA 01545 Contact: Keith Gazaille kgazaille@solitudelake.com Phone: 508-885-0101
<i>Land Stewardship, Inc.</i> PO Box 511 Turner Falls, MA 01376 Contact: Chris Polatin Email: info@landstewardshipinc.com Phone: 413-367-5292	<i>SWCA Environmental Consultants</i> 15 Research Drive Contact: Scott Fisher Phone: 413-658.2056 Email: sfisher@swca.com Amherst, MA 01002
<i>Native Habitat Restoration</i> P.O. Box 582 Stockbridge, MA 01262 Contact: Jess M. Toro : 413-358-7400 Email: nativehabitatrestoration@gmail.com Phone: 413-394-0277	<i>Vegetation Control Service, Inc.</i> 2342 Main St. Athol, MA 01331 Contact: Andrew Powers Email: apowers@vegetationcontrol.com Phone: 800-323-7706

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to proposed treatment the IPMS shall be submitted for approval by the Engineer and MassDOT Landscape Architect, and a representative of the Town of Sudbury Conservation Commission. All chemicals, methods and work done under this item shall be consistent with the IPMS. The IPMS shall be as described under Item 102.33.

Herbicide Use Report

Within two (2) weeks after each application, the Contractor shall provide to the Engineer a completed and signed MassDOT Herbicide Use Report.

Photo Documentation

Digital photos with date and time of herbicide application work may be required and shall be submitted upon request.

MATERIALS

All proposed herbicides shall be as approved in the IPMS. Herbicides shall be labeled for the method of treatment and shall meet all federal, state and local regulation requirements. Application rates will depend on herbicide proposed and shall be per the manufacturer's label for specific application.

METHODS

All methods used shall be as approved in the IPMS which shall be determined during the Initial Site Walk as described under Item 102.33 Invasive Plant Management Strategy. The site walk shall include a representative of the Town of Sudbury Conservation Administrator

The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

The Contractor shall notify the Engineer and a representative of the Town of Sudbury a minimum of 3 days prior to date of expected herbicide application. Applicators shall notify the Engineer upon arriving on-site.

Herbicide Applications

All herbicide application shall conform to Massachusetts Pesticide Laws and Regulations per the Massachusetts Department of Agricultural Resources (MDAR) Pesticide Bureau.

Mixing, applying and/or disposing of herbicides shall always be in accordance with instructions on their labels and all applicable federal, state, and local regulations. Mixing shall not occur within sensitive areas, wetlands, or buffer zones.

Contractor shall not spray 2 hours prior to precipitation, during rain, or during windy conditions. The Contractor shall be responsible for monitoring weather conditions and adjusting the work schedule as appropriate for the herbicide and application method to be used.

Targeted vegetation shall be identified and marked prior to treatment. Plants treated by foliar spray, injection or glove application or other methods that leave standing vegetation, as opposed to cut-stump application, shall remain clearly marked for identification through the contract period.

Desirable vegetation shall be protected from both spray and other physical damage.

Contractor is responsible for any damage to vegetation not designated for removal or treatment. Vegetation damaged shall be restored. Cost of replacement plants and/or restoration shall be borne by the Contractor.

Contractor shall ensure that the public does not enter a work area while herbicide application or spraying is underway.

Non-Herbicidal Methods

If specified in the IPMS, non-herbicidal methods such as manual removal may be used in some areas. Areas to be treated with non-herbicidal methods must be clearly marked for differentiation from any area receiving herbicidal application throughout the contract period.

Disposal Of Invasive Plant Material

All material to be cleared shall become the property of the Contractor. The satisfactory disposal of all cleared plant material (seeds, roots, woody vegetation, associated soils, etc.) shall be the Contractor's responsibility.

The Contractor shall take measures to prevent viable plant material from leading to further infestations (seeds, roots, woody material, etc.) while stockpiled, in transit, or at final disposal locations. All precautions shall be taken to avoid contamination of natural landscapes with invasive plants or invasive plant material.

Chipping, shredding, or on-site burning of plant material must be approved by the Engineer and included in the IPMS.

For plant material taken to an incinerating facility per the IPMS, a receipt from that facility shall be submitted to the Engineer as proof of disposal.

Disposal of invasive plants by burial on site shall not be approved unless allowed by the Town of Sudbury.

The Contractor shall be responsible for treating or otherwise managing areas of re-growth due to improper disposal. Treatment shall be at the Contractor's expense.

Follow-Up Treatment

Plants and areas shall be re-treated as necessary and as appropriate to the time of year. Treatment shall be for the duration of the contract and per the IPMS.

MEASURE OF SUCCESS

The expectation is a minimum of 85-95 percent control achieved after the first treatment, depending on plants targeted and extent of population, and based on the expectations laid out in the IPMS. The expectation for the contract duration is 95-100% eradication by the end of the treatment period, unless otherwise specified in the IPMS.

METHOD OF MEASUREMENT

Item 102.3 will be measured for payment by the Hour of crew time spent on the project doing actual herbicide application work or by hour of crew time spent doing non-herbicidal removal work such as manual removal if specified in the IPMS plan. A crew shall be defined as a minimum of two licensed applicators each equipped with (at minimum) back-pack sprayer and mist blower. The crew shall also have a properly equipped spray truck with hoses and a tank with sufficient capacity for a full day of work. If manual labor is used a crew shall consist of two laborers.

BASIS OF PAYMENT

Item 102.3 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment will be based upon time spent on the project doing actual work and shall not include travel time to and from the Contractor's place of business and shall also not include time for investigative field trips.

If there is only one applicator, hourly payment shall be adjusted to 50 percent of the unit price.

The contractor shall not exceed the contract quantity (hours) without prior authorization by the Town of Sudbury and MassDOT. Any treatment of invasives beyond the contract bid quantity shall be considered a non-participating cost for which the contractor shall be compensated for by the Town of Sudbury.

The Invasive Plant Management Strategy will be paid for under Item 102.33.

ITEM 102.33**INVASIVE PLANT MANAGEMENT STRATEGY****HOUR**

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY CONTRACTS)

This item consists of providing an Invasive Plant Management Strategy (IPMS) for the control of invasive plants currently existing on the project site and/or as directed and shall be coordinated with Item 102.3 Herbicide Treatment of Invasive Plants. The IPMS shall be submitted for review and approval and the IPMS shall be implemented on-site.

Herbicide treatment for invasive plants shall be as described under Item 102.3 Herbicide Treatment of Invasive Plants and shall be compensated per that Item.

Work under this item shall be coordinated with work and schedule for Selective Clearing, Clearing and Grubbing, Mowing, Tree Removal, Planting, and Wetland Mitigation as relevant to the project.

Individual attending the site walk and determining the Invasive Plant Management Strategy must demonstrate expertise with vegetation management and invasive plant control and submit qualifications as described below.

SUBMITTALS**Task Summary**

For measurement of payment, the contractor shall submit the total sum and a breakdown of hours for the tasks performed. At a minimum, the tasks shall include the Initial Site Walk, the IPMS Written Report, and if necessary to accommodate project or site changes, a Follow-up Site Inspection and accompanying IPMS Amendment.

Interim Site Monitoring Reports and/or a Final Report shall be submitted if requested by the MassDOT Landscape Design contact. The MassDOT Landscape Design contact and the Town of Sudbury Conservation Coordinator shall each be notified to attend the final walk through when a Final Report has been requested.

Qualifications

Individual shall be from the same company as that providing services for Item 102.3 Herbicide Treatment of Invasive Plants or shall meet the following requirements:

- Submit copy of current Core license.
- Submit a resume listing five (5) or more years of experience managing invasive plants with a company specializing in vegetation management. References shall be submitted if requested.

Invasive Plant Management Strategy (IPMS)

At least thirty (30) days prior to construction activities and/or any proposed treatment, submit a written IPMS proposal for approval by the Engineer and MassDOT Landscape Architect and a

representative of the Town of Sudbury Conservation Commission. All chemicals and methods proposed shall be consistent with applicable Massachusetts Wetlands Protection Act Order of Conditions.

The IPMS shall be completed in coordination with the Roadway Contractor and the Engineer and a representative of the Town of Sudbury Conservation Commission and shall include the following as appropriate to the project:

- I. Project Information**
 - a. Company writing IPMS and performing herbicide application.
 - b. Date of site walk
 - c. Attendees at site walk
 - d. Expected end date of contract and expected last treatment (month/season)
- II. Brief Description of Conditions**
 - a. Provide a free-hand sketch on construction plans or aerial image showing species, location, and as relevant, show or note extent of population as relevant to Strategy (i.e., population extends off ROW preventing eradication, small population and eradication deemed feasible within contract schedule, etc.).
- III. Coordination with Roadway Contractor regarding other work**
 - a. Tree Work: Note coordination to be implemented with tree removal, clearing, and clearing and grubbing as applicable to the project.
 - b. Wetland Mitigation - Include management proposed for wetland mitigation areas in the IPMS, if and as required.
 - c. Planting: If there will be planting in areas proposed for treatment, propose treatment and schedule to avoid herbicide damage to plants.
 - d. Mowing: If coordination is required with state mowers, note need in IPMS.
- IV. Soil Management**
 - a. Provide specifics on how soil with invasive plant roots (in particular) or seeds will be handled (i.e., separate stockpiles, plant material will be buried on-site, re-used on-site, disposed off site and if so, where?).
 - b. Show stockpile locations on plan and include treatment schedule.
 - c. Note measures that will be implemented to avoid spread through equipment, including how and where equipment will be cleaned.
- V. Invasive Plant Treatment & Management**
 - a. Proposed chemical and methods of treatment for each species or area.
 - b. Proposed non-chemical method of treatment if applicable.
 - c. Time of treatment based on target plant species.
 - d. Submit product label including application methods and rates (entire MSDS information need not be submitted if available online).
 - e. Proposed performance metrics or measure of treatment success if different from that specified under Item 102.3.
 - f. Method for disposing invasive plant material. This includes material that may result in spread (i.e., seeds, roots) and material that has been treated and/or is not viable (foliage, dead wood, etc.). Methods may include grinding in place, stockpiling and treating, and incinerating offsite.
 - g. Expected follow-up treatment for duration of contract.
- VI. Monitoring Schedule** if requested by MassDOT.

Note: The IPMS is critical for identifying pre-construction conditions as well as strategies for minimizing import or spread of invasive plants. Failure to provide an approved IPMS may

jeopardize this item, in which case, the contractor will be responsible for management of invasive plants found on-site at no cost to the contract.

Photo Documentation

Digital photos with date and time verification shall be provided with the IPMS and with any follow-up monitoring or reporting.

IPMS Follow-up Amendments

The IPMS may be amended to address additional concerns or adjust to conditions. The amended IPMS shall be submitted to the Engineer and MassDOT Landscape Architect and a representative of the Town of Sudbury Conservation Commission for approval at least fourteen (14) days prior to any proposed treatment.

Interim Site Monitoring Inspection Reports

If required by the MassDOT Landscape Architect and Engineer, Interim Site Monitoring and an accompanying report shall be conducted.

Final Report

A final inspection and report documenting the status of the invasive control may be required for regulatory purposes or for instances where control will be continued by others. The report shall include photo documentation of pre-construction (existing) and post-treatment conditions, notations on a plan or aerial image of area treated, summary of treatment performed, and control achieved.

INITIAL SITE WALK

Prior to any work the Contractor shall walk the site with the Engineer and the MassDOT Landscape Architect and a representative of the Sudbury Conservation Commission to determine the IPMS. During the site walk the Contractor shall identify limits of work and, as necessary, mark locations of areas designated for treatment and individual plants targeted for treatment or removal. The Contractor shall be responsible for marking delineated areas and plants to be preserved, removed, or otherwise treated. Fencing or other materials needed for marking and delineating protected areas shall be incidental to this item.

METHOD OF MEASUREMENT

Item 102.33 will be measured for payment by the Hour. The basis for measurement shall be per the completion of tasks as approved under the Task Summary submittal.

BASIS OF PAYMENT

Item 102.33 will be paid at the contract unit price per Hour, which price shall include all labor, materials, equipment, tools, and all incidentals required to complete the work.

Payment shall not include travel time to and from the Contractor's place of business.

ITEM 102.511**TREE PROTECTION – ARMORING & PRUNING****EACH****REV. 2021.01.01 (REV. DATE TO BE REMOVED BY CONTRACTS)**

The work under this item shall conform to the relevant provisions of Sections 771 and shall be for furnishing and installing temporary tree trunk protection and for minor limb pruning or removal of lower tree limbs to prevent injury to the tree from construction equipment and activities.

Trunk armoring is for instances where construction activity (the use of heavy equipment) comes close enough to potentially damage the tree trunk or limbs. It is to be used where shown on the plans and as directed by the Engineer.

REFERENCES

If requested, the Contractor shall provide to the Engineer one copy of the latest edition of the American National Standards Institute (ANSI) A300 Standard Practices for Tree, Shrub, and Other Woody Plant Maintenance: Part 1-Pruning and Part 5-Construction Management Standard. Provision of reference shall be incidental to this item.

MATERIALS

Trunk armoring shall be such that it prevents damage to the trunk from construction equipment. Selected material shall be such that installation and removal will not damage the trunk.

Acceptable materials include 2x4 wood cladding with wire or metal strapping, or, for instances when duration of construction activities is less than three months, corrugated plastic pipe mounted with duct tape. Height of cladding shall be from base of tree (including root flare) to the bottom of the first branch, eight feet above the ground, or as required by the Engineer. Material and methods shall be approved by the Engineer.

Other materials or methods may be acceptable if approved by MassDOT Landscape Design or by an Arborist (if included in the contract).

METHODS OF WORK

Prior to construction activities, the Engineer, the Contractor, the Town Tree Warden, and the Arborist (if item is included in the contract), shall review trees noted on the plans to be protected. Final decision as to trees armored and/or pruned shall be per the Engineer.

Care shall be taken to avoid damage to the bark during installation and removal of armoring. Trunk armoring shall be replaced and maintained such that it is effective for as long as required and shall be removed immediately upon completion of work activities adjacent to trees.

Pruning of limbs shall conform to the techniques and standards of the most recent ANSI A300 standards.

DAMAGES & PENALTIES

If trees designated for protection under this item are damaged, including root damage from unapproved trespassing onto the root zone, the Contractor shall, at his own expense obtain an Arborist. The Arborist shall be approved by MassDOT.

If, based on the recommendations of the Arborist, the Engineer determines that damages can be remedied by corrective measures, such as repairing trunk or limb injury, soil compaction remediation, pruning, and/or watering, the damage will be repaired as soon as possible within the appropriate season for such work and according to industry standards.

If the Engineer determines that damages are irreparable, the Contractor shall pay for the damages in the amount of \$500.00 per diameter inch at breast height (DBH) per tree.

Additionally, if the Engineer determines that the damages are such that the tree is sufficiently compromised as to pose a future safety hazard, the tree shall be removed. Tree removal will include clean up of all wood parts, grinding of the stump to a depth sufficient to plant a replacement tree or plant, removal of all chips from the stump site, and filling the resulting hole with topsoil.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 102.511 will be measured and paid at the contract unit price per each. This will include full compensation for all labor, equipment, materials, and incidentals for the satisfactory completion of the work and the subsequent removal and satisfactory disposal of the protective materials upon completion of the contract.

In the event of tree damage, cost of Arborist services, of remediation measures, and/or tree removal will be borne by the Contractor.

Payment under this item will be scheduled throughout the length of contract:

- 40% of value shall be paid upon installation of trunk armoring and completion of pruning work, if required.
- 60% shall be paid at the end of construction operations that would damage the tree and after protection materials have been removed and properly disposed of by the Contractor. In the event of repairable damages, payment shall be made after the completion of remediation measures.

In the event of irreparable damage due to lack of proper protective measures being take there will be no compensation in addition to the \$500.00 per diameter inch penalty.

ITEM 105.40**TREE REMOVED (EXCLUDING STUMP)**
DIAMETER UNDER 24 INCHES**EA**

Work under this Item shall consist of the removal and satisfactory disposal of trees and stumps as directed by the Engineer and shall conform to the relevant provisions of Section 101 of the Standard Specifications and the following:

Partial payment in the amount of 75% of the unit bid price for the item will be paid for a tree removed by topping with its stump remaining when, in the judgment of the Engineer, heavy snow cover or other impediment would make complete removal specified under the item impracticable. The remaining 25% of the unit bid price shall be paid upon complete removal of the item at a later date. Topping shall consist of reducing a tree by removal and the satisfactory disposal of all limbs, branches, and the main trunk to a point below the main branching system.

Basis Of Payment

All work under this contract will be paid for at the unit bid prices under the respective items, which price shall constitute full compensation for all labor, tools, materials, equipment, and other incidental work necessary to satisfactorily complete the items.

The work under this item shall conform to Subsection M4.02.14 included herein and the following:

Work under this item shall include all materials, equipment and labor needed to construct the 48” high by 48” wide precast concrete culvert with a natural substrate bottom that passes under the shared use path in Sudbury at Sta 167+17. The work shall also include the concrete headwalls at the ends of the culvert.

NATURAL SUBSTRATE BOTTOM

Description

The Contractor shall provide for the excavation, stockpiling, and replacement of natural streambed material from the existing streambed to restore the streambed and bank to natural pre-construction conditions to the maximum extent practicable for the installation of the 48x48 inch culvert. The intent is to reuse the existing native streambed material that must be excavated for the installation of the culvert. If additional streambed material is needed, it shall be furnished as described below in the Materials section. The purpose of this is to establish a high-quality, natural streambed and banks that improve aquatic organism habitat and passage through the structure.

The Contractor is advised that if applicable, compliance with US Army Corps of Engineers (USACE) and Massachusetts Department of Environmental Protection (MassDEP) permit Conditions may be required for this Project which includes, but is not limited to, Conditions for submittals, reviews, and approvals for pre-construction, construction, and post-construction work. In the event of conflicts of the Plan with Permit conditions, the Contractor shall immediately notify the Engineer.

The Contractor shall investigate the proposed culvert location and sample the natural stream substrate. The substrate material sample shall be tested, at the Contractors expense, to determine the gradation and composition of material present.

A Wetland Specialist shall be present during construction to monitor installation activities including but not limited to erosion control, stockpiling and dewatering.

Materials

Existing streambed materials shall be stockpiled as native streambed material. Any native material excavated from the existing streambed during construction of the culvert shall be stockpiled and reused for streambed restoration, provided the excavated material is characteristic of the existing channel substrate in the vicinity of the work area. Care shall be taken to not mix the layers of the material. The streambed material shall be fully removed and stockpiled prior to proceeding with soil excavation for the installation of the culverts.

ITEM 236.01 (Continued)

Additional Streambed Material

Supplemental borrow materials are to be used when stockpiled native materials have been exhausted or if stockpiled native materials are found to be unsuitable. If additional streambed material is needed, the Contractor shall furnish the material in accordance with the following.

The supplemental borrow for native material shall be locally sourced, rounded river stone, that matches the composition of the native streambed. The following gradation may be used as a guide.

Supplemental Borrow for Native Material Gradation

Stone/Sieve Size	% Finer
12 inches	100
6 inches	30-75
No. 4	4-30
No. 200	4-6

Prior to placement of the supplemental material, the Contractor shall obtain approval from the Engineer and the Town of Sudbury Conservation Coordinator regarding the suitability of the actual material used. For the Engineer's review, the Contractor shall provide two samples, at 15 lb minimum each, of the supplemental borrow material with any amendments incorporated, to the Engineer. The Contractor shall also submit a sieve analysis of the material to the Engineer. In the event that the submitted material is not acceptable, the Contractor shall re-sample, re-test, and re-submit materials at his own expense until the Engineer accepts the submitted materials.

If supplemental borrow materials are required, the Contractor shall notify the Engineer and the Town of Sudbury Conservation Coordinator 24 hours in advance of installation of the supplemental borrow materials so that the Engineer can observe the amount of supplemental borrow material installed.

Construction Methods

A 2'-0" thick layer of native streambed material shall be placed inside of the culvert. The material shall be shaped to resemble a natural channel as depicted on the plans. The purpose of this material is to restore a natural streambed for improved aquatic habitat, terrestrial wildlife passage and aesthetics. This material shall be installed during dewatered conditions behind cofferdams to avoid the release of sediment and negative water quality impacts.

The existing elevations and conditions of the streambed shall be maintained to the maximum extent practicable.

ITEM 236.01 (Continued)

Once all material has been placed in the stream channel and approved by the Engineer, the Contractor shall remove the cofferdams in such a way to slowly wet the stream to minimize the initial sediment pulse. Every attempt shall be made to minimize the downstream movement of sediment.

The final streambed and banks shall look like a natural stream, shall match nearby stream reaches, and there shall be minimal to no subsurface flow upon final inspection by the Engineer.

The Contractor shall submit to the Engineer for approval prior to the start of operations, a placement plan and method of placement, which shall be approved prior to the commencement of streambed restoration. The Town of Sudbury Conservation Coordinator shall be copied on the placement plan.

The stockpiled material shall be kept moist and covered during stockpiling and shall be reused within two weeks of its initial excavation.

COMPENSATION

Precast Concrete Culvert – 48x48 Inches will be paid for at the Contract lump sum price, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for design, drawings, excavation, culvert, concrete headwalls, gravel backfill, native streambed material, additional borrow for streambed material, compaction, bituminous damp-proofing, or shoring required for the construction of the culvert.

Any excavation required below the bottom of the culvert bedding as shown on plans to remove unsuitable materials will be paid for separately under Class B Trench Excavation, Item 142.

The 1'-0" of crushed stone under the culvert as depicted on the plans and any crushed stone used in backfilling areas where unsuitable material has been removed below the crushed stone bedding will be paid for separately under Crushed Stone, Item 156.

If encountered, rock excavation will be paid for separately under Class B Rock Excavation, Item 144.

ITEM 751.72**COMPOST BLANKET****SQUARE YARD**

The work under this Item shall conform to the relevant provisions of Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications and the following:

Work shall consist of furnishing and pneumatically applying compost as a thin mulch blanket over prepared soil to provide temporary soil stabilization and organic matter for plant growth.

SUBMITTALS AND MATERIALS

No materials shall be delivered until the required submittals have been approved by the Engineer. The Town of Sudbury Conservation Coordinator shall be copied on all submittals. Delivered materials shall match the approved samples. Approval of test results does not constitute final acceptance.

Contractor shall submit to the Engineer samples and certified test results no sooner than 60 days prior to application of compost. Vender certification that material delivered meets the test results shall be submitted if requested. The Town of Sudbury Conservation Coordinator shall be copied on all submittals.

Compost may be a blended product of compost and fine wood chips. No kiln-dried wood, construction debris or ground palette is allowed. Material shall meet the following criteria:

- Organic matter content shall be minimum 30 percent (dry weight basis)
- Moisture content shall be 30-60 percent (wet weight basis)
- Bulk Density <1000 lb/cy
- pH shall be 5.5-7.5
- Conductivity shall be a maximum of 4 mmhos
- Stability test shall produce a maximum of 8mg CO₂-C/gram of organic material per day
- Particle size shall not exceed ¾ inch
- Compost may be a blended product of compost and fine wood chips.

Compost testing shall be by a laboratory approved by the US Compost Council using the Testing Method for the Examination of Compost and Composting (TMECC) protocols.

The Engineer shall approve the Contractor's equipment for application.

CONSTRUCTION METHODS

Application of compost material shall not begin until the Engineer has approved the site and soil conditions. Soil preparation shall be as specified under the applicable item for soil placement or for seeding. The Contractor shall notify the Engineer when areas are ready for inspection and application of compost.

Compost topdressing shall be pneumatically applied (blown on) to a depth of one half to one inch unless specified otherwise on the plans.

When compost topdressing is proposed with seeding, seed shall be broadcast and shall occur in conjunction with compost topdressing, as specified under the relevant item for seeding.

When compost topdressing is proposed for areas with planting, compost (and seed if applicable) shall be applied after planting. If compost and seed occur prior to planting, areas shall be regraded and compost and seed reapplied to the satisfaction of the Engineer and at the Contractor's expense.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 751.72 will be measured and paid for at the Contract unit price per Square Yard which price shall include all labor, materials, equipment, and all incidental costs required to complete the work of pneumatically applying compost.

Surface preparation of substrate receiving compost blanket shall be compensated under the applicable item for placement of loam, sand, ordinary borrow, wetland soil, topsoil rehandled and spread, tilled existing soil, or other specified substrate.

Seeding will be compensated for under the appropriate seeding item.

ITEM 755.35**INLAND WETLAND REPLICATION AREA****LUMP SUM**

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

The work under this item shall conform to the relevant provisions of Sections 120, 770, 771 of the Standard Specifications and the following:

Work under this item shall include furnishing material and the construction and maintenance of inland wetland replication areas as shown on the drawings and as required by the Engineer. Inland Wetland Replication Area shall hereafter be referred to as Replication Area. All work shall be in coordination with an approved Wetland Specialist as specified under that item.

Wetland Restoration work shall be as specified and compensated under that item. Construction of tidal wetlands shall be as specified under the appropriate item for tidal wetland mitigation.

The Replication Area shall be constructed prior to wetland impacts unless otherwise approved by the Engineer, specified herein, or specified in permit conditions and approvals. Construction schedule shall be appropriate to planting and seeding season (see below). Changes to this schedule will require written approval from the Engineer.

DESCRIPTION OF WORK

Construction of the Replication Area shall be completed as shown on the drawings at the following location(s):

Area/s A at Station: **212+70**

Area = **2,240** sf.

Replication Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers Permit.

The Contractor is responsible for protection and preservation of natural areas adjacent to the Replication Area both within and outside the project limits and for the duration of the Contract; including but not limited to damage to soils or vegetation due to erosion, sedimentation, compaction, trampling, vehicles, storage of materials, or other negligence shall be repaired to the satisfaction of the Engineer and at the Contractor's expense.

The Wetland Specialist overseeing the Wetland Replication construction work shall not be from the same company as that which is performing planting, seeding, or participating in any aspect of the Wetland Replication construction.

SUBMITTALS - DOCUMENTS

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): As specified below, shall be submitted to the Engineer for distribution to appropriate regulatory agencies.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.75 and 755.76.

SUBMITTALS - MATERIAL

Soil and Amendments

No soil, compost, or other soil amendment imported to the work site shall contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants.

At least sixty (60) days prior to installation and prior to ordering, the Contractor shall submit for approval sources of soil, compost, and amendments. Submittal shall include the supplier and location of the source. Off-site sources shall be identified and available for inspection by the Wetland Specialist prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts. The Town of Sudbury Conservation Coordinator shall be copied on all submittals.

Samples of tested and approved wetland soil and soil amendments for soil texture, organic carbon content or other routine soil analysis parameters (e.g., pH, Cation Exchange Capacity, Percent Base Saturation) and Soil Organic Matter Analysis will be required if requested by the Engineer. The grab samples shall be collected by the Contractor or Wetland Specialist from multiple representative locations in the wetland topsoil mix following the "Umass Soil and Plant Tissue Testing Laboratory Sampling and Collection Protocols" (or equivalent certification paperwork provided by the soil supplier). The lab analysis shall be provided to the Engineer along with written certification from the Contractor or Wetland Specialist that the wetland topsoil was collected per the referenced protocol and meets the desired specification. The analysis and written certification of same shall be provided to the Engineer prior to placing the wetland topsoil in the Replication Area.

Seed Mix

Certificate of Materials from the supplier shall be submitted 30 days prior to seeding and must be approved prior to ordering materials. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).

Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.

Bill of lading or notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Plant Certification

Plant Certification shall be per the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the Standard Specifications. The nursery source shall certify the provenance or origin of all plants.

Other Material: Submittals shall be per the respective item.

MATERIALS

Sediment Control Barrier and Erosion Prevention Measures

Sediment control barriers shall be per Item 767.121.

Erosion prevention measures for disturbed areas adjacent to the Replication Area shall include but not necessarily be limited to compost blankets, erosion control matting, geotextile fabric, seeding, and/or combinations thereof as approved by the Engineer.

Sediment controls and erosion prevention devices and measures shall be compensated under the respective items.

Wetland Soil

Soil appropriate for the Replication Area may be either hydric soil excavated from the impacted wetland, a manufactured mix of compost and on-site borrow, or a combination thereof, as approved by the Engineer. The Town of Sudbury Conservation Coordinator shall be copied on all submittals.

Hydric soil from the impacted wetland area may be spread on the surface of the constructed Replication Area as an inoculant or can be placed in a bulk fashion in a roughly 1:1 ratio of area and depth. Soil shall be handled such that the original soil structure is preserved and shall not be compacted, screened, or otherwise processed.

Hydric soil from the impacted wetland that is infested with invasive plant species identified on the Massachusetts Invasive Plant Advisory Group (MIPAG) shall not be used in the Replication Area unless approved by the Wetland Specialist and Engineer. To the extent possible, infested soil shall be disposed of within the project limits in an upland area outside of regulated areas and as approved by the Invasive Plant Management Strategy item (if in the contract) or by the Engineer.

A manufactured mix suitable for wetlands shall consist of on-site borrow from the proposed Replication Area (if approved by the Wetland Specialist and Engineer) thoroughly mixed with compost to achieve a target organic carbon content of 10-12% (up to 21% percent organic matter) by dry weight. The organic material used for mixing shall be well or partially decomposed. Clean leaf compost is the preferred soil amendment to achieve these standards though other materials may be used if approved by the Wetland Specialist and Engineer. Note that “clean” refers both to a negligible amount (<1%) of physical contaminants such as plastic and to the lack of chemical contaminants that might pose a hazard to plants or animals. Off-site borrow may be used for mixing if approved in advance by the Engineer.

No soil or soil amendment shall be brought on site without approval of the material source by the Wetland Specialist and the Engineer. Soils used in the replacement area shall be free of rocks greater than 4 inches in diameter.

Plants

Plant material shall conform to the applicable requirements of Section 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the latest edition of the Standard Specifications and as amended below.

Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion.

Plant species and sizes to be included in the Replication Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the Wetland Specialist, MassDOT Landscape Architect, and, if required, the relevant regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions. The Town of Sudbury Conservation Coordinator shall be copied on all submittals for substitutes.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries that have been inspected by state and/or federal agencies.

Seed Mix

Seeding shall conform to the Standard Specifications Section M6, ROADSIDE DEVELOPMENT MATERIALS.

All wetland replication areas shall be seeded using the seed mix specified in Item 765.554 Wetland Mix/Basin Mix. Wetland seeding shall occur at a rate as specified under that item.

Upland areas shall be seeded using the seed mix specified in Item 765.416 Upland Shade Mix. Wetland seeding shall occur at a rate as specified under that item.

Fertilizers shall not be used.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

Mulch/Compost Blanket for Seeding

Hydromulch shall be per the manufacturer's recommendations and shall be wood fiber or straw mulch only. Mulch shall be incidental to seeding.

Compost Blanket may be used in lieu of mulch for seeding. Compost Blanket shall meet the material and submittal requirements of that Item and shall be applied as specified below. Compost Blanket shall be compensated under that item.

CONSTRUCTION METHODS & SEQUENCE

SITE PROTECTION MEASURES

Minimizing Damage

The Contractor shall plan and execute operations in a manner minimizing the amount of excavated and exposed fill or other foreign materials that could be washed or otherwise carried into Replication Area and nearby resource areas.

Construction of and access to the Replication Area shall minimize damage to existing vegetation and soils as specified herein. Access to the wetland replication area shall be from the MassDOT rail corridor right of way. The contractor shall create an access route between the rail corridor and the wetland replication area which minimizes disturbance and damage to the wooded area.

Damage to trees, soils or vegetation shall be repaired to the satisfaction of the Engineer and at the Contractor's expense. If required for soil remediation, tilling and the addition of compost shall be at the Contractor's expense.

Wetland topsoil shall be deposited and graded in the Replication Area in a manner that minimizes travel and subsequent compaction of the subgrade (including any specified pit and mound topography) to the extent practicable, including use of track mounted excavators as appropriate. Should soils be compacted, they shall be loosened by a method such as disking, spring-tooth harrowing and/or rototilling. The Contractor shall use boards, timber or composite mats, or other approved materials as necessary, to protect existing and/or new wetlands from compaction due to heavy foot traffic or if equipment is required to travel over wetland soil. All labor and materials required for protection and preservation of site shall be incidental to this item.

Stockpiling of Soil

Stockpiling of soil, including hydric soil for replication, shall be at least 100 feet from the edge of the bordering and isolated vegetated wetlands and inland banks, unless approved otherwise by the Engineer. Stockpiled soils shall be securely stabilized and contained. Any areas of exposed soil or stockpiles within and adjacent to the Replication Area that will remain inactive for more than 7 calendar days shall be sown with a mix of rapid germinating annual grasses (e.g., annual rye) covered with a layer of straw mulch applied at a rate of 90 pounds per 1,000 square feet. As necessary, the mulch shall be anchored with a tacking coat (non-tar) applied by a hydro seeder or other method recommended by the Wetland Specialist in consultation with the Engineer. In the event that there is excess borrow, it shall be disposed of under Excavation, Item 120..

Sediment Barriers

Placement: Sediment barriers shall be installed along the downslope perimeter of the Replication Area beginning and ending in the surrounding upland so that no excavated material or disturbed soil can enter adjacent wetlands or waters. Where construction work is immediately upgradient of the wetland, barriers shall be located so as to protect the Replication Area until slopes are

stabilized. Sediment barriers shall be in place and approved by the Engineer prior to excavation work. No work shall take place outside the barriers.

Maintenance: The Contractor shall ensure that all sediment barriers function as intended and at all times per the specifications of those respective items.

Existing Trees to Remain

Tree protection shall be per the relevant specifications and as shown on the plans or as required by the Engineer. To protect root systems of existing trees to remain, the limits of the Replication Area may be adjusted, but, the total area of replication required by the permits shall not be reduced. Access route may be adjusted as required.

Trees to be retained as snags (upright dead or dying trees left for wildlife habitat) within or adjacent to the Replication Area shall be as shown on the plans or as directed by the Wetland Specialist or Landscape Architect during the initial site walk. Trees to remain as snags shall be clearly marked prior to clearing. Trees that pose a potential fall hazard (i.e., are near a roadway) should have limbs and trunk cut such that the tree does not pose a fall hazard.

Coarse woody debris in the form of cut trees, stumps, logs, and brush shall be incorporated as shown on the plans or as directed by the Wetland Specialist or Landscape Architect. On site material shall be selected and marked by the Wetland Specialist, retained on the project site, and placed as specified below under Placement of Coarse Woody Debris.

All trees, stumps, or brush not specified to remain shall be removed and shall not be stockpiled in the wetland resource areas while awaiting disposal.

Work shall be coordinated with Clearing or Tree Removal Item and compensated under that Item.

PRE-WETLAND CONSTRUCTION SITE WALK

Delineating the Replication Area and Access Route. The Contractor shall stake out the Replication Area boundaries and the intended access route and set grade stakes for approval by the Wetland Specialist and Engineer. The Town of Sudbury Conservation Coordinator shall be invited to attend the site walk. Following staking and demarcation of areas, the Engineer and Wetland Specialist shall approve or modify as necessary the limits of work, the access route, final location and configuration of replication, grade stake elevations, proposed location of sediment barriers, and review proposed construction methods.

As part of the delineation and approval process, the Wetland Specialist shall mark trees to be converted to snags, select coarse woody debris to be retained for re-use, and select rocks or other elements to be used for habitat features.

Invasive Plants: As part of the initial site walk, the wetland to be impacted and the proposed replication site shall be inspected for the presence of invasive plants. If invasive plants are found they shall be addressed as described herein under Invasive Plants.

SOIL WORK

Final grades in the Replication Area shall meet the target elevations as shown on the Plans or as adjusted by the Wetland Specialist to achieve the desired hydrology and micro-habitat. If adjustments are required, a Request for Information (RFI) shall be submitted to the Engineer for approval. Adjustments shall be documented and included in the As-Built plans (if required) and/or other applicable required documents.

Excavation & Grading

When required by permits, the Wetland Specialist shall notify MADEP and the ACOE (as applicable) at least 72 hours prior to excavation.

Soil in the proposed wetland areas that must be removed for grades to conform to the proposed elevations shall be stripped and disposed of, or, if suitable for reuse, be stockpiled in an approved location. Stockpiled soils shall be kept wet and not allowed to dry out. Procedures for maintaining appropriate moisture levels shall be documented by the Wetland Specialist and provided to the Engineer and the Contractor.

Replication area shall be excavated as shown on the drawings. Where replication area is adjacent to existing reference wetland, finish grade of replication shall generally match existing grades and micro-topography, notwithstanding any deviations that are necessary to achieve the desired hydrology and habitat in the Replication Area.

Prior to placement of backfill, scarify subgrade to a depth of 4 to 6 inches.

Placement of Wetland Soil

Following excavation, scarification, and grading of sub-grade, and after the sub-grade elevations are approved by the Wetland Specialist, suitable soil previously removed or an evenly mixed organic/mineral soil created on-site shall be spread to the design depth and thickness over the proposed wetland areas as shown on the plans and as directed by the Wetland Specialist.

Vehicles used to transport soil from offsite shall be washed or cleaned with air pressure to prevent exotic or invasive seeds or root fragments from contaminating the Replication Area.

Final Grading

The finished grade of the Replication Area shall be at an elevation that will provide an unrestricted hydrologic connection between the Replication Area and adjacent resource areas. The hydrologic connection should be in keeping with restoring the intended function of the replacement wetland relative to the impacted reference wetland. The Contractor shall verify that this elevation is not at a level that could negatively alter the hydrology of an adjacent wetland. Microtopography in the form of hummocks, pits and mounds shall be as shown on the plans or as adjusted by the Wetland Specialist. Final elevations and grading of wetland soil shall be approved by the Wetland Specialist and the Engineer.

To avoid compaction once soil has been placed, no heavy equipment shall travel across placed soil and no work shall occur in wet or moist soil. Soil that is compacted due to construction activities shall be replaced with soil as specified herein and at the Contractor's expense.

Installation of Monitoring Wells in Replication Area

For a constructed Replication Area over 1,000 square feet, a representative number of monitoring wells shall be installed in locations as shown on the Plans. Monitoring wells shall include data loggers. For purposes of this specification, a data logger refers to a battery powered device that records groundwater level. Data shall be collected by the Wetland Specialist and submitted with Monitoring Reports and as required by applicable permits. Wells shall be installed immediately following completion of construction of the Wetland Replication Area. Wells shall be installed in accordance with USDA/NRCS technical report entitled: "Sprecher, S.W. 2008. Installing monitoring wells in soils (Version 1.0). National Soil Survey Center, Natural Resources Conservation Service, USDA, Lincoln, NE." or equivalent methodology approved by Engineer.

RESTORING VEGETATION

Placement of Coarse Woody Material

If specified within this Contract or if directed by the Wetland Specialist or Landscape Architect during the initial site walk, woody debris shall be placed in the Replication Area and/or adjacent upland buffer. Material shall be placed as shown on the plans or as directed following placement of wetland soil and prior to application of compost and/or seed. Woody material shall cover a minimum of 5-20 percent of the Replication Area, depending on whether it is a meadow or woodland wetland and how much wood is available from construction clearing. Where trees are cut for construction purposes, logs of a minimum length of 8 feet must comprise a minimum of 50% of the woody material left on site. Brush shall be included along with logs and stumps as directed. Woody material shall be placed in a deliberate and naturalistic manner.

Planting

Following placement of wetland soil and approval of final grade and conditions, Replication Area shall be planted. Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season shall be May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Prior to planting, the Wetland Specialist shall approve the condition of the plant material and the method of installation and shall oversee the planting work. Replication Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer or Wetland Specialist and shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the Wetland Specialist may propose substitutions relative to species, size, and quantities for review and approval by the MassDOT Landscape Architect. Upon approval by MassDOT, substitutions shall be approved by the regulating authority, if and as necessary. Provisions shall be made for a growth warranty of at least two (2) calendar years from the date of Conditional Acceptance as described below or as required by permits.

Seeding

Following placement of wetland soil and planting (if included), the Replication Area shall be seeded using one of the following methods:

- Broadcast by hand or with a hand-held spreader followed by application of straw mulch. If necessary, seed shall be lightly raked to insure good seed-to-soil contact.
- Hydro-seeded with hydro mulch per the Standard Specifications and per the manufacturer's directions.
- Hand broadcast seed with Compost Blanket pneumatically applied at the same time to ensure light cover of soil topdressing over seed.

If spring conditions are drier than usual, supplemental watering may be required. If sowing during the summer months, supplemental watering will likely be required until germination.

If required, seeding limits for different seed mixes shall be determined by the Wetland Specialist.

PLANT ESTABLISHMENT AND INVASIVE MANAGEMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to be established according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

Invasive Plants: Corrective measures shall be taken to remove or treat invasive plant species in the Replication Areas. Invasive plants shall include those listed as invasive by Massachusetts Invasive Plant Advisory Group (MIPAG) and the US Army Corp of Engineer's New England District's Compensatory Mitigation Guidance

Option 2: The strategy for chemical and/or manual removal shall be as directed by the Wetland Specialist, shall continue for the duration of the monitoring period, and shall be incidental to this item. The Town of Sudbury Conservation Coordinator shall be notified and allowed to review methodology for invasives removal.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland construction work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist demonstrating that the wetland replication construction work was done according to plans (or how modified) and meets required permit conditions. The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, the Town of Sudbury Conservation Coordinator, and regulatory representative (if required) shall assess the Replication Area and surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The final finished target elevations have been met and maintained relative to the approved plans and reference wetland. Areas that are too high or too low should be identified along with suggested corrective measures.
- Hydrology meets performance standards.
- Specified seed mix has been seeded. If inspected 30 or more days after seeding, seeded species in the wetland and adjacent upland shall show signs of good germination and healthy growth.
- Planted woody and herbaceous species meet specifications and are establishing well.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- There are no invasive plants visible in the replication area.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Replication work is not approved, MassDOT will issue a rejection letter requiring corrective actions. The Wetland Specialist shall recommend corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

REQUEST FOR CERTIFICATE OF COMPLIANCE

If required, a request for a Certificate of Compliance (Partial or Full) pursuant to the Massachusetts Wetlands Protection Act regulations shall be prepared and submitted to MassDOT within 30 days following Conditional Acceptance.

The Request for Certificate of Compliance shall include the following:

- A brief narrative of the work on company letterhead signed by the Wetland Specialist. Narrative shall be prepared as a MS Word document and shall include substantive explanation that demonstrates compliance with EACH relevant permit condition. Narrative shall note variations from the originally permitted design.
- As-built Drawings signed by the Contractor's PE registered in the Commonwealth of Massachusetts. As-built drawings shall show hydrologic conditions, status of plantings and seeding, and shall include a narrative and minimum of 4 photographs documenting site conditions. Plans should note variations from the originally permitted design.

When required, drawings shall meet the Army Corp of Engineer's New England District's Compensatory Replication Guidance, including: scale in the range of 1"=20' to 1" = 100', contours at 1' intervals, spot elevations for intermediate elevations, and polygons outlining each Replication Area, and, as applicable, plant community types. The As-built Drawings shall be provided to the Engineer electronically in Portable Document Format (PDF). If requested by the Engineer, the Drawings shall be provided in printed paper format (11" x 17" sheets, unless otherwise directed). Drawings must be scalable.

- Other documents as required.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Contractor, Wetland Specialist, the Town of Sudbury Conservation Coordinator, and regulatory representative (if required) shall assess the Replication Area. Final Acceptance will initiate the start of the Wetland Monitoring Period.

The following conditions shall be inspected and approved for acceptance and payment.

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover at least 95 percent of the Replication Area, excluding areas of open water areas or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.
- Silt fence and non-biodegradable sediment barrier materials have been removed.

If the mitigation work does not meet the above condition and is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions. Work not approved will be addressed by the Contractor at no extra cost.

Wetland Specialist shall be compensated under Item 755.75.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 95 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.

- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.35 will be paid for at the Contract unit price per Lump Sum, which price shall include all labor, materials, equipment, submittals, maintenance, all required soil, site preparation, grading, wetland seeding, planting, mulching, watering, monitoring wells, registered surveyor, as-built plans, Request for Certificate of Compliance, and all incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 60% upon Conditional Acceptance.
- 20% after receipt and acceptance of Certificate of Compliance by the Engineer and once all permit construction requirements have been met and approved.
- 20% upon Final Acceptance.

Excavation will be paid under Item 120.

Compost Blanket for seeding will be paid under Item 751.72

Sediment Control Barrier will be paid under Item 767.121

Wetland Specialist will be paid under Item 755.75

Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

ITEM 755.45**WETLAND RESTORATION****SQUARE YARD**

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

DESCRIPTION

The work under this item shall conform to the relevant provisions of Subsections 120, 751, 765, 767, and 771 of the Standard Specifications and the following:

The work under this item shall include all labor and furnishing of materials to complete the work specified herein to protect and restore existing inland wetland areas that will be temporarily impacted as shown on the drawings and as required by the Engineer.

Inland Wetland Replication work shall be as specified and compensated under that item. Tidal wetland mitigation shall be as specified under the appropriate item for tidal wetlands.

Restoration Area shall be constructed to meet the requirements of all associated permits and certifications, including relevant performance standards of the Massachusetts Wetlands Protection Act (MGL C. 131, s40), Section 401 Water Quality Certification, and Section 404, U.S. Army Corps of Engineers General Permit.

All work shall be in coordination with an approved Wetland Specialist. Wetland Specialist qualifications and requirements shall be per Item 755.75, Wetland Specialist.

SUBMITTALS – DOCUMENTS

Survey: To establish or confirm pre-construction baseline elevation of temporarily impacted area(s), a survey shall be submitted to the Engineer prior to any fill or other land disturbance.

Request for Conditional Acceptance: As specified below, a letter requesting Conditional Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Final Acceptance: As specified below, a letter requesting Final Acceptance of the work and the site conditions shall be submitted to the Engineer.

Request for Certificate of Compliance (Partial or Full): If applicable, request for a Certificate of Compliance shall be submitted to the Engineer for distribution to appropriate regulatory agencies as specified below.

Monitoring Reports: Reports shall be submitted to the Engineer as specified below. Reports shall be compensated under Item 755.76 Wetland Monitoring Reports.

ASSOCIATED ITEMS AND MATERIALS

Geotextile Fabric for Temporary Soil Protection shall be as specified under item 698.3 Geotextile Fabric for Separation.

Compost shall be in accordance with Subsection 751 and M1.06.0 Organic Soil Additives of the Standard Specifications. Compost shall not contain seeds, roots, stems, or other viable parts of invasive plants or other noxious plants. Off-site sources shall be identified and available for inspection prior to transport of material to the site to verify that they are likely to be free of invasive plant species, including all viable plant parts.

Compost Blanket shall be as specified under item 751.72.

Seed Mix

Required submittals include:

- Certificate of Materials from the supplier shall be submitted and approved 30 days prior to ordering seed. Seed species listed on the certificate shall include ecotype region (i.e., *Asclepias incarnata*, PA Ecotype).
- Seed tag from the bag of seed used shall be submitted to the Engineer at the time of seeding. Seed tag shall include ecotype region and species, guaranteed percentages of purity, weed content and germination of the seed, and the net weight. Seed tag shall match the Certificate of Materials, include the name of the supplier, and date material was sent.
- Bill of lading or a notarized Certificate of Compliance from the Supplier serving as proof of purchase shall be submitted if requested by the Engineer. Document shall include date of sale, quantity, lot number, and address of Supplier. This shall match the seed tag. Notary shall not work for either the contractor or seed supplier.

Seed mix shall be:

The seed mix for wetland restoration areas shall conform to the specification and application rate in Item 765.554 Wetland Basin Mix.

Fertilizers shall not be used.

Straw mulch or hydromulch shall be per Section M6 of the Standard Specifications.

Plants

Plant material shall conform to the applicable requirements of Subsection 771, PLANTING TREES, SHRUBS AND GROUND COVER, of the Standard Specifications and as amended below.

Plant Certifications shall be submitted at the time of delivery and shall conform to the Standard Specifications. Plants shall be native species, not cultivars. To the extent possible, plants shall originate from the applicable EPA Level III Ecoregion. The nursery source shall certify the provenance or origin of all plants.

Plant species and sizes to be included in the Restoration Area shall be as specified on the plans.

Requests for substitutions shall be submitted in writing to the Engineer for review by the MassDOT Landscape Architect, the Town of Sudbury Conservation Coordinator and, if required, the relevant

regulatory agency at least thirty (30) days prior to planting. All proposed substitutes shall be in conformance with the requirements herein and suitable for the site conditions.

Transplanting and plant material collected from the wild is prohibited unless approved in writing by the Engineer. Plants shall be selected from certified nurseries.

Dead and failing plants shall be replaced per the requirements of Subsection 771 of the Standard Specifications.

Water

The Contractor shall provide water and all equipment required at no extra cost. Water shall be suitable for irrigation and free from ingredients harmful to plants and wildlife. Water from the adjacent water bodies or waterways shall not be utilized. It is the Contractor's responsibility to correct injury or damage due to the lack of water, too much water, or use of contaminated water.

CONSTRUCTION METHODS & SEQUENCE

Site Protection Prior to Impacts

Prior to any land work, as part of the initial site-walk, the Wetland Specialist shall photo-document the site and provide a summary report of existing conditions as outlined under Item 755.75 Wetland Specialist.

Where and as required vegetation shall be cut flush and area surveyed to establish pre-construction elevations.

Following the cutting and surveying, temporary separation fabric or timber matting shall be placed as required to protect soil and vegetation from compaction, contamination, and/or other damages. Fabric and timber mats shall be placed as specified under the respective items and the Engineer shall approval placement.

Restoration Upon Completion of Trail Construction Work

Sediment Barriers

If required for sediment control during Restoration work (i.e, tilling is required to restore soil), sediment barriers shall be installed along the downslope perimeter of the Restoration Area beginning and ending in the surrounding upland so that no disturbed soil can enter adjacent wetlands or waters. Sediment barriers shall be in place and approved by the Engineer prior to any soil disturbance. No work shall take place outside the barriers.

Removal of Fill and Grading

Fill and temporary separation fabric or mats shall be removed and disposed of as specified under the respective items.

If required, grades shall be restored to pre-construction elevations as shown in the baseline survey

or as required by the Engineer and Wetland Specialist to restore hydrologic functions. Final elevations shall be approved by the Engineer prior to soil preparation and seeding. Grading shall be incidental to this item.

Following approval of grading to elevations required, soil shall be prepared and seeded as follows.

Soil Scarification

Compacted soil shall be scarified with equipment approved by the Engineer. Upon approval of soil scarification, the area shall be seeded with Compost Blanket as specified below. Seeding shall immediately follow soil preparation.

Seeding with Compost Blanket

Application of compost blanket and seed shall be done as one application and shall not begin until the Engineer has approved the site and soil conditions. The Contractor shall notify the Engineer when raked areas are ready for inspection and application of compost blanket and seed.

Compost shall be pneumatically applied (blown on) to a depth of one half to one inch at the same time that seed is broadcast such that seed is covered by a light application of compost.

When planting occurs on projects with compost blankets and seed application, planting shall occur prior to application of compost and seed. Otherwise, compost and seed shall be re-applied to the satisfaction of the Engineer and at not cost to the contract.

Seed tags shall be submitted at time of seeding.

Planting

Planting shall conform to SECTION 771 PLANTING TREES, SHRUBS AND GROUNDCOVER of the Division I Standard Specifications and as amended below.

Planting Season is May 15-June 15 and September 1-November 1 unless otherwise specified in applicable permit conditions.

Restoration Area shall be planted in the dry. Plants shall be placed according to the planting details and within the range of target elevations and at the spacing shown on the Plans or, if spacing is not indicated on the Plans, at the direction of the Wetland Specialist or the MassDOT Landscape Architect. Unless otherwise noted on the Plans, final plant locations shall be determined on site and located with regard to expected hydrology, plant growth characteristics, habitat desired, and water protection.

Plant material shall be installed as soon as possible after delivery. Plants stored on-site prior to installation shall be stored in the shade and watered twice daily up until time of installation. Plants showing signs of stress or compromised health may be rejected by the Engineer and shall be replaced at the Contractor's expense.

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by

September 1 after spring planting or by June 1 after fall planting shall be replaced at the Contractor's expense.

Plant material shall be furnished and installed as indicated including all labor, materials, plants, equipment, incidentals, re-setting of plants (frost heaves, etc), irrigation, re-planting and clean up.

If previously approved species are not available at the time of planting, the MassDOT Landscape Architect will propose substitutions relative to species, size, and quantities. Substitutions shall then be approved by the regulating authority if necessary. Provisions shall be made for a growth warranty as described below or as required by permits.

PLANT AND SEED ESTABLISHMENT

Plants shall be watered as necessary to maintain healthy establishment. Plants that fail by September 1 after spring planting or by May 15 after fall planting shall be replaced within the immediate or next planting period and at the Contractor's expense.

Seeding that fails to establish according to the conditions of acceptance below shall be over-seeded as required by the Engineer. Washouts and channels shall be repaired and stabilized prior to overseeding. Excessive weed growth shall be pulled out by the roots or, with approval from the Engineer, cut prior to over-seeding. Soil repair and weed control are incidental to this item.

CONDITIONAL ACCEPTANCE OF WORK

Conditional Acceptance shall indicate approval of the wetland restoration work and agreement that work has been done according to plan or modified as approved.

Upon completion of construction, the Contractor shall submit a Request for Conditional Acceptance that includes a brief narrative from the Wetland Specialist (if applicable to project) demonstrating that the wetland restoration work was done according to plans (or how modified) and meets required permit conditions (if applicable). The narrative shall include, photo-documentation of pre-construction conditions as well as soil work, planting, and seeding. Seed tags shall be submitted as part of the Request for Conditional Acceptance.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, the Town of Sudbury Conservation Coordinator, and regulatory representative (if required) shall assess the Restoration Area and the surrounding areas. At a minimum, the following conditions shall be included in the narrative and reviewed as part of the on-site assessment of whether:

- The target elevations have been restored per the survey or adjusted per the Engineer. Areas that are too high or too low should be identified along with suggested corrective measures.
- Soil compaction has been mitigated.
- Soils are stabilized and there is no sediment in the wetland and no channeling of slopes.
- Hydrology meets performance standards and has been adequately restored.
- Specified seed mix has been seeded and seeded species in the wetland and adjacent upland show signs of good germination and healthy growth.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no invasive plants visible in the restored wetland area.

- Silt fence and non-biodegradable sediment barrier materials have been removed.

Upon approval that the work meets the above conditions, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Restoration work is not approved, MassDOT will issue a rejection letter requiring corrective actions. Work not approved shall be addressed by the Contractor at no extra cost.

Erosion of adjacent slopes or the flow of sediments into the wetland between Conditional and Final Acceptance shall be immediately addressed by the Contractor.

FINAL ACCEPTANCE OF WORK

Following one full growing season, the Contractor shall submit a Request for Final Acceptance. Submittal shall include a brief narrative of conditions. Upon receiving the Request, the Engineer, Wetland Specialist, the Town of Sudbury Conservatin Coordinator, and regulatory representative (if required) shall assess the Restoration Area. Final Acceptance will initiate the start of the Monitoring Period (if required).

The following conditions shall be inspected and approved for acceptance and payment:

- Hydrology is functioning as intended.
- The desired seeded species are establishing well and cover 100 percent of the restoration area, excluding areas of open water, large boulders or planned bare soil.
- No sediments have entered the wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- Planted woody and herbaceous species (if included) meet specifications and are establishing well.
- There are no visible invasive plants.

If the restoration work is not approved, MassDOT will issue a rejection letter requiring corrective action. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation. Work not approved shall be addressed by the Contractor at no extra cost.

MONITORING REPORTS FOR REGULATORY COMPLIANCE

Post wetland construction Monitoring Reports shall be completed and submitted by the Wetland Specialist as specified and compensated under Item 755.76 Wetland Monitoring Reports.

Generally, the following conditions shall be met upon each inspection:

- Hydrology is functioning as intended, relative to the preexisting condition of the restored wetland.
- Seeded species are establishing well and cover 100 percent of the area, excluding areas of open water areas or planned bare soil.
- No sediments have entered into wetland.
- Adjacent slopes are stabilized with desirable vegetation.
- All planted species (if included) are living and establishing well.
- There are no visible invasive plants.

If, at the end of the required monitoring period, the requirements have not been met and success of the wetland replication area has not been achieved as determined by the Monitoring Reports, the Contractor shall provide corrective measures. All costs associated with corrective measures and plant replacement shall be incidental to this item with no additional compensation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Item 755.45 will be paid for at the Contract unit price per Square Yard, which price shall include all labor, materials, compost and amendments, seed, mulch, equipment, submittals, maintenance, grading, and incidental costs necessary to complete the work as required.

Payment shall be as follows:

- 50% upon completion of soil preparation and seeding
- 25% upon Conditional Acceptance
- 25% upon Final Acceptance or approval of the Engineer

Excavation of temporary fill will be paid under Item 120.

Geotextile Fabric for Temporary Soil Protection will be paid under Item 698.3

Sediment Control Barrier will be paid under Item 767.121

Compost Blanket will be paid under Item 751.72

Wetland Specialist will be paid under Item 755.75

Wetland Monitoring Reports for follow-up monitoring will be paid under Item 755.76

Plants will be paid under the respective items separately.

ITEM 755.75**WETLAND SPECIALIST****HOUR**

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this Item shall be for services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications hereafter referred to as the “Wetland Specialist.”

“Wetland Mitigation” shall be used herein for applicable wetland work. For this project, applicable wetland work is for: Item 755.35 Inland Wetland Replication Area (creation of a new wetland) and/or Item 755.45 Wetland Restoration (restoration after temporary impacts).

The Wetland Specialist shall demonstrate knowledge and expertise to coordinate and oversee all work associated with the Wetland Mitigation as defined herein, as shown on the Plans, as required by permits, and as specified under the relevant Wetland Mitigation items.

Regulatory monitoring reports following Final Acceptance of the Wetland Mitigation shall be per Item 755.76, Wetland Monitoring Reports.

For all onsite work, the Wetland Specialist shall sign in and sign out with the Engineer.

The Wetland Specialist shall not be from the same company as the company responsible for planting, seeding, and/or maintaining the wetland.

QUALIFICATIONS

The Wetland Specialist shall have a minimum of five (5) years of experience with construction and monitoring of wetland mitigation areas similar in size, type, and complexity to the Contract mitigation. When required by permits, at least ten (10) years of experience may be required. The Wetland Specialist shall be thoroughly versed in the Commonwealth of Massachusetts Wetlands Protection Act (MGL C.131, s.40), U.S. Army Corps of Engineers New England District Compensatory Mitigation Guidance, and all other relevant regulations of the Massachusetts Department of Environmental Protection and the U.S. Army Corps of Engineers New England District.

SUBMITTALS - QUALIFICATION

Within sixty (60) days following the Notice to Proceed, the Contractor shall provide proof of qualifications for the Wetland Specialist to the Engineer for approval. Submittals shall include, but not be limited to, the following:

- Resume of the individual on-site implementing the Wetland Specialist work. If the Wetland Specialist changes over the course of the project, the new individual shall submit resume and qualifications for approval 30 days prior to doing any work on-site.
- Resume of any personnel working on-site in place of the Wetland Specialist. Individual shall be approved prior to work on-site.

- Narrative describing the company, its expertise, technical qualifications and experience with wetland construction.
- At least three (3) references from prior work of a similar nature completed in the last five (5) years and by the individuals who will perform the work. Provide contact information for each reference including address, phone number and email.
- A summary of each reference project including nature of the work, project size, dates, and period of construction and monitoring, methodologies used, and summary of success (or not) in terms of meeting performance objectives. Summary shall include a minimum of one before and one after photo for each project.

SUBMITTALS – DOCUMENTATION AND REPORTS

Wetland Construction Oversight

Wetland Specialist shall provide documentation of pre-existing conditions and wetland construction as specified below and as part of fulfilling the Scope of Work described below. Documentation shall include photos that are clear and legible. Photos are incidental to this item.

- ***Site Walk Prior to Disturbance and Construction of Wetlands:*** Provide brief assessment with photos, including documentation of the existing wetlands to be impacted (both permanent and temporary), proposed wetland replication area, and reference/model wetland areas (typically an adjacent undisturbed wetland or the existing wetland to be impacted). Photos of existing wetlands that will be temporarily impacted shall include a view from at least 3 angles.
- ***Excavation and Grading:*** Documentation shall include minimum of two photos of the excavated wetland and two photos after final grading prior to planting and seeding. For restoration areas, photos shall show soil preparation (i.e, tilling and grading), if applicable.
- ***Approval of Subgrades:*** The Wetland Specialist shall inspect the sub-grade of the Replication Area to ensure that proper hydrology is likely to be established and shall provide the Engineer with written confirmation and photographs upon completion of subgrade excavation work. Written confirmation shall include recommended field adjustments, based on field observations, to achieve the desired hydrology and designed wetland system.
- ***Planting and Seeding:*** Provide assessment and photos of vegetation upon completion of planting and seeding work.
- ***Data logger output from Monitoring Wells*** shall be submitted with reports, if applicable and requested.

Wetland construction documentation and reports shall be submitted with Request for Conditional Acceptance and for the Order of Conditions, Water Quality Certifications, and other regulatory permits as required. A copy of all documentation shall be sent to the Town of Sudbury Conservation Coordinator or Agent.

Requests for Acceptance of Work & Regulatory Compliance

The Wetland Specialist shall submit the following documents if and as specified herein and under Item the relevant Wetland Mitigation items:

- Request for Conditional Acceptance.
- Request for Certificate of Compliance (Partial or Full) when applicable.
- Request for Final Acceptance.

SCOPE OF WORK

In the event of discrepancies with the applicable permits, the Wetland Specialist shall submit a Request for Information (RFI) to the Engineer.

General

The Wetland Specialist shall be responsible for the following:

- Review and have a comprehensive knowledge of the environmental permits relevant to the specific mitigation work being done so as to ensure compliance throughout the duration of the contract.
- Identify and inform the Contractor and Engineer and Town of Sudbury Conservation Coordinator of unique site conditions which may require adjustments to the schedule, design, or construction methods. For example, wildlife nesting, illegal dumping, or rare species.
- Identify and inform the Contractor and Engineer and Town of Sudbury Conservation Coordinator of any sediment or erosion control problems observed within mitigation areas.
- Advise so as to avoid impacts to adjacent areas and regulated wetland resources.
- Participate in necessary meetings as required by permits and when requested by the Engineer.

Inspections & Construction Oversight

The Wetland Specialist shall be responsible for, but not limited to, the following:

- Pre-Construction Site Walk
 - Following surveying, flagging, and staking of all relevant boundaries and elevations by the Contractor, the Wetland Specialist shall walk the site with the Engineer, the Contractor, and a representative of the Town of Sudbury Conservation Commission to review existing and proposed conditions, recommend changes if necessary, and approve the following: location and boundaries of the Mitigation Area, target elevations and grades, location of tree protection associated with the Mitigation Area, and final layout and limits of clearing for access route.
 - Select and mark snags, logs, and woody material to be retained for placement in the Wetland Mitigation, as appropriate.
 - Note invasive plants in and adjacent to Wetland Mitigation.
 - Provide summary report if and as specified under Wetland Mitigation items.
- Excavation, Soil Placement, Grading for Replication Areas
 - Approve excavated depth and grading for appropriate wetland hydrology, subsoil preparation, and finished grade of placed wetland soil.

- Adjust grades as required and approve microtopography. If grades need to be adjusted, submit an RFI to the Engineer.
- If requested by the Engineer, the Wetland Specialist shall inspect stockpiled wetland soil for moisture content and signs of undesirable weeds. The Town of Sudbury Shall conservation coordinator shall be allowed to inspect any stockpiled wetland soil for approval.
- Soil Protection and Restoration Measures for Restoration Areas
 - Review and approve methods of soil protection and restoration if required.
 - Confirm decompaction will adequately restore appropriate wetland hydrology. If decompaction measures need to be adjusted, submit an RFI to the Engineer.
- Re-vegetation of Mitigation Area
 - Placement of woody material to be re-used.
 - Verify seed used complies with specifications and site conditions, determine limits for wetland seeding based on elevations, approve seeding and mulching methods, and collect seed tags to submit with Request for Conditional Acceptance.
 - Review planting methods (if applicable) prior to installation and oversee layout of wetland plants.

Conditional Acceptance

Upon completion of construction of the wetland, as part of the Request for Conditional Acceptance, the Wetland Specialist shall provide a brief narrative demonstrating that the wetland construction work was done according to plans (or how modified) and meets the conditions required for acceptance as specified under the Wetland Mitigation items. Submittal shall include a report and photo documentation of pre-construction conditions, construction work, seeding, planting, and other work as specified under the Wetland Mitigation items. Photos of completed Wetland Restoration areas shall include the same views as the pre-construction reference photos. A copy of the request shall be sent to the Town of Sudbury Conservaton Coordinator.

Upon receipt of a Request for Conditional Acceptance, the Engineer, the Wetland Specialist, the Town of Sudbury Conservation Coordinator, and a regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the Wetland Mitigation items.

Upon approval, MassDOT will issue a letter of Conditional Acceptance. If the Wetland Mitigation work is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

Request for Certificate of Compliance

If required, a Request for Certificate of Compliance shall be prepared and submitted to the Engineer immediately following Conditional Acceptance. Request shall be as specified under the relevant Wetland Mitigation items.

Request for Final Acceptance

Following one full growing season, the Wetland Specialist shall provide a brief narrative of the status of the Wetland Mitigation to be submitted with the Request for Final Acceptance. A copy of the narrative submittal shall be provided to the Town of Sudbury Conservation Coordinator.

Upon receipt of the Request, the Engineer, the Wetland Specialist, The Town of Sudbury Conservation Coordinator and a regulatory representative (if required) shall assess the Wetland Mitigation and surrounding area to ensure that it meets the conditions specified under the relevant Wetland Mitigation items.

If the Wetland Mitigation is not approved, MassDOT will issue a rejection letter requiring corrective action. The Wetland Specialist shall recommend corrective actions.

METHOD OF MEASUREMENT

Item 755.75 Wetland Specialist shall be measured per hour for on-site service provided by the Wetland Specialist.

Work shall include all inspections, photos, submittals, and associated tasks for construction and restoration oversight, narratives for Conditional and Final Acceptance, Request for Certificate of Compliance (Partial or Full) if required, documentation required for permits, and all other work specified above. Payment shall not include travel time or time spent off-site on reports. Decimal Pay Limits will be 0.25 hours.

BASIS OF PAYMENT

Item 755.75 Wetland Specialist shall be paid at the Contractor bid price for each hour, or fraction thereof, spent on-site to perform the work as described above. Reports and photo documentation are required for payment.

Post wetland construction reports shall be per Item 755.76, Wetland Monitoring Reports.

ITEM 755.76**WETLAND MONITORING REPORTS****LUMP SUM**

REV. 2022.01.01 (REV. DATE TO BE REMOVED BY MASSDOT CONTRACTS)

Work under this item shall be for the submittal of Wetland Monitoring Reports following the completion of wetland construction and shall include all inspections, photos, and other work required to complete those reports as specified herein.

“Wetland Mitigation” shall be used herein for applicable wetland work, whether Wetland Replication (creation of a new wetland) and/or Wetland Restoration (restoration after temporary impacts).

The Contractor shall retain the services of a Wetland Scientist, Wetland Ecologist, Restoration Ecologist, or other professional with similar qualifications, hereafter referred to as the “Wetland Specialist,” to complete the Wetland Monitoring reports. Wetland Specialist shall meet requirements specified under Item 755.75 Wetland Specialist.

All on-site Wetland Specialist services required to complete the construction and revegetation of the wetland replication, including preparation and submission of monitoring reports during construction, shall be per Item 755.75 Wetland Specialist.

SCOPE OF WORK**Post-Construction Wetland Monitoring Reports**

Final Acceptance of the wetland construction work as specified under item 755.35 Inland Wetland Replication and 755.45 Wetland Restoration shall initiate the beginning of the Monitoring Period.

Inspections and reports shall be performed to ensure compliance with mitigation requirements defined under the relevant Wetland Mitigation items and with all applicable environmental permits. Monitoring reports shall cover the following:

- Identification of all plant species present
- Percent cover for each plant species and overall percent surface area cover by indigenous wetland plant species for replication area and upland
- Description of the viability, health, and vigor of installed plants as well as volunteer plant species within the replication areas
- Description of remedial measures taken to ensure criteria are met
- Depth to apparent water table and/or depth of surface inundation, both as measured from the soil surface and data loggers, as appropriate.
- A conclusion regarding the success of the wetland mitigation area relative to the performance standards at 310 CMR 10.55(4)(b) (unless varied), the design plans, and performance criteria established by MADEP in the variance conditions (when applicable), and the reference wetland.
- Recommendation for a corrective plan of action if needed.

Reports shall be submitted to the Engineer as a digital copy in Portable Document Format (PDF) unless otherwise requested. An electronic copy of all reports shall be sent to the Town of Sudbury Conservation Coordinator. Hard copies shall be provided as requested by the Engineer. All reports shall be marked with the applicable permit numbers and identifying information as required in the permits. Reports shall include photo documentation of the wetland/s being monitored and shall include a minimum of 3 views from different orientations. Views shall be labeled.

Spring Reports, when required, shall be submitted to the Engineer by July 1 for dispersal to the appropriate permitting agencies.

End of Year Reports (which may serve as the Fall Report) shall be based on inspections that occur prior to October 15th. Reports shall be submitted to the Engineer no later than November 1 of each year.

Monitoring Reports shall be as follows for 2 years:

- *MassDEP: 2 Report each year - (Spring and end of year).*
- *Town of Sudbury Conservation Commission: 2 Report each year (Spring and end of year).*

BASIS OF PAYMENT AND METHOD OF MEASUREMENT

Item 755.76 Wetland Monitoring Reports and associated inspections shall be at the Contract unit price per Lump Sum and shall include all labor, materials, equipment, and all incidental costs required to complete the work. Lump Sum will be paid in equal installments of the Lump Sum divided by the number of reports submitted. Payment shall be upon submittal and acceptance of each report, based on the following schedule:

- Year 1 = 2 Report
- Year 2 = 2 Report

ITEM 756.**NPDES STORM WATER POLLUTION
PREVENTION PLAN****LUMP SUM****GENERAL**

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit.

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the U.S. Environmental Protection Agency (EPA) for coverage under the NPDES General Permit for Storm Water Discharges From Construction Activities. On July 14, 2008 (73 FR 40338), EPA issued the final NPDES Construction General Permit (CGP) for construction activity.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the U.S. EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a seven (7) day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The General Permit also requires the preparation and implementation of a Storm Water Pollution Prevention Plan (SWPPP) in accordance with the afore-mentioned statutes and regulations. The Plan will include the General Permit conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least four weeks prior to any site activities. It is the responsibility of the Contractor to be familiar with the General Permit conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to this project and to include in the Stormwater Pollution Prevention Plan the methods and means necessary to comply with applicable conditions of said permits.

ITEM 756. (Continued)

It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA Construction General Permit, provide all information required, and obtain any and all certifications as required by the Construction General Permit. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

INSPECTION

Included in the General Permit conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.5 inches in twenty-four hours. The Contractor shall choose a qualified individual who will be on-site during construction to perform these inspections. The Engineer must approve the contractor's inspector. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. The Town of Sudbury Conservation Coordinator shall be included on the distribution list for the weekly inspection forms and monthly summary reports. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the General Permit. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. Inspection of these controls is considered incidental to the applicable items. This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The Town of Sudbury Conservation Coordinator shall be included on the distribution list for the NOT.

COMPENSATION

Payment for all work under this Item shall be made at the contract unit price, lump sum, which shall include all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment of fifty (50) % of the contract price shall be made upon acceptance of the Stormwater Pollution Prevention plan. Payment of forty (40) % of the contract price shall be made in equal installments for implementation of the Stormwater Pollution Prevention plan. Payment of the final ten (10) % of the contract price shall be paid upon satisfactory submissions of a Notice of termination (NOT) when final stabilization has been achieved.

<u>ITEM 765.111</u>	<u>SEEDING - LOW UPLAND MIX</u>	<u>SQUARE YARD</u>
<u>ITEM 765.423</u>	<u>SEEDING-MID HEIGHT POLLINATOR MIX</u>	<u>SQUARE YARD</u>
<u>ITEM 765.453</u>	<u>SEEDING – WOODLAND EDGE</u>	<u>SQUARE YARD</u>
	<u>SHADE MIX</u>	
<u>ITEM 765.554</u>	<u>SEEDING - WETLAND/BASIN MIX</u>	<u>SQUARE YARD</u>

Work under these Items shall conform to the relevant provisions of Sections 765, 767, M6, and the following:

The intent of these Items is to provide both a naturalized ground cover that only requires bi- annual mowing. Unless otherwise shown on the plans or directed by the Engineer, all exposed soil areas will be provided with a grassed surface. The work shall consist of planting and establishing a stand of grass in the areas shown on the plans or as required by the Engineer. For the purposes of these specifications, the term “grass” shall apply to all the forbs, grasses, sedges, and rushes included in the materials. Project requires three different types of seed mixtures as follows and as shown on the plans:

Item 765.111 – Permanent grass seed mixture for sunny/partly shaded path shoulders and general-purpose areas. This mixture accounts for most of the loamed and seeded areas in the project limits.

Item 765.423 – Is intended to be used at the native vegetation area south of Hudson Rd where invasive plant species will be replaced with native plantings.

Item 765.453 – Is intended to be used at Pantry Brook and to revegetate the access path and work area surrounding the wetland replication area.

Item 765.554 – Is intended to be used in wetland replication and restoration areas, stormwater infiltration basins, as well as compensatory flood storage basins for which there may be seasonal flooding or during heavy/frequent rain events. The above locations are identified on the construction and/or landscape plans.

All seeding shall be done by a company having a minimum of five years of experience with native grass establishment. Prior to beginning work, the seeding Contractor shall furnish proof of qualifications to the Engineer for approval. Proof of qualifications includes, if requested, providing documentation (photos and contacts) to demonstrate knowledge and expertise with native seeding and proof of having completed successful native seeding projects.

Seeding shall be done within 48 hours of placement of loam and final grading. Mulch for seed shall be Compost Topdressing or hydromulch as specified below and shall be incidental to this item.

SEEDING SEASON

Seeding seasons shall be April 1 through May 15 and October 1 through December 1 for dormant seeding. *Seeding that occurs outside of these periods, shall be increased by 50%.*

MATERIALS

Seed

Samples and Submittals

- 1) Certificate of Materials. 60 days prior to ordering, the Contractor shall submit to the Engineer the manufacturer or supplier's notarized Certificate of Materials. This document shall not be used as proof of purchase, proof of material delivered, or proof of material seeded, but simply to verify supplier availability of seed listed on the date certified. The species listed shall match those specified on the plans or herein, however, cultivars may vary due to availability. Substantial substitutions or changes in the mix from that specified on the plans or herein shall be approved by MassDOT Landscape Design Section.
- 2) Seed Tag Certification. All seed lots have a seed analysis tag as required by State and Federal law. The contractor shall submit seed tags for each bag of seed used on the project site or ensure that each tag is photo documented by the Engineer. Number of tags shall match number of bags sent by the supplier to meet rate of Pure Live Seed specified on the plans. Tag must include: kind and variety of seed; lot number; origin of seed; net weight; % purity; germination; dormant seed; germination test date; inert matter; weed, noxious and other crop seed; and name and address of company responsible for the analysis. Seeding may be considered unacceptable for payment if no tags are submitted.
- 3) Certificate of Compliance. Prior to payment, contractor shall submit a bill of lading or a signed, dated, and notarized Certificate of Compliance from the Supplier that serves as proof of purchase. This document shall include kind and variety of seed, lot number, net weight shipped, date of sale, invoice number under which seed was purchased, and name and address of Supplier or Manufacturer. All information must be included on the notarized form, including lot number and net weight shipped for specified job. This information shall match Seed Tag Certification and quantity of seed applied on the job. Seeding may be considered unacceptable for payment if information is incomplete.
- 4) Seed Sample. Contractor may be asked, prior to seeding, to submit a seed sample for testing.

Quantities specified are Pure Live Seed (PLS). Greater quantities of ordered seed may be required to achieve actual specified seeding rates. Pure Live Seed is defined as the fraction of pure seed species within the mix that, by standard seed testing practices, will germinate. This is determined by multiplying the percent of seed purity by the percent of seed germination.

Seed mix shall be a custom blend as shown on the plans or shall be as specified below. Seed cultivars shall be those that are as regional to New England or the local ecotype as possible.

Any species substitutions shall be with a species having similar characteristics and native to New England. Substantial changes in the mix shall be approved by MassDOT Landscape Design Section.

Item 765.111 – LOW UPLAND MIX

Permanent grass seed mixture for sunny/partly shaded path shoulders and general-purpose areas shall be in accordance with Section 765 of standard specifications and Section M6.03.0 Table M6.03.0-2 for Slopes and Shoulders. This mixture accounts for most of the areas in the project limits. Species ecotype shall be as native to New England region as possible. Apply this mix at 15 lbs PLS/acre.

Item 765.423 – MID-HEIGHT POLLINATOR MIX

Permanent seed mixture for use at the native vegetation area south of Hudson Rd and as shown on plans.

	Botanical Name	Common Name	% PLS by Weight
<u>Grass</u>	Schizachyrium scoparium	Little Bluestem 'Albany Pine	46.00%
	'Albany Pine'		
	Elymus riparius	Riverbank Wild Rye	21.00%
	Andropogon gerardii NY Eco	Big Bluestem NY Eco	7.00%
	Panicum virgatum	Switch Grass	5.00%
	Agrostis perennans	Upland Bentgrass	0.20%
			79.20%
<u>Herb/Forb</u>	Echinacea purpurea	Purple Coneflower	6.00%
	Chamaecrista fasciculata	Partridge Pea	2.50%
	Linum perenne lewisii	Blue Flax	2.00%
	Coreopsis lanceolata	Lance-leaf Coreopsis	2.00%
	Penstemon digitalis	Beard-tongue	2.00%
	Desmodium canadense	Showy Tick Trefoil	1.20%
	Rudbeckia triloba	Brown Eyed Susan	0.80%
	Liatris scariosa	Northern Blazing Star	0.60%
	Rudbeckia hirta-VT ecotype	Black-eyed Susan-VT ecotype	0.50%
	Aster novae-angliae	New England Aster	0.30%
	Aster laevis NY Ecotype	Smooth Aster NY Ecotype	0.30%
	Aster lateriflorus	Calico Aster	0.30%
	Monarda fistulosa	Wild Bergamot	0.30%
	Aster pilosus	Heath Aster	0.30%
	Ratibida pinnata	Grey-head coneflower	0.30%
	Solidago nemoralis	Grey Goldenrod	0.20%
	Pycnanthemum tenuifolium	Slender Mountain Mint	0.20%
	Solidago rigida	Rigid Goldenrod	0.20%
	Solidago odora	Licorice Scented Goldenrod	0.20%
			20.40%
<u>Woody Species admixture</u>	Cornus alternifolia	Alternate-leaf dogwood	0.10%
	Corylus americana	American Hazlenut	0.10%
	Viburnum dentatum	Arrowwood	0.10%
	Viburnum lentago	Nannyberry	0.10%
			0.40%

100%**Seeding Rate:**

Apply this mix at 20 lbs PLS/acre. Add 30lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding item.

Item 765.453 – WOODLAND EDGE SHADE MIX

Permanent seed mixture for upland areas including the temp. access route and upland grading surrounding the wetland replication area and the surface of the compost top dressing at Pantry Brook Bridge and/or as specified on the plans.

Botanical Name	Common Name	% PLS by Weight
<u>Grass</u>		
Elymus virginicus	Virginia Wild Rye	35.00%
Elymus riparius	Riverbank Wild Rye	25.00%
Panicum clandestinum'Tioga'	Deer Tongue 'Tioga'	9.00%
Schizachyrium scoparium 'Albany Pine'	Little Bluestem 'Albany Pine'	5.30%
Elymus hystrix	Bottlebrush Grass	3.00%
Agrostis perennans	Upland Bentgrass	2.50%
Carex vulpinoidea	Fox Sedge	2.00%
Cinna arundinacea	Sweet Woodreed	2.00%
Carex scoparia	Broom sedge	0.20%
Juncus tenuis	Path Rush	0.20%
Juncus effusus	Soft Rush	0.10%
		<hr/> 84.3%
<u>Herb/Forb</u>		
Chamaecrista fasciculata	Partridge Pea	4.00%
Desmodium canadense	Showy Tick Trefoil	2.00%
Penstemon digitalis	Beard-tongue	2.00%
Geum canadense	White Avens	2.00%
Heliopsis helianthoides	Ox-Eye Sunflower	2.00%
Zizia aurea	Golden Alexanders	0.80%
Aster macrophyllus	Bigleaf Aster - PA Ecotype	0.40%
Anemone virginiana	Thimbleweed	0.40%
Monarda fistulosa	Wild Bergamot	0.30%
Aster divaricatus	White Wood Aster	0.20%
Aster prenanthoides	Zig Zag Aster	0.30%
Solidago caesia	Woodland Goldenrod	0.20%
Solidago odora	Licorice Scented Goldenrod	0.20%
Oenothera fruticosa var. fruticosa	Sundrops	0.20%
Solidago bicolor	White Goldenrod	0.20%
Eupatorium fistulosum	Joe Pye Weed	0.10%
		<hr/> 15.3%

<u>Woody</u>	Cornus alternifolia	Alternate-leaf dogwood	0.10%
<u>Species</u>			
<u>Admixture</u>			
	Corylus americana	American Hazlenut	0.10%
	Viburnum dentatum	Arrowwood	0.10%
	Viburnum lentago	Nannyberry	0.10%
			<hr/>
			0.40%
			<hr/>
			100%

Seeding Rate:

Apply this mix at 15 lbs PLS/acre. Add 30 lbs/acre of a cover crop. For a cover crop use either grain oats (1 Jan to 31 July) or grain rye (1 Aug to 31 Dec). Cover crop shall be incidental to seeding item.

Item 765.554 – WETLAND/BASIN MIX

Permanent seed mixture for the wetland replication area, wetland restoration areas, infiltration basin at Broadacres Farm parking lot, and swales parallel to the trail where indicated on the plans.

	<u>Botanical Name</u>	<u>Common Name</u>	<u>% PLS By Weight</u>
<u>Grass</u>			
	Elymus riparius	Riverbank Wild Rye	20.00%
	Andropogon gerardii NY Eco	Big Bluestem NY Eco	12.00%
	Carex lupulina	Hop Sedge	10.00%
	Panicum clandestinum 'Tioga'	Deer Tongue 'Tioga'	10.00%
	Carex vulpinoidea	Fox Sedge	10.00%
	Carex scoparia	Broom sedge	8.00%
	Sorghastrum nutans NY Eco	Indiangrass NY Ecotype	8.00%
	Panicum virgatum	Switch Grass	8.00%
	Juncus effusus	Soft Rush	2.00%
	Juncus tenuis	Path Rush	1.00%
			<hr/>
			89.00%
<u>Herb/Forb</u>			
	Verbena hastata	Blue Vervain	4.00%
	Desmodium canadense	Showy Tick Trefoil	2.00%
	Eupatorium maculatum	Joe-pye Weed	1.00%
	Asclepias incarnata	Swamp Milkweed	1.00%
	Aster novae-angliae	New England Aster	1.00%
	Eupatorium perfoliatum	Boneset	0.70%
	Helenium autumnale	Common Sneezeweed	0.50%
	Aster puniceus	Aster - Swamp	0.50%

Mimulus ringens	Monkey Flower	0.20%
Vernonia noveboracensis	New York Ironweed	0.10%
		<hr/>
		11.00%
		<hr/>
		100.00%

Seeding Rate:

Species ecotype shall be as native to New England region as possible. Apply this mix at 20 lbs PLS/acre.

Fertilizer

No fertilizers shall be applied.

Water

Water, including hose and all other watering equipment required for the work, shall be furnished by the Contractor to the site at no additional cost. Water shall be suitable for irrigation and free from ingredients harmful to plant life. All plants injured or work damaged due to the lack of water or the use of too much water shall be the Contractor's responsibility to correct.

Mulch

Mulch for seeding and topdressing shall be incidental to this item. Mulch shall be:

- Compost Topdressing and as specified below under Seeding and Mulching.
- OR*
- Hydromulch per the manufacturer's recommendation. Mulch for hydroseeding shall be wood fiber only.

Photo Documentation

Contractor shall submit photo documentation to the Engineer and Landscape Design Section. Each photo shall be date stamped. Photos shall be submitted after the following stages of construction:

- Soil preparation
- Seed and hydromulch/compost topdressing
- Germination
- Grass establishment after one full growing season (growing season is June-September)

CONSTRUCTION

Surface Preparation

Soil preparation and seeding shall occur only when the bed is in a friable condition, not muddy or hard. Bare soils shall be raked to remove large stiff clods, lumps, brush, roots, stumps, litter, and other

foreign matter. Ruts and depressions shall be filled with additional loam or compost and the soil shall be re-graded to a smooth and even finish corresponding to the required grades.

When seeding over existing or compacted soil, surface will be prepared by raking or tracking to a depth of 2 inches prior to seeding and prior to Compost Topdressing (when applicable).

Surface preparation shall be compensated for under Item 751. Loam Borrow.

Surface preparation shall be approved by the Engineer prior to seeding.

Seeding over Various Substrates

Loam: Seeding shall occur within 48 hours of site preparation to prevent loss of topsoil. Seeding shall be hydroseeding or broadcast as specified below.

Seeding Methods

No seeding or surface preparation work shall be done if soils are muddy or dry and compacted.

Broadcast Seeding: Seed shall be broadcast spread using a cyclone or whirlwind seeder or hand broadcast. Small or light-seeded species such as bluestem may be mixed with approved filler (e.g., sawdust, rice, kitty litter, or clean damp sand) to achieve an even distribution. Broadcast seeding shall be undertaken in two separate passes at ninety degrees to each other. One-half the seeding rate shall be applied in each direction.

To ensure seed to soil contact with broadcasting of seed, seed shall be tracked or rolled with a weighted roller.

All broadcast seeding shall be followed by hydromulching unless seeding is done as part of Compost Topdressing and as specified above.

Hydroseeding shall include hydromulch.

Hydromulching shall be per the Standard Specifications and per the manufacturer's directions.

After seeding and mulching, water seeded areas to moisten soil to a depth of at least 2 inches.

Seed and Grass Care

During Germination: Contractor shall care for seeded areas as determined necessary by the Engineer and the MassDOT Landscape Architect. Care may include irrigation and weed control as necessary for germination.

During Establishment: Following germination of seeded species, the contractor shall maintain the stand of grasses to ensure healthy growth. Work shall include mowing or weed-whacking for weed control, irrigation if necessary, and monitoring for invasive plants.

Watering shall provide uniform coverage without eroding soil or grassed surfaces. Treatment of invasive plants shall be per the direction of MassDOT Landscape Architect.

The Contractor shall provide all labor, equipment, materials, and water required for establishment. Contractor shall water all seeded areas as necessary to a depth of 2 inches or greater.

Over-seeding

If there are areas of bare ground greater than 2-3 feet in diameter, these areas shall be over-seeded with the specified mix. Over-seeding application rates and methods shall be the same as those listed above. After seeding, areas shall be mulched with straw mulch or ¼ - ½ inch Compost Topsoil and watered with a fine mist to moisten soil to a depth of at least 2 inches.

Areas that are invaded by weeds shall be mowed as low as possible and over-seeded as directed. Soil that is compacted shall be raked or roughened prior to over-seeding. Following over-seeding, soil shall be lightly tamped to ensure seed to soil contact.

Over-seeding and mulch for over-seeding shall be incidental to this item.

ESTABLISHMENT

Native upland grasses and forbs will not look like turf grass. Many of the native grasses are bunch type grasses and will not form a uniform growth or have a sod-type appearance. However, seeded area shall show general uniform growth of the seeded species throughout the area. Areas with significant gaps of bare soil, generally greater than 2-3 feet in diameter, will require over-seeding.

A well-established stand of grasses at the end of one full growing season (June-September), as determined by the Engineer and the MassDOT Landscape Architect, will be required for acceptance. At least 80-90 percent of the grass established shall be the seeded species and any invasive or aggressive weeds (mugwort, ragweed, or knapweed) shall have been cut or otherwise managed.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Items 765.111 through 765.554 will be measured for payment by the square yard after one full growing season (June-September) has elapsed between seed application and inspection and upon approval of establishment by the Engineer and the MassDOT Landscape Architect.

Item 765.111, through 765.554 will be paid for at the Contract unit price per Square Yard upon receipt of required submittals as specified above and upon approval of established stand of grass as specified above.

This price shall include seeding, rolling to ensure seed-to-soil contact, care during germination and establishment, irrigation, mulching, over-seeding, labor, materials, equipment, photo documentation, and all incidental costs required to complete the work. Site preparation, including raking, tilling, removal of debris and stones, and other work to the prepare site for seeding shall be compensated for under Item 751, Loam Borrow or, as applicable, Item 767.78 Composted Mulch Over Modified Rock Fill.

ITEM 767.7**MATTING FOR EROSION CONTROL****SQUARE YARD**

The work under these items shall conform to the relevant provisions of Section 120, 170, 280, and 767 of the Standard Specifications and the following:

This work consists of constructing temporary installations to control erosion, enhance vegetation establishment, and survivability on slopes, channels, and includes installing rolled erosion control products.

Matting for Erosion Control

Furnish a temporary rolled erosion control product with the necessary longevity and performance properties to effectively control erosion and assist in the establishment of vegetation under the anticipated immediate site conditions.

MATERIALS**Matting for Erosion Control - Erosion Control Blanket**

A temporary degradable rolled erosion control product composed of processed natural fibers mechanically or structurally bound together to form a continuous matrix to provide erosion control and facilitate vegetation establishment.

Erosion Control Blankets & Open Weave Textiles – An erosion control blanket composed of processed slow degrading natural fibers mechanically bound together between two slow degrading natural fiber nettings to form a continuous matrix or an open weave textile composed of processed slow degrading natural or yarns or twines woven into a continuous matrix.

Maximum Gradient = 1:1 (H:V)

C Factor ≥ 0.25 @ 1:1

Minimum Tensile Strength = 100 lbs/ft (1.45 kN/m)

Staples or Stakes shall be manufactured from a biodegradable material.

ITEM 767.7 (Continued)

METHOD OF CONSTRUCTION

Installation Guide for Rolled Erosion Control Products (RECPs) Including Mulch Control Erosion Control Blankets (ECBs), and Turf Reinforcement Mats (TRMs) This document is intended to provide general guidelines for the installation of RECPs and does not supersede manufacturer's guidelines. The following sections summarize the general, accepted procedures for installation of RECPs and provide basic guidance for slope and channel installations. Detailed design/installation information should be obtained from the manufacturer.

General Procedure.

Prepare a stable and firm soil surface free of rocks and other obstructions. Apply soil amendments as necessary to prepare seedbed. Place compost, water, and seed in accordance with manufacturer, or special provision requirements. Typically, RECPs are unrolled parallel to the primary direction of flow. Ensure the product maintains intimate contact with the soil surface over the entirety of the installation. Do not stretch or allow material to bridge over surface inconsistencies. Staple/stake RECPs to soil such that each staple/stake is flush with underlying soil. Install anchor trenches, seams and terminal ends as specified.

Install RECPs after application of seed, compost, mulches (if necessary) and other necessary soil amendments, unless soil in-filling of the TRM is required. For TRMs if soil in-filling, install TRM, apply seed, and other soil amendments lightly brush or rake 0.3 to 0.7 in. of topsoil into TRM matrix to fill the product thickness. If in-filling with a hydraulically-applied matrix or medium is required; install TRM, then install hydraulically-applied matrix or medium at the manufacturer's suggested application rate.

Anchor Trenches, Seams and Terminal Ends

Upslope Anchor – utilize one of the methods detailed below for initial anchoring of RECPs Staples. Install the RECPs 3 to 4 ft. beyond the shoulder of the slope onto flat final grade. Secure roll end with a single row of stakes/staples on 1 ft. centers.

Anchor trench.

Excavate a 12 in. by 12 in. anchor trench. Extend the upslope terminal end of the RECPs 3 ft. past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. terminal end of the RECPs. Fold product over compacted soil in anchor trench to overlap downslope material. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. centers.

ITEM 767.7 (Continued)

Seams

Utilize one of the methods detailed below for seaming of RECPs

Adjacent seams. Overlap edges of adjacent RECPs by 4 in. or by abutting products as defined by manufacturer. Use a sufficient number of stakes or staples to prevent seam or abutted rolls from separating.

Consecutive rolls. Shingle and overlap consecutive rolls 2 to 6 in. in the direction of flow. Secure staples through seam at 1 ft intervals.

Terminal Ends

Utilize one of the methods detailed below for all terminal ends of RECPs Staples. Install the RECPs 3 ft. beyond the end of the channel and secure end with a single row of stakes/staples on 1 ft. centers. Stakes/staples for securing RECPs to the soil are typically 6 in. long, but may be up to 12in long at terminal ends per manufacturer specifications.

Anchor trench. Excavate a 12 in. by 12 in. anchor trench. Extend the terminal end of the RECPs 3 ft. past the anchor trench. Use stakes or staples to fasten the product into the bottom of the anchor trench on 1 ft. centers. Backfill the trench and compact the soil into the anchor trench. Apply seed and any necessary soil amendments to the compacted soil and cover with remaining 1 ft. terminal end of the RECPs. Secure terminal end of RECPs with a single row of stakes or staples on 1 ft. centers.

Check Slot

Construct a stake/staple check slot along the terminal end of the RECPs by installing two rows of staggered stakes/staples 4 in. apart on 4 in. centers.

Erosion Control Blanket (Matting for Erosion Control) Installations

At the top of slope, anchor the RECPs according to the method detailed above. Securely fasten all RECPs to the soil by installing stakes/staples within the body of the blanket. Use stake/staple patterns and densities as recommended by the manufacturer. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed above. The terminal end of the RECPs installation must be anchored using the methods detailed above.

Turf Reinforcement Mat (Jute Mesh Waterway and Geotextile Fabric for Permanent Erosion Control) Installations

Construct an anchor trench at the beginning of the channel across its entire width according to above. Follow the manufacturer's installation guidelines in constructing additional anchor trenches or stake/staple check slots at intervals along the channel reach and at the terminal end of the channel, according to the above respectively. Unroll RECPs down the center of the channel in the

primary water flow direction. Securely fasten all RECPs to the soil by installing stakes/staples at a minimum rate of 1.7/yd². Significantly higher anchor rates and longer stakes/staples may be necessary in sandy, loose, or wet soils and in severe applications. For adjacent and consecutive rolls of RECPs follow seaming instructions detailed above. All terminal ends of the RECPs must be anchored using the methods detailed in above.

Ensure sufficient staples to resist uplift from hydraulics, wind, mowers, and foot traffic. Use stake/staple patterns as directed in this special provision or densities as recommended by the manufacturer if manufacturer recommendations exceed.

Repair any damaged areas immediately by restoring soil to finished grade, re-applying soil amendments and seed, and replacing the RECPs.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Matting for Erosion Control will be measured, complete in place, by the square yard.

Jute Mesh (Waterways) and Matting for Erosion Control will be paid for at the contract unit price per square yard which price shall include all labor, materials, equipment, and incidental costs required to complete the work. No separate payment will be made for fabric, compost, fertilizer, or staples/stakes, but all costs in connection therewith shall be included in the Contract unit price bid. Loam and seeding will be paid for separately under loam borrow and seeding items.

ITEM 767.78**COMPOSTED MULCH OVER MODIFIED ROCK****SQUARE YARD****GENERAL**

The purpose of this item is to provide compost mulch for mixing with seed, to be placed on designated modified rockfill slopes in areas where establishment of vegetation in the rock slope is desired. This item shall conform to the requirements of Section 767 and 765 of the Standard Specifications and the following.

MATERIALS**Composted mulch**

Composted Mulch shall be an aged organic substance meeting the requirements of M1.06.0 of the Supplemental Standard Specifications. No manure, bio-solids, kiln dried wood, or construction debris shall be allowed.

Organic matter content shall be between 20-100% (dry weight basis) as determined by ASTM D2974 (method A) Standard Test Methods for Moisture, Ash and Organic Matter of Peat and Other Organic Soils.

Moisture content shall be <15% by dry weight (<60% by wet weight) as measured by ASTM D2216 Standard Test Method for Laboratory Determination of Water Content of Soil and Rock and ASTM D2974 (cited above).

Particle size as measured by sieving shall be as follows:

Sieve Size	%Passing
2 in	100%
¾ in	70-100%
#4	30-75%
#20	20-40%

Soluble salts shall be <5.0 mmhos/cm (dS/m). The pH shall be between 5.5 and 8.0.

Seed

Seed shall be a native mix as specified under Item 765.416 Upland Shade Mix.

CONSTRUCTION METHODS

Methods of installation shall be reviewed and approved by the Engineer prior to placement of material.

Placement of compost mulch shall be as shown on the plans and as directed by the Engineer. Compost mulch material shall be applied pneumatically. Material shall be placed so that settled material is at or slightly below the surface plane of the stone. Contractor shall ensure that there will be adequate quantity, including adjustment for settlement.

Seeding shall be done at the same time as compost topsoil is being applied and shall be by broadcast method as specified under the seeding item and such that a very thin blanket of material covers the seed.

COMPENSATION

Compost Mulch for Modified Rock will be measured and paid for at the Contract unit price per Square Yard which price shall include all labor, materials, equipment, site preparation, and all incidental costs required to complete the work.

Seed shall be compensated at the bid price per the seeding item.

<u>ITEM 991.1</u>	<u>CONTROL OF WATER – STRUCTURE NO. S-31-007</u>	<u>LUMP SUM</u>
<u>ITEM 991.2</u>	<u>CONTROL OF WATER – STRUCTURE NO. S-31-013</u>	<u>LUMP SUM</u>
<u>ITEM 991.3</u>	<u>CONTROL OF WATER – PRECAST CONCRETE</u>	
	<u>CULVURT 48 x 48 INCHES</u>	<u>LUMP SUM</u>

The work to be performed under this Item shall include all pumping, sandbagging, earth, and other measures, inclusive of optional sheeting if deemed practical, necessary for sufficient water control to accomplish headwall and culvert installation, repairs, repointing, and rebuilding of the stone masonry abutments and wingwalls. Also, this Item includes all water pollution prevention including sediment control and flood prevention of the excavated areas at the structure for demolition, reconstruction, and riprap placement necessary to complete the bridge superstructure replacement.

The Work under this Item shall conform to the relevant provisions of Subsection 140 of the Standard Specifications and these Special Provisions.

The Contractor's attention is directed to the section of these Special Provisions that addresses the Contractor's obligations for Sedimentation and Erosion Control for this project.

CONSTRUCTION METHODS

As part of the work under this Item, it is the responsibility of the Contractor to determine the means and method to maintain the required channel opening for fish and water flow, dewatering techniques and sedimentation controls needed to control water and sediment for the required operations. Prior to commencing construction, the Contractor shall submit Plans showing the methods and materials he/she proposes to use for the Engineer's approval. The submittal shall include a hydraulic calculation showing the proposed methods do not result in flood impact to improvements on surrounding properties due to storm flows. The Plans and hydraulic calculations shall be prepared and stamped by a Professional Engineer registered in the Commonwealth of Massachusetts.

All work shall be performed during the low flow season, and the design submittal must consider a minimum 10 year flood elevation for the cross-section in each stage of construction (see Bridge Manual Part I 1.3.3.3E). A minimum of 1 foot of freeboard shall be provided with the 10 year flood elevation for water control purposes. The 10 year flood elevation that is indicated on the Plans is based on the particular cross-section shown for each stage of construction. Any deviation of the location of the water control system from the Plans will require a determination of a new 10 year flood elevation for the design.

The Contractor shall use such equipment and shall perform his/her operations in such a manner that boiling or other disturbances of the soil in the foundation area will be prevented. He/She shall keep the area being excavated dry by such means that water will be prevented from entering from the adjacent soils and adversely affecting the stability of the foundation material or supporting soils. In the event of high flow rates, the Contractor shall be responsible to develop and implement a reasonable means necessary to handle the additional flows to protect the surrounding area, as approved by the engineer.

All dewatering and related earthwork shall be conducted in such a manner as to prevent siltation or contamination of the waterway.

The Contractor shall provide the means of removing all sediment from water pumped from channel excavation or water entering the bridge excavation via ground water or from surface flow; this shall include the use of sedimentation basins, check dams, sedimentation fences or tanks as required in these Special Provisions under Sedimentation and Erosion Control listed below.

All temporary support of excavation that protrudes into the soil that supports the bridge structure shall be left in place. Supporting soil shall be defined as all soil directly below the footing contained within a series of planes that originate at the perimeter of the bottom of the footing and project down and away from the footing at an angle of 45 degrees from the horizontal.

Measures to control the discharge of pollutants into water resource areas shall include, but not be limited to the following:

- Rigorous management of construction operations involving potentially hazardous materials, such as, refueling and maintenance of construction equipment.
- Formulation of contingency plans to control accidental spillage from potentially hazardous materials.
- Sighting of construction staging areas outside of the buffer zones on relatively flat ground.
- Scheduling of work within the resource areas to avoid periods of high flood (e.g., spring floods) and inclement weather.
- Installation and continuous maintenance of staked hay bales and filter fences to prevent sediment migration into adjacent downstream resource areas. Placement of erosion controls shall be as shown on the plans, as specified herein, or as directed by the Engineer, so as to accomplish maximum control of project related sediment mobilization. Additional erosion control measures shall be employed as necessary to prevent erosion and sedimentation of the streambed. These measures shall be maintained for the duration of the contract.
- All discharge resulting from dewatering activities shall be directed to temporary settling tanks/basins located as necessary to control turbidity (see below). At no time shall said discharge be directly released into adjacent resource areas.

The pumping discharge shall not be allowed to enter directly into Hop Brook or Pantry Brook. The water from the work areas shall be pumped to a settling tank. The tank shall be constructed to allow for the pumped water to pass through the tank with sediments settling out before discharging to an area enclosed by hay bales. The tank can be constructed of concrete, fiberglass or any other material that will meet the following:

1. Approximately 70 percent sedimentation trapping efficiency shall be achieved with a typical tank to ensure that the tanks are adequately sized to prevent overtopping from dewatering and to provide the required filtering.
2. The outlet from the settling tank shall not cause erosion of the surrounding area. An approved method of controlling erosion, such as an erosion control blanket, stone, etc., shall be used at the outlet of the tank.

The settling tanks shall be maintained as follows:

1. Inspect at least twice daily during dewatering operations.
2. Repair any damage immediately.
3. Clean tank outlet daily. Remove any debris immediately.
4. Remove sediments when deposits reach 8 inches below the outlet invert.
5. Dispose sediments outside of wetland areas at a location approved by the Engineer.
6. The Contractor shall inspect hay bales that surround the outlet daily and shall immediately replace any that are damaged.

The approximate location of the settling tanks shall be shown on the Contractor's Plans as part of the submittal for the Engineer's approval.

Pumping shall be conducted in a manner which will not adversely affect the work within the excavation.

The Contractor shall provide and maintain ample pumps, pipes and other devices to promptly and continually remove and dispose of water from the excavation areas. The size and configuration of pumps and pipes shall be selected by the Contractor.

The Contractor is advised that the effectiveness of the water control method used will vary based on the field conditions and the time at which the actual excavation work is being performed. The Engineer has the right to order the Contractor to stop all excavation operations when in his judgment the Contractor's water control operations are failing to produce adequate results or are posing a threat to the environment.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for all water control work, including design for flood prevention of excavated areas, water pollution prevention and dewatering operation, all necessary tools, material, installation, and removal of all temporary measures necessary for the measures outlined above, shall be included in the Contract LUMP SUM Price for this Item.

Payment under this Item is a partial progressive payment of the Lump Sum Contract Bid Price of this Item and shall be made based upon the following percentages: 50% upon completion of the installation of the water control system to the satisfaction and approval of the Engineer, and 50% upon the removal and satisfactory disposal of the water control system from the project site at the completion of the work.

Appendix L

Notification to Abutters
(MassDOT exempt, Town will attach for municipal use)

Appendix M

Long-Term Operating and Maintenance Plan

MEMORANDUM

TO: Town of Sudbury

FROM: Fuss & O'Neill, Inc.

DATE: February 16, 2022

RE: Long Term Operation and Maintenance Plan
Bruce Freeman Rail Trail
Sudbury, MA

This Long Term Operation and Maintenance Plan (O&M) is for the long term operation of the Bruce Freeman Rail Trail in Sudbury, Massachusetts. This Long Term O&M Plan has been prepared in accordance with the Massachusetts Stormwater Handbook.

Property Owner and Responsible Party:
Town of Sudbury
322 Concord Road
Sudbury, MA 01776

It will be the responsibility of the Owner to comply with this Long Term Operation and Maintenance Plan. The owner is responsible for all financing, maintenance and emergency repairs. Should the property or any portion of the property be transferred to another owner, that new owner will be notified of the presence of this Long Term Operation and Maintenance Plan and be held responsible for the implementation of this plan and financing as it pertains to their property.

Operation and Maintenance Plan

The post construction operation and maintenance plan outlined hereafter provides recommendations for periodic inspection and maintenance activities for the stormwater management system. This Long-Term Operation and Maintenance Plan will ensure that the stormwater management system functions as designed throughout the life of the system.

- Paved surface of the trail will be swept twice annually, April and October, to remove debris.
- Trail shoulder areas planted with grass will be mowed twice annually.
- Drainage swales, ditches, and channels shall be inspected quarterly. This will include checking for signs of riling and gulying. Also this will include checking for the accumulation of sediments and pollutants. Sediment forebays shall be cleaned annually and when sediment depth is between 3 to 6 inches. When mowing grasses, keep the grass height no greater than six inches.
- Drainage culverts, headwalls, inlet/outlet protection, Hop Brook, and Pantry Brook Bridges shall be inspected after every major storm event for the first three months and a minimum once

a year thereafter. Pipes shall be inspected for, but not limited to, evidence of differential settlement, cracking, erosion, leakage in the embankments, tree growth on the embankments, condition of riprap, and sediment accumulation. Upper-stage, side slopes, embankments, and emergency spillways shall be mowed at least twice a year. Trash and debris shall be removed at least twice a year and accumulated sediment shall be removed at least twice a year.

- Trash receptacles will be cleared once per week. If use of an individual trash receptacle warrants, twice weekly clearings will be provided.

Snow Removal and Storage

Snow removal and storage shall be performed when needed as follows:

- Snow removal is not anticipated for the BFRT but may be incorporated assuming adherence to the following:
- De-icing chemicals or sanding shall not be used.
- Town should not remove snow on Hop Brook Bridge due to timber decking and damages that may result from equipment usage.

Location and Access of Stormwater Management System

All components of the stormwater management system are located within project site area. Access to the site will be provided at any public roadway grade crossing. Access to the trail shall not be allowed at Codjer lane .

Records of Maintenance and Repair Activities

The responsible parties shall keep records of installation, maintenance and repairs of the stormwater management facilities. These records shall be retained for the most recent five years on site and be provided to the Conservation Commission upon request. An example Operation and Maintenance Log Form is attached.

Attachments:

O&M Log Form

Operation and Maintenance Log Form

Project/Location: Bruce Freeman Rail Trail, Sudbury, MA

“As Built” Plans Available? _____

Date/Time: _____

Days since Previous Rainfall and Rainfall Amount: _____

Inspector: _____

Maintenance Item	Satisfactory	Unsatisfactory	Comments
1. Paved Areas			
• Evidence of erosion			
Action to be Taken:			
Date to be Completed by:			
2. Drainage Swales/Ditches			
• swales free of debris, litter and waste.			
• Grass height is between 3 and 6 inches.			
• Depth of sediments is less than half of the channel			
Action to be Taken:			
Date to be Completed by:			
3. Drainage Culverts & Bridges			
• Vegetation coverage adequate			
• Undesirable vegetative growth			
• Undesirable woody vegetation			
• Concrete Condition (cracking, spalling, etc0			
• Embankment in good repair			
• No evidence of erosion or Scour			
• Inlet/outlet protection is still intact (missing stones)			
• Sediment and/or trash accumulation			
• Other (specify)			
Action to be Taken:			
Date to be Completed by:			

Source: Adapted from Watershed Management Institute, Inc. 1997. *Operation, Maintenance, and Management of Stormwater Management Systems*. In cooperation with U.S. Environmental Protection Agency, Office of Water. Washington, D.C.